Honeywell

SYSTEM DESCRIPTION, INSTALLATION,
AND MAINTENANCE MANUAL
MCS-4000/7000

TEMPORARY REVISION NO. 23-2

TO HOLDERS OF MCS-4000/7000 MULTI-CHANNEL SATCOM SYSTEM SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL 23-20-27, REVISION 2, DATED 5 FEB 2008.

INSERT THIS PAGE AS THE FIRST PAGE OF THE MANUAL.

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UP86308

TEMPORARY REVISION NO. 23-1

TO HOLDERS OF MCS-4000/7000 MULTI-CHANNEL SATCOM SYSTEM SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL 23-20-27, REVISION 2, DATED 5 FEB 2008.

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Publication Number D200102000060

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TO HOLDERS OF SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL, PUB. NO. A15-5111-001, MCS 4000/7000 MULTI-CHANNEL SATCOM SYSTEM

REVISION NO. 002 DATED 5 FEB 2008

This revision replaces some data in the manual. All changed pages have a new date, as identified in the List of Effective Pages. Revision bars identify the changed data. An "R" adjacent to the Fig./Item column identifies changes in the Detailed Parts List.

Put the changed pages in the manual and remove and discard all replaced pages. Write the revision number, revision date, and replacement date on the Record of Revisions page.

Insert Page	Description of Change
T-1 thru T-4	Changed to show the revision date. Expanded the proprietary notice. Changed the publication number from A15-5111-001 to D200102000060. Added the export control code.
LEP-1 thru LEP-8	Changed to show the changed pages in manual.
---	Removed the Business Reply Card (User Registration Card), Customer Response form, and Report of Possible Data Error form because this data is available on the Honeywell Online Technical Publications Web site. The location of the Web site is included in the INTRODUCTION.
TC-1 thru TC-14	Changed to include Appendix D in the TESTING/FAULT ISOLATION section.
INTRO-1 thru INTRO-10	Replaced all pages of the INTRODUCTION. Revision bars are not used in the INTRODUCTION to show these changes. Removed the Proprietary Notice and Export Notice data. Added a Customer Support paragraph. Changed the sequence of the INTRODUCTION data. Changed References, Verification Data, and Acronyms and Abbreviations data.
1-12, 1-14	Corrected references to Figure 1-6 and Figure 1-7.
6-1	Added statement in paragraph 1.A (1) to reference Appendix D system fault codes.
C-8	Corrected reference to Table C-1.
D-1 thru D-146	Added system fault codes as Appendix D.
INDEX-3	Added an index entry for fault codes.

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System Description, Installation, and Maintenance Manual

MCS-4000/7000 Multi-Channel SATCOM System

UP86308

Publication Number D200102000060, Revision 002 Revised 5 Feb 2008
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Revision Number	Revision Date	Date Put In Manual	By	Revision Number	Revision Date	Date Put In Manual	By
1	30 Aug 2002	30 Aug 2002	H				
2	5 Feb 2008	5 Feb 2008	H				

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RECORD OF TEMPORARY REVISIONS

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23-1	30 OCT 2017		30 OCT 2017	H		
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* The initial H in this column shows Honeywell has done this task.

** Temporary revisions are incorporated in the manual by normal revision.

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INTRODUCTION

1. How to Use this Manual

A. General

(1) The purpose of this manual is to help you install, operate, maintain, and troubleshoot the MCS-4000/7000 Multi-Channel SATCOM System. Common system maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

(2) This manual gives general system description and installation information for the MCS-4000/7000 Multi-Channel SATCOM System. It also gives block diagram and interconnect information to permit a general understanding of the system interface.

(3) Warnings, cautions, and notes in this manual give the data that follows:

- A WARNING gives a condition that, if you do not obey, can cause injury or death.
- A CAUTION gives a condition that, if you do not obey, can cause damage to the equipment.
- A NOTE gives data to make the work easier or gives direction to go to a procedure.

(4) Warnings and cautions go before the applicable paragraph or step. Notes follow the applicable paragraph or step.

(5) All personnel who operate equipment and do the specified maintenance must know and obey the safety precautions.

B. Symbols

(1) The symbols in Figure Intro-1 identify ESDS and moisture sensitive devices in this manual, if applicable.

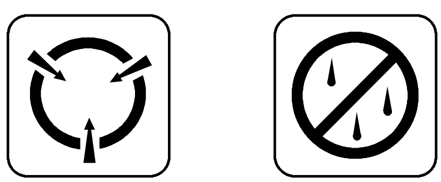

Figure Intro-1. Symbols

C. Weights and Measurements

(1) All weights and measurements are in U.S. and SI (metric) values.

2. Customer Support

A. Honeywell Aerospace Online Technical Publications Web Site

(1) If you have access to the Internet, go to the Honeywell Online Technical Publications web site at http://portal.honeywell.com/wps/portal/aero to:

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- Make sure that you get the next revision of this manual.

3. References

A. Honeywell Publications

(1) The list that follows identifies Honeywell publications that are related to this manual:

- ATA No. 23-20-03 (Pub. No. A32-5111-008), HP-600 High Power Amplifier Component Maintenance Manual
- ATA No. 23-20-25 (Pub No. A09-5111-025), HP-700 Watt High Power Amplifier Component Maintenance Manual
- ATA No. 23-20-26 (Pub. No. A09-5111-026), SD-700 Satellite Data Unit Component Maintenance Manual
- Pub. No. A09-1100-001, Handling, Storage, and Shipping Procedures for Honeywell Avionics Equipment Instruction Manual

B. Other Publications

(1) These publications are standard references:

- The United States Government Printing Office (GPO) Style Manual 2000 (available at http://www.gpoaccess.gov/stylemanual/browse.html)

- ANSI/IEEE Std 260 (1978), Standard Letter Symbols for Units of Measurement (available from the American National Standards Institute, New York, NY)
- ASME Y14.38-1999 (Formerly ASME Y1.1-1989), Abbreviations for Use on Drawings and in Text (available from the American National Standards Institute, New York, NY)
- ANSI/IEEE Std 315-1975 (Replaces ANSI Y32.2-1975), Graphic Symbols for Electrical and Electronics Diagrams (available from the American National Standards Institute, New York, NY)
- ANSI/IEEE Std 91 (1984), Graphic Symbols for Logic Functions (available from the American National Standards Institute, New York, NY).

4. Acronyms and Abbreviations

A. General

(1) Refer to the list that follows for acronyms and abbreviations in this manual.

List of Acronyms and Abbreviations

Term	Full Term
AAC	Aeronautical Administrative Communications
ACARS	Aircraft Communications Addressing and Reporting System
ACP	audio control panel
ACU	antenna control unit
ADL	airborne data loader
ADS	automatic dependent surveillance
APC	Aeronautical passenger communications
AES	aircraft earth station
AFIS	aircraft flight information system
AMS	audio management system
AMU	audio managment unit
AOC	Aeronautical Operational Control
AOR-E	Atlantic Ocean Region-East
AOR-W	Atlantic Ocean Region-West
APBX	analog private branch exchange
APC	Aeronautical passenger communications
APHONE	analog telephone
APOS	actual power out status
ARINC	Aeronautical Radio, Inc.

List of Acronyms and Abbreviations (cont)

Term	Full Term
ATA	Air Transport Association
ATC	air traffic control
ATS	air traffic services
BIT	built-in test
BITE	built-in test equipment
BSU	beam steering unit
CAIMS	central aircraft information and maintenance system
CCA	circuit card assembly
CCS	cabin communications system
CF/M	cubic feet per minute
CFDIU	centralized fault display interface unit
CFDS	central fault display system
CGU	communications gateway unit
CLR	clear
CM	continuous monitoring
CMC	central maintenance computer
CMT	commissioning and maintenance terminal
CMU	communications management unit
CPDF	cabin packet data function
CRC	cyclic redundancy check
CTM	cabin telecommunications
CTU	cabin telecommunications unit
D/LNA	diplexer/low noise amplifier
DEL	delete
DIP	dual in-line packaging
DIU	data interface unit
DTE	data terminal equipment
DTMF	dual tone multifrequency
ECS	electronic cable specialists
EIRP	effective isotopic radiated power

List of Acronyms and Abbreviations (cont)

Term	Full Term
FAX	facsimile
FMC	flight management computer
FWP	fault warning processor
GES	ground earth station
GMT	Greenwich Mean Time
GSDB	GES-specific data broadcast
GSPD	groundspeed
HGA	high gain antenna
HMN	Honeywell Material Number
HPA	high power amplifier
HPR	high power relay
I/O	input/output
ICAO	International Civil Aviation Organization
ID	identification
IGA	intermediate gain antenna
INMARSAT	International Maritime Satellite Organization
INS	inertial navigation system
IOR	Indian Ocean Region
IPC	illustrated parts catalog
IRS	inertial reference system
ISO	International Standards Organization
ISU	initial signal unit
ITU	International Telecommunications Union
LED	light emitting diode
LGA	low gain antenna
LRU	line replaceable unit
LS	line select
MAR	maintenance activity record
MCDU	multifunction control display unit
MCS	MCS-4000/7000 Multi-Channel SATCOM

List of Acronyms and Abbreviations (cont)

Term	Full Term
MCU	modular concept unit
MEL	minimum equipment list
MTBF	mean-time-between-failure
MU	management unit
NVM	non-volatile memory
OCXO	oven controlled crystal oscillator
OEM	Original Equipment Manufacturer
OMS	onboard maintenance system
ORT	owner requirements table
PABX	private automatic branch exchange
PAST	person-activated self-test
PDL	portable data loader
PF	power factor
PLO	phase-locked oscillator
PMAT	portable maintenance access terminal
POC	power-on counter
POR	Pacific Ocean Region
POST	power-on self-test
PROM	programmable read-only memory
PSTN	Public Switched Telephone Network
PSU	power supply unit
PTT	push-to-talk
RFM	radio frequency module
RFU	radio frequency unit
RFUIA	radio frequency unit interface adapter
RTC	real-time clock
RTCA	radio technical commission for aeronautics
SAL	system address label
SCDU	SATCOM control and display unit
SCPC	single channel per carrier

List of Acronyms and Abbreviations (cont)

Term	Full Term
SCU	signal conditioning unit
SDI	source destination identifier
SDU	satellite data unit
SITA	Satellite Aircom
SMT	surface mount technology
SRU	shop replaceable unit
SSM	sign-status matrix
TDM	time division multiplex
TDMA	time division multiple access
TIF	terminal interface function
TOTC	total on-time clock
TSPO	time since power-on
TTCM	triple transcoder modem
UTC	universal time coordinated
VCM	voice codec module
VSWR	voltage standing wave ratio
XTB	cross-talk bus

5. Maximum Permissible Exposure Level

A. General

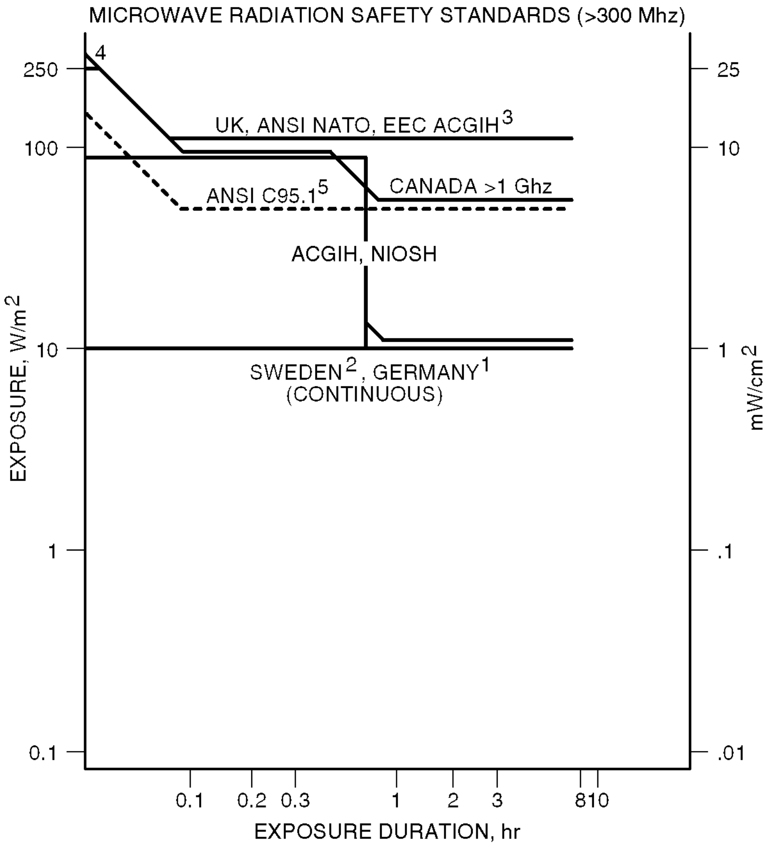
(1) The radio frequency energy generated by the MCS system may be hazardous to personal health. To eliminate the potential danger, Honeywell recommends that operators of the MCS system implement safety procedures.

(2) When the MCS system is in operation, personnel should remain at a distance from the antenna that is greater than the maximum permissible exposure level (MPEL) radius. Because there are many possible antenna locations, antenna gains, and system output powers, it is the responsibility of the operator to ascertain the MPEL radius for their MCS system configuration and train their personnel in safe ground procedures. The following warnings state Honeywell's MPEL recommendations for both high and low gain antennas.

WARNING: TO AVOID POTENTIALLY DANGEROUS EXPOSURE TO RADIO FREQUENCY ENERGY ABOVE THE ANSI C95.1 LIMIT AND OTHER WORLD STANDARDS (SEE FIGURE INTRO-2) WHEN USING A HIGH GAIN ANTENNA (12 dB NOMINAL ANTENNA), DO NOT OPERATE THE MCS SYSTEM WHEN ANY PERSONNEL ARE WITHIN 8.5 FEET OF THE ANTENNA OR WITHIN 20 FEET OF THE ANTENNA FOR PERIODS OF LONGER THAN 3 MINUTES PER HOUR.

WARNING: TO AVOID POTENTIALLY DANGEROUS EXPOSURE TO RADIO FREQUENCY ENERGY ABOVE THE ANSI C95.1 LIMIT AND OTHER WORLD STANDARDS (SEE FIGURE INTRO-2) WHEN USING AN INTERMEDIATE GAIN ANTENNA (6 dB NOMINAL ANTENNA), DO NOT OPERATE THE MCS SYSTEM WHEN ANY PERSONNEL ARE WITHIN 3 FEET OF THE ANTENNA OR WITHIN 6 FEET OF THE ANTENNA FOR PERIODS OF LONGER THAN 3 MINUTES PER HOUR.

WARNING: TO AVOID POTENTIALLY DANGEROUS EXPOSURE TO RADIO FREQUENCY ENERGY ABOVE THE ANSI C95.1 LIMIT AND OTHER WORLD STANDARDS (SEE FIGURE INTRO-2) WHEN USING A LOW GAIN ANTENNA (0 dB NOMINAL ANTENNA), DO NOT OPERATE THE MCS SYSTEM WHEN ANY PERSONNEL ARE WITHIN 1.5 FEET OF THE ANTENNA OR WITHIN 3 FEET OF THE ANTENNA FOR PERIODS OF LONGER THAN 3 MINUTES PER HOUR.



COMPARISON OF WHOLE-BODY EXPOSURE STANDARDS FOR NON-IONIZING RADIATION

NOTES:
1. VDE 0866/DIN 57 866, FIRST EDITION 215, AMENDMENT NO. 1.
2. SHORT TERM POWER DENSITY MUST NOT EXCEED 25 mW/cm^2.
3. USA (ACGIH) 8 hr LIMIT 10mW/cm^2, 10 min/hr LIMIT 25mW/cm^2.
4. UK, USA (ANSI), EEC LIMIT 2 min IN ANY 0-1 hr PERIOD.
5. USED FOR MPEL.

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Figure Intro-2. Radio Frequency Energy Levels

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SECTION 1
SYSTEM DESCRIPTION

1. Overview

A. General

(1) The MCS-4000/7000 Multi-Channel SATCOM (MCS) system is a mobile avionics communications system that supplies continuous worldwide voice and data communications services to and from the aircraft through satellite. The MCS system interfaces at baseband with various avionics data equipment, as well as with crew and passenger voice equipment on–board the aircraft. It interfaces with the antenna subsystem through L-band RF signals that emanate from (and are received by) satellites in geostationary orbit. These satellites then convey the information to and from ground stations that interface with the terrestrial telephone network.

(2) The MCS system augments and/or supersedes the present high frequency transceiver by supplying higher quality voice service and by supplying data services at higher bit rates needed by some future datalink (ATN) applications, such as automatic dependent surveillance (ADS) and an international aircraft communications addressing and reporting system (ACARS). Additional services include cockpit communications with administrative and operational personnel and with governmental bodies such as air traffic services (ATS). The system is designed to ensure that communications for safety and regularity of flight are not delayed by the transmission and reception of other types of messages.

(3) The MCS-4000/7000 system supports seven communication channels capable of simultaneous full duplex voice communications and one channel of data communications. The MCS-4000 system operates identically to the MCS-7000 except four communication channels rather than seven are supplied. Both the MCS-7000 and MCS-4000 SATCOM systems supply one channel of data communications. The MCS system accommodates the four categories of communications:

- Air traffic control (ATC)
- Aeronautical operational control (AOC)
- Aeronautical administrative communications (AAC)
- Aeronautical passenger communications (APC).

(4) The four communication categories are recognized by the International Civil Aviation Organization (ICAO) and the International Telecommunications Union (ITU), and have been assigned priorities for communications purposes.

(5) The total aviation satellite communications system, shown in Figure 1-1, is made up of the following:

- Aircraft earth station (airborne avionics subsystems and antenna subsystem)
- Space segment (satellite network)
- Ground earth stations
- Terrestrial data and voice networks.

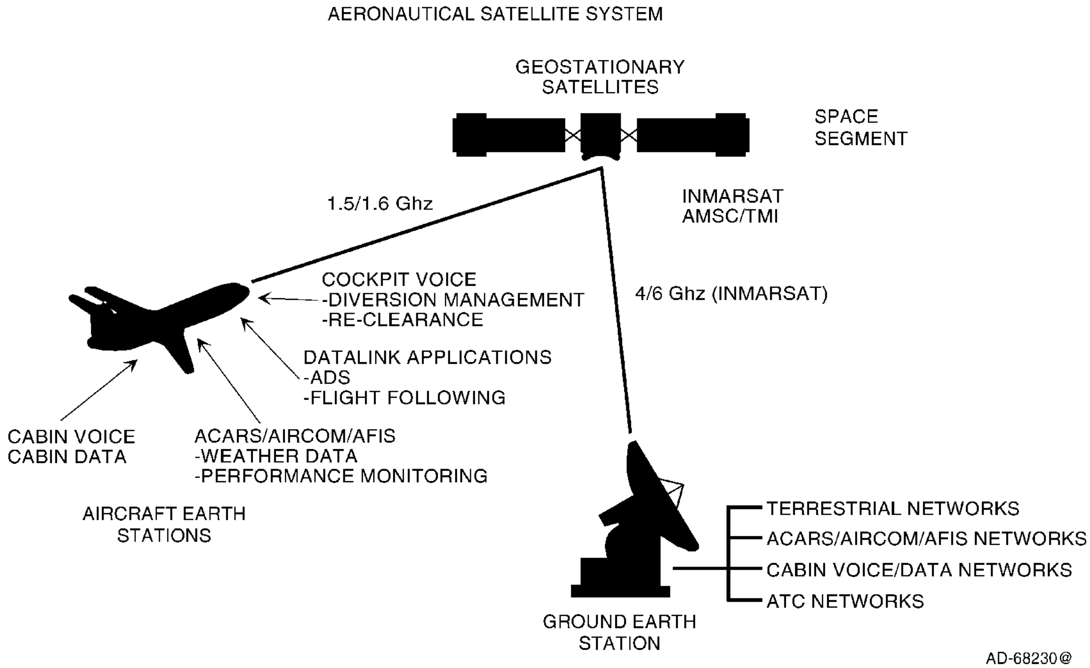


Figure 1-1. Aviation Satellite Communications System

B. Aircraft Earth Station

(1) General

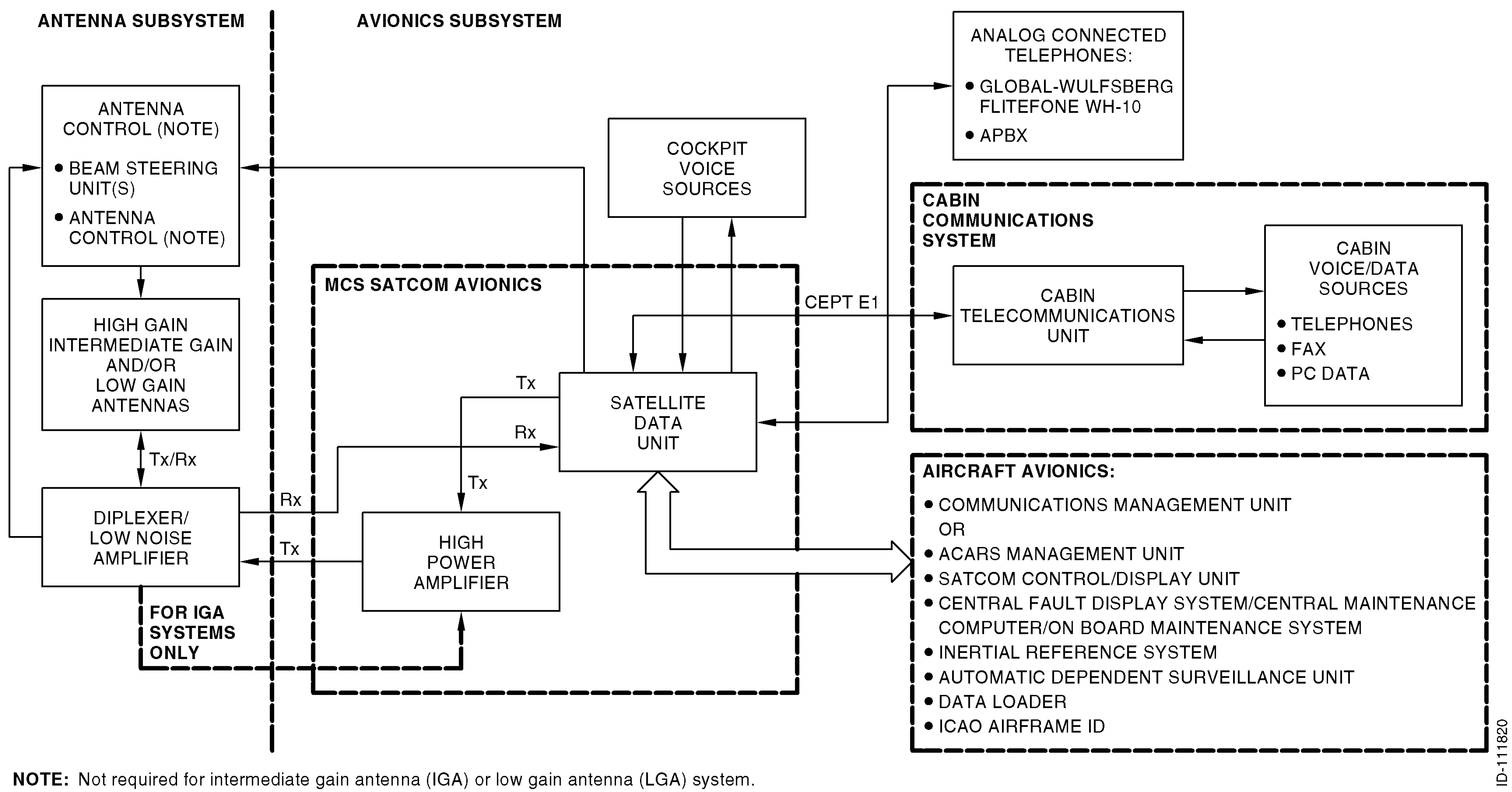
(a) The aircraft earth station (AES) is fully compliant with requirements of Aeronautical Radio, Inc (ARINC) Characteristics 741/761. Standard interfaces between the MCS avionics and other aircraft avionics enable the AES to accept data and voice messages from various sources, encode and modulate this information onto appropriate RF carrier frequencies, and transmit these carriers to the space segment for relay to a ground earth station (GES). The AES also receives RF signals from a GES through the satellite, demodulates these signals, performs the necessary decoding of the encoded messages, and outputs the data or voice message for use by either the pilot, copilot,or the passengers.

(2) AES Components

(a) General

1 A block diagram of the AES is shown in Figure 1-2. The AES is made up of the following components:

- MCS avionics
- Antenna subsystem
- Cabin communications services
- Analog connected telephones
- Cockpit voice sources
- Aircraft avionics.



NOTE: Not required for intermediate gain antenna (IGA) or low gain antenna (LGA) system.

Figure 1-2. Aircraft Earth Station Block Diagram

(b) MCS Avionics

1 The MCS avionics are made up of the satellite data unit (SDU) and high power amplifier (HPA). The SDU supplies the interface to all aircraft avionics, and implements all functionality associated with modulation/demodulation, error correction, channel rate/frequency selection, and RF translation for seven communication channels. The SDU supports seven communication channels capable of simultaneous full duplex voice and data communication services. The SDU manages the RF link protocols on the satellite side and supplies the system interface with communications management avionics. The SDU interface to other aircraft avionics involves the exchange of ARINC 429 and discrete data.

2 A cockpit audio system conveys cockpit voice to and from the SDU. Messages requiring cockpit action or initiation appear on the multifunction control display unit (MCDU) and/or other cockpit annunciators. The communications management unit (CMU) or equivalent routes packet data messages to and from the SDU. Cabin communications use either a cabin communications system (CCS) or an analog equivalent (cabin unit) to supply voice telephony communication. Enhancements supply facsimile (FAX) service and secure voice and personal computer modem interfaces.

3 The SDU supplies all essential services required to accommodate effective air/ground communications through satellite using the antenna and related RF components. Both the 40 Watt and 20 Watt HPAs supply linear power amplification to boost the RF signals up to the power levels required for transmitting to the satellite. In addition, the 20 Watt HPA (used primarily for the intermediate gain antenna) supports a beam steering function which converts tracking and pointing coordinates from the SDU into signals needed to select the desired (beam) direction towards the satellite.

4 Two additional LRUs may be required for some aircraft configurations:

- Radio frequency unit interface adapter (RFUIA)
- Signal conditioning unit (SCU).

5 The RFUIA is used in place of the radio frequency unit (RFU) in the MCS-7000 system.

6 The SCU is used in MCS installations on older generation aircraft having an inertial navigation system (INS) that does not output navigation data in an ARINC 429 high speed format which is consistent with the ARINC 704 characteristic.

(c) Antenna Subsystem

1 The primary function of the antenna subsystem is to complete the communication link between the GES, the space segment, and the AES. The diplexer is a three-port RF device (antenna, transmit, and receive), which supplies signal routing and filtering functions. Signals in the receive band are routed from the antenna port to the receive port, and transmit signals are routed from the transmit port to the antenna port. The low noise amplifier establishes the noise floor of the communication system by boosting the signals and noise received from the antenna to a level much greater than the noise level of subsequent components in the receive path.

2 The high gain antenna (HGA) and intermediate gain antenna (IGA) transmit L-band RF signals from the HPA to a satellite, and receive L-band RF signals from a satellite for the SDU. The low gain antenna (LGA) supplies backup communications (packet data only) for the high gain antenna or intermediate gain antenna by supplying low rate packet data communication services.

3 The beam steering unit used in the HGA system converts tracking and pointing coordinates (aircraft relative azimuth and elevation) from the SDU into signals needed to select the antenna array elements in combinations that point the antenna beam in the desired direction towards the satellite. An antenna control unit (ACU) is required for mechanically steered antenna arrays. The antenna control unit translates digitized beam position data and beam position change commands from the SDU into a format needed to position the antenna beam in the desired direction toward the satellite. A beam steering function is incorporated into the 20 Watt HPA for use with the IGA.

(d) Cabin Communications System (CCS)

1 The CCS, in conjunction with the MCS avionics and a worldwide network of ground stations, supplies cabin services such as telephone, facsimile, and other communication interfaces. The CCS is partitioned into two sections: the cabin telecommunications unit (CTU) and cabin/passenger communications equipment (digitally connected telephones).

2 The CTU performs onboard private automatic branch exchange (PABX) telephony functions letting the digitally connected telephones make the best use of resources supplied by the MCS avionics. The CTU supplies the interface between the digitally connected phones and the SDU. A specialized interface conversion function supplies compatibility between the ARINC 746 CTU and the ARINC 741/761 SDU. This interface is made up of a high-speed (CEPT-E1) serial bus pair that accommodates up to 32 digitized voice channels along with status and control information.

3 The digitally connected phones (handsets) are primarily supplied for passenger use and can be located throughout the aircraft. The digital handsets interface indirectly to the satellite communications equipment and are controlled by the CCS.

(e) Analog Connected Telephones

1 The SDU has provisions to support up to two simultaneous analog audio channels. Each analog channel supports two interface types: Global-Wulfsberg Flitephone WH-10 and the analog private branch exchange (APBX). The WH-10 is a stand-alone handset with a 12-button keypad. The APBX has analog trunk lines and in-line dual tone multifrequency (DTMF) signaling.

(f) Cockpit Voice Sources

1 The SDU supports headset interfaces for cockpit use only. These interfaces incorporate off-hook/on-hook signaling and dialing through the combination of a control and display unit (either [SATCOM control and display unit] SCDU or MCDU), and push-to-talk (PTT) or similar switches. When the PTT switch is pushed, a microphone audio signal is sent to the selected voice channel and a discrete signal is sent to the SDU. An audible chime and call lamps announce call connections.

(g) Aircraft Avionics

1 Standard interfaces between the MCS avionics and the other aircraft avionics include the following:

- Communications management unit (CMU), or the management unit (MU) of the Aircraft Communications Addressing and Reporting System (ACARS), where installed.
- SATCOM control and display unit (SCDU), where installed, to supply an interface to the MCS system for system log-on, GES selection, cockpit voice call setup, data loading, and to access the SATCOM maintenance pages including fault messages.
- Central fault display system (CFDS), central maintenance computer (CMC), or on-board maintenance system (OMS), where installed, for fault reporting.
- The inertial reference system (IRS), where installed, to supply the SDU with navigation coordinates for positioning the antenna platform.
- Channels are also supplied for voice and data communication with ATC to support departure clearances by datalink, as well as ADS for non radar position reporting in oceanic regions.
- There is an ARINC 615 Airborne or portable data loader (ADL or PDL) for uploading operational software and the owner requirements table (ORT). Connections are made through front and back panel connectors on the MCS avionics LRUs.
- The 24-bit ICAO address identifies the aircraft in which the SDU is installed. Address pins identified to take on the binary one state must be left open. Address pins identified to take on the binary zero state must be wired to address common on the airframe side of the connector. ARINC 429 interface options for the ICAO address are also supplied.

(3) AES Classifications

(a) Each AES is classified according to the configuration and dynamic capabilities of its aircraft avionics and antenna subsystem. An AES can be fitted with any combination of the classes of installations given in Table 1-1.

Table 1-1. Classes of Installations

Class	Description
1	A Class 1 AES installation uses a low gain antenna only and supplies low rate packet-mode data services only.
2	A Class 2 AES installation uses a high gain antenna or intermediate gain antenna, and supplies telephony and optional circuit-mode services.
3	A Class 3 AES installation uses a high gain antenna or intermediate gain antenna, and supplies telephony services, packet-mode data services, and optional circuit-mode data services.
4	A Class 4 AES installation uses a high gain antenna or intermediate gain antenna, and supplies packet-mode data services only.

(4) GES Communication Links

(a) The MCS avionics supply access to ground-based networks through the ground earth stations. Each GES supplies system synchronization and coordination through ground-to-aircraft transmissions. Four types of RF channels are defined for use with the MCS avionics as given in Table 1-2.

Table 1-2. Types of RF Channels

RF Channel	Description
P-Channel	Packet-mode time division multiplex (TDM) channel used in the forward (outbound) direction (ground-to-aircraft) to carry signaling and packet-mode data. The transmission is continuous from each GES in the satellite network.
R-Channel	Random access (slotted Aloha) channel used in the return (inbound) direction (aircraft-to-ground) to carry signaling and packet-mode data, specifically the initial signals of a transaction (typically request signals).
T-Channel	Reservation time division multiple access (TDMA) channel used in the return direction only. The receiving GES reserves time slots for transmissions requested by an AES according to message length. The sending AES transmits the messages in the reserved time slots.
C-Channel	Circuit-mode single channel per carrier (SCPC) channel used in both forward and return directions to carry digital voice or data/facsimile traffic. The use of the channel is controlled by assignment and release signaling at the start and end of each call or FAX transmission.

C. Space Segment

(1) The space segment is made up of satellites placed in geostationary orbits to supply air-ground packet-switched data services and voice communications, both of which use worldwide standardized conventions and capabilities. The satellites function as communication transponders to support L-band links to and from the aircraft, and supply links to and from ground earth stations. The space segment supplier for airline aeronautical satellite communications is the International Maritime Satellite Organization (INMARSAT), whose system supplies worldwide coverage. The four-region satellite system supplied by INMARSAT is shown in Figure 1-3.

D. Ground Earth Station

(1) Each GES has the necessary equipment to communicate with terrestrial networks and communicate through satellites with the aircraft. The ground earth stations are designed to supply the airline customer with a diverse routing of national and international voice and data communications through submarine cable, satellite, and microwave links to all destinations. Automatic traffic management systems ensure efficient routing of communications by using optimum links into public switched telephone networks (PSTN) and avoiding multiple satellite connections whenever possible.

(2) Ground earth stations are located strategically around the globe to supply redundancy and diversity in the terrestrial extension of communications. Aircraft are connected to a GES through an **in-view** satellite depending on the service preference settings encoded in the SDU ORT. Some problems may be encountered when the aircraft flies in polar regions with a latitude greater than 75 degrees.

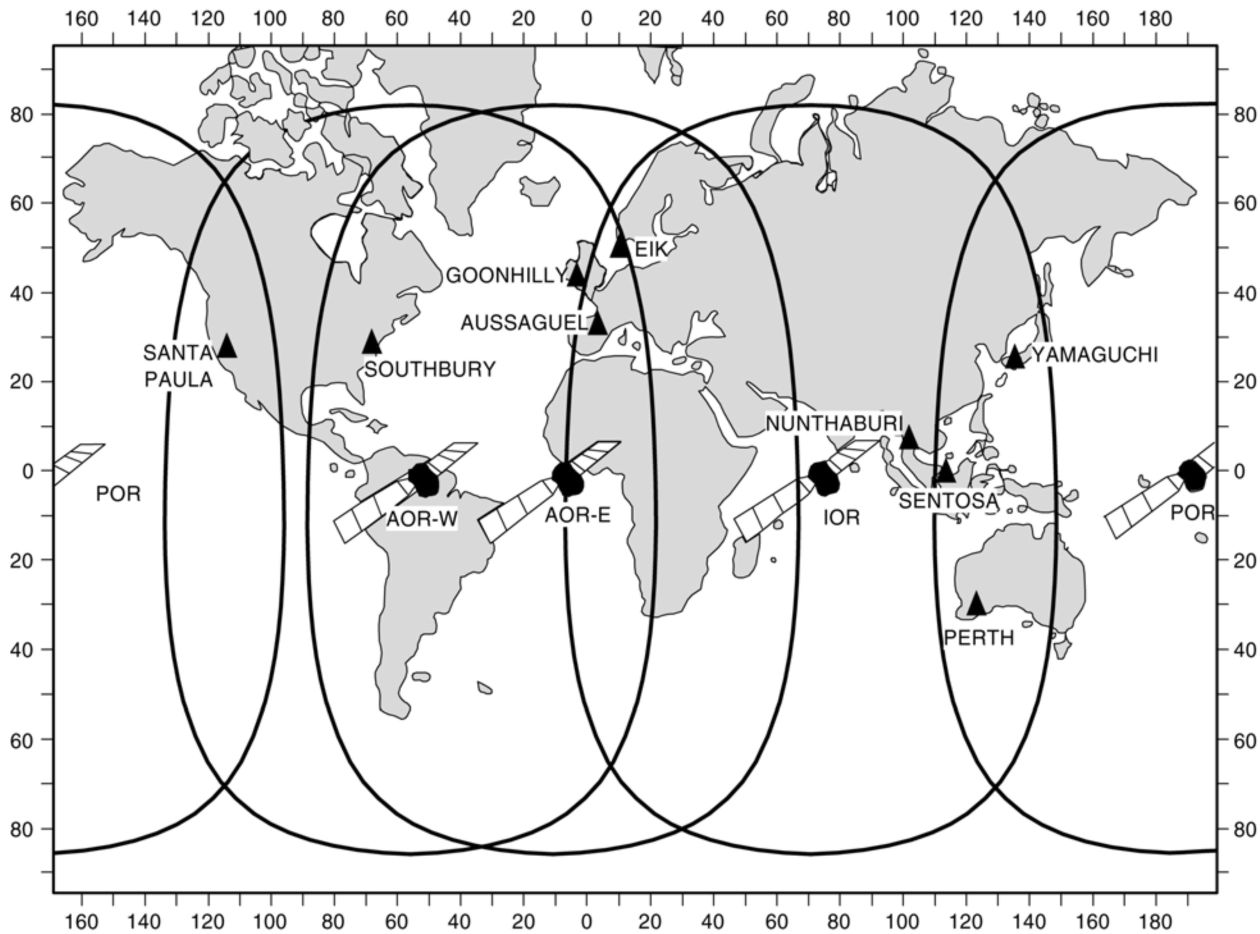
E. Terrestrial Data and Voice Networks

(1) Data and voice services available through satellites and ground earth stations include 9.6 and 4.8 kilobit/second digital voice, and packet-mode data at RF channel rates ranging from 600 bit/second up to 10.5 kilobit/second. The present worldwide complement of ground earth stations including location, operator, and coverage region are summarized in Table 1-3. Aeronautical communications through the INMARSAT satellites are transmitted to and from the terrestrial phone and data networks through these ground earth stations. The satellite regions that service these ground earth stations are shown in Figure 1-4.

Table 1-3. Ground Earth Stations

GES Name	GES ID	SAT ID	Service Provider
Goonhilly-AW	001	000 (AOR-W)	Stratos
Southbury-AW	002	000	Telenor
Eik-AW	004	000	Telenor
Aussaguel-AW	005	000	Satellite Aircom (SITA)
Goonhilly-AE	101	001 (AOR-E)	Stratos
Aussaguel-AE	103	001	SITA
Eik-AE	104	001	Telenor
Sentosa-P	201	002 (POR)	Sing-Tel
Santa Paula-P	202	002	Telenor
Yamaguchi-P	203	002	KDD
Perth-P	205	002	SITA
Eik-I	301	003 (IOR)	Telenor
Nunthaburi-I	302	003	Telenor
Perth-I	305	003	SITA
Yamaguchi-I	306	003	KDD
Sentosa-I	310	003	Sing-Tel

INMARSAT FOUR - REGION SERVICE SATELLITE COVERAGE AND GROUND EARTH STATION NETWORKS



SATELLITE	ACCESS CODE	ID	LOCATION
AOR-W	8745	00	55.5° WEST
AOR-E	8715	01	15.5° WEST
IOR	8735	03	64.5° EAST
POR	8725	02	180° EAST

AOR-W GROUND EARTH STATIONS
GOONHILLY ID 001
SOUTHBURY ID 002*
EIK ID 004*
AUSSAGUEL ID 005*

AOR-E GROUND EARTH STATIONS
GOONHILLY ID 101
AUSSAGUEL ID 103*
EIK ID 104*

POR GROUND EARTH STATIONS
SENTOSA ID 201
SANTA PAULA ID 202*
YAMAGUCHI ID 203
PERTH ID 205*

IOR GROUND EARTH STATIONS
EIK ID 301*
PERTH ID 305*
YAMAGUCHI ID 306
SENTOSA ID 310
NUNTHABURI ID 302

* SPOT BEAM CAPABLE

ID-068232

Figure 1-4. INMARSAT Four-Region Satellite Coverage

2. System Components

A. General

(1) The MCS avionics is comprised of the following components:

- Satellite data unit (SDU)
- High power amplifier (HPA).

(2) These components are compatible with ARINC Characteristic 741. Table 1-4 gives the MCS system components supplied by Honeywell. Table 1-5 gives the MCS system components not supplied by Honeywell. Table 1-6 thru Table 1-8 give system component configuration information.

Table 1-4. System Components Supplied by Honeywell

Component	Model No.	Honeywell Part No.
Satellite Data Unit	SD-700	7516118-xxyyy Figure 1-6
High Power Amplifier (40 W)	HP-600	7516250-xxyyy Figure 1-7
High Power Amplifier (20 W)	HP-700	7516251-xxyyy Figure 1-7
Diplexer/Low Noise Amplifier - Aero-I	- -	7516193-901
Intermediate Gain Antenna	- -	7516194-901
Radio Frequency Unit Interface Adapter (RFUIA) [1.]	- -	7516222-901

NOTES:

1. The five digit dash number (xxyyy) corresponds to the hardware/software version of the unit where the first two digits correspond to the hardware version and the last three digits correspond to the software version.
2. The RFUIA is installed with the 115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data), or 28 V dc.

Table 1-5. System Components Not Supplied by Honeywell

Component	Comments
SDU Installation Equipment (See Note)	ARINC 600 6-MCU tray, cables, connectors, assemblies, mounting hardware, and kits
HPA (40 W) Installation Equipment (See Note)	ARINC 600 8-MCU tray, cables, connectors, assemblies, mounting hardware, and kits
HPA (20 W) Installation Equipment (See Note)	ARINC 600 4-MCU tray, cables, connectors, assemblies, mounting hardware, and kits
Signal Conditioning Unit (SCU)	RACAL Part No. 56047-010XX

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INSERT PAGE 2 OF 3 FACING PAGE 1-13.

Reason: To add PN 7516118-77010 and PN 7516118-74010, and to change description for PNs 75166118-27020 and -24020 in Table 1-6.

Table 1-6 is changed as follows:

Table 1-6. SDU Configurations

SDU Part Number	Description
7516118-27010	115 V ac/400 Hz, 7-channel SOU (6 voice, 1 data)
7516118-77010	115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data), Digital RFM
7516118-57010	+28 V dc, 7- channel SOU (6 voice, 1 data)
7516118-24010	115 V ac/400 Hz, 4-channel SOU (3 voice, 1 data)
7516118-74010	115 V ac/400 Hz, 4-channel SDU (3 voice, 1 data), Digital RFM
7516118-54010	+28 V dc, 4- channel SOU (3 voice, 1 data)
7516118-27020	115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data) for Airbus applications, (HW MOD J contains Digital RFM)
7516118-24020	115 V ac/400 Hz, 4-channel SDU (6 voice, 1 data) for EPIC applications, (HW MOD J contains Digital RFM)
7516118-27011	115 V ac/400 Hz, 7-channel SOU (6 voice, 1 data) for EPIC applications
7516118-57011	+28 V dc, 7-channel SOU (6 voice, 1 data) for EPIC applications
7516118-24011	115 V ac/400 Hz, 4-channel SOU (3 voice, 1 data) for EPIC applications
7516118-54011	+28 V dc, 4- channel SOU (3 voice, 1 data) for EPIC applications

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Table 1-5. System Components Not Supplied by Honeywell (cont)

Component	Comments
High Gain Antenna Equipment	BAE Systems - Canada Ball Aerospace - USA Dassault Electroniq - France
NOTE: Installation of this equipment is dependent on the specific requirements of the operator. Refer to Appendix A, Vendor Equipment, for additional information.	

Table 1-6. SDU Configurations

SDU Part Number	Description
7516118-27010	115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data)
7516118-57010	+28 V dc, 7-channel SDU (6 voice, 1 data)
7516118-24010	115 V ac/400 Hz, 4-channel SDU (3 voice, 1 data)
7516118-54010	+28 V dc, 4-channel SDU (3 voice, 1 data)
7516118-27020	115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data) for Airbus applications
7516118-24020	115 V ac/400 Hz, 4-channel SDU (3 voice, 1 data) for Airbus applications
7516118-27011	115 V ac/400 Hz, 7-channel SDU (6 voice, 1 data) for EPIC applications
7516118-57011	+28 V dc, 7-channel SDU (6 voice, 1 data) for EPIC applications
7516118-24011	115 V ac/400 Hz, 4-channel SDU (3 voice, 1 data) for EPIC applications
7516118-54011	+28 V dc, 4-channel SDU (3 voice, 1 data) for EPIC applications

Table 1-7. HPA (40 Watt) Configurations

HPA Part No.	Software Package	Description
7516250-10001	A	3-channel initial release
7516250-15020	B	3-channel update with cabin voice
7516250-18033	C0.0	6-channel cabin voice and data (1-data, 5-voice) and fax (2400/4800 bps)
7516250-18036	C2.0	6-channel cabin voice and data (1-data, 5-voice) and fax (2400/4800 bps)
7516250-19034	C3.0	Improves log-on capability and reversion; adds maintenance pages
7516250-19037	C3.5	Adds Boeing 777 capability

Table 1-7. HPA (40 Watt) Configurations (cont)

HPA Part No.	Software Package	Description
7516250-19037	C3.5	Adds Boeing 777 capability
7516250-20050	D2.0	Adds several improvements to BITE, including antenna VSWR detection reporting and compatibility with hardware Mod D (Software Mod F); Uses 115 V ac primary power.
7516250-55050	D2.0	Adds several improvements to BITE, including antenna VSWR detection reporting and compatibility with hardware Mod D (Software Mod F); Uses 115 V ac primary power.
7516250-60001	A	3-channel initial release
7516250-60020	B	3-channel update with cabin voice
7516250-60033	C0.0	6-channel cabin voice and data (1-data, 5-voice) and fax (2400/4800 bps)
7516250-60050	D2.0	Adds several improvements to BITE, including antenna VSWR detection reporting and compatibility with hardware Mod D (Software Mod F); Uses 28 V dc primary power.
NOTE: For the various part numbers, -1XXXX refers to an air transport LRU, while -55XXX and -6XXXX refers to a business and commuter LRU. The functional descriptions are the same for both.		

Table 1-8. HPA (20 Watt) Configurations

HPA Part Number	Software Package	Description
7516251-20060	E1.5	20 Watt HPA with Aero-I IGA beam steering functionality; Uses 115 V ac or 28 V dc power supply.
7516251-60060	E1.5	20 Watt HPA with Aero-I IGA beam steering functionality; Uses 115 V ac or 28 V dc power supply.
NOTE: For the various part numbers, -2XXXX refers to an air transport LRU, while -6XXXX refers to a business and commuter LRU. The functional descriptions are the same for both.		

3. System Description

A. General

(1) The system description gives a general overview and summary of the features and interfaces that the MCS implements. Figure 1-7 is a simplified block diagram of the MCS system.

(2) The core of the AES avionics subsystem is the MCS avionics, supporting data, and voice communications at rates from 600 to 21,000 bits per second. Interfaces to various aircraft systems including cockpit voice, cabin voice/data, aircraft avionics, and the antenna subsystem enable the MCS avionics to handle data and voice messaging functions for the AES.

(3) The SDU supplies all essential services required to accommodate effective air/ground communications through satellite, using the antenna and related RF components. The SDU manages the RF link protocols on the AES side and supplies the system interface with communications management avionics. The HPA boosts the signal to be transmitted up to the power levels required for transmission to the satellite.

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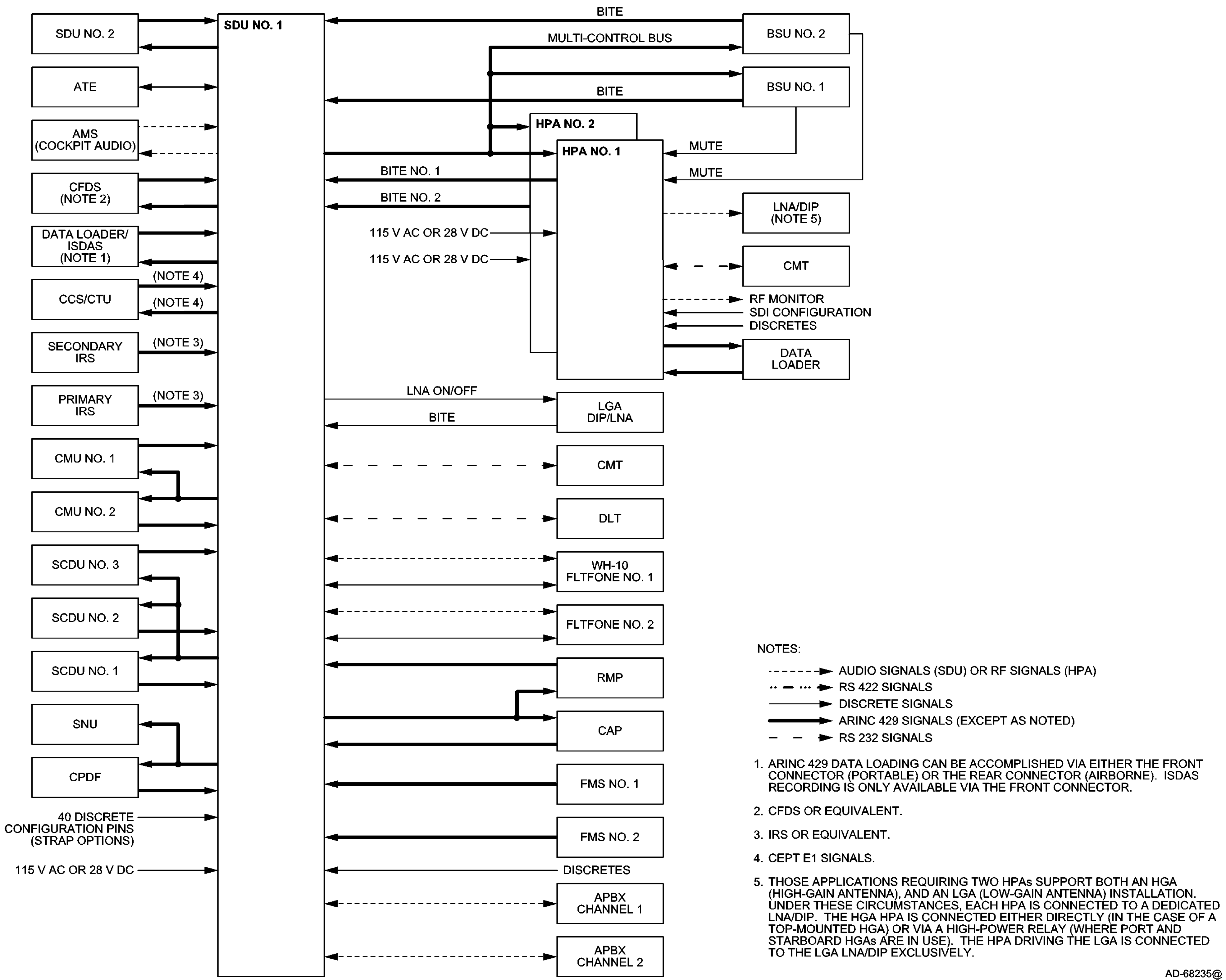

Figure 1-4. MCS Avionics Block Diagram

B. Satellite Data Unit

(1) General

(a) The SDU is the core element of the MCS avionics and is responsible for overall AES control and monitoring. The unit interfaces to many aircraft avionics (e.g., CFDS, primary/secondary IRS, CMU 1/2, MCDU 1/2/3, ADL, etc) and has operational functionality, including coding and decoding all system voice and data signals and defining system protocols. The SDU contains six channels capable of supplying simultaneous full duplex voice communication, one channel of data 2/3 communication, and RF circuitry sufficient to operate the AES. Figure 1-5 shows the circuit card assembly (CCA) layout for the MCS-7000 SDU. Removal of one of the triple transcoder modem (TTCM) CCA results in the MCS-4000 SDU.

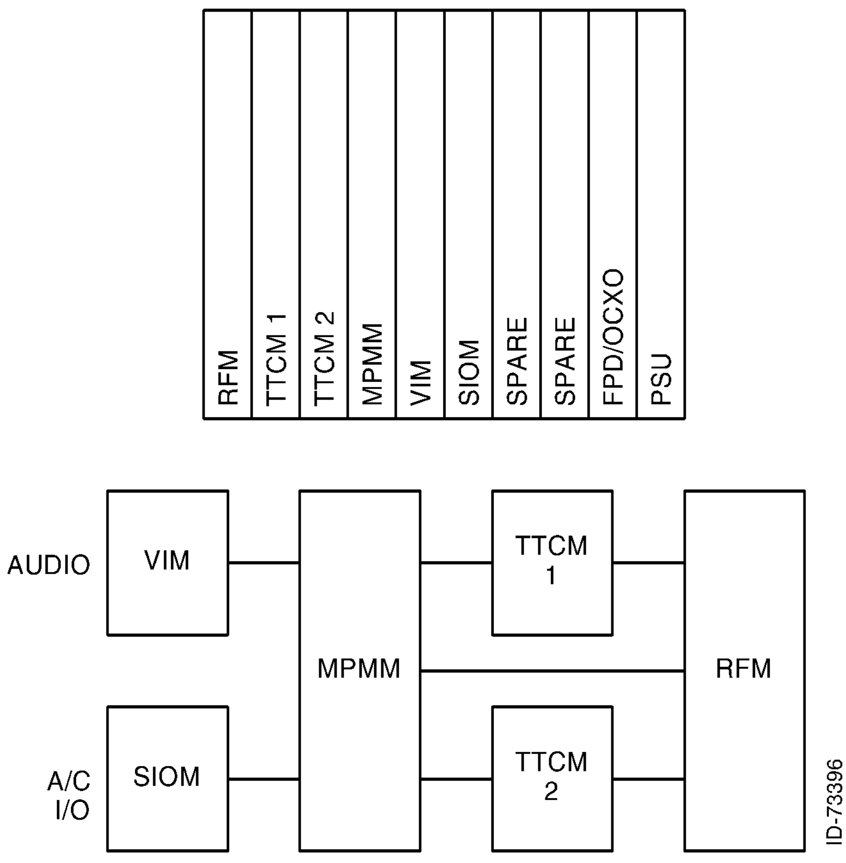

Figure 1-5. MCS-4000/7000 SDU Equipment Description

(b) The format for voice/data codes follows the INMARSAT system definitions for voice and data transmission and reception. The INMARSAT system uses a digital format for voice and data. The SDU digitizes the voice or data signal and adds special codes to make the aircraft-to-ground station connection possible. Voice signals are transmitted at a rate designed to supply high voice quality (perceived quality is close to that of a good quality public telephone line). When signal processing is complete, the coded voice/data signal is sent to HPA. The SDU also controls the protocols for automatic call, setup, and clear-down. System protocols are defined so the designated GES recognizes it is being **called** by the AES.

(c) The SDU houses the voice interface modules and transcoder modems required for voice and data service, and the RF transmit/receive circuitry needed to convert modulated baseband signals to an L-band frequency (and vice versa). All AES satellite signals use digital coding and modulation, which include the voice circuits. The voice interface modules translate baseband analog voice signals to and from the 9600 bps or 4800 bps digital coding standard. Efficient information compression and coding techniques supply high voice quality at an economical bit rate. The modems, one for each communication channel, perform all of the physical layer signal processing functions, including multiplexing/demultiplexing, interleaving/de-interleaving, scrambling/unscrambling, modulation/demodulation, and Doppler effect correction.

(d) The SDU system table memory contains the location of all satellites. When a GES is selected, the SDU uses this location information and aircraft positional information (through an ARINC 429 interface) from the IRS to compute the position of the satellite relative to the aircraft. The SDU then transmits pointing and tracking coordinates (aircraft relative azimuth and elevation) to the beam steering unit (BSU) to permit optimum signal transmission and reception between the high gain antenna subsystem and the satellite.

(e) The high gain antenna subsystem translates these steering commands into control signals to the antenna(s). Once the beam has been steered toward the satellite, the SDU receives the pilot tone from the satellite transponder through its receive RF link from the antenna subsystem.

(f) The SDU is now free to route communications data over the satellite link. The SDU accomplishes this by sending commands to the MU and the CTU. These commands are sent through ARINC 429 and CEPT E1 interfaces between the SDU and the MU/CTU. Data is then routed from the MU/CTU to the SDU. In the SDU, the baseband data modulates RF carriers, which are sent to the HPA for amplification, and then to the antenna subsystem for transmission to the satellite. The SDU can adjust the transmission frequency in one-Hertz increments to compensate for the Doppler shift caused by the speed of the aircraft. The receive mode is handled in a similar manner. Since the MCS is a full-duplex system, the transmit and receive signals are processed simultaneously as in conventional terrestrial telephone equipment.

(2) Output Power Control

(a) General

1 The AES output power to the satellite, specified and calculated as effective isotopic radiated power (EIRP) from the antenna in the direction of the satellite, is controlled by the SDU as specified in the following paragraphs. The SDU is capable of controlling up to one HGA HPA, one LGA HPA, or one IGA HPA. These HPA(s) can be a linear or class C type in any combination. The SDU does not establish a C-channel voice call using a class C HGA HPA or through any LGA HPA.

(b) Assumed Initial C-Channel EIRP

1 The SDU calculates the assumed initial C-channel EIRP as being the lowest of the currently GES-commanded EIRPs for any/all C-channels in progress. If there are no C-channels currently in progress, the SDU uses the value in ORT item xxx, or the value in ORT item xxx reduced by 6 dB if the SDU is currently logged on through a spot-beam.

(c) Current Reserved EIRP

1 The SDU calculates the current reserved EIRP as the summation in Watts of the following EIRPs:

- The power reserved for the R/T-channel transmission, for the highest bit rate assigned, calculated from the EIRP assigned in the log-on confirm signal, or the most recent data channel reassignment, if any.
- The GES-assigned EIRPs of all the currently active C-channel carriers, if any.
- The cockpit reserved channel power if the reservation has been made through ORT option vii and is not in use. This continuously tracks the assumed initial C-channel EIRP. If it is in use, then the actual GES-assigned EIRP is used.
- The power reserved for any C-channel calls in the process of being set up (i.e., after resources have been allocated but no C-channel assignment signal has been received). For each such channel, the assumed initial C-channel EIRP is used.

(d) Current and Projected or Peak-To-Average Power Ratio

1 If the HPA is linear, the SDU calculates the current peak-to-average power ratio based on the EIRP levels for all the carriers considered in the current reserved EIRP calculation. The current peak-to-average ratio value is sent to the HPA periodically, alternating with the projected peak-to-average ratio (i.e., what the peak-to-average ratio would be if one additional C-channel were established).

2 The SDU waits at least 450 milliseconds after transmitting the HPA command word before assuming the received HPA maximum available RMS output power corresponds to the most recently sent peak-to-average ratio in the HPA command words. The current peak-to-average ratio is sent in order to calculate the current available EIRP from the returned maximum available RMS power. The projected peak-to-average ratio is sent in order to determine (along with other criteria) if an additional C-channel can be established, if and when it is requested. If all carriers are at the same power level (not true in general), the peak-to-average ratio is equal to the number of carriers. If the HPA is class C, the SDU always sends a peak-to-average ratio equal to 1.

(3) Installation Dependent Considerations

(a) General

1 The SDU stores the following installation dependent values to enable it to set the EIRPs accurately:

- SDU to HPA loss (assumed common for both LGA and HGA HPAs)
- HPA to antenna loss (two values are stored, one for the HGA HPA, and a separate value for the LGA HPA)
- HPA in use is class C, the SDU stores the HPA maximum output power.

(b) SDU to HPA Loss

1 The SDU stores the calibrated SDU to HPA loss in nonvolatile memory. When the HPA is linear, this value is calculated once whenever there is an R-or T-channel burst transmission in the absence of C-channel transmission. This value is also calculated whenever there is a single C-channel transmission in the absence of R- or T-channel, unless the reported actual power output value in the HPA status word:

- Matches or is less than the minimum reportable actual power value stored in ORT item xxix
- Matches either the unique code 00100_B for **at/below measurable range** or **3 dB greater than 40 W** or the flag was set indicating the HPA or modem backoff was limited.

2 When a single measurable carrier (R-/T-or C-channel) is present, the SDU recalculates the SDU to HPA loss as the actual output power reported by the HPA, less the HPA nominal gain, plus the HPA backoff, or SDU calculated RFM power. This value includes the actual cable loss, plus any uncompensated variation from nominal in the HPA gain, and any variation from the calibrated RFM output power (due to temperature). This value also lets the SDU accurately determine the common transmit gain. If the calibration results in a value outside the range of 10 dB to 30 dB, a failure is raised for the HGA HPA and LGA HPA.

(c) HPA to Antenna Loss

1 The SDU is capable of storing in nonvolatile memory the actual loss (to the nearest tenth of a dB) between the HPA and the input to the antenna for use in the power control computation. This loss is the sum of the HPA to diplexer cable loss, the high power relay loss (if used), the diplexer loss, and the diplexer to antenna cable loss in an ARINC 741 system. This value is expected to be between 0.9 and 2.5 dB, but the SDU allows the entry of values in the range of 0.0 to 5.0 dB. A separate value is maintained and used for each antenna subsystem.

2 This loss value is necessary to enable the SDU to accurately set the antenna EIRPs, and to determine power availability for additional C-channels. This value is not part of the ORT and is not an option. The value is estimated/calibrated at the time of system installation or commissioning, and can vary among otherwise identical installations. It is inadequate to assume a default of either end of the range, since at the low end the AES would not necessarily make the return link in marginal conditions. At the high end, the SDU would radiate all carriers high, wasting power and prematurely inhibiting further calls from being set up.

(d) Class C HPA Maximum Output Power

1 When the HPA is class C, the SDU stores the calibrated HPA maximum output power value in nonvolatile memory. This value is calculated once per burst when there is a single measurable carrier present, unless the reported actual power output value in the HPA status word:

- Matches or is less than the minimum reportable actual power value stored in ORT item xxix
- Matches either the unique code 00100_B for **at/below measurable range** or **3 dB greater than 40 W**; or the flag was set indicating the HPA or modem backoff was limited.

2 This value is the actual output power reported by the HPA, plus the HPA backoff. If the calibration results in a value outside the range of 14 dBW to 21 dBW, a failure is raised for the HGA HPA and LGA HPA.

(4) Antenna Subsystem Selection

(a) The purpose of installing both HGA and LGA subsystems simultaneously is to increase system availability and geographical orientation coverage. When the SDU has the choice of antenna subsystems (HGA or LGA), either as part of a single MCS system or in its role as half of a dual system, reversion from HGA to LGA (and from LGA to HGA) is accomplished by automatic means. Automatic reversion from the HGA to the LGA occurs only upon failure of the HGA subsystem. The SDU automatically switches from the LGA to the HGA if the HGA subsystem reverts to a normal state. In lieu of a physically separate LGA, an HGA is also usable as a steered LGA when its gain drops below the level specified by ORT item xxii.

(b) Loss of reliable communications with a GES normally occurs as a result of channel degradation. When channel degradation occurs, the AES considers itself logged-off and searches for another GES. If no GES is found for communications using the HGA subsystem, automatic switching to the LGA subsystem does occur. Manual reversion through the SCDU is the only way the SDU switches from the HGA subsystem to the LGA subsystem.

(c) The purpose of installing an IGA subsystem is to use the spot beam coverage. The satellite spot beams supply a times 8 (x8) amplification. Less power is required for C-channel (circuit mode) operation that equates to less cost per minute of operation.

C. High Power Amplifier

(1) The SDU sends such information as power amplifier on/off commands and amplification gain commands to the HPA. The bidirectional link carries status and maintenance information to the SDU such as gain verification, standing wave ratio data, and indication of dangerous system conditions such as temperature warnings or power supply failures.

(2) The HPA supplies RF power amplification of the L-band signals generated by the SDU to a power level required for transmission to the satellite. Because multiple signals are transmitted through the HPA, the HPA is a linear device (i.e., operating class AB) capable of amplifying more than one signal at a time. An average of 40 Watts RF output power is developed by the HPA (up to 25 Watts RF power by the 20 Watt HPA) while passing multiple signals without generating excessive intermodulation products.

(3) In addition to providing RF power amplification, the HPA must control output power to supply the desired EIRP from the AES. The SDU controls the gain of the Honeywell HPA over a 25-dB range in 1-dB increments through the ARINC 429 interface. This lets automatic adjustment of signal strength compensate for a wide variety of conditions. The HPA also measures output power and available power and reports to the SDU, which uses the information to determine if additional calls can be accommodated.

(4) Under favorable propagation conditions, the full output power capability of the HPA is not required. The HPA automatically consumes less power and dissipates less heat when full power is not used.

(5) The 20 Watt HPA supplies beam steering capabilities previously implemented in the antenna beam steering unit. Commands are generated to steer the antenna elements based on the SDU, IRS information, and beam map data stored in the HPA.

D. Avionics Configurations

(1) The SDU determines the configuration installed on the aircraft, including the presence of optional peripherals, by examining the system configuration pins. The SDU supports interaction only with those peripherals indicated as being present by the configuration pins.

(2) The Aero H+ SATCOM system requires installation of an SDU and 40 Watt HPA, and supports seven independent simultaneous channels for voice and data communications. One channel is dedicated to data and system management transactions. The remaining six channels are available for analog or digital voice communications.

(3) The Aero I SATCOM system requires installation of an SDU and 20 Watt HPA, and supports seven independent simultaneous channels for voice and data communications. One channel is dedicated to data and system management transactions. The remaining six channels are available for analog voice communications.

4. MCS Component Descriptions

A. Physical Description

(1) The LRUs are designed to perform reliably under field conditions and to supply ease of maintenance when required. Each LRU is designed as a modular concept unit (MCU), as defined by ARINC Characteristic 600, to permit easy replacement of each shop replaceable unit (SRU). The SRUs use both digital and analog solid state circuitry constructed using a mixture of surface mount technology (SMT) and dual in-line packaging (DIP) technology.

(2) All SRUs are built to standards that qualify them for both airline and business aircraft usage. Adjustment mechanisms are accessible with the SRU installed in the LRU. These SRUs can be removed to reduce the number of functional channels without compromising the functionality of the remaining channels.

(3) The MCS system components meet the requirements specified in parts A and B of the Minimum Operational Performance Standards for Aeronautical Mobile Satellite Services Document, Document No. RTCA/DO-210.

B. Satellite Data Unit (SDU)

(1) The SDU is packaged as an ARINC 600 6-MCU suitable for mounting in the equipment bay. The mechanical chassis is constructed of lightweight aluminum alloy sheet metal; forced air moving through the chassis in an upward or downward direction supplies internal cooling. Two hold-down clamps enable the unit to be firmly clamped in the mounting rack. The unit is carried by a fixed C-shaped handle mounted to the front panel assembly.

(2) The front panel assembly contains a 20-character alphanumeric display for displaying built-in test equipment (BITE) failure messages, system LRU part numbers, and the ORT identification. The display remains inactive when its temperature is less than -10 °C (+14 °F) or greater than +50 °C (+122 °F). The front panel also contains two momentary action buttons labeled TEST and CM/SCROLL. The TEST button initiates BITE in the SDU. The CM/SCROLL button lets the alphanumeric display scroll through the BITE failure messages and the software confirmation numbers.

(3) The front panel also contains an ARINC 615 portable data loader connector and a primary cell for the real-time clock/calendar function of the processor module.

(4) The rear connector receptacle is a size No. 2 shell assembly (in accordance with ARINC 600) that engages a mating connector in the mounting rack when the SDU is installed. The top and middle inserts are type 02 arrangements and the bottom insert is a type 04 arrangement. Index pin code 04 is used on both the SDU and the mounting rack connectors.

(5) The SDU is shown in Figure 1-6. The SDU leading particulars are given in Table 1-9. DO-160D environmental categories for the SDU are given in Table 1-10.

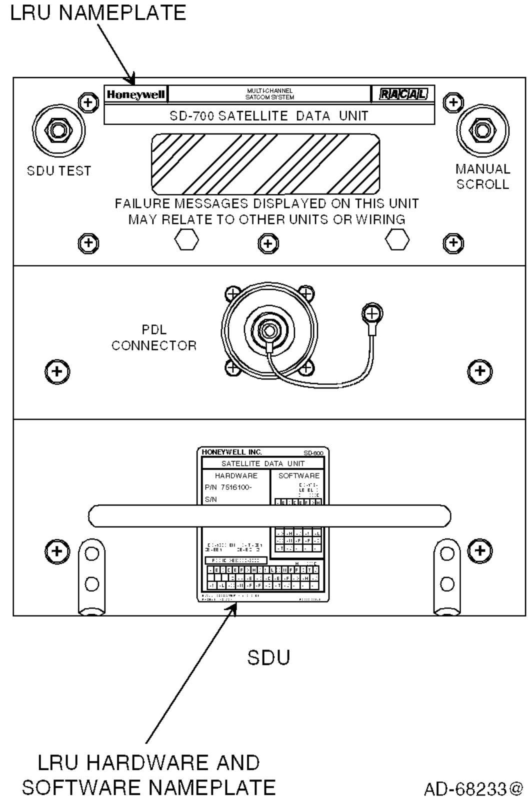

Figure 1-6. Satellite Data Unit

Table 1-9. SDU Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Height	7.624 in. (193.65 mm)
• Width	7.51 in. (190.75 mm)
• Length	15.26 in. (337.60 mm)
Weight (maximum)	21 lb (9.6 kg)
Power Requirements:	
• AC Voltage	104 to 122 V ac, 380 to 420 Hz (normal operation)
	97 V ac, 360 Hz minimum; 134 V ac, 440 Hz maximum
• DC Voltage	22.0 to 30.3 V dc (normal operation)
	20.5 V dc minimum, 32.2 V dc maximum

Table 1-9. SDU Leading Particulars (cont)

Characteristic	Specification
AC Current Requirements [1.]:	
• Nominal at 115 V ac (Current/Power Factor)	1.3 amps/0.70
• Maximum at 104 V ac (Current/Power Factor)	2.1 amps/0.91
DC Current Requirements:	
• Nominal at 28 V dc	3.8 amps
• Maximum at 20.5 V dc	7.0 amps
Circuit Breaker Ratings:	
• 115 V ac Circuit Breaker	3 amp TYPE A
• 28 V dc Circuit Breaker	10 amp TYPE A
User Replaceable Parts	None
Operating Temperature	-55 °C (-67 °F) to +70 °C (158 °F)
Operating Altitude	to 70,000 ft (21.34 kilometers)
Cooling Requirements [2.]:	
• Minimum	0.15 ± 0.05 in. (3.81 ± 1.27 mm) of water at a flow rate of 72.8 ± 2.0 lb (33.0 ± 0.9 kg) per hour
• Maximum	0.25 ± 0.05 in. (6.35 ± 1.27 mm) of water at a flow rate of 96.2 ± 2.0 lb (43.6 ± 0.9 kg) per hour
Power Dissipation [3.]:	
• Nominal	105 W
• Maximum	198 W
Mating Connectors:	
• J1	Radiall Part No. NSXN2P201X004
• J2	Honeywell Part No. 4004295-160, ITT Part No. KJ6F18A53P
Mounting	ARINC 600 6-MCU Tray Assembly

NOTES:

1. All power factors (PF) are leading.
2. Refer to Appendix A, Vendor Equipment, for mounting trays with integral cooling fans that meet the cooling requirements.
3. The SDU draws an additional 20 W during the first 10 minutes (maximum) of operation at 25°C (77 °F) because of the OCXO. The OCXO continuously dissipates this additional 20 W at -55 °C (-67 °F).

Table 1-10. SDU DO-160D Environmental Categories

Environmental Condition	Category
Temperature and Altitude	Category A2E1/Z (E1) [1.]
Temperature Variation	Category B
Humidity	Category A
Shock	Category B
Vibration	Category SB2
Explosion	Category E
Waterproofness	Category X
Fluids Susceptibility	Category X
Sand and Dust	Category X
Fungus Resistance	Category X
Salt Spray	Category X
Magnetic Effect	Category Z
Power Input - 115 V ac	Category E
Power Input - 28 V dc	Category BZ [2.]
Voltage Spike	Category A
Audio Frequency Susceptibility - 115 V ac	Category E
Audio Frequency Susceptibility - 28 V dc	Category Z
Induced Signal Susceptibility	Category Z
Radio Frequency Susceptibility	Category RRR
Radio Frequency Emissions	Category M
Lightning Induced	Category A3E3
Lightning Direct	Category X
Icing	Category X
Electro Static Discharge	Category A

NOTES:

1. E1 - Operating High Temperature/High Short Time = 70 °C (158 °F).
2. Z - The power input requirements for the 28 V dc LRU are category Z except for an emergency operation, in which case the requirements of category B apply.

C. High-Power Amplifier (40 Watt)

(1) The HPA is packaged as an ARINC 600 8-MCU suitable for mounting in the equipment bay or near the antenna system. The mechanical chassis is constructed of lightweight aluminum alloy sheet metal. Forced air moving through the chassis in an upward or downward direction supplies internal cooling. Two hold-down clamps let the unit be firmly clamped in the mounting rack. The unit is carried by a fixed C-shaped handle mounted to the front panel assembly.

(2) The front panel assembly contains a PTT switch to initiate BITE and a red (FAIL) and green (PASS) light emitting diode(LED) to indicate BITE status. The front panel also contains an ARINC 615 portable data loader connector and an RF monitor port.

(3) The rear connector receptacle is a size No. 2 shell assembly (in accordance with ARINC 600) that engages a mating connector in the mounting rack when the HPA is installed. The top insert is a type 08 arrangement, the middle insert is a type 05 arrangement, and the bottom insert is a type 04 arrangement. Index pin code 08 is used on both the HPA and mounting rack connectors.

(4) The HPA (40 Watt) is shown in Figure 1-7. The leading particulars for the HPA (40 Watt) are given in Table 1-11. DO-160C environmental categories for the HPA (40 Watt) are given in Table 1-12.

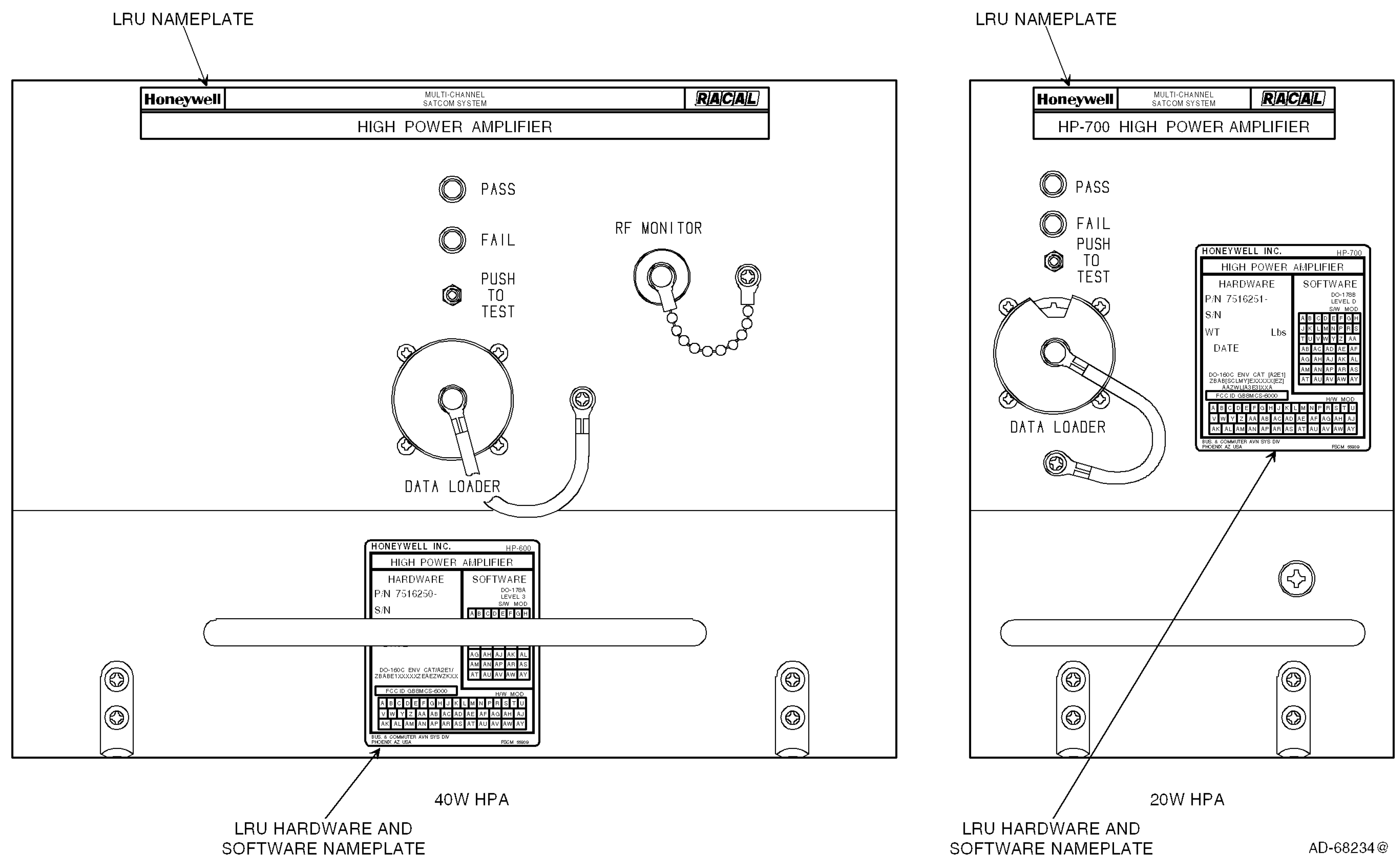

Figure 1-7. High-Power Amplifier (40 and 20 Watt)

Table 1-11. HPA (40 Watt) Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Height	7.813 in. (198.45 mm)
• Width	10.22 in. (259.59 mm)
• Length	15.20 in. (386.08 mm)
Weight (maximum)	29.15 lb (13.22 kg)
Power Requirements:	
• AC Voltage	104 to 122 V ac, 380 to 420 Hz (normal operation) 97 V ac, 360 Hz minimum; 134 V ac,440 Hz maximum
• DC Voltage	22.0 to 30.3 V dc (normal operation) 20.5 V dc minimum, 32.2 V dc maximum
AC Current Requirements [1.]:	
• Nominal at 115 V ac (Current/Power Factor)	1.94 amps/0.95
• Maximum at 104 V ac (Current/Power Factor)	2.2 amps/0.96
DC Current Requirements:	
• Nominal at 28 V dc	7.3 amps
• Maximum at 20.5 V dc	8.2 amps
RF Power Output:	
• Rated operating power	40 W (multiple carriers)
• Maximum power	80 W (short duration, single carrier)
Circuit Breaker Ratings:	
• 115 V ac Circuit Breaker	7.5 amp TYPE A
• 28 V dc Circuit Breaker [2.]	30 amp TYPE A
User Replaceable Parts	None
Operating Temperature	−55 °C (−67 °F) to +70 °C (158 °F)
Operating Altitude	to 70,000 ft (21.34 kilometers)
Cooling Requirements [3.]:	
• Minimum	0.15 ± 0.05 in. (3.81 ± 1.27 mm) of water at a flow rate of 121.3 ± 2.0 lb (55.0 ± 0.9 kg) per hour
• Maximum	0.25 ± 0.05 in. (6.35 ± 1.27 mm) of water at a flow rate of 176.4 ± 2.0 lb (80.0 ± 0.9 kg) per hour

Table 1-11. HPA (40 Watt) Leading Particulars (cont)

Characteristic	Specification
Power Dissipation:	
• Nominal	300 W
• Maximum	362 W
Mating Connectors:	
• J1	Radiall Part No. NSXN2P221X0008
• J2	Honeywell Part No. 4004295-160, ITT Part No. KJ6F18A53P
• J3	BNC Plug
Mounting	ARINC 600 8-MCU Tray Assembly

NOTES:
1. All PF are leading.
2. Wiring can not exceed 18 V dc drop at 30 amps.
3. Refer to Appendix A, Vendor Equipment, for mounting trays with integral cooling fans that meet the cooling requirements.

Table 1-12. HPA (40 Watt) DO-160C Environmental Categories

Environmental Condition	Category
Temperature and Altitude	Category A2E1/Z (E1) [1.]
Temperature Variation	Category B
Humidity	Category A
Shock	Category B
Vibration	Category BLMY
Explosion	Category E1
Waterproofness	Category X
Fluids Susceptibility	Category X
Sand and Dust	Category X
Fungus Resistance	Category X
Salt Spray	Category X
Magnetic Effect	Category Z
Power Input - 115 V ac	Category E
Power Input - 28 V dc	Category Z [2.]
Voltage Spike	Category A

Table 1-12. HPA (40 Watt) DO-160C Environmental Categories (cont)

Environmental Condition	Category
Audio Frequency Susceptibility - 115 V ac	Category E
Audio Frequency Susceptibility - 28 V dc	Category Z
Induced Signal Susceptibility	Category Z
Radio Frequency Susceptibility	Category W [3.]
Radio Frequency Emissions	Category Z
Lightning Induced	Category K
Lightning Direct	Category X
Icing	Category X

NOTES:

1. E1 - Operating High Temperature/High Short Time = 70 °C (158 °F).
2. Z - The power input requirements for the 28 V dc LRU are category Z except for an emergency operation, in which case the requirements of category B apply.
3. W - Performance of this test is required to satisfy the HIRF requirements. The LRUs must survive a category W event without degradation (i.e., regain normal operation at the termination of the HIRF event), and must operate through (with performance degradation permitted) and after (without performance degradation) a category T event.

D. High-Power Amplifier (20 Watt)

(1) The HPA is packaged as an ARINC 600 4-MCU suitable for mounting in the equipment bay or near the antenna system. The mechanical chassis is constructed of lightweight aluminum alloy sheet metal. Forced air moving through the chassis in an upward or downward direction supplies internal cooling. Two hold-down clamps let the unit be firmly clamped in the mounting rack. The unit is carried by a fixed C-shaped handle mounted to the front panel assembly.

(2) The front panel assembly contains a PTT switch to initiate BITE and a red (FAIL) and green (PASS) LED to indicate BITE status. The front panel also contains an ARINC 615 portable data loader connector.

(3) The rear connector receptacle is a size No. 2 shell assembly (in accordance with ARINC 600) that engages a mating connector in the mounting rack when the HPA is installed. The top insert is a type 08 arrangement, the middle insert is a type 05 arrangement, and the bottom insert is a type 04 arrangement. Index pin code 08 is used on both the HPA and mounting rack connectors.

(4) The HPA (20 Watt) is shown in Figure 1-7. The leading particulars for the HPA (20 Watt) are given in Table 1-13. DO-160D environmental categories for the HPA (20 Watt) are given in Table 1-14.

Table 1-13. HPA (20 Watt) Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Height	7.64 in. (194.056 mm)
• Width	4.90 in. (124.46 mm)
• Length	15.26 in. (387.604 mm)
Weight (maximum)	15.80 lb (7.17 kg)
Power Requirements:	
• AC Voltage	104 to 122 V ac, 380 to 420 Hz (normal operation) 97 V ac, 360 Hz minimum; 134 V ac, 440 Hz maximum
• DC Voltage	22.0 to 30.3 V dc (normal operation) 20.5 V dc minimum, 32.2 V dc maximum
AC Current Requirements [1.]:	
• Nominal at 115 V ac (Current/Power Factor)	1.94 amps/0.96
• Maximum at 104 V ac (Current/Power Factor)	2.2 amps/0.96
DC Current Requirements:	
• Nominal at 28 V dc	7.3 amps
• Maximum at 20.5 V dc	12 amps
RF Power Output:	
• Rated operating power	25.1 W (under all conditions)
• Maximum power	25.1 W (under all conditions)
Circuit Breaker Ratings:	
• 115 V ac Circuit Breaker	7.5 amp TYPE A
• 28 V dc Circuit Breaker	15 amp TYPE A
User Replaceable Parts	None
Operating Temperature	-15 °C (5 °F) to +70 °C (158 °F)
Operating Altitude	to 55,000 ft (16.76 kilometers)
Cooling Requirements (Minimum) [2.]	0.20 ± 0.12 in. (5 ± 3 mm) of water at a flow rate of 72.8 ± 2.0 lb (33.0 ± 0.9 kg) per hour
Power Dissipation:	
• Nominal	150 W
• Maximum	219 W

Table 1-13. HPA (20 Watt) Leading Particulars (cont)

Characteristic	Specification
Mating Connectors:	
• J1	Radiall Part No. NSXN2P221X0008
• J2	Honeywell Part No. 4004295-160, ITT Part No. KJ6F18A53P
Mounting	ARINC 600 4-MCU Tray Assembly

NOTES:
1. All PF are leading.
2. Refer to Appendix A, Vendor Equipment, for mounting trays with integral cooling fans that meet the cooling requirements.

Table 1-14. HPA (20 Watt) DO-160D Environmental Categories

Environmental Condition	Category
Temperature and Altitude	Category A2E1/Z (E1) [1.]
Temperature Variation	Category B
Humidity	Category A
Shock	Category B
Vibration	Category SB2
Explosion	Category E
Waterproofness	Category X
Fluids Susceptibility	Category X
Sand and Dust	Category X
Fungus Resistance	Category X
Salt Spray	Category X
Magnetic Effect	Category Z
Power Input - 115 V ac	Category E
Power Input - 28 V dc	Category BZ [2.]
Voltage Spike	Category A
Audio Frequency Susceptibility - 115 V ac	Category E
Audio Frequency Susceptibility - 28 V dc	Category Z
Induced Signal Susceptibility	Category Z
Radio Frequency Susceptibility	Category RRR [3.]
Radio Frequency Emissions	Category M

Table 1-14. HPA (20 Watt) DO-160D Environmental Categories (cont)

Environmental Condition	Category
Lightning Induced	Category A3E3
Lightning Direct	Category X
Icing	Category X
Electrostatic Discharge	Category A

NOTES:
1. E1 - Operating High Temperature/High Short Time = 70 °C (158 °F).
2. BZ - The power input requirements for the 28 V dc version of the 20 Watt HPA are category Z except for an emergency operation, in which case the requirements of category B apply.
3. RRR - Performance of this test is required to satisfy the HIRF requirements.

E. CMA-2200 Intermediate Gain Antenna

(1) The Intermediate Gain Antenna supplies a minimum of 6 dB antenna gain (8 dB nominal) and operates with the 20 W HPA. The IGA is manufactured by BAE Systems Canada Inc. (formerly Canadian Marconi Company Aerospace) under both BAE Systems - Canada Part No. 100-602372-000 and Honeywell Part No. 7516194-901. Features of the IGA are given in Table 1-15.

Table 1-15. CMA-2200 Intermediate Gain Antenna Features

Characteristic	Specification
Service coverage	less than 95% of the Inmarsat hemisphere
• Receive	1525.0 - 1559.0 MHz
• Transmit	1626.5 - 1660.5 MHz
Polarization	Right hand circular
Receive figure of merit (G/T)	−15.5 dB/K typical, −19 dB/K minimum
Effective Isotropic Radiated Power (EIRP)	19.5 dBW typical, 16.5 dBW minimum
Phase discontinuity	2.5° typical, less than 30° for 99% of all beam steering increments
Beam switching	50 μs maximum
Carrier/Multipath	15 dB typical, 10 dB minimum at 5° elevation; 20 dB typical,12 dB minimum at 20° elevation
Satellite discrimination	16 dB typical, 7 dB minimum
Latitude global Inmarsat satellite coverage	± 86 degrees
Required antenna gain	6 dB

Table 1-15. CMA-2200 Intermediate Gain Antenna Features (cont)

Characteristic	Specification
Support/Test equipment required	None at organizational level
Design characteristics (RTCA/ARINC/TSO/etc.)	DO-160C, ARINC 761, MOPS, SARPS

(2) Other features of the CMA-2200 IGA include:

- Inmarsat Generation 3 Spot Beam coverage
- Proven compatibility with ARINC 761 intermediate-gain antenna subsystems
- BIT status reporting.

(3) The leading particulars for the CMA-2200 IGA are given in Table 1-16. DO-160C environmental categories for the CMA-2200 IGA are given in Table 1-17.

Table 1-16. CMA-2200 IGA Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Height	3.82 in. (97.0 mm)
• Width:	
- At radome	3.22 in. (81.8 mm)
- At base	4.25 in. (108.0 mm)
• Length	29.92 in. (760.0 mm)
Weight (maximum)	6 lb (2.7 kg)
Power Requirements	15 V dc, 8 V dc and -80 V dc (7 Watts)
Operating Environment:	
• Temperature range (operating)	-55° to +70° C (-67° to +158° F)
• Temperature range (non-operating)	-55° to +85° C (-67° to +158° F)
• Operating altitude	to 70,000 ft (21.34 km)
Mating Connectors:	
• J1	Circular Connector - Part No. D38999/26FB35SN
• J2	TNC JACK - Mates with TNC plug

Table 1-17. CMA-2200 IGA DO-160C Environmental Categories

Environmental Condition	Category
Temperature and Altitude	E1
In-Flight Loss of Cooling	X
Temperature Variation	A
Humidity	C
Operational Shock and Crash Safety	--
Vibration	E
Explosion Proofness	X
Waterproofness	S
Fluids Susceptibility	F
Sand and Dust	D
Fungus Resistance	F
Salt Spray	S
Magnetic Effect	X
Power Input	X
Voltage Spike	X
Audio Frequency Conducted Susceptibility	A
Induced Signal Susceptibility	A
Radio Frequency Susceptibility	U
Radio Frequency Emissions	A
Lightning Induced	XXE3
Lightning Direct Effects	2A
Icing	C

F. CMA-2200 Diplexer/Low Noise Amplifier

(1) The CMA-2200 Diplexer/Low Noise Amplifier (D/LNA) supplies the RF transmit (diplexer) and RF receive (low noise amplifier) paths between the HGA, IGA, or LGA and the HPA and SDU, respectively. The D/LNA is manufactured by BAE Systems - Canada (formerly Canadian Marconi Company Aerospace) under both BAE Systems - Canada Part No. 100-602200-001 and the Honeywell Part No. 7516193-901. The features of the D/LNA are given in Table 1-18.

Table 1-18. CMA-2200 D/LNA Features

Characteristic	Specification
Frequency range:	
• Receive	1525.0 - 1559.0 MHz
• Transmit	1626.5 - 1660.5 MHz
Receive gain	53 dB minimum, 60 dB maximum
Noise figure	0.8 dB maximum at 25° C.
Support/Test equipment required	None at organizational level
Design characteristics (RTCA/ARINC/TSO/etc)	DO-160C, ARINC 741/761, MOPS, SARPS

(2) Other features of the CMA-2200:

- Proven compatibility with:
  - ARINC 761 intermediate-gain antenna subsystems
  - ARINC 741 high-gain or low-gain antenna subsystems
- Self-test function.

(3) The leading particulars for the CMA-2200 D/LNA are given in Table 1-19. DO-160C environmental categories for the CMA-2200 D/LNA are given in Table 1-20.

Table 1-19. CMA-2200 D/LNA Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Height	2.00 in. (50.8 mm)
• Width	7.78 in. (197.6 mm)
• Length	11.59 in. (294.4 mm)
Weight (maximum)	6.5 lb (3.0 kg)
Power Requirements	115 V ac, 400 Hz, 150 milliamps maximum
Operating Environment:	
• Temperature range (operating)	-55° to +70° C (-67° F to +158° F)
• Temperature range (non-operating)	-55° to +85° C (-67° F to +158° F)
• Operating altitude	to 70,000 ft (21.34 km)

Table 1-20. CMA-2200 D/LNA DO-160C Environmental Categories

Environmental Condition	Category
Temperature and Altitude	E1
In-Flight Loss of Cooling	X
Temperature Variation	B
Humidity	A
Operational Shock and Crash Safety	--
Vibration	C
Explosion Proof	E2
Waterproof	W
Fluids Susceptibility	X
Sand and Dust	X
Fungus Resistance	F
Salt Spray	X
Magnetic Effect	A
Power Input	E
Voltage Spike	A
Audio Frequency Conducted Susceptibility	E
Induced Signal Susceptibility	Z
Radio Frequency Susceptibility	V
Radio Frequency Emissions	Z
Lightning Induced	XXE3
Lightning Direct Effects	X
Icing	X

G. Radio Frequency Unit Interface Adapter (RFUIA)

(1) The RFUIA is packaged as an ARINC 600 4-MCU suitable for mounting in the equipment bay or near the antenna system. It consists of a housing assembly integrated with an ARINC 600 connector on the back of the unit.

(2) The RFUIA is not an operational unit and it does not contain active internal electronic components. No aircraft power is needed. This unit is installed in the aircraft in place of the RFU to complete the RF receive and transmit paths for the MCS-7000 system.

(3) The housing is constructed of lightweight aluminum alloy sheet metal. No forced air cooling is required. Two hold-down clamps let the unit be firmly clamped in the mounting rack. The unit is carried by a fixed C-shaped handle mounted to the front panel assembly.

(4) Figure 1-8 is a block diagram that shows how the RFUIA interfaces to the other system LRUs. The leading particulars for the CMA-2200 D/LNA are given in Table 1-21.

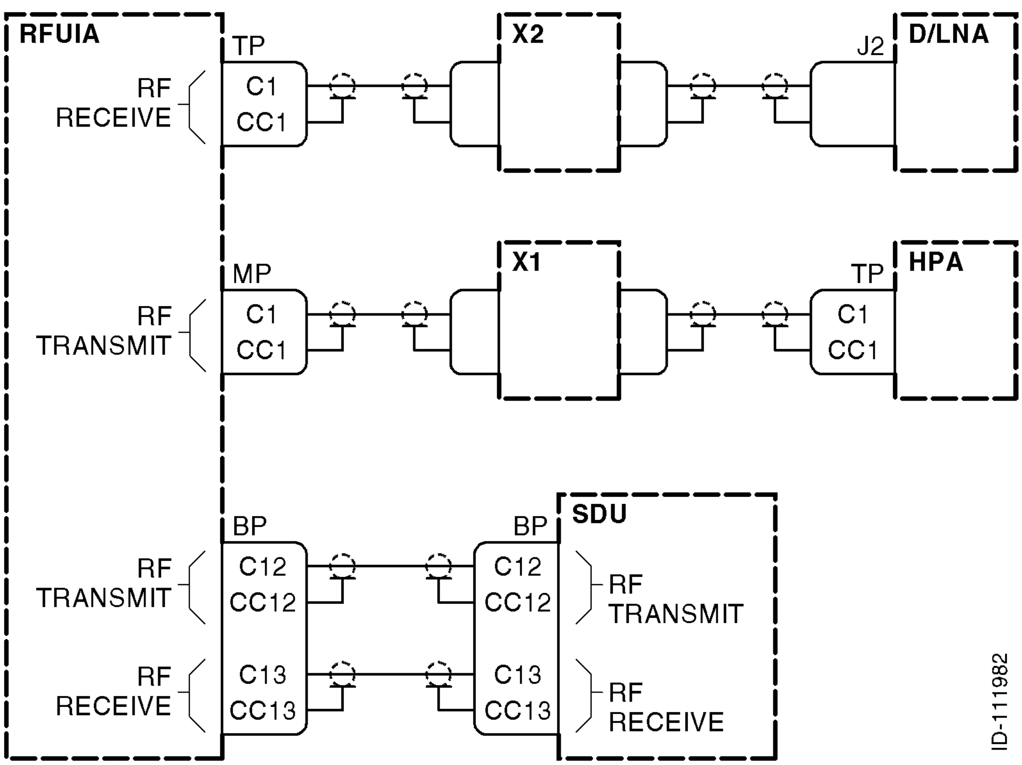

Figure 1-8. RFUIA System Interface Diagram

Table 1-21. RFUIA Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Length	12.76 in. (324.1 mm)
• Width	4.90 in. (124.5 mm)
• Height	7.64 in. (194.1 mm)
Weight (maximum)	4 lb (1.82 kg)
Power requirements	None
Cooling	Convection, no forced air required

H. ARINC 429 Data Requirements

(1) The MCS system requires ARINC 429 data for antenna pointing, antenna stabilization, and Doppler frequency correction. If the aircraft does not have an IRS that supplies this ARINC data, the SCU can be used to convert INS data sources. Refer to Appendix A, Vendor Equipment, for additional information about the SCU and the ARINC 429 data requirements.

I. Nameplates 3 (SDU and HPA)

(1) General

(a) Each LRU has two externally mounted nameplates consisting of:

- Front panel-mounted LRU nameplate
- Second LRU nameplate that reflects the full hardware and software status of the LRU.

(b) The details of these nameplates are specified in the following paragraphs. See Figure 1-6 and Figure 1-7 for the location of each nameplate.

(2) Front Panel LRU Nameplate

(a) Each front panel LRU nameplate contains each company's logo (Honeywell and Racal), the name of the system, and the LRU equipment name.

(3) LRU Hardware and Software Nameplate

(a) Each LRU hardware and software nameplate contains the following information:

- Name of the company responsible for manufacturing it
- Model number (e.g., SD700, HP600, or HP700)
- LRU equipment name
- LRU hardware part number
- LRU serial number
- Weight
- Applicable DO-160C/DO-160D categories
- FCC identifier
- LRU hardware modification level
- LRU end item part number
- LRU software part number
- Software modification level
- Applicable DO-178A or DO-178B software level.

(b) The model number is a five-digit alphanumeric sequence. The first two digits are upper-case alphabetic characters in the range AA to ZZ and the last three digits are numeric characters in the range 100 to 999. The LRU equipment name is displayed with as many upper-case letters as are required to spell out the equipment name. The LRU serial number consists of an eight-digit numeric sequence; the first two digits indicate the year of manufacture, the second two digits indicate the month of manufacture, and the final four digits indicate how many LRUs of this type have been manufactured. The range of the last four digits is 0100 to 9999.

(c) The DO-160C or DO-160D categories applicable to the MCS system consist of a mix of numeric and upper-case alphabetic characters. See Table 1-10, Table 1-12, or Table 1-14 for a list of environmental categories applicable to the MCS LRUs.

(d) The FCC identifier applicable to all MCS LRUs is **GB8MCS-4000 or GB8MCS-7000**. The LRU hardware modification level is indicated by the set of all marked modification level identifiers. Each modification level identifier is a maximum of two upper-case alphabetic characters that range from A to ZZ, with letters I, O, Q, and X excluded.

(e) The LRU end item part number consists of a seven-digit base part number and a five-digit dash number. The first two digits of the dash number indicate the LRU's hardware configuration and consist of numeric values ranging from 10 to 99. The last three digits of the dash number reflect the LRU's software configuration number and consist of numeric values ranging from 001 to 999.

(f) The software modification level consists of a maximum of two upper-case alphabetic characters ranging from A (or "-") to ZZ, with letters I, O, Q, and X excluded. Usage of this nameplate characteristic reflects the implementation of minor software changes.

(g) The DO-178A or DO-178B software levels applicable to the MCS LRUs is the level an LRU was certified. This nameplate is capable of being removed and replaced when a software change is significant enough to require the three-digit software configuration number be incremented, or a hardware change is significant enough to require that the two-digit hardware configuration number be incremented.

J. Software and Hardware Compatibility (SDU and HPA)

(1) Provisions for a set of discrete wire jumpers (straps) are included in each MCS LRU to ensure hardware and software compatibility. The code setting for these straps is manually changed each time a hardware revision is made that is not compatible with all previously released versions of software. The status of these straps is tested every time an LRU undergoes a cold start (power-on self-test [POST], or person-activated self-test [PAST]), and every time a software load is attempted from an ARINC 615 portable data loader.

(2) The LRU header records in the ARINC 615 data loader software upload file and in the operational software itself, contain a list of hardware/software compatibility strap codes with which the software is compatible. This list of codes is compared with the wired hardware/software compatibility strap code in the LRU; if any of the codes in the software upload file match the hardware/software compatibility strap code in the LRU, then the software upload process is allowed (otherwise it is inhibited). Similarly, if any of the codes in the software itself match the strap code in the LRU, normal LRU operation is allowed (otherwise it remains in an inert state).

SECTION 2
SYSTEM OPERATION

1. Overview

A. General

The AES accepts data and voice signals from various sources, encodes the signals, modulates the information onto the appropriate RF carrier frequencies, and transmits these carriers to a GES through satellite. The AES also receives RF signals from the satellites, demodulates and decodes these signals, and outputs data or voice message for passengers or flight crew members. System operation begins when the P-channel transmission from a GES in the satellite region is received. The AES then logs onto the GES to establish the uplink and exchange information. System operation terminates when the AES logs off from the GES.

2. AES Management

A. General

(1) At any time, different satellite regions can have different satellite configurations. All satellites have the global beam capability to receive the continuous Psmc-channel transmission of every GES in view. For a spot beam satellite, each spot beam is associated with at least one GES having a continuous P-channel transmission. Selected channels from the Psmc- and Pd-channels are designated by INMARSAT for satellite and spot beam selection.

(2) An AES logs onto a GES to enter the satellite communications system and logs off to terminate its operation in the system. Log-off is initiated automatically or by a user command issued as part of normal operational procedures.

(3) The AES also logs off before initiating handover. The AES does not log off if handover is initiated because of degradation or loss of the P-channel. Handover can be initiated by the flight crew, or can be carried out automatically by the AES without human intervention. A handover procedure is followed automatically when an AES needs to change the log-on GES or to access a different satellite.

(4) When an AES receives a higher level instruction, for example a command from the flight crew, to change its log-on to another GES operating in the same satellite region, any previously established data communication channels are maintained until clearing before the handover is carried out. In the case of a user command initiated satellite-to-satellite handover, the AES ensures all communication channels are clear prior to starting the handover procedure. If any connections are in progress, the AES applies time supervision of three minutes and then clears any remaining connections.

(5) Automatic handover is initiated upon detection of Pd-channel link degradation defined as:

- Error rate rises above 10^4 over an averaging period of 3 minutes
- More than 10 short-term interruptions (loss of P-channel clock synchronization for less than 10 seconds) in any 3 minute period.

(6) Automatic handover is also initiated upon detection of loss of the Pd-channel defined as:

- Loss of clock synchronization for more than 10 seconds
- Log-on renewal procedure is unsuccessful.

(7) A GES-to-GES handover is carried out by logging onto a new GES in the same satellite region. The required P-channel frequency can be found in the system table. Each GES maintains an up-to-date status table of all AESs that have logged on. Each GES also has an inter-GES signaling capability letting the GES set up calls with any AES operating in the same satellite region as that GES, and manages the AESs during handover.

(8) If the AES attempts to renew its log-on and fails to log on to its previous GES or to the preferred alternative GES after a log-on prompt, loss of P-channel quality, or a log-on renewal request from an application, the AES returns to the latter stages of the initial search procedure and scans the spot beam primary Pd-channels on its current satellite to identify an alternative spot beam. The required P-channel frequencies are found in the system table. Once an alternative spot beam is identified, the AES renews its log-on automatically to a preferred GES.

(9) During log-on renewal, if the AES is unable to log onto its previous GES or to another GES in the same satellite region, then the AES enters the search mode to select the Psmc-channel frequency of a GES operating in a new satellite region. The required P-channel frequency is found in the system table. Having selected a new suitable quality Psmc-channel (in another satellite region) and updating the system table for the new satellite region (if necessary), the AES carries out a log-on procedure with the new GES.

(10) Each AES maintains a system table stored in nonvolatile memory in the SDU. The system table contains the satellite and GES identifying information, such as satellite Psid-channel frequencies, satellite locations and associated GES IDs, and GES Psmc-channel frequencies. The system table does not lose its contents because of loss of primary power.

(11) The SDU also maintains a bootstrap system table containing a default set of satellite and GES identifying information. This information includes satellite Psid-channel frequencies, satellite location and associated GES IDs, plus satellite inclination and right ascension, spot beam support, and GES Psmc-channel frequencies that are set to zero.

(12) The bootstrap system table is loaded into the SDU as an inseparable part of the upload of executable software. The SDU defaults to the bootstrap system table in the absence of a stored system table, or upon execution of a factory settings restart. The default data for a satellite is used until that satellite is first accessed, where a complete update of the data for that satellite takes place. Satellite region blocks that have not yet been updated over the air are marked with a null revision number.

3. System Log-On/Log-Off

A. General

(1) Two operational modes are available for AES log-on:

- Automatic
- User commanded (constrained).

(2) In the automatic mode, the AES operation is fully automatic with satellite log-on and handover procedures occurring without external control. In the user commanded mode, the flight crew or flight control system is able to select the satellite and GES for log-on and handover, and can initiate handovers at any time. The automatic mode is considered the normal mode of operation.

(3) The log-on/log-off of an AES to/from the satellite communications system lets the GES manage the number of AESs that can receive a P-channel (Pd) and transmit on each R-channel (Rd). This controls the queuing delays and burst collision probabilities that can be experienced. When an AES is powered up, it enters a GES selection mode if the log-on policy is set to automatic. This permits the AES to select the most preferred GES operating in its visible satellite region (there may be one or two satellites visible to the AES), and that GES is selected for log-on. If the log-on policy is not set to automatic, the AES waits for the GES to be selected through the user commanded mode (or for a reversion to the automatic mode).

(4) After selecting a GES, the AES tries to acquire one of the identifying Psmc-channel frequencies of the satellite contained in the initial system table. Typically there are two frequencies per satellite (or group of satellites if several satellites supply service to essentially one region). The AES receives that Psmc-channel until one of the system table's broadcast signal units is received, which permits the AES to determine whether the revision number of the system table currently stored in the SDU is valid. If the revision number for the AES is out-of-date, an AES updating procedure is implemented.

(5) When the revision number is verified as correct, the AES checks for any entries in the satellite spot beam search table. If an entry exists, the AES checks the Pd-channel frequencies of all spot beams supported by the selected GES to identify the most applicable spot beam. The AES then determines which Pd-channel has the highest signal quality. Once this task is complete, the AES is ready to log-on to the satellite communications system using the selected GES and the optimum spot beam, or the global beam if the GES does not operate a P-channel in the required spot beam.

(6) The AES initiates the log-on procedure by tuning to the Psmc-channel (global beam) of the selected GES and sending a log-on request signal unit on one of the corresponding Rsmc-channels. If the log-on request signal unit cannot be accepted by the GES, because of reasons like GES overload, invalid message, unauthorized access, etc, the GES responds with a log-on reject signal unit, which includes the cause of the rejection. By returning a log-on confirm signal unit with a different AES class value, the GES can offer log-on in a different AES class than originally requested. The AES can either accept log-on in the offered class by continuing the log-on signaling procedure, or reject log-on by discontinuing the log-on signaling procedure.

(7) The AES uses the log-on request signal unit to supply the selected GES with its own identification (a 24-bit ICAO aircraft identification code), plus the identification of the spot beam where the AES is located. A zero value is used in the spot beam identification field of the log-on message if:

- No spot beam on the selected satellite
- AES is out of any spot beam coverage area
- Selected GES does not operate a Pd-channel in the required spot beam.

(8) The AES also informs the GES of the number of C-channels the AES is equipped to handle, the bit rate/coding algorithm in use on the voice channels, and the data bit rate capability for the R-channels, P-channels, and T-channels. Except for the number of C-channels and the data bit rate capability, this information is repeated in the log-on confirm signal unit for use by other GESs.

(9) An AES having circuit-mode data service capability and desiring allocation of circuit-mode data capable channel units at the GES for every ground-to-air call, informs the GES of the type of interface required. The interface is either analog interconnect or digital interconnect. If the GES does not support circuit-mode data service, it ignores the information. If the GES supports the service, it registers the information in its log-on AES table and retransmits the information for use by other GESs.

(10) The AES supplies the GES with its flight identification number at log-on, if the owner/operator of the AES desires to use the aircraft flight identification as the address for ground originated calls. The use of this information in the GES depends upon the services being offered, and therefore is at the discretion of the GES operator.

(11) The AES is given an EIRP setting for Rd-channels in the log-on confirm signal. If a T-channel is assigned, the AES determines the EIRP for the T-channel in accordance with the assigned R-channel EIRP and the ratio of the R-channel and T-channel bit rates. The GES assigns a Pd-channel from the available channels, taking into account the loadings on the channels, the need to use a P-channel of low power if possible, and the need to supply some means of recovery from P-channel degradation or failure. The ability to work with a low power P-channel is determined by the AES class. If the GES assigns a Pd-channel different than the Psmc-channel, the GES transmits the new channel frequency to the AES using the P/R-channel control signaling message following the log-on confirm.

(12) If the GES is using more than one set of R-channel frequencies and assigns new Rd-channels to the aircraft, the GES transmits the new channel frequencies (up to eight) to the AES using the signaling message(s) that follow the log-on confirm. In addition, the GES transmits from one to four T-channel frequencies to the AES if data services are supplied. The GES uses the following criteria to determine the channel and EIRP assignments for data services:

- Satellite in use (its return link sensitivity)
- Class of AES
- Bit rate capability of the AES.

(13) The GES assigns data channels at the highest agreeable bit rate supplied in both the AES and GES, and supported by the combination of the satellite in use and the class of AES. Subsequent log-on transactions for handover use Rsmc- and Psmc-channels in the same manner as the initial log-on transaction.

B. Automatic Log-On

(1) The SDU supports two types of log-on:

- Automatic
- Constrained mode.

(2) The SDU implements the automatic log-on mode upon user command if the AES is currently logged-off, AES is logging-on, or AES is logged-on in the constrained mode. Automatic log-on is also implemented by the SDU, if ORT item i (log-on policy) indicates automatic at startup. The user command can originate from either the SCDU, from the analog connected telephone handsets, or from the commissioning and maintenance terminal (CMT).

(3) When the AES is in the automatic mode, the log-on GES/satellite/spot beam chosen is based on the GES preference (ORT item iii). A GES with a preference level of zero is not considered for automatic log-on. The SDU allows the use of tied GES preferences. The SDU resolves tied preferences by selecting the GESs in descending order of satellite elevation. During GES selection, the set (as yet untied) of GESs with the highest preference are initially processed to exclude those GESs associated with satellites not in view.

(4) Satellites are deemed in view if they are above the elevation handover threshold specified in ORT item xxxix, or their elevation is higher than 1 degree less than the elevation of the highest satellite. If no IRS data is available and the currently selected antenna is the low gain antenna, then all satellites are deemed to be in view. The remainder of the GESs in the preference group are then sorted into a list by satellite elevation and GES on the highest elevation satellite chosen for initial access. If more than one GES in the preference group have the same satellite elevation, then those GESs are ordered by a pseudo-random choice algorithm with a uniform probability density.

C. Constrained Log-On

(1) Constrained log-on is where the user manually selects the specific GES to be used for log-on. The user command can originate from either the SCDU, from the analog-connected telephone handsets, or from the CMT. The GES preferences specified in ORT item iii have no effect in the constrained log-on mode, and it is possible to execute a constrained log-on to a GES with a preference level of zero.

(2) If the user has manually selected the log-on GES, and therefore also selecting the satellite, the SDU is constrained to search for the specific GES-related satellite Psid frequency (or frequencies), the set of spot beam Pd frequencies where the selected GES radiates P-channels, and the selected GES Psmc frequency during the log-on sequences. If the specific GESs satellite Psid frequencies cannot be acquired, the SDU takes no action other than to reattempt the acquisition with alternate modems. If none of the GES-related spot beam Pd frequencies can be acquired, the SDU starts the GES Psmc frequency search as it would normally do after acquiring a spot beam frequency. If the GES Psmc frequency cannot be acquired, the SDU reattempts the acquisition indefinitely. This state of unsuccessful satellite/GES Psmc frequency acquisition is exited either by the frequency being acquired, or by a user command to select automatic log-on, by selection of a different satellite/GES, or to log-off.

(3) Once logged-on in this mode with the GES constrained, only spot beam handover takes place. The user is able to exit this constrained log-on mode by commanding log-off, by selecting the automatic log-on mode, or by cycling SDU primary power (if ORT item i log-on policy is auto log-on..

D. Log-On Mode Selection

(1) User selection of the automatic log-on mode while the AES is logging-on in the constrained mode causes the SDU to abort the current log-on attempt and revert to the automatic mode. User selection of the automatic log-on mode while the AES is logged-on in the constrained mode causes the SDU to log-off from the current constrained GES, and to revert to the automatic mode if there are GESs in view with higher preference levels than the current log-on GES. User selection of the automatic mode when the AES is logged-off causes the SDU to implement automatic log-on. The SDU lets the user command log-off while the AES is logging-on or logged-on in the constrained or automatic mode.

(2) The user is able to change the selected GES if the AES is logging-on or is logged on in the constrained mode. The user can enter the constrained mode by selecting a specified GES while the SDU is logging-on or is logged-on in the automatic mode. In both cases, providing the constrained GES selection is different from the automatically chosen GES, the SDU either aborts the current log-on attempt or logs-off from the current GES before attempting to log-on to the new GES, depending upon the current status.

E. Handover

(1) The SDU causes the AES to initiate a handover procedure for the following reasons:

- Automatic handover when the AES is logged-on in the automatic or constrained mode, because of P-channel degradation.
- Automatic handover when the AES is logged-on in the automatic mode, because of the log-on satellite being below the elevation handover threshold specified in ORT item xxxix, with another satellite being at least 1 degree higher than the log-on satellite for more than 10 seconds.
- Automatic handover as specified in ORT item xxii for 10 seconds because of the reported HGA Tx gain being less than the threshold value when the AES is logged-on in the automatic or constrained mode.
- User command to select the constrained mode when the AES is logged-on (or awaiting log-on acknowledge) in the automatic mode if the constrained selection is different from the current, automatically selected GES.
- User command to select the constrained mode for a particular GES when the AES is currently logged-on (or awaiting log-on acknowledge) to a different GES, but also in the constrained mode.
- User command to select the automatic mode when the AES is logged-on (or awaiting log-on acknowledge) in the constrained mode if a GES exists with a higher preference level than the current log-on GES.
- User command to adjust the GES preference levels if the AES is logged-on (or awaiting log-on acknowledge) in the automatic mode, and the adjustment results in any GES having a higher preference level than the current log-on GES.

(2) The SDU logs off from the current log-on GES before logging onto the new GES for all of the above handover stimuli, except for automatic handover because of P-channel degradation and automatic handover because of the reported HGA Tx gain being less than the threshold value.

(3) If any modems are being used for circuit-mode voice when a handover to a GES in a different satellite region occurs, then the SDU terminates the current C-channel calls with an SLCV cause of 1221x. The SDU also causes a suitable voice pacifier message (Sorry, your call can no longer be sustained) to be sent to each currently in-use digital or analog headset to inform each user of the reason for the call termination. The SDU does not clear down any ongoing C-channel calls if the handover is local to the current satellite region.

F. Log-Off

(1) Log-off is initiated in the AES by a user command, either from the SCDU, from the analog-connected telephone handset, or from the CMT. Log-off is also initiated by the SDU as part of the handover sequence, except for handovers implemented because of P-channel degradation.

4. System Software/Database Updates

A. General

(1) Each MCS LRU (SDU and HPA) has an ARINC 615 Airborne Data Loader (ADL) and PDL port. The SDU and HPA are capable of transferring the data sets listed in Table 2-1 through these ports.

Table 2-1. Data Set Upload/Download

LRU	Data Set	Upload/Download
SDU	Operational Software	Upload Only
	Owner Requirements Table	Upload and Download
	Event and Failure Logs	Download Only
	Maintenance Activity Log	Download Only
	Periodic Data Logging (SDU system and operational parameters)	Download Only
HPA	Operational Software	Upload Only

(2) In Table 2-1, upload is defined as the transfer of a data set from the ARINC 615 data loader to the appropriate LRU. A download is defined as the transfer of a data set from an appropriate LRU to the ARINC 615 data loader. The data set to be transferred is independent of the port used. If during a data transfer session the other port becomes active, the session associated with the initially activated port continues to completion before initiating any session with the other port. The software upload function is resident in the bootstrap program and functions independently of any uploadable software in the LRU.

B. Software Upload Process

(1) The uploading of the software is done by either connecting a PDL to the ARINC 615 connector port on the LRU to be programmed, or (in the case of an ADL) by the user selecting the LRU to be programmed. With the data loader connected, the Link A connection is completed.

(2) The diskette containing a configuration file and a file containing the software to be uploaded is inserted into the disk drive of the data loader. The configuration file contains information for the data loader (ADL or PDL) to configure itself for operation. All MCS ORT download/upload diskettes contain a configuration file located in the root directory of the diskette with the filename CONFIG.LDR. The data loader reads the configuration file and initializes itself according to the parameters read. The data loader then repeatedly transmits an RTS word.

(3) With the operational software running, the SDU software upload is initiated only after:

- SDU senses the low impedance state on Link A.
- SDU determines it is not airborne (unless the operational software is not valid where the on-ground/airborne state is ignored).
- SDU detects receiving an RTS word with a system address label (SAL) equal to 307.

(4) The HPA software is similarly initiated only after the requirements mentioned are satisfied, except software uploading is also enabled when a valid air/ground status from the SDU is not available to the LRU.

(5) For the LRUs, the software upload is a single pass process. Upload validation checks both the LRU and SRU header records for applicability. Each data loader block is then transferred directly to the program store. When the software upload is completed, the program store CRC is checked over defined regions of the program store. If either validation process fails, the software upload process aborts. Further upload attempts can only be initiated by resetting both the data loader and the LRU. When successfully validated, the LRU causes the data loader to initiate the transfer complete function and the LRU remains in the data load state, while the Link A connection remains intact. When the Link A connection is removed, the HPA performs a POST and the SDU performs a factory settings restart. A factory settings restart results in Category C nonvolatile data being set to default values followed by execution of POST/PAST.

C. Validation of the Software Upload File

(1) The following items are validated when software is loaded:

- First two bytes of each LRU/SRU header record indicates a valid record type for the record position in the data sequence.
- Company name in the LRU header record must be HONEYWELL/RACAL.
- LRU name and base part number must match the current LRU specification as given on the LRU nameplates.
- Software compatibility codes in each SRU ID PROM must appear in the list of compatible hardware/software codes for every SRU listed in the LRU header.

5. Owner Requirements Table

A. General

(1) The ORT is stored in nonvolatile memory in the SDU. The ORT contains information relating to different areas of functionality like log-on and telephony. The ORT does not lose its contents because of the loss of SDU primary power or as a result of PAST. All ORT contents are set to default values by a factory settings restart. The ORT contains all pilot and aircraft operator entered information preserved when the SDU is powered-down.

(2) Validity of the ORT content is determined by the SDU using a checksum process. This verification is performed at the time of each power-up. An invalid checksum results in the SDU reverting to the default values specified in TESTING/FAULT ISOLATION, ORT default value usage. The contents of the ORT are specified in Appendix C.

(3) The ORT items are organized into two distinct partitions:

- Secured
- User.

(4) The individual ORT items defined in Table C-1.1 are assigned to a partition by the designation of secured or user in the attributes column.

(5) The secured partition contains those items the equipment manufacturer, aircraft manufacturers, and certification authorities have determined to be configuration-dependent and crucial to the proper operation of the SATCOM system. The user partition contains all other items of the ORT. The user partition typically includes items the aircraft operator is able to set or modify, enabling the efficient use of the equipment in normal operation. A composite ORT file contains all items (both partitions) in the ORT. This version of ORT is defined to supply a consistent interface (single ORT file) to those users that do not require the additional security supplied by the management of two partitions for essential certification.

(6) The content of the ORTs in both SDUs in a dual system is intended to be identical. For the sake of ORT requirements that must be capable of being different in SDUs 1 and 2, the ORT items affected are **duplicated** within the ORT. Each of those items is capable of storing separate, independent entries for SDUs 1 and 2, to be used by each particular SDU as appropriate based on the strapping of its system configuration pins TP13E/F. The lone SDU in a single system uses the entry for SDU 1 for duplicated items. ORT items not duplicated are said to be **common**, where the single entry applies to SDUs 1 and 2 in dual systems as well as to the lone SDU in a single system.

6. ORT Upload/Download Process

A. General

(1) Each ORT download/upload diskette contains a configuration file. The configuration file contains information for the data loader (ADL or PDL) to configure itself for operation. All MCS ORT download/upload diskettes contain a configuration file located in the root directory of the diskette with the filename CONFIG.LDR.

(2) The ORT upload/download file is named SDU_ORT.TAB. This file is made up of an ORT header record followed by the ORT data. The ORT format version in the ORT header record is an indication of the ORT data contained in the upload/download file.

B. Startup

(1) ORT downloading/uploading is initiated through the SCDU page or the CMT page. The diskette containing a configuration file is inserted into the data loader, which reads the configuration files and initializes itself according to the parameters read. The data loader then repeatedly transmits a POLL word. The LRU detects receiving a POLL word and initiates the ORT download/upload.

(2) In the event no configuration file is present or the diskette is not formatted, the data loader solicits a subsystem identification. The SDU does not respond to the command and the data loader performs a change disk or a read/write fail.

C. ORT Download

(1) The ORT file is transferred using the control mode download sequence. If insufficient space exists to contain an ORT, the transfer operation terminates. A file name SDU_ORT.TAB is created on the ORT diskette. This file replaces any existing file with the same name. An ORT header is written at the head of the file. The ORT format version written into the header is the latest version supported by the installed software build. After transferring the header record, the ORT data is written to the file until the whole data table is transferred. The file is then closed and a load complete function is commanded. When an error is detected during the ORT download (i.e., unable to create file, ARINC 615 transfer failure, etc.) the download process aborts and an ADL/PDL error status is indicated on the SCDU/CMT.

D. Control Mode ORT Upload Procedures

(1) Upload the ORT through the MCDU (SCDU)

(a) Make sure the ADL switch in the cockpit has SDU (SAT or SATCOM) selected, or a PDL is connected to the SDU and the MCS system is logged off.

(b) Insert an ORT diskette containing the ORT file SDU_ORT.TAB, plus the CONFIG.LDR file into the ADL/PDL.

(c) Access the SDU data loader menu from the MCDU through the following path:

- MCDU main menu
- SATCOM main menu
- Submenu
- Maintenance (Boeing Aircraft Only)
- Data loader.

(d) Make sure line 1L indicates ready.

(e) Select line 2L (*UPLD OWNER REQS).

(f) When the MCDU displays CONNECTED, the data upload is complete. Remove the diskette from the ADL/PDL. Disconnect the ADL/PDL from the SDU and initiate PAST in the SDU.

(2) Upload the ORT through the CMT

(a) Make sure the PDL is connected to the SDU through the appropriate connector on the interface cable, and the MCS system is logged off.

(b) Insert an ORT diskette containing the ORT file SDU_ORT.TAB, plus the CONFIG.LDR file into the PDL.

(c) Access the SDU data loader menu from the CMT by performing the following key entries from the CMT main menu:

- D (SDU maintenance menu)
- B (data loader menu).

(d) Make sure the data loader menu screen indicates PDL ready.

(e) Select G (load owner requirements table from diskette).

(f) When the PDL diskette activity stops, push enter and make sure the CMT displays ADL or PDL CONNECTED. The data upload is complete. Remove the diskette from the ADL/PDL. Disconnect the PDL from the SDU and initiate PAST in the SDU.

(3) Upload the ORT through the CMTI (Windows)

(a) Make sure the PDL is connected to the SDU through the appropriate connector on the interface cable, and the MCS system is logged off.

(b) Insert an ORT diskette containing the ORT file SDU_ORT.TAB, plus the CONFIG.LDR file into the PDL.

(c) Access the SDU data loader menu from the CMT by performing the following from the CMTI main menu:

- Select the <u>O</u>RT menu
- Select the ORT <u>T</u>ransfer menu
- Select the <u>P</u>DL to SDU option.

(d) Make sure the status line indicates Data Transfer in Progress.

(e) When the PDL diskette activity stops, the status line should indicate Transfer Complete. Remove the diskette from the ADL/PDL. Disconnect the PDL from the SDU and initiate PAST in the SDU.

E. Auto Mode ORT Upload Procedure

(1) Make sure the PDL is connected to the SDU through the appropriate connector on the interface cable, and the MCS system is logged off.

(2) Insert into the PDL an ORT diskette containing a CONFIG.LDR file and a ORT file created by the ORTool as an **Auto Mode**, **Boeing Mode**, or **B777 Mode** Loader File Type.

(3) Make sure the status line indicates Data Transfer in Progress.

(4) When the PDL diskette activity stops, the status line should indicate Transfer Complete. Remove the diskette from the ADL/PDL. Disconnect the PDL from the SDU and initiate PAST in the SDU.

7. Circuit-Mode Services

A. Circuit-Mode Voice

(1) The SDU supports cockpit and cabin voice services (refer to SYSTEM DESCRIPTION for a description of cabin/cockpit communications) that use the INMARSAT aeronautical satellite system. Cockpit voice services use the equipment currently found on the flight deck (i.e., headsets, call lamps, chime, chime reset, push-to-talk switches, and audio control panels and audio management systems) as shown in Figure 2-1. Cabin voice services are accommodated by the following:

- CCS including a CTU interfacing with the SDU.
- Standard interwiring interfaces reserved for cabin audio to supply priority 4 services. These SDU interfaces support analog voice with in-band DTMF dialing and some discrete signaling.

B. Circuit-Mode Data

(1) General

(a) Once a call is established and two-way communication exists using a C-channel, the C-channel can be used for purposes other than the initial (default) purpose of carrying real-time voice signals using the defined codec standard. Circuit-mode data services can be used to support a variety of communication applications like interactive or bulk data communication, encrypted voice/data communication, and facsimile transmission.

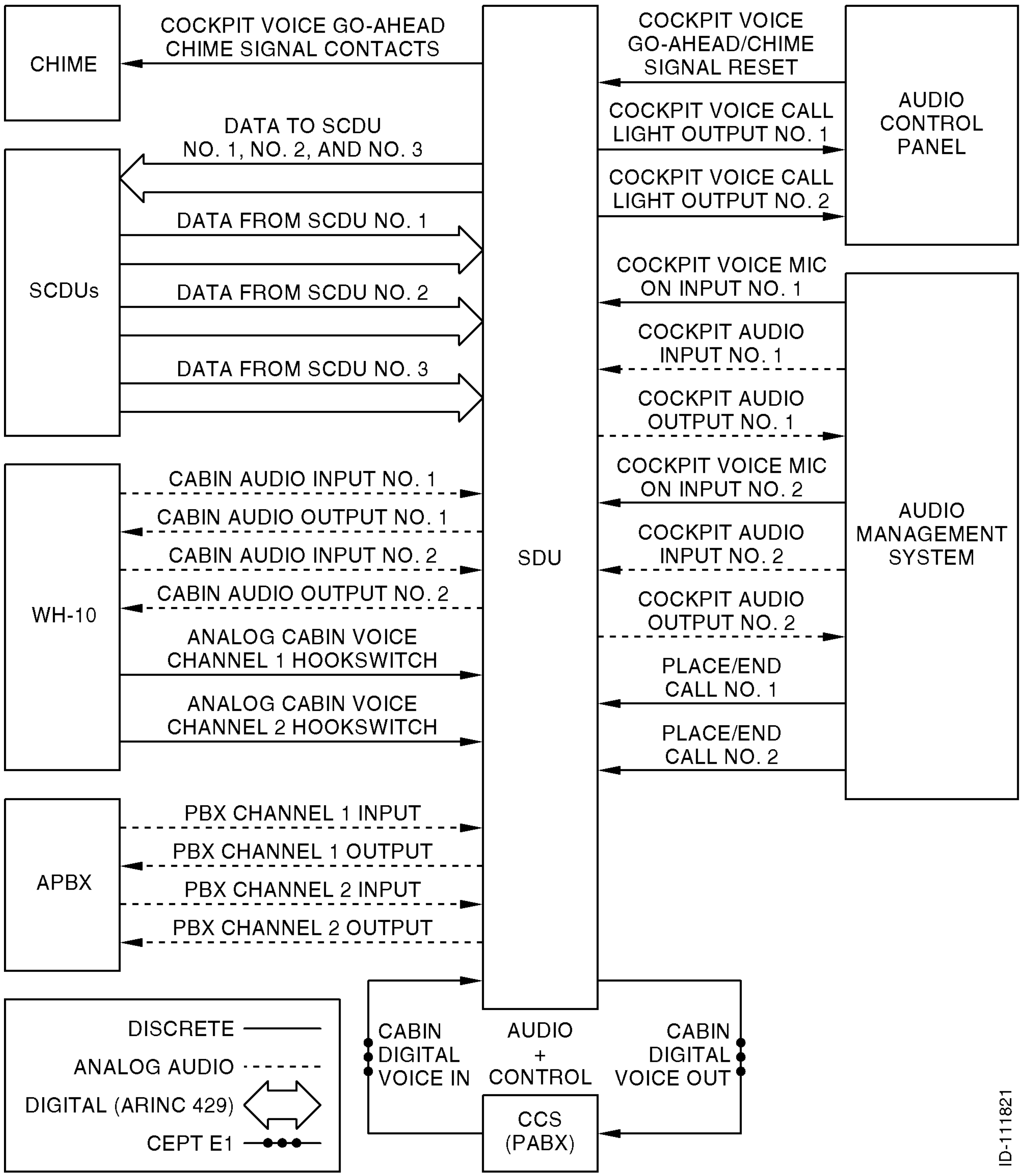

Figure 2-1. Satellite Audio System

(2) Sub-Band Signaling

(a) Support of circuit-mode data services is achieved through the use of sub-band signaling, and/or primary-band signaling. The call setup sequence for a circuit-mode data call is identical to a standard telephone call setup sequence, except when the AES must indicate to the GES circuit-mode data operation can be invoked at some point during the call. Sub-band signaling circuit-mode data is implemented using the data interface unit (DIU) technique, which is a nontransparent design that uses sub-band C-channel capacity for end-to-end signaling. These signaling transactions require diversion of the input/output (I/O) bit-stream from the SDU codecs to either a DIU (for PC modem applications) or a secure voice coding unit.

(3) Primary-Band Signaling

(a) Primary-band circuit-mode data is implemented using the terminal interface function (TIF) technique, which uses primary-band C-channel capacity for end-to-end signaling. The TIF is integrated within the SDU codec. All circuit-mode data activation and deactivation procedures relating to circuit-mode data operation are automatically performed within the TIF. The TIF encodes/decodes circuit-mode PC modem data and facsimile data using an algorithm.

8. Packet-Data Services

A. General

(1) Data services are available in the form of a standard data interface that supports Data-2 and Data-3 as defined by INMARSAT. Data-3 complies with International Standards Organization (ISO) standard 8208 for open systems interconnection. Data-3 permits the operator to connect to the MCS system any data terminal equipment (DTE) compatible with this international standard. The transmission rate available to the operator depends on the aircraft equipment, and in particular on the antenna gain. It also depends on the capabilities of the satellite serving that particular region of the earth and the GES logged-on to the satellite.

(2) Within the scope of the normal mode of operation, packet mode data messages are handled by two basic types of data service. Small messages (up to 128 bytes) are handled by one self-contained message that includes the information required to set up and clear the circuit as well as the data itself. This connectionless message traverses the communication link autonomously and quickly.

(3) Longer messages must be divided into a string of shorter messages for which a connection-oriented circuit is set up. When the connection is established, all subsequent data packets carry abbreviated address and control information. This supplies more efficiency for longer messages and inquiry/response data dialogues with no limit set on the length of individual messages.

9. Dual SATCOM Configuration

A. Overview

(1) General

(a) Dual SATCOM configuration is one where two SDUs work together in a master/slave relationship. This configuration also uses dual antenna systems.

(b) Dual SATCOM systems can be used to supply backup redundancy for circuit-mode and packet-mode safety communications, or for additional circuit-mode channel capability, or both. Each system in a dual system has the capability to function without the other if necessary (as a sole single system while the other has failed or is disabled), or to work with the other system as a coordinated pair. There are three distinctions made for dual systems regarding the SDUs:

(2) No. 1 versus No. 2

(a) This is a static distinction as determined by the programmed state of the SDU system configuration pin. (No. 1 and No. 2 can also be referred to as left and right, respectively, on Boeing aircraft.)

(3) Master versus Slave

(a) This is a logical and potentially dynamic distinction. Because an aircraft can have only one ICAO address assigned to it, dual MCS systems operate with a single master SDU and the other as slave SDU. Each SDU is capable of providing its services with no assistance from the other SDU (e.g., when the other SDU is powered-down). Each SDU is capable of being the master or the slave. There are never two masters or two slaves (except during brief switching transients and certain failure plus manual override conditions). The master does not depend on the slave for any of the services supplied directly by the master.

(b) The master is in control. Only the master is allowed to use the P, R, and T packet-mode channels for log-on and other satellite system management, Data-2, Data-3, and GES-specific data broadcast (GSDB) packet-mode data services, and circuit-mode call setups. The slave (which must be equipped with an HGA in order to be a true slave from the perspective of offering additional channel capacity) does not perform log-on or any packet-mode data function, but is only used to supply additional C-channels for circuit-mode services under control of the master. The master controls all circuit-mode call setups, preemptions, and selective releases; normal ongoing slave system call management (e.g., power control) and call termination are controlled by the slave SDU.

(c) In a dual system made up of an HGA and an LGA, if the LGA-equipped SDU is the master, it cannot use the HGA-equipped system as a slave. The LGA master must be capable of operation through its LGA and must log-on as a Class 1 AES. If the slave is only equipped with an LGA, it cannot function as a true slave, but only as a standby backup system for low-rate packet-mode data services, ready to take over as master in case the original master fails.

(d) A system is said to be disabled when it is inhibited from making any RF transmissions. This disabling can be because of a failure or being manually inhibited through the control interfaces. Any disabled SDU indicates this in bit 12 of its label 276 status word. If a system is not disabled, it is enabled. When one system is disabled, the other is usually selected, i.e., the selected system is essentially a single system and cannot use any potential slave resources in the disabled system. It is possible both systems can be manually disabled for special purposes like when maintenance or deicing personnel are in close proximity to the antennas. The master controls the system functional capability indicators and indicates itself as the master to the MU, cabin packet data function (CPDF), and CTU. This is true even when both SDUs are disabled (there must still be a designated master).

(4) This versus Other

(a) This is a relational distinction where **this** refers to any and all SDUs in dual systems, and **other** refers to the companion SDU interfaced to **this** SDU ARINC 429 cross-talk bus (XTB) and select/disable discretes.

B. Dual System Control/Status Interfaces

(1) Manual and automatic control of the master/slave/select/disable attributes of the two systems are done by using the XTB between the two SDUs (one high-speed ARINC 429 bus in each direction), and by the dual system select discrete I/O and dual system disable discrete input discretes, which are cross-wired between the two SDUs. Figure 2-2 shows a classic wiring diagram.

(2) The select and disable discretes are normally in a high-impedance state. The select output supplies a low-impedance to ground when it is asserting, and the select and disable inputs are pulled low to be asserted. An optional external switch can also be supplied to manually select one system while disabling the other. A switch normally leaves both discretes open-circuited, enabling fully automatic control. The optional switch can additionally have the enhanced capability of simultaneously disabling both systems while selecting neither. Manual control is also supplied through the SCDUs for cases where the optional external switch is not supplied.

(3) The disable discrete is an input only. It is automatically asserted by the other SDU select output when attempting to perform an aggressive handover of mastery; it can also be manually asserted when the crew has determined this system has failed.

(4) The select discrete is a combination input and open-collector-type output. Activation of this discrete by the crew indicates this system should be the sole master and it must not attempt to use the other as a slave. If an SDU detects the other system has failed, it can activate its own select output, which disables the other system and typically becomes the sole master.

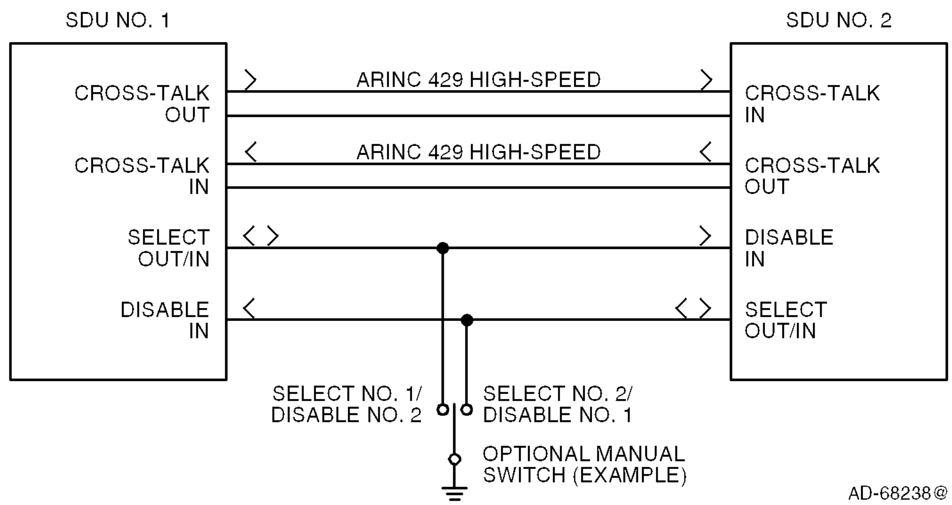

Figure 2-2. Dual System Wiring Diagram

C. System Reversion

(1) General

(a) The dual MCS system can change which SDU is master automatically or manually. Automatic system reversion of handover of mastery from the current master to the current slave is done through cooperative, aggressive, and special handovers.

(2) Automatic System Reversion

(a) Cooperative handover of mastery is performed through the XTB and does not make use of the select/disable discretes. The current master continually assesses the potential service capabilities of each system, including the usage of the other's resources as a slave for providing additional voice services. Since different aircraft owners/operators can value the individual assessed service capabilities differently, weighting factors are selected in the ORT to reflect the relative importance of the various capabilities. This flexibility allows all capabilities to be compared equally, or for any one capability to outweigh all of the others combined, or any combination between these extremes. When the current master determines the current slave should become the new master, the current master indicates it is abdicating its mastery. The slave detects the abdication of the master and takes over as master.

(b) Aggressive handover of mastery (used when cooperation is impossible because of XTB failure, manual intervention, or other reasons) makes use of the select/disable discretes for mastery handover. An SDU asserts its select output (connected to the Disable input of the other SDU) and commands **Disable Other SATCOM** on its XTB output to the other SDU (in its Dual Control/Status word). When an SDU detects its disable discrete input has been asserted, or it has received a **Disable Other SATCOM** command through the XTB, it immediately asserts its **My Disable Is Asserted** bit in its dual control/status word on its XTB output, and after being so disabled for 1 second or longer, it then inhibits RF transmissions and asserts its **This SDU Is Disabled** bit in its dual control/status word.

(c) If the master SDU main processor resets itself, handover of mastery occurs when the slave detects XTB inactive (unless the slave is externally disabled).

(3) Manual System Reversion

(a) The cockpit crew can manually select one system as the sole master and disable the other system using an external select/disable switch or through the SCDU disable other SATCOM line select key. This permits manual system reversion for special cases, like undetected failures. Some external select/disable switches may permit both systems to be disabled simultaneously for special cases involving close proximity to the SATCOM antennas of maintenance or deicing personnel.

(b) The SCDU line select key makes use of the XTB as well as the select/disable discretes to send the appropriate command to the other SDU, thus optimizing the robustness of this function.

D. Antenna Configurations

(1) A number of dual system antenna configurations can be assembled to address various user requirements for availability and channel capability, containing various combinations of LGA-, HGA- or IGA-equipped systems — i.e., HGA(IGA) + HGA(IGA), HGA(IGA) + LGA, or LGA + LGA. The IGA equipment can be used interchangeably (when airplane installation supports) with the HGA equipment. Any HGA in a dual (or single) system can function as a logically distinct steered LGA when its gain drops below 7 dB. Also possible is one pseudo-dual system plus one HGA system —i.e., (HGA+LGA) + HGA.

(2) The basic configurations supported by the MCS dual system design are as given in Table 2-2.

Table 2-2. Basic Antenna Configurations

SDU No. 1	SDU No. 2	Notes
HGA	LGA	Original ARINC 741 dual system architecture
HGA	HGA	MD-11 and 777 dual standard
LGA	LGA	- -
HGA + LGA	HGA	SDU No. 1 is pseudo-dual

(3) Some specific examples of these configurations are shown in the following figures . Only unique combinations (as opposed to permutations) are shown.

(4) Figure 2-3 and Figure 2-4 show the two types of the HGA + LGA configuration. This configuration is normally capable of providing five circuit-mode channels plus one (potentially) high-rate packet-mode data channel. It supplies single-point failure tolerance for low-rate packet-mode data services. Channel unit redundancy within the HGA system supplies a limited but very flexible degree of failure tolerance for circuit-mode and high-rate packet-mode services.

(5) Figure 2-5, Figure 2-6, and Figure 2-7 shows the three types of the HGA + HGA configuration. This configuration is normally capable of providing 10 circuit-mode channels plus one (potentially) high-rate packet-mode data channel. It supplies single-point failure tolerance for all grades of all services. Channel unit redundancy within each half of the dual system supplies a limited but very flexible degree of failure tolerance for all grades of all services before more serious failures force a handover of mastery.

(6) Figure 2-8 shows the LGA + LGA configuration. This configuration is capable of providing only one low-rate packet-mode data channel, and supplies single-point failure tolerance for that capability.

(7) Figure 2-9 thru Figure 2-12 shows the different types of the pseudo-dual (HGA + LGA) + HGA configuration. This configuration contains all of the normal and failure-tolerance capabilities as the HGA + HGA configuration, and adds the capability of one low-rate packet-mode data channel in instances where both HGAs are unusable because of trying to point into keyholes. (The use of dissimilar dual HGAs, like those shown in Figure 2-7, helps to minimize the need for such a configuration.)

