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U.S.A.

System Description and Installation Manual

HS-700
High Speed Data System

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Honeywell

SYSTEM DESCRIPTION AND INSTALLATION MANUAL

HS-700 High Speed Data System

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INTRODUCTION

1. Proprietary, Export, and Precautionary Data

A. Proprietary Notice

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C. Special Precautions

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

- A WARNING is an operation or maintenance procedure or condition that, if not obeyed, can cause injury or death.
- A CAUTION is an operation or maintenance procedure or condition that, if not obeyed, can cause damage to the equipment.
- A NOTE gives data to make the work easier or gives directions to go to a procedure.

(2) All personnel who operate equipment and do maintenance specified in this manual must know and obey the safety precautions. The warnings and cautions that follow apply to all parts of this manual.

WARNING: BEFORE YOU USE A MATERIAL, REFER TO THE MANUFACTURERS' MATERIAL SAFETY DATA SHEETS FOR SAFETY INFORMATION. SOME MATERIALS CAN BE DANGEROUS.

CAUTION: DO NOT USE MATERIALS THAT ARE NOT EQUIVALENT TO MATERIALS SPECIFIED BY HONEYWELL. MATERIALS THAT ARE NOT EQUIVALENT CAN CAUSE DAMAGE TO THE EQUIPMENT AND CAN VOID THE WARRANTY.

CAUTION: THE HS-700 HIGH SPEED DATA SYSTEM CONTAINS ITEMS THAT ARE ELECTROSTATIC DISCHARGE SENSITIVE (ESDS). IF YOU DO NOT OBEY THE NECESSARY CONTROLS, A FAILURE OR UNSATISFACTORY OPERATION OF THE UNIT CAN OCCUR FROM ELECTROSTATIC DISCHARGE. USE APPROVED INDUSTRY PRECAUTIONS TO KEEP THE RISK OF DAMAGE TO A MINIMUM WHEN YOU TOUCH, REMOVE, OR INSERT PARTS OR ASSEMBLIES.

2. Content Data

A. How to Use This Manual

(1) This manual gives general system description and installation information for the HS-700 High Speed Data System. It also gives block diagram and interconnect information to permit a general understanding of the system interface.

(2) The purpose of this manual is to help you install, operate, maintain, and troubleshoot the HS-700 High Speed Data System. Common system maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

(3) Related publications that are referred to in this manual are identified in Table Intro-1.

Table Intro-1. Related Publications

Publication	Publication No.
Handling, Storage, and Shipping Procedures for Honeywell Avionics Equipment Instruction Manual	A09-1100-001
MCS-4000/7000 Multi-Channel SATCOM System Description, Installation, and Maintenance Manual	A15-5111-001

NOTES:

1. You can order a Honeywell publication from Honeywell as follows:
   Telephone No.: (602) 436-6900
   Fax No.: (602) 436-1588
   E-mail: cas-publications-distribution@honeywell.com

B. Weights and Measurements

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

(2) The letter symbols for units of measurement are the same as shown in ANSI/IEEE Std 260.

C. Acronyms and Abbreviations

(1) The acronyms and abbreviations that follow help the reader identify terms and definitions used by Honeywell.

(2) The letter symbols for units of measurement are the same as shown in ANSI/IEEE Std 260.

Term	Definition
ACSE	access control and signalling equipment
ACU	antenna control unit
BSU	beam steering unit
CCA	circuit card assembly
CDM	configuration data module
CMT	commissioning and maintenance terminal
CNS/ATM	communication, navigation, and surveillance/air traffic management
DCE	data circuit-terminating equipment
DLNA	diplexer/low noise amplifier
ESD	electrostatic discharge
ESDS	electrostatic discharge sensitive
HGA	high gain antenna
HIRF	high intensity radiated electromagnetic frequencies
HPA	high power amplifier
HSD	high speed data
HSU	high speed data unit
ICAO	International Civil Aviation Organization: Agency of the UN
IETF	Internet Engineering Task Force
IPC	Illustrated Parts Catalog
IPDS	Inmarsat Packet Mode Data Service
IRS	inertial reference system
ISDN	Integrated Services Digital Network
LES	land earth station
LESA	land earth station assignment
LRU	line replaceable unit
MCS	multi-channel SATCOM
MCU	modular concept unit
MEL	minimum equipment list
MES	Mobile Earth Station
MM/HSD	Mini M/high speed data

Term	Definition
MTBF	mean-time-between-failures
NCSA	network coordination station assignment
NT	network termination
PC	personal computer
PID	personal identification number
PSTN	Public Switched Telephone Network
RF	radio frequency
RFC	request for comments
RFU	radio frequency unit
SATCOM	satellite communications
SCPC	single channel per circuit
SDM	System Definition Manual
SDU	satellite data unit
SU	signal unit
TA	terminal adapter
TDM	time division multiplex
TE	terminal equipment
TDMA	time division multiple access

3. Customer Assistance

A. Who to Contact

(1) For assistance with installation, operation, or maintenance of the HS-700 High Speed Data System, contact your local Honeywell Dealer or regional Honeywell Customer Support Engineer. Additional assistance can be obtained from:

- Honeywell
  Aviation Services, Customer Response Center (CRC)
  Commercial Electronic Systems
  21111 N. 19th Avenue
  Phoenix, AZ 85027

  TEL: (877) 436-2005 (Toll-Free)
  FAX: (602) 436-1501

SECTION 1
SYSTEM DESCRIPTION AND OPERATION

1. Overview

A. General

(1) The HS-700 high speed data (HSD) system is designed to form part of the MCS-7000 Aero H/H+ satellite communication (SATCOM) system. The MCS-7000 multi-channel SATCOM (MCS) system includes a SD-700 satellite data unit (SDU), HP-600 high power amplifier (HPA), and Aero-H/H+ high gain antenna (HGA). The HS-700 high speed data unit (HSU) provides an additional dedicated 64 kbps integrated services digital network (ISDN) or mobile packet data service (MPDS) channel that can be operated simultaneously with the MCS-7000 SATCOM system.

(2) Figure 1-1 shows how the HSU interconnects to the MCS-7000 SATCOM system. The HSU is operated as a slave to the MCS system in cooperative mode. The SD-700 SDU controls the slave HSU through a high speed ARINC 429 bus and a disable discrete.

(3) The HSU is a terminal for data, fax, and voice communications through the Inmarsat global area network (GAN). It provides the services of this network to the user. The user can access these services through the user interfaces of the terminal.

(4) The L-band radio frequency (RF) transmit outputs of the HSU and the SDU are combined with an RF combiner. The output of the RF combiner drives a common 40 W HPA, the diplexer portion of the diplexer/low noise amplifier (DLNA), and nominal 12 dB gain antenna. The SDU manages the satellite selection and steers the HGA.

(5) The L-band RF signals received from the satellite by the HGA and amplified by the low noise amplifier in the DLNA are divided in two by the RF splitter. One signal set is connected to and processed by the SDU. The other signal set is connected to and processed by the HSU. In this way, full duplex communication is achieved for all parts of the system (MCS-7000 and HS-700).

(6) The MCS-7000 SDU and HPA require only operational software modifications to properly operate with the HS-700.

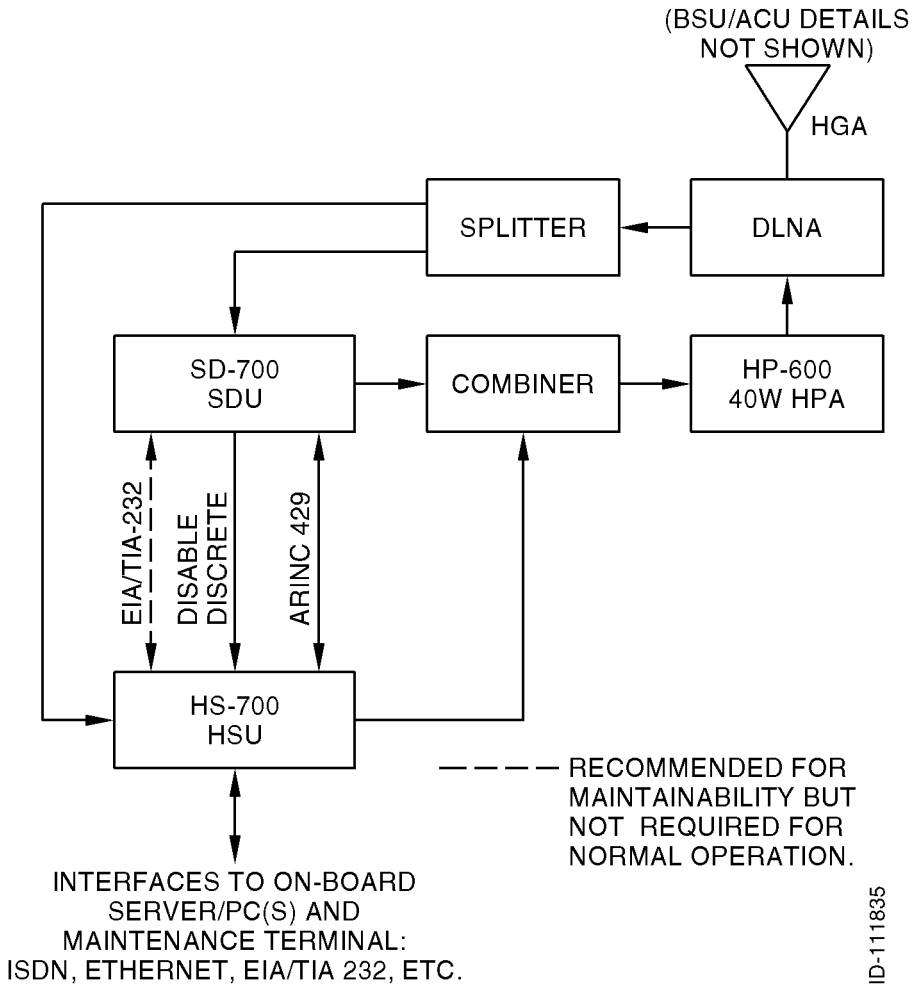

Figure 1-1. High Speed Data System Block Diagram

B. Aero-H/H+

(1) Aero-H/H+ is a multi-channel aeronautical system that can operate in both the Inmarsat-3 global and spot beams using either a fuselage- or tail-mounted HGA. The type of antenna and the global/spot beam operation identify the type of service possible as given in Table 1-1.

Table 1-1. Type of Service

Aero Type	Antenna	Global Beam	Spot Beam	Voice 9.6 kbps	Voice 4.8 kbps	Secure Voice 4.8 kbps	Fax (max)	PC Data (max)	Packet Mode Data (max)
Aero-H	High gain	Yes	No	Yes	No	Yes	4.8 kbps	2.4 kbps	10.5 kbps
Aero-H+	High gain	Yes	Yes	Yes	Yes	Yes	4.8/2.4 kbps	2.4 kbps	10.5 kbps

(2) When used within the spot beams, the Aero-H+ service requires less power so that call charges are reduced.

(3) All Honeywell/Thales aeronautical equipment complies with the International Civil Aviation Organization (ICAO) Agency of the UN requirements for aeronautical safety services. The equipment can be used for communication, navigation, and surveillance/air traffic management (CNS/ATM).

C. HSD Services

(1) The HS-700 HSD system provides two modes of communication: circuit-mode and packet-mode. In these modes, there are five services provided as follows:

- ISDN speech, typically used for ISDN telephones and Public Switched Telephone Network (PSTN) telephones connected with a terminal adapter (TA).
- 3.1 kHz audio, typically used for analog data modems, group 3 fax machines, and secure telephone unit (STU) terminals connected through a TA.
- 56 kbps unrestricted digital information (UDI) which is provided for compatibility with equipment requiring this service.
- 64 kbps UDI, typically used for video terminals, group 4 fax machines, data communication, and secure telephone equipment (STE) terminals.
- MPDS, which is used for internet access and access to corporate local area networks (LAN) through the virtual private network (VPN) service.

(2) The first four services are circuit-mode services and MPDS is a packet-mode service.

D. User Interfaces

(1) The services of the HS-700 HSD system can be accessed through three interfaces:

- ISDN NT1 (European S/T Interface)
- EIA/TIA-232 Asynchronous Serial Port
- 10BASE-T Ethernet Port.

(2) The ISDN network termination 1 (NT1) interface is the access point for all circuit-mode services. This interface is physically located on the ARINC-404 connector on the rear of the HSU. Except for the physical design of the connector, this interface is ISDN compliant. The HS-700 is configured as NT1 for direct connection to the user's terminal equipment 1 (TE1) interface, or for connection to terminal equipement 2 (TE2) through an external terminal adapter (TA).

(3) The HS-700 includes an internal 100 ohm termination resistor for the ISDN interface to support cable lengths longer than three meters.

(4) The ISDN interface can supply power to up to four ISDN devices, but supports up to eight devices if at least four of them have their own power supply. During primary power interruptions of up to 200 ms duration, the HS-700 is capable of maintaining hold-up with no more than one ISDN device being powered by the HS-700. For example, if more than one such phone is connected and an incoming call is received during a 200 ms power interrupt, the HS-700 may reset rather than hold-up over the power interruption.