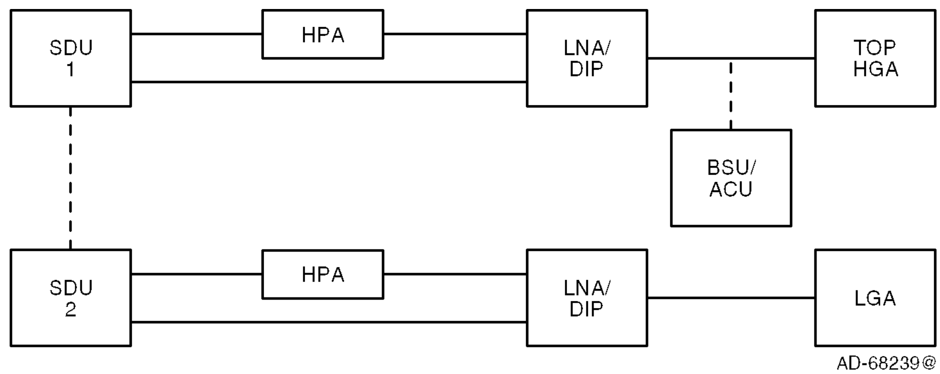

Figure 2-3. HGA + LGA Configuration with Top-Mounted HGA

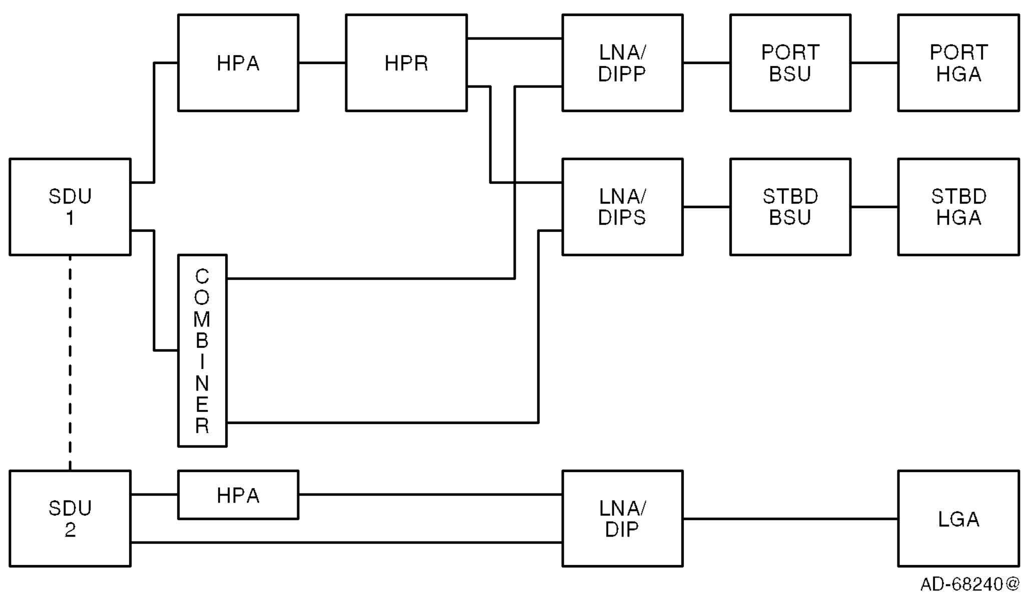

Figure 2-4. HGA + LGA Configuration with Side-Mounted HGA

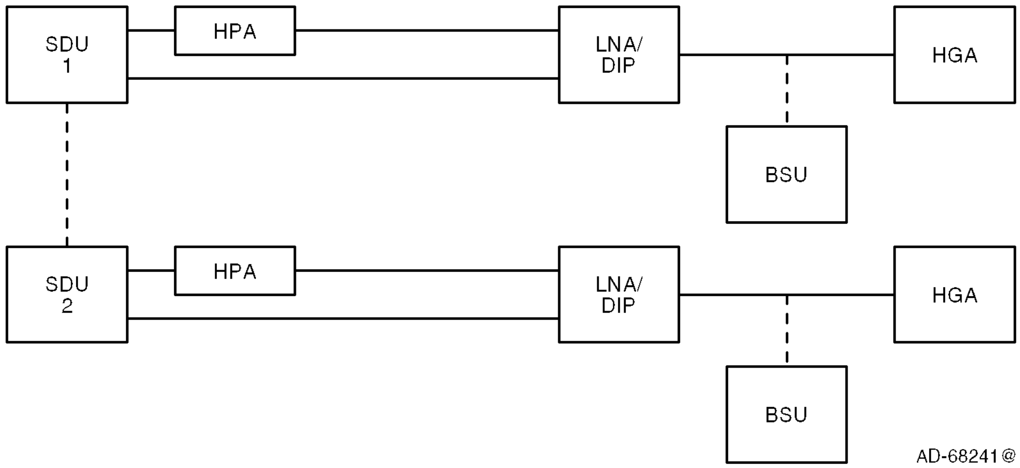

Figure 2-5. HGA + HGA Configuration with Two Top-Mounted HGAs

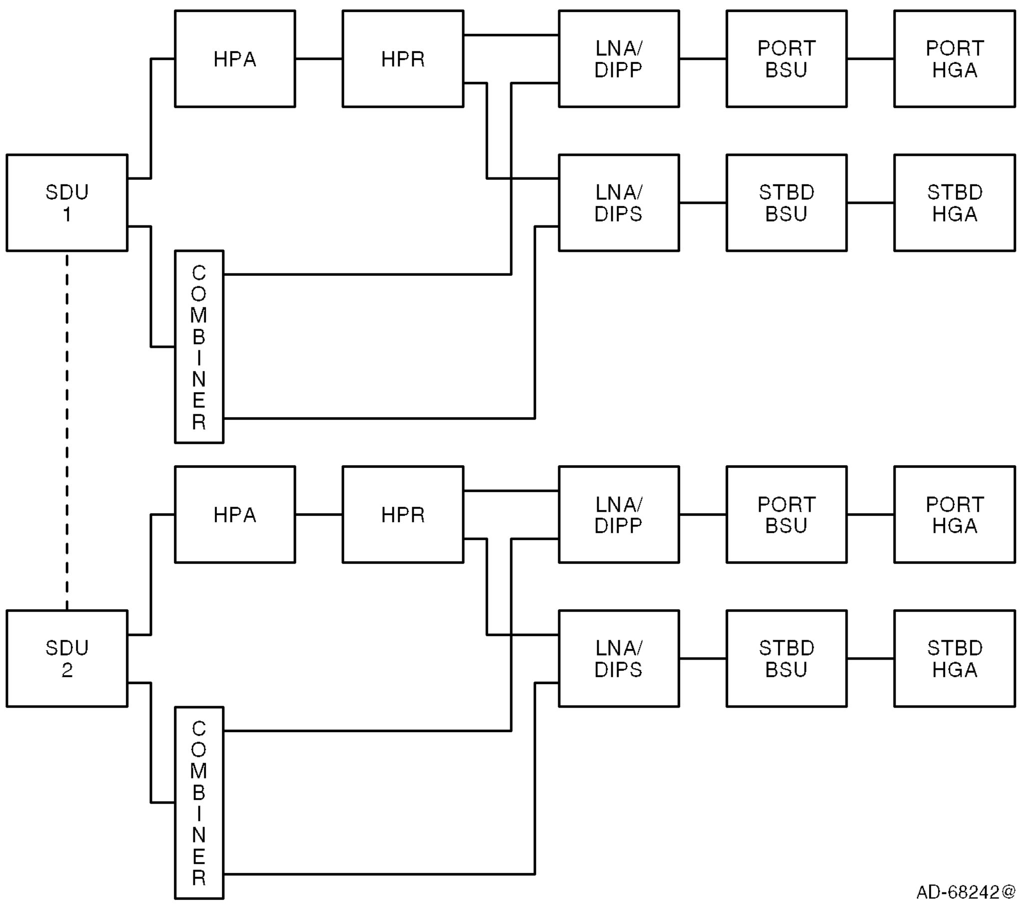

Figure 2-6. HGA + HGA Configuration with Two Side-Mounted HGAs

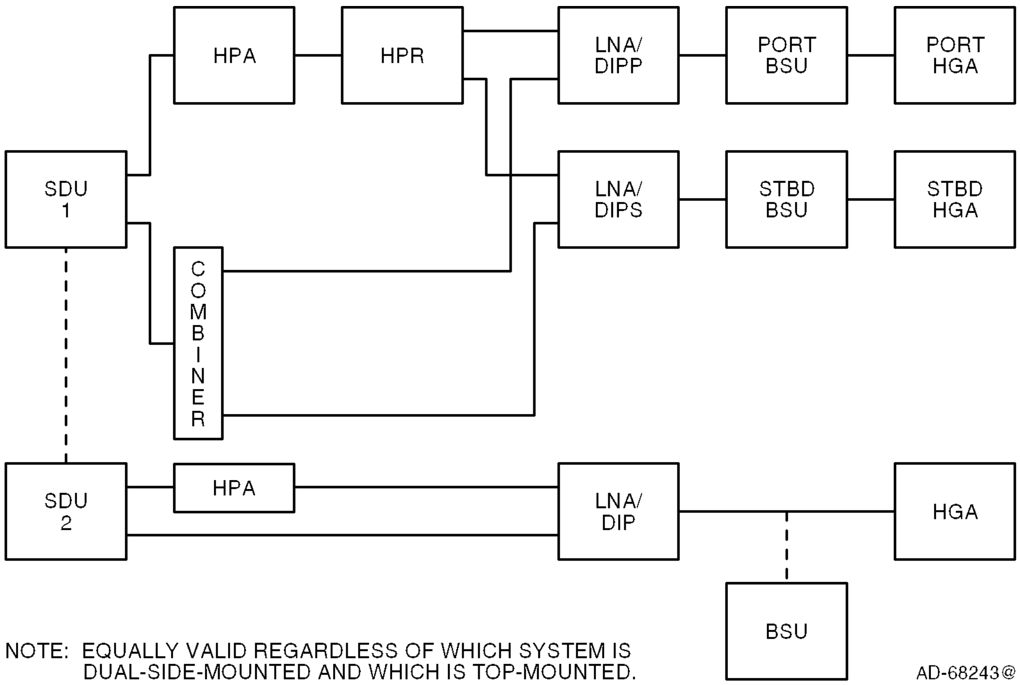

Figure 2-7. HGA + HGA Configuration with One Side-Mounted HGA + One Top-Mounted HGA (Dissimilar HGA)

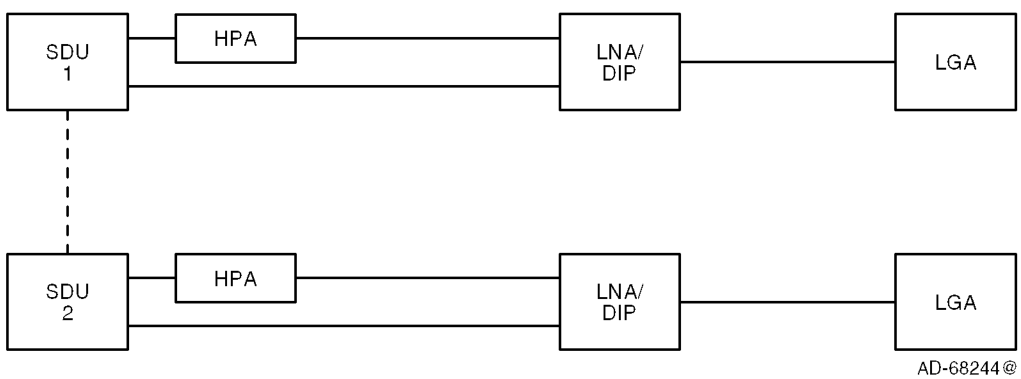

Figure 2-8. LGA + LGA Configuration

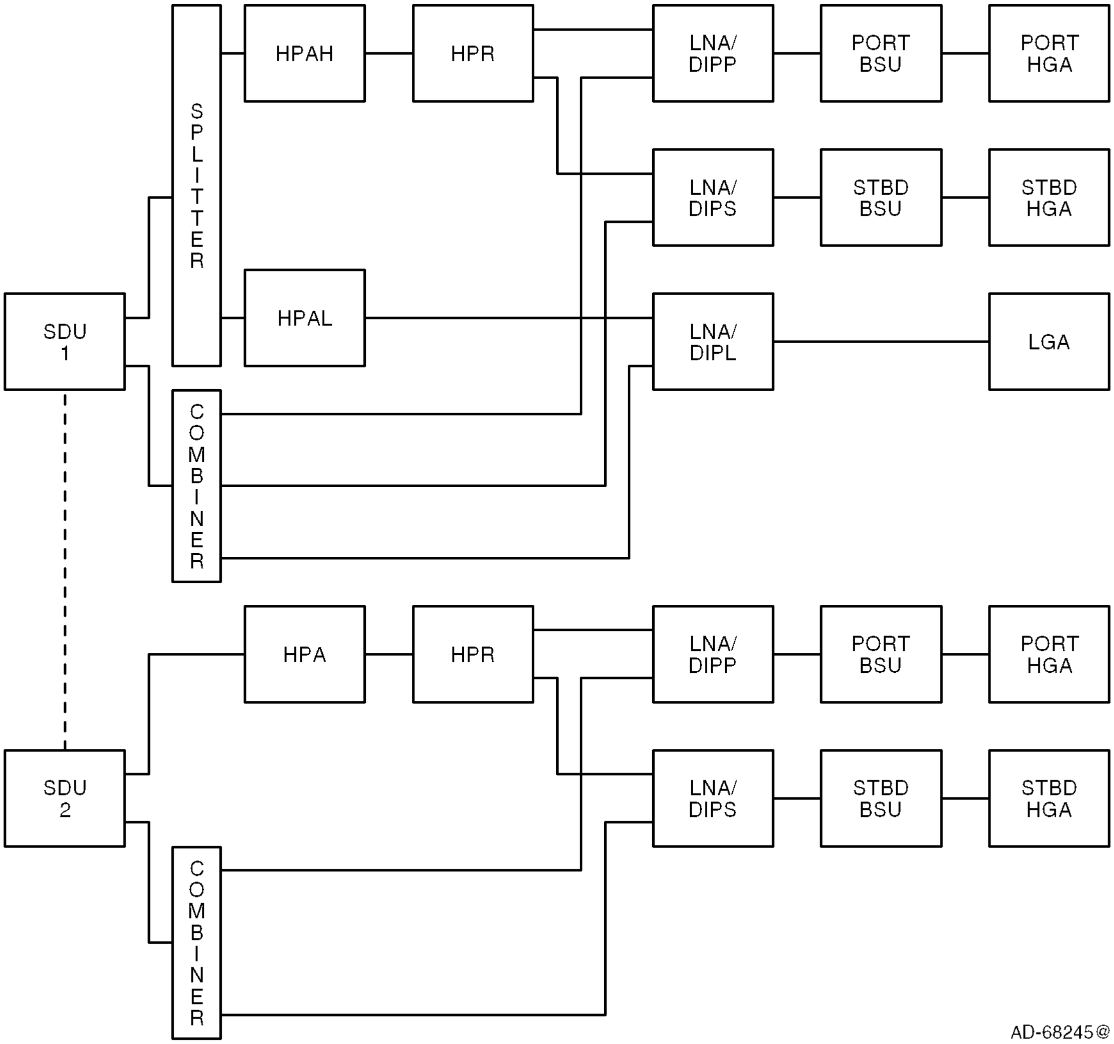

Figure 2-9. (HGA + LGA) + HGA Configuration with Two Side-Mounted HGAs

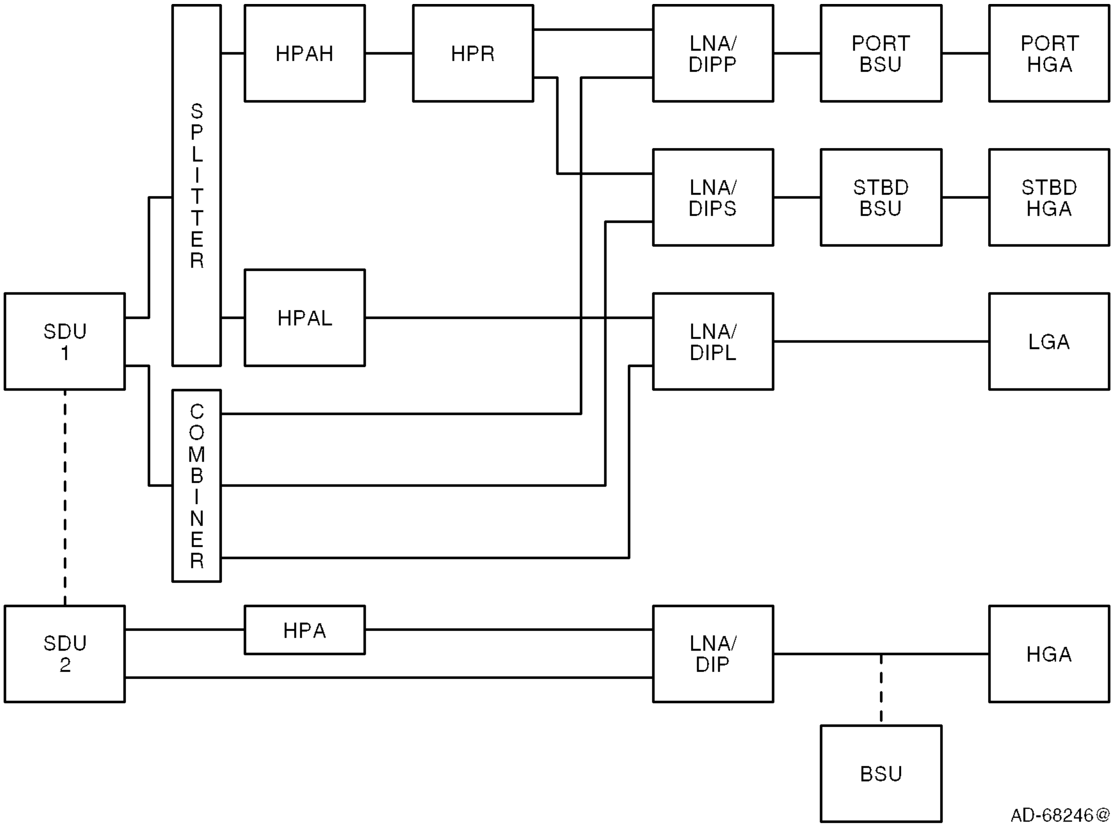

Figure 2-10. (HGA + LGA) + HGA Configuration with the LGA Paired with One Side-Mounted HGA

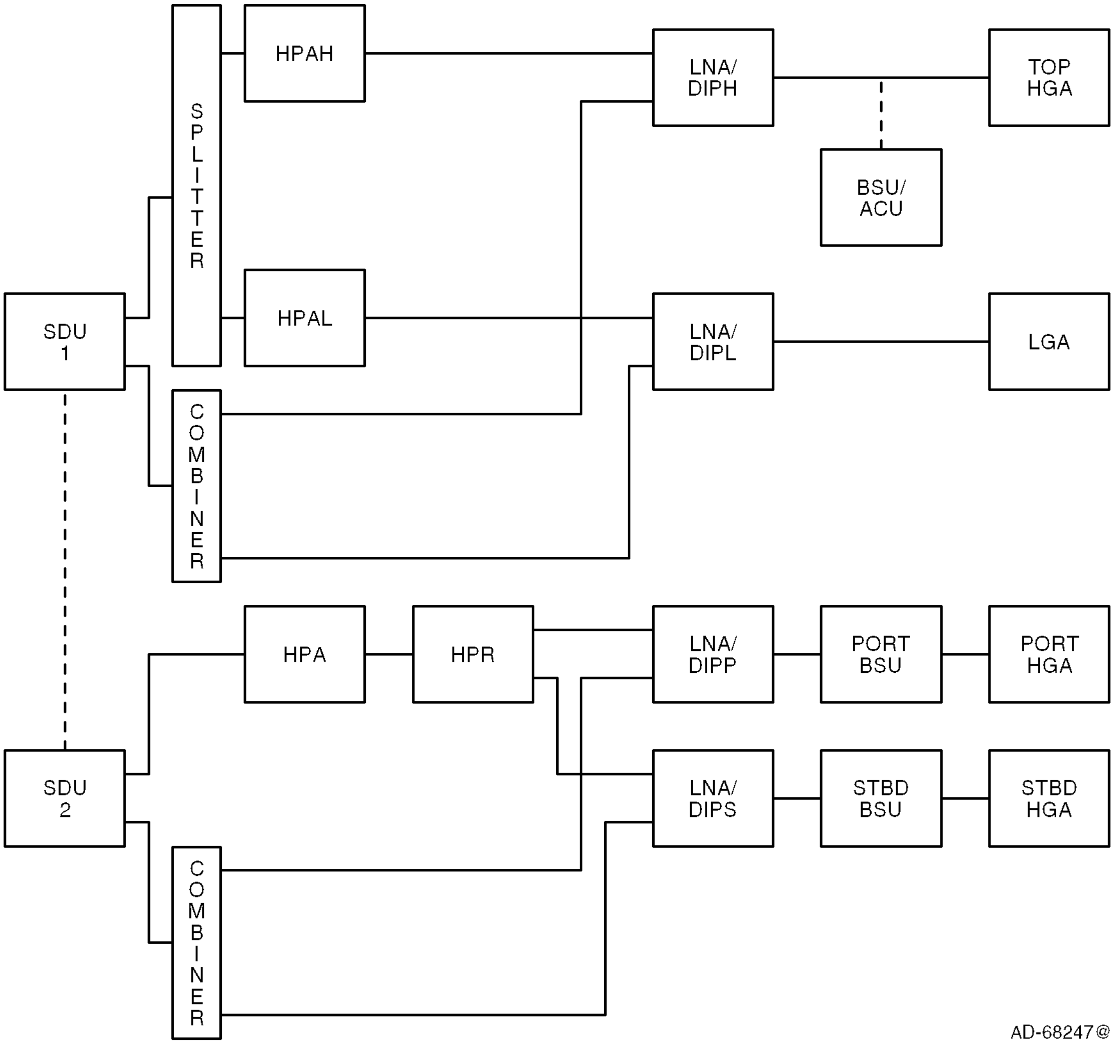

Figure 2-11. (HGA + LGA) + HGA Configuration with the LGA Paired with One Top-Mounted HGA

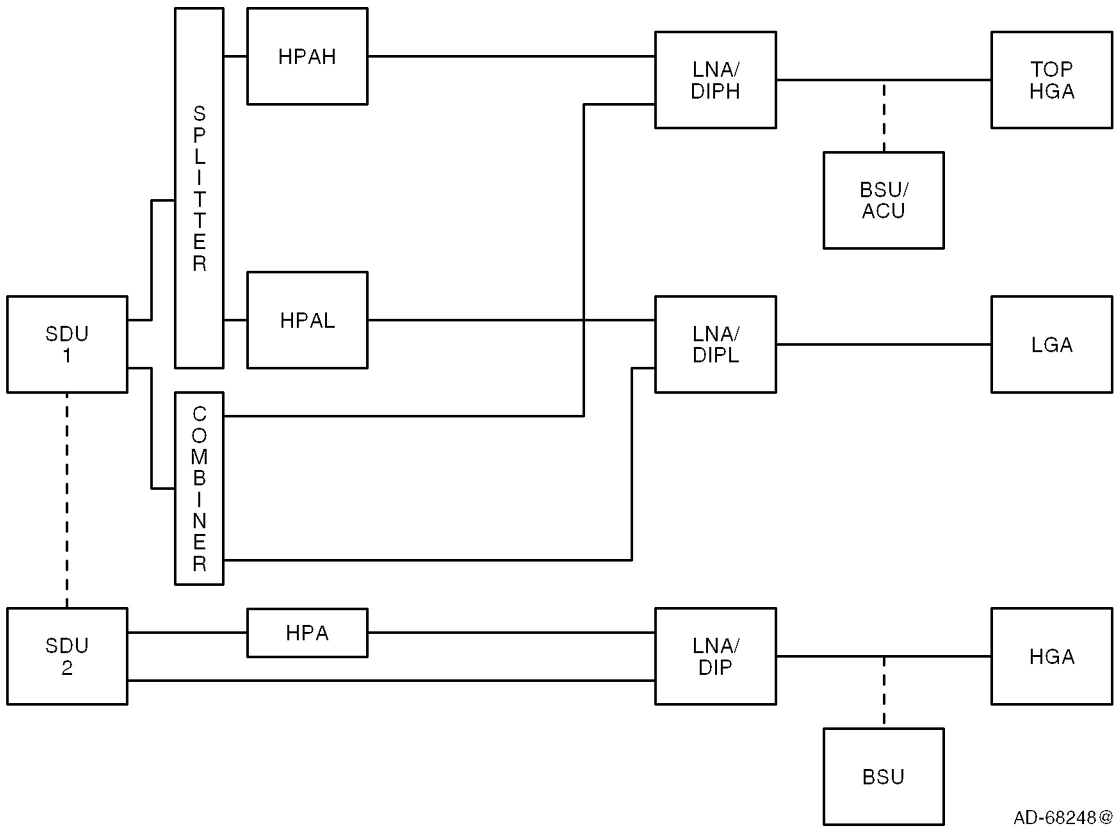

Figure 2-12. (HGA + LGA) + HGA Configuration with Two Top-Mounted HGAs

E. Cockpit Voice Configurations and Functionality

(1) System configuration pins TP13F and TP13J specify the physical wiring for the codecs of each SDU to the possible interfaces - a codec/channel can only be available to the cockpit if the wiring strap is set to Cockpit or Both (and not if the wiring is to Cabin or Neither).

(2) An additional issue with dual systems is how to map the potentially available four physical SDU cockpit voice channels with the one or two (maximum) usable logical cockpit channels controllable through the audio control panels (ACPs) and the SCDUs (i.e., as seen by the audio management system [AMS] user). Two configurations are defined, which are identified by ORT item xlviii (Cockpit Channel Interface Type for Dual): (1) interfacing each ACP/SCDU logical channel to one physical channel on one SDU only (**fixed**), and (2) interfacing an ACP/SCDU logical channel to one physical channel on each of the two SDUs (**shared**). Note the interfacing referred to is conceptual and not necessarily physical - i.e., for shared, the physical wiring can be literally paralleled, or it can be simple point-to-point, with some form of signal splitting/combining or paralleling being performed within the AMS itself. The system configuration straps for codec wiring let the SDU determine the physical channels which are candidate channels for each logical channel.

10. ACARS/Aircraft Flight Information System (AFIS) Peripheral Function

A. General

(1) The ACARS/AFIS peripheral function lets the SATCOM SDU act like any other ACARS/AFIS peripheral to receive or send blocks of data from/to ground terminals on the ARINC/SITA network, e.g., uplink ORTs, and downlink ORTs, call event logs, data event logs, system management event logs, and failure logs. This functionality integrates with the satellite subnetwork transfer capability. The requirements are taken from ARINC 618 for the air-to-ground link and ARINC 620 for the data link service provider requirements.

SECTION 3
CABIN/COCKPIT COMMUNICATIONS

1. Cabin Communications

A. General

(1) Cabin communications are done with both digitally connected phones and analog connected phones (see Figure 3-1). The user interface with digitally connected phones is handled by the cabin communications system (CCS). The SDU has provisions to support up to two analog connected channels, one per installed codec. Each analog channel supports two interface types:

- Global-Wulfsberg Flitephone WH-10
- Analog Private Branch Exchange (APBX).

B. Cabin Communications System

(1) The CCS, in conjunction with the MCS avionics and a worldwide network of ground stations, supply cabin services like telephone, facsimile, and PC data interfaces. The CCS is partitioned into two sections:

- Cabin telecommunications unit (CTU)
- Cabin/passenger communications equipment (digitally connected telephones).

(2) The CTU performs on-board PABX telephone functions that let the digitally connected telephones make the best use of resources supplied by the MCS avionics. Other functions supplied by the CTU include signal processing (for example, analog-to-digital and digital-to-analog), dial tone generation, call queuing, call transfer, call conferencing, and generating pacifier messages (like **please hold, your call is being processed**).

(3) The CTU supplies the interface between the digitally connected phones and the SDU. The digital phones (handsets) are primarily supplied for passenger use and may be located throughout the aircraft. The digital handsets interface indirectly to the satellite communications equipment and they are controlled by the CCS. Each digital handset supplies all the normal functions of a domestic telephone. Some handset types are battery powered and can be used anywhere in the aircraft. When not in use, handsets are stowed in a holster with a built-in battery charger for recharging the batteries.

C. Analog Audio Channels

(1) General

(a) The SDU has provisions to support up to two analog channels. Each audio channel supports two interface types:

- Global-Wulfsberg Flitephone WH-10
- Analog private branch exchange (APBX).

(b) The WH-10 is a stand-alone handset with a 12-button keypad. The APBX CTU or handset has analog trunk lines and in-line DTMF signaling. The SDU can support both analog handsets being connected simultaneously.

(c) Two in-use discrete outputs are supplied for analog channels 1 and 2. These discretes are asserted (i.e., turn on the call lamps) while the voice codec associated with that analog channel is in use (off-hook) by the analog handset.

(d) These interfaces can be connected to individual or up to five parallel aircraft-suitable handsets. The interface presented to the SDU must emulate a single handset. The analog handsets, which can be located in the cabin or cockpit areas, supply only APC priority (priority 4) level service. This does not preclude their use for other communications, but the SDU assigns an APC priority to the call.

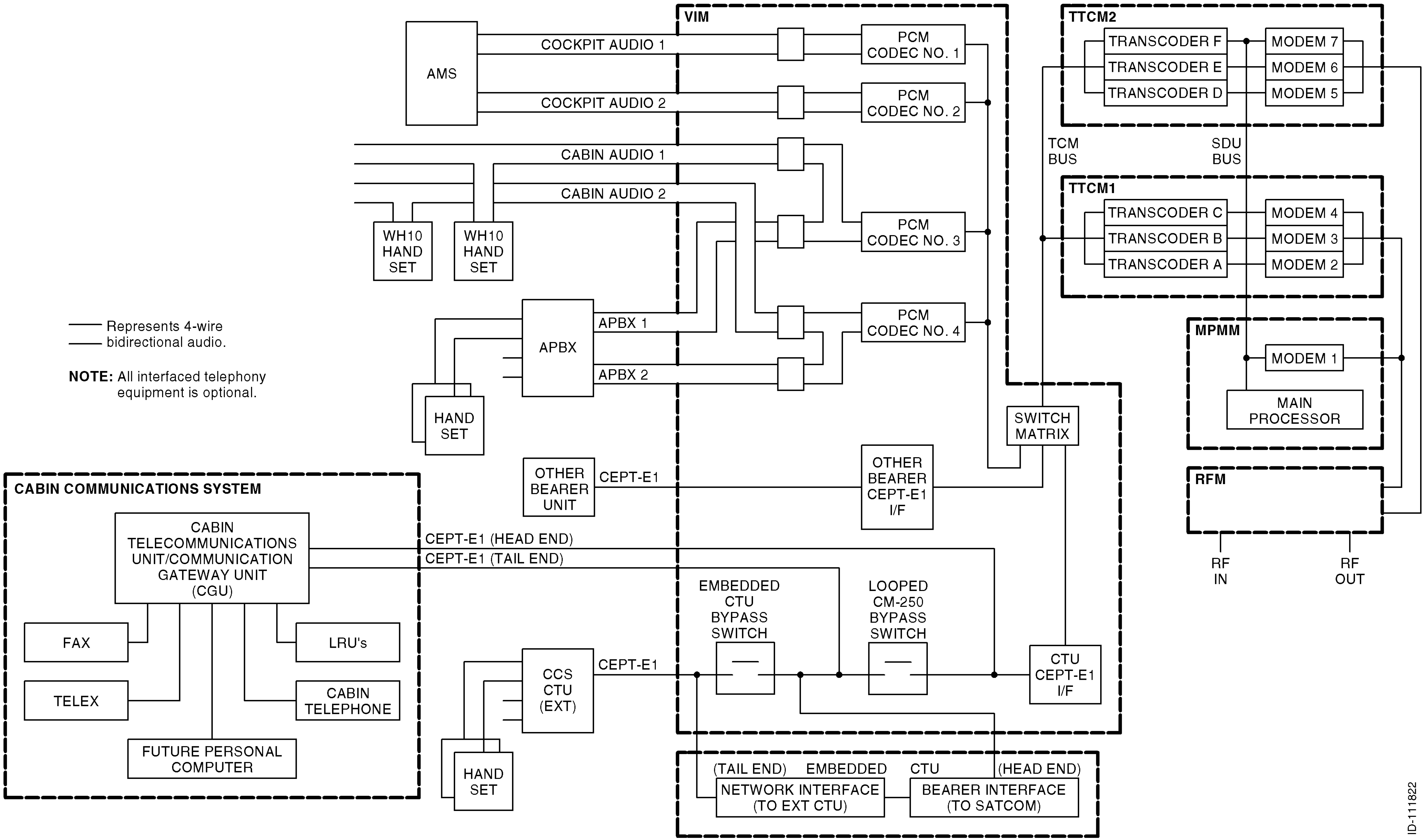

Figure 3-1. Audio Interfaces

(2) Global-Wulfsberg Flitephone WH-10 Interface

(a) Taking an analog WH-10 handset off-hook results in the following processes. The SDU to WH-10 handset actions are defined in Table 3-1.

- If the voice codec is being used by another analog phone user, the handset may be placed in parallel with the other analog phone. Buffering and sidetone arrangements are supplied by the analog connected phone, not by the SATCOM equipment.
- If the voice codec is reserved by a headset user, is dedicated to a headset, or is failed, the analog phone user hears silence.
- If the SDU is not logging-on, logged-on, or in the idle (standby) state, the analog phone user hears silence.
- If the call barring level is 2 (ORT item xxiv), the SDU performs action 1.
- If sufficient resources are not available due to equipment failure, the SDU performs action 2.
- If the SDU is logging-on, the SDU performs action 3.
- If the SDU is in the idle (standby) state, the SDU performs action 4.
- If a SDU modem is not available or there is not sufficient power to sustain a new voice call, or the AES class is currently 1 or 4, the SDU performs action 5.
- Or else the SDU performs action 6 and the respective analog phone channel is deemed usable for placing a call.

(b) If the system condition, as determined by the SDU, changes from usable (action 6) to unusable while the analog phone is off-hook and a call is not in progress, then the appropriate handset action is performed to annunciate the new condition. An analog channel does not change from unusable to usable while the analog phone is off-hook unless there is a call termination on that channel.

Table 3-1. SDU to WH-10 Handset Actions

Action	
1	Play message 10 as defined in Table 3-5 outgoing calls have been disallowed) followed by an interrupted dial tone.
2	Play message 1 as defined in Table 3-5 (equipment failure) followed by an interrupted dial tone.
3	Play message 2 as defined in Table 3-5 (attempting satellite access) followed by an interrupted dial tone.
4	Play message 3 as defined in Table 3-5 (log-on disabled) followed by an interrupted dial tone.
5	Play message 4 as defined in Table 3-5 (channel not available) followed by an interrupted dial tone.
6	Play the dial tone.

(c) The commands given in Table 3-2 are executable from the analog WH-10 handset. The inter-key push time-out is 15 seconds. After this time, a # sign is automatically appended to the end of the keyed sequence by the SDU, and the command given by the user is parsed and executed. Commands shown in the table as not being terminated by a # sign are parsed and executed as soon as the valid key sequence has been entered. An invalid sequence only generates voice message 18 (Command rejected) when a # is appended, either by the user or by the SDU after the 15-second time-out (Table 3-5).

(d) Codec-generated pacifiers or messages issued as a direct result of the user keying a command start with one second of silence to allow the user enough time to bring the handset to their ear. During the playing of any codec-generated messages and pacifiers, receipt of the # key immediately mutes the codec, aborting the current message sequence. The voice codec plays the appropriate dial tone (normal or interrupted) as specified in Table 3-2.

(e) An inactivity check is implemented so the SDU considers an off-hook channel to be in the on-hook state if no call has been in progress on that channel and no DTMF digits have been received for at least 120 seconds, except where indicated in Table 3-2. A WH-10 handset in this state must have its hookswitch cycled (i.e., go on-hook, then off-hook) to signal the off-hook state to the SDU.

Table 3-2. Global-Wulfsberg Flitephone WH-10 Commands

Command Sequence	Command Description
dddd...#	Dial a short phone number (between 2 and 6 digits – the first two can not be 00).
00dddd...#	Dial a long phone number (between 6 and 18 digits including the two leading zeros).
*0	Redial the last called phone number (refer to NOTE).
*m	Dial a stored phone number from memory location m (refer to NOTE).
There are 10 memory locations assigned to each of the two analog (APHONE) channels (ORT item xvi). Memory location 0 of each channel holds the last number called on that channel. Memory locations 1 thru 9 are user-programmable. If ORT item xxvi is set to TRUE, then the channel memory locations are separate (i.e., modifying memory locations from a handset connected to channel 1 does not affect the memory locations assigned to channel 2). However, if ORT item xxvi is set to FALSE, then modifying memory locations from a handset connected to channel 1 causes channel 2 memory locations to also be modified. The store phone number memory commands are specified as follows:	
**1mdddd...#	This store phone number memory command causes the phone number (dddd...) to be stored in memory location m. If the call barring level (ORT item xxiv) is 1 or 2, then message 9 or 10 (dialed calls have been disallowed/outgoing calls have been disallowed) are played; otherwise, the entered data is checked. A valid command causes message 17 (command accepted) to be played and the number stored. An invalid command causes message 18 (command rejected) to be played.
**2#	This announce phone number memory command causes the phone numbers stored in memory locations 1 thru 9 to be read out using a series of message 19s (the phone number stored in memory...) for non empty locations, and message 5s (phone number memory ... is empty.) for empty locations. If this command is entered through the WH-10 handset, the inactivity check is disabled until the next key-push or until the next on-hook/off-hook transition.
**2m	This announce phone number memory command causes the phone number in memory location m to be read out using message 19 (the phone number stored in memory ...) or message 5 (phone number memory ... is empty.). If m is not between 1 and 9, then message 18 (command rejected) is played instead. The digit 0 is announced as **oh**, not as **zero**.
If the call barring level is 1 or 2 (ORT item xxiv), the SDU plays messages 9 or 10 (dialed calls have been disallowed/outgoing calls have been disallowed) if an attempt is made to place a call. For all the following call barring commands, an invalid security code (cccc) causes the command to be rejected and message 18 (command rejected) to be played. If the command is valid, then the action is performed and message 17 (command accepted) is played. The call barring commands are specified as follows:	
**30cccc	This command sets the call barring level (ORT item xxiv) to 0, which allows all outgoing calls.
**31cccc	This command sets the call barring level (ORT item xxiv) to 1, which disallows all manual dialing of full-length phone numbers (6 to 18 digits starting with 00). No memory locations can be updated using the store phone number memory command.

Table 3-2. Global-Wulfsberg Flitephone WH-10 Commands (cont)

Command Sequence	Command Description
**32cccc	This command sets the call barring level (ORT item xxiv) to 2, which disallows all outgoing calls, both manual and stored number. No memory locations can be updated using the store phone number memory command.
**39cccc nnn nnnn	This command changes the security code to nnnn unless the first four n's are not the same as the second four n's, in which case message 18 (command rejected) is played.
**4ggg#	This command causes ggg to be the GES ID used in the access request signal unit for any calls initiated on that channel until the next on-hook.
If ORT item xxiii is set to disable the analog (APHONE) system management commands, the following commands are rejected; i.e., the SDU responds to the commands with message 18 (Command rejected). The APHONE system management commands are specified as follows:	
**50	This log-off/standby command sets the log-on policy (ORT item i) to **User Commanded Log-on**. If already logged-on, the SDU logs off (refer to SYSTEM OPERATION). If logging-on, the SDU terminates the logging on procedure. If the command is valid, message 17 (command accepted) is played immediately without waiting for the log-off to be achieved. If the SDU is already in the standby state, then message 18 (command rejected) is played.
**51	This auto log-on command sets the log-on policy (ORT item i) to **Automatic Log-on**. If the SDU is in the standby state, the SDU initiates the automatic log-on procedure (refer to SYSTEM OPERATION). If the SDU is in the constrained log-on mode, a handover stimulus is generated to initiate automatic satellite/GES selection. If the command is valid, message 17 (command accepted) is played immediately without waiting for the log-on to be achieved. If the SDU is already in the automatic mode, message 18 (command rejected) is played.
**52ggg# **52gggsss#	These commands set the SDU to the constrained log-on mode for selection of a specified GES. The log-on policy (ORT item i) is set to **Manual Log-on**. If the SDU is not logged-on to the GES ggg (or gggsss as appropriate), the SDU attempts a log-on to that GES alone. Any other number of digits cause message 18 (command rejected) to be played. If the specified GES does exist in the system table, then the command is rejected. If the command is valid, message 17 (command accepted) is played immediately without waiting for the log-on to be achieved. If the SDU is already constrained to GES ggg (or gggsss as appropriate), then message 18 (command rejected) is played.
**59	This log-on status command causes the SDU log-on status to be announced using message 20 (the SATCOM is in ...). If the SDU is logged-on, message 21 (logged-on to ...) is also played. Digit 0 for the GES and satellite ID is announced as **oh**.
If any of the following GES preference commands are determined to be invalid, the SDU plays messages 18 (command rejected); otherwise, if a specific message is not specified, then message 17 (command accepted) is played. If ORT item xxiii is set to disable the APHONE system management commands, the next three commands (the preference changing commands) are rejected; i.e., the SDU responds to the commands with message 18 (command rejected). The GES preference commands are specified as follows.	
**60	This command sets the preference levels for all GESs to 1.

Table 3-2. Global-Wulfsberg Flitephone WH-10 Commands (cont)

Command Sequence	Command Description
**61gggp# **61gggsssp#	These commands cause the GES with ID ggg (or ggg and assigned to satellite sss) to be set to preference level p in the system table. The SDU accepts either four or seven digits following the ****61...** and preceding the # sign. Any other number of digits is interpreted to be an invalid command. If no GES listed in the system table matches the one specified in the command, the command is invalid and the user is so informed through message 18 (command rejected).
**62ggg# **62gggsss#	These commands cause all current GES preference levels of 9 to be lowered to 8. The GES with ID ggg (or ggg and assigned to satellite sss) has its preference level set to 9. The SDU accepts either three or six digits following the **62...** and preceding the # sign. Any other number of digits is interpreted to be an invalid command. If no GES listed in the system table matches the one specified in the command, the command is invalid and the user is so informed through message 18 (command rejected).
**69#	This command causes all GES preference levels to be announced using a sequence of message 22s (The preference level of GES ID...). If this command is entered through the WH-10 handset, the inactivity check is disabled until the next key-push, or until the next on-hook/off-hook transition.
**69ggg# **69gggsss#	These commands cause the SDU to announce the preference level of GES ggg or (ggg and assigned to satellite sss) using message 22 (The preference level of GES ID...). The SDU accepts either three or six digits following the **69... and preceding the # sign. Any other number of digits is interpreted to be an invalid command. If no GES listed in the ORT (item iii) matches the one specified in the command, the command is invalid and the user is so informed through message 18 (command rejected).
If any of the following incoming call management commands are rejected, the SDU plays messages 18 (command rejected); otherwise, if a specific message is not specified, then message 17 (command accepted) is played. If ORT item xxiii is set to disable the APHONE system management commands, the following commands are rejected; i.e., the SDU responds to the commands with message 18 (command rejected). The four DDI CTid commands allow **ddd** to be up to three decimal digits (including leading zeros, e.g., 02), validating the number to be within the range of 0 to 999. The incoming call management commands are specified as follows.	
**70#	This command sets ORT item xlv for APHONE Channel 1 to the default value; i.e., no CTid assigned.
**70ddd#	This command sets ORT item xlv for APHONE Channel 1 to ddd, Nonexclusive, unless the configuration straps indicate Channel 1 is not wired for APHONE, or ddd is already assigned as the CTid for Channel 2, or (in a dual system) ddd is already assigned to one of the other SDU APHONE channels, in which case, the command is rejected. Additionally, if ORT item xiii indicates ground-to-air Priority 4 calls are disallowed, it is adjusted to specify routing to APHONE.
**71ddd#	This command sets ORT item xlv for APHONE Channel 1 to ddd, Exclusive, unless the configuration straps indicate Channel 1 is not wired for APHONE, or ddd is already assigned as the CTid for Channel 2, or (in a dual system) ddd is already assigned to one of the other SDU APHONE channels, in which case, the command is rejected. Additionally, if ORT item xiii indicates ground-to-air Priority 4 calls are disallowed, it is adjusted to specify routing to APHONE.

Table 3-2. Global-Wulfsberg Flitephone WH-10 Commands (cont)

Command Sequence	Command Description
**72#	This command sets ORT item xlv for APHONE Channel 2 to the default value; i.e., no CTid assigned.
**72ddd#	This command sets ORT item xlv for APHONE Channel 2 to ddd, Nonexclusive, unless the configuration straps indicate Channel 2 is not wired for APHONE, or ddd is already assigned as the CTid for Channel 1, or (in a dual system) ddd is already assigned to one of the other SDU APHONE channels, in which case, the command is rejected. Additionally, if ORT item xiii indicates ground-to-air Priority 4 calls are disallowed, it is adjusted to specify routing to APHONE.
**73ddd#	This command sets ORT item xlv for APHONE Channel 2 to ddd, Exclusive, unless the configuration straps indicate Channel 2 is not wired for APHONE, or ddd is already assigned as the CTid for Channel 1, or (in a dual system) ddd is already assigned to one of the other SDU APHONE channels, in which case, the command is rejected. Additionally, if ORT item xiii indicates ground-to-air Priority 4 calls are disallowed, it is adjusted to specify routing to APHONE.
**740#	This command sets ORT item xiii to disallowed and causes message 33 to be played with the destination announced as **disallowed**.
**741#	This command sets ORT item xiii to APHONE and causes message 33 to be played with the destination announced as **APHONE**, unless no codec channel is wired for APHONE (as defined by the configuration straps), in which case, the command is rejected and the ORT item is set to Disallowed.
**742#	This command sets ORT item xiii to DPHONE and causes message 33 to be played with the destination announced as **DPHONE**, unless no codec channel is wired for CCS (as defined by the configuration straps), in which case, the command is rejected and the ORT item is set to Disallowed.
**743#	This command sets ORT item xiii to headset and causes message 33 to be played with the destination announced as **headset**, unless no codec channel is wired for AMS (as defined by the configuration straps), or if configuration pin TP13A is **zero**, in which case, the command is rejected and the ORT item is set to Disallowed.
**750#	This command sets ORT item x to disallow incoming circuit mode data calls and causes message 34 to be played to announce such calls as **disallowed**, unless the SDU is logging on or logged on, in which case, the command is rejected.
**751#	This command sets ORT item x to allow incoming circuit mode data calls and causes message 34 to be played to announce such calls as **allowed**, unless the SDU is logging on or logged on, in which case, the command is rejected.
**79#	This command causes the SDU to announce the DDI CTid assignment for channels 1 and 2 using message 31, if no ID is assigned, and message 32 if an ID is assigned, where the type of ID assignment is announced as **exclusive** or **nonexclusive**.

Table 3-2. Global-Wulfsberg Flitephone WH-10 Commands (cont)

Command Sequence	Command Description	
Legend:	c	Security code digit (0 thru 9)
	d	Decimal digit (0 thru 9)
	g	GES ID octal digit, where ggg is in range (000 thru 377)
	m	Memory location (1 thru 9)
	n	New security code digit (0 thru 9)
	p	GES preference level (0 thru 9), where 1 is the least preferred and 9 is the most preferred, and 0 indicates never to be selected for automatic log-on
	s	Satellite ID octal digit, where sss is in range (000 thru 076)
NOTE: There are 10 memory locations for each channel to store phone numbers (0 thru 9). Memory number 0 is used by the SDU to store the last called phone number.		

(3) Call Initiation from Analog (WH-10) Phone

(a) The analog phone user can initiate a call using any of the following commands:

- Short number manual dialing (dd...#). Between two and six digits can be specified, with the first two digits not 00. The 00 digits are used as the called–party address.
- Long number manual dialing (00dddd...#). Between seven and 18 digits can be specified including the leading 00. The 00 digits are used as the called–party address.
- Last call redial (*0). The last phone number called by an analog phone user on a channel is used as the called–party address. If the phone number stored in memory location 0 (i.e., last number called location) is not defined (length field set to zero), then message 5 (phone number memory ... is empty.) is played. Otherwise, the phone number is used as the called–party address.
- Stored phone dialing (*m). Parameter m specifies a memory location between 1 and 9. If the phone number stored in memory location m is not defined (length field set to zero), then message 5 (phone number memory ... is empty.) is played. Otherwise, the phone number is used as the called–party address.

(4) Analog Private Branch Exchange (APBX) Interface

(a) General

1 The APBX/SATCOM avionics interface protocol is based on the bidirectional DTMF tones being signaled in-band. In the APBX-to-SATCOM direction, the DTMF digits are assigned to the on- and off-hook transitions as specified in Table 3-3, and are valid only from the APBX handset. All other DTMF digits are common to both the WH-10 and APBX interfaces.

2 Taking an APBX handset off-hook results in the same decisions as specified for the WH-10 handset. However, the SDU to APBX off-hook actions are specified in Table 3-4, where the DTMF tone sequence <DTMF-C>, <DTMF-n> (n is 0, 1, 2, or 4) sent to the APBX handset indicates the SATCOM channel status:

- An outgoing call cannot be supported (n = 1, 2, or 4) or
- An outgoing call can be attempted (n = 0).

3 If the channel status indicates a call can be attempted, the SDU accepts any command determined to be valid from an APBX interface, including the on-hook DTMF tone. If the channel status indicates a call can not be attempted, the APBX handset is expected to send the on-hook DTMF tone. Otherwise, the SDU still accepts any command determined to be valid from an APBX interface; though the checked B-party address transfer command is guaranteed to produce a call setup failure. Subsequent to call setup commands sent to the SDU, call setup progress, failure, and termination DTMF tone sequences are sent to the APBX handset.

4 The SDU considers an off-hook channel to be in the on-hook state if no call has been in progress on that channel and no DTMF signals have been received for at least 120 seconds. A channel in the on hook state must issue another DTMF off-hook signal to enable the reentry into the off-hook state.

(b) Checked Credit Card Data Transfer Command

1 The *2284*c*ddd# command, if valid, loads the transferred three-digit value into the SDU calling terminal ID buffer. This data is used in place of the default 000 in the calling terminal field of the call information service address initial signal unit (ISU) (S5) for any outgoing call setups on this channel until the next APBX on-hook is received. The command is accepted only if the modulo 10 sum of all the decimal digits in the command, including 2284, the three-digit calling terminal ID, and the check digit c is zero.

(c) Checked B-Party Address Transfer Command

1 The *2262*cdddd....# command, if valid, initiates a call setup request to the GES using the transferred digits dddd... as the B-party address and any track 2 credit card data stored since the previous on-hook transition on this channel. The command is only accepted if the modulo 10 sum of all decimal digits in the command, including 2262 and the check digit c is zero. A valid command causes the SDU to send the DTMF sequence <DTMF-C>, <DTMF-8> to the APBX handset. An invalid command causes the SDU to send the DTMF sequence <DTMF-C>, <DTMF-9> to the APBX handset.

Table 3-3. Assignment of DTMF Digits in the APBX Interface

DTMF Digit	Low (Hz)	High (Hz)	Meaning	To/From SDU
1	697	1209	1	Both
2	697	1336	2	Both
3	697	1477	3	Both
4	770	1209	4	Both
5	770	1336	5	Both
6	770	1477	6	Both
7	852	1209	7	Both
8	852	1336	8	Both
9	852	1477	9	Both
0	941	1336	0	Both
*	941	1209	*/STX	To
#	941	1477	#/ETX	To
A	697	1633	FS/Answer	Both
B	770	1633	Off-Hook	To
C	852	1633	Status	From
D	941	1633	On-Hook	To
NOTE: STX (start sentinel), ETX (end sentinel), and FS (frame separator) are used in the transfer of ISO 7813 track 2 data from the APBX to the SDU.				

Table 3-4. SDU to APBX Off-Hook Actions

Action	Description
1	Play <DTMF-C>, <DTMF-2> followed by silence (idle).
2	Play <DTMF-C>, <DTMF-1> followed by silence (failure).
3	Play <DTMF-C>, <DTMF-4> followed by silence (accessing).
4	Play <DTMF-C>, <DTMF-2> followed by silence (idle).
5	Play <DTMF-C>, <DTMF-4> followed by silence (accessing).
6	Play <DTMF-C>, <DTMF-0> followed by silence (available).

2. Cockpit Communications

A. General

(1) The SDU codecs support headset interfaces for cockpit use only. These interfaces incorporate 600-ohm, 4-wire, off-hook/on-hook signaling and dialing through the combination of a control and display unit (either SCDU or MCDU), and (at the user's option) PTT, mic-on, or place/end call switches. If used, when the PTT button is pushed, the microphone audio signal is sent to the selected voice channel; activation of one of the discretes is signalled to the SDU. Also, an off-hook signal can be sent to the SDU through the SCDU. An audible chime and call lamps announce a ground-to-air call.

(2) The cockpit headsets interface with the codecs in the SDU through an audio management unit (AMU), which is also connected to other aircraft radios. The ACP associated with the AMU can be capable of selecting either a single or dual voice channels for the MCS system. When single-channel AMUs are installed, voice channel 1 is wired to AMU No. 1 and voice channel 2 is wired to AMU No. 2. This permits operation of two independent channels. When dual-channel AMUs are installed, voice channels No. 1 and No. 2 are wired in parallel to each AMU, enabling two voice channels to be shared by the cockpit users.

(3) Two functionally identical voice codec modules (VCM) are installed in the SDU and designated Codec A and Codec B.

(4) Associated with the SATCOM channels are SCDU pages, call lamps, channel selection switches, a chime, and a chime reset. The SDU hookswitch signaling can be supplied:

- When the ACP SATCOM channel select switch is activated
- When a PTT switch is activated
- When signaling through the SCDU, where the SDU hookswitch signaling discrete is inactive.

(5) Once off-hook, microphone audio is supplied to the selected SATCOM voice channel and the appropriate signaling is exchanged for call lamp and chime reset. Conversely, once on-hook, microphone audio is removed from the selected SATCOM voice channel and the call lamp is turned off.

B. Headset Off-Hook Signaling

(1) The headset is capable of going off-hook (to connect the call and to acknowledge the call signaling) if the cockpit voice call light output has transitioned for either the flashing or steady light activation, at which time:

- If the latched ACP hookswitch signaling is strapped, the headset is considered off-hook whenever the cockpit voice mic-on input is activated (connected to ground).
- If the switched PTT hookswitch signaling is strapped, the headset is considered off-hook whenever the cockpit voice mic-on input is activated for the first time after the call light activation for an incoming call, or when the place/end call input is activated to initiate an outgoing call.

(2) If ORT item xliii is enabled, the headset is capable of going off-hook when ANSWER CALL is selected on the SATCOM main menu page (TESTING/FAULT ISOLATION) after the call light activation and irrespective of hookswitch signaling.

C. Headset On-Hook Signaling

(1) If latched ACP hookswitch signaling is strapped, the headset is placed on-hook when an open is present on the cockpit voice mic-on input. Regardless of the hookswitch signaling, the cockpit voice place/end call 1 and 2 discrete inputs place the headset interface on-hook for cockpit audio channels 1 and 2, respectively, when a call clear event occurs. If ORT item xliii is enabled, the selection of END CALL or REJECT on the SATCOM main menu page (TESTING/FAULT ISOLATION) places the headset interface on-hook. Placing the headset on-hook results in normal call termination.

D. Voice Codec Module Audio Switching

(1) Headsets and analog connected phones interface to the SDU through the VCMs. Using a switch internal to the modules, each VCM can be connected to one of the cabin audio interfaces, or to one of the cockpit audio interfaces (or to both). Each VCM can be switched between either of its audio interfaces as follows:

- Codec A can be used in conjunction with either cabin audio No. 1 (WH-10 or APBX) or cockpit audio No. 1
- Codec B can be used in conjunction with either cabin audio No. 2 (WH-10 or APBX) or cockpit audio No. 2.

E. Voice Codec Module Sidetone

(1) Sidetone is supplied by each VCM. The sidetone level is adjustable for the cockpit audio, and is set to off for cabin audio. The adjustment range for cockpit sidetone is from 0 dB below the receive audio to off, with the default value set to 14.1 dB below the receive audio level. This setting is stored in nonvolatile memory within the SDU.

F. Voice Interface Module Stored Audio Messages

(1) The VIMs are capable of playing standard telephony supervisory lone signals, DTMF tones, and voice messages to the headset and analog phone users. These pacifiers are only sent to the analog interfaces:

- Headset
- WH-10 handsets
- APBX handsets.

(2) Stored audio messages are summarized in Table 3-5.

Table 3-5. Stored Audio Messages

Message No.	Message
1	Sorry, equipment failure, please refer to the user guide.
2	Sorry, attempting satellite access, please try later.
3	Sorry, log-on disabled, please refer to the user guide.
4	Sorry, no channel available, please try later.
5	Phone number memory <one> is empty.
6	Sorry, your call can no longer be sustained, please try later.
7	Sorry, your call has been preempted, please try later.
8	Sorry, connection failure, please try later.
9	Sorry, dialed calls have been disallowed, please refer to the user guide.
10	Sorry, outgoing calls have been disallowed, please refer to the user guide.
11	Sorry, number unobtainable.
12	Sorry, number busy, please try later.
13	Sorry, network congestion, please try later.
14	Sorry, credit card not honored at the ground station.
15	Sorry, access unauthorized.
16	Please wait, connecting your call.
17	Command accepted.
18	Command rejected.
19	The phone stored in memory <one> is <oh> <oh> <one>...
20	The SATCOM is in <standby> |<auto log-on| <constrained log-on> mode.
21	Logged on to GES ID <one> <oh> <three>.
22	The preference level of GES ID <three> <oh> <two> on satellite <oh> <oh> <three> is <six>.
23	Equipment failure, equipment failure.
24	No channel available, no channel available.
25	Your call can no longer be sustained.
26	Your call has been preempted.
27	Connection failure, connection failure.
28	Number unobtainable, number unobtainable.
29	Number busy, number busy.
30	Network congestion, network congestion.
31	Channel <one> terminal ID is not assigned.
32	Channel <two> terminal ID is <oh> <one> <three> <nonexclusive>.

Table 3-5. Stored Audio Messages (cont)

Message No.	Message
33	Ground-to-air public calls destination set to <disallowed>.
34	Ground-to-air circuit mode data calls are <allowed>.

G. Voice Interface Module Dedication

(1) Each voice interface module (VIM) has the property of dedication, which is different from the codec wiring. This property is of value on aircraft that have both headset and cabin (analog and digital) interface wiring, where contention for codec use can arise. Each VIM dedication is set to cabin, headset, or automatic through ORT item vi.

(2) A VIM with its dedication set to automatic can be allocated to a headset call or a cabin call, and is allocated on a first-come, first-served basis. A VIM can be reallocated to a headset call of priority 1, 2, or 3 through the preemption mechanism. A VIM with its dedication set to cabin is dedicated to its cabin (WH-10 or APBX) interface.

(3) A VIM with its dedication set to headset is unusable by the cabin interface. A VIM can be reallocated to a different headset call of priority 1, 2, or 3 through the preemption mechanism. ORT item vii (Appendix C) specifies whether a modem and HPA power should be reserved for a VIM dedicated to headset. This lets the pilot reserve one channel for cockpit use only.

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TEMPORARY REVISION NO. 23-1

INSERT PAGE 2 OF 6 FACING PAGE 4-1.

Reason: To add cooling information and to update applicable equipment and figure references.

Steps 1.A.(1), 3.A.(1), and 3.A.(2) are changed as follows:

1. Overview

A. General

(1) This section contains information on how and where to mount each component of the MCS system. For new installations, plan the installation in three stages. First, determine the location of the LRUs in the aircraft. Next, determine the length of RF and electrical interconnections for selected locations and finally, determine how the LRUs are to be cooled in regards to the placement of the LRUs.

3. Mechanical Installation Design

A. LRU Mechanical Installation

(1) The SDU and HPA are installed in mounting racks (ARINC 600) typically in the equipment bay of the aircraft. For a SATCOM installation, the primary installation dependent parameter is the RF coax cable loss requirements identified in Table 4-1 and cooling requirements identified in Section E and Table 4-2 of this document. To make sure these requirements are met, some installations require the HPA(s) be installed in close proximity to the antenna subsystem components. Refer to the aircraft installation drawings for the location of the SATCOM equipment. For new installations, refer to Table 4-1 to determine the location of the SATCOM equipment to make sure the cable loss requirements are met as well as the cooling specifications in Section E are met.

(2) Mechanical installation data for the SDU, HPA, HSDU, and RFUIA are shown in Figure 4-2 thru Figure 4-5.

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SECTION 4
MECHANICAL INSTALLATION

1. Overview

A. General

(1) This section contains information on how and where to mount each component of the MCS system. For new installations, plan the installation in two stages. First, determine the location of the LRUs in the aircraft. Next, determine the length of RF and electrical interconnections for selected locations.

2. Equipment and Materials

A. General

(1) Refer to SYSTEM DESCRIPTION for mounting tray and mating connector information. For all other components, refer to the applicable Outline and Installation Diagram in this section.

(2) No additional special equipment or materials, other than those commonly used in the shop, are required to install the units in existing trays and clamps, and to adjust the system. Do not over tighten mounting screws. Where torque values are not given, it is acceptable to finger tighten the mounting screws.

3. Mechanical Installation Design

A. LRU Mechanical Installation

(1) The SDU and HPA are installed in mounting racks (ARINC 600) typically in the equipment bay of the aircraft. For a SATCOM installation, the primary installation dependent parameter is the RF coax cable loss requirements identified in Table 4-1. To make sure these requirements are met, some installations require the HPA(s) be installed in close proximity to the antenna subsystem components. Refer to the aircraft installation drawings for the location of the SATCOM equipment For new installations, refer to Table 4-1 to determine the location of the SATCOM equipment to make sure the cable loss requirements are met.

(2) Mechanical installation data for the SDU, HPA (40 Watt), HPA (20 Watt), IGA , D/LNA, and RFUIA are shown in Figure 4-2 thru Figure 4-7.

See TR

CAUTION: BEFORE AN LRU IS INSTALLED, PULL THE CIRCUIT BREAKERS THAT SUPPLY POWER TO THE LRU TO REMOVE POWER.

CAUTION: MOISTURE AND DIRT CAUSE DAMAGE TO LRUs.

CAUTION: LRU FAILURE RATES INCREASE WITH A RISE IN TEMPERATURE. INSTALL THE LRUs WITH CLEARANCE; LET THE AIR FLOW ON TOP AND BOTTOM OF LRUs TO PREVENT OVERHEATING.

CAUTION: MAKE SURE THAT THE LATEST ORT DATABASE SOFTWARE IS INSTALLED IN THE SDU BEFORE PERFORMING SYSTEM OPERATIONS.

NOTE: Honeywell/Racal recommend the MCS LRUs be installed so their installation is level (zero degrees) to the horizontal plane of the aircraft. Compliance with RTCA/DO-160C has been demonstrated with this orientation.

NOTE: Ambient temperature at the LRU location must be less than 40 °C (104 °F) during operation for best reliability.

B. Installation Dependent Considerations

(1) Refer to the SYSTEM DESCRIPTION section for the installation dependent considerations for the SDU.

C. Owner Requirements Table (ORT) Uploading

(1) When the SDU is changed, the ORT needs to be uploaded before normal operation can begin. Refer to the SYSTEM OPERATION section for the ORT upload procedures.

D. Cable Loss Requirements

(1) The attenuation and voltage standing wave ratio (VSWR) of coaxial cable used in the MCS system must meet the requirements specified in Table 4-1 to make sure the system operates correctly. Figure 4-1 shows the specific cable attenuations for the SATCOM equipment. All specified cable attenuations include connector losses, which are assumed to be 0.1 dB each. Honeywell recommends each cable assembly be sweep tested for loss and VSWR.

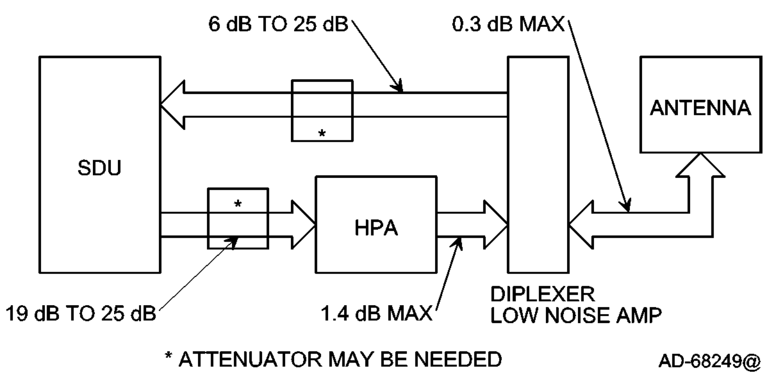


Figure 4-1. Cable Attenuations

TEMPORARY REVISION NO. 23-1

INSERT PAGE 3 OF 6 AND PAGE 4 OF 6 FACING PAGE 4-2.

Reason: To update the third CAUTION and the first NOTE and to delete the second NOTE before Paragraph 3.B., and to change Figure 4-1.

The third CAUTION and the NOTES are updated and deleted, and Figure 4-1 is changed as follows:

CAUTION: BEFORE AN LRU IS INSTALLED, PULL THE CIRCUIT BREAKERS THAT SUPPLY POWER TO THE LRU TO REMOVE POWER.

CAUTION: MOISTURE AND DIRT CAUSE DAMAGE TO LRUs.

CAUTION: LRU FAILURE RATES INCREASE WITH A RISE IN OPERATIONAL TEMPERATURE BEYOND LRU-SPECIFIED COOLING LEVELS. INSTALL THE LRUs WITH CLEARANCE. LET THE AIR FLOW ON TOP AND BOTTOM OF LRUs TO PREVENT OVERHEATING.

CAUTION: MAKE SURE THAT THE LATEST ORT DATABASE SOFTWARE IS INSTALLED IN THE SDU BEFORE PERFORMING SYSTEM OPERATIONS.

NOTE: Honeywell/Thales recommends the MCS LRUs be installed so their installation is level (zero degrees) to the horizontal plane of the aircraft. Compliance with RTCA/DO-160D has been demonstrated with this orientation.

B. Installation Dependent Considerations

TEMPORARY REVISION NO. 23-1

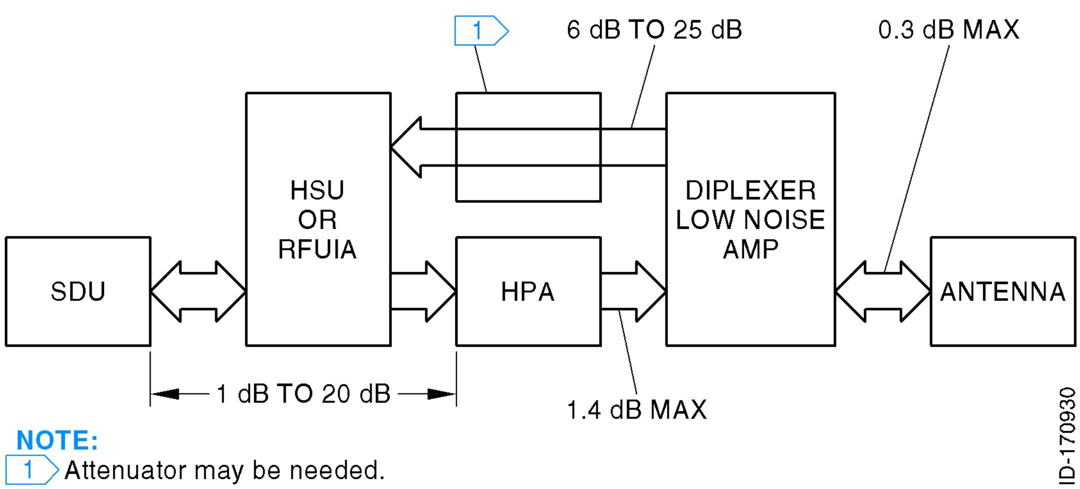


Figure 4-1. Cable Attenuations

TEMPORARY REVISION NO. 23-1

INSERT PAGE 5 OF 6 AND PAGE 6 OF 6 FACING PAGE 4-3.

Reason: To update Table 4-1, to update the cooling requirements in Step 3.E., and to update Table 4-2.

Table 4-1, Step 3.E., and Table 4-2 are changed as follows:

Table 4-1. Cable Loss Requirements

Cable Assembly	Location	Minimum Loss	Maximum Loss	Maximum VSWR
TX Cable	Between SDU, HSU, and HPA	1 dB	20 dB	2.0
RX Cable	Between Diplexer/LNA and SDU	6 dB	25 dB	2.0
TX Cable	Between HPA and Diplexer/LNA	N/A	1.4 dB [1.]	1.3
RX Cable	Between Diplexer/LNA and Antenna	N/A	0.3 dB	1.3

NOTES:

1. In installations that use a high power relay (HPR), the HPR loss must be included. The maximum Tx cable loss between the HGA and the antenna must not exceed 2.5 dB.
2. N/A = Not applicable.

E. **Cooling Requirements**

(1) The cooling requirements for the MCS avionics are specified in Table 4-2 as follows:

- Power dissipation is in Watts
- Mass airflow is in pounds per hour
- CF/M is cubic feet per minute at sea level and 104°F (40°C)
- Pressure drop is in inches of water.

(2) If the LRUs are to be operated above an altitude where the flow rates defined in Table 4-2 cannot be met, then the units must be installed in a pressurized compartment that provides a means to meet the Table 4-2 cooling requirements.

(3) The temperature of the cooling air for the LRUs must not exceed 104°F (40°C).

TEMPORARY REVISION NO. 23-1

Table 4-2. Cooling Requirements

	Power Dissipation		Mass Airflow		CF/M		Pressure Drop	
LRU	**Max.**	**Nom.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**
SDU	150	105	96 (44 kg/hr)	73 (33 kg/hr)	23	18	0.25 (6.35 mm)	0.15 (3.81 mm)
HPA (60W)	425	250	176 (80 kg/hr)	121 (55 kg/hr)	42	29	0.25 (6.35 mm)	0.2 (5.0 mm)
HSU	100	55	63 (29 kg/hr)	49 (22 kg/hr)	15	11	0.25 (6.35 mm)	0.15 (3.81 mm)

NOTE: The SDU draws an additional 20 W during the first 10 minutes (maximum) of operation at 25°C because of the oven controlled crystal oscillator (OCXO). The OCXO continuously dissipates this additional 20 W at −55°C.

Table 4-1. Cable Loss Requirements

Cable Assembly	Location	Minimum Loss	Maximum Loss	Maximum VSWR
TX Cable	Between SDU and HPA	19 dB	25 dB [1.]	TBD
RX Cable	Between Diplexer/LNA and SDU	6 dB	25 dB [2.]	TBD
TX Cable	Between HPA and Diplexer/LNA		1.4 dB	TBD
RF Cable	Between Diplexer/LNA and Antenna		0.3 dB	TBD

NOTES:

1. In installations that use a combiner, the combiner loss must be included.
2. In installations that use a high power relay (HPR), the HPR loss must be included. The maximum Tx cable loss between the HGA and the antenna must not exceed 2.5 dB.

E. Cooling Requirements

(1) The cooling requirements for the MCS avionics are specified in Table 4-2 as follows:

- Power dissipation is in Watts
- Mass airflow is in pounds per hour
- CF/M is cubic feet per minute at sea level and 40 °C (104 °F)
- Pressure drop is in inches of water.

(2) In most cases, a cooling system that meets the sea level requirements also meets the cooling requirements at −55 °C (−67 °F) and 70,000 feet.

Table 4-2. Cooling Requirements

LRU	Power Dissipation		Mass Airflow		CF/M		Pressure Drop	
	Max.	Nom.	Max.	Min.	Max.	Min.	Max.	Min.
SDU	198	105	96 (44 kg/hr)	73 (33 kg/hr)	23	18	0.25 (6.35 mm)	0.15 (3.81 mm)
HPA (40W)	362	300	176 (80 kg/hr)	121 (44 kg/hr)	42	29	0.25 (6.35 mm)	0.15 (3.81 mm)
HPA (20W)	180	150	96 (44 kg/hr)	73 (33 kg/hr)	23	18	0.3 (7.62 mm)	0.2 (5.08 mm)

NOTE: The SDU draws an additional 20 W during the first 10 minutes (maximum) of operation at 25 °C because of the oven controlled crystal oscillator (OCXO). The OCXO continuously dissipates this additional 20 W at -55 °C.

F. Vendor Supplied Equipment

(1) Installation equipment like mounting trays, connectors, and cables can be obtained from various vendors. Refer to Appendix A for additional information about vendor manufactured equipment. For vendor supplied avionics, refer to the vendor documentation.

TEMPORARY REVISION NO. 23-2

INSERT PAGE 3 OF 3 FACING PAGE 4-5/(4-6 BLANK).

Reason: To change drawing data for Figure 4-2.

Figure 4-2 is changed as follows:

CONVERSION TABLE	
INCHES	MILLIMETERS
0.010	0.254
0.015	0.381
0.02	0.508
0.025	0.635
0.040	1.016
0.080	2.032
0.120	3.048
0.130	3.302
0.160	4.064
0.36	9.144
0.40	10.16
1.40	35.56
1.97	50.038
2.12	53.848
2.50	63.50
3.60	91.44
3.80	96.52
3.83	97.282
3.84	97.536
4.04	102.616
4.50	114.3
5.18	131.572
5.20	132.08
5.22	132.588
5.50	139.70
7.49	190.246
7.51	190.754
7.624	193.650

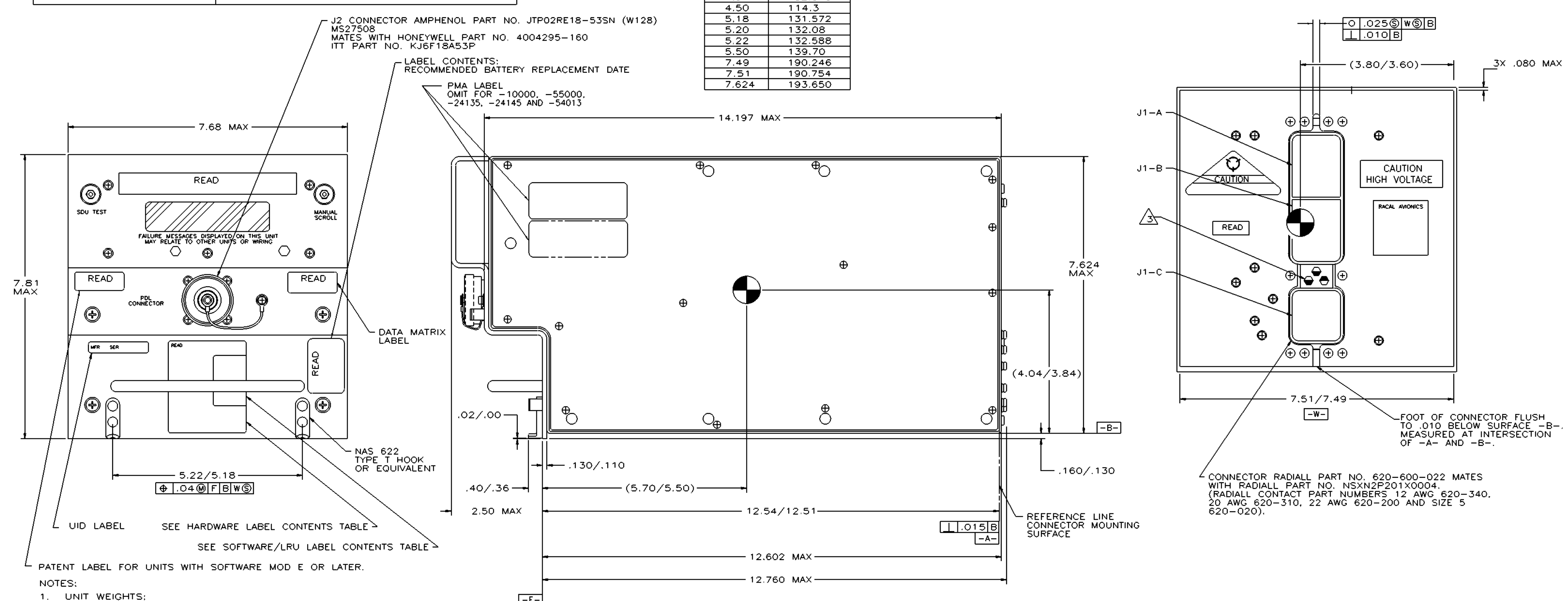
CONVERSION TABLE	
INCHES	MILLIMETERS
7.68	195.072
7.81	198.374
10.79	274.066
11.30	287.02
12.51	317.754
12.54	318.516
12.602	320.091
12.760	324.104
14.197	360.604

7

SOFTWARE/LRU LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
PART NUMBER	7516118-24010, 7516118-27010, 7516118-24130, 7516118-27130, 7516118-24135, 7516118-27135, 7516118-74010, 7516118-77010, 7516118-77135
DO-178B LEVEL	D

7

HARDWARE LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
MODEL NUMBER	SD-700 OR SD-720
UNIT NAME	SATELLITE DATA UNIT OR SDU-SATCOM
HARDWARE PART NUMBER	7516118-24, 7516118-27 AND 7516118-77
WEIGHT	(ACTUAL UNIT WEIGHT – SEE NOTE 1)
ENVIRONMENTAL CATEGORY SD-700	DO-160D ENV CAT [(A2)(F2)Z] BAB [SB2] EXXXXXZ [EBZ] A [EZ] Z [RRR] M [A2E3] XXA
ENVIRONMENTAL CATEGORY SD-720	DO-160D ENV CAT [(A2)(F2)Z] BAB [SB] EXXXXXZ [A(WF)XBZ] A [JZ] Z [RR] M [A2J33] XXA
FCC ID	SD-700 SD-720 13



NOTES:

1. UNIT WEIGHTS:

UNIT	POUNDS	KILOGRAMS
7516118-240XX	20.78 ± .62	9.42 ± .28
7516118-241XX	19.60 ± .59	8.89 ± .27
11 7516118-270XX	21.33 ± .64	9.67 ± .29
12 7516118-270XX	19.88 ± .60	9.02 ± .27
7516118-271XX	20.15 ± .60	9.14 ± .27
7516118-540XX	20.69 ± .62	9.39 ± .28
7516118-570XX	21.24 ± .64	9.63 ± .29
7516118-740XX	19.33 ± .58	8.76 ± .26
7516118-770XX	19.88 ± .60	9.02 ± .27
7516118-771XX	18.70 ± .56	8.48 ± .25

2. DENOTES APPROXIMATE CENTER OF GRAVITY.

3. DARKENED PORTION INDICATES SOLID PART OF POLARIZING KEYWAY.

4. THE INSTALLATION IS IN ACCORDANCE WITH ARINC 600 NUMBER 6 MCU.

5. DIMENSIONS ARE IN INCHES. SEE METRIC CONVERSION TABLE FOR CORRESPONDING DIMENSIONS IN MILLIMETERS.

6. COOLING AIR FLOW REQUIREMENTS:
LRU SHALL BE COOLED TO ARINC 600 AIRFLOW RATE.
MINIMUM: .20±.12 INCHES OF WATER (5±3 MILLIMETERS OF WATER) AT
A FLOW RATE OF 72.8±2.0 POUNDS PER HOUR (33±.91 KILOGRAMS PER HOUR.
FOR ADDED RELIABILITY THE FOLLOWING MAY BE USED:
.25±.05 INCHES OF WATER (6.35±1.27 MILLIMETERS OF WATER) AT
A FLOW RATE OF 96.2±2.0 POUNDS PER HOUR (43.64±.91 KILOGRAMS PER HOUR.

7. THIS DRAWING DEFINES END UNIT 7516118-XXYYY.
XX= HARDWARE DASH NUMBER FROM 10 THROUGH 99.
YYY= SOFTWARE DASH NUMBER FROM 001 THROUGH 999.
FOR UNITS SUPPLIED TO BOEING SEE HARDWARE AND SOFTWARE/LRU LABEL CONTENT TABLES.
FOR END UNIT DASH NUMBERS 24130, 24135, 24140, 24145, 27020, 27130, 27135, 27140, 27145, 27150, 27151, 47145, 47151, 77010, 77135 AND 77145 THE NAMEPLATE PART NUMBER WILL REFLECT THESE DASH NUMBERS.

8. UNIT FINISH: CHEMICAL FILM.

9. ON LABELS READ IS FOR ORIENTATION ONLY.

10. UNIT DISSIPATION: 115 WATTS NOMINAL, 177 WATTS MAXIMUM.

11. UNIT WEIGHT ONLY APPLICABLE TO UNITS WITHOUT HARDWARE MODIFICATION J INSTALLED.

12. UNIT WEIGHT ONLY APPLICABLE TO UNITS WITH HARDWARE MODIFICATION J INSTALLED.

13.

SDU	FCC ID	END UNIT PART NUMBERS
SD-700	GB8SD-700	7516118-24010, 7516118-27010
SD-700	GB8SD-700A	7516118-74010, 7516118-77010
SD-720	GB8SD-720	7516118-24130, 7516118-27130, 7516118-24135, 7516118-27135
SD-720	GB8SD-720A	7516118-77135

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See TR

7 SOFTWARE/LRU LABEL CONTENTS

PART NUMBER	7516118-24010, 7516118-27010
DO-178B LEVEL	D

7 HARDWARE LABEL CONTENTS

MODEL NUMBER	SD-700
UNIT NAME	SATELLITE DATA UNIT
HARDWARE PART NUMBER	7516118-24 AND 7516118-27
WEIGHT	(ACTUAL UNIT WEIGHT)
ENVIRONMENTAL CATEGORY	DO-160D ENV CAT [(A2)(E1)Z] BAB [SB2] EXXXXXZ [EBZ] A [EZ] Z [RRR] M [A2E3] XXA
FCC ID	FCC ID GB8MCS-6000

CONVERSION TABLE

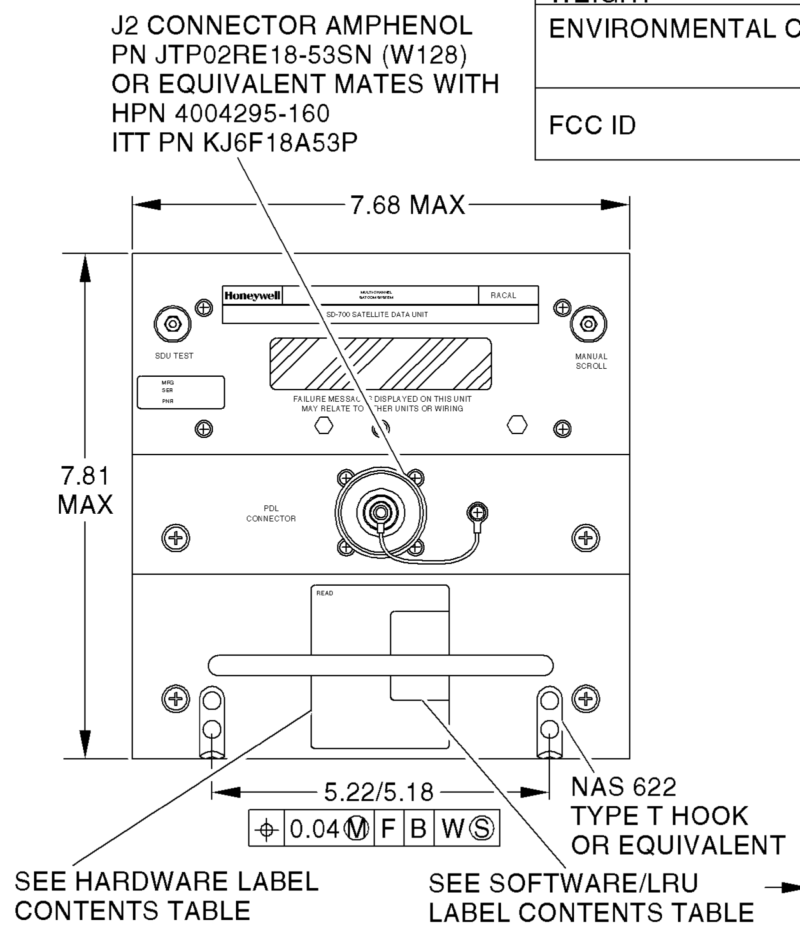
INCHES	MILLIMETERS
0.010	0.254
0.015	0.381
0.02	0.508
0.025	0.635
0.040	1.016
0.080	2.032
0.120	3.048
0.130	3.302
0.160	4.064
0.36	9.144
0.40	10.16
1.40	35.56
1.97	50.038
2.12	53.848
2.50	63.50

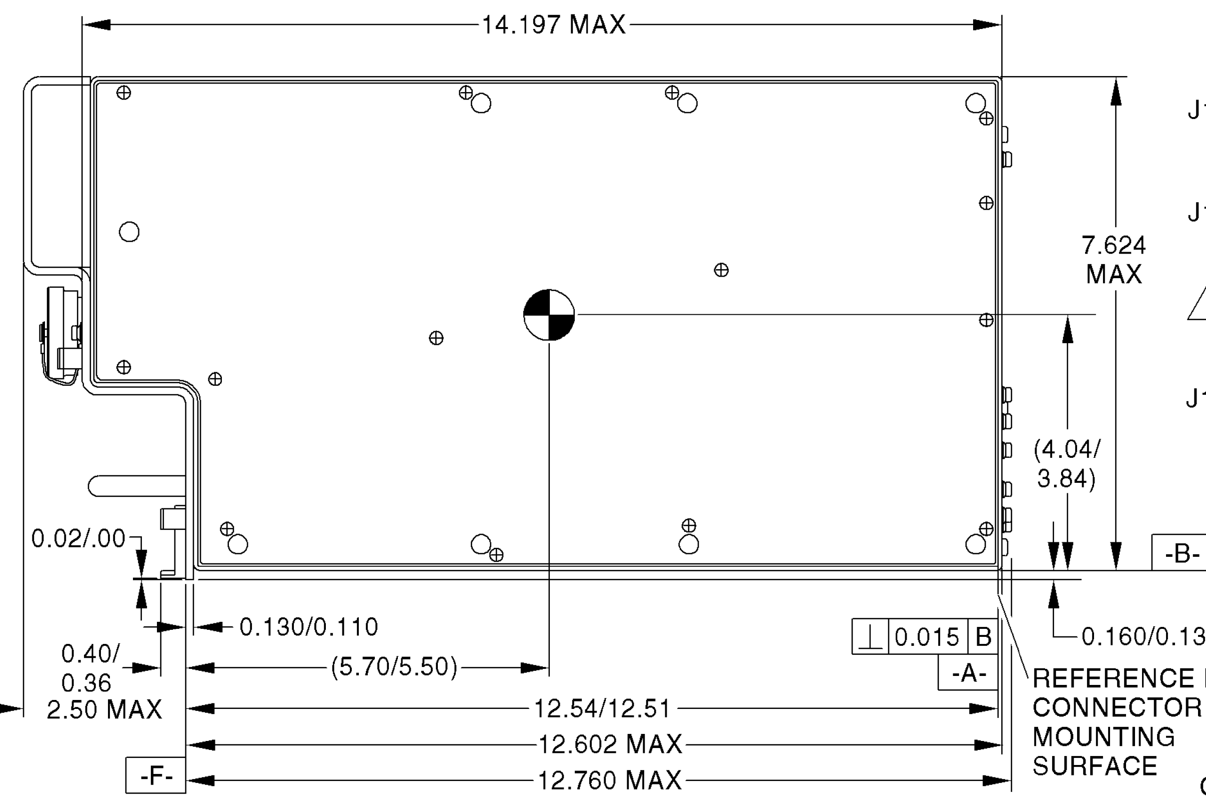
CONVERSION TABLE

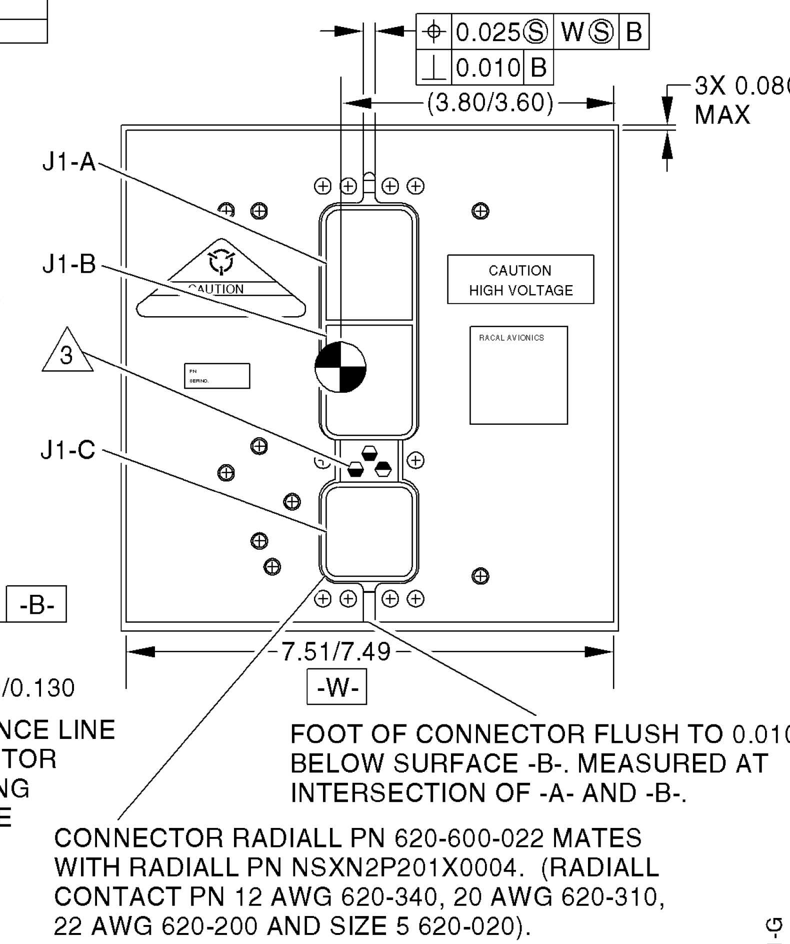
INCHES	MILLIMETERS
3.60	91.44
3.80	96.52
3.83	97.282
3.84	97.536
4.04	102.616
4.50	114.3
5.18	131.572
5.20	132.08
5.22	132.588
5.50	139.70
7.49	190.246
7.51	190.754
7.624	193.650

CONVERSION TABLE

INCHES	MILLIMETERS
7.68	195.072
7.81	198.374
10.79	274.066
11.30	287.02
12.51	317.754
12.54	318.516
12.602	320.091
12.760	324.104
14.197	360.604







NOTES:

1. Unit weights:

UNIT	POUNDS	KILOGRAMS
7516118-24XXX	20.78 ± 0.62	9.42 ± 0.28
7516118-27XXX	21.33 ± 0.64	9.67 ± 0.29
7516118-54XXX	20.69 ± 0.62	9.39 ± 0.28
7516118-57XXX	21.24 ± 0.64	9.63 ± 0.29

2. Denotes approximate center of gravity.

3 Darkened portion indicates solid part of polarizing keyway.

4. The installation is in accordance with ARINC 600 number 6 MCU.
5. Dimensions are in inches. See metric conversion table for corresponding dimensions in millimeters.
6. Minimum cooling airflow requirements: 0.25 ± 0.05 inches of water (6.35 ± 1.27 millimeters of water) at a flow rate of (96.2 ± 2.0 pounds per hour) (43.64 ± 0.91 kilograms per hour).

7 This drawing defines end unit 7516118-XXYYY.
XX= Hardware dash number from 10 through 99.
YYY= Software dash number from 001 through 999.
For units supplied to Boeing see hardware and software/LRU label content tables.

8. Unit finish: Chemical film.
9. On labels read is for orientation only.
10. Unit dissipation: 115 watts nominal, 177 watts maximum.

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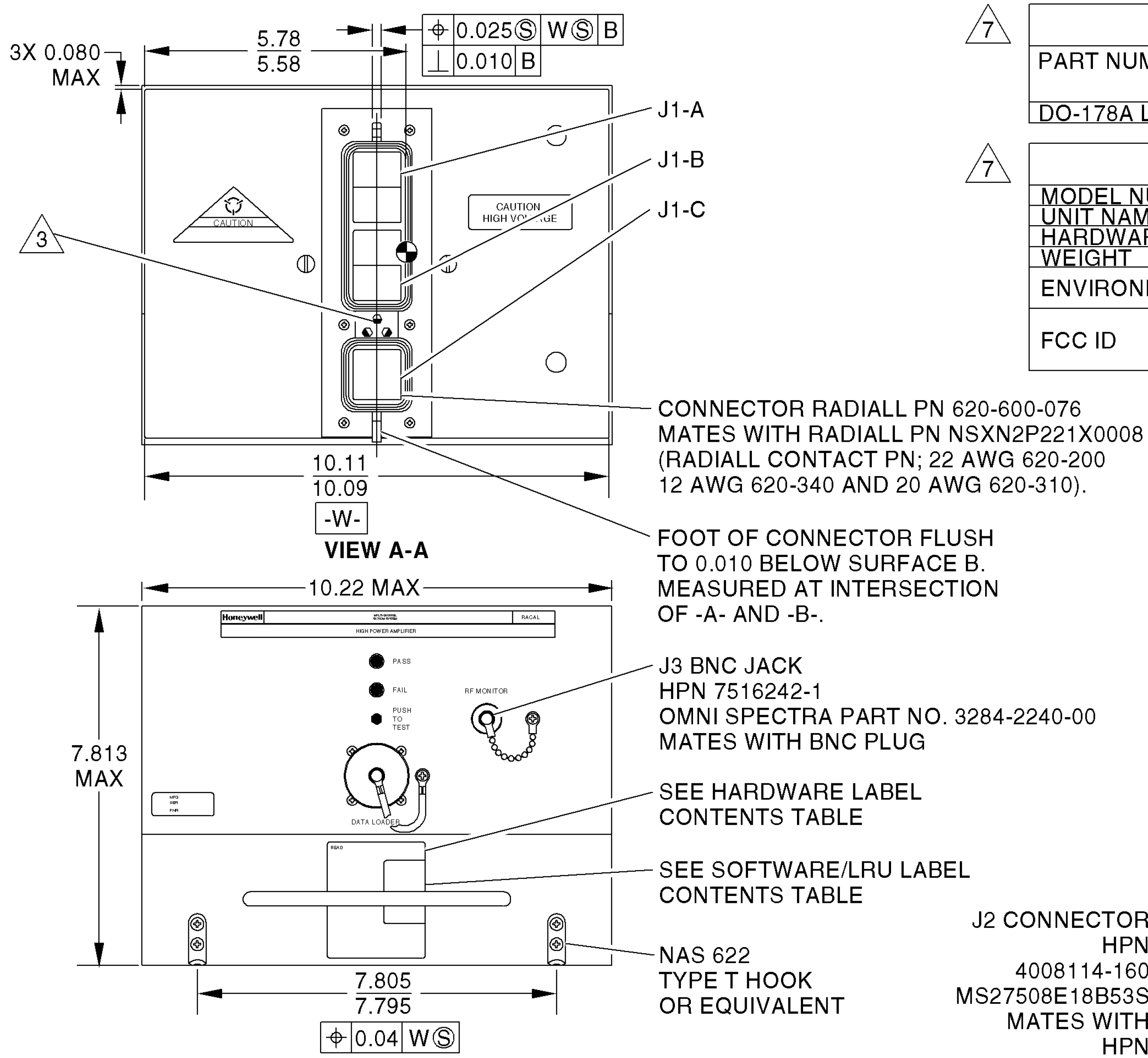
Figure 4-2. Satellite Data Unit Outline and Installation Diagram

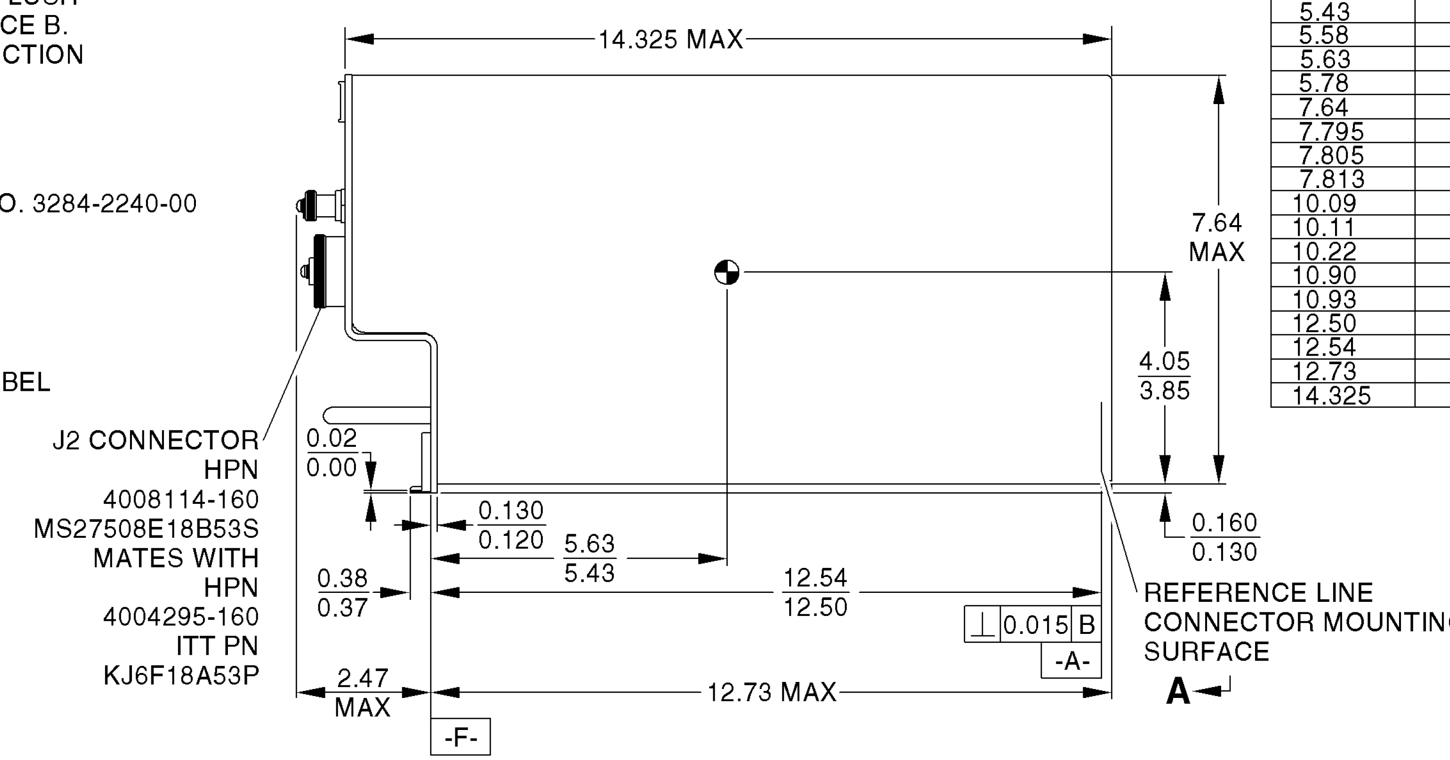


7 SOFTWARE/LRU LABEL CONTENTS	
PART NUMBER	7516250-15020, 7516250-19034, 7516250-20050, 7516250-19037
DO-178A LEVEL	3

7 HARDWARE LABEL CONTENTS	
MODEL NUMBER	HP-600
UNIT NAME	HIGH POWERED AMPLIFIER
HARDWARE PART NUMBER	7516250-15, 7516250-19 AND 7516250-20
WEIGHT	(ACTUAL UNIT WEIGHT)
ENVIRONMENTAL CATEGORY	DO-160C ENV CAT/A2E1/ZBABE1XXXXZEAEZWZKXX
FCC ID	FCC ID GB850-700

CONVERSION TABLE

INCHES	MILLIMETERS
0.02	0.51
0.025	0.635
0.040	1.016
0.120	3.048
0.130	3.302
0.160	4.064
0.355	9.017
0.365	9.271
0.370	9.398
0.38	9.652
2.09	53.09
2.11	53.59
2.18	55.37
2.21	56.13
2.33	59.18
2.35	59.69
2.47	62.74
3.85	97.79
4.05	102.87
4.51	114.55
4.54	115.32
5.33	135.38
5.35	135.89
5.43	137.92
5.58	141.73
5.63	143.00
5.78	146.81
7.64	194.06
7.795	197.993
7.805	198.247
7.813	198.450
10.09	256.29
10.11	256.79
10.22	259.59
10.90	276.86
10.93	277.62
12.50	317.50
12.54	318.52
12.73	323.34
14.325	363.855



NOTES:

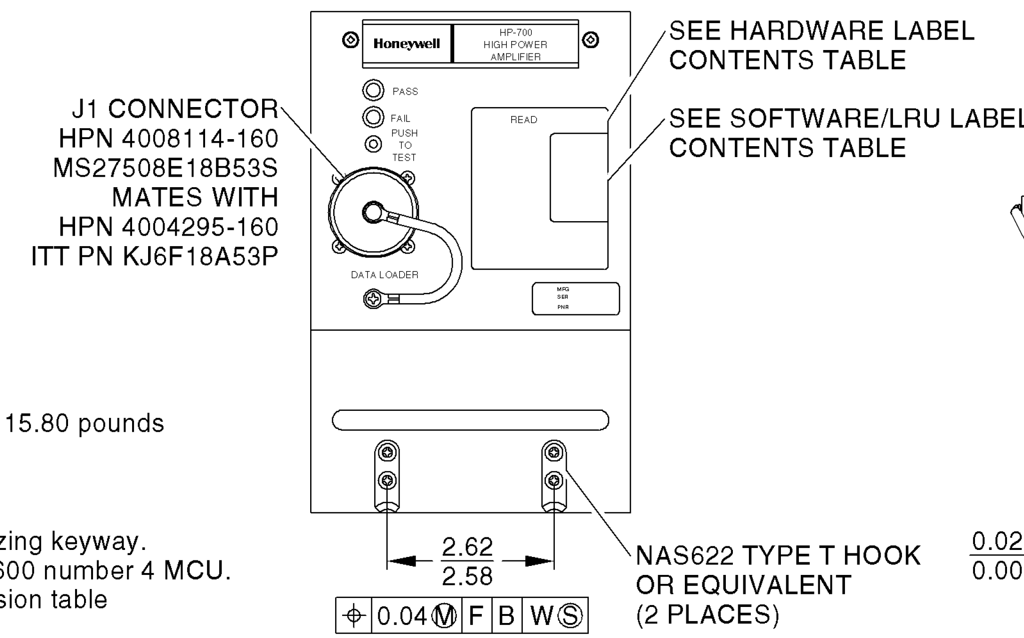
1. Unit weight: 29.15 max pounds (13.22 max kilograms).
2. ⊕ Denotes approximate center of gravity.
3. Darkened portion indicates solid part of polarizing keyway.
4. The installation is in accordance with ARINC 600 number 8 LRU.
5. Dimensions are in inches. See metric conversion table for corresponding dimensions in millimeters.
6. Cooling air flow requirements:
   0.15 ± 0.05 inches of water at a flow rate of 121.3 ± 2.0 pounds per hour.
   0.25 ± 0.05 inches of water at a flow rate of 176.4 ± 2.0 pounds per hour.
7. This drawing defines end unit 7516250-XXYYY.
   XX = Hardware dash number from 10 through 99.
   YYY = Software dash number from 001 through 999.
   For units supplied to Boeing see hardware and software/LRU lable content tables.
8. Unit finish: Black semi-gloss with semi-gloss clear splatter all over except for bottom which is chemical film.
9. On labels read is for orientation only.

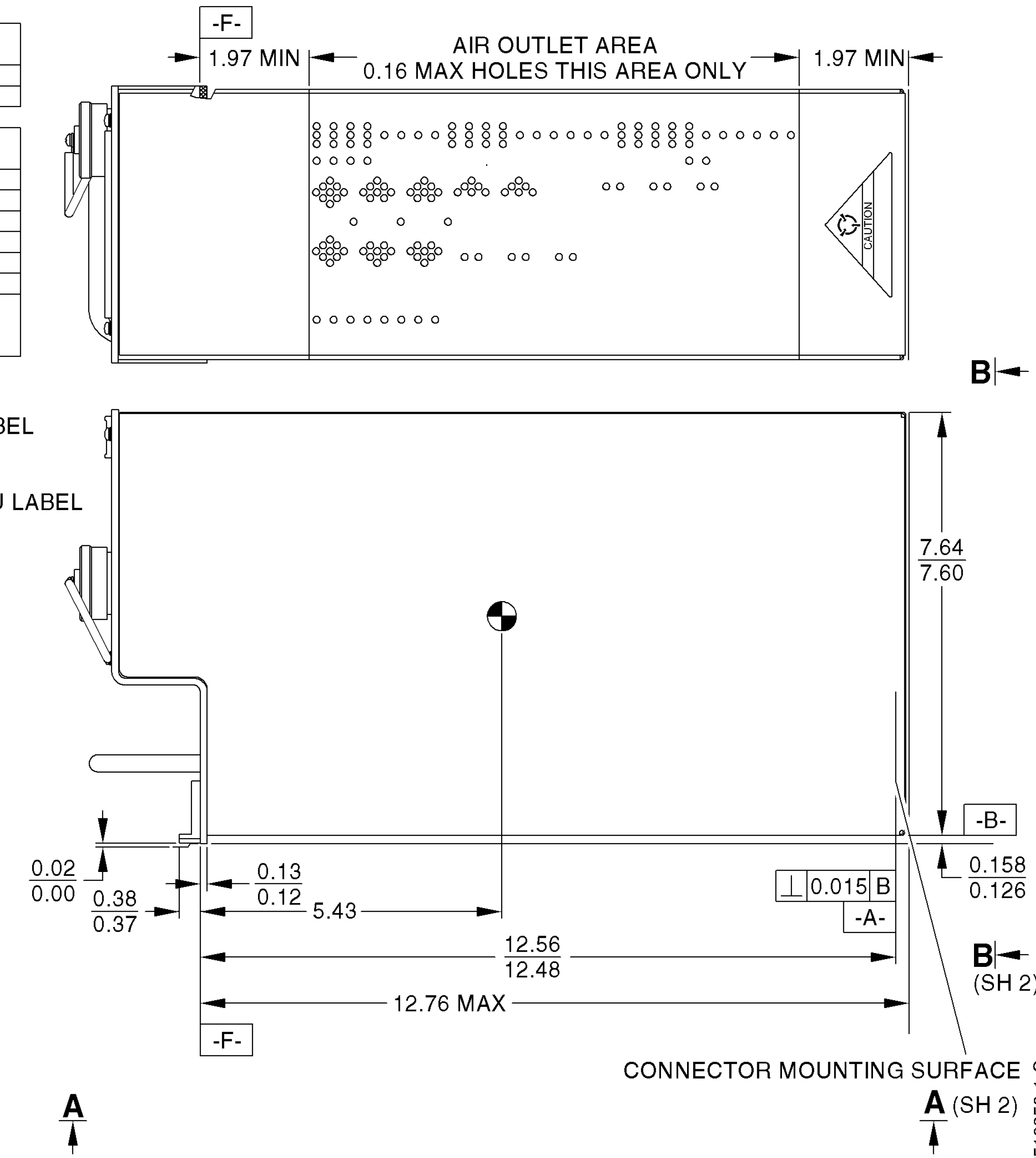
ID-111824 E7516106-1-J

Figure 4-3. 40 Watt High Power Amplifier Outline and Installation Diagram

7	SOFTWARE/LRU LABEL CONTENTS (FOR 115 VOLT UNITS SUPPLIED TO BOEING ONLY)	
	PART NUMBER	7516251-20060
	DO-178B LEVEL	D

7	HARDWARE LABEL CONTENTS (FOR 115 VOLT UNITS SUPPLIED TO BOEING ONLY)	
	MODEL NUMBER	HP-700
	UNIT NAME	HIGH POWER AMPLIFIER
	HARDWARE PART NUMBER	7516251-20
	WEIGHT	ACTUAL UNIT WEIGHT
	ENVIRONMENTAL CATEGORY	DO-160D ENV CAT [(A2)(F2)Z]BAB[SCLMY]EXXXXXZ[EBZ]A[EZ]Z[RRR]M[A3E3]XXA
	FCC ID	FCC ID GB8HP-700





NOTES:

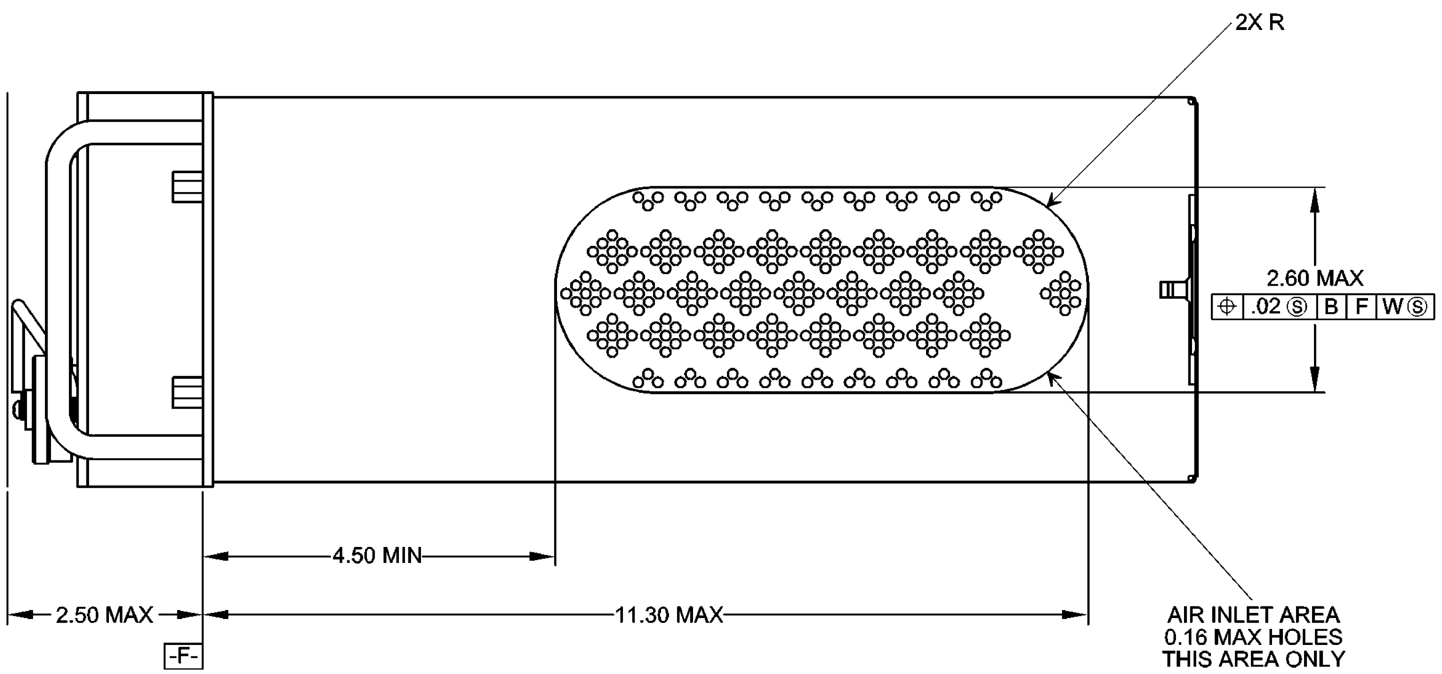
1. Unit weight: Nominal 15.40 pounds/maximum 15.80 pounds (6.98/7.17 kilograms).
2. Denotes approximate center of gravity.
3. Darkened portion indicates solid part of polarizing keyway.
4. The installation is in accordance with ARINC 600 number 4 MCU.
5. Dimensions are in inches. See metric conversion table for corresponding dimensions in millimeters.
6. Cooling airflow requirements: 0.20 ± 0.12 inches of water (5 ± 3 millimeters of water) at a flow rate of 72.8 ± 2 pounds per hour (33 ± 0.9 kilograms per hour).
7. This drawing defines end unit 7516251-YYXXX.
   YY = Hardware dash number from 10 through 99.
   XXX = Software dash number from 001 through 999.
   For units supplied to Boeing see hardware and software/LRU label content tables.
8. Unit finish: Shemical film.
9. 0.10 max rear panel thickness is required in connector mounting area defined as zone A. No other projections except connector mounting hardware are permitted in area defined as zone A.
10. On labels read is for orientation only.

Figure 4-4 (Sheet 1). 20 Watt High Power Amplifier Outline and Installation Diagram

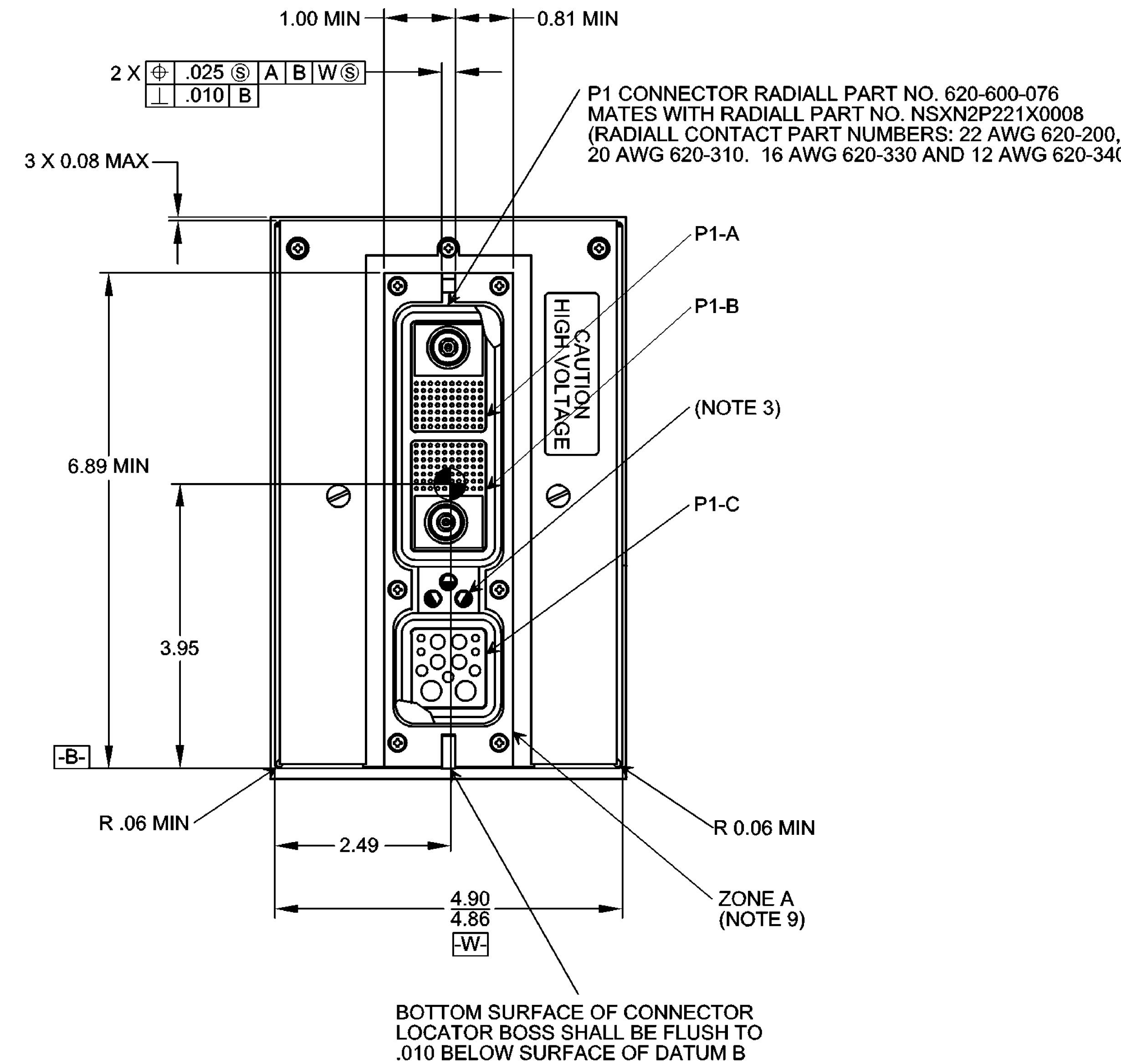
UP86308

CONVERSION TABLE			
INCHES	MILLIMETERS	INCHES	MILLIMETERS
.010	.254	2.50	63.50
.015	.381	2.58	65.53
.020	.508	2.59	65.79
.025	.635	2.62	66.55
.040	1.016	3.63	92.20
.06	1.52	3.78	96.01
.08	2.03	3.95	100.33
.10	2.54	4.50	114.30
.12	3.05	4.86	123.44
.126	3.200	4.90	124.46
.13	3.30	5.43	137.92
.158	4.013	5.49	139.45
.16	4.06	5.57	141.48
.25	6.35	6.89	175.01
.37	9.40	7.60	193.04
.38	9.65	7.64	194.06
.81	20.57	11.30	287.02
1.00	25.40	12.48	316.99
1.97	50.04	12.56	319.02
2.43	61.722	12.76	324.10
2.49	63.25		

(NOTE 5)



VIEW A-A



VIEW B-B

E7516256-2-A
AD-68253@

Figure 4-4 (Sheet 2). 20 Watt High Power Amplifier Outline and Installation Diagram

UP86308

SUPPLIER ID LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
INTERMEDIATE GAIN ANTENNA CMA xxxx	
P/N xxx-xxxxxx-xxx	S/N xxxx
TRANSPORT CANADA xx-xx	
SUPPLIER NAME AND LOCATION	
TCA APPROVAL xx-xx	

SUPPLIER MOD LABEL (FOR UNITS SUPPLIED TO BOEING ONLY)
CONTAINS SUPPLIER MOD NUMBERS

ESD LABEL (FOR UNITS SUPPLIED TO BOEING ONLY)
CONTAINS ESD SYMBOL AND CAUTION

LRU LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
UNIT NAME	INTERMEDIATE GAIN ANTENNA
PART NUMBER	7516194-901
WEIGHT	ACTUAL UNIT WEIGHT
ENVIRONMENTAL CATEGORY	DO-160C ENV CAT D2BCBEXSFDFSXXXXAUA [XXE3] 2AX
CONTAINS HONEYWELL MOD LETTERS	

CONVERSION TABLE 3	
INCHES	MILLIMETERS
0.020	0.508
0.150	3.810
0.18	4.572
0.213	5.410
0.390	9.906
0.58	14.732
0.70	17.780
0.80	20.320
1.628	41.351
1.84	46.736
1.86	47.244
2.13	54.102
2.500	63.500
3.22	81.788
3.680	93.472
3.82	97.028
4.128	104.851
4.25	107.950
8.750	222.250
12.500	317.500
12.54	318.516
13.750	349.250
14.96	379.984
23.000	584.200
29.56	750.824
29.92	759.968

PMA LABEL (FOR UNITS SUPPLIED TO BOEING ONLY)
CONTAINS PMA APPROVED AIRCRAFT

NOTES:

1. Unit weight 6.0 pounds (2.7 kilograms) maximum.
2. Denotes approximate center of gravity.
3. Dimensions are inches. See Metric Conversion Table for corresponding dimensions in millimeters.
4. Unit finish: white gloss except areas noted to be free of paint shall be chemical film.
5. The top surface of 0.390 diameter c'bore shall be free of paint 8 places.
6. In the Label Contents Tables lower case x = a character.
7. It is recommended that Corrosion Resisting Steel (CRES) hardware be used to attach the antenna to the aircraft and/or the adapter plate, for lightning protection purposes.

ID-73600 E7516196-1-A

Figure 4-5 (Sheet 1). Intermediate Gain Antenna Outline and Installation Diagram

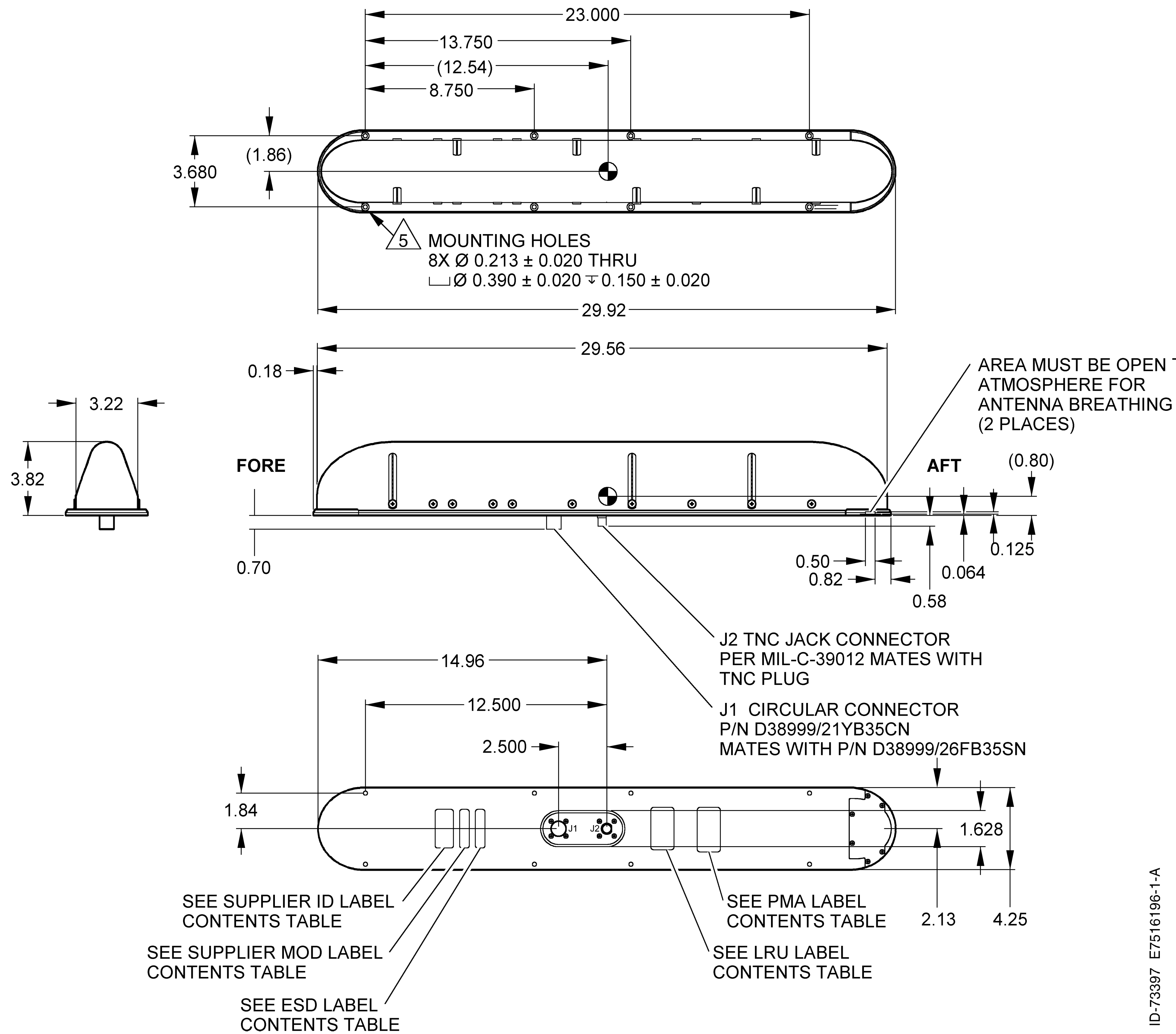


Figure 4-5 (Sheet 2). Intermediate Gain Antenna Outline and Installation Diagram

SUPPLIER ID LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
CUSTOMER NAME AND LOCATION	
CUSTOMER P/N xxx-xxxxxx-xxx	CUSTOMER REV x
TRANSPORT CANADA APPR # x-xx MANUFACTURED BY LOGO	MANUFACTURED BY NAME AND LOCATION
PHASE P/N xxx-xxxx-xx	PHASE REV xx
SERIAL # xxxxxxxxxx	WEIGHT x.x (BLANK) LBS GRAMS
DESCRIPTION DIPLEXER/LNA	
TSO # (BLANK) TRANSPORT CANADA APPR: xx-xx	

ESD LABEL (FOR UNITS SUPPLIED TO BOEING ONLY)
CONTAINS ESD SYMBOL AND CAUTION

LRU LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
UNIT NAME	LNA DIPLEXER
PART NUMBER	7516193-901
WEIGHT	ACTUAL UNIT WEIGHT
ENVIRONMENTAL CATEGORY	DO-160C ENV CAT A2BABCXWXXFXXEAEAUAKXX

PMA LABEL (FOR UNITS SUPPLIED TO BOEING ONLY)
CONTAINS PMA APPROVED AIRCRAFT

CONVERSION TABLE 3	
INCHES	MILLIMETERS
0.028	0.711
0.05	1.270
0.10	2.540
0.218	5.537
0.229	5.817
0.25	6.350
0.30	7.620
0.35	8.890
0.45	11.430
0.50	12.700
0.70	17.780
0.75	19.050
0.77	19.558
0.82	20.828
0.83	21.082
0.86	21.844
1.00	25.400
1.70	43.180
1.97	50.038
3.88	98.552
3.96	100.584
4.15	105.410
4.83	122.682
7.00	177.800
7.60	193.040
7.76	197.104
8.88	225.552
9.55	242.570
9.65	245.110
10.35	262.890
11.05	280.670

NOTES:
1. Unit weight 6.5 pounds (2.95 kilograms) maximum.
2. Denotes approximate center of gravity.
3. Dimensions are in inches. See Metric Conversion Table for corresponding dimensions in millimeters.
4. Unit finish: black semi-gloss except areas noted to be free of paint shall be chemical film.
5. Indicated areas shall be free of paint.
6. In the Label Contents Tables lower case x = a character.

ID-73601 E7516195-1-A

Figure 4-6 (Sheet 1). D/LNA Outline and Installation Diagram

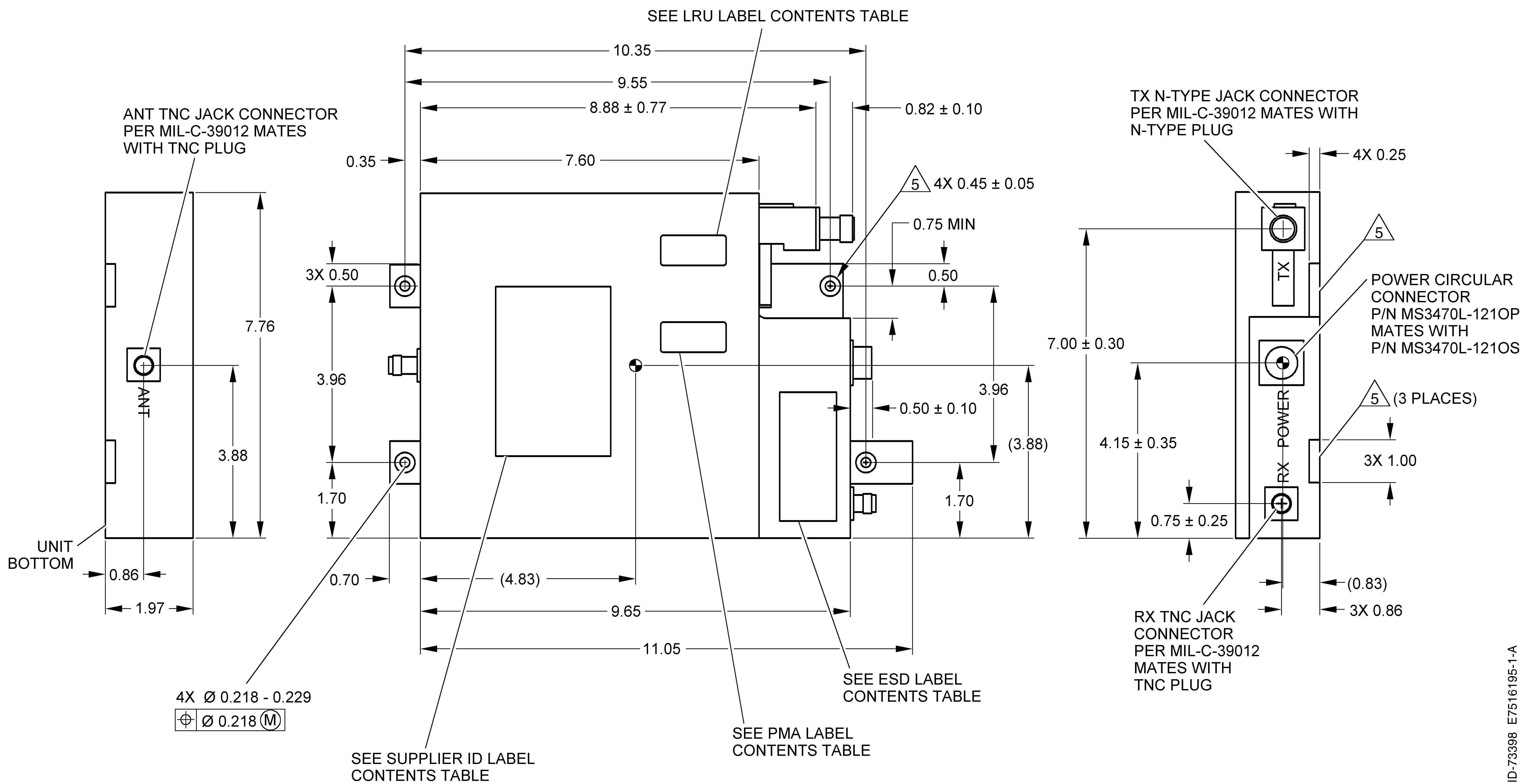


Figure 4-6 (Sheet 2). D/LNA Outline and Installation Diagram

ID LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
MODEL NO.	RFUia
UNIT NAME	RADIO FREQUENCY UNIT INTERFACE ASSEMBLY
WEIGHT	ACTUAL UNIT WEIGHT
UNIT PART NO.	7516222-901
ENVIRONMENTAL CATEGORY	DO160D ENV CAT (XXX1XXB[SCLMY] XXXXXXZXXXX[XXX]X[XXXX]XXX

5

METRIC CONVERSION TABLE			
INCHES	MILLIMETERS	INCHES	MILLIMETERS
0.010	0.254	0.750	19.050
0.015	0.381	1.810	45.974
0.020	0.508	2.440	61.980
0.025	0.635	2.500	63.500
0.030	0.762	2.600	66.090
0.040	1.016	3.300	83.820
0.060	1.524	4.860	123.444
0.080	2.032	4.900	124.460
0.100	2.540	6.580	167.130
0.120	3.048	6.890	175.006
0.145	3.683	7.640	194.056
0.184	4.674	12.520	318.008
0.188	4.775	12.760	324.104
0.380	9.652		

NOTES, UNLESS OTHERWISE SPECIFIED:

1. Unit Weight: Normal 3.49 lb/maximum 3.69 lb (1.58/1.67 kg).
2. ⌖ Denotes approximate center of gravity.
3. Darkened portion indicates solid part of polarizing keyway.
4. RFUia is in accordance with Arinc 600 number 4 MCU.
5. Dimensions are in inches. See Metric Conversion Table for corresponding dimensions in millimeters.
6. Unit finish: Gold chemical film per Honeywell specification M690278-2.
7. 0.100 maximum rear panel thickness is required in connector mounting area defined as Zone A. No other projections except connector mounting hardware are permitted in area defined as Zone A.
8. Cooling is not required. Unit is free of cooling air holes.
9. Applies 0.750 from Datum B.
10. Read is for orientation only.

ID-112067

Figure 4-7 (Sheet 1). RFUIA Outline and Installation Diagram

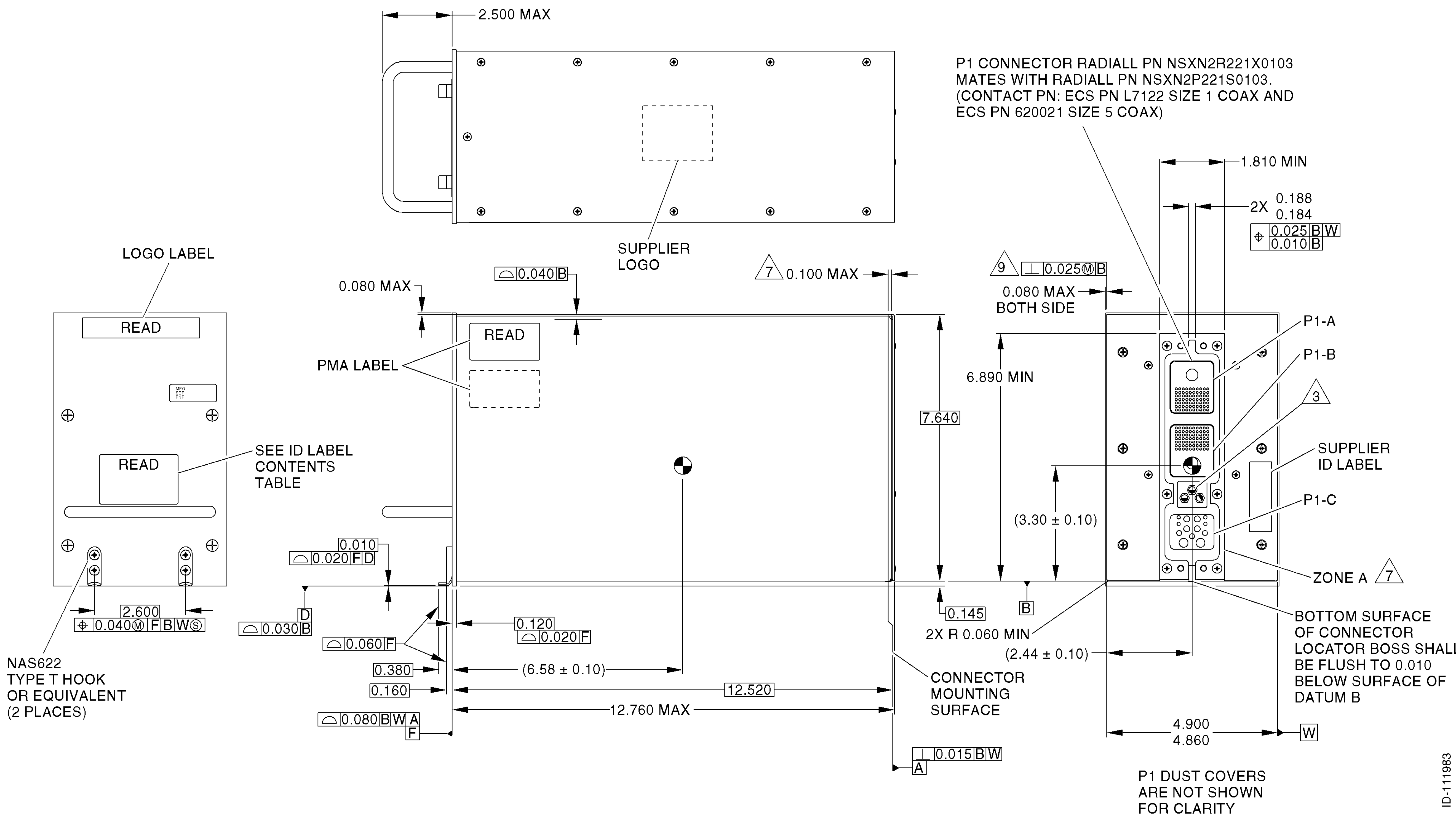


Figure 4-7 (Sheet 2). RFUIA Outline and Installation Diagram

SECTION 5
ELECTRICAL INSTALLATION

1. Overview

A. General

(1) This section supplies electrical installation procedures, power distribution, and interconnect diagrams for each component of the MCS system.

2. Equipment and Materials

A. General

(1) None.

3. Electrical Installation Procedure

A. Connector Layout and Contact Arrangement

(1) Each front panel connector of the SDU and HPA complies with ARINC characteristic 615, and is used to interface the LRU with an ARINC 615 portable data loader for software uploads. Pin callouts are specified in Table 5-1. See the MECHANICAL INSTALLATION section for specifics regarding connector part numbers for the ARINC 615 connector for each LRU and the corresponding mating connector.

(2) The rear connectors of the SDU ,HPA, and RFUIA comply with ARINC characteristic 600 as specified in Table 5-2. The ARINC 600 connector layouts and contact arrangement for the various connector plugs for each LRU of the MCS system are shown in Figure 5-1 thru Figure 5-10.

Table 5-1. ARINC 615 Connector Pin Callouts

Pin	SDU Signal Name	HPA Signal Name
1	PDL 429 A IN	PDL TO HPA 429 A
2	PDL 429 B IN	PDL TO HPA 429 B
5	SHIELD GND	CHASSIS GND
8	PDL 429 A OUT	HPA TO PDL 429 A
9	PDL 429 B OUT	HPA TO PDL 429 B
11	SPARE RX RS232	– –
13	SPARE TX RS232	– –
16	SHIELD GND	COMMON GND
18	PDL LINK A	PDL LINK A NO
19	GND (PDL LINK B)	GND (PDL LINK B)
20	115 VAC HOT	115 VAC HOT
21	CHASSIS GND	CHASSIS GND
22	115 VAC COLD	115 VAC GND
25	CTU RX RS232 FUTURE USE	– –
27	CTU TX RS232 FUTURE USE	– –
32	WH10 MIC HI	– –
33	WH10 MIC LO	– –
34	WH10 SPEAKER HI	– –
35	WH10 SPEAKER LO	– –
36	WH10 HOOKSWITCH	– –
40	RS232 A RX-DLT	– –
41	RS232 A TX-DLT	– –
42	RS232 B RX-CMT	RS232 TO HPA
43	RS232 B TX-CMT	RS232 TO DEBUG
48	LOGIC COMMON	COMMON GROUND
49	LOGIC COMMON	COMMON GROUND
50	DL FUNCTION DISC 1	– –
51	DL FUNCTION DISC 2	– –

Table 5-2. ARINC 600 Connector Requirements

LRU	Connector Description	LRU Rear Connector Part No.	Rack Mounting Connector Part No.	Outline Diagram
SDU	ARINC 600 - Size 6 MCU No. 2 Shell • Type 02 Top Insert • Type 02 Middle Insert • Type 04 Bottom Insert • Index Pin Code 04	620-600-022 (Radiall)	NSXN2P201X0004 (Radiall)	Figure 4-2, Figure 5-1, Figure 5-2, Table 5-3, and Table 5-4
HPA (40 W)	ARINC 600 - Size 8 MCU No. 2 Shell • Type 08 Top Insert • Type 05 Middle Insert • Type 04 Bottom Insert • Index Pin Code 08	620-600-076 (Radiall)	NSXN2P221X0008 (Radiall)	Figure 4-3 Figure 5-3 thru Figure 5-6
HPA (20 W)	ARINC 600 - Size 4 MCU No. 2 Shell • Type 08 Top Insert • Type 05 Middle Insert • Type 04 Bottom Insert • Index Pin Code 08	620-600-076 (Radiall)	NSXN2P221X0008 (Radiall)	Figure 4-4, Figure 5-3, Figure 5-7, Figure 5-8, and Figure 5-9
RFUIA	ARINC 600 - Size 4 MCU No. 2 Shell • Type 08 Top Insert • Type 05 Middle Insert • Type 04 Bottom Insert • Index Pin Code 03	NSXNR221X0103 (Radiall)	NSXNP221S0103 (Radiall)	Figure 4-7 and Figure 5-10

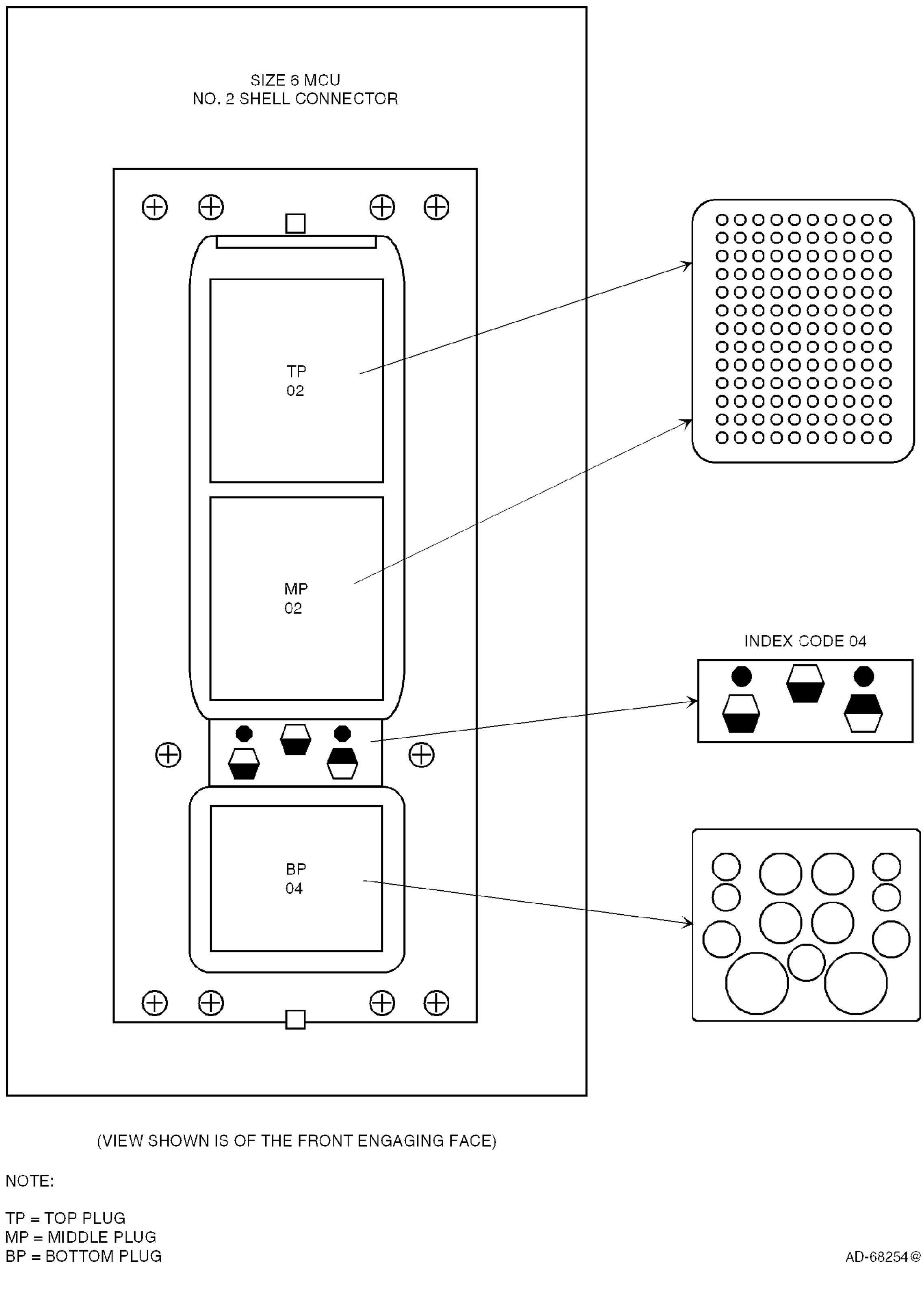


Figure 5-1. SDU ARINC 600 Connector Layout

Table 5-3. Contact Arrangements for Top Insert, SDU ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	ANALOG CABIN VOICE CHANNEL 1 HOOK-SWITCH	ANALOG CABIN VOICE CHANNEL 2 HOOK-SWITCH	WH10-1 STATUS A (RINGER)	WH10-1 STATUS B (RINGER)	WH10-2 STATUS A (RINGER)	WH10-2 STATUS B (RINGER)	AVIONICS SUB-SYSTEM SATCOM FAIL WARNING (NON MCS FAIL)	ANALOG CABIN VOICE CHANNEL 1 IN-USE	SATELLITE LINK NOT READY	ANALOG CABIN VOICE CHANNEL 2 IN-USE
2	ANALOG PBX CHANNEL 1 INPUT HI	ANALOG PBX CHANNEL 1 INPUT LO	ANALOG PBX CHANNEL 1 OUTPUT HI	ANALOG PBX CHANNEL 1 OUTPUT LO	ANALOG PBX CHANNEL 2 INPUT HI	ANALOG PBX CHANNEL 2 INPUT LO	ANALOG PBX CHANNEL 2 OUTPUT HI	ANALOG PBX CHANNEL 2 OUTPUT LO	O	O
3	COCKPIT VOICE UN-AVAILABLE	ANALOG CABIN VOICE UN-AVAILABLE	PACKET DATA UN-AVAILABLE	PACKET DATA LOW SPEED ONLY AVAILABLE	SATCOM IN-OPERABLE (MCS FAIL)	CEPT-E1 0V SHIELD (GND)	CEPT-E1 to BRIDGED CTU (CM-250) 1A	CEPT-E1 to BRIDGED CTU (CM-250) 1B	CEPT-E1 to BRIDGED CTU (CM-250) 2A	CEPT-E1 to BRIDGED CTU (CM-250) 2B
4	APM PWR OUT FUTURE USE	APM PWR RTN FUTURE USE	APM CLK OUT FUTURE USE	APM DATA OUT FUTURE USE	APM DATA IN FUTURE USE	APM WE OUT 1 FUTURE USE	APM WE OUT 2 FUTURE USE	APM EN1 FUTURE USE	APM EN2 FUTURE USE	CEPT-E1 0V
5	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP	CTU SLOOP
6	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741
7	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741	RESERVED BY ARINC 741
8	O	O	O	O	O	O	O	O	O	O
9	SPARE DISCRETE INPUT CONFIG STRAP TYPE	SPARE DISCRETE INPUT CONFIG STRAP TYPE	O	O	O	O	O	O	O	O
10	AVAIL OF 429 SSR MODE S ADDRESS	RESERVED FOR FMC CONFIG	RESERVED FOR FMC CONFIG	CMU BUS SPEED	CPDF CONFIG	RESERVED FOR STRAP OPTION	RESERVED FOR STRAP OPTION	RESERVED FOR STRAP OPTION	RESERVED FOR STRAP OPTION	CALL LIGHT ACTIVATOR CONFIGU-RATION
11	STRAP PARITY (ODD)	CCS PRESENCE	IRS CONFIG	IRS CONFIG	HPR/HPA/ BSU/LGA CONFIG	HPR/HPA/ BSU/LGA CONFIG	HPR/HPA/ BSU/LGA CONFIG	HPR/HPA/ BSU/LGA CONFIG	HPR/HPA/ BSU/LGA CONFIG	HPR/HPA/ BSU/LGA CONFIG
12	CFDS/CMC TYPE	CFDS/CMC TYPE	CFDS/CMC TYPE	RESERVED A/C ID OR CFDS/ SDU CONFIG	SDU CONFIG	SDU NUMBER	CMU NO. 1 CONFIG	CMU NO. 2 CONFIG	MCDU/ SCDU NO. 1 CONFIG	MCDU/ SCDU NO. 2 CONFIG
13	PRIORITY 4 CALLS	MCDU/ SCDU BUS SPEED	LIGHT/ CHIME CODE	LIGHT/ CHIME CODE	MCDU/ SCDU NO. 3 CONFIG	SDU CODEC 1 WIRING	SDU CODEC 1 WIRING	SDU CODEC 2 WIRING	SDU CODEC 2 WIRING	COCKPIT SIGNALING METHOD
14	5 V POS_MON	9 V POS_MON	RESERVED ATE	RESET-MON_N	PEIT_SEL_N	RESERVED ATE	RESERVED ATE	RESERVED ATE	CEPT-E1 FROM BRIDGED CTU (CM-250)1A	CEPT-E1 FROM BRIDGED CTU (CM-250)1A
15	15 V POS_MON	15 V NEG_MON	GND (ATE COMMON)	CEPT-E1 FROM BRIDGED CTU (CM-250) 2A	CEPT-E1 FROM BRIDGED CTU (CM-250) 2A	DLT_RX (RS232 RX-SDU)	DLT_TX (RS232 TX-SDU)	CMT_RX (RS232 RX-SDU)	CMT_TX (RS232 TX-SDU)	CMT_DLT_ RTN

Table 5-4. Contact Arrangements for Middle Insert, SDU ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	WH10 CABIN NO. 1 AUDIO IN HI	WH10 CABIN No. 1 AUDIO IN LO	WH10 CABIN No. 1 AUDIO OUT HI	WH10 CABIN No. 1 AUDIO OUT LO	DATA BUS FROM CABIN PACKET DATA A	DATA BUS FROM CABIN PACKET DATA B	FROM CMU NO. 1 429 A	FROM CMU NO. 1 429 B	TO CMU NO. 1 AND NO. 2 429 A	TO CMU NO. 1 AND NO. 2 429 B
2	COCKPIT AUDIO CH 1 INPUT HI	COCKPIT AUDIO CH 1 INPUT LO	COCKPIT AUDIO CH 1 OUTPUT HI	COCKPIT AUDIO CH 1 OUTPUT LO	COCKPIT AUDIO CH 2 INPUT HI	COCKPIT AUDIO CH 2 INPUT LO	COCKPIT AUDIO CH 2 OUTPUT HI	COCKPIT AUDIO CH 2 OUTPUT LO	CEPT-E1 FROM CTU INPUT A	CEPT-E1 FROM CTU INPUT B
3	CEPT-E1 TO CTU OUTPUT A	CEPT-E1 TO CTU OUTPUT B	DATA FROM SCDU NO. 1 A	DATA FROM SCDU NO. 1 B	DATA FROM SCDU NO. 2 A	DATA FROM SCDU NO. 2 B	DATA FROM CMU NO. 2 A	DATA FROM CMU NO. 2 B	DATA TO SCDU NO. 1, NO. 2, AND NO. 3 A	DATA TO SCDU NO. 1, NO. 2, AND NO. 3 B
4	AES ID INPUT A	AES ID INPUT B	FROM CFDS A	FROM CFDS B	TO CFDS A	TO CFDS B	MULTI-CONTROL OUTPUT A	MULTI-CONTROL OUTPUT B	WH10 CABIN NO. 2 AUDIO IN HI	WH10 CABIN NO. 2 AUDIO IN LO
5	LGA LNA ON/OFF CONTROL	WEIGHT-ON-WHEELS INPUT NO. 1	INPUT NO. 2	PROGRAM SELECT	WH10 CABIN NO. 2 AUDIO OUT HI	WH10 CABIN NO. 2 AUDIO OUT LO	BITE INPUT FROM LGA LNA	CHIME/ LIGHT INHIBIT	DUAL SYSTEM SELECT DISCRETE I/O	DUAL SYSTEM SELECT DISCRETE INHIBIT
6	DATA FROM PRIMARY IRS A	DATA FROM PRIMARY IRS B	DATA FROM SECONDARY IRS A	DATA FROM SECONDARY IRS B	BITE INPUT FROM HGA/HPA A	BITE INPUT FROM HGA/HPA B	SPARE 429 INPUT A	SPARE 429 INPUT B	BITE INPUT FROM LGA/HPA A	BITE INPUT FROM LGA/HPA B
7	DATA BUS FROM AIRBORNE LOADER A	DATA BUS FROM AIRBORNE LOADER B	DATA BUS TO AIRBORNE LOADER A	DATA BUS TO AIRBORNE LOADER B	BSU NO. 1 AND NO. 2 STEER INHIBIT A	BSU NO. 1 AND NO. 2 STEER INHIBIT B	BITE INPUT FROM ACU OR TOP-PORT BSU A	BITE INPUT FROM ACU OR TOP-PORT BSU B	BITE INPUT FROM STBD BSU A	BITE INPUT FROM STBD BSU B
8	DATA LOADER LINK A	DATA LOADER LINK B	RESERVED FOR DATA BUS FROM RMP A	RESERVED FOR DATA BUS FROM RMP B	CP VOICE CALL LGT OUTPUT NO. 1	CP VOICE MIC ON INPUT NO. 1	CP VOICE CALL LGT OUTPUT NO. 2	CP VOICE MIC ON INPUT NO. 2	DATA FROM SCDU NO. 3 A	DATA FROM SCDU NO. 3 B
9	DATA BUS TO SNU OR CPDF A	DATA BUS TO SNU OR CPDF B	RESERVED FOR DATA TO RMP A	RESERVED FOR DATA TO RMP B	RESERVED DATA BUS	RESERVED DATA BUS	RESERVED DATA BUS	RESERVED DATA BUS	CEPT-E1 FROM 0BE1 A	CEPT-E1 FROM 0BE1 B
10	CEPT-E1 TO 0BE1 A	CEPT-E1 TO 0BE1 B	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
11	FROM MOTION SENSOR NO. 1	MOTION SENSOR NO. 1 PROGRAM SELECT	CALL CANCEL DISCRETE INPUT NO. 1	CALL CANCEL DISCRETE INPUT NO. 2	RESERVED UNSPEC PROGRAM	RESERVED UNSPEC PROGRAM	RESERVED UNSPEC PROGRAM	RESERVED UNSPEC PROGRAM	RESERVED UNSPEC PROGRAM	RESERVED UNSPEC PROGRAM
12	CROSSTALK FROM OTHERSDU A	CROSSTALK FROM OTHERSDU B	CROSSTALK TO OTHERSDU A	CROSSTALK TO OTHERSDU B	SPARE O	SPARE O	RESERVED FOR DATA FROM FMC 1 A	RESERVED FOR DATA FROM FMC 1 B	RESERVED FOR DATA FROM FMC 2 A	RESERVED FOR DATA FROM FMC 2 B
13	SPARE DISCRETE OUTPUT 28 VDC CALL LAMP TYPE	SPARE O	ICAO ADDRESS BIT NO. 1 (MSB)	ICAO ADDRESS BIT NO. 2	ICAO ADDRESS BIT NO. 3	ICAO ADDRESS BIT NO. 4	ICAO ADDRESS BIT NO. 5	ICAO ADDRESS BIT NO. 6	ICAO ADDRESS BIT NO. 7	ICAO ADDRESS BIT NO. 8
14	CP VOICE GO-AHEAD CHIME RESET NO. 1	CP VOICE CHIME CONTACT 1	CP VOICE CONTACT 2	ICAO ADDRESS BIT NO. 9	ICAO ADDRESS BIT NO. 10	ICAO ADDRESS BIT NO. 11	ICAO ADDRESS BIT NO. 12	ICAO ADDRESS BIT NO. 13	ICAO ADDRESS BIT NO. 14	ICAO ADDRESS BIT NO. 15
15	ICAO ADDRESS BIT NO. 16	ICAO ADDRESS BIT NO. 17	ICAO ADDRESS BIT NO. 18	ICAO ADDRESS BIT NO. 19	ICAO ADDRESS BIT NO. 20	ICAO ADDRESS BIT NO. 21	ICAO ADDRESS BIT NO. 22	ICAO ADDRESS BIT NO. 23	ICAO ADDRESS BIT NO. 24 (LSB)	ICAO ADDRESS COMMON

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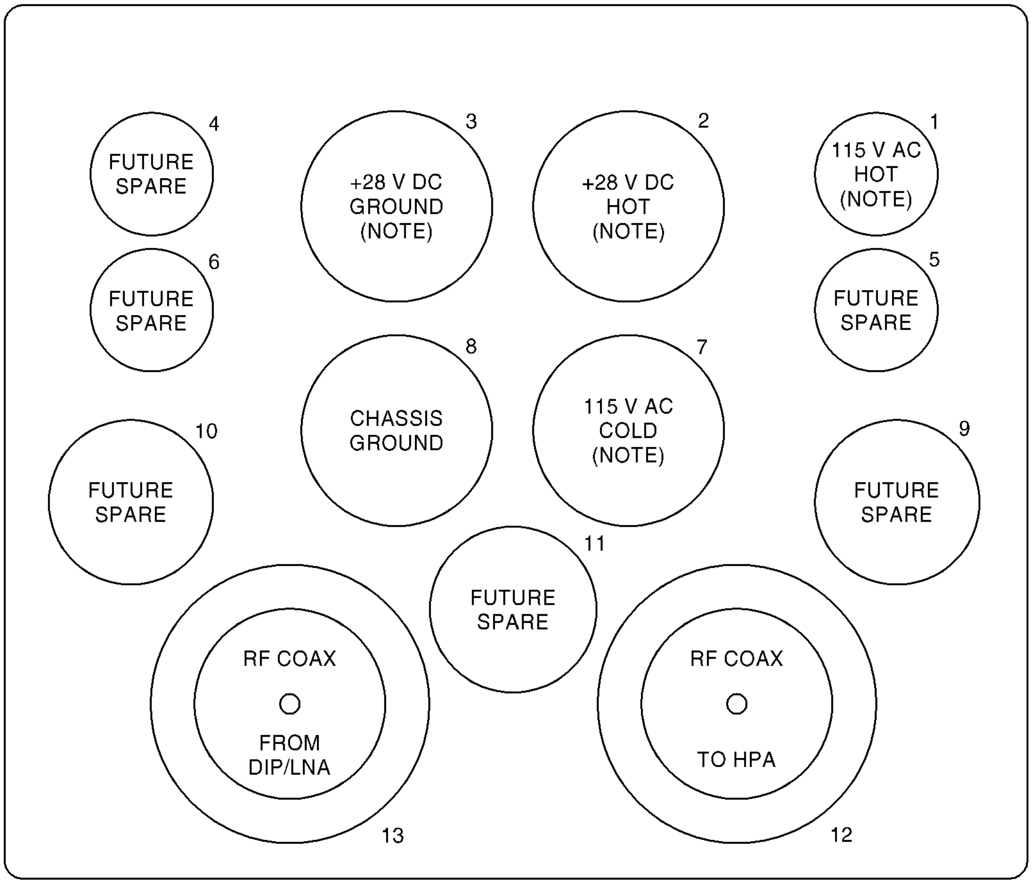

NOTE: THE SDU PRIMARY POWER IS SUPPLIED TO EITHER +28 V DC (PINS 2 AND 3) OR 115 V AC (PINS 1 AND 7). THEREFORE, ONLY ONE SET OF PINS SHOULD BE USED IN AN INSTALLATION.