(5) The EIA/TIA-232 asynchronous serial port interface is the primary access point for MPDS. The port provides a standard modem interface with a Hayes compatible AT style command set. For the data communication, the port operates in the point to point protocol (PPP) mode. The HS-700 is configured as data circuit-terminating equipment (DCE), using hardware flow control (RTS/CTS) and operating at 115.2 kbps.

(6) The 10BASE-T Ethernet port is an alternate access point for MPDS. The interface implements a standard 10BASE-T Ethernet port, except for the connector. MPDS is accessed using the point to point protocol over Ethernet (PPPoE). Only one of the two MPDS interfaces (10BASE-T or EIA/TIA-232-E) can be used at a time. The port to be enabled is selected during the configuration of the HSU. The MPDS interface configuration settings are stored in the configuration data module (CDM). The HS-700 is configured as an Ethernet hub (DCE).

E. Service Routing

(1) Table 1-2 illustrates the routing or mapping of calls of a certain service to the corresponding interface in the HS-700 system.

Table 1-2. Service Routing

Service/Interface	ISDN	Ethernet	EIA/TIA-232
ISDN Speech	Yes	No	No
3.1 kHz Audio	Yes	No	No
64 kbps UDI	Yes	No (Note)	No (Note)
56 kbps UDI	Yes	No (Note)	No (Note)
MPDS	No	Yes	Yes
NOTE: Hardware for these combinations are implemented but no software is implemented in the initial version of the HS-700 system.			

F. Control and Status Interfaces

(1) The control interfaces include the following:

- CMT interfaces
- ARINC 429 control interfaces
- HSU disable control interface
- Discrete outputs.

(2) The HSU has two CMT interfaces, one on the front panel and one on the ARINC 404 connector at the rear panel. The rear panel interface makes it possible to connect to the SDU and have the SDU access the HSU's commissioning and maintenance terminal (CMT) interface. The front panel interface provides an interface to a personal computer (PC) terminal for configuration and maintenance purposes. The CMT interfaces are used for configuration control, SW downloads, and debug.

(3) The debug shell provides access to a series of commands provided for debugging purposes. The commands are organized in shells. The active shell can be read from the command prompt.

(4) The SDU controls the HSU via the ARINC 429 Interface. The HSU operates as a slave to the SDU in cooperative mode. Three levels of communication are implemented on the ARINC 429 control interface as follows:

- Solo words used for block transfers and solo words, for example, high priority and timing-critical messages.
- Periodic words, which are words transmitted at a periodic rate.
- SDU/HSU message transfer, which is a high level message transfer by Williamsburg protocol.

(5) The Williamsburg protocol provides detection of errors and retransmissions of failed packets. The protocol also provides the transmission of data packets spanning more than one ARINC word.

(6) A discrete input is provided for the SDU to disable the HSU. The HSU disable signal inhibits the transmitter output and keeps the HSU reset as long as it is activated. When released, the HSU performs a normal power-on self test (POST) procedure.

(7) The HS-700 is supplied with three discrete outputs. One of the outputs is a spare for future use (not defined yet). The second is an HSD service availability indicator (ISDN or MPDS). The third is used to indicate failures in the HSU (from built-in test equipment [BITE], person-activated self-test [PAST] and POST).

G. CDM

(1) The HSU is supplied with a CDM, which is plugged into the rear panel of the HSU. The CDM stores all installation and user specific data and is designed to remain with the aircraft. This allows easy replacement of the HSU, without the need for a reconfiguration of the CDM. The CDM stores the following parameters:

- ISN Number
- Forward and Return ID
- CDM Model Number
- CDM Serial Number
- CDM Data Type Version
- Allowed Land Earth Station (LES)
- Preferred LES
- Default LES
- Initial Equivalent Isotropic Radiated Power (EIRP) (e.g. 22.5 to 25.0 dBW)
- Minimum Initial EIRP (e.g. 22.5 dBW)
- Minimum Call EIRP (e.g. 17 dBW)
- MPDS Initial EIRP (e.g. 22.5 dBW)
- MPDS Interface Selection (Ethernet or EIA/TIA-232)
- Receive (RX) Cable Loss
- Transmit (TX) Cable Loss
- Automatic Test Equipment (ATE) Access Levels.

(2) All parameter values and settings except for the protected and non-changeable values can be read out from the CMT interfaces. This makes it possible to store all the information on a floppy disk.

(3) Each CDM is configured from the manufacturer with ISN numbers, IDs, and default values for all of the configuration parameters. If a defective CDM is replaced on an aircraft, all of the configuration parameters must be reentered into the new CDM through the CMT. Two CDMs cannot have the same ISN and IDs.

H. Boot Loader

(1) All software in the HSU (except for the boot loader) can be downloaded through the CMT interfaces without any hardware modifications. New software is loaded using the X-modem protocol with 1024 byte packets and cyclic redundancy check (CRC) on all packets. The transfer rate is 9.6 kbps (fixed) except for software upload on the CMT1 (front panel) interface, which is 115.2 kbps. During download, the HSU verifies the software for compatibility and errors (CRC). A command in the debug shell lists the loaded file with CRC and version information.

I. BITE

(1) General

(a) The HSU has two types of BITE: continuous monitoring (CM) and PAST/POST. If a BITE error occurs, the BITE error code number is reported to the SDU and the fail/pass light emitting diode (LED) illuminates red.

(b) The CDM has no BITE functions performed by itself. The HSU performs the BITE tests on the CDM by checking CRC, etc. If a BITE error occurs in the CDM, the BITE error code number is reported to the SDU and the fail/pass LED on the HSU illuminates red.

(2) POST

(a) The HSU can report some errors during POST, but these errors do not prevent the SDU from operating properly. The SDU and HSU take appropriate actions on the detected BITE errors. Some of the more drastic actions from the SDU could be to turn the HSU RF off and reset and keep the HSU reset.

(3) PAST

(a) The PAST can be activated either through the SDU control interface or the reset button on the front panel of the HSU. The PAST performs the same tests as the POST.

(4) CM

(a) Some of the hardware in the HSU is under continuous supervision by the BITE software or by dedicated BITE monitoring hardware (for burst duration monitoring). If any errors are detected either by software or hardware, they are reported to the SDU and appropriate actions are taken.

(5) Performed Tests

(a) Each error code is categorized into either an error or warning. Errors are errors that prevent the full use of all the HSU functionalities. Warnings are errors that do not prevent the use of the HSU but require the HSU to be sent for repair. The tests include:

- Digital hardware integrity tests
- Software integrity tests
- RF hardware monitoring.

J. Cable Loss

(1) The RF cable loss specifications for the RX and TX coax cables are per ARINC 741. ARINC 741 specifies an allowable input power level to the HPA of -12 to -2 dBm, given a variation in SDU to HPA cable loss of 19 to 25 dB (including a possible external combiner for multiple antenna configurations). For each installation, the specific RX and TX cable loss must be entered into the CDM through the CMT interface for the HSU to be able to compensate its RX and TX gain accordingly.

K. Power Management

(1) General

(a) The HPA is shared between the SDU and the HSU. The HSU has to cooperate with the SDU regarding the use of the shared HPA.

(2) Power Allocation

(a) The output power of the HPA is a limited resource. The SDU is responsible for the management of this resource. The HSU must request that the SDU allocate power before it can start a transmission. Depending on the channel mode (Table 1-3), the HSU asks the SDU to allocate the required amount of power before using the channel. For burst mode channels such as MPDS, a fixed power allocation is assumed. If sufficient power is granted, the SDU informs the HSU what backoff from 12 dBm will generate the requested power, and then the HSU can initiate the transmission. The HSU indicates to the SDU what is the lowest amount of power that the SDU can allocate to initiate a call before the call setup is rejected.

(b) In the single carrier per channel (SCPC) and MPDS modes, the HSU may operate in either nominal power mode (25 dBW) or economy mode (less than 25 dBW) depending on a setting in the CDM. When the power control protocol of the LES reduces or increases the EIRP of the HSU, the HSU gives the SDU the new EIRP level. The HSU also waits for the SDU to indicate what power is available and what the HSU backoff level should be. If the HSU receives a lower power allocation than it requested, it operates the channel until the channel naturally terminates or the power is less than the Inmarsat minimum requirement of 17 dBW.

(c) An SDU owner requirements table (ORT) item governs the minimum power that the SDU will allocate for the HS-700, even when the HS-700 indicates a lower current power requirement due to ongoing dynamic power control commands from the ground station. This allows for more stability of both Aero-H/H+ and HSD calls, for example, fewer incidents of calls being terminated (shortly after being established) due to changing power requirements.

Table 1-3. Power Allocation

Channel Mode	Power Required
Time Division Multiplex (TDM) (Signaling)	14 dBW
SCPC (Circuit-Mode)	As defined in the CDM (nominally 25 dBW)
MPDS (Packet-Mode)	As defined in the CDM (nominally 25 dBW)

(3) Power Adjustment

(a) By design, the shared HPA assumes a constant input level. Subsequently, the HSU has to adjust its carrier level when an event causes the SDU to change its carrier level.

(b) The SDU is responsible for informing the HSU when adjustment is required and what the new backoff will be relative to the initial power. The HSU applies the new backoff immediately upon reception of the SDU message.

(4) Power Preemption

(a) There are conditions when the SDU needs to ask the HSU to release the power that has been reserved for its use. For example, a cockpit/important cabin call needs to be made and there is not enough power available for it without sacrificing the HSU power, the antenna gain has fallen too low to support any channel types, etc.

(b) The preempt type indicates power is no longer available and all the HSU can do is terminate any ongoing transmission and inform any user that the service is no longer available. When a preemption has taken place and the SDU is still logged-on (e.g still steering the antenna), the HSU asks for power to be reserved every 10 seconds.

(c) An SDU ORT item governs how the SDU will manage preemption of HSD calls when Aero-H/H+ calls (new or ongoing) require power that would otherwise be used by HSD calls. This item has no effect on the priority preemption scheme, whereby higher priority safety-service Aero-H/H+ calls preempt lower-priority calls (including HSD) as required. This ORT item has separate settings for ISDN and for MPDS. These settings govern whether or not the respective HSD service can be preempted, as required, in favor of non-safety (public correspondence) low-priority Aero-H/H+ calls (voice, fax, or PC modem). This item can thus be used to favor such Aero-H/H+ calls over HSD, or vice-versa. For example, the SDu can be set to allow Aero-H/H+ calls to preempt (as necessary) MPDS HSD, but not ISDN HSD, assuming that active phone calls are more important than the always-on but possibly idle MPDS, and that active ISDN HSD is more important than voice calls.

2. System Components

A. General

(1) Table 1-4 gives the component part numbers supplied by Honeywell. Table 1-5 gives components that are necessary, but are not supplied by Honeywell.

Table 1-4. Components Supplied by Honeywell

Component	Model No.	Honeywell Part No.
HSU	HS-700	7519360-901 (with CDM) 7519360-902 (without CDM)
RF Splitter/Combiner	-	7519349-1
CDM	HS-700-001	7519362-1

Table 1-5. Components/Parts Not Supplied by Honeywell

Component/Part	Comments
HSU Mounting Tray	ARINC 404A, 1/4 short ATR mount, cooling air not required. (Installer to supply mount.)
NOTE: Refer to paragraph 3.D. in this section for mounting tray information.	

3. Component Descriptions

A. HS-700 HSU

(1) The HSU is designed to perform reliably under field conditions and provide ease of maintenance when required.

(2) The HSU is packaged as a 1/4 short ATR. The mechanical chassis is constructed of aluminum alloy sheet metal. The HSU does not require external cooling air. The HSU is shown in Figure 1-2.

(3) Table 1-6 gives the leading particulars for the HSU and Table 1-7 gives the DO-160D categories that this equipment meets or exceeds.

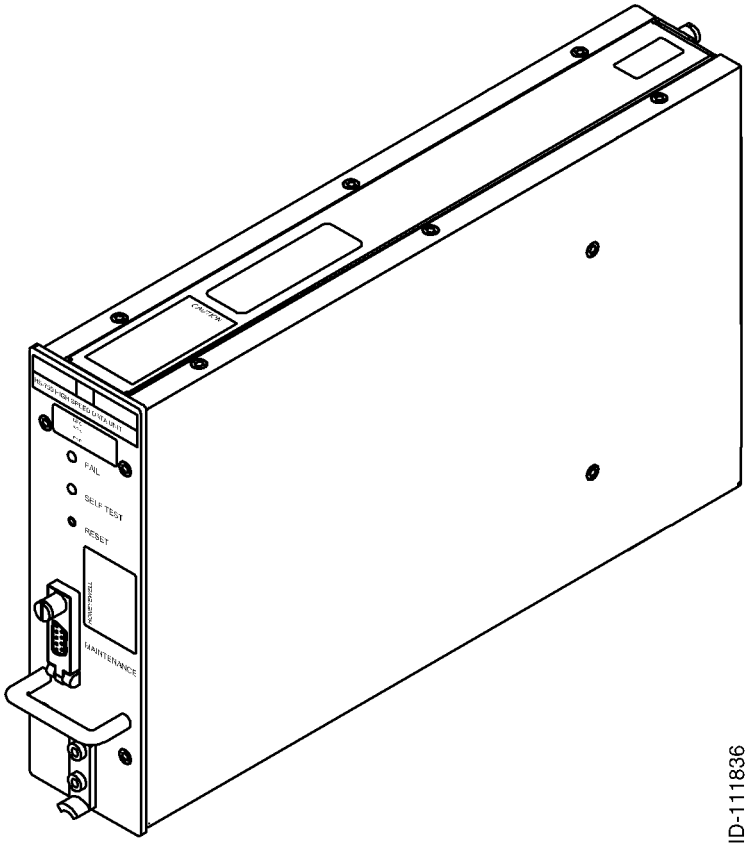

Figure 1-2. HS-700 HSU

Table 1-6. HS-700 Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Length	12.99 in. (329.946 mm)
• Width	2.25 ± 0.03 in. (57.150 ± 0.762 mm)
• Height	7.62 in. (193.548 mm)
Weight (maximum)	4.63 lb (2.1 kg) nominal, 5.97 lb (2.7 kg) maximum
Power requirements (continuous operation):	
• Nominal	28 V dc
• Maximum	32.2 V dc
• Minimum	20.5 V dc
Power consumption	20 W maximum (eight ISDN phones connected)
Power hold-up	5 ms (fully operational), 200 ms (power save mode) [1.]
Cooling requirements	None
Connector X1 (front)	D-sub 9 contact receptacle
Mating connector (X1)	Standard D-sub 9 contact plug
Connector X2 (rear)	Radiall Part No. 616-697-202
Mating connector (X2)	Radiall Part No. 616-697-201
• 20 AWG contacts	Radiall Part No. 616-310
• 16 AWG contacts	Radiall Part No. 616-330
• Size 5 twinax contacts	Radiall Part No. 616-095-001
• Size 5 coax contacts	Radiall Part No. 616-021
Mounting	Tray, ARINC 404A, 1/4 short ATR
Tuning range:	
• RX	1525.0 to 1559.0 MHz
• TX	1626.5 to 1660.5 MHz
Doppler compensation	± 2.5 kHz (approximately ± 360 m/s)
Rate of Doppler frequency change (maximum)	± 65 Hz/s (approximately 50° banking angle)
RF receive levels:	
• M4 (134.4 kbps)	-96 to -43 dBm per carrier
• Mini-M (3.0 kbps)	-109 to -50 dBm per carrier [2.]

Table 1-6. HS-700 Leading Particulars (cont)

Characteristic	Specification
RF transmit levels:	
• Output power level (nominal)	+12 dBm
• Output power level range	-13 to +13 dBm
Channel spacing:	
• High speed data M-4 channel (134.4 kbps)	40.0 kHz
• Mini-M transmit signalling (3.0 kbps)	20.0 kHz
• Mini-M receive signalling (6.0 kbps)	10.0 kHz
Channel grid spacing (all channel types)	1.25 kHz
MPDS 232	EIA/TIA-232, 115.2 kbps, asynchronous RFC 1549 high-level data link control (HDLC), configuration: data circuit-terminating equipment (DCE) with hardware flow control
MPDS 10BASE-T	Ethernet 10BASE-T (10 Mbps)
ISDN:	
• UDI	64 kbps
• Data	56 kbps
• Audio	64 kbps (3.1 kHz)
• Speech	64 kbps
Fax data rate	14,400 bps V.17 (3.1 kHz audio)
SDU control interface	100 kbps high speed ARINC 429
Configuration and maintenance	Standard asynchronous serial EIA/TIA-232-E, 9.6 kbps (115.2 kbps for software upload) via front panel CMT1 interface, configuration: DCE with software flow control, XON, XOFF
Ambient temperature:	
• Operational	-20 °C to +55 °C
• Storage	-55 °C to +85 °C
Altitude:	
• Non-pressurized (Cat F1)	55,000 ft
• Pressurized (Cat A1)	15,000 ft
Relative humidity	95% non-condensing at +50 °C
Circuit breaker current capability	20 W at 17.7 V dc [3.]

Table 1-6. HS-700 Leading Particulars (cont)

Characteristic	Specification
Power supply cable impedance requirement .	Less than 225 milliohm (includes circuit breaker)

NOTES:

1. During the power save mode, there is a short interruption, but the connection/call is kept (no redial is necessary).
2. The HS-700 does not support mini-M services. The mini-M transmit and receive signals are only used for signalling/controlling the Aero-M4 high speed data services.
3. For example, the Klixon 2TC series circuit breaker with a 4 A current rating, or equivalent, should be sufficient for most installations.

Table 1-7. DO-160D Environmental Categories

Description	Category
Temperature and Altitude	A1F1
In-Flight Loss of Cooling	X
Temperature Variation	C
Humidity	A
Shock	B
Vibration	S2B2
Explosion Proofness	E
Waterproofness	X
Fluids Susceptibility	X
Sand and Dust	X
Fungus Resistance	X
Salt Spray	X
Magnetic Effect	A
Power Input	A()B
Voltage Spike	A
Audio Frequency Susceptibility	A()B
Induced Signal Susceptibility	Z
Radio Frequency (RF) Susceptibility	RRR
Emission of RF Energy	M
Lightning Indirect Effects	A3E3
Lightning Direct Effects	X

Table 1-7. DO-160D Environmental Categories (cont)

Description	Category
Icing	X
Electrostatic Discharge (ESD)	A

(4) Table 1-8 gives a description of the HSU front panel lights and button.

Table 1-8. HSU Front Panel Description

LED/Button	Description
FAIL LED	The red FAIL LED continually illuminates when a failure has been detected in the HSU which can degrade the system operation.
SELF TEST LED	The green SELF TEST LED continually flashes during POST and PAST to indicate that the self test is operating. The LED is extinguished when all self tests have been completed.
RESET Button	The HSU has a RESET button on the front panel for BITE purposes. If the RESET button is pushed, the HSU first asks the SDU for permission to perform the reset procedure. The RESET button can be activated at any time. During the RF loop back part of the test procedure, the HPA and DLNA are switched off by the SDU.

B. CDM

(1) The CDM is housed in a small box which fits into the slot on the rear panel of the HSU. Figure 1-3 shows the CDM. The leading particulars for the CDM are given in Table 1-9.

NOTE: When extracting the LRU from the aircraft's mounting tray for maintenance, detach the CDM from the rear of the removed LRU and install the CDM on the replacement LRU.

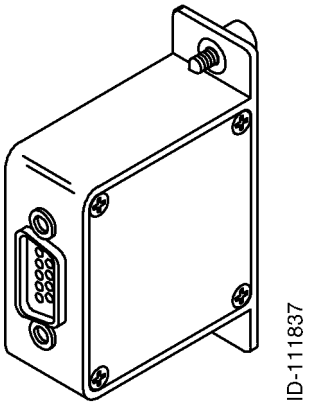

Figure 1-3. CDM

Table 1-9. CDM Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Length	1.79 ± 0.02 in. (45.5 ± 0.05 mm)
• Width	0.79 ± 0.02 in. (20.0 ± 0.05 mm)
• Height (excluding fasteners)	2.68 ± 0.02 in. (68.0 ± 0.05 mm)
Weight (maximum)	.022 lb (0.1 kg)
Power requirement	+3.0 to +3.5 V dc
Power consumption	5 mA
Power hold-up	Full power hold-up provided by the HSU
Memory capacity	32 kbyte
Write sessions	100,000 minimum
Ambient temperature:	
• Operational	-20 °C to +55 °C
• Storage	-55 °C to +85 °C
Altitude:	
• Non-pressurized (Cat F1)	55,000 ft
• Pressurized (Cat A1)	15,000 ft
Relative humidity	95% non-condensing at +50 °C

C. RF Splitter/Combiner

(1) One RF splitter/combiner divides the signal received from the DLNA which is then sent to the SDU and HSU; the other RF splitter/combiner combines the transmit outputs of the SDU and HSU to drive the HPA. Each unit weighs 2.5 oz. (70.87 grams). Figure 1-4 shows the RF splitter/combiner.

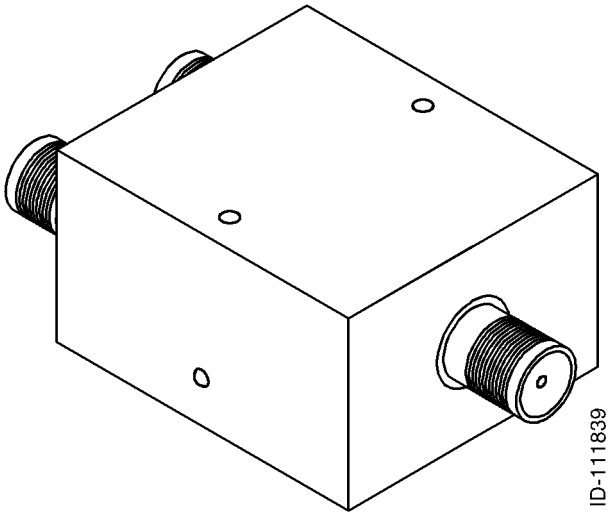

Figure 1-4. RF Splitter/Combiner

D. HSU Mounting Tray

(1) The HS-700 HSU ARINC 404A connector, contacts, and mounting trays can be purchased from ECS or EMTEQ. The addresses for ECS and EMTEQ are as follows:

Electronic Cable Specialists
5300 W. Franklin Drive
Franklin, WI 53132
U.S.A.

Telephone: (414) 421-5300
Fax: (414) 421-5301

EMTEQ
S84 W. 18693 Enterprise Drive
Muskego, WI 53150
U.S.A.

Telephone: (262) 679-6170 / 1-888-679-6170

(2) Table 1-10 gives a list of HSU mounting trays available through ECS. Contact EMTEQ for a list of HSU mounting trays available.

Table 1-10. HSU Mounting Trays

ECS Part No.	Description	Voltage
4130	1/4 ATR Tray Assembly Short/Short with DPX2 Cutout	28 V dc

SECTION 2
MECHANICAL INSTALLATION

1. Overview

A. General

(1) This section contains information on how and where to mount the HSU, CDM, combiner, and splitter. Figure 2-1 shows the HSU dimensions. Figure 2-2 shows mounting tray dimensions. Figure 2-3 shows the physical attributes of the CDM. Figure 2-4 shows the dimensions and mounting hole dimensions of the RF splitter/combiner.

B. Equipment and Materials

(1) See the applicable outline and installation diagram in this section for mounting information.

2. Mechanical Installation Design

A. HS-700 HSU Provisions

(1) Mechanical installation data for the HS-700 HSU is shown in Figure 2-1. The HSU is mounted in an ARINC 404A 1/4 ATR short , 2MCU chassis with one hold-down hook. It can be installed inside the pressurized area, or outside (within the limits of DO-160D specifications). It is important that the HSU is installed in a location where its operational temperature specifications are met. The HSU is approved for installation on jet engine aircraft, but not turboprops or helicopters. No special cooling is required, but the airflow must not be blocked.

(2) The location of the mounting tray should allow the interface cabling to other units to be as short as possible. The location must give protection against rain, condensation, solvents, and hydraulic fluid. The mounting tray must be electrically bonded to the aircraft frame by a low resistance path of less than 0.1 ohm. Mechanical installation data for the mounting tray is shown in Figure 2-2.

B. CDM Provisions

(1) Mechanical installation data for the CDM is shown in Figure 2-3. The CDM is designed for mounting into the slot in the HSU rear panel and acts as an integrated part of the HSU. The CDM has the same installation requirements as the HSU.

(2) A stud on the CDM can be used to attach a tether between the CDM and the mounting tray to make sure that the CDM stays with the aircraft in case the HSU must be replaced.

C. RF Splitter/Combiner Provisions

(1) Mechanical installation data for the splitter/combiner is shown in Figure 2-4.