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Figure 5-2. Contact Arrangements for Bottom Insert, SDU ARINC 600 Connector

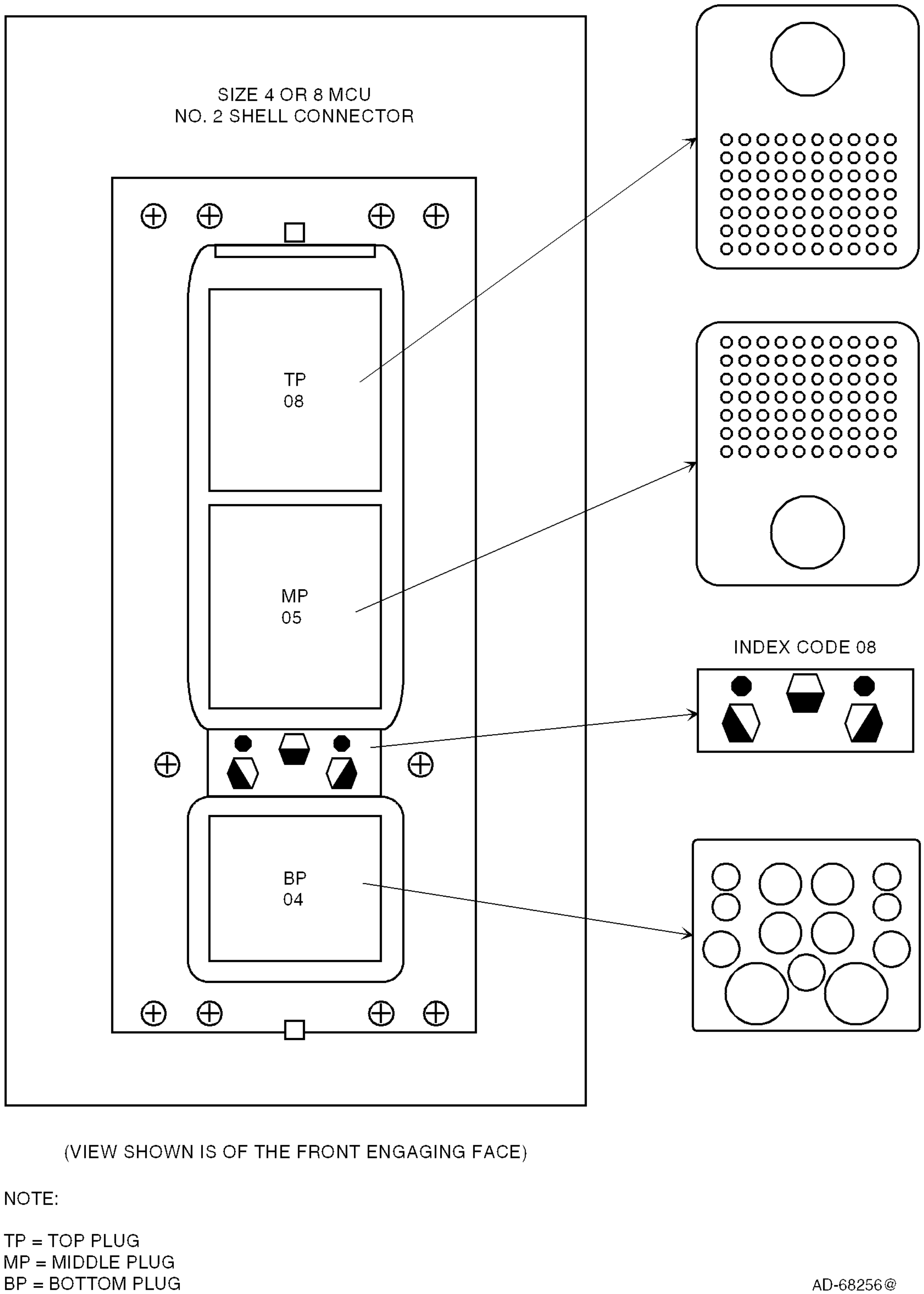
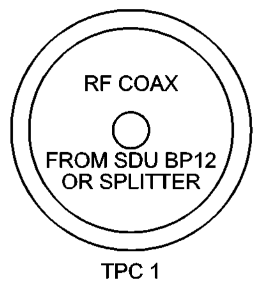


Figure 5-3. HPA ARINC 600 Connector Layout



	A	B	C	D	E	F	G	H	J	K
1	INPUT MULTI-CTL A	INPUT MULTI-CTL B	OUTPUT HPA BITE A	OUTPUT HPA BITE B	DATA BUS FROM AIRBORNE DATALDR A	DATA BUS FROM AIRBORNE DATALDR B	DATA BUS TO AIRBORNE DATALDR A	DATA BUS TO AIRBORNE DATALDR B	DATA LOADER LINK A	DATA LOADER LINK B
2	SPARE 429 INPUT	SPARE 429 INPUT	SPARE 429 OUTPUT	SPARE 429 OUTPUT	SPARE DISC INPUT	SPARE DISC INPUT	SPARE DISC INPUT	SPARE DISC OUTPUT	SPARE DISC OUTPUT	SPARE DISC OUTPUT
3	TOP/PORT HPA (1) A	TOP/PORT HPA (1) B	STR B HPA (2) A	STR B HPA (2) B	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	SDI NO. 1	SDI NO. 2	0	SDI COMMON	0	0	0	0	0	0
6	5V POS_MON	25V POS_MON	RESERVED ATE	RESET_ MON_N	ERR_LOG_ DISBL_NO	CAL_MEM_ ENABLE_NO	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE
7	15V POS_MON	15V NEG_MON	GND (ATE COMMON)	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE

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Figure 5-4. Contact Arrangements for Top Insert, HPA (40 Watt) ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0

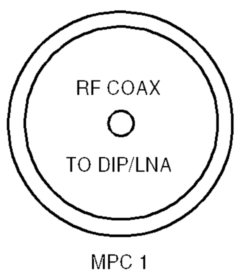

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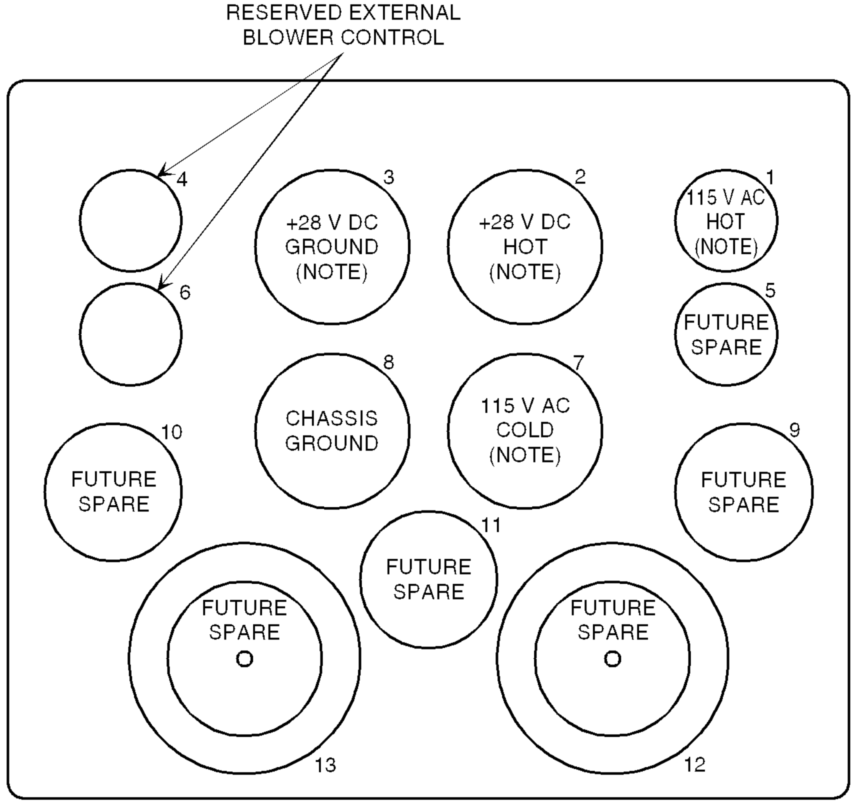
Figure 5-5. Contact Arrangements for Middle Insert, HPA (40 Watt) ARINC 600 Connector



NOTE: THE HPA PRIMARY POWER IS SUPPLIED TO EITHER +28 V DC (PINS 2 AND 3) OR 115 V AC (PINS 1 AND 7). THEREFORE, ONLY ONE SET OF PINS SHOULD BE USED IN AN INSTALLATION.

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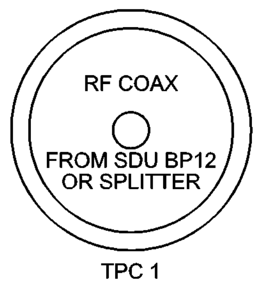
Figure 5-6. Contact Arrangements for Bottom Insert, HPA (40 Watt) ARINC 600 Connector



	A	B	C	D	E	F	G	H	J	K
1	INPUT MULTI-CTL A	INPUT MULTI-CTL B	OUTPUT HPA BITE A	OUTPUT HPA BITE B	DATA BUS FROM AIRBORNE DATALDR A	DATA BUS FROM AIRBORNE DATALDR B	DATA BUS TO AIRBORNE DATALDR A	DATA BUS TO AIRBORNE DATALDR B	DATA LOADER LINK A	DATA LOADER LINK B
2	SPARE 429 INPUT	SPARE 429 INPUT	SPARE 429 OUTPUT	SPARE 429 OUTPUT	IGA LNA BITE	SPARE DISC INPUT	SPARE DISC INPUT	IGA LNA CNTRL	SPARE DISC OUTPUT	SPARE DISC OUTPUT
3	TOP/PORT HPA (1) A	TOP/PORT HPA (1) B	STR B HPA (2) A	STR B HPA (2) B	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	SDI NO. 1	SDI NO. 2	0	SDI COMMON	0	0	0	0	0	0
6	5V POS_MON	25V POS_MON	RESERVED ATE	RESET_ MON_N	ERR_LOG_ DISBL_NO	CAL_MEM_ ENABLE_NO	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE
7	15V POS_MON	15V NEG_MON	GND (ATE COMMON)	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE	RESERVED ATE

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Figure 5-7. Contact Arrangements for Top Insert, HPA (20 Watt) ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	IGA BITE A	IGA CNTRL A	0	0	0	0	0	0	0	-80 V DC
6	IGA BITE B	IGA CNTRL B	0	0	0	0	0	0	0	15 V DC HI
7	0	IGA CNTRL SHLD	0	0	0	0	0	0	0	15 V DC RETURN

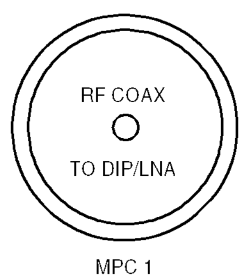

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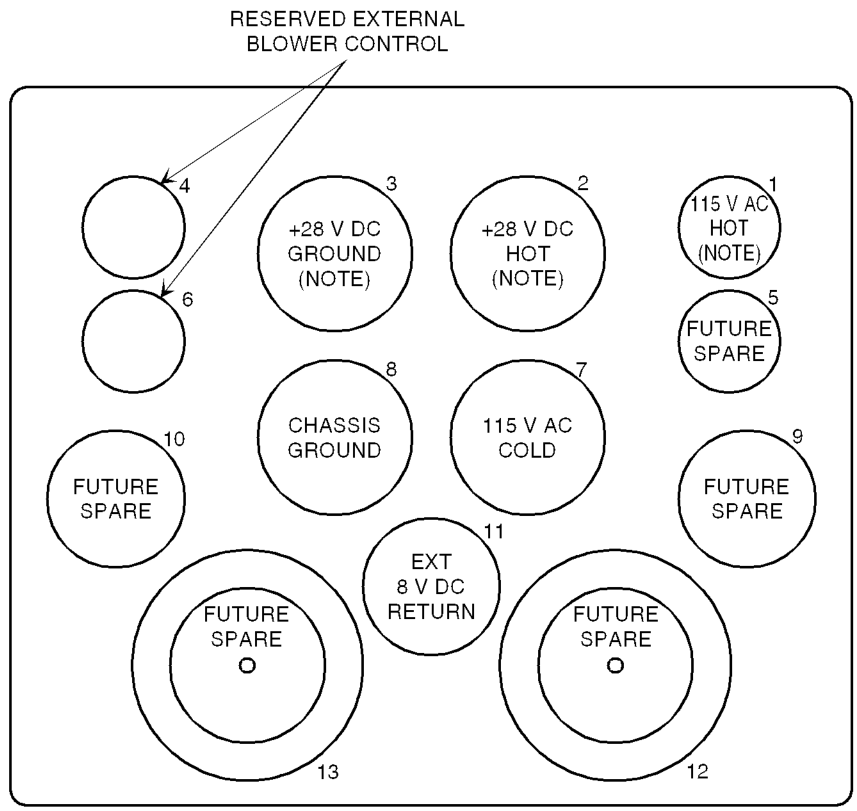
Figure 5-8. Contact Arrangements for Middle Insert, HPA (20 Watt) ARINC 600 Connector



NOTE: THE HPA PRIMARY POWER IS SUPPLIED TO EITHER +28 V DC (PINS 2 AND 3) OR 115 V AC (PINS 1 AND 7). THEREFORE, ONLY ONE SET OF PINS SHOULD BE USED IN AN INSTALLATION.

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Figure 5-9. Contact Arrangements for Bottom Insert, HPA (20 Watt) ARINC 600 Connector

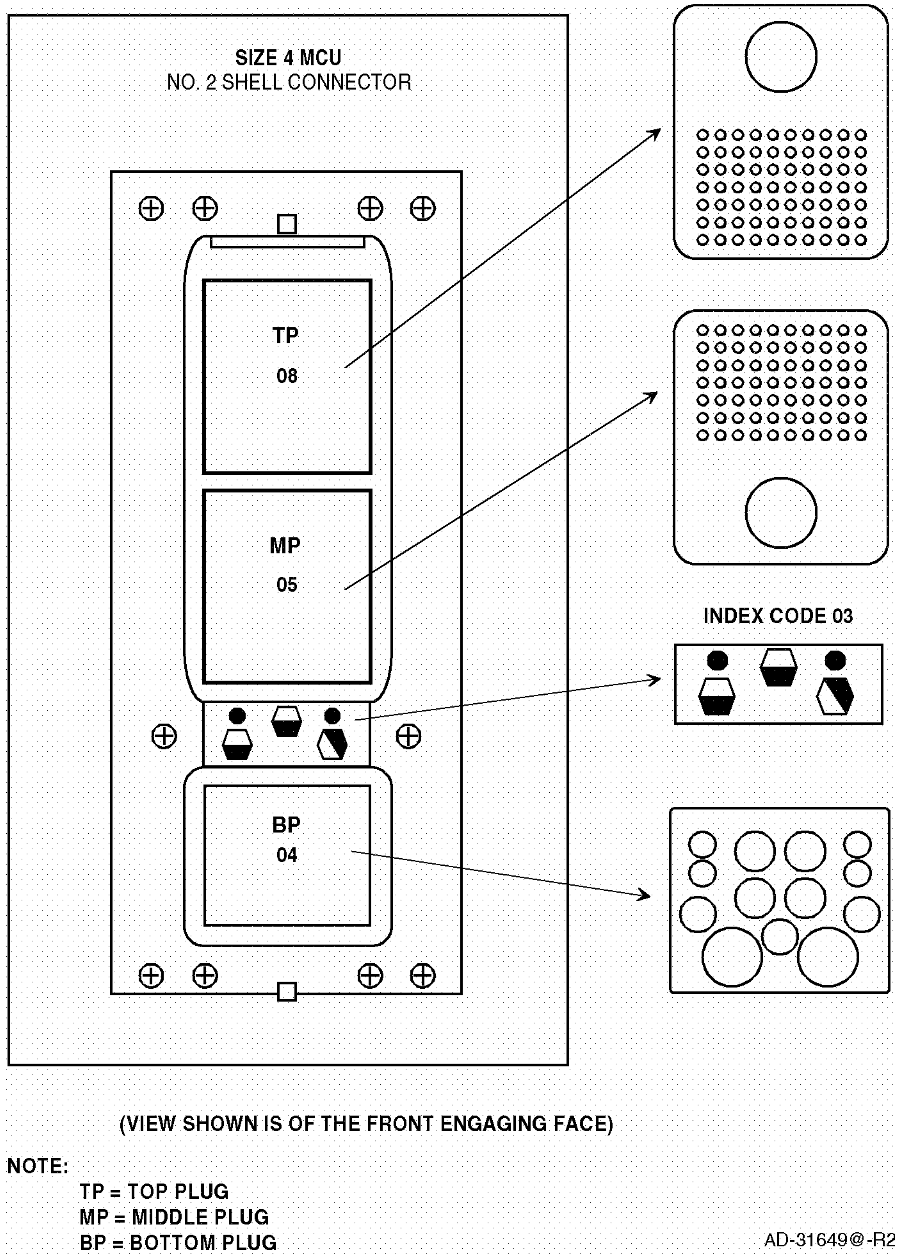

Figure 5-10. RFUIA ARINC 600 Connector Layout

B. Electrical Installation

(1) The information necessary to supply the electrical interconnects is shown in Figure 5-11 thru Figure 5-26. Interconnect diagrams are as follows:

- Figure 5-11. Satellite Data Unit Interface Diagram
- Figure 5-12. WH-10 Handset Interface Diagram
- Figure 5-13. Four-to-Two Wire Interface Diagram
- Figure 5-14. Avtech Fax Interface Diagram
- Figure 5-15. HF-SAT Transfer Panel Interface Diagram
- Figure 5-16. Signal Conditioning Unit Interface Diagram
- Figure 5-17. Maintenance Panel Assembly Interface Diagram
- Figure 5-18. Intermediate Gain Antenna Interface Diagram
- Figure 5-19. CMC Top-Mount High Gain Antenna Interface Diagram
- Figure 5-20. Tecom Top-Mount High Gain Antenna Interface Diagram
- Figure 5-21. Racal Mechanically Steered High Gain Antenna Interface Diagram
- Figure 5-22. AMT-50 Mechanically Steered High Gain Antenna Interface Diagram
- Figure 5-23. Dassault Conformal High Gain Antenna Interface Diagram
- Figure 5-24. Ball Conformal High Gain Antenna Interface Diagram
- Figure 5-25. Low Gain Antenna Interface Diagram
- Figure 5-26. Toyocom Top-Mount High Gain Antenna Interface Diagram.

(2) The applicable configuration pins in the aircraft wiring must be connected to make the MCS system functional. The SDU receives and sends 30 system configuration discrete inputs through the configuration pins to properly match the avionics equipment installed on the aircraft (see Figure 5-11 and Paragraph 4. to identify the configuration pins).

(3) The SDU receives a 24-bit ICAO address that identifies the aircraft in which the SDU is installed (Figure 5-11). Continuity is defined as a resistance of 10 ohms or less between a configuration pin or address pin and the common. Continuity is broken when the resistance between a configuration pin or address pin and common measures 100k ohms or greater.

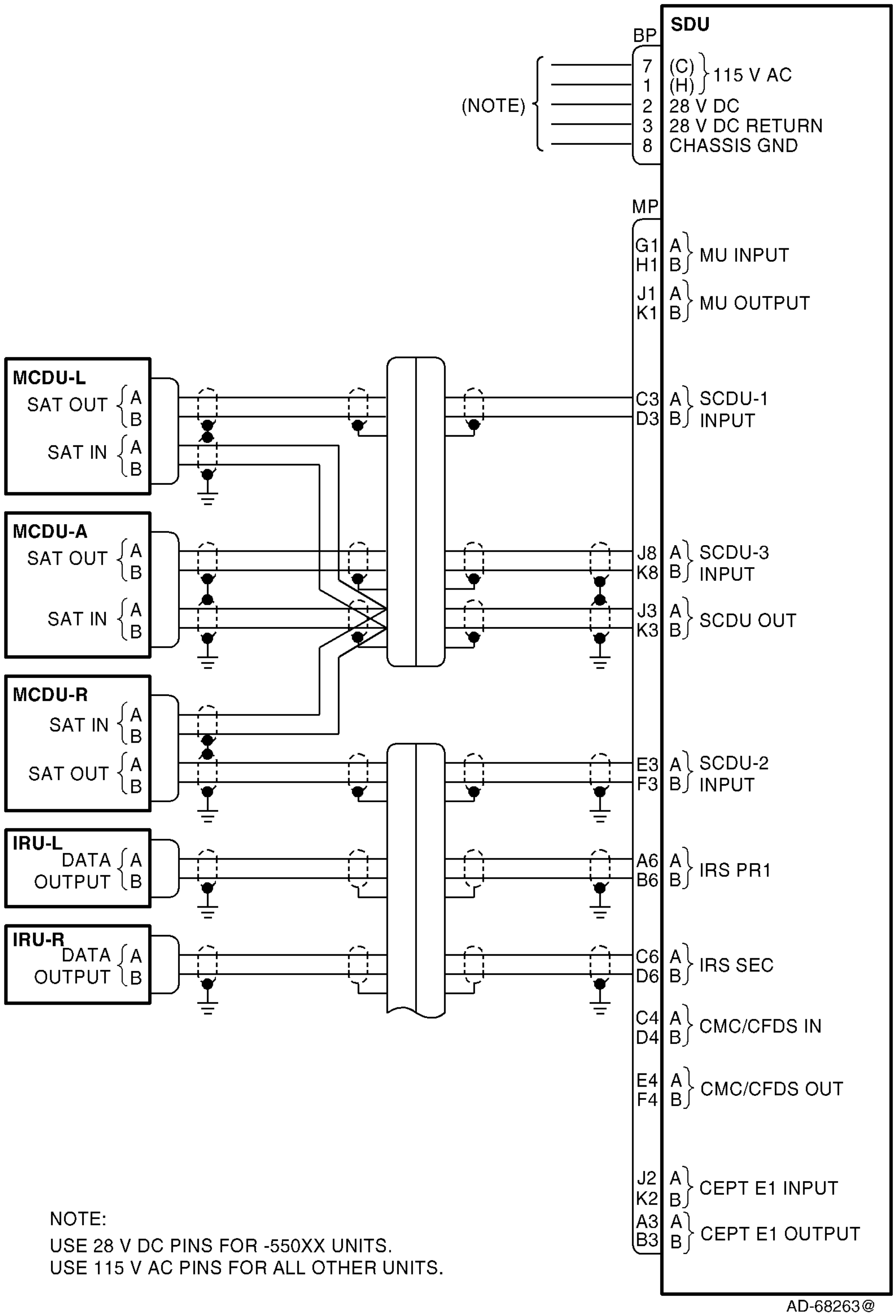

Figure 5-11 (Sheet 1). Satellite Data Unit Interface Diagram

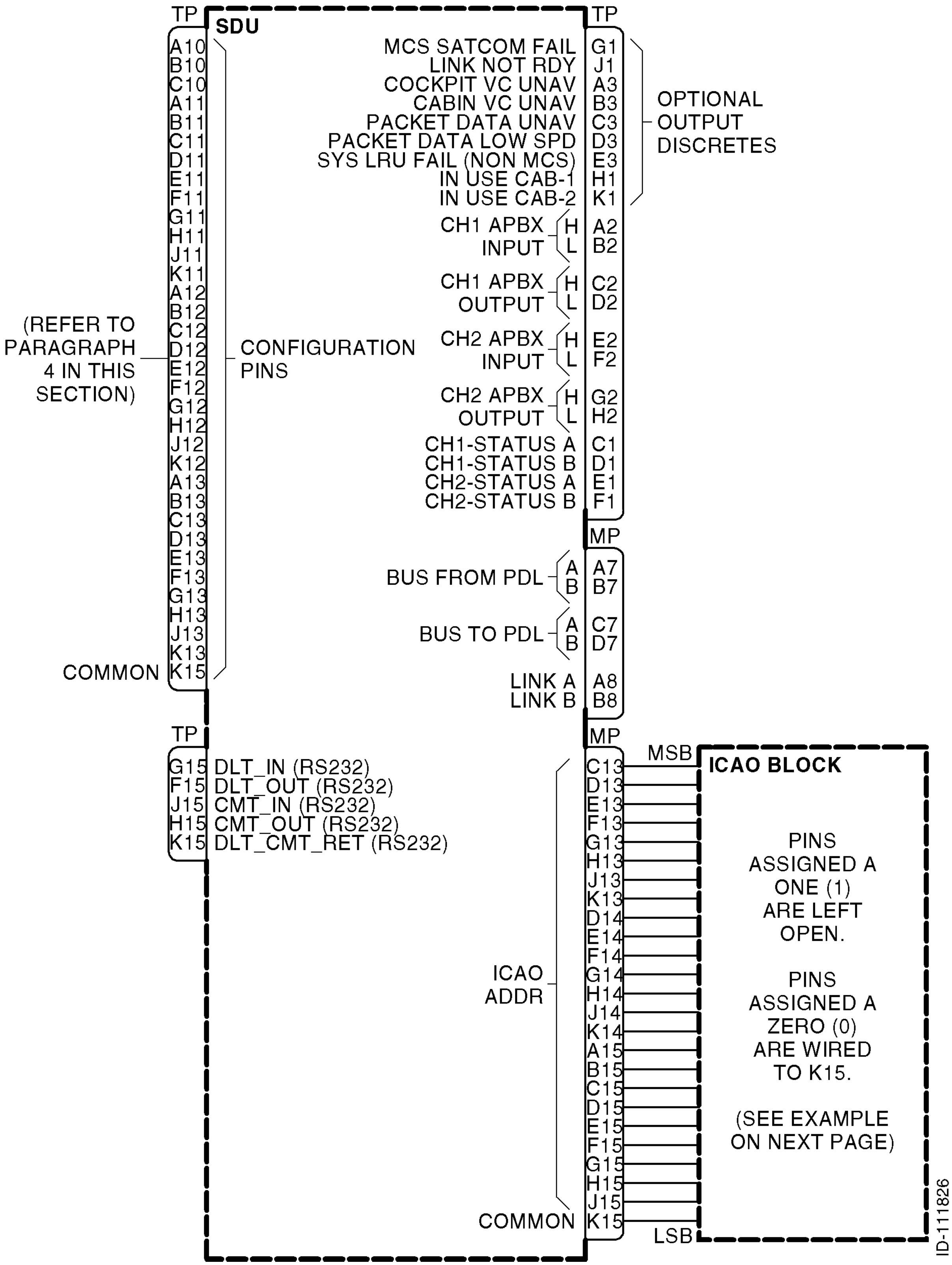

Figure 5-11 (Sheet 2). Satellite Data Unit Interface Diagram

Table 5-5. ICAO Block Strapping

Example: AES ID 53375006 (Octal)		
Octal	**Binary**	**SDU Connector Pin (MP)**
5	1	C13
	0	D13
	1	E13
3	0	F13
	1	G13
	1	H13
3	0	J13
	1	K13
	1	D14
7	1	E14
	1	F14
	1	G14
5	1	H14
	0	J14
	1	K14
0	0	A15
	0	B15
	0	C15
0	0	D15
	0	E15
	0	F15
6	1	G15
	1	H15
	0	J15
Common		K15

NOTES:

1. 53375006 (Octal) = 101011011111101000000110 (Binary).
2. Binary 1 = Open; Binary 0 = Ground.
3. Pins assigned a zero (0) are wired to SDU connector pin MP-K15 (common).

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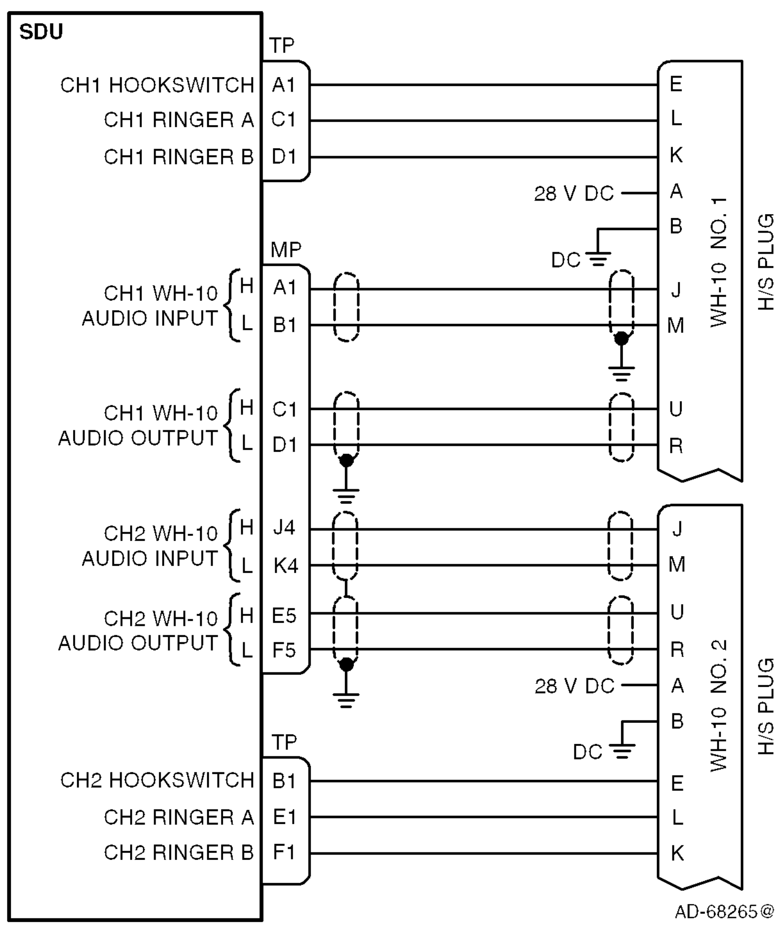


Figure 5-12. WH-10 Handset Interface Diagram

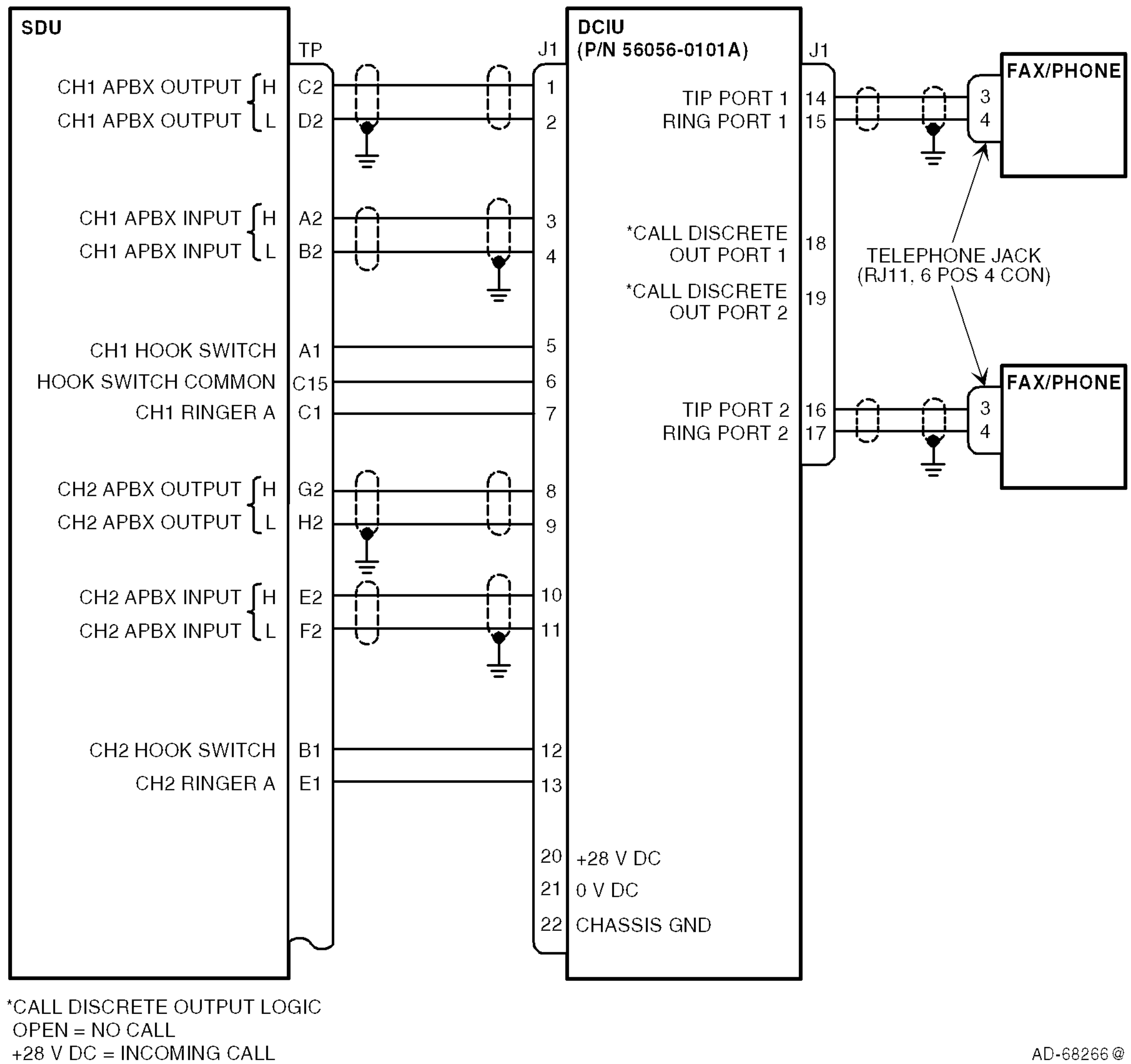


Figure 5-13. Four-to-Two Wire Interface Diagram

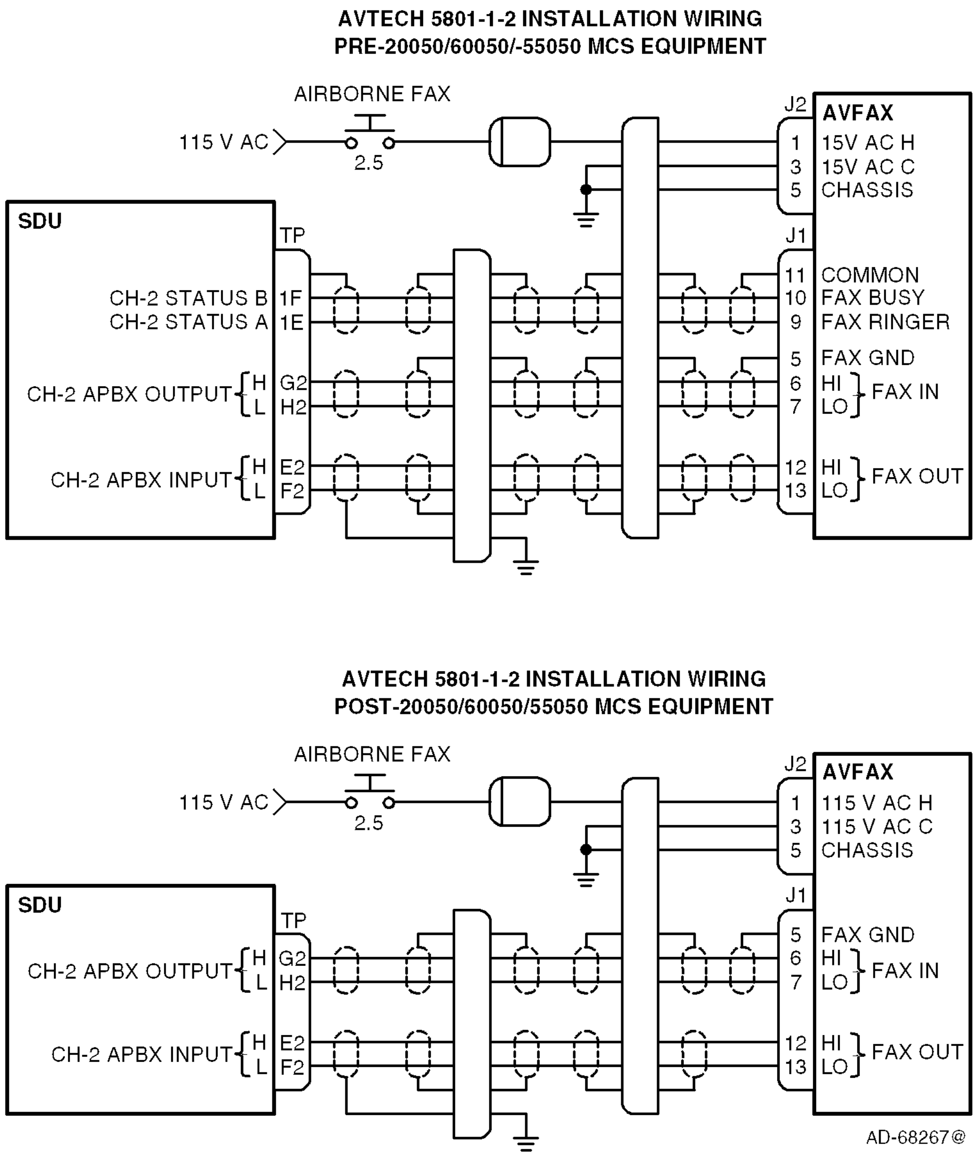


Figure 5-14. Avtech Fax Interface Diagram

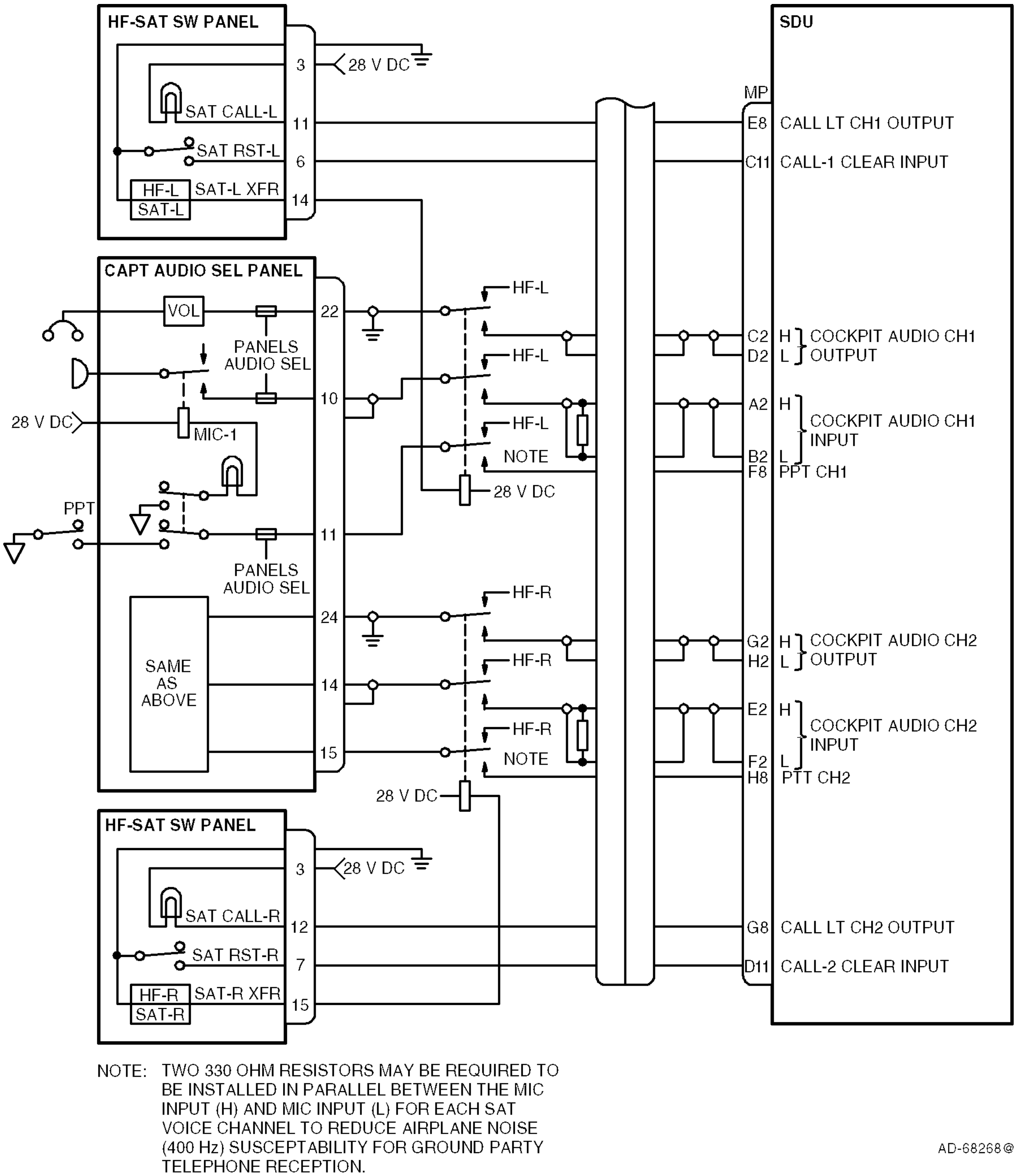
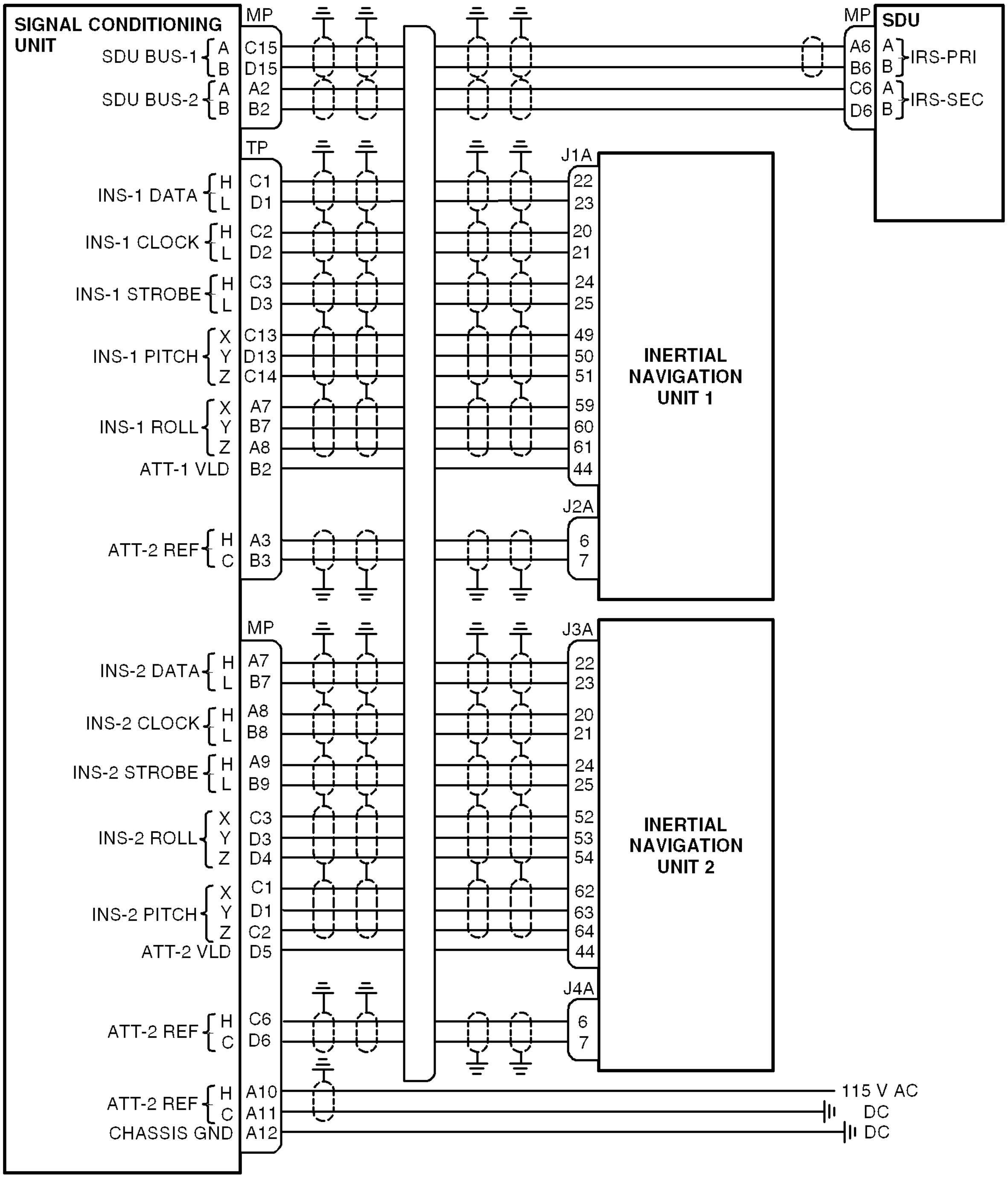


Figure 5-15. HF-SAT Transfer Panel Interface Diagram



NOTE: THIS INTERFACE DIAGRAM REPRESENTS ONE OF MANY SCU CONFIGURATIONS

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Figure 5-16. Signal Conditioning Unit Interface Diagram

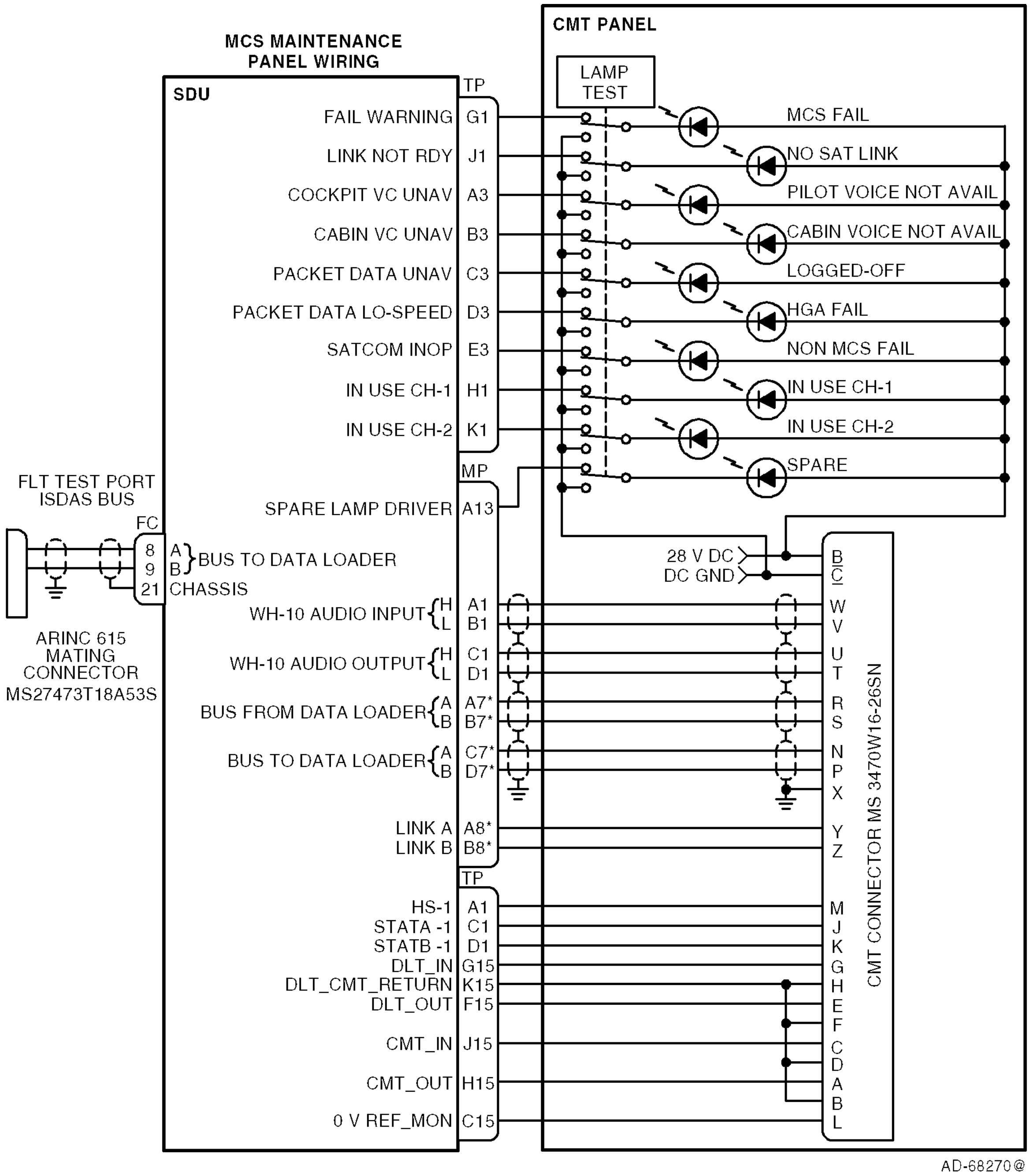

Figure 5-17. Maintenance Panel Assembly Interface Diagram

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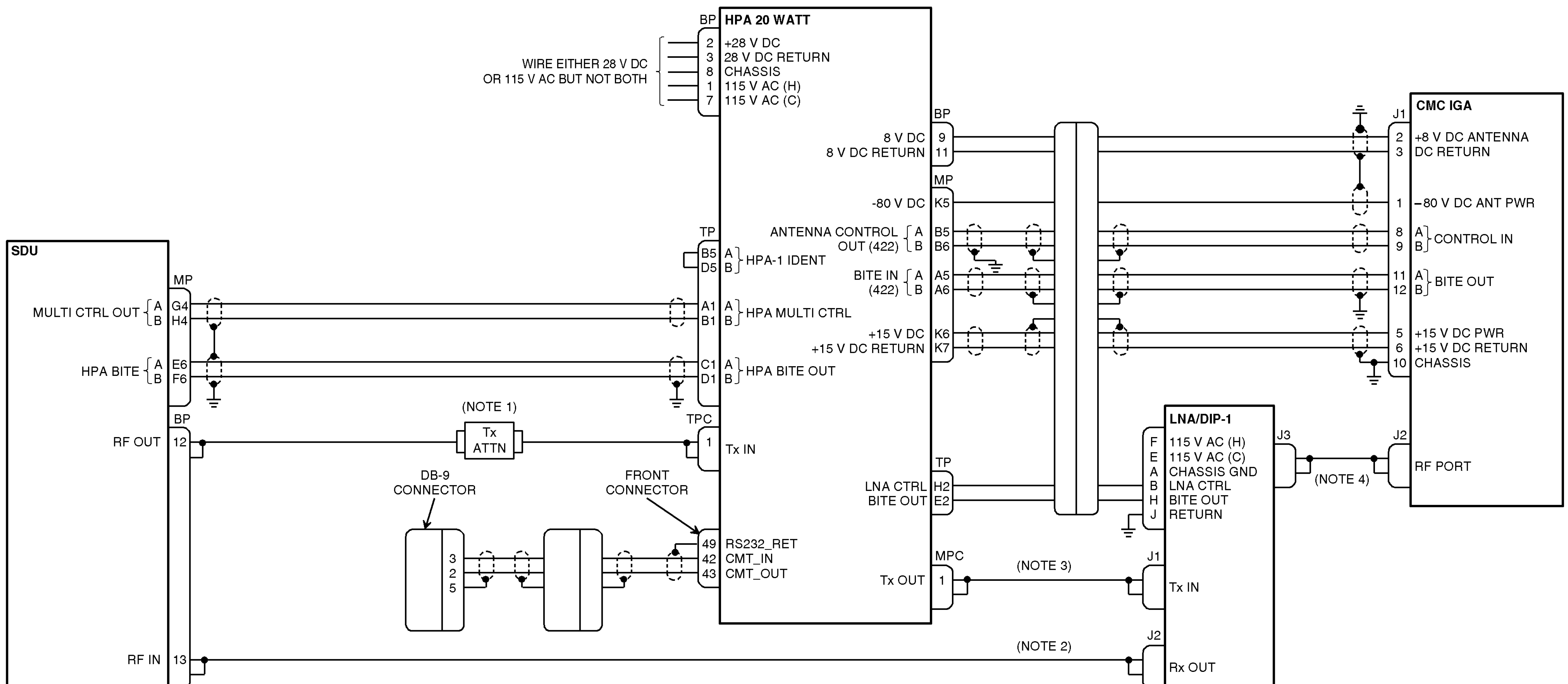
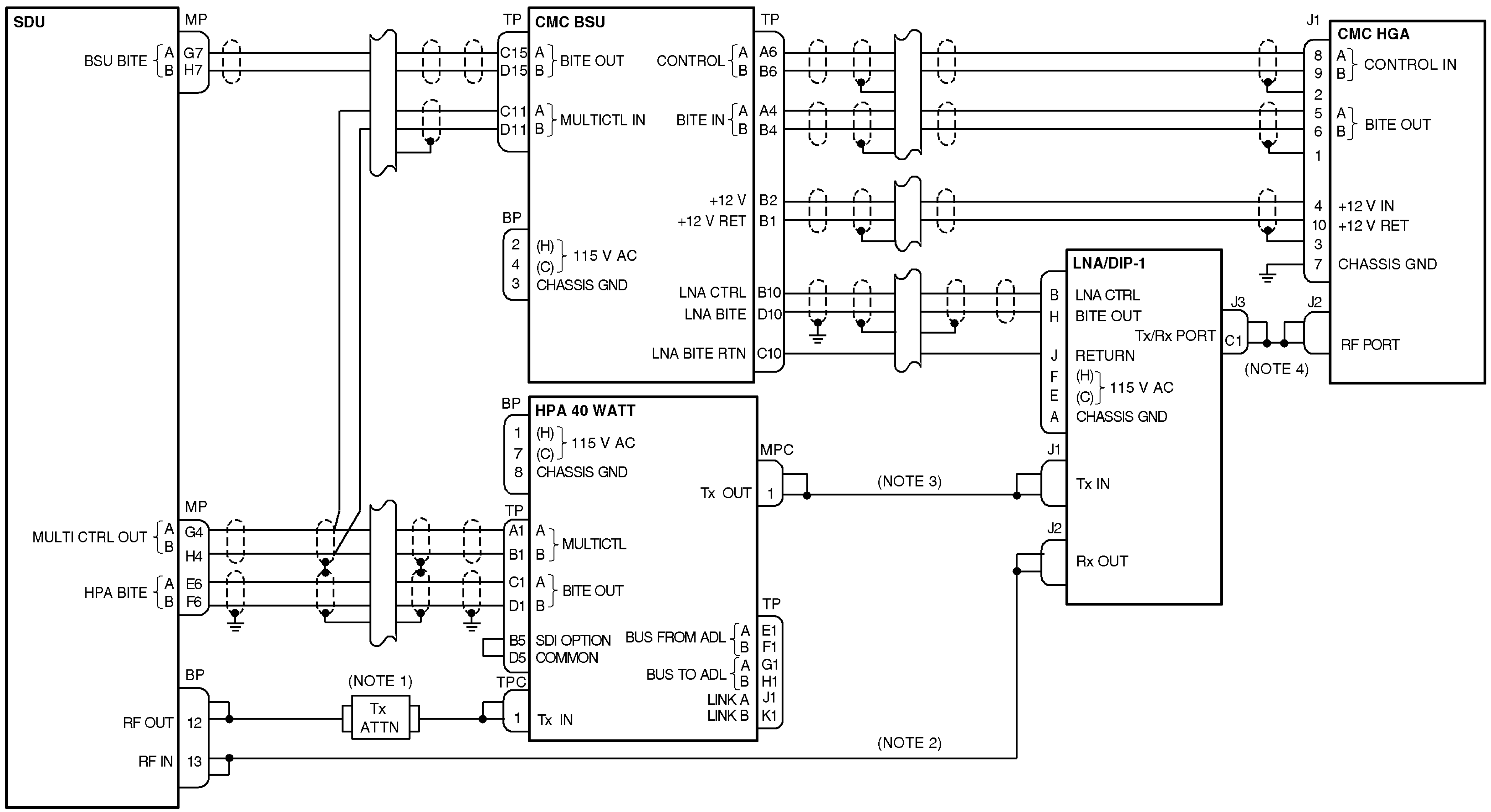


NOTES:

1. SUM OF CABLE, CONNECTOR LOSSES AND TX ATTN LOSSES IS 22 ± 3 dB AT 1.6 GHz.
2. SUM OF CABLE, CONNECTOR LOSSES 6 dB TO 25 dB AT 1.6 GHz.
3. MAXIMUM CABLE AND CONNECTOR LOSSES IS 1.4 dB AT 1.6 GHz.
4. MAXIMUM CABLE AND CONNECTOR LOSSES IS 0.3 dB AT 1.6 GHz.

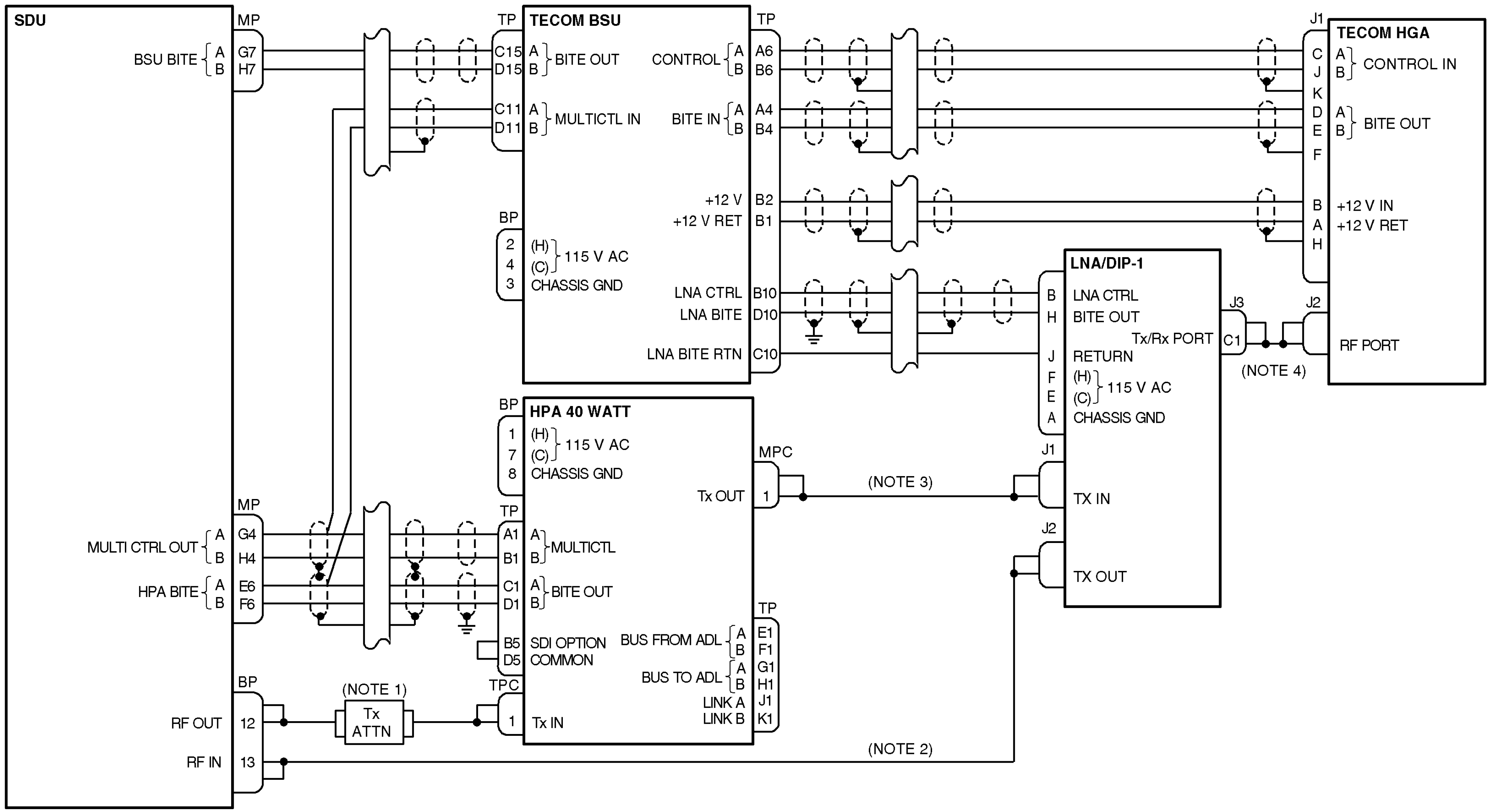
Figure 5-18. Intermediate Gain Antenna Interface Diagram



NOTES:

1. SUM OF CABLE, CONNECTOR LOSSES AND TX ATTN LOSSES IS 22 ± 3 dB AT 1.6 GHz.
2. SUM OF CABLE, CONNECTOR LOSSES 6 dB TO 25 dB AT 1.6 GHz.
3. MAXIMUM CABLE AND CONNECTOR LOSSES IS 1.4 dB AT 1.6 GHz.
4. MAXIMUM CABLE AND CONNECTOR LOSSES IS 0.3 dB AT 1.6 GHz.

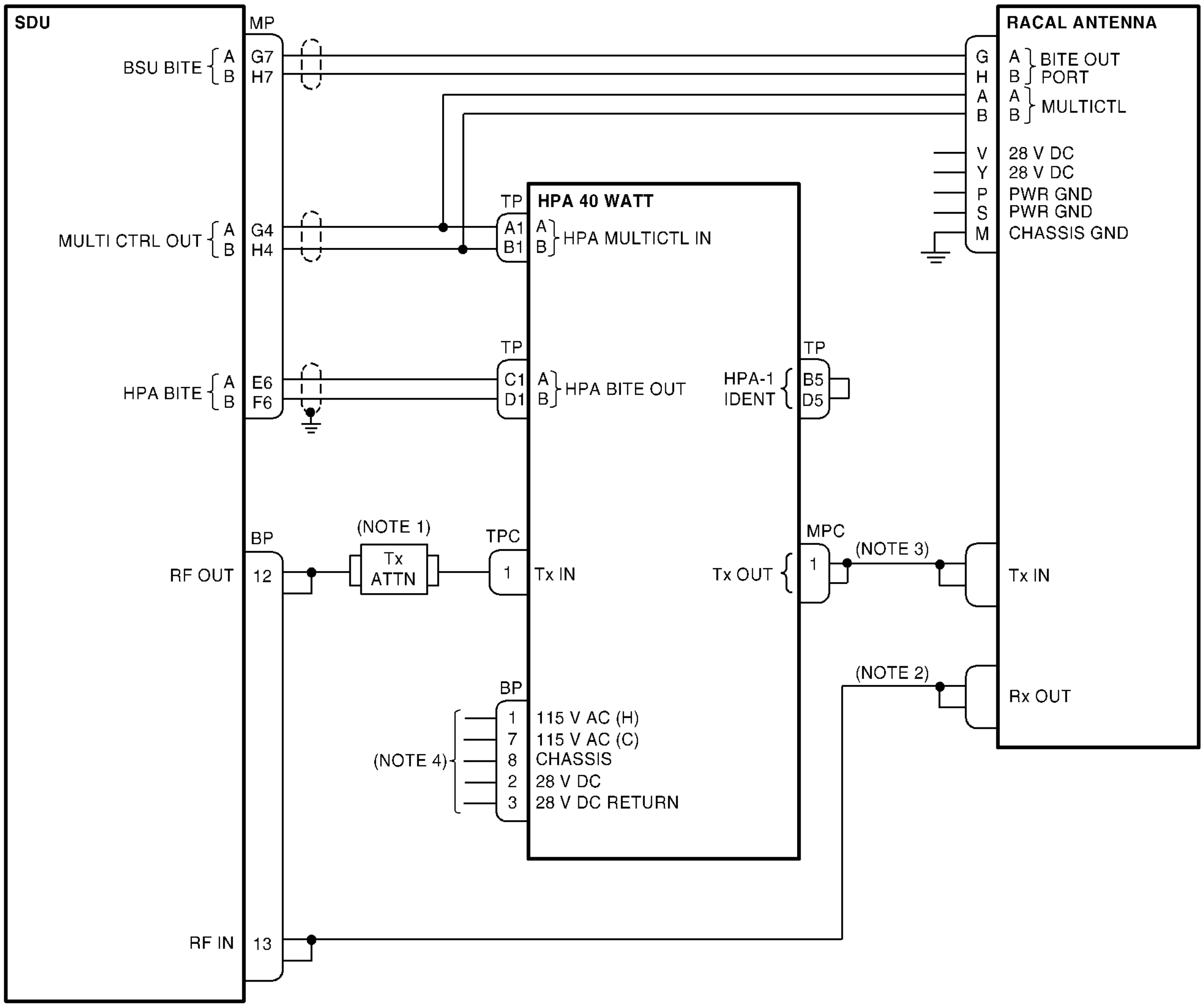
Figure 5-19. CMC Top-Mount High Gain Antenna Interface Diagram



NOTES:

1. SUM OF CABLE, CONNECTOR LOSSES AND TX ATTN LOSSES IS 22 ± 3 dB AT 1.6 GHz.
2. SUM OF CABLE, CONNECTOR LOSSES 6 dB TO 25 dB AT 1.6 GHz.
3. MAXIMUM CABLE AND CONNECTOR LOSSES IS 1.4 dB AT 1.6 GHz.
4. MAXIMUM CABLE AND CONNECTOR LOSSES IS 0.3 dB AT 1.6 GHz.

Figure 5-20. Tecom Top-Mount High Gain Antenna Interface Diagram



NOTES:

1. SUM OF CABLE, CONNECTOR LOSSES AND TX ATTN LOSSES IS 22 ± 3 dB AT 1.6 GHz.
2. SUM OF CABLE, CONNECTOR LOSSES 6 dB TO 25 dB AT 1.6 GHz.
3. MAXIMUM CABLE AND CONNECTOR LOSSES IS 1.4 dB AT 1.6 GHz.
4. USE 28 V DC PINS FOR -5YZZZ UNITS; USE 115 V AC PINS FOR ALL OTHER UNITS AT 1.6 GHz.

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Figure 5-21. Racal Mechanically Steered High Gain Antenna Interface Diagram

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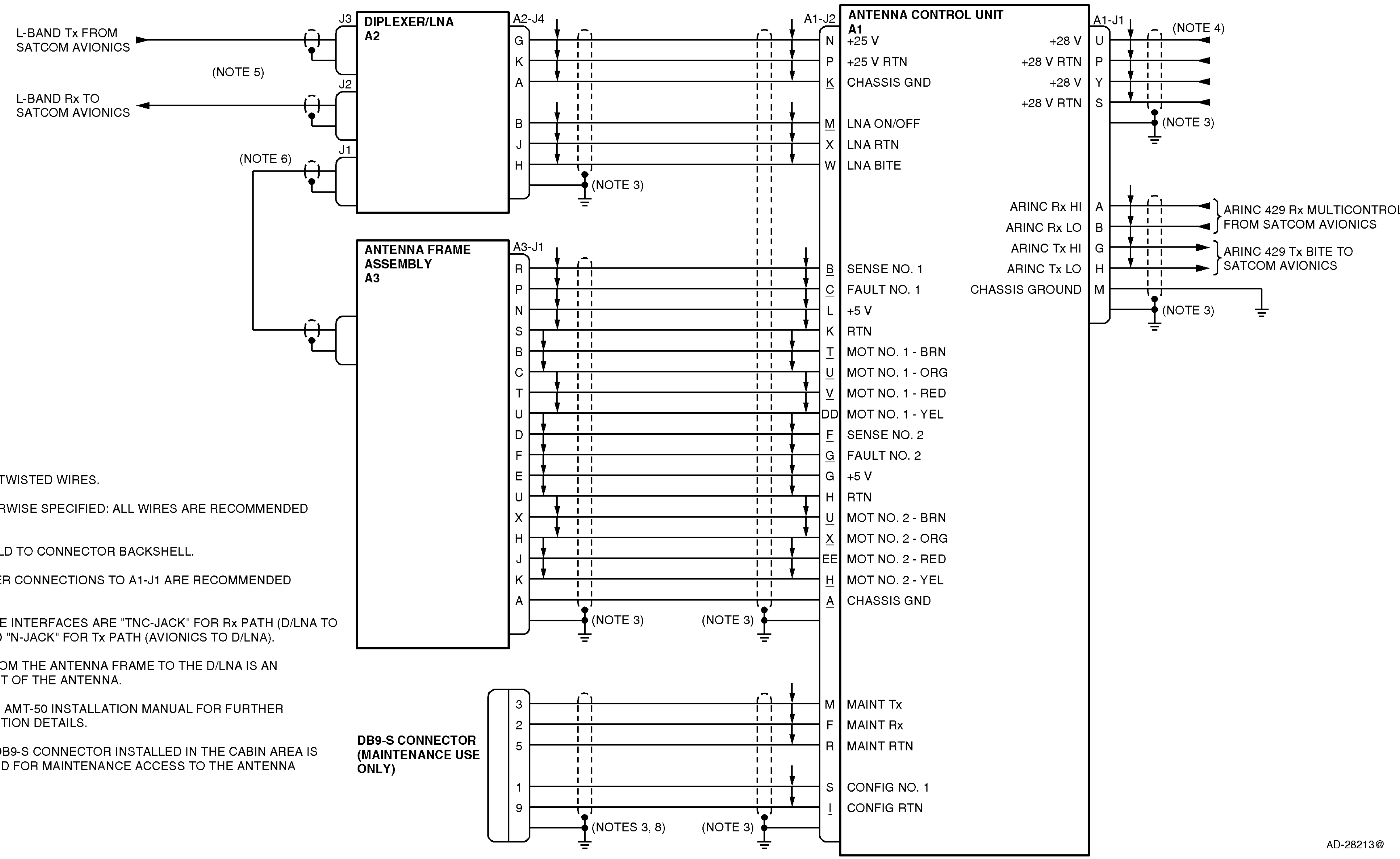
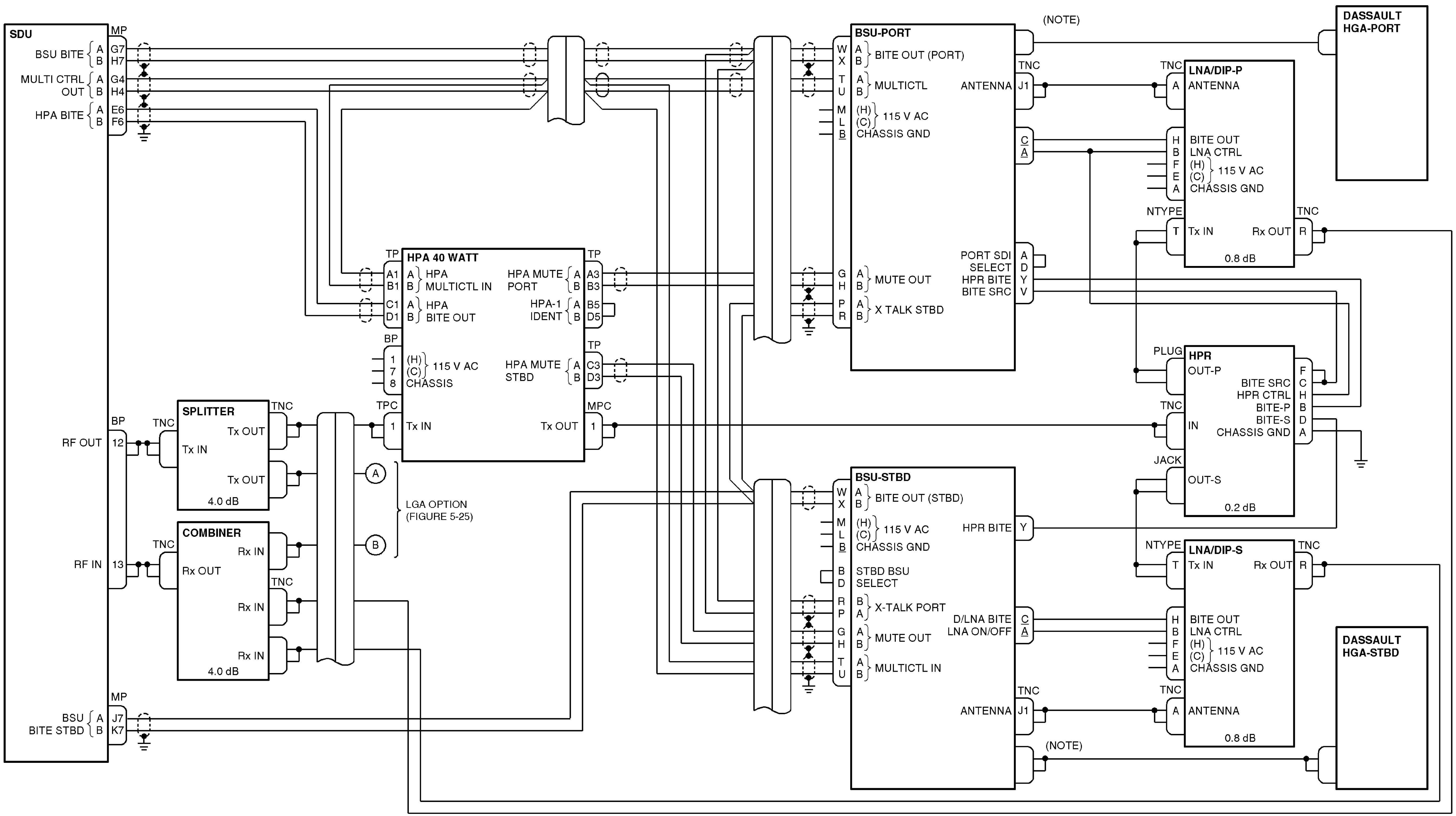


NOTES:

1. - DENOTES TWISTED WIRES.
2. UNLESS OTHERWISE SPECIFIED: ALL WIRES ARE RECOMMENDED NO. 22 AWG.
3. GROUND SHIELD TO CONNECTOR BACKSHELL.
4. ALL 28 V POWER CONNECTIONS TO A1-J1 ARE RECOMMENDED NO. 16 AWG.
5. COAXIAL CABLE INTERFACES ARE "TNC-JACK" FOR Rx PATH (D/LNA TO AVIONICS) AND "N-JACK" FOR Tx PATH (AVIONICS TO D/LNA).
6. THE CABLE FROM THE ANTENNA FRAME TO THE D/LNA IS AN INTEGRAL PART OF THE ANTENNA.
7. REFER TO THE AMT-50 INSTALLATION MANUAL FOR FURTHER INTERCONNECTION DETAILS.
8. A BREAKOUT DB9-S CONNECTOR INSTALLED IN THE CABIN AREA IS RECOMMENDED FOR MAINTENANCE ACCESS TO THE ANTENNA SUBSYSTEM.

Figure 5-22. AMT-50 Mechanically Steered High Gain Antenna Interface Diagram



NOTE: CONNECTED TO 24 MATCHED COAXIAL CONNECTORS.

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Figure 5-23. Dassault Conformal High Gain Antenna Interface Diagram

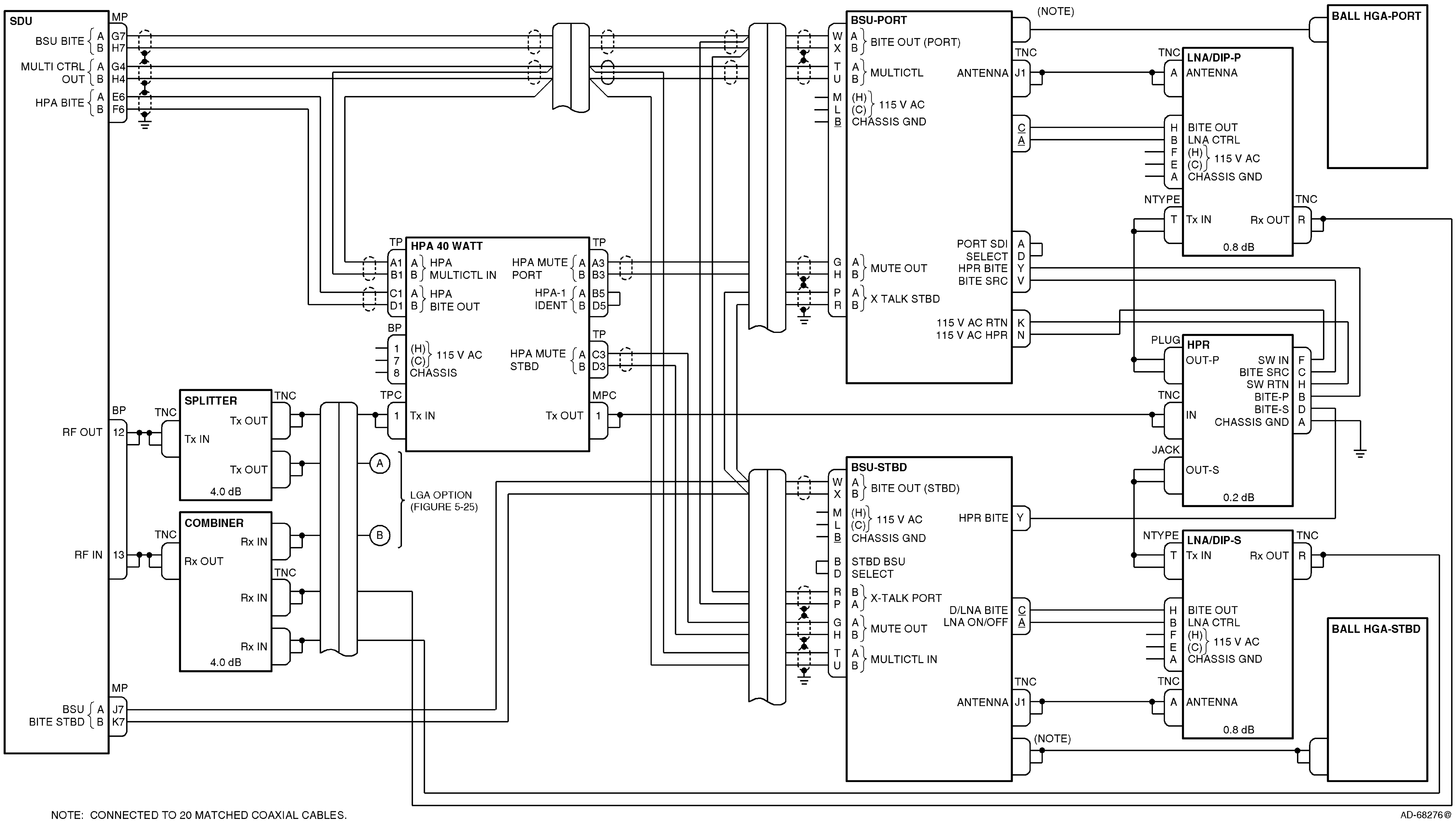

Figure 5-24. Ball Conformal High Gain Antenna Interface Diagram

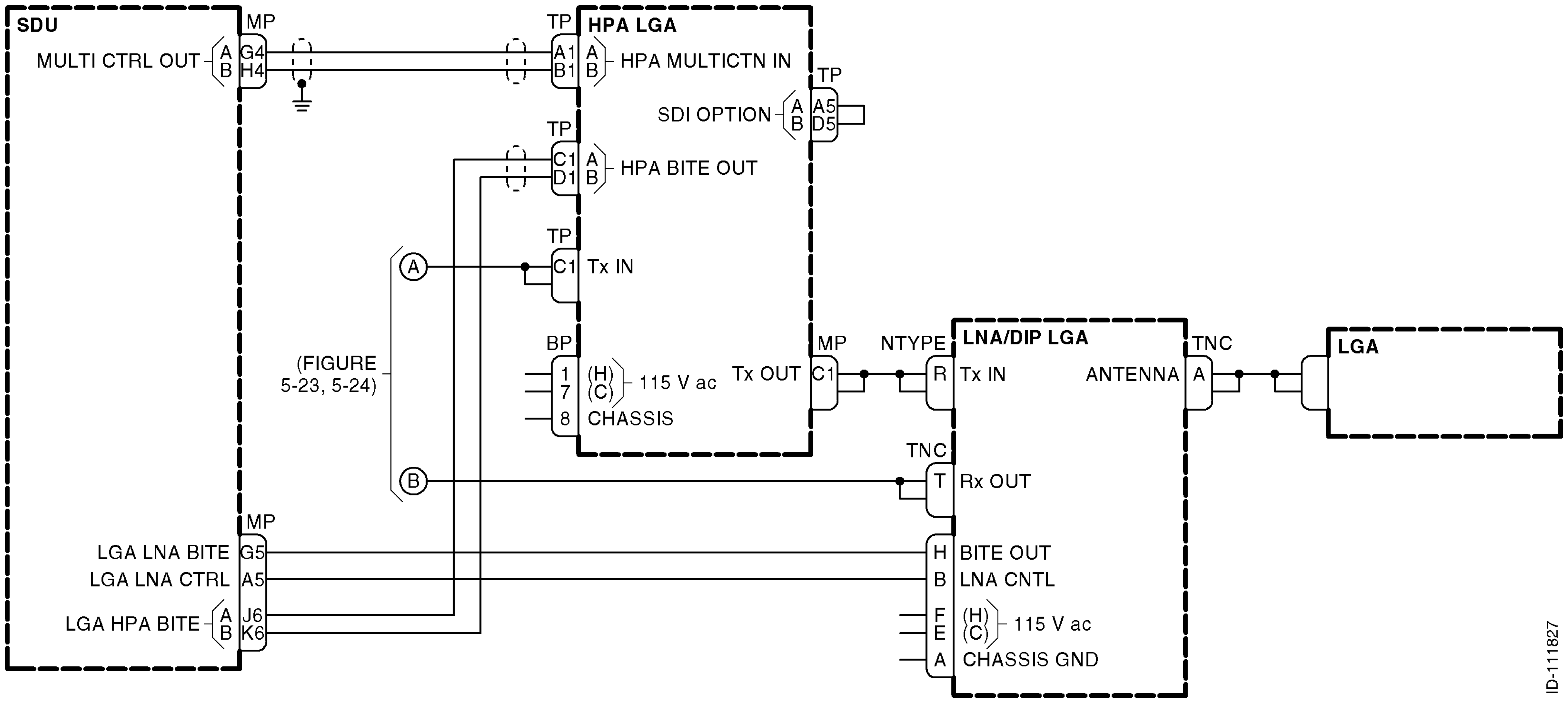

Figure 5-25. Low Gain Antenna Interface Diagram

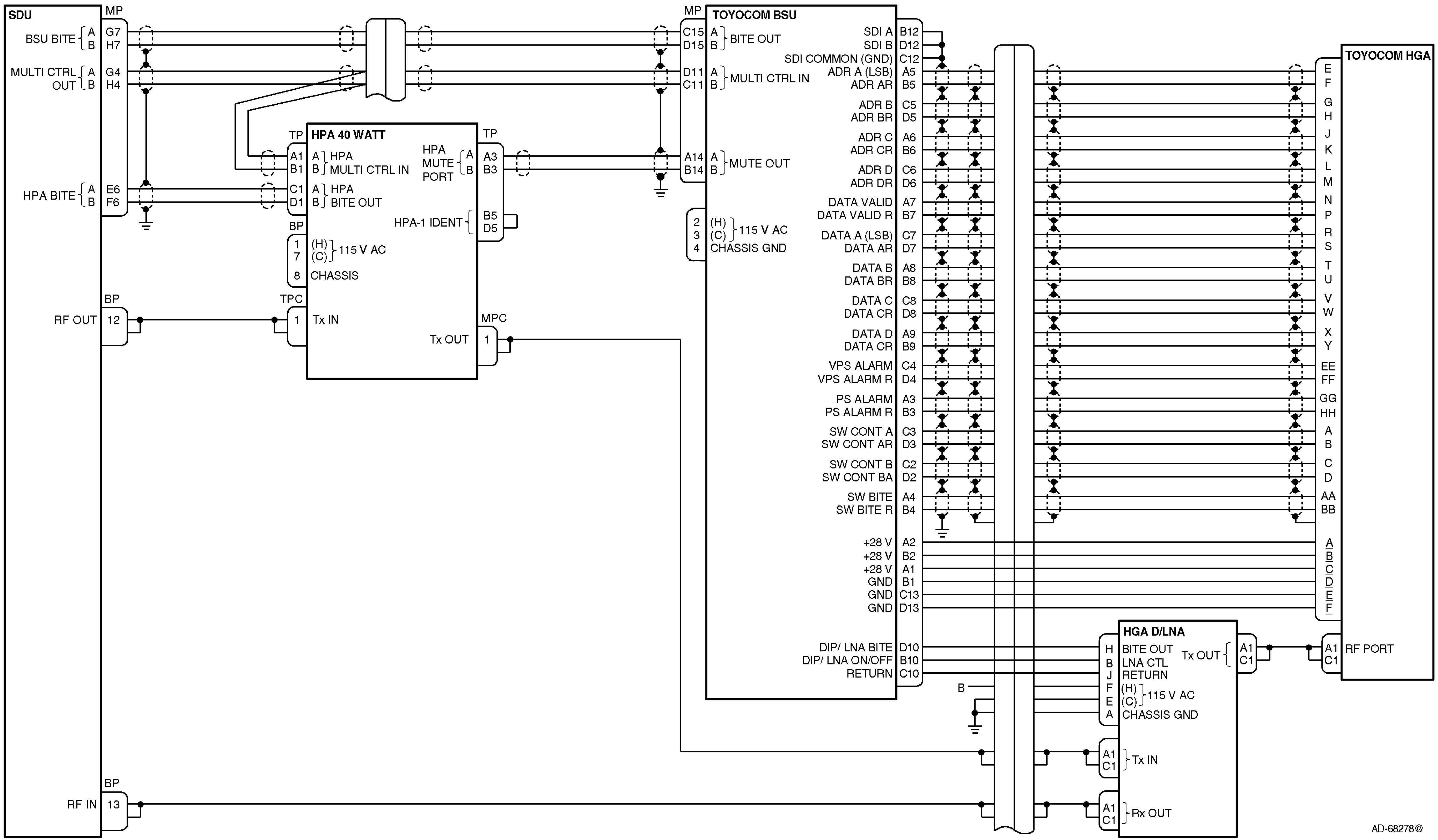

Figure 5-26. Toyocom Top-Mount High Gain Antenna Interface Diagram

4. Configuration Pins

A. General

(1) The following paragraphs supply system configuration pins definition and interpretation information. Pins assigned to take on the binary **one** state in a given code should be left as an open circuit. Pins assigned to take on the binary **zero** state in the code should be wired to SDU connector pin MP15K (address common) on the airframe side of the connection. The configuration pins are listed in Table 5-6.

Table 5-6. Configuration Pins

Pin	Definition
TP10A	AVAILABILITY OF ARINC 429 SSR MODE S ADDRESS (AES ID) FROM 429 PORTS
TP10B	FMC CONNECTION TO SDU
TP10C	FMC CONNECTION TO SDU
TP10D	ARINC 429 BUS SPEED TO/FROM CMU NO. 1 AND CMU NO. 2
TP10E	CPDF CONFIGURATION
TP10F	429 BUS SPEED OF AES ID INPUT
TP10G	RESERVED FOR STRAP OPTION
TP10H	RESERVED FOR STRAP OPTION
TP10J	RESERVED FOR STRAP OPTION
TP10K	CALL LIGHT ACTIVATION
TP11A	STRAP PARITY (ODD: COVERING THE OTHER 39 STRAP PINS)
TP11B	CCS PRESENCE
TP11C	IRS CONFIGURATION
TP11D	IRS CONFIGURATION
TP11E	HPR/HPA/BSU/LGA CONFIGURATION
TP11F	HPR/HPA/BSU/LGA CONFIGURATION
TP11G	HPR/HPA/BSU/LGA CONFIGURATION
TP11H	HPR/HPA/BSU/LGA CONFIGURATION
TP11J	HPR/HPA/BSU/LGA CONFIGURATION
TP11K	HPR/HPA/BSU/LGA CONFIGURATION
TP12A	CFDS TYPE
TP12B	CFDS TYPE
TP12C	CFDS TYPE
TP12D	PAD FOR CFDS/SDU CONFIGURATION

Table 5-6. Configuration Pins (cont)

Pin	Definition
TP12E	SDU CONFIGURATION
TP12F	SDU NUMBER
TP12G	CMU NO. 1 CONFIGURATION
TP12H	CMU NO. 2 CONFIGURATION
TP12J	MCDU/SCDU NO. 1 CONFIGURATION
TP12K	MCDU/SCDU NO. 2 CONFIGURATION
TP13A	PRIORITY 4 CALLS TO/FROM COCKPIT
TP13B	ARINC 429 BUS SPEED TO MCDU/SCDU NO. 1, NO. 2, AND NO. 3
TP13C	COCKPIT VOICE CALL LIGHT/CHIME OPTIONS
TP13D	COCKPIT VOICE CALL LIGHT/CHIME OPTIONS
TP13E	MCDU/SCDU NO. 3 CONFIGURATION
TP13F	SDU CODEC 1 WIRING
TP13G	SDU CODEC 1 WIRING
TP13H	SDU CODEC 2 WIRING
TP13J	SDU CODEC 2 WIRING
TP13K	COCKPIT HOOKSWITCH SIGNALING METHOD

B. Availability of ARINC 429 SSR MODE S (AES ID) from CMU Ports

(1) The interpretation of this configuration pin is given in Table 5-7.

Table 5-7. Availability of ARINC 429 SSR MODE S (AES ID) from CMU Ports

TP10 Pin A	Interpretation
1	SSR MODE S ADDRESS (AES ID) NOT AVAILABLE FROM CMU NO. 1 NOR RESERVED AES ID INPUT
0	SSR MODE S ADDRESS (AES ID) IS AVAILABLE FROM CMU NO. 1 AND/OR CMU NO. 2 AND/OR AES ID INPUT

(2) When wired to the zero state, the TP10A configuration pin indicates the SSR mode S address (AES ID) is available in the ARINC 429 label 275/276 format from one or both of the SDU CMU input ports or the AES ID input port, and that one of those ARINC 429 sources of the address is used with no specific preference for CMU 1, CMU 2, CMU 3, or the AES ID input. In this state, the discrete inputs on SDU pins MP13C thru MP13K and MP14D thru MP14J are not assumed to be wired and the SDU does not use the discretes, even if the ARINC 429 sources fail or remain inactive.

(3) In the zero state, the SDU monitors the CMU 1, CMU 2, and AES ID input buses until a valid ICAO address is received. Bits 1 thru 16 of the AES ID are obtained from the label 275 word and bits 17 thru 24 are obtained from the label 276 word. The SDU only constructs a full 24-bit address from labels 275 and 276 words received from the same input port (e.g., label 275 from CMU 1 can not be combined with label 276 from CMU 2 or the AES ID input). The address is only considered valid if it does not consist of all zeros or ones, and has been received in ARINC 429 words with their sign-status matrix (SSM) indicating normal operation.

(4) If address words containing either all zeros or ones are received, followed by address words with a valid address (i.e., not all zeros or ones), the SDU verifies the receipt of both labels 275 and 276 at least twice with the same address bits content in each respective word before declaring the address valid. This is to preclude the SDU from inadvertently and prematurely assuming the address is valid after only one of the two labels has yielded a valid segment of the overall address, but the most previously received copy of the other label has not yet been updated to its intended code. The root problem is that the 24 correlated address bits are transmitted in two separate asynchronous words that are not inherently correlated/paired. This requirement is intended to effectively pair the label 275 and 276 transmissions.

(5) Once a valid ICAO address is received on any bus, the SDU ignores further data received on any of the buses until the next POST/PAST. This requirement relieves the SDU of having to deal with the possibility that the ICAO technical address might change while the SDU is logged-on. The AES ID (ICAO address) is determined at startup and cannot change until the next POST/PAST. The SDU does not log-on until it has a valid AES ID. The SDU waits indefinitely to receive a valid address from an available ARINC 429 source rather than giving up at the end of POST/PAST, since it cannot proceed as an AES without the address. If the configuration pin indicates the ARINC 429 source is available, the discretes are not wired. The SDU should not revert to the discretes at the end of POST/PAST as the CMU may not yet be operational.

(6) If configuration pin TP10A is wired to the one state, then neither CMU input port nor the AES ID input port is capable of supplying the AES ID in the ARINC 429 format and the SDU reads the AES ID from the discrete inputs.

(7) With either the ARINC 429 or discrete inputs source, an AES ID of all zeros or all ones (binary) is invalid (typically indicative of an unprogrammed address) which constitutes a failure. The SDU does not attempt to log-on to a GES with an invalid AES ID.

C. FMC Connection to SDU

(1) The interpretation of these configuration pins is given in Table 5-8.

Table 5-8. FMC Connection to SDU

TP10 Pins		Interpretation
B	C	
0	0	FMC NO. 1 CONNECTED, FMC NO. 2 CONNECTED
0	1	FMC NO. 1 CONNECTED, FMC NO. 2 NOT CONNECTED
1	0	FMC NO. 1 NOT CONNECTED, FMC NO. 2 CONNECTED
1	1	NEITHER FMC CONNECTED
NOTE: SATCOM does not support the FMC interface.		

(2) When individually wired to the zero state, configuration pins TP10B and TP10C indicate respectively that the inputs designated for FMC No. 1 and FMC No. 2 (pins MP12G/MP12H and MP12J/MP12K, respectively) are connected to a ARINC 429 source of flight plan information (next way point, etc.). The SDU only logs/reports/indicates bus inactivity on either bus if the respective configuration pin indicates the bus is supposed to be connected to an ARINC source. The SDU can assume (for functional purposes) the presence of the flight management computer (FMC) connections from the state of these configuration pins.

D. ARINC 429 Speed to/from CMU No. 1 and CMU No. 2

(1) The interpretation of this configuration pin is given in Table 5-9.

Table 5-9. ARINC 429 Speed to/from CMU No. 1 and CMU No. 2

TP10 Pin D	Interpretation
1	LOW SPEED ARINC 429 DATA BUS
0	HIGH SPEED ARINC 429 DATA BUS

(2) When this configuration pin is wired to the zero state, the SDU operates its input and output ARINC 429 buses for the CMUs No. 1 and No. 2 at high speed. When wired to the one state, the SDU operates these buses at the low speed.

E. Cabin Packet Data Function (CPDF)

(1) The interpretation of this configuration pin is given in Table 5-10.

Table 5-10. Cabin Packet Data Function (CPDF)

TP10 Pin E	Interpretation
0	CPDF CONNECTED
1	CPDF NOT CONNECTED

(2) When wired to the zero state, this configuration pin indicates the input designated for the CPDF (MP1E and MP1F) is connected to an ARINC 429 source of data-3 packet data and that the SDU output (pins MP9A and MP9B) is wired to the CPDF. The SDU only logs/reports/ indicates CPDF failures and bus inactivity on the CPDF input bus if this configuration pin indicates the bus is supposed to be connected to an ARINC source. The SDU can assume (for functional purposes) the presence of the CPDF connections from the state of this pin.

F. ARINC 429 BUS Speed of AES ID Input

(1) The interpretation of these configuration pins is given in Table 5-11 and Table 5-12.

Table 5-11. ARINC 429 Bus Speed of AES ID Input

TP10 Pin F	Interpretation
0	HIGH SPEED ARINC 429 BUS
1	LOW SPEED ARINC 429 BUS

Table 5-12. Call Light On (Air/Ground Calls)

TP10 Pin K	Interpretation
0	CALL LIGHT ON AT CALL INITIATION (FOR AIR/GROUND CALLS)
1	CALL LIGHT ON AT CALL CONNECTION (FOR AIR/GROUND CALLS)

G. Strap Parity (ODD)

(1) The interpretation of this configuration pin is given in Table 5-13.

Table 5-13. Strap Parity (ODD)

TP11 Pin A	Interpretation
0	SUM OF ALL OTHER STRAPS SET TO 1 IS ODD
1	SUM OF ALL OTHER STRAPS SET TO 1 IS EVEN

(2) The coverage of the parity pin is SDU connector pins TP10A thru TP10K and TP11B thru TP13K (39 pins other than itself). The parity pin is programmed to a zero or one to yield an odd number of strap bits set to the one state, including the parity pin itself.

(3) The parity pin is wired to yield odd parity over all 40 configuration pins (i.e., the parity pin is programmed to the zero or one state to yield an odd number of configuration pins wired to the one state, including itself. The SDU verifies the state of the parity pin is correct when the configuration pins are read (typically once per power cycle just after power-up). An invalid state of the parity pin is logged/reported/indicated; the states of the other configuration pins are used as read despite the parity error.

H. Cabin Communications System (CCS)

(1) The interpretation of this configuration pin is given in Table 5-14.

Table 5-14. Cabin Communications System (CCS)

TP11 Pin B	Interpretation
0	CCS INSTALLED
1	CCS NOT INSTALLED

(2) The state of this configuration pin is ignored. The SDU can assume (for functional purposes) the presence of the CCS connections from the state of this pin.

(3) Before the availability of software package C, aircraft can be fitted with interim versions of the CCS that make use of the analog PBX interface. These installations set the configuration pin to the zero state, but other analog PBX installations can not so its state should be ignored in such prepackage C systems.

I. Inertial Reference System (IRS)

(1) The interpretation of these configuration pins is given in Table 5-15.

Table 5-15. Inertial Reference System (IRS)

TP11 Pins		Interpretation
C	D	
0	0	PRIMARY IRS INSTALLED, SECONDARY IRS INSTALLED
0	1	PRIMARY IRS INSTALLED, SECONDARY IRS NOT INSTALLED
1	0	PRIMARY IRS NOT INSTALLED, SECONDARY IRS INSTALLED
1	1	PRIMARY IRS NOT INSTALLED, SECONDARY IRS NOT INSTALLED

(2) When individually wired to the zero state, configuration pins TP11C and TP11D indicate, respectively, that the inputs designated for the primary and secondary IRSs (MP6A/MP6B and MP6C/MP6D, respectively) are connected to an ARINC 429 source of IRS label 310, 311, 312, 314, 324, 325, and 361 information (although label 361, Inertial Altitude, is not required for SATCOM). The actual IRS (i.e., IRS No. 1, IRS No. 2, or IRS No. 3) driving either SDU input is determined from the source destination identifier (SDI) bits of the received ARINC words. The SDU only logs/reports/indicates bus inactivity on either bus if the respective configuration pin indicates that the bus is supposed to be connected to an ARINC 429 source. The SDU can assume (for functional purposes) the presence of the IRS connections from the state of these pins.

J. HPA/Antenna Subsystem Configuration

(1) The interpretation of these configuration pins is given in Table 5-16.

Table 5-16. HPA/Antenna Subsystem Configuration

TP11 Pins						LGA + LNA / DIPLEXER	LGA HPA	TOP / PORT BSU + HGA	STARBOARD BSU + HGA	HGA HPA	HPR	RESERVED FOR FUTURE	RESERVED FOR MFR	IGA HPA	
E	F	G	H	J	K										
1	1	1	1	1	1	*	*								
0	1	1	1	1	1			*		*					
1	0	1	1	1	1	*	*	*		*					
0	0	1	1	1	1	*	*	*	*	*	*				
1	1	0	1	1	1							*			
0	1	0	1	1	1							*			
1	0	0	1	1	1	*		*		*	*				Note 1.
0	0	0	1	1	1	*	*	*	*		*				Note 1.
1	1	1	0	1	1			*	*	*	*				
0 1	1 0	1 0	0 1	1 0	1 0	t o						*			
1 0	1 0	1 0	0 0	0 0	1 0	t o							*		
1	1	1	0	0	0									*	

NOTES:
1. Not defined at this time.
2. Other configurations are possible and can be added at a later date.

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(2) For functional purposes, the SDU assumes the HPA and antenna subsystem configuration of its particular installation from states of these configuration pins. However, configurations 100111 and 000111 are not supported. Both of the nonsupported configurations involve the sharing of a single HPA between an LGA and HGA, by using a high power relay (HPR). No control or BITE signal interfaces are specified for the HPR, the MCS system does not accommodate these configurations.

(3) The SDU commands the system, uses its resources, and logs/reports/indicates failures in the HPAs and antenna subsystem based on the determined HPA and antenna subsystem configuration. Inactivity on the SDU input buses from the HPA(s) and ACU/BSU(s) and failures against the diplexer/LNA and HPR are logged/reported/indicated if the respective LRU is specified to be connected according to these pins. If these configuration pins are set to a nonsupported, reserved for future, or reserved for **Mfr** state, the SDU logs/reports/indicates the appropriate strap failure(s) and does not attempt any satellite communication functions.

K. CFDS/CMC

(1) The interpretation of these configuration pins is given in Table 5-17.

Table 5-17. CFDS/CMC

TP12 Pins			Interpretation
A	B	C	
0	0	0	UNDEFINED
0	0	1	McDONNELL-DOUGLAS TYPE CFDS
0	1	0	AIRBUS TYPE CFDS
0	1	1	HONEYWELL CAIMS
1	0	0	BOEING TYPE CMC
1	0	1	UNDEFINED
1	1	0	UNDEFINED
1	1	1	CFDS NOT INSTALLED

(2) For functional purposes, the SDU can assume the type of central fault/maintenance system (if any) that is connected from the state of these configuration pins. The CMC/CFDS interface operates according to the determined type. The appropriate strap failure(s) is(are) logged/indicated if an undefined code is present. The SDU only logs/reports/indicates bus inactivity for the MP4C/MP4D CFDS interface input bus if the configuration pins indicate the CMC/CFDS is supposed to be installed.

L. SDU Configuration

(1) The interpretation of this configuration pin is given in Table 5-18.

Table 5-18. SDU Configuration

TP12 Pin E	Interpretation
0	SECOND SDU INSTALLED
1	SECOND SDU NOT INSTALLED

(2) When wired to the zero state, this configuration pin indicates a second SDU is present as part of the MCS system installation. The zero state also indicates pins MP12C/MP12D and MP12A/MP12B (cross talk to and from the other SDU, respectively) and MP5j/MP5K (dual system select and dual system disable discretes, respectively) are connected to the second SDU. When this pin is in the zero state, it also indicates these signals are used to determine dual SATCOM operation as specified in SYSTEM OPERATION. The SDU only logs/reports/indicates inactivity on its input cross-talk bus from the second SDU when this pin is in the zero state. The SDU can assume (for functional purposes) the presence of a second SDU from the state of this configuration pin. The SDU also uses the state of this pin (and for dual SATCOM installations, the state of SDU number pin TP12F) to determine the state of its output word SDI fields.

M. SDU Number

(1) The interpretation of this configuration pin is given in Table 5-19.

Table 5-19. SDU Number

TP12 Pin F	Interpretation
0	SDU NO. 2
1	SDU NO. 1
NOTE: The state of this strap is **Don't Care** for a single SDU configuration.	

(2) When wired to the zero state, this configuration pin indicates this SDU is No. 2 in a dual MCS system installation. The one state indicates this SDU is No. 1 in a dual installation. The SDU uses the state of this pin and the SDU configuration pin TP12E to determine the state of its output word SDI fields. In a single MCS system installation, the status of this configuration pin is ignored.

N. CMU No. 1 and No. 2 Configuration

(1) The interpretation of these configuration pins is given in Table 5-20 and Table 5-21.

Table 5-20. CMU No. 1

TP12 Pin G	Interpretation
0	CMU NO. 1 INSTALLED
1	CMU NO. 1 NOT INSTALLED

Table 5-21. CMU No. 2

TP12 Pin H	Interpretation
0	CMU NO. 2 INSTALLED
1	CMU NO. 2 NOT INSTALLED

(2) When individually wired to the zero state, configuration pins TP12G and TP12H indicate, respectively, that the inputs designated for CMU No. 1 and CMU No. 2 (pins MP1G/MP1H and MP3G/MP3H, respectively) are connected to an ARINC 429 source of CMU information (e.g., CMU label 270 and SAL 304), and also the single SDU output (pins MP1J/MP1K) is wired to the appropriate CMU(s). The SDU only logs/reports/indicates bus inactivity on either CMU input bus if the respective configuration pin indicates the bus is supposed to be connected to an ARINC source. The SDU can assume (for functional purposes) the presence of the CMU connections from the state of these configuration pins.

O. MCDU/SCDU No. 1 thru No. 3 Configuration

(1) The interpretation of these configuration pins is given in Table 5-22 thru Table 5-24.

Table 5-22. MCDU/SCDU No. 1

TP12 Pin J	Interpretation
0	MCDU/SCDU NO. 1 INSTALLED
1	MCDU/SCDU NO. 1 NOT INSTALLED

Table 5-23. MCDU/SCDU No. 2

TP12 Pin K	Interpretation
0	MCDU/SCDU NO. 2 INSTALLED
1	MCDU/SCDU NO. 2 NOT INSTALLED

Table 5-24. MCDU/SCDU No. 3

TP13 Pin E	Interpretation
0	MCDU/SCDU NO. 3 INSTALLED
1	MCDU/SCDU NO. 3 NOT INSTALLED

(2) When individually wired to the zero state, configuration pins TP12J, TP12K, and TP13E indicate, respectively, that the inputs designated for MCDU/SCDU No. 1, No. 2, and No. 3 (pins MP3C/MP3D, MP3E/MP3F, and MP8J/MP8K, respectively) are connected to an ARINC 429 source of line select/keypad control information, and also the single SDU output (MP3J/MP3K) is wired to all appropriate MCDU/SCDU(s). The SDU only logs/reports/indicates bus inactivity on any of the three buses if the respective configuration pin indicates the bus is supposed to be connected to an ARINC source. The SDU can assume (for functional purposes) the presence of the MCDU/SCDU connections from the state of these configuration pins.

P. Priority 4 Calls to/from Cockpit

(1) The interpretation of this configuration pin is given in Table 5-25.

Table 5-25. Priority 4 Calls to/from Cockpit

TP13 Pin A	Interpretation
0	DISALLOW PRIORITY 4 CALLS
1	ALLOWS PRIORITY 4 CALLS

(2) When this configuration pin is wired to the zero state, the SDU disallows priority 4 calls from being routed to or initiated from the cockpit. This state prevents ORT item xiii (Appendix C) from being set to allow routing of ground-to-air priority 4 calls to the cockpit headset. When this configuration is wired to the one state, the SDU lets priority 4 calls be initiated from the cockpit and lets ground-to-air calls be routed to the cockpit based upon ORT item xiii.

Q. ARINC 429 BUS Speed to SCDU No. 1 / SCDU No. 2 / SCDU No. 3

(1) The interpretation of this configuration pin is given in Table 5-26.

Table 5-26. ARINC 429 Bus Speed to SCDU No. 1 / SCDU No. 2 / SCDU No. 3

TP13 Pin B	Interpretation
0	LOW SPEED ARINC 429 BUS
1	HIGH SPEED ARINC 429 BUS

(2) When this configuration pin is wired to the zero state, the SDU operates its ARINC 429 output bus for MCDU/SCDUs No. 1, No. 2, and No. 3 at the low speed. When wired to the one state, the SDU operates this bus at the high speed.

R. Cockpit Voice Call Light/Chime Option

(1) The interpretation of these configuration pins is given in Table 5-27.

Table 5-27. Cockpit Voice Call Light/Chime Option

TP13 Pins		
C	D	Interpretation
0	0	SPARE
0	1	STEADY LIGHTS AND MULTISTROKE CHIME
1	0	FLASHING LIGHTS AND SINGLE STROKE CHIME
1	1	STEADY LIGHTS AND SINGLE STROKE CHIME

(2) The SDU determines the mode of cockpit call annunciation (flashing vs. steady voice call lamp, multistroke vs single stroke chime) from the states of these configuration pins. The functionality of the cockpit call annunciation interface (pins MP8E and MP8G for the call lights, and MP14B and MP14C for the chime) operate according to the configuration pin connections selected. The selected state of pins TP13C and TP13D applies to both air- and ground-initiated calls; it only applies to the call annunciation phase (i.e., following connection acknowledgement by receipt of the off-hook state as specified by the state of TP13K, a multistroke chime is silenced and the call lamp remains on steady). The appropriate strap failure(s) is logged/indicated if an undefined code is present. The SDU defaults to the steady lights and single stroke chime state if an undefined code is present.

(3) The steady versus flashing light option applies to the call annunciation phase only. The light remains on (steady) for the duration of the call after the acknowledgement of the annunciation for either the steady or flashing light option.

S. SDU CODEC 1 and CODEC 2 Wiring

(1) The interpretation of these configuration pins is given in Table 5-28 and Table 5-29.

Table 5-28. SDU Analog Interface No. 1 Wiring

TP13 Pins		Interpretation
F	G	
0	0	AMS WIRED, CABIN AUDIO WIRED
0	1	AMS WIRED, CABIN AUDIO NOT WIRED
1	0	AMS NOT WIRED, CABIN AUDIO WIRED
1	1	AMS NOT WIRED, CABIN AUDIO NOT WIRED

Table 5-29. SDU Analog Interface No. 2 Wiring

TP13 Pins		Interpretation
H	J	
0	0	AMS WIRED, CABIN AUDIO WIRED
0	1	AMS WIRED, CABIN AUDIO NOT WIRED
1	0	AMS NOT WIRED, CABIN AUDIO WIRED
1	1	AMS NOT WIRED, CABIN AUDIO NOT WIRED

(2) The SDU determines the extent and nature of the analog cockpit and cabin voice connections from the states of these configuration pins. The functionality of the analog cockpit and cabin voice interface (pins MP1A/MP1B, MP1C/MP1D, MP2A/MP2B, MP2C/MP2D, MP2E/MP2F, MP2G/MP2H, MP4J/MP4K, and MP5E/MP5F) operate according to the connections selected. ORT item vi for codec dedication (Appendix C) is related to the SDU codec configuration pins; dedication or automatic sharing of a codec to or with a particular interface is only possible if the SDU codec wiring straps indicate the codec is wired to that interface.

T. Cockpit Hookswitch Signaling Method

(1) General

(a) The interpretation of this configuration pin is given in Table 5-30.

Table 5-30. Cockpit Hookswitch Signaling Method

TP13 Pin K	Interpretation
1	SWITCHED PTT AND/OR SCDU LINE SWITCH(ES)
0	LATCHED AUDIO CONTROL PANEL SATCOM MICROPHONE SWITCH

(b) This configuration pin specifies the functionality of the SDU **Cockpit Voice Mic-On Input No. 1** (and No. 2) discrete inputs (referred to as the **mic-on inputs**). When TP13K is wired to the one state, the SDU utilizes the **switched PTT and/or SCDU line switch(es)** (referred to as **switched PTT**) method for cockpit hookswitch signaling on the mic-on inputs. When TP13K is wired to the zero state, the SDU utilizes the **latched audio control panel SATCOM microphone switch** (referred to as the **latched ACP**) method. These two methods are described below.

(2) Switched PTT Method

(a) With the switched PTT method, the SDU assumes the mic-on inputs are wired to conventional microphone momentary push-to-talk switches (i.e., they are dynamically active [on/off] throughout the duration of the call). The SDU assumes the air- or ground-initiated call annunciation to have been acknowledged (i.e., the call to in the off-hook state) when the appropriate mic-on input is activated (connected to ground) for the first time after the call annunciation for a particular channel. Successive activations of that mic-on input for the duration of that call have no effect on the status of that call until the call has been cleared.

(b) With the switched PTT method, the off-hook state is also entered following activation of the **Answer Call** line select switch on the SCDU. The on-hook state is entered following activation of the **End Call** line select switch on the SCDU that results in call clearing.

(c) This method also allows usage of the place/end call discrete input and associated switch to initiate calls to preselected numbers, as well as to terminate existing calls.

(3) Latched ACP Method

(a) With the latched ACP method, the SDU assumes the mic-on inputs are wired to SATCOM microphone select switches on the ACP that are latched on (connected to ground) for the entire duration of a call. The SDU considers the air- or ground-initiated call annunciation to have been acknowledged (i.e., the call to be in the off-hook state) when the appropriate mic-on input is active (connected to ground) for a particular channel. The call is cleared and the channel is considered to be in the on-hook state when the mic-on input is in the open-circuit state.

(b) With the latched ACP method, all hookswitch signaling for answering and terminating all air- and ground-initiated calls is handled by the mic-on inputs; the SCDU **Answer Call** and **End Call** options are blanked (the SCDU is only necessary for specifying the called-party number and initiating the call process for air-to-ground calls).

(c) This method also allows usage of the mic-on discrete input and switch to initiate calls to preselected numbers.

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SECTION 6
TESTING/FAULT ISOLATION

1. Overview

A. General

(1) This section defines the built-in test equipment (BITE) requirements for the MCS system (i.e., SDU and HPA). Information supplied in this section describes how MCS system failures are detected, recorded, and reported. See Figure 6-1 for an overview of the BITE system communications. Refer to Appendix D for an explanation of the fault codes obtained by any troubleshooting process.

(2) System BITE contributes to a number of maintenance functions:

- Detection of internal and external failures
- Storage of in-flight failure data
- Reporting failure status in the air and on the ground
- Ground test capability for isolating faulty LRUs, performance verification, and system level testing.

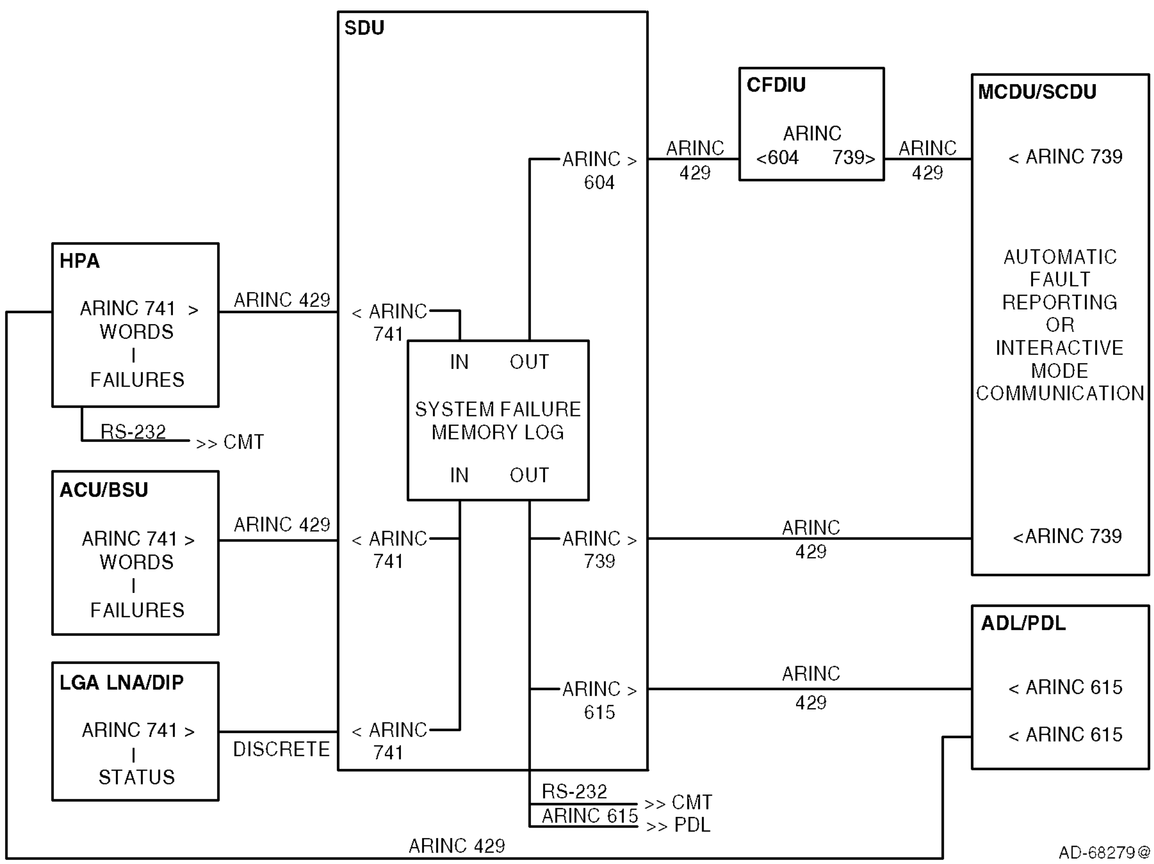


Figure 6-1. System BITE Communication

B. Definitions

(1) Degraded Operation

(a) Degraded operation is defined as the condition when the MCS system is operating with a failure that results in diminished capability (e.g., some, but not all channel units available, or less than nominal HPA power available).

(2) Failure

(a) A failure is defined as a fault that persists for a predetermined amount of time or for a predetermined number of samples. The tolerance on all failure timing criteria is ± 0.5 second.

(3) Intermittent Failure

(a) An intermittent failure is defined as a fault that had been declared a failure, recovered to its normal valid state, and then is declared to have failed again. A failure occurrence counter is maintained for each entry in the LRU and system failure logs to identify intermittent failures.

(4) Fault

(a) A fault is defined as the result of a measurement or comparison that does not satisfy the test or monitoring result requirements. The test or monitoring result requirements can require a time element.

(5) Reversion

(a) Reversion is defined as the system response to a failure condition that results in continued system operation in the presence of the failure, and can result in degraded system capability.

(6) MCS LRU

(a) The following are defined as the MCS LRUs (i.e., those manufactured by Honeywell/Racal):

- SDU
- HPA.

C. Failure Detection and Reporting Levels

(1) Failures are detected in the MCS system by a wide variety of tests. The immediate result of failure detection is usually diagnosis of the failure to a specific component or functional circuit group, on a specific SRU, in a specific LRU. However, some detected failures may only be able to be diagnosed to a suspect SRU, or only to a suspect LRU, or only to a pair or group of LRUs and the physical or logical interface(s) between them. Three enumerated levels of failure diagnosis are defined in Table 6-1.

Table 6-1. Levels of Failure

Level	Description
Level I	Diagnosis to the LRU level or its equivalent (e.g., a specific inactive bus, error, or warning)
Level II	Diagnosis to the SRU (module or circuit card) level
Level III	Diagnosis to the component or functional circuit group level or equivalent (e.g., a very specific error condition)

(2) All MCS LRUs implement Level I and, where possible, Level II failure detection. Level I diagnosis primarily supports line maintenance. Front panel displays and automatic reports to central fault/maintenance systems are only performed to Level I resolution because they are primarily used to support line maintenance, which is typically limited to LRU replacement. Level II and Level III diagnosis primarily support shop and factory maintenance. Level II and Level III failure detection information is stored in the LRU and system failure logs, and can be displayed on the commissioning and maintenance terminal (CMT) pages.

D. LRU Coverage

(1) The LRU coverage is defined as the sum of all component failure rates covered by the BITE circuitry within an LRU, divided by the total of the component failure rates within that LRU. This coverage is greater than or equal to 0.95 as defined. The LRU probability of false detection is defined as the sum of all component failure rates of the BITE circuitry within an LRU divided by the total of the component failure rates within that LRU. This coverage is greater than 0.01 as defined. The LRU coverage includes the following:

- All SDU to avionic interfaces, where possible
- All MCS inter-LRU interfaces
- All power supply voltages
- All battery voltages
- All microprocessors/microcontrollers
- All memory devices (RAM, ROM, etc).

(2) All discrete drivers between the SDU and the avionics LRUs have over current protection and open-circuit detection.

E. Monitoring and Testing Functions

(1) General

(a) The declaration of an inactive input bus takes precedence over declaration of one or more data word failures against the LRU driving that bus (i.e., if the bus is inactive, additional logging and reporting of low-rate failures of individual data words on that bus are precluded). The failure and recovery criteria is set to make sure individual data word failures are not declared when the bus is inactive. This is typically done by setting inactive bus failure criteria (e.g., three seconds) to be faster than word update rate failure criteria (e.g., five seconds), and inactive bus recovery criteria (e.g., two seconds) to be longer than word update rate recovery criteria (e.g., one second).

(b) Unless an LRU providing ARINC 429 data declares itself to have failed, a fault is declared against that LRU when the ARINC 429 data is faulty. This is determined by checking (as appropriate for each word) for data inconsistencies, data out-of-range, uses of undefined or reserved values, and occurrences of the failure warning state in the sign/status matrix (SSM) field.

(c) Two basic types of failure detection testing performed are: functional tests and continuous monitoring (CM). The purpose of functional testing in the form of power-on self test and person-activated self test is to exercise the equipment in a manner as closely as possible to its normal operation. Failures detected during functional testing are declared to be current failures until a subsequent functional test shows the failure condition has recovered.

(d) The purpose of continuous monitoring is to test the equipment in a nondisruptive manner while it is performing its normal operations. Such testing usually includes monitoring the power supply voltages, temperature sensors, bias currents, input bus activity, buffer overflow, input data failures, etc. This testing can also include abnormal failures that cannot be tested as part of the functional testing, such as protocol failures, processor instruction traps, data loader problems, etc.

(2) Power-On Self-Test

(a) General

1 The power-on self-test (POST) is a series of functional tests for individual LRUs; each MCS LRU performs its own internal POST upon a cold start. A cold start is defined as the response of an LRU where no retention of any previously stored information in any volatile memory is assumed. The power supply provides signals to help an orderly power-down and power-up process for the LRU during power interrupts of any length. Primary power interrupts of less than 5 milliseconds duration have no effect on system operation. For primary power interrupts longer than 5 milliseconds and up to 200 milliseconds duration, the LRU maintains normal operation, except the RF transmit and receive processes do not need to be supported in any LRU during this interval. For primary power interrupts greater than 200 milliseconds duration that causes normal operation to cease, the LRU performs a cold start following restoration of primary power.

2 The POST sequence of tests does not terminate when an out-of-tolerance condition is encountered. Instead, the sequence continues to complete as many tests as possible to record all available information regarding existing failures. An individual LRU that successfully passes POST is declared to be fully functional. POST must take into account failures detected by continuous monitoring (i.e., if POST passes, but testing unique to continuous monitoring has detected and logged a current failure, then the POST result is logged as a failure).

3 After executing its own POST, the SDU commands a system-wide functional test of the HPA(s) and ACU/BSU(s) (including the HGAs, HGA diplexer/LNA, and HPR) as applicable for the installed equipment in accordance with the system configuration pins (see MECHANICAL INSTALLATION). The SDU then processes the results of the functional tests from these LRUs. The SDU commands the functional test as follows through:

- SSM field of the HPA command word(s) for the HPA
- SSM field(s) for the ACU/BSU control word(s) for the ACU/BSU(s).

4 The BITE status from the LGA diplexer/LNA is continuously sent to the SDU, with no functional test command necessary or possible. Test results from the HGA(s), HGA diplexer/LNA, and HPR are reported by the ACU/BSU(s).

5 The SDU allows up to 30 ± 1 seconds for other system LRUs to report their POST results following initiation of a system-wide functional test. If an LRU fails to report its functional test results within this time period, but otherwise meets the ARINC 429 bus communication rate requirements, the SDU considers that LRU to have failed. If no ARINC 429 bus communication is received on a particular bus, the SDU considers that bus to be inactive.

(b) Test Initiation

1 The correct operation of much of the internal circuitry of the SDU depends on clocks derived from the high-stability frequency reference generated by the oven-controlled crystal oscillator (OCXO). Therefore, it is inappropriate to perform BITE tests until this clock frequency has achieved gross stability. If the SDU is powered on after having stabilized at a cold external temperature (e.g., −55° C), it can take several tens of seconds for the frequency drift rate to be low enough before the phase locked oscillators (PLO) that derive the dependent clocks can lock onto the OCXO frequency reference.

2 The SDU defers testing of sensitive equipment until a positive indication of settling is detected, or sufficient time passes so the lack of settling itself can be classified as a failure. Deferral of these sections of POST also result in normal operation being deferred, including access to the user interfaces (SCDU, CFDS, and CMT) and all automatic calibration processing. Consequently, the SDU suspends POST until the SDU detects the first of the following conditions:

- OCXO heater monitor indicates it has achieved operating temperature
- Power supply unit (PSU) temperature sensor indicates a reading above 25 °C
- Channel filter module transmit and receive PLO lock detectors both indicate that lock has been achieved
- More than 4 minutes have elapsed since primary power was applied.

(c) LRU Front Panel LED and Alphanumeric Display Tests

1 A test of the HPA front panel LEDs is performed as a part of each POST. At a minimum, this is made up of flashing the LEDs on and off. The LED flashing continues until POST is completed or for 3 ± 0.5 seconds. During the test, the SDU tests its alphanumeric display by incorporating one or more occurrences of the word **TESTING** into its display sequence to make sure all display elements are tested.

(d) RF Loop Back Tests

1 As part of the system-wide POST, the SDU implements a RF loop back test. The RF loop back occurs in the radio frequency module (RFM) installed in the SDU.

2 The SDU delays initiating the RF loop back test until it receives an indication the RF loop back has been activated. If the SDU fails to receive a valid indication within 30 seconds following the RF loop back request, then the SDU completes its POST without executing the RF loop back test. The SDU cancels the RF loop back request when the loop back test is completed, or if the 30 second timer expires while waiting for verification of an active RF loop back.

(3) Person-Activated Self-Test

(a) The person-activated self-test (PAST) performs the same functions as POST. PAST is initiated in the HPA by pushing the PUSH-TO-TEST (PTT) switch on the respective LRU front panel. PAST can also be initiated any time through:

- Respective CMT interface to the LRU
- SSM field of the HPA command word sent to the HPA from the SDU.

(b) A stuck switch on the CMT or LRU front panel does not cause PAST to remain active. Any switch activity is ignored while PAST (or POST) is executing.

(c) The HPA inhibits PAST while the aircraft is airborne, except when PAST is initiated through the CMT that is permitted at any time. The HPA cannot properly function if it is not receiving valid command words from the SDU containing the air/ground status and command information. Under these conditions, the HPA is not usable by the SDU. PAST is only permitted while the aircraft is on the ground, or when the airborne/on-ground status is unknown. In lieu of the airborne/on-ground status information from the SDU, the HPA permits PAST as though the aircraft is on the ground.

(d) A system-wide PAST is initiated in the SDU when commanded by:

- Entry through the SATCOM control and display unit (SCDU)
- Entry through the central maintenance computer (CMC)
- Entry through the central fault display system (CFDS)
- Command from the CMT
- Activating the PTT switch (SDU TEST) on the front panel.

(e) A stuck switch on the SDU front panel does not cause PAST to remain active. Any switch activity is ignored while PAST (or POST) is executing.

(4) Continuous Monitoring

(a) Continuous monitoring (CM) of the BITE circuitry does not interfere with the normal operation of the system. Instead any failure condition is recorded and reported. Continuous monitoring operates as a background task at all times, even during functional testing. Functional test failure codes that are identical to the continuous monitoring codes (except for the MSB of the level 3 code) indicate cases where the functional test differs in some way from the companion CM test. Those CM failures detected during functional testing (e.g., maintenance and status word failures) are logged as CM failures, not functional failures.

F. Failure Recording

(1) The SDU records CFDS internal failures at all times. The SDU only records CFDS external failures while receiving a valid All Call DC1 Command if a Douglas or Airbus CFDS is installed. Internal failures are defined as those internal to the SATCOM subsystem. External failures are defined as those external to the SATCOM subsystem. If a Boeing CMC (or no CFDS) is installed or if valid DC commands are not available, then the air/ground status is used to generate pseudo DC states of DC0 (aircraft on-ground) and DC1 (aircraft airborne).

(2) The HPA records internal failures at all times. The HPA only records external failures while the aircraft is airborne, based on the status of the weight-on-wheels discrete (on-ground vs. airborne). Internal failures are defined as those that have the same Level I code as the LRU recording the failure (i.e., 01 for the SDU, 04 for the HGA HPA, and 07 for the LGA HPA). External failures are defined as those failures not having the same level 1 code as the LRU recording the failure.

(3) The HPA stores their functional test and CM failure records in nonvolatile memory designated as the LRU failure memory log. Each LRU failure memory log is capable of being interrogated and cleared. The SDU contains a nonvolatile memory that serves as a system failure memory log. Functional test results supplied by the HPA(s), ACU/BSU(s), LGA diplexer/LNA, and the SDU itself are recorded in this system failure memory log. The system failure memory log is capable of being interrogated and cleared for each LRU individually. Each LRU failure memory log and the system failure memory log is capable of recording at least 1000 failures.

(4) The HPA and other system LRUs supply failure information to the SDU for storage in the system failure memory log. In the absence of any detected failures during a flight leg, the SDU records the flight leg counter, flight number, ICAO address, date, and Greenwich Mean Time (GMT) at the flight leg transition. The SDU also records the aircraft identification for display on the SCDU and CFDS maintenance pages.

(5) Class - The SDU declares and stores the classification (Airbus/Douglas CFDS) of failure (one, two, three) for each entry in this field.

- Class 1 failures are indicated in flight to the crew by the CFDS because they have operational consequences for the current or next flight(s).
- Class 2 failures are not automatically indicated in flight to the crew by the CFDS because they have no operational consequences for the current or next flight(s), but are indicated to the crew on the ground because they cannot be left uncorrected until the next routine scheduled maintenance check.
- Class 3 failures are not indicated to the flight crew because they can be left uncorrected until a routine scheduled maintenance check. An accumulation of Class 3 failures can lead to a Class 2 or Class 1 failure.
- Aircraft Identification - The aircraft identification (i.e., the tail number) is made up of nine alphanumeric characters. The SDU obtains the aircraft identification from the CMC or CFDS through ARINC labels 301, 302, and 303 (if available).

G. Failure Reporting

(1) General

(a) Active failures include those internal and external failures deemed to be currently failing while the aircraft is on the ground or airborne. Unlike failure recording that excludes recording external failures while on the ground, failure reporting has its own set of criteria as specified in the following paragraphs.

(2) HPA Failure Reporting

(a) General

1 The HPA reports its functional test/CM failure status by lighting its front panel LEDs, and through communication to the SDU.

(b) HPA Front Panel Indicators and Controls

1 The HPA indicators and controls are given in Table 6-2.

Table 6-2. HPA Indicators/Controls

Indicator/Control	Description
PASS LED	Shows green after a test, if no failures are detected in the HPA
FAIL LED	Shows red after a test, if failures are detected in the HPA
PUSH-TO-TEST (PTT)	Push this button to start a test of the HPA

(c) HPA Front Panel LEDs

1 Functional testing effectively controls the on/off state of the front panel LEDs during the period beginning with initiation of the functional testing (POST/PAST), through execution of the functional test sequences (including LED testing), and up to and including the indication of the test results on the LEDs. Continuous monitoring exclusively controls the LEDs at all other times.

2 The green LED (PASS) lights for 30 ± 5 seconds at the conclusion of the functional test sequences if both of the following are true:

- The HPA determines there are no currently active CM failures having its own Level I code (i.e., 04 or 07, as applicable)
- No functional test failures have been detected with its own Level I code.

3 There must be no known failures in order to light the green LED as the functional test indication.

4 The red LED (FAIL) lights continuously during the functional test indication phase and through the transition to the CM indication phase, if the HPA detects at least one currently active CM failure with its own Level I code. If the HPA detects only functional test failures (i.e., no CM failures are currently active), the red LED lights for 30 ± 5 seconds and is then turned off.

5 The red LED also lights as long as the failure persists, if the HPA detects any CM failure that has its own Level I code while continuous monitoring is controlling the LEDs. Otherwise, both LEDs are turned off. Continuous monitoring itself never causes the green LED to light. The presence or absence of functional test failures does not affect the CM indication.

(d) HPA-SDU Communication

1 The HPA communicates its functional testing/CM failure status to the SDU through the HPA maintenance and status words. The HPA only indicates a FW SSM state in its maintenance and status words, and active discrete failure bits in its maintenance word. Since no failures unique to functional testing activate the SSM FW state or the discrete failure bits in the maintenance word, no functional test failures need to be latched until the next functional testing sequence.

2 For certain failures detected during continuous monitoring, the appropriate discrete failure bits and the SSM FW state are set within the maintenance and status words as long as the failure persists.

(3) SDU Failure Reporting

(a) General

1 The SDU reports its functional testing/CM failure status and all other system LRUs by:

- Activating its alphanumeric display
- Communicating to the SCDU, CMC, CFDS, and CMT interfaces.

2 The alphanumeric display indicates all applicable failure conditions with no regard to:

- Any type of internal/external failure differentiation
- Any CFDS failure class distinctions
- Which LRU detected a failure (either the SDU itself or one of the reporting LRUs in the SATCOM subsystem).

3 The SDU delays reporting the results of the functional test sequence for a period of 5 seconds. This gives continuous monitoring the opportunity to perform its unique tests during the delay period, and include any current CM failures in the test report. The SDU takes a snapshot at the end of the functional test delay period to include all currently active CM failures in addition to all failures detected during functional testing. The functional test delay period applies to the SDU alphanumeric display, the SCDU maintenance pages, the CFDS pages, and the CAIMS and CMC fault summary words, but not to the CMT.

(b) SDU Front Panel Indicators and Controls

1 The SDU indicators and controls are given in Table 6-3.

Table 6-3. SDU Indicators/Controls

Indicator/Control	Description
SDU TEST	Push this button to initiate a system-wide SATCOM test
SYSTEM STATUS DISPLAY	Shows data defining the SATCOM system configuration and the identification of all SATCOM components that are not operating as required
MANUAL SCROLL	Push this button to scroll through the messages on the system status display

(c) Front Panel Alphanumeric Display and MANUAL SCROLL Button

1 General

a The alphanumeric display makes it easy for the maintenance personnel to identify which system LRU has failed. The alphanumeric display is blank unless specifically activated for temporary display of failure messages and other status information. The alphanumeric display is also kept blank under conditions of extreme temperatures. The display is not intended to be started when its temperature is less than −5 °C, or greater than +30 °C. The alphanumeric display is started during the LED test portion of the functional test sequence. After the functional test delay period, and any time during continuous monitoring, the alphanumeric display can be started by pushing the MANUAL SCROLL button.

b The operator can scroll the alphanumeric display through the entire applicable message sequence by repeatedly pushing the MANUAL SCROLL button within 30 ± 5 seconds after the display is started. One left-justified 20-character (or less) message is displayed each time the MANUAL SCROLL button is pushed. When the end of the display sequence is reached (i.e., END OF LIST), the next actuation of the MANUAL SCROLL button returns the alphanumeric display to the top of the display sequence, enabling the operator to scroll through the sequence again. Message scrolling is performed according to the following sequence:

- One of four possible system/SDU pass/fail messages
- All applicable Level I failure messages
- LRU part number messages (up to four lines)
- ORT identification message
- END OF LIST message.

c If the MANUAL SCROLL button is inactivate for 30 ± 5 seconds at any point during the display sequence, the alphanumeric display is blanked and any display sequence in progress is aborted. At the same time, one or both of the front panel LEDs (as appropriate) are turned off if they were exclusively indicating functional test failures with no current CM failures.

2 SYSTEM/SDU PASS/FAIL Message

a This one-line message, which summarizes the overall functional test or CM status, takes on one of four possible states:

- SDU PASS SYS PASS
- SDU PASS SYS FAIL
- SDU FAIL SYS PASS
- SDU FAIL SYS FAIL.

3 Level I Failure Messages

a This section lists all the applicable Level I failure messages that can be displayed on the alphanumeric display, along with the appropriate LRU or control bus input. These messages are listed in failure code order in Table 6-4. For the functional test display, the message list includes all the active failures in the snapshot and the list is static.

b For continuous monitoring, the message list includes all currently active CM failures. The presence or absence of functional test failures does not affect the CM message list. The failure message list for the CM display is potentially dynamic.

c During continuous monitoring, if a new CM failure becomes active during the scroll sequence, the respective message appears at its proper location in the sequence according to its Level I code. This occurs either during the current scroll sequence if that Level I code has not yet been reached, or during the next scroll sequence if the failure is still active. If a CM failure recovers during a scroll sequence, its message does not appear in any subsequent scroll sequence, even if it had appeared earlier. If a CM failure recovers while its particular message is currently being displayed, the message continues to be displayed until the MANUAL SCROLL button is activated or until the time-out period expires.

Table 6-4. Level 1 Failure Messages

Level 1 Code	Failure Message	Description
	AES LRU Failures:	
00	(not applicable)	Unknown Level I failure
01	SDU	SDU failed
02	OTHER SDU	Other SDU (of a dual system) failed
04	HPA-HI GAIN	High Gain Antenna HPA failed
07	HPA-LO GAIN	Low Gain Antenna HPA failed
0A	HI POWER RELAY	HPR (antenna system) failed
0D	DLNA-(TOP/L)	Top/Port Diplexer/Low Noise Amplifier failed
0F	DLNA-R	Starboard Diplexer/Low Noise Amplifier failed
10	DLNA-LO GAIN	LGA Diplexer/Low Noise Amplifier failed
13	BSU-(TOP/L)	Top/Port BSU or ACU failed
15	BSU-R	Starboard BSU failed
1A	HI GAIN ANT-(TOP/L)	Top/Port HGA failed

Table 6-4. Level 1 Failure Messages (cont)

Level 1 Code	Failure Message	Description
1C	HI GAIN ANTENNA-R	Starboard HGA failed
1F	LO GAIN ANTENNA	LGA failed
21	SCDU1	No. 1 SCDU failed
22	SCDU2	No. 2 SCDU failed
23	SCDU3	No. 3 SCDU failed
	Non-AES LRU Failures:	
33	(ACARS MU/CMU)1	No. 1 AFIS/ACARS unit failed
34	(ACARS MU/CMU)2	No. 2 AFIS/ACARS unit failed
35	IRS1	No. 1 IRS failed
36	IRS2	No. 2 IRS failed
37	IRS3	No. 3 IRS failed
38	IRS4	No. 4 IRS failed
39	(CFDIU/CMC)	CFDS/CMC failed
3D	FMC1	No. 1 FMC failed
3E	FMC2	No. 2 FMC failed
40	ARINC 429 ICAO ADDR	429 ICAO address source failed
41	(not applicable)	Discrete cockpit indicators failed
42	CTU	Cabin file server/cabin packet data function failed
43	(CFS/CPDF)	Cabin telecommunications unit failed
	Inactive BITE Bus Input to SDU from other LRU:	
52	(CFS/CPDF)/SDU	Cabin file server/cabin packet data function bus
53	(ACARS MU/CMU)1/SDU	No. 1 AFIS/ACARS unit bus
54	CTU/SDU	CEPT-E1 bus from the CCS
55	SCDU1/SDU	No. 1 SCDU bus
56	SCDU2/SDU	No. 2 SCDU bus
57	(ACARS MU/CMU)2/SDU	No. 2 AFIS/ACARS unit bus
59	(CFDIU/CMC)/SDU	CFDS bus
5A	IRS-PRI/SDU	Primary IRS bus
5B	IRS-SEC/SDU	Secondary IRS bus

Table 6-4. Level 1 Failure Messages (cont)

Level 1 Code	Failure Message	Description
5C	HPA-HI GAIN/SDU	High Gain Antenna HPA bus
5F	HPA-LO GAIN/SDU	Low Gain Antenna HPA bus
62	BSU-(TOP/L)/SDU	Top/port BSU bus
64	BSU-R/SDU	Starboard BSU bus
65	(not applicable)	Radio Management Panel bus
66	SCDU3/SDU	No. 3 SCDU bus
67	TP1AB/SDU MP9EF	Data bus from RFU to SDU (BITE signaling)
68	TP1EF/SDU MP9JK	CEPT-E1 from RFU to CTU through SDU
6A	TP1JK/SDU MP10CD	ST-Bus data from RFU to SDU (overflow digital audio)
6C	TP3CD/SDU MP10GH	ST-Bus C_2 clock from RFU to SDU (overflow digital audio)
6D	TP3EF/SDU MP10JK	ST-Bus F_0 frame from RFU to SDU (overflow digital audio)
71	OTHER SDU/THIS SDU	Bus from other SDU in a dual system
73	FMC1/SDU	No. 1 FMC bus
74	FMC2/SDU	No. 2 FMC bus
	Inactive Bus Inputs to other LRU:	
80	SDU MP9GH/RFU TP1CD	Data bus to RFU from SDU (control)
82	CTU/SDU MP10AB	CEPT-E1 bus from CTU to RFU through SDU
88	SDU MP10EF TP3A/B	ST-Bus data from SDU to RFU (overflow digital audio)
90	SDU M-CTRL/HPA-HI	Multicontrol bus to HGA HPA from SDU
96	SDU M-CTRL/HPA-LO	Multicontrol bus to LGA HPA from SDU
98	SDU M-CTRL/BSU-(T/L)	Multicontrol bus to top/port BSU from SDU
9A	BSU-R XTALK/BSU-L	Crosstalk bus to port BSU from starboard BSU
9C	SDU M-CTRL/BSU-R	Multicontrol bus to starboard BSU from SDU
9D	BSU-L XTALK/BSU-R	Crosstalk bus to starboard BSU from port BSU
	Miscellaneous Failures:	
C0	WRG:STRAPS/SDU	System configuration pins error
C1	WOW1/WOW2/SDU	Weight on wheels discrete inputs disagree
C2	SDU DUAL SEL/DISABLE	Dual system discrete inputs disagree
C3	WRG:ICAO ADDR/SDU	ICAO address straps error

Table 6-4. Level 1 Failure Messages (cont)

Level 1 Code	Failure Message	Description
C4	TX PATH VSWR-HI GAIN	Excessive VSWR load at HGA HPA output
C5	WRG:STRAPS/SDU ORT	Configuration pins and ORT settings disagree
C6	TX PATH VSWR-LO GAIN	Excessive VSWR load at LGA HPA output
C7	HPA-HI GAIN OVERTEMP	Over temperature in HGA HPA
C8	BAD GROUND STATION	Invalid GES frequency command
C9	HPA-LO GAIN OVERTEMP	Over temperature in LGA HPA
CA	SDU/DLNA-LO GAIN	LGA LNA control driver SDU
CB	WRG:SDI/HPA-HI GAIN (see NOTE)	HGA HPA identification strapped incorrectly
CC	WRG:SDI/HPA-LO GAIN (see NOTE)	LGA HPA identification strapped incorrectly
CD	SDU (POC/TOTC)	SDU power-on counter or total-on-time counter has been reset
CE	RFU (POC/TOTC)	RFU power-on counter or total-on-time counter has been reset
CF	HPA-HI (POC/TOTC)	HGA HPA power-on counter or total-on-time counter has been reset
D0	HPA-LO (POC/TOTC)	LGA HPA power-on counter or total-on-time counter has been reset
D1	WRG:SDI/HPA-HI GAIN (see NOTE)	HGA HPA identification strapped incorrectly
D2	WRG:SDI/HPA-LO GAIN (see NOTE)	LGA HPA identification strapped incorrectly
D3	WRG:SDI/BSU-(T/L)	Top/Port BSU identification strapped incorrectly
D4	WRG:SDI/BSU-R	Starboard BSU identification strapped incorrectly
D5	HPA-HI GAIN COAX	HGA HPA input coax cable
D6	HPA-LO GAIN COAX	LGA HPA input coax cable
D7	SDU COAX	RFU input coax cable
D8	DLNA/(SDU)-(T/L)	Top/Port HGA LNA coax cable output to RFU or SDU
D9	DLNA/(SDU)-R	Starboard HGA LNA coax cable output to RFU or SDU
DA	DLNA/(SDU)-LO GN	LGA LNA coax cable output to RFU or SDU
DB	LO GAIN SUBSYSTEM	LGA log-on functional test failure or could not initiate test

Table 6-4. Level 1 Failure Messages (cont)

Level 1 Code	Failure Message	Description
DC	NO ACTIVE MU/CMU	At least one (C)MU is communicating, but none have declared themselves active
DD	SDU OWNER REQS-SECD	Error in the secured ORT partition
DE	SDU OWNER REQS-USER	Error in the user ORT partition
DF	HI GAIN SUBSYSTEM	Slave HGA log-on functional test failure or could not initiate test
E0	COAX/SDU	SDU input coax cable from RFU
FE	PWR SUPPLY INTERRUPT	SDU had an in-flight primary power interrupt
	Undefined:	
Others	LEVEL 1 FAULT XX	XX is the Level 1 failure code (undefined)

NOTE: The front panel display messages associated with failure codes CBx and CCx (WRG:SDI/HPA HI-GAIN and WRG:SDI/HPA LO-GAIN, respectively) are identical to the messages raised for failure codes D1x and D2x, respectively. This use of a single front panel display message for multiple failure codes (where the CB/CCx codes reflect detection by the HGA/LGA HPA of an invalid HPA SDI strap condition, while the D1/D2x codes are generated by the SDU in response to a report from the HGA/LGA HPA of having detected an unexpected SDI code) is deliberate, and results from alignment of the front panel display messages with their CFDS/CMC counterparts. Because of this approach, it is possible (in this specific case) for an operator to receive two consecutive front panel display messages that are the same.

4 LRU Identification (Part Numbers) Electronically

a Following the display of all Level I failure messages, a list of the available LRU end-item part numbers is displayed. This list only includes part numbers for those LRUs present in the given installation as defined by the system configuration pins (see MECHANICAL INSTALLATION). For an installed LRU whose end-item part number is not available, dashes are displayed in place of the part number (e.g., **HPL** _ _ _ _ _ _ _ _ _ _ _). The list of part numbers are displayed in the order given in Table 6-5.

Table 6-5. List of Part Numbers

LRU	Part No.
SDU	SDbbbbbbb-hhsss-nn
HGA HPA	HHbbbbbbb-hhsss-nn
IGA HPA	IHbbbbbbb-hhsss-nn
LGA HPA	LHbbbbbbb-hhsss-nn

NOTES:

1. bbbbbbb represents the seven-digit LRU end-item base part number.
2. hh represents the two-digit LRU end-item hardware configuration number.
3. sss represents the three-digit LRU end-item software configuration number.
4. nn represents the two-character LRU end-item software modification level (possibly including space, dash characters, and alpha characters).

b For Honeywell/Racal LRUs, the three-digit LRU hardware configuration number must be entered manually through the CMT interface for valid data to be available for display. This data is stored during LRU end-item testing. All other numbers reside within the LRU software. All numbers are communicated to the SDU by Honeywell/Racal HPA(s) through the part number block transfer. For non-Honeywell/Racal interfacing HPAs, no such data is available to the SDU, therefore, dashes are displayed for the HPA end-item part number.

5 Part Number Block Format

a The information contained in the part number block is required for display on the CMC/CFDS MCDU, SCDU, CMT, and the SDU alphanumeric display. The information must be in the specified format (i.e., character restrictions or only digits and field length) for proper display. The part number block transfer is made up of:

- Seven-digit end-item base part number
- Two-digit end-item hardware configuration number (the first part of the end-item dash number, which also reflects the boot PROM software version).
- Three-digit software configuration number (the latter part of the end-item dash number, which only reflects the version of uploaded software)
- Two-letter (uppercase) hardware modification level
- Two-letter (uppercase) software modification level
- Eight-digit LRU serial number
- Four-hexadecimal character LRU program store CRC code
- Two-hexadecimal character hardware/software compatibility strap.

6 ORT Identification

a Following the display of the LRU end-item part numbers, the user ORT identification is displayed as specified:

- ORT ID-XXXXXXXXXXXXX (first line)
- XXXXXXXXXXX-MODIFIED (second line, after another activation of the MANUAL SCROLL button).

b Where XXXXXXXXXXXXXXXXXXXXXXXX represents the 24-character description contained in the user ORT description field. The user ORT description field is used to annotate a particular set of ORT items to identify one from another (e.g., NORTH PACIFIC ROUTE, SOUTH ATLANTIC ROUTE, 747-400 ASIAN ROUTE, 777 ASIAN ROUTE). Alternatively, this item could contain a software identification (e.g., a software part number for the user ORT as a released entity).

c The MODIFIED flag is only displayed if the state of the user ORT modified flag indicates any item in the user ORT has been modified since the user ORT was created. When any user ORT item is modified by the SDU software, either directly or indirectly, the user ORT modified flag is set to MODIFIED. If the state of the user ORT modified flag is unmodified, the MODIFIED flag is not displayed. The state of the user ORT modified flag is never set to unmodified by the SDU software.

d The next two pushes of the MANUAL SCROLL button present the same information for the Secured ORT partition.

7 End Of List Message

a The END OF LIST message is displayed at the end of the display list after the ORT identification.

H. Miscellaneous BITE Requirements

(1) The typical retention period for the BITE memory is at least five years at 25 °C. The worst case retention period is at least one year at 50 °C. If batteries are used to supply backup power for the BITE memory, the typical battery lifetime should be at least 10 years at 25 °C. The worst case lifetime is at least two years at 50 °C.

(2) Each system LRU has a total on-time clock (TOTC) to accumulate and record the amount of time the LRU has been powered up. The TOTC has a 10 minute resolution, and is capable of accumulating and recording a count of at least 200,000 hours.

(3) The TOTC value is capable of being examined, and of being reset to 0:00 through the CMT. Any manual TOTC reset, or any automatic TOTC reset (e.g., upon detection of corruption of its value), results in an automatic entry of the event into the LRU failure memory log and the SDU system failure memory log. The TOTC hours are capable of being automatically entered into the LRUs maintenance activity log.

I. Maintenance Activity Log

(1) A maintenance activity log is stored in each system LRU. The maintenance activity log is made up of the six most recent maintenance activity records (MAR). Each MAR can be entered through the CMT. Information is stored in the MAR as shown in Table 6-6 and in the order listed.

Table 6-6. MAR Information

Field	Size	Range
Document Number	16 ASCII Characters	a-z, A-Z, 0-9
Date (yymmdd)	6 ASCII Numerics	yy 00-99 mm 01-12 dd 01-31
Location	32 ASCII Characters	a-z, A-Z, 0-9
Phone Number	18 ASCII Numerics	0-9
Total On-Time Clock (Hours)	6 ASCII Numerics	0-200,000

(2) The fields are defined as follows:

- Document number - The document number has up to 16 alphanumeric characters. The intent of this field is to supply maintenance activity traceability.
- Date field - The date field is made up of six numeric characters in the format of yymmdd, where yy represents the year, mm represents the month, and dd represents the day. This field is entered automatically by the SDU as determined by its internal real-time clock (RTC); it is entered manually for the HPA. The intent of this field is to record the date the maintenance activity was performed.
- Location field - The location field has up to 32 alphanumeric characters. The intent of this field is to indicate the place where the LRU maintenance service was performed.
- Phone number field - The phone number field is made up of 18 numeric characters. The intent of this field is to supply a phone number of who performed the LRU maintenance. This phone number should include the combination of country code, area code, and local phone number.
- Total on-time clock field - The TOTC field is made up of six numeric characters representing hours. This field is entered automatically by the LRU as determined by the internal TOTC.

2. SATCOM Control and Display Unit

A. General

(1) The SATCOM Control and Display Unit (SCDU) menu formats obey the accepted industry standards for multifunction (multipurpose) control and display units (MCDU). The following paragraphs describe the SCDU display layout and terminology used to describe the display, font size conventions, scratchpad usage, format, keyboard usage, display symbols, and update rates.

B. SCDU Display Terminology and Basic Operation

(1) General

(a) The SCDU display is made up of 14 lines of 24 characters. The top line (line 1) is referred to as the title line and the bottom line (line 14) is referred to as the scratchpad. Lines 2 thru 13 are arranged into six pairs having a label line and data line. The SDU communicates to the SCDU for all data to be displayed in green. The color displayed on the MCDU depends on how the MCDU responds to this communication.

(b) There are six line select (LS) keys on each side of the SCDU display designated left (L) and right (R) and numbered 1 to 6 from top to bottom. The LS keys are associated with a pair of display lines where the upper line of a pair is the label line and the lower line is the data line. The LS key/line pair relations are given in Table 6-7.

(c) The SCDU can display a large and small font size. Different character fonts are not shown in the example SCDU page figures given in this section. The use of large font is indicated by the presence of uppercase letters in the SCDU page figures, while the use of small fonts are demonstrated by lowercase letters. In general, page names displayed in the title line are in large font. For pages where p/t is specified to be displayed in the title line, the p/t is in small font. Data entered into the scratchpad is displayed in large font. Data in the label lines is displayed in small font, while data in the data lines is displayed in large font. Numerical character font sizes cannot be shown in the figures, but their font sizes follow the same conventions.

Table 6-7. LS Key/Line Pair Relations

LS Keys	Display Lines
1L - 1R	2 and 3
2L - 2R	4 and 5
3L - 3R	6 and 7
4L - 4R	8 and 9
5L - 5R	10 and 11
6L - 6R	12 and 13

(d) Labels on the left side of the SCDU display are displayed beginning in column 2 of the label line. Data on the left side is left-justified in the data line. Labels and data on the right side of the SCDU display is right-justified. This is the case unless specified otherwise.

(2) Scratchpad

(a) General

1 The scratchpad is used for data entry and displaying SDU generated messages. Pushing an alphanumeric key on the keypad (0 through 9, A through Z, +/- [plus or minus], / [slash, space]) enters that character into the scratchpad. The scratchpad is not used for fixed format display purposes. The mechanism used for data entry is described below.

(b) Data Entry

1 When the user types the appropriate characters using the SCDU keypad, the characters are echoed on the scratchpad. After data entry, the user must push the appropriate LS key adjacent to the data field where the data is to be displayed. The SDU then checks the data for format and acceptability (out-of-range, entry not permitted into the field, etc). If the data is incorrect, the SDU leaves the previous data in the field and displays the appropriate error message in the scratchpad. If any LS key is pushed adjacent to a blank or nonselectable field, the scratchpad message 1 (i.e., NOT ALLOWED) is issued. If the entry was rejected because an incorrect LS key was pushed, the entry is accepted if the correct LS key is subsequently pushed.

(c) Scratchpad Message

1 If the SDU determines a data entry does not conform to format or acceptability requirements after an entry is attempted, the SDU issues a scratchpad message prompting the user for the correct data. The user can clear a scratchpad message by using the clear (CLR) key, or by entering data into the scratchpad over the message.

(d) CLR and DEL Keys

1 General

a The CLR and delete (DEL) keys are used to clear the scratchpad and alter the data fields. Generally, for MCDUs that have only a CLR key (e.g., Airbus and Douglas) the scratchpad is cleared and the data fields are altered by using this key. For MCDUs that have both CLR and DEL keys (e.g., Boeing), the scratchpad is cleared using the CLR key, while the data fields are altered using the DEL key.

2 CLR Key

a Pushing the CLR key clears the scratchpad message. When the scratchpad contains user-entered characters, momentary actuation of the CLR key clears the last entered character, while continual actuation of the CLR key clears the entire contents of the scratchpad.

b When the scratchpad is empty, pushing the CLR key causes CLR to be displayed in the scratchpad indented five spaces. If an LS key is pushed and the field adjacent to the LS key is specified to be either erasable (e.g., an unprotected number) or a default maintained value (e.g., protected number priorities), the field is cleared or reverts back to its default value, as applicable.

c For compatibility with the Boeing 777 AIMS/CDU, the SDU clears the entire scratchpad when the CLR command is received with the repeat bit set.

3 DEL Key

a The DEL key (if available) can be used to clear or revert the data fields. Pushing the DEL key causes no response when the scratchpad is not empty, except for either an SDU issued error message or pilot-entered characters.

b When the scratchpad is empty, pushing the DEL key causes DELETE to be displayed in the scratchpad.

NOTE: Pushing the DEL key again does not clear DELETE from the scratchpad. Instead, pushing the CLR key when DELETE is displayed in the scratchpad clears DELETE.

c If an LS key is pushed and the field adjacent to the LS key is specified to be either erasable (e.g., an unprotected number) or a default maintained value (e.g., protected number priorities), the field is cleared or reverts back to its default value, as applicable.

d When the scratchpad contains CLR indented five spaces as the result of the CLR key being pushed with an empty scratchpad and the DEL key is subsequently pushed, the SDU replaces CLR with DELETE in the scratchpad.

(e) NEXT PAGE and PREV PAGE Keys

1 General

a Pushing the NEXT PAGE and PREV PAGE (if available) function keys on the SCDU keypad causes the SDU to display the next page, or previous page of the display sequence where appropriate (i.e., when p/t is displayed in the title line).

2 NEXT PAGE Key

a Pushing this key causes the next page in the sequence to be displayed. If the last page in a multiple page sequence is displayed and the NEXT PAGE key is pushed, the first page is displayed. The SDU ignores this key if the key is pushed when p/t is not displayed, or if a p/t display is the value 1/1.

3 PREV PAGE Key

a Pushing this key causes the previous page in the sequence to be displayed. If the first page in a multiple page sequence is displayed and the PREV PAGE key is pushed, the last page is displayed. The SDU ignores this key if the key is pushed when p/t is not displayed, or if a p/t display is the value 1/1.

(f) Special Symbols

1 When displayed, special symbols are defined as given in Table 6-8.

Table 6-8. Special Symbols

Symbol	Description
* (Asterik)	Pushing the LS key adjacent to this symbol (when it appears) causes an action of some kind to occur (e.g., making a phone call, sorting a phone list, or initiating log-off).
[ ] (Brackets)	Empty brackets prompt the user for data entry into the field. However, data entry is not mandatory. Brackets surrounding data indicate the data is unprotected and can be modified or deleted. Not all fields modifiable are surrounded by brackets. When brackets are used to enclose existing data, as opposed to prompting entry of data into an empty field, they are intended as an indication the data is unprotected (i.e., an unprotected phone number). Conversely, protected phone numbers do not have brackets, indicating the phone number cannot be modified or deleted.
< , > (Carets)	A caret adjacent to an LS key indicates if the key is pushed the display changes to a new page. The new page is either the one indicated next to the caret or, in case of RETURN>, the higher level page.
<SEL>	Indicates the data in the field is currently selected (e.g., the selected GES or antenna).

(g) Updates

1 Dynamically generated display fields, whose contents have changed, are updated by the SDU both periodically (at a rate of at least 1 Hz), and upon completion of an LS key action that could have caused the display or the display field to change. With multiple SCDU configurations, the SDU only maintains one version of each page for display. The SDU responds to LS key actuations from all SCDUs in a serial fashion and updates the display page(s). Each SCDU scratchpad and the channel selection fields are independent from all others, allowing each user to perform independent actions.

C. SCDU Page Hierarchy

(1) The SCDU page hierarchy is shown in Figure 6-2. The SATCOM MAIN MENU page is accessed by pushing the LS key adjacent to <SAT for single SDU installations. Highlighted blocks in Figure 6-2 represent maintenance pages that are discussed in detail in paragraph D. Refer to the appropriate MCS SATCOM System Guide for additional non highlighted SATCOM displays.

D. SCDU Pages

(1) SATCOM MAIN MENU Page

(a) Access to this page is from the MCDU MAIN MENU page. The purpose of this page is to display call status information, to make, answer, and terminate calls, and to supply access to lower level pages. See Figure 6-3 for example pages.

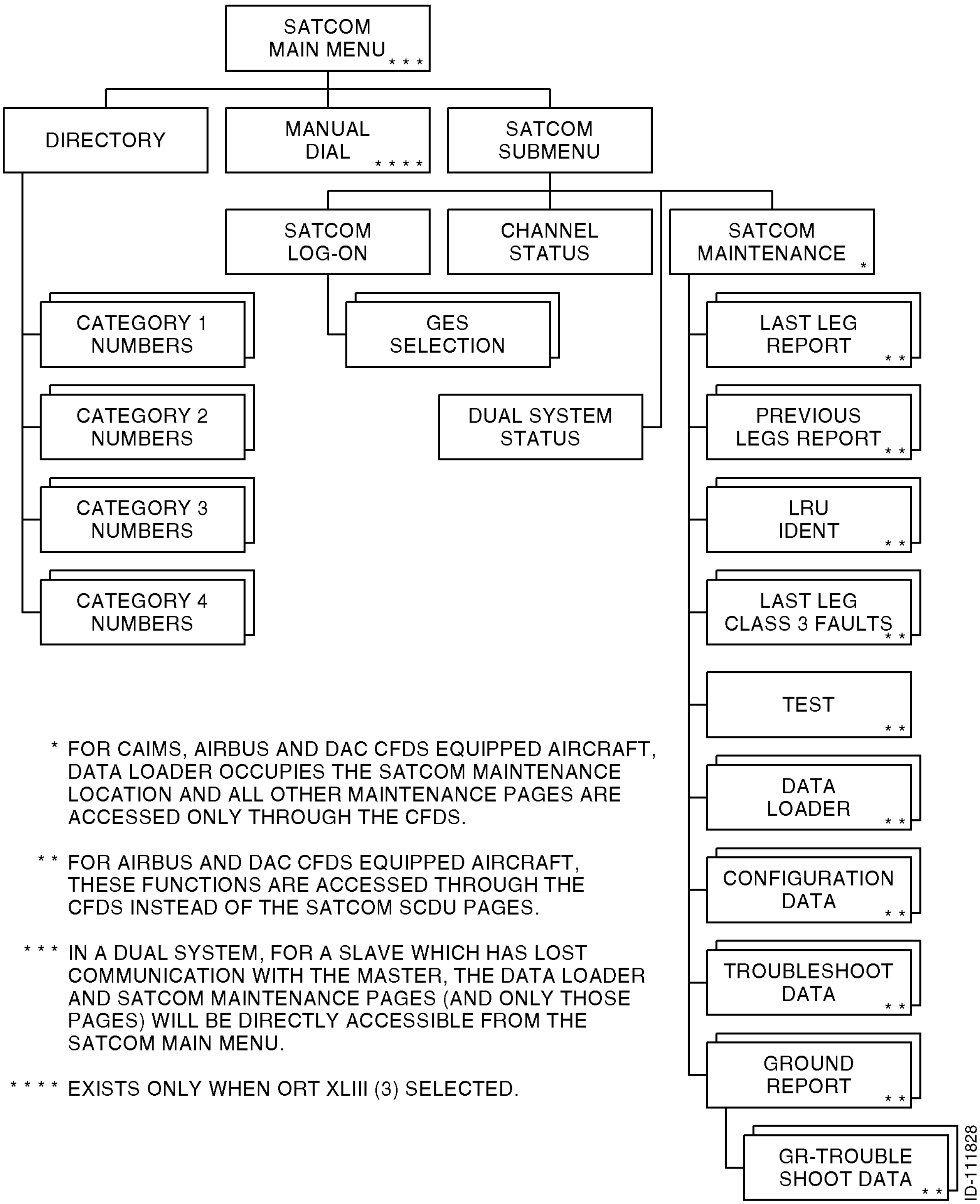


Figure 6-2. SATCOM SCDU Page Hierarchy

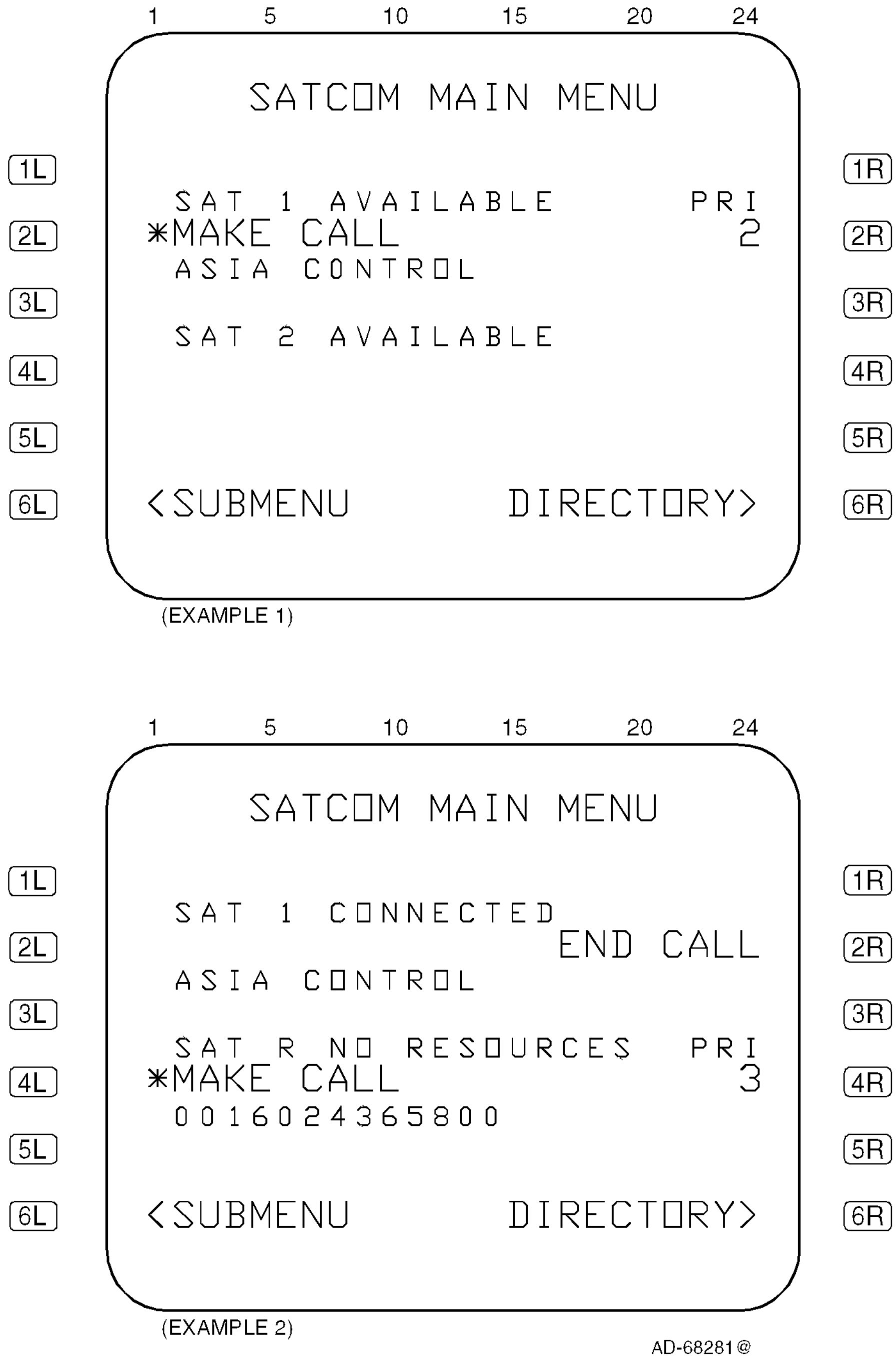


Figure 6-3. SATCOM SCDU Main Menu Page

(2) SATCOM SUBMENU Page

(a) Access to this page is from the SATCOM MAIN MENU page. The purpose of this page is to display the current log-on state, to supply a way of entering and displaying flight identifier, and to supply access to the SATCOM LOG-ON, SATCOM CHANNEL STATUS, and SATCOM MAINTENANCE (or, if applicable, DATA LOADER MENU) pages. When in a dual system, access to the DUAL SYSTEM STATUS menu page is supplied. See Figure 6-4 for example pages.

(3) SATCOM MAINTENANCE Pages

(a) General

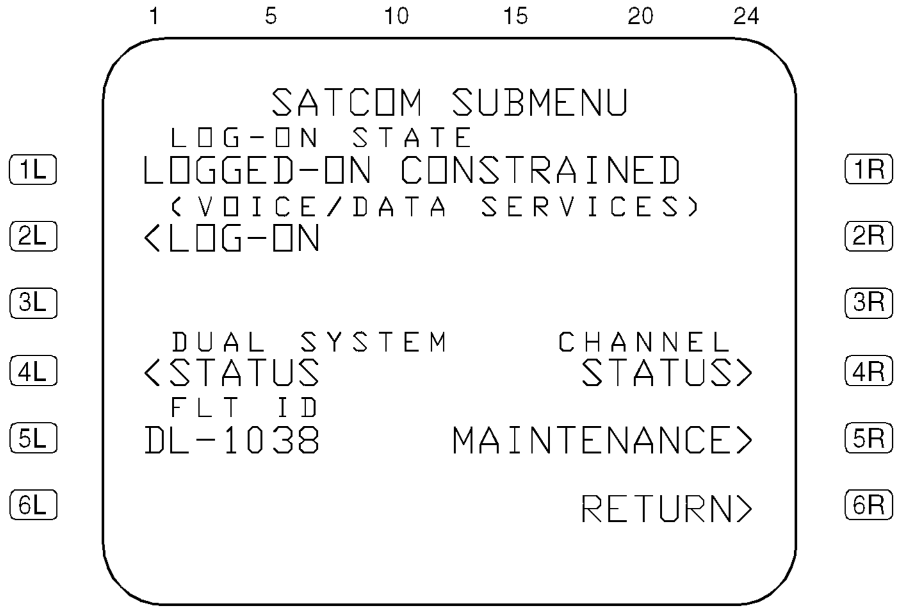
1 An example SATCOM MAINTENANCE page for non-Airbus/Douglas CFDS equipped aircraft is shown Figure 6-5.

2 The SATCOM MAINTENANCE pages menu selection, subject to ORT item iv (refer to SYSTEM OPERATION), is accessible from the SATCOM SUBMENU page only on non-Airbus/Douglas CFDS equipped aircraft. In Airbus and Douglas configurations, these pages are accessed through the CFDS.

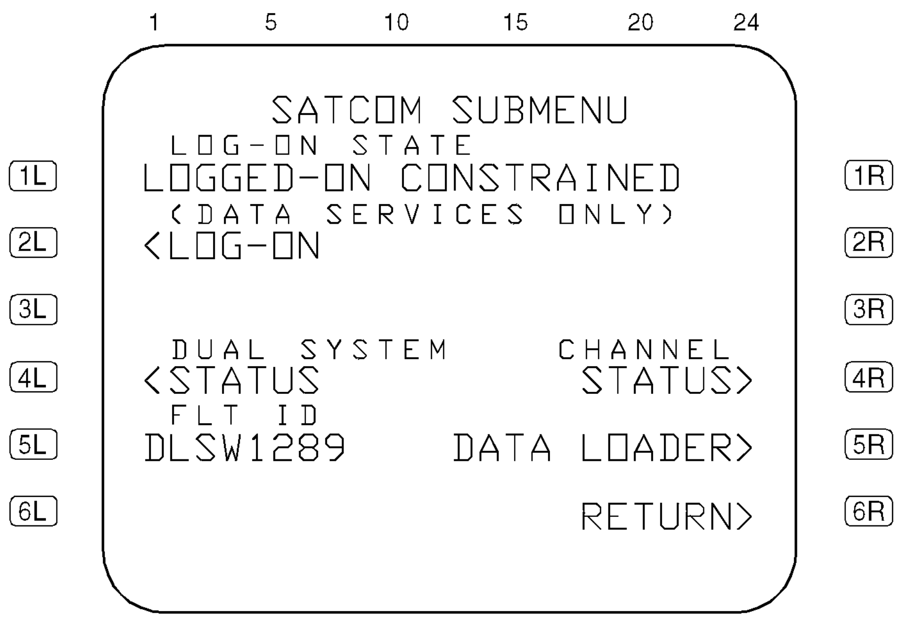
3 The purpose of these pages are to display SATCOM maintenance data. In a dual system, the maintenance data pertains to the system from which the display pages are being supplied (SAT 1 or SAT 2).

4 The display format and functionality for the SATCOM maintenance pages (i.e., for the SAT-N, LAST LEG REPORT, PREVIOUS LEGS REPORT, LRU IDENTIFICATION, LAST LEG CLASS 3 FAULTS, TEST, TROUBLESHOOT DATA, GROUND TROUBLESHOOT DATA, GROUND REPORT, and CONFIGURATION DATA pages) is the same as defined for the CFDS interactive mode maintenance pages with the exception of the following:

- The RETURN> prompt is displayed on the right adjacent to the 6R key, as opposed to the left.
- The SDU issues scratchpad message 1 (i.e., NOT ALLOWED) if any LS key is pushed adjacent to a blank or display-only field.



SCDU ACCESSED MAINTENANCE PAGE AVAILABLE



SCDU ACCESSED MAINTENANCE PAGES NOT AVAILABLE

AD-68282@

Figure 6-4. SATCOM SUBMENU Page

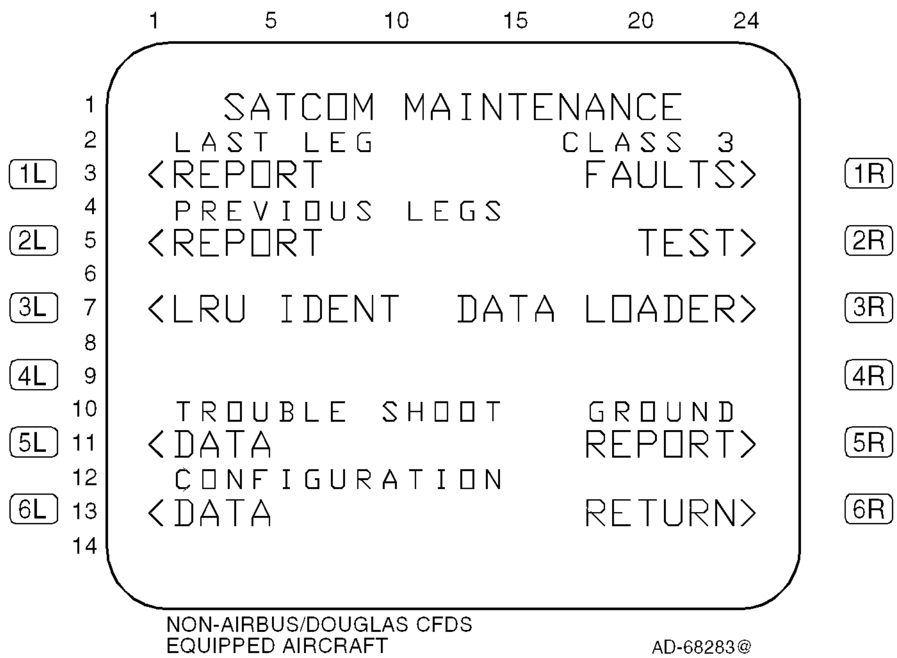


Figure 6-5. SATCOM MAINTENANCE Page

5 Access to SATCOM maintenance displays are as follows:

- Push LS key 1L to show the Last Leg Report page (see Figure 6-10)
- Push LS key 2L to show the Previous Leg Report page (see Figure 6-11)
- Push LS key 3Lto show the LRU Identification page (see Figure 6-12)
- Push LS key 5L to show the Trouble Shooting Data page (see Figure 6-13)
- Push LS key 6L to show the Configuration Data page (see Figure 6-8)
- Push LS key1R to show the Last Leg Class 3 Faults page (see Figure 6-14)
- Push LS key 2R to show the Test page (see Figure 6-6)
- Push LS key 3R to show the Data Loader Menu page (see Figure 6-9)
- Push LS key 5R to show the Ground Report page (see Figure 6-15).

(b) TEST page

1 For software packages prior to D2.0, if a system-wide functional test (i.e., PAST) is initiated from the SCDU interface (i.e., by pushing the 2R key on the SATCOM MAINTENANCE page), the first access of the SATCOM subsystem from an SCDU MAIN MENU page after the POST/PAST Results Delay period causes the TEST page to be shown with the status of the current failures. However, the TEST page shows the TEST IN PROGRESS 60S message if this first access occurs during the POST/PAST Results Delay period. If the SATCOM subsystem is not accessed within 5 minutes of the completion of an SCDU-initiated PAST, the page hierarchy is reset to its original structure as shown in Figure 6-2.

2 When the 2R key is pushed on the SATCOM MAINTENANCE (i.e., SAT-N) page, the SDU initiates a PAST and the page display temporarily goes to the TEST page where TEST IN PROGRESS 60S is displayed. However, the SCDU eventually times out the SATCOM subsystem and takes back control of the display. This is due to the fact that for SCDU-accessed maintenance pages, the SDU interfaces directly with the SCDU (as opposed to going through the CFDIU) and is unable to maintain proper bus activity (which the CFDIU normally does) during initial execution of the PAST.

3 To display the test results, the user must reselect the SATCOM system by pushing the LS key adjacent to the <SAT prompt on the SCDU MAIN MENU page, where the initial page shown is the TEST page. If the user does not reselect the SATCOM system on the SCDU MAIN MENU page after 5 minutes of completion of PAST, the page hierarchy resets to its original structure as shown in Figure 6-2.

4 The TEST IN PROGRESS 60S message during the POST/PAST Results Delay period is required to prevent the display of premature test results, i.e., to permit continuous monitoring sufficient time to add its contribution to the POST/PAST results.

(4) TEST Menu Page

(a) General

1 Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page by pushing LS key 2R. The purpose of this page is to initiate a PAST, to enable/disable a voice loopback on a selected (physical) channel, to enable/disable a test of the cockpit voice call light for a selected (logical) channel, and activation of the cockpit voice go-ahead chime test. See Figure 6-6 for example pages.

(b) Data Fields

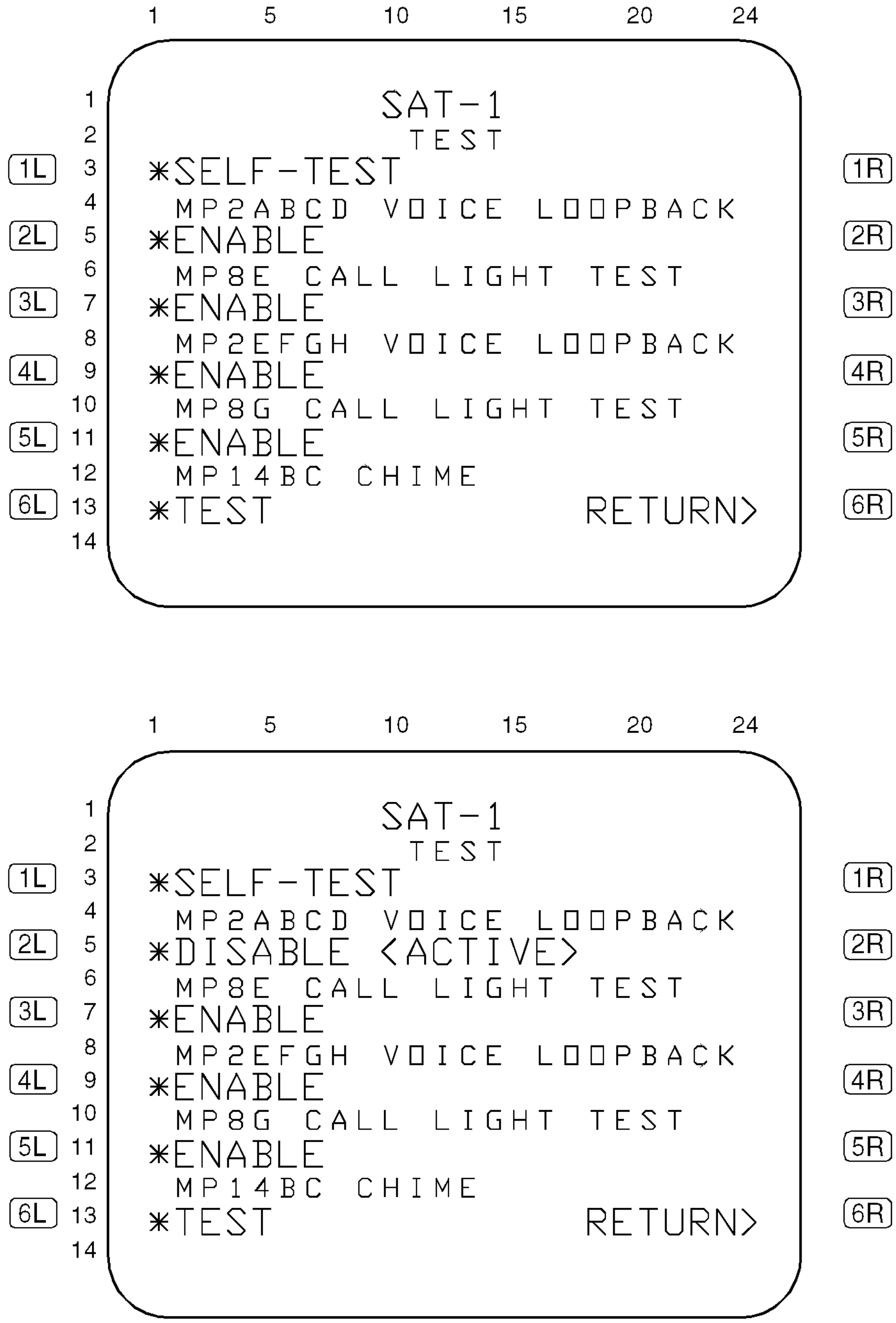
1 Line 3

a This line displays SELF-TEST beginning in column 1. The asterisk prompt is not displayed if the aircraft is airborne.

b If the LS key 1L is pushed when the SELF-TEST asterisk prompt is shown, the system activates a PAST.

2 Line 4

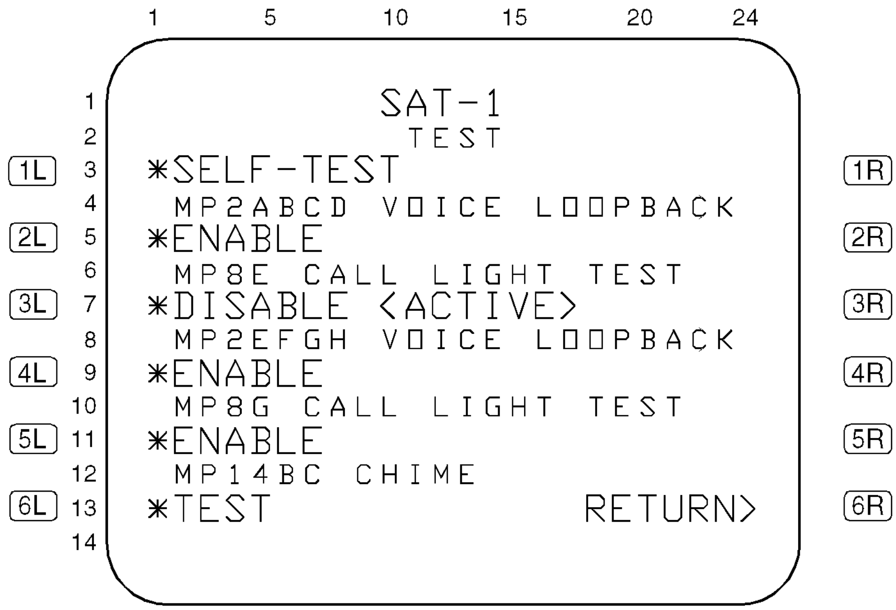
a This line displays MP2ABCD VOICE LOOPBACK beginning in column 2. Pushing LS key 2l configures the SATCOM system to perform an audio loopback test of flight deck channel 1.



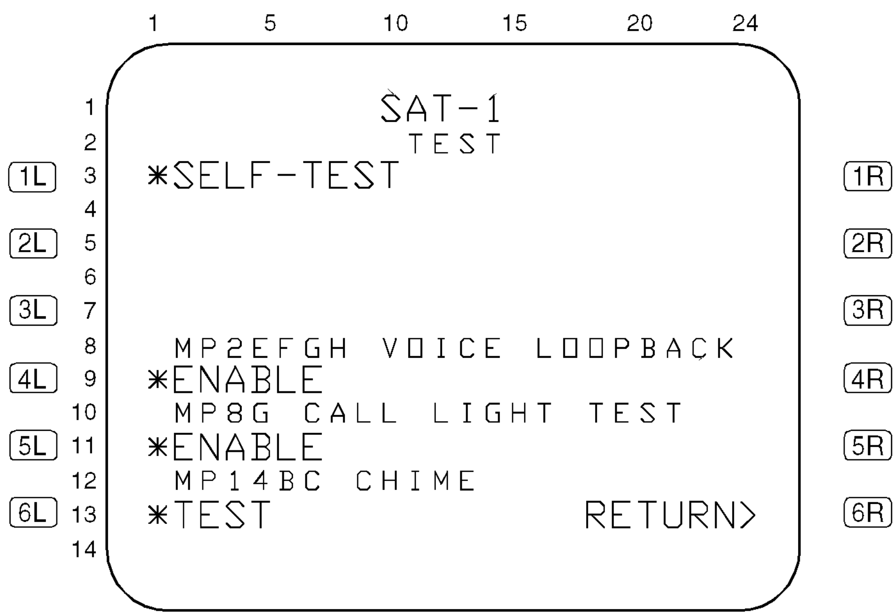
VOICE LOOPBACK TEST ACTIVATED

AD-68284@

Figure 6-6 (Sheet 1). TEST Page



CALL LIGHT TEST ACTIVATED



EXAMPLE WITH ONLY ONE CHANNEL CONFIGURED

AD-68285@

Figure 6-6 (Sheet 2). TEST Page

3 Line 5

a This line displays the message ENABLE beginning in column 1 when the test is not active. The asterisk prompt is displayed and the test allowed only if the log-on state is Standby. This line displays *DISABLE <ACTIVE> beginning in column 1 when the test is active. If the log-on state changes from Standby to any other state while the test is active, the test is terminated. The commands on lines 4 and 5 are shown only if the configuration straps indicate this channel is wired for headset use.

b Pushing LS key 2L when the ENABLE asterisk prompt is shown causes the voice channel selected to be activated into an analog loopback test state. Pushing LS key 2L when the DISABLE prompt is shown causes the voice loopback test state to be terminated.

4 Line 6

a This line displays MP8E CALL LIGHT TEST beginning in column 2. Pushing LS key 3L initiates a lamp test of the flight deck channel 1 call lamp.

5 Line 7

a This line displays *ENABLE beginning in column 1 when the test is not active. The asterisk prompt is shown and the test allowed only if the log-on state is Standby. This line displays *DISABLE <ACTIVE> beginning in column 1 when the test is active. If the log-on state changes from Standby to any other state while the test is active, the test is terminated. The commands on lines 6 and 7 are shown only if the configuration straps indicate this channel is wired for headset use.

b Pushing LS key 3L when the ENABLE asterisk prompt is shown causes the cockpit voice call light to be activated for a steady indication (regardless of the state of configuration pin TP13C). Pushing LS key 3L when the DISABLE prompt is displayed causes the cockpit voice call light test to be terminated.

6 LIne 8

a This line displays MP2EFGH VOICE LOOPBACK beginning in column 2. Pushing LS key 4L configures the SATCOM system to perform an audio loopback test of flight deck channel 2.

7 Line 9

a This line displays ENABLE beginning in column 1 when the test is not active. The asterisk prompt is shown and the test allowed only if the log-on state is Standby. This line displays *DISABLE <ACTIVE> beginning in column 1 when the test is active. If the log-on state changes from Standby to any other state while the test is active, the test is terminated. The commands on lines 8 and 9 are displayed only if the configuration straps indicate this channel is wired for headset use.

b Pushing LS key 4L when the ENABLE asterisk prompt is displayed causes the voice channel selected to be activated into an analog loopback test state. Pushing LS key 4L when the DISABLE prompt is displayed causes the voice loopback test state to be terminated.

8 Line 10

a This line displays MP8G CALL LIGHT TEST beginning in column 2. Pushing LS key 5L initiates a lamp test of the flight deck channel 2 call lamp.

9 Line 11

a This line displays *ENABLE beginning in column 1 when the test is not active. The asterisk prompt is displayed and the test allowed only if the log-on state is Standby. This line displays *DISABLE <ACTIVE> beginning in column 1 when the test is active. If the log-on state changes from Standby to any other state while the test is active, the test is terminated. The commands on lines 10 and 11 are displayed only if the configuration straps indicate this channel is wired for headset use.

b Pushing LS key 5L when the ENABLE asterisk prompt is displayed causes the cockpit voice call light to be activated for a steady indication (regardless of the state of configuration pin TP13C). Pushing LS key 5L when the DISABLE prompt is displayed causes the cockpit voice call light test to be terminated.

10 Line 12

a This line displays MP14BC CHIME beginning in column 2. Pushing LS key 6L initiates the channel test.

11 Line 13

a This line displays TEST beginning in column 1. The asterisk prompt is displayed and the test allowed only if the log-on state is Standby.

b Pushing LS key 6L when the asterisk prompt is displayed causes the cockpit voice go-ahead chime to be activated for a single stroke.

(5) SATCOM SELF-TEST (PAST) Page

(a) General

1 The purpose of this page is to initiate a PAST, to enable/disable a voice loopback on a selected (physical) channel, to enable/disable a test of the cockpit voice call light for a selected (logical) channel, and activation of the cockpit voice go-ahead chime test. See Figure 6-7 for example pages.

(b) Data Fields

1 Line 1

a This line displays the title of the page, SAT-N, beginning in column 10, where N represents 1 or 2 to indicate a single SDU (N = 1), SDU No. 1 (N = 1), or SDU No. 2 (N = 2) as determined by the settings of configuration pins TP12E and TP12F.

b If there are current failures to report after the execution of a PAST, columns 20 thru 24 display p/t in small font, where p represents the current displayed page, and t represents the total number of pages needed to show the current failures. The display of the slash is always in column 22, with p right-justified to the slash and t left-justified to the slash.

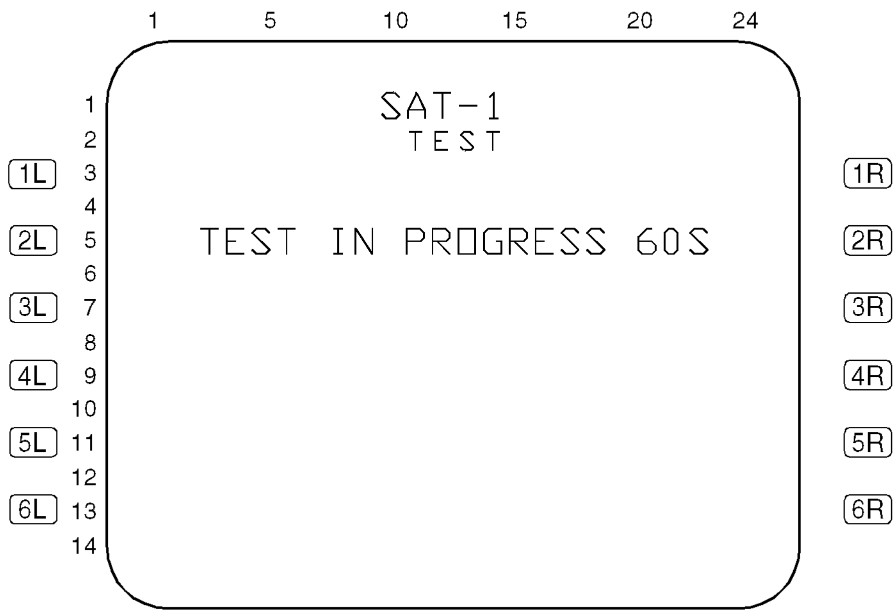
2 Line 3

a This line displays headers ATA beginning in column 1 and CLASS beginning in column 20 if there are current failures to report after execution of a PAST. This line is blank if there are no failures to report.

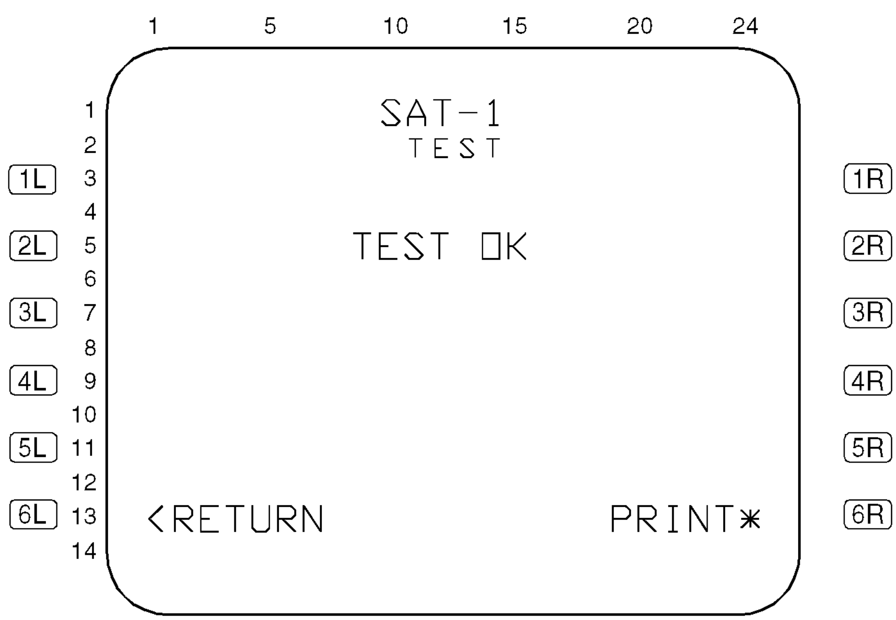
b In addition to the above, for CFDS type none, the header ATA is not displayed (CLASS is still displayed as specified).

3 Line 5

a This line displays the message TEST IN PROGRESS 60S beginning in column 3 within one second of a PAST being initiated on the SAT-N (i.e., SATCOM MAINTENANCE) page, and then throughout the duration of PAST. If there are no current failures to report at the conclusion of the PAST (including the POST/PAST results delay period), the message TEST OK is displayed. If there are current failures to report at the conclusion of the PAST (including the POST/PAST results delay period), refer to paragraph 4 for line requirements.



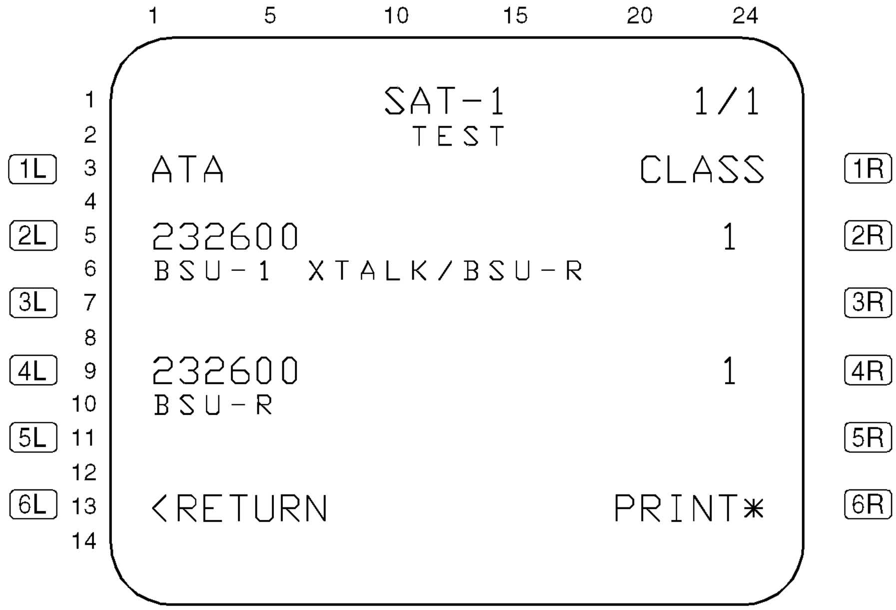
DURING EXECUTION OF PAST



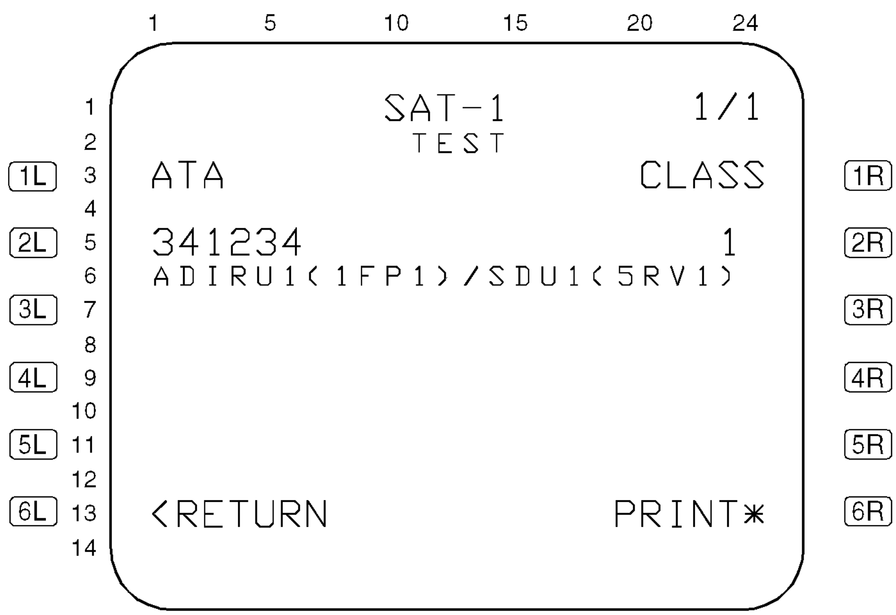
WITH NO CURRENT FAILURES

AD-68286@

Figure 6-7 (Sheet 1). SATCOM SELF-TEST Page



WITH CURRENT FAILURES



WITH FAIL-SAFE PAST RESTRICTION

AD-68287@

Figure 6-7 (Sheet 2). SATCOM SELF-TEST Page

4 Other Information

a The SELF-TEST page lists two failures per page if failures are detected during the PAST(self-test). These two sets of lines (lines 5, 6, and 7 and lines 9, 10, and 11) display Level 1 diagnosed current failures. Failures are shown in chronological order (i.e., the most recent detected failure last) with no more than two failures displayed per page.

b The number of TEST pages depends on the number of current failures to report (up to a maximum of 99 pages). When there is an odd number of current failures to report, the odd failure is displayed on a separate page in lines 5, 6, and 7, and lines 9, 10, and 11 are blank. If there are no failures to report, lines 5, 6, 7, 9, 10, and 11 are blank except as noted in paragraph 3.

c Line 5 and, if applicable, line 9 display the ATA number beginning in column 1 and the class number beginning in column 23. The ATA number is displayed as aaaaaa, where aaaaaa represents the ATA reference number of the reported failure as specified in paragraph 3.E. for each type of CFDS. For CFDS type none, no ATA number is displayed. The class number is displayed as c, where c represents the class (1, 2, or 3) of the failure.

d Lines 6 and 7 and, if applicable, lines 10 and 11 display a text message, as specified in paragraph 3.E. for each CFDS type, for the reported failure beginning in column 1.

(6) CONFIGURATION DATA Pages

(a) General

1 Access to these pages is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of these pages is to display the status of SATCOM configuration input parameters. See Figure 6-8 for example pages.

(b) CONFIGURATION DATA Page 1 (Figure 6-8, sheet 1):

1 Data Fields

a Line 3

(1) This line displays the ICAO address of eight octal characters, as determined by discrete inputs from the ICAO address straps. This display is not derived from any ARINC 429 version of the ICAO address.

b Line 5

(1) This line displays CONFIG as determined by the setting of the system configuration pins, followed by (HEX). The configuration pin settings are mapped into hexadecimal digits as shown in Table 6-9. In the figure, digits 0 thru 9 correlate to hexadecimal digits 0 thru 9 in the table.

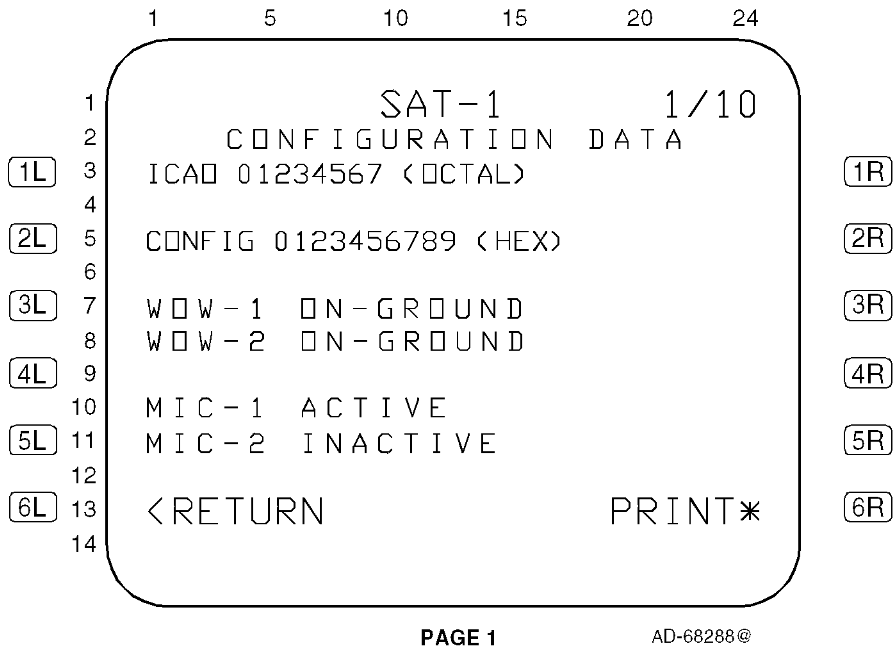


Figure 6-8 (Sheet 1). Configuration Data

Table 6-9. System Configuration Pin Mapping

<table>
<tr><th colspan="12">Configuration Pins</th></tr>
<tr><td colspan="3">TP10</td><td colspan="3">TP11</td><td colspan="3">TP12</td><td colspan="3">TP13</td></tr>
<tr><td>A B C D</td><td>E F G H</td><td>J K</td><td>A B</td><td>C D E F</td><td>G H J K</td><td>A B C D</td><td>E F G H</td><td>J K</td><td>A B</td><td>C D E F</td><td>G H J K</td></tr>
<tr><td colspan="12">Hex Digits</td></tr>
<tr><td>0</td><td>1</td><td colspan="2">2</td><td>3</td><td>4</td><td>5</td><td>6</td><td colspan="2">7</td><td>8</td><td>9</td></tr>
</table>

c Line 7

(1) This line displays the WOW-1 status of SDU weight-on-wheels discrete input No. 1 as IN-AIR/NOT WIRED or ON-GROUND.

d Line 8

(1) This line displays the WOW-2 status of the SDU weight-on-wheels discrete input No. 2 as IN-AIR/NOT WIRED or ON-GROUND.

e Line 10

(1) This line displays the MIC-1 status of the SDU cockpit voice microphone On discrete input No. 1 as ACTIVE or INACTIVE.

f Line 11

(1) This line displays the MIC-2 status of the SDU cockpit voice microphone On discrete input No. 2 as ACTIVE or INACTIVE.

(c) CONFIGURATION DATA Page 2 (Figure 6-8, sheet 2):

1 Data Fields

a Line 3

(1) This line displays the CHIME RESET status of the SDU cockpit voice go-ahead chime signal reset discrete input as ACTIVE or INACTIVE.

b Line 5

(1) This line displays the DUAL SYS SELECT status of the SDU dual system select discrete input as ACTIVE or INACT.

c Line 6

(1) This line displays the DUAL SYS DISABLE status of the SDU dual system disable discrete input as ACTIVE or INACT.

d Line 8

(1) This line displays IRS SOURCE as determined by which IRS input bus the SDU is using. A dash is displayed for the IRS source if a 429 source of IRS is not connected to the SDU.

e Line 10

(1) This line displays the PLACE/END CALL 1 status of the SDU cockpit voice place/end call 1 discrete input as ACTIVE or INACT.

f Line 11

(1) This line displays the PLACE/END CALL 2 status of the SDU cockpit voice place/end call 2 discrete input as ACTIVE or INACT.

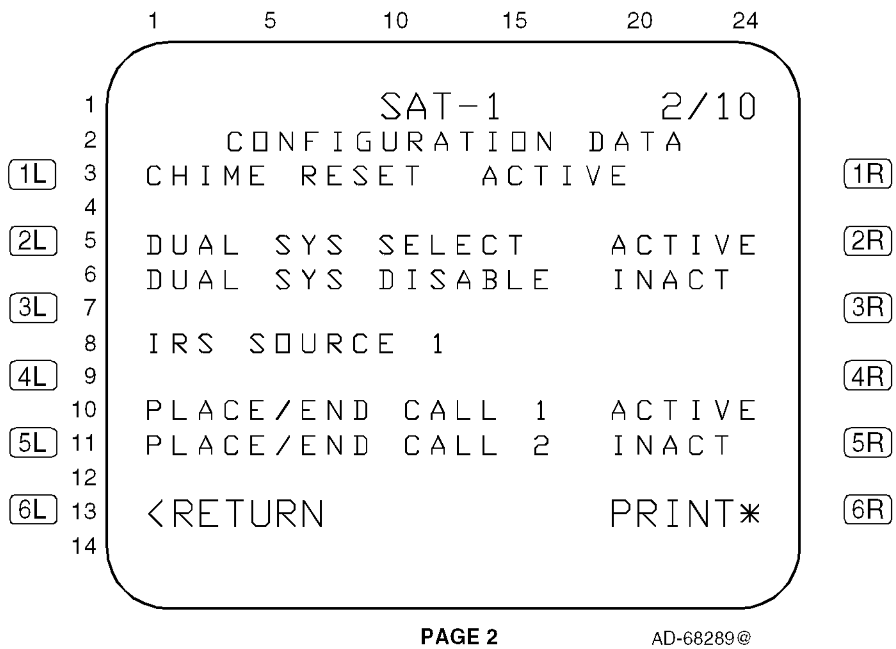


Figure 6-8 (Sheet 2). Configuration Data

(d) CONFIGURATION DATA Page 3 (Figure 6-8, sheet 3):

1 General

a For CONFIGURATION DATA pages 3 thru 10, the strap setting value 0 or 1 in parentheses is as follows: 1= open circuit; and 0 = tied to common.

2 Data Fields

a Line 4

(1) This line displays A(0) ICAO ADRS AVAIL or A(1) ICAO ADRS NOT AVAIL left-justified as determined by the state of system configuration pin TP10A.

b Line 6

(1) This line displays B(0) FMC1 CONNECTED or B(1) FMC1 NOT CONNECTED left-justified as determined by the state of system configuration pin TP10B.

c Line 8

(1) This line displays C(0) FMC2 CONNECTED or C(1) FMC2 NOT CONNECTED left-justified as determined by the state of system configuration pin TP10C.

d Line 10

(1) This line displays D(0) HS 429 TO/FROM CMUS or D(1) LS 429 TO/FROM CMUS left-justified as determined by the state of system configuration pin TP10D.

e Line 12

(1) This line displays E(0) CPDF CONNECTED or E(1) CPDF NOT CONNECTED left-justified as determined by the state of system configuration pin TP10E.

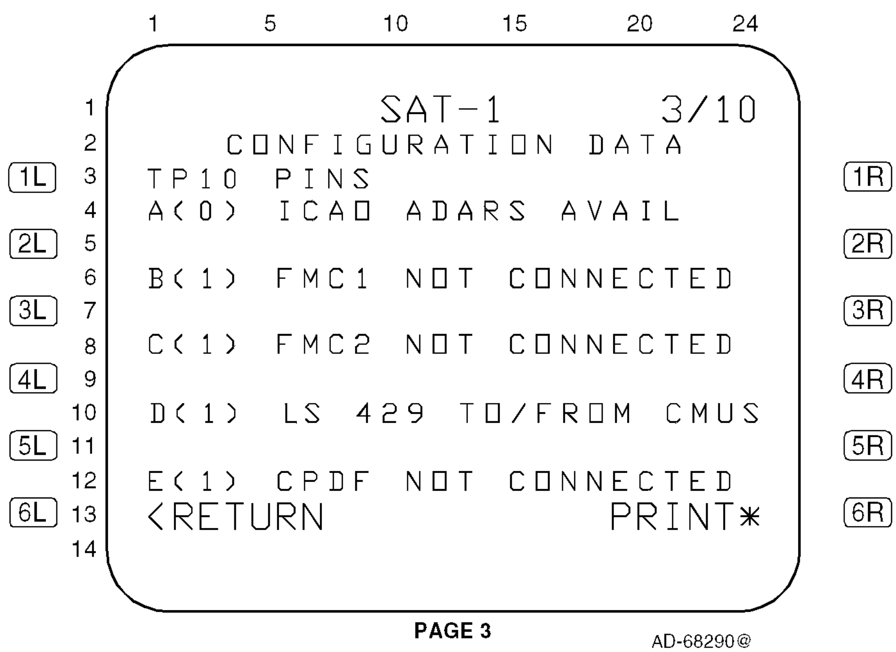


Figure 6-8 (Sheet 3). Configuration Data

(e) CONFIGURATION DATA Page 4 (Figure 6-8, sheet 4):

1 Data Fields

a Line 4

(1) This line displays F(0) HS 429 ICAO ADRS or F(1) LS 429 ICAO ADRS left-justified as determined by the state of system configuration pin TP10F.

b Line 6

(1) This line displays G(0) SPARE or G(1) SPARE left-justified as determined by the state of system configuration pin TP10G.

c Line 8

(1) This line displays H(0) SPARE or H(1) SPARE left-justified as determined by the state of system configuration pin TP10H.

d Line 10

(1) This line displays J(0) SPARE or J(1) SPARE left-justified as determined by the state of system configuration pin TP10J.

e Line 12

(1) This line displays K(0) LAMP ON CALL INIT or K(1) LAMP ON CALL CONNCT left-justified as determined by the state of system configuration pin TP10K.

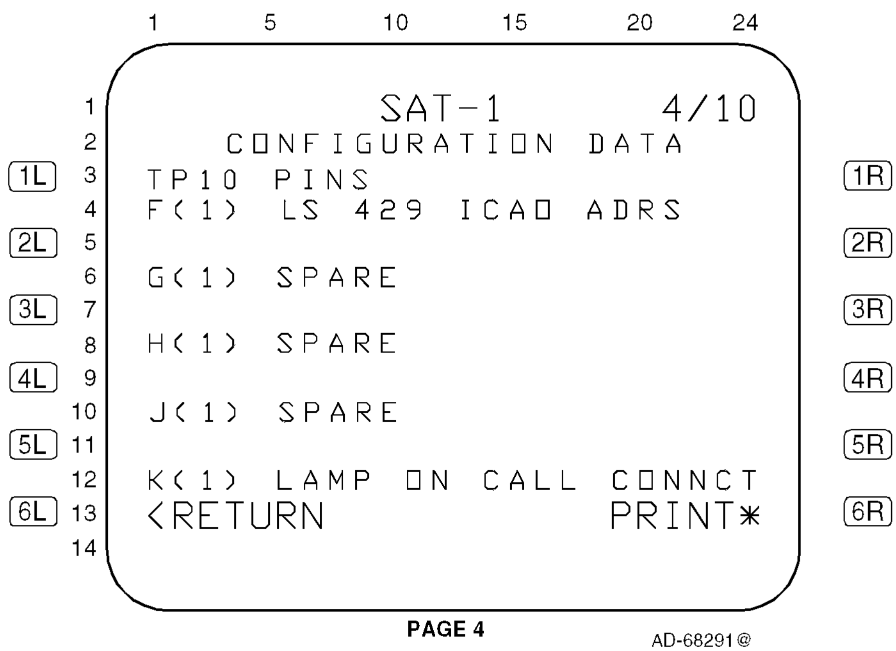


Figure 6-8 (Sheet 4). Configuration Data

(f) CONFIGURATION DATA Page 5 (Figure 6-8, sheet 5):

1 Data Fields

a Line 4

(1) This line displays A(0) PARITY: GOOD, A(1) PARITY: GOOD, A(0) PARITY: BAD, or A(1) PARITY: BAD left-justified as determined by the state of system configuration pin TP11A and the result of the parity validation test.

b Line 6

(1) This line displays B(0) CCS INSTALLED or B(1) CCS NOT INSTALLED left-justified as determined by the state of system configuration pin TP11B.

c Line 8

(1) This line displays C(0) PRI IRS INSTALLED or C(1) PRI IRS NOT INSTLLD left-justified as determined by the state of system configuration pin TP11C.

d Line 10

(1) This line displays D(0) SEC IRS INSTALLED or D(1) SEC IRS NOT INSTLLD left-justified as determined by the state of system configuration pin TP11D.

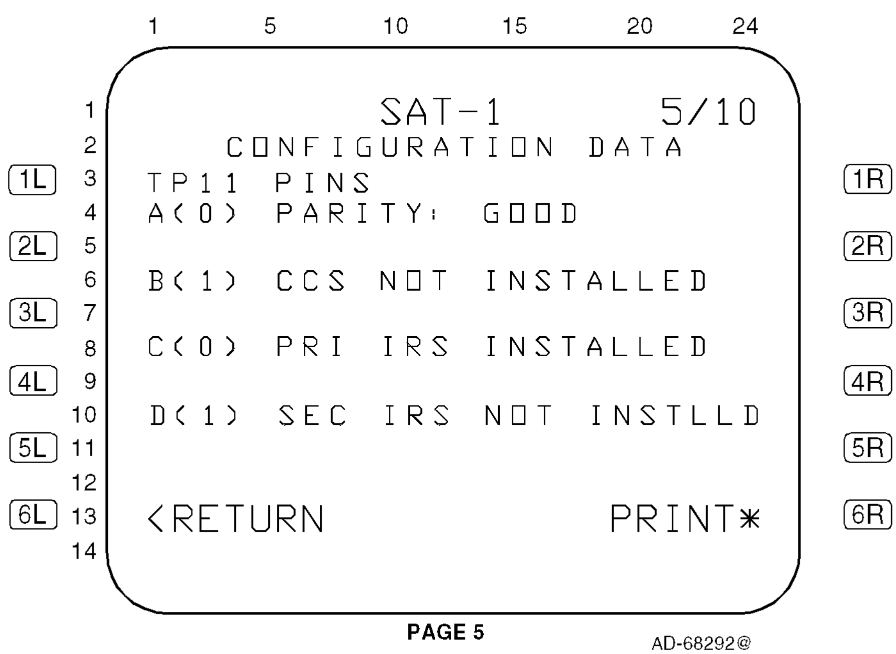


Figure 6-8 (Sheet 5). Configuration Data

(g) CONFIGURATION DATA Page 6 (Figure 6-8, sheet 6):

1 Data Fields

a Lines 4 thru 9

(1) These lines display X(0)* or X(1)* left-justified as shown in the figure, where X represents E, F, G, H, J, and K, respectively. X(0)* or X(1)* is determined by the states of system configuration pins TP11E, TP11F, TP11G, TP11H, TP11J, and TP11K. Asterisks are displayed in column 5 to indicate these pins are a coded group.

(2) Beginning in column 6, textual messages are displayed (refer to Table 6-10) in lines 4 thru 9 (as needed), where an x indicates the message(s) to be displayed based on the state of system configuration pins TP11E, TP11F, TP11G, TP11H, TP11J, and TP11K.

Table 6-10. Textual Message Display (Page 6 - Lines 4 thru 9)

System Configuration Pin	System Configuration Pin Settings (1 = open circuit / 0 = tied to common)						
TP11E	1	0	1	0	1	1	All Other Pin Combinations
TP11F	1	1	0	0	1	1	
TP11G	1	1	1	1	1	1	
TP11H	1	1	1	1	0	0	
TP11J	1	1	1	1	1	0	
TP11K	1	1	1	1	1	0	
Textual Message	Textual Messages To Display Based On System Configuration Pin Settings						
LO GAIN ANT+DLNA	X		X	X			
HPA-LO GAIN	X		X	X			
HI GAIN ANT+BSU-T/L		X	X	X	X		
HI GAIN ANT+BSU-R				X	X		
HPA-HI GAIN		X	X	X	X		
HI POWER RELAY				X	X		
HPA-IGA						X	
ERROR/UNDEFINED							X

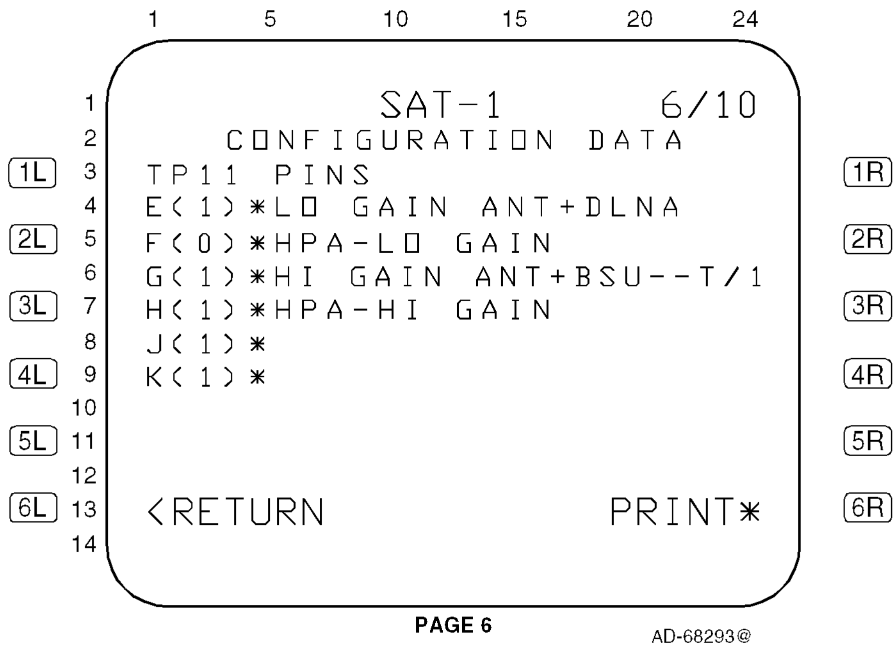


Figure 6-8 (Sheet 6). Configuration Data

(h) CONFIGURATION DATA Page 7 (Figure 6-8, sheet 7):

1 Data Fields

a Lines 4 thru 6

(1) These lines display X(0)* or X(1)* left-justified as shown in the figure, where X represents A, B and C, respectively. X(0)* or X(1)* are determined by the state of system configuration pins TP12A, TP12B, and TP12C. Asterisks are displayed in column 5 to indicate these pins are a coded group.

(2) CFDS/CMC TYPE = is displayed in line 4 beginning in column 6.

(3) Beginning in column 6, a textual message is displayed according to Table 6-11, where an x indicates the message to be displayed, based on the state of system configuration pins TP12A, TP12B and TP12C.

b Line 10

(1) This line displays D(0) RESERVED or D(1) RESERVED left-justified as determined by the state of system configuration pin TP12D.

c Line 12

(1) This line displays E(0) OTHER SDU INSTALLED or E(1) OTHER SDU NOT INSTD left-justified as determined by the state of system configuration pin TP12E.

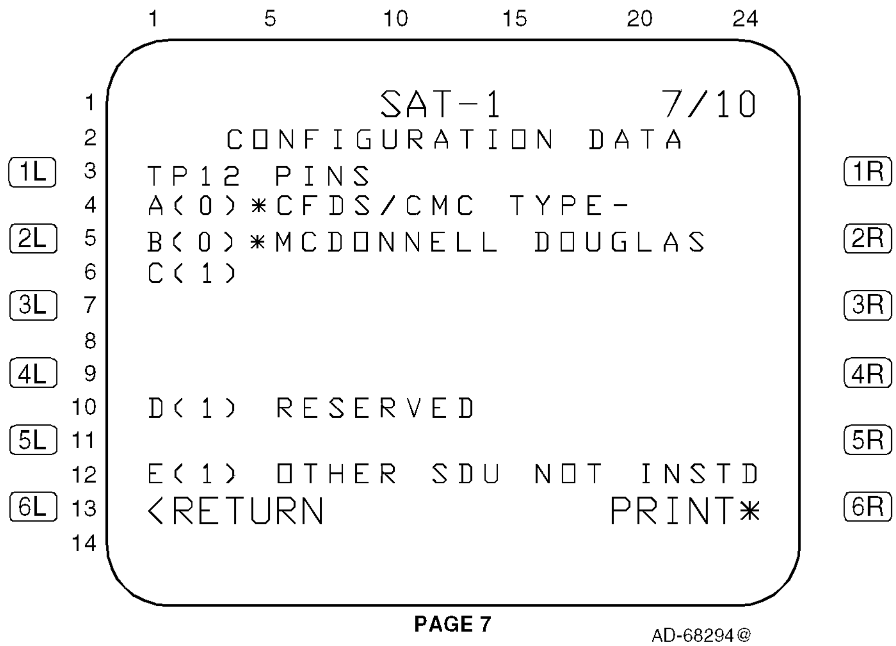


Figure 6-8 (Sheet 7). Configuration Data

Table 6-11. Textual Message Display (Page 7 - Lines 4, 5, an 6)

System Configuration Pin	System Configuration Pin Settings (1 = open circuit / 0 = tied to common)				
TP12A	0	0	1	1	All Other Pin Combinations
TP12B	0	1	0	1	
TP12C	1	0	0	1	
Textual Message	Textual Messages To Display Based On System Configuration Pin Settings				
MCDONNELL-DOUGLAS	X				
AIRBUS		X			
BOEING			X		
NOT INSTALLED				X	
ERROR/UNDEFINED					X

(i) CONFIGURATION DATA Page 8 (Figure 6-8, sheet 8):

1 Data Fields

a Line 4

(1) This line displays F(0) THIS IS SDU2 or F(1) THIS IS SDU1 left-justified as determined by the state of system configuration pin TP12F.

b Line 6

(1) This line displays G(0) CMU1 INSTALLED or G(1) CMU1 NOT INSTALLED left-justified as determined by the state of system configuration pin TP12G.

c Line 8

(1) This line displays H(0) CMU2 INSTALLED or H(1) CMU2 NOT INSTALLED left-justified as determined by the state of system configuration pin TP12H.

d Line 10

(1) This line displays J(0) SCDU1 INSTALLED or J(1) SCDU1 NOT INSTALLED left-justified as determined by the state of system configuration pin TP12J.

e Line 12

(1) This line displays K(0) SCDU2 INSTALLED or K(1) SCDU2 NOT INSTALLED left-justified as determined by the state of system configuration pin TP12K.

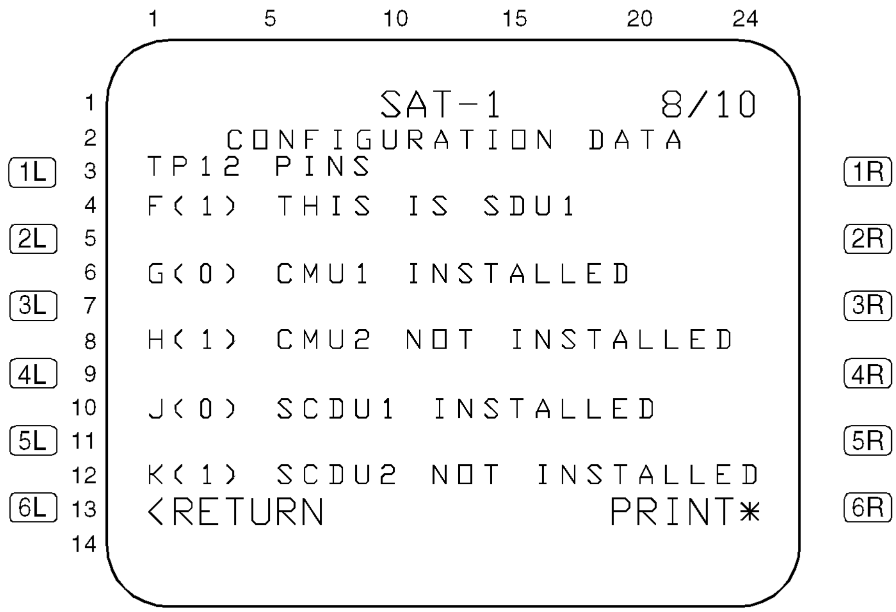


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Figure 6-8 (Sheet 8). Configuration Data

(j) CONFIGURATION DATA Page 9 (Figure 6-8, sheet 9):

1 Data Fields

a Line 4

(1) This line displays A(0) NO HSET PRI 4 CALLS or A(1) HSET PRI 4 CALLS OK left-justified as determined by the state of system configuration pin TP13A.

b Line 6

(1) This line displays B(0) LS 429 TO SCDUS or B(1) HS 429 TO SCDUS left-justified as determined by the state of system configuration pin TP13B.

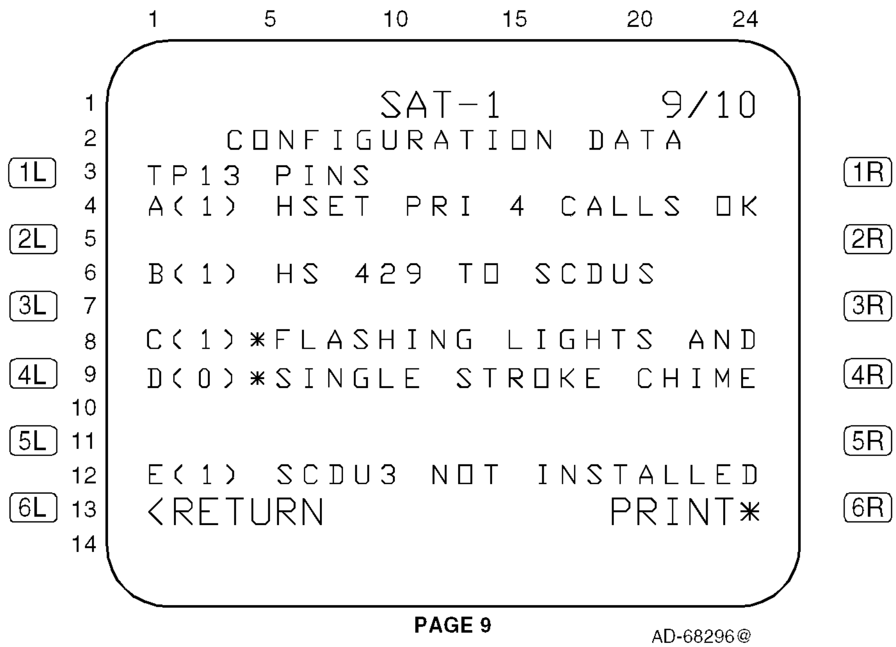

Figure 6-8 (Sheet 9). Configuration Data

c Lines 8 and 9

(1) These lines display X(0)* or X(1)* left-justified as shown in the figure, where X represents C and D, respectively. X(0)* or X(1)* are determined by the state of system configuration pins TP13C and TP13D. Asterisks are displayed in column 5 to indicate these pins are a coded group.

(2) Beginning in column 6, a textual message is shown in line 8 and according to Table 6-12, where an x indicates the message to be displayed, based on the state of system configuration pins TP13C and TP13D.

d Line 12

(1) This line displays E(0) SCDU3 INSTALLED or E(1) SCDU3 NOT INSTALLED left-justified as determined by the state of system configuration pin TP13E.

Table 6-12. Textual Message Display (Page 9 - Lines 8 and 9)

System Configuration Pin	System Configuration Pin Settings (1 = open circuit / 0 = tied to common)			
TP13C	0	0	1	1
TP13D	0	1	0	1
Textual Message	Textual Messages to Display Based on System Configuration Pin Settings			
LIGHTS AND CHIME (Line 8) UNDEFINED (Line 9)	X			
STEADY LIGHTS AND (Line 8) MULTISTROKE CHIME (Line 9)		X		
FLASHING LIGHTS AND (Line 8) SINGLE STROKE CHIME (Line 9)			X	
STEADY LIGHTS AND (Line 8) SINGLE STROKE CHIME (Line 9)				X

(k) CONFIGURATION DATA Page 10 (Figure 6-8, sheet 10):

1 Data Fields

a Lines 4 and 5

(1) These lines display X(0)* or X(1)* left-justified as shown in the figure, where X represents F and G, respectively. X(0)* or X(1)* are determined by the state of system configuration pins TP13F and TP13G.

(2) Beginning in column 6, a textual message is displayed in lines 4 and 5 according to Table 6-13, where an x indicates the message to be displayed based on the state of system configuration pins TP13F and TP13G.

b Lines 8 and 9

(1) These lines display X(0)* or X(1)* left-justified, where X represents H and J, respectively. X(0)* or X(1)* are determined by the state of system configuration pins TP13H and TP13J. Asterisks are displayed in column 5 to indicate these pins are a coded group.

(2) Beginning in column 6, a textual message is displayed in lines 8 and 9 according to Table 6-14, where an x indicates the message to be displayed based on the state of system configuration pins TP13H and TP13J.

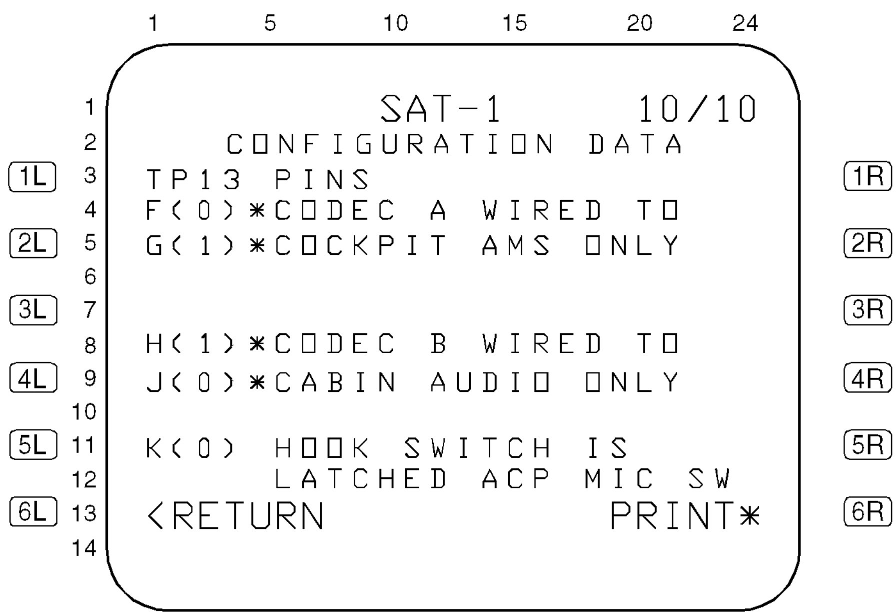

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Figure 6-8 (Sheet 10). Configuration Data

c Lines 11 and 12

(1) Line 11 displays K(0) HOOK SWITCH IS left-justified and line 12 displays LATCHED ACP MIC SW beginning in column 6; or line 11 displays K(1) HOOK SWITCH IS left-justified and line 12 displays SWITCHED PTT/SCDU beginning in column 6, as determined by the state of system configuration pin TP13K.

d Line 13 (LS Key 6L)

(1) This line displays <RETURN left-justified and PRINT* right-justified (if applicable). The PRINT* prompt is only displayed if bit 11 of ARINC label 155 is set to 1. Pushing the 6L key causes the page display to revert to the SAT-N (i.e., SATCOM MAINTENANCE) page.

Table 6-13. Textual Message Display (Page 10 - Lines 4 and 5)

System Configuration Pin	System Configuration Pin Settings (1 = open circuit / 0 = tied to common)			
TP13F	0	0	1	1
TP13G	0	1	0	1
Textual Message	Textual Messages to Display Based on System Configuration Pin Settings			
CODEC A WIRED TO AMS (Line 4) AND CABIN (Line 5)	X			
CODEC A WIRED TO (Line 4) COCKPIT AMS ONLY (Line 5)		X		
CODEC A WIRED TO CABIN (Line 4) AUDIO ONLY (Line 5)			X	
CODEC A NOT WIRED (Line 4) BLANK (Line 5)				X

Table 6-14. Textual Message Display (Page 10 - Lines 8 and 9)

System Configuration Pin	System Configuration Pin Settings (1 = open circuit / 0 = tied to common)			
TP13H	0	0	1	1
TP13J	0	1	0	1
Textual Message	Textual Messages to Display Based on System Configuration Pin Settings			
CODEC B WIRED TO AMS (Line 8) AND CABIN (Line 9)	X			
CODEC B WIRED TO (Line 8) COCKPIT AMS ONLY (Line 9)		X		
CODEC B WIRED TO CABIN (Line 8) AUDIO ONLY (Line 9)			X	
CODEC B NOT WIRED (Line 8) BLANK (Line 9)				X

(l) CONFIGURATION DATA Page 11 (Figure 6-8, Sheet 11):

1 General

a Page 11 of the CONFIGURATION DATA page is shown below.

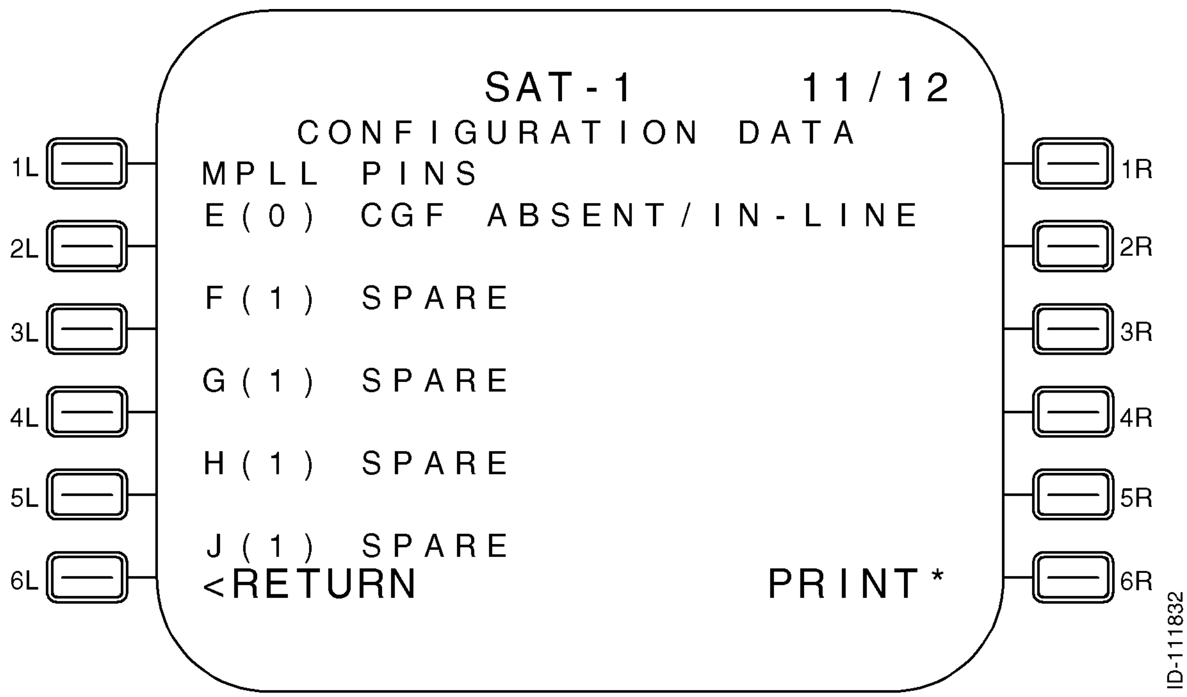


Figure 6-8 (Sheet 11). Configuration Data

(m) CONFIGURATION DATA Page 12 (Figure 6-8, Sheet 12):

1 General

a Page 12 of the CONFIGURATION DATA page is shown below.

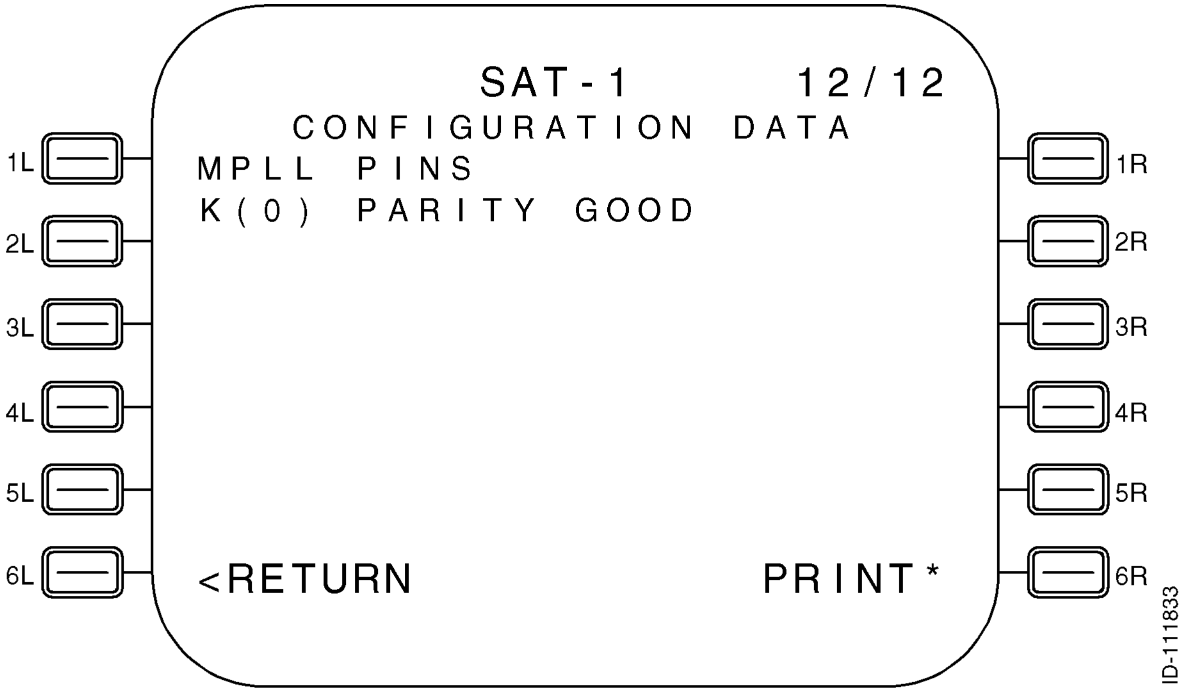


Figure 6-8 (Sheet 12). Configuration Data

(n) CONFIGURATION DATA Page 13 (Figure 6-8, Sheet 13):

1 General

a These configuration data pages are only available on the non-Airbus/Douglas SCDU maintenance pages, in which case the 12 pages shown in the previous paragraphs are 1/12 thru 10/12.

2 Data Fields

a Line 3

(1) This line displays the CALL LAMP 1 status of the SDU Cockpit Voice-Call Lamp Discrete Output as ACTIVE or INACT as appropriate.

b Line 4

(1) This line displays the CALL LAMP 2 status of the SDU Cockpit Voice-Call Lamp Discrete Output as ACTIVE or INACT as appropriate.

c Line 6

(1) This line displays the DUAL SYS SELECT status of SDU Dual System Select Discrete Output as ACTIVE or INACT as appropriate.

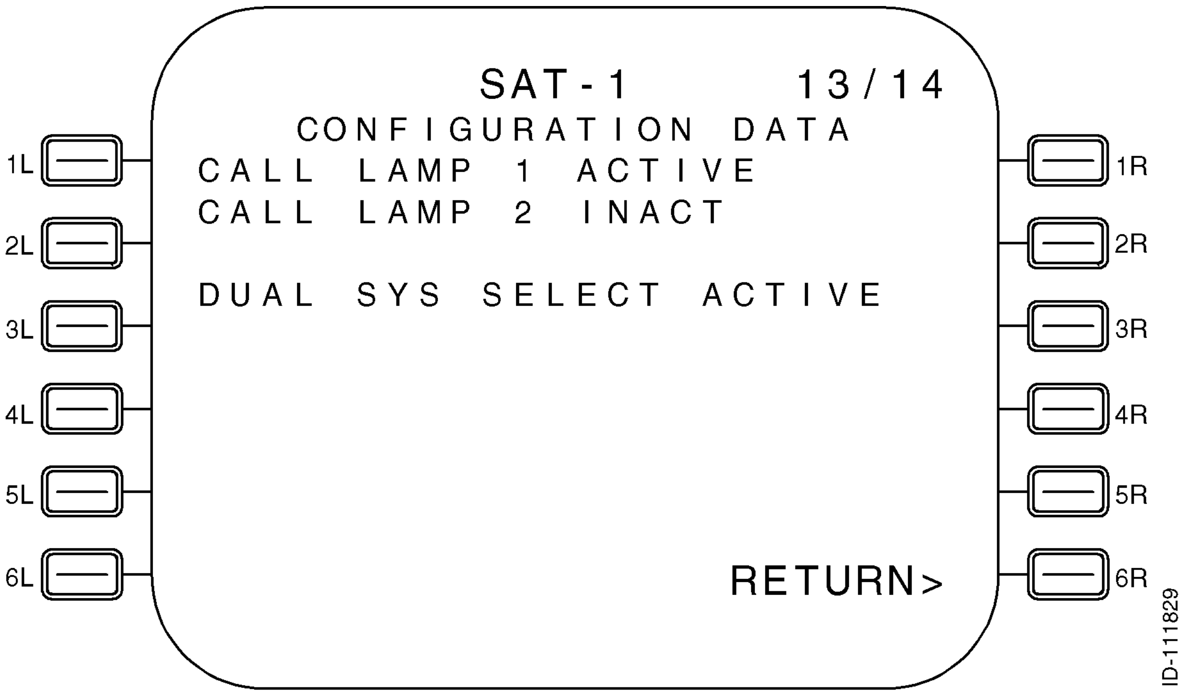


Figure 6-8 (Sheet 13). Configuration Data

(o) CONFIGURATION DATA Page 14 (Figure 6-8, sheet 14):

1 Data Fields

a Line 3

(1) This line displays HPA CMND/STAT beginning in column 1, HGA beginning in column 15, and LGA beginning in column 22.

b Line 4

(1) This line displays BACKOFF(DB) beginning in column 1. The HGA HPA commanded backoff power level (in dB) is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA command word Label 143). The LGA HPA commanded backoff power level (in dB) is displayed (if configured) right-justified in column 24 (as determined from the HGA HPA command word Label 143. The ranged allowed for display of the backoff is 0 to 31 dB in increments of 1 dB.

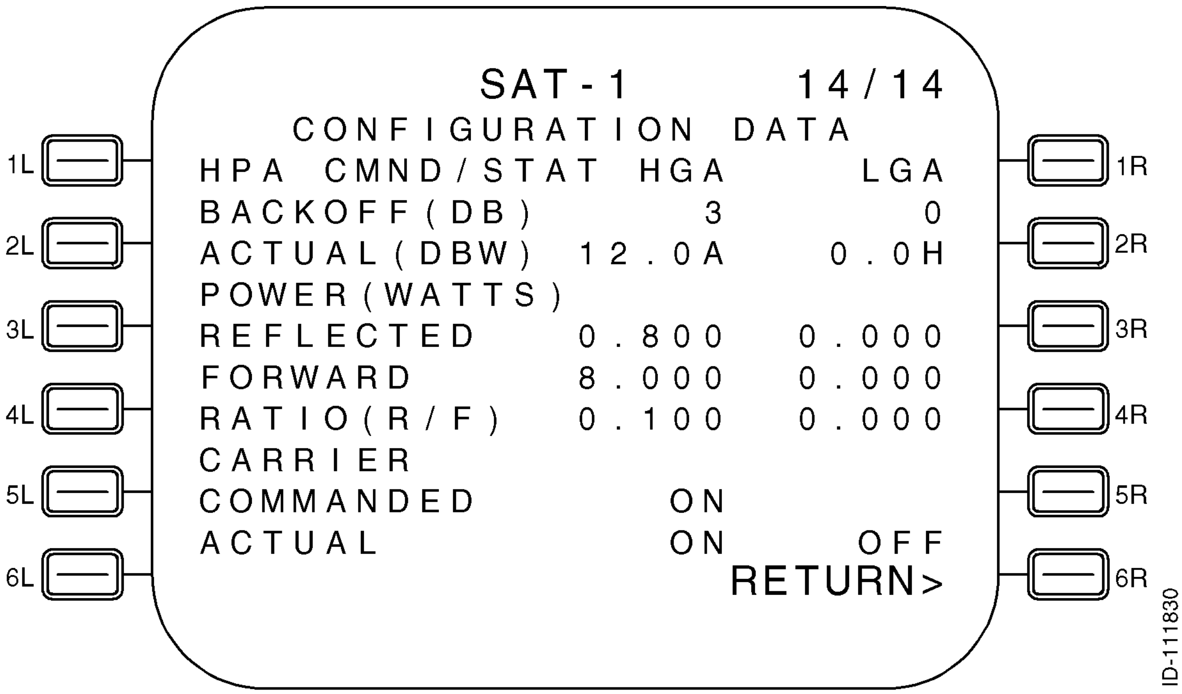


Figure 6-8 (Sheet 14). Configuration Data

c Line 5

(1) This line displays ACTUAL(DBW) beginning in column 1. The HGA HPA reported power level (in dB Watts) is displayed (if configured) right-justified in column 16 (as determined from the HGA HPA status word Label 144). The state of the actual power out status (APOS) bit is indicated as either A for actual or H for held and is displayed in column 17. The LGA HPA commanded backoff power level (in dB Watts) is displayed (if configured) right-justified in column 23 (as determined from the LGA HPA status word Label 144). The state of the APOS status bit is displayed in column 24 as previously stated. The allowable range for display of the actual power is −11.5 to 19.0 dBW in increments of 0.5 dBW. If the actual power value is outside the measurable range, dashes are displayed for the actual power value. If valid data is not available for the HPA status label, dashes are displayed to indicate the unknown data.

d Line 6

(1) This line displays POWER(WATTS) beginning in column 1.

e Line 7

(1) This line displays REFLECTED beginning in column 1. The HGA HPA reflected power level (in Watts) is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA). The LGA HPA reflected power level (in Watts) is displayed (if configured) right-justified in column 24 (as determined from the LGA HPA). The allowable range for the display of the reflected power value is 0.000 to 25.056 Watts. If the power level is unavailable, dashes are displayed.

f Line 8

(1) This line displays FORWARD beginning in column 1. The HGA HPA reflected power level (in Watts) is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA). The LGA HPA reflected power level (in Watts) is displayed (if configured) right-justified in column 24 (as determined from the LGA HPA). The allowable range for the display of the reflected power value is 0.000 to 80.000 Watts. If the power level is unavailable, dashes are displayed.

g Line 9

(1) This line displays RATIO(R/F) beginning in column 1. The HGA HPA reflected power to forward power ratio is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA). The LGA HPA reflected power to forward power ratio is displayed (if configured) right-justified in column 24 (as determined from the LGA HPA). The allowable range for the display of the reflected power to forward power ratio is 0.000 to 1.000 Watts. If the reported ratio is over-range, the text OVER is displayed. If the ratio number is unavailable, dashes are displayed.

NOTE: The over-range condition occurs when the forward power is more than 50 Watts while the reflected power is at the maximum of 25.056 Watts. The HPA indicates the over-range condition through the solo word ratio value of $FF_{H.}$

h Line 10

(1) This line displays CARRIER beginning in column 1.

i Line 11

(1) This line displays COMMANDED beginning in column 1. The HGA HPA commanded carrier state is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA). The LGA HPA commanded carrier state is displayed (if configured) right-justified in column 24 (as determined from the LGA HPA). The commanded carrier state is displayed as either ON or OFF.

j Line 12

(1) This line displays ACTUAL beginning in column 1. The HGA HPA actual carrier state is displayed (if configured) right-justified in column 17 (as determined from the HGA HPA). The LGA HPA commanded carrier state is displayed (if configured) right-justified in column 24 (as determined from the LGA HPA). The actual carrier state is displayed as either ON or OFF.

k Line 13

(1) This line displays RETURN> right-justified. Pushing LS key 6L causes the page display to revert to the SAT-N (SATCOM MAINTENANCE) page.

(7) DATA LOADER MENU Page

(a) General

1 Access to this page is from SATCOM SUBMENU page (or the SATCOM MAINTENANCE page). The access page depends on the configuration of the aircraft as defined in Figure 6-2. The purpose of this page is to supply a means of commanding data loader actions. See Figure 6-9 for example pages.

(b) Data Fields

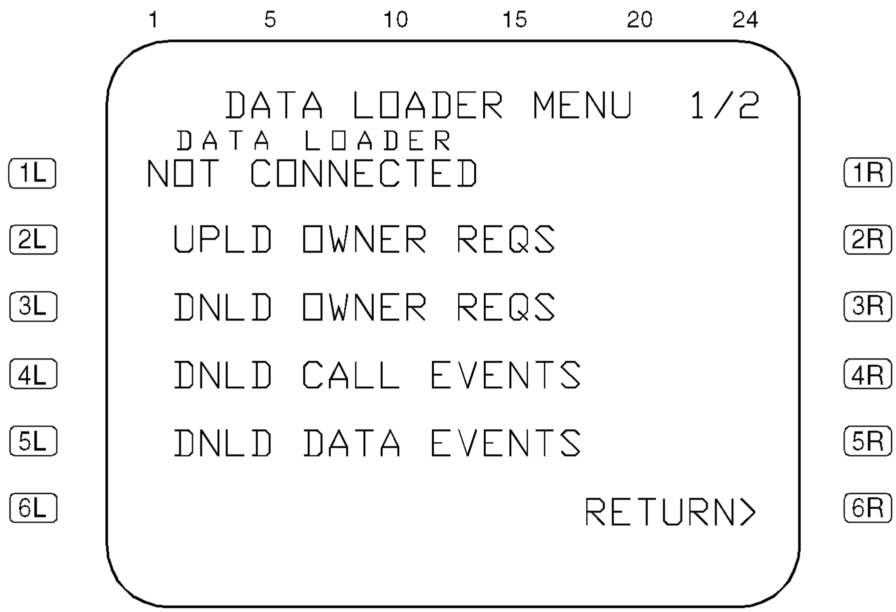
1 Field 1L

a This field displays DATA LOADER in the label line and the data loader status in the data line. Possible status displays depend on the data loader status as follows:

- NOT CONNECTED - Displayed when the status of both data loader is absent.
- CONNECTED - Displayed when at least one data loader status is CONNECTED, and the status of neither data loaders is READY, BUSY, or ERROR.
- READY - Displayed when a data loader status is READY.
- BUSY - Displayed when a data loader status is BUSY.

b READY must be displayed before data uploading or downloading can be performed.

c Asterisks are only displayed adjacent to the left LS keys when the data loader status is READY.



DATA LOADER MENU PAGE 1-NO DATA LOADER CONNECTED

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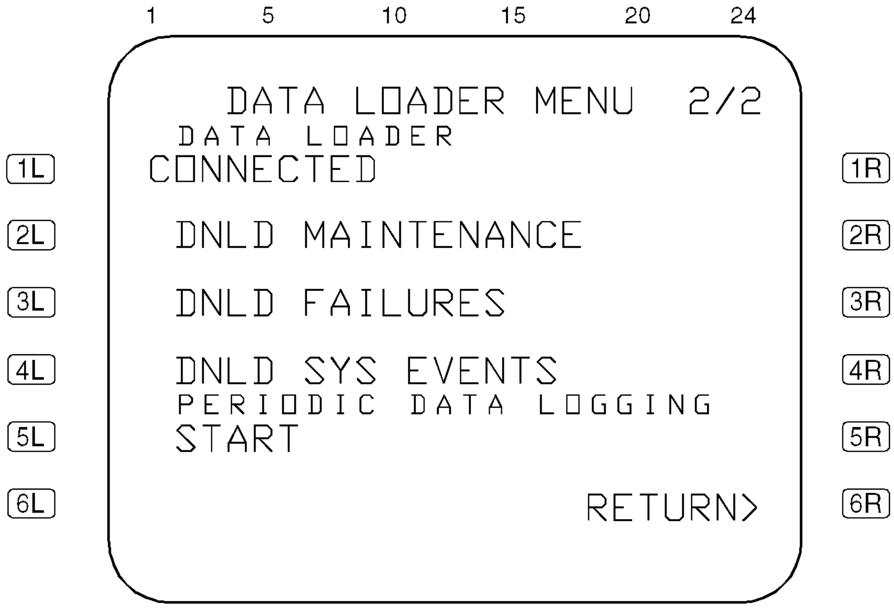
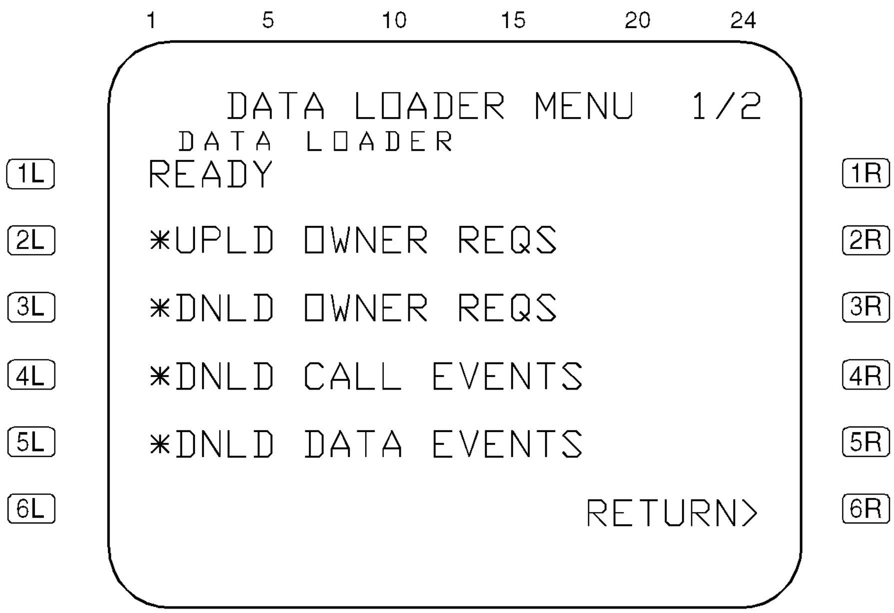
Figure 6-9 (Sheet 1). DATA LOADER MENU



DATA LOADER MENU PAGE 2- DATA LOADER CONNECTED BUT NOT READY FOR TRANSMISSION



DATA LOADER MENU PAGE 1- DATA LOADER READY FOR TRANSMISSION

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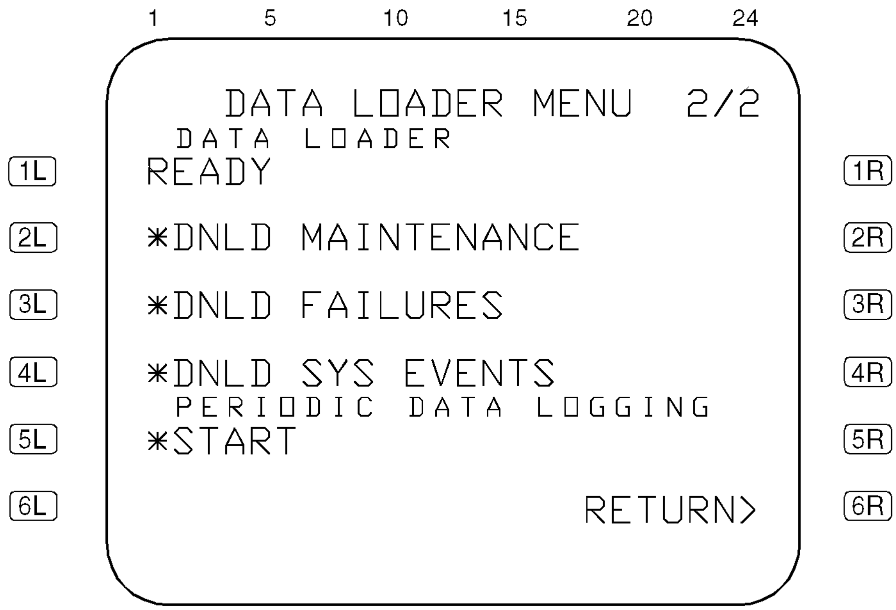
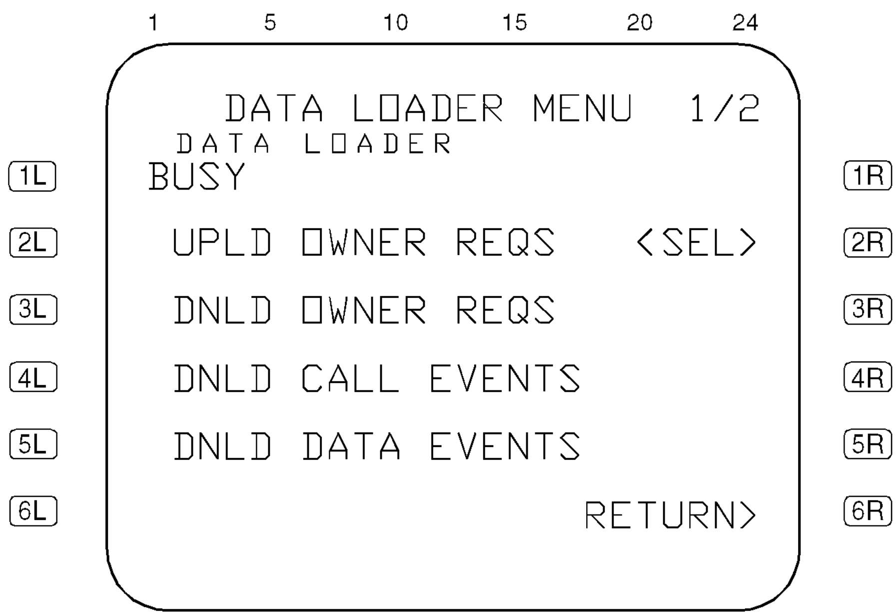
Figure 6-9 (Sheet 2). DATA LOADER MENU



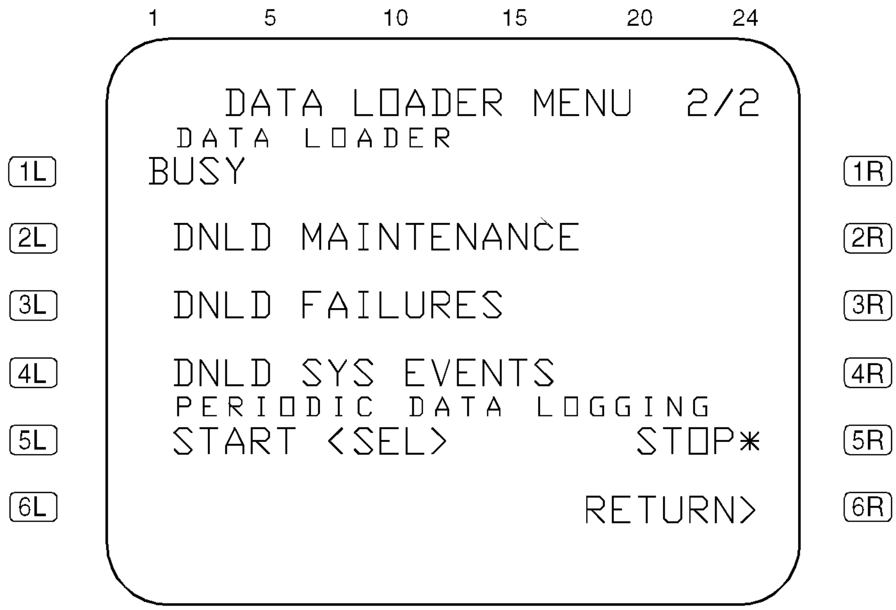
DATA LOADER MENU PAGE 2- DATA LOADER READY FOR TRANSMISSION



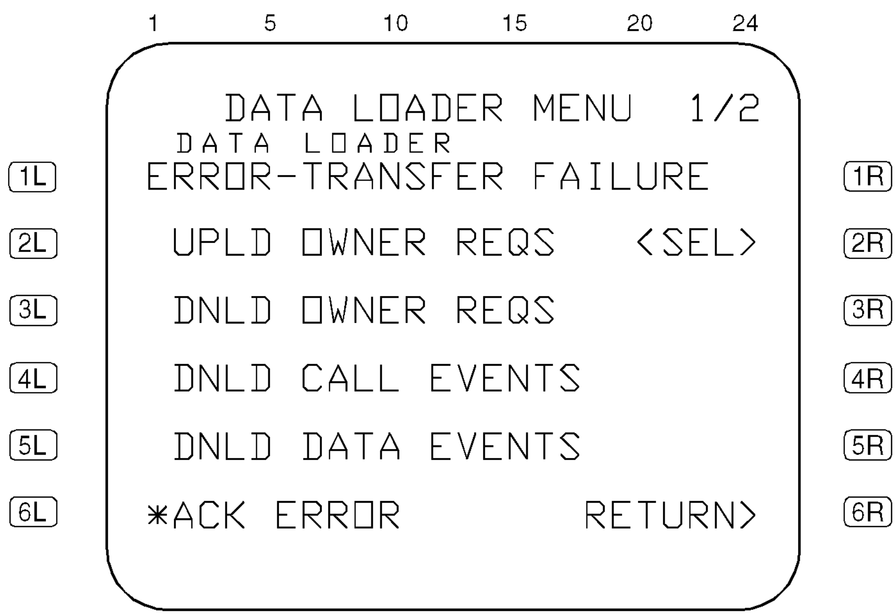
DATA LOADER MENU PAGE 1-DATA LOADER BUSY WITH SELECTED COMMAND

AD-68303@

Figure 6-9 (Sheet 3). DATA LOADER MENU



DATA LOADER MENU PAGE 2- DATA LOADER BUSY WITH SELECTED COMMAND



DATA LOADER MENU PAGE 1-TRANSFER FAILURES

AD-68304@

Figure 6-9 (Sheet 4). DATA LOADER MENU

d Several messages are displayed when the status of a data loader is ERROR . If the status becomes ERROR, an appropriate error message is appended to ERROR, separated by a dash. Possible error messages are displayed as follows:

- DISK FULL
- TRANSFER FAILURE
- FILE NOT FOUND
- CRC FAILURE
- BAD FILE HEADER
- BAD OWNER REQS VER
- OPEN DISK
- CLOSE DISK
- WRITE PROTECT
- COMPOSITE ORT NOT ALLOW.

e The TRANSFER FAILURE error message indicates an ARINC 615 protocol transfer failure (e.g., loss of communications). The OPEN DISK and CLOSE DISK error messages are displayed when an undefined disk command completion code is received. COMP ORT NOT ALLOW is indicated when a composite ORT version upload is attempted and the setting for ORT item liv does not allow it.

2 Fields 2L thru 5L

a These fields display prompts in the data line for commanding data loader actions. The prompts that can be displayed for the indicated DATA LOADER MENU page (1 or 2) are as given in Table 6-15.

Table 6-15. DATA LOADER MENU Page Prompts

LS Key	Display Prompt (Page 1)	Display Prompt (Page 2)
2L	UPLD OWNER REQS	DNLD MAINTENANCE
3L	DNLD OWNER REQS	DNLD FAILURES
4L	DNLD CALL EVENTS	DNLD SYS EVENTS
5L	DNLD DATA EVENTS	Refer to the description for the 5L and 5R keys

b The display prompts given in Table 6-15 command the following actions:

- UPLD OWNER REQS – upload owner requirements table
- DNLD OWNER REQS – download owner requirements table
- DNLD CALL EVENTS – download call event log
- DNLD DATA EVENTS – download data event log
- DNLD MAINTENANCE – download maintenance activity log
- DNLD FAILURES – download SDU/system failure log
- DNLD SYS EVENTS – download system management event log.

c Asterisks are only displayed beside the adjacent left LS key when the data loader status is READY (except as stated below). When asterisks are displayed, pushing the left LS key adjacent to the desired action commands the data loader to initiate that action. Prior to software package D2.0, asterisks are not displayed when the data loader status is either NOT CONNECTED, CONNECTED, BUSY, or ERROR.

d In addition, if the data loader status is READY but the log-on state is LOGGING-ON INOP, LOGGING-ON, LOGGED-ON AUTO, or LOGGED-ON CONSTRAINED; an asterisk is not displayed beside the UPLD OWNER REQS prompt. Scratchpad message 1 is issued if an LS key is pushed when no asterisks are displayed. For software packages D2.0 and after, uploads are allowed regardless of the log-on state (composite uploads are inhibited only by ORT item liv and not the log-on state).

e Once a left LS key is pushed, the <SEL> message is displayed to the right of the selected data loader action, right-justified. The data loader status changes to BUSY and data transfers occur. There is only one data loader command selected at a time. The <SEL> message remains displayed until the 6L key is pushed if the data loader status becomes ERROR after a left LS key is pushed. When the data transfer is completed, or after an error has been acknowledged, the <SEL> message is removed and the data loader status changes appropriately.

3 Fields 5L and 5R

a PERIODIC DATA LOGGING is displayed on page 2 in the label line beginning in column 2. In the data line, START is displayed adjacent to the 5L key. No asterisk is displayed beside the 5L key when the data loader status is either NOT CONNECTED, CONNECTED, BUSY, or ERROR.

b When the START prompt is selected by pushing the 5L key when the data loader status is READY:

- Periodic data logging starts
- The asterisk next to START is removed
- The <SEL> message is displayed beginning in column 8
- STOP is displayed adjacent to the 5R key.

c Periodic data logging continues until the 5R key is pushed, at that time the data line display reverts to its original state (i.e., only the START prompt with or without an asterisk as appropriate).

d The <SEL> message remains displayed and the STOP prompt is blanked if the data loader status changes to ERROR after periodic data logging has started. This condition remains until the error is acknowledged by pushing the 6L key and/or the data loader status changes, at that time the data line display changes as appropriate.

4 Field 6L

a 6L - This data line displays the *ACK ERROR prompt. This prompt is displayed when the data loader status is ERROR. Pushing the 6L key causes the SDU to remove the ERROR status and display the current data loader status (i.e., NOT CONNECTED or CONNECTED) in the 1L data line.

b The SDU completes the upload/download data transfer by commanding the data loader transfer complete function. The data loader responds with a TRANSFER COMPLETE indication and enters a no loop. To return the data loader to the READY state, the user must cause the data loader to read the configuration file on the diskette (i.e., cycle data loader power or remove/insert the diskette).

5 Field 6R

a 6R - This data line displays the RETURN> prompt. Pushing the 6R key causes the display to revert to the SATCOM SUBMENU page (or SATCOM MAINTENANCE page) as appropriate.

(8) LAST LEG REPORT Page

(a) Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of this page is to display Class 1 and 2, Level 1 diagnosed, failures reported during the last leg. See Figure 6-10 for example pages.

(b) The Last Leg Report lists two failures per page if a failure is present during the last leg. These two sets of lines display Class 1 and 2, Level 1 diagnosed, last leg failures. Failures are displayed in chronological order (i.e., the most recent detected failure last) with no more than two failures displayed per page. The number of LAST LEG REPORT pages depends on the number of failures to report (up to a maximum of 99 pages). When there is an odd number of failures to report, the odd failure is displayed on a page of its own in lines 5, 6, and 7, and lines 9, 10, and 11 are blank. If there are no failures to report, lines 6, 7, 9, 10, and 11 are blank. Line 5 displays NO FAULT DETECTED beginning in column 4 if there are no failures to report.

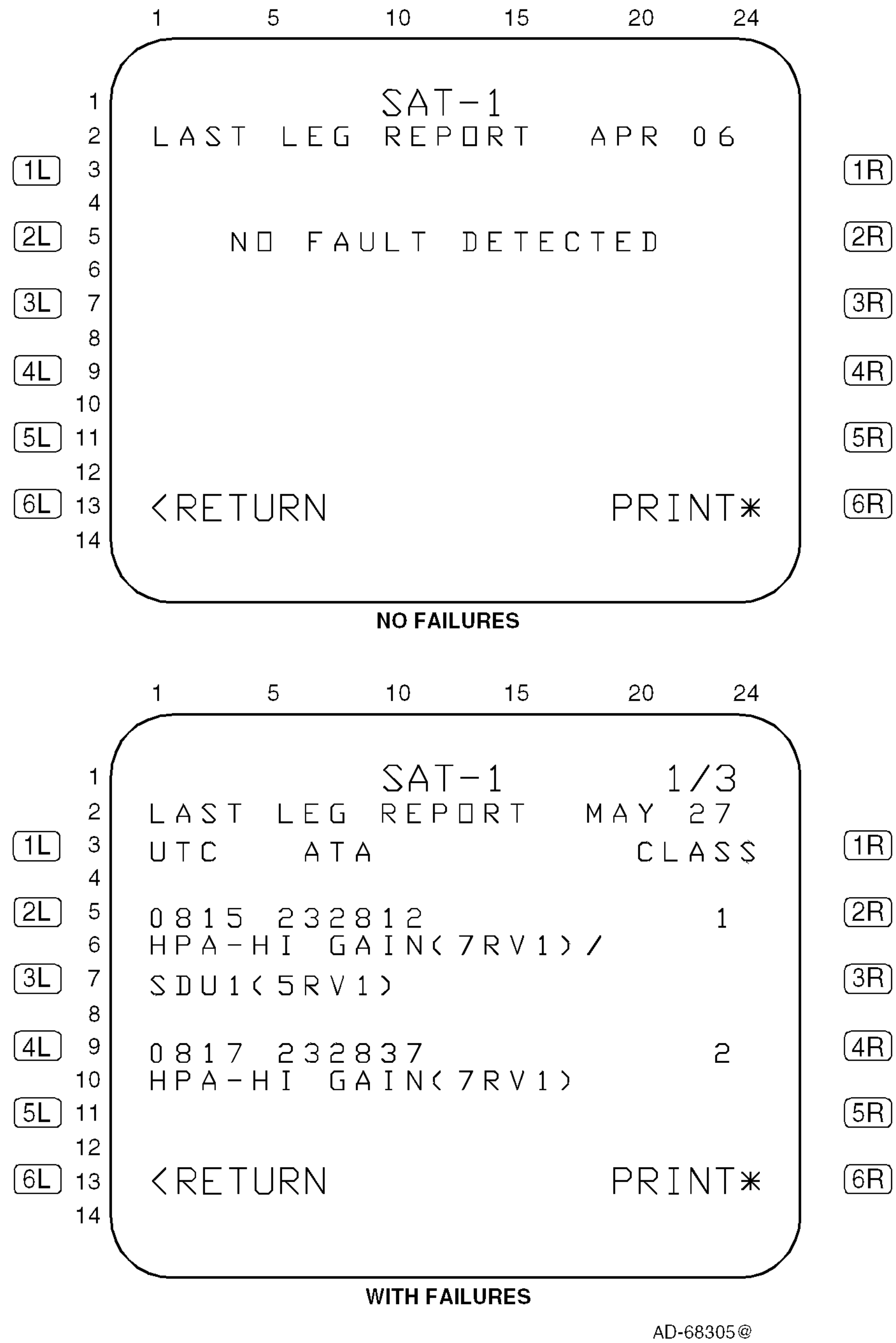


Figure 6-10. LAST LEG REPORT Page

(c) Line 5 and, if applicable, line 9 display the universal time coordinated (UTC) beginning in column 1, and ATA beginning in column 6, and the class number in column 23.

(d) The UTC is displayed as hhmm, where hh represents the UTC hours from 00 to 23, and mm represents the UTC minutes from 00 to 59. The UTC is the time of the failure reporting as stored in the SDU system failure memory log. Dashes are displayed if no valid UTC data is available.

(e) The ATA number is displayed as aaaaaa, where aaaaaa represents the ATA reference number of the reported failure as specified in paragraph 3.E. for each type of CFDS. For CFDS type none, no ATA number is displayed.

(f) The class number is displayed as c, where c represents the class (1 or 2) of the failure.

(9) PREVIOUS LEGS REPORT Page

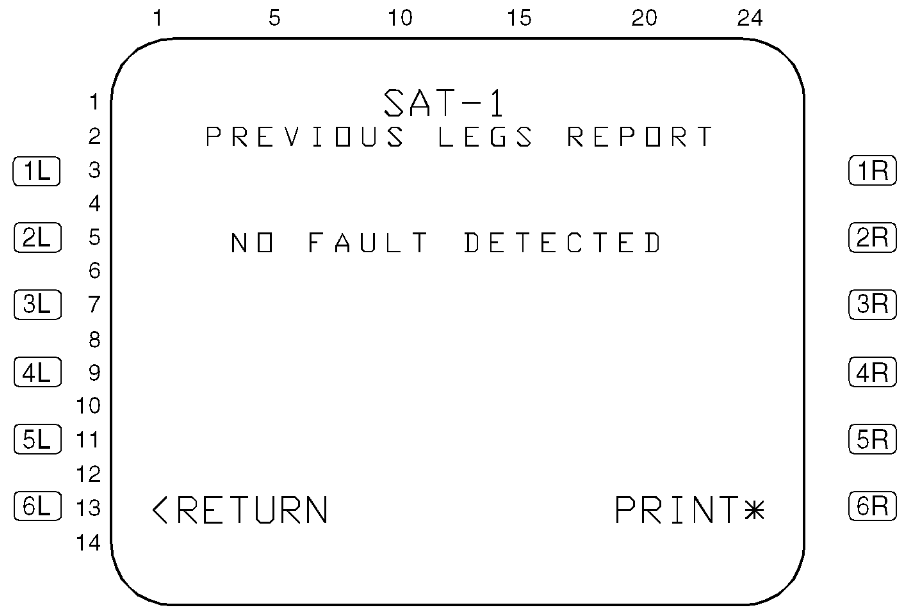
(a) Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of this page is to display Class 1 and 2, Level 1 diagnosed, failures reported during previous legs. See Figure 6-11 for example pages.

(b) The Previous Leg Report lists two failures per page if a failure was present during the previous leg. These two sets of lines display Class 1 and 2, Level 1 diagnosed, last leg failures. Failures within each flight leg are displayed in chronological order (i.e., the most recent detected failure last) with no more than two failures displayed per page. However, the flight leg display is in reverse chronological order (i.e., flights go back in time while failures for each individual flight go forward in time).

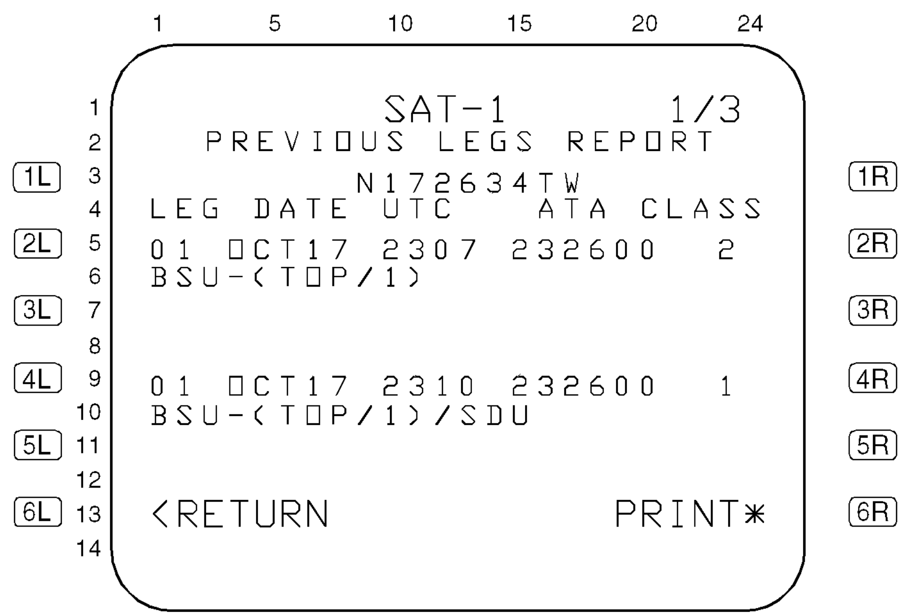
(c) The number of PREVIOUS LEGS REPORT pages depends on the number of failures to report (up to a maximum of 99 pages). If there are no failures to report, lines 6, 7, 9, 10, and 11 are blank. Line 5 displays NO FAULT DETECTED beginning in column 4 if there are no failures to report.

(d) Failures from different flight legs with the same aircraft identification are mixed on the same page. When the last leg falls in lines 5, 6, and 7, failures from the previous flight leg are displayed on the same page in lines 9, 10, and 11.

(e) When the given flight leg has a different aircraft identification recorded than the flight leg before it, the failure display begins in lines 5, 6, and 7 on the next page of the multiple page sequence. When there are no failures to report for a given flight leg, nothing is reported for that flight leg (i.e., the flight leg is skipped).



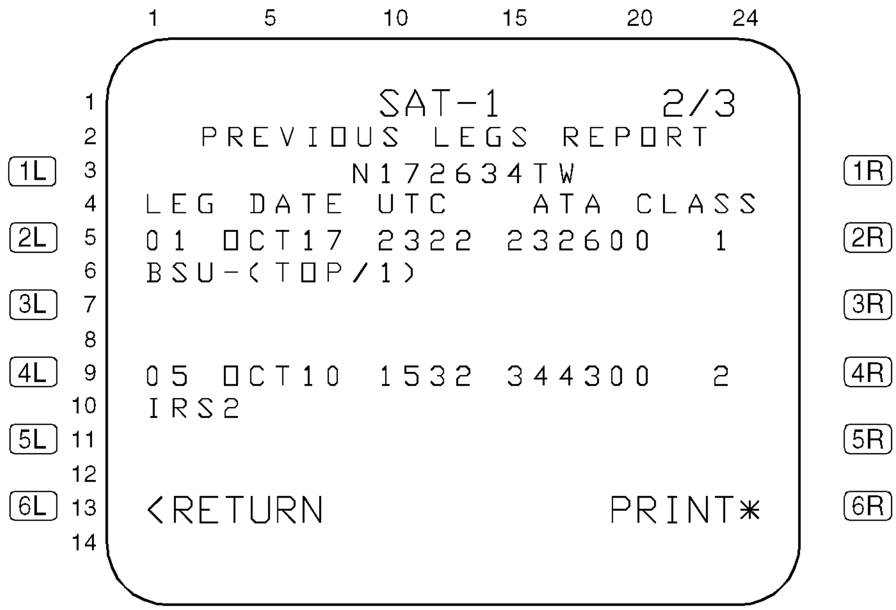
NO FLIGHT LEGS RECORDED IN FAILURE MEMORY LOG



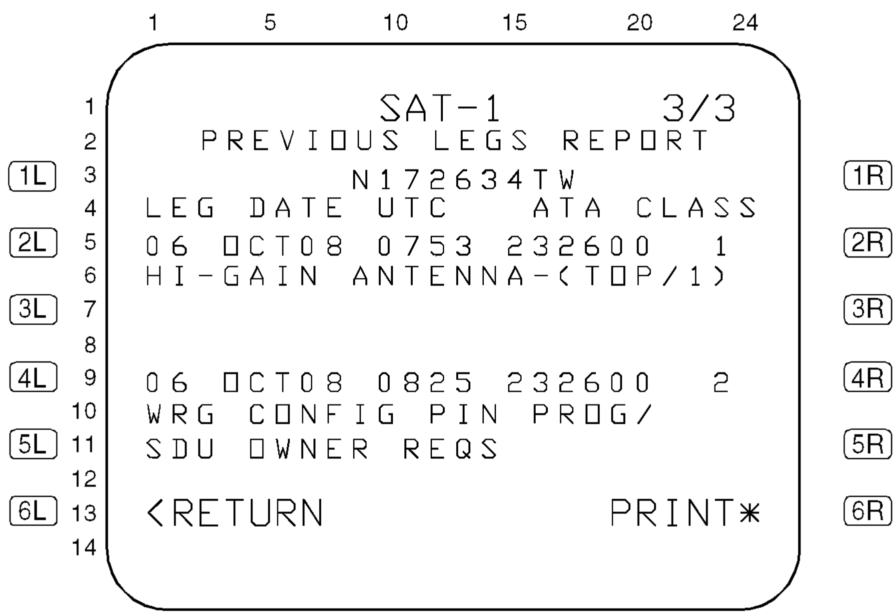
WITH REPORTED FAILURES

AD-68306@

Figure 6-11 (Sheet 1). PREVIOUS LEG REPORT Page



WITH REPORTED FAILURES



WITH REPORTED FAILURES

AD-68307@

Figure 6-11 (Sheet 2). PREVIOUS LEG REPORT Page

(f) Line 5 and line 9 (if applicable) display the flight leg number beginning in column 1, the UTC beginning in column 10, and the ATA number beginning in column 15.

(g) The flight leg is displayed as fl, where fl represents the flight leg number from 01 to either:

- The number of flight legs recorded in the SDU system failure memory log
- 63 flight legs
- From 01 to the maximum number of flight legs that can be displayed given the PREVIOUS LEGS REPORT page limit of 99.

(h) The date is displayed as mmmdd, where mmm represents the month of the year as JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC, and dd represents the day of the month from 01 to 31. The date is the date of the flight leg number as stored in the SDU system failure memory log. Dashes are displayed if no valid UTC data is available.

(i) The UTC time is displayed as hhmm, where hh represents the UTC hours from 00 to 23, and mm represents the UTC minutes from 00 to 59. The UTC is the time of the failure reporting as stored in the SDU system failure memory log. Dashes are displayed if no valid UTC data is available.

(j) The ATA number is displayed as aaaaaa, where aaaaaa represents the ATA reference number of the reported failure as specified in paragraph 3.E. for each type of CFDS. For CFDS type none, no ATA number is displayed.

(k) The class number is displayed as c, where c represents the class (1 or 2) of the failure.

(10) LRU IDENTIFICATION Page

(a) Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of this page is to display a list of all installed LRUs with their associated part numbers, modification levels, and serial numbers, and to display ORT identification data. See Figure 6-12 for example pages.

(b) If a Honeywell/Racal HPA is installed, the associated part/serial number is displayed; otherwise the HPA display entry is removed. The number of LRU IDENTIFICATION pages depends on the number of LRUs to list.

(c) For the LRUs, line 4 and, if applicable, line 9 display a three letter acronym representing the installed LRU. The possible LRU acronyms are given in Table 6-16.

Table 6-16. LRU Acronyms

LRU Acronym	LRU Name
SDU	Satellite Data Unit
HPH	High Power Amplifier - High Gain Antenna
HPL	High Power Amplifier - Low Gain Antenna

(d) For the LRUs, line 5 and, if applicable, line 10 display P/N beginning in column 1, the LRU end-item part number beginning in column 6, and the software modification level in columns 23 and 24.

(e) The P/N is displayed as bbbbbbb-hhsss, where bbbbbbb-hhsss represents the LRU end-item part number consisting of a seven-digit LRU base part number (i.e., bbbbbbb), a two-digit hardware configuration number (i.e., hh), and a three-digit software configuration number (i.e., sss). Dashes are displayed if no valid data is available.

(f) The software modification level is displayed as nn, where nn represents up to a two-character LRU software modification level.

(g) Line 6 and, if applicable, line 11 display S/N beginning in column 1 and the LRU serial number beginning in column 5. The S/N is diplayed as ssssssss, where ssssssss represents the LRU serial number. Dashes are displayed if no valid data is available.

(h) For the Honeywell/Racal MCS system, the two-digit LRU hardware and LRU serial number must be manually entered through the CMT interface for valid data to be available for display. This data is stored during an LRU end-item test. All other numbers reside within the LRU software. For non-Honeywell/Racal interfacing HPAs, no such data is available to the SDU, therefore, dashes are displayed for the HPA part/serial numbers.

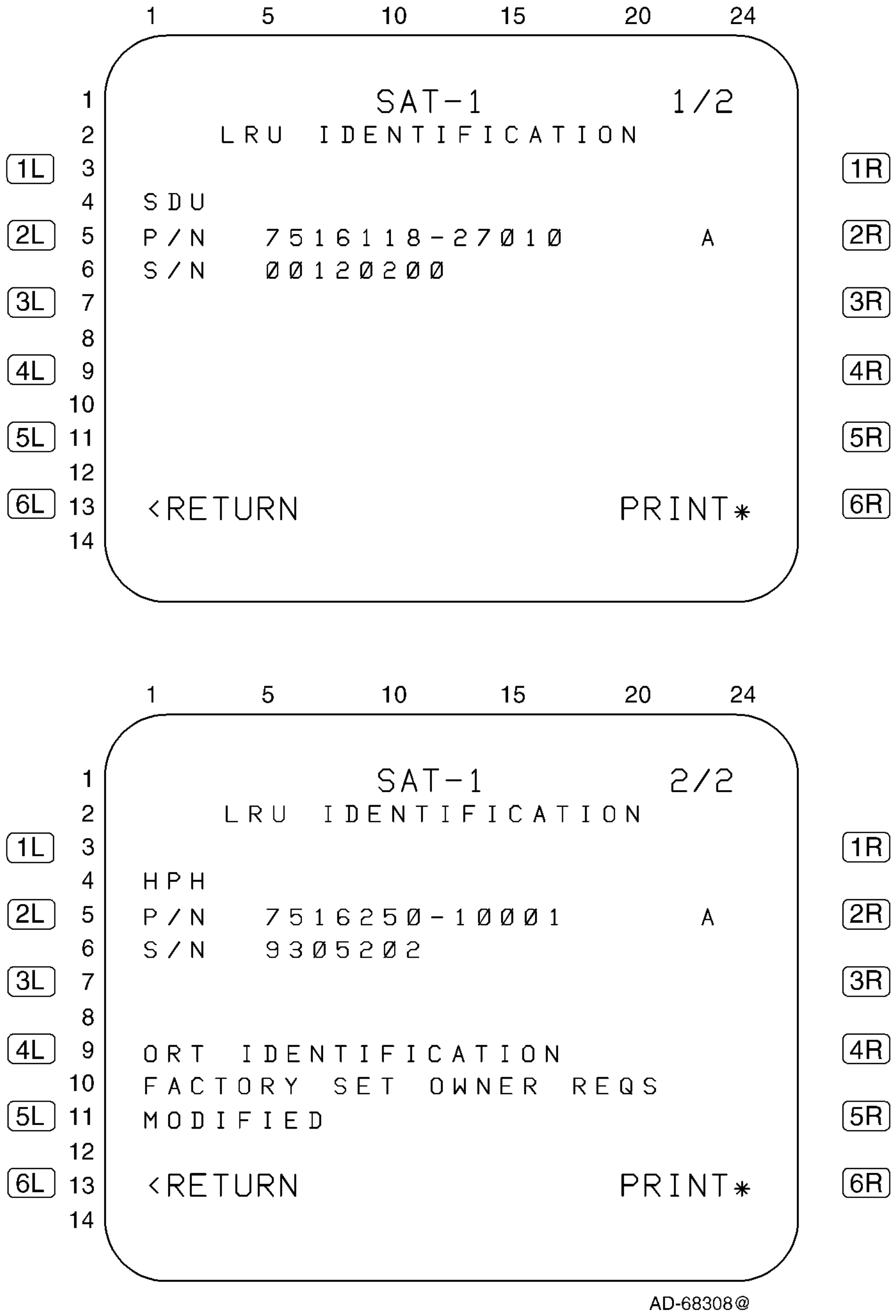
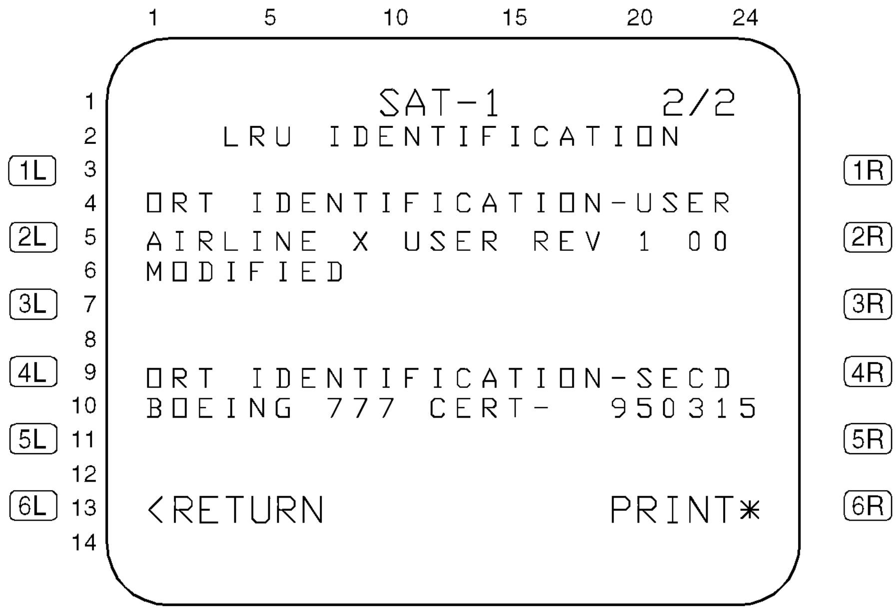


Figure 6-12 (Sheet 1). LRU IDENTIFICATION Page



ORT PARTITION EXAMPLES

AD-68309@

Figure 6-12 (Sheet 2). LRU IDENTIFICATION Page

(i) The ORT identification is displayed in either lines 4, 5, and 6, or in lines 9, 10, and 11 depending on where the LRU list falls. Line 4 or line 9, as appropriate, displays the header ORT IDENTIFICATION left-justified. If the ORT is a partitioned version, the text, -USER, is added to the end of the header text. Line 5 or line 10, as appropriate, displays the ORT 24-character description as contained in ORT item xxxiii (refer to Appendix B). Line 6 or line 11, as appropriate, displays MODIFIED left-justified, if the state of ORT item xxxvii (refer to Appendix C) is modified. If the state of ORT item xxxvii is unmodified, the MODIFIED flag is not displayed.