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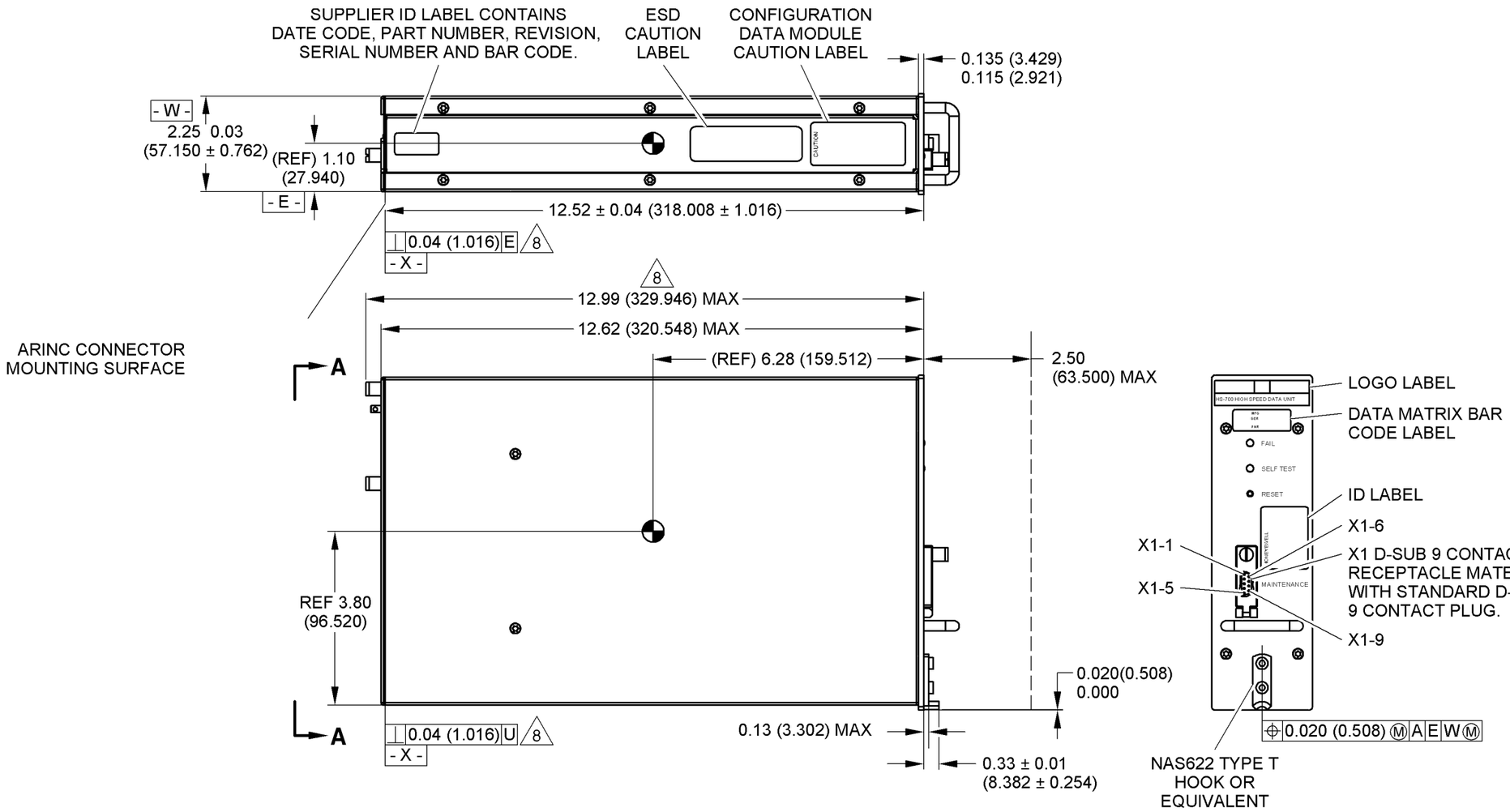


NOTES:

1. Unit weight: Nominal 4.63 lb/maximum 5.97 lb (2.1/2.3 kg).
2. ⌖ Denotes approximate center of gravity.
3. Darkened portion indicates solid part of polarizing keyway, index code 4.
4. The HS-700 installation is in accordance with ARINC 404A 1/4 short ATR, except the configuration module mounting hardware exceeds the unit rear case projection outline as noted.
5. Dimensions in parentheses are millimeters.
6. Unit finish: Gold chemical film per Honeywell specification M690278-2.
7. Cooling is not required. Unit is free of cooling air holes.
8. Applies only to area A.
9. Tolerances unless otherwise specified:
   Two place tolerances 0.XX ± 0.02 (0.YYY ± 0.508)
   Three place tolerances 0.XXX ± 0.005 (0.YYY ± 0.127)

Figure 2-1 (Sheet 1). HSU Outline and Installation Diagram

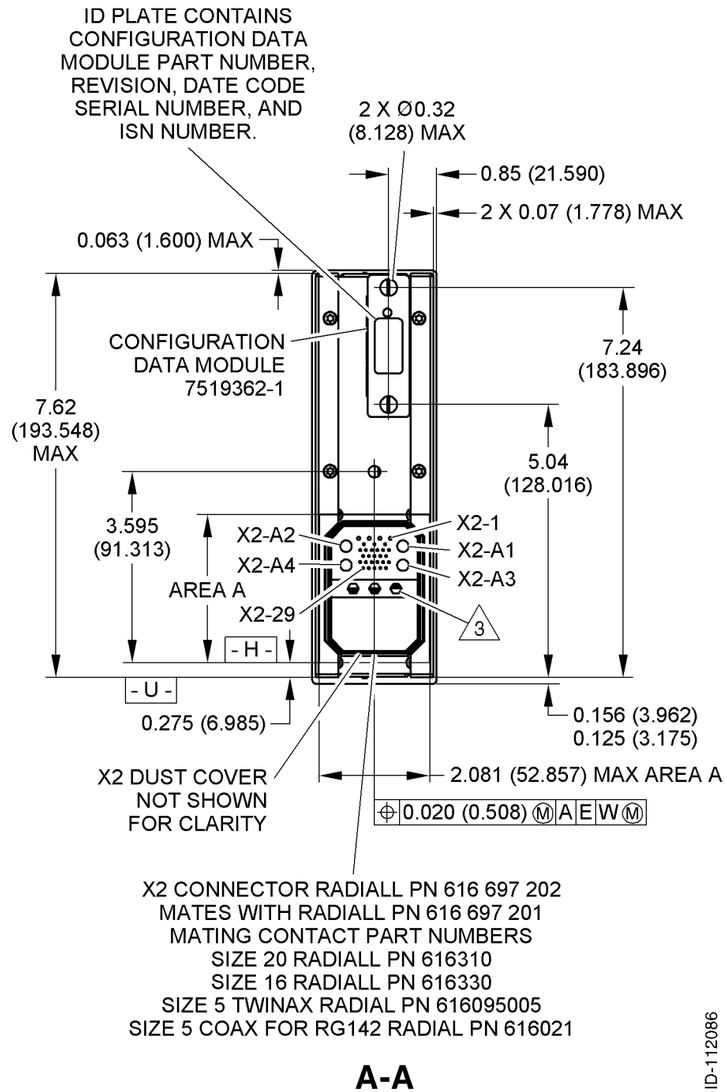


Figure 2-1 (Sheet 2). HSU Outline and Installation Diagram

NOTES:
Unless otherwise specified

1. Dimensions and tolerances per ANSI Y14.5M-1982.
2. Designed to meet the applicable requirements of the following:
   ARINC 404A-1/4-ATR-SHORT
   RTCA/DO-160C ENV. CAT. (A3F2)-BABXXXXXXXXXXXXXXXX
3. Finish (clear chem film per MIL-C-554), Class 3).
4. Maximum extension when LRU is securely fastened to tray assembly.
5. Identify with ECS PN and lot Number per EP210.

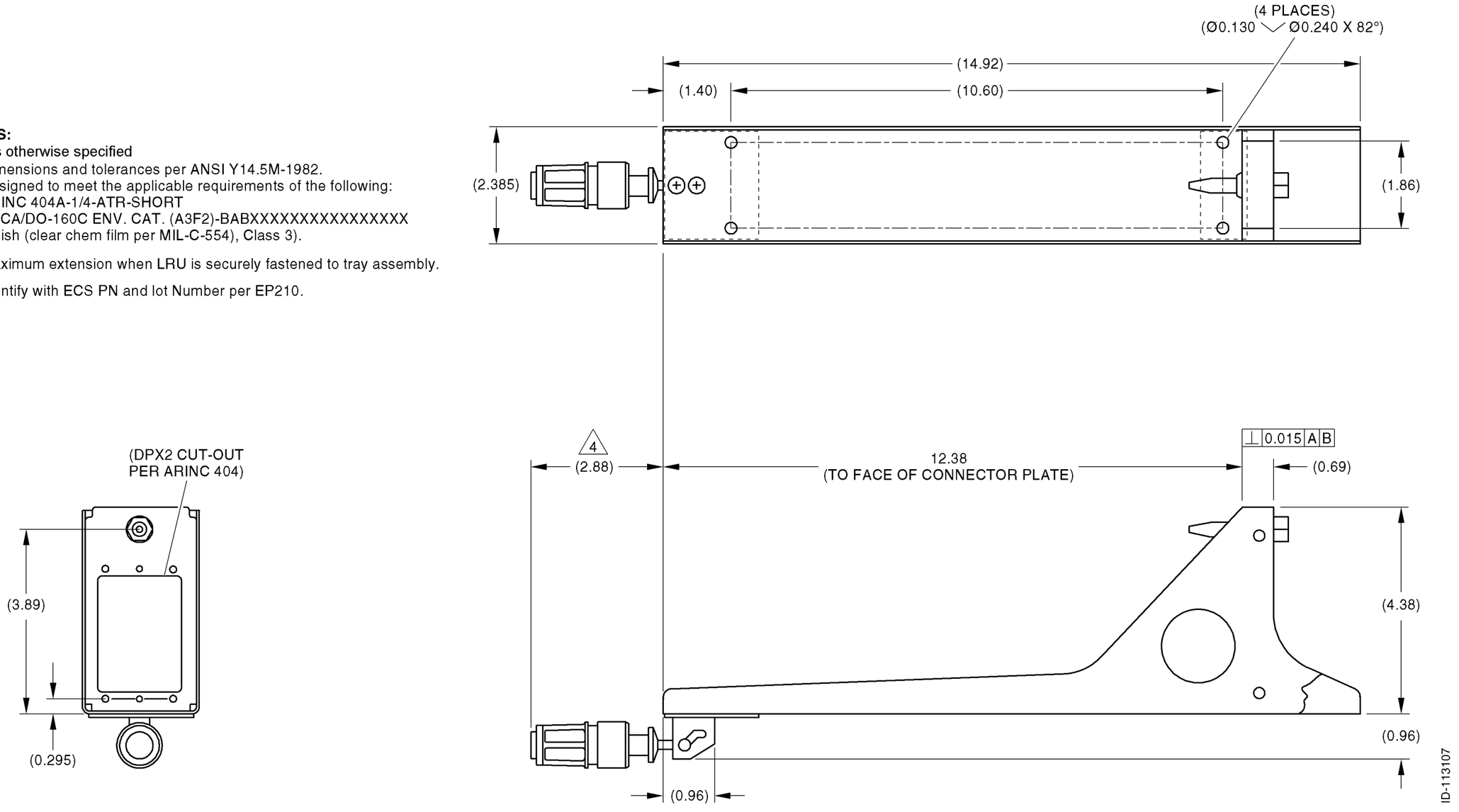


Figure 2-2. Mounting Tray Outline and Installation Diagram

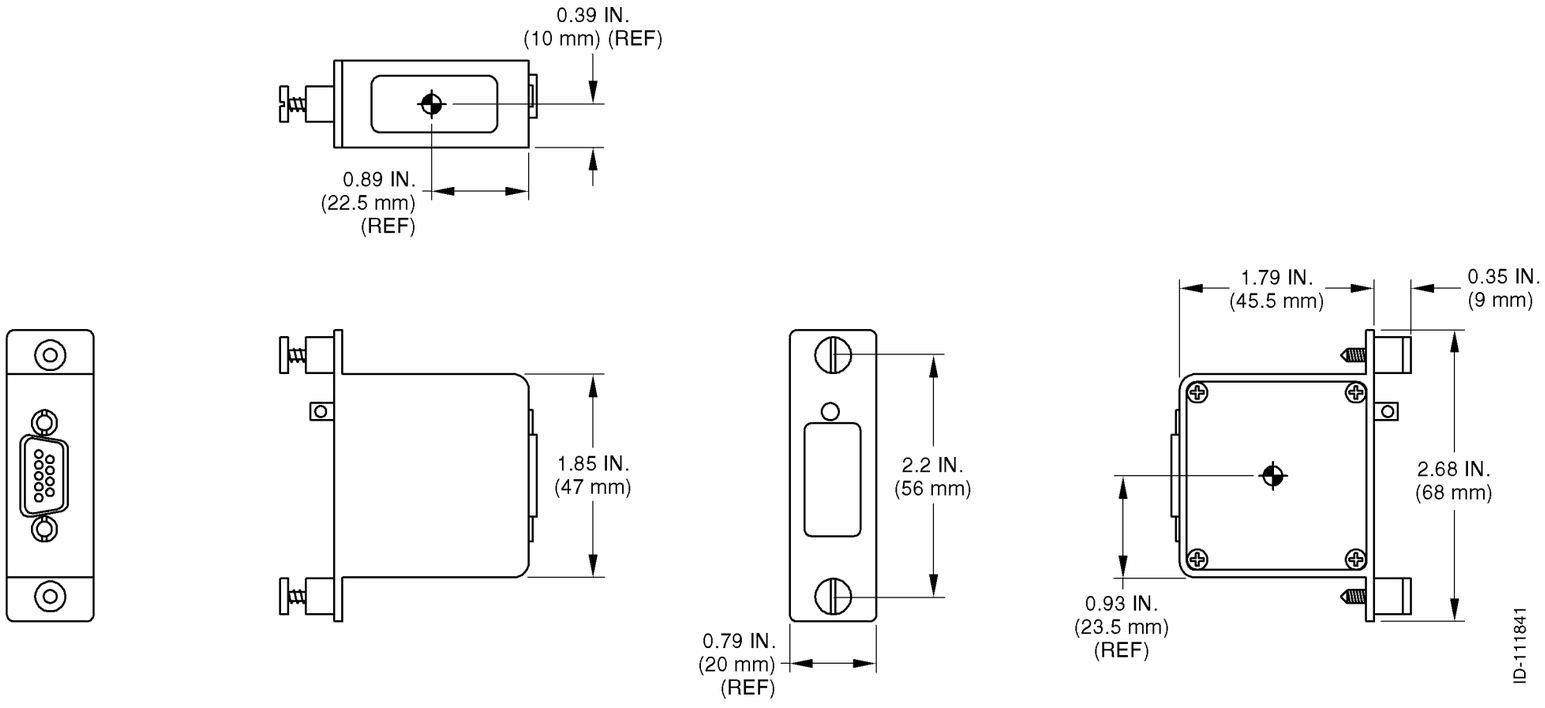
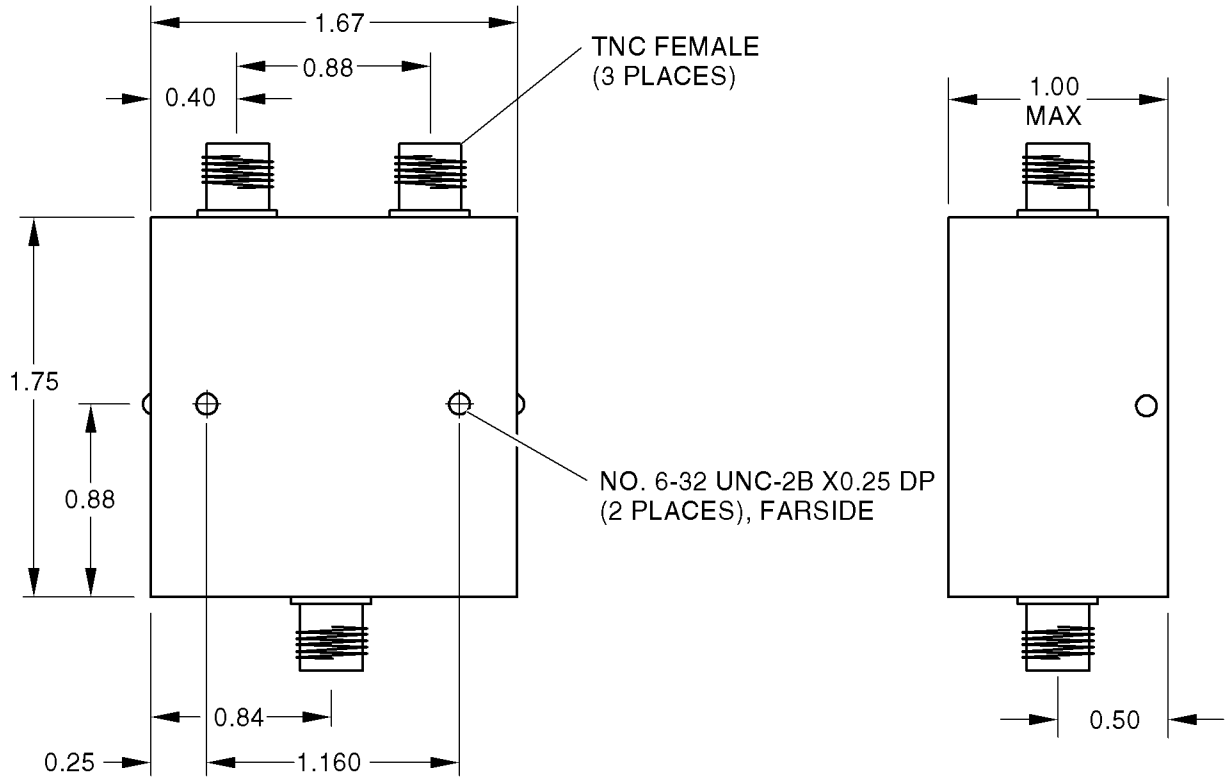


Figure 2-3. CDM Outline and Installation Diagram



NOTE:
Tolerances:
two place decimal ± 0.02
three place decimal ± 0.005

ID-111843

Figure 2-4. RF Splitter/Combiner Outline Diagram

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SECTION 3
ELECTRICAL INSTALLATION

1. Overview

A. General

(1) This section gives electrical installation procedures, power distribution, and interconnect information for the HSU, combiner, and splitter.

(2) Procedures for proper shield, power, and signal grounding are also provided in this section. In addition, procedures for the various buses are included.

B. Equipment and Materials

(1) See leading particulars table for a list of mating connectors required to do the electrical installation.

2. Electrical Installation Procedure

A. General

(1) The information necessary to provide the electrical interconnects is contained in the following paragraphs.

B. Power Requirements

(1) The aircraft dc power supply must be 28 V dc (nominal). The normal minimum and maximum voltages permitted are 20.5 and 32.2 V dc respectively.

(2) Power supply to the HSU – The voltage level of the power supplied to the HSU is important in this installation. The potential is the difference between the power pins and power ground pins at the line replaceable unit (LRU). Excessive voltage drops in the power wire(s) and power ground wire(s) cause one or more of the following conditions:

- The LRU draws additional current from the aircraft supply system.
- The voltage drop can become large enough that the LRU oscillates on and off at low line. This oscillation can damage the LRU.

(3) The HSU is supplied from the 28 V dc aircraft power system through a separate circuit breaker. It is essential to keep the impedance of the power supply cables below the limits specified in Table 1-6. The HSU also provides the power supply voltages to the CDM.

(4) The recommended maximum total combined voltage drop (voltage drop of the power wire[s] plus voltage drop of the power ground wire[s]) low line input is 1.0 V. Voltage drop is a function of current and resistance (resistance in this case is a function of wire gauge and wire length). See Figure 3-1 for determining proper wire gauge for a round trip length of LRU power and power ground wires.

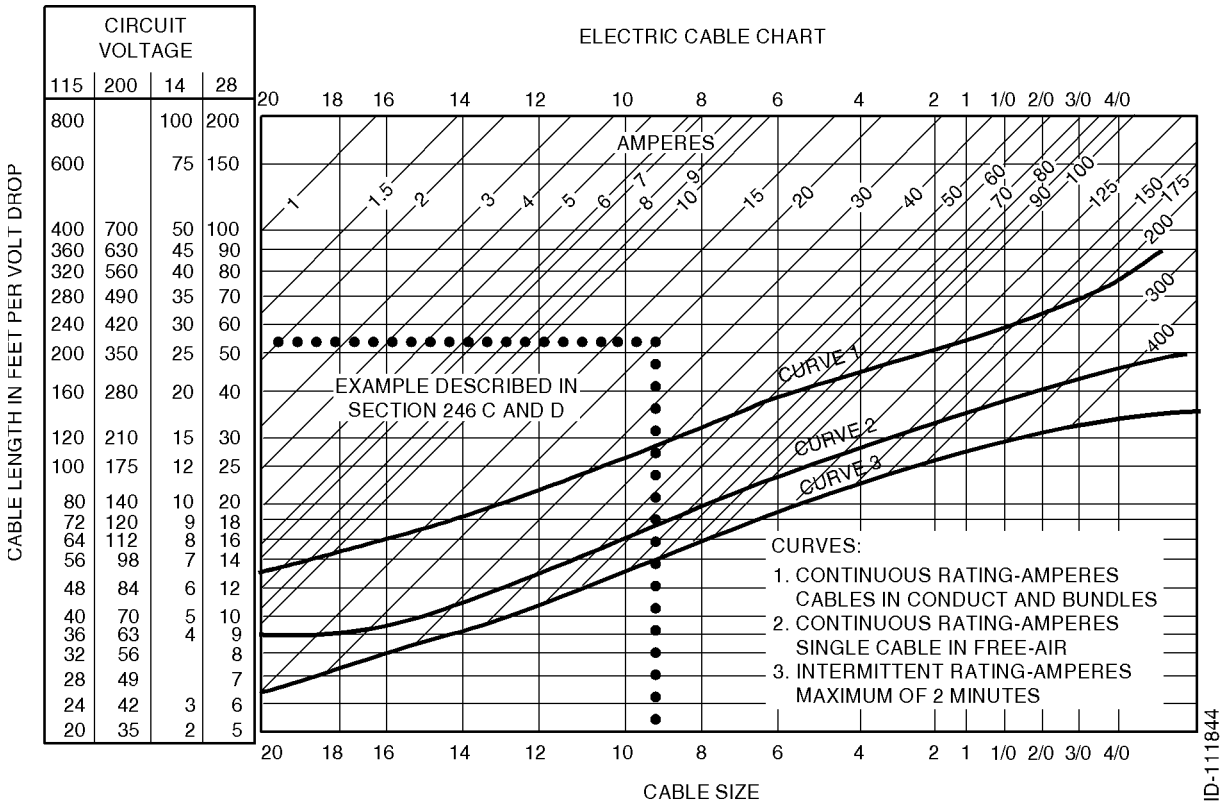


Figure 3-1. Electric Cable Chart

C. Ground Requirements

(1) General

(a) Proper grounding is a key factor in ensuring proper system operation under normal conditions, high intensity radiated electromagnetic frequencies (HIRF), and lightning environments. You must obey this section to satisfy these requirements.

NOTE: HIRF and lightning requirements dictate that the shielded wires meet the requirements of paragraph 2.C.(3). Installation of this system into aircraft manufactured prior to the FAA requirements adheres to these practices whenever feasible.

(2) Chassis Grounding

(a) All rack mount/remote mount units are electrically bonded to the airframe. This is done by making sure the mating surfaces between the LRU mounting tray (or LRU mounting feet if a tray is not used) provide a low impedance (< 0.1 Ω) electrical path.

(b) The mating surfaces must be free of all paint and other non-conductive elements and are burnished to ensure a good bond. If the aircraft mating surface is not conductive, a bonding strap of a least 1/4-inch wide (preferably 1/2-inch wide) tin coated copper braid can be used between the LRU mounting tray (or LRU itself if a tray is not used) and the nearest airframe grounding point.

(3) Shield Grounds

(a) The shield wires in the HSU have the shield grounded at both ends. This is called multi-point grounding and is specified to minimize the adverse effects of HIRF and lightning.

(b) The shield must not be connected to any LRU or bulkhead connector pin.

(c) Examples of multi-point shield grounding methods are shown in Figure 3-2 and Figure 3-3. The shield grounding method for rack mount units is detailed in Figure 3-4. This is the preferred shield grounding method for the HSU rack mount unit.