(j) If the ORT is loaded as separate partitions, the secured ORT identification is displayed in either lines 4, 5, and 6, or in lines 9, 10, and 11 depending on where the first ORT ident falls. Line 4 or line 9, as appropriate, displays the header ORT IDENTIFICATION-SECD left-justified. Line 5 or line 10, as appropriate, displays the ORT 24-character description as contained in ORT item liii (refer to Appendix C) for the secured partition. Line 6 or line 11, as appropriate, displays MODIFIED left-justified, if the state of the ORT secured partition modified flag (refer to Appendix C) is modified. If the state of the ORT secured partition modified flag is unmodified, the MODIFIED flag is not displayed.

(11) TROUBLE SHOOTING DATA Page

(a) General

1 Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of this page is to display Class 1 and 2, Level 1, diagnosed failures reported during the last leg and previous legs. See Figure 6-13 for example pages.

2 The Trouble Shooting Data pages display the class 1 and 2 last leg and previous legs failure details. Failures are displayed in chronological order (i.e., the most recent detected failure last) with one failure displayed per page. Flight leg display order is reverse chronological (i.e., flights go back in time while failures for each individual flight go forward in time). The number of pages depends on the number of failures to report (up to 64 flight legs or 99 pages).

(b) Data Fields

1 Line 4

a Line 4 displays the date beginning in column 2 and the UTC beginning in column 8. The date and time are displayed as follows.

b The month is displayed as mmm, where mmm represents the month of the year as JAN, FEB, MAR, APR, MAY JUN, JUL, AUG, SEP, OCT, NOV, or DEC.

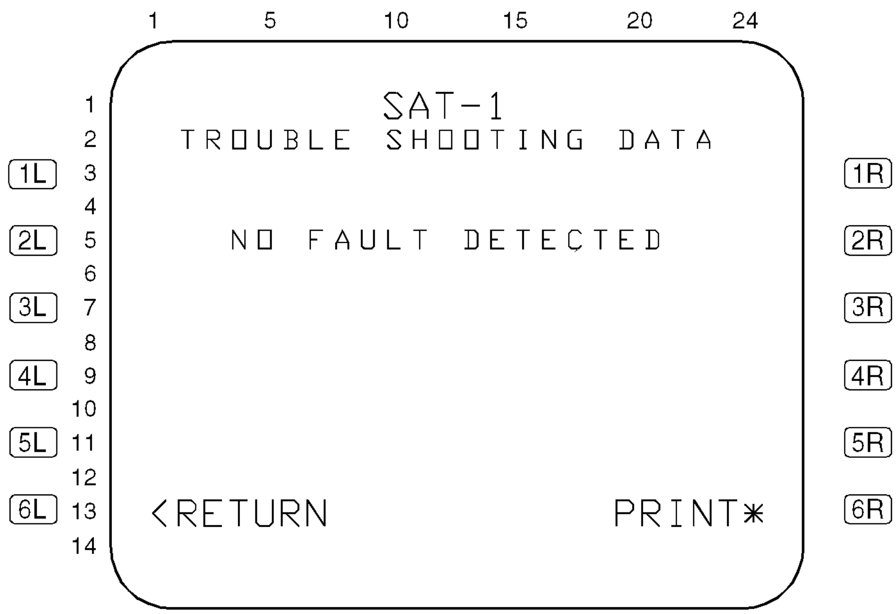
c The day is displayed as dd, where dd represents the day of the month from 01 to 31.

d The UTC is displayed as hh:mm, where hh represents the UTC hours from 00 to 23 and mmm represents the UTC minutes from 00 to 59. The UTC is the time the failure was stored in the failure memory log on this flight leg. Dashes are displayed if no valid UTC data is available.

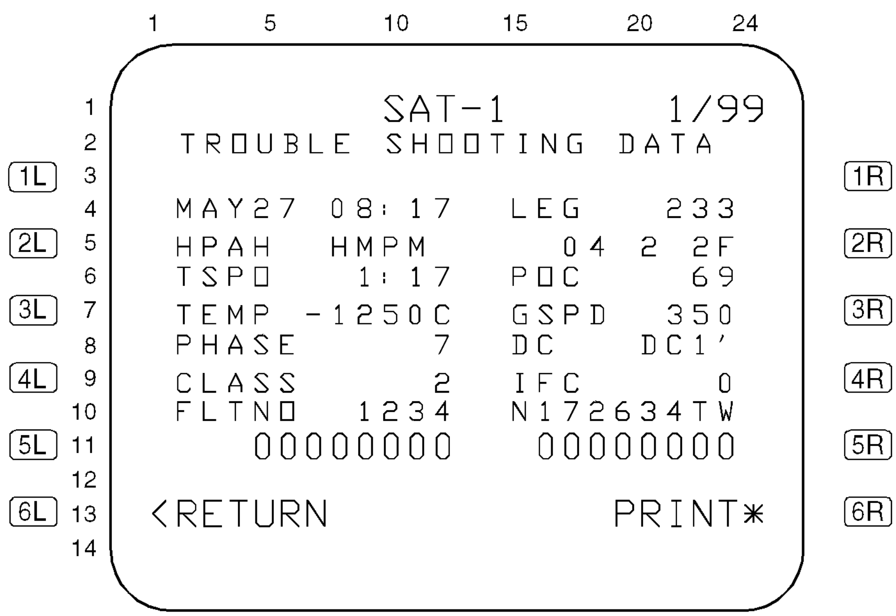
e Line 4 displays the header, LEG, beginning in column 15 and the flight leg count right-justified from column 23.

2 Line 5

a Line 5 displays beginning in column 2 the LRU abbreviated name of up to five characters that corresponds to the level 1 failure code. The SRU abbreviated name of up to five characters is displayed beginning in column 8. If the SRU designation in the failure code is 0, no SRU abbreviation is displayed. The LRU failure code is displayed as two hexadecimal digits beginning in column 17. The SRU failure code is displayed as one hexadecimal digit beginning in column 20. The failure code is displayed as two hexadecimal digits beginning in column 22.



NO FAILURES



LAST LEG AND PREVIOUS LEGS FAILURES

AD-68310@

Figure 6-13. TROUBLE SHOOTING DATA Page

3 Line 6

a Line 6 displays the time since power-on (TSPO) header beginning in column 2, and the LRU power-on counter (POC) header beginning in column 15. The LRU time since power-on is displayed right-justified from column 12.

b The TSPO is displayed as hhh:mm, where hhh represents the hours of the elapsed time since the unit powered up from 0 to 999, and mm represents the minutes portion of the elapsed time from 0 to 59.

c Line 6 displays the power-on count value from 0 to 65535 right-justified from column 23.

4 Line 7

a Line 7 displays the headers, TEMP, beginning in column 2, and groundspeed (GSPD), beginning in column 15. The LRU-failed SRU (or PSU) temperature is displayed right-justified from column 12. Dashes are displayed if no valid temperature data is available. The GSPD is displayed right-justified from column 23.

5 Line 8

a Line 8 displays the headers, PHASE, beginning in column 2, and DC, beginning in column 15. The flight phase is displayed right-justified from column 12. If a numbered flight phase is not available, then an **a** or **g** is shown in column 12, as appropriate. The DC state is displayed as DC0, DC0’, DC1, DC1’, or DC2 right-justified from column 23.

6 Line 9

a Line 9 displays the headers, CLASS, beginning in column 2, and IFC, beginning in column 15. The failure class is displayed in column 12. The intermittent failure count is displayed in column 23.

7 Line 10

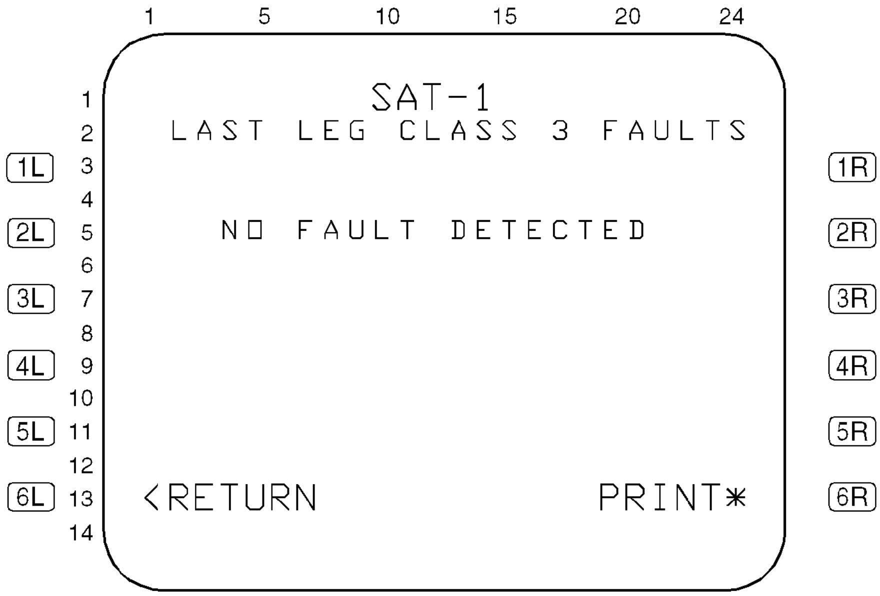
a Line 10 displays the header FLTNO beginning in column 2. The flight number is displayed right-justified from column 12. The aircraft tail number is displayed right-justified from column 23. Dashes are displayed if no valid flight number or tail number data is available.

8 Line 11

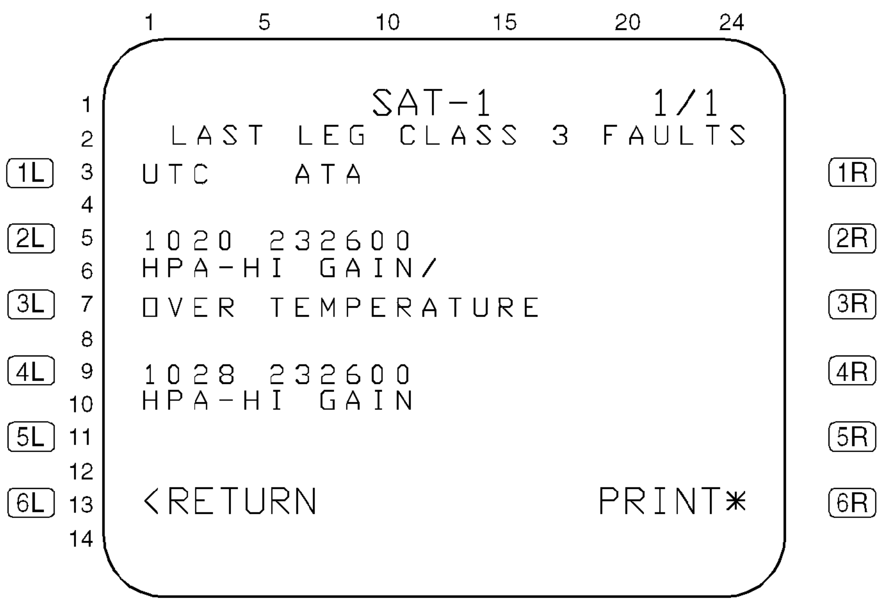
a Line 11 displays the failure parameter as eight hexadecimal digits beginning in column 5. The associated parameter is displayed as eight hexadecimal digits beginning in column 16.

(12) LAST LEG CLASS 3 FAULTS Page

(a) Access to this page is from the SAT-N (CFDS SATCOM Maintenance Menu) page. The purpose of this page is to display Class 3, Level 1 diagnosed, failures reported during the last leg. See Figure 6-14 for example pages.



NO CLASS 3 FAILURES



WITH CLASS 3 FAILURES

AD-68311@

Figure 6-14. LAST LEG CLASS 3 FAULTS Page

(b) The Last Leg Class 3 Faults lists two Class 3 faults per page if Class 3 faults are present during the last leg. These two sets of lines display Class 3, Level 1 diagnosed, last leg failures. Failures are displayed in chronological order (i.e., the most recent detected failure last) with no more than two failures displayed per page.

(c) The number of LAST LEG CLASS 3 FAULTS pages depends on the number of failures to report (up to a maximum of 99 pages). When there is an odd number of failures to report, the odd failure is displayed on a separate page in lines 5, 6, and 7, and lines 9, 10, and 11 are blank. If there are no failures to report, lines 6, 7, 9, 10, and 11 are blank. Line 5 displays NO FAULT DETECTED beginning in column 4 if there are no failures to report.

(d) Line 5 and, if applicable, line 9 display the UTC beginning in column 1 and the ATA number beginning in column 6.

(e) The UTC number is displayed as hh:mm, where hh represents the UTC hours from 00 to 23, and mm represents the UTC minutes from 00 to 59. The UTC is the time of the failure reporting as stored in the SDU system failure memory log. Dashes are displayed if no valid UTC data is available.

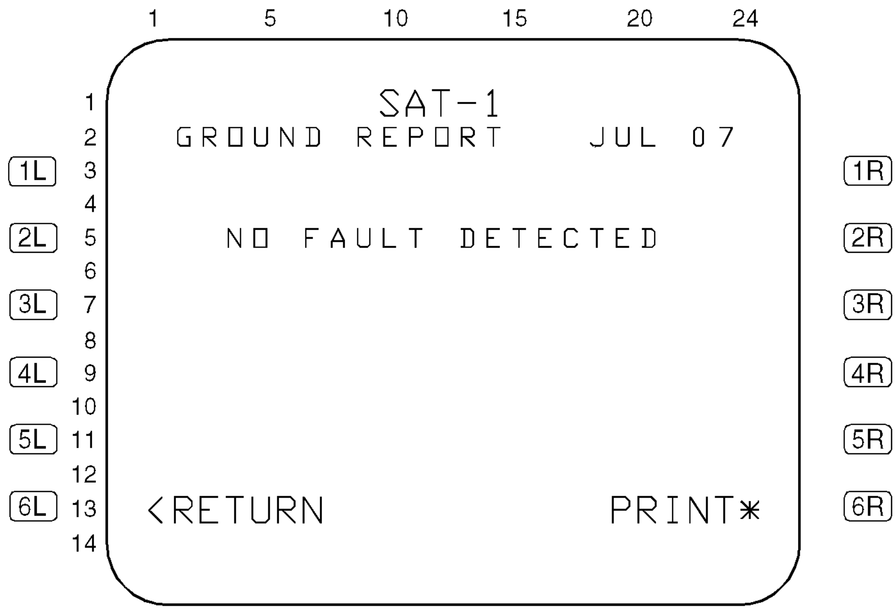
(f) The ATA number is displayed as aaaaaa, where aaaaaa represents the ATA reference number of the reported failure as specified in paragraph 3.E. for each type of CFDS. For CFDS type none, no ATA number is displayed.

(13) GROUND REPORT Page

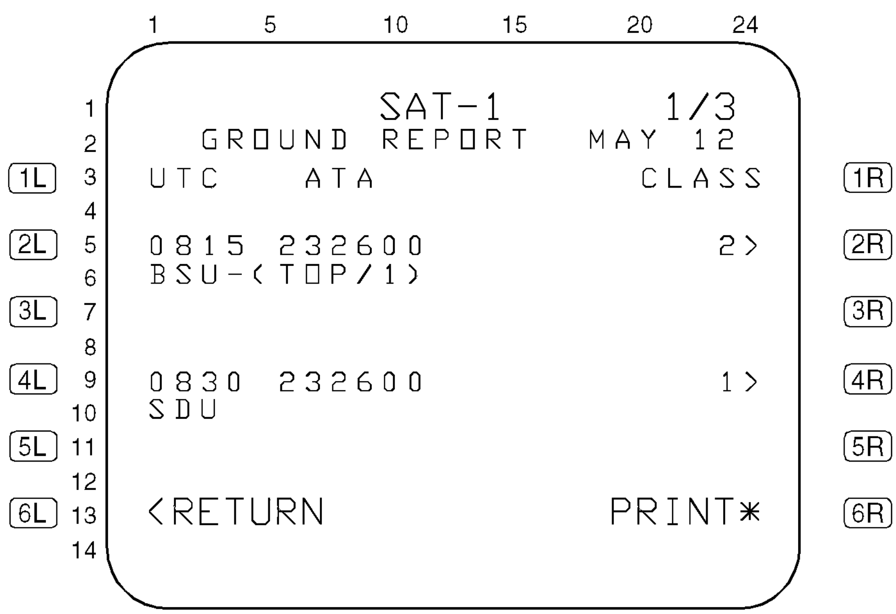
(a) Access to this page is from the SAT-N (i.e., SATCOM MAINTENANCE) page. The purpose of this page is to display Class 1, 2, or 3, Level 1 diagnosed ground failures that occurred during the last leg. See Figure 6-15 for example pages.

(b) The Ground Report lists two failures per page if failures are detected during the last leg. These two sets of lines display Class 1, 2, and 3, Level 1 diagnosed, last leg failures. Failures are displayed in chronological order (i.e., the most recent detected failure last) with no more than two failures displayed per page.

(c) The number of GROUND REPORT pages depends on the number of failures to report (up to 99 pages). When there is an odd number of failures to report, the odd failure is displayed on a separate page in lines 5, 6, and 7, and lines 9, 10, and 11 are blank. If there are no failures to report, lines 6, 7, 9, 10, and 11 are blank. Line 5 displays NO FAULT DETECTED beginning in column 4 if there are no failures to report.



NO FAILURES



WITH FAILURES

AD-68312@

Figure 6-15. GROUND REPORT Page

(14) GROUND REPORT (TROUBLE SHOOTING DATA) Page

(a) General

1 Access to this page is from the GROUND REPORT page. The purpose of this page is to display Class 1, 2, or 3, Level 1 diagnosed ground failures that occurred during the last leg ground report. See Figure 6-16 for example pages.

2 One failure is listed per page if a failure is present. These lines display Class 1, 2, and 3, Level 1 diagnosed, last leg ground report failure details corresponding to the Level 1 failures from which the troubleshooting data was initiated. Failures are displayed in chronological order (i.e., the most recent detected failure last) with one failure displayed per page.

(b) Data Fields

1 Line 4

a Line 4 displays the date beginning in column 2 and the UTC beginning in column 8. The date and time are displayed as follows.

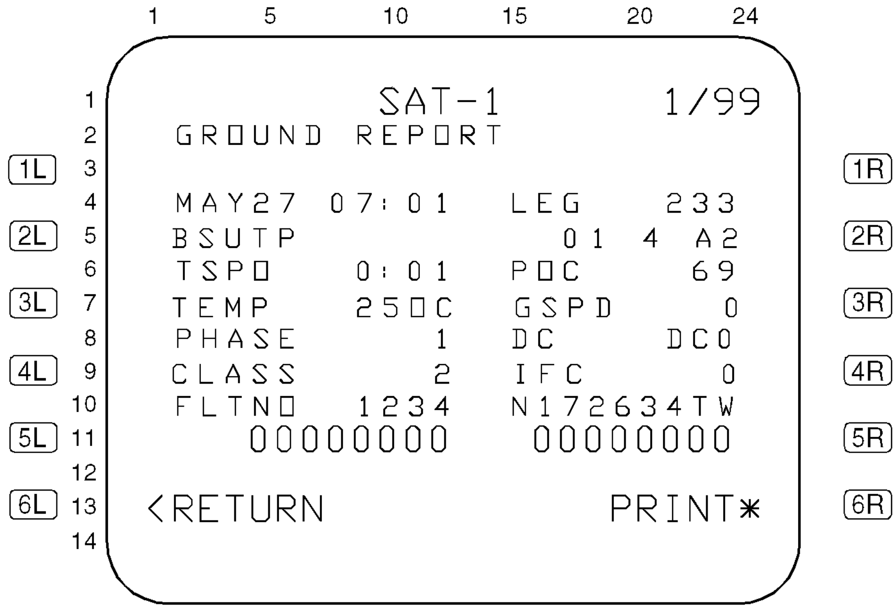
b The month is displayed as mmm, where mmm represents the month of the year as JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC.

c The day is displayed as dd, where dd represents the day of the month from 01 to 31.

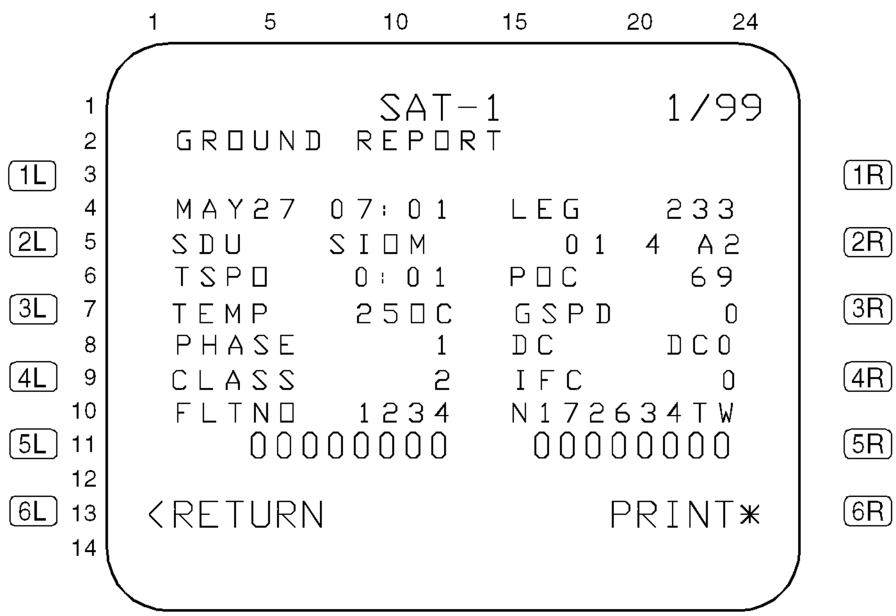
d The UTC is displayed as hh:mm, where hh represents the UTC hours from 00 to 23 and mm represents the UTC minutes from 00 to 59. The UTC is the time the failure was stored in the failure memory log on this flight leg. Dashes are displayed if no valid UTC data is available.

2 Line 5

a Line 5 displays the LRU abbreviated name of up to five characters that corresponds to the Level 1 failure code. The SRU abbreviated name of up to five characters is displayed beginning in column 8. If the SRU designation in the failure code is 0, no SRU abbreviation is displayed. The LRU failure code is displayed as two hexadecimal digits beginning in column 17. The SRU failure code is displayed as one hexadecimal digit beginning in column 20. The failure code is displayed as two hexadecimal digits beginning in column 22.



FOR CLASS 2 FAILURE



FOR CLASS 1 FAILURE

AD-68313@

Figure 6-16. GROUND REPORT TROUBLE SHOOTING DATA Page

3 Line 6

a Line 6 displays the headers, TSPO, beginning in column 2 and, POC, beginning in column 15. The LRU time since power-on is displayed right-justified from column 12.

b The UTC is displayed as hh:mm, where hh represents the UTC hours from 00 to 23 and mm represents the UTC minutes from 00 to 59. The UTC is the time the failure was stored in the failure memory log on this flight leg. Dashes are displayed if no valid UTC data is available.

c Line 6 displays the power-on count value from 0 to 65535 right-justified from
column 23.

4 Line 7

a Line 7 displays the headers, TEMP, beginning in column 2, and GSPD, beginning in column 15. The LRU-failed SRU (or PSU) temperature is displayed right-justified from column 12. Dashes are displayed if no valid temperature data is available. The groundspeed is displayed right-justified from column 23.

5 Line 8

a Line 8 displays the headers, PHASE, beginning in column 2, and DC, beginning in column 15. The flight phase is displayed right-justified from column 12. If a numbered flight phase is not available, then an **a** or **g** is shown in column 12, as appropriate. The DC state is displayed as DC0, DC0', DC1, DC1', or DC2 right-justified from column 23.

3. Maintenance Computer Interface

A. General

(1) The SDU is designed to interface with the Boeing 747-400 Central Maintenance Computer (CMC) or the Boeing 777 On-board Maintenance System (OMS), the Airbus Central Fault Display System (CFDS), and the McDonnell Douglas CFDS in accordance with guidelines outlined in Boeing documents D220U050 (747-400 CMC - release date 3 June 1991) and D243W201-1 (777 OMS - release date 30 October 1992) and Airbus document ABD0048 issue C, all of which supersede ARINC 604 for their respective applications.

(2) The Boeing maintenance computers (i.e., 747-400 CMC and 777 OMS) are virtually indistinguishable to the SDU. The operations to support these two systems are very similar and, therefore, are presented together. The operations to support the Airbus and McDonnell Douglas maintenance computers are very similar and, therefore, are presented together. The SDU determines the aircraft type on which the SDU is installed, and then supports only the functionality required by that particular system.

B. Boeing 747-400 CMC/777 OMS

(1) General

(a) The CMC and SDU communicate with each other through an ARINC 429 data bus using ARINC 429 words.

(b) When the SDU receives the standard ground test command containing its equipment ID and source destination identifier (SDI), the SDU responds by setting the command word (ARINC label 350) acknowledge bit to ACK for four seconds. The SDU initiates a system-wide functional test. As soon as possible during the execution of the functional test, the SDU sets the SSM for ARINC label 350 to functional test.

(2) CMC to SDU Communication - Automatic Fault Reporting

(a) The CMC and SDU communicate with each other through an ARINC 429 data bus using ARINC 429 words.

(b) When the SDU receives the standard ground test command containing its equipment ID and source destination identifier (SDI), the SDU responds by setting the command word (ARINC label 350) acknowledge bit to ACK for 4 seconds. The SDU then initiates a system-wide functional test. As soon as possible during the execution of the functional test, the SDU sets the SSM for ARINC label 350 to functional test.

(c) At the conclusion of the functional test, the SDU builds the fault summary words using ARINC labels 350 thru 354 by mapping currently active failures to the appropriate bits in the words. Once the words are built they are latched for 30 seconds, then the SDU returns to automatic fault reporting. The SDU continuously transmits the fault summary words to the CMC at a rate of 1 to 2 Hz, with the SSM bits set to normal operation during reporting of the test results.

(3) CMC Interactive Mode

(a) The SDU supports configuration data in CMC interactive mode for a Boeing 777 installation. If the CMC transmits a configuration data interactive mode command addressed to the SDU on ARINC label 227, the SDU processes the command by supplying the first page of configuration information and then resumes automatic mode processing. The configuration data command is used to display configuration information for the SATCOM LRUs (SDU and HPAs). The SDU responds to the configuration data command from the automatic mode.

(b) The SDU does not support ground test and shop faults in CMC interactive mode. If the CMC transmits a ground test or shop faults interactive mode command addressed to the SDU on label 227, the SDU ignores the command.

(4) Configuration Data Messages

(a) General

1 When configuration data is commanded, the MCS configuration data page(s) is(are) displayed. These data pages display installed LRUs as determined by the SDU system configuration pin settings with their associated part/serial number data. These lines also display the ORT identification along with modification status. Figure 6-17 supplies an example of the configuration data page.

2 The ORT 24-character description as contained in ORT item xxxiii is displayed. For non-777 installations, the text is limited to 20 characters per line.

(b) USER ORT STATUS

1 This displays MODIFIED if the state of the ORT user partition is modified, otherwise no status or header is displayed.

(c) SECD ORT IDENTIFICATION

1 This is the 24-character description as contained in ORT item liii. For non-777 installations, the text is limited to 20 characters per line.

(d) SECURED ORT STATUS

1 This displays MODIFIED if the state of the ORT secured partition is modified, otherwise, no status or header is displayed. For software package C3.5, the ORT is not partitioned so only a single ORT IDENTIFICATION is supplied for the ORT display lines.

```
USER ORT IDENTIFICATION
        FACTORY SET  OWNER REQS
USER ORT STATUS:
        MODIFIED
SECD ORT IDENTIFICATION
        BOEING 777 - XXXXXXXXXXX
<OPTIONAL BLANK LINE>
SDU PART NUMBER:
        ;7516100-20050  AA
SDU SERIAL NUMBER:
        12345678
SDU S/W PART NUMBER:
        PSXXXXXX-XXX
SDU CONFIG STRAPS:
        FFFFFFFFFF
<OPTIONAL BLANK LINE>
HPH PART NUMBER:
        7516250-10001  AA
HPH SERIAL NUMBER:
        12345678
<OPTIONAL BLANK LINE>
HPL PART NUMBER:
        7516250-10001  AA
HPL SERIAL NUMBER:
        12345678
```

NOTE: THE OPTIONAL BLANK LINES IN THIS EXAMPLE ARE USED TO ENHANCE THE READABILITY OF THE MULTIPLE LRU RECORDS, BUT ARE NOT REQUIRED. IF THE DISPLAY PAGE IS RESTRICTED TO ONLY 10 LINES PER PAGE, THE BLANK LINE CORRESPONDS TO THE PAGE BREAK.

AD-68314@

Figure 6-17. Configuration Data Pages for Boeing 777 Installation

(e) LRU PART NUMBER

1 The part numbers for the LRUs installed are displayed as follows. The word LRU is displayed, which is substituted with the appropriate LRU acronym. The LRU part number is displayed as bbbbbbb-hhsss, where bbbbbbb-hhsss represents the LRU end item part number consisting of a seven-digit LRU base part number (bbbbbbb), a two-digit hardware configuration number (hh), and a three-digit software configuration number (sss). Dashes are displayed if no valid data is available.

(f) LRU SERIAL NUMBER

1 The serial numbers of the LRUs installed are displayed as follows. The word LRU is displayed, which is substituted with the appropriate LRU acronym. The LRU serial number is displayed as ssssssss, where ssssssss represents the LRU serial number. Dashes are displayed if no valid data is available.

(g) SDU S/W PART NUMBER

1 This displays the software part number that corresponds to the software load. The configuration data page includes the header SDU CONFIG STRAPS and the raw strap setting for the current installation.

(5) Standard Ground Test (Non-interactive)

(a) When a standard test on a CMC ground test menu is selected, the CMC commands the SDU to start a standard ground test. The SDU prevents the CMC commanded standard ground test while the aircraft is airborne. The SDU starts a system-wide PAST after it has responded to the receipt of a standard ground test command from the CMC.

(b) At the end of the CMC-commanded PAST, the SDU builds labels 350 thru 354 fault summary words by mapping PAST-detected SATCOM subsystem failures to the appropriate bits. The SDU continuously transmits these fault summary words to the CMC at a rate of 1 to 2 Hz, with the SSM set to Normal Operation, during reporting of the test results.

C. Airbus/Douglas CFDS

(1) General

(a) The CFDS uses a centralized fault display interface unit (CFDIU) as an interface between the SDU and the SCDU. Throughout these paragraphs the acronym CFDIU is used to include both the A320 CFDS and the A340 CMC.

(b) When the SDU is installed on an Airbus or McDonnell Douglas aircraft with a CFDS, it supports the normal mode and interactive mode as required by the CFDS.

(2) CFDIU to SDU Communication

(a) The CFDIU communicates with the SDU through an ARINC 429 data bus using ARINC 429 words.

(3) SDU to CFDIU Communication

(a) The SDU supports both the normal mode and the interactive mode, as required by the CFDS. The SDU also transmits the LRU part number and serial number and ORT identification data blocks to the CFDIU.

(b) The LRU/ORT identification data records make up the LRU/ORT identification data blocks. Each LRU data record contains the LRU acronym, part number, and serial number. Each ORT identification data record contains the ORT IDENTIFICATION header, the ORT 24 character description, and the state of the modified flag.

(4) Normal Mode Failure Messages

(a) As specified, the SDU transmits failure messages and LRU/ORT identification information while operating in the normal mode. The following paragraphs defined the contents of these reports.

(b) Once a failure is reported in the normal mode, the failure remains in the report for that entire flight, regardless of whether the failure is cleared. As new failures are reported, they are added to the beginning of the report (i.e., the report is in reverse chronological order, bearing in mind the CFDS considers the time of the failure to be the time it is first reported on this flight leg rather than when it first occurs).

(c) In addition to latching the failures, the contents of the normal mode report depend on the failure class and when it occurs in relationship to other failures against the same LRU. Level I failures against the same LRU reported in the normal mode are not to be transmitted more than once unless they are an upper class and the upper class failure occurs after the lower class failure(s). Once a report is sent to the CFDIU during the normal mode for the current flight, the SDU does not change the content or order except to add new failure messages, as appropriate to the beginning of the report.

(d) The McDonnell Douglas CFDIU does not decode the normal mode report until the CFDIU detects an increase in the block word count. However, unlike the Airbus CFDIU, the McDonnell Douglas CFDIU decodes the entire report. After sending an All Call DC2 command for a new flight leg, the Airbus CFDIU delays processing the normal mode report for about 30 seconds before regarding the report as pertaining to the new flight leg.

(e) The SDU transmits the names of the installed LRUs, as determined by the system configuration pin settings, along with their associated part/serial numbers. At the end of this LRU transmission, the SDU transmits the ORT identification with a modification status. The LRU names can be transmitted in any order. Transmission of an HPA LRU part/serial number uses the same criteria as the display of HPA data.

(5) Interactive Mode

(a) The CFDIU supplies for two-way communication between the SCDU and the SDU, which is referred to as the interactive mode. When the SDU operates in the interactive mode, it is responsible for all information displayed on the CFDS maintenance pages, with exception of the scratchpad. The SDU enters the interactive mode upon receiving an ENQ command from the CFDIU when the aircraft is on the ground.

D. Central Aircraft Information and Maintenance System

(1) The central aircraft information and maintenance system (CAIMS) is a distributive maintenance system where each member system performs its own built-in test (BIT) and stores its own faults. Also, each system supplies real-time status information on the health of each of its LRUs and their interfaces. The member systems support CAIMS during normal operation and during on-ground maintenance.

(2) In the normal operation mode, member systems gather and store fault data when equipment failure occurs during normal operation. This is typically performed by continuous BIT and power-up BIT, with identified faults stored in the member systems non-volatile memory (NVM). The CAIMS does not store fault information for member systems, but the fault warning processor (FWP) supplies fault event data, such as: flight leg, date, time, fault zone, and aircraft serial number information that is stored with the fault in the member systems NVM.

(3) In the maintenance mode, the CAIMS is active and is called the on-board maintenance system (CAIMS OMS). The CAIMS OMS is the ground maintenance function and is accessible through communication link to a portable maintenance access terminal (PMAT). With the PMAT, the aircraft maintenance crew can retrieve stored fault data from a member system. For member systems, the CAIMS OMS displays fault information, commands BITE test, and displays real-time data for status displays, and commands the download of NVM fault data.

E. Level I Failure Messages and ATA Reference Numbers

(1) The Level I failure messages and ATA reference numbers that are available for transmittal in the CFDS normal mode, for display in the CFDS interactive mode, and for display on SCDU accessed maintenance pages are specified in the following paragraphs for each CFDS type installed. Level I failure messages are intended for use by line maintenance crews. Therefore, the failure messages are designed to be LRU-based and only supply LRU-level identification.

(2) The Level 1 failure codes are two-digit hexadecimal numbers that define the LRU, data communication bus, or miscellaneous interface signal where a failure, bus inactivity, or signal error has been determined to have occurred. When multiple LRUs are suspect, the most likely LRU is listed first followed by the next most likely LRU, separated by a slash. The ATA number listed is for the first suspect LRU. Additional text can be supplied at the end to help clarify the failure message.

- Table 6-17 describes the Level I failure messages and ATA reference numbers to use for display on the SCDU accessed maintenance pages when the installed CFDS type is a Boeing CMC. Also shown is the CMC message ID which is displayed by the CMC in response to the Level I failure messages (refer to the OEM's maintenance manual and fault isolation manual).
- Table 6-18 and Table 6-19 describe the Level I failure messages and ATA reference numbers to use for transmittal in the CFDS normal mode, and the CFDS interactive mode pages displayed when the installed CFDS type is an Airbus. Table 6-18 is for the SDU (single configuration) or SDU No. 1 (dual configuration), and Table 6-19 is for SDU No. 2 (dual configuration) as determined by the settings of configuration pins TP12E and TP12F.
- Table 6-20 describes the Level I failure messages and ATA reference numbers to use for transmittal in the CFDS normal mode, and the CFDS interactive mode pages displayed when the installed CFDS type is a McDonnell Douglas.
- For CFDS type none, the Level I failure messages displayed on the SCDU accessed maintenance pages are the same as those specified for Boeing (refer to Table 6-17). However, no ATA reference numbers are displayed.

(3) For Level I codes identified as not applicable in the tables, the SDU does not report the failure on that particular interface (i.e., CFDS normal and interactive modes or SCDU accessed maintenance pages as appropriate). Where TBD is used in the Level I failure message column, it is coded as literally read. For failures that occur that are undefined in the tables, the SDU does not report the failure on that particular interface.

Table 6-17. Boeing Level I Failure Messages and ATA Reference Numbers

Failure Code	SCDU Accessed Maintenance Pages	ATA Number	CMC Message ID
01	SDU	232500	23205
02	OTHER SDU INCOMPATIBILITY	232500	23205
03	RESERVED		
04	HPA-HI GAIN [IGA] HPA-HI GAIN [HGA]	232500	23207
07	HPA-LO GAIN	232500	23209
0A	HI POWER RELAY	232500	23218
0D	LNA/DIP-(TOP/PORT)	232500	23210
0F	LNA/DIP-STBD	232500	23211
10	LNA/DIP-LO GAIN	232500	23212
13	BSU-(TOP/PORT)	232500	23213
15	BSU-STBD	232500	23214
1A	IN GAIN ANTENNA-TOP [IGA] HI GAIN ANTENNA-(TOP/PORT) [HGA]	232500	23215
1C	HI GAIN ANTENNA-STBD	232500	23216
1F	LO GAIN ANTENNA	232500	23225
21	MCDU1	346100	
22	MCDU2	346100	
23	MCDU3	346100	
33	(ACARS MU/CMU)1	232700	23219
34	(ACARS MU/CMU)2	232700	23219
35	IRS-PRI	342100	34222
36	IRS-SEC	342100	34224
37	RESERVED		
38	RESERVED		
39	CMC	454500	23201
3D	FMC1	346100	
3E	FMC2	346100	
40	ARINC 429 ICAO ADDRESS	None	23251

Table 6-17. Boeing Level I Failure Messages and ATA Reference Numbers (cont)

Failure Code	SCDU Accessed Maintenance Pages	ATA Number	CMC Message ID
42	CTU	231900	23235
43	(CFS/CPDF)	233200	
52	(CFS/CPDF)/SDU	233200	
53	(ACARS MU/CMU)1/SDU	232700	23219
54	CTU/SDU	231900	23235
55	MCDU1/SDU	346100	
56	MCDU2/SDU	346100	
57	(ACARS MU/CMU)2/SDU	232700	23235
59	CMC/SDU	454500	23201
5A	IRS-PRI/SDU	342100	23222
5B	IRS-SEC/SDU	342100	23224
5C	HPA-IN GAIN/SDU [IGA] HPA-HI GAIN/SDU [HGA]	232500	23226
5F	HPA-LO GAIN/SDU	232500	23225
62	BSU-(TOP/PORT)/SDU	232500	23213
64	BSU-STBD/SDU	232500	23214
66	MCDU3/SDU	346100	
67	RESERVED		
68	RESERVED		
6A	RESERVED		
6C	RESERVED		
6D	RESERVED		
6E	RESERVED		
6F	RESERVED		
71	OTHER SDU/THIS SDU	232500	
73	FMC1/SDU	346100	
74	FMC2/SDU	346100	
80	RESERVED		
82	RESERVED		

Table 6-17. Boeing Level I Failure Messages and ATA Reference Numbers (cont)

Failure Code	SCDU Accessed Maintenance Pages	ATA Number	CMC Message ID
88	RESERVED		
90	SDU M-CTRL/HPA-IN GAIN [IGA] SDU M-CTRL/HPA-HI GAIN [HGA]	232500	23246
96	SDU M-CTRL/HPA-LO GAIN	232500	23248
98	SDU M-CTRL/BSU-(TOP/PORT)	232500	23249
9A	BSU-STBD XTALK/BSU-PORT	232500	23252
9C	SDU M-CTRL/BSU-STBD	232500	23250
9D	BSU-PORT XTALK/BSU-STBD	232500	23253
C0	WRG:CONFIG PIN PROG/SDU	232500	23236
C1	SDU WOW MISCOMPARE	N/A	
C2	SDU/OTHER SDU SELECT-DISABLE DISCRETE	232500	
C3	WRG:ICAO ADDRESS PIN PROG/SDU	232500	23251
C4	TX PATH VSWR-IN GAIN [IGA] TX PATH VSWR-HI GAIN [HGA]	232500	23257
C5	WRG:CONFIG PIN PROG/SDU OWNER REQS	232500	
C6	TX PATH VSWR-LO GAIN	232500	23216
C7	HPA-HI GAIN/OVER TEMPERATURE [IGA] HPA-HI GAIN/OVER TEMPERATURE [HGA]	232500	23247
C8	BAD DATA FROM GROUND EARTH STATION	None	
C9	HPA-LO GAIN/OVER TEMPERATURE	232500	23254
CA	SDU/LNA/DIP-LO GAIN	232500	23237
CB	WRG:SDI PIN PROG/HPA-IN GAIN [IGA] WRG:SDI PIN PROG/HPA-HI GAIN [HGA]	232500	
CC	WRG:SDI PIN PROG/HPA-HI GAIN	232500	
CD	SDU (POC/TOTC) DATA RESET	None	
CE	RESERVED		
CF	HPA-IN GAIN (POC/TOTC) DATA RESET [IGA] HPA-HI GAIN (POC/TOTC)DATA RESET [HGA]	None	
D0	HPA-LO GAIN (POC/TOTC) DATA RESET	None	

Table 6-17. Boeing Level I Failure Messages and ATA Reference Numbers (cont)

Failure Code	SCDU Accessed Maintenance Pages	ATA Number	CMC Message ID
D1	WRG:SDI PIN PROG/HPA-IN GAIN [IGA] WRG:SDI PIN PROG/HPA-HI GAIN [HGA]	232500	
D2	WRG:SDI PIN PROG/HPA-LO GAIN	232500	
D3	WRG:SDI PIN PROG/BSU-(TOP/PORT)	232500	
D4	WRG:SDI PIN PROG/BSU-STBD	232500	
D5	SDU COAX/HPA-IN GAIN [IGA] SDU COAX/HPA-HI GAIN [HGA]	232500	23237
D6	SDU COAX/HPA-LO GAIN	232500	23237
D7	RESERVED		
D8	LNA/DIP/ (SDU)-(TOP/PORT)	232500	23236
D9	LNA/DIP/ (SDU)-STBD	232500	23236
DA	LNA/DIP/ (SDU)-LO GAIN	232500	23236
DB	LO GAIN SUBSYSTEM	232500	
DC	NO ACTIVE ACARS MU/CMU	232700	
DD	SDU OWNER REQS - SECURED	None	
DE	SDU OWNER REQS - USER	None	
DF	IN GAIN SUBSYSTEM [IGA] HI GAIN SUBSYSTEM [HGA]	232500	
E0	RESERVED		
FE	POWER SUPPLY INTERRUPT	None	

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No.

Failure Code	SDU/SDU No. 1 - CFDS Normal and Interactive Modes	ATA Number
01	SDU1(105RV1) [IGA] SDU1(5RV1) [HGA]	232834 232834
02	SDU2(105RV2) [IGA] SDU2(5RV2) INCOMPATIBILITY [HGA]	232834 232834
03	RESERVED	

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 – CFDS Normal and Interactive Modes		ATA Number
04	HPA1(107RV1)	[IGA]	232835
	HPA-HIGAIN(7RV1)	[HGA]	232831
07	HPA-LO GAIN(9RV)		232835
0A	HI POWER RELAY(21RV)		232842
0D	DLNA1(119RV1)	[IGA]	232837
	DLNA-TOP(19RV1)	[Top Mount]	232838
	DLNA-L(20RV1)	[Conformal]	232837
0F	DLNA-R(20RV2)	[Conformal]	232837
10	DLNA-LO GAIN(14RV)		232836
13	BSU(8RV1)	[Top Mount]	232846
	BSU-L(15RV1)	[Conformal]	232844
15	BSU-R(15RV2)	[Conformal]	232844
1A	ANTENNA1(116RV1)	[IGA]	232813
	HI GAIN ANTENNA-TOP(16RV1)	[Top Mount]	232813
	HI GAIN ANTENNA-L(17RV)	[Conformal]	232812
1C	HI GAIN ANTENNA-R(18RV)	[Conformal]	232812
1F	LO GAIN ANTENNA(13RV)		232811
21	MCDU1(2CA1)		228212
22	MCDU2(2CA2)		228212
23	MCDU3(2CA3)		228212
33	ATSU1(1TX1)	[A320/A330/A340 ATSU]	462100
	ACARS MU(1RB)	[A320 ACARS]	232434
	ACARS MU1(1RB1)	[A330/A340 ACARS]	232434
34	ATSU2 (1TX2)	[A320/1A330/A340 ATSU]	462100
	ACARS MU2	[A320 ACARS]	N/A
	ACARS MU2(1RB2)	[A330/A340 ACARS]	232434
35	ADIRU1(1FP1)		341234
36	ADIRU2(1FP2)		341234
37	RESERVED		N/A
38	RESERVED		N/A

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 - CFDS Normal and Interactive Modes		ATA Number
39	CFDIU(1TW)	[A320]	313234
	CMC1(1TM1)	[A320/A340]	451334
3D	FMGC1(1CA1)	[A320]	228334
	FMGEC1(1CA1)	[A330/A340]	228334
3E	FMGC2(1CA2)	[A320]	228334
	FMGEC2(1CA2)	[A330/A340]	228334
40	ARINC 429 ICAO		N/A
42	CTU(303RD)	[A320]	233534
	CTU(3RY)	[A330/A340]	239234
43	CPDF		N/A
52	CPDF/SDU1		N/A
53	ATSU1 (1TX1)/SDU1(105RV1)	[IGA A320/A330/A340 ATSU]	462100
	ATSU1 (1TX1)/SDU1(5RV1)	[HGA A320/A330/A340 ATSU]	462100
	ACARS MU (1RB)/SDU1(105RV1)	[IGA A320 ACARS]	232434
	ACARS MU1 (1RB1)/SDU1(105RV1)	[IGA A330/A340 ACARS]	232434
	ACARS MU (1RB)/SDU1(5RV1)	[HGA A320 ACARS]	232434
	ACARS MU1 (1RB1)/SDU1(5RV1)	[HGA A330/A340 ACARS]	232434
54	CTU (303RD)/SDU1(105RV1)	[IGA A320]	233534
	CTU (3RY)/SDU1(105RV1)	[IGA A330/A340]	239234
	CTU (303RD)/SDU1(5RV1)	[HGA A320]	233534
	CTU (3RY)/SDU1(5RV1)	[HGA A330/A340]	239234
55	MCDU1(2CA1)/SDU1(105RV1)	[IGA]	228212
	MCDU1(2CA1)/SDU1(5RV1)	[HGA]	228212
56	MCDU2(2CA2)/SDU1(105RV1)	[IGA]	228212
	MCDU2(2CA2)/SDU1(5RV1)	[HGA]	228212

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 - CFDS Normal and Interactive Modes		ATA Number
57	ATSU2 (1TX2)/SDU1(105RV1)	[IGA A320/A330/A340 ATSU]	462100
	ATSU2 (1TX2)/SDU1(5RV1)	[HGA A320/A330/A340 ATSU]	462100
	ACARS MU2/SDU1(105RV1)	[IGA A320 ACARS]	232434
	ACARS MU2 (1RB2)/SDU1(105RV1)	[IGA A330/A340 ACARS]	232434
	ACARS MU2/SDU1(5RV1)	[HGA A320 ACARS]	232434
	ACARS MU2 (1RB2)/SDU1(5RV1)	[HGA A330/A340 ACARS]	232434
59	CFDIU(1TW)/SDU1(105RV1)	[IGA A320]	313243
	CMC1(1TM1)/SDU1(105RV1)	[IGA A330/A340]	451334
	CFDIU(1TW)/SDU1(5RV1)	[HGA A320]	313243
	CMC1(1TM1)/SDU1(5RV1)	[HGA A330/A340]	451334
5A	ADIRU1(1FP1)/SDU1(105RV1)	[IGA]	341234
	ADIRU1(1FP1)/SDU1(5RV1)	[HGA]	341234
5B	ADIRU2(1FP2)/SDU1(105RV1)	[IGA]	341234
	ADIRU2(1FP2)/SDU1(5RV1)	[HGA]	341234
5C	HPA1 (107RV1)/SDU1(105RV1)	[IGA]	232835
	HPA-HI GAIN(7RV1)/SDU1(5RV1)	[HGA]	232831
5F	HPA-LO GAIN(9RV)/SDU1(5RV1)		232835
62	BSU(8RV1)/SDU1(5RV1)	[Top Mount]	232846
	BSU-L(15RV1)/SDU1(5RV1)	[Conformal]	232844
64	BSU-R(15RV2)/SDU1(5RV1)	[Conformal]	232844
66	MCDU3(2CA3)/SDU1(105RV1)	[IGA]	228212
	MCDU3(2CA3)/SDU1(5RV1)	[HGA]	228212
67	RESERVED		
68	RESERVED		
6A	RESERVED		
6C	RESERVED		
6D	RESERVED		
6E	RESERVED		
6F	RESERVED		

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 - CFDS Normal and Interactive Modes		ATA Number
71	SDU2(105RV2)/SDU1(105RV1)	[IGA]	232834
	SDU2(5RV2)/SDU1(5RV1)	[HGA]	232834
73	FMGC1(1CA1)/SDU1(105RV1)	[IGA A320]	228334
	FMGEC1(1CA1)/SDU1(105RV1)	[IGA A330/A340]	228334
	FMGC1(1CA1)/SDU1(5RV1)	[HGA A320]	228334
	FMGEC1(1CA1)/SDU1(5RV1)	[HGA A330/A340]	228334
74	FMGC2(1CA2)/SDU1(105RV1)	[IGA A320]	228334
	FMGEC2(1CA2)/SDU1(105RV1)	[IGA A330/A340]	228334
	FMGC2(1CA2)/SDU1(5RV1)	[HGA A320]	228334
	FMGEC2(1CA2)/SDU1(5RV1)	[HGA A330/A340]	228334
80	RESERVED		
82	RESERVED		
88	RESERVED		
90	SDU1(105RV1) BUS M-CTRL/HPA1(107RV1)	[IGA]	232834
	SDU1(5RV1) BUS M-CTRL/HPA-HI GAIN(7RV1)	[HGA]	232834
96	SDU1(5RV1) BUS M-CTRL/HPA-LO GAIN(9RV)		232834
98	SDU1(5RV1) BUS M-CTRL/BSU(8RV1)	[Top Mount]	232834
	SDU1(5RV1) BUS M-CTRL/BSU-L(15RV1)	[Conformal]	232834
9A	BSU-R XTALK/BSU-L	[Conformal]	N/A
9C	SDU1(5RV1) BUS M-CTRL/BSU-R(15RV2)	[Conformal]	232834
9D	BSU-L XTALK/BSU-R	[Conformal]	N/A
C0	WRG:CONFIG PIN PROG/SDU1(105RV1)	[IGA]	232834
C0	WRG:CONFIG PIN PROG/SDU1(5RV1)	[HGA]	232834
C1	LGCIU1(5GA1)/LGCIU2(5GA2)/SDU1(105RV1)	[IGA]	323171
	LGCIU1(5GA1)/LGCIU2(5GA2)/SDU1(5RV1)	[HGA]	323171
C2	SDU1(105RV1) SEL-DISABLE DISCRETE/SDU2(105RV2)	[IGA]	232834
	SDU1(5RV1) SEL-DISABLE DISCRETE/SDU2(5RV2)	[HGA]	232834

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 – CFDS Normal and Interactive Modes		ATA Number
C3	WRG:ICAO ADDRESS PIN PROG/SDU1(105RV1)	[IGA]	232834
	WRG:ICAO ADDRESS PIN PROG/SDU1(5RV1)	[HGA]	232834
C4	HPA1 (107RV1)/VSWR	[IGA]	232835
	HPA-HI GAIN(7RV1)/VSWR	[HGA]	232831
C5	WRG:CONFIG PIN PROG/SDU1(105RV1) OWNER REQS DB	[IGA]	232834
	WRG:CONFIG PIN PROG/SDU1(5RV1) OWNER REQS DB	[HGA]	232834
C6	HPA-LO GAIN(9RV)/VSWR		232835
C7	HPA(107RV1)/OVER TEMPERATURE	[IGA]	232835
	HPA-HI GAIN(7RV1)/OVER TEMPERATURE	[HGA]	232831
C8	SDU1(105RV1)/BAD DATA FROM GROUND STATION	[IGA]	232834
	SDU1(5RV1)/BAD DATA FROM GROUND EARTH STATION	[HGA]	232834
C9	HPA-LO GAIN(9RV)/OVER TEMPERATURE		232835
CA	SDU1(5RV1)/DLNA-LO GAIN(14RV)		232834
CB	WRG:SDI PIN PROG/HPA1(107RV1)	[IGA]	232835
	WRG:SDI PIN PROG/HPA-HI GAIN(7RV1)	[HGA]	232831
CC	WRG:SDI PIN PROG/HPA-LO GAIN(9RV)		232835
CD	DATA:SDU1 POC/TOTC RESET		N/A
CE	RESERVED		
CF	DATA:HPA1 POC/TOTC RESET	[IGA]	N/A
	DATA:HPA-HI GAIN POC/TOTC RESET	[HGA]	N/A
D0	DATA:HPA-LO GAIN POC/TOTC RESET		N/A
D1	WRG:SDI PIN PROG/HPA1 (107RV1)	[IGA]	232835
	WRG:SDI PIN PROG/HPA-HI GAIN(7RV1)	[HGA]	232831
D2	WRG:SDI PIN PROG/HPA-LO GAIN(9RV)		232835
D3	WRG:SDI PIN PROG/BSU(8RV1)	[Top Mount]	232846
	WRG:SDI PIN PROG/BSU-L(15RV1)	[Conformal]	232844

Table 6-18. Airbus Level I (SDU No. 1) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 1 - CFDS Normal and Interactive Modes		ATA Number
D4	WRG:SDI PIN PROG/BSU-R(15RV2)	[Conformal]	232844
D5	SDU1(105RV1) COAX/HPA1(107RV1)	[IGA]	232833
	SDU1(5RV1) COAX/HPA-HI GAIN (7RV1)	[HGA]	232833
D6	SDU1 (5RV1) COAX/HPA-LO GAIN (9RV)		232833
D7	RESERVED		
D8	DLNA1(119RV1)/SDU1(105RV1)	[IGA]	232838
	DLNA-TOP(19RV1)/SDU1(5RV1)	[Top Mount]	232838
	DLNA-L(20RV1)/SDU1(5RV1)	[Conformal]	232837
D9	DLNA-R(20RV2)/SDU1(5RV1)	[Conformal]	232837
DA	DLNA-LO GAIN(14RV)/SDU1(5RV1)		232836
DB	DLNA-LO GAIN(14RV)/LO GAIN ANTENNA(13RV)		232836
DC	ATSU1(1TX1)/NO ACTIVE ATSU	[A320/A330/A340 ATSU]	462100
	ACARS MU(1RB)/NO ACTIVE MU	[A320 ACARS]	232434
	ACARS MU(1RB1/2)/NO ACTIVE MU	[A330/A340 ACARS]	232434
DD	SDU1(105RV1) OWNER REQS DB SECURED PARTITION	[IGA]	N/A
	SDU1(5RV1) OWNER REQS DB SECURED PARTITION	[HGA]	N/A
DE	SDU1(105RV1) OWNER REQS DS USER PARTITION	[IGA]	N/A
	SDU1(5RV1) OWNER REQS DB USER PARTITION	[HGA]	N/A
DF	DLNA-T(19RV1)/BSU(8RV1)/HI GAIN ANT-TOP(16RV)	[Top Mount]	232838
	HI PWR RELAY(21RV)/BSU-L(15RV1)/BSU-R (15RV2)	[Conformal]	232842
E0	RESERVED		
FE	POWER SUPPLY INTERRUPT		240000

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No.

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
01	SDU2(105RV2)	[IGA]	232834
	SDU2(5RV2)	[HGA]	232834
02	SDU1(105RV1) INCOMPATIBILITY	[IGA]	232834
	SDU1(5RV1) INCOMPATIBILITY	[HGA]	232834
03	RESERVED		
04	HPA2(107RV2)	[IGA]	232835
	HPA-HI GAIN(7RV1)	[HGA]	232831
07	HPA-LO GAIN(9RV)		232835
0A	HI POWER RELAY(21RV)		232842
0D	DLNA2 (119RV2)	[IGA]	232837
	DLNA-TOP(19RV1)	[Top Mount]	232838
	DLNA-L(20RV1)	[Conformal]	232837
0F	DLNA-R(20RV2)	[Conformal]	232837
10	DLNA-LO GAIN(14RV)		232836
13	BSU(8RV1)	[Top Mount]	232846
	BSU-L(15RV1)	[Conformal]	232844
15	BSU-R(15RV2)	[Conformal]	232844
1A	ANTENNA2(116RV2)	[IGA]	232813
	HI GAIN ANTENNA-TOP(16RV1)	[Top Mount]	232813
	HI GAIN ANTENNA-L(17RV)	[Conformal]	232812
1C	HI GAIN ANTENNA-R(18RV)	[Conformal]	232812
1F	LO GAIN ANTENNA(13RV)		232811
21	MCDU1(2CA1)		228212
22	MCDU2(2CA2)		228212
23	MCDU3(2CA3)		228212
33	ATSU1(1TX1)	[A320/A330/A340 ATSU]	462100
	ACARS MU(1RB)	[A320 ACARS]	232434
	ACARS MU1(1RB1)	[A330/A340 ACARS]	232434

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
34	ATSU2 (1TX2)	[A320/A330/A340 ATSU]	462100
	ACARS MU2	[A320 ACARS]	232434
	ACARS MU2(1RB2)	[A320/A340 ACARS]	232434
35	ADIRU1(1FP1)		341234
36	ADIRU2(1FP2)		341234
37	RESERVED		N/A
38	RESERVED		N/A
39	CFDIU(1TW)	[A320]	313234
	CMC1(1TM1)	[A330/A340]	451334
3D	FMGC1(1CA1)	[A320]	228334
	FMGEC1(1CA1)	[A330/A340]	228334
3E	FMGC2(1CA2)	[A320]	228334
	FMGEC2(1CA2)	[A330/A340]	228334
40	ARINC 429 ICAO		N/A
42	CTU(303RD)	[A320]	233534
	CTU(3RY)	[A330/A340]	239234
43	CPDF		N/A
52	CPDF/SDU1		N/A
53	ATSU1 (1TX1)/SDU2(105RV2)	[IGA A320/A330/A340 ATSU]	462100
	ATSU1 (1TX1)/SDU2(5RV2)	[HGA A320/A330/A340 ATSU]	462100
	ACARS MU(1RB)/SDU2(105RV2)	[IGA A320 ACARS]	232434
	ACARS MU1(1RB1)/SDU2(105RV2)	[IGA A330/A340 ACARS]	232434
	ACARS MU(1RB)/SDU2(5RV2)	[HGA A320 ACARS]	232434
	ACARS MU1(1RB1)/SDU2(5RV2)	[HGA A330/A340 ACARS]	232434
54	CTU(303RD)/SDU2(105RV2)	[IGA A320]	233534
	CTU(3RY)/SDU2(105RV2)	[IGA A330/A340]	239234
	CTU(303RD)/SDU2(5RV2)	[HGA A320]	233534
	CTU(3RY)/SDU2(5RV2)	[HGA A330/A340]	239234
55	MCDU1(2CA1)/SDU2(105RV2)	[IGA]	228212
	MCDU1(2CA1)/SDU2(5RV2)	[HGA]	228212

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
56	MCDU2(2CA2)/SDU2(105RV2)	[IGA]	228212
	MCDU2(2CA2)/SDU2(5RV2)	[HGA]	228212
57	ATSU2 (1TX2)/SDU2(105RV2)	[IGA A320/A330/A340 ATSU]	462100
	ATSU2 (1TX2)/SDU2(5RV2)	[HGA A320/A330/A340 ATSU]	462100
	ACARS MU2/SDU2(105RV2)	[IGA A320 ACARS]	232434
	ACARS MU2 (1RB2)/SDU2(105RV2)	[IGA A330/A340 ACARS]	232434
	ACARS MU2/SDU2(5RV2)	[HGA A320 ACARS]	232434
	ACARS MU2(1RB2)/SDU2(5RV2)	[HGA A330/A340 ACARS]	232434
59	CFDIU(1TW)/SDU2(105RV2)	[IGA A320]	313234
	CMC1(1TM1)/SDU2(105RV2)	[IGA A330/A340]	451334
	CFDIU(1TW)/SDU2(5RV2)	[HGA A320]	313234
	CMC1(1TM1)/SDU2(5RV2)	[HGA A330/A340]	451334
5A	ADIRU1(1FP1)/SDU2(105RV2)	[IGA]	341234
	ADIRU1(1FP1)/SDU2(5RV2)	[HGA]	341234
5B	ADIRU2(1FP2)/SDU2(105RV2)	[IGA]	341234
	ADIRU2(1FP2)/SDU2(5RV2)	[HGA]	341234
5C	HPA2(107RV2)/SDU2(105RV2)	[IGA]	232835
	HPA-HI GAIN(7RV1)/SDU2(5RV2)	[HGA]	232831
5F	HPA-LO GAIN(9RV)/SDU2(5RV2)		232835
62	BSU(8RV1)/SDU2(5RV2)	[Top Mount]	232846
	BSU-L(15RV1)/SDU2(5RV2)	[Conformal]	232844
64	BSU-R(15RV2)/SDU2(5RV2)	[Conformal]	232844
66	MCDU3(2CA3)/SDU2(105RV2)	[IGA]	228212
	MCDU3(2CA3)/SDU2(5RV2)	[HGA]	228212
67	RESERVED		
68	RESERVED		
6A	RESERVED		
6C	RESERVED		
6D	RESERVED		

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
6E	RESERVED		
6F	RESERVED		
71	SDU1(105RV1)/SDU2(105RV2)	[IGA]	232834
	SDU1(5RV1)/SDU2(5RV2)	[HGA]	232834
73	FMGC1(1CA1)/SDU2(105RV2)	[IGA A320]	228334
	FMGEC1(1CA1)/SDU2(105RV2)	[IGA A330/A340]	228334
	FMGC1(1CA1)/SDU2(5RV2)	[HGA A320]	228334
	FMGEC1(1CA1)/SDU2(5RV2)	[HGA A330/A340]	228334
74	FMGC2(1CA2)/SDU2(105RV2)	[IGA A320]	228334
	FMGEC2(1CA2)/SDU2(105RV2)	[IGA A330/A340]	228334
	FMGC2(1CA2)/SDU2(5RV2)	[HGA A320]	228334
	FMGEC2(1CA2)/SDU2(5RV2)	[HGA A330/A340]	228334
80	RESERVED		
82	RESERVED		
88	RESERVED		
90	SDU2(105RV2) BUS M-CTRL/HPA2(107RV2)	[IGA]	232834
	SDU2(5RV2) BUS M-CTRL/HPA-HI GAIN(7RV1)	[HGA]	232834
96	SDU2(5RV2) BUS M-CTRL/HPA-LO GAIN(9RV)		232834
98	SDU2(5RV2) BUS M-CTRL/BSU(8RV1)	[Top Mount]	232834
	SDU2(5RV2) BUS M-CTRL/BSU-L(15RV1)	[Conformal]	232834
9A	BSU-R XTALK/BSU-L	[Conformal]	N/A
9C	SDU2(5RV2) BUS M-CTRL/BSU-R(15RV2)	[Conformal]	232834
9D	NBSU-L XTALK/BSU-R	[Conformal]	N/A
C0	WRG:CONFIG PIN PROG/SDU2(105RV2)	[IGA]	232834
	WRG:CONFIG PIN PROG/SDU2(5RV2)	[HGA]	232834
C1	LGCIU1(5GA1)/LGCIU2(5GA2)/SDU2(105RV2)	[IGA]	323171
	LGCIU1(5GA1)/LGCIU2(5GA2)/SDU2(5RV2)	[HGA]	323171

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
C2	SDU2(105RV2) SEL-DISABLE DISCRETE/SDU1(105RV1)	[IGA]	232834
	SDU2(5RV2) SELECT-DISABLE DISCRETE/SDU1(5RV1)	[HGA]	232834
C3	WRG:ICAO ADDRESS PIN PROG/ SDU2(105RV2)	[IGA]	232834
	WRG:ICAO ADDRESS PIN PROG/ SDU2(5RV2)	[HGA]	232834
C4	HPA2(107RV2)/VSWR	[IGA]	232835
	HPA-HI GAIN(7RV1)/VSWR	[HGA]	232831
C5	WRG:CONFIG PIN PROG/SDU2(105RV2) OWNER REQS DB	[IGA]	232834
	WRG:CONFIG PIN PROG/SDU2(5RV2) OWNER REQS DB	[HGA]	232834
C6	LPA-LO GAIN(9RV)/VSWR		232835
C7	HPA-HI GAIN(107RV2)/OVER TEMPERATURE	[IGA]	232835
	HPA-HI GAIN(7RV1)/OVER TEMPERATURE	[HGA]	232831
C8	SDU2(105RV2)/BAD DATA FROM GROUND STATION	[IGA]	232834
	SDU2(5RV2)/BAD DATA FROM GROUND EARTH STATION	[HGA]	232834
C9	HPA-LO GAIN(9RV)/OVER TEMPERATURE		232835
CA	SDU2(5RV2)/DLNA-LO GAIN(14RV)		232834
CB	WRG:SDI PIN PROG/HPA2(107RV1)	[IGA]	232835
	WRG:SDI PIN PROG/HPA-HI GAIN(7RV1)	[HGA]	232831
CC	WRG:SDI PIN PROG/HPA-LO GAIN(9RV)		232835
CD	DATA:SDU1 POC/TOTC RESET		N/A
CE	RESERVED		
CF	DATA:HPA2 POC/TOTC RESET	[IGA]	N/A
	DATA:HPA-HI GAIN POC/TOTC RESET	[HGA]	N/A
D0	DATA:HPA-LO GAIN POC/TOTC RESET		N/A

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes		ATA Number
D1	WRG:SDI PIN PROG/HPA2(107RV2)	[IGA]	232835
	WRG:SDI PIN PROG/HPA-HI GAIN(7RV1)	[HGA]	232831
D2	WRG:SDI PIN PROG/HPA-LO GAIN(9RV)		232835
D3	WRG:SDI PIN PROG/BSU(8RV1)	[Top Mount]	232846
	WRG:SDI PIN PROG/BSU-L(15RV1)	[Conformal]	232844
D4	WRG:SDI PIN PROG/BSU-R(15RV2)	[Conformal]	232844
D5	SDU2(105RV2) COAX/HPA2(107RV2)	[IGA]	232833
	SDU2(105RV2) COAX/HPA-HI GAIN(7RV1)	[HGA]	232833
D6	SDU2(105RV2) COAX/HPA-LO GAIN(9RV)		232833
D7	RESERVED		
D8	DLNA2(119RV2)/SDU2(105RV2)	[IGA Top Mount]	232838
	DLNA-TOP(19RV1)/SDU2(5RV2)	[HGA Top Mount]	232838
	DLNA-L(20RV1)/SDU2(5RV2)	[Conformal]	232837
D9	DLNA-R(20RV2)/SDU2(5RV2)	[Conformal]	232837
DA	DLNA-LO GAIN(14RV)/SDU2(5RV2)		232836
DB	DLNA-LO GAIN(14RV)/LO GAIN ANTENNA(13RV)		232836
DC	ATSU1 (1TX1)/ NO ACTIVE ATSU	[A320/A330/A340 ATSU]	462100
	ACARS MU(1RB)/ NO ACTIVE MU	[A320 ACARS]	232434
	ACARS MU(1RB1/2) NO ACTIVE MU	[A330/A340 ACARS]	232434
DD	SDU2 (105RV2) OWNER REQS DB SECURED PORTITION	[IGA]	N/A
	SDU2 (5RV2) OWNER REQS DB SECURED PORTITION	[HGA]	N/A
DE	SDU2 (105RV2) OWNER REQS DB USER PORTITION	[IGA]	N/A
	SDU2 (5RV2) OWNER REQS DB USER PORTITION	[HGA]	N/A
DF	DLNA-T(19RV1)/BSU(8RV1)/HI GAIN ANT-TOP(16RV)	[Top Mount]	232838
	HI PWR RELAY(21RV)/BSU-L (15RV1)/BSU-R(15RV2)	[Conformal]	232842

Table 6-19. Airbus Level I (SDU No. 2) Failure Messages and ATA No. (cont)

Failure Code	SDU/SDU No. 2 - CFDS Normal and Interactive Modes	ATA Number
E0	RESERVED	
FE	POWER SUPPLY INTERRUPT	240000

Table 6-20. McDonnell Douglas Level I Failures Messages and ATA Reference Numbers

Failure Code	CFDS Normal and Interactive Modes	ATA Number
01	SDU	232610
02	OTHER SDU INCOMPATIBILITY	232611
03	RESERVED	
04	HPA-IN GAIN [IGA] HPA-HI GAIN [HGA]	232600 232613
07	HPA-LO GAIN	232614
0A	HI POWER RELAY	232615
0D	DLNA-(TOP/L)	232616
0F	DLNA-R	232618
10	DLNA-LO GAIN	232619
13	BSU-(TOP/L)	23261B
15	BSU-R	23261C
1A	IN GAIN ANTENNA-TOP [IGA] HI GAIN ANTENNA-(TOP/L) [HGA]	232600 23261D
1C	HI GAIN ANTENNA-R	23261F
1F	LO GAIN ANTENNA	232620
21	MCDU1	232635
22	MCDU2	232636
23	MCDU3	232637
33	(ACARS MU/CMU)	23243C
34	(ACARS MU/CMU)2	N/A
35	(IRS/ADIRU)-PRI	23263E
36	(IRS/ADIRU)-SEC	23263F

Table 6-20. McDonnell Douglas Level I Failures Messages and ATA Reference Numbers (cont)

Failure Code	CFDS Normal and Interactive Modes	ATA Number
37	RESERVED	
38	RESERVED	
39	CFDIU	454500
3D	(FMC/VIA)1	232642
3E	(FMC/VIA)2	232643
40	ARINC 429 ICAO ADDRESS	N/A
42	CTU	232644
43	(CFS/CPDF)	TBD
52	(CFS/CPDF)/SDU	TBD
53	(ACARS MU/CMU)/SDU	23263C
54	CTU/SDU	232644
55	MCDU1/SDU	232635
56	MCDU2/SDU	232636
57	(ACARS MU/CMU)2/SDU	N/A
59	CFDIU/SDU	232641
5A	(IRS/ADIRU)-PRI/SDU	23263E
5B	(IRS/ADIRU)-SEC/SDU	23263F
5C	HPA-IN GAIN/SDU [IGA] HPA-HI GAIN/SDU [HGA]	232600 232600
5F	HPA-LO GAIN/SDU	232623
62	BSU-(TOP/L)/SDU	232626
64	BSU-R/SDU	232627
66	MCDU3/SDU	232637
67	RESERVED	
68	RESERVED	
6A	RESERVED	
6C	RESERVED	
6D	RESERVED	

Table 6-20. McDonnell Douglas Level I Failures Messages and ATA Reference Numbers (cont)

Failure Code	CFDS Normal and Interactive Modes	ATA Number
6E	RESERVED	
6F	RESERVED	
71	OTHER SDU/THIS SDU	232600
73	(FMC/VIA)1/SDU	232642
74	(FMC/VIA)2/SDU	232643
80	RESERVED	
82	RESERVED	
88	RESERVED	
90	SDU M-CTRL/HPA-IN GAIN [IGA] SDU M-CTRL/HPA-HI GAIN [HGA]	232600 232600
96	SDU M-CTRL/HPA-LO GAIN	23262D
98	SDU M-CTRL/BSU-(TOP/L)	232600
9A	BSU-R XTALK/BSU-L	232600
9C	SDU M-CTRL/BSU-R	232630
9D	BSU-L XTALK/BSU-R	232600
C0	WRG:CONFIG PIN PROG/SDU	232600
C1	SDU WOW MISCOMPARE	N/A
C2	SDU/OTHER SDU SELECT-DISABLE DISCRETE	232600
C3	WRG:ICAO ADDRESS PIN PROG/SDU	232631
C4	TX PATH VSWR-IN GAIN [IGA] TX PATH VSWR-HI GAIN [HGA]	232600 232600
C5	WRG:CONFIG PIN PROG/SDU OWNER REQS	232600
C6	TX PATH VSWR-LO GAIN	232600
C7	HPA-IN GAIN/OVER TEMPERATURE [IGA] HPA-HI GAIN/OVER TEMPERATURE [HGA]	232600 23262C
C8	BAD DATA FROM GROUND EARTH STATION	None
C9	HPA-LO GAIN/OVER TEMPERATURE	232634
CA	SDU/DLNA-LO GAIN	232619

Table 6-20. McDonnell Douglas Level I Failures Messages and ATA Reference Numbers (cont)

Failure Code	CFDS Normal and Interactive Modes		ATA Number
CB	WRG:SDI PIN PROG/HPA-IN GAIN WRG:SDI PIN PROG/HPA-HI GAIN	[IGA] [HGA]	232600 232600
CC	WRG:SDI PIN PROG/HPA-LO GAIN		232600
CD	SDU (POC/TOTC) DATA RESET		None
CE	RESERVED		
CF	HPA-IN GAIN (POC/TOTC) DATA RESET HPA-HI GAIN (POC/TOTC) DATA RESET	[IGA] [HGA]	None None
D0	HPA-LO GAIN (POC/TOTC)		None
D1	WRG:SDI PIN PROG/HPA-IN GAIN WRG:SDI PIN PROG/HPA-HI GAIN	[IGA] [HGA]	232600 232600
D2	WRG:SDI PIN PROG/HPA-LO GAIN		232600
D3	WRG:SDI PIN PROG/BSU-(TOP/L)		232600
D4	WRG:SDI PIN PROG/BSU-R		232600
D5	SDU COAX/HPA-IN GAIN SDU COAX/HPA-HI GAIN	[IGA] [HGA]	232600 232600
D6	SDU COAX/HPA-LO GAIN		232600
D7	RESERVED		
D8	DLNA/(SDU)-(TOP/L)		232600
D9	DLNA/(SDU)-R		232600
DA	DLNA/(SDU)-LO GAIN		232600
DB	LO GAIN SUBSYSTEM		232600
DC	NO ACTIVE ACARS MU/CMU		232400
DD	SDU OWNER REQS - SECURED		None
DE	SDU OWNER REQS - USER		None
DF	IN GAIN SUBSYSTEM HI GAIN SUBSYSTEM	[IGA] [HGA]	232600 232600
E0	RESERVED		
FE	POWER SUPPLY INTERRUPT		None

4. SCDU for Dual SATCOM

A. General

(1) The SDU supports SCDU page displays for dual systems. All pages are as specified in paragraph 2.D. (SCDU pages) with the following exceptions.

B. SATCOM Logical Channels

(1) The SATCOM channels for HEADSET calls in a dual system can be supplied by several combinations of physical channels within both SDUs. These combinations are determined by the configuration strap settings for cockpit wiring and ORT items regarding the use of SDU channel resources (items vi, vii, and xlviii). The display of channel status and selections as reported on menus MAIN, DIRECTORY, and CATEGORY-n reflect the logical channel status.

C. SATCOM MAIN MENU (Cross-Talk Bus Failed)

(1) The SDU designated as the slave unit in a dual system must receive most of the system status information from the master over the SDU cross-talk bus. If full communication is not established, the slave unit cannot receive the necessary data for the display pages. The default SATCOM MAIN MENU display page **THIS UNIT UNAVAILABLE** is displayed in this case.

D. SATCOM CHANNEL STATUS

(1) The channel status page reflects the physical channels within the SDU that is providing the display page.

E. SATCOM MAINTENANCE Menus

(1) The maintenance menus reflect the maintenance data for the SATCOM system that is providing the display page.

5. Maintenance Panel Assembly

A. General

(1) The maintenance panel assembly interface diagram (Figure 5-17) supplies remote monitoring of MCS system operation. The maintenance panel assembly is made up of two parts: the cabin telecommunications (CTM) panel and the Commissioning and Maintenance Terminal (CMT) panel. The CTM panel is used for monitoring the cabin telecommunications equipment. The panel contains six lamps to indicate the availability of the telephone handsets. A keyed on/off switch arms the system when the key is turned to the ON position.

(2) The CMT panel is used primarily to debug, detect, isolate software and/or hardware integration, LRU and system integration, formal testing, and system access approval, as well as general performance analysis. The CMT data connector supplies an access port for a commissioning and maintenance terminal that can be a personal computer, a dumb terminal, or a modem. The SDU interface connector on the panel supplies a remote access port for testing the SDU. The panel also contains lamps to indicate the status of the MCS system. These lamps are defined in Table 6-21.

Table 6-21. Commissioning and Maintenance Terminal Panel Lamps

Lamp	Definition
IN USE CH-1	(SDU pin TPH1) This lamp lights to show channel 1 is in use.
IN USE CH-2	(SDU pin TPK1) This lamp lights to show channel 2 is in use.
PILOT VCE NOT AVAIL	(SDU pin TP3A) This lamp lights to show no additional voice channels can be established. This can be because no resources are available, or all available resources being allocated to existing calls.
LOG OFF	(SDU pin TPC3) This lamp lights to show no packet mode data service capability exists at any data rate; system not logged on.
CABIN VCE NOT AVAIL	(SDU pin TPB3) This lamp lights to show no additional channels can be established for analog or digital cabin voice, or circuit-mode data. This can be because no resources are available, or all available resources being allocated to existing calls.
MCS FAIL	(SDU pin TPG1) This lamp lights to show a total loss of all SATCOM voice and data services, and at least one cause can be attributable to the MCS system LRUs themselves. Replacement of the appropriate LRU (SDU, HPA) is necessary to restore partial or complete service. It is possible for this indicator and the MCS inoperable indicator (NON-MCS FAIL) to be active simultaneously, indicating failure in both the MCS system LRUs and nonsystem LRUs.
NON-MCS FAIL	(SDU pin TPE3) This lamp lights to show total loss of all SATCOM voice and data services, and at least one cause is attributable to the non-MCS system LRUs, or interfaces to those LRUs. Replacement of the appropriate non MCS LRU(s), or correction of the interface failure is necessary to restore partial or complete service. It is possible for this indicator and the SATCOM fail indicator (MCS FAIL) to be active simultaneously, indicating failure in both the MCS system LRUs and the nonsystem LRUs or interfaces.
NO SAT LINK	(SDU pin TPJ1) This lamp lights to show no SATCOM voice or data services are available because of the AES not being successfully logged-on, and the cause is definitely not due to reported failures (MCS or non-MCS). If there is a MCS or non-MCS failure, the NO SAT LINK lamp will not light.
HGA FAIL	(SDU pin TPD3) This lamp lights to show packet-mode data service capability exists, but only at the lowest channel rates (600 and 1200 bps). This indicator is assumed to only be present in high gain antennas installations that have a low gain antenna backup system. The lamp indicates an HGA failure due to the reduction from normal high speed capability.

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SECTION 7
MAINTENANCE PRACTICES

1. Overview

A. General

(1) This section supplies instructions for removing, reinstalling, and adjusting each LRU of the MCS that has been installed by the aircraft manufacturer or completion center. Where applicable, instructions for replacing lamps, knobs, and set screws are included. Adjustment information is called out as required.

CAUTION: SHOULD ANY INSTALLATION CRITICAL CASES ARISE WITH THE REINSTALLATION OF ANY UNIT, YOU MUST COMPLY 100 PERCENT WITH THE INSTRUCTION.

CAUTION: TO PREVENT DAMAGE TO EQUIPMENT, TURN AIRCRAFT POWER OFF WHEN REMOVING OR INSTALLING LRUS.

2. Equipment and Materials

A. General

WARNING: BEFORE YOU USE A MATERIAL, KNOW THE HAZARD CODE AND GET THE NECESSARY PROTECTION. REFER TO THE PAGE ABOUT HAZARD CODES FOR MATERIALS IN THE FRONT OF THIS MANUAL.

(1) Maintenance materials identified with a Honeywell Material Number (HMN) are given in Table 7-1.

(2) No additional special equipment or materials other than those commonly used in the shop are required to install the units in existing trays and clamps, and to adjust the system. Do not over tighten mounting screws. Where torque values are not given, it is acceptable to finger tighten the mounting screws.

Table 7-1. Materials

Item	Description	Source
HMN 97P5778	RTV silicone, No. 3145, translucent, per MIL-A-46146, Group II, Type I military designation M4614621XTN.	Dow Corning Corp, Midland, MI (05AJ8)
HMN 98C0978	Sealant, corrosion inhibitive (MIL-S-81733, Type II-1/2 - for extrusion application in the time of 1/2 hour) — Pro-Seal 870B-1/2	Courtaulds Aerospace, Glendale, CA (83574)

NOTES: NOTES:
1. Equivalent alternatives are permitted for materials in this list.
2. The HMN codes in the list of materials identify the Honeywell Material Number (HMN) given to each material.

3. Procedure for Antennas

A. General

(1) The following paragraphs describe general information when removing or installing antennas.

NOTE: For all antennas not supplied by Honeywell, removal and installation should be done according to installation instructions from the manufacturer.

B. Antenna Weather Protection

(1) Some antennas require gaskets and others have O-rings. When reinstalling antennas, new gaskets or O-rings should be used.

(2) A weather sealant should be applied around the periphery of the antenna base to prevent seepage of water and condensation and preclude corrosion. If a sealant or aerodynamic smoother is used around the periphery of the antenna base, it should be applied after the antenna has been bolted down. The sealant used should be nonadhering so the antenna can be removed at a later time, if necessary. Chromatic tape is recommended.

NOTE: When mounting antennas on a pressurized fuselage, a leveling and sealing compound like Pro-Seal 870B-1/2 should be used between the entire mounting surface of the antenna and the fuselage. Use of this compound, in addition to the installation gasket, compensates for surface irregularities and voids between the antenna and the fuselage. A mold releasing agent can be used on the fuselage prior to installation to prevent the leveling compound from adhering to the fuselage.

(3) To prevent water seepage on top mounted antennas, it can be necessary to apply Silastic sealant (RTV-3145 or equivalent) to the mounting screw heads.

C. Antenna Hardware

(1) Clean the airframe at the antenna mounting area to remove any foreign material.

(2) Because of the insulation qualities of gaskets and leveling compounds, the mounting screws are required to supply the electrical bonding between the antennas and the aircraft (typically 15 milliohms or less is required). The technician doing the reinstallation must be sure any hardware being reused is clean and free of corrosion. If in doubt, use new hardware.

(3) Gaskets and O-rings deform during initial installation. While it is possible to reuse gaskets and O-rings, it is highly recommended new gaskets or O-rings be used.

D. General Antenna Removal Instructions

NOTE: These procedures apply to all antennas. To prevent damage to the antennas, do not apply pressure to the plastic housings or pry on plastic housings.

(1) Pull the appropriate circuit breakers.

(2) After removing and saving the hardware, cut the bond line of any installer-applied sealant between the antenna and the aircraft skin.

(3) Pull the antenna away from the aircraft skin far enough to disconnect the cable connector(s).

4. Procedure for the LRUs

CAUTION: BEFORE AN LRU IS INSTALLED OR REMOVED, PULL THE CIRCUIT BREAKERS THAT SUPPLY POWER TO THE LRU TO REMOVE POWER.

CAUTION: MOISTURE AND DIRT CAUSE DAMAGE TO LRUs.

CAUTION: LRU FAILURE RATES INCREASE WITH A RISE IN TEMPERATURE. INSTALL THE LRUs WITH CLEARANCE; LET THE AIR FLOW ON TOP AND BOTTOM OF LRUS TO PREVENT OVERHEATING.

A. LRU Removal

(1) Remove an LRU as follows:

(a) Disconnect the circuit breakers that supply power to the LRU.

(b) Tag the circuit breakers with DO-NOT-OPERATE identifiers.

(c) Loosen the clamp knobs and let them drop out of the way.

(d) Pull the LRU forward a minimum of 1/2 inch to clear the rear connector pins.

(e) Lift the LRU free of the cooling air-duct gasket on the mounting rack.

B. LRU Installation

(1) Install an LRU as follows:

(a) Determine the location of each LRU in the aircraft.

(b) Check the LRU to be installed and make sure all connector pins are straight and ready for connection.

(c) Make sure the index pin coding on the rear connector is correct for the mating connector.

(d) Place the LRU in the appropriate mounting rack and align the connectors. Push the LRU back to make contact with the connector pins. Push the LRU into place and rock the LRU sideways slightly.

CAUTION: DO NOT OVER TIGHTEN THE CLAMP. EXCESSIVE TORQUE CAN CAUSE BRACKETS AND CONNECTORS TO WARP AND BEND.

(e) Put the hold-down clamps in place and tighten the knobs finger-tight.

5. Owner Requirements Table Uploading

A. General

(1) When the SDU is replaced, the ORT needs to be uploaded before normal operation can begin. Refer to SYSTEM OPERATION, for the ORT uploading procedure.

6. Instructions for Continued Airworthiness, FAR 25.1529

A. General

(1) Maintenance requirements and instructions for continued airworthiness of the MCS components are contained in the paragraphs that follow.

(2) Installation of the MCS on an aircraft by supplemental type certificate or Form 337 obligates the aircraft operator to include the maintenance information supplied by this manual in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program.

(a) Maintenance information for the MCS (system description, removal, installation, testing, etc.) is contained in this manual.

(b) LRU part numbers and other necessary part numbers contained in this manual should be placed into the aircraft operator's appropriate aircraft illustrated parts catalog (IPC).

(c) Wiring diagram information contained in this manual should be placed into the aircraft operator's appropriate aircraft Wiring Diagram Manuals.

(d) The MCS system components are considered on-condition units and no additional maintenance is required other than a check for security and operation at normal inspection intervals.

(e) If a system component is inoperative, remove unit, secure cables and wiring, collar applicable switches and circuit breakers, and placard them inoperative. Revise equipment list and weight and balance as applicable prior to flight and make a log book entry that unit was removed (refer to section 91.213 of the FAR or the aircraft's minimum equipment list (MEL).

(f) The MCS components can be repaired at a factory authorized repair center or an appropriately rated FAA Part 145 repair station.

(g) Once repaired, reinstall the LRU in the aircraft in accordance with the original Form 337 approved data or instructions in this manual. Do a Return to Service test of the system and approve it for return to service with a log book entry required by section 43.9.

(h) Scheduled maintenance program tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

1 Recommended periodic scheduled servicing tasks: None required.

2 Recommended periodic inspections: None required.

NOTE: The (applicable LRUs) used with this system have test and inspections that are required by FAR 91.413 to be completed every 24 calender months.

3 Recommended periodic scheduled preventative maintenance tests (Tests to determine system condition and/or latent failures): None required.

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APPENDIX A
VENDOR EQUIPMENT

1. Overview

A. General

(1) Appendix A contains information on vendor-manufactured equipment that can be installed on an aircraft configured for MCS system. Installation of this equipment depends on the specific requirements of the operator. Therefore, information in this section is supplied as a courtesy to the MCS equipment operators.

2. Electronic Cable Specialists

A. General

(1) This paragraph contains information on how to select installation provisions offered by electronic cable specialists (ECS) for the Honeywell MCS-4000/7000 system. ECS designs and manufactures the installation provisions described here and can supply either individual components or complete installation kits. The address for Electronic Cable Specialists is as follows:

Electronic Cable Specialists
5300 W. Franklin Drive
Franklin, WI 53132
U.S.A.

Telephone: (414) 421-5300
FAX: (414) 421-5301

B. Radio Frequency Components

(1) All RF components (cable, connectors, and attenuators) supplied to interface the SATCOM Avionics and Antenna Subsystems have been designed to meet the strict usage and attenuation requirements of the Honeywell MCS-4000/7000 system and ARINC 741/761. A selected list of RF components offered by ECS for SATCOM installations is shown in Table A-1 and Table A-2.

C. Cable Assembly Fabrication

(1) ECS fabricates cable assemblies guaranteed to meet SATCOM system requirements and ARINC 741 specifications.

- Each cable assembly is fabricated with an individual part number, which is permanently affixed to each end of the assembly.
- Each set of cable assemblies is assigned a serial number, which is printed on the part number label. Serialization makes sure each cable assembly is traceable and repeatable.

Table A-1. ECS Cables and Connectors

ECS Cable Part No.	310801	310201	311501	311601	311901	3C142B*
Nominal Attenuation @ 1.6 GHz (dB/100 ft)	4.7	6.9	8.7	10.7	15.5	18.4
Overall Diameter	0.45 in.	0.32 in.	0.245 in.	0.23 in.	0.195 in.	0.195 in.
Pounds/100 ft	15.0	8.6	5.2	5.0	4.3	5.0
Male TNC 180°	CTS022	CTS122	CTS922	CTS922	CTS722	CTS722
Male TNC 90°	CTR022	CTR122	CTR922	CTR922	CTR722	CTR722
Male N 180°	CNS022	CNS122	CNS922	CNS922	CNS722	CNS722
Male N 90°	CNR022	CNR122	CNR922	CNR922	CNR722	CNR722
Female N 180°	FNS022	FNS122	FNS922	FNS922	FNS722	FNS722
ARINC 600 Size 1	L0122	L1122	L9122	L9122	L7122	L7122
ARINC 600 Size 5	N/A	N/A	A650922	A650922	225791-2	225791-2

Table A-2. ECS Attenuators

Attenuator (Transmit Path)	Attenuator (Receive Path)
Fixed or Variable	Fixed or Variable

D. Cable Assembly Testing

(1) Testing is done on Hewlett-Packard 8753 network analyzers to verify insertion loss and VSWR. The results become part of a test database and are shipped with each cable assembly. Each cable assembly is tested across the SATCOM system frequency bandwidth (1530 MHz to 1660.5 MHz). Received path cable assemblies are test swept from 1530 MHz to 1559 MHz. Customers have the option of having cable assemblies tested with or without attenuators.

E. ARINC 600 Connectors

(1) ECS supplies ARINC 600 connectors for ARINC 741 style avionic electrical interfaces. The SATCOM rack-side connectors (Figure A-1) are described in this paragraph. Connector part numbers are:

- HPA - NIC66H20A00AA0
- SDU - NIC66H21A00AA0
- SCU/BSU - NIC66F11A00AA0.

(2) ECS supplies ARINC 600 Size 1 coaxial connectors with the requisite termination kit and assembly instructions (Figure A-2).

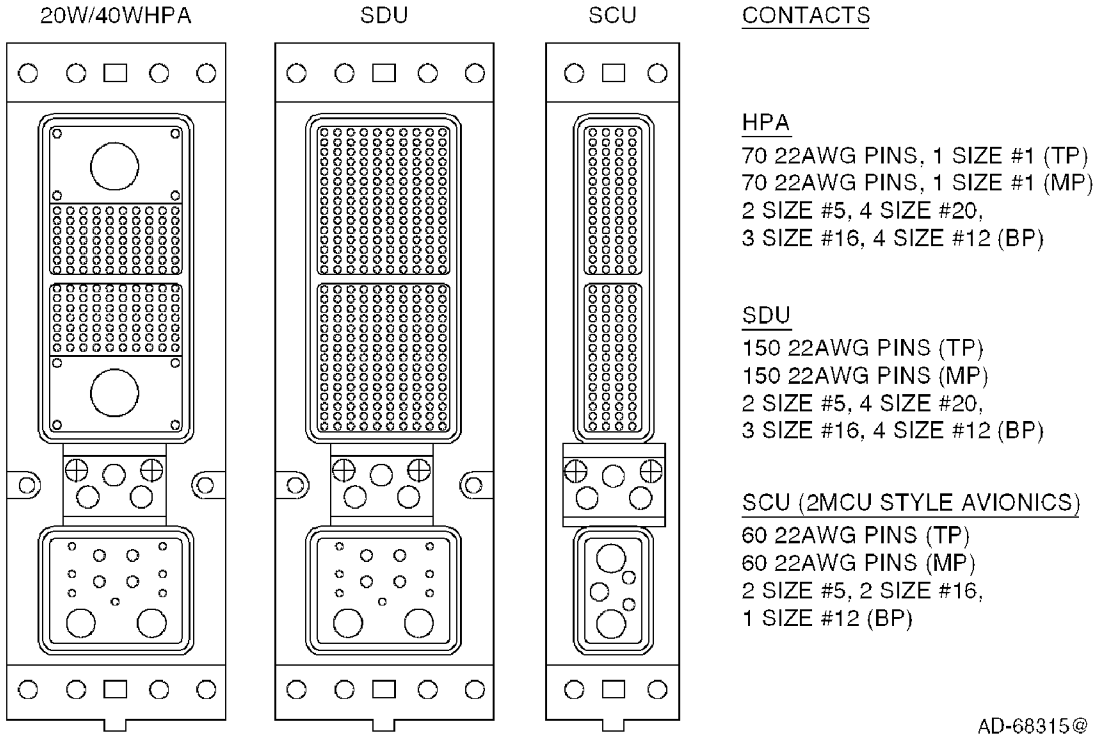


Figure A-1. ARINC Connectors

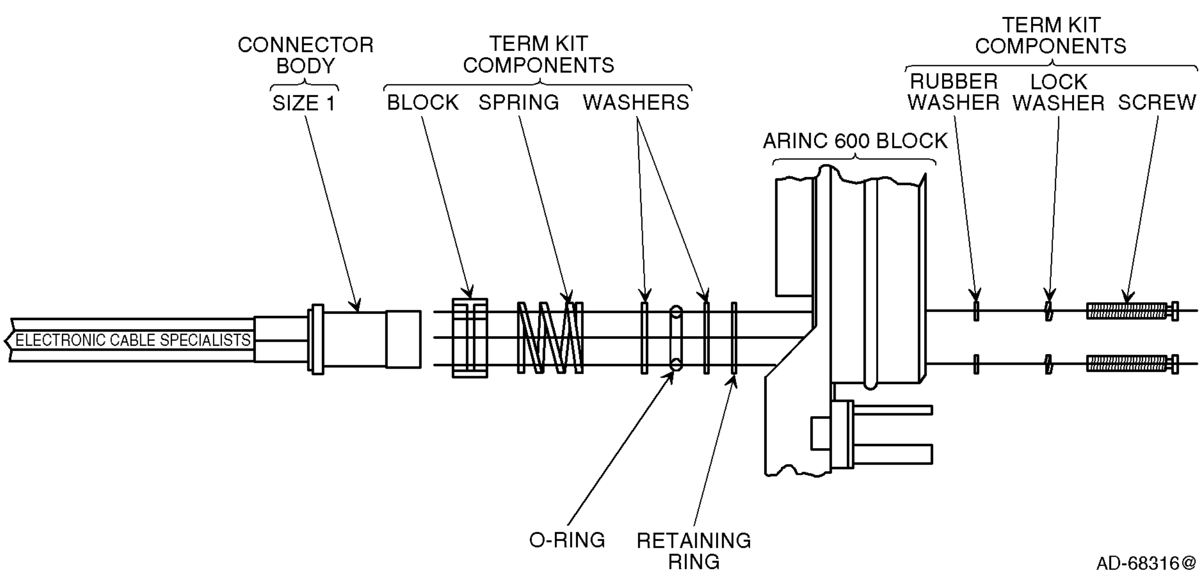


Figure A-2. ARINC Assembly

F. SATCOM Avionics Unit Mounting Hardware

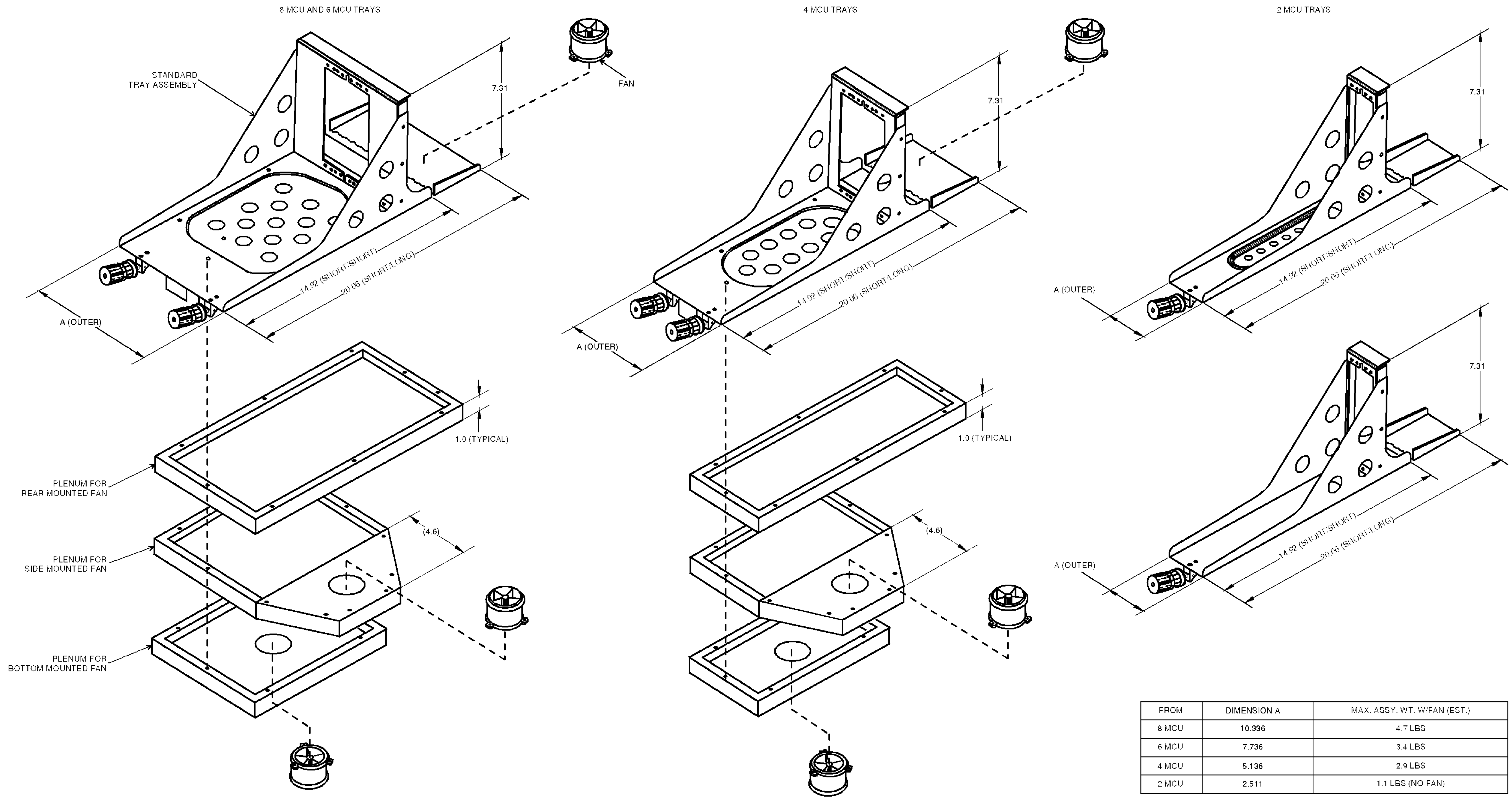
(1) SATCOM avionics mounting hardware is made up of the HPA, SDU, and SCU and will be mounted in ARINC 600 style tray assemblies. The HPA and SDU each require forced air cooling during normal operation, whereas the SCU can function properly with convection cooling alone. Refer to MECHANICAL INSTALLATION, for LRU cooling requirements.

G. SATCOM Hardware Component Kits

(1) This paragraph contains information on how to select SATCOM hardware component kits offered by ECS for the Honeywell MCS-4000/7000 avionic units in Table A-3 thru Table A-6. ECS supplies several options for each kit to accommodate the variety of mounting requirements specific to each aircraft installation. ECS tray assemblies come with and without independent cooling systems to ensure installation flexibility.

(2) The tray assemblies have been specially designed to meet Honeywell and ARINC 600 LRU cooling requirements. Tray assemblies are supplied with insertion/extraction front hold-downs as standard, but are available with other front hold-down options. For tray assembly dimensions refer to Figure A-3.

(3) The hardware component kits for the HPAs, SDU, and BSU are listed in Table A-3 thru Table A-6, respectively.



FROM	DIMENSION A	MAX. ASSY. WT. W/FAN (EST.)
8 MCU	10.336	4.7 LBS
6 MCU	7.736	3.4 LBS
4 MCU	5.136	2.9 LBS
2 MCU	2.511	1.1 LBS (NO FAN)

NOTES:
1. MATERIAL: 0.063 ALLOY 6061-T6 PER QQ-A-250/11.
2. FINISH: CLEAR CHEMFILM PER MIL-C-5541, CLASS 3.

AD-68317@

Figure A-3. Dimensions for ECS Tray Assemblies

Table A-3. HP-600 HPA (40W) Hardware Component Kit, Part No. 998HQS-900-1XX

Kit Part No. *	Item Part Number	Description	Quantity
998HQS-900-102	6292-101	8 MCU S/S standard tray	1
998HQS-900-103	6288-101	8 MCU S/S tray w/bottom fan	1
998HQS-900-104	6290-101	8 MCU S/S tray w/left side fan	1
998HQS-900-106	6284-101	8 MCU S/S tray w/right side fan	1
998HQS-900-107	6286-101	8 MCU S/L standard tray	1
* Parts supplied with each kit	NIC66H20A00AA0	HPA ARINC connector 22 AWG pins 20 AWG sockets 16 AWG sockets 12 AWG sockets Size 5 coaxicons	1 140 4 3 4 2

Table A-4. HP-700 HPA (20W) Hardware Component Kit, Part No. 998HQS-904-1XX

Kit Part No. *	Item Part Number	Description	Quantity
998HQS-904-102	6280-101	4 MCU S/S standard tray	1
998HQS-904-103	6278-101	4 MCU S/S tray w/bottom fan	1
998HQS-904-104	6279-101	4 MCU S/S tray w/left side fan	1
998HQS-904-106	6302-101	4 MCU S/S tray w/right side fan	1
998HQS-904-107	6277-101	4 MCU S/L standard tray	1
* Parts supplied with each kit	NIC66H20A00AA0	HPA ARINC connector 22 AWG pins 20 AWG sockets 16 AWG sockets 12 AWG sockets Size 5 coaxicons	1 140 4 3 4 2

Table A-5. SD-700 SDU Hardware Component Kit, Part No. XXXXXX-XXX-1XX

Kit Part No. *	Item Part Number	Description	Quantity
998HQS-901-102	6283-101	6 MCU S/S standard tray	1
998HQS-901-103	6232-101	6 MCU S/S tray w/bottom fan	1
998HQS-901-104	6282-101	6 MCU S/S tray w/left side fan	1
998HQS-901-106	6045-109	6 MCU S/S tray w/right side fan	1
998HQS-901-107	6281-101	6 MCU S/L standard tray	1
* Parts supplied with each kit	NIC66H21A00AA0	SDU ARINC connector 22 AWG pins 20 AWG sockets 16 AWG sockets 12 AWG sockets Size 5 coaxicons	1 300 4 3 4 2

Table A-6. BSU Hardware Component Kit, Part No. 970HQS-903-1XX

Kit Part No. *	Item Part Number	Description	Quantity
970HQS-903-101	6064-101	2 MCU S/S standard tray	1
970HQS-903-102	6074-101	2 MCU S/S flat bottom tray	1
970HQS-903-103	6051-101	2 MCU S/L standard tray	1
970HQS-903-104	6120-101	2 MCU S/L flat bottom tray	1
* Parts supplied with each kit	NIC66F11A00AA0	SCU/BSU ARINC connector 22 AWG pins 16 AWG sockets 12 AWG sockets Size 5 coaxicons	1 140 2 1 2

H. Air Filtration Assemblies

(1) ECS can supply air filtration assemblies for the HPA, SDU, and BSU tray assemblies described in Table A-3 thru Table A-6. These filter assemblies offer protection against airborne contaminants, such as dust and cigarette smoke. System mean-time-between-failures (MTBF) can be significantly increased. Appendix B supplies installation procedures for air filtration hardware.

I. SATCOM Shelf Assemblies

(1) ECS supplies customized and standard turnkey plenum shelf assemblies to accommodate either single or dual SATCOM installations. A shelf assembly can incorporate equipment trays, racking, and additional support structures, such as disconnect panels, cover plates, and mounting brackets. ECS can supply components that are compatible with all types of air transport aircraft.

NOTE: Some SATCOM system installation locations render the aircraft cooling system inadequate. ECS has designed a self-contained cooling system for the SATCOM shelf assembly that can be used in this type of installation.

J. Additional Avionics Installation Components

(1) ECS supplies a variety of additional components to support a SATCOM installation. These include RF splitters, combiners, high power relays, maintenance panels, placards, circuit breakers, and control annunciator panels.

K. Antenna System Provisions

(1) SATCOM antenna systems are available in numerous configurations. ECS supplies installation provisions for each of these configurations.

- Some high-gain top-mounted antenna systems require a 2-MCU tray assembly and an ARINC 600 connector (Part No. NIC66F11A00AA0) for the BSU. Others require mounting bracketry for the BSU. ECS supplies both BSU 2-MCU tray assembly, and connector and mounting bracketry as required.
- ECS supplies trays and ARINC connectors for various SCUs in the market place.
- ECS supplies other antenna mounting hardware, such as mounting brackets for the diplexer/low noise amplifier (D/LNA) and high- and low-gain antenna doublers.

L. Cabin Communications System Provisions

(1) ECS supplies ARINC 746 compliant air-to-ground communication systems installation provisions. These provisions include mounting hardware and connectors, shelves, racks, brackets, placards, cover plates, RF cable, connectors, cable assemblies, and wire harness assemblies.

M. Wire Harnesses

(1) ECS can supply wire harness provisions that interface the SATCOM avionics with the cabin communication units, the cabin communications units with the cabin phones, and both the SATCOM avionics and cabin communication units with other aircraft systems.

(2) ECS wire harness assemblies can be custom designed and fabricated to meet system installation requirements.

N. Complete Integrated SATCOM Installation Kits

(1) Complete system integration packages are available for ECS for virtually any given installation requirements. These integration packages can include any of the installation provisions discussed in this section, along with other customer-specified components. ECS can also support Honeywell's customers with systems installation design engineering and certification design data packaging.

3. Hollingsead International

A. General

(1) This information aids you in selecting the engineering services and installation provisions offered by Hollingsead International for the various MCS systems. Hollingsead International is rapidly transforming into a world-class avionics and aircraft systems integration leader, providing the capability to perform any or all of the following:

- Design and manufacturing of the structural mounting for the MCS and all associated avionics.
- Design and manufacturing of all wire and cable harness assembly interface connections between the MCS and all associated avionics.
- Development of all engineering design substantiation, documentation, and testing in support of FAA approval.
- Complete on-site support of a full installation team for the entire MCS installation kit.

(2) You can contact them at the following address regarding your specific MCS program requirements:

Hollingsead International
13701 Excelsior Drive
Santa Fe Springs, CA 90670
U.S.A.

Telephone: (310) 921-3438
FAX: (310) 921-6313
Telex: 691-462

B. Engineering Services

(1) As addressed in the previous paragraph, Hollingsead International supplies any level of engineering support from minimal consultation to full turn-key. Full turn-key support is defined as Hollingsead International undertaking the entire systems integration from initial design through procurement and manufacture of parts to final installation and certification on behalf on the customer.

C. LRU Mounting Requirements

(1) MCS avionics are made up of the HPA, SDU, and BSU, which are mounted in ARINC 600 style tray assemblies. The HPA and SDU each require forced air cooling during normal operation. The BSU and CMU, which are mounted in an ARINC 404 tray, function properly with convection cooling alone.

D. Installation Kit Components

(1) General

(a) Complete system installation kits are available from Hollingsead International for virtually any given installation requirement. These installation kits can include any of the installation provisions discussed herein along with other customer-specified components.

(2) Coaxial Cables

(a) All coaxial cables, connectors, and attenuators have been designed to fulfill the MCS system and the ARINC 741 usage and attenuation requirements. Hollingsead International supplies immediate access to several types and manufacturers of coaxial cable, appropriate N or TNC connectors, and attenuators to make sure the specific attenuation profiles for each aircraft installation is achieved. These cables range in nominal attenuation from 1.27 to 16.3 dB per 100 feet at 1.6 GHz. The cable outer diameter range is from 0.206 inch to 1.55 inches. Each cable assembly is fabricated with an individual part number and, where necessary, is assigned a serial number, which is permanently affixed to each end. Serialization insures traceability and reproducibility.

(b) Testing of each cable assembly is performed to verify insertion loss and VSWR. The results become part of a test database and are shipped with each cable assembly. Each cable assembly is tested across the MCS system frequency bandwidth. Transmit path cable assemblies are test swept from 1626.5 MHz to 1660.5 MHz and receive path cable assemblies are test swept from 1530 MHz to 1559 MHz. Customers have the option of having cable assemblies tested with or without attenuators.

(3) Connectors

(a) Hollingsead International supplies the appropriate ARINC connectors for ARINC Characteristic 741 style avionics electrical interfaces. The SATCOM rack-side connector blocks are appropriately mounted on each tray assembly. Hollingsead International supplies ARINC 600 Size 1 coaxial connectors with the necessary termination kit assembly instructions.

(b) The connector part numbers are as follows:

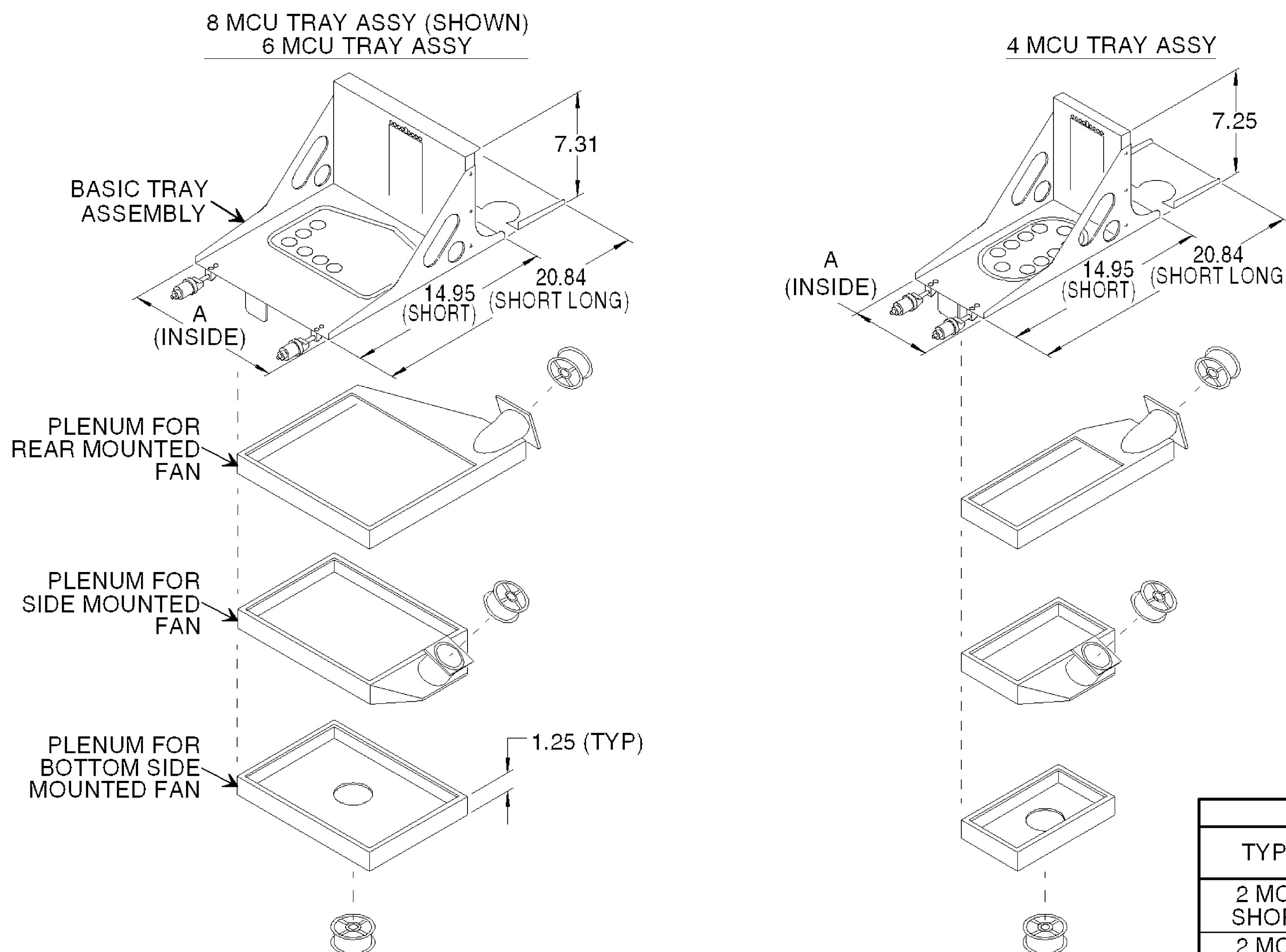
- SDU - C-06B3-0204-0100
- HPA (40W) - C-06B3-0708-0100
- HPA (20W) - C-06B3-0708-0100
- BSU - C-06B1-0101-0100
- CMU - DPX2MA-A106PA106P-33B-0001.

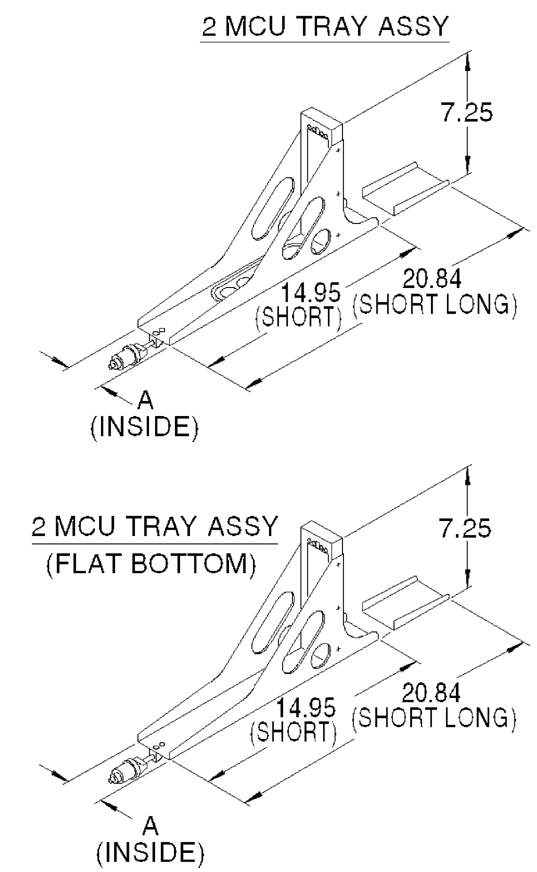
(4) Tray Assemblies

(a) Hollingsead International manufactures several tray assemblies for the MCS avionics. These tray assemblies come with or without independent cooling systems to ensure installation flexibility. Where forced air cooling is required, these tray assemblies have been specially designed to meet the cooling requirements of each LRU using a single fan. Tray assemblies are supplied with insertion/extraction front hold-downs as standard, but are available with other front hold-down options. Table A-7 identifies the various tray options and Figure A-4 identifies the dimensions for each tray assembly.

Table A-7. Tray Assembly Part Numbers

Type	Standard Tray Assembly	Assembly Fan Location				
		Bottom	Left Side	Right Side	Left Rear	Right Rear
8 MCU S/S	1708006-101	1708007-101	1708008-101	1708008-102	N/A	N/A
8 MCU S/L	1708006-201	1708007-201	1708008-201	1708008-202	1708009-101	1708009-102
6 MCU S/S	1706007-101	1706008-101	1706009-101	1706009-102	N/A	N/A
6 MCU S/L	1706007-201	1706008-201	1706009-201	1706009-202	1706010-101	1706010-102
4 MCU S/S	1704008-101	1704009-101	1704010-101	1704010-102	N/A	N/A
4 MCU S/L	1704008-201	1704009-201	1704010-201	1704010-202	1704011-101	1704011-102
2 MCU S/S	1702002-101	1702003-101				
2 MCU S/L	1702002-201	1702003-201				





TYPE	MAXIMUM ESTIMATED WEIGHTS: BASIC TRAY ASSEMBLY	PLENUM / FAN ASSY: BOTTOM	PLENUM / FAN ASSY: SIDE	PLENUM / FAN ASSY: REAR	A DIMENSION
2 MCU SHORT	1.4 LBS	TBD	TBD	N/A	2.39
2 MCU SHORT LG	1.5 LBS	TBD	TBD	TBD	
4 MCU SHORT	1.7 LBS	2.1 LBS	2.3 LBS	N/A	5.01
4 MCU SHORT LG	1.9 LBS	2.3 LBS	2.4 LBS	2.6 LBS	
6 MCU SHORT	2.3 LBS	2.6 LBS	3.2 LBS	N/A	7.61
6 MCU SHORT LG	2.6 LBS	2.9 LBS	3.5 LBS	3.6 LBS	
8 MCU SHORT	2.6 LBS	3.7 LBS	4.0 LBS	N/A	10.21
8 MCU SHORT LG	3.0 LBS	4.1 LBS	4.2 LBS	4.3 LBS	

AD-68318@

Figure A-4. Dimensions for Hollingsead Tray Assemblies

(5) Plenum Shelf Assemblies

(a) Hollingsead International supplies customized and standard turnkey plenum shelf assemblies to accommodate either single or dual MCS system installations. A shelf assembly can incorporate equipment trays, racking, and additional support structures such as disconnect panels, cover plates, and mounting brackets. Hollingsead International can supply components that are compatible with all types of air transport aircraft.

(6) Additional Components

(a) Hollingsead International supplies a variety of additional components to support an MCS installation, including RF splitters, combiners, high power relays, maintenance panels, placards, circuit breakers, and control enunciator panels.

(7) Antenna System Provisions

(a) The antenna subsystems for the MCS system are available in numerous configurations. Hollingsead International supplies installation provisions for each of these configurations. Some high-gain, top-mounted antenna systems use a 2-MCU tray assembly and ARINC 600 connector for the BSU. Others use mounting bracket hardware for the BSU. Hollingsead International supplies both BSU 2-MCU tray assemblies and mounting bracket hardware as necessary. Hollingsead International supplies other antenna mounting hardware such as mounting brackets for the diplexer/LNA and high-gain and low-gain antenna doublers.

(8) Cabin Communications System Provisions

(a) Hollingsead International supplies ARINC 746 compliant air-to-ground communications system installation provisions. These provisions include mounting hardware and connectors, shelves, racks, brackets, placards, cover plates, RF cable, connectors, cable assemblies, and wire harness assemblies.

(9) Wire Harness Assemblies

(a) Hollingsead International wire harness assemblies are custom designed and fabricated to meet each customer's specific system installation requirements. Hollingsead International supplies wire harness assemblies for the following interfaces:

- MCS avionics and cabin communication units
- MCS avionics and flight deck data and voice communication sources
- Cabin communications units and cabin telephones
- Both the SATCOM avionics and cabin communication units with other aircraft systems.

4. Signal Conditioning Unit

A. General

(1) The SCU (Racal Part No. 56047-010XX) is manufactured by Racal Avionics in the U.S.A. Contact the project manager at the following address for additional information not supplied in this section:

Racal Avionics Incorporated
8851 Monard Drive
Silver Spring, MD 20910
U.S.A.

Telephone: (301) 495-6695
FAX: (301) 585-7578
Telex: 898316

(2) The MCS system requires ARINC 429 data for antenna pointing, antenna stabilization, and Doppler frequency correction. These requirements are defined in Table A-8. If the aircraft does not have an IRS that supplies this ARINC data, the SCU can be used to supply the data.

(3) The SCU is packaged as an ARINC 600 2 MCU and weighs a maximum of 5.95 pounds (2.70 kilograms). The outer case of the SCU is constructed from two half-shells identical in dimensions, which are made of an aluminum alloy 1.6 millimeters thick. The front and rear panels are made of the same alloy 3.3 millimeters thick. Both panels attach to the outer half-shells with corner brackets. Two divider plates mount between the half-shells of the outer case to supply additional rigidity and electrical shielding.

(4) The SCU translates and consolidates various input data formats into a two-wire differential ARINC 429 high speed output for latitude and longitude position, true heading, track angle, ground speed, and pitch and roll attitude. Program pins define the particular type of data being received. These pins are interrogated at power on by the software to determine the required configuration.

(5) The SCU operates from a nominal 115 V ac, 400 Hz single phase supply and/or from 28 V dc primary power. Input pins are supplied for both power sources in the ARINC 600 connector, and both power inputs can be connected to the aircraft power. Current consumption depends on the input voltage and temperature, but is typically 0.25 amperes at 115 V ac or 0.40 amperes at 28 V dc.

Table A-8. ARINC 429 Data Requirements

Label	Definition	Minimum Rate (MS)	Maximum Rate (ms)
310	Latitude of present position	334	67
311	Longitude of present position	334	67
312	Ground speed	125	22
313	Track angle	55	22
314	True heading	55	22
324	Pitch	40	8
325	Roll	40	8

B. Operator Functions

(1) The front panel contains six LED indicators to allow monitoring of the SCU status. However, these indicators are intended for use during repair by maintenance personnel rather than by the operator during normal flight operation. Discrete outputs representing the state of each LED indicator are also supplied for remote monitoring. The functions of these discretes are defined in Table A-9.

Table A-9. SCU Discrete Functions

Color	Nomenclature	Function
Green	Power	Indicates SCU is on and all voltages are correct when lit.
Green	SCU Valid	Indicates correct operation of the SCU logic and processing circuits when lit.
Red	BIT Fail	• Indicates normal operation when off. • Indicates BIT is running repetitively when flashing slowly. Indicates the SCU has failed BIT when steadily lit. • Indicates the SCU has failed BIT when steadily lit.
Amber	Signal 1	Indicates selection of input channel 1 when lit.
Amber	Signal 2	Indicates selection of input channel 2 when lit.
Amber	Signal 3	Indicates selection of input channel 3 when lit.

(2) Three amber LED indicators supply an error code that is displayed when the SCU fails in the BIT mode. The red indicator lights and a three-bit code is continuously displayed on the amber LEDs as indicated in Table A-10. BIT is interruptive and all normal operation ceases during the time when the SCU is in the BIT mode.

Table A-10. SCU Error Code

Failure	Code	LED 1	LED 2	LED 3
ARINC 429 translator not programmed	1	ON	OFF	OFF
RAM read/write failed	2	OFF	ON	OFF
ARINC 561 translator failed	3	ON	ON	OFF
PROM checksum failed	4	OFF	OFF	ON
ARINC 561 translator not programmed	5	ON	OFF	ON
Discrete input failed	6	OFF	ON	ON
ARINC 429 translator failed	7	ON	ON	ON

C. Control Functions

(1) Normal operation of the SCU is fully automatic and does not require operator intervention. Some control functions are supplied through the main ARINC 600 connector. These functions include:

- Remote SCU on/off control
- BIT initiate control
- Signal select A
- Signal select B
- Program pin A
- Program pin B
- Program pin C.

(2) The remote SCU on/off control line enables the operation of the SCU power supply. The control line is active low and must be connected to ground to enable operation of the SCU. An open circuit or 28 V dc on this line shuts down operation of the SCU.

(3) The BIT initiate control line is an active low input used to enable BIT in the SCU. The BIT mode is an optional function that supplies a pre/post-flight confidence check and is intended for use by maintenance personnel as a diagnostic tool. The SCU remains in the BIT mode as long as the BIT initiate control line is grounded. An open circuit or 28 V dc on this control causes the SCU to return to normal operation.

(4) Signal selection is normally an automatic function under control of the internal SCU program and is based on the validity of the received data. The signal select control lines supply an override of this automatic function to allow manual selection of one input from three available sources. The signal select control lines are active low and are internally pulled high. Manual selection is accomplished by applying a ground to the control lines as given in Table A-11.

Table A-11. SCU Manual Signal Selection

Function	Signal Select Control Lines	
	A	B
Automatic Selection	High	High
Select Input No. 1	Low	High
Select Input No. 2	High	Low
Select Input No. 3	Low	Low

D. System Functions

(1) Initialization

(a) Operation begins with BIT when the SCU is activated by applying aircraft power and grounding the on/off control line. Testing normally takes approximately 0.5 second and when BIT passes normal operation begins. If the SCU fails the initial BIT check, the unit latches in the BIT mode and displays an error code with the amber LED indicators.

(2) Automatic Input Selection Mode

(a) There are three available data input channels. Unless a channel is manually selected, the input to be used by the SCU is selected automatically. After initially selecting Channel 1, the SCU checks for the presence of the required valid words in the input data stream and the status of the attitude warning discrete from the selected synchro channel. If all validity conditions are met within 1.6 seconds from the initial channel selection, the SCU locks on to the current channel and continues to operate from that data source. The appropriate amber LED indicator lights to indicate the selected channel to operator. If any of the required data is invalid, the SCU cycles to the next input channel until a channel providing a complete frame of valid data is received.

(3) Valid Channel Condition

(a) Conditions that must exist to let the SCU accept the current input channel include:

- At least one new data word for each of the required labels is received within the specified time period.
- The sign/status matrix (SSM) of all words for all required labels must be valid.
- The primary attitude warning input discrete must be in a valid state to indicate the synchro inputs for attitude are usable.

(4) Channel Switching Timing

(a) The SCU allows 1.6 seconds for the selected input channel to receive a valid data frame. However, if 1.6 seconds has passed and the valid channel conditions have not been satisfied, the input channel cycles to the next sequential channel. If all three input channels have been checked and none are valid, the SCU prevents further cycling of the input channel selection for 1 minute. This prevents the SCU from continuously cycling when the inertial navigation units or other sources of navigation data have not been initialized. After the 1-minute delay, the SCU again initiates the checking cycle.

(5) Data Input

(a) A data subset made up of present latitude and longitude, true heading, track angle, and ground speed is received through either the ARINC 561-6 wire inputs or the ARINC 571-2 wire inputs as defined by the program pin selections. When used as a selector of ARINC 404 data inputs, pitch and roll labels are also included. The words are selected from the data stream by their octal labels while other words are ignored. Program pin selections and associated data formats and labels are defined in Table A-12 thru Table A-16.

Table A-12. ARINC 561 Binary Data

Octal Label	Coded	Program Pin			Definition
		A	B	C	
310	Binary	0	0	0	Latitude of present position
311	Binary	0	0	0	Longitude of present position
212	Binary	0	0	0	Ground speed
213	Binary	0	0	0	Track angle
214	Binary	0	0	0	True heading

Table A-13. ARINC 561 BCD Data

Octal Label	Coded	Program Pin			Definition
		A	B	C	
010	BCD	1	0	0	Latitude of present position
011	BCD	1	0	0	Longitude of present position
012	BCD	1	0	0	Ground speed
013	BCD	1	0	0	Track angle
014	BCD	1	0	0	True heading

Table A-14. ARINC 571 Data, ARINC 429 Format

Octal Label	Program Pin			Definition
	A	B	C	
310	0	1	0	Latitude of present position
311	0	1	0	Longitude of present position
212	0	1	0	Ground speed
213	0	1	0	Track angle
214	0	1	0	True heading

Table A-15. ARINC 571 Data, ARINC 419 Format

Octal Label	Program Pin			Definition
	A	B	C	
210	1	1	0	Latitude of present position
211	1	1	0	Longitude of present position
212	1	1	0	Ground speed
213	1	1	0	Track angle
214	1	1	0	True heading

Table A-16. ARINC 404 Data, ARINC 429 Format

Octal Label	Program Pin			Definition
	A	B	C	
310	0	0	1	Latitude of present position
311	0	0	1	Longitude of present position
312	0	0	1	Ground speed
313	0	0	1	Track angle
314	0	0	1	True heading
324	0	0	1	Pitch
325	0	0	1	Roll

(b) The SSM of each received data word is checked. Valid words are converted to ARINC 429 data. Invalid words are discarded.

(c) With exception of the ARINC 404 input, the SCU also receives attitude data from an associated attitude source. The attitude data is in the form of ARINC 407 pitch and roll synchro channels and an attitude warning flag. Attitude data is selected from a source associated with the source selected for digital data. The attitude inputs used are given in Table A-17.

Table A-17. SCU Attitude Data Inputs

Data	Line Function
Roll	Synchro X
Roll	Synchro Y
Roll	Synchro Z
Pitch	Synchro X
Pitch	Synchro Y
Pitch	Synchro Z
Roll/Pitch	Reference HI
Roll/Pitch	Reference LO
Warning Flag	HI Flag (HI = Good)

(d) The pitch and roll synchro inputs are read every 20 milliseconds. The attitude warning flag is sampled before each computation to check the validity of the input data before the data is accepted.

(6) Data Output

(a) The SCU transmits ARINC 429 serial words at a rate of one complete seven-word message every 20 milliseconds. The SSMs in the navigation data words are based on those supplied by the digital input words. The SSM data for the attitude words is derived from computations and from the primary warning flag.

(b) The data output is in accordance with ARINC 429 high speed data (100 kHz clock speed). The SCU outputs ARINC 429 data on two separate ports operating in parallel. Data from both ports is identical, but independent output buffers are used to supply redundancy.

E. ARINC 600 Connector Pin Assignments

(1) The rear connector (ARINC Part No. NIC66F11A00AA0) of the SCU complies with ARINC Characteristic 600 as specified in the following:

- ARINC 600 - Size MCU 2 no. 2 shell
- Type 0X top insert
- Type 0X middle insert
- Type 0X bottom insert
- Index pin code 0X.

(2) The contact arrangements for the connector are specified in Table A-18. An example pin designation of BC12 for the table is given below.

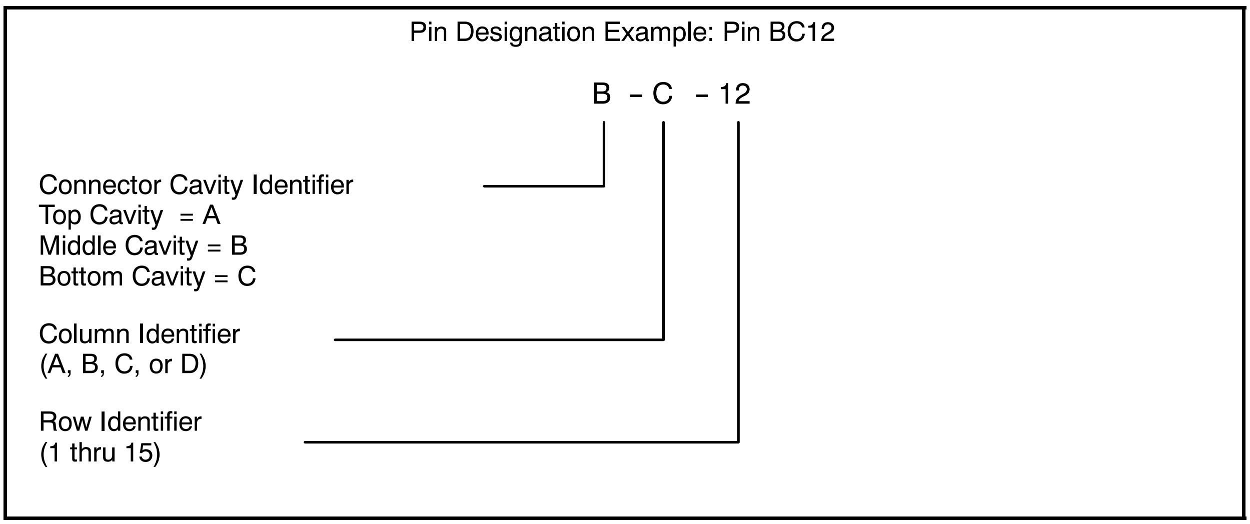


Table A-18. Contact Arrangements for SCU ARINC 600 Connector

Pin	Function	Remarks
AC1	ARINC 561 Data No. 1 (HI)	Note 1.
AD1	ARINC 561 Data No. 1 (LO)	Note 1.
AC2	ARINC 561 Clock No. 1 (HI)	Note 1.
AD2	ARINC 561 Clock No. 1 (LO)	Note 1.
AC3	ARINC 561 Strobe No. 1 (HI) or ARINC 429/419 Data No. 1 (HI)	Note 1.
AD3	ARINC 561 Strobe No. 1 (LO) or ARINC 429/419 Data No. 1 (LO)	Note 1.
AC4	Spare	
AD4	Spare	
AC5	Spare	
AD5	Spare	
AC6	Spare	
AD6	Spare	
AC7	Spare	
AD7	Spare	
AC8	Spare	
AD8	Spare	
AC9	ARINC 561 Data No. 3 (HI)	Note 1.
AD9	ARINC 561 Data No. 3 (LO)	Note 1.
AC10	ARINC 561 Clock No. 3 (HI)	Note 1.
AD10	ARINC 561 Clock No. 3 (LO)	Note 1.
AC11	ARINC 561 Strobe No. 3 (HI) or ARINC 429/419 Data No. 3 (HI)	Note 1.
AD11	ARINC 561 Strobe No. 3 (LO) or ARINC 429/419 Data No. 3 (LO)	Note 1.
AC12	Spare	
AD12	Spare	
AC13	ARINC 407 Pitch No. 1 X	Note 2.
AD13	ARINC 407 Pitch No. 1 Y	Note 2.
AC14	ARINC 407 Pitch No. 1 Z	Note 2.
AD14	ARINC 407 Heading X	Reserved
AC15	ARINC 407 Heading Y	Reserved
AD15	ARINC 407 Heading Z	Reserved

Table A-18. Contact Arrangements for SCU ARINC 600 Connector (cont)

Pin	Function	Remarks
AA1	ARINC 407 Pitch No. 3 X	Note 2.
AB1	ARINC 407 Pitch No. 3 Y	Note 2.
AA2	ARINC 407 Pitch No. 3 Z	Note 2.
AB2	Attitude Warning No. 1 (From Attitude Source)	Note 2.
AA3	ARINC 407 Reference No. 1 (HI)	
AB3	ARINC 407 Reference No. 1 (LO)	
AA4	ARINC 407 Heading Reference (HI)	Reserved
AB4	ARINC 407 Heading Reference (LO)	Reserved
AA5	ARINC 407 Reference No. 3 (HI)	
AB5	ARINC 407 Reference No. 3 (LO)	
AA6	Attitude Warning No. 3 (From Attitude Source)	Note 2.
AB6	Spare	
AA7	ARINC 407 Roll No. 1 X	Note 2.
AB7	ARINC 407 Roll No. 1 Y	Note 2.
AA8	ARINC 407 Roll No. 1 Z	Note 2.
AB8	Spare	
AA9	Spare	
AB9	Spare	
AA10	Spare	
AB10	Spare	
AA11	ARINC 407 Roll No. 3 X	Note 2.
AB11	ARINC 407 Roll No. 3 Y	Note 2.
AA12	ARINC 407 Roll No. 3 Z	Note 2.
AB12	Spare	
AA13	ARINC 404 Echo (HI)	Note 3.
AB13	ARINC 404 Echo (LO)	Note 3.
AA14	Spare	
AB14	Spare	
AA15	Spare	
AB15	Spare	

Table A-18. Contact Arrangements for SCU ARINC 600 Connector (cont)

Pin	Function	Remarks
BC1	ARINC 407 Pitch No. 2 X	Note 2.
BD1	ARINC 407 Pitch No. 2 Y	Note 2.
BC2	ARINC 407 Pitch No. 2 Z	Note 2.
BD2	Spare	
BC3	ARINC 407 Roll No. 2 X	Note 2.
BD3	ARINC 407 Roll No. 2 Y	Note 2.
BC4	Spare	
BD4	ARINC 407 Roll No. 2 Z	Note 2.
BC5	Spare	
BD5	Attitude Warning No. 2 (From Attitude Source)	Note 2.
BC6	ARINC 407 Reference No. 2 (HI)	
BD6	ARINC 407 Reference No. 2 (LO)	
BC7	Signal Source Select A (Input No. 1)	Note 4.
BD7	Signal Source Select (Input No. 2)	Note 4.
BC8	BIT initiate (Input No. 3)	Note 5.
BD8	Spare	
BC9	BIT Failed (Output No. 2)	Reserved
BD9	SCU Valid	Reserved
BC10	Superflag (+28 V dc = Output Valid)	Note 6.
BD10	/Superflag (<1 V dc = Output Valid)	Note 6.
BC11	Program Pin A (Input No. 5)	Note 7.
BD11	Program Pin B (Input No. 6)	Note 7.
BC12	Program Pin C (Input No. 7)	Note 7.
BD12	Spare	
BC13	Spare	
BD13	Spare	
BC14	Spare	
BD14	Spare	
BC15	ARINC 429 Out No. 1 (HI)	
BD15	ARINC 429 Out No. 1 (LO)	

Table A-18. Contact Arrangements for SCU ARINC 600 Connector (cont)

Pin	Function	Remarks
BA1	Spare	
BB1	Spare	
BA2	ARINC 429 Out No. 2 (HI)	
BB2	ARINC 429 Out No. 2 (LO)	
BA3	Spare	
BB3	Spare	
BA4	Discrete Out No. 3 (Select No. 2 LED)	Reserved
BB4	Discrete Out No. 4 (Select No. 3 LED)	Reserved
BA5	Discrete Out No. 5 (Select No. 1 LED)	Reserved
BB5	Discrete Out No. 6	Reserved
BA6	Discrete Out No. 7	Reserved
BB6	Discrete Out No. 8	Reserved
BA7	ARINC 561 Data No. 2 (HI)	Note 1.
BB7	ARINC 561 Data No. 2 (LO)	Note 1.
BA8	ARINC 561 Clock No. 2 (HI)	Note 1.
BB8	ARINC 561 Clock No. 2 (LO)	Note 1.
BA9	ARINC 561 Strobe No. 2 (HI) or ARINC 429/419 Data No. 2 (HI)	Note 1.
BB9	ARINC 561 Strobe No. 2 (LO) or ARINC 429/419 Data No. 2 (LO)	Note 1.
BA10	+28 V dc Power	Aircraft Power (Note 8.)
BB10	+28 V dc Power	Aircraft Power (Note 8.)
BA11	0 V dc Power Return	Aircraft Power (Note 8.)
BB11	0 V dc Power Return	Aircraft Power (Note 8.)
BA12	Chassis Ground	
BB12	Remote SCU On/Off Control	Note 9.
BA13	Shield return	Connected to Chassis
BB13	Shield Return	Connected to Chassis
BA14	115 V ac Power 400 Hz (HI)	Aircraft Power (Note 8.)
BB14	Chassis Ground	
BA15	115 V ac Power 400 Hz (LO)	Aircraft Power (Note 8.)

Table A-18. Contact Arrangements for SCU ARINC 600 Connector (cont)

Pin	Function	Remarks
BB15	Chassis Ground	

NOTES:

1. The 6-wire ARINC 561 or 2-wire ARINC 429/419 (ARINC 571/404) data can be routed from up to three sources. However, if a single input is supplied, it should be connected to the No. 1 inputs as indicated. Inputs No. 2 and 3 should be left open. The type of data being used, either ARINC 561 or ARINC 571/404, must be indicated by selecting the proper program pins as specified in NOTE 7. Also, refer to NOTE 4. for more information on selecting a specific input as the data source.
2. The synchro pitch and roll data can be routed from up to three sources. However, sources of attitude data must be paired with sources of ARINC 561 or ARINC 571 data. Thus, if only one source of ARINC 561 or ARINC 571 data is available, then only one source of attitude data can be used. An attitude warning flag for each source of attitude that is active must be supplied. +28 V dc = valid. Ground or open = invalid.
3. When the SCU is used as a selector/controller of multiple ARINC 404 compatible data sources, the receiving equipment should be connected to the ARINC 404 echo outputs. In this configuration, the input as valid by the SCU is routed back out of the unit on these pins. Since attitude data is embedded in the ARINC 404 data stream, no attitude inputs are used.
4. When multiple sources of data are available and routed to the SCU, it automatically searches for an input with valid attitude data and ARINC 561/571 data. If only one source of ARINC 561/571 data and attitude data is available, the SCU should be connected to only one input and the signal source select lines should be linked as applicable for the selected input as given in Table A-19.
5. Grounding the BIT initiate input forces the SCU to enter the interruptive BIT mode and repetitively do its BIT routines until ground is removed. BIT is automatically done at each power-up cycle. This input should be an open, if not used.
6. The superflag output is +28 V dc whenever the SCU is operating normally and the output data is valid. If a portion of the input data is invalid or the SCU detects an internal fault, then the superflag output is 0 V dc. The /superflag output is the inverse of the superflag output.
7. The data format and characteristics accepted by the SCU are programmable through pins A, B, and C. The combinations supported by the SCU are specified in Table A-20.
8. The SCU operates from either +28 V dc or 115 V ac, 400 Hz power. The power source not used should remain unconnected.
9. The remote SCU on/off control can be used to power down the SCU from a remote location. A ground activates the unit and an open switches the unit off. If remote control is not required, this pin should be permanently grounded at the connector.

Table A-19. Signal Source Select Lines

Signal Source Select	A	B
Auto	Open	Open
Input No.1	Ground	Open
Input No. 2	Open	Ground
Input No. 3	Ground	Ground

Table A-20. SCU Program Pin Combinations

Program Pins			Input Description
A	B	C	
0	0	0	ARINC 561 data, binary labels, synchro attitude
1	0	0	ARINC 561 data, BCD labels, synchro attitude
0	1	0	ARINC 571 data with ARINC 429 format, synchro attitude
1	1	0	ARINC 571 data with ARINC 419 format, synchro attitude
NOTE: Ground = 1; open = 0.			

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APPENDIX B
INSTALLATION PROCEDURES FOR SATCOM AIR FILTRATION SYSTEMS

1. Introduction

A. General

(1) Appendix B contains information on the different air filtration systems available for the SATCOM installations. Procedures for installing these air filtration systems are also supplied. After you have determined the proper air filtration system for your needs, follow the appropriate procedures in paragraph 4.

(2) The SATCOM system (SDU and HPA) is designed to ARINC 600 standards including ARINC 600 cooling requirements. ARINC 600 calls for the cooling air to contain no contamination particles in excess of 400 microns. Several installation designs do not supply cooling air in accordance with ARINC 600. The OEM installation design for the B747, B767, and B777 supply unfiltered cooling air (cabin air) to the SATCOM LRUs. As a result, contaminants in the air tend to accumulate on and inside the LRUs sometimes blocking off the cooling air passages. This leads to units operating at a higher temperature, which can result in decreasing the MTBF of the units.

(3) Filter assemblies have been designed that attach to the SATCOM LRUs or to the LRU trays. These filter assemblies contain filter media that filter out contaminants before entering the LRUs. This design is for installations where the cooling air is drawn through the LRU top to bottom, and where there is at least 1 inch of clearance above the LRUs to allow for the assembly itself. Thus, the air filtration units included in this appendix are acceptable for installation on the B747 and B777 aircraft, but because of clearance problems, are not acceptable for installation on the OEM-provisioned B767 aircraft.

2. Continued Airworthiness

A. General

CAUTION: THE FILTER MEDIA MUST BE REPLACED (OR CLEANED) APPROXIMATELY EVERY 4000 FLIGHT HOURS OR EVERY C CHECK, WHICHEVER COMES FIRST, OR THE EFFECTIVENESS OF THE AIR FILTRATION ASSEMBLY CAN BE DEGRADED.

(1) The selection of the type of filter media cartridge is based on the following:

- Effectiveness of the filter media in removing contaminants from the cooling air before entering the SATCOM LRUs.
- Impact of the filter media on the cooling air mass flow rate through the units.
- Time between removals.

3. Equipment and Materials

A. General

WARNING: BEFORE YOU USE A MATERIAL, KNOW THE HAZARD CODE AND GET THE NECESSARY PROTECTION. REFER TO THE PAGE ABOUT HAZARD CODES FOR MATERIALS IN THE FRONT OF THIS MANUAL.

(1) Refer to Table B-1 for a list of materials.

Table B-1. Materials

Item	Description	Source
HMN 9730178	Retaining compound (MIL-S-22473, grade A) — Grade A	Loctite Corp, Rocky Hill, CT (05972)
HMN 9731178	Primer for retaining compound, ready-to-use, quick (MIL-S-22473, grade T, form R) — Locquic Grade T	
NOTES: NOTES: 1. Equivalent alternatives are permitted for equipment and materials in this list. 2. The HMN codes in the list of materials identify the Honeywell Material Number (HMN) given to each material.		

(2) The equipment listed in Table B-2, Table B-3, and Table B-4 supplies the necessary hardware to install air filtration systems on the aircraft. Find the air filtration system and filter that best fits your needs and contact the company that manufacturers that particular equipment.

Table B-2. Air Filtration Systems from ECS for a Top Mount Assembly

Equipment	Quantity	LRU	Part No.	SATCOM System
SATCOM Filter Assembly	1	SDU	10919-101	6-MCU assembly
SATCOM Filter Assembly	1	HPA (20W)	10968-101	4-MCU assembly
SATCOM Filter Assembly	1	HPA (40W)	10923-101	8-MCU assembly
Filter Cartridge Assembly	1	SDU	10907-105	6-MCU assembly
Filter Cartridge Assembly	1	HPA (20W)	10907-104	4-MCU assembly
Filter Cartridge Assembly	1	HPA (40W)	10907-106	8-MCU assembly

Table B-3. Air Filtration Systems from ECS for a Body-Mounted Design

Equipment	Quantity	LRU	Part No.	SATCOM System
SATCOM Filter Assembly	1	SDU	P0329-106	6-MCU assembly
SATCOM Filter Assembly	1	HPA (20W)	P0329-104	4-MCU assembly
SATCOM Filter Assembly	1	HPA (40W)	P0329-108	8-MCU assembly
Filter Cartridge Assembly	1	SDU	20008-05	6-MCU assembly
Filter Cartridge Assembly	1	HPA (20W)	20008-04	4-MCU assembly
Filter Cartridge Assembly	1	HPA (40W)	20008-06	8-MCU assembly

Table B-4. Air Filtration Systems from ECS for a Tray-Mounted Design

Equipment	Quantity	LRU	Part No.	SATCOM System
SATCOM Filter Assembly	1	SDU	20005-103	6-MCU assembly
SATCOM Filter Assembly	1	HPA (20W)	20005-102	4-MCU assembly
SATCOM Filter Assembly	1	HPA (40W)	20005-104	8-MCU assembly
Filter Cartridge Assembly	1	SDU	20008-05	6-MCU assembly
Filter Cartridge Assembly	1	HPA (20W)	20008-04	4-MCU assembly
Filter Cartridge Assembly	1	HPA (40W)	20008-06	8-MCU assembly

4. Installation Instructions

A. Top Mount Assembly

(1) The ECS top mount air filtration assembly is designed to clamp to the top of the SATCOM LRUs so it does not come off the LRU. Once attached to the top of the LRU, it forms a seal letting only filtered air enter the LRU. The assembly is held to the top of the LRU by friction from the sides of the assembly and by the clamps that supply friction to the front and rear panels of the unit. Figure B-1 shows the location of the components for the following procedures.