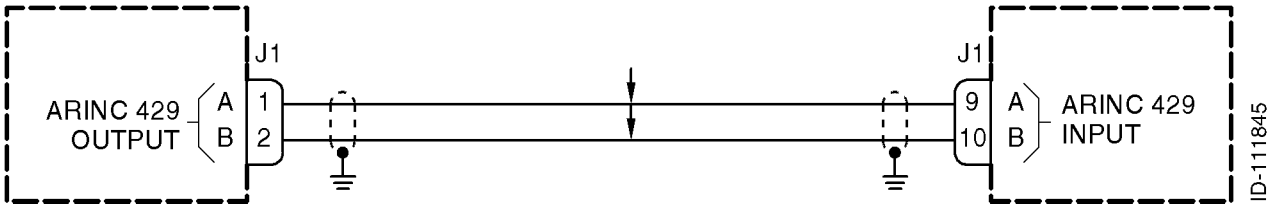


Figure 3-2. Example 1, Multi-point Shield Ground

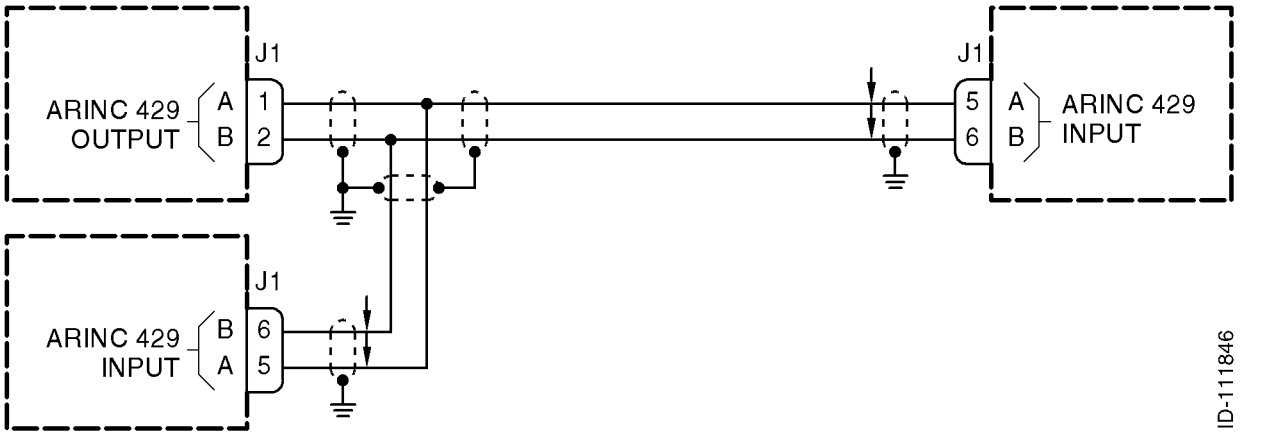


Figure 3-3. Example 2, Multi-point Shield Ground

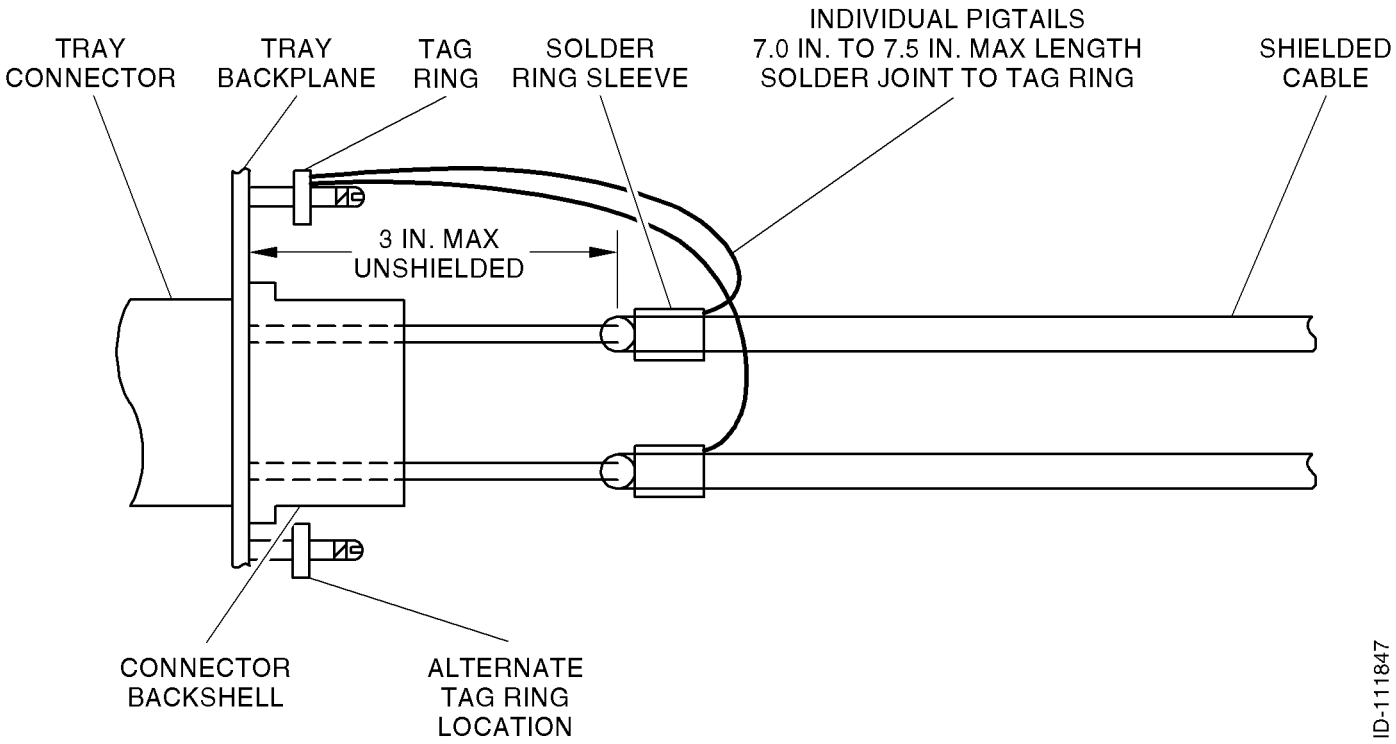


Figure 3-4. Shield Grounding Example for Rack Mount Connectors

(4) Power/Signal Grounds

(a) The length of exposed unshielded cable and the length of the drain leads is critical for proper operation and EMC compliance. Figure 3-5 shows the proper aircraft grounding method. It is critical that the ground pigtails be individually connected to the tag ring(s). If the are daisy-chained, there will be EMC compliance issues. Coaxial cables must have a continuous shield from the cable into the tray connector. Do not put pigtails coaxial cables.

NOTE: It is very important this grounding technique be adhered to. Do not tie the various ground wires to multiple aircraft frame points and depend on the aircraft structure to supply a low impedance path for the individual grounds. Only chassis grounds and shield grounds are grounded at multiple points in the aircraft.

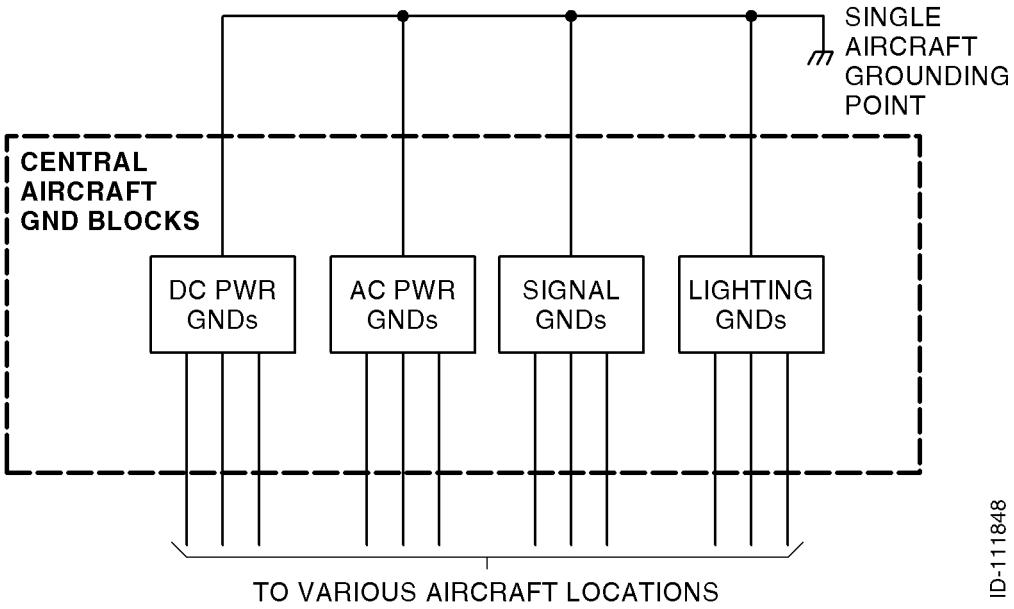


Figure 3-5. Aircraft Grounding

(b) Because signal grounds are low currents, multiple signal grounds can be connected to remote aircraft terminal blocks other than the central grounding blocks as long as these remote terminal blocks are isolated from ground. The various remote signal ground blocks must all be grounded only at the aircraft central grounding point. If 10 signal grounds are connected to a remote terminal block, a minimum of one grounding wire must be run from this terminal block to the aircraft central grounding point.

3. Electrical Installation

A. HSU

(1) General

(a) The HSU interface block diagram is shown in Figure 3-6.

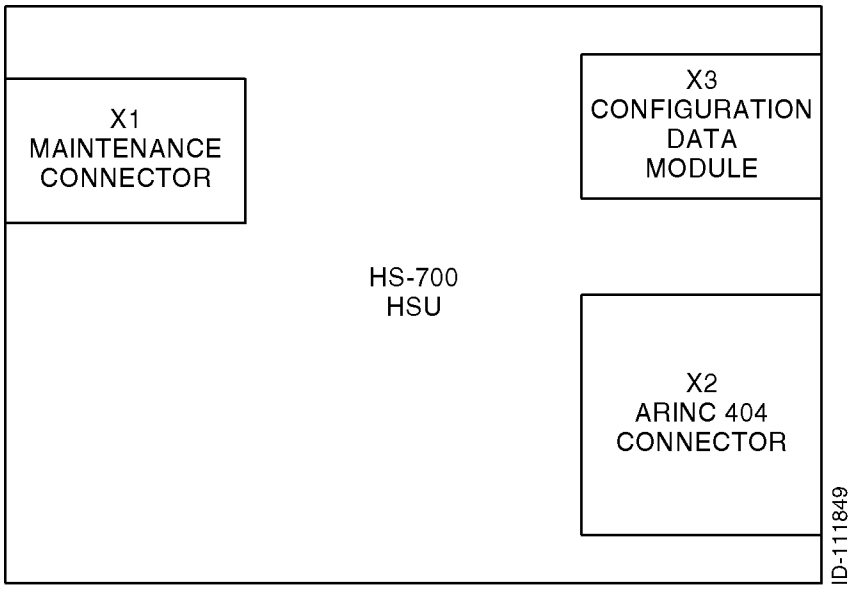


Figure 3-6. HSU Interface Block Diagram

(2) HSU X1 Connector

(a) The HSU front panel X1 connector is an interface to a PC for maintenance purposes. The X1 connector is a 9-pole female sub-D filter connector. The HSU X1 connector layout is shown in Figure 3-7. Table 3-1 gives the pin assignments of the X1 connector.

(b) The HSU has two CMT interfaces, one on the X1 connector (CMT1) and one on the X2 connector (CMT2). Both interfaces support EIA/TIA-232-E standard and can also be used as a printer interface. Only the CMT1 on the X1 connector can be used for software uploading. The interfaces are configured as DCE on the HSU.

(c) The CMT1 interface (pins 2, 3, and 5) has a Baud rate of 9,600 bps or 115.2 kbps for software uploading. There are eight data bits and one stop bit with no parity.

(d) The HSU X1 connector contains an input pin (pin 4) to disable the X2 rear connector CMT2 interface. If the rear connector CMT2 interface is connected to a terminal, it is diabled when using the front connector CMT1 since both CMTs share the same internal serial I/O port.

(e) The rear connector CMT2 interface is disabled by connecting X1 connector pin 4 to -12 V dc. This is done by mounting a jumper from pin 4 to pin 6 in the serial cable plug. If a fully populated RS-232 serial cable is used, no jumper is needed.

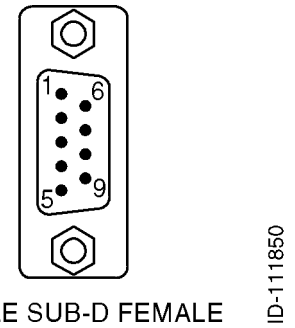


Figure 3-7. HSU Maintenance Connector (X1) Pin Layout

Table 3-1. HSU X1 Connector Pin Assignments

Pin	Signal Name/Description
1	Not Used
2	CMT1 RXD Output (EIA/TIA-232-E)
3	CMT1 TXD Input (EIA/TIA-232-E)
4	CMT2 Interface Disable Input
5	CMT1 GND (EIA/TIA-232-E)
6	CMT1 -12VDC (to pull down pin 4)
7	Not Used
8	Not Used
9	Not Used

(3) HSU X2 Connector

(a) The HSU rear panel X2 connector is an interface to aircraft and SATCOM interconnections. The X2 connector is an ARINC 404 shell size 2 receptacle connector. The layout of the HSU X2 connector is shown in Figure 3-8. Table 3-2 gives the pin assignments of the X2 connector.

(b) The HSU disable input is used by the SDU to reset and inhibit the transmitter output signal from the HSU. The ARINC 429 interface is used by the SDU to control the HSU. The HSU operates as a slave to the SDU. The interface is a 100 kbps high speed ARINC 429 receive and transmit data bus to/from the SDU. The HSU transmits and receives simultaneously on the two ARINC 429 channels.

(c) The CMT2 interface (pins 5, 6, and 7) has a Baud rate of 9,600 bps fixed. There are eight data bits and one stop bit with no parity.