(2) Install the filter assembly to an SDU or HPA using the following steps.

(a) Make sure the correct size assembly is selected for the given LRU (refer to Table B-2).

(b) OPTIONAL — Remove the SATCOM LRU from its tray and set it on a secure surface. (The assembly can be installed while the unit is in the rack.)

(c) Install the air filtration media inside the air filtration assembly in the rectangular filter frame.

(d) Place the filter assembly over the top of the LRU with the clamps in the up (thumb lever over the top of the filter assembly) position and pointing toward you.

(e) Push down on the air filtration unit until it fits over the top of the SATCOM LRU. The sides of the air filtration assembly may need to be spread open slightly prior to sliding over the sides of the LRU.

(f) Once the air filtration unit is firmly seated to the top of the LRU, clamp the assembly to the unit by pushing down on the two thumb levers until they lock into position. The thumb levers pass through approximately 180 degrees of rotation for the clamping process.

(g) Make sure the air filtration assembly remains seated firmly against the top of the LRU to maintain the air seal.

(h) Make sure the air filtration assembly is held tightly to the unit by gently lifting up on the assembly; making sure the assembly does not pull off of the LRU.

(i) OPTIONAL - Install the SATCOM LRU back into its tray if removed in step 4.A.(2)(b).

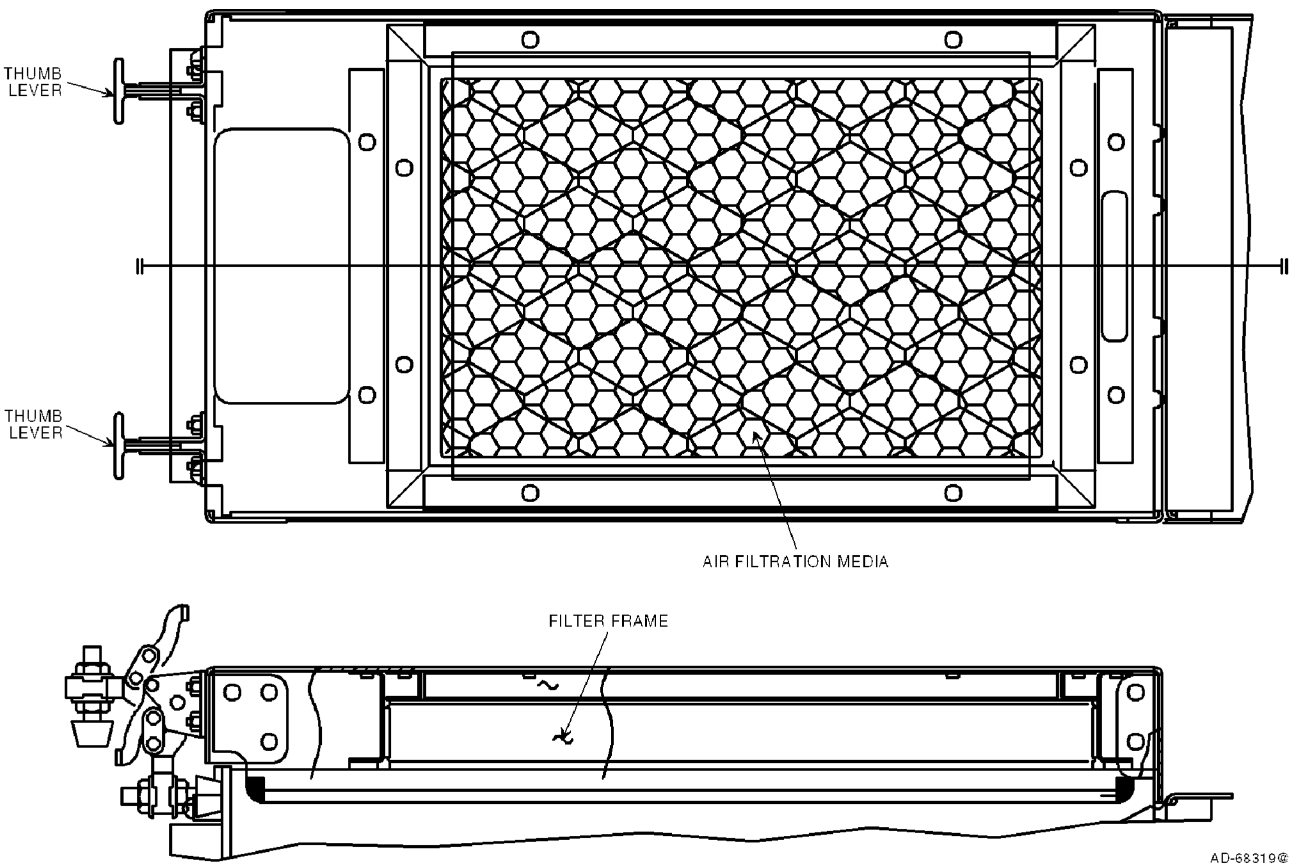

Figure B-1. ECS Top Mount Air Filtration Assembly

(3) Replace the filter media according to the following steps.

(a) Gain access to the SATCOM LRUs.

(b) Lift up on the two thumb levers (approximately 180 degrees).

(c) Pull up on the air filtration unit until it lifts off the top of the SATCOM LRU. The sides of the air filtration assembly may need to be spread open slightly prior to sliding up the sides of the LRU.

(d) Remove the air filtration media from the air filtration assembly in the rectangular filter frame.

(e) Once the assembly is removed, pull the filter assembly out of its retaining fixture and discard the filter appropriately.

(f) Obtain a new filter.

(g) Make sure the correct size filter assembly is selected for the given LRU (refer to Table B-2).

(h) Install the new filter media into the filter assembly retaining fixture.

(i) OPTIONAL — Remove the SATCOM LRU from its tray and set on a secure surface. (The assembly can be installed while the unit is in the rack.)

(j) Install the air filtration media inside the air filtration assembly in the rectangular filter frame.

(k) Place the filter assembly over the top of the LRU with the clamps in the up (thumb lever over the top of the filter assembly) position and pointing toward you.

(l) Push down on the air filtration unit until it fits over the top of the SATCOM LRU. The sides of the air filtration assembly may need to be spread open slightly prior to sliding over the sides of the LRU.

(m) Once the air filtration unit is firmly seated to the top of the LRU, clamp the assembly to the unit by pushing down on the two thumb levers until they lock into position. The thumb levers will pass through approximately 180 degrees of rotation for the clamping process.

(n) Make sure the air filtration assembly remains seated firmly against the top of the LRU to maintain the air seal.

(o) Make sure the air filtration assembly is held tightly to the unit by gently lifting up on the assembly to verify the assembly does not pull off the LRU.

(p) OPTIONAL - Install the SATCOM LRU back into its tray if removed in step 4.A.(3)(i).

B. Body-Mounted Assembly

(1) The ECS body-mounted air filtration assembly is designed to strap around the body of the SATCOM LRUs in a way that it will not come off the LRU. Once attached to the LRU, it forms a seal allowing only filtered air to enter the LRU. The assembly is held to the top of the LRU with a strap that fits securely around the body of the unit. The filtration unit sits on top of the SATCOM LRU. The strap runs down the side, underneath, and up the other side of the LRU. By way of a clamping system on top of the LRU, the strap is pulled tight, which firmly secures the filter assembly to the top of the unit.

(2) Install the filter assembly to an SDU or HPA according to the following steps.

(a) Make sure the correct size assembly is selected for the given LRU (refer to Table B-3).

(b) Remove the SATCOM LRU from its tray and set it on a secure surface.

(c) Slide the filter strap around the front of the LRU so the strap is underneath and coming up each side of the LRU.

(d) Place the filter assembly on top of the LRU so the back lip of the assembly unit fits over the back of the LRU.

(e) Pull the strap around the top of the filter assembly unit so the two ends of the strap overlap. The strap should come over the top of the filter assembly on the front end of the assembly (dog-house end of the LRU). A channel is built into the filter assembly for the strap.

(f) With the strap in place, latch the strap together by inserting the lips of the strap ends together so they latch together. With the LRU facing you, the strap on the left-hand side should latch over the top of the strap on the right-hand side.

(g) Once the strap is latched, make sure the lip on the rear of the filter assembly is seated firmly just over the rear of the LRU.

(h) Make sure the filter retainer mechanism is latched closed.

(3) Replace the filter media according to the following steps. Figure B-2 shows the location of the components used.

(a) Gain access to the SATCOM LRUs.

(b) Locate the filter retaining clips located on the forward end of the filter assembly mechanism.

(c) Slide the retainer clips (one on the left and one on the right) out to disengage the clips from the latching pins.

(d) Lift the filter retaining tray up, (hinged on the rear side) remove the filter media cartridge and discard the filter appropriately.

(e) Install the new filter media by placing a new filter media cartridge in the filter retaining tray chamber.

(f) Lower the filter retaining tray down until the locating pins protrude through the clearance holes on the filter retaining tray.

(g) Slide the retaining clips (left and right) in until they latch around the latching pins.

C. Tray-Mounted Assembly

(1) The ECS tray-mounted air filtration assembly is designed as an integral part of the equipment tray and does not attach to the LRU itself. The SATCOM LRU slides into the tray, sandwiched between the tray and plenum below, and the air filtration assembly above. Since the air filtration assembly is an integral part of the equipment tray, in order to install this type of assembly, a modified equipment tray must be purchased for each LRU.

(2) Replace the filter media according to the following steps. Figure B-2 shows the location of the components used.

(a) Gain access to the SATCOM LRUs.

(b) Locate the filter retaining clips located on the forward end of the filter assembly mechanism.

(c) Slide the retainer clips (one on the left and one on the right) out to disengage the clips from the latching pins.

(d) Lift the filter retaining tray up (hinged on the rear side) and remove the filter media cartridge. Discard the filter media cartridge appropriately.

(e) Install the new filter media by placing a new filter media cartridge in the filter retaining tray chamber.

(f) Make sure the filter cartridge is supported on the air plenum seals. The direction of airflow through the filter is not important.

(g) Lower the filter retaining tray until the locating pins protrude through the clearance holes on the filter retaining tray.

(h) Slide the retaining clips (left and right) in until they latch around the latching pins.

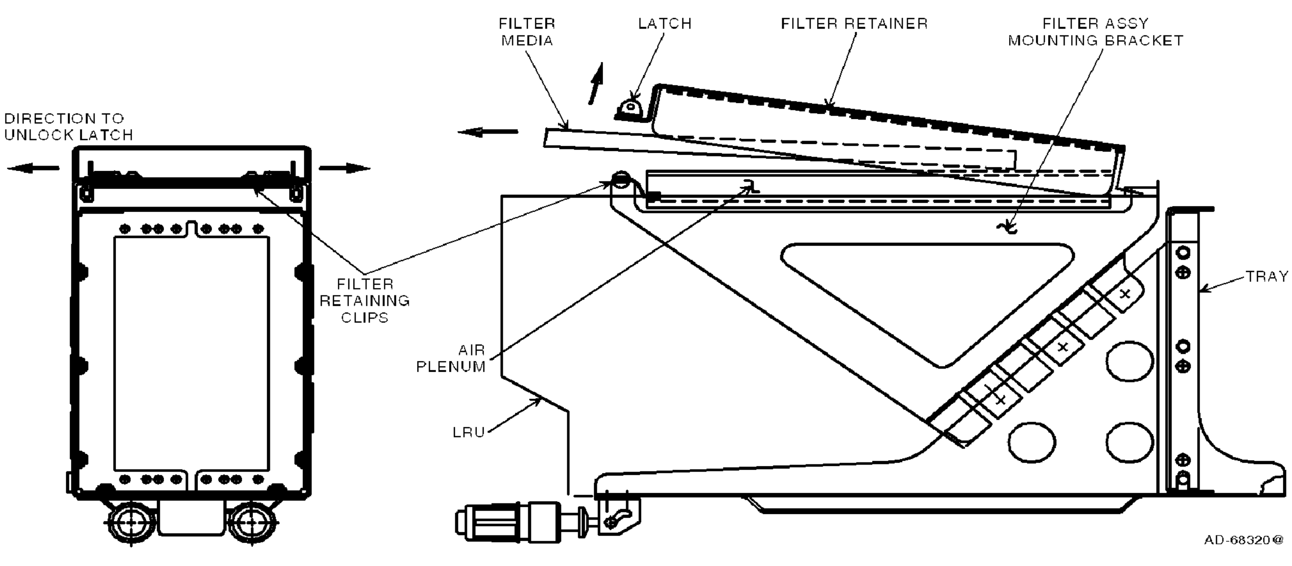

Figure B-2. Front and Side Views Showing Filter Removal

APPENDIX C
OWNER REQUIREMENTS TABLE

1. Overview

A. General

(1) Appendix C contains information on the owner requirements table (ORT) and is stored in non-volatile memory in the SDU. The ORT contains information relating to different areas of functionality, such as log-on and telephony. The ORT does not lose its contents because of the loss of SDU primary power or as a result of PAST. All ORT contents are set to default values by a factory settings restart. The ORT contains all pilot and aircraft operator entered information preserved when the SDU is powered-down. The characteristics of the ORT are specified in Table C-1.

NOTE: Honeywell supplies Windows-based software (ORT editor) that is used to generate the ORT files for upload. Contact your Honeywell representative for a copy of this software.

Table C-1. ORT Characteristics

ORT Item	Characteristic	Attributes	Description
i	Log-On Policy	Secured, common	This item defines the log-on procedure. When the SDU has power applied, the SDU either starts the automatic log-on procedure at the earliest opportunity (automatic), or the SDU goes to an inert standby state, even if the SDU is entirely failure free, where the SDU then waits for user stimulus to start logging-on (commanded).
ii	Satellite/GES Names	User, common	This item defines associated names for the satellites and GESs. Satellite names are up to five characters long. GES names are up to 14 characters long. Names made up of upper case letters, decimal digits, hyphens, and spaces are allowed. A GES name can include satellite and service identifying strings; e.g., GOON A-E SKY takes 12 characters and identifies Goonhilly, the United Kingdom GES servicing the Skyphone consortium and using the Atlantic ocean region east satellite.
iii	GES Preference Values	User, common	This item defines the automatic log-on preference values for GESs from 0 to 9, where 9 corresponds to the most preferred GES. The interpretation of preference value 0 is determined by item lvi, 0 is either the least preferred GES or it is not used for automatic log-on. GESs with preference level 0 can still be used for a constrained log-on. When all GESs on a particular satellite have a preference level of 0 and this satellite becomes the candidate for logon, the logon processing considers all of these GESs to have a preference level of 1 to facilitate continued SATCOM operation.
iv	Maintenance Page Access	User, common	This item defines whether the SCDU maintenance pages are accessible as: a) never; b) always; or c) only when the aircraft is on the ground.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
v	Cockpit Telephone Numbers	User, common	This item defines up to 100 telephone numbers as follows: • Each made up of up to 18 numeric characters (including optional spaces and/or trailing network ID preceded by a slash) • Each number having an associated priority value (i.e., 1 thru 4), protection (i.e., protected or unprotected), and a mnemonic of up to 14 characters • All are located in four user-definable categories of no more than 25 telephone numbers each. If configuration pin TP13A is set to the zero state, every entry with a priority 4 is modified to a priority 3 following an ORT upload or following a POST/PAST where priority 4 numbers existed prior to TP13A being set to the zero state. In a dual system, this modification takes place only if strap TP13A is in the zero state on both SDU systems. This item includes manually entered telephones from the SCDU CATEGORY NUMBERS pages.
vi	Deleted		
vii	Resources Reserved for Headset	User, common	When enabled, this item reserves the following resources for cockpit headset use at all times: one codec, one modem, and sufficient HPA power to support an extra C-channel in all prevailing circumstances. These resources are capable of being reserved for either of the cockpit audio channels. In a dual system, **channel** refers to logical channel.
viii	Response Capability to Log-On Interrogation	N/A	This item is not considered part of the MCS ORT, since the AES always supports log-on interrogation. There is always one SDU modem dedicated to P-channel reception and capable of R-channel and T-channel transmission.
ix	Use and Value of Flight Identification	N/A	This item is not considered part of the MCS ORT since the value is dynamic and is obtained from the CFDS/CMC/OMS or SCDU (along with item xxxiv).
x	Ground-to-Air Circuit-Mode Data	User, common	This item defines the allowing/disallowing of analog interconnect circuit-mode data on ground-to-air calls. It lets the AES identify itself to the GES as being data capable and the owner/operator anticipates receiving ground-to-air calls that need circuit-mode data service, thereby directing the GES to assign data capable channels to all ground-to-air calls.
xi	Deleted		
xii	Deleted		

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xiii	Ground-to-Air Calls	User, common	This item defines the allowing/disallowing and routing of ground-to-air priority 4 calls. If calls are allowed and if two or more of the AES voice user interfaces (i.e., digital phones, analog handset, or headset) are fitted, this item specifies which destination (digital phone, analog handset, or headset) incoming priority 4 calls are routed. However, routing to the headset is only possible if configuration pin TP13A is set to the one state. If TP13A is set to the zero state, the ORT setting is modified to Disallowed following a factory setting restart, an ORT upload with headset selected, or a POST/PAST if headset was selected prior to TP13A being set to the zero state. In a dual system, ground-to-air priority 4 calls can be routed to an interface that is installed on at least one of the SDU systems. Routing to HEADSET is only possible if at least one SDU system has a codec wired to AMS with TP13A strap in the one state (on this same SDU system).
xiv	Call Camp-On Duration	User, common	This item defines the camp-on duration be either indefinite, or a specified time-out period in the range of 1 to 15 minutes, or a time-out period of zero minutes (immediate time-out).
xv	Camp-On Time-out Action	User, common	This item defines whether the camp-on time-out action is to (a) preempt (if a candidate call exists) or to cancel camp-on (if no candidate call exists), or (b) to cancel camp-on.
xvi	Stored APHONE (WH-10) Telephone Numbers	User, duplicated	This item defines up to 10 stored telephone numbers (9 numbers plus last number redial), with each telephone number made up of up to 18 digits, for each of the two analog (APHONE) WH-10 channels. All such telephone numbers are priority 4 and the priority is not modifiable. These two sets of stored telephone numbers can be separate (distinct) or shared as specified in ORT item xxvi.
xvii	Deleted		
xviii	Noise Insertion Level	Secured, common	This item defines whether to enable or disable noise insertion on ground-to-air circuit-mode telephone calls. When noise insertion is enabled, this item also defines the level, as selected. Noise insertion minimizes annoying noise modulation when the GES drops the carrier in the forward (to-aircraft) direction during speech pauses.
xix	Ground-to-Air Preemption	User, common	This item defines whether or not incoming calls of priority 2 and/or 3 automatically preempt (as necessary) a candidate call as specified in SYSTEM DESCRIPTION. Priority 1 ground-to-air calls unconditionally preempt other calls of lower priority as necessary.
xx	Preferred Cockpit Call Routing	User, common	This item defines the routing of ground-initiated cockpit voice calls to a particular channel when two channels are available. This item does not affect which channel should be preempted if both channels are not available. In a dual system, channel refers to logical channel.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xxi	Preferred APHONE Call Routing	User, duplicated	When allowed by item xiii, this item defines the routing of ground-to-air priority 4 calls, when allowed in accordance with item xiii, to a particular channel when two APHONE channels are available. In a dual system, this item specifies the preferred physical channel on each SDU system, or None when there is no channel wired to APHONE on that system.
xxii	HGA Tx Gain Threshold	Secured, common	This item specifies the threshold on the reported HGA Tx gain for stimulating log-on renewal at Class 1 or automatic handover.
xxiii	Analog telephone (APHONE) System Management Commands	Secured, duplicated	This item defines the allowing/disallowing of system management commands from the analog phone (APHONE) interface (WH-10 or APBX).
xxiv	Analog telephone (APHONE) Outgoing Call Barring Level	User, duplicated	This item defines one of three levels for analog phone call barring. Level 0 allows all outgoing calls and the Store Phone Number Memory command specified in SYSTEM DESCRIPTION, but disallows six-digit numbers between 42XXXX and 47XXXX if accompanied by credit card data. Level 1 allows only stored phone numbers, directly dialed short-code phone numbers, and long dialed numbers from the APBX accompanied with credit card data to initiate outgoing calls. Level 1 disallows manually dialed full-length phone numbers not accompanied with credit card data, six-digit numbers between 42XXXX and 47XXXX if accompanied by credit card data, and the Store Phone Number Memory command. Level 2 disallows all outgoing calls, both manual and stored numbers, and the Store Phone Number Memory command. **NOTE:** The six-digit numbers between 42XXXX and 47XXXX have been designated air traffic control (ATC) destinations. These numbers may be dialed at any priority and are assigned a network ID of 1. In order to prevent unauthorized use of these numbers once they become publicly available, the AES filters these numbers appropriately. The filtering specified prohibits these numbers from being dialed with credit card data present based on the assumption anyone making a call to one of these numbers using a credit card is not an authorized user (i.e., a passenger).
xxv	Call Barring Security Code	User, duplicated	This item defines a four-digit password that, if entered through the analog phone (APHONE), allows call barring commands (SYSTEM DESCRIPTION) to be accepted.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xxvi	Shared Analog Telephone (WH-10) (APHONE) Number Storage	User, duplicated	This item defines whether the 10 stored numbers (9 numbers plus the last number redial) maintained for each of the analog phone (APHONE) channels are separate or shared (i.e., whether a phone number stored on a channel is accessible by the dial stored phone number command on the other channel).
xxvii	Deleted		
xxviii	Default HPA Backoff Limits	Secured, duplicated	This item defines the maximum backoff values for the linear and class C HPAs. The working (volatile) values are automatically updated by non zero values (i.e., other than 16 dB) received in the HPA backoff range fields of valid HPA status words. The nonvolatile entries are not modified with the received values.
xxix	HPA Minimum Reportable Actual Power Output	Secured, duplicated	This item defines the minimum values of actual power output capable of being reported through the HPA status words by the linear and class C HPAs. When this value or a lower value is reported in the HPA status word, calibration is inhibited.
xxx	Default Assumed Global Beam Initial C-Channel EIRP	Secured, common	This item defines the default assumed global beam initial C-channel EIRP. This value is used to assess the power availability for a C-channel call in the absence of any existing C-channels.
xxxi	SCDU Telephone Number Preselect	Secured, common	This item defines whether selection of a phone number on one of the CATEGORY NUMBERS pages preselects the phone number or initiates a call using the phone number. If this item is enabled, the selection of a phone number on one of the CATEGORY NUMBERS pages or manual entry of a phone number on the DIRECTORY page retrieves the selected number to the SATCOM MAIN MENU page (TESTING/FAULT ISOLATION), where the number can then be dialed by selecting the MAKE CALL prompt or by any of the call initiation methods triggered by activation of an input discrete.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xxxii	ACP Call Initiation	Secured, common	This item enables/disables ACP call initiation. This item can only be enabled when item xxxi is enabled. If enabled, one of the following two pairs of SDU discretes are capable of being used for call initiation (when the associated cockpit voice call light outputs are open), based on the state of program pin TP13K: • Cockpit voice mic on inputs — if the latched ACP hookswitch signaling method is strapped. • Place/End call discrete inputs — if the switched PTT hookswitch signaling method is strapped. In either case, this item specifies whether the number dialed should come from the ATC phone number register rather than the SCDU MAIN menu. If the MAIN menu is selected, the phone number displayed on the SATCOM MAIN MENU (3L label line for channel 1, or 5L label line for channel 2) is used for call initiation. If the ATC menu is selected, the phone number displayed on the ATC menu is used for call initiation on either cockpit channel. In a dual system, this item is enabled if the straps of both SDU systems are identical.
xxxiii	User (or Composite) Partition ORT Description	User, common	This item defines the 24-character field to describe the ORT. The ORT description is a 24-character field that annotates a particular set of options, in order to distinguish one set from another (e.g., NORTH PACIFIC ROUTE, SOUTH ATLANTIC ROUTE, 747-400 ASIAN ROUTE, 777 ASIAN ROUTE). Alternatively, this item could contain a software identification (e.g., a software part number for the ORT as a released entity). If the ORT version is for a composite file, the description field is for the entire ORT and item liii is not used. See item liii also.
xxxiv	Airline Code	User, common	This item defines an airline code made up of up to four ISO-5 characters to be used with a four-digit BCD flight number received from a McDonnell Douglas CFDIU (SYSTEM DESCRIPTION) in constructing a flight identifier for log-on. This is only used if the CFDS/CMC/OMS does not supply the airline code.
xxxv	Headset Outgoing Call Barring Level	User, common	This item defines one of two levels for headset call barring. Level 0 allows all outgoing calls. Level 1 allows only stored phone numbers, manually dialed short-code numbers, and manually dialed numbers with a network ID other than 1. For Level 1 call barring, all cockpit stored numbers are treated as protected (i.e., they cannot be modified from the SCDU).
xxxvi	Headset Transit Call	User, common	This item either enables or disables transit calls from the headset for line select key 4L.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xxxvii	User ORT Partition Modified Flag	User, common	This item indicates whether any item in the nonvolatile copy of the user partition of the ORT partition has been modified since the ORT was created in a configured state by the PC-based off-line ORT editing tool. When any user-partition ORT item is modified in nonvolatile memory by the SDU software, either directly or indirectly, this flag is set to modified. This value is never set to unmodified by the SDU software. Its value is displayed on the SCDU, on the CFDS, on the front panel display of the SDU, and on the CMT.
xxxviii	Failure Masking Data	Secured, common	This item is made up of a list of up to 50 failures (Level I code, SRU code, and failure code) whose operation is masked or suppressed. A switch is stored with each specified failure to indicate whether that failure should never be raised (i.e., the failure annunciation and reversion should be suppressed completely), or whether the failure should be annunciated normally (i.e., recorded and reported as specified in TESTING/FAULT ISOLATION) when declared, but not indict the appropriate functional resource specified for the failure (i.e., not take any other action in response to the failure, such as reconfiguring redundant resources). Unused entries in this table are represented by the Level I code, SRU code, and failure code all set to zero.
xxxix	Elevation Handover Threshold	Secured, common	This item, ranging in integer degrees between 0° and 90°, is used in combination with calculated elevation of the highest satellite to determine at what elevation to initiate a handover from the current satellite. This item is also used to determine when a satellite is not high enough in elevation to be considered in view for acquisition purposes by the automatic log-on process.
xl	High Rate Data Transmit Support	User, common	This item made up of two flags that specify (by being set to enabled or disabled) whether the SDU indicates support for 10,500 bps R- and T-channels in its log-on request of class 2, 3, and 4 (i.e., when using a high gain antenna), for the global beam and spot beam log-on requests, respectively.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xli	Automatic Transit Call GES Table	Secured, common	This item indicates the transit GES ID to be specified in an air-to-ground call setup request (SYSTEM DESCRIPTION) if no transit GES ID has been explicitly specified through the initiating user interface (APHONE, Headset, DPHONE). If the GES ID in the table is 377 octal (indicating null), then the log-on GES is used in the call setup request. For each satellite ID of 0, 1, 2, and 3, the table stores a GES ID to be used with the following types of calls: • Any PSTN long number call (i.e., with network ID 1, with between 7 and 18 digits, beginning with 00) with country code beginning with 1 (i.e., North America) • Any PSTN long number call with a country code beginning with 2 (i.e., Africa) • Any PSTN long number call with a country code beginning with 3 (i.e., South and West Europe) • Any PSTN long number call with a country code beginning with a 4 (i.e., North and East Europe) • Any PSTN long number call with a country code beginning with a 5 (i.e., South America) • Any PSTN long number call with a country code beginning with a 6 (i.e., South East Asia and Australia) • Any PSTN long number call with a country code beginning with a 7 (i.e., Soviet Union) • Any PSTN long number call with a country code beginning with an 8 (i.e., Far East) • Any PSTN long number call with a country code beginning with a 9 (i.e., India and Middle East) • Any PSTN short number call (i.e., network ID of 1, with between 2 and 6 digits not beginning with 00) The geographical region associated with each zone is approximate; refer to Table C-1 for details of individual country codes.
xlii	Air-to-Ground Chime	Secured, common	This item defines one of three chime options. These options only affect air-to-ground chime activation for call annunciation and the setting of SDU-to-ACARS MU/CMU status word bits. The first option is to always chime and always set the appropriate bits. The second option is to chime and set the appropriate bits only if the call was camped-on. The third option is to never chime and never set the bits.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xliii	SCDU Call Prompts	Secured, common	This item defines one of three levels of SCDU call prompt display. Level 0 causes all SCDU call prompts to be displayed. Level 1 causes the ANSWER CALL, REJECT, and END CALL prompts to not be displayed. Level 2 causes the MAKE CALL prompt and the Level 1 prompts to not be displayed. Level 2 is selectable only if ORT item xxxii is enabled.
xliv	EIRP Overdraft Checking Priority	Secured, common	This item defines the call priority level where at least one call must be in progress when considering if an EIRP overdraft is allowed.
xlv	Analog Telephone (APHONE) Called Terminal ID Assignment	User, duplicated	This item provides for the assignment of a three-digit called terminal identification (CTid) code to each APHONE channel routing ground-to-air priority 4 calls to the APHONE interface, based on the called terminal field in the call announcement signal unit. The CTid assigned can be any decimal value between -1 and 999. A CTid value of -1 represents no specific routing. This item also specifies a CTid assignment type of exclusive or nonexclusive for each channel. The assignment type defaults to nonexclusive if no CTid is assigned. An assignment type of exclusive with no CTid assigned is undefined and is not selectable. With a CTid assigned, an assignment type of exclusive inhibits all incoming calls from being routed to the associated channel unless the call announcement contains a CTid that matches the assigned value. An assignment type of nonexclusive allows all incoming calls to be routed to the associated channel unless the call announcement contains a CTid that matches the assigned value of the other channel. Regardless of the assignment type, an incoming call with a matching CTid is rejected if the associated channel is unavailable. Modifications of this item through the APHONE or CMT are checked for duplication with the other APHONE channel in the SDU and, in a dual system, with the APHONE channels in the other SDU. The primary use of this ORT item is to let incoming facsimile calls be routed to the channel connected to the facsimile machine.
xlvi	Cockpit Audio Level Settings	Secured, common	This item defines the level settings for the cockpit microphone, sidetone, and receive audio.
xlvii	HGA Retry Period (ground and air)	Secured, common	This item defines the time interval for ground and airborne cases after which SATCOM (when logged on through the LGA) is to make attempts to logon through the HGA. A value of 0 disables the periodic retry for each case. The time interval is in integer minutes ranging from 0 to 255.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
xlviii	Cockpit Channel Interface Type for Dual	Secured, common	This item defines the functional mapping of the one to four potentially available physical SDU cockpit voice channels in a dual system to the one or two logical cockpit voice channels (as viewed from the perspective of the ACP and SCDU). It is used in combination with ORT item vi and system configuration pins TP13F and TP13J to determine the number of logical channels and which physical channel(s) is/are potentially available for each logical channel. This item is capable of taking on the states of fixed and shared. Fixed interfacing is interfacing each ACP/SCDU (logical) channel to one physical channel on one SDU only. Shared interfacing is interfacing each ACP/SCDU logical channel to one physical channel on each of the two SDUs. The fixed or shared interfacing declaration refers to the functional channel mapping, and not necessarily to the physical interwiring, e.g., the interwiring can be independent but the interface can be effectively shared by virtue of splitting/combining/paralleling within the AMS (as in the Boeing 777), or the interwiring can be literally paralleled, forcing the interface type to shared. In the case of two logical channels, it is assumed the single value for this item applies to both channels (i.e., both fixed or both shared). For the case of shared (for one or two logical channels), it is assumed each logical channel shares the same numbered physical channel on each SDU. The state of this item is checked for compatibility with the state of pins TP13F and TP13J of both SDUs and the state of ORT item vi of both SDUs.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
il	Mastery Handover Algorithm Weighting	User, common	This item stores the relative weighting factors for each of the six functional capability items that form the criteria for determining which system should automatically become the master in a dual system. Each of the six weighting factors is a non-negative integer ranging from 0 to 99. Higher factors indicate more important criteria; however, only the relative values of the factors is significant. Zero is used to indicate a capability factor not installed, not used, or is a don't care. The functional capability items are as follows: • CoV - Cockpit voice (for any number of channels). • CaV - Cabin circuit-mode voice/fax/data (any number of channels, any cabin interface). • CoL - Cockpit packet-mode data (through [C]MU) at low-rate only. • CoH - Cockpit packet-mode data (through [C]MU) at (potentially) high-rate. • CaL - Cabin packet-mode data (through CPDF or CTU) at low rate only. • CaH - Cabin packet-mode data (through CPDF or CTU) at (potentially) high-rate. CoL and CoH are mutually exclusive, as are CaL and CaH — i.e., regardless of the weighting factors assigned, no more than one of the cockpit data (or cabin data) capabilities can be true at a time. The primary practical use of this ORT item is for determining which SDU in a dual system should be the master when the choice is down to one system which only has voice capability vs one which only has data capability, or one with only cockpit services capabilities vs one with only cabin services capabilities.
l	Disable/Reenable Other SATCOM SCDU Prompts	Secured, common	This item determines if the disable other SATCOM and re-enable other SATCOM toggling SCDU prompts are presented or suppressed. The SCDU prompts are usually suppressed if the optional external manual switch (that controls the dual system select and disable discretes) is supplied so there is only one means of performing any function at a time and the possibility of inadvertently disabling both systems is avoided.
li	SCDU SATCOM Subsystem Prompts	Secured, duplicated	This item defines up to six ISO-5 characters used for the SCDU main menu SATCOM subsystem selection LSK prompts. The owner/operator is able to select any ISO-5 characters and any length up to six characters. Example character strings would be SAT L and SAT R, or <SDU-1 and <SDU-2.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
lii	SCDU Channel Label Suffixes	Secured, common	This item defines the one-character suffix for each cockpit voice channel label on the SCDU displays. The choices are 1 and 2, or L and R for channels 1 and 2, respectively. These suffixes are used for the channel identifiers on the SATCOM Main Menu, Directory, and Category Numbers pages.
liii	Secured ORT Description	Secured, common	This items defines a 24-character (ISO-5) field to describe the secured ORT partition. The description field is used to write a particular set of secured ORT items to distinguish one from another (e.g., B777 DUAL 950901, B747-400 DUAL 951001, B747-300 STC 951225). Alternatively, this item can contain a software identification (e.g., a software part number for the ORT as a released entity). If the ORT version is for a composite file, description field xxxiii is for the entire ORT, so item liii is not used in that case.
liv	Composite ORT File Upload Capability	Secured, common	This item defines whether or not the uploading of a composite ORT file version is to be allowed. This option is required to prevent the unintentional overwriting of the secured partition with a composite ORT file that contains both user and secured ORT items.
lv	Secured ORT Modified Flag	Secured, common	This item indicates whether any item in the nonvolatile copy of the secured ORT partition has been modified since the ORT was created in a configured state by the PC-based off-line ORT editing tool. When any secured ORT item is modified in nonvolatile memory by the SDU software, directly or indirectly, this flag is set to Modified. This value is never set to Unmodified by SDU software. Its value is displayed on the SCDU, the CFDS, the front panel display, and the CMT.
lvi	Access to Zero-Preference GESs	Secured, common	This item defines whether automatic log-on is allowed or disallowed to GESs with preference values set to zero by ORT item iii. This is intended to be set to allowed in Essential certified systems so at least two GESs are selectable for automatic log-on on each satellite. It can be set to disallowed in nonessential certified systems to intentionally preclude automatic log-on to particular GESs, e.g., those with the AES owner/operator have no contractual arrangements. See ORT item iii for additional information.
lvii	L-Band Reference Offset Calibration Thresholds	Secured, common	This item defines (in Hz) the thresholds of the L-Band reference offset calibration for both the **with IRS** and **without IRS** cases. These thresholds are used to determine whether to adjust the L-Band reference offsets. These values are displayed on the CMT.
lviii	Suppress AES Position Reporting	User, common	This item enables or disables the AES position reporting sent across each active C-channel.

Table C-1. ORT Characteristics (cont)

ORT Item	Characteristic	Attributes	Description
lix	APHONE Audio Level Setting	Secured, common	This item defines the output level setting for the receive audio.
lx	AERO H Only Operation	Secured, common	This item defines the service mode when an HGA is installed.

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APPENDIX D
FAULT CODES

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
Failure Overview					
SDU					
UNKNOWN SDU SRU					
01	0	02	CM	HMPM	HPA CMD WORD (143) UPDATE RATE FAIL
01	0	03	CM	HMPM	HPA CMD WORD (143) DATA FAIL
01	0	07	CM	SMPM	HSU1-SDU W'BURG DATA TX FAIL
01	0	08	CM	SMPM	HSU1-SDU W'BURG SOLO WORD ACK FAIL
01	0	0B	CM	SMPM	HSU2-SDU W'BURG DATA TX FAIL
01	0	0C	CM	SMPM	HSU2-SDU W'BURG SOLO WORD ACK FAIL
01	0	10	CM	SMPM	HGA HPA COMMAND WORD (NCD)
01	0	12	CM	SMPM	LGA HPA COMMAND WORD (NCD)
01	0	96	PP	SMPM	INCOMPLETE ID PROM RESPONSES
SMPM: SDU MAIN PROCESSOR MODULE					
01	1	81	PP	SMPM	SDU H/W-S/W COMPATIBILITY FAIL
01	1	82	PP	SMPM	BATTERY VOLTAGE LOW
01	1	83	PP	SMPM	WATCHDOG TIMEOUT FAIL
01	1	84	PP	SMPM	MICRO BOOT ROM FAIL
01	1	85/05	PP/CM	SMPM	EEPROM FAIL
01	1	86/06	PP/CM	SMPM	FLASH FAIL
01	1	87/07	PP/CM	SMPM	SRAM FAIL]
01	1	88/08	PP/CM	SMPM	REAL TIME CLOCK FAIL
01	1	89	PP	SMPM	QUART FAIL
01	1	0A	CM	SMPM	SOFTWARE ERROR (SYSFAIL)
01	1	0B	CM	SMPM	FLASH-PSRAM MISCOMPARE
01	1	0C	CM	SMPM	FLASH-PSRAM MISCOMPARE EXTENSION
01	1	0D	CM	SMPM	FLASH-PSRAM MISCOMPARE EXTENSION
CODA: SDU VOICE CODEC MODULE A					
01	2	81/01	PP/CM	CODA	<CODEC-A> PROGRAM MEMORY CRC FAIL
01	2	87/07	PP/CM	CODA	<CODEC-A> TIMING GENERATOR FAIL
01	2	88	PP	CODA	<CODEC-A> DUAL PORT RAM FAIL CODEC SIDE
01	2	8A/0A	PP/CM	CODA	<CODEC-A> PROGRAM MEMORY W/R FAIL
01	2	8B	PP	CODA	<CODEC-A> DSP INTERNAL MEMORY W/R FAIL
01	2	8C/0C	PP/CM	CODA	<CODEC-A> DSP COMPREHENSIVE FAIL
01	2	0D	CM	SMPM	<CODEC-A> HEALTH COUNT UPDATE
01	2	8E	PP	SMPM	<CODEC-A> DUAL PORT RAM FAIL SMPM SIDE
01	2	90	PP	SMPM	<CODEC-A> BUS ERROR
01	2	91	PP	SMPM	<CODEC-A> SELF TEST MISOPERATION
01	2	12	CM	SMPM	<CODEC-A> COMMUNICATION PROBLEM
01	2	94	PP	SMPM	<CODEC-A> ST BUS AUDIO LOOPBACK FAIL
01	2	95	PP	SMPM	<CODEC-A> SW DOWNLOAD FAIL

CODB: SDU VOICE CODEC MODULE B

01 3 Same entries as for CODA above except substitute CODB for CODA, SRU code 3 for code 2, [CODEC_B] for [CODEC_A] and <CODEC-B> for <CODEC-A>.

Fault codes for codecs C-F have Level 2 (SRU) codes E-H. They are listed in the appropriate section of this table for those SRU codes.

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
SIOM: SDU INPUT/OUTPUT MODULE (EXCLUSIVE TO SIOM)					
01	4	81	PP	SMPM	A429 XMTR LOOP-BACK TO OTHER SDU FAIL
01	4	82	PP	SMPM	A429 XMTR LOOP-BACK TO CFDS FAIL
01	4	83	PP	SMPM	A429 XMTR LOOP-BACK TO ADL FAIL
01	4	84	PP	SMPM	A429 XMTR LOOP-BACK TO PDL FAIL
01	4	85	PP	SMPM	A429 XMTR LOOP-BACK TO (C)MUs FAIL
01	4	86	PP	SMPM	A429 XMTR LOOP-BACK TO SCDUs FAIL
01	4	87	PP	SMPM	A429 XMTR LOOP-BACK TO MULTI-CNTRL FAIL
01	4	89	PP	SMPM	A429 XMTR LOOP-BACK TO RMP/CAP FAIL
01	4	8A	PP	SMPM	A429 XMTR LOOP-BACK TO SNU/CPDF FAIL
01	4	8B	PP	SMPM	A429 XMTR LOOP-BACK TO HSU1 FAIL
01	4	8C	PP	SMPM	A429 XMTR LOOP-BACK TO HSU2 FAIL
01	4	8D	PP	SMPM	A429 XMTR LOOP-BACK SPARE
01	4	8E	PP	SMPM	A429 XMTR LOOP-BACK SPARE
01	4	8F	PP	SMPM	A429 XMTR LOOP-BACK SPARE
01	4	90	PP	SMPM	A429 XMTR LOOP-BACK SPARE
01	4	AB	PP	SMPM	SIOM BUS ERROR
01	4	2C	CM	SMPM	A429 TX TO OTHER SDU BUFFER FULL
01	4	2D	CM	SMPM	A429 TX TO CFDS BUFFER FULL
01	4	2E	CM	SMPM	A429 TX TO ADL BUFFER FULL
01	4	2F	CM	SMPM	A429 TX TO PDL BUFFER FULL

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
01	4	30	CM	SMPM	A429 TX TO (C)MUs BUFFER FULL
01	4	31	CM	SMPM	A429 TX TO SCDUs BUFFER FULL
01	4	32	CM	SMPM	A429 TX TO MULTI-CTRL BUFFER FULL
01	4	34	CM	SMPM	A429 TX TO RMP/CAP BUFFER FULL
01	4	35	CM	SMPM	A429 TX TO SNU/CPDF BUFFER FULL
01	4	36	CM	SMPM	A429 TX TO HSU1 BUFFER FULL
01	4	37	CM	SMPM	A429 TX TO HSU2 BUFFER FULL
01	4	38	CM	SMPM	A429 TX BUFFER FULL SPARE
01	4	39	CM	SMPM	A429 TX BUFFER FULL SPARE
01	4	3A	CM	SMPM	A429 TX BUFFER FULL SPARE
01	4	3B	CM	SMPM	A429 TX BUFFER FULL SPARE
01	4	BC	PP	SMPM	SIOM INTERRUPT FAIL
01	4	3D	CM	SMPM	IRS ASIC MATCHING PROBLEM

SMDM1: SDU MODEM MODULE #1

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
01	5	81	PP	SMDM1	<MODEM-1> PROCESSOR FAIL
01	5	84/04	PP/CM	SMDM1	<MODEM-1> PROGRAM CRC FAIL
01	5	0A	CM	SMDM1	<MODEM-1>MODEM TO RFM INTERFACE FAIL
01	5	8B	PP	SMDM1	<MODEM-1> TIMER/INTERRUPT FAIL
01	5	8E	PP	SMDM1	<MODEM-1> EXTERNAL MEMORY FAIL
01	5	91	PP	SMDM1	<MODEM-1> MODEM DPR FAIL
01	5	95	PP	SMPM	<MODEM-1> SMPM SIDE DPR FAIL
01	5	16	CM	SMPM	<MODEM-1> SW DOWNLOAD FAIL
01	5	17	CM	SMPM	<MODEM-1> HEALTH COUNT UPDATE FAIL
01	5	99	PP	SMPM	<MODEM-1> BUS ERROR
01	5	9A	PP	SMPM	<MODEM-1> SELF TEST MISOPERATION
01	5	1B	CM	SMDM1	<MODEM-1> SOFTWARE FAIL
01	5	1C	CM	SMPM	<MODEM-1> COMMUNICATIONS PROBLEM
01	5	9E	PP	SMPM	<MODEM-1> RFM SSI LOOPBACK FAIL

SMDM2: SDU MODEM MODULE #2

01 6 Same entries as for SMDM1 above except substitute SMDM2 for SMDM1, SRU code 6 for code 5, [MODEM_2] for [MODEM_1] and <MODEM-2> for <MODEM-1>.

SMDM3: SDU MODEM MODULE #3

01 7 Same entries as for SMDM1 above except substitute SMDM3 for SMDM1, SRU code 7 for code 5, [MODEM_3] for [MODEM_1] and <MODEM-3> for <MODEM-1>.

Fault codes for modems 4-7 have Level 2 (SRU) codes J, L, M and N. They are listed in this table in the appropriate section for those SRU codes.

SRFM: SDU RADIO FREQUENCY MODULE

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
01	8	8E/0E	PP/CM	SMPM	RF SYNTH CHAN1 LOCK DETECT FAIL
01	8	90/10	PP/CM	SMPM	RF SYNTH CHAN2 LOCK DETECT FAIL
01	8	92/12	PP/CM	SMPM	RF SYNTH CHAN3 LOCK DETECT FAIL
01	8	96/16	PP/CM	SMPM	RF SYNTH CHAN4 LOCK DETECT FAIL
01	8	97/17	PP/CM	SMPM	RF SYNTH CHAN5 LOCK DETECT FAIL
01	8	98/18	PP/CM	SMPM	RF SYNTH CHAN6 LOCK DETECT FAIL
01	8	99/19	PP/CM	SMPM	RF SYNTH CHAN7 LOCK DETECT FAIL
01	8	9A/1A	PP/CM	SMPM	RF SYNTH CHAN8 LOCK DETECT FAIL
01	8	9B/1B	PP/CM	SMPM	RF SYNTH TX BLOCK PLO LOCK DETECT FAIL
01	8	9C/1C	PP/CM	SMPM	RF SYNTH RX BLOCK PLO LOCK DETECT FAIL
01	8	9D/1D	PP/CM	SMPM	RF SYNTH RX CHAN PLO LOCK DETECT FAIL
01	8	9E/1E	PP/CM	SMPM	RF SYNTH TX DOPPLER PLO LOCK DETECT FAIL
01	8	A0	PP	SMPM	RFM CHAN 1 L-BAND LOOP-BACK (TX) FAIL
01	8	A1	PP	SMPM	RFM CHAN 1 L-BAND LOOP-BACK (RX) FAIL
01	8	A2	PP	SMPM	RFM CHAN 2 L-BAND LOOP-BACK (TX) FAIL
01	8	A3	PP	SMPM	RFM CHAN 2 L-BAND LOOP-BACK (RX) FAIL
01	8	A4	PP	SMPM	RFM CHAN 3 L-BAND LOOP-BACK (TX) FAIL
01	8	A5	PP	SMPM	RFM CHAN 3 L-BAND LOOP-BACK (RX) FAIL
01	8	A6	PP	SMPM	RFM CHAN 4 L-BAND LOOP-BACK (TX) FAIL
01	8	A7	PP	SMPM	RFM CHAN 4 L-BAND LOOP-BACK (RX) FAIL
01	8	A8	PP	SMPM	RFM CHAN 5 L-BAND LOOP-BACK (TX) FAIL
01	8	A9	PP	SMPM	RFM CHAN 5 L-BAND LOOP-BACK (RX) FAIL
01	8	AA	PP	SMPM	RFM CHAN 6 L-BAND LOOP-BACK (TX) FAIL
01	8	AB	PP	SMPM	RFM CHAN 6 L-BAND LOOP-BACK (RX) FAIL
01	8	AC	PP	SMPM	RFM CHAN 7 L-BAND LOOP-BACK (TX) FAIL
01	8	AD	PP	SMPM	RFM CHAN 7 L-BAND LOOP-BACK (RX) FAIL
01	8	AE	PP	SMPM	RFM CHAN 8 L-BAND LOOP-BACK (TX) FAIL
01	8	AF	PP	SMPM	RFM CHAN 8 L-BAND LOOP-BACK (RX) FAIL
01	8	30	CM	SMPM	RFM CHAN 1 TX CALIBRATION ERROR
01	8	31	CM	SMPM	RFM CHAN 2 TX CALIBRATION ERROR
01	8	32	CM	SMPM	RFM CHAN 3 TX CALIBRATION ERROR

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
01	8	33	CM	SMPM	RFM CHAN 4 TX CALIBRATION ERROR
01	8	34	CM	SMPM	RFM CHAN 5 TX CALIBRATION ERROR
01	8	35	CM	SMPM	RFM CHAN 6 TX CALIBRATION ERROR
01	8	36	CM	SMPM	RFM CHAN 7 TX CALIBRATION ERROR
01	8	37	CM	SMPM	RFM CHAN 8 TX CALIBRATION ERROR
01	8	38	CM	SMPM	RFM CHAN 1 RX CALIBRATION ERROR
01	8	39	CM	SMPM	RFM CHAN 2 RX CALIBRATION ERROR
01	8	3A	CM	SMPM	RFM CHAN 3 RX CALIBRATION ERROR
01	8	3B	CM	SMPM	RFM CHAN 4 RX CALIBRATION ERROR
01	8	3C	CM	SMPM	RFM CHAN 5 RX CALIBRATION ERROR
01	8	3D	CM	SMPM	RFM CHAN 6 RX CALIBRATION ERROR
01	8	3E	CM	SMPM	RFM CHAN 7 RX CALIBRATION ERROR
01	8	3F	CM	SMPM	RFM CHAN 8 RX CALIBRATION ERROR
01	8	C0/40	PP/CM	SMPM	RFM CHAN 1 AGC TELLBACK FAIL
01	8	C1/41	PP/CM	SMPM	RFM CHAN 2 AGC TELLBACK FAIL
01	8	C2/42	PP/CM	SMPM	RFM CHAN 3 AGC TELLBACK FAIL
01	8	C3/43	PP/CM	SMPM	RFM CHAN 4 AGC TELLBACK FAIL
01	8	C4/44	PP/CM	SMPM	RFM CHAN 5 AGC TELLBACK FAIL
01	8	C5/45	PP/CM	SMPM	RFM CHAN 6 AGC TELLBACK FAIL
01	8	C6/46	PP/CM	SMPM	RFM CHAN 7 AGC TELLBACK FAIL
01	8	C7/47	PP/CM	SMPM	RFM CHAN 8 AGC TELLBACK FAIL
01	8	C8/48	PP/CM	SMPM	RFM BLOCK AGC TELLBACK FAIL
01	8	C9	PP	SMPM	I/Q CALIBRATION FAIL
01	8	D0	PP	SMPM	RFM CHAN 1 AGC CALIBRATION ERROR
01	8	D1	PP	SMPM	RFM CHAN 2 AGC CALIBRATION ERROR
01	8	D2	PP	SMPM	RFM CHAN 3 AGC CALIBRATION ERROR
01	8	D3	PP	SMPM	RFM CHAN 4 AGC CALIBRATION ERROR
01	8	D4	PP	SMPM	RFM CHAN 5 AGC CALIBRATION ERROR
01	8	D5	PP	SMPM	RFM CHAN 6 AGC CALIBRATION ERROR
01	8	D6	PP	SMPM	RFM CHAN 7 AGC CALIBRATION ERROR
01	8	D7	PP	SMPM	RFM CHAN 8 AGC CALIBRATION ERROR
01	8	D8	PP	SMPM	RFM BLOCK AGC CALIBRATION ERROR
OCXO: SDU OVEN CONTROLLED CRYSTAL OSCILLATOR					
01	A	01	CM	SMPM	OVEN READY FAIL
SMB: SDU MOTHER BOARD					
01	B	NONE			
SPSU: SDU AC OR DC POWER SUPPLY UNIT					
01	C	01	CM	SMPM	PSU TEMP LIMITS FAIL
01	C	03	CM	SMPM	PSU SECONDARY VOLTAGE FAIL
SFPDM: SDU FRONT PANEL DISPLAY MODULE					
01	D	01	CM	SMPM	TEST (PAST) SWITCH STUCK
01	D	02	CM	SMPM	MANUAL SCROLL SWITCH STUCK

CODC: SDU VOICE CODEC MODULE C

01 E Same entries as for CODA (01 2 xx) above except substitute CODC for CODA, SRU code E for code 2, [CODEC_C] for [CODEC_A] and <CODEC-C> for <CODEC-A>.

CODD: SDU VOICE CODEC MODULE D

01 F Same entries as for CODA (01 2 xx) above except substitute CODD for CODA, SRU code F for code 2, [CODEC_D] for [CODEC_A] and <CODEC-D> for <CODEC-A>.

CODE: SDU VOICE CODEC MODULE E

01 G Same entries as for CODA (01 2 xx) above except substitute CODE for CODA, SRU code G for code 2, [CODEC_E] for [CODEC_A] and <CODEC-E> for <CODEC-A>.

CODF: SDU VOICE CODEC MODULE F

01 H Same entries as for CODA (01 2 xx) above except substitute CODF for CODA, SRU code H for code 2, [CODEC_F] for [CODEC_A] and <CODEC-F> for <CODEC-A>.

01 I Not used.

SMDM4: SDU MODEM MODULE #4

01 J Same entries as for SMDM1 (01 5 xx) above except substitute SMDM4 for SMDM1, SRU code J for code 5, [MODEM_4] for [MODEM_1] and <MODEM-4> for <MODEM-1>.

01 K Not used.

SMDM5: SDU MODEM MODULE #5

01 L Same entries as for SMDM1 (01 5 xx) above except substitute SMDM5 for SMDM1, SRU code L for code 5, [MODEM_5] for [MODEM_1] and <MODEM-5> for <MODEM-1>.

SMDM6: SDU MODEM MODULE #6

01 M Same entries as for SMDM1 (01 5 xx) above except substitute SMDM6 for SMDM1, SRU code M for code 5, [MODEM_6] for [MODEM_1] and <MODEM-6> for <MODEM-1>.

SMDM7: SDU MODEM MODULE #7

01 N Same entries as for SMDM1 (01 5 xx) above except substitute SMDM7 for SMDM1, SRU code N for code 5, [MODEM_7] for [MODEM_1] and <MODEM-7> for <MODEM-1>.

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
VIM: VOICE INTERFACE MODULE					
01	P	81	PP	SMPM	CABIN INTERFACE 1 AUDIO LOOPBACK FAIL
01	P	82	PP	SMPM	CABIN INTERFACE 2 AUDIO LOOPBACK FAIL
01	P	83	PP	SMPM	COCKPIT INTERFACE 1 AUDIO LOOPBACK FAIL
01	P	84	PP	SMPM	COCKPIT INTERFACE 2 AUDIO LOOPBACK FAIL
01	P	85	PP	SMPM	CTU CEPT-E1 AUDIO LOOPBACK FAIL
01	P	07	CM	SMPM	CABIN AUDIO DISCRETE OUTPUTS LOOPBACK FAIL
01	P	08	CM	SMPM	COCKPIT AUDIO DISCRETE OUTPUTS LOOPBACK FAIL
01	P	89	PP	SMPM	CTU CEPT-E1 HDLC LOOPBACK FAIL
01	P	8A	PP	SMPM	CABIN INTERFACE 1 BUS ERROR
01	P	8B	PP	SMPM	CABIN INTERFACE 2 BUS ERROR
01	P	8C	PP	SMPM	COCKPIT INTERFACE 1 BUS ERROR
01	P	8D	PP	SMPM	COCKPIT INTERFACE 2 BUS ERROR
01	P	8E	PP	SMPM	CTU CEPT-E1 BUS ERROR
“OTHER” SATCOM SYSTEM					
02	0	01	CM	SMPM	PROTOCOL VERSION NUMBER INCOMPATIBLE
02	0	02	CM	SMPM	SDU/SDU MESSAGE PROTOCOL ERROR
HSU					
Only applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent.					
UNKNOWN HSU SRU					
03	0	01	CM	SMPM	HSU SELF-DECLARED FAILURE
03	0	02	CM	SMPM	HSU WILLIAMSBURG PROTOCOL ALO/ALR FAIL
03	0	03	CM	SMPM	HSU WILLIAMSBURG PROTOCOL DATA XFER FAIL
03	0	84	PP	SMPM	HSU SELF-TEST MISOPERATION
03	0	05	CM	HSCP	HSU SERIAL PORT MIS-WIRING
03	0	86/06	PP/CM	HSCP	HSU TOTC RESET
03	0	87/07	PP/CM	HSCP	HSU POC RESET
03	0	0C	CM	SMPM	HSU CHANNEL 1 FAILURE
03	0	0D	CM	SMPM	HSU CHANNEL RELEASE ACKNOWLEDGE FAILURE
03	0	8E/0E	PP/CM	SMPM	HSU RF LOOPBACK INHIBIT FAILURE
03	0	0F	CM	SMPM	HSU CHANNEL 2 FAILURE
03	0	10	CM	SMPM	HSU CHANNEL 3 FAILURE
03	0	11	CM	SMPM	HSU CHANNEL 4 FAILURE
HSCC1: HSU CHANNEL CARD 1					
03	1	01	CM	HSCP	HSU CC1 MODEM FAULT
03	1	02	CM	HSCP	HSU CC1 MODEM FAILURE
03	1	03	CM	HSCP	HSU CC1 PERIPHERAL ERROR
03	1	04	CM	HSCP	HSU CC1 PERIPHERAL FAILURE
03	1	05	CM	HSCP	HSU CC1 CP SW INCOMPATIBILITY
03	1	07	CM	HSCP	HSU CC1 RF FAULT
03	1	08	CM	HSCP	HSU CC1 RF FAILURE
03	1	09	CM	HSCP	HSU CC1 TAL ERROR
03	1	0A	CM	HSCP	HSU CC1 MODEM CALIBRATION MISSING
03	1	0B	CM	HSCP	HSU CC1 TEMPERATURE UNREADABLE
03	1	0C	CM	HSCP	HSU CC1 OVER TEMPERATURE
03	1	0E	CM	HSCP	HSU CC1 TURBO FAULT
03	1	0F	CM	HSCP	HSU CC1 TURBO FAILURE
03	1	11	CM	HSCP	HSU CC1 VCODEC FAULT
03	1	12	CM	HSCP	HSU CC1 VCODEC FAILURE
03	1	93	PP	HSCP	HSU CC1 APPLICATION CODE ERROR
HSCC2: HSU CHANNEL CARD 2					
03	2	01	CM	HSCP	HSU CC2 MODEM FAULT
03	2	02	CM	HSCP	HSU CC2 MODEM FAILURE
03	2	03	CM	HSCP	HSU CC2 PERIPHERAL ERROR
03	2	04	CM	HSCP	HSU CC2 PERIPHERAL FAILURE
03	2	05	CM	HSCP	HSU CC2 CP SW INCOMPATIBILITY
03	2	07	CM	HSCP	HSU CC2 RF FAULT
03	2	08	CM	HSCP	HSU CC2 RF FAILURE
03	2	09	CM	HSCP	HSU CC2 TAL ERROR
03	2	0A	CM	HSCP	HSU CC2 MODEM CALIBRATION MISSING
03	2	0B	CM	HSCP	HSU CC2 TEMPERATURE UNREADABLE
03	2	0C	CM	HSCP	HSU CC2 OVER TEMPERATURE
03	2	0E	CM	HSCP	HSU CC2 TURBO FAULT
03	2	0F	CM	HSCP	HSU CC2 TURBO FAILURE
03	2	11	CM	HSCP	HSU CC2 VCODEC FAULT
03	2	12	CM	HSCP	HSU CC2 VCODEC FAILURE
03	2	93	PP	HSCP	HSU CC2 APPLICATION CODE ERROR

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
HSDIO: HSU DATA I/O CARD					
03	3	02	CM	HSCP	HSU UNRECOVERABLE SW / PROTOCOL ERROR
03	3	03	CM	HSCP	HSU I/O CHANNEL CARD 1 UNSERVICEABLE
03	3	04	CM	HSCP	HSU I/O CHANNEL CARD 2 UNSERVICEABLE
03	3	85	PP	HSCP	HSU CONFIGURATION ERROR
03	3	86	PP	HSCP	HSU I/O PERIPHERAL FAILURE
03	3	07	CM	HSCP	HSU I/O BOTH CHANNEL CARDS UNSERVICEABLE
03	3	08	CM	HSCP	HSU I/O RAM FAULT
03	3	09	CM	HSCP	HSU I/O ROM FAULT
03	3	0A	CM	HSCP	HSU SW CONFIGURATION ERROR
03	3	0B	CM	HSCP	HSU PPPoE SESSION FAILURE
HSCP: HSU CONTROL PROCESSOR					
03	4	87/07	PP/CM	HSCP	HSU CP CHANNEL CARD 1 UNRESPONSIVE
03	4	88/08	PP/CM	HSCP	HSU CP CHANNEL CARD 2 UNRESPONSIVE
03	4	89/09	PP/CM	HSCP	HSU CP BOTH CHANNEL CARDS UNRESPONSIVE
03	4	8A/0A	PP/CM	HSCP	HSU DATA I/O CARD UNRESPONSIVE
03	4	0B	CM	HSCP	HSU CP RAM FAULT
03	4	0C	CM	HSCP	HSU CP ROM FAULT
03	4	0D	CM	HSCP	HSU OVER TEMPERATURE
03	4	0E	CM	HSCP	HSU CHANNEL CARD 1 OVER TEMPERATURE
03	4	0F	CM	HSCP	HSU CHANNEL CARD 2 OVER TEMPERATURE
03	4	10	CM	HSCP	HSU BOTH CHANNEL CARDS OVER TEMPERATURE
03	4	91	PP	HSCP	HSU ADL BUS INTERFACE FAILURE
03	4	92	PP	HSCP	HSU PDL BUS INTERFACE FAILURE
03	4	93	PP	HSCP	HSU DATA I/O DUART FAILURE
03	4	94	PP	HSCP	HSU CHANNEL CARD 1 DUART FAILURE
03	4	95	PP	HSCP	HSU CHANNEL CARD 2 DUART FAILURE
03	4	96	PP	HSCP	HSU BOTH CHANNEL CARDS DUART FAILURE
03	4	97	PP	HSCP	HSU MAINTENANCE INTERFACE DUART FAILURE
03	4	98	PP	HSCP	HSU DISCRETE OUTPUT FAILURE
03	4	99	PP	HSCP	HSU BOARD CONFIGURATION/REVISION FAILURE
HOCXO: HSU OVEN-CONTROLLED 10 MHZ OSCILLATOR					
03	5	01	CM	HSCP	HSU OCXO TIMEOUT
03	5	02	CM	HSCP	HSU OCXO TEMPERATURE UNSTABLE
HSPSU: HSU POWER SUPPLY UNIT					
03	6	01	CM	HSCP	HSU POWER SUPPLY FAIL
03	6	02	CM	HSCP	HSU PSU OVER TEMPERATURE
HSCDM: HSU CONFIGURATION DATA MODULE					
03	7	NONE			
HSFP: HSU FRONT PANEL					
03	8	81	PP	HSCP	HSU SELF-TEST BUTTON STUCK
HSBP: HSU BACKPLANE					
03	9	NONE			
HGA/IGA HPA					
This section lists failure codes inclusive of all HPA designs. Each HPA uses the SRU codes appropriate to its design.					
UNKNOWN HGA/IGA HPA SRU					
04	0	01	CM	SMPM	<HGA HPA> STATUS WORD (143) UPDATE RATE FAIL
04	0	02	CM	SMPM	<HGA HPA> STATUS WORD (143) DATA FAIL
04	0	03	CM	SMPM	<HGA HPA> MNTNC WORD (350) UPDATE RATE FAIL
04	0	04	CM	SMPM	<HGA HPA> MNTNC WORD (350) DATA FAIL
04	0	87	PP	SMPM	<HGA HPA> SELF-TEST MISOPERATION
04	0	08	CM	HMPM	<HGA HPA> RF OVERDRIVE ERROR
04	0	09	CM	HMPM	<HGA HPA> RF SUPPLY CURRENT FAIL
04	0	0A	CM	HMPM	<HGA HPA> OVER TEMP (COMB/DET) SHUTDOWN
04	0	0B	CM	SMPM	<HGA HPA> NO RESPONSE TO CARRIER COMMAND
04	0	0C	CM	SMPM	<HGA HPA> FAILURE WARNING W/NO DISC'S SET
04	0	0D	CM	SMPM	<HGA HPA> 429 MNTNC WORD PSU FAIL (350)
04	0	0E	CM	SMPM	<HGA HPA> 429 MNTNC WORD INTERNAL RAM FAIL
04	0	0F	CM	SMPM	<HGA HPA> 429 MNTNC WORD INTERNAL ROM FAIL
04	0	10	CM	SMPM	<HGA HPA> CLASS C HPA MAX AVAIL PWR FAIL
04	0	40	CM	HMPM	<HGA HPA> SELF-TEST BUTTON STUCK
04	0	41	-	-	<HGA HPA> RESERVED (HP-720 "RF Power Input Low")
HPSU: HPA AC OR DC POWER SUPPLY UNIT					
04	1	01	CM	HMPM	<HGA HPA> PSU OVER TEMP SHUTDOWN
04	1	02	CM	HMPM	<HGA HPA> PSU TEMP SENSOR FAIL
04	1	03	CM	HMPM	<HGA HPA> PSU BIAS +5VDC FAIL
04	1	04	CM	HMPM	<HGA HPA> PSU +28/+25.5 VDC FAIL
04	1	05	CM	HMPM	<HGA HPA> PSU +5 VDC FAIL
04	1	06	CM	HMPM	<HGA HPA> PSU +15 VDC FAIL

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
04	1	07	CM	HMPM	<HGA HPA> PSU -15 VDC FAIL
04	1	08	CM	HMPM	<HGA HPA> PSU -85 VDC FAIL
04	1	09	CM	HMPM	<HGA HPA> PSU +8 VDC FAIL
04	1	0A	CM	HMPM	<HGA HPA> PSU +16 VDC FAIL
04	1	40	CM	HMPM	<HGA HPA> INTERNAL POWER SUPPLY FAIL
04	1	41	CM	HMPM	<HGA HPA> PSU OVER TEMP
HMPM: HPA MAIN PROCESSOR MODULE					
04	2	81	PP	HMPM	<HGA HPA> H/W-S/W COMPATIBILITY FAIL
04	2	83/03	PP/CM	HMPM	<HGA HPA> BOOT FLASH MEMORY FAIL
04	2	04	CM	HMPM	<HGA HPA> A429 SDU XMTR LOOP-BACK FAIL
04	2	87	PP	HMPM	<HGA HPA> A429 MULTICNT RCVR FAIL
04	2	88	PP	HMPM	<HGA HPA> A429 ADL RCVR FAIL
04	2	89	PP	HMPM	<HGA HPA> A429 PDL-TO-HPA RCVR FAIL
04	2	0A	CM	HMPM	<HGA HPA> MAINTENANCE MEMORY CRC FAIL
04	2	0B	CM	HMPM	<HGA HPA> MAINTENANCE MEMORY WRITE FAIL
04	2	8C/0C	PP/CM	HMPM	<HGA HPA> CALIBRATION MEMORY CRC FAIL
04	2	0D	CM	HMPM	<HGA HPA> CALIBRATION MEMORY WRITE FAIL
04	2	8E/0E	PP/CM	HMPM	<HGA HPA> PROGRAM FLASH MEMORY FAIL
04	2	90	PP	HMPM	<HGA HPA> RAM FAIL
04	2	11	CM	HMPM	<HGA HPA> CPU OVER TEMP SHUTDOWN
04	2	12	CM	HMPM	<HGA HPA> CPU TEMP SENSOR FAIL
04	2	93/13	PP/CM	HMPM	<HGA HPA> CPU GND REF FAIL
04	2	94/14	PP/CM	HMPM	<HGA HPA> FAN RELAY DRIVER FAIL
04	2	95/15	PP/CM	HMPM	<HGA HPA> BIAS ENABLE LOOPBACK FAIL
04	2	96/16	PP/CM	HMPM	<HGA HPA> VAR ATTN DRIVER FAIL
04	2	17	CM	HMPM	<HGA HPA> FRONT PANEL TEST SWITCH STUCK
04	2	98	PP	HMPM	<HGA HPA> WATCHDOG TIMEOUT FAIL
04	2	19	CM	HMPM	<HGA HPA> DRIVER GND FAIL
04	2	9C/1C	PP/CM	HMPM	<HGA HPA> DRIVER TEST - MUX
04	2	9D	PP	HMPM	<HGA HPA> DRIVER TEST - GREEN LED
04	2	9E	PP	HMPM	<HGA HPA> DRIVER TEST - RED LED
04	2	A0	PP	HMPM	<HGA HPA> DRIVER TEST-MUTE ATTENUATOR
04	2	A2	PP	HMPM	<HGA HPA> DRIVER TEST - SER DATA CONCATENATE
04	2	A5	PP	HMPM	<HGA HPA> MUTE INPUT TEST
04	2	A6	PP	HMPM	<HGA HPA> CPU DEVICE TEST
04	2	A7	PP	HMPM	<HGA HPA> ACTUAL POWER CALIBRATION
04	2	A8	PP	HMPM	<HGA HPA> VALIDATION OF UPLOAD
04	2	29	CM	HMPM	<HGA HPA> MUTE ATTEN P OUT OF LIMITS
04	2	2A	CM	HMPM	<HGA HPA> CODE VPP OUT OF LIMITS
04	2	2B	CM	HMPM	<HGA HPA> MAINT LOG VPP OUT OF LIMITS
04	2	2C	CM	HMPM	<HGA HPA> CAL MEM VPP OUT OF LIMITS
04	2	AD/2D	PP/CM	HMPM	HGA HPA> ADC REF OUT OF LIMITS
04	2	2E	CM	HMPM	<HGA HPA> PWR LO OUT OF LIMITS
04	2	2F	CM	HMPM	<HGA HPA> PSU TEMP LO OUT OF LIMITS
04	2	30	CM	HMPM	<HGA HPA> AMPS LO OUT OF LIMITS
04	2	31	CM	HMPM	<HGA HPA> SOFTWARE FAULT
04	2	B3/33	PP/CM	HMPM	<HGA HPA> DISC OUTPUT TEST - FAN
04	2	B4	PP	HMPM	<HGA HPA> RS-422 INTERNAL LOOPBACK FAIL
04	2	35	CM	HMPM	<HGA HPA> IGA LNA/DIP ON/OFF DISC LOOP FAIL
04	2	C0	PP	HMPM	<HGA HPA> I2C INTERFACE FAILURE
04	2	C1/41	PP/CM	HMPM	<HGA HPA> RAM FAILURE
04	2	C2	PP	HMPM	<HGA HPA> KERNAL CODE ERROR
04	2	C3	PP	HMPM	<HGA HPA> APPLICATION CODE ERROR
04	2	C4	PP	HMPM	<HGA HPA> CONFIGURATION ERROR
04	2	C5	PP	HMPM	<HGA HPA> SDU BUS I/F FAILURE
04	2	C6	PP	HMPM	<HGA HPA> ADL BUS I/F FAILURE
04	2	C7	PP	HMPM	<HGA HPA> PDL BUS I/F FAILURE
04	2	C8	PP	HMPM	<HGA HPA> MAINTENANCE DUART FAILURE
04	2	C9/49	PP/CM	HMPM	<HGA HPA> DISCRETE OUTPUTS FAILURE
04	2	CA/4A	PP/CM	HMPM	<HGA HPA> CP TEMP SENSOR FAILURE
04	2	CB	PP	HMPM	<HGA HPA> BOARD CONFIG/REV FAILURE
04	2	4C	CM	HMPM	<HGA HPA> I2C INTERFACE FAILURE
04	2	4D	CM	HMPM	<HGA HPA> ROM FAILURE
DRIV: HPA RF DRIVER					
04	3	01	CM	HMPM	<HGA HPA> DRIVER RF OUTPUT FAIL
04	3	02	CM	HMPM	<HGA HPA> DRIVER TEMP SENSOR FAIL
04	3	03	CM	HMPM	<HGA HPA> DRIVER OVER TEMP SHUTDOWN
04	3	04	CM	HMPM	<HGA HPA> DRIVER VCC FAIL

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LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
PWR1: HPA RF POWER AMPLIFIER (1)					
04	5	01	CM	HMPM	<HGA HPA> <AMP 1> RF BALANCE FAIL
04	5	02	CM	HMPM	<HGA HPA> <AMP 1> VCC FAIL
PWR2: HPA RF POWER AMPLIFIER (2)					
04 6 Same as for PWR1 except sub. SRU code 6 for 5 and <AMP-2> for <AMP-1>.					
PWR3: HPA RF POWER AMPLIFIER (3)					
04 7 Same as for PWR1 except sub. SRU code 7 for 5 and <AMP-3> for <AMP-1>.					
C/DET: HPA RF POWER COMBINER/DETECTOR					
04	8	01	CM	HMPM	<HGA HPA> FORWARD OUTPUT POWER DET 1 FAIL
04	8	02	CM	HMPM	<HGA HPA> FORWARD OUTPUT POWER DET 2 FAIL
04	8	03	CM	HMPM	<HGA HPA> FORWARD OUTPUT PWR COMPARE FAIL
04	8	04	CM	HMPM	<HGA HPA> REFLECTED OUTPUT PWR DET FAIL
04	8	05	CM	HMPM	<HGA HPA> COMBINER TEMP SENSOR FAIL
FPAMP: HPA RF FINAL POWER AMPLIFIER					
04	9	01	CM	HMPM	<HGA HPA> FINAL AMP 1 RF BALANCE FAIL
04	9	02	CM	HMPM	<HGA HPA> FINAL AMP 1 VCC FAIL
04	9	04	CM	HMPM	<HGA HPA> FINAL AMP 2 RF BALANCE FAIL
04	9	05	CM	HMPM	<HGA HPA> FINAL AMP 2 VCC FAIL
04	9	C0/40	PP/CM	HMPM	<HGA HPA> PA UNRESPONSIVE
04	9	42	CM	HMPM	<HGA HPA> OVER CURRENT FAILURE
04	9	43	CM	HMPM	<HGA HPA> DRIVER AMPLIFIER DC VOLTAGE FAILURE
04	9	44	CM	HMPM	<HGA HPA> DRIVER AMPLIFIER CURRENT FAILURE
04	9	45	CM	HMPM	<HGA HPA> 12 VDC FAILURE
04	9	46	CM	HMPM	<HGA HPA> PA MUTE FAILURE
04	9	47	CM	HMPM	<HGA HPA> PA OVER TEMP
04	9	48	CM	HMPM	<HGA HPA> PA STATUS FAILURE
04	9	49	CM	HMPM	<HGA HPA> PA TEMP SENSOR FAILURE
HMB: HPA MOTHER BOARD					
04	A	40	CM	HMPM	<HGA HPA> BP TEMP SENSOR FAILURE
RFAM: 20W HPA RF AMPLIFIER MODULE					
04	B	01	CM	HMPM	<HGA HPA> OVER TEMP SHUTDOWN
04	B	02	CM	HMPM	<HGA HPA> RFAM VCC FAIL
04	B	03	CM	HMPM	<HGA HPA> AMP 1 VCC FAIL
04	B	04	CM	HMPM	<HGA HPA> FORWARD OUTPUT POWER DET 1 FAIL
04	B	05	CM	HMPM	<HGA HPA> FORWARD OUTPUT POWER DET 2 FAIL
04	B	06	CM	HMPM	<HGA HPA> REFLECTED OUTPUT PWR DET FAIL
04	B	07	CM	HMPM	<HGA HPA> TEMP SENSOR FAIL
04	B	08	CM	HMPM	<HGA HPA> FORWARD OUTPUT POWER FAIL
04	B	09	CM	HMPM	<HGA HPA> AMP 2 RF BALANCE FAIL
04	B	0A	CM	HMPM	<HGA HPA> AMP 2 VCC FAIL
LGA HPA					
07 Same entries as for HGA/IGA HPA above except substitute LRU code 7 for code 4, <LGA HPA> for <HGA HPA>, and [LGA_SUBSYS] for [HGA_SUBSYS]. For the cases of conditional HGA subsystem indictments ([cond_HGA_SUBSYS]), the equivalent LGA HPA failures shall UNconditionally indict [LGA_SUBSYS].					
HSU #1					
Only applicable prior to SDU Part Number 7516118-XX130/-xx140.					
UNKNOWN <HSU1> SRU					
08	0	01	CM	SMPM	<HSU1> SELF-DECLARED FAILURE
08	0	02	CM	SMPM	<HSU1> WILLIAMSBURG PROTOCOL ALO/ALR FAIL
08	0	03	CM	SMPM	<HSU1> WILLIAMSBURG PROTOCOL DATA XFER FAIL
08	0	84	PP	SMPM	<HSU1> SELF-TEST MISOPERATION
08	0	05	CM	SMPM	<HSU1> CHANNEL RELEASE ACKNOWLEDGE FAILURE
08	0	86/06	PP/CM	SMPM	<HSU1> RF LOOPBACK INHIBIT FAILURE
HSCPU: <HSU1> CPU					
08	1	FA	PP	HSCPU	<HSU1> ACCESS LEVEL DEVELOPMENT
08	1	FB	PP	HSCPU	<HSU1> ACCESS LEVEL PRODUCTION
08	1	FC	PP	HSCPU	<HSU1> ACCESS LEVEL PRODUCTION FAST STARTUP
08	1	FD	PP	HSCPU	<HSU1> SW VERSIONS INCONSISTENCY
08	1	7F	CM	HSCPU	<HSU1> ENVIRONMENT TEMP AT POWER-UP FAIL
08	1	91	PP	HSCPU	<HSU1> TEMP SENSOR FAILURE
FDSMP: <HSU1> FRAME DSP (AND INTERFACES)					
08	2	95	PP	HSCPU	<HSU1> FRAME DSP/CPU INTERFACE FAILURE
VSDPM: <HSU1> VFC DSP (AND INTERFACES)					
08	3	98	PP	HSCPU	<HSU1> VFC DSP/CPU INTERFACE FAILURE
TFPGA: <HSU1> TURBO FPGA					
08	4	86	PP	HSCPU	<HSU1> TURBO FPGA FAIL
ISDNT: <HSU1> ISDN TRANSCEIVER					
08	5	87	PP	HSCPU	<HSU1> ISDN TRANSCEIVER FAILURE

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
AFPGA: <HSU1> ARINC 429 FPGA					
08	6	NONE			
CPURM: <HSU1> CPU RAM					
08	7	84	PP	HSCPU	<HSU1> CPU RAM FAILURE
CEM: <HSU1> CONVERTER EEPROM					
08	8	81	PP	HSCPU	<HSU1> EEPROM FAILURE
FLASH: <HSU1> FLASH					
08	9	82	PP	HSCPU	<HSU1> PARAMETER BLOCK CHECKSUM FAILURE
08	9	83	PP	HSCPU	<HSU1> CPU BIOS/APPLICATION CRC FAILURE
08	9	87	PP	HSCPU	<HSU1> MISSING FILE IN FLASH
08	9	88	PP	HSCPU	<HSU1> CORRUPTED FILE IN FLASH/INCORRECT CRC
QUART: <HSU1> QUAD UART					
08	A	91	PP	HSCPU	<HSU1> EXTERNAL UART FAILURE
ETHER: <HSU1> ETHERNET					
08	B	NONE			
PSPCB: <HSU1> POWER SUPPLY PCB					
08	C	0B	CM	HSCPU	<HSU1> POWER FAILURE
HCDMI: <HSU1>/CDM INTERFACE					
08	G	F2	PP	HSCPU	<HSU1> CDM INTERFACE FAILURE
08	G	FE	PP	HSCPU	<HSU1> CDM NOT FITTED
TDRAM: <HSU1> TURBO DECODER RAM					
08	J	8A	PP	HSCPU	<HSU1> TURBO DECODER RAM FAILURE
BATTM: <HSU1> BATTERY					
08	K	85	PP	HSCPU	<HSU1> BATTERY CHECK FAILURE
STAM: <HSU1> STEP ATTENUATOR					
08	M	B5	PP	HSCPU	<HSU1> STEP ATTENUATOR FAILURE
HRFM: <HSU1> RF					
08	N	81	PP	HSCPU	<HSU1> 1.LO LOCK DETECTOR FAILURE
08	N	82	PP	HSCPU	<HSU1> 2.LO LOCK DETECTOR FAILURE
08	N	83	PP	HSCPU	<HSU1> 3.LO LOCK DETECTOR FAILURE
08	N	91	PP	HSCPU	<HSU1> 1.LO MIN FREQUENCY TEST FAILURE
08	N	92	PP	HSCPU	<HSU1> 2.LO MIN FREQUENCY TEST FAILURE
08	N	93	PP	HSCPU	<HSU1> 3.LO MIN FREQUENCY TEST FAILURE
08	N	A1	PP	HSCPU	<HSU1> 1.LO MAX FREQUENCY TEST FAILURE
08	N	A2	PP	HSCPU	<HSU1> 2.LO MAX FREQUENCY TEST FAILURE
08	N	A3	PP	HSCPU	<HSU1> 3.LO MAX FREQUENCY TEST FAILURE
08	N	B0	PP	HSCPU	<HSU1> ALC - CARRIER OFF FAILURE
08	N	B1	PP	HSCPU	<HSU1> ALC - CARRIER ON FAILURE
08	N	B2	PP	HSCPU	<HSU1> RF LOOPBACK FAILURE
08	N	B3	PP	HSCPU	<HSU1> AVERAGE AMPLITUDE FAILURE
08	N	B4	PP	HSCPU	<HSU1> 16QAM SCPC FRAME SYNC FAILURE
08	N	BA	PP	HSCPU	<HSU1> INTERNAL RX COAX CABLE FAILURE
08	N	BB	PP	HSCPU	<HSU1> TX/RX CHANNEL FREQUENCY ERROR
08	N	BC	PP	HSCPU	<HSU1> CARRIER_ON OFF CONTROL FAILURE
08	N	BD	PP	HSCPU	<HSU1> RF LOOP_BACK OFF CONTROL FAILURE
08	N	BE	PP	HSCPU	<HSU1> TX_ON/OFF CONTROL FAILURE
08	N	41	CM	HSCPU	<HSU1> AGC LEVEL OUTSIDE LIMITS WARNING
08	N	C3	PP	HSCPU	<HSU1> LINEARITY OUTSIDE LIMITS WARNING
08	N	51	CM	HSCPU	<HSU1> 1.LO LOCK FAILURE
08	N	52	CM	HSCPU	<HSU1> 2.LO LOCK FAILURE
08	N	53	CM	HSCPU	<HSU1> 3.LO LOCK FAILURE
REOSM: <HSU1> REFERENCE OSCILLATOR					
08	O	42	CM	HSCPU	<HSU1> REF OSC WARNING: SEND HSU TO CAL
08	O	63	CM	HSCPU	<HSU1> REF OSC FAILURE/VOLTAGE TOO LOW
08	O	64	CM	HSCPU	<HSU1> REF OSC FAILURE/VOLTAGE TOO HIGH
BMONM: <HSU1> BURST DURATION MONITOR					
08	P	81	PP	HSCPU	<HSU1> BURST DURATION MONITOR CIRCUIT
08	P	04	CM	HSCPU	<HSU1> TDM BURST DURATION FAILURE
08	P	85	PP	HSCPU	<HSU1> CARRIER ON SIGNALS
DCOMM: <HSU1> DOPPLER COMPENSATION					
08	Q	39	CM	HSCPU	<HSU1> REF OSC COMPENSATION ERROR
FVFCI: <HSU1> FRAME DSP/VFC DSP INTERFACE					
08	R	17	CM	HSCPU	<HSU1> FRAME DSP/VFC DSP FAILURE
FDTFI: <HSU1> FRAME DSP/TURBO FPGA INTERFACE					
08	S	96	PP	HSCPU	<HSU1> FRAME TURBO FPGA INTERFACE FAILURE
PSIPI: <HSU1> POWER SUPPLY PCB/ISDN PHONE INTERFACE					
08	W	88	PP	HSCPU	<HSU1> ISDN SUPPLY VOLTAGE FAILURE

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
CDM: <HSU1> CONFIGURATION DATA MODULE					
08	X	F1	PP	HSCPU	<HSU1> INVALID SERIAL NUMBER
08	X	F3	PP	HSCPU	<HSU1> CDM ESSENTIAL DATA FAILURE
08	X	F4	PP	HSCPU	<HSU1> CDM DATA ACCESS ERROR
08	X	F5	PP	HSCPU	<HSU1> CDM MISSING WRITE PROTECTION
08	X	F6	PP	HSCPU	<HSU1> CDM INCORRECT VERSION
ITPSI: <HSU1> ISDN TRANSCEIVER/POWER SUPPLY PCB INTERFACE					
08	Z	89	PP	HSCPU	<HSU1> ISDN RX VOLTAGE
HSU #2					
09 Same entries as for HSU #1 above except substitute LRU code 09 for code 08, <HSU2> for <HSU1>, and [HSU2] for [HSU1]. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.					
HIGH POWER RELAY					
UNKNOWN HPR SRU					
0A	0	01	CM	SMPM	(PORT) MNTNC WORD HPR FAIL
0A	0	02	CM	SMPM	(STBD) MNTNC WORD HPR FAIL
TOP/PORT LNA/DIPLEXER					
UNKNOWN TOP/PORT LNA/DIPLEXER SRU					
0D	0	01	CM	SMPM	<T/P LNA/DIP> MNTNC WORD FAIL
STARBOARD LNA/DIPLEXER					
0F Same entries as for TOP/PORT LNA/Diplexer above except substitute STBD BSU for T/P BSU, LRU code 0F for code 0D and <STBD LNA/DIP> for <T/P LNA/DIP>.					
LGA LNA/DIPLEXER					
UNKNOWN LGA LNA/DIPLEXER SRU					
10	0	01	CM	SMPM	LGA LNA/DIP FAIL
TOP/PORT BSU OR ACU					
UNKNOWN TOP/PORT BSU OR ACU SRU					
13	0	01	CM	SMPM	<T/P B/A> MNTNC WORD (350) UPDATE RATE FAIL
13	0	02	CM	SMPM	<T/P B/A> MNTNC WORD (350) DATA FAIL
13	0	03	CM	SMPM	<T/P B/A> STATUS WORD (144) UPDATE RATE FAIL
13	0	04	CM	SMPM	<T/P B/A> STATUS WORD (144) DATA FAIL
13	0	05	CM	SMPM	<T/P B/A> MNTNC WORD RAM FAIL
13	0	06	CM	SMPM	<T/P B/A> MNTNC WORD ROM FAIL
13	0	07	CM	SMPM	<T/P B/A> MNTNC WORD PSU FAIL
13	0	08	CM	SMPM	<T/P B/A> MNTNC WORD PARAMETER FAIL
13	0	09	CM	SMPM	<T/P B/A> MNTNC WORD TEMP FAIL
13	0	8A	PP	SMPM	<T/P B/A> SELF-TEST MISOPERATION
STARBOARD BSU					
15 Same entries as for TOP/PORT BSU or ACU above except substitute LRU code 15 for code 13 and <STBD BSU> for <T/P B/A>.					
TOP/PORT HGA/IGA					
UNKNOWN TOP/PORT HGA/IGA SRU					
1A	0	01	CM	SMPM	<T/P HGA/IGA> MNTNC WORD FAIL
1A	0	02	CM	HMPM	IGA FAILURE
1A	0	03	CM	HMPM	IGA RS-422 INPUT BUS LINK FAULT
1A	0	04	CM	HMPM	IGA HPA RS-422 INPUT BUS ERROR/INACTIVE
STARBOARD HGA					
1C Same entries as for TOP/PORT HGA above except substitute LRU code 1C for code 1A, <STBD BSU> for <T/P B/A>, and <STBD HGA> for <T/P HGA>.					
LGA					
UNKNOWN LGA SRU					
SCDU/WSC #1					
UNKNOWN SCDU/WSC #1 SRU					
21	0	01	CM	SMPM	<SCDU-1> PROTOCOL ERROR
21	0	02	CM	SMPM	<WSC-1> STATUS (270) BAD SSM
21	0	03	CM	SMPM	<WSC-1> MASTER PROTOCOL ERROR
21	0	04	CM	SMPM	<WSC-1> DATA TRANSMISSION FAILURE
21	0	07	CM	SMPM	<WSC-1> MASTER TEST LOOP FAILURE
SCDU/WSC #2					
22 Same entries as for SCDU/WSC #1 above except substitute LRU code 22 for code 21, <WSC-2> for <WSC-1>, and <SCDU-2> for <SCDU-1>.					
SCDU/WSC #3					
23 Same entries as for SCDU/WSC #1 above except substitute LRU code 23 for code 21, <WSC-3> for <WSC-1>, and <SCDU-3> for <SCDU-1>.					
(C)MU #1					
UNKNOWN (C)MU #1 SRU					
33	0	02	CM	SMPM	<(C)MU-1> STATUS (270) BAD SSM
33	0	03	CM	SMPM	<(C)MU-1> MASTER PROTOCOL ERROR
33	0	04	CM	SMPM	<(C)MU-1> DATA TRANSMISSION FAILURE
33	0	05	CM	SMPM	<(C)MU-1> SLAVE PROTOCOL ERROR
33	0	06	CM	SMPM	<(C)MU-1> SELF-DECLARED FAILURE

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
33	0	07	CM	SMPM	<(C)MU-1> MASTER TEST LOOP FAILURE
33	0	08	CM	SMPM	<(C)MU-1> SLAVE TEST LOOP FAILURE
(C)MU #2					
34 Same entries as for CMU #1 above except substitute LRU code 34 for code 33 and <(C)MU-2> for <(C)MU-1>.					
IRS-PRI					
UNKNOWN IRS-PRI SRU					
35	0	02	CM	SMPM	<IRS-PRI> LAT DATA (310) FAIL
35	0	04	CM	SMPM	<IRS-PRI> LON DATA (311) FAIL
35	0	06	CM	SMPM	<IRS-PRI> GND SPD DATA (312) FAIL
35	0	08	CM	SMPM	<IRS-PRI> TRK DATA (313) FAIL
35	0	0A	CM	SMPM	<IRS-PRI> TRUE HDG DATA (314) FAIL
35	0	0C	CM	SMPM	<IRS-PRI> PITCH DATA (324) FAIL
35	0	0E	CM	SMPM	<IRS-PRI> ROLL DATA (325) FAIL
IRS-SEC					
36 Same entries as for IRS-PRI above except substitute LRU code 36 for code 35 and <IRS-SEC> for <IRS-PRI>.					
CFDS/CMC					
UNKNOWN CFDS/CMC SRU					
39	0	01	CM	SMPM	INVALID OMS PARAMETER(S)
429 ICAO ADDRESS SOURCE					
UNKNOWN 429 ICAO ADDRESS SOURCE SRU					
40	0	01	CM	SMPM	429 ICAO ADDRESS FAIL
40	0	02	CM	SMPM	DUAL SYSTEM DIFFERENT 429 AES ID
CABIN TELECOMMUNICATIONS UNIT					
UNKNOWN CABIN TELECOMMUNICATIONS UNIT SRU					
42	0	01	CM	SMPM	CCS ECL NOT ESTABLISHED
42	0	02	CM	SMPM	CCS CCL NOT ESTABLISHED
42	0	03	CM	SMPM	CCS CTU NOT AVAILABLE
42	0	04	CM	SMPM	CCS PDL NOT ESTABLISHED
CPDF					
43 Same entries as for CMU #1 above except substitute LRU code 43 for code 33, <CPDF> for <(C)MU-1> and make the class of all CPDF failure 2.					
SDU INPUT BUSES AND RELATED					
50	0	01	CM	SMPM	SDU HSU1 BUS INACTIVE
50	0	02	CM	SMPM	HSU1 SELF-TEST MISOPERATION
50	0	03	CM	SMPM	HSU1 PERIODIC DATA RATE FAIL
50	0	04	CM	SMPM	HSU1 SOLO WORD DATA RATE FAIL
50	0	05	CM	SMPM	HSU1 W'BURG DATA RATE FAIL
51	0	01	CM	SMPM	SDU HSU2 BUS INACTIVE
51	0	02	CM	SMPM	HSU2 SELF-TEST MISOPERATION
51	0	03	CM	SMPM	HSU2 PERIODIC DATA RATE FAIL
51	0	04	CM	SMPM	HSU2 SOLO WORD DATA RATE FAIL
51	0	05	CM	SMPM	HSU2 W'BURG DATA RATE FAIL
52	0	01	CM	SMPM	SDU CPDF BUS INACTIVE
53	0	01	CM	SMPM	SDU CMU-1 BUS INACTIVE
54	0	01	CM	SMPM	SDU CTU CEPT-E1 BUS INACTIVE
55	0	01	CM	SMPM	SDU SCDU/WSC-1 BUS INACTIVE
56	0	01	CM	SMPM	SDU SCDU/WSC-2 BUS INACTIVE
57	0	01	CM	SMPM	SDU CMU-2 BUS INACTIVE
59	0	01	CM	SMPM	SDU CFDS BUS INACTIVE
59	0	02	CM	SMPM	INVALID OMS PARAMETER(S)
5A	0	01	CM	SMPM	SDU PRI IRS BUS INACTIVE
5B	0	01	CM	SMPM	SDU SEC IRS BUS INACTIVE
5C	0	01	CM	SMPM	SDU HGA/IGA HPA BITE BUS INACTIVE
5C	0	02	CM	SMPM	HGA/IGA HPA SELF-TEST MISOPERATION
5F	0	01	CM	SMPM	SDU LGA HPA BITE BUS INACTIVE
5F	0	02	CM	SMPM	LGA HPA SELF-TEST MISOPERATION
62	0	01	CM	SMPM	SDU TOP/PORT BSU/ACU BITE BUS INACTIVE
62	0	02	CM	SMPM	TOP/PORT BSU/ACU SELF-TEST MISOPERATION
64	0	01	CM	SMPM	SDU STBD BSU BITE BUS INACTIVE
64	0	02	CM	SMPM	STBD BSU/ACU SELF-TEST MISOPERATION
65	0	01	CM	SMPM	SDU RMP BUS INACTIVE
66	0	01	CM	SMPM	SDU SCDU/WSC-3 BUS INACTIVE
71	0	01	CM	SMPM	SDU CROSS-TALK BUS INACTIVE
73	0	01	CM	SMPM	SDU FMC-1 BUS INACTIVE
74	0	01	CM	SMPM	SDU FMC-2 BUS INACTIVE
HGA/IGA HPA INPUT BUSES					
90	0	01	CM	SMPM	HGA/IGA HPA 429 MNTNC WORD CTL BUS INACTIVE
90	0	02	CM	HMPM	HGA/IGA HPA MULTICONTROL BUS INACTIVE

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
LGA HPA INPUT BUSES					
96	0	01	CM	SMPM	LGA HPA 429 MNTNC WORD CONTROL BUS INACTIVE
96	0	02	CM	HMPM	LGA HPA MULTICONTROL BUS INACTIVE
TOP/PORT BSU/ACU INPUT BUSES					
98	0	01	CM	SMPM	MNTNC WORD T/P BSU/ACU MULTICTL BUS INACTIVE
PORT BSU INPUT BUSES					
9A	0	01	CM	SMPM	MNTNC WORD PORT BSU CROSSTALK BUS INACTIVE
STARBOARD BSU INPUT BUSES					
9C	0	01	CM	SMPM	MNTNC WORD STBD BSU MULTICTL BUS INACTIVE
9D	0	01	CM	SMPM	MNTNC WORD STBD BSU CROSSTALK BUS INACTIVE
HSU #1 INPUT BUS					
9E	0	01	CM	SMPM	<HSU1> 429 CONTROL BUS INACTIVE
9E	0	02	CM	SMPM	<HSU1> ICAO ADDRESS INVALID
9E	0	03	CM	SMPM	<HSU1> POSITION UNAVAILABLE
9E	0	04	CM	SMPM	<HSU1> VELOCITY UNAVAILABLE
HSU #2 INPUT BUS					
9F Same as entries for HSU #1 above except substitute Level 1 code 9F for code 9E and <HSU2> for <HSU1>. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.					
WSC INPUT BUSES					
A1	0	01	CM	SMPM	WSC1 429 CNTRL BUS FROM THIS SDU INACTIVE
A2	0	01	CM	SMPM	WSC2 429 CNTRL BUS FROM THIS SDU INACTIVE
A3	0	01	CM	SMPM	WSC3 429 CNTRL BUS FROM THIS SDU INACTIVE
HSU USER INTERFACES					
A6	0	01	CM	HSCP	HSU ETHERNET PORT 1 BUS INACTIVE
A7	0	01	CM	HSCP	HSU ETHERNET PORT 2 BUS INACTIVE
A8	0	01	CM	HSCP	HSU ISDN PORT 1 BUS INACTIVE
A9	0	01	CM	HSCP	HSU ISDN PORT 2 BUS INACTIVE
MISCELLANEOUS ERRORS, FAILURES AND WARNINGS					
SDU SYSTEM CONFIGURATION STRAP ERRORS					
C0	0	81	PP	SMPM	SDU STRAPS PARITY ERROR
C0	0	82	PP	SMPM	SDU ANT CONFIG STRAPS ERROR
C0	0	83	PP	SMPM	SDU CFDS CONFIG STRAPS ERROR
C0	0	84	PP	SMPM	SDU STRAPS INCONSISTENCY
C0	0	05	CM	SMPM	DUAL SYSTEM CONFIG STRAPS ERROR
C0	0	06	CM	SMPM	DUAL REMOTE COCKPIT STRAPS INCOMPATIBLE
C0	0	87	PP	SMPM	MANUFACTURER-SPECIFIC STRAPS PARITY ERROR
MISC					
C1	0	81/01	PP/CM	SMPM	SDU WOW MISCOMPARE ERROR
C2	0	81	PP	SMPM	SDU DUAL SYSTEM SELECT/DISABLE TEST ERROR
C2	0	82	PP	SMPM	SDU DUAL SYSTEM SEL/DIS TEST NOT INITIATED
C3	0	81	PP	SMPM	SDU (ICAO) ADDRESS BITS (STRAPS) ERROR
C3	0	02	CM	SMPM	DUAL SYSTEM DIFFERENT STRAPS AES ID
C4	0	01	CM	SMPM	HGA/IGA HPA 429 MNTNC WORD OUTPUT VSWR BAD
C4	0	02	CM	HMPM	HGA/IGA HPA REFLECTED OUTPUT POWER ERROR
C5	0	81/01	PP/CM	SMPM	ORT/LOCAL CONFIG STRAPS INCOMPATIBILITY
C5	0	02	CM	SMPM	DUAL ORT/COMBINED CONFIG STRAPS INCOMP
C6	0	01	CM	SMPM	LGA HPA 429 MNTNC WORD OUTPUT VSWR BAD
C6	0	02	CM	HMPM	LGA HPA REFLECTED OUTPUT POWER ERROR
HGA/IGA HPA OVER TEMP WARNINGS					
C7	0	01	CM	SMPM	HGA HPA MNTNC WORD LRU OVER TEMP
C7	1	01	CM	HMPM	HGA HPA PSU OVER TEMP WARNING
C7	2	01	CM	HMPM	HGA HPA CPU OVER TEMP WARNING
C7	2	02	CM	HMPM	HGA HPA OVER TEMP WARNING
C7	3	01	CM	HMPM	HGA HPA DRIVER OVER TEMP WARNING
C7	8	01	CM	HMPM	HGA HPA OVER TEMP (COMBINER) WARNING
C7	B	01	CM	HMPM	HGA HPA RFAM OVER TEMP WARNING
MISC					
C8	0	01	CM	SMPM	INVALID FREQ CMD FROM GES
C8	0	02	CM	SMPM	GNSS INTERFERENCE RISK FROM GES
LGA HPA OVER TEMP WARNINGS					
C9	0	01	CM	SMPM	LGA HPA MNTNC WORD LRU OVER TEMP
C9	1	01	CM	HMPM	LGA HPA PSU OVER TEMP WARNING
C9	2	01	CM	HMPM	LGA HPA CPU OVER TEMP WARNING
C9	2	02	CM	HMPM	LGA HPA OVER TEMP WARNING
C9	3	01	CM	HMPM	LGA HPA DRIVER OVER TEMP WARNING
C9	8	01	CM	HMPM	LGA HPA OVER TEMP (COMBINER) WARNING
C9	B	01	CM	HMPM	LGA HPA RFAM OVER TEMP WARNING

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
MISC					
CA	0	01	CM	SMPM	LGA LNA CONTROL DRIVER FAIL
CB	0	01	PP	HMPM	HGA/IGA HPA INVALID SDI STRAPPING
CC	0	01	PP	HMPM	LGA HPA INVALID SDI STRAPPING
TOTC/POC RESETS					
CD	0	81/01	PP/CM	SMPM	SDU TOTC AUTO/MANUAL RESET
CD	0	82/02	PP/CM	SMPM	SDU POC AUTO/MANUAL RESET
CF	0	81/01	PP/CM	HMPM	HGA/IGA HPA TOTC AUTO/MANUAL RESET
CF	0	82/02	PP/CM	HMPM	HGA/IGA HPA POC AUTO/MANUAL RESET
D0	0	81/01	PP/CM	HMPM	LGA HPA TOTC AUTO/MANUAL RESET
D0	0	82/02	PP/CM	HMPM	LGA HPA POC AUTO/MANUAL RESET
WRONG SDI CODES					
D1	0	01	CM	SMPM	HGA/IGA HPA WRONG A429 SDI CODE
D2	0	01	CM	SMPM	LGA HPA WRONG A429 SDI CODE
D3	0	01	CM	SMPM	TOP/PORT BSU/ACU WRONG A429 SDI CODE
D4	0	01	CM	SMPM	STARBOARD BSU WRONG A429 SDI CODE
RF INTER-LRU FAILURES					
D5	0	01	CM	SMPM	SDU TO HGA/IGA HPA CALIBRATION ERROR
D5	0	02	CM	SMPM	SDU TO LINEAR HGA/IGA HPA RF CONTIN. FAIL
D5	0	03	CM	SMPM	SDU TO CLASS C HGA/IGA HPA RF CONTIN. FAIL
D5	0	04	CM	SMPM	SDU TO HGA/IGA HPA ATTEN. CALIBRATION ERROR
D5	0	05	CM	SMPM	SDU TO LINEAR HGA/IGA HPA ATTEN. RF CONTIN. FAIL
D6	0	01	CM	SMPM	SDU TO LGA HPA CALIBRATION ERROR
D6	0	02	CM	SMPM	SDU TO LINEAR LGA HPA RF CONTINUITY FAIL
D6	0	03	CM	SMPM	SDU TO CLASS C LGA HPA RF CONTINUITY FAIL
D6	0	04	CM	SMPM	SDU TO LGA HPA ATTEN. CALIBRATION ERROR
D6	0	05	CM	SMPM	SDU TO LINEAR LGA HPA ATTEN. RF CONTIN. FAIL
D8	0	81	PP	SMPM	T/P HGA LNA TO SDU RF CONTINUITY FAIL
D9	0	81	PP	SMPM	STBD HGA LNA TO SDU RF CONTINUITY FAIL
DA	0	81	PP	SMPM	LGA LNA TO SDU RF CONTINUITY FAIL
MISC					
DB	0	01	CM	SMPM	LGA LOG-ON TEST FAILURE
DB	0	02	CM	SMPM	SLAVE LGA LOG-ON TEST NOT INITIATED
DC	0	01	CM	SMPM	NO DECLARED ACTIVE (C)MU
SDU ORT ERRORS					
SDU SECURED ORT ERRORS					
DD	0	01	CM	SMPM	(I) STARTUP LOG-ON POLICY
DD	0	03	CM	SMPM	(VIII) RESPONSE CAPABILITY TO LOG-ON INTRRGTN
DD	0	04	CM	SMPM	(XVIII) NOISE INSERTION LEVEL
DD	0	05	CM	SMPM	(XXII) TX GAIN THRESHOLD
DD	0	06	CM	SMPM	(XXIII) APHONE SYSTEM MANAGEMENT COMMANDS
DD	0	08	CM	SMPM	(XXVIII) HPA BACKOFF LIMITS
DD	0	09	CM	SMPM	(XXIX) HPA MIN REPORTABLE ACTUAL PWR OUT
DD	0	0A	CM	SMPM	(XXX) DEFAULT ASSUMED GLOBAL INITIAL C-CH EIRP
DD	0	0B	CM	SMPM	(XXXI) SCDU TELEPHONE NUMBER PRESELECT
DD	0	0C	CM	SMPM	(XXXII) ACP CALL INITIATION
DD	0	0D	CM	SMPM	(XXXVIII) FAILURE MASKING DATA
DD	0	0E	CM	SMPM	(XXXIX) ELEVATION HANDOVER THRESHOLD
DD	0	0F	CM	SMPM	(XLI) AUTOMATIC TRANSIT CALL GES TABLE
DD	0	10	CM	SMPM	(XLII) AIR-TO-GROUND CHIME
DD	0	11	CM	SMPM	(XLIII) SCDU CALL PROMPTS
DD	0	12	CM	SMPM	(XLIV) EIRP OVERDRAFT CHECKING PRIORITY
DD	0	13	CM	SMPM	(XLVI) COCKPIT AUDIO LEVEL SETTINGS
DD	0	14	CM	SMPM	(XLVII) HGA RETRY PERIOD
DD	0	15	CM	SMPM	(XLVIII) COCKPIT CHAN INTERFACE TYPE FOR DUAL
DD	0	16	CM	SMPM	(L) “DIS/REENABLE OTHER SATCOM” SCDU PROMPTS
DD	0	17	CM	SMPM	(LI) SCDU SATCOM SUBSYSTEM PROMPTS
DD	0	18	CM	SMPM	(LII) SCDU CHANNEL LABEL SUFFIXES
DD	0	19	CM	SMPM	(LIII) SECURED ORT DESCRIPTION
DD	0	1A	CM	SMPM	(LIV) COMPOSITE ORT FILE UPLOAD ALLOWED
DD	0	1B	CM	SMPM	SECURED ORT MISMATCH WITH OTHER SDU
DD	0	1C	CM	SMPM	(LVI) ACCESS TO ZERO-PREFERENCE GESS
DD	0	1D	CM	SMPM	(LV) SECURED ORT MODIFIED FLAG
DD	0	1E	CM	SMPM	(LVII) L-BAND REFERENCE OFFSET CAL THRESHOLDS
DD	0	1F	CM	SMPM	(LIX) APHONE AUDIO LEVEL SETTING
DD	0	20	CM	SMPM	(LX) AERO-H ONLY OPERATION
SDU USER ORT ERRORS					
DE	0	01	CM	SMPM	(II) SATELLITE/GES NAMES
DE	0	02	CM	SMPM	(III) GES PREFERENCE VALUES

LEVEL 1	SRU	FAILURE	MONITORING	TESTER	FAILURE DESCRIPTION
DE	0	03	CM	SMPM	(IV) MAINTENANCE PAGE ACCESS
DE	0	04	CM	SMPM	(V) COCKPIT TELEPHONE NUMBERS
DE	0	05	CM	SMPM	(VII) RESOURCES RESERVED FOR HEADSET
DE	0	07	CM	SMPM	(X) GROUND-TO-AIR CIRCUIT-MODE DATA
DE	0	08	CM	SMPM	(XIII) GROUND-TO-AIR CALLS
DE	0	09	CM	SMPM	(XIV) CALL CAMP-ON DURATION
DE	0	0A	CM	SMPM	(XV) CAMP-ON TIMEOUT ACTION
DE	0	0B	CM	SMPM	(XVI) STORE APHONE TELEPHONE NUMBERS
DE	0	0C	CM	SMPM	(XIX) GROUND-TO-AIR CALL PREEMPTION
DE	0	0D	CM	SMPM	(XX) PREFERRED COCKPIT CALL ROUTING
DE	0	0E	CM	SMPM	(XXI) PREFERRED APHONE CALL ROUTING
DE	0	0F	CM	SMPM	(XXIV) APHONE OUTGOING CALL BARRING LEVEL
DE	0	10	CM	SMPM	(XXV) CALL BARRING SECURITY CODE
DE	0	11	CM	SMPM	(XXVI) SHARED APHONE PHONE NUMBER STORAGE
DE	0	12	CM	SMPM	(XXXIII) ORT DESCRIPTION
DE	0	13	CM	SMPM	(XXXIV) AIRLINE CODE
DE	0	14	CM	SMPM	(XXXV) HEADSET OUTGOING CALL BARRING LEVEL
DE	0	15	CM	SMPM	(XXXVI) HEADSET TRANSIT CALL
DE	0	16	CM	SMPM	(XL) HIGH RATE DATA TRANSMIT SUPPORT
DE	0	17	CM	SMPM	(XLV) APHONE CALLED TERMINAL ID ASSIGNMENT
DE	0	18	CM	SMPM	(IL) MASTERY HANDOVER ALGORITHM WEIGHTING
DE	0	19	CM	SMPM	(LVIII) AES POSITION REPORTING
DE	0	1A	CM	SMPM	(LXI) HSD PREEMPTION FOR PRIORITY 4 CALLS
DE	0	1B	CM	SMPM	(LXII) ONGOING HSD CALL EIRP
DE	0	1C	CM	SMPM	(XXXVII) ORT MODIFIED FLAG
DE	0	1D	CM	SMPM	(LXIII) WSC MANUAL DIALING
DE	0	1E	CM	SMPM	(LXIV) MINIMUM HSD CALL EIRP
DE	0	1F	CM	SMPM	(LXV) HSD REGISTRATION PREFERENCE
DE	0	20	CM	SMPM	(LXVI) SWIFT64 M-ISDN LES PREFERENCE VALUES
DE	0	21	CM	SMPM	(LXVII) SWIFT64 MPDS LES PREFERENCE VALUES
DE	0	22	CM	SMPM	(LXVIII) ETHERNET MAC ADDRESS ASSIGNMENT
DE	0	23	CM	SMPM	(LXIX) PPPoE ACCESS-CONCENTRATOR NAME
DE	0	24	CM	SMPM	(LXX) TELNET SERVER ACCESS
DE	0	25	CM	SMPM	(LXXI) DHCP SERVER ACCESS
DE	0	26	CM	SMPM	(LXXII) TELNET IP ADDRESS ASSIGNMENT
DE	0	27	CM	SMPM	(LXXIII) TELNET SUBNET MASK ASSIGNMENT
DE	0	28	CM	SMPM	(LXXIV) TELNET DEFAULT GATEWAY ASSIGNMENT
DE	0	29	CM	SMPM	(LXXV) DHCP IP ADDRESS ASSIGNMENT
DE	0	2A	CM	SMPM	(LXXVI) DHCP IP ADDRESS POOL ALLOCATION
DE	0	2B	CM	SMPM	(LXXVII) BGAN PDP SESSION PARAMETERS
DE	0	2C	CM	SMPM	(LXXVIII) PSID SUPPLEMENTARY FREQUENCIES
MISC					
DF	0	01	CM	SMPM	SLAVE HGA/IGA LOG-ON TEST FAILURE
DF	0	02	CM	SMPM	SLAVE HGA/IGA LOG-ON TEST NOT INITIATED
E1	0	01	CM	SMPM	HSU1 SYSTEM DISABLE DISCRETE FAILURE
E1	0	01	CM	SMPM	HSU SYSTEM DISABLE DISCRETE FAILURE
E2	0	01	CM	SMPM	HSU2 SYSTEM DISABLE DISCRETE FAILURE
E3	0	01	CM	SMPM	UNSUPPORTED HSU1 CONFIGURATION
E3	0	02	CM	SMPM	UNSUPPORTED HSU2 CONFIGURATION
E4	0	81	PP	SMPM	HSU1/SDU INTERFACE VERSION INCOMPATIBILITY
E5	0	81	PP	SMPM	HSU2/SDU INTERFACE VERSION INCOMPATIBILITY
E6	0	81/01	PP/CM	SMPM	HSU1/HPA TX RF SIGNAL PATH FAILURE
E6	0	02	CM	SMPM	HSU1 to HGA/IGA HPA CALIBRATION ERROR
E6	0	03	CM	SMPM	HSU2 to HGA/IGA HPA CALIBRATION ERROR
E6	0	04	CM	SMPM	HSU3 to HGA/IGA HPA CALIBRATION ERROR
E6	0	05	CM	SMPM	HSU4 to HGA/IGA HPA CALIBRATION ERROR
E7	0	01	CM	SMPM	HSU2/HPA TX RF SIGNAL PATH FAILURE
E8	0	81	PP	SMPM	DLNA/HSU1 RX RF SIGNAL PATH FAILURE
E9	0	81	PP	SMPM	DLNA/HSU2 RX RF SIGNAL PATH FAILURE
EA	0	01	CM	SMPM	DUAL HSU-700 CONFIG WARNING
EB	0	01	CM	SMPM	NO DECLARED ACTIVE WSC
EC	0	81	PP	HSCP	HSU CONFIGURATION STRAPS PARITY ERROR
EC	0	82	PP	HSCP	HSU CONFIGURATION STRAPS ERROR
ED	0	01	CM	HSCP	SDU ORT/HSU CONFIG STRAPS INCOMPATIBILITY
EE	0	81	PP	HSCP	HSU FORWARD ID ADDRESS BITS (STRAPS) ERROR
EE	0	82	PP	HSCP	ILLEGAL HSU FORWARD ID ADDRESS
FD	0	01-16	N/A	SMPM	EXTERNAL PILOT EVENT MARKER TO SDU
FE	0	01	POST	SMPM	EXTERNAL POWER SUPPLY INTERRUPT TO SDU

COMMENTARY

The following information is applicable prior to SDU Part Number 7516118-XX130/-xx140, and translates the HSU failure codes to their "original" codes (for correlation with non-SYP documentation).

HSU FAILURES ORIGINAL CODE
08 0 01 -
08 0 02 -
08 0 03 -
08 0 84 -
08 1 FA UH7A
08 1 FB UH7B
08 1 FC UH7C
08 1 FD UH7D
08 1 7F UHB0
08 1 91 UHB1
08 2 95 UH95
08 3 98 UH98
08 4 86 UHA6
08 5 87 UHA7
08 7 84 UH84
08 8 81 UHEU
08 9 82 UH82
08 9 83 UH83
08 9 87 UH87
08 9 88 UH88
08 A 91 UH91
08 C 0B UHAB
08 G F2 UH72
08 G FE UH7E
08 J 8A UHAA
08 K 85 UH85
08 M B5 UH35
08 N 81 UH01
08 N 82 UH02
08 N 83 UH03
08 N 91 UH11
08 N 92 UH12
08 N 93 UH13
08 N A1 UH21
08 N A2 UH22
08 N A3 UH23
08 N B0 UH30
08 N B1 UH31
08 N B2 UH32
08 N B3 UH33
08 N B4 UH34
08 N BA UE01
08 N BB UH3B
08 N BC UH3C
08 N BD UH3D
08 N BE UH3E
08 N 40 UHW0
08 N 41 UHW1
08 N C3 UHW3
08 N 51 UH51
08 N 52 UH52
08 N 53 UH53

08 O 42 UHW2
08 O 63 UH63
08 O 64 UH64
08 P 81 UHA1
08 P 04 UHA4
08 P 85 UHA5
08 Q 39 UH39
08 R 17 UH97
08 S 96 UH96
08 W 88 UHA8
08 X F1 UH71
08 X F3 UH73
08 X F4 UH74
08 X F5 UH75
08 X F6 UH76
08 Z 89 UHA9
9E 0 02 UH77
9E 0 03 UH78
9E 0 04 UH79

COMMENTARY

The following information is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and translates the remapped HSU failure codes back to their "original" codes (as reported by the HSU via Williamsburg messages).

HSU FAILURES ORIGINAL CODE
A6 0 01 0 01
A7 0 01 0 02
A8 0 01 0 03
A9 0 01 0 04
EC 0 81 0 8C
EC 0 82 9 82
ED 0 01 0 0F
EE 0 81 9 81
EE 0 82 0 90

NOTES:

1. This note not used for MCS7000.
2. Not implemented.
3. To preclude the possibility of ongoing failure indications in case the "OK" flag block transfer (which clears a failure when it is no longer currently active) is not received for any reason, failure codes 04/07 1 40, 04/07 2 41/4D, 90/96 0 02, C4/C6 0 02 are implemented only in the HPA (i.e., they are ignored by the SDU and are not copied into the system failure log) since they are redundant to failures raised by the SDU in response to certain HPA Maintenance Word DISCRETES bits being set.
4. This note not applicable for MCS7000.
5. This failure is declared "Internal," even though it is believed to be caused by the GES, in order to permit it to be logged if it occurs while the aircraft is on the ground (since the defined response is to reset the SDU, whereupon the failure is lost while on the ground due to external failure logging being inhibited at that time).
6. Failure CB 0 01 is used by either the SDU in the system failure log ("HGA HPA INVALID ...") or generically by either HPA in its LRU failure log ("HPA INVALID ..."), hence the bracketed "[HGA]" in the failure description entry (because the "HGA" part only applies to the SDU usage). Failure CC 0 01 is used exclusively by the SDU, hence "LGA" is not bracketed. Contrary to the usual convention, the CM failure code 01 is used (rather than the POST/PAST code 81) even though the failures are only detected during POST/PAST.
7. This note not applicable to MCS7000.
8. This note not applicable to MCS7000.
9. If the 40W HGA (or LGA) HPA's hardware/software compatibility strap setting is 00h (indicating the presence of the original 40W HPA hardware configuration), then regardless of the software package resident in the HPA, failure codes 04 (or 07)/4/xx (for the splitter SRU [A4]), 04 (or 07)/6/xx (for the power amplifier #2 SRU [A6]), and 04 (or 07)/7/xx (for the power amplifier #3 SRU [A7]) is reported to the SDU as well as stored

in the HPA when the respective failures occur. If the HPA's HW/SW compatibility strap setting is 02h or beyond (indicating the inclusion of Hardware Mod D, in which the functions of the former A4, A6, and A7 SRUs, as well as the combiner portion of the former A8 SRU, are integrated into a single new final power amplifier SRU [A9]), and if the resident HPA software package is any one prior to D2.0, then the HPA shall transmit 04 (or 07)/7/xx (the code for SRU A7 [power amplifier #3]) to the SDU whenever 04 (or 07)/9/xx (the code for SRU A9 [final power amplifier]) is recorded in the HPA's internal failure log; under these conditions, the other codes (for A4 and A6) are never transmitted to the SDU.

10. Failure codes 04 (or 07)/9/xx is reported to the SDU as well as stored in the HPA when the HPA's resident software package is D2.0 or beyond and the HPA has a hardware/software compatibility strap setting of 02h or beyond.

11. All other HPA block-transfer failures that are redundant to those covered by the HPA Maintenance Word are not implemented in the SDU (per Note 3 above). The overtemp warnings and shutdowns covered by this note, however, (04/07 0 0A/42, 04/07 1 01/41, 04/07 2 11, 04/07 3 03, 04/07 9 47, 04/07 B 01, C7/C9 1/2/3/8/B 01, C7/C9 2 02), which do map to HPA Maintenance Word bit #13 (which is covered by failure C7/C9 0 01), are nonetheless still implemented by the SDU.

12. Code 35 is designated IRS-PRI, code 36 is designated IRS-SEC.

13. This note not applicable to MCS7000.

14. This is a pseudo-failure.

15. This failure is only generated by the Honeywell 20W HPA.

16. This failure is only generated by the Honeywell 40W HPA.

17. The PSU +25.5 VDC failure is only applicable to the Honeywell 20W HPA and the +28 VDC failure is only applicable to the Honeywell 40W HPA.

18. Not used.

19. These BSU Maintenance Word-related failures can also be raised due to Solo Word #8 transmitted from a Honeywell 20W HPA that is steering an IGA.

20. This fault, if it does not transition to a failure, will cause the modem software to be reloaded.

21. This note not applicable to MCS7000.

22. This note not applicable to MCS7000.

23. This note not applicable to MCS7000.

24. This note not applicable to MCS7000.

25. This failure is only applicable to Modems 2 and 5.

26. Code not used in MCS7000, reserved due to use in MCS 3000/6000.

27. The indicted functional resource is conditional -- [hga_subsys] if another antenna subsystem is installed (including the case of a dual system), and NONE if the HGA is the only antenna subsystem installed.

28. These failures shall not apply to aircraft strapped for "Airbus" CFDS type.

29. These failures shall only apply to aircraft strapped for "Airbus" CFDS type.

30. Resource indictment prior to package 2.0 is (unconditional) [hga_subsys].

31. HSU failures reported by the HSU via Williamsburg message type code 4Dx do not directly indict the [hsu1] or [hsu2] functional resources (hence the "NONE" entries in this table for these failures). HSU functional resource indictment for these failures is handled indirectly, as necessary, via the SSM = Failure Warning state of the HSU's label 270 status word, as follows:

Within the HSU, errors (failures) are classified as either fatal, essential or non-essential, depending on their operational impact. ("Fatal" means that one or more HSD services are unavailable and that the HSU is not allowed to continue to operate in normal mode, else it may be harmful to itself or other LRUs; "essential" means that one or more services are unavailable, but the HSU can run in normal mode without any risk of harm to itself or other LRUs; "non-essential" means that there is no definite service unavailability, but that there is some kind of service degradation, and that the HSU can run in normal mode without any risk of harm to itself or other LRUs). The HSU sets its label 270 status word SSM to Failure Warning [and also asserts its HSU Failure discrete output, and also sets its Category field to 1 (indicting) in its code 4Dx failure messages] for all current fatal errors. Depending on the HSU user data interface configuration as specified by the HSU's CDM programming (MPDS {Ethernet or 232}, or M-ISDN, or both), the HSU may set its label 270 status word SSM to Failure Warning for current essential errors (it will if all configured user data interfaces {one or the other or both sets} are rendered unavailable by the essential error(s)). [The HSU also sets the HSU Failure discrete output if its label 270 status word SSM is set to Failure Warning, and sets its Category field to 1 (indicting) in its code 4Dx failure messages, for all current essential errors.] The HSU does not set its label

270 status word SSM to Failure Warning [nor does it set its HSU Failure discrete output, nor does it set its Category field to 1 (indicting) in its code 4Dx failure messages] for any current non-essential errors.
When the SDU receives HSU label 270 status words with the SSM = Failure Warning, the SDU raises the HSU Self-Declared Failure (08/0/01 or 09/0/01), and indicts the respective HSU functional resource ([hsu1] or [hsu2]).
Through this indirect process, the SDU thus indicts the HSU functional resources as required for the HSU's self-reported failures.
In this table, an asterisk following the note "31" entry indicates the failures which may (depending on the HSU's user data interface configuration) or definitely do result in HSU functional resource indictment via this indirect process.
32. These failures is not implemented in software packages 3.0 and subsequent. These failure codes is not used for any other purpose in packages 3.0 and subsequent in order to maintain compatibility with their pre-package 3.0 usage.
33. Although no functional resource is indicted for this condition, there is grave operational impact
34. These failures are applicable prior to SDU Part Number 7516118-XX130/-xx140.
35. These failures are applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent.
36. HSU failures reported by the HSU (via Williamsburg message type code 6Dx) shall never directly indict the [hsu] functional resource. If an HSU failure requires indictment, the SSM field will be set to Failure Warning in the label 270 status word sent from the HSU (see Commentary below for details). The SDU shall then raise the HSU Self-Declared Failure (03/0/01), and indict the HSU functional resource. Failures which can cause HSU functional resource indictment via this indirect process are indicated in the table by an asterisk * next to "36" in the NOTES column.
The HS-720 (supported from SDU Part Number 7516118-XX130/-xx140) provides Channel Failure information in the label 270 status word, in addition to the SSM Failure Warning indication. When an HSU failure results in the loss of one or more individual HSD channels, the HSU will set the associated Channel Failure bit(s) in the status word. The SDU shall then raise the appropriate non-indicting HSU Channel Failure(s) (03/0/0C, 03/0/OF, 03/0/10, 03/0/11), as specified in COMMENTARY
For failures with major operational impact, the HSU will set the Category field to 1 (indicting) in the corresponding Williamsburg failure message, will set SSM to Failure Warning in the label 270 status word, and will assert the HSU Failure discrete output. For failures with no/limited operational impact, the HSU will set the Category field to 0 (non-indicting) in the corresponding Williamsburg failure message, but will not set the SSM to Failure Warning in the label 270 status word, and will not assert the HSU Failure discrete output.
37. This failure is only generated by the Honeywell 60W HPA.
38. The HP-720 60W HPA has several failures that do not map to the DISCRETES bits in the HPA Maintenance word but which do cause SSM=FW in Maintenance and the Status words. When the HP-720 raises such failures, the SDU will raise this failure (04 0 0C), resulting in both failures appearing in the failure logs.
39. HP-720 failure codes 04/07 2 C0/C1/C2/C3/C4/C will never be transferred to the SDU via the HPA block transfer for various reasons, which are detailed in the Remarks block for the respective failure.
40. Prior to SDU Part Number 7516118-XX130/-xx140, these failures shall indict the [hsu1] functional resource, whereas for SDU Part Number 7516118-XX130/-xx140 and subsequent, these failures shall indict the [hsu] functional resource.
41. The POST/PAST failure is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent only.
42. These failures are not currently implemented in the HS-720.
43. Prior to SDU Part Number 7516118-XX130/-xx140, these failures shall indict the [hsu1] functional resource, whereas for SDU Part Number 7516118-XX130/-xx140 and subsequent, these failures is non indicting.
44. This failure code (04 0 41) is used by the HP-720 to indicate when the RF power at the HPA input is less than -32 dBm. In addition to transferring this failure with the label 171 manufacturer-specific status word, the HP-720 also sets DISCRETES bit 14 in the label 350 maintenance word. Since the SDU completely ignores this failure code and the state of bit 14, this failure code is not defined, but is reserved so that it not be used for anything else.

Failure Details
This section provides a further level of detail to the failure. Each failure has the following associated information:
DESCRIPTION : A thorough description of the fault condition. Whether stated explicitly in the following subsections or not, an implicit requirement for every failure is that it shall only be declared if the associated Level 1 equipment has been installed, as defined by the system
configuration straps; LRU failures and inactive buses is not declared if the associated LRU is not installed.
PARAMETERS : The data parameter(s) that are required to be saved as part of the failure information. This data will provide the exact nature of the error, e.g., a voltage value for a power fault.
FAIL CRITERIA : The time limit or other criteria for which the fault condition must exist before it is declared a failure. The tolerance on all failure timing criteria is + 0.5 second.
RECOVERY CRIT. : The time or other criteria for which a normal condition must exist before a failure condition will be considered to have been “healed” and the current failure status removed. The tolerance on all failure timing criteria is + 0.5 second.
REMARK : Any information that is important in understanding the fault condition or affect on other fault conditions that may seem important to remember.
With the exception of the Level 1 code 01, the hex equivalent of the Level 1, SRU and Failure codes are added to each title for ease of comparison.
COMMENTARY
Failures that are described as not being explicitly cleared, may be cleared at the next cold or factory settings start. Not explicitly clearing means that during the power cycle when the failure occurred, no tests on the failed component will be carried out and thus the failure will not be cleared from the current failures list.

SDU (Level 1 Code 01h)
SMPM: SDU Main Processor Module (SRU Code 1)
SDU H/W-S/W Compatibility Fail (01 1 81)
DESCRIPTION : During POST/PAST the SMP Hardware/Software Compatibility Codes as read from the ID PROMs of each physical SRU is compared against the list of ardware/Software Compatibility Codes for each SRU contained in the SDU LRU Header record (stored as part of the SDU software image). If a conflict is found then a ’H/W-S/W COMPATIBILITY FAIL’ is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a fail immediately
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

Battery Voltage Low (01 1 82)
DESCRIPTION : During POST/PAST the voltage of the battery is read. If the battery voltage is below the threshold required to maintain the contents of battery backed RAM then the test is repeated. If the second test also fails, then a ’BATTERY VOLTAGE LOW’ fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a fail immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

Watchdog Timeout Fail (01 1 83)
DESCRIPTION : During POST the watchdog is interrogated to determine if the reason for the Cold Start was the watchdog timer not being strobed. If there is a watchdog timer reset and no other failure or PAST request is declared then a ’WATCHDOG TIMEOUT FAIL’ fault shall
be declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into a failure immediately
RECOVERY CRIT. : This failure is cleared immediately.
REMARK : All failures and PAST requests will result in transition to the POST/PAST state via a watchdog timeout failure, however the battery backed RAM will contain an indication of the failure cause/PAST request. Watchdog timeout fail will only be regarded as a fault when it occurs in isolation from any other failure or PAST request.

Micro Boot ROM Fail (01 1 84)
DESCRIPTION : During POST/PAST the validity of the Micro Boot Image in Flash is determined by comparing a value calculated from the contents of the Micro Boot, with the stored value calculated at the time the Micro Boot image was built. If the values differ during the first comparison then the calculation and the comparison is repeated. If the values still differ after the second comparison then a failure is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into a failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

EEPROM Fail (01 1 85/05)
DESCRIPTION : If CM detects a corruption of EEPROM, then a Cold Start is initiated indicating Unrecoverable Failure - EEPROM Fail. During the resulting POST/PAST the EEPROM is non-destructively tested. If the test passes, only the CM fault is declared. If the POST/PAST test fails, it is repeated. If both the first and second tests fail, the POST/PAST fault is declared.
PARAMETERS : If this is a CM fault, an identifier indicating which section of EEPROM has failed is stored.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : After detection of EEPROM Fail, a Factory Settings start is initiated.

FLASH Fail (01 1 86/06)
DESCRIPTION : During POST/PAST the validity of the FLASH contents is determined by comparing a checksum value calculated from the contents of the FLASH, with the stored checksum value calculated at the time the FLASH image was built. If no match is found during the first comparison then the comparison is repeated. If the values differ during both the first and second comparisons then a 'FLASH FAIL' fault is declared.
During CM the validity of the FLASH contents is determined by periodically comparing a CRC value calculated from the contents of the FLASH with the stored CRC value calculated at the time the FLASH image was built. If the values differ, a CM 'FLASH FAIL' fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into a failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SRAM Fail (01 1 87/07)
DESCRIPTION : During POST/PAST the SRAM is tested by a method capable of detecting addressing faults. If the test fails the first attempt, it is repeated. If both the first and second test results indicate a failure then a 'SRAM FAIL' is raised.
During CM each location of category A and B data is tested at least once every thirty minutes by saving the current contents, writing/reading a binary pattern, checking that the value read equals the value written and then restoring the original value. Should there be any variation between the two values then a CM 'SRAM FAIL' fault is declared.
PARAMETERS : For the CM failure, the SRAM address where the fault occurred.
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

Real Time Clock Fail (01 1 88/08)
DESCRIPTION : During POST/PAST tests is conducted on the Real Time Clock as appropriate to the device selected. Once the Real Time Clock is operating, a comparison between Real Time Clock elapsed time and the micro processor operating speed is conducted. If any of these tests fail, they is repeated. If any of these tests fail both the first and second attempts then a 'REAL TIME CLOCK FAIL' fault is declared.
During CM the Real Time Clock (RTC) is tested once per second to ensure it is still ticking. While in the fault state the RTC is tested once per second, to see if the fault has cleared.
PARAMETERS : For the POST/PAST case, an indication of which of the above RTC tests it was that failed is stored. For the CM tests the value shall indicate the time that it failed.

FAIL CRITERIA : The POST/PAST fault transitions to a failure immediately. The CM fault transitions into failure if it persists for ten seconds or more. For the case of the gross update check, since it is not explicitly cleared, the failure will be logged ten seconds after the offending update.
RECOVERY CRIT. : For the POST/PAST or gross CM check the failure is not explicitly cleared. In the case of the CM 1 second update test, this failure is cleared if the cleared condition persists for more than 10 seconds.
REMARK : If the POST/PAST RTC versus micro processor operating speed fault condition is found the fault may be in either device.

QUART Fail (01 1 89)
DESCRIPTION : During POST/PAST the QUART is tested for asynchronous transmit and receive on all channels, and its timer is tested against the microprocesser operating speed. If any test fails it is repeated. A second failure of any of the transmit/receive tests shall result in a 'QUART FAIL' being declared. If the timer test fails the second test the Boot software shall not hand over to the Application software, but shall initiate a Cold Start indicating Unrecoverable Failure - QUART Fail. If on a subsequent attempt the test does not fail, then on the successful Application startup a QUART Fail fault is declared.
PARAMETERS : An indication of which of the above tests it was that failed is stored.
FAIL CRITERIA : This fault transitions into a failure immediately
RECOVERY CRIT. : The timer failure is cleared immediately. The transmit and receive failure is not explicitly cleared.
REMARK : Note that the QUART timer failure is only logged after the problem has recovered; therefore, the information logged with the failure (e.g., date, time, power-on count, etc.) Is not necessarily accurate.

Software Error (SYSFAIL) (01 1 0A)
DESCRIPTION : Any unexpected interrupt, trap or exception (other than Bus Error while accessing SIOM, Codec, or Modem during POST/PAST), or any internal software inconsistency being detected shall result in a 'S/W SYS FAIL' fault being declared (SRU Bus Error during POST/PAST has a separate fault for each SRU).
PARAMETERS : The address of a string which gives an indication of the cause of S/W SYS FAIL (e.g., unexpected interrupt) and a data item which helps diagnose the problem (e.g., the exception which caused the S/W SYS FAIL, or the failed address for a Bus Error trap).
FAIL CRITERIA : This fault transitions into a failure immediately
RECOVERY CRIT. : This failure transitions to normal immediately
REMARK : A software SYS FAIL results in a Cold start. The fault will be logged after the reset. In order to prevent erroneous display of this event, the failure condition is immediately removed from the current failures list after it has been logged. This prevents the failure condition from appearing in multiple flight leg reports until a subsequent system reset.

Flash-PSRAM Miscompare (01 1 0B)
DESCRIPTION : CM shall periodically compare the copy of the SMP Application Program in SRAM (i.e. PSRAM) with the contents of Flash memory. If no match is found during the first comparison then the comparison is repeated. If discrepancies are found on both the first and second comparisons, then a Cold Start is initiated indicating Unrecoverable Failure - Flash-PSRAM Miscompare. If the resulting POST/PAST does not result in a different Unrecoverable Failure restart occuring (e.g. due to an SRAM Fail or a Flash Fail) then a Flash-PSRAM Miscompare fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure is cleared immediately.
REMARK : See failures (01/1/0C) and (01/1/0D) for storage of additional diagnostic information for this failure.

Flash-PSRAM Miscompare Extension 1 (01 1 0C)
DESCRIPTION : This failure is raised with the Flash-PSRAM Miscompare failure (01/1/0B) as a vehicle to store additional diagnostic information in its parameters.

PARAMETERS : The first parameter holds the address in SRAM of the 32-bit longword in which the first Flash-PSRAM Miscompare was detected. The second parameter holds the length (in bytes) of the first contiguous block of corruption.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure is explicitly cleared immediately.
REMARK :

Flash-PSRAM Miscompare Extension 2 (01 1 0D)
DESCRIPTION : This failure is raised with the Flash-PSRAM Miscompare failure (01/1/0B) as a vehicle to store additional diagnostic information in its parameters.
PARAMETERS : The first parameter holds the contents of the first 32-bit longword of SRAM in which corruption was detected. The second parameter holds the second 32-bit longword of SRAM in which corruption was detected, unless only 4 bytes or less of corruption were detected.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure is cleared immediately.
REMARK :

<CODEC-A> SRU (SRU Code 2)

Program Memory CRC Fail (01 2 81/01)
DESCRIPTION : During POST/PAST and CM, a CRC is calculated on Program memory and compared against the stored CRC in the memory being tested.
PARAMETERS : None for POST/PAST.
Event code (001) for CM.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

Timing Generator Fail (01 2 87/07)
DESCRIPTION : During POST/PAST and CM, a timing generator (serial input/output) test is performed. This fault is declared if the codec detects loss of timing generator synchronization.
PARAMETERS : None for POST/PAST.
Event code (006) for CM.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The codec declares a timing generator failure when the audio samples are not clocked into and out of the DSP's serial port.

Dual Port RAM Fail Codec Side (01 2 88)
DESCRIPTION : During POST/PAST, a Dual Port RAM test is performed. The test is a nondestructive RAM test.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

Program Memory W/R Fail (01 2 8A/0A)
DESCRIPTION : During POST/PAST and CM, a Program Memory (RAM) test is performed. This test is a non-destructive RAM test.
PARAMETERS : None for POST/PAST.
For CM the following code applies:
(00B) = Program Memory W/R failure.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

DSP Internal Memory W/R Fail (01 2 8B)
DESCRIPTION : During POST/PAST, a DSP Internal Memory (RAM) test is performed. This test is a non-destructive RAM test.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

DSP Comprehensive Fail (01 2 8C/0C)
DESCRIPTION : During POST/PAST and CM, a DSP comprehensive/instruction test is performed. A representative sample of the DSP instructions is tested. These tests is performed such that they do not interfere with other operations.
During CM, a DSP Internal Memory (RAM) test is performed. This test is a non-invasive RAM test.
PARAMETERS : None for POST/PAST.
For CM the following codes apply:
(00C) = DSP Internal Memory W/R failure,
(00D) = DSP Instruction failure.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

Health Count Update (01 2 0D)
DESCRIPTION : During CM <CODEC-A> is supplied with a value (Codec Health Count) once per second and must echo it back within the next second. Should the Codec fail to echo the value within the time limit or echo an incorrect value then a '<CODEC-A> Health Count Update' fault is declared. Once faulted, the test is not continued.
PARAMETERS : Codec Health Count Echo, Codec Health Count
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : Should this failure occur, the Codec will be held in reset until the next power cycle.

Dual Port RAM Fail SMPM Side (01 2 8E)
DESCRIPTION : During POST/PAST the Dual Port RAM of <CODEC-A> is tested for read and write access while the codec is held in reset. If any value read from the DPR differs from the value written, then the test is repeated. A '<CODEC-A> Dual Port RAM SMPM Side Fail' fault is declared if, during the second test, any value read from the DPR differs from the value written, and if ID Prom information relating to this SRU has successfully been received.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : Should this failure occur, the Codec will be held in reset until the next power cycle.

Bus Error (01 2 90)
DESCRIPTION : If a bus error occurs during POST/PAST while accessing <CODEC-A> then this test is repeated. If a bus error occurs during the second test, and ID Prom information relating to this SRU has successfully been received, then a '<CODEC-A> Bus Error' fault is declared.
PARAMETERS : The address where the bus error occured.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : Should this failure occur, the Codec will be held in reset. If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address.

Self Test Misoperation (01 2 91)
DESCRIPTION : During POST/PAST <CODEC-A> is commanded to perform a self-test. Should the Codec fail to return a bit response within 2 seconds then a '<CODEC-A> Self Test

Misoperation' fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This failure occuring, might indicate software download to the Codec had been unsuccessful. Codec Self test is a part of the Codec booting up activity, ie it will be done immediately after code download and before any other commands are sent to the Codec.

Communication Problem (01 2 12)
DESCRIPTION : This fault is declared if the Communication across the Dual Port Ram interface to the Codec becomes inconsistent.
PARAMETERS : An enumeration of the possible cause is stored.
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : An example would be the command buffer to the Codec filling up, indicating the Codec was not servicing the buffer.

ST Bus Audio Loopback Fail (01 2 94)
DESCRIPTION : During POST/PAST, the codec is tested.
PARAMETERS : Param 1 : Actual DTMF digit received, or zero for no DTMF digit received
Param 2 : Expected DTMF digit
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SW Download Fail (01 2 95)
DESCRIPTION : This fault is declared if the codec does not behave as expected at any point during the downloading of its code.
PARAMETERS : Parameter 1
Bits 31-28 Failure Type
1 Not used.
2 Timeout waiting for codec to clear buffer full flag.
3 Response from codec is unexpected.
4 The codec has not sent a codec ready event at startup.
When the failure type is set to 3 then the following additional bits of parameter 1 together with parameter 2 are also given.
Bits 27-24 Identity of the code segment read from the codec.
Bits 23-20 Last block flag read from the codec.
Bits 15-0 Block number read from the codec.
Parameter 2
Bits 27-24 Identity of the code segment passed to the codec.
Bits 23-20 Last block flag passed to the codec.
Bits 15-0 Block number passed to the codec.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : If at startup the SMP is not able to load the codec code into the codec this failure is raised with parameters indicating at what point during the download the problem occured.

Codec B SRU (SRU Code 3)
As for Codec A above except substitute SRU code 3 for code 2 and <CODEC-B> for <CODEC-A>

SIOM: SDU Input/Output Module (Exclusive To SIOM) (SRU Code 4)

A429 XMTR Loop-Back To Other SDU Fail (01 4 81)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To Other SDU Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input. This fault shall only be raised after the configuration straps have been read and the pertinent

interface has been found to be wired.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To CFDS Fail (01 4 82)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To CFDS Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input. This fault shall only be raised after the configuration straps have been read and the pertinent
interface has been found to be wired.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To ADL Fail (01 4 83)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To ADL Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To PDL Fail (01 4 84)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To PDL Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To (C)MUs Fail (01 4 85)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To (C)MUs Fail' fault is declared if, after two attempts, no messages are received via the loop back input. This fault shall only be raised after the configuration straps have been read and at least one CMU has been
found to be wired.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To SCDUs Fail (01 4 86)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To SCDUs Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input. This fault shall only be raised after the configuration straps have been read and at least one
SCDU has been found to be wired, as specified in section 3.2.4.19.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To Multi-Cntrl Fail (01 4 87)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To Multi-Cntrl Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

A429 XMTR Loop-Back To RMP/CAP Fail (01 4 89)
DESCRIPTION : This failure is not implemented since Boeing and Airbus have not implemented CAP/RMP. If implemented, then during POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. If implemented, an 'A429 XMTR Loop-Back To RMP/CAP Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None
FAIL CRITERIA : If implemented, this fault transitions into failure immediately
RECOVERY CRIT. : If implemented, this failure is never explicitly cleared
REMARK : This failure is only pertinent if software is in place to communicate operational information to the RMP or CAP on this output; if no such software exists (e.g., in early builds), this failure should be ignored.

A429 XMTR Loop-Back SNU/CPDF (01 4 8A)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To SNU/CPDF Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This failure is only pertinent if an SNU/CPDF is fitted; if an SNU/CPDF is not fitted, this failure should be ignored.

A429 XMTR Loop-Back HSU1 (01 4 8B)
DESCRIPTION : During POST/PAST the A429 XMTR transmitter is tested by using the BITE ARINC loop back receiver. An 'A429 XMTR Loop-Back To HSU Fail' fault is declared if, after two consecutive attempts, no messages are received via the loop back input.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This failure is only pertinent if HSU1 is fitted; if HSU1 is not fitted, this failure should be ignored.

A429 XMTR Loop-Back HSU2 (01 4 8C)
Same as for 01 4 8B except substitute "HSU2" for "HSU1". Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

SIOM Bus Error (01 4 AB)
DESCRIPTION : During POST/PAST all SIOM devices is tested for read write access. An 'SIOM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address.

A429 Tx To Other SDU Buffer Full (01 4 2C)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.

PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To CFDS Buffer Full (01 4 2D)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To ADL Buffer Full (01 4 2E)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To PDL Buffer Full (01 4 2F)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To (C)MUs Buffer Full (01 4 30)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To SCDUs Buffer Full (01 4 31)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To MULTI_CTRL Buffer Full (01 4 32)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To RMP/CAP Buffer Full (01 4 34)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None

FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To SNU/CPDF Buffer Full (01 4 35)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To HSU1 Buffer Full (01 4 36)
DESCRIPTION : The ARINC 429 Hardware is not accepting data for transmission, and the Tx buffer has become full.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This would indicate that a specific ASIC had failed.

A429 Tx To HSU2 Buffer Full (01 4 37)
Same as for 01 4 36 except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

SIOM Interrupt Fail (01 4 BC)
DESCRIPTION : The SIOM is forced to interrupt the SMPM; if this does not occur within the expected time, then the attempt to interrupt the SMPM is repeated. If this does not occur within the expected time during the second attempt then a fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : Without this interrupt, no ARINC communication can take place.

IRS ASIC Matching Problem (01 4 3D)
DESCRIPTION : This fault is declared if any unexpected data is received whilst the label matching algorithm is enabled.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is not explicitly cleared in the unexpected label match case
REMARK :

SMDM1: SDU Modem Module #1 (SRU Code 05)
<MODEM-1> Processor Fail (01 5 81)
DESCRIPTION : A subset of the DSP56300 processor instruction set is tested, along with associated condition flags. Following the instruction set test, the processor internal memory is tested. If either of these tests fail, the Processor fail condition is reported to the SMP. If this test or
any other Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. If this test fails on the second attempt, a failure is raised.
PARAMETERS : Parameter 1 bit 1 - Set when Internal Memory test Failed bit 0 - Set when Instruction Set test Failed
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : It is noteworthy that not all of the DSP56300 instructions are tested, as this would take an inordinate time to complete. The subset of instructions chosen are deemed to test all addressing modes of the processor, and all of the condition flags, thus exercising the

processor in the most time efficient manner.

<MODEM-1> Program CRC Fail (01 5 84/04)
DESCRIPTION : A Cyclic Redundancy Check is performed on the external program memory segments, to check for program corruption. The CRC algorithm used is that described in the CCITT Redbook recommendation X.25, Section 3.2.1.2.7. The Continuous Monitoring fault is raised only if the CRC check fails twice within a 10 second period. This fault shall only transition into failure if it satisfies the conditions specified in section 4.3.6.7. If this test or any other Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. If this test fails on the second attempt, a failure is raised.
PARAMETERS : Parameter 1 #bit 28 - 31 Corrupted Segment Number
bit 24 - 27 Unused
*bit 0 - 23 Start Address of Corrupt Data
Parameter 2 *bit 24 - 31 Number of Corrupt Words (FFx if >= FFx)
*bit 0 - 23 Contents of First Corrupt Address
'*' - These diagnostics shall only provided if there is enough available memory in the modem to store a 'shadow' copy of the program segments to check against.
'#' - This information shall only be provided by a POST/PAST test failure, as the CM test has no knowledge of the segment which it is currently checking.
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : The program segment CRC values against which the modem checks will have been calculated by the code build tools, and inserted into the program segment memory as the last entry. If enough free memory exists in the modem, a 'shadow' copy of the program segments is stored, enabling a word by word comparison to be made, and further diagnostics provided to the main processor for inclusion in Failure Parameter words.