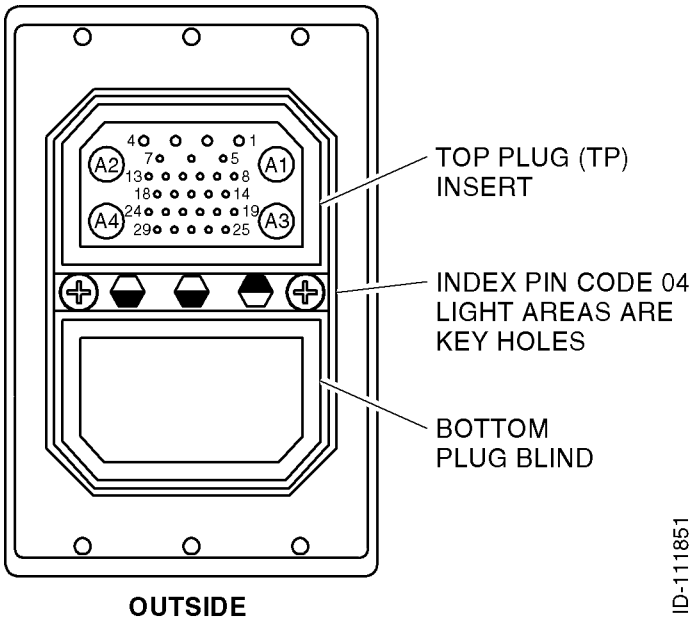


Figure 3-8. HSU ARINC 404 Connector (X2) Pin Layout

Table 3-2. HSU X2 Connector Pin Assignments

Pin	Signal Name/Description
TP A1	RF RX Input from DLNA/Splitter
TP A2	RF TX Output to HPA/Combiner
TP A3	10Base-T RX Output to User (RJ-45 pins 3 and 6)
TP A4	10Base-T TX Input from User (RJ-45 pins 1 and 2)
TP1	+28 V dc Ground Power
TP2	GND (Ground Power Return)
TP3	Chassis Ground
TP4	Not Used
TP5	CMT2 GND (EIA/TIA-232-E)
TP6	CMT2 TXD Input (EIA/TIA-232-E)
TP7	CMT2 RXD Output (EIA/TIA-232-E)
TP8	HSU Disable Discrete Input
TP9	ATE #1 Discrete Input
TP10	ATE #2 Discrete Input
TP11	MPDS TXD Input (EIA/TIA-232-E) from User (DB25-2/DE9-3)
TP12	MPDS RXD Output (EIA/TIA-232-E) to User (DB25-3/DE9-2)

Table 3-2. HSU X2 Connector Pin Assignments (cont)

Pin	Signal Name/Description
TP13	MPDS RTS Input (EIA/TIA-232-E) from User (DB25-4/DE9-7)
TP14	MPDS CTS Output (EIA/TIA-232-E) to User (DB25-5/DE9-8)
TP15	MPDS DTR Input (EIA/TIA-232-E) from User (DB25-20/DE9-4)
TP16	MPDS DCD Output (EIA/TIA-232-E) to User (DB25-8/DE9-1)
TP17	MPDS DSR Output (EIA/TIA-232-E) to User (DB25-6/DE9-6)
TP18	MPDS GND (EIA/TIA-232-E) (DB25-7/DE9-5)
TP19	Data Bus Output to SDU (ARINC 429-A)
TP20	Data Bus Output to SDU (ARINC 429-B)
TP21	Data Bus Input from SDU (ARINC 429-A)
TP22	Data Bus Input from SDU (ARINC 429-B)
TP23	ISDN TxP (c) Input + (Plus) from User (RJ-45 pin 3)
TP24	ISDN RxP (d) Output + (Plus) to User (RJ-45 pin 4)
TP25	ISDN RxN (e) Output - (Minus) to User (RJ-45 pin 5)
TP26	ISDN TxN (f) Input - (Minus) from User (RJ-45 pin 6)
TP27	HSU Failure Discrete Output (Lamp Type)
TP28	Service Available Discrete Output (Lamp Type)
TP29	Discrete Output Spare 2 (Lamp Type)

(4) HSU X3 Connector

(a) The HSU rear panel X3 CDM connector is an interface to the CDM. The X3 connector is a 9-pole female sub-D connector. The layout of the HSU X3 connector is shown in Figure 3-9. Table 3-3 gives the pin assignments of the X3 connector.

(b) The CDM consists of a write protected memory area and a non-write protected memory area. The write protected area contains the ISN number and the forward/return IDs which can only be altered by the manufacturer. The non-write protected area contains the system configuration and installation specific data. The contents of the non-write protected area can be altered or accessed by use of a software password. The communication protocol between the HSU and the CDM follows a synchronous serial protocol.

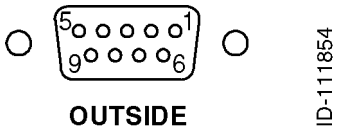


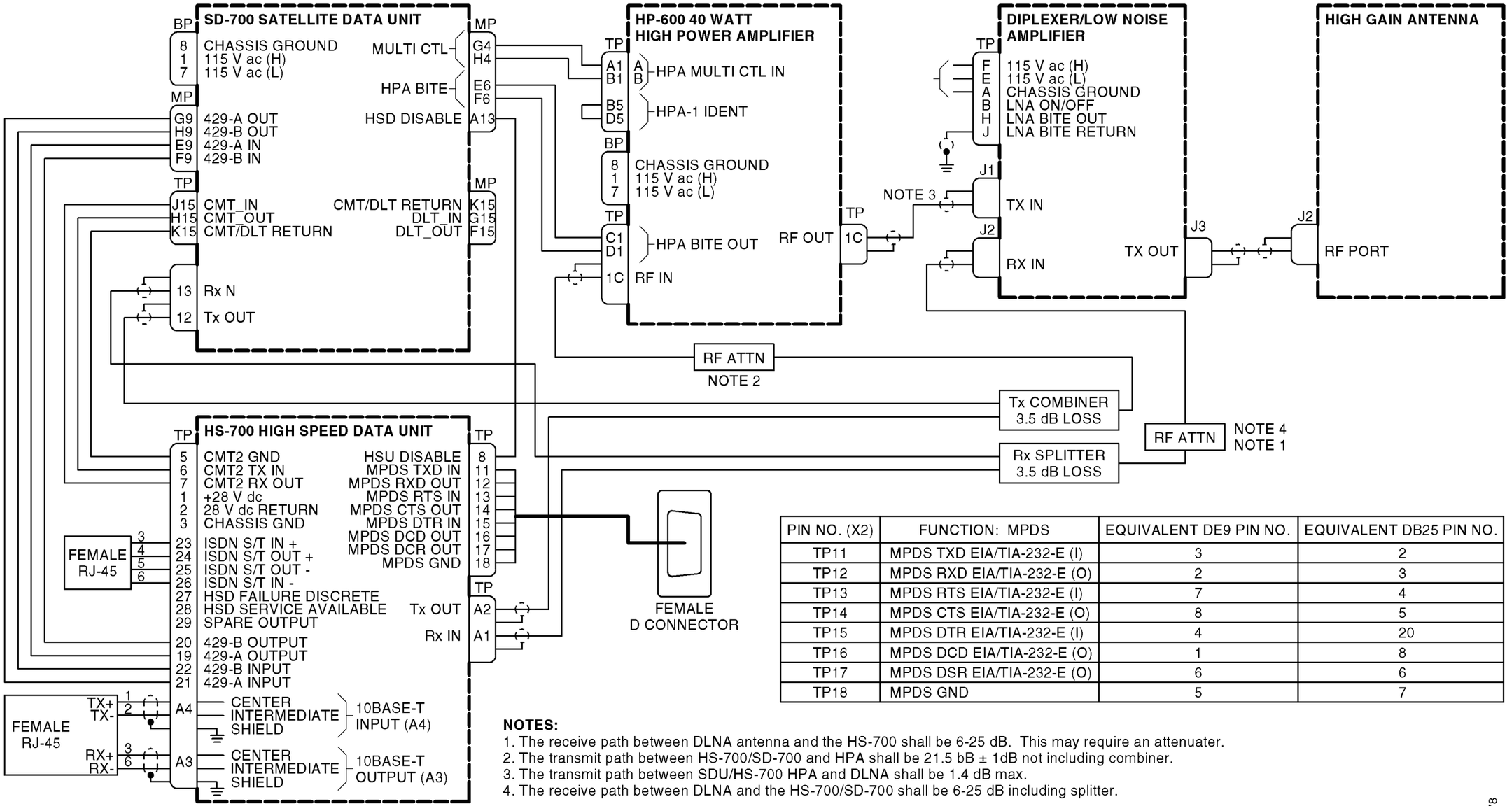
Figure 3-9. HSU CDM Connector (X3) Pin Layout

Table 3-3. HSU X3 Connector Pin Assignments

Pin	Signal Name/Description
1	CS – Chip Select Signal to the CDM (Active Low)
2	SO – Serial Output Data from the CDM
3	WP – Write Protect Signal to the CDM (Active Low)
4	NC – Not Connected
5	SI – Serial Input Data to the CDM
6	SCK – Serial Clock to the CDM (2 MHz maximum)
7	ADR0 – Address output to the CDM (5 V/10 mA maximum)
8	ADR1/ ID Input – Output: 3 V Levels (Tri-state), Input: 3 V or 5 V Levels and 10 Kohm pull down resistor
9	VCC – Power Supply Voltage to the CDM (3.3 V ± 0.15 V, 5 mA maximum)
Shield	GND – Sheild must be connected internally to ground

B. CDM

(1) The CDM is connected to the X1 connector of the HSU. Refer to paragraph 3.A.(4) in this section for electrical installation information for the HSU X1 connector.



PIN NO. (X2)	FUNCTION: MPDS	EQUIVALENT DE9 PIN NO.	EQUIVALENT DB25 PIN NO.
TP11	MPDS TXD EIA/TIA-232-E (I)	3	2
TP12	MPDS RXD EIA/TIA-232-E (O)	2	3
TP13	MPDS RTS EIA/TIA-232-E (I)	7	4
TP14	MPDS CTS EIA/TIA-232-E (O)	8	5
TP15	MPDS DTR EIA/TIA-232-E (I)	4	20
TP16	MPDS DCD EIA/TIA-232-E (O)	1	8
TP17	MPDS DSR EIA/TIA-232-E (O)	6	6
TP18	MPDS GND	5	7

NOTES:
1. The receive path between DLNA antenna and the HS-700 shall be 6-25 dB. This may require an attenuater.
2. The transmit path between HS-700/SD-700 and HPA shall be 21.5 bB ± 1dB not including combiner.
3. The transmit path between SDU/HS-700 HPA and DLNA shall be 1.4 dB max.
4. The receive path between DLNA and the HS-700/SD-700 shall be 6-25 dB including splitter.

ID-111978

Figure 3-10. HS-700 High Speed Data System Interconnect Diagram

SECTION 4
INSTALLATION CHECK

1. Overview

A. General

(1) TBD.

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SECTION 5
ADJUSTMENT/TEST

1. Overview

A. General

(1) To be supplied.

Blank Page

SECTION 6
FAULT ISOLATION

1. Overview

A. General

(1) To be supplied.

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SECTION 7
MAINTENANCE PRACTICES

1. Overview

A. General

(1) This section provides instructions for removing, reinstalling, and adjusting the HSU, CDM, combiner, and/or splitter that has been previously installed by the aircraft manufacturer or completion center. 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.

B. Equipment and Materials

(1) 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 adjust the system. Do not over tighten mounting screws. Where torque values are not given, it is acceptable to finger tighten the mounting screws.

2. Procedure for the HS-700 HSU

A. Removal and Reinstallation Procedures

(1) Remove the HSU.

(a) Remove power from the HSU and the interfacing subsystems (such as SATCOM). Circuit breakers for the systems are typically located on the flight deck.

(b) Loosen the mounting tray holddown clamp by rotating in a counterclockwise direction.

(c) Slowly pull forward on the unit handle to separate the unit and tray connectors and slide the unit out of the tray, lifting slightly to clear the holddown clamps.

(d) Remove the CDM. Refer to paragraph 3. in this section.

(e) Place electrostatic protective covers on the HSU connectors to protect the pins from damage.

(f) Place the HSU in a protective static-resistant bag and protective carrying case.

(2) Reinstall the HSU.

(a) Remove the HSU from the protective carrying case and protective static-resistant bag.

(b) Remove the electrostatic protective covers from the HSU rear connector.

(c) Install the CDM. Refer to paragraph 3. in this section.

(d) Slide the unit into the mounting tray.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(e) Gently slide the unit backwards until its connectors are fully engaged with the mating connectors of the mounting tray.

(f) Put the holddown clamps in place and tighten the knobs in a clockwise direction until the proper torque is applied (clutch engages).

(g) Reapply power to the HSU and its interfacing equipment.

NOTE: Upon applying primary power, the HSU will automatically power up and start a POST.

B. Adjustment Procedures

(1) Not applicable.

C. Repair Procedures

(1) Not applicable.

D. Return to Service Procedures

(1) Refer to test procedures in the INSTALLATION CHECK section of this manual.

3. Procedure for the CDM

A. Removal and Reinstallation Procedures

(1) Remove the CDM.

(a) Remove power from the HSU and its interfacing equipment. Circuit breakers for the HSU are typically located on the flight deck.

(b) Remove the HSU. Refer to paragraph 2. in this section.

(c) Loosen the two screws holding the CDM to the HSU.

(d) Remove the CDM from the HSU and place a protective cover on the connector.

(2) Reinstall the CDM.

(a) Remove the protective cover from the connector.

(b) Carefully attach the CDM to the HSU using two screws.

(c) Install the HSU. Refer to paragraph 2. in this section.

(d) Reapply power to the HSU and its interfacing equipment.

B. Adjustment Procedures

(1) Re-enter all of the configuration parameters using the CMT.

C. Repair Procedures

(1) Not applicable.