<MODEM-1> Modem To RFM Interface Fail (01 5 0A)
DESCRIPTION : The Modem/RFM Interface is continuously monitored to ensure that the I and Q samples are transmitted under interrupt. If no samples are transmitted for 100ms whilst the Tx Channel is active, the modem reports a failure to the SMP via the DPR interface. This fault shall only transition into failure if it satisfies the conditions specified in section 4.3.6.7.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> Timer Interrupt Fail (01 5 8B)
DESCRIPTION : The internal timers 0 and 1 (both 128Hz) and the IRQB input are tested on the Modem processor. The TIO0 external input (10.08MHz) is implicitly tested by testing the internal timers 0 and 1. IRQB is a general purpose 1KHz timer signal generated by external hardware logic. The purpose of this test is twofold, as follows;
1. To verify that the internal timers 0 and 1 are present.
2. To verify that the frequency of the external IRQB input signal is accurate to 1000 parts per million.
If this test or any other Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. If this test fails on the second attempt, a failure is raised.
PARAMETERS : Parameter 1 bit 2 IRQB Failure
bit 1 Timer 1 Failure
bit 0 Timer 0 Failure
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : The full details on this test are available in section 3.4.6 of the MDM DDD. The following is a brief outline of the test method. Depending on which timer is under test, interrupts should be generated at a known frequency. The processor performs a count in background, following the first detected interrupt. The count is checked following the next interrupt, and should be within a known range. The count is reset for the next count sequence. If the

count value is out of range a failure is reported to the SMP in the DPR interface.

<MODEM-1> External Memory Fail (01 5 8E)
DESCRIPTION : The Modem Processor's external Y-RAM is tested. External X-RAM is the DPR and is tested elsewhere. The external P-RAM is tested by the CRC test. The test is performed by writing words with alternating bit patterns (AAAAAAx, 555555x), and also with incrementing bit patterns to all Y-RAM locations, reading the values back and checking for errors. If this test or any other Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. If this test fails on the second attempt, a failure is raised.
PARAMETERS : Parameter 1 bit 28 - 31 Test Type ('1' - Incrementing, 'A' or '5' - Alternating)
bit 24 - 27 Unused
bit 0 - 23 Address of First Location which failed test
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> Modem DPR Fail (01 5 91)
DESCRIPTION : The DPR is decoded as X-RAM space in the modem address space. The Modem Processor tests each location by writing alternating bit patterns (AAAAx, 5555x), and also with incrementing bit patterns, reading them back and checking for errors. If this test or any other Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. If this test fails on the second attempt, a failure is raised.
PARAMETERS : Parameter 1 bit 28 - 31 Test Type ('1' - Incrementing, 'A' or '5' - Alternating)
bit 24 - 27 Unused
bit 0 - 23 Address of First Location which failed test
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : As the DPR is the mechanism for communications between the Modem Processor and the SMP, and the DPR test is destructive, the SMP is not allowed access to the DPR until the end of DPR testing. The modem indicates to the SMP that the test is finished by interrupting the SMP.

<MODEM-1> SMPM Side DPR Fail (01 5 95)
DESCRIPTION : During POST/PAST the Dual Port RAM of <MODEM-1> is tested by the SMP for read and write access. The modem is held in reset during the test. If any value read from the DPR differs from the value written, the test is repeated. If the test fails on the second attempt, and Id Prom information from the associated physical SRU has been received successfully, a '<MODEM-1> SMPM Side DPR Fail' fault is declared.
PARAMETERS : The address in the DPR where the error occured.
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> SW Download Fail (01 5 16)
DESCRIPTION : During POST/PAST the modem code is downloaded to <MODEM-1>. A '<MODEM-1> SW Download Fail' fault is declared if any errors occur during the download process.
PARAMETERS : Parameter 1 bit 28 - 31 Segment Id
bit 24 - 27 Destination Memory
bit 20 - 23 SRU Identity
bit 4 - 19 Sent Block Number
bit 3 Last Block of Segment Flag
bit 2 Last Segment Flag
bit 1 SMPM to Modem Buffer Full Flag
bit 0 if set, indicates a timeout error
Parameter 2 bit 28 - 31 Response Block Number
bit 27 Set if last Block of Segment
bit 26 Set if last Segment

bit 25 Buffer Full Flag (Set if block processed okay)
bit 1 - 24 Unused
bit 0 Set if failure occured
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : Refer to Section 3.2 of the SMP DDD for further details of diagnostic parameters.

<MODEM-1> Health Count Update Fail (01 5 17)
DESCRIPTION : During CM <MODEM-1> is supplied with three values (Modem Health Counts) once per second. Each Modem virtual processor must echo its Health Count back within the next second. Should a Modem virtual processor fail to echo the value within the time limit or echo an incorrect value then a '<MODEM-1> Health Count Update' fault is declared.
This fault shall only transition into failure if it satisfies the conditions specified in section 4.3.6.7.
Once faulted, the test is not continued for the failed Modem virtual Processor.
PARAMETERS : Parameter 1 bit 2 Modem Decoder Process Fail
bit 1 Modem Receiver Process Fail
bit 0 Modem Controller Process Fail
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> Bus Error (01 5 99)
DESCRIPTION : During POST/PAST if a bus error occurs during the Dual Port RAM test on <MODEM-1>, the test is repeated. If the test fails on the second attempt. and Id Prom information relating to this physical SRU has been received successfully, then a '<MODEM-1> Bus Error' fault is declared.
PARAMETERS : The address where the bus error occured
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address.

<MODEM-1> Self Test Misoperation (01 5 9A)
DESCRIPTION : During POST/PAST <MODEM-1> is commanded to perform a self-test. Should the modem fail to return a bit response within 1 second or any Modem Start-up Built-in Test (SBIT) fails during POST/PAST, SBIT is requested a second time. Should the modem fail to return a bit response within 1 second on the second attempt, a '<MODEM-1> Self Test Misoperation' fault is declared.
During a Factory Setting Start, and once every 24 hours, <MODEM-1> is commanded to perform the I/Q calibration of the selected RFM channels. Should the modem fail to return a response to the I/Q calibration request within 30 seconds or any initial calibration fails, <MODEM-1> is commanded to repeat the calibration. Should the modem fail to return a response to the repeated I/Q calibration request within 30 seconds, a '<MODEM-1> Self Test Misoperation' fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> Software Fail (01 5 1B)
DESCRIPTION : If the modem detects a fatal internal software problem during normal operation, this fault is declared.
PARAMETERS :
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<MODEM-1> Communication Problem (01 5 1C)

DESCRIPTION : If the SMP detects a problem with communication to the Modem through the DPR (such as it filling up with commands from the SMP, receiving an unknown Modem Event or
Response, or receiving a 'Last SMP Command Invalid' Event), then this fault is declared.
PARAMETERS : Parameter 1 bit 31 SMP to Modem DPR Full
bit 30 Unknown/Invalid Modem Event received
bit 29 Last SMP (to Modem) Command Invalid
bit 0 - 23 Offending Command/Event Value
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<Modem-1> RFM SSI Loopback Fail (01 5 9E)
DESCRIPTION : During POST/PAST, the modem and its connection to the RFM is tested.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

SMDM2:SDU Modem Module #2 (SRU Code 6)
As for SMDM1 except substitute SRU code 6 for code 5 and <MODEM-2> for <MODEM-1>.

SMDM3:SDU Modem Module #3 (SRU Code 7)
As for SMDM1 except substitute SRU code 7 for code 5 and <MODEM-3> for <MODEM-1>.

SRFM: SDU Radio Frequency Module (SRU Code 8)

<SRFM> RF Synth Chan 1 Lock Detect Fail (01 8 8E/0E)
DESCRIPTION : During POST/PAST the RFM Synth Chan 1 lock is tested. A 'RF Synth Chan 1 Lock Detect Fail' fault is declared if the synthesizer lock discrete indicates a loss of lock after 2 succesive tests.
During CM the RFM Synth Chan 1 lock is tested at least once every second, and after each time it is tuned. An 'RF Synth Chan 1 Lock Detect Fail' fault is declared if the synthesizer lock discrete indicates a loss of lock.
While in the fault state the RFM Synth Chan 1 lock is tested at least once every second. The 'RF Synth Chan 1 Lock Detect Fail' fault is cleared if the synthesizer lock discrete indicates lock has been regained.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure if it persists for 3 seconds or more.
RECOVERY CRIT. : This failure is cleared immediately
REMARK :

<SRFM> RF Synth Chan 2 Lock Detect Fail (01 8 90/10)
As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 2' for 'Chan 1'.

<SRFM> RF Synth Chan 3 Lock Detect Fail (01 8 92/12)
As RF Synth Chan 1 Lock Detect Fail except substitute Chan 3 for 'Chan 1'.

<SRFM> RF Synth Chan 4 Lock Detect Fail (01 8 96/16)
As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 4' for 'Chan 1'.

<SRFM> RF Synth Chan 5 Lock Detect Fail (01 8 97/17)
As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 5' for 'Chan 1'.

<SRFM> RF Synth Chan 6 Lock Detect Fail (01 8 98/18)
As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 6' for 'Chan 1'.

<SRFM> RF Synth Chan 7 Lock Detect Fail (01 8 99/19)
As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 7' for 'Chan 1'.

<SRFM> RF Synth Chan 8 Lock Detect Fail (01 8 9A/1A)

As RF Synth Chan 1 Lock Detect Fail except substitute 'Chan 8' for 'Chan 1'.

<SRFM> RF Synth TX Block PLO Lock Detect Fail (01 8 9B/1B)
As RF Synth Chan 1 Lock Detect Fail except substitute 'TX Block PLO' for 'Chan 1'.

<SRFM> RF Synth RX Block PLO Lock Detect Fail (01 8 9C/1C)
As RF Synth Chan 1 Lock Detect Fail except substitute 'RX Block PLO' for 'Chan 1'.

<SRFM> RF Synth RX Channel PLO Lock Detect Fail (01 8 9D/1D)
As RF Synth Chan 1 Lock Detect Fail except substitute 'RX Channel PLO' for 'Chan 1'.

<SRFM> RF Synth TX Doppler PLO Lock Detect Fail (01 8 9E/1E)
DESCRIPTION : During POST/PAST the RF Synth TX Doppler PLO lock is tested. A 'RF Synth TX Doppler PLO Lock Detect Fail' fault is declared if the synthesizer lock discrete
indicates a loss of lock after 2 succesive tests.
During CM the RF Synth TX Doppler PLO lock is tested at least once every second, and after each time it is tuned. An 'RF Synth TX Doppler PLO Lock Detect Fail' fault is declared if the synthesizer lock discrete indicates a loss of lock.
While in the fault state the RF Synth TX Doppler PLO lock is tested at least once every second. The 'RF Synth TX Doppler PLO Lock Detect Fail' fault is cleared if the synthesizer lock discrete indicates lock has been regained.
PARAMETERS : bit 0: Failure Reference Lock
bit 1: Failure Main Lock
FAIL CRITERIA : This fault transitions into failure if it persists for 3 seconds or more.
RECOVERY CRIT. : This failure is cleared immediately
REMARK :

<SRFM> RFM Chan 1 L-Band Loop-back (TX) Fail (01 8 A0)
DESCRIPTION : During POST/PAST, the RFM channel is tested. This fault is raised if the LNA Continuity tests (D8-DA 0 81) for all installed LNAs have passed.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<SRFM> RFM Chan 1 L-Band Loop-back (RX) Fail (01 8 A1)
DESCRIPTION : During POST/PAST, the RFM channel is tested. This fault is raised if the LNA Continuity tests (D8-DA 0 81) for all installed LNAs have passed.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

<SRFM> RFM Chan 2 L-Band Loop-back (TX) Fail (01 8 A2)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 2' for 'Chan 1'.

<SRFM> RFM Chan 2 L-Band Loop-back (RX) Fail (01 8 A3)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 2' for 'Chan 1'.

<SRFM> RFM Chan 3 L-Band Loop-back (TX) Fail (01 8 A4)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 3' for 'Chan 1'.

<SRFM> RFM Chan 3 L-Band Loop-back (RX) Fail (01 8 A5)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 3' for 'Chan 1'.

<SRFM> RFM Chan 4 L-Band Loop-back (TX) Fail (01 8 A6)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 4' for 'Chan 1'.

<SRFM> RFM Chan 4 L-Band Loop-back (RX) Fail (01 8 A7)

As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 4' for 'Chan 1'.

<SRFM> RFM Chan 5 L-Band Loop-back (TX) Fail (01 8 A8)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 5' for 'Chan 1'.

<SRFM> RFM Chan 5 L-Band Loop-back (RX) Fail (01 8 A9)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 5' for 'Chan 1'.

<SRFM> RFM Chan 6 L-Band Loop-back (TX) Fail (01 8 AA)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 6' for 'Chan 1'.

<SRFM> RFM Chan 6 L-Band Loop-back (RX) Fail (01 8 AB)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 6' for 'Chan 1'.

<SRFM> RFM Chan 7 L-Band Loop-back (TX) Fail (01 8 AC)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 7' for 'Chan 1'.

<SRFM> RFM Chan 7 L-Band Loop-back (RX) Fail (01 8 AD)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 7' for 'Chan 1'.

<SRFM> RFM Chan 8 L-Band Loop-back (TX) Fail (01 8 AE)
As RFM Chan 1 L-Band Loop-back (TX) Fail except substitute 'Chan 8' for 'Chan 1'.

<SRFM> RFM Chan 8 L-Band Loop-back (RX) Fail (01 8 AF)
As RFM Chan 1 L-Band Loop-back (RX) Fail except substitute 'Chan 8' for 'Chan 1'.

RFM Chan 1 TX Calibration Error (01 8 30)
DESCRIPTION : During a Factory Setting Start, and once every 24 hours, RFM channel 1 is calibrated in TX for power variation over the frequency range. This fault is declared if the RFM channel cannot achieve the commanded frequency or power setting.
PARAMETERS : Param 1 : Bit 0 1 = Lock error during RFM Synth tuning
Bit 16 1 = Back off error during power setting
Param 2 : (used only if there was an error during power setting)
0 = Low power setting not achieved
1 = High power setting not achieved.
FAIL CRITERIA : This fault transitions to failure immediately
RECOVERY CRIT. : This failure is not explicitly cleared
REMARK :

RFM Chan 2 TX Calibration Error (01 8 31)
Same as RFM Chan 1 TX Calibration Error

RFM Chan 3 TX Calibration Error (01 8 32)
Same as RFM Chan 1 TX Calibration Error

RFM Chan 4 TX Calibration Error (01 8 33)
Same as RFM Chan 1 TX Calibration Error except substitute chan 4 for chan 1

RFM Chan 5 TX Calibration Error (01 8 34)
Same as RFM Chan 1 TX Calibration Error except substitute chan 5 for chan 1

RFM Chan 6 TX Calibration Error (01 8 35)
Same as RFM Chan 1 TX Calibration Error except substitute chan 6 for chan 1

RFM Chan 7 TX Calibration Error (01 8 36)
Same as RFM Chan 1 TX Calibration Error except substitute chan 7 for chan 1

RFM Chan 8 TX Calibration Error (01 8 37)
Same as RFM Chan 1 TX Calibration Error except substitute chan 8 for chan 1

RFM Chan 1 RX Calibration Error (01 8 38)
DESCRIPTION : During a Factory Setting Start, and once every 24 hours, RFM channel 1 is calibrated in RX for power variation over the frequency range. This fault is declared if the RFM channel cannot achieve the commanded frequency or if the incoming power is out of range.
PARAMETERS : Param 1 : Bit 0 1 = Lock error during RFM Synth tuning
Bit 16 1 = Incoming ADC power out of range
Param 2 : (used only if power was out of range)
Measured incoming power (16 bits, tenths of dB with respect to Full Scale (dBFS))
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

RFM Chan 2 RX Calibration Error (01 8 39)
Same as RFM Chan 1 RX Calibration Error except substitute chan 2 for chan 1

RFM Chan 3 RX Calibration Error (01 8 3A)
Same as RFM Chan 1 RX Calibration Error except substitute chan 3 for chan 1

RFM Chan 4 RX Calibration Error (01 8 3B)
Same as RFM Chan 1 RX Calibration Error except substitute chan 4 for chan 1

RFM Chan 5 RX Calibration Error (01 8 3C)
Same as RFM Chan 1 RX Calibration Error except substitute chan 5 for chan 1

RFM Chan 6 RX Calibration Error (01 8 3D)
Same as RFM Chan 1 RX Calibration Error except substitute chan 6 for chan 1

RFM Chan 7 RX Calibration Error (01 8 3E)
Same as RFM Chan 1 RX Calibration Error except substitute chan 7 for chan 1

RFM Chan 8 RX Calibration Error (01 8 3F)
Same as RFM Chan 1 RX Calibration Error except substitute chan 8 for chan 1

RFM Chan 1 AGC Tellback Fail (01 8 C0/40)
DESCRIPTION : This failure (and failures 01 8 C1/41 through 01 8 C8/48, which reference this section) is only implemented in software packages prior to 3.0. During POST/PAST following programming and during CM at a rate of 1 Hz the RFM channel 1 AGC value is checked to ensure that it lies within 5 dB of the programmed value. The fault is declared if, after two attempts, the programmed value has not been achieved. The POST/PAST fault is not raised if a factory setting restart has been performed.
COMMENTARY
A wide tolerance range has been chosen as the tellback is intended as a gross indication that the command has been received at the RFM rather than an accurate measure of the gain value.
The POST/PAST fault is not raised following a factory setting restart as the channel AGC calibration will not have been performed.
PARAMETERS : Param 1 : Expected AGC value in units of 1/10 dB.
Param 2 : Actual AGC value in units of 1/10 dB.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

RFM Chan 2 AGC Tellback Fail (01 8 C1/41)
Same as RFM Chan 1 AGC Fail except substitute chan 2 for chan 1.

RFM Chan 3 AGC Tellback Fail (01 8 C2/42)
Same as RFM Chan 1 AGC Fail except substitute chan 3 for chan 1.

RFM Chan 4 AGC Tellback Fail (01 8 C3/43)
Same as RFM Chan 1 AGC Fail except substitute chan 4 for chan 1.

RFM Chan 5 AGC Tellback Fail (01 8 C4/44)
Same as RFM Chan 1 AGC Fail except substitute chan 5 for chan 1.

RFM Chan 6 AGC Tellback Fail (01 8 C5/45)
Same as RFM Chan 1 AGC Fail except substitute chan 6 for chan 1.

RFM Chan 7 AGC Tellback Fail (01 8 C6/46)
Same as RFM Chan 1 AGC Fail except substitute chan 7 for chan 1.

RFM Chan 8 AGC Tellback Fail (01 8 C7/47)
Same as RFM Chan 1 AGC Fail except substitute chan 8 for chan 1.

RFM Block AGC Tellback Fail (01 8 C8/48)
As RFM Chan1 AGC Fail except substitute 'Block' for 'Channel 1'.

I/Q Calibration Fail (01 8 C9)
DESCRIPTION : During a Factory Setting Start, and once every 24 hours, I/Q calibration is performed on all RFM transmit and receive channels to compensate for errors introduced by the quadrature sections of the hardware. If the modem controlling the calibration of a transmit/receive channel pair reports a failure to calibrate or fails to respond to the SMP within 30 seconds, then it is commanded to repeat the calibration. Should the Modem report a failure to the repeated calibration request, an 'I/Q Calibration Fail' fault is declared.
PARAMETERS : Param 1 : 1 = Power level insufficient for I/Q Calibration
2 = RFM channels have failed to converge on a result
Param 2 : Bit 0-15 RFM Transmit Channel Id
Bit 16-31 RFM Receive Channel Id
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

RFM Chan 1 AGC Calibration Error (01 8 D0)
DESCRIPTION : During a Factory Setting Start, and once every 24 hours, RFM channel 1 AGC is calibrated for DAC and ADC values over a variable gain range (the default being a range
of 5 to 35 dB). Prior to calibrating the channel AGC, the block AGC is adjusted from an initial 0 dB gain such that the power level as measured at the modem ADC is less than -10 dB relative to full scale, with the channel AGC at 35 dB gain. This fault is declared if the block AGC cannot be adjusted sufficiently to achieve the required ADC power level threshold, or if the initial value of the measured ADC power with the channel AGC at 35 dB gain and the block AGC at 0 dB gain is below -30 dB relative to full scale.
PARAMETERS : Param 1 : Final modem ADC power level in units of 1/10 dB relative to full scale
Param 2 : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

RFM Chan 2 AGC Calibration Error (01 8 D1)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 2 for chan 1

RFM Chan 3 AGC Calibration Error (01 8 D2)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 3 for chan 1

RFM Chan 4 AGC Calibration Error (01 8 D3)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 4 for chan 1

RFM Chan 5 AGC Calibration Error (01 8 D4)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 5 for chan 1
RFM Chan 6 AGC Calibration Error (01 8 D5)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 6 for chan 1

RFM Chan 7 AGC Calibration Error (01 8 D6)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 7 for chan 1

RFM Chan 8 AGC Calibration Error (01 8 D7)
Same as RFM Chan 1 AGC Calibration Error except substitute chan 8 for chan 1

RFM Block AGC Calibration Error (01 8 D8)
DESCRIPTION : During a Factory Setting Start, and once every 24 hours, the RFM block AGC is calibrated for DAC and ADC values over a 0 to -28 dB gain range. Prior to calibrating the
block AGC, the channel AGC is adjusted such that the power level as measured at the modem ADC is in the range -10 to -15 dB relative to full scale, with the block AGC at 0 dB gain. This fault is declared if the required range cannot be achieved following adjustment of the channel AGC.
PARAMETERS : Param 1 : Final modem ADC power level in units of 1/10 dB relative to full scale
Param 2 : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

SCFM SRU (SRU Code 9)

OCXO SRU (SRU Code A)

Oven Ready Fail (01 A 01)
DESCRIPTION : During CM no tests is carried out on the OCXO Oven Ready discrete during the first 12 minutes after power on to allow the device time to reach operating temperature.
After the 12 minute delay the OCXO Oven Ready discrete is tested once per second. Should the discrete indicate that the oven has not maintained temperature then an 'OVEN
READY FAIL' fault is declared. While in the fault state the OCXO Oven Ready discrete is tested once per second. The 'OVEN READY FAIL' fault is cleared if the discrete indicates that the oven temperature is achieved again.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure if it persists for ten seconds or more.
RECOVERY CRIT. : This failure is cleared, on receipt of an 'OVEN READY FAIL' fault cleared report, if no further 'OVEN READY FAIL' faults are reported for ten seconds or more.
REMARK :

SPSU SRU (SRU Code C)
PSU Temp Limits Fail (01 C 01)
DESCRIPTION : During CM the PSU temperature sensor is read once per second. A 'PSU Temp Limits Fail' fault is declared if the temperature sensor has a reading below -55 deg. C or above +125 deg.C.
While in the fault state the PSU temperature sensor is read once per second. The 'PSU Temp Limits Fail' fault is cleared if the PSU temperature sensor has a reading equal to or above -55 deg. C and less than or equal to +125 deg C.
PARAMETERS : The PSU temperature sensor reading
FAIL CRITERIA : This fault transitions into failure if it persists for ten seconds or more
RECOVERY CRIT. : This failure is cleared, on receipt of a 'PSU Temp Limits Fail' fault cleared report, if no further 'PSU Temp Limits Fail' faults are reported for ten seconds or more
REMARK :

PSU Secondary Voltage Fail (01 C 03)
DESCRIPTION : The PSU secondary voltage supply discrete is tested every second. A 'PSU Secondary Voltage Fail' fault is declared if the discrete indicates the secondary voltage supply is not operational.
While in the fault state the PSU secondary voltage discrete is not tested and the fault
is not explicitly cleared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : Should this fault occur, but the 5 Volt rail still remain up, then this failure can be logged because the SMPM will be active, but it is unlikely to be able to communicated outside of the SDU as the other voltage rails typically provide the power for the I/O device drivers.

SFPDM SRU (SRU Code D)

Test (PAST) Switch Stuck (01 D 01)
DESCRIPTION : Should the Test (PAST) switch become stuck on, i.e. have become activated and remained activated for a period greater than 10 seconds without going inactive, then this fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure after 80 seconds.
RECOVERY CRIT. : Cleared if it goes good for greater than 10 seconds.
REMARK : The 10 second delay required for the fault to be declared, combined with the 80 second delay required to transition to failure, result in a total period of 90 seconds the test switch must be on before a failure is declared.

Manual Scroll Switch Fail (01 D 02)
DESCRIPTION : Should the Manual Scroll switch become stuck on, i.e. have become activated and remained activated for a period greater than 90 seconds without going inactive, then this fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is cleared when the switch returns to the inactive state.
REMARK :

CODEC C SRU (SRU Code E)
As for Codec A above except substitute SRU code E for code 2 and <CODEC-C> for <CODEC-A>.

CODEC D SRU (SRU Code F)
As for Codec A above except substitute SRU code F for code 2 and <CODEC-D> for <CODEC-A>.

CODEC E SRU (SRU Code G)
As for Codec A above except substitute SRU code G for code 2 and <CODEC-E> for <CODEC-A>.

CODEC F SRU (SRU Code H)
As for Codec A above except substitute SRU code H for code 2 and <CODEC-F> for <CODEC-A>.

SMDM4:SDU Modem Module #4 (SRU Code J)
As for SMDM1 above except substitute SRU code J for code 5 and <MODEM-4> for <MODEM-1>.

SMDM5:SDU Modem Module #5 (SRU Code L)
As for SMDM1 above except substitute SRU code L for code 5 and <MODEM-5> for <MODEM-1>.

SMDM6:SDU Modem Module #6 (SRU Code M)
As for SMDM1 above except substitute SRU code M for code 5 and <MODEM-6> for <MODEM-1>.

SMDM7:SDU Modem Module #7 (SRU Code N)
As for SMDM1 above except substitute SRU code N for code 5 and <MODEM-7> for <MODEM-1>.

VIM SRU (SRU Code P)

Cabin Interface 1 Audio Loopback Fail (01 P 81)
DESCRIPTION : During POST/PAST, Cabin Analogue Audio Interface 1 and its connection to the Codecs is tested.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

Cabin Interface 2 Audio Loopback Fail (01 P 82)
As for Cabin Interface 1 Audio Loopback Fail but substitute 'Interface 2' for 'Interface 1'.

Cockpit Interface 1 Audio Loopback Fail (01 P 83)
DESCRIPTION : During POST/PAST, Cockpit Analogue Audio Interface 1 and its connection to the Codecs is tested.
PARAMETERS : None

FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

Cockpit Interface 2 Audio Loopback Fail (01 P 84)
As for Cockpit Interface 1 Audio Loopback Fail but substitute 'Interface 2' for 'Interface 1'.

CTU CEPT-E1 Audio Loopback Fail (01 P 85)
DESCRIPTION : During POST/PAST, the CTU CEPT-E1 Interface and its connection to the Codecs is tested.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK :

Cabin Audio Discrete Outputs Loopback Fail (01 P 07)
DESCRIPTION : During CM, a test of each of the four WH-10 Status discrete outputs is performed 10 times a second (Status A and B discrete outputs on each of Cabin Audio Interfaces #1 and #2). If a discrete output is being driven to the active state it is verified to be at the active state.
PARAMETERS : The following codes apply:
(001) = WH-10 Status A #1 output failure,
(002) = WH-10 Status A #2 output failure,
(003) = WH-10 Status B #1 output failure,
(004) = WH-10 Status B #2 output failure,
FAIL CRITERIA : The CM fault transitions to a failure if the fault persists for 1 second.
RECOVERY CRIT. : This failure is cleared immediately.
REMARK : The fault to failure timer is included to prevent the annunciation of spurious failures detected as the various SDU PSU buses decay on loss of primary power.

Cockpit Audio Discrete Outputs Loopback Fail (01 P 08)
During CM, a test of each of the Cockpit Call Lamp discrete outputs (on Cockpit Audio Interfaces #1 and #2) and the Cockpit Chime discrete output is performed 10 times a second. If the Cockpit Chime discrete output is being driven to the active state it is verified to be at the active state. If the Cockpit Call Lamp discrete output is being driven to the active state it is verified to be at the active state.
PARAMETERS : The following codes apply:
(001) = Cockpit Call Lamp #1 output failure,
(002) = Cockpit Call Lamp #2 output failure,
(003) = Cockpit Chime output failure.
FAIL CRITERIA : The CM fault transitions to a failure if the fault persists for 1 second.
RECOVERY CRIT. : This failure shall recover immediately.
REMARK : The fault to failure timer is included to prevent the annunciation of spurious failures detected as the various SDU PSU busses decay on loss of primary power.
When MP11F=0, the discretes associated with this failure map to the CD1/2 discretes.

CTU CEPT-E1 HDLC Loopback Fail (01 P 89)
DESCRIPTION : During POST/PAST, the HDLC controller within CEPT-E1 framer chip is tested by looping back the transmitter to the receiver on the chip. This fault is declared if the received frame does not match the transmitted frame after two successive tests.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

Cabin Interface 1 Bus Error (01 P 8A)
DESCRIPTION : During POST/PAST all VIM devices is tested for read write access. A 'VIM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately

RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address. Faults (01 P 8A)-(01 P 8E) are identical, and have been split out due to the desire to indict all applicable resources.

Cabin Interface 2 Bus Error (01 P 8B)
DESCRIPTION : During POST/PAST all VIM devices is tested for read write access. A 'VIM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address. Faults (01 P 8A)-(01 P 8E) are identical, and have been split out due to the desire to indict all applicable resources.

Cockpit Interface 1 Bus Error (01 P 8C)
DESCRIPTION : During POST/PAST all VIM devices is tested for read write access. A 'VIM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address. Faults (01 P 8A)-(01 P 8E) are identical, and have been split out due to the desire to indict all applicable resources.

Cockpit Interface 2 Bus Error (01 P 8D)
DESCRIPTION : During POST/PAST all VIM devices is tested for read write access. A 'VIM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address. Faults (01 P 8A)-(01 P 8E) are identical, and have been split out due to the desire to indict all applicable resources.

CTU CEPT-E1 Bus Error (01 P 8E)
DESCRIPTION : During POST/PAST all VIM devices is tested for read write access. A 'VIM Bus Error' is declared if any of the tests result in a bus error.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure immediately
RECOVERY CRIT. : This failure is never explicitly cleared
REMARK : If a Bus Error occurs during normal operation, a S/W SYSFAIL failure is raised whatever the failed address. Faults (01 P 8A)-(01 P 8E) are identical, and have been split out due to the desire to indict all applicable resources.

HPA Command Word (143) Update Rate Fail (01 0 02)
DESCRIPTION : The number of HPA Command Words with no parity error received by the HPA in the last second is less than 1 after completion of POST/PAST, and the associated bus is not inactive.
PARAMETERS : Number of HPA Command Words received with no parity error during the 1st second of the fault. None for 60W HPA.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for at least five seconds but other words are being received on the Multi-Control bus (i.e., the bus is not inactive).
RECOVERY CRIT. : The fault is cleared if the word is received in the range specified for at least one second.
REMARK : This fault can only be reported with a Honeywell HPA, as the fault report is made using the manufacturer specific protocol. "No Computed Data" will be indicated in the HPA Status words. The 60W HPA will set bit 15 in its Maintenance words. The SDU will raise failure (90 0 01), section 4.4.5.144.1 while bit 15 is set.

HPA Command Word (143) Data Fail (01 0 03)
DESCRIPTION : The last HPA Command Word with no parity error received by the HPA contains a field set to an unauthorised or undetermined value.
PARAMETERS : HPA Command Word in error.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for at least five seconds.
RECOVERY CRIT. : The fault is cleared if the valid word is received for at least five seconds.
REMARK : Only the first error seen on one of the HPA Command Words received will be reported; subsequent errors, possibly affecting other data fields in the word, will not be reported unless the first error disappears. This fault can only be reported with a Honeywell HPA, as the fault report is made using the manufacturer specific protocol.

HSU1-SDU Williamsburg Data TX Fail (01 0 07)
DESCRIPTION : The SDU shall raise this fault when bit 15 of the HSU's label 270 status word is set, i.e., the SDU has failed to transfer data to the HSU or any of the Williamsburg timers/retries have been exceeded, unless the HSU input bus inactive failure is currently active (reference 9E 0 01, Section 4.4.5.158).
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure if bit 15 is set in at least 5 consecutive words.
RECOVERY CRIT. : This fault is cleared when the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the label 270 HSU Status word indicating Functional Test.
REMARK:

HSU1-SDU Williamsburg Solo Word Ack Fail (01 0 08)
DESCRIPTION : The SDU shall raise this fault when bit 16 of the HSU's label 270 status word is set, i.e., the HSU has not received an acknowledgment back from the SDU within 25 ms after sending a solo word transmission.
PARAMETERS : None
FAIL CRITERIA : This fault transitions into failure if bit 16 is set in at least 5 consecutive status words.
RECOVERY CRIT. : This fault is cleared when the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the label 270 HSU Status word indicating Functional Test.
REMARK :

HSU2-SDU Williamsburg Data TX Fail (01 0 0B)
Same as 01 0 07 except substitute "HSU2" for "HSU1". Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

HSU2-SDU Williamsburg Solo Word Ack Fail (01 0 0C)
Same as 01 0 08 except substitute "HSU2" for "HSU1". Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

<HGA HPA> Command Word (NCD) (01 0 10)
DESCRIPTION : This fault is declared if the SSM of Status words from the HGA HPA show No Computed Data (due to not receiving valid Command words for at least one second), but the Multi-Control bus is not inactive.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure if the fault persists for at least three seconds.
RECOVERY CRIT. : Cleared as soon as the first status word is received without SSM = NCD or the control bus is declared inactive.
REMARK :

<LGA HPA> Command Word (NCD) (01 0 12)
Same as <HGA HPA> Command Word (NCD).

Incomplete ID Prom Responses (01 0 96)
DESCRIPTION : During Power Up or Factory Setting Start, the Id Prom on each physical SRU is interrogated as specified in Section 3.2.1.2.3.5.1. The response is held in category B storage. On each subsequent PAST or system reset, the preserved response is checked to verify that, for each mandatory SRU and each optional SRU determined to be present, the Id Prom responds correctly. This fault is raised if any Id Prom fails to give a response.

PARAMETERS : The SRUs which failed to respond is identified as follows:

Bit	SRU
0	MPMM
1	SIOM
2	VIM
3	RFM
4	MBD
5	FPD
6	IFM
7	TTCM in slot #1
8	TTCM in slot #2

FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : Also reference Section 3.2.1.3.1.5.4, which defines the cases of depopulation, faulty (but populated) SRUs, and unprogrammed Id Proms. Section 3.2.1.2.3.5.1 requires that if an Id Prom is found to have not been programmed, software upload processes are allowed to proceed, assuming (hoping for) hardware/software compatibility; and it also requires that this failure be raised under such conditions. For any logic in the SDU main processor that is dependent upon Id Prom information (e.g., the front panel display type), default values are assumed when the relevant data is unavailable.

"Other" SATCOM System (Level 1 Code 02h)
"Other" SATCOM System, Unknown SRU (SRU Code 0h)
Protocol Version Number Incompatible (02 0 01)
DESCRIPTION : This fault is declared in a dual system if the Protocol Version Number (PVN) received from the other SDU is lower than this SDU's PVN, and this SDU is not capable of operating with the lower PVN.
PARAMETERS : 1st parameter: Last 8 decimal digits of this SDU's PVN (presented as BCD) 2nd parameter: Last 8 decimal digits of the other SDU's PVN (presented as BCD)
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if a compatible PVN is received from the other SDU.
REMARK : This failure is only declared in the SDU disabling the other one.

SDU/SDU Message Protocol Error (02 0 02)
DESCRIPTION : This fault is declared if an SDU/SDU Message Transfer protocol error is detected by this SDU. This fault is not declared if the cross-talk bus is inactive.
PARAMETERS : Error discriminator:
1: Transmission Buffer Overflow in this SDU
2: Retransmission Retry Limit exceeded (from this SDU)
3: Invalid Message Received by this SDU
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared after one second.
REMARK : When this failure is detected, the XTB falls back to initial communications status.

HSU (Level 1 Code 03h)
This section, and all its subsections, are only applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, for the HS-720. Although not documented for individual failures in the subsections that follow, any and all current failures for the HSU (i.e., failures having the HSU level 1 failure code) is considered to have "recovered" when the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the label 270 status word indicating Functional Test.
In the subsections below, the statement "HSU is declared unserviceable" indicates that the following actions are taken by the HSU: in the HSU Status Word (Label 270), all four Channel Failure bits are set to 1 and SSM is set to Failure Warning; all four HSD Service Available discretes are set to 0; the HSU Failure discrete is set to 1.

HSCC1: HSU Channel Card 1 (SRU Code 1h)
COMMENTARY
Error reporting for the HS-720 channel cards is performed by the TAL (Terminal Adaption Layer) --the common interface to access the top layer of the different protocol stacks (i.e. Swift64 Circuit

Switched, Swift64 MPDS or BGAN). There are two instances of the TAL in each channel card (one per modem). When a TAL error is reported, the HS-720 translates the hexadecimal TAL error code into the appropriate HSU failure, which is then reported to the SDU via a Williamsburg Failure Report message in the usual manner.
Certain channel card faults, mainly software and communication errors, are transitory and normal operation may resume if the TAL is commanded to the 'Idle' state. Other faults are more likely to reoccur. For such errors, the TAL will first be commanded to 'Idle'. If the fault reoccurs, then a reboot of the entire channel card will be performed. For faults that are considered more likely to be hardware related, recovery from a transition to 'Idle' is unlikely and therefore a reboot of the channel card will be performed immediately.

HSU Channel Card 1 Modem Fault (03 1 01)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B090h (modem burst overflow), B091h (modem data overflow) or B093h (modem burst sent too late).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs within one minute of the associated TAL being commanded to the 'Idle' state following the initial TAL report.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the reboot of the channel card (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will reboot channel card 1.

HSU Channel Card 1 Modem Failure (03 1 02)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B0B3h-B0B6h (DSP not responding), B493h (DSP failed to boot), B49Ah (modem not sending messages), B090h (modem burst overflow), B091h (modem data overflow) or B093h (modem burst sent too late).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1 or 2) to 0.

HSU Channel Card 1 Peripheral Error (03 1 03)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B922h (invalid peripheral request), B923h (peripheral acknowledgement lost), B940h (peripheral data overflow), B941h (peripheral not in correct mode) or B942h (peripheral parameter error).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the associated TAL being commanded to the 'Idle' state (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will command the TAL reporting the error to the 'Idle' state.

HSU Channel Card 1 Peripheral Failure (03 1 04)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B924h (peripheral not responding).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1or 2) to 0.

HSU Channel Card 1 Control Processor SW Incompatibility (03 1 05)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B590h (unknown processor parameter), B591h (processor function not implemented) or B592h (incorrect processor parameter).

PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Channel Card 1 RF Fault (03 1 07)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports one of 24 specific errors relating to RF (B660h, B661h, B662h, B663h, B664h, B666h, B667h, B668h, B669h, B66Bh, B66Fh, B670h, B672h, B673h, B674h, B675h, B676h, B677h, B678h, B679h,
B67Ah, B67Bh, B67Ch, B67Dh).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs within one minute of the associated TAL being commanded to the 'Idle' state following the initial TAL report.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the reboot of the channel card (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will reboot channel card 1.

HSU Channel Card 1 RF Failure (03 1 08)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B492h (RF failed to boot), B494h (RF failed to calibrate), B49Bh (RF not sending messages), or one of the 24 errors relating to RF.
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1or 2) to 0.

HSU Channel Card 1 TAL Error (03 1 09)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B490h (TAL smartcard not responding) or B491h (TAL PPD late).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the associated TAL being commanded to the 'Idle' state (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will command the TAL reporting the error to the 'Idle' state.

HSU Channel Card 1 Modem Calibration Missing (03 1 0A)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B49Ch (calibration modem values missing).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1 or 2) to 0.

HSU Channel Card 1 Temperature Unreadable (03 1 0B)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B49Dh (temperature sensor not reading).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1 or 2) to 0.

HSU Channel Card 1 Over Temperature (03 1 0C)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B400h (temperature over limit).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Channel Card 1 TURBO Fault (03 1 0E)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B800h (TURBO busy, cannot accept message) or B801h (bad TURBO parameters).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs within one minute of the associated TAL being commanded to the 'Idle' state.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the reboot of the channel card (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will reboot channel card 1.

HSU Channel Card 1 TURBO Failure (03 1 0F)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B800h (TURBO busy, cannot accept message) or B801h (bad TURBO parameters).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1 or 2) to 0.

HSU Channel Card 1 VCODEC Fault (03 1 11)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B880h (VCODEC busy, cannot accept message) or B881h (bad VCODEC parameters).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs within one minute of the associated TAL being commanded to the 'Idle' state following the initial report.
RECOVERY CRIT. : This failure is cleared if there is no reoccurrence within one minute of the reboot of the channel card (refer to Remark below).
REMARK : When this failure is declared, the HSU control processor will reboot Channel Card 1.

HSU Channel Card 1 VCODEC Failure (03 1 12)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B880h (VCODEC busy, cannot accept message) or B881h (bad VCODEC parameters).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure if the fault reoccurs following a reboot of the associated channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the appropriate Channel Failure bit (1 or 2) to 1 in the HSU Status Word (Label 270), and the appropriate HSD Service Available discrete (1 or 2) to 0.

HSU Channel Card 1 Application Code Error (03 1 93)
DESCRIPTION : This fault is declared by the HSU when channel card 1 TAL reports error B593h (PROM corrupted).
PARAMETERS : TAL error code in failure parameter; TAL ID in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 1 Failure and Channel 2 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 1 Service Available and HSD 2 Service Available discretes to 0. Thus, the HSU declares channel card 1 unserviceable.

HSCC2: HSU Channel Card 2 (SRU Code 2h)
Same as for HSCC1, but make the following substitutions:
SRU Code 2 instead of SRU Code 1,
Channel card 2 instead of channel card 1,
Channel 3/4 Failure instead of Channel 1/2 Failure,
HSD 3/4 Service Available instead of HSD 1/2 Service Available.

HSDIO: HSU Data I/O Card (SRU Code 3h)

HSU Unrecoverable SW / Protocol Error (03 3 02)
DESCRIPTION : This fault is declared by the HSU when an unrecoverable software or protocol error occurs in the Data I/O Card.
PARAMETERS : Data I/O Card error code in failure parameter; associated Data I/O error code in associated failure parameter.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared immediately.
REMARK : When this failure is declared, the Data I/O card automatically reboots.

HSU Channel Card 1 Unresponsive / Unserviceable (03 3 03)
DESCRIPTION : This fault is declared by the HSU when channel card 1 is observed to be unresponsive or unserviceable via an associated interface (identified by the failure parameter).
PARAMETERS : The failure parameter contains one of the following values:
01: ISDN interface
02: Serial interface
03: Ethernet interface
FAIL CRITERIA : This fault transitions to a failure if the fault persists through one retry of the affected interface.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 1 Failure and Channel 2 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 1 Service Available and HSD 2 Service Available discretes to 0. Thus, the HSU declares channel card 1 unserviceable.

HSU Channel Card 2 Unresponsive / Unserviceable (03 3 04)
DESCRIPTION : This fault is declared by the HSU when channel card 2 is observed to be unresponsive or unserviceable via an associated interface (identified by the failure parameter).
PARAMETERS : The failure parameter contains one of the following values:
01: ISDN interface
02: Serial interface
03: Ethernet interface
FAIL CRITERIA : This fault transitions to a failure if the fault persists through one retry of the affected interface.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 3 Failure and Channel 4 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 3 Service Available and HSD 4 Service Available discretes to 0. Thus, the HSU declares channel card 2 unserviceable.

HSU Configuration Error (03 3 85)
DESCRIPTION : This fault is declared by the HSU when the Boot or Application fails a software/hardware compatibility check.
PARAMETERS : The failure parameter contains one of the following values:
00: Boot / hardware incompatibility
01: Application / hardware incompatibility
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Peripheral Failure (03 3 86)
DESCRIPTION : This fault is declared by the HSU when at least one of the peripherals fails an integrity check.

PARAMETERS : The failure parameter contains one of the following values:
00: MPC 862 (Serial Communication Controllers for Ethernet 1 and 2, MPDS, Control Processor interface (RS-232), debug port (RS-232) and TDM bus for E1 and POTS.
01: ST16C654 (Quad. UART for communications with the channel card MPDS ports)
02: PSB21150 #1 (ISDN transceiver)
03: PSB21150 #2 (ISDN transceiver)
04: DS21354LN (E1 transceiver)
The associated failure parameter contains the number of loopback test faults for the failed peripheral.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests for a specific peripheral fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Both Channel Cards Unresponsive / Unserviceable (03 3 07)
DESCRIPTION : This fault is declared by the HSU when both channel card 1 and channel card 2 are unresponsive or unserviceable.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU RAM Fault (03 3 08)
DESCRIPTION : This fault is declared by the HSU when a CRC check of the Data I/O Application image in RAM fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure when the fault is reported more than twice since the HSU powered up.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable and the Data I/O card automatically reboots.

HSU ROM Fault (03 3 09)
DESCRIPTION : This fault is declared by the HSU when a CRC check of the configuration information stored in EEPROM or Flash fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure when the fault is reported more than twice since the HSU powered up.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable and the Data I/O card automatically resets the configuration information to factory defaults.

HSU SW Configuration Error (03 3 0A)
DESCRIPTION : This fault is declared by the HSU when an illegal configuration parameter value is received from the SDU.
PARAMETERS : The failure parameter contains the relevant parameter number if the parameter is contained in the HSU Configuration Data Part 1 message sent from the SDU. The associated parameter contains the relevant parameter number if the parameter is contained in the HSU Configuration Data Part 2 message sent from the SDU.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared when all Data I/O configuration parameters received from the SDU are valid.
REMARK : None.

HSU PPPoE Session Failure (03 3 0B)
DESCRIPTION : This fault is declared by the HSU when the PPPoE client has been unresponsive.
PARAMETERS : None.

FAIL CRITERIA : This fault transitions to a failure if the PPPoE client has been unresponsive for at least five seconds.
RECOVERY CRIT. : This failure is cleared immediately.
REMARK : When this failure is declared, the HSU will clear the PPPoE session.

HSU Channel Card 1 Unresponsive (03 4 87/07)
DESCRIPTION : This fault is declared by the HSU when channel card 1 is observed to be unresponsive (or unserviceable).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists through a reboot of the channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 1 Failure and Channel 2 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 1 Service Available and HSD 2 Service Available discretes to 0. Thus, the HSU declares channel card 1 unserviceable.

HSU Channel Card 2 Unresponsive (03 4 88/08)
DESCRIPTION : This fault is declared by the HSU when channel card 2 is observed to be unresponsive (or unserviceable).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists through a reboot of the channel card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 3 Failure and Channel 4 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 3 Service Available and HSD 4 Service Available discretes to 0. Thus, the HSU declares channel card 2 unserviceable.

HSU Both Channel Cards Unresponsive (03 4 89/09)
DESCRIPTION : This fault is declared by the HSU when both channel card 1 and channel card 2 are observed to be unresponsive (or unserviceable or both channel cards are reporting unrecoverable errors on all TALs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately .
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Data I/O Card Unresponsive (03 4 8A/0A)
DESCRIPTION : This fault is declared by the HSU when the Data I/O Card is observed to be unresponsive.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists through a reboot of the Data I/O card.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Control Processor RAM Fault (03 4 0B)
DESCRIPTION : This fault is declared by the HSU when a CRC check of the control processor Application image in RAM fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after a retry of the CRC check also fails.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared.

HSU Control Processor ROM Fault (03 4 0C)
DESCRIPTION : This fault is declared by the HSU when a CRC check of the configuration information stored in EEPROM or Flash fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after a retry of the CRC check also fails.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared.

HSU Control Processor Over Temperature (03 4 0D)
DESCRIPTION : This fault is declared by the HSU when the control processor on-board temperature sensor reaches 85°C.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared when the control processor on-board temperature sensor drops to below 60°C.
REMARK : When this failure is detected, the HSU is declared.

HSU Channel Card 1 Over Temperature (03 4 0E)
DESCRIPTION : This fault is declared by the HSU when the control processor detects channel card 1 reporting a temperature that exceeds the over-temperature threshold (indicating a temperature of at least 85°C).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure when channel card 1 reports a temperature that exceeds the over-temperature threshold for at least five seconds.
RECOVERY CRIT. : This failure is cleared if channel card 1 reports a temperature below the over temperature threshold for at least five seconds following the repowering of the channel card (refer to Remark below).
REMARK : When this failure is declared, channel card 1 is powered-down and then powered-up again after five minutes. The HSU also sets the Channel 1 Failure and Channel 2 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 1 Service Available and HSD 2 Service Available discretes to 0. Thus, the HSU declares Channel Card 1 unserviceable.

HSU Channel Card 2 Over Temperature (03 4 0F)
DESCRIPTION : This fault is declared by the HSU when the control processor detects channel card 2 reporting a temperature that exceeds the over-temperature threshold (indicating a temperature of at least 85°C).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure when channel card 2 reports a temperature that exceeds the over-temperature threshold for at least five seconds.
RECOVERY CRIT. : This failure is cleared if channel card 2 reports a temperature below the over temperature threshold for at least five seconds following the repowering of the channel card (refer to Remark below).
REMARK : When this failure is declared, channel card 2 is powered-down and then powered-up again after five minutes. The HSU also sets the Channel 3 Failure and Channel 4 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 3 Service Available and HSD 3 Service Available discretes to 0. Thus, the HSU declares Channel Card 2 unserviceable.

HSU Both Channel Cards Over Temperature (03 4 10)
DESCRIPTION : This fault is declared by the HSU when the control processor detects both channel cards reporting a temperature exceeding the over-temperature threshold.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if both channel cards report a temperature below the over temperature threshold for at least five seconds following the repowering of the channel cards (refer to Remark below).
REMARK : When this failure is declared, both channel cards are powered-down and then powered-up again after five minutes. The HSU is also declared unserviceable.

HSU ADL Bus Interface Failure (03 4 91)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test of the ARINC 429 transceiver used for the ADL fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU PDL Bus Interface Failure (03 4 92)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test of the ARINC 429 transceiver used for the PDL fails.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Data I/O DUART Failure (03 4 93)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test for channel 1 of DUART 1 fails. This channel is used for communications with the Data I/O card.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Channel Card 1 DUART Failure (03 4 94)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test for channel 1 of DUART 2 fails. This channel is used for communications with channel card 1.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 1 Failure and Channel 2 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 1 Service Available and HSD 2 Service Available discretes to 0. Thus, the HSU declares Channel Card 1 unserviceable.

HSU Channel Card 2 DUART Failure (03 4 95)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test for channel 2 of DUART 2 fails. This channel is used for communications with channel card 2.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is declared, the HSU sets the Channel 3 Failure and Channel 4 Failure bits to 1 in the HSU Status Word (Label 270), and the HSD 3 Service Available and HSD 4 Service Available discretes to 0. Thus, the HSU declares Channel Card 2 unserviceable.

HSU Both Channel Cards DUART Failure (03 4 96)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback tests for channels 1 and 2 of DUART 2 fail.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU Maintenance Interface DUART Failure (03 4 97)
DESCRIPTION : This fault is declared by the HSU during PP when the loopback test for DUART 3 fails. This device is used for communications with the maintenance interface.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if two out of three consecutive loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Discrete Output Failure (03 4 98)
DESCRIPTION : This fault is declared by the HSU during PP when there is no response from the Discrete Outputs device.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if there is no response from the Discrete Outputs hardware for two out of three consecutive tests.

RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Board Configuration/Revision Failure (03 4 99)
DESCRIPTION : This fault is declared by the HSU during PP when there is no response from the Board Configuration/Revision device.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if there is no response from the Board Configuration/Revision hardware for two out of three consecutive tests.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HOCXO: HSU Oven-Controlled 10 MHz Oscillator (SRU Code 5h)

HSU OCXO Timeout (03 5 01)
DESCRIPTION : This fault is declared by the HSU when the “OCXO Ready” discrete signal remains de asserted.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the “OCXO Ready” signal remains de-asserted for at least 15 minutes after powering-up the HSU.
RECOVERY CRIT. : This failure is cleared if the “OCXO Ready” signal is asserted for five seconds.
REMARK : When this failure is detected, the HSU is declared unserviceable.

HSU OCXO Temperature Unstable (03 5 02)
DESCRIPTION : This fault is declared by the HSU when the “OCXO Ready” signal transitions from the asserted to de-asserted state.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the “OCXO Ready” signal remains de-asserted for at least five seconds.
RECOVERY CRIT. : This failure is cleared if the “OCXO Ready” signal is asserted for five seconds.
REMARK : None.

HSPSU: HSU Power Supply Unit (SRU Code 6h)
HSU Power Supply Fail (03 6 01)
DESCRIPTION : This fault is declared by the HSU when the PSU “Power Good” signal is de-asserted.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the “Power Good” signal remains de-asserted for at least 250 ms.
RECOVERY CRIT. : This failure is cleared if the “Power Good” signal is asserted for five seconds.
REMARK : None.

HSU PSU Over Temperature (03 6 02)
DESCRIPTION : This fault is declared by the HSU when PSU “Over Temperature” signal is asserted.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the PSU “Over Temperature” signal is asserted for at least 5 ms.
RECOVERY CRIT. : This failure is cleared if the PSU “Over Temperature” signal is de-asserted for at least five seconds.
REMARK : When this failure is detected, both channel cards are powered-down and the HSU is declared unserviceable.

HSFP: HSU Front Panel (SRU Code 8h)

HSU Self-Test Button Stuck (03 8 81)
DESCRIPTION : This fault is declared by the HSU when the self-test button becomes stuck on, i.e. has become activated and remained activated for an abnormally long period of time without going inactive.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the self-test button remains active for at least 10 seconds.

RECOVERY CRIT. : This failure is cleared if the self-test button becomes de-activated for at least one second.
REMARK : None.

HSU Self-Declared Failure (03 0 01)
DESCRIPTION : This fault is declared by the SDU if the SSM field of the Label 270 status word received from the HSU is set to Failure Warning.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if it is continually active in at least 5 consecutive status words.
RECOVERY CRIT. : This failure is cleared as soon as a status word is received with the SSM set to Normal Operation.
REMARK: One second of filtering is applied by the SDU (assuming the nominal transfer rate of 5 Hz) to cover the possibility that the HSU does not apply any filtering to its activation of SSM = Failure Warning.

HSU Williamsburg Protocol ALO/ALR Fail (03 0 02)
DESCRIPTION : This fault is declared by the SDU if, after 3 transmissions of an ALO word to the HSU, the SDU has not received a responding ALR word.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared as soon as communication is re-established with the HSU.
REMARK : None.

HSU Williamsburg Protocol Data Transfer Fail (03 0 03)
DESCRIPTION : This fault is declared by the SDU if the maximum number of RTS words have been sent to the HSU without receiving a valid CTS word, or if the maximum number of attempts have been made for transmitting an LDU to the HSU without receiving a valid ACK word when HSU is the active DTE.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared as soon as a successful transmission of an LDU has been made to the HSU.
REMARK : A transmission failure indicates a break in the bus connecting the SDU output and the HSU input.

HSU Self Test Misoperation (03 0 84)
DESCRIPTION : This fault is declared by the SDU, and covers all possible SDU-initiated POST/PAST misbehavior related to HSU Functional Test. If no ARINC words are being received from the HSU, the POST/PAST fault is not declared. Also, if the HSU is declaring the control bus input inactive, the POST/PAST no response fault is not declared.
PARAMETERS : For SDU-initiated POST/PAST:
   01: The HSU has not responded to functional test commanded for 15 seconds by the SDU (POST/PAST).
   02: The HSU has started functional test, but the SDU has not received an HSU self-test complete response within the 60 seconds accorded to external LRUs during system-wide POST/PAST.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : Functional Test response checking is determined on the HSU Status Word. The CM version of this fault is (50 0 02).

HSU Serial Port Mis-wiring (03 0 05)
DESCRIPTION : This fault is declared by the HSU when inconsistent behaviour of RTS, CTS, DTR and Tx is detected in communications from the User.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure when the behaviour persists for at least five seconds.
RECOVERY CRIT. : This failure is cleared when a PPPoE session is successfully established on the serial port.
REMARK : None.

HSU TOTC Reset (03 0 86/06)
DESCRIPTION : This fault is declared by the HSU when the TOTC has been reset (either with or without user intervention).
PARAMETERS : The failure parameter contains the value of TOTC prior to being reset.
The associated failure parameter contains one of the following values:
0: Auto Reset -- TOTC has been reset without user intervention (rollover, or automatic clearing of EEPROM due to corruption).
1: Manual Reset -- TOTC has been reset through user intervention.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure occurs during PP (ie. 03 0 86), the associated failure parameter will always contain the value 0 (Auto Reset).

HSU POC Reset (03 0 87/07)
DESCRIPTION : This fault is declared by the HSU when the POC has been reset (either with or without user intervention).
PARAMETERS : The failure parameter contains the value of POC prior to being reset.
The associated failure parameter contains one of the following values:
0: Auto Reset -- POC has been reset without user intervention (rollover, or automatic clearing of EEPROM due to corruption).
1: Manual Reset -- POC has been reset through user intervention.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : When this failure occurs during PP (ie. 03 0 87), the associated failure parameter will always contain the value 0 (Auto Reset).

HSU Channel 1 Failure (03 0 0C)
DESCRIPTION : This fault is declared by the SDU if bit 17 of the HSU's label 270 status word is set, i.e. the HSU has detected one or more "fatal" or "essential" errors that prevent the use of channel 1.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if bit 17 is set in at least 5 consecutive status words.
RECOVERY CRIT. : This failure is cleared as soon as a status word is received with bit 17 cleared.
REMARK : None.

HSU Channel Release Acknowledge Failure (03 0 0D)
DESCRIPTION : This fault is declared by the SDU if the HSU fails to acknowledge a cooperative channel release request from the SDU within 20 seconds.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK : None.

HSU RF Loopback Inhibit Failure (03 0 8E/0E)
DESCRIPTION : This fault is declared by the SDU if the HSU fails to acknowledge the termination of RF loopback testing by indicating "Normal Operation" in bits 12 and 13 of the HSU status word. The failure code shall reflect CM(0E) or PP(8E) depending on the CM/PP state of the SDU at the time the failure was declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if bits 12 and 13 of the HSU status word do not indicate "Normal Operation" within two seconds of inhibit command from the SDU.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDUbus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK : None.

HSU Channel 2 Failure (03 0 0F)
DESCRIPTION : This fault is declared by the SDU if bit 18 of the HSU's label 270 status word is set, i.e. the HSU has detected one or more "fatal" or "essential" errors that prevent the use of channel 2.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if bit 18 is set in at least 5 consecutive status words.
RECOVERY CRIT. : This failure is cleared as soon as a status word is received with bit 18 cleared.
REMARK : None.

HSU Channel 3 Failure (03 0 10)
DESCRIPTION : This fault is declared by the SDU if bit 19 of the HSU's label 270 status word is set, i.e. the HSU has detected one or more "fatal" or "essential" errors that prevent the use of channel 3.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if bit 19 is set in at least 5 consecutive status words.
RECOVERY CRIT. : This failure is cleared as soon as a status word is received with bit 19 cleared.
REMARK : None.

HSU Channel 4 Failure (03 0 11)
DESCRIPTION : This fault is declared by the SDU if bit 20 of the HSU's label 270 status word is set, i.e. the HSU has detected one or more "fatal" or "essential" errors that prevent the use of channel 4.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if bit 20 is set in at least 5 consecutive status words.
RECOVERY CRIT. : This failure is cleared as soon as a status word is received with bit 20 cleared.
REMARK : None.

HGA/IGA HPA (Level 1 Code 04h)
Failures listed in this section apply to both the HGA (40W/60W) and IGA (20W) Honeywell/Thales HPAs, as noted in the description for each failure.

HPSU: HPA (AC Or DC) Power Supply Unit (SRU Code 1h)

<HGA HPA> PSU Over Temp Shutdown (04 1 01)
DESCRIPTION : During CM (for all software packages prior to as well as including D2.0), the 40W HPA's PSU temperature is tested four times per second and a fault is declared if it equals or exceeds +130 degrees Celsius; for all 40W HPA software packages subsequent to D2.0, and for all software versions of the 20W HPA, the maximum value threshold shall be increased from +130 to +133 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU temperature sensor scaled analog output, shutdown temperature limit.
FAIL CRITERIA : A failure is declared if the PSU temperature sensor scaled analog output is greater than or equal to the specified fault threshold for four consecutive readings.
RECOVERY CRIT. : The failure is cleared (by all software packages prior to as well as including D2.0) if after four consecutive readings the 40W HPA's PSU temperature sensor scaled analog output is less than +130 degrees Celsius; for all 40W HPA software packages subsequent to D2.0, and for all software versions of the 20W HPA, the temperature threshold is decreased from +130 to +125 degrees Celsius.
REMARK : The HPA shall set bit 13 and indicate Failure Warning in its Maintenance words while this failure is active (reference also Section 4.3.5.1). The HPA Carriers is set to OFF, the HPA Bias voltage is set to OFF, and the Variable Attenuator is set to maximum while this failure is active.

<HGA HPA> PSU Temp Sensor Fail (04 1 02)
DESCRIPTION : This fault is declared if (during CM) the reported PSU temperature is either less than -90 degrees Celsius or greater than +210 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU temperature sensor scaled analog output.
FAIL CRITERIA : PSU temperature sensor scaled analog output either less than -90 degrees Celsius or greater than +210 degrees Celsius for four consecutive reads.
RECOVERY CRIT. : PSU temperature sensor scaled analog output greater than or equal to -90 degrees Celsius and less than or equal to +210 degrees Celsius for four consecutive reads.

REMARK : It is assumed that the PSU temperature sensor is faulty if the reported PSU temperature is either less than -90 degrees Celsius or exceeds +210 degrees Celsius. The HPA Carriers, the HPA Bias, and the Variable Attenuator is restored to normal operation, and a temperature of +25 degrees Celsius reported while this fault is active.

<HGA HPA> PSU +5VDC Bias Fail (04 1 03)
DESCRIPTION : The PSU +5VDC Bias voltage fault limits is dependent upon the logic state of the Bias discrete. A failure is registered if the PSU +5VDC Bias voltage is outside of those limits for four consecutive readings. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU +5VDC Bias scaled analog voltage
FAIL CRITERIA : Bias discrete OFF-state limits:
PSU +5VDC Bias voltage of less than -1.0 VDC or greater than 1.0 VDC.
Bias discrete ON-state limits:
PSU +5VDC Bias voltage of less than 3.0 VDC or greater than 7.0 VDC.
RECOVERY CRIT. : When the PSU +5VDC Bias voltage returns to within normal limits (dependent upon the Bias discrete state) for four consecutive reads.
REMARK : The 20W HPA power supply hardware can independently disable the +5VDC bias voltage as a protective measure, e.g., when a short-circuit condition is detected on a secondary output voltage. This will result in failure 04 1 03 being raised.

<HGA HPA> PSU +28/+25.5 VDC Fail (04 1 04)
DESCRIPTION : For the 40W Honeywell HPA, during CM, the PSU +28 VDC scaled analog value is faulted if it exceeds its limits. For the 20W Honeywell HPA, during CM, the PSU +25.5 VDC scaled analog value is faulted if it exceeds its limits. This fault is neither recorded nor annunciated by either HPA if it is detected while the respective LRU's Power Fail Warning signal (PFW) is asserted; note that this requirement shall only be implemented in software packages subsequent to D2.0 where the 40W HPA is concerned; and subsequent to E1.0 for the 20W HPA. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : In the 40W HPA the PSU +28 VDC scaled analog voltage is the parameter. In the 20W HPA the PSU +25.5 VDC scaled analog voltage is the parameter.
FAIL CRITERIA : For all software packages prior to as well as including D2.0, the 40W HPA shall declare a failure if the PSU +28 VDC scaled analog value is less than +20.0 VDC or greater than +30.0 VDC for four consecutive reads; in all software packages subsequent to D2.0, the upper threshold is increased from +30.0 to +35.0 VDC. The 20W HPA shall declare a failure if the PSU +25.5 VDC scaled analog value is not within +20% of 25.5 VDC for four consecutive reads.
RECOVERY CRIT. : The 40W HPA PSU +28 VDC transitions to not failed if the scaled analog value is within its specified limits for four consecutive reads. The 20W HPA PSU +25.5 VDC transitions to not failed if the scaled analog value is within its specified limits for four consecutive reads.
REMARK : None

<HGA HPA> PSU +5 VDC Fail (04 1 05)
DESCRIPTION : During CM, the PSU +5 VDC scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU +5 VDC scaled analog voltage.
FAIL CRITERIA : The 40W HPA shall (for all software packages prior to as well as including D2.0) declare a failure if the PSU +5 VDC scaled analog value is less than +4.0 VDC or greater than +7.0 VDC for four consecutive reads. For all software packages subsequent to D2.0 in the 40W HPA, and for all software versions of the 20W HPA, the upper threshold is decreased from +7.0 to +6.0 VDC.
RECOVERY CRIT. : The PSU +5 VDC transitions to not failed if the scaled analog value is within its specified limits for four consecutive reads.

<HGA HPA> PSU +15 VDC Fail (04 1 06)
DESCRIPTION : During CM, the PSU +15 VDC scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.

PARAMETERS : PSU +15 VDC scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the PSU +15 VDC scaled analog value is less than +10.0 VDC or greater than +20.0 VDC for four consecutive readings.
RECOVERY CRIT. : The PSU +15 VDC transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.

<HGA HPA> PSU -15 VDC Fail (04 1 07)
DESCRIPTION : During CM, the PSU -15 VDC scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU -15 VDC scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the PSU -15 VDC scaled analog value is less than -20 VDC or greater than -10.0 VDC for four consecutive readings.
RECOVERY CRIT. : The PSU -15 VDC transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.

<HGA HPA> PSU -85 VDC Fail (04 1 08)
DESCRIPTION : During CM, the 20W HPA PSU -85 VDC scaled analog value is faulted if it exceeds its limits. This fault is neither recorded nor annunciated by the 20W HPA if it is detected while the Power Fail Warning signal (PFW) is asserted. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : 20W HPA PSU -85 VDC scaled analog voltage.
FAIL CRITERIA : The 20W HPA shall declare a failure if the PSU -85 VDC scaled analog value is less than -100 VDC or greater than -70 VDC for four consecutive readings.
RECOVERY CRIT. : The 20W HPA PSU -85 VDC transitions to not failed if the scaled analog value is within its specified limits for 4 consecutive readings.
REMARKS : If the 25.5V power supply fails and is = 22.95 VDC, then a failure in the final RF Power amp (failure code 04 9 XX) may be the root cause.
If any one of the +8V, +16V or the -85V power supply failures is currently active in a “low voltage” state, the root cause may be a short circuit in the external cabling to the IGA or in the IGA itself. The definition of “low voltage” is as follows: = 1VDC for the +8V and +16V power supplies, and = -4VDC for the -85V power supply.
Also see failure D5 0 02.

<HGA HPA> PSU +8 VDC Fail (04 1 09)
DESCRIPTION : During CM, the 20W HPA PSU +8 VDC scaled analog value is faulted if it exceeds its limits. This fault is neither recorded nor annunciated by the 20W HPA if it is detected while the Power Fail Warning signal (PFW) is asserted. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : 20W HPA PSU +8 VDC scaled analog voltage.
FAIL CRITERIA : The 20W HPA shall declare a failure if the PSU +8 VDC scaled analog value is less than +6.5 VDC or greater than +9.5 VDC for four consecutive readings.
RECOVERY CRIT. : The 20W HPA PSU +8 VDC transitions to not failed if the scaled analog value is within its specified limits for 4 consecutive readings.
REMARKS : See remarks for Failure (04 1 08).

<HGA HPA> PSU +16 VDC Fail (04 1 0A)
DESCRIPTION : During CM, the 20W HPA PSU +16 VDC scaled analog value is faulted if it exceeds its limits. This fault is neither recorded nor annunciated by the 20W HPA if it is detected while the Power Fail Warning signal (PFW) is asserted. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : 20W HPA PSU +16 VDC scaled analog voltage.
FAIL CRITERIA : The 20W HPA shall declare a failure if the PSU +16 VDC scaled analog value is less than +12.0 VDC or greater than +20.0 VDC for four consecutive readings.
RECOVERY CRIT. : The 20W HPA PSU +16 VDC transitions to not failed if the scaled analog value is within its specified limits for 4 consecutive readings.
REMARKS : See remarks for Failure (04 1 08).

<HGA HPA> Internal Power Supply Fail (04 1 40)
DESCRIPTION : During CM, the PSU “Power Good” signal is de-asserted. This fault is applicable to the 60W HPA only.

PARAMETERS : None.
FAIL CRITERIA : Two consecutive readings with “Power Good” signal de-asserted, followed by 5 seconds more with Maximum Available Power reduced by 3 dB.
RECOVERY CRIT. : The “Power Good” is asserted for 5 seconds.
REMARKS : The 60W HPA will set bit 11 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words, illuminate its red (fail) LED and command PA “carriers off” while this failure is active. The SDU will raise failure (04 0 0D) while bit 11 is set.

<HGA HPA> PSU Over Temp (04 1 41)
DESCRIPTION : During CM, the PSU temperature detector measures a value over the threshold of 89 to 94 degrees celsius. This fault is applicable to the 60W HPA only.
PARAMETERS : None.
FAIL CRITERIA : The PSU temperature exceeds the threshold for at least 5 ms.
RECOVERY CRIT. : The PSU temperature drops below the threshold for at least 5 seconds.
REMARKS : The 60W HPA will set bit 13 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words, report Actual Power Out = “At/Below Measurable Range” in its Status words and illuminate its red (fail) LED while this failure is active. The HPA control processor will also command carriers off to the PA while this failure is active.

HMPM: HPA Main Processor Module (SRU Code 2h)

<HGA HPA> H/W-S/W Compatibility Fail (04 2 81)
DESCRIPTION : A variable in the LRU header contains the Hardware/Software Compatibility bits from the Upload file stored in HPA flash memory. This variable is compared to the H/W-S/W Compatibility straps once during POST/PAST, and if different, a fault shall exist. The parity of the HW/SW straps shall also be checked. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter is none. Associated parameter: H/W-S/W Compatibility straps parity=1, LRU Header H/W-S/W Compatibility mismatch=0.
FAIL CRITERIA : A failure is declared if the H/W-S/W Compatibility bits and the LRU Header H/W-S/W Compatibility value do not match.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : This failure shall cause the HPA to transition to standby mode only when tested during POST.

<HGA HPA> Boot Flash Memory Fail (04 2 83/03)
DESCRIPTION : During POST only, the validity of the Flash contents is determined by comparing the checksum value calculated from the contents of the Boot Flash, with the stored checksum calculated at the time the Flash image was built. If the values differ, then the Boot software shall not hand over to the Program software, but instead transitions to standby mode where the failed test is continuously repeated. The results from POST testing is
made available for future PAST testing.
Once every sixty seconds during CM, the validity of the Flash contents is determined by comparing a CRC value calculated from the contents of the Flash with the stored CRC value calculated at the time the Flash image was built. The HPA shall use the 32-bit IEEE 802.3 CRC to calculate the Boot Memory CRC. If the values differ, a CM Boot Flash Memory fault is declared. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : During CM: Calculated CRC, stored CRC.
During PP: Value of the calculated checksum for the boot code.
FAIL CRITERIA : POST: This fault transitions into a failure immediately.
CM: This fault transitions into a failure after four consecutive compare faults.
RECOVERY CRIT. : POST: This failure is not explicitly cleared.
CM: This failure shall clear after one valid CRC compare.
REMARK : None

<HGA HPA> A429 HPA-to-SDU Xmtr Loop-Back Fail (04 2 04)
DESCRIPTION : The A429 HPA-to-SDU Xmtr is tested using the ARINC 429 loop-back receiver. An A429 HPA-to-SDU Xmtr Loop-Back fault is declared if no messages are received via the loop back input. This failure code shall only be applicable to the 20W and 40W HPAs.

PARAMETERS : Test word transmitted, test word received.
FAIL CRITERIA : This fault transitions into failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.

<HGA HPA> A429 SDU-to-HPA Multicnt Rcvr Fail (04 2 87)
DESCRIPTION : During POST/PAST, the A429 SDU-to-HPA Multicontrol Receiver is tested using the ARINC 429 loop-back transmitter. An A429 SDU-to-HPA Multicnt Rcvr fault is declared if the received word does not equal the test word. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> A429 ADL-to-HPA Rcvr Fail (04 2 88)
DESCRIPTION : During POST/PAST, the A429 ADL-to-HPA Receiver is tested using the ARINC 429 loop-back transmitter and a test word. An A429 ADL-to-HPA Rcvr fault is declared if the received word does not equal the test word. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> A429 PDL-to-HPA Rcvr Fail (04 2 89)
DESCRIPTION : During POST/PAST, the A429 PDL-to-HPA Receiver is tested using the ARINC 429 loop-back transmitter and a test word. An A429 PDL-to-HPA Rcvr fault is declared if the received word does not equal the test word. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.

<HGA HPA> Maintenance Memory CRC Fail (04 2 0A)
DESCRIPTION : During POST/PAST, each maintenance memory record is checked to verify its CRC is correct. The HPA shall use the 32-bit IEEE 802.3 CRC to calculate the Maintenance Memory CRC. A fault is declared if the calculated CRC does not match the CRC stored with each record. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : The failed Flash device (HI or LO).
FAIL CRITERIA : This fault transitions into a failure after four consecutive faults are declared.
RECOVERY CRIT. : There is no explicit clearing of this failure.

<HGA HPA> Maintenance Memory Write Fail (04 2 0B)
DESCRIPTION : A Maintenance Memory Write fault shall exist if the programming or erase operations fail. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.

<HGA HPA> Calibration Memory CRC Fail (04 2 8C/0C)
DESCRIPTION : At the time of calibration, a CRC is computed over the range of calibration memory used. The resulting CRC is stored in an adjacent area of calibration memory. During POST/PAST and once every 60 seconds, the CRC of the calibration memory is
computed and compared to the stored value. The HPA shall use the 32-bit IEEE 802.3 CRC to calculate the Calibration Memory CRC. A fault is declared if the two CRCs are different. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure after one miscomparison.
RECOVERY CRIT. : This failure is cleared after one successful comparison.

<HGA HPA> Calibration Memory Write Fail (04 2 0D)
DESCRIPTION : A calibration memory write fault shall exist if the calibration Flash programming or erase operations fail. This failure code shall only be applicable to the 20W and 40W HPAs.

PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure after four consecutive faults are declared.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> Program Flash Memory Fail (04 2 8E/0E)
DESCRIPTION : During POST only, the validity of the Program Flash contents is determined by comparing a checksum value calculated from the contents of the Flash, with the stored checksum value calculated at the time the Flash image was built. If the values differ, then
the Boot software shall not hand over to the Program software, but instead transitions to standby mode where the failed test is continuously repeated. The results from POST testing is made available for future PAST testing.
Once every 60 seconds during CM, the validity of the Flash contents is determined by comparing a CRC value calculated from the contents of the Flash with the stored CRC value calculated at the time the Flash image was built. The HPA shall use the 32-bit IEEE 802.3 CRC to calculate the Program Memory CRC. If the values differ, a CM Program Flash Memory fault is declared. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : During CM: Calculated CRC, stored CRC.
During PP: Value of the calculated checksum for the program code.
FAIL CRITERIA : POST: This fault transitions into a failure immediately.
CM: This fault transitions into a failure after four consecutive compare faults.
RECOVERY CRIT. : POST: This failure is not explicitly cleared.
CM: This failure shall clear after one valid CRC compare.

<HGA HPA> RAM Fail (04 2 90)
DESCRIPTION : It is required that all volatile memory be tested to determine that every byte of RAM is addressable and can correctly store data. Testing shall include all address combinations
and exercise each bit by storing both high (Logic ’1’) and low (Logic ’0’). Each location is shown to retain its content while all other locations are written to. The protected area at the end of RAM is not tested in order to preserve data passed between Boot software and Program software. Since the RAM test is destructive, the test is performed only during POST testing, and transitions to standby mode where the failed test is continuously repeated. The results from POST testing is made available for future PAST testing. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.

<HGA HPA> CPU Over Temp Shutdown (04 2 11)
DESCRIPTION : During CM (for all software packages prior to as well as including D2.0), the 40W HPA’s CPU temperature is tested four times per second, and a fault is declared if it equals or exceeds +130 degrees Celsius; for all 40W HPA software packages subsequent
to D2.0, and for all software versions of the 20W HPA, the maximum value threshold is increased from +130 to +133 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : CPU temperature sensor scaled analog output value, shutdown temperature limit.
FAIL CRITERIA : A failure is declared if the CPU temperature sensors’s scaled analog output value is greater than or equal to the specified fault threshold for four consecutive readings.
RECOVERY CRIT. : The failure is cleared (by all software packages prior to as well as including D2.0) if after four consecutive readings, the 40W HPA’s CPU temperature sensor scaled analog output value is less than +130 degrees Celsius; for all 40W HPA software packages subsequent to D2.0, and for all software versions of the 20W HPA, the temperature threshold is decreased from +130 to +125 degrees Celsius.
REMARK : The HPA shall set bit 13 and indicate Failure Warning in its Maintenance words while this failure is active. The HPA Carriers is set to OFF, the HPA Bias voltage is set
to OFF, and the Variable Attenuator is set to maximum while this failure is active.

<HGA HPA> CPU Temp Sensor Fail (04 2 12)
DESCRIPTION : This fault is declared if (during CM) the reported CPU temperature is either less than -90 degrees Celsius or greater than +210 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.

PARAMETERS : CPU temperature sensor scaled analog output value.
FAIL CRITERIA : CPU temperature sensor scaled analog output value is either less than -90 degrees Celsius or greater than +210 degrees Celsius for four consecutive readings.
RECOVERY CRIT. : CPU temperature sensor scaled analog output value is greater than or equal to -90 degrees Celsius and less than or equal to +210 degrees Celsius for four consecutive readings.
REMARK : It is assumed that the CPU temperature sensor is faulty if the reported CPU temperature is either less than -90 degrees Celsius or exceeds +210 degrees Celsius. The HPA Carriers, the HPA Bias voltage, and the Variable Attenuator voltage is restored to normal operation, and a temperature of +25 degrees Celsius reported while this failure is active.

<HGA HPA> CPU Gnd Ref Fail (04 2 93/13)
DESCRIPTION : During CM, CPU Gnd Ref scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : CPU Gnd Ref scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the CPU Gnd Ref scaled analog value is less than -0.3 VDC or greater than +0.3 VDC for four consecutive readings.
RECOVERY CRIT. : The CPU Gnd Ref transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Fan Relay Driver Fail (04 2 94/14)
DESCRIPTION : The Fan Relay Driver voltage fault limits is dependent upon the logic state of the Fan discrete. A failure is registered if the Fan Relay Driver voltage is outside of those limits for four consecutive readings. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : HMPM Fan discrete, Fan Relay Driver scaled analog voltage.
FAIL CRITERIA : Fan discrete OFF state limit:
Fan Relay Driver voltage of less than 8.0 VDC.
Fan discrete ON state limit:
Fan Relay Driver voltage greater than 12.0 VDC.
RECOVERY CRIT. : When the Fan Relay Driver voltage returns to within normal limits dependent upon the Bias discrete state for four consecutive reads.
REMARK : None

<HGA HPA> Bias Enable Loop-back Fail (04 2 95/15)
DESCRIPTION : The Bias Enable discrete is measured at the loop-back discrete input, and a fault is declared if the loop-back discrete value does not match the last Bias Enable value set. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : During CM: Carriers off: parameter=0; assoc. parameter=1.
Carriers on: parameter=1; assoc. parameter=0.
Parameter during PP: Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input word. Lower 16 bits contain the hw/sw port discrete input word.
Assoc. parameter during PP: Mux port discrete input word.
FAIL CRITERIA : POST/PAST:
The Bias Enable discrete is set to 1. The discrete loop-back is read, and a failure is declared if the Bias Enable discrete value does not equal the loop-back value.
CM: As the Bias Enable is set, the loop-back discrete value is compared to the
Bias Enable. A failure is declared if the Bias Enable value does not equal the discrete loop-back value.
RECOVERY CRIT. : POST/PAST:
This failure is not explicitly cleared.
CM: This failure transitions to not failed after four successful comparisons.
REMARK : None

<HGA HPA> Var Atten Driver Fail (04 2 96/16)
DESCRIPTION : During POST/PAST, the Bias voltage is set to off and the DAC output set to 0fffh (for +10.0 VDC out), 0800h (for +5.0 VDC out), and 007h (for +17 mVDC out). A fault is declared if the Var Atten Driver voltage is not the voltage specified (plus or minus 10 mVDC).

During CM, a fault is declared if the Variable Attenuator Driver voltage, as measured at the analog loop-back input, is not within the range of the voltage specified plus or minus 10 mVDC.
A fault is declared if the Variable Attenuator Driver analog value exceeds the absolute limits of less than -0.7 mVDC or greater than +18.0 VDC.
This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter: Variable Attenuator Driver scaled analog output value.
Associated parameter: 2 possible values 0x00050000 = DAC output was set to +5.0 VDC out
0x000A0000 = DAC output was set to +10.0 VDC out.
FAIL CRITERIA : POST: This fault transitions into a failure immediately.
CM: A failure is declared if the Variable Attenuator Driver scaled analog value exceeds its limits for four consecutive readings.
RECOVERY CRIT. : POST: This failure is not explicitly cleared.
CM: The Variable Attenuator Driver transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.

<HGA HPA> Front Panel Test Switch Stuck (04 2 17)
DESCRIPTION : A fault is declared if the Front Panel Test Switch is stuck in the depressed state. The switch is considered stuck if it is detected as depressed for the entire duration of PAST, including the 30 second display of the PAST results. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : A failure is declared if (after the 30 second display of PAST results) the Front Panel Test Switch is closed for 5 consecutive readings of the discrete.
RECOVERY CRIT. : The failure transitions to not failed if the Front Panel Test switch is in the open position for 5 consecutive readings of the discrete.

<HGA HPA> Watchdog Timeout Fail (04 2 98)
DESCRIPTION : When the HPA receives a hardware reset, the discrete input WDO (WatchDog Output) is tested. If the WDO discrete is TRUE, a Watchdog timeout fault is recorded. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : For Packages prior to E1.0, this failure is not explicitly cleared. For Package E1.0 and later software, this failure is cleared immediately.

<HGA HPA> Driver Gnd Fail (04 2 19)
DESCRIPTION : During CM, Driver Gnd scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Driver Gnd scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Driver Gnd scaled analog value is less than -1.0 VDC or greater than +1.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Driver Gnd transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This fault is raised after the ensuing processor reset.

<HGA HPA> Driver Test - Mux (04 2 9C/1C)
DESCRIPTION : The Analog Multiplexer Status is a partially decoded version of the Analog Multiplexer Channel Latch output. During POST/PAST, the Analog Multiplexer Latch address bits are sequentially toggled. A fault is recorded if the Analog Multiplexer Status' bits do not match the Analog Multiplexer Latch bits. This failure code shall only be applicable to the 20W and 40W HPAs.
During CM, the Analog Multiplexer Status bits shall match those of the most recent Analog Multiplexer Channel Latch.
PARAMETERS : Parameter during CM: Analog Multiplexer Status bits, Analog Multiplexer bits.
Parameter during PP: Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input word. Lower 16 bits contain the hw/sw port discrete input word.
Assoc. parameter during PP: Mux port discrete input word.
FAIL CRITERIA : POST/PAST:
This fault transitions into a failure immediately.

CM:
This fault transitions into a failure after four consecutive mismatches.
RECOVERY CRIT. : POST/PAST:
This failure is not explicitly cleared.
CM:
This failure shall clear after four consecutive correct matches.

<HGA HPA> Driver Test - Green LED (04 2 9D)
DESCRIPTION : During POST/PAST the Green LED is turned on and off with a 2.0 +/- 1 Hz frequency, with the ratio of on-time to off-time equal to .5 +/- .25. In the 40W HPA (for all software packages prior to as well as including D2.0), the discrete loop-back is read, and a failure is declared if the Green LED Driver discrete value does not equal the loopback value. For all software packages subsequent to D2.0 in the 40W HPA, and for all software versions of the 20W HPA, this test is not implemented. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter: Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input w=rd. =ower 16 bits contain the hw/sw port discrete input word.
Assoc. parameter: Mux port discrete input word.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The Green LED indicator on the front of the HPA is tested by turning on and off. No results are recorded by the HPA, therefore operator observation is required to detect an indicator failure.

<HGA HPA> Driver Test - Red LED (04 2 9E)
DESCRIPTION : During POST/PAST, the Red LED is turned on and off with a 2.0 +/- 1 Hz frequency, with the ratio of on-time to off-time equal to .5 +/- .25. In the 40W HPA (for all software packages prior to as well as including D2.0), the discrete loop-back is read, and a failure is declared if the Red LED Driver discrete value does not equal the loop-back value.
For all software packages subsequent to D2.0 in the 40W HPA, and for all software versions of the 20W HPA, this test is not implemented. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter: Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input word. Lower 16 bits contain the hw/sw port discrete input word.
Assoc. parameter: Mux port discrete input word.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The Red LED indicator on the front of the HPA is tested by turning on and off. No results are recorded by the HPA, therefore operator observation is required to detect an indicator failure.

<HGA HPA> Driver Test - Mute Atten (04 2 A0)
DESCRIPTION : During POST/PAST, the discrete loop-back is read, and a failure is declared if the Mute Attenuator Driver discrete value does not equal the loop-back value. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Failure Parameter: Two types of inputs:
1) Concatenated Top Mute Discrete Input Word and the Starboard Mute Discrete Input Word. Upper 16 bits contain the Starboard Mute Discrete Input word. Lower 16 bits contain the top Mute Discrete Input Word.
2) Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input word. Lower 16 bits contain the hw/sw port discrete input word.
Associated failure parameter: Two types of inputs:
1) Values used to distinguish types of mute test. Possible values are 0-3, 5-7. Mute test 4 can be ignored.
2) Mux port discrete input word.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> Driver Test - Ser Data Concatenate (04 2 A2)
DESCRIPTION : During POST/PAST, the discrete loop-back is read, and a failure is declared if the Serial Data Concatenate discrete value does not equal the loop-back value. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter: Concatenated HPACPU and Arinc429 discrete input words. Upper 16 bits contain the arinc port discrete input word. Lower 16 bits contain the hw/sw port discrete input word.
Assoc. parameter: Mux port discrete input word.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> Mute Input Test (04 2 A5)
DESCRIPTION : During POST/PAST, the BSU Mute Buffers is tested by writing the INPUTS and verifying the OUTPUTS. During these tests the Variable Attenuator is set to maximum attenuation. The software shall set the inputs ("Mute test data bit 1" and "Mute test data bit 2") low while the buffers are not being tested so that the buffers will receive BSU mute data. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS :
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> CPU Device Test (04 2 A6)
DESCRIPTION : The CPU is tested by executing selected instruction sets, which shall exercise the internal pathways of the INTEL 80C186 device. The outputs is compared to predefined results, and if in error, a fault shall exist. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> Actual Power Calibration (04 2 A7)
DESCRIPTION : The criteria for valid calibration data is as follows:
1. The CRC for the calibration data must be valid.
2. Actual Power 1 and Actual Power 2 tables must have at least 3 entries in each table.
3. The entries for Forward Power-volts and Forward Power-watts in the Actual Power 1 and Actual Power 2 tables shall increase monotonically, whereby each table data point is larger than the previous one.
4. Attenuator Cal table shall have at least 20 entries.
5. Attenuator Cal table shall increase monotonically.
If upon hardware reset the Actual Power calibration tables are found to be invalid, the default calibration tables is used and a fault declared. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Parameter: 3 possible values.
1 - Fault related to Power Table 1
2 - Fault related to Power Table 2
3 - Fault related to Attenuator Table
Associated Parameters: 3 possible values
0 - Used in conjunction with failure parameter of 1 (calibrated with different software, version failure).
- used in conjunction with failure parameter of 3 (There has to be > 20 entries in the attenuator table).
11 - Used in conjunction with failure parameter of 1 (Values are not monotonically increasing in Power Table 1).
- used in conjunction with Failure parameter of 2 (Values are not monotonically increasing in Power Table 2).
12 - Used in conjunction with failure parameter of 1 (there has to be >= 3 entries in Power Table 1).
- Used in conjunction with Failure parameter of 2 (there has to be >= 3 entries in power Table 2).
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : None

<HGA HPA> Validation Of Upload (04 2 A8)
DESCRIPTION : The following items is validated when new application software is loaded:
1. The first two bytes of each LRU/SRU header record shall indicate a valid record type for the record position in the data sequence.
2. The company name in the LRU header record is HONEYWELL/RACAL.
3. The LRU name and base part number shall match the current LRU specification.
4. The LRU Hardware/Software Compatibility strap, as read by the processor, shall match one of the Hardware/Software Compatibility straps contained in the list in the LRU Header record of the software upload file.
5. The SRU name is valid for the named LRU.
6. The start address within an LRU/SRU Record shall represent a valid target storage address of the Program Store.
A fault is declared, and the HPA transitioned into Standby mode, if the Upload does not validate. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The Validation of Upload test occurs only at the time of an upload of application software. The invalid code is rejected and the HPA transitioned into standby mode. When the ADL/PDL link is cleared, the HPA will attempt to run the application software residing in flash memory if application code is present.

<HGA HPA> Mute Atten P Out Of Limits (04 2 29)
DESCRIPTION : The Mute Attenuator voltage fault limits is dependent upon whether or not muting is selected. A failure is registered if the Mute Attenuator voltage is outside of those limits for four consecutive readings. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Mute Atten P scaled analog voltage.
FAIL CRITERIA : Muted state limit:
Mute Atten P voltage of >= 5.0 VDC.
Not muted state limit:
Mute Atten P voltage <= -5.0 VDC.
RECOVERY CRIT. : When Mute Atten P voltage returns to within normal limits dependent upon the Mute discrete state for four consecutive reads.
REMARK : None

<HGA HPA> Code VPP Out Of Limits (04 2 2A)
DESCRIPTION : The Code VPP voltage fault limits is dependent upon the state of the ADL/PDL Link. A failure is registered if the Code VPP voltage is outside of those limits for four consecutive readings. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Code VPP scaled analog voltage
FAIL CRITERIA : Active state limit:
Code VPP voltage of less than 11.5 VDC or greater than 12.7 VDC.
Inactive state limit:
Code VPP voltage of less than -2.0 VDC or greater than 9.0 VDC.
RECOVERY CRIT. : When Code VPP voltage returns to within normal limits (dependent upon the ADL/PDL Link state) for four consecutive reads.
REMARK : None

<HGA HPA> Maint Log VPP Out Of Limits (04 2 2B)
DESCRIPTION : A failure is registered if the Maint Log VPP voltage is outside of its limits for four consecutive readings. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Maint Log VPP scaled analog voltage.
FAIL CRITERIA : Maint Log VPP voltage of less than 11.5 VDC or greater than 12.7 VDC.
RECOVERY CRIT. : When Maint Log VPP voltage returns to within normal limits for four consecutive reads.
REMARK : None

<HGA HPA> Cal Mem VPP Out Of Limits (04 2 2C)
DESCRIPTION : A fault is registered if the Cal Mem VPP voltage is outside its specified limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Cal Mem VPP scaled analog voltage.
FAIL CRITERIA : A failure is declared if the Cal Mem VPP voltage of less than -2.0 VDC or greater than +12.7 VDC for four consecutive readings.
RECOVERY CRIT. : When Cal Mem VPP voltage returns to within normal limits (dependent upon the Cal Mem Enable discrete) state for four consecutive reads.
REMARK : None

<HGA HPA> ADC Ref Out Of Limits (04 2 AD/2D)
DESCRIPTION : ADC Ref scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : ADC Ref scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the ADC Ref scaled analog value is less than +4.5 VDC or greater than +5.5 VDC for four consecutive readings.
RECOVERY CRIT. : The ADC Ref transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Power LO Out Of Limits (04 2 2E)
DESCRIPTION : During CM, Power LO scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Power LO scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Power LO scaled analog value is less than -1.0 VDC or greater than +1.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Power LO transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> PSU Temp LO Out Of Limits (04 2 2F)
DESCRIPTION : During CM, PSU Temp LO scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU Temp LO scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the PSU Temp LO scaled analog value is less than -1.0 VDC or greater than +1.0 VDC for four consecutive readings.
RECOVERY CRIT. : The PSU Temp LO transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Amps LO Out Of Limits (04 2 30)
DESCRIPTION : During CM, Amps LO scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Amps LO scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Amps LO scaled analog value is less than -1.0 VDC or greater than +1.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Amps LO transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Software Fault (04 2 31)
DESCRIPTION : A software fault is activated when a divide-by-zero or overflow error occurs in the floating point operations. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : FFFFFFFFh for overflow error; 0 for divide by zero error.
FAIL CRITERIA : This fault transitions into a failure immediately.
RECOVERY CRIT. : For Packages prior to D2.1, this failure is not explicitly cleared. For Packages D2.1and later, this failure is cleared immediately.
REMARK : This fault is raised after the ensuing processor reset.

<HGA HPA> Discrete Output Test - Fan (04 2 B3/33)
DESCRIPTION : During POST/PAST, the discrete loop-back is read, and a failure is declared if the Fan discrete value does not equal the loop-back value.
During CM, the discrete loop-back is read, and a failure is declared if the Fan discrete value does not equal the loop-back value.
This failure code shall only be applicable to the 40W HPA.
PARAMETERS : None.
FAIL CRITERIA : POST/PAST:
This fault transitions into a failure immediately.
CM:
This fault transitions into a failure after four consecutive mismatches.
RECOVERY CRIT. : POST/PAST:
This failure is not explicitly cleared.
CM:
This failure shall clear after four consecutive correct matches.
REMARK : None

<HGA HPA> RS-422 Internal Loopback Fail (04 2 B4)
DESCRIPTION : This fault shall only be applicable to the 20W HPA (with IGA beam steering capabilities).
During POST/PAST, the 82510 asynchronous serial controller is placed into internal loopback mode. A single character is transmitted and subsequently looped back to the receive port, and the received and transmitted characters is compared; this is done four times. All four tests must fail for this fault to be declared.
PARAMETERS : Parameter: Transmitted Loopback character.
Associated parameter: Received Loopback character.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : Declaration of this failure means that the 20W Honeywell HPA is not able to control an HPA-beam-steered IGA; however, this is only significant if such an IGA is installed. Rather than requiring the class and functional resource indictment of this failure to be configuration-dependent, the class is fixed at 3, no resource is indicted, and failure 1A 0 01 (Top/Port HGA/IGA Maintenance Word Fail, which will subsequently trigger as well, and which is configuration dependent and is Class 1 and does indict [hga_subsys] if another antenna subsystem is installed) is depended upon to bring this condition to a class 1 level of awareness and to cause functional resource-dependent reconfiguration to take place as necessary. If this occurs, the existence of failure 04 2 B4 will point to the HPA as a (if not the) cause of the Maintenance Word Fail condition.

<HGA HPA> IGA LNA/DIP On/Off Discrete Loopback Fail (04 2 35)
DESCRIPTION : This fault shall only be applicable to the 20W HPA (with IGA beam steering capabilities).
During CM, the loopback of the LNA/DIP on/off discrete output is compared with the commanded value. A fault is declared if the loopback logic state does not match the commanded state.
PARAMETERS : LNA/DIP command wrap around discrete; commanded value.
FAIL CRITERIA : For Packages prior to and not including D2.1, this fault transitions to a failure after four consecutive mismatches. For Package D2.1 and later software, This fault transitions to a failure after twelve consecutive mismatches.
RECOVERY CRIT. : For Packages prior to and not including D2.1, this failure shall clear after four consecutive matches. For Package D2.1 and later software, This failure shall clear immediately after one match.
REMARK : This test does not need to be performed during POST/PAST because of the system-wide functional test, which toggles the LNA/DIP control in order to check whether the receive noise floor rises when the LNA is turned on.

<HGA HPA> I2C Interface Failure (04 2 C0)
DESCRIPTION : During PP, the control processor fails to communicate with the backplane unit configuration or control processor discrete input devices on the I2C bus. This failure code shall only be applicable to the 60W HPA.

PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared
REMARKS : The 60W HPA cannot transmit any words but does illuminate its red (fail) LED while this failure is active. This failure cannot be transferred to the SDU, although the Kernel maintenance and data loader interfaces are activated. This failure is also not recorded in the HPA failure log and can only be observed via the Kernel maintenance interface.
The SDU will raise a bus inactive failure (5C 0 01).

<HGA HPA> RAM Failure (04 2 C1/41)
DESCRIPTION : The CRC check of the application image in RAM fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : Failure parameter:
CM: None.
PP: Address of faulty memory word.
Associated parameter:
CM: None.
PP: Number of failed attempts.
FAIL CRITERIA : This fault transitions to a failure after a retry of the CRC check also fails.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : The 60W HPA will set bit 16 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active.
For the PP case only, this failure cannot be transferred to the SDU, although the Kernel maintenance and data loader interfaces are activated.
The SDU will raise failure (04 0 0E) while bit 16 is set.

<HGA HPA> Kernel Code Error (04 2 C2)
DESCRIPTION : During PP, the CRC check of the Kernel code fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : The 60W HPA will set bit 17 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. This failure cannot be transferred to the SDU, although the Kernel maintenance and data loader interfaces are activated.
The SDU will raise failure (04 0 0F) while bit 17 is set.

<HGA HPA> Application Code Error (04 2 C3)
DESCRIPTION : During PP, the CRC check of the Application code fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : The 60W HPA will set bit 17 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. This failure cannot be transferred to the SDU, although the Kernel maintenance and data loader interfaces are activated.
The SDU will raise failure (04 0 0F) while bit 17 is set.

<HGA HPA> Configuration Error (04 2 C4)
DESCRIPTION : During PP, the hardware/software compatibility check of the Kernel or Application code fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : 0 = Kernel / hardware incompatibility
1 = Application / hardware incompatibility
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.

REMARKS : The 60W HPA will set bit 17 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. This failure cannot be transferred to the SDU, although the Kernel maintenance and data loader interfaces are activated. The SDU will raise failure (04 0 0F) while bit 17 is set.

<HGA HPA> SDU Bus Interface Failure (04 2 C5)
DESCRIPTION : During PP, the loopback test of the SDU input/output fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : The 60W HPA cannot transmit any words, therefore, this failure cannot be transferred to the SDU, but its red (fail) LED is illuminated and the Kernel maintenance and data loader interfaces are activated. The SDU will raise a bus inactive failure (5C 0 01).

<HGA HPA> ADL Bus Interface Failure (04 2 C6)
DESCRIPTION : During PP, the loopback test of the ADL input/output fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : None

<HGA HPA> PDL Bus Interface Failure (04 2 C7)
DESCRIPTION : During PP, the loopback test of the PDL input/output fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : None

<HGA HPA> Maintenance DUART Failure (04 2 C8)
DESCRIPTION : During PP, the loopback test of the maintenance port fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 loopback tests fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : The 60W HPA maintenance interface will not be functional.

<HGA HPA> Discrete Output Failure (04 2 C9/49)
DESCRIPTION : The control processor receives no response from the discrete outputs device. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 communication attempts fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : None

<HGA HPA> Control Processor Temp Sensor Failure (04 2 CA/4A)
DESCRIPTION : The control processor receives no response from the control processor board temperature sensor. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 communication attempts fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : If both the CP and BP temp sensors are non-responsive, the 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The Kernel maintenance and data loader interfaces are activated otherwise the application software is inactive. The SDU will raise failure (04 0 0C) while SSM=FW and no DISCRETES bits set. If only the CP temp sensor is non-responsive, the BP temp sensor is used for temp monitoring.

<HGA HPA> Board Config/Rev Failure (04 2 CB)
DESCRIPTION : During PP, the control processor receives no response from the board config/rev device. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 communication attempts fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : If the software is sensitive to board config/rev, the 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The Kernel maintenance and data loader interfaces are activated, otherwise the application software is inactive. The SDU will raise failure (04 0 0C) while SSM=FW and no DISCRETES bits set.

<HGA HPA> I2C Interface Failure (04 2 4C)
DESCRIPTION : During CM, the control processor fails to communicate with the power amplifier (PA), discrete output devices and temperature sensors on the I2C bus. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after two attempts to reset the I2C bus.
RECOVERY CRIT. : This failure is never explicitly cleared
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The application software effectively becomes inactive since the CP cannot control the PA. The SDU will raise failure (04 0 0C) while SSM=FW and no DISCRETES bits set.

<HGA HPA> ROM Failure (04 2 4D)
DESCRIPTION : During CM, the CRC check of the configuration information stored in EEPROM or Flash fails. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after a retry of the CRC check also fails.
RECOVERY CRIT. : This failure is never explicitly cleared
REMARKS : The 60W HPA will set bit 17 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The SDU will raise failure (04 0 0F, while bit 17 is set.

DRIV: HPA RF Driver (SRU Code 3h)
<HGA HPA> Driver RF Output Fail (04 3 01)
DESCRIPTION : During CM, Driver Pwr HI scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Driver Pwr HI scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Driver Pwr HI scaled analog value is less than -1.0 VDC or greater than +6.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Driver Pwr HI transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Driver Temp Sensor Fail (04 3 02)
DESCRIPTION : This fault is declared if (during CM) the reported Driver temperature is either less than -90 degrees Celsius or greater than +210 degrees Celsius. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Driver temperature sensor scaled analog voltage.
FAIL CRITERIA : Driver temperature sensor scaled analog output value is either less than -90 degrees Celsius or greater than +210 degrees Celsius for four consecutive readings.
RECOVERY CRIT. : Driver temperature sensor scaled analog output value is greater than or equal to -90 degrees Celsius and less than or equal to +210 degrees Celsius for four consecutive readings.
REMARK : It is assumed that the Driver temperature sensor is faulty if the reported Driver temperature is either less than -90 degrees Celsius or exceeds +210 degrees Celsius. The HPA Carriers, the HPA Bias, and the Variable Attenuator is restored to normal operation, and a temperature of +25 degrees Celsius reported while this fault is active.

<HGA HPA> Driver Over Temp Shutdown (04 3 03)
DESCRIPTION : During CM (for all software packages prior to as well as including D2.0), the Driver temperature is tested four times per second, and fault is declared if it equals or exceeds the maximum value of +130 degrees Celsius; for all software packages subsequent to D2.0, the maximum value threshold is increased from +130 to +133 degrees Celsius. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Driver temperature sensor scaled analog voltage, shutdown temperature limit.
FAIL CRITERIA : A failure is declared if the Driver temperature sensor output scaled analog value is greater than or equal to the specified fault threshold for four consecutive readings.
RECOVERY CRIT. : The failure is cleared (by all software packages prior to as well as including D2.0) if after four consecutive readings the Driver temperature sensor scaled analog output is less than +130 degrees Celsius; for all software packages subsequent to D2.0, the temperature threshold is decreased from +130 to +125 degrees Celsius.
REMARK : The HPA shall set bit 13 and indicate Failure Warning in its Maintenance words while this failure is active. The HPA Carriers is set to OFF, the HPA Bias voltage is set to OFF, and the Variable Attenuator is set to maximum while this failure is active.

<HGA HPA> Driver VCC Fail (04 3 04)
DESCRIPTION : During CM, Driver VCC scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Driver VCC scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Driver VCC scaled analog value is less than 50 percent of the PSU +15 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Driver VCC transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

PWR1: HPA RF Power Amplifier (1) (SRU Code 5h)
<HGA HPA> Amp 1 RF Balance Fail (04 5 01)
DESCRIPTION : During CM, the Amp1 RF Balance Error scaled analog value is faulted if it exceeds its limits. This failure shall only be raised when a single RF carrier is operating. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Amp1 RF Balance Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Amp1 RF Balance Error scaled analog value is greater than +3.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Amp1 RF Balance Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : The applicability of this failure is limited to single-carrier operation since this failure has no definitive meaning in the multi-carrier case. The determination as to whether the system is operating in single-carrier or multi-carrier mode is made by examining the Peak-to-Average Power Ratio contained in the three most recent HPA Control Words. When the lowest reading of the three is equal to one, the RF Balance is checked for the error condition; for all other readings, the RF Balance is not examined.

<HGA HPA> Amp 1 VCC Fail (04 5 02)
DESCRIPTION : During CM, Amp1 VCC Error scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Amp1 VCC Error scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Amp1 VCC Error scaled analog value is less than 75 percent of the PSU +28 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Amp1 VCC Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

<HGA HPA> Spare (04 5 03)
PWR2: HPA RF Power Amplifier (2) (SRU Code 6h)
Same as for PWR1, except substitute Amp2 for Amp1. This failure code is only reported for HPAs with a hardware/software strap setting of 00h.

PWR3: HPA RF Power Amplifier (3) (SRU Code 7h)
Same as for PWR1, except substitute Amp3 for Amp1. This failure code is only reported for HPAs with a hardware/software strap setting of 00h; it is reported to the SDU in lieu of failure code 04 (or 07)/9/xx for HPAs having a hardware/software strap setting of 02h or greater, although the HPA will record internally the correct failure code for the hardware present.

HPA RF Power Combiner/Detector (SRU Code 8h)
<HGA HPA> Forward Output Power Det 1 Fail (04 8 01)
DESCRIPTION : During CM, Range 1 Forward Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Range 1 Forward Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Range 1 Forward Power detector scaled analog value is less than −2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Range 1 Forward detector transitions to not failed if the scaled analog value is greater than or equal to −2.0 VDC for four consecutive readings.
REMARK : None

<HGA HPA> Forward Output Power Det 2 Fail (04 8 02)
DESCRIPTION : During CM, Range 2 Forward Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Range 2 Forward Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Range 2 Forward Power detector scaled analog value is less than −2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Range 2 Forward detector transitions to not failed if the scaled analog value is greater than or equal to −2.0 VDC for four consecutive readings.
REMARK : None

<HGA HPA> Forward Output Power Compare Fail (04 8 03)
DESCRIPTION : During CM, a fault is declared if the forward powers detected by the two sensors do not agree to within 10 dB. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into a failure after four consecutive miscompares of the two forward power sensors.
RECOVERY CRIT. : This failure transitions to not failed if the two forward power sensors compare successfully for four consecutive readings.
REMARK : These two sensors are used to independently measure two different output power ranges, and are not compared in any other way than for this detection of a gross failure of one sensor.

<HGA HPA> Reflected Output Power Det Fail (04 8 04)
DESCRIPTION : During CM, Reflected Output Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Reflected Output Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Reflected Output Power detector scaled analog value is less than −2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Reflected Output Power detector transitions to not failed if the scaled analog value is greater than or equal to −2.0 VDC for four consecutive readings.
REMARK : None

<HGA HPA> Combiner Temp Sensor Fail (04 8 05)
DESCRIPTION : This fault is declared if (during CM) the reported Combiner temperature is either less than −90 degrees Celsius or greater than +210 degrees Celsius. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Combiner temperature sensor scaled analog voltage.
FAIL CRITERIA : Combiner temperature sensor scaled analog output value is either less than −90 degrees Celsius or greater than +210 degrees Celsius for four consecutive readings.
RECOVERY CRIT. : Combiner temperature sensor scaled analog output value is greater than or equal to −90 degrees Celsius and less than or equal to +210 degrees Celsius for four consecutive readings.

REMARK : It is assumed that the Combiner temperature sensor is faulty if the reported Driver temperature is either less than -90 degrees Celsius or exceeds +210 degrees Celsius. The
HPA Carriers, the HPA Bias, and the Variable Attenuator is restored to normal operation, and a temperature of +25 degrees Celsius reported while this fault is active.

HPA Final RF Power Amplifier (SRU Code 9h)
<HGA HPA> Final Amp 1 RF Balance Fail (04 9 01)
DESCRIPTION : During CM, the Final Amp1 RF Balance Error scaled analog value is faulted if it exceeds its limits while only a single RF carrier is in use; this fault is not raised if
multiple RF carriers are operating. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Final Amp1 RF Balance Error scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp1 RF Balance Error scaled analog value is greater than +3.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Final Amp1 RF Balance Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This failure will occur only in HPAs using Package D2.0 software (or beyond) in conjunction with a hardware/software compatibility strap setting of 02h (or greater). In HPAs having a hardware/software compatibility strap setting of 02h or greater for which the resident
software package is any one prior to D2.0, the HPA shall report failure code 04 7 01 to the SDU (although failure code 04 9 01 is recorded by the HPA in its internal failure log). The failure applicability is limited to the single-RF carrier case since it has no definitive meaning in the multi-carrier case. The determination as to whether the system is operating in single-carrier or multi-carrier mode is made by examining the Peak-to-Average Power Ratio contained in the three most recent HPA Control Words. When the lowest reading of the three is equal to one, the RF Balance is checked for the error condition; for all other readings, the RF Balance is not examined.

<HGA HPA> Final Amp 1 VCC Fail (04 9 02)
DESCRIPTION : During CM, the Final Amp1 VCC Error scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Final Amp1 VCC Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp1 VCC Error scaled analog value is less than 75 percent of the PSU +28 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Final Amp1 VCC Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This failure will occur only in HPAs using Package D2.0 software (or beyond) in conjunction with a hardware/software compatibility strap setting of 02h (or greater). In HPAs having a hardware/software compatibility strap setting of 02h or greater for which the resident
software package is any one prior to D2.0, the HPA shall report failure code 04 7 02 to the SDU (although failure code 04 9 02 is recorded by the HPA in its internal failure log).

<HGA HPA> Final Amp 2 RF Balance Fail (04 9 04)
DESCRIPTION : During CM, the Final Amp2 RF Balance Error scaled analog value is faulted if it exceeds its limits while only a single RF carrier is in use; this fault is not raised if
multiple RF carriers are operating. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Final Amp2 RF Balance Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp2 RF Balance Error scaled analog value is greater than +3.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Final Amp2 RF Balance Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This failure will occur only in HPAs using Package D2.0 software (or beyond) in conjunction with a hardware/software compatibility strap setting of 02h (or greater). In HPAs having a hardware/software compatibility strap setting of 02h or greater for which the resident
software package is any one prior to D2.0, the HPA shall report failure code 04 7 01 to the SDU (although failure code 04 9 04 is recorded by the HPA in its internal failure log). The failure applicability is limited to the single RF carrier case since it has no definitive meaning in the multi-carrier case. The determination as to whether the system is operating in single-carrier or multi-carrier mode is made by examining the Peak-to-Average Power Ratio contained in the three most recent HPA Control Words. When the lowest

reading of the three is equal to one, the RF Balance is checked for the error condition; for all other readings, the RF Balance is not examined.

<HGA HPA> Final Amp 2 VCC Fail (04 9 05)
DESCRIPTION : During CM, the Final Amp2 VCC Error scaled analog value is faulted if it exceeds it limits. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Final Amp2 VCC Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp2 VCC Error scaled analog value is less than 75 percent of the PSU +28 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Final Amp2 VCC Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This failure will occur only in HPAs using Package D2.0 software (or beyond) in conjunction with a hardware/software compatibility strap setting of 02h (or greater). In HPAs having a hardware/software compatibility strap setting of 02h or greater for which the resident
software package is any one prior to D2.0, the HPA shall report failure code 04 7 02 to the SDU (although failure code 04 9 05 is recorded by the HPA in its internal failure log).

<HGA HPA> PA Unresponsive (04 9 C0/40)
DESCRIPTION : The control processor receives no response from the power amplifier (PA) module. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : Number of failed attempts.
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 communication attempts fail.
RECOVERY CRIT. : This failure is cleared when all devices on the I2C bus are responsive.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The Kernel maintenance and data loader interfaces are activated and the PA is reset.
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> Over Current Failure (04 9 42)
DESCRIPTION : The control processor receives an over current failure indication from the power amplifier (PA). This failure code shall only be applicable to the 60W HPA.
PARAMETERS : PA status word.
FAIL CRITERIA : This fault transitions to a failure after two consecutive PA status readings reporting over current failure.
RECOVERY CRIT. : This failure is cleared if the PA failure indication clears for at least 5 seconds.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The PA is reset.
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> Driver Amplifier DC Voltage Failure (04 9 43)
DESCRIPTION : The control processor receives a driver amplifier DC voltage failure indication from the power amplifier (PA). This failure code shall only be applicable to the 60W HPA.
PARAMETERS : PA status word.
FAIL CRITERIA : This fault transitions to a failure after two consecutive PA status readings reporting Driver Amplifier DC Voltage failure.
RECOVERY CRIT. : This failure is cleared if the PA failure indication clears for at least 5 seconds.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The PA is reset
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> Driver Amplifier Current Failure (04 9 44)
DESCRIPTION : The control processor receives a driver amplifier current failure indication from the power amplifier (PA). This failure code shall only be applicable to the 60W HPA.
PARAMETERS : PA status word.
FAIL CRITERIA : This fault transitions to a failure after two consectuive PA status readings reporting Driver Amplifier Current failure.
RECOVERY CRIT. : This failure is cleared if the PA failure indication clears for at least 5 seconds.

REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The PA is reset.
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> 12 VDC Failure (04 9 45)
DESCRIPTION : The control processor receives a 12 VDC failure indication from the power amplifier (PA). This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after two consecutive PA BITE discrete readings reporting 12 Vdc failure.
RECOVERY CRIT. : This failure is cleared if the PA failure indication clears for at least 5 seconds.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The PA is reset.
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> PA Mute Failure (04 9 46)
DESCRIPTION : The output power detector measures power greater than +24 dBm when the PA mute is asserted. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure if fault persists for 3 ms.
RECOVERY CRIT. : This failure is cleared when output power is less than or equal to +24 dBm while the PA mute is asserted for at least 8 ms.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active.
The SDU will raise failure (04 0 0C) per section 4.4.5.4.20.12 while SSM=FW and no DISCRETES bits set.

<HGA HPA> Over Temp Failure (04 9 47)
DESCRIPTION : The control processor receives an over temperature indication from the power amplifier (PA). This failure code shall only be applicable to the 60W HPA.
PARAMETERS : PA status word.
FAIL CRITERIA : This fault transitions to a failure if fault persists for two consecutive PA status reports.
RECOVERY CRIT. : This failure is cleared if the PA failure indication clears for at least two consecutive PA status reports.
REMARKS : The 60W HPA will set bit 13 in its Maintenance words, indicate Failure Warning in its Status and Maintenance words, report Maximum Available RMS Power = "8 dB less than 40W" in its Status words and illuminate its red (fail) LED while this failure is active. The PA is shut down.

<HGA HPA> PA Status Failure (04 9 48)
DESCRIPTION : The control processor receives no response from the I2C PA Status device. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after no response from PA status device in two out of three tests.
RECOVERY CRIT. : This failure is cleared if the PA status device responds to tests for at least 5 seconds.
REMARKS : The 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The PA is reset.

<HGA HPA> PA Temp Sensor Failure (04 9 49)
DESCRIPTION : The control processor receives no response from the I2C PA temperature sensor device. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure after no response from PA temperature sensor device in two out of three tests.
RECOVERY CRIT. : This failure is cleared if the PA temperature sensor device responds to tests for at least 5 seconds.
REMARKS : The PA is reset.

HPA Mother Board (SRU Code Ah)
<HGA HPA> Backplane Temp Sensor Failure (04 A 40)
DESCRIPTION : The control processor receives no response from the backplane (BP) temperature sensor. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 2 out of 3 communication attempts fail.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARKS : If both the CP and BP temp sensors are non-responsive, the 60W HPA will indicate Failure Warning in its Status and Maintenance words and illuminate its red (fail) LED while this failure is active. The Kernel maintenance and data loader interfaces are activated otherwise the application software is inactive. The SDU will raise failure (04 0 0C) while SSM=FW and no DISCRETES bits set.
If only the BP temp sensor is non-responsive, the CP temp sensor is used for temp monitoring.

<HGA HPA> RFAM: 20W HPA RF Amplifier Module (SRU Code Bh)
Over Temp Shutdown (04 B 01)
DESCRIPTION : During CM, the RFAM temperature is tested four times per second, and a fault is declared if it equals or exceeds the maximum value of +133 degrees Celsius. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : RFAM temperature sensor scaled analog voltage.
FAIL CRITERIA : A failure is declared if the RFAM temperature sensor output scaled analog value is greater than or equal to +133 degrees Celsius for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the RFAM temperature sensor scaled analog output is less than +125 degrees Celsius.
REMARK : The HPA shall set bit 13 and indicate Failure Warning in its Maintenance words while this failure is active. The HPA Carriers is set to OFF, the HPA Bias voltage is set to OFF, and the Variable Attenuator is set to maximum while this failure is active.

RFAM VCC Fail (04 B 02)
DESCRIPTION : During CM, RFAM VCC scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : RFAM VCC scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the RFAM VCC scaled analog value is less than 50 percent of the PSU +15 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The RFAM VCC failure transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

Amp 1 VCC Fail (04 B 03)
DESCRIPTION : During CM, Amp1 VCC Error scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Amp1 VCC Error scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Amp1 VCC Error scaled analog value is less than 75 percent of the PSU +28 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Amp1 VCC Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : None

Forward Output Power Det 1 Fail (04 B 04)
DESCRIPTION : During CM, Range 1 Forward Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Range 1 Forward Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Range 1 Forward Power detector scaled analog value is less than -2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Range 1 Forward detector transitions to not failed if the scaled analog value is greater than or equal to -2.0 VDC for four consecutive readings.
REMARK : None

Forward Output Power Det 2 Fail (04 B 05)
DESCRIPTION : During CM, Range 2 Forward Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Range 2 Forward Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Range 2 Forward Power detector scaled analog value is less than -2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Range 2 Forward detector transitions to not failed if the scaled analog value is greater than or equal to -2.0 VDC for four consecutive readings.
REMARK : None

Reflected Output Pwr Det Fail (04 B 06)
DESCRIPTION : During CM, Reflected Output Power detector scaled analog value is faulted if it exceeds its limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Reflected Output Power detector scaled analog voltage.
FAIL CRITERIA : The HPA shall declare a failure if the Reflected Output Power detector scaled analog value is less than -2.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Reflected Output Power detector transitions to not failed if the scaled analog value is greater than or equal to -2.0 VDC for four consecutive readings.
REMARK : None

Temp Sensor Fail (04 B 07)
DESCRIPTION : This fault is declared if (during CM) the reported RFAM temperature is either less than -90 degrees Celsius or greater than +210 degrees Celsius. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : RFAM temperature sensor scaled analog voltage.
FAIL CRITERIA : The RFAM temperature sensor scaled analog output value is either less than -90 degrees Celsius or greater than +210 degrees Celsius for four consecutive readings.
RECOVERY CRIT. : The RFAM temperature sensor scaled analog output value is greater than or equal to -90 degrees Celsius and less than or equal to +210 degrees Celsius for four consecutive readings.
REMARK : This sensor is located in the Driver portion of the RFAM; therefore, it is assumed that the RFAM temperature sensor is faulty if the reported Driver temperature is either less than -90 degrees Celsius or exceeds +210 degrees Celsius. The HPA Carriers, the HPA Bias, and the Variable Attenuator is restored to normal operation, and a temperature of +25 degrees Celsius reported while this fault is active.

<HGA HPA> Forward Output Power Compare Fail (04 B 08)
DESCRIPTION : During CM, a fault is declared if the forward powers detected by the two sensors do not agree to within 10 dB. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Forward power voltage 1; forward power voltage 2.
FAIL CRITERIA : This fault transitions into a failure after four consecutive miscompares of the two forward power sensors.
RECOVERY CRIT. : This failure transitions to not failed if the two forward power sensors compare successfully for four consecutive readings.
REMARK : These two sensors are used to independently measure two different output power ranges, and are not compared in any other way than for this detection of a gross failure of one sensor.

Amp 2 RF Balance Fail (04 B 09)
DESCRIPTION : During CM, the Final Amp2 RF Balance Error scaled analog value is faulted if it exceeds its limits while only a single RF carrier is in use; this fault is not raised if multiple RF carriers are operating. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Final Amp2 RF Balance Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp2 RF Balance Error scaled analog value is greater than +3.0 VDC for four consecutive readings.
RECOVERY CRIT. : The Final Amp2 RF Balance Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.

REMARK : This failure will occur only in HPAs using Package E1.0 software or beyond. The failure applicability is limited to the single RF carrier case since it has no definitive meaning in the multi-carrier case. The determination as to whether the system is operating in single-carrier or multi-carrier mode is made by examining the Peak-to-Average Power Ratio contained in the three most recent HPA Control Words. When the lowest reading of the three is equal to one, the RF Balance is checked for the error condition; for all other readings, the RF Balance is not examined.

Amp 2 VCC Fail (04 B 0A)
DESCRIPTION : During CM, the Final Amp2 VCC Error scaled analog value is faulted if it exceeds it limits. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : Final Amp2 VCC Error scaled analog value.
FAIL CRITERIA : The HPA shall declare a failure if the Final Amp2 VCC Error scaled analog value is less than 75 percent of the PSU +28 VDC scaled analog value for four consecutive readings.
RECOVERY CRIT. : The Final Amp2 VCC Error transitions to not failed if the scaled analog value is within its specified limits for four consecutive readings.
REMARK : This failure will occur only in HPAs using Package E1.0 software or beyond.

HGA HPA, Unknown SRU (SRU Code 0h)
<HGA HPA> Status Word (143) Update Rate Fail (04 0 01)
DESCRIPTION : This fault is declared when the number of HPA Status Words with no parity error received by the SDU in the last second is less than 1 or exceeds 15 for that HPA after completion of system-wide POST/PAST, and the associated bus is not inactive.
PARAMETERS : Number of HPA Status Words received with no parity error during the first second of the fault.
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT.: Immediately upon receipt of a fault cleared report (i.e. the correct number of words in a second), or the occurrence of an HGA HPA input bus fault.
REMARK : None

<HGA HPA> Status Word (143) Data Fail (04 0 02)
DESCRIPTION : This fault is declared when the last HPA Status Word with no parity error received by the SDU contains a field set to an unauthorized or undetermined value.
PARAMETERS : The offending status word.
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT. : As soon as an HPA Status Word is received with no error.
REMARK : Only the first error seen on one of the HPA Status Words received will be reported, subsequent errors, possibly affecting other data fields in the word, will not be reported unless at least one HPA Status Word was declared “correct.”

<HGA HPA> Maintenance Word (350) Update Rate Fail (04 0 03)
DESCRIPTION : This fault is declared when the number of HPA Maintenance Words with no parity error received by the SDU in the last second is less than 1 or exceeds 15 for that HPA after completion of system-wide POST/PAST, and the associated bus is not inactive.
PARAMETERS : Number of HPA Maintenance Words received with no parity error during the first second of the fault.
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT. : As soon as the HPA Maintenance Word is received with no parity errors in the correct rate range for one second, or upon the occurrence of an HGA HPA input bus fault.
REMARK : None
<HGA HPA> Maintenance Word (350) Data Fail (04 0 04)
DESCRIPTION : This fault is declared when the last HPA Maintenance Word with no parity error received by the SDU contains a field set to an unauthorized or undetermined value.
PARAMETERS : The offending maintenance word.
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with no error.
REMARK : The only error possibly detected in the HPA Maintenance Word is the SSM field set to NO COMPUTED DATA (according to ARINC 741 Note 30 : “should not be used”).

<HGA HPA> Self Test Misoperation (143) (04 0 87)
DESCRIPTION : This fault covers all possible POST/PAST misbehaviour related to HPA Functional Test. The POST/PAST fault is not declared if no ARINC words are being received from the HPA.
Also, the POST/PAST no response fault is not declared if the HPA is declaring the control bus input inactive.
PARAMETERS : For SDU-initiated POST/PAST:
01 : the HPA has not responded to functional test commanded for 30 seconds by the SDU (POST/PAST).
02 : the HPA has started functional test, but the SDU has not received an HPA self- test complete response within the 30 seconds accorded to external LRUs during system wide POST/PAST.
03 : HPA functional tests exceeded 15 seconds.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared
REMARK : Functional Test response checking is determined on the HPA Status Word's SSM field. The CM version of this fault is (5C 0 02).

<HGA HPA> RF Overdrive Error (04 0 08)
DESCRIPTION : Tested continuously at a rate of 4 times per second, a fault is declared if the 40W HPA output power “greater than 80 watt” limiting function is activated. This same fault is declared if the 20W HPA output power “greater than 40 watt” limiting function is activated. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Actual Power Out value.
FAIL CRITERIA : This fault transitions into a failure if it is not cleared after one second.
RECOVERY CRIT. : For the 40W HPA, this failure transitions to not failed if the power output is less than 80 watts for more than one second. For the 20W HPA, this failure transitions to not failed if the power output is less than 40 watts for more than one second.
REMARK : None

<HGA HPA> RF Supply Current Fail (04 0 09)
DESCRIPTION : This fault is based on a measure of the LRU primary (i.e., 115 VAC or +28 VDC) input power consumption for the 40W HPA; it is based on a measure of the current drawn by the RF Amplifier Module from the +25.5 VDC supply in the 20W HPA. For both HPAs, during CM, a fault is declared if the Amps HI scaled analog value exceeds its limits, where the limits are dependent on the operational status of the HPA. This fault is neither recorded nor annunciated by either HPA if it is detected while the respective LRU's PSU Power Fail Warning (PFW) signal is asserted. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : Amps HI scaled analog voltage, RF carrier-on bit.
FAIL CRITERIA : This fault transitions into a failure if the Amps HI scaled analog value exceeds its limits for four consecutive readings. Those limits are as follows:
Operational: 40W HPA: Less than -15 Watts or greater than +500 Watts.
20W HPA: Greater than 8.0 Amps DC.
Idle: 40W HPA: Less than -20 Watts or greater than +190 Watts.
20W HPA: Not applicable.
Standby: 40W HPA: Less than -100 Watts or greater than 70 Watts.
20W HPA: Greater than +0.7 Amps DC.
RECOVERY CRIT. : This failure transitions to not failed if the Amps HI scaled analog value is within specified limits for four consecutive readings.
REMARK : An offset of 100 is used by the 40W HPA software in scaling the LRU primary input power value, which accounts for the negative power limits specified above. An offset of 0.5 is used by the 20W HPA software in scaling the current drawn by the RFAM.
Operational is defined as carriers-on and RF output power greater than 1 Watt (for both HPAs). Idle is defined as carriers-on and RF output power less than or equal to 1 Watt (40W HPA only). Standby is defined as carriers-off (for both HPAs).

<HGA HPA> Over Temperature (Combiner/Detector) Shutdown (04 0 0A)
DESCRIPTION : During CM (for all software packages prior to as well as including D2.0), the Combiner/Detector temperature is tested four times per second, and shall declare a fault if it equals or

exceeds +130 degrees Celsius; for all software packages subsequent to D2.0, the maximum value threshold is increased from +130 to +133 degrees Celsius.
This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Combiner/Detector temperature sensor output scaled analog voltage.
FAIL CRITERIA : A failure is declared if the Combiner/Detector temperature sensor output scaled analog value is greater than or equal to the specified fault threshold for four consecutive readings.
RECOVERY CRIT. : The failure is cleared (by all software packages prior to as well as including D2.0) if after four consecutive readings the Combiner/Detector temperature sensor scaled analog output is less than +130 degrees Celsius; for all software packages subsequent to D2.0, the temperature threshold is decreased from +130 to +125 degrees Celsius.
REMARK : The HPA shall set bit 13 and indicate Failure Warning in its Maintenance words while this failure is active. The HPA Carriers is set to OFF, the HPA Bias voltage is set to OFF, and the Variable Attenuator is set to maximum while this failure is active. Prior to hardware modification D to the 40W HPA, the sensor for this fault resided on the Combiner module. With implementation of hardware modification D, this sensor was relocated to the 40W HPA's Detector module. Since the sensor's function remains the same regardless of location, this fault was renamed (in conjunction with introduction of hardware modification D to the 40W HPA) so as to cover its arising from either site.

<HGA HPA> No Response To Carrier Command (143) (04 0 0B)
DESCRIPTION : This fault is declared when the SDU has commanded the HPA to a new carrier on/off state (via the HPA command word) for at least one second, but the HPA has not yet indicated its response to the new commanded state in the HPA status word.
PARAMETERS : 01 : no response to carrier ON.
02 : no response to carrier OFF.
FAIL CRITERIA : This fault transitions into failure if it is not cleared after one second.
RECOVERY CRIT. : As soon as an HPA Status Word is received with the correct carrier state.
REMARK : None

<HGA HPA> Failure Warning With No Discretes Set (350) (04 0 0C)
DESCRIPTION : The last HPA Maintenance Word received indicates a Failure Warning, but none of discretes #11, #12, #13, #15 #16 or #17 are set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after the receipt of four consecutive maintenance words indicating Failure Warning but with none of discretes #11, #12, #13, #15 #16 nor #17 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with either no Failure Warning or one of the above discretes is set.
REMARK : None

<HGA HPA> 429 Maintenance Word PSU Fail (350) (04 0 0D)
DESCRIPTION : This fault is declared when the last HPA Maintenance Word received had bit #11 set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after the receipt of four consecutive maintenance words with bit 11 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with the above discrete cleared.
REMARK : None

<HGA HPA> 429 Maintenance Word Internal RAM Fail (350) (04 0 0E)
DESCRIPTION : This fault is declared when the last HPA Maintenance Word received had bit #16 set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after the receipt of four consecutive maintenance words with bit 16 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with the above discrete cleared.
REMARK : None

<HGA HPA> 429 Maintenance Word Internal ROM Fail (350) (04 0 0F)
DESCRIPTION : This fault is declared when the last HPA Maintenance Word received had bit #17 set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure after the receipt of four consecutive maintenance words with bit 17 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with the above discrete cleared.
REMARK : None

<HGA HPA> Class C HPA Maximum Available Power Fail (04 0 10)
DESCRIPTION : This fault is declared when calibration of the HGA Class C HPA (i.e., projected maximum output power capability as specified in Section 3.3.1.3.2.8.4, in terms of the
Actual Power Output reported by the HPA plus a factor corresponding to the current HPA backoff) has determined that the maximum output power capability projected for the Class C HGA HPA (i.e., at 0 dB backoff) is outside of the range of 14 dBW to 21 dBW (approximately 25 to 126 watts).
PARAMETERS : Failure Param: A 1 shall indicate that the calibrated output power was calculated to be greater than the maximum value.
A 0 shall indicate that the calibrated output power was less than the minimum value.
Assoc Param: The projected maximum output power capability, in tenths of dBW.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : As soon as a calibration yields a maximum output power capability within the range of 14 to 21 dBW.
REMARK : None.

<HGA HPA> Self-Test Button Stuck (04 0 40)
DESCRIPTION : The self-test button is detected as being depressed for more than 10 seconds. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after 10 seconds of button press indication.
RECOVERY CRIT. : This failure is cleared if the button is released for at least 1 second.
REMARKS : None

LGA HPA (Level 1 Code 07h)
Same as for the <HGA HPA>

HSU #1 (Level 1 Code 08h)
This section, and all its subsections, are only applicable prior to SDU Part Number 7516118-XX130/-xx140. Although not documented for individual failures in the subsections that follow, any and all current failures for the HSU (i.e., failures having the HSU level 1 failure code) is considered to have recovered” when the SDU’s input bus from the HSU transitions from an inactive to an active state, with the SSM field of the label 270 status word indicating Functional Test.
Note: unlike other subsections of Section 4.4.5, the 6th level of the subsection numbers in the subsections that follow do not correlate directly to their Level 3 failure codes.

<HSU1> CPU (SRU Code 1h)
<HSU1> Access Level Development (08 1 FA)
DESCRIPTION :
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Access Level Production (08 1 FB)
DESCRIPTION :
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Access Level Production Fast Startup (08 1 FC)
DESCRIPTION :
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> SW Versions Inconsistency (08 1 FD)
DESCRIPTION : This fault is raised when one or more software items in the HSU have a different version number other than the expected one in the main application.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Environment Temperature At Power-Up Failure (08 1 7F)
DESCRIPTION : This fault is raised when the temperature in the HSU is less than -30 Celsius, and also when the temperature is greater than 95 Celsius.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Temperature Sensor Failure (08 1 91)
DESCRIPTION : This fault is raised if the sensor does not send valid data to the CPU within 500 ms.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Frame DSP (SRU Code 2h)
<HSU1> Frame DSP/CPU Interface Failure (08 2 95)
DESCRIPTION : This fault is raised when the HSU fails to write or read a block of the DSP memory through the IDMA interface.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> VFC DSP (SRU Code 3h)
<HSU1> VFC DSP/CPU Interface Failure (08 3 98)
DESCRIPTION : This fault is raised when the HSU fails to write or read a block of the DSP memory through the IDMA interface.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Turbo FPGA (SRU Code 4h)
<HSU1> Turbo FPGA Fail (08 4 86)
DESCRIPTION : This fault is raised when the HSU fails to load the Turbo FPGA at the end of its self-test.
PARAMETERS : 01: The Turbo FPGA code does not exist in the Flash.
02: The Turbo FPGA code is defective. The code's CRC does not match the stored CRC.
03: The interface between the CPU and the Turbo FPGA is defective.
04: The Turbo FPGA is defective.
FAIL CRITERIA :

RECOVERY CRIT. :
REMARK :

<HSU1> ISDN Transceiver (SRU Code 5h)
<HSU1> ISDN Transceiver Failure (08 5 87)
DESCRIPTION : This fault is raised when the HSU ISDN S/T interface transceiver Byte Register 5 fails the internal loop back.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CPU RAM (SRU Code 7h)
<HSU1> CPU RAM Failure (08 7 84)
DESCRIPTION : This fault is raised when the HSU fails its RAM data/address line test.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Converter EEPROM (SRU Code 8h)
<HSU1> EEPROM Failure (08 8 81)
DESCRIPTION : This fault is raised when the HSU reports that the CRC check of its EEPROM has failed.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Flash (SRU Code 9h)
<HSU1> Parameter Block Checksum Failure (08 9 82)
DESCRIPTION : This fault is raised when the HSU reports that the arithmetic checksum of its Parameter Block has failed.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CPU BIOS/Application CRC Failure (08 9 83)
DESCRIPTION : This fault is raised when the HSU reports that the CRC check of its BIOS/Application has failed.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Missing File In Flash (08 9 87)
DESCRIPTION : This fault is raised when the HSU reports that the list of files in Flash does not match the list of files in the main application.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Corrupted File In Flash/Incorrect CRC (08 9 88)
DESCRIPTION : This fault is raised when the HSU reports that the CRC in a file in the flash list does not match the stored CRC in the file header.
PARAMETERS :

FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Quad UART (SRU Code A)
<HSU1> External UART Failure (08 A 91)
DESCRIPTION : This fault is raised when a loopback test of the external UART in the HSU fail.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

PSPCB: <HSU1> Power Supply PCB (SRU Code C)
<HSU1> Power Failure (08 C 0B)
DESCRIPTION : This fault is raised when the HSU detects a loss of external power for more than 10 seconds.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1>/CDM Interface (SRU Code G)
<HSU1> CDM Interface Failure (08 G F2)
DESCRIPTION : This fault is raised when an error occurs on the interface between the HSU and the CDM, and the HSU CPU is unable to read valid data.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CDM Not Fitted (08 G FE)
DESCRIPTION : This fault is raised when the CDM is either not fitted or incorrectly inserted in the HSU.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Turbo Decoder RAM (SRU Code J)
<HSU1> Turbo Decoder RAM Failure (08 J 8A)
DESCRIPTION : This fault is raised when the interface between the turbo decoder FPGA and the RAM has failed, or when the contents of the RAM are corrupt.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Battery (SRU Code K)
<HSU1> Battery Check Failure (08 K 85)
DESCRIPTION : This fault is raised if the HSU battery voltage drops below 2.0 V.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Step Attenuator (SRU Code M)
<HSU1> Step Attenuator Failure (08 M B5)
DESCRIPTION : This fault is raised when the accuracy of the Rx attenuator and the two Tx attenuators is worse than the limit of ± 2 dB of their commanded settings during RF loopback, or when AestAvgHi is > its low threshold and when AestAvgHi is < its high threshold.

PARAMETERS : 01: Rx attenuator = 16 dB, Tx attenuator1 = 0 dB, Tx attenuator2 = 0 dB
02: Rx attenuator = 8 dB, Tx attenuator1 = 4 dB, Tx attenuator2 = 4 dB
03: Rx attenuator = 4 dB, Tx attenuator1 = 10 dB, Tx attenuator2 = 2 dB
04: Rx attenuator = 0 dB, Tx attenuator1 = 8 dB, Tx attenuator2 = 8 dB
05: Rx attenuator = 12 dB, Tx attenuator1 = 1 dB, Tx attenuator2 = 3 dB
06: Rx attenuator = 12 dB, Tx attenuator1 = 0.5 dB, Tx attenuator2 = 3.5 dB
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> RF (SRU Code N)
<HSU1> 1.LO Lock Detector Failure (08 N 81)
DESCRIPTION : This fault is raised when PLL 1 indicates lock detected when it has been forced not to lock.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 2.LO Lock Detector Failure (08 N 82)
DESCRIPTION : This fault is raised when PLL 2 indicates lock detected when it has been forced not to lock.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 3.LO Lock Detector Failure (08 N 83)
DESCRIPTION : This fault is raised when PLL 3 indicates lock detected when it has been forced not to lock.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 1.LO Min Frequency Test Failure (08 N 91)
DESCRIPTION : This fault is raised when PLL 1 does not lock at its minimum frequency specification.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 2.LO Min Frequency Test Failure (08 N 92)
DESCRIPTION : This fault is raised when PLL 2 does not lock at its minimum frequency specification.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 3.LO Min Frequency Test Failure (08 N 93)
DESCRIPTION : This fault is raised when PLL 3 does not lock at its minimum frequency specification.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 1.LO Max Frequency Test Failure (08 N A1)
DESCRIPTION : This fault is raised when PLL 1 does not lock at its maximum frequency specification.
PARAMETERS :
FAIL CRITERIA :

RECOVERY CRIT. :
REMARK :

<HSU1> 2.LO Max Frequency Test Failure (08 N A2)
DESCRIPTION : This fault is raised when PLL 2 does not lock at its maximum frequency specification.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 3.LO Max Frequency Test Failure (08 N A3)
DESCRIPTION : This fault is raised when PLL 3 does not lock at its maximum frequency specification.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> ALC - Carrier Off Failure (08 N B0)
DESCRIPTION : This fault is raised when ALC_Level exceeds its BITE threshold, or when Power_Detected is HIGH.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> ALC - Carrier ON Failure (08 N B1)
DESCRIPTION : This fault is raised when ALC_Level < its low threshold, or when ALC_Level > its high threshold, and when Power_Detected* is HIGH.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> RF Loopback Failure (08 N B2)
DESCRIPTION : This fault is raised when the measured BER in a period of one second is = 10.2 %.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Average Amplitude Failure (08 N B3)
DESCRIPTION : This fault is raised when the average AGC_value = AGC0-100, and when AGC_value = AGC0+100 during RF loopback.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 16QAM SCPC Frame Sync Failure (08 N B4)
DESCRIPTION : This fault is raised when the Rx channel is not able to acquire frame sync during RF loopback
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Internal RX Coax Cable Failure (08 N BA)
DESCRIPTION : This fault is raised when Rx_BITE is HIGH during RF loopback.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Tx/Rx Channel Frequency Error (08 N BB)
DESCRIPTION : This fault is raised when the frequency error is = 20 Hz during RF loopback.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Carrier_ON/OFF Control Failure (08 N BC)
DESCRIPTION : This fault is raised when the time between the frame reports (Tfr) is < its threshold, and also when the ALC_Level is > than its threshold, and also when Pwr_Detected* = 0 when the Frm_Carrier_ON signal is in its “off” state during RF loopback.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : The HSU performs a set of three related tests of which this is one (see also 08 N BD and 08 N BE), to verify that no transmit power is measured when none is expected.

<HSU1> RF Loopback OFF Control Failure (08 N BD)
DESCRIPTION : This fault is raised when time between the frame reports (Tfr) is < its threshold, and also when the ALC_Level is > than its threshold, and also when Pwr_Detected* = 0 when the RF_Loopback signal is in its “off” state.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : The HSU performs a set of three related tests of which this is one (see also 08 N BC and 08 N BE), to verify that no transmit power is measured when none is expected.

<HSU1> TX_ON/OFF Control Failure (08 N BE)
DESCRIPTION : The fault is raised time between the frame reports (Tfr) is < its threshold when Frm_TX_ON signal is in its “off” state during RF loopback.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : The HSU performs a set of three related tests of which this is one (see also 08 N BC and 08 N BD), to verify that no transmit power is measured when none is expected.

<HSU1> AGC Level Outside Limits Warning (08 N 41)
DESCRIPTION : This fault, as a warning, is raised when AGC0 - 100 < AGC_Value < AGC0 - 50, or when AGC0 + 50 < AGC_Value < AGC0 + 100.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Linearity Outside Limits Warning (08 N C3)
DESCRIPTION : This fault is raised as a warning during RF loopback if the magnitude between two modulation constellation test symbols, one at maximum amplitude (e.g., 1111) and the other at minimum amplitude (e.g., 1010), is different from the expected 3.00 by more than 0.11 (i.e. < 2.89 or > 3.11).
PARAMETERS :

FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 1.LO Lock Failure (08 N 51)
DESCRIPTION : This fault is raised when the #1 local oscillator fails to indicate lock detection during CM, including within 10 ms after a Tx or Rx channel change.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 2.LO Lock Failure (08 N 52)
DESCRIPTION : This fault is raised when the #2 local oscillator fails to indicate lock detection during CM, including within 10 ms after a Tx or Rx channel change.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> 3.LO Lock Failure (08 N 53)
DESCRIPTION : This fault is raised when the #3 local oscillator fails to indicate lock detection during CM, including within 20 ms after a Tx or Rx channel change. The #3 LO is monitored only if “In Use”.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Reference Oscillator (SRU Code O)
<HSU1> Ref Osc Warning: Send HSU To Cal (08 O 42)
DESCRIPTION : This fault is raised when the reference oscillator tune voltage is within either its lower or upper warning range (but not within either of its failure ranges).
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : See fault 08 O 63

<HSU1> Ref Osc Failure/Voltage Too Low (08 O 63)
DESCRIPTION : This fault is raised when the reference oscillator tune voltage is within its lower failure range.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : See fault 08 O 42

<HSU1> Ref Osc Failure/Voltage Too High (08 O 64)
DESCRIPTION : This fault is raised when the reference oscillator tune voltage is within its upper failure range.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : See 08 O 42

<HSU1> Burst Duration Monitor (SRU Code P)
<HSU1> Burst Duration Monitor Circuit (08 P 81)
DESCRIPTION : This fault is raised when a TDM burst of a specific duration is detected to be outside the range of the Burst Duration Monitor, i.e., a burst duration error occurs if the Burst Duration Monitor is set to 60 ms and TDM burst is > 60 ms.

PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> TDM Burst Duration Failure (08 P 04)
DESCRIPTION : This fault is raised when a TDM channel signaling burst more than 160 ms in length triggers the burst duration monitor.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Carrier On Signals (08 P 85)
DESCRIPTION : This fault is raised when a continuous TDM burst is transmitted and no carrier on signal is present.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK : The CPU can read the Carrier_On and Tx_On signals from the burst duration monitor.

<HSU1> Doppler Compensation (SRU Code Q)
<HSU1> Reference Oscillator Compensation Error (08 Q 39)
DESCRIPTION : This fault is raised if, 20 seconds after the Rx channel is present (i.e., the Rx channel has acquired satellite frequency tracking), the frequency error is greater than 290 Hz.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Frame DSP/VFC DSP Interface (SRU Code R)
<HSU1> Frame DSP/VFC DSP Interface Failure (08 R 17)
DESCRIPTION : This fault is raised when an error occurs in the serial link between the Frame DSP and the VFC DSP.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Frame DSP/Turbo FPGA Interface (SRU Code S)
<HSU1> Frame DSP/Turbo FPGA Interface Failure (08 S 96)
DESCRIPTION : This fault is raised when a write/read error occurs in a block of the RAM attached to the Turbo FPGA through its parallel interface with the Frame DSP.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Power Supply PCB/ISDN Phone Interface (SRU Code W)
<HSU1> ISDN Supply Voltage Failure (08 W 88)
DESCRIPTION : This fault is raised when the 38V ISDN line voltage is out of range, i.e., less than 33V or greater than 43V.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> Configuration Data Module (SRU Code X)
<HSU1> Invalid Serial Number (08 X F1)
DESCRIPTION : This fault is raised when the HSU detects that the LRU serial number, HW revision number, PCB number, CDM internal serial number, CDM internal revision number, or CDM internal part number are not valid.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CDM Essential Data Failure (08 X F3)
DESCRIPTION : This fault is raised when the HSU detects that essential data in the CDM is not available.
PARAMETERS : 01: Inconsistent Major or Minor version on an essential structure
02: Both backup and main structure for an essential structure are corrupted or unavailable
03: The CDM platform type is incompatible
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CDM Data Access Error (08 X F4)
DESCRIPTION : This fault is raised when the HSU detects that non-essential data in the CDM is corrupted.
PARAMETERS : 01: Either backup or (exclusive or) main structure for an essential structure are corrupted or unavailable
02: Either backup or main structure for a non-essential structure are corrupted or unavailable
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CDM Missing Write Protection Failure (08 X F5)
DESCRIPTION : This fault is raised by the HSU when any status register in the CDM EEPROMs has the wrong status or is able to update a test variable in the write-protected area.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> CDM Incorrect Version (08 X F6)
DESCRIPTION : This fault is raised by the HSU when the version of the data in the CDM is not correct, and also when the version on an essential and non-essential structure is inconsistent.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1> ISDN Transceiver/Power Supply PCB Interface (SRU Code Z)
<HSU1> ISDN Rx Voltage (08 Z 89)
DESCRIPTION : This fault is raised when the HSU detects that the ISDN voltage supplied to the S-bus is outside its range, i.e., less than 33V or greater than 43V.
PARAMETERS :
FAIL CRITERIA :
RECOVERY CRIT. :
REMARK :

<HSU1>, Unknown SRU (SRU Code 0)
<HSU1> Self-Declared Fail (08 0 01)
DESCRIPTION : This fault is raised if the SSM field of the Label 270 status word received by the SDU from the HSU is set to Failure Warning.

PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure if it is continually active in at least 5 consecutive status words.
RECOVERY CRIT. : As soon as a status word is received with the SSM cleared to Normal Operation.
REMARK : One second of filtering is applied by the SDU (assuming the nominal transfer rate of 5 Hz) to cover the possibility that the HSU does not apply any filtering to its activation of SSM = Failure Warning.

<HSU1> Williamsburg Protocol ALO/ALR Fail (08 0 02)
DESCRIPTION : This fault is declared by the SDU If the HSU does not respond with an ALR word after 3 transmissions of the ALO word to it.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as communication is re-established with the HSU.
REMARK : None

<HSU1> Williamsburg Protocol Data Transfer Fail (08 0 03)
DESCRIPTION : If the maximum number of RTS words have been sent to the HSU without receiving a valid CTS word or if the maximum number of attempts have been made for transmitting an LDU to the HSU without receiving a valid ACK word when HSU is the active DTE, this fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as a successful transmission of an LDU has been made to the HSU.
REMARK : A transmission failure indicates a break in the bus connecting the SDU output and the HSU input.

<HSU1> Self Test Misoperation (08 0 84)
DESCRIPTION : This fault covers all possible SDU-initiated POST/PAST misbehavior related to HSU Functional Test. The POST/PAST fault is not declared if no ARINC words are being received from the HSU. Also, the POST/PAST no response fault is not declared if the HSU is declaring the control bus input inactive.
PARAMETERS : For SDU-initiated POST/PAST:
01 : the HSU has not responded to functional test commanded for 15 seconds by the SDU (POST/PAST).
02 : the HSU has started functional test, but the SDU has not received an HSU self-test complete response within the 40 seconds accorded to external LRUs during system wide POST/PAST.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : Functional Test response checking is determined on the HSU Status Word’s SSM field. The CM version of this fault is (50 0 02).

<HSU1> Channel Release Acknowledge Failure (08 0 05)
DESCRIPTION : This fault is declared by the SDU If the HSU fails to acknowledge a cooperative channel release request from the SDU within 10 seconds.
PARAMETERS :
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU’s input bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK :

<HSU1> RF Loopback Inhibit Failure (08 0 86/06)
DESCRIPTION : This fault is declared by the SDU if the HSU fails to acknowledge the termination of RF loopback testing by indicating “Normal Operation” in bits 12 and 13 of the HSU status word. The failure code shall reflect CM(06) or PP(86) depending on the CM/PP state of the SDU at the time (not the HSU).
PARAMETERS :
FAIL CRITERIA : This fault transitions into a failure if bits 12 and 13 of the HSU status word do not indicate “Normal Operation” within two seconds of inhibit command from the SDU.

RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK :

HSU #2 (Level 1 Code 09h)
Same as for HSU #1, Level 1 code 08, except substitute <HSU2> for <HSU1>. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

High Power Relay (Level 1 Code 0Ah)
High Power Relay, Unknown SRU (SRU Code 0h)
(PORT) MNTNC WORD HPR Fail (0A 0 01)
DESCRIPTION : The HPR status is determined to be failed from discrete bit #17 in the Maintenance Word from the Port BSU
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 17 set.
RECOVERY CRIT. : As soon as a fault cleared report is made
REMARK : The LNA/DIP control discrete from the BSU is also used to control the HPR

(STBD) MNTNC WORD HPR Fail (0A 0 02)
DESCRIPTION : The HPR status is determined to be failed from discrete bit #17 in the Maintenance Word from the Starboard BSU
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 17 set.
RECOVERY CRIT. : As soon as a Starboard BSU/ACU Maintenance Word is received with bit #17 clear
REMARK : The LNA/DIP control discrete from the BSU is also used to control the HPR.

Top/Port LNA/Diplexer (Level 1 Code 0Dh)
Top/Port LNA/Diplexer, Unknown SRU (SRU Code 0h))
<T/P LNA/DIP> Maintenance Word Fail (0D 0 01)
DESCRIPTION : This fault is raised when the LNA/DIP BITE discrete bit #20 in the BSU Maintenance Word is set, indicating failure of the Top/Port LNA/DIP, or (for software package E1.0 and later) when bit #25 of solo word #08 from the 20W HPA is set, indicating failure of the IGA LNA/DIP.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance or solo words with the respective bit set.
RECOVERY CRIT. : As soon as a maintenance or solo word is received with the respective bit cleared.
REMARK : Solo word #08 is only generated by a Honeywell 20W HPA using the internal beam steering functionality to control an IGA system.

Spare LRU (Level 1 Code 0Eh)
Starboard LNA/Diplexer (Level 1 Code 0Fh)
Same as for the Top/Port LNA/Diplexer (Section 4.4.5.13), except substitute Starboard for both Top/Port and Port/Top, <STBD LNA/DIP> for <T/P LNA/DIP>, and failure code (0F 0 01) for (0D 0 01).

LGA LNA/Diplexer (Level 1 Code 10h)
Unknown LGA LNA/Diplexer (SRU Code 0h)
LGA LNA Dip Fail (10 0 01)
DESCRIPTION : This fault is raised if the LGA LNA BITE discrete input is not Ok when the LGA LNA has been commanded to the "On" state, more than 1/7th second after the command is applied.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure if it is not cleared after one second.
RECOVERY CRIT. : Immediately after the LGA LNA BITE discrete input is as expected.
REMARK : No functional resource indictment is performed because there is no possible reversion action; the SDU will continue to attempt to utilize the LGA, even though BITE has indicated this failure.

Top/Port BSU Or ACU (Level 1 Code 13h)
Top/Port BSU Or ACU, Unknown SRU (SRU Code 0h)
<T/P B/A> Mntnc Word (350) Update Rate Fail (13 0 01)
DESCRIPTION : The number of Top/Port BSU Maintenance Words (label 350) with no parity error received by the SDU in the last second is less than 1 or greater than 15 for that BSU after
completion of system-wide POST/PAST, and the associated bus is not inactive.
PARAMETERS : Number of BSU Maintenance Words received with no parity error during the first second of the fault
FAIL CRITERIA : If the fault is active for more than 5 seconds.
RECOVERY CRIT. : As soon as a fault cleared report is made (ie the correct number of words have been received in a second), or a Top/Port BSU input bus fault is declared.
REMARK :

<T/P B/A> Mntnc Word (350) Data Fail (13 0 02)
DESCRIPTION : The last Top/Port BSU Maintenance Word (label 350) with no parity error received by the SDU contains a field set to an unauthorised or indeterminate value
PARAMETERS : BSU Maintenance Word in error
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT. : As soon as a Top/Port BSU Maintenance Word is received with no error
REMARK : This is not implemented since there are no fields worth checking.

<T/P B/A> Status Word (144) Update Rate Fail (13 0 03)
DESCRIPTION : The number of Top/Port BSU Status Words (label 144) with no parity error received by the SDU in the last second is less than 1 or greater than 15 after completion of system-wide
POST/PAST, and the associated bus is not inactive.
PARAMETERS : The number of Status Words received in the first second
FAIL CRITERIA : If the fault is active for 5 seconds
RECOVERY CRIT. : As soon as a fault cleared report is made (ie the correct number of words have been received in a second), or a Top/Port BSU input bus fault is declared.
REMARK :

<T/P B/A> Status Word (144) Data Fail (13 0 04)
DESCRIPTION : The last Top/Port BSU Status Word (label 144) with no parity error received by the SDU contains a field set to an unauthorised or indeterminate value
PARAMETERS : BSU Status Word in error
FAIL CRITERIA : If the fault is active for five seconds
RECOVERY CRIT. : As soon as a Top/Port BSU Status Word is received with no error
REMARK : Only the first error seen will be reported. Subsequent errors, even those affecting different fields, will not be reported unless separated by one or more 'correct' BSU Status Words.
The only field checked will be the closed loop tracking bit which should only be open loop.

<T/P B/A> Maintenance Word RAM Fail (13 0 05)
DESCRIPTION : Top/Port BSU Maintenance Word (label 350) discrete bit #14 set indicating internal RAM failed
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 14 set.
RECOVERY CRIT. : Immediately after a Top/Port BSU Maintenance Word is received with bit #14 clear.
REMARK :

<T/P B/A> Maintenance Word ROM Fail (13 0 06)
DESCRIPTION : Top/Port BSU Maintenance Word (label 350) discrete bit #15 set indicating internal ROM failed
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 15 set.
RECOVERY CRIT. : Immediately after a Top/Port BSU Maintenance Word is received with bit #15 clear.
REMARK :

<T/P B/A> Maintenance Word PSU Fail (13 0 07)
DESCRIPTION : Top/Port BSU Maintenance Word (label 350) discrete bit #16 set indicating internal PSU failed
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 16 set.
RECOVERY CRIT. : Immediately after a Top/Port BSU Maintenance Word is received with bit #16 clear
REMARK :

<T/P B/A> Maintenance Word Parameter Fail (13 0 08)
DESCRIPTION : Top/Port BSU Maintenance Word (350) discrete bit #18 is set indicating internal Parameter failure
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 18 set.
RECOVERY CRIT. : Immediately after a Top/Port BSU Maintenance Word is received with bit #18 clear
REMARK :

<T/P B/A> Maintenance Word Temp Fail (13 0 09)
DESCRIPTION : Top/Port BSU Maintenance Word (350) discrete bit #22 is set indicating BSU Over temperature
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance words with bit 22 set.
RECOVERY CRIT. : Immediately after a Top/Port BSU Maintenance Word is received with bit #22 clear
REMARK : None

<T/P B/A> Self-Test Misoperation (13 0 8A)
DESCRIPTION : This fault covers all possible POST/PAST misbehaviour related to BSU Functional Test. This fault is not declared if no ARINC words are being received from the BSU.
PARAMETERS : 01 : the BSU has not responded to functional test commanded for 30 seconds by the SDU (POST/PAST)
02 : the BSU has started functional test, but the SDU has not received a BSU self test response complete within the 30 seconds accorded to external LRUs during system wide POST/PAST
03 : BSU functional tests exceeded 15 seconds
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared for cases 1,2 and 3
REMARK : Functional Test response checking is determined on the BSU Maintenance word's SSM field. The CM version of this failure is (62 0 02).

<T/P B/A> Spare (13 0 0B)
Spare LRU (Level 1 Code 14h)
Starboard BSU (Level 1 Code 15h)
Same as for the Top/Port BSU or ACU (Section 4.4.5.19)

Top/Port HGA/IGA (Level 1 Code 1A)
Unknown Top/Port HGA/IGA (SRU Code 0h)
Top/Port HGA/IGA Maintenance Word Fail (1A 0 01)
DESCRIPTION : This fault is raised when the Top/Port BSU Maintenance Word (label 350) discrete bit #11 is set indicating HGA Failed, or in an IGA system when bit #24 of solo word #08 from the 20W HPA is set, indicating failure of the IGA or the interface between the HPA and the IGA.
PARAMETERS : None. However, for the case of this failure being triggered by the 20W IGA HPA setting solo word #8 bit #24, the HPA will be declaring one or more of failures 1A/0/02, 1A/0/03 or 1A/0/04, which do contain parameter information relevant to this failure.
FAIL CRITERIA : This fault transitions to a failure after the receipt of four consecutive maintenance or solo words with the respective bit set.

RECOVERY CRIT. : Immediately after a maintenance or solo word is received with the respective bit cleared.
REMARK : Solo word #08 is only generated by a Honeywell 20W HPA using its internal beam steering functionality to control an IGA system.
Also note that, contrary to the norm, Level 1 failure code 1A is used for failures of the power and signal interfaces between the IGA and the 20W HPA, as well as for the IGA itself.

IGA Failure (1A 0 02)
DESCRIPTION : This fault is raised by the 20W HPA whenever the BITE Data Word received from the IGA indicates Power Supply Fault [whose root cause could be in the IGA, or in the power feed from the HPA, including the HPA itself], and also when the IGA's re-transmitted echo (also in the BITE Data Word from the IGA) of the HPA's commanded Beam Steering Word byte #1 bit #0 does not match the commanded bit, indicating failure of the IGA or the interface between the HPA and the IGA. While this failure is currently active, the HPA shall also set bit #24 of its solo word #8.
PARAMETERS : For the failure parameter, the following codes apply:
0 = Reserved
1 = CMC antenna
2 = CAL antenna
The associated parameter is defined as follows:
BIT Meaning
0 Reserved
1 Reserved
2 1 = CMC Steering Data Mismatch, 0 = OK
3 1 = CMC Power Supply fault (-85V), 0 = OK
4 Reserved
5 Reserved
FAIL CRITERIA : After four successive fault conditions are declared (any one or more of the conditions specified in the associated parameter value).
RECOVERY CRIT. : Immediately after none of the conditions specified in the associated parameter value is detected by the HPA nor indicated by the IGA.
REMARK : The parameters stored with this failure will be pertinent to the 1A/0/01 failure stored by the SDU in response to the HPA's solo word.

IGA RS-422 Input Bus Link Fault (1A 0 03)
DESCRIPTION : This fault is raised by the 20W HPA whenever the BITE Data Word received from the IGA has its Link Fault bit set, indicating failure of the IGA or the RS-422 bus from the HPA to the IGA (whose root cause could be in the IGA, or in the RS-422 interface from the HPA to the IGA, or in the HPA). While this failure is currently active, the HPA shall also set bit #24 of its solo word #8.
PARAMETERS : None.
FAIL CRITERIA : After four successive fault conditions are declared.
RECOVERY CRIT. : Immediately after the IGA's BITE Data Word is received with the Link Fault bit cleared.
REMARK :

IGA HPA RS-422 Input Bus Error/Inactive (1A 0 04)
DESCRIPTION : This fault is raised by the 20W HPA if the IGA fails to respond to a steering command word transmitted from the HPA after 0.5 second, and also when the HPA detects interface errors on the associated serial input port, indicating failure of the IGA or the RS-422 bus from the IGA to the HPA (whose root cause could be in the IGA, or in the RS-422 bus from the IGA to the HPA, or in the HPA). While this failure is currently active, the HPA shall also set bit #24 of its solo word #8.
PARAMETERS : The associated parameter value is set to the last received character. The failure parameter is set as follows (with bits 0 through 7 obtained from the associated UART status register [and those specified as "Always 0" being masked out by the HPA software]):
Bit 0: Always 0.
Bit 1: 1 = Receive data character framing error, 0 = OK.
Bit 2: 1 = Break flag (twisted pair wiring probably reversed), 0 = OK.
Bit 3: Always 0.
Bit 4: 1 = Receive data character parity error, 0 = OK.
Bit 5: 1 = Receive data noisy, 0 = OK.

Bit 6: Always 0.
Bit 7: Always 0.
Bit 8: Bus inactive (response data timeout fault).
FAIL CRITERIA : For bus inactive: after 10 expected responses are missed. (The word transmission/response rate is not fixed, but varies with the rate of change of commanded beam steering data; this criteria equates to approximately 0.5 to 5 seconds, depending on the actual command word transmission rate.) For all other indicated fault causes: after four consecutive indications of any one or more of the causes listed for the failure parameter.
RECOVERY CRIT. : As soon as valid data is received.
REMARK :

Starboard HGA (Level 1 Code 1C)
Same as for the Top/Port HGA

SCDU/WSC-1 (Level 1 Code 21h)
The SDU may be wired to ARINC 739 SCDUs/MCDUs or to ARINC 741 Williamsburg SDU controllers (WSCs) for similar functionality on the same physical SDU ARINC 429 interfaces (but with only one controller type at a time). Due to this similarity, the same Level 1 failure codes are used for both controller types. Different Level 3 failures shall apply as appropriate to the controller type. The failures defined below for the WSC are patterned after those for the (C)MU (Level 1 code 33).

SCDU/WSC-1, Unknown SRU (SRU Code 0h)
<SCDU-1> Protocol Error (21 0 01)
DESCRIPTION : The SDU shall declare this failure in response to specifically defined errors occuring in the communication protocol between the SDU and the SCDU. For expedience, the specific errors are defined below along with their respective stored parameter codes.
PARAMETERS : Each detected protocol error shall result in its respective parameter value bit being set to the one state (with unused and inactive bits cleared to zero). The bits (decimal weighted) and their error definitions is as follows:
1 CTS Timeout: After transmitting an RTS word, if a CTS word is not received within 200 ms, the SDU repeats the RTS/Wait-For-CTS cycle up to 10 times if necessary. If no CTS word is received within 200 ms after the 10th repeat, this error is declared.
4 Transmit ACK Timeout: After transmission of a message transfer block, the SDU waits for an ACK or NAK for up to 1.5 seconds; if none is received, the SDU repeats the Transmit/Wait-For-ACK-or-NAK cycle up to nine times if necessary, repeating the sequence of sending RTS and awaiting CTS after every three transmissions. If no ACK or NAK is received within 1.5 seconds of the ninth transmission, this error is declared.
8 Transmit NAK: During or after a message transfer block, a SYN or NAK word may be received from the SCDU, at which time the SDU discontinues transmission of the block and repeats the transmission sequence (beginning with the RTS word), up to two times if necessary. If a SYN or NAK word is received again on the second repeat, this error is declared.
16 Discrete Timeout: The SDU transmits SCDU Discrete word updates to the SCDU; if no ACK is received within one second, the SDU repeats the Transmit/Wait-For-ACK cycle up to 3 times if necessary. If no ACK is received within one second after the 3rd repeat, this error is declared.
FAIL CRITERIA : This fault transitions to a failure if it persists for between three to six seconds (ensuring that the cause is not an inactive input bus).
RECOVERY CRIT. : Successful receipt of an ENQ word from the SCDU.
REMARK :

<WSC-1> Status (270) Bad SSM (21 0 02)
DESCRIPTION : This fault is raised if a label 270 WSC-1 Status word is received with “Failure Warning” (11b) indicated in the SSM field.
PARAMETERS : None
FAIL CRITERIA : If the fault persists for three seconds.
RECOVERY CRIT. : As soon as a WSC-1 Status word is received with “Normal Operation” (00b) in its SSM field or when an SDU WSC-1 Bus Inactive fault is raised.
REMARK :

<WSC-1> Master Protocol Error (21 0 03)
DESCRIPTION : If WSC-1 is the first WSC to declare itself “active” after system initialization, and then it subsequently does not respond with an ALR word after 3 transmissions of the ALO word to it, then this fault is raised if the SDU is configured as a single SDU or is the Master in a dual system.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure only if it persists for at least ten seconds.
RECOVERY CRIT. : As soon as communication is re-established with WSC-1, or an SDU WSC-1 Bus Inactive fault is raised.
REMARK :

<WSC-1> Data Transmission Failure (21 0 04)
DESCRIPTION : If the maximum number of RTS words have been sent to WSC-1 without receiving a valid CTS word or the maximum number of attempts have been made for transmitting an LDU to WSC-1 without receiving a valid ACK word when WSC-1 is the “active” WSC, this fault is raised.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as a successful transmission of an LDU has been made to WSC-1, or WSC-1 responds to a SOLO TEST word, or when an SDU WSC-1 Bus Inactive failure is declared.
REMARK : Whenever the SDU has a data file ready to transmit to WSC-1, it follows the transfer procedure.

<WSC-1> Master TEST/LOOP Failure (21 0 07)
DESCRIPTION : If WSC-1 fails to respond to two consecutive SOLO TEST words with the correct LOOP word, then this fault is raised if the SDU is either the sole SDU in a single system or the Master in a dual system.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as WSC-1 responds to a SOLO TEST word with the correct LOOP word, an SDU WSC-1 Bus Inactive fault is raised.
REMARK :

SCDU/WSC-2 (Level 1 Code 22h)
Same as for SCDU/WSC-1 (Section 4.4.5.33), except substitute SCDU-2 for SCDU-1 and WSC-2 for WSC-1.

SCDU/WSC-3 (Level 1 Code 23h)
Same as for SCDU/WSC-1 (Section 4.4.5.33), except substitute SCDU-3 for SCDU-1 and WSC-3 for WSC-1.

(C)MU-1 (Level 1 Code 33h)
(C)MU-1, Unknown SRU (SRU Code 0h)
COMMENTARY
The failure of a (C)MU to respond to ALO, SOLO TEST words or data transmissions is indicative of a broken SDU to CMU bus. These faults will indict the [cmu] level-2 resource. This does not affect bit 11 of the SDU label 270 status word, but may initiate a handover of mastery in a dual system.

(C)MU-1 Status (270) Bad SSM (33 0 02)
DESCRIPTION : For Airbus, this fault is raised if a Label 270 Status word is received with the SSM field set to “Failure Warning” (11b). For other aircraft, this fault is raised if a Status word is received with anything other than “Normal Operation” (00b) in the SSM field.
PARAMETERS : None
FAIL CRITERIA : For Airbus, if the fault is active for three seconds; for other aircraft, if the fault is active for five seconds.
RECOVERY CRIT. : For Airbus, this failure shall clear as soon as a Status word is received with its SSM field set to any state other than Failure Warning or when a CMU-1 Bus Inactive fault is declared. For other aircraft, this failure shall clear as soon as a Status word is received with “Normal Operation” in its SSM field or when a CMU-1 Bus Inactive fault is declared.

REMARK : The failure criteria for this fault was changed to three seconds for Airbus in response to Airbus EPR 109, in order that such a fault would be reported on the Airbus CFDS Test page upon completion of the Test (PAST) function.

(C)MU-1 Master Protocol Error (33 0 03)
DESCRIPTION : If this CMU is the first CMU to declare itself active after system init, and then it subsequently does not respond with an ALR word after 3 transmissions of the ALO word to it, then this fault is declared if the SDU is configured as a single SDU or is the Master in a dual system.
PARAMETERS : None
FAIL CRITERIA : Prior to Package 2.0, this fault transitions to a failure immediately. For Package 2.0 and subsequent, this fault transitions to a failure only if it persists for at least ten seconds.
RECOVERY CRIT. : As soon as communication is re-established with this CMU, a CMU-1 Bus Inactive fault is declared, or a CMU-1 Slave Protocol Error is declared.
REMARK :

(C)MU-1 Data Transmission Failure (33 0 04)
DESCRIPTION : If the maximum number of RTS words have been sent to the CMU without receiving a valid CTS word or if the maximum number of attempts have been made for transmitting an LDU to the CMU without receiving a valid ACK word when CMU 1 is the active DTE, this fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as a successful transmission of an LDU has been made to the CMU, or the CMU responds to a SOLO TEST word, or when a CMU-1 Bus Inactive failure is declared.
COMMENTARY
A transmission failure indicates a break in the bus connecting the SDU output and the CMU input. It should indict the [cmu] resource because several back-to-back LDU transfers could prevent this being detected by a SOLO TEST/LOOP test. To make this failure recoverable it should be cleared once a SOLO TEST/LOOP test succeeds (these are still carried out regardless of [cmu] indictment).
REMARK : Whenever the SDU has a data file ready to transmit to the CMU, it follows the transfer procedure.

(C)MU-1 Slave Protocol Error (33 0 05)
DESCRIPTION : If this CMU is the first CMU to declare itself active after system init, and then it subsequently does not respond with an ALR word after 3 transmissions of the ALO word to it, then this fault is declared if the SDU is the Slave in a dual system.
PARAMETERS : None.
FAIL CRITERIA : Prior to Package 2.0, this fault transitions to a failure immediately. For Package 2.0 and subsequent, this fault transitions to a failure only if it persists for at least ten seconds.
RECOVERY CRIT. : As soon as communication is re-established with this CMU, a CMU-1 Bus Inactive fault is declared, or a CMU-1 Master Protocol Error is declared.
REMARK : See failure 33 0 03.

(C)MU-1 Self-Declared Failure (33 0 06)
DESCRIPTION : This fault is declared if the Fail bit (bit 16) of the Label 270 Status word received by the SDU from the (C)MU is set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to the failure state if it is continuously active for at least three seconds.
RECOVERY CRIT. : As soon as a Status word is received with bit 16 cleared or a CMU-1 Bus Inactive fault is declared.
REMARK : The three seconds of filtering is applied by the SDU to cover the possibility that the (C)MU does not apply any time filtering to its activation of bit 16.

(C)MU-1 Master TEST/LOOP Failure (33 0 07)
DESCRIPTION : If this CMU fails to respond to two consecutive SOLO TEST words with the correct LOOP word, then this fault is declared if the SDU is either the sole SDU in a single system or the Master in a dual system.

PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as the CMU responds to a SOLO TEST word with the correct LOOP word, a CMU-1 Bus Inactive fault is declared, or a CMU-1 Slave Protocol Error is declared.
REMARK : A nuisance case of this failure may occur on Airbus aircraft when the CFDS is not powered on or is otherwise not functioning properly, due to the fact that the CFDS is used to inform the ATSU of the SDU's presence or absence. If the CFDS does not inform the ATSU that the SDU is installed, then the ATSU will ignore the SDU's TEST words, resulting in this failure being raised. Such nuisance failure should not occur if the CFDS is powered on and is operating normally.

(C)MU-1 Slave TEST/LOOP Failure (33 0 08)
DESCRIPTION : If this CMU fails to respond to two consecutive SOLO TEST words with the correct LOOP word, then this fault is declared if the SDU is the Slave in a dual system.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as the CMU responds to a SOLO TEST word with the correct LOOP word, a CMU-1 Bus Inactive fault is declared, or a CMU-1 Master Protocol Error is declared.
REMARK : See the Remark in Section 4.4.5.51.20.7 regarding failure 33 0 07.

(C)MU-2 (Level 1 Code 34h)
Same as for (C)MU-1, except (C)MU-2 for (C)MU-1.

IRS-PRI (Level 1 Code 35h)
IRS-PRI, Unknown SRU (SRU Code 0h)
COMMENTARY
If the SDU is strapped for both IRSs being installed (Primary and Secondary), the SDU software uses the IRS inputs as follows:
The Primary IRS is initially selected to be the active IRS data source. The Secondary IRS is monitored for its health status, such that the SDU can revert to the Secondary IRS if the Secondary is healthy and the Primary fails. Such reversions can thereafter occur in either direction if the currently selected IRS fails and the other IRS is healthy.
The ARINC 429 receiver used for the IRS interface is programmed to constantly detect the seven 429 labels used by the SDU software on seven of its input channels (one label per channel) from the currently selected IRS interface. A single channel of an ARINC 429 receiver is used to monitor the IRS input that is NOT currently selected, by dynamically programming the label-matching register to input one different label (of the seven labels used) every second -- i.e., on the monitored bus, each label is examined for validity and presence every seven seconds.

<IRS-PRI> Spare (35 0 01)
<IRS-PRI> Lat (310) Data Fail (35 0 02)
DESCRIPTION : A data failure condition associated with latitude data has been detected. The possible failure conditions are; latitude data update rate failure (ARINC latitude words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC latitude data word received with the SSM status field set to the 'No Computed Data' state.
The maximum update rate for ARINC latitude words is 15 words in a one second interval and the minimum is 3 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively as defined in Section 14 Attachment 2 Table 2 of this document, with a tolerance margin added.
PARAMETERS : Last Latitude word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being

monitored for test purposes
REMARK : Reversion between IRS sources is discussed in Section 4.4.6, relating to the [nav] functional resource.

4.4.5.53.20.3 <IRS-PRI> Spare (35 0 03)
4.4.5.53.20.4 <IRS-PRI> Lon (311) Data Fail (35 0 04)
DESCRIPTION : A data failure condition associated with longitude data has been detected. The possible failure conditions are; longitude data update rate failure (ARINC longitude words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC longitude data word received with the SSM status field set to the 'No Computed Data' state.
The maximum update rate for ARINC longitude words is 15 words in a one second interval and the minimum is 3 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
PARAMETERS : Last Longitude word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK : Reversion between IRS sources is discussed in Section 4.4.6, relating to the [nav] functional resource.

<IRS-PRI> Spare (35 0 05)
<IRS-PRI> Grd Spd (312) Data Fail (35 0 06)
DESCRIPTION : A data failure condition associated with ground speed data has been detected. The possible failure conditions are; ground speed data update rate failure (ARINC ground speed words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC ground speed data word received with the SSM status field set to the 'No Computed Data' state. The maximum update rate for ARINC ground speed words is 45 words in a one second interval and the minimum is 8 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
PARAMETERS : Last Ground Speed word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK :

<IRS-PRI> Spare (35 0 07)
<IRS-PRI> Trk (313) Data Fail (35 0 08)
DESCRIPTION : A data failure condition associated with track angle data has been detected. The possible failure conditions are; track angle data update rate failure (ARINC track angle words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC track angle data word received with the SSM status field set to the 'No Computed Data' state. Track angle words received with the SSM field set to the 'No Computed Data' state shall only be considered as failure conditions if the current ground speed indicates that the aircraft is airborne.

The maximum update rate for ARINC track angle words is 45 words in a one second interval and the minimum is 1 word in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
COMMENTARY
The extremely low minimum update rate is specifically set to tolerate the Honeywell Laseref II Type HG 1075 AE03, which outputs this word at only a 2 Hz rate. The preferred minimum rate is 18 words in a one second interval (which accommodates the minimum value of 20 words in a one second interval specified by ARINC Characteristic 704).
PARAMETERS : Last Track Angle word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK : Reversion between IRS sources is discussed in Section 4.4.6, relating to the [nav] functional resource.

<IRS-PRI> Spare (35 0 09)
<IRS-PRI> True Hdg (314) Data Fail (35 0 0A)
DESCRIPTION : A data failure condition associated with true heading data has been detected. The possible failure conditions are; true heading data update rate failure (ARINC true heading words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC true heading data word received with the SSM status field set to the 'No Computed Data' state.
The maximum update rate for ARINC true heading words is 45 words in a one second interval and the minimum is 18 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
PARAMETERS : Last True Heading word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK :

<IRS-PRI> Spare (35 0 0B)
<IRS-PRI> Pitch (324) Data Fail (35 0 0C)
DESCRIPTION : A data failure condition associated with pitch data has been detected. The possible failure conditions are; pitch data update rate failure (ARINC pitch words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or an ARINC pitch data word received with the SSM status field set to the 'No Computed Data' state.
The maximum update rate for ARINC pitch words is 120 words in a one second interval and the minimum is 20 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
PARAMETERS : Last Pitch word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the IRS is selected or within seven seconds if the IRS is being monitored for test purposes.

RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK :

<IRS-PRI> Spare (35 0 0D)
<IRS-PRI> Roll (325) Data Fail (35 0 0E)
DESCRIPTION : A data failure condition associated with roll data has been detected. The possible failure conditions are; roll data update rate failure (ARINC roll words received at less than the minimum update rate or more than the maximum update rate if the associated bus is not
inactive), a valid ARINC IRS data word (latitude, longitude, ground speed, track angle, true heading, pitch or roll) received with the SSM status field set to the 'Failure Warning' state or
an ARINC roll data word received with the SSM status field set to the 'No Computed Data' state.
The maximum update rate for ARINC roll words is 120 words in a one second interval and the minimum is 20 words in a one second interval. Maximum and minimum update rates are derived from minimum and maximum transmit intervals respectively with a tolerance margin added.
PARAMETERS : Last Roll word received and the number of words received in the last second.
FAIL CRITERIA : A 'Failure Warning' or 'No Computed Data' SSM status field state failure will be reported immediately. Update rate failures will be reported within five seconds of occurrence if the
IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
RECOVERY CRIT. : Failure recovery will be reported within one second of recovery from all possible failure criteria for this fault if this IRS is selected or within seven seconds if the IRS is being monitored for test purposes.
REMARK

IRS-SEC (Level 1 Code 36h)
Same as for IRS-PRI except substitute IRS-SEC for IRS-PRI.

CMC/CFDIU (Level 1 Code 39h)
CMC/CFDIU, Unknown SRU (SRU Code 39h)
Invalid OMS Data (39 0 01)
DESCRIPTION : This fault is applicable prior to SDU Part Number 7516118-XX130/-xx140, and shall only apply to aircraft strapped for “Airbus” CFDS type. This fault is declared when any Airbus on-board maintenance system (OMS) “general parameter” data item (any one of labels 125, 126, 155-157, 227, 233-237, 260, 301-303 [and 304 if processed] -- is received with SSM = FW (where applicable) or the data is not received with an update period better than 10 times the period.
PARAMETERS : The 32-bit Failure Parameter shall use single-bit coding per condition to indicate the specific nature of the failure. The parameter is structured as follows:
BIT NUMBER WEIGHT (HEX) MEANING
0 0000 0001 Label 125 received with SSM = FW
1 0000 0002 Label 126 “
2 0000 0004 Label 155 “
3 0000 0008 Label 156 “
4 0000 0010 Label 157 “
BIT NUMBER WEIGHT (HEX) MEANING
5 0000 0020 Spare (0) [Label 227 has no SSM field]
6 0000 0040 Label 233 received with SSM = FW
7 0000 0080 Label 234 “
8 0000 0100 Label 235 “
9 0000 0200 Label 236 “
10 0000 0400 Label 237 “
11 0000 0800 Label 260 “
12 0000 1000 Spare (0) [Label 301 has no SSM field]
13 0000 2000 Spare (0) [Label 302 has no SSM field]
14 0000 4000 Spare (0) [Label 303 has no SSM field]
15 0000 8000 Spare (0)
16 0001 0000 Label 125 received with update period > 10*N

17 0002 0000 Label 126 “
18 0004 0000 Label 155 “
19 0008 0000 Label 156 “
20 0010 0000 Label 157 “
21 0020 0000 Spare (0) (Label 227 is covered by 59/0/01)
22 0040 0000 Label 233 received with update period > 10*N
23 0080 0000 Label 234 “
24 0100 0000 Label 235 “
25 0200 0000 Label 236 “
26 0400 0000 Label 237 “
27 0800 0000 Label 260 “
28 1000 0000 Label 301 “
29 2000 0000 Label 302 “
30 4000 0000 Label 303 “
31 8000 0000 Spare (0)
BIT NUMBER WEIGHT (HEX) MEANING
N = The nominal period specified for that label.
FAIL CRITERIA : This fault transitions to failure after any particular invalid condition persists for 60 seconds or 60 receipts of the OMS ARINC 429 label data (whichever occurs first), as long as failure 59 0 01 (CFDS bus inactive) is not already being declared.
RECOVERY CRIT. : Immediately after the previously invalid OMS ARINC 429 label data is received as valid.
REMARK : E.g., after finding a 40 second or worse update period for label 301, that condition must persist for at least 60 additional seconds before declaring this failure; or, after receiving a label 125 word with SSM=FW, at least 60 additional such words must be received, or at least 60 seconds' worth of such words must be received, whichever occurs first, before declaring this failure. Since the MCS ARINC 429 hardware handles parity checking and does not interrupt the processor for data with parity errors, but rather discards any such data, parity error coverage (required by Airbus) is handled under the data update rate checks.
Label 237 is not transmitted on A320s.
COMMENTARY
The 32-bit failure parameter specified above was originally intended to permit multiple OMS ARINC 429 label data problems to share this single failure code, with the parameter field indicating the specific condition(s) causing the failure, such that multiple data failures occurring at different times could be captured by simply updating the stored parameter value. This proved to be impossible to properly implement in the software due to the way it is structured for dealing with other existing requirements, such as the intermittent failure occurrence counter. The 32-bit failure parameter is retained, but it is not capable of indicating multiple OMS data problems occurring at different times.

429 ICAO Address Source (Level 1 Code 40h)
Unknown 429 ICAO Address Source SRU (SRU Code 0H)
429 ICAO Address Fail (40 0 01)
DESCRIPTION : This fault shall cover all problems with the SDU attempting to obtain the AES ID from a 429 source of the ICAO Address, as directed by system configuration pin TP10A when it is in the “zero” state (reference Section 3.2.4.1). Once POST/PAST is complete, this fault shall be declared if a valid ICAO address has not been obtained for any reason after a period of four seconds, including no activity on all three of the possible input buses, or if the received address is all zeros or all ones, or if the address cannot be determined because the SSM associated with either label shows other than normal operation or no computed data.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : As soon as a valid AES ID can be constructed by the SDU from any of the 429 inputs.
REMARK :

Dual System Different 429 AES ID (40 0 02)
DESCRIPTION : This fault is declared in a dual system if this SDU's AES ID is obtained from an ARINC 429 source, and a valid AES ID received from the other SDU on the cross-talk bus is different from this SDU's valid AES ID.

PARAMETERS : 1st: This SDU's AES ID
2nd: Other SDU's AES ID
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if a valid AES ID is received from the other SDU which matches this SDU's valid AES ID.
REMARK : This fault is declared in both SDUs. No functional resource is indicted; however, one SDU will become disabled.

CTU: Unknown SRU (SRU Code 0h)
CCS ECL Not Established (42 0 01)
DESCRIPTION : This fault is declared if the SDU cannot achieve full communications with the CTU on the ECL link.
Full communications have not been achieved when:
- the layer 2 SAPI 2 data link fails to establish after one second; or
- the layer 2 SAPI 2 data link is established but the CTU fails to respond to an ECL Request message after 10 seconds; or
- the layer 2 SAPI 2 data link is released.

PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately (with the confirmation criteria included in the failure description above).
RECOVERY CRIT. : This failure is cleared when the SDU attains full communications on the ECL link.
REMARK :

CCS CCL Not Established (42 0 02)
DESCRIPTION : This fault is declared if the SDU cannot achieve full communications with the CTU on the CCL link.
Full communications have not been achieved when the layer 2 SAPI 0 data link fails to establish within one second or is released.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately (with the confirmation criteria included in the failure description above).
RECOVERY CRIT. : This failure is cleared when the layer 2 SAPI 0 data link is established.
REMARK :

CCS CTU Not Available (42 0 03)
DESCRIPTION : This fault is declared if the CTU responds to an ECL 'Get CTU Availability' request with a parameter other than 'Normal Operation'.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure if it is not cleared after 3 seconds.
RECOVERY CRIT. : This failure is cleared when the CTU responds with 'Normal operation'.
REMARK :

CCS PDL Not Established (42 0 04)
DESCRIPTION : This fault is declared if the SDU cannot achieve full communications with a packet data-capable CTU on the PDL link, unless the SDU CEPT-E1 bus is inactive.
Full communications have not been achieved when the layer 2 SAPI 16 data link fails to establish after four retries or is released.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately (with the confirmation criteria included in the failure description above).
RECOVERY CRIT. : This failure is cleared when the layer 2 SAPI 16 data link is established.
REMARK :

CPDF (Level 1 Code 43H)
Same as for (C)MU-1, except substitute CPDF for (C)MU-1 and CMU, and remove Airbus references. In the failure descriptions, reference is made to the CMU declaring itself 'active'.

CPDF Spare (43 0 01)
CPDF Status (270) Bad SSM (43 0 02)
DESCRIPTION : This fault is raised if a Status word is received with anything other than “Normal Operation” (00b) in the SSM field.
PARAMETERS : None
FAIL CRITERIA : If the fault is active for five seconds.
RECOVERY CRIT. : This failure shall clear as soon as a Status word is received with “Normal Operation” in its SSM field.
REMARK :

CPDF Master Protocol Error (43 0 03)
DESCRIPTION : If this CPDF is the first CPDF to declare itself active after system init, and then it subsequently does not respond with an ALR word after 3 transmissions of the ALO word to it, then this fault is declared if the SDU is configured as a single SDU or is the Master in a dual system.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as communication is re-established with this CPDF, a CDPF Bus Inactive fault is declared, or a CPDF Slave Protocol Error is declared.
REMARK :

CDPF Data Transmission Failure (43 0 04)
DESCRIPTION : If the maximum number of RTS words have been sent to the CPDF without receiving a valid CTS word or if the maximum number of attempts have been made for transmitting an LDU to the CPDF without receiving a valid ACK word when CPDF is the active DTE, this fault is declared.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as a successful transmission of an LDU has been made to the CPDF, or the CPDF responds to a SOLO TEST word, or when a CPDF Bus Inactive failure is declared.
COMMENTARY
A transmission failure indicates a break in the bus connecting the SDU output and the CPDF input. It should indict the [cpdf] resource because several back-to-back LDU transfers could prevent this being detected by a SOLO TEST/LOOP test. To make this failure recoverable it should be cleared once a SOLO TEST/LOOP test succeeds (these are still carried out regardless of [cpdf] indictment).
REMARK : Whenever the SDU has a data file ready to transmit to the CPDF, it follows the transfer procedure.

CPDF Slave Protocol Error (43 0 05)
DESCRIPTION : If this CPDF is the first CPDF to declare itself active after system init, and then it subsequently does not respond with an ALR word after 3 transmissions of the ALO word to it, then this fault is declared if the SDU is the Slave in a dual system.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : As soon as communication is re-established with this CPDF, a CPDF Bus Inactive fault is declared, or a CPDF Master Protocol Error is declared.
REMARK :

CPDF Self-Declared Failure (43 0 06)
DESCRIPTION : This fault is declared if the Fail bit (bit 16) of the Label 270 Status word received by the SDU from the CPDF is set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to the failure state if it is continuously active for at least three seconds.
RECOVERY CRIT. : As soon as a Status word is received with bit 16 cleared or a CPDF Bus Inactive fault is declared.
REMARK : The three seconds of filtering is applied by the SDU to cover the possibility that the CPDF does not apply any time filtering to its activation of bit 16.

CPDF Master TEST/LOOP Failure (43 0 07)
DESCRIPTION : If this CPDF fails to respond to two consecutive SOLO TEST words with the correct LOOP word, then this fault is declared if the SDU is either the sole SDU in a single system or the Master in a dual system.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as the CPDF responds to a SOLO TEST word with the correct LOOP word, a CPDF Bus Inactive fault is declared, or a CPDF Slave Protocol Error is declared.
REMARK :

CPDF Slave TEST/LOOP Failure (43 0 08)
DESCRIPTION : If this CPDF fails to respond to two consecutive SOLO TEST words with the correct LOOP word, then this fault is declared if the SDU is the Slave in a dual system.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : As soon as the CPDF responds to a SOLO TEST word with the correct LOOP word, a CPDF Bus Inactive fault is declared, or a CPDF Master Protocol Error is declared.
REMARK :

SDU HSU1 Bus Inactive (50 0 01)
DESCRIPTION : This fault is raised if no label 270 words have been received from the HSU in the last three seconds of operation outside of the system-wide POST/PAST period.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure immediately when the HSU is outside the POST/PAST, and shall also transition to failure 15 seconds after HSU PAST has been requested.
RECOVERY CRIT. : Immediately after receipt of a valid Label 270 word in each of two successive 1-second periods.
REMARK : None

HSU1 Self-Test Misoperation (50 0 02)
DESCRIPTION : This fault covers all possible misbehaviour related to HSU Functional Test outside the system-wide POST/PAST period (i.e., SDU-initiated during CM, HSU POST, HSU PAST, or HSU spontaneously entering functional test during SDU CM). This fault is not declared if the HSU bus inactive fault is active.
PARAMETERS : 01: The HSU has not responded to functional test commanded for 15 seconds by the SDU (CM), i.e., as a result of the raising of an HSU specific CM.

02: The HSU has started functional test commanded by the SDU (CM), but the SDU has not received an HSU self-test complete response within 40 seconds prior to SDU Part Number 7516118-XX130/-xx140 or within 60 seconds for SDU Part Number 7516118-XX130/-xx140 and subsequent.

03: The HSU has not entered functional test within 15 seconds of the PAST Requested bit in the HSU Status Word being set.

04: The HSU has entered un-commanded functional test as a result of an HSU POST.

05: The HSU has spontaneously entered un-commanded functional test for an unknown reason.

FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure shall clear as soon as a fault clearance is declared, (i.e., if and when the HSU self-test finally completes).
REMARK : Functional Test response checking is determined on the HSU Status Word's SSM field. This fault is typically caused by the HSU breaker being pulled, which generates the (50 0 01) failure; when power is restored, the SDU will clear the Bus Inactivity failure (50 0 01), and the LRU self-test executes, which generates this self-test misoperation failure. Hence, this self test misoperation failure is typically not indicative of an LRU failure, so it uses this bus inactive level 1 code (50) as opposed to the HSU level 1 code (08 or 09 prior to SDU Part Number 7516118-XX130/-xx140, or 03 for SDU Part Number 7516118-XX130/-xx140 and subsequent). The POST/PAST version of this fault is (08 0 84) prior to SDU Part Number 7516118-XX130/-xx140, or (03 0 84) for SDU Part Number 7516118-XX130/-xx140 and subsequent.

HSU1 Periodic Data Rate Fail (50 0 03)
DESCRIPTION : This fault is declared when the rate at which periodic ARINC 429 words are received from the HSU exceeds 22 words over a period of 1 second prior to SDU Part Number 7516118-XX130/-xx140 or 48 words over a period of 1 second for SDU Part Number 7516118-XX130/-xx140 and subsequent. All periodic ARINC word transmissions by the HSU (labels 172, 270, 271, 272, 273, 274, 275 prior to SDU Part Number 7516118-XX130/-xx140 and labels 172, 301 - 306, 351, 352 for SDU Part Number 7516118-XX130/-xx140 and subsequent) is monitored to generate the required word count.
PARAMETERS : Monitored periodic word data rate.
FAIL CRITERIA : This fault transitions into failure if the fault persists for at least 3 seconds.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK : Under normal conditions, the SDU is expected to receive 11 periodic words per second prior to SDU Part Number 7516118-XX130/-xx140 and up to 24 periodic words per second for SDU Part Number 7516118-XX130/-xx140 and subsequent; the failure threshold is double this value.

4.4.5.80.3 HSU1 Solo Word Data Rate Fail (50 0 04)
DESCRIPTION : This fault is declared when the rate at which solo words are received from the HSU exceeds 200 words over a period of 1 second. ARINC label 276 (prior to SDU Part Number 7516118-XX130/-xx140) or label 300 (for SDU Part Number 7516118-XX130/-xx140 and subsequent) transmissions by the HSU is monitored to generate the required word count.
PARAMETERS : Monitored solo word data rate.
FAIL CRITERIA : This fault transitions into failure if the fault persists for at least 3 seconds.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK : Under normal conditions prior to SDU Part Number 7516118-XX130/-xx140, the SDU is required to receive no more than 200 words per second based on its use for Carrier On/Off commands (in 5-word bursts), which should be separated by at least 25ms.

HSU1 Williamsburg Data Rate Fail (50 0 05)
DESCRIPTION : This fault is declared when the rate at which Williamsburg words are received from the HSU exceeds 120 words over a period of 1 second. ARINC label 307 (173 for SDU #2) transmissions by the HSU is monitored to generate the required word count.
PARAMETERS : Monitored Williamsburg word data rate.
FAIL CRITERIA : This fault transitions into failure if the fault persists for at least 3 seconds.
RECOVERY CRIT. : The SDU shall assert the HSU System Disable discrete for 10 seconds. This failure is cleared when, following the associated HSU reset, the SDU's input bus from the HSU transitions from an inactive to an active state, with the SSM field of the Label 270 status word indicating Functional Test.
REMARK :

SDU HSU2 Bus Inactive (Level 1 Code 51h)
Same as for Level 1 code 50 X XX, except substitute "HSU2" for "HSU1". Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

CPDF To SDU Bus Inactive (52 0 01)
Same as for (C)MU-1 Bus Inactive (Section 4.4.5.83).

SDU CMU-1 Bus Inactive (53 0 01)
DESCRIPTION : This fault is declared if no CMU status word has been received in the last three seconds of operation outside of the system-wide POST/PAST period prior to SDU Part Number 7516118-XX130/-xx140 and in the last 10 seconds for packages 6.0 and beyond.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : If at least one status word is received with no parity errors in each of two successive one second periods.
REMARK : The status word nominally arrives at 1Hz.

SDU CTU CEPT-E1 Bus Inactive (54 0 01)
DESCRIPTION : This fault is declared if the CTU CEPT-E1 interface circuitry detects that the bus is not synchronised and the CCS configuration strap indicates that the CTU is present.
PARAMETERS : None.
FAIL CRITERIA : Prior to SDU Part Number 7516118-XX130/-xx140, this fault transitions to failure if not cleared after 3 seconds. For SDU Part Number 7516118-XX130/-xx140 and subsequent, this fault transitions to failure if not cleared after 120 seconds.
RECOVERY CRIT. : When the CTU CEPT-E1 interface achieves synchronisation.
REMARK :

SDU SCDU/WSC-1 Bus Inactive (55 0 01)
DESCRIPTION : Prior to Package 4.0, this fault is declared if no Label 377 Equipment Identification word has been received from SCDU1 in the last three seconds of operation outside of the system-wide POST/PAST period.
For Packages 4.0 and subsequent, this fault is used for an inactive bus on the SDU's MP3C/D input, whether interfaced to an ARINC 739 SCDU or an ARINC 741 WSC, with the
controller type indicated by the programming state of system configuration pin TP10H as specified in Section 3.2.4.7. For the SCDU case, the definition is unchanged from
that for prior software packages. For the WSC case, this fault is declared if no Label 270 status words have been received from WSC1 in the last three seconds of operation outside of the system-wide POST/PAST period.
For Packages 6.0 and subsequent, for WSC configurations only (not for SCDU configurations), the criteria for the period of label 270 inactivity is increased to 10 seconds.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to the failure state immediately.
RECOVERY CRIT. : Prior to Package 4.0, if at least one Equipment Identification word is received from SCDU1 with no parity errors.
For Packages 4.0 and subsequent, for the SCDU case, the same as for prior software packages; for the WSC case, if at least one Label 270 Status word is received from WSC1 with no parity errors in each of two successive one-second periods.
REMARK : The SCDU Equipment Identification and WSC Status words are nominally received from their respective sources (depending on the installation configuration) at a rate of 1 Hz.

SDU SCDU/WSC-2 Bus Inactive (56 0 01)
Same as fault 55 0 01, except substitute SCDU2 or WSC2 for SCDU1 or WSC1.

SDU CMU-2 Bus Inactive (57 0 01)
Same as SDU CMU-1 Bus Inactive.

SDU CFDS Bus Inactive (59 0 01)
DESCRIPTION : This fault is declared if no label 227 words are received in the last 3 to 7 seconds of operation outside of the system-wide POST/PAST period prior to SDU Part Number 7516118-XX130/-xx140, and in the last 10 seconds for packages 6.0 and beyond. This requirement applies to all aircraft configurations and modes of operation, except for the “CAIMS wait” state of Maintenance Mode in the CAIMS configuration (refer to SYP 4.3.7.3.2.2.6) -- in this special case, the fault is declared if no label 227 words are received in the last 3 minutes of operation.
COMMENTARY
The pre-SDU Part Number 7516118-XX130/-xx140 software implementation has an indeterminate nature such that the declaration of this fault will occur after a minimum of 3 seconds and a maximum of 7 seconds after receipt of the last label 227 word.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is cleared if at least one label 227 word is received without any parity errors in each of two successive one-second periods.
REMARK : This fault shall clear any current rate, protocol or data failures associated with the SDU's input from the CFDS. The nominal rate of arrival of label 227 words is 1Hz.

Invalid OMS Data (59 0 02)

DESCRIPTION : This fault is applicable for SDU Part Number 7516118-XX130/-xx140 and subsequent, and shall only apply to aircraft strapped for "Airbus" CFDS type. This fault is declared when any Airbus on-board maintenance system (OMS) "general parameter" data item (any one of labels 125, 126, 155-157, 233-237, 260, 301-303 [and 304 if processed] -- is received with SSM = FW (where applicable) or the data is not received with an update period better than 10 times the period specified for the data.

PARAMETERS : The 32-bit Failure Parameter shall use single-bit coding per condition to indicate the specific nature of the failure. The parameter is structured as follows:

BIT NUMBER WEIGHT (HEX) MEANING
0 0000 0001 Label 125 received with SSM = FW
1 0000 0002 Label 126 "
2 0000 0004 Label 155 "
3 0000 0008 Label 156 "
4 0000 0010 Label 157 "
5 0000 0020 Spare (0) [Label 227 has no SSM field]
6 0000 0040 Label 233 received with SSM = FW
7 0000 0080 Label 234 "
8 0000 0100 Label 235 "
9 0000 0200 Label 236 "
10 0000 0400 Label 237 "
11 0000 0800 Label 260 "
12 0000 1000 Spare (0) [Label 301 has no SSM field]
13 0000 2000 Spare (0) [Label 302 has no SSM field]
14 0000 4000 Spare (0) [Label 303 has no SSM field]
15 0000 8000 Spare (0)
16 0001 0000 Label 125 received with update period > 10*N
17 0002 0000 Label 126 "
18 0004 0000 Label 155 "
19 0008 0000 Label 156 "
20 0010 0000 Label 157 "
21 0020 0000 Spare (0) [Label 227 is covered by 59/0/01]
22 0040 0000 Label 233 received with update period > 10*N
23 0080 0000 Label 234 "
24 0100 0000 Label 235 "
25 0200 0000 Label 236 "
26 0400 0000 Label 237 "
27 0800 0000 Label 260 "
28 1000 0000 Label 301 "
29 2000 0000 Label 302 "
30 4000 0000 Label 303 "
31 8000 0000 Spare (0)
N = The nominal period specified for that label in Section 4.3.7.4.1.

FAIL CRITERIA : This fault transitions to failure after any particular invalid condition persists for 60 seconds or 60 receipts of the OMS ARINC 429 label data (whichever occurs first), as long as (per Section 4.3.3) failure 59 0 01 (CFDS bus inactive) is not already being declared.

RECOVERY CRIT. : Immediately after the previously invalid OMS ARINC 429 label data is received as valid.

REMARK : E.g., after finding a 40 second or worse update period for label 301, that condition must persist for at least 60 additional seconds before declaring this failure; or, after receiving a label 125 word with SSM=FW, at least 60 additional such words must be received, or at least 60 seconds' worth of such words must be received, whichever occurs first, before declaring this failure. Since the MCS ARINC 429 hardware handles parity checking and does not interrupt the processor for data with parity errors, but rather discards any such data, parity error coverage (required by Airbus) is handled under the data update rate checks.

Label 237 is not transmitted on A320s.

COMMENTARY
The 32-bit failure parameter specified above was originally intended to permit multiple OMS ARINC 429 label data problems to share this single failure code, with the parameter field indicating the specific condition(s) causing the failure, such that multiple data failures occurring at different times could be captured by simply updating the stored parameter value. This proved to be impossible to properly implement in the software due to the way it is structured for dealing with other existing requirements, such as the intermittent failure occurrence counter. The 32-bit failure parameter is retained, but it is not capable of indicating multiple OMS data problems occurring at different times.

SDU Pri IRS Bus Inactive (5A 0 01)
DESCRIPTION : A primary IRS bus inactive fault is reported if no ARINC latitude(310), longitude(311), ground speed(312), track angle(313), true heading(314), pitch(324) or roll(325) data words are received within the last one second of operation outside of the system-wide
POST/PAST period.
PARAMETERS : None.
FAIL CRITERIA : Primary IRS bus inactive failure is reported if the primary IRS input is selected and no ARINC words are received during a three second interval. The same fault is also reported if the primary IRS input is being monitored for test purposes and no ARINC words are
received during a seven second interval.
RECOVERY CRIT. : Recovery from primary IRS bus inactive failure is reported if the primary IRS input is selected and ARINC words are received during a two second interval. Recovery is also
reported if the primary IRS input is being monitored for test purposes and ARINC words are received during a seven second interval.
REMARK :

SDU Sec IRS Bus Inactive (5B 0 01)
Same as SDU Pri IRS Bus Inactive, except replace Pri with Sec throughout.

SDU HGA/IGA HPA BITE Bus Inactive (5C 0 01)
DESCRIPTION : No ARINC 429 words (labels 143, 171, 350) without parity problems have been received within the last two successive one-second periods.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure if the fault persists for at least two seconds.
RECOVERY CRIT. : The fault is cleared after any data is received without parity errors in each of two successive one-second periods; the failure is cleared after a further seven seconds.
REMARK : The seven second recovery timer is applied by the SDU to ensure that the [hga_subsys] functional resource remains indicted during the HPA self-tests, since the “Self Test
Misoperation” CM fault is not raised when it is preceded by a bus inactivity fault.

HGA/IGA HPA Self-Test Misoperation (5C 0 02)
DESCRIPTION : This fault covers all possible CM misbehaviour related to HPA Functional Test. This fault is not declared if the HGA HPA bus inactivity fault is being raised.
PARAMETERS : 04: The HPA indicated functional test active outside the system-wide POST/PAST period (i.e., the HPA spontaneously entered functional test, or remained in functional test beyond the end of System Initialization and Self-Test).
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure shall clear as soon as a fault clearance is declared, (i.e., if and when the spontaneous or extended self test finally completes).
REMARK : Functional Test response checking is determined on the HPA Status Word’s SSM field. This fault is typically caused by the HPA breaker being pulled, which generates the (5C 0 01) failure; when power is restored, the LRU self-test executes, which generates this selftest misoperation failure and clears the bus inactive failure (5C 0 01). Hence, this self test misoperation failure is typically not indicative of an LRU failure, so it uses this bus inactive level 1 code (5C) as opposed to the HPA level 1 code (04).

SDU LGA HPA BITE Bus Inactive (5F 0 01)
Same as HGA HPA BITE Bus Inactive.

LGA HPA Self-Test Misoperation (5F 0 02)
Same as HGA/IGA HPA Self-Test Misoperation.

SDU Top/Port BSU/ACU BITE Bus Inactive (62 0 01)
DESCRIPTION : No ARINC 429 words (labels 144, 350) without parity problems, have been received on this bus in the last two successive one-second periods.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure if the fault persists for at least two seconds.
RECOVERY CRIT. : The fault is cleared after any data is received without parity errors in each of two successive one-second periods; the failure is cleared after a further seven seconds.
REMARK : The seven second recovery timer is applied by the SDU to ensure that the [hga_subsys] functional resource remains indicted during the HPA self-tests, since the "Self Test Misoperation" CM fault is not raised when it is preceded by a bus inactivity fault. This fault will only be reported if Top/Port BSU is configured as present in system.

Top/Port BSU/ACU Self-Test Misoperation (62 0 02)
DESCRIPTION : This fault covers all possible CM misbehaviour related to BSU Functional Test. This fault is not declared if the bus inactivity fault is being raised.
PARAMETERS : 01 : The BSU indicated functional test active outside the system-wide POST/PAST period (i.e., the BSU spontaneously entered functional test, or remained in functional test beyond the end of System Initialization and Self-Test).
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure shall clear as soon as a fault clearance is declared, i.e. if and when the spontaneous or extended self test finally completes.
REMARK : Functional Test response checking is determined on the BSU Maintenance word's SSM field. This fault is typically caused by the BSU breaker being pulled, which generates the (62 0 01) failure; when power is restored, the LRU self-test executes, which generates this self-test misoperation failure and clears the bus inactive failure (62 0 01). Hence, this self test misoperation failure is typically not indicative of an LRU failure, so it uses this bus inactive level 1 code (62) as opposed to the BSU level 1 code (13).

SDU Stbd BSU BITE Bus Inactive (64 0 01)
Same as Top/Port BSU BITE Bus Inactive except substitute Stbd BSU for Top/Port BSU.

Starboard BSU/ACU Self-Test Misoperation (64 0 02)
Same as Top/Port BSU/ACU Self Test Misoperation.

SDU SCDU/WSC-3 Bus Inactive (66 0 01)
Same as fault 55 0 01, except substitute SCDU3 or WSC3 for SCDU1 or WSC1.

SDU Cross-Talk Bus Inactive (71 0 01)
DESCRIPTION : This fault is declared in a dual system after the completion of POST/PAST if the cross-talk bus becomes inactive, i.e., no valid DCS words are received from the other SDU for a period of 0.3 second.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if it persists for 3 seconds or longer.
RECOVERY CRIT. : As soon as any data with valid parity is received in each of two successive 0.1 second periods.
REMARK :

HGA/IGA HPA Multicontrol Bus Inactive (Level 1 Code 90)
HGA/IGA HPA 429 Maintenance Word Control Bus Inactive (90 0 01)
DESCRIPTION : The last HPA Maintenance Word was received with bit #15 set.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure after the receipt of at least four consecutive maintenance words with bit 15 set, and if the fault persists for more than three seconds.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with bit #15 cleared.
REMARK : The additional four-sample filtering is applied by the SDU to cover the possibility of other manufacturers' HPAs not applying any filtering to their activation of Maintenance Word bit 15.

HGA/IGA HPA Multicontrol Bus Inactive (90 0 02)
DESCRIPTION : The HPA has received no data with valid parity on the Multicontrol bus during the previous second; the HPA shall set bit 15 in its Maintenance words while this failure is active.
PARAMETERS : None.
FAIL CRITERIA : If the fault is active for three seconds or longer.
RECOVERY CRIT. : As soon as any data with valid parity is received in each of two successive one-second periods.
REMARK : The SDU will raise failure (90 0 01) per section 4.4.5.144.1 while bit 15 in the HPA Maintenance word is set.

LGA HPA Multicontrol Bus Inactive (96 0 01, 96 0 02)
Same as HGA HPA Multicontrol bus Inactive.

Top/Port BSU/ACU Multicontrol Bus Inactive (98 0 01)
DESCRIPTION : Discrete bit #13 in Top/Port BSU/ACU Maintenance Word (350) set indicating Control Bus Input inactive.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure after the receipt of four consecutive maintenance words with bit 13 set.
RECOVERY CRIT. : As soon as a TOP/PORT BSU Maintenance Word is received with bit #13 clear.
REMARK : The four-sample filtering is applied by the SDU to cover the possibility that the BSU/ACU does not apply any filtering to its activation of Maintenance Word bit 13.

Port BSU Crosstalk Bus Inactive (9A 0 01)
DESCRIPTION : Discrete bit #12 of Port BSU Maintenance Word is set indicating that the Crosstalk Input is inactive.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to failure after the receipt of four consecutive maintenance words with bit 12 set.
RECOVERY CRIT. : As soon as a Port BSU Maintenance Word is received with bit #12 clear.
REMARK : The four-sample filtering is applied by the SDU to cover the possibility that the BSU/ACU does not apply any filtering to its activation of Maintenance Word bit 12.

Stbd BSU Multicontrol Bus Inactive (9C 0 01)
Same as Top/Port Multicontrol Bus Inactive except substitute Stbd BSU for Top/Port BSU.

Stbd BSU Crosstalk Bus Inactive (9D 0 01)
Same as Top/Port Crosstalk Bus Inactive.

HSU1 429 Control Bus Inactive (9E 0 01)
DESCRIPTION : The SDU shall raise this fault when the SDU Signalling Bus bit of the HSU Status word is not set, indicating that the HSU's input bus is inactive.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to failure after this condition is indicated in at least 15 consecutive HSU status words.
RECOVERY CRIT. : Immediately after receipt of at least 10 consecutive valid HSU status words with the SDU Signalling Bus bit set.
REMARK : None.

HSU1 ICAO Address Invalid (9E 0 02)
DESCRIPTION : This fault is applicable prior to SDU Part Number 7516118-XX130/-xx140 only, and is raised by the SDU in response to the HSU Williamsburg file transfer for HSU fail code 0E/77 (L2/L3), i.e., the ICAO address provided by the SDU to the HSU does not match the one programmed in the HSU CDM, or no ICAO address has been received from the SDU within 10 seconds of achieving full communications (reference section 3.4.1.1.2).
PARAMETERS :

	ICAO Address Not Received		ICAO Address Does Not Match	
	ASCII	Hex	ASCII	Hex
Failure Parameter Most Sig. Byte	M	4D	W	57
Failure Parameter Least Sig. Byte	i	69	r	72
Associated Failure Parameter Most Sig. Byte	s	73	o	6F
Associated Failure Parameter Least Sig. Byte	s*	E6	n*	DC

* This 7-bit ASCII code is shifted left one bit position in order to have the Category bit in bit 0.
FAIL CRITERIA : The fault transitions to failure immediately.
RECOVERY CRIT. : Immediately upon receipt of a valid ICAO address by the HSU from the SDU, which matches the one programmed in the HSU CDM.
REMARK :

HSU1 Position Unavailable (9E 0 03)
DESCRIPTION : This fault is applicable prior to SDU Part Number 7516118-XX130/-xx140 only, and is raised by the SDU in response to the Williamsburg file transfer for HSU fail code 0E/78 (L2/L3), i.e., the HSU is not receiving valid latitude and/or longitude position data from the SDU, and also when a timeout of 15 seconds has elapsed since the last position was received.
PARAMETERS : HSU has received position data but latitude and/or longitude is invalid:
SOUR: Failure Parameter Value - 0000 534Fx
Associated Parameter Value - 0000 55A5x or 0000 55A4x
More than 15 seconds have elapsed since the last position was received:
TIME: Failure Parameter Value - 0000 5449x
Associated Parameter Value - 0000 4D8Ax or 0000 4D8Bx

FAIL CRITERIA : The fault transitions to failure immediately.
RECOVERY CRIT. : Immediately upon receipt of valid data by the HSU from the SDU.
REMARK :

HSU1 Velocity Unavailable (9E 0 04)
DESCRIPTION : This fault is applicable prior to SDU Part Number 7516118-XX130/-xx140 only, and is raised by the SDU in response to the HSU Williamsburg file transfer for HSU fail code 0E/79 (L2/L3), i.e., the HSU is not receiving aircraft velocity data from SDU.
PARAMETERS : The HSU has not received a velocity ARINC word for the past 7.5 seconds:
Lost: Failure Parameter Value - 0000 4C6Fx
Associated Failure Parameter - 0000 73E8x or 0000 73E9x
The HSU has not received a velocity ARINC word within 30 seconds after establishing full communications:
Miss: Failure Parameter Value - 0000 4D69x
Associated Parameter Value - 0000 73E6x or 0000 73E7x
FAIL CRITERIA : The fault transitions to failure immediately.
RECOVERY CRIT. : Immediately upon receipt of valid data by the HSU from the SDU.
REMARK :

HSU2 429 Control Bus Inactive (Level 1 Code 9Fh)
Same as for Level 1 code 9E X XX, except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

WSC1 Input Bus Inactive (A1 0 01)
DESCRIPTION : The last label 270 WSC Status word from WSC1 was received with the pertinent bit set indicating an inactive input bus from “this” SDU (bit 21 if this is SDU 1, or bit 22 if this is SDU 2 in a dual system).
PARAMETERS : “1” if the inactive input bus bit corresponding to the “other” SDU is also set in the WSC1 Status word, for this WSC1 Status word or for any of the subsequent WSC1 Status words considered during the fault-to-failure interval defined in the Fail Criteria below; “0” otherwise.
FAIL CRITERIA : This fault transitions to failure after the receipt of at least four consecutive WSC1 Status words with the pertinent bit set, and if the fault persists for more than three seconds.
RECOVERY CRIT. : As soon as a WSC1 Status word is received with the pertinent bit cleared.
REMARK :

WSC2 Input Bus Inactive (A2 0 01)
Same as for WSC1 Input Bus Inactive (A1 0 01), except substitute WSC2 for WSC1.

WSC3 Input Bus Inactive (A3 0 01)
Same as for WSC1 Input Bus Inactive (A1 0 01), except substitute WSC2 for WSC1.

HSU Ethernet Port 1 Bus Inactive (A6 0 01)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/01) when the Ethernet port 1 interface is configured (as indicated by the Ethernet 1 Presence configuration strap, HSU pin MP2A) and no link pulses are observed on the Ethernet port 1 bus.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for 3 seconds.
RECOVERY CRIT. : This failure is cleared when link pulses are detected on the Ethernet port 1 bus for at least 2 seconds.
REMARK : None.

HSU Ethernet Port 2 Bus Inactive (A7 0 01)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/02) when the Ethernet port 2 interface is configured (as indicated by the Ethernet 2 Presence configuration strap, HSU pin MP2B) and no link pulses are observed on the Ethernet port 2 bus.
PARAMETERS : None.

FAIL CRITERIA : This fault transitions to a failure if the fault persists for 3 seconds.
RECOVERY CRIT. : This failure is cleared when link pulses are detected on the Ethernet port 2 bus for at least 2 seconds.
REMARK : None.

HSU ISDN Port 1 Bus Inactive (A8 0 01)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/03) when the ISDN port 1 interface is configured (as indicated by the ISDN 1 Presence configuration strap, HSU pin MP1E) and no activity is observed on the ISDN port 1 bus.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for 3 seconds.
RECOVERY CRIT. : This failure is cleared when activity is detected on the ISDN port 1 bus for at least 2 seconds.
REMARK : None.

HSU ISDN Port 2 Bus Inactive (A9 0 01)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/04) when the ISDN port 2 interface is configured (as indicated by the ISDN 2 Presence configuration strap, HSU pin MP1F) and no activity is observed on the ISDN port 2 bus.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for 3 seconds.
RECOVERY CRIT. : This failure is cleared when activity is detected on the ISDN port 2 bus for at least 2 seconds.
REMARK : None.

SDU System Configuration Error (Level 1 Code C0h)
SDU System Configuration Error, Unknown SRU (SRU Code 0h)
SDU Straps Parity Error (C0 0 81)
DESCRIPTION : During POST/PAST the configuration straps parity is tested. If the parity is even then this fault is declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SDU Antenna Configuration Straps Error (C0 0 82)
DESCRIPTION : During POST/PAST the antenna configuration straps is tested. If an invalid, unsupported or undefined configuration is read, then this fault is declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SDU CFDS Configuration Straps Error (C0 0 83)
DESCRIPTION : During POST/PAST the CFDS configuration straps is tested. If an invalid or undefined configuration is read, then this fault is declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SDU Straps Inconsistency (C0 0 84)
DESCRIPTION : During POST/PAST the configuration straps is tested. If an inconsistency (as delineated below) is read, then this fault is declared.
PARAMETERS : (One bit per condition; multiple conditions may apply; if so, set all appropriate bits)

1 = Not used/Spare.
2 = Undefined Lamp/Chime Option.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

Dual System - Config Straps Error (C0 0 05)
DESCRIPTION : This fault is declared in a dual system if the SDU Number received from the other SDU on the cross-talk bus is the same as this SDU's Number, and also when an SDU is strapped as single and DCS words are received on the XTB.
PARAMETERS : 1st: Strap parity (good or bad)
2nd: SDU number, as follows:
0 Single SDU
1 #1 of 2
2 #2 of 2
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : If the straps parity is bad as per Section 3.2.3.1.23.1.3, the SDU will use the SDU Number different from the other SDU's after a reversion reset.

Dual System - Cockpit Straps Incompatible (C0 0 06)
DESCRIPTION : This fault is declared in a dual system when the configuration straps associated with cockpit functionalities are inconsistent between the two SDUs.
PARAMETERS : (One bit per condition; multiple conditions may apply; if so, set all appropriate bits)
1 = TP13A Priority 4 Call To/From Cockpit.
2 = TP13C-TP13D Cockpit Voice Call Light/Chime Options.
4 = TP13K Cockpit Hookswitch Signalling Method.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared after the other SDU resets and reads straps which are compatible.
REMARK : When this failure is active, the behavior of cockpit voice will depend on the straps read by the SDU supporting the physical channel for the call.

Manufactuer-Specific SDU Straps Parity Error (C0 0 87)
DESCRIPTION : During POST/PAST, the manufacturer-specific SDU configuration straps is tested for parity. If the computed parity is odd, this fault is declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK :

SDU WOW Miscompare Error (C1 0 81/01)
DESCRIPTION : During CM, (1) if the configuration straps indicate no CFDS or IRS presence, or (2) if the aircraft type is Airbus, then the two Weight On Wheels discretes is compared once per second. Should there be a mismatch in the readings then a 'SDU WOW Miscompare Error' fault is declared.
While in the fault state the two Weight On Wheels discretes is compared once per second. The 'SDU WOW Miscompare Error' fault is cleared if the discretes agree. A similar test shall also be performed during POST/PAST (1) if the configuration straps indicate no CFDS or IRS presence, or (2) if the aircraft type is Airbus.
PARAMETERS : None.
FAIL CRITERIA : CM: This fault transitions into failure if it persists for ten seconds or more.
POST/PAST: This fault transitions into failure if it persists for multiple samples for three seconds or more.
RECOVERY CRIT. : CM: This failure is cleared, on receipt of a 'SDU WOW Miscompare Error' fault cleared report (see DESCRIPTION above), if no further 'SDU WOW Miscompare Error' faults are reported for ten seconds or more.
POST/PAST: This failure is not explicitly cleared.
REMARK :

SDU Dual System Select/Disable Error (Level 1 Code C2)
SDU Dual System Select/Disable Test Error (C2 0 81)
DESCRIPTION : During POST/PAST in a dual system, as long as the other SDU is not already disabled and the cross-talk bus (XTB) input is active, each SDU shall test its ability to assert its Select/Disable output to the other SDU, and for the other SDU to report within 0.3 second (via its “My Disable Is Asserted” bit in its Dual Control/Status word on the XTB) that its Disable input is being asserted. The asserting SDU shall release the test assertion after the positive indication from the other SDU, or after 0.3 second, whichever occurs first. If the test cannot be carried out during POST/PAST, it is carried out once, later, if the opportunity arises. Although carried out after POST/PAST, the code shall still be C2 0 81.
PARAMETERS : State of the Select input discrete during the test.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This fault is never explicitly cleared.
REMARK : The other SDU is not actually disabled during this test since the Select/Disable must be asserted for at least one second for that to occur. If the other SDU is already disabled (and this test is therefore inhibited), failure C2 0 82 is declared.

Select/Disable Test Not Initiated (C2 0 82)
DESCRIPTION : Reference the Description for failure C2 0 81; if the Select/Disable Test cannot be initiated due to the other SDU already being disabled or the XTB input being inactive, this fault is declared at the end of POST/PAST.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if the test is able to be performed after POST/PAST (i.e., other SDU no longer disabled, or XTB input no longer inactive).
REMARK : This failure serves as a warning that a critical part of the normal POST/PAST procedure was bypassed, hence the dual system cannot be positively declared to be 100% functional.

SDU (ICAO) Address Bits (Straps) (Level 1 Code C3)
SDU (ICAO) Address Bits (Straps) Error (C3 0 81)
DESCRIPTION : Should there be no ARINC 429 source of ICAO aircraft address indicated as present in the configuration straps, and the discrete value when read during POST/PAST indicates all zero’s or all ones’s, then this fault is declared.
PARAMETERS : The ICAO aircraft address read from the discretes.
FAIL CRITERIA : This fault transitions into failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK :

Dual System Different Straps AES ID (C3 0 02)
DESCRIPTION : This fault is declared in a dual system if this SDU obtains its AES ID from its strapped discretes, and a valid AES ID received from the other SDU via the cross-talk bus is different from this AES’ valid ID.
PARAMETERS : 1st: This SDU’s AES ID
2nd: Other SDU’s AES ID
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if a valid AES ID is received from the other SDU which matches this SDU’s valid AES ID.
REMARK : This fault is declared in both SDUs. No functional resource is indicted; however, one SDU will become disabled.

HGA/IGA HPA Reflected Output Power (Level 1 Code C4)
HGA/IGA HPA 429 Maintenance Word Output VSWR Bad (C4 0 01)
DESCRIPTION : This fault is declared if bit #12 in the Maintenance Word received by the SDU from the HGA/IGA HPA was set.
PARAMETERS : None.

FAIL CRITERIA : This fault transitions to failure after the receipt of four consecutive maintenance words with bit 12 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received by the SDU with bit #12 cleared.
REMARK : The Honeywell/Racal HPA sets bit 12 in its Maintenance words while failure C4 0 02 is active.

HGA/IGA HPA Reflected Output Power Error (C4 0 02)
DESCRIPTION : The HPA shall (for any software package resident in a 40W HPA having hardware/software compatibility strap settings of 00h) declare this fault if the measured reflected output power exceeds 20 watts. For any software package operating in a 20W or 40W HPA having a hardware/software compatibility strap setting of 02h or greater, the HPA shall declare and latch this fault if the measured reflected output power exceeds half of the forward output power. The 60W HPA shall declare and latch this fault if the measured reflected output power exceeds three tenths of the forward power and is greater than +24 dBm.
PARAMETERS : 20W/40W HPA: The measured reflected output power; 60W HPA: None.
FAIL CRITERIA : This fault transitions to failure (in HPAs having hardware/software compatibility strap settings of 00h) if the fault persists for one second. This fault transitions to failure (in HPAs having hardware/software compatibility strap settings of 02h or higher, or if the 60W HPA) if the fault persists for 100 ms.
RECOVERY CRIT. : This failure is cleared (for any software package resident in HPAs having hardware/software compatibility strap settings of 00h) if the measured reflected output power is less than 20 watts for one second. For any software package operating in HPAs having hardware/software compatibility strap settings of 02h or greater, this failure is cleared only if the measured reflected power is less than half the forward output power for 100 ms while forward output power is present at the detector. For the 60W HPA, this failure is cleared when the measured reflected power is less than three tenths of the forward power for 100 ms while forward output power is present at the detector.
REMARK : The HPA shall set bit 12 in its Maintenance words while this failure is active. The SDU will raise failure (C4 0 01) while bit 12 in the HPA Maintenance word is set.

SDU ORT/Configuration Straps Incompatibility (Level 1 Code C5)
SDU ORT/Local Configuration Straps Incompatibility (C5 0 81/01)
DESCRIPTION : When the ORT is uploaded, at POST/PAST and after a User partition ORT crossload in a dual system, the values of items that depend on the physical configuration of the local system are checked against the local system configuration straps. This failure is declared if any ORT item value is incompatible with any strap states.
PARAMETERS : (One bit per condition; multiple conditions may apply; if so, set all appropriate bits)
10x : ORT item vii indicates reservation of all necessary resources for one HEADSET call on cockpit channel 1, but the straps don't indicate wiring of codec A to the cockpit AMS (single system only).
20x : ORT item vii indicates reservation of all necessary resources for one HEADSET call on cockpit channel 2, but the straps don't indicate wiring of codec B to the cockpit AMS (single system only).
40x : ORT item xiii indicates routing to DPHONE, but the straps don't indicate that the CCS is installed (single system only).
80x : ORT item xiii indicates routing to APHONE, but the straps don't indicate the wiring of either codec to the cabin (single system only).
100x : ORT item xiii indicates routing to HEADSET, but the straps don't indicate the wiring of either codec to the cockpit AMS (single system only).
200x : ORT item xxxii indicates selection of the ACP mic switch call initiation method, but ORT item xxxi does not indicate selection of the SCDU telephone number preselect only option.
400x : ORT item xiii indicates routing to HEADSET, but the strap TP13A indicates that APC calls to/from the cockpit are not allowed (single system only).
800x : ORT item v contains telephone numbers assigned priority 4, but the strap TP13A indicates that APC calls to/from the cockpit are not allowed (single system only).
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This fault is cleared once the ORT becomes compatible with the local straps.
REMARK : The default value(s) of the ORT item(s) causing the incompatibility will be substituted for the current power-up cycle to permit operation to proceed.

Dual ORT/Combined Configuration Straps Incompatibility (C5 0 02)
DESCRIPTION : In a dual system, when the ORT is uploaded, after POST/PAST and after a User partition ORT crossload, the values of duplicated items that depend on the physical configuration of the remote system, and the values of common items that depend on system-wide
configuration straps, is checked after the remote straps are available (i.e., when full cross-talk communications are established). This fault is declared if any ORT item value is incompatible with any strap states.
PARAMETERS : (One bit per condition; multiple conditions may apply; if so, set all appropriate bits)
10x : ORT item vii indicates reservation of all necessary resources for one HEADSET call, but none of the four codecs is Usable by the cockpit.
20x : Not used.
40x : ORT item xiii indicates routing to DPHONE, but none of both SDU system's straps indicate that the CCS is installed.
80x : ORT item xiii indicates routing to APHONE, but none of the four codecs is strapped as being wired to the cabin.
100x : ORT item xiii indicates routing to HEADSET, but none of the four codecs is strapped as being wired to the cockpit AMS.
200x : Not used.
400x : ORT item xiii indicates routing to HEADSET, but either the TP13A straps on both SDUs indicate that APC calls to/from the cockpit are not allowed (set to "zero"), or only one SDU has codecs wired to AMS but its TP13A is set to "zero".
800x : ORT item v contains telephone numbers assigned priority 4, but TP13A strap on both SDUs indicate that APC calls to/from the cockpit are not allowed.
4000x : ORT item xlviii indicates Fixed, but there are more than two physical channels usable by the cockpit.
8000x : ORT item xlviii indicates Shared, but a channel Usable by the cockpit is not matched by the same numbered channel in the other SDU also being Usable by the cockpit.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This fault is cleared when the ORT becomes compatible with the remote or systemwide straps.
REMARK : The default value(s) of the ORT item(s) causing the incompatibility will be substituted for the current power-up cycle to permit operation to proceed.

LGA HPA Reflected Output Power Error (C6 0 01, C6 0 02)
Same as HGA HPA Reflected Output Power Error except (i) substitute LGA HPA for
HGA HPA; (ii) substitute C6 0 02 for C4 0 02 in the Remarks.

HGA/IGA HPA Over Temp Warnings (Level 1 Code C7h)
The failures listed in this section apply to both the HGA (40W/60W) and IGA (20W) Honeywell/Thales HPAs, as note in the description for each failure.

HGA HPA PSU Over Temp Warning (C7 1 01)
DESCRIPTION : During CM, the PSU temperature is tested four times per second and an Over Temp Warning fault is declared if the PSU temperature is greater than or equal to +100 degrees Celsius and less than +130 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : PSU temperature sensor scaled analog voltage, and the warning temperature limit.
FAIL CRITERIA : A failure is declared if the PSU temperature sensor scaled analog output is within the limits specified above for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the PSU temperature sensor scaled analog output is less than +100 degrees Celsius.
REMARK : The HPA shall set bit 13 in its Maintenance words while this failure is active.

HGA HPA Processor (SRU Code 2h)
HGA HPA CPU Over Temp Warning (C7 2 01)
DESCRIPTION : During CM, the CPU temperature is tested four times per second and an Over Temp Warning fault is declared if the CPU temperature is greater than or equal to +100 degrees Celsius and less than +130 degrees Celsius. This failure code shall only be applicable to the 20W and 40W HPAs.
PARAMETERS : CPU temperature sensor scaled analog voltage, and the warning temperature limit.

FAIL CRITERIA : A failure is declared if the CPU temperature sensor scaled analog output is within the limits specified above for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the CPU temperature sensor scaled analog output is less than +100 degrees Celsius.
REMARK : The HPA shall set bit 13 in its Maintenance words while this failure is active.

HGA HPA Over Temp Warning (C7 2 02)
DESCRIPTION : During CM, if the PA temperature sensor detects a temperature greater than +100 degrees Celsius, an Over Temp Warning fault is declared. While this failure is active, the HPA shall reduce maximum available RMS power to 8dB below 40W. This failure code shall only be applicable to the 60W HPA.
PARAMETERS : None
FAIL CRITERIA : A failure is declared if two consecutive readings are above +100 degress Celsius.
RECOVERY CRIT. : The failure is cleared if two consecutive readings drop below +85 degrees Celsius.
REMARK : The 60W HPA will set bit 13 in its Maintenance words while this failure is active. The SDU will also raise failure (C7 0 01) per section 4.4.5.199.20 while bit 13 in the HPA Maintenance word is set.

HGA HPA Driver Over Temp Warning (C7 3 01)
DESCRIPTION : During CM, the Driver temperature is tested four times per second and an Over Temp Warning fault is declared if the Driver temperature is greater than or equal to +100 degrees Celsius and less than +130 degrees Celsius. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Driver temperature sensor scaled analog voltage.
FAIL CRITERIA : A failure is declared if the Driver temperature sensor scaled analog output is within the limits specified above for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the Driver temperature sensor scaled analog output is less than +100 degrees Celsius.
REMARK : The HPA shall set bit 13 in its Maintenance words while this failure is active.

HGA HPA Combiner Over Temp Warning (C7 8 01)
DESCRIPTION : During CM, the Combiner temperature is tested four times per second and an Over Temp Warning fault is declared if the Combiner temperature is greater than or equal to +100 degrees Celsius and less than +130 degrees Celsius. This failure code shall only be applicable to the 40W HPA.
PARAMETERS : Combiner temperature sensor scaled analog voltage.
FAIL CRITERIA : A failure is declared if the Combiner temperature sensor scaled analog output exceeds its limits for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the Combiner temperature sensor scaled analog output is less than +100 degrees Celsius.
REMARK : The HPA shall set bit 13 in its Maintenance words while this failure is active.

HGA HPA RFAM Over Temp Warning (C7 B 01)
DESCRIPTION : During CM, the RFAM temperature is tested four times per second, and an Over Temp Warning is declared if the RFAM temperature is greater than or equal to +100 degrees Celsius and less than +130 degrees Celsius. This failure code shall only be applicable to the 20W HPA.
PARAMETERS : RFAM temperature sensor scaled analog voltage, and the warning temperature limit.
FAIL CRITERIA : A failure is declared if the RFAM temperature sensor scaled analog output exceeds its limits for four consecutive readings.
RECOVERY CRIT. : The failure is cleared if after four consecutive readings the RFAM temperature sensor scaled analog output is less than +100 degrees Celsius.
REMARK : The HPA shall set bit 13 in its Maintenance words while this failure is active.

HGA HPA MNTNC WORD LRU Over Temp (C7 0 01)
DESCRIPTION : This fault is declared if bit #13 in the Maintenance Word from the HGA HPA was set.
PARAMETERS : The maintenance word.
FAIL CRITERIA : This fault transitions to failure after the receipt of four consecutive maintenance words with bit 13 set.
RECOVERY CRIT. : As soon as an HPA Maintenance Word is received with bit #13 cleared
REMARK : The Honeywell HPA does not generate this failure directly, nor log it internally, nor communicate it to the SDU. The SMPM is the “Tester”; it is simply responding to the Maintenance word bit 13. The Honeywell HPA controls bit.

GES Frequency Command Errors (Level 1 Code C8H)
Invalid Frequency Command From GES (C8 0 01)
DESCRIPTION : The SDU shall log this failure if it receives a frequency command from the GES that lies outside of the specified transmit band for the specified channel rate/modulation type.
PARAMETERS : The channel number.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The SDU executes a cold start after logging this failure.

GNSS Interference Risk From GES (C8 0 02)
DESCRIPTION : Per Section 3.3.1.3.4.1, the SDU shall log this failure if it receives a frequency command from the GES that would cause a third- or fifth-order MCS intermodulation product to fall into the GNSS frequency band.
PARAMETERS : The new channel number, as well as the fL and fH channel numbers.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The SDU executes a cold start after logging this failure.

LGA HPA Over Temp Warnings (Level 1 Code C9)
LGA HPA PSU Over Temp Warning (C9 1 01)
Same as for the HGA HPA.

LGA HPA Processor (SRU Code 2h)
LGA HPA CPU Over Temp Warning (C9 2 01)
Same as for the HGA HPA.

LGA HPA Over Temp Warning (C9 2 02)
Same as for the HGA HPA.

LGA HPA Driver Over Temp Warning (C9 3 01)
Same as for the HGA HPA.

LGA HPA Over Temp (Combiner) Warning (C9 8 01)
Same as for the HGA HPA.

LGA HPA RFAM Over Temp Warning (C9 B 01)
Same as for the HGA HPA.

LGA HPA MNTNC WORD LRU Over Temp (C9 0 01)
Same as for the HGA HPA.

LGA/LNA Control Driver Fail (CA 0 01)
DESCRIPTION : The LGA/LNA output discrete is tested by comparing the level of the BITE tell-back with the commanded state, as specified below. Should the output discrete's BITE tell-back
value not be the same as the commanded value for either the active or inactive state (or both), and the antenna subsystem configuration includes an LGA then this fault is declared.
During POST/PAST, the LGA/LNA output discrete is tested for being able to achieve the active and inactive states by commanding the LGA/LNA to the active state briefly, and then inactive again. If the first test pair cycle fails (for either or both states), it is repeated. If the second test pair cycle also fails, then this fault is declared.
During CM, the LGA/LNA output discrete is tested whenever its commanded state is changed for operational reasons, and also once every thirty seconds.
Test results for the discrete output successfully achieving the commanded state (active or inactive) is recorded independently, and the fault shall only be cleared when both commanded states have been recorded as being achieved the last time they were tested.
PARAMETERS : Parameter 1 is set to 1 if the active state is not achieved.
Parameter 2 is set to 1 if the inactive state is not achieved.

FAIL CRITERIA : This fault transitions to a failure if the fault persists continuously for one second.
RECOVERY CRIT. : This failure is cleared as soon as the fault is cleared, i.e., as soon as both commanded states have been recorded as being achieved the last time they were tested.
REMARK : This failure is Class 2, and does not indict [lga_subsys] nor [hga_subsys], because the reason could as likely be failure in the SDU BITE circuitry, and because other, more definitive tests (LGA LNA diplexer and LGA LNA RF continuity) cover this functionality.
Level 3 failure code 81 is not used for the POST/PAST case second commentary, fourth paragraph (i.e., the POST/PAST and CM tests are identical).
In the actual implementation, if an LGA is installed, this discrete is repetitively commanded to its currently required state (whether on or off) at a rate of ~ 15 Hz. The CM test is performed after each such command, hence continuously at ~ 15 Hz (which includes the case of whenever a state change is commanded) as well as once every thirty seconds. Since there is no separate Level 3 failure code 81 for the POST/PAST case, even the POST/PAST case includes the one-second fail criteria. The POST/PAST case also requires the retest fail criteria in order to avoid nuisance failures because there is no guarantee that the CM testing (which might otherwise clear a POST/PAST-detected fault) will begin or resume within one second of POST/PAST.

HGA/IGA HPA Invalid SDI Strapping (CB 0 01)
DESCRIPTION : HPA perspective: The HPA shall read the programmed state of its SDI pins at each coldstart and each functional test (i.e., each POST/PAST). This fault is declared if the SDI pins are set to any invalid state (Reserved or Unused). When this occurs, the HPA shall, in software packages D2.0 and subsequent, aside from logging the failure, behave in every way as though it was strapped to be the HGA/IGA HPA.
SDU perspective: The HGA/IGA HPA has reported this failure using the manufacturer specific block transfer protocol.
PARAMETERS : The as-read invalid SDI code.
FAIL CRITERIA : HPA perspective: This fault transitions to a failure immediately.
SDU perspective: This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This failure results in the LGA HPA being unable to respond to all but all-call commands sent via the ARINC 429 Multicontrol bus, which renders it virtually useless. Both HPAs shall use failure CB 0 01, since they cannot tell which HPA they are supposed to be.
When the SDU receives a CB 0 01 block on the HGA/IGA HPA bus, it shall make the entry into the system failure log using code CB 0 01; conversely, it shall use code CC 0 01 if the CB 0 01 block is received on the LGA HPA bus (see below). Note that failure code 01 is used, even though the test is (only) performed during POST/PAST.
Note: In HPA software packages prior to D2.0, upon detecting this failure, the HPA would use the “unused” SDI code (11b) in its transmitted ARINC 429 words, and would only respond to Command Words with SDI fields set to the “All Call” code.

LGA HPA Invalid SDI Strapping (CC 0 01)
DESCRIPTION : HPA perspective: Not used.
SDU perspective: The LGA HPA has reported failure CB 0 01 using the manufacturer specific block transfer protocol.
PARAMETERS : The as-read invalid SDI code.
FAIL CRITERIA : SDU perspective: This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The HPAs themselves do not use this failure -- they use CB 0 01. When the SDU receives a CB 0 01 block on the LGA HPA bus, it shall make the entry into the system failure log using code CC 0 01. Note that failure code 01 is used, even though the test is (only) performed during POST/PAST.

SDU POC/TOTC Reset (Level 1 Code CDh)
SDU TOTC Auto/Manual Reset (CD 0 81/01)
DESCRIPTION : The SDU has performed either an automatic (Level 3 code 81) or manual (code 01) TOTC reset.
PARAMETERS : The value of the TOTC (in 10-minute increments) just prior to it being reset. This may be valid, or it may be corrupted.

FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an SDU TOTC reset event has occurred.

SDU POC Auto/Manual Reset (CD 0 82/02)
DESCRIPTION : The SDU has performed either an automatic (Level 3 code 82) or manual (code 02) POC reset.
PARAMETERS : The value of the POC just prior to it being reset. This may be valid, or it may be corrupted.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an SDU POC reset event has occurred.

HGA/IGA HPA POC/TOTC Reset (Level 1 Code CFh)
HGA/IGA HPA TOTC Auto/Manual Reset (CF 0 81/01)
DESCRIPTION : HPA perspective: As specified in Section 4.3.6.3, the HGA/IGA HPA has performed either an automatic (Level 3 code 81) or manual (code 01) TOTC reset.
SDU perspective: The HGA/IGA HPA has reported this failure using the manufacturerspecific block transfer protocol.
PARAMETERS : The value of the TOTC (in 10-minute increments) just prior to it being reset. This may be valid, or it may be corrupted.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an HGA HPA TOTC reset event has occurred.

HGA/IGA HPA POC Auto/Manual Reset (CF 0 82/02)
DESCRIPTION : HPA perspectiveThe HGA/IGA HPA has performed either an automatic (Level 3 code 82) or manual (code 02) POC reset.
SDU perspective: The HGA/IGA HPA has reported this failure using the manufacturerspecific block transfer protocol.
PARAMETERS : The value of the POC just prior to it being reset. This may be valid, or it may be corrupted.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an HGA HPA POC reset event has occurred.

LGA HPA POC/TOTC Reset (Level 1 Code D0h)
LGA HPA TOTC Auto/Manual Reset (D0 0 81/01)
DESCRIPTION : HPA perspective: As specified in Section 4.3.6.3, the LGA HPA has performed either an automatic (Level 3 code 81) or manual (code 01) TOTC reset.
SDU perspective: The LGA HPA has reported this failure using the manufacturer-specific block transfer protocol.
PARAMETERS : The value of the TOTC (in 10-minute increments) just prior to it being reset. This may be valid, or it may be corrupted.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an LGA HPA TOTC reset event has occurred.

LGA HPA POC Auto/Manual Reset (D0 0 82/02)
DESCRIPTION : HPA perspective: The LGA HPA has performed either an automatic (Level 3 code 82) or manual (code 02) POC reset.
SDU perspective: The LGA HPA has reported this failure using the manufacturer-specific block transfer protocol.
PARAMETERS : The value of the POC just prior to it being reset. This may be valid, or it may be corrupted.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This entry into the failure log is used to indicate that an LGA HPA POC reset event has occurred.

HGA HPA Wrong A429 SDI Code (D1 0 01)
DESCRIPTION : An expected ARINC 429 Word (labels 143,350,171) received on the HGA HPA to SDU bus contains an SDI different from HGA HPA.
PARAMETERS : First word containing the wrong SDI code.
FAIL CRITERIA : This fault transitions to a fail immediately.
RECOVERY CRIT. : Immediately when any of the expected ARINC 429 words received on this bus contain an SDI indicating HGA HPA.
REMARK :

LGA HPA Wrong A429 SDI Code (D2 0 01)
DESCRIPTION : An expected ARINC 429 Word (labels 143,350,171) received on the LGA HPA to SDU bus contains an SDI different from LGA HPA.
PARAMETERS : First word containing the wrong SDI code.
FAIL CRITERIA : This fault transitions to a fail immediately.
RECOVERY CRIT. : Immediately when any of the expected ARINC 429 words received on this bus contain an SDI indicating LGA HPA.
REMARK :

Top/Port BSU/ACU Wrong A429 SDI Code (D3 0 01)
DESCRIPTION : An expected ARINC 429 Word (labels 144,350) received on the Top/Port BSU/ACU to SDU bus contains an SDI not equal to Port/Top or ACU.
PARAMETERS : First word containing the wrong SDI code.
FAIL CRITERIA : This fault transitions to a failure after three seconds.
RECOVERY CRIT. : Immediately when any of the expected ARINC 429 words received on this bus contain a correct SDI.
REMARK :

Starboard BSU Wrong A429 SDI Code (D4 0 01)
DESCRIPTION : An expected ARINC 429 Word (labels 144,350) received on the Starboard BSU to SDU bus contains an SDI not equal to Starboard.
PARAMETERS : First word containing the wrong SDI code.
FAIL CRITERIA : This fault transitions to a failure after three seconds.
RECOVERY CRIT. : Immediately when any of the expected ARINC 429 words received on this bus contain a correct SDI.
REMARK :

SDU/RFUIA To HGA/IGA HPA Cable Loss (Level 1 Code D5)
SDU/RFUIA To HGA/IGA HPA Calibration Error (D5 0 01)
DESCRIPTION : This fault is declared if the calculated SDU/RFUIA to HPA Loss is outside acceptable limits (ie not within 10 to 30dB).
PARAMETERS : Failure Param: A 1 shall indicate that the calibrated loss was calculated to be greater than the maximum value.
A 0 shall indicate that the calibrated loss was calculated to be less than the minimum value.
Assoc Param: The calculated loss in tenths of dB.
FAIL CRITERIA : This fault transitions to a failure if the fault persists for at least two successive measurement samples.
RECOVERY CRIT. : This failure can only be cleared whilst the HGA antenna is the currently selected one.
REMARK : This test is not done during the PAST period but only on actual transmissions (e.g. during log-on). This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The test also depends on the correct functioning of the HPA's output power detector and the expected HPA amplification (gain), so if the HPA is muted, or not amplifying correctly, this failure may result.
Although "illegal" in either the too-high or too-low case, this failure is only a real operational problem if the loss is too high, and depending on variables such as geographic location, antenna gain, number of channels in use, etc., the system may work to some extent even then. For SDU Part Number 7516118-XX130/-xx140 and subsequent, if the calculated cable loss is less than 10dB and the selected HPA is a 60W HPA, the SDU

shall attempt to set the input attenuator to give a nominal cable loss of 15dB in order to prevent potential equipment damage to the HPA.
The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the calibration test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

SDU/RFUIA To Linear HGA/IGA HPA RF Continuity Fail (D5 0 02)
DESCRIPTION : This fault is declared when the HPA is a Linear HPA and fails to detect any measurable Actual Output Power while the SDU is sending a Log-On Request with the SDU/RFUIA to HGA/IGA HPA Loss set to the maximum value.
PARAMETERS : Failure Param: The last positively calibrated SDU/RFUIA to HGA/IGA HPA Loss in tenths of dB, or the Factory Settings default value if no calibration has been
achieved.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : If during the burst the HPA reports a measurable Actual Output Power but the calibration of the SDU/RFUIA to HPA Loss cannot be performed (backoffs are set to the limit or the HPA reports an APO equal to 19 dBW), the fault is not raised. This test is not done during the
PAST period but only on actual transmissions (e.g. during log-on). This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The test also depends on the correct functioning of the HPA's output power detector and the expected HPA amplification (gain), so if the HPA is not amplifying correctly, this failure may result. A basic troubleshooting guide can help determine the general location where the failure is most likely to occur.
This fault will also be declared whenever the HPA independently turns carriers off (i.e., not under normal command from the SDU), which causes any subsequent RF continuity test to fail. Such action is required for the 20W HPA whenever a short circuit condition is detected on any of the secondary power supply output voltages externally wired to an HPA-controlled IGA. In such cases, all of the secondary output voltages typically fail together. The 20W HPA power supply turns carriers off by disabling the +5VDC bias voltage, which subsequently results in that failure being raised as well. Reference failure 04 1 03, and failures 04 1 08 through 04 1 0A.
The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the calibration test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

SDU/RFUIA To Class C HGA/IGA HPA RF Continuity Fail (D5 0 03)
DESCRIPTION : This fault is declared when the HPA is a Class C HPA and fails to detect any measurable Actual Output Power while the SDU is sending a Log-On Request with the HPA Maximum Output Power set to the minimum value.
PARAMETERS : Failure Param: The last positively calibrated Class C maximum Output Power in tenths of dB, or the Factory Settings default value if no calibration has been achieved.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : If during the burst the HPA reports a measurable Actual Output Power but the calibration of the Class C HPA Maximum Output Power cannot be performed (backoffs are set to the limit or the HPA reports an APO equal to 19 dBW), the fault is not raised.
The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the continuity test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

SDU/RFUIA To HGA/IGA HPA Attenuator Calibration Error (D5 0 04)
DESCRIPTION : This fault is only applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared if the SDU/RFUIA to HPA Loss calculated during the input attenuator calibration for a 60W HPA is greater than 35dB.
PARAMETERS : Failure Param: A 1 shall indicate that the calibrated loss was calculated to be greater than the maximum value.
Assoc Param: The measured HPA input power in mW.

FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This test is not done during the PAST period (refer to Section 3.3.1.3.2.8.6). This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the calibration test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

SDU/RFUIA To Linear HGA/IGA HPA Attenuator RF Continuity Fail (D5 0 05)
DESCRIPTION : This fault is only applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared when the HPA is a Linear 60W HPA and fails to detect any measurable input power while the SDU is performing the HPA input attenuator calibration.
PARAMETERS : None
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : This test is not done during the PAST period. This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The test also depends on the correct functioning of the HPA's input power detector and input attenuator, so if these devices are not operating correctly, this failure may result. A basic troubleshooting guide (reference Section 4.4.5.233 Commentary) can help determine the general location where the failure is most likely to occur.
The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the calibration test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.
The HS-720 HSU may be installed in place of the RFUIA. It contains a passive combiner that does affect the calibration test because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the HSU if this failure occurs.

SDU/RFUIA To LGA HPA Cable Loss (Level 1 Code D6)
SDU/RFUIA To LGA HPA Calibration Error (D6 0 01)
Same as SDU/RFUIA to HGA HPA Calibration Error except this fault shall only be declared if the LGA HPA is a linear HPA.

SDU/RFUIA To Linear LGA HPA RF Continuity Fail (D6 0 02)
Same as SDU/RFUIA to Linear HGA HPA RF Continuity Fail.

SDU/RFUIA To Class C LGA HPA RF Continuity Fail (D6 0 03)
Same as SDU/RFUIA to Class C HGA HPA RF Continuity Fail.

SDU/RFUIA To LGA HPA Attenuator Calibration Error (D6 0 04)
Same as SDU/RFUIA to HGA HPA Attenuator Calibration Error except this fault shall only be declared if the LGA HPA is a linear HPA.

SDU/RFUIA To Linear LGA HPA Attenuator RF Continuity Fail (D6 0 05)
Same as SDU/RFUIA to Linear HGA HPA Attenuator RF Continuity Fail.

Top/Port HGA LNA To SDU/RFUIA RF Continuity Fail (D8 0 81)
DESCRIPTION : This fault is declared if the SDU does not indicate (via RFM narrowband AGC measurement) a rising noise floor level from an active Top/Port HGA LNA on any one of its three receive channels within five seconds of the Top/Port HGA LNA having been turned on. This test shall only be performed if the Top/Port BSU to SDU input bus is active, the Top/Port LNA BITE is Ok, and the Top/Port BSU is declaring the SDU Control Bus input as active and the three AGCs are at their respective LNA Off states. This test is not performed if any BSU self-test misoperation failures [13/0/8A, 13/0/0A, 15/0/8A, 15/0/0A] are declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.

REMARK : A basic troubleshooting guide can help determine the general location where the failure is most likely to occur. The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the continuity test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

Starboard HGA LNA To SDU/RFUIA RF Continuity Fail (D9 0 81)
DESCRIPTION : This fault is declared if the SDU does not indicate (via RFM narrowband AGC measurement) a rising noise floor level from an active Starboard HGA LNA on any one of its three receive channels within five seconds of the Starboard HGA LNA having been turned on. This test shall only be performed if the Starboard BSU to SDU input bus is active, the Starboard LNA BITE is Ok, the Starboard BSU is declaring the SDU Control Bus input as active, and the three AGCs are at their respective LNA Off states. This test is not performed if any BSU self-test misoperation failures [13/0/8A, 13/0/0A, 15/0/8A, 15/0/0A] are declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : A basic troubleshooting guide can help determine the general location where the failure is most likely to occur. The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the continuity test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

LGA LNA To SDU/RFUIA RF Continuity Fail (DA 0 81)
DESCRIPTION : This fault is declared if the SDU does not indicate (via RFM narrowband AGC measurement) a rising noise floor level from an active LGA LNA on any one of its three receive channels within five seconds of the LGA LNA having been turned on. This test shall only be performed if the LGA LNA BITE is Ok and the three AGCs are at their respective LNA Off states. This test is not performed if any BSU self-test misoperation failures [13/0/8A, 13/0/0A, 15/0/8A, 15/0/0A] are declared.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The RFUIA is a passive and optional device which, if present, is ignored by the SDU. However, the RFUIA does affect the continuity test if it is present because it is included in the signal path. Maintenance personnel need to be aware of the potential impact of the RFUIA if this failure occurs.

LGA Log-on Test (Level 1 Code DBh)
LGA Log-on Test Failure (DB 0 01)
COMMENTARY
In a single or dual system containing more than one antenna and at least one LGA, it is likely that long periods may elapse without using that LGA for normal communication. In order to detect latent faults, it is necessary for the SDU with that LGA to perform a test logon regularly, and for a fault to be declared if the test log-on fails, with suitable checks to minimise the occurrence of misleading failure reports due to signal blockage, etc. In a single pseudo-dual system (HGA+LGA), no equivalent test is required for the HGA, since an unreported failure in the HGA subsystem which results in the HGA being unusable would be self-evident.
DESCRIPTION : If more than one antenna is installed and at least one is an LGA, and both the LGA and at least one other antenna are not failed, and the system is in automatic antenna selection mode then the SDU shall perform an LGA log-on test.
If the LGA to be tested is on the current master SDU in a dual system, or on a single SDU, and in either case the antenna configuration is HGA+LGA, the SDU shall test by selecting its LGA, renewing the log-on, then switching back to its HGA and again renewing the logon. A fault is declared if the SDU does not achieve log-on via the LGA, but subsequently does achieve log-on via the HGA.
If the LGA is on the current slave system in a dual system, the master SDU shall test by requesting the slave SDU to perform a log-on test (via its LGA), and then switching back to the master and its antenna (HGA or LGA) and renewing the log-on. A fault is declared by the slave SDU if the system does not achieve log-on via the slave's LGA, but does subsequently achieve log-on via the master's antenna.
COMMENTARY
This requires that SATCOM transmissions not be restricted while the aircraft is on ground.

PARAMETERS : Cumulative count of sequential test failures since the last factory settings restart or test passing.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : Successful log-on via the LGA.
REMARK : LGA log-on test failure is also reported in 270-28 and/or 276-11. If raised, this failure needs to be considered in conjunction with other failures, such as Rx continuity, Tx cable loss, etc. If no other failures exist, the root cause must be cabling from HPA to DLNA, or the LGA itself, or the cable between LGA and DLNA.
Note that it is not raised if the HGA system cannot log-on, so building blockage is not a likely cause.

Slave LGA Log-on Test Not Initiated (DB 0 02)
DESCRIPTION : This fault is declared if a slave LGA log-on test is not initiated because of equipment failure ([r_sdu_min_op.X] OR [r_lga_subsys.X]), cross-talk bus (XTB) full communications not being established, or the slave being disabled ([r_common.C]); or the master SDU attempts a test log-on via the slave, but no response is received from the slave via the XTB
within five minutes; or if the test is aborted due to any of the reasons previously stated.
PARAMETERS : 1 = slave LGA equipment not OK
2 = XTB full communications not achieved
3 = slave SDU is disabled
4 = response timeout
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : Performing a successful test log-on via the LGA, or upon a handover of mastery, or upon failure DB 0 01 (preceeding section) becoming active.
REMARK : LGA slave log-on test not initiated is also reported in 276-11.

No Declared Active (C)MU (DC 0 01)
DESCRIPTION : This fault is declared when at least one (C)MU input bus is active, but no installed (C)MU indicates “Active” in its label 270 status words (bit 20).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure if the fault persists for 10 seconds.
RECOVERY CRIT. : As soon as a label 270 status word is received from a (C)MU with an “Active” indication in bit 20 or the busses from all installed (C)MUs are declared inactive.
REMARK : This failure condition is reflected in the SDU’s label 270 status word (in bit 29) to the (C)MU, which is also read by the EICAS/ECAM/EDU.

Secured ORT Error (Level 1 Code DDh)

Item (i) - Startup Logon Policy (DD 0 01)
DESCRIPTION : Upon ORT upload, the Startup Log-on Policy setting is NOT within the acceptable range defined in Section 3.3.3.1.4.1 (i).
PARAMETERS : The uploaded ORT item (i) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (viii) - Response Capability To Log-On Interrogation (DD 0 03)
DESCRIPTION : Upon ORT upload, the Log-On Interrogation Response setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (viii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xviii) - Noise Insertion Level (DD 0 04)
DESCRIPTION : Upon ORT upload, the Noise Insertion Level setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxii) - Tx Gain Threshold (DD 0 05)
DESCRIPTION : Upon ORT upload, the HGA and/or IGA Tx Gain Threshold settings is/are NOT within the acceptable ranges.
PARAMETERS : Failure Param: The uploaded ORT item (xxii) value that has failed the range test.
Assoc Param: A 0 shall indicate that the failure is associated with an HGA.
A 1 shall indicate that the failure is associated with an IGA.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxiii) - APHONE System Management Commands (DD 0 06)
DESCRIPTION : Upon ORT upload, the APHONE System Management Commands setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxiii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxviii) - HPA Backoff Limits (DD 0 08)
DESCRIPTION : Upon ORT upload, the HPA Backoff Limits setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxix) - HPA Minimum Reportable Actual Power Output (DD 0 09)
DESCRIPTION : Upon ORT upload, the HPA Minimum Reportable Actual Power Output setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxix) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxx) - Default Assumed Global Beam Initial C-Channel EIRP (DD 0 0A)
DESCRIPTION : Upon ORT upload, the Default Assumed Global Beam Initial C-Channel EIRP setting is less than 0 dBW or more than 25.5 dBW.
PARAMETERS : The uploaded ORT item (xxx) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxi) - SCDU Telephone Number Preselect (DD 0 0B)
DESCRIPTION : Upon ORT upload, the SCDU Telephone Number Preselect setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxxi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxii) - ACP Call Initiation (DD 0 0C)
DESCRIPTION : Upon ORT upload, the ACP Call Initiation setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxxii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxviii) - Failure Masking Data (DD 0 0D)
DESCRIPTION : Upon ORT upload, the Failure Masking Data setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxxviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxix) - Elevation Handover Threshold (DD 0 0E)
DESCRIPTION : Upon ORT upload, the Elevation Handover Threshold setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xxxix) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xli) - Automatic Transit Call GES Table (DD 0 0F)
DESCRIPTION : Upon ORT upload, the Automatic Transit Call GES Table setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xli) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xlii) - Air-to-Ground Chime (DD 0 10)
DESCRIPTION : Upon ORT upload, the Air-to-Ground Chime setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xlii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xliii) - SCDU Call Prompts (DD 0 11)
DESCRIPTION : Upon ORT upload, the SCDU Call Prompts setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xliii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xliv) - EIRP Overdraft Checking Priority (DD 0 12)
DESCRIPTION : Upon ORT upload, the EIRP Overdraft Checking Priority setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xliv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xlvi) - Cockpit Audio Level Settings (DD 0 13)
DESCRIPTION : Upon ORT upload, the Cockpit Audio Level setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xlvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xlvii) - HGA Retry Period (ground And Air) (DD 0 14)
DESCRIPTION : Upon ORT upload, the HGA Retry Period setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xlvii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xlviii) - Cockpit Channel Interface Type For Dual (DD 0 15)
DESCRIPTION : Upon ORT upload, the Cockpit Channel Interface Type for Dual setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (xlviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (l) - "Disable/Reenable Other SATCOM" SCDU Prompts (DD 0 16)
DESCRIPTION : Upon ORT upload, the "Disable/Reenable Other SATCOM" SCDU Prompts setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (l) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (li) - SCDU SATCOM Subsystem Prompts (DD 0 17)
DESCRIPTION : Upon ORT upload, the SCDU SATCOM Subsystem Prompts setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (li) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lii) - SCDU Channel Label Suffixes (DD 0 18)
DESCRIPTION : Upon ORT upload, the SCDU Channel Label Suffixes setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (liii) - Secured ORT Description (DD 0 19)
DESCRIPTION : Upon ORT upload, the Secured ORT Description setting is NOT within the acceptable range of 24 ISO-5 characters maximum as.
PARAMETERS : The uploaded ORT item (liii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (liv) - Composite ORT File Upload Allowed (DD 0 1A)
DESCRIPTION : Upon ORT upload, the Composite ORT File Upload Allowed setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (liv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Secured ORT Mismatch With Other SDU (DD 0 1B)
DESCRIPTION : This fault is declared if the Secured ORT Partition CRC or the Secured ORT Description (ORT item liii) received from the other SDU on the cross-talk bus are different from this SDU's Secured ORT CRC and Description.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared if the same Secured ORT Partition CRC and Description are received from the other SDU.
REMARK : This fault is declared in both SDUs.

Item (lvi) - Access To Zero-Preference GESs (DD 0 1C)
DESCRIPTION : Upon ORT upload, the Access to Zero-Preference GESs setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lv) - Secured ORT Modified Flag (DD 0 1D)
DESCRIPTION : Upon ORT upload, the Secured ORT Modified Flag setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lvii) - L-Band Reference Offset Calibration Thresholds (DD 0 1E)
DESCRIPTION : Upon ORT upload, the L-Band Reference Offset Calibration Thresholds setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lvii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lix) - APHONE Audio Level Setting (DD 0 1F)
DESCRIPTION : Upon ORT upload, the Aphone Audio Level setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lix) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lx) - Aero-H Only Operation (DD 0 20)
DESCRIPTION : Upon ORT upload, the Aero-H Only Operation setting is NOT within the acceptable range.
PARAMETERS : The uploaded ORT item (lx) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

User ORT Error (Level 1 Code DEh)
Item (ii) - Satellite/GES Names (DE 0 01)
DESCRIPTION : Upon ORT cross/upload, the Satellite/GES Names are NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (ii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (iii) - GES Preference Values (DE 0 02)
DESCRIPTION : Upon ORT cross/upload, the GES Preference Values setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (iii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (iv) - Maintenance Page Access (DE 0 03)
DESCRIPTION : Upon ORT cross/upload, the Maintenance Page Access setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (iv) value that has failed the range test.

FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (v) – Cockpit Telephone Numbers (DE 0 04)
DESCRIPTION : Upon ORT cross/upload, the Cockpit Telephone Numbers setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (v) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (vii) – Resources Reserved For Headset (DE 0 05)
DESCRIPTION : Upon ORT cross/upload, the Resources Reserved for Headset setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (vii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (x) – Ground-to-Air Circuit-Mode Data (DE 0 07)
DESCRIPTION : Upon ORT cross/upload, the Ground-to-Air Circuit-Mode Data setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (x) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xiii) – Ground-to-Air Calls (DE 0 08)
DESCRIPTION : Upon ORT cross/upload, the Ground-to-Air Calls setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xiii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xiv) – Call Camp-On Duration (DE 0 09)
DESCRIPTION : Upon ORT cross/upload, the Call Camp-On Duration setting is NOT within the acceptable range.
PARAMETERS : The corss/uploaded ORT item (xiv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xv) – Camp-On Timeout Action (DE 0 0A)
DESCRIPTION : Upon ORT cross/upload, the Camp-On Timeout Action setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xvi) – Store APHONE Telephone Numbers (DE 0 0B)
DESCRIPTION : Upon ORT cross/upload, the Store APHONE Telephone Numbers setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xix) - Ground-to-Air Call Preemption (DE 0 0C)
DESCRIPTION : Upon ORT cross/upload, the Ground-to-Air Call Preemption setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xix) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xx) - Preferred Cockpit Call Routing (DE 0 0D)
DESCRIPTION : Upon ORT cross/upload, the Preferred Cockpit Call Routing setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xx) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxi) - Preferred APHONE Call Routing (DE 0 0E)
DESCRIPTION : Upon ORT cross/upload, the Preferred APHONE Call Routing setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxiv) - APHONE Outgoing Call Barring Level (DE 0 0F)
DESCRIPTION : Upon ORT cross/upload, the APHONE Outgoing Call Barring Level setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxiv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxv) - Call Barring Security Code (DE 0 10)
DESCRIPTION : Upon ORT cross/upload, the Call Barring Security Code setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxvi) - Shared APHONE Telephone Number Storage (DE 0 11)
DESCRIPTION : Upon ORT cross/upload, the Shared APHONE Telephone Number Storage setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxiii) - ORT Description (DE 0 12)
DESCRIPTION : Upon ORT cross/upload, the ORT Description setting is NOT within the acceptable range of 24 ISO-5 characters maximum.
PARAMETERS : The cross/uploaded ORT item (xxxiii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxiv) - Airline Code (DE 0 13)
DESCRIPTION : Upon ORT cross/upload, the Airline Code setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxxiv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxv) - HEADSET Outgoing Call Barring Level (DE 0 14)
DESCRIPTION : Upon ORT cross/upload, the HEADSET Outgoing Call Barring Level setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxxv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xxxvi) - HEADSET Transit Call (DE 0 15)
DESCRIPTION : Upon ORT cross/upload, the HEADSET Transit Call setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxxvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xl) - High Rate Data Transmit Support (DE 0 16)
DESCRIPTION : Upon ORT cross/upload, the High Rate Data Transmit Support setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xl) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (xlv) - APHONE Called Terminal Id Assignment (DE 0 17)
DESCRIPTION : Upon ORT cross/upload, the APHONE Called Terminal Id Assignment setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xlv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (il) - Mastery Handover Algorithm Weighting (DE 0 18)
DESCRIPTION : Upon ORT cross/upload, the Mastery Handover Algorithm Weighting setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (il) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lviii) - AES Position Reporting (DE 0 19)
DESCRIPTION : Upon ORT cross/upload, the AES Position Reporting setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxi) - HSD Preemption Preferences (DE 0 1A)
DESCRIPTION : Upon ORT cross/upload, the HSD Preemption Preferences setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately, and the default setting is used in place of the failed ORT setting.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The ORTool does not allow undefined selections of this parameter code.

Item (lxii) - Ongoing HSD Call EIRP (DE 0 1B)
DESCRIPTION : Upon ORT cross/upload, the HSU Call Progress Reserved EIRP setting is NOT within the acceptable range defined in Section 3.3.3.1.4.1 (lxii).
PARAMETERS : The cross/uploaded ORT item (lxii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting specified in Section 3.3.3.1.4.3.2 (lxii) is used in place of the failed ORT setting.

Item (xxxvii) - ORT Modified Flag (DE 0 1C)
DESCRIPTION : Upon ORT cross/upload, the ORT Modified Flag setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (xxxvii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxiii) - WSC Manual Dialing (DE 0 1D)
DESCRIPTION : Upon ORT cross/upload, the WSC Manual Dialing setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxiii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxiv) - Minimum HSD Call EIRP (DE 0 1E)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Minimum HSD Call EIRP setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxiv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxv) - HSD Registration Preference (DE 0 1F)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the HSD Registration Preference setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxvi) - Swift64 M-ISDN LES Preference Values (DE 0 20)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Swift64 M-ISDN LES Preference Values setting is NOT within the acceptable range.
PARAMETERS : Param 1: 01 = Satellite Id out of range
02 = LES Id out of range
03 = LES preference out of range
Param 2: The cross/uploaded ORT item (lxvi) value that has failed the range test.

FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxvii) - Swift64 MPDS LES Preference Values (DE 0 21)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Swift64 MPDS LES Preference Values setting is NOT within the acceptable range.
PARAMETERS : Param 1: 01 = Satellite Id out of range
02 = LES Id out of range
03 = LES preference out of range
Param 2: The cross/uploaded ORT item (lxvii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxviii) - Ethernet MAC Address Assignment (DE 0 22)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Ethernet MAC Address Assignment setting is NOT within the acceptable range.
PARAMETERS : 01:The uploaded ORT duplicated item (lxviii) has identical non-zero values for SDU 1 and SDU 2.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxix) - PPPoE Access-Concentrator Name (DE 0 23)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the PPPoE Access-Concentrator Name setting is NOT within the acceptable range.
PARAMETERS : Param 1: 01 = The uploaded ORT duplicated item (lxix) has identical values for SDU 1 and SDU 2
Any value other than 1 = The cross/uploaded ORT item (lxix) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxx) - Telnet Server Access (DE 0 24)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Telnet Server Access setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxx) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxi) - DHCP Server Access (DE 0 25)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the DHCP Server Access setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxii) - Telnet IP Address Assignment (DE 0 26)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Telnet IP Address Assignment setting is NOT within the acceptable range.
PARAMETERS : 01:The uploaded ORT duplicated item (lxxii) has identical values for SDU 1 and SDU 2.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxiii) - Telnet Subnet Mask Assignment (DE 0 27)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Telnet Subnet Mask Assignment setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxiii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxiv) - Telnet Default Gateway Assignment (DE 0 28)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the Telnet Default Gateway Assignment setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxiv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxv) - DHCP IP Address Assignment (DE 0 29)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the DHCP IP Address Assignment setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxv) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxvi) - DHCP IP Address Pool Allocation (DE 0 2A)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the DHCP IP Address Pool Allocation setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxvi) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxvii) - BGAN PDP Session Parameters (DE 0 2B)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the BGAN PDP Session Parameters setting is NOT within the acceptable range.
PARAMETERS : The cross/uploaded ORT item (lxxvii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Item (lxxviii) - PSID Supplementary Frequencies (DE 0 2C)
DESCRIPTION : Applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. Upon ORT cross/upload, the PSID Supplementary Frequencies setting is NOT within the acceptable range.
PARAMETERS : Param 1: 01 = Satellite Id out of range
02 = Psid frequency out of range
03 = Table revision out of range
Param 2: The cross/uploaded ORT item (lxxviii) value that has failed the range test.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The default setting is used in place of the failed ORT setting.

Slave HGA/IGA Log-on Test (Level 1 Code DFh)
Slave HGA/IGA Log-on Test Failure (DF 0 01)
DESCRIPTION : If two HGAs and/or IGAs are installed in a dual system and not failed, and the system is in automatic antenna selection mode the SDU shall perform an HGA/IGA log-on test. The conditions for the test is the same as for the LGA log-on test.

COMMENTARY
This assumes that an HGA/IGA slave is not tested if the master is logged-on via an LGA. The master SDU shall test by requesting the slave SDU to perform a log-on via its HGA/IGA, then switching back to the original master's HGA/IGA and renewing the log-on.
A fault is declared by the slave SDU if it does not achieve log-on, but log-on is subsequently successful via the original master's HGA/IGA.
PARAMETERS : Cumulative count of sequential test failures since the last factory settings restart or test passing.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : Successful log-on via this HGA/IGA, either due to a test log-on, or log-on being achieved as master.
REMARK : This failure condition is reported in 276-11.

Slave HGA/IGA Log-on Test Not Initiated (DF 0 02)
DESCRIPTION : This fault is declared if a slave HGA/IGA log-on test is not initiated because of equipment failure ([r_sdu_min_op.X] OR [r_hga_subsys.X]) , cross-talk bus (XTB) full communications not being established, the slave being disabled ([r_common.C]), or the master only being logged-on via LGA; or if the master SDU attempts a test log-on via the slave, but no response is received from the slave via the XTB within five minutes; or if the test is aborted due to any of the reasons previously stated.
PARAMETERS : 1 = slave HGA/IGA equipment not OK
2 = XTB full communications not achieved
3 = slave SDU is disabled
4 = response timeout
5 = master log-on is LGA
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : Performing a successful test log-on, or handover of mastery, or upon failure DF 0 becoming active.
REMARK : This failure condition is reported in 276-11.

HSU1 System Disable Discrete Failure (E1 0 01)
DESCRIPTION : The SDU's HSU disable discrete is tested by comparing the level of the BITE tellback with the commanded state, as specified below. Should the output discrete's BITE tellback value not be the same as the commanded value for either the active or inactive state (or both) after two successive checks, then this fault is declared.
During POST/PAST, the HSU disable discrete output is tested for being able to achieve the active and inactive states by commanding the HSU to the active state briefly (i.e., 10 ms), and then inactive again.
During CM, the HSU disable discrete is tested whenever its commanded state is changed for operational reasons, and also monitored for its currently commanded state once every 30 seconds.
Test results for the discrete output successfully achieving the commanded state (active or inactive) is recorded independently, and the fault shall only be cleared when both commanded states have been recorded as being achieved the last time they were tested.
PARAMETERS : Parameter 1 is set to 1 if the active state is not achieved.
Parameter 2 is set to 1 if the inactive state is not achieved.
FAIL CRITERIA : This fault transitions immediately to a failure.
RECOVERY CRIT. : This failure is cleared as soon as the fault is cleared, i.e., as soon as both commanded states have been recorded as being achieved the last time they were tested.
REMARK : This failure is Class 2 (Class 3 for Airbus), and does not indict [HSU1]/[HSU], because the reason could as likely be failure in the SDU BITE circuitry.
Level 3 failure code 81 is not used for the POST/PAST case (i.e., the POST/PAST and CM tests are identical).
In the actual implementation, if an HSU is installed, this discrete is repetitively commanded to its currently required state (whether on or off) at a rate of ~ 15 Hz. The CM test is performed after each such command, hence continuously at ~ 15 Hz (which includes the case of whenever a state change is commanded) as well as once every thirty seconds.

Since there is no separate Level 3 failure code 81 for the POST/PAST case, even the POST/PAST case includes the one-second fail criteria. The POST/PAST case also requires the retest fail criteria in order to avoid nuisance failures because there is no guarantee that the CM testing (which might otherwise clear a POST/PAST-detected fault) will begin or resume within one second of POST/PAST.

HSU2 System Disable Discrete Failure (E2 0 01)
Same as E1 0 01 except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

Unsupported Configuration (Level 1 Code E3h)
These failures are only applicable prior to SDU Part Number 7516118-XX130/-xx140.

Unsupported HSU1 Configuration (E3 0 01)
DESCRIPTION : The SDU shall raise this fault when it detects an HSU configuration that is not allowed, as specified below. The HSU “number” is determined per the part number information transferred by the HSU in its Build Identity message.
PARAMETERS : 01: A lone HS-702 is installed on either HSU port (i.e., SDU is strapped for only one HSU, and it is HS-702).
02: Two HS-702 units are installed (i.e., SDU is strapped for two HSUs, and both are HS-702).
03: HS-700 is installed on the HSU2 port, and HS-702 is installed on the HSU1 port (i.e., the units are not wired to the correct ports).
04: A lone HS-700 is installed on the HSU2 port.
FAIL CRITERIA : This fault transitions to failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : The SDU needs to be restarted to allow this failure to recover after the HSU configuration has been corrected to a valid one. This is done in order to avoid the complexities of having to deal with unsupported configurations that might nonetheless be allowed to operate by the SDU due to an inactive HSU1 input bus (i.e., a simultaneous unsupported configuration and a failure).

Unsupported HSU2 Configuration (E3 0 02)
Same as E3 0 01.
COMMENTARY
This failure is raised when E3 0 01 is raised so that both functional resources [hsu1] and [hsu2] can be indicted when any of the unsupported configurations occur.

HSU1/SDU Interface Version Incompatibility (E4 0 81)
DESCRIPTION : This fault is raised during the Initial Communications phase when the SDU determines that the bus interface version numbers between the HSU and SDU are incompatible (i.e., not identical). Prior to SDU Part Number 7516118-XX130/-xx140. For SDU Part Number 7516118-XX130/-xx140 and subsequent.
PARAMETERS : The interface version number of the SDU as the least significant nibble of the parameter value long word; the interface version number of the HSU as the least significant nibble of the associated parameter value long word.
FAIL CRITERIA : This fault transitions into failure after the receipt of 5 or more consecutive HSU status words containing the same incompatible version number.
RECOVERY CRIT. : This failure is cleared after the receipt of 5 or more consecutive HSU status words containing the same compatible version number.
REMARK : Version 1 is the only acceptable value prior to SDU Part Number 7516118-XX130/-xx140, while version 2 is the only acceptable value for SDU Part Number 7516118-XX130/-xx140 and subsequent.

HSU2/SDU Interface Version Incompatibility (E5 0 81)
Same as for E4 0 01 except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

HSU/HPA Tx RF Signal Path (Level 1 Code E6)
HSU1/HPA Tx RF Signal Path Failure (E6 0 81/01)
DESCRIPTION : For SDU Part Number 7516118-XX130/-xx140 and subsequent, the POST/PAST fault is declared when the SDU fails to detect a transition in the reported HPA input power level when the HSU transmits a CW test signal. This POST/PAST test shall only be performed when the installed HPA is a linear 60W HPA.
For Packages 3.0 and subsequent, the CM fault is declared when the HPA fails to report to the SDU any detected output power while the HSU is transmitting its ocean region registration request. This CM test shall only be performed if failure D5 0 02 is not currently active and only when the HSU carrier is the only one present.
PARAMETERS : None.
FAIL CRITERIA : The POST/PAST fault transitions to a failure if there is no transition in the reported HPA input power level for two consecutive tests. The CM fault transitions to a failure after 5 consecutive attempts by the HSU result in no measurable HPA output power level.
RECOVERY CRIT. : Neither the POST/PAST or CM failure is explicitly cleared.
REMARK : POST/PAST fault: For SDU Part Number 7516118-XX130/-xx140 and subsequent, the POST/PAST test (combined with the SDU/HPA Tx RF continuity check) allows RF transmit continuity failures to be isolated to either the HSU to HPA cable or the SDU to HSU cable without the need for the SDU to be logged on.
CM fault: This test is not done during the PAST period but only on actual transmissions (e.g. during EIRP request for M-ISDN registration, for SDU Part Number 7516118-XX130/-xx140 and subsequent). This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The test also depends on the correct functioning of the HPA's output power detector and the expected HPA amplification (gain), so if the HPA is not amplifying correctly, this failure may result. A basic troubleshooting guide can help determine the general location where the failure is most likely to occur.
This CM fault will also be declared whenever the HPA independently turns carriers off (i.e., not under normal command from the SDU), which causes any subsequent RF signal path test to fail.
Prior to SDU Part Number 7516118-XX130/-xx140: In order to facilitate the independent calibration of HSU to HPA cable losses and HSU/HPA Transmit RF continuity checks in dual HSU configurations, the SDU will delay for 15 seconds the satellite data link availability indicator for HSU2 after the availability for HSU1 has been established.
COMMENTARY
For SDU Part Number 7516118-XX130/-xx140 and subsequent, the HSU shall delay the registration of all remaining HSD channels for 15 seconds following the registration of the first HSD channel, to allow the SDU to perform calibration of HSU to HPA cable loss and HSU/HPA Transmit RF continuity testing.

HSU1 To HGA/IGA HPA Calibration Error (E6 0 02)
DESCRIPTION : This fault is declared if the calculated HSU to HPA Loss for HSU channel 1 is outside acceptable limits (ie not within 10 to 30dB).
PARAMETERS : Failure Param: A 1 shall indicate that the calibrated loss was calculated to be greater than the maximum value.
A 0 shall indicate that the calibrated loss was calculated to be less than the minimum value.
Assoc Param: The calculated loss in tenths of dB.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is cleared following the first successful calibration (i.e. within the specified range) of the HSU to HPA loss for HSU channel 1.
REMARK : This test is not done during the PAST period but only on actual transmissions (e.g. during EIRP request for M-ISDN registration for SDU Part Number 7516118-XX130/-xx140 and subsequent). This means it will not show up on the CFDS Test Results page, and it is hard to determine if it has been fixed without incrementing the flight leg after each attempt at fixing it. The test also depends on the correct functioning of the HPA's output power detector and the expected HPA amplification (gain), so if the HPA is not amplifying correctly, this failure may result.(e.g. during log-on).

HSU2 To HGA/IGA HPA Calibration Error (E6 0 03)
Same as for E6 0 02 except substitute “channel 2” for “channel 1”.

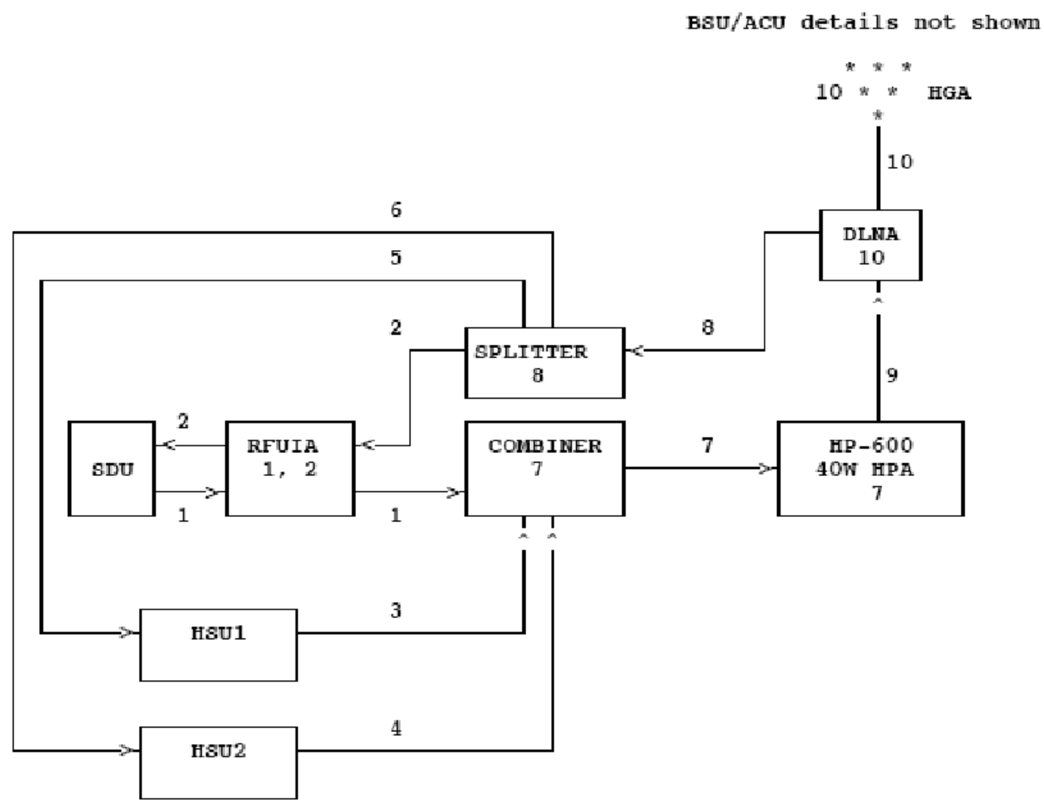
HSU3 To HGA/IGA HPA Calibration Error (E6 0 04)
Same as for E6 0 02 except substitute “channel 3” for “channel 1”.

HSU4 To HGA/IGA HPA Calibration Error (E6 0 05)
Same as for E6 0 02 except substitute “channel 4” for “channel 1”.

HSU2/HPA Tx RF Signal Path Failure (E7 0 01)
Same as for E6 0 01 except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.

DLNA/HSU1 Rx RF Signal Path Failure (E8 0 81)
DESCRIPTION : For Packages 3.0 and subsequent, this fault is declared during POST/PAST when the HSU does not report to the SDU a valid (i.e., normal operation data, not NCD) RF input power measurement, via Label 277 prior to SDU Part Number 7516118-XX130/-xx140, or Label 306 for SDU Part Number 7516118-XX130/-xx140 and subsequent that indicates a rising noise floor level from an active HGA LNA within five seconds of the HGA LNA having been turned on. This test shall only be performed if the BSU input bus is active, the HGA LNA BITE is Ok, and the BSU is declaring the multi-control bus input as active. This test is not performed if any BSU self-test misoperation failures [13/0/8A, 13/0/0A, 15/0/8A, 15/0/0A] are declared or label 277/306 does not declare normal operation data.
PARAMETERS : 16-bit Rx Power Level measurement.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is not explicitly cleared.
REMARK : The HSU only outputs valid data for this test between the completion of its own POST and the SDU removing SSM = Functional Test from its HSU control word transmissions. A
basic troubleshooting guide (reference Section 4.4.5.233 Commentary) can help determine the general location where the failure is most likely to occur.

HSU2/LNA RX RF Coax Continuity Failure (E9 0 81)
Same as for E8 0 01 except substitute “HSU2” for “HSU1”. Only applicable prior to SDU Part Number 7516118-XX130/-xx140.
COMMENTARY
Assuming a single failure in the Tx or Rx signal path, the block diagrams and tables that follow can be helpful in determining which signal path segment is the single root cause from the available current failure information.



Signal path segments:
1 = SDU to combiner
2 = Splitter to SDU
3 = HSU1 to combiner
4 = HSU2 to combiner
5 = Splitter to HSU1
6 = Splitter to HSU2
7 = Combiner, combiner to HPA, HPA
8 = DLNA to splitter, splitter
9 = HPA to DLNA
10 = DLNA, DLNA to/from HGA, HGA

All signal path elements may not to pertain to every installation.

Reference the table that follows for guidance on which signal path segment has most likely failed (assuming a single root cause) for certain combinations of current failures.

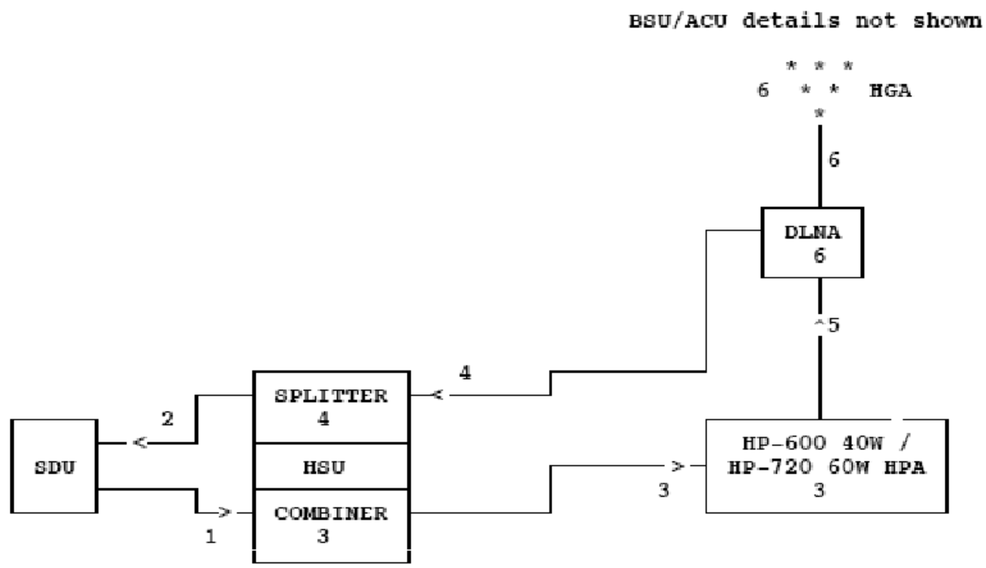
Figure 4.4.5.233-1 Single-Point Failure RF Signal Path Troubleshooting Guide (Pre-SDU Part Number 7516118-XX130/-xx140)

UP86308

SIGNAL PATH FAILURES (Pre-Package 6.0)							
D5 0 02 (STx)	D8 0 81 or D9 0 81 (SRx)	E6 0 01 (H1Tx)	E7 0 01 (H2Tx)	E8 0 81 (H1Rx)	E9 0 81 (H2Rx)	C4 0 xx (VSWR)	Segment Most Likely To Have Failure
Yes	X	No *	No **	X	X	X	1, 7 ***
X	Yes	X	X	No *	No **	X	2
No	X	Yes	No **	X	X	X	3
No	X	No *	Yes	X	X	X	4
X	No	X	X	Yes	No **	X	5
X	No	X	X	No *	Yes	X	6
X	Yes	X	X	Yes *	Yes **	No	8
X	No	X	X	No	No	Yes	9
X	Yes	X	X	Yes *	Yes **	Yes	10

SIGNAL PATH FAILURES (Pre-SDU Part Number 7516118-XX130/-xx140)

* This term is only required if HSU1 is wired (”X” otherwise)
** This term is only required if HSU2 is wired (”X” otherwise)
*** This condition (segment 7 failure) may exist, but it cannot be annunciated as such because the tests for failures E6/0/01 and E7/0/01 are not performed if failure D5/0/02 (which is tested first) is already currently active.
Notes: X = Don’t care
S = SDU
H1 = HSU1
H2 = HSU2
Tx = Transmit
Rx = Receive
Not all possible combinations are shown -- only those for which there is a reasonably high probability of drawing conclusions regarding a single root cause.



Signal path segments:
1 = SDU to HSU combiner
2 = HSU splitter to SDU
3 = HSU combiner, HSU combiner to HPA, HPA
4 = DLNA to HSU splitter, HSU splitter
5 = HPA to DLNA
6 = DLNA, DLNA to/from HGA, HGA

Reference the table that follows for guidance on which signal path segment has most likely failed (assuming a single root cause) for certain combinations of current failures. Note, the table pertains only to those installations which include the optional HSD capability, as shown above.

SIGNAL PATH FAILURES (SDU Part Number 7516118-XX130/-xx140 and Subsequent) D5 0 02 and/or D5 0 05*

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SIGNAL PATH FAILURES (Package 6.0 and Subsequent)					
D5 0 02 and/or D5 0 05* (STx)	D8 0 81 or D9 0 81 (SRx)	E6 0 81* (HTx)	E8 0 81 (HRx)	C4 0 xx (VSWR)	Segment Most Likely To Have Failure
Yes	X	No	X	X	1, 3 **
X	Yes	X	No	X	2
Yes	X	Yes	X	X	3 **
X	Yes	X	Yes	No	4
X	No	X	No	Yes	5
X	Yes	X	Yes	Yes	6

* This failure is only raised when the installed HPA is a linear 60W HPA (HP-720)

** This condition (segment 3 failure) is annunciated by the tests associated with failures D5 0 05 and E6 0 81 when the installed HPA is a linear 60W HPA (HP-720). However, when the installed HPA is a linear 40W HPA (HP-600), this condition may exist, but it cannot be annunciated as such because the test for failure E6/0/01 is not performed if failure D5/0/02 (which is tested first) is already currently active.

Notes: X = Don’t care
S = SDU
H = HSU
Tx = Transmit
Rx = Receive
Not all possible combinations are shown -- only those for which there is a reasonably high probability of drawing conclusions regarding a single root cause.

Dual HS-700 Config Warning (EA 0 01)
DESCRIPTION : This warning is only applicable prior to SDU Part Number 7516118-XX130/-xx140, and is raised when the SDU detects that two HS-700 units are installed when it is strapped for dual HSU configuration. The HSU “number” is determined per the part number information transferred by the HSU in its Build Identity message.
PARAMETERS : None
FAIL CRITERIA : Immediately
RECOVERY CRIT. : This warning is cleared when the HSU that is wired to the SDU’s HSU2 port reports that it is an HS-702.
REMARK : None

No Declared Active WSC (EB 0 01)
DESCRIPTION : This fault is declared when at least one WSC input bus is active (which includes TP10H being strapped to the “WSC” state [reference Section 3.2.4.7], and at least one of TP12J, TP12K and TP13E being strapped for the respective WSC(s) “installed” as well as receipt of label 270 WSC status words), but no installed WSC indicates “Active” in its label 270 status words (bit 20).
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to failure if the fault persists for 10 seconds.
RECOVERY CRIT. : As soon as a label 270 status word is received from a WSC with an “Active” indication in bit 20, or the buses from all installed WSCs are declared inactive.

REMARK : *[Related information]* For the case of WSC Type = Honeywell MAU where only one MAU is expected to be active at a time for the case of multiple MAUs, the SDU makes no attempt to deal with the possible opposite condition of multiple MAUs declaring themselves to be active simultaneously [whereas it does maintain multiple Williamsburg sessions for WSC Type = Airbus RAIMP]. This includes no BIT for that condition.

HSU Straps (Configuration Pins) Error (Level 1 Code ECh)
HSU Configuration Straps Parity Error (EC 0 81)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. During POST/PAST, the HSU configuration straps (reference Section 3.4.2) is tested for parity. If the computed parity is even, this fault is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/8C).
PARAMETERS : The HSU configuration strap and parity settings.
FAIL CRITERIA : This fault transitions to failure if the fault persists for two out of three consecutive tests.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : None.

HSU Configuration Straps Error (EC 0 82)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU during POST/PAST (via a Williamsburg Failure Report message with fault code 9/82) when there is no response from the hardware device used to access the HSU configuration straps.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure if there is no response from the Configuration Straps hardware device on two out of three consecutive tests.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : HSU is declared unserviceable.

SDU ORT / HSU Configuration Straps Incompatibility (Level 1 Code EDh)
HSU BGAN Configuration Error (ED 0 01)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent. It is declared by the HSU (via a Williamsburg Failure Report message with fault code 0/0F) when HSD Registration Selection in the HSU configuration data passed to the HSU is set to “BGAN Always”, but the BGAN Enable HSU configuration strap (HSU pin MP 1B) is set to Disable”.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : HSU is declared unserviceable.

HSU Forward Id Address Bits (Straps) Error (Level 1 Code EEh)
HSU Forward Id Address Bits (Straps) Error (EE 0 81)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU during POST/PAST (via a Williamsburg Failure Report message with fault code 9/81) when there is no response from the hardware device used to access the strapped HSU Forward Id Address.
PARAMETERS : The failure parameter indicates which hardware device failed and contains one of the following values:
1: PCA9554A I2C device
2: PCA9555 I2C device
3: Both I2C devices.
FAIL CRITERIA : This fault transitions to a failure if there is no response from the hardware device used to access the HSU Forward Id Address Straps on two out of three consecutive tests.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : HSU is declared unserviceable.

Illegal HSU Forward Id Address (EE 0 82)
DESCRIPTION : This fault is applicable to SDU Part Number 7516118-XX130/-xx140 and subsequent, and is declared by the HSU during POST/PAST (via a Williamsburg Failure Report message with fault code 0/90) when the strapped HSU Forward Id address is set to all zero's, all one's or to an invalid value as determined by comparison with the internal look-up table held by the HSU.
PARAMETERS : The HSU Forward Id address read from the discrete straps.
FAIL CRITERIA : This fault transitions to a failure if the fault persists on two out of three consecutive tests.
RECOVERY CRIT. : This failure is never explicitly cleared.
REMARK : HSU is declared unserviceable.

Pilot Event Marker (FD 0 01-16)
DESCRIPTION : While either airborne or on the ground, the pilot observes an 'event' and desires to have a snapshot of all system states and therefore presses the PEM switch in the cockpit. This condition is flagged with a failure when the PEM is received from the CAIMS OMS.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately upon receipt of CAIMS Label 226 with bit 29 set to one when CAIMS is inactive.
RECOVERY CRIT. : This failure transitions to normal when Label 226 bit 29 transitions to zero.
REMARK : This condition is used to synchronize the log to a special event observed by the pilot while either in-flight or on the ground. This is unique in that subsequent activations of this fault in a specific flight leg increments the Failure index so that a specific time stamp can be assigned each time.

External Power Supply Interrupt In-Flight (FE 0 01)
DESCRIPTION : While airborne, the power to the SDU is interrupted. This condition is flagged with a failure when the POC is incremented and the current DC state is DC1 or DC1'.
PARAMETERS : None.
FAIL CRITERIA : This fault transitions to a failure immediately
RECOVERY CRIT. : This failure transitions to normal immediately.
REMARK : This condition is used to annunciate a special case of SDU power-up while in-flight. The failure message will preclude the unnecessary removal of the SDU when a power interrupt occurs and other LRUs indict the SDU. The failure is immediately removed from the current failures list to avoid an erroneous failure indication on the front panel alphanumeric display.

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