D. Return to Service Procedures

(1) Refer to test procedures in the INSTALLATION CHECK section of this manual.

4. Procedure for the Combiner/Splitter

A. Removal and Reinstallation Procedures

(1) Remove the combiner.

(a) Remove power from the HSU. Circuit breakers for the HSU are typically located on the flight deck.

(b) Locate the combiner.

(c) Disconnect the aircraft connectors from the combiner and place protective covers on the connectors.

(d) Remove the two screws holding the combiner in position.

(2) Reinstall the combiner.

(a) Attach the combiner using two screws.

(b) Remove the protective covers from the connectors and install the aircraft connectors on the combiner.

(c) Reapply power to the HSU and its interfacing equipment.

(3) Remove the splitter.

(a) Remove power from the HSU. Circuit breakers for the HSU are typically located on the flight deck.

(b) Locate the splitter.

(c) Disconnect the aircraft connectors from the splitter and place protective covers on the connectors.

(d) Remove the two screws holding the splitter in position.

(4) Reinstall the splitter.

(a) Attach the splitter using two screws.

(b) Remove the protective covers from the connectors and install the aircraft connectors on the splitter.

(c) Reapply power to the HSU and its interfacing equipment.

B. Adjustment Procedures

(1) Not applicable.

C. Repair Procedures

(1) Not applicable.

D. Return to Service Procedures

(1) Refer to test procedures in the INSTALLATION CHECK section of this manual.

5. Instructions for Continued Airworthiness, Code of Federal Regulation CFR 91.213

A. General

(1) Maintenance requirements and instructions for continued airworthiness of the HS-700 HSU components are contained in the following paragraphs:

(2) Installation of the HSU on an aircraft by Supplemental Type Certificate or Form 337 obligates the aircraft operator to include the maintenance information provided by this manual in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program.

B. Instructions

(1) Maintenance information for the HSU (system description, removal, installation, testing, etc.) is contained in this manual.

(2) 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).

(3) Wiring diagram information contained in this manual should be placed into the aircraft operator's appropriate aircraft Wiring Diagram Manuals.

(4) The high speed data 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.

(5) 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 CFR or the aircraft's minimum equipment list (MEL).

(6) The HSU components can be repaired only at a factory authorized repair center or an appropriately rated FAA Part 145 repair station.

(7) 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 of the FAR.

(8) Scheduled Maintenance Program tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

(a) Recommended Periodic Scheduled Servicing Tasks: None Required

(b) Recommended Periodic Inspections: None Required

(c) Recommended Periodic Scheduled Preventative Maintenance Tests (Tests to determine system condition and/or latent failures): None Required

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APPENDIX A
INMARSAT REGISTRATION FORM

1. Overview

A. General

(1) This appendix provides an example of the Inmarsat registration form required to activate the HSD system.

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Registration for service activation of Aircraft Earth Station (AES)

PSA use only code ☐☐☐☐

Application number

Date

Customer's reference number

All Sections are to be completed by all customers
Tick Boxes as appropriate
Please write in block capitals

1. Your details (See note A)

Your name or the name of your organisation:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Email Address:

Contact person:

Title: Department:

What is their telephone number and/or extension? + Country code ( ) Area code ( ) Telephone number ( )

2. Paying the bill (See note B)

With whom have you arranged payment of calls for this AES?

The Service Provider — What is their code: ☐☐☐☐ If the Code is unknown, enter their name: (only Aero-C, mini-M & Swift 64)

OR

The Accounting Authority — What is their code: ☐☐☐☐ If the Code is unknown, enter their name: (ALL)

OR

If the bills are to be settled directly by the Aircraft Owner/Operator please enter details below: (only H, H+, I & L)

Name:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Contact person:

Title: Department:

3. What type of Aeronautical Earth Station (AES) are you registering? (See note C)

Installed on an Aircraft ☐ Fixed Installation ☐

The System

Aero-C	☐	Aero H	☐		
Mini-M Aero	☐	Aero H+	☐		
Aero Swift64 ISDN	☐	Aero I	☐		
Aero Swift64 MPD	☐	Aero L	☐		

What will be the primary use of the AES?

Government	☐
Commercial Air carrier	☐
Private/Corporate	☐

What will be the country of registry of this AES:

4. Technical Details for H, H+, I and L Services (See Note D)

AES Manufacturer : AES Model (Access Approval Number) :

Antenna Type:

5. What services are you applying for?

a) Aero-C Mobile Earth Stations (AES) (See Note E)

Enter your Aeronautical Earth Station (AES) Serial number ☐☐☐☐☐☐☐☐

Privacy	Telex answerback	PSA *use only* Inmarsat Mobile number
☐	☐☐☐☐	4☐☐☐☐☐☐☐☐

b) Mini-M Aero, Swift64 and SIM card services (See note F)

Enter your Inmarsat Serial number (ISN) 7 6 ☐☐☐☐☐☐☐☐☐☐

Enter SIM card serial number (SSN) ☐☐☐☐☐☐☐☐☐☐☐☐

Service	Privacy	Service code	PSA *use only* Inmarsat Mobile number	Service	Privacy	Service code	PSA *use only* Inmarsat Mobile number
4.8 Kbits Voice ☐	☐		76		☐		
2.4 kbit/s Fax ☐	☐		76		☐		
2.4 kbits/s Data ☐	☐		76		☐		
64 kbit/s Data ☐	☐		60		☐		
56kbit/s Data ☐	☐		60		☐		
SPEECH ☐	☐		60		☐		
AUDIO 3.1 ☐	☐		60		☐		
MPDS ☐	☐		60		☒		

To enter more services copy and complete this page as required

c) Aero-H, -H+, -I and -L Services (Classic Aero Services) (See Note G)

ICAO 24 bit technical address

☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐

PSA use only: Inmarsat Mobile number: 5☐☐☐☐☐☐☐ (above converted into octal)

Number of Voice Channels: 9600 bps ☐ 4800 bps ☐

			PSA use only **DDI** number issued
Direct dialling-in (alternate) number required (Y/N):	Voice: ☐	Available for Aero-H, -H+ and -I	_____
	Fax: ☐	Only available for Aero-H+ and -I	_____
	Data: ☐	Only available for Aero-H+ and -I	_____

Credit Card Option Required: YES ☐ NO ☐ Dual AES installed: YES ☐ NO ☐

Please select Service/s required (tick in appropriate boxes):

Service:		Privacy required?
Voice	☐	☐
Fax	☐	☐
Packet-Mode Data 2 (ACARS)	☐	☐
Packet-Mode Data 3 (OSI)	☐	☐

6. Emergency Contact Details (See note H)

ALL USERS MUST COMPLETE THIS SECTION

Who should we contact:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Alternative 24 hour emergency telephone + Country code ( ) Area code ( ) Telephone number ( )

7. Installation details (See Note I)

Complete only if installed on an AIRCRAFT

What is the aircraft's tail number (registration number): Fuselage/airframe number:

In which country is the aircraft registered:

Aircraft Manufacturer: Aircraft Model:

If Commercial, please name Airline:

Complete only if installed in a FIXED LOCATION

Complete only if you are installing an Aircraft Earth Station (AES) on a **FIXED** location (including simulators)

Fixed Location:

Description of Use:

8. Integrator Details (See Note J)

Name:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Contact person: Position:

9. Certification and agreement (See note K)

☐☐☐☐ Accepts the above Account. AA Signature:
(Enter AA Code)

I _____

the owner, have read and agree to comply with the 'Terms and Conditions for the use of the Inmarsat space segment', in particular with all applicable national laws and regulations relating to the use of Inmarsat Mobile Terminals

Signed _____ Date _____

I _____

the representative of the Point of Service Activation (PSA) received this form completed and signed by the owner.

Signed Date

_____ _____

TERMS AND CONDITIONS FOR THE UTILIZATION

**OF THE INMARSAT SPACE SEGMENT
BY AIRCRAFT EARTH STATIONS (AESs)**

**Article 1
Scope of Terms and Conditions**

(A) These Terms and Conditions shall apply to the authorization between Inmarsat Limited ("the Company") and the Licensee of the Aircraft Earth Station ("AES") ("the AES Licensee") described in the applicable Service Activation Registration Form ("SARF") with respect to the utilization of the Inmarsat space segment by the AES.

(B) For the purpose of these Terms and Conditions:

(1) "SARF" means an application made by the AES Licensee for the utilization of the Inmarsat space segment;

(2) "Point of Service Activation (PSA)" means the entity responsible for processing the SARF.

(C) The AES Licensee shall ensure that any operator or user of the AES ("the AES Operator") is informed of and complies with these Terms and Conditions, as far as applicable, at all times.

**Article 2
AES Performance, Criteria and Operations**

(A) Authorization Subject to Compliance with Technical and Operating Requirements

(1) Throughout the utilization of the Inmarsat space segment:

(a) the AES shall comply with the criteria and performance standards to which it was access-approved;

(b) the AES shall be controlled by an operator holding a licence or certificate issued or recognized by the State under whose authority the aircraft is operating (AES Operator); and

(c) AES Operators shall be required to comply with the Company's AES operating procedures, and with these Terms and Conditions as far as applicable, and any amendments thereto, as notified by the Company to the AES Licensee at any time or times.

(2) The AES shall be used exclusively for peaceful purposes.

(3) The AES Licensee shall notify the PSA promptly of any change in the Accounting Authority or Inmarsat Service Provider (ISP) or other billing entity, as specified in the SARF.

(4) The authorization to utilize the Inmarsat space segment shall be conditional upon compliance with this Article 2. The AES Licensee and AES Operators shall not utilize the Inmarsat space segment in a manner contrary to the environmental usage and distress and safety conditions specified in the SARF or contrary to these Terms and Conditions, without the prior written consent of the Company.

(B) Sanctions in the Case of Non-Compliance

(1) The Company shall be entitled, at any time or times, and with immediate effect, unilaterally to modify, restrict, suspend or terminate, temporarily or permanently, the authorization, by notification to the AES Licensee and the AES Operator, if the Company deems the AES or the AES Licensee or an AES Operator to not so comply, or to practise a utilization not so authorized, no matter what the cause or causes of such non-compliance or practice.

(2) The Company shall also send a copy of the notification to the PSA.

(3) Unless the authorization has been terminated, the Company shall lift such modification, restriction or suspension, if it is demonstrated to the Company's satisfaction that compliance has been resumed and will be maintained, or that such unauthorized practice has been and will be discontinued by the AES Licensee or the AES Operator.

(C) Suspension and Termination in Special Circumstances

(1) The authorization shall be deemed to be suspended during any period in which persistent malfunction or any operation of the AES that degrades the performance of the Inmarsat space segment occurs.

(2) The authorization shall be deemed to be terminated if any of the following circumstances occurs:

(a) reconfiguration of the AES while retaining the same configuration number;

(b) any modification or change to the AES configuration or installation that will result in an installation with a different configuration number from that provided at the time of commissioning; and
(c) any change in the information contained in the SARF which would require a change in the International AES Number.

(3) The Company shall be notified promptly in writing via the PSA by the AES Licensee of any of the events specified in sub-paragraphs (1) and (2) above.

(4) Upon suspension of the authorization for the reasons set forth in sub-paragraph (1) above, the Company shall inform the AES Licensee whether any retesting is required, and when the suspension has been lifted.

(5) Upon the termination of the authorization for any of the reasons set forth in sub-paragraph (2) above, recommissioning and the issue of a new Commissioning Certificate shall be required in order for the AES to recommence utilization of the system.

(D) Suspension for Non-Payment of Accounts and Other Causes

(1) Without prejudice to any of the other remedies and provisions of these Terms and Conditions or at law, the Company and any or all of the GES Operators in the Inmarsat system may, individually or jointly, suspend the authorization due to non-payment of accounts for the telecommunications services provided by the GESs, loss or theft of the AES, fraudulent use of the AES, request by the aircraft owner or fleet operator to bar the AES for at least ten (10) days as the aircraft is about to be grounded or other non-compliance with these Terms and Conditions, or any other reason established under the Company's Barring Procedures in force at the relevant time.

(2) Upon being satisfied that the causes of the suspension have been remedied, the Company and the GESs Operators may lift the suspension.

(3) The suspension shall not restrict the AES from transmitting a distress alert and distress priority message. The Company shall use reasonable efforts to restore access to the space segment for subsequent safety communications associated with the distress situation.

(4) In connection with the administration of the Company's Barring Procedures, the Company and the GES Operators may share information about the status of the AES with each other and with Nominated Barring Authorities designated by GES Operators.

(E) Compliance with National and International Regulations

(1) The issue of the Commissioning Certificate shall be without prejudice to the compliance by the AES with any laws, standards and procedures applicable to the installation, operation and use of the AES for any types of aeronautical communications. In utilizing the Inmarsat space segment, the AES Licensee and the AES Operators shall, respectively, be required to ensure compliance with:

(a) the conditions of any licence, certification or other authorization for the installation and operation of the AES on board the aircraft, issued by the State under whose authority the aircraft is operating;

(b) the conditions of the AES Operators' licences or certificates issued or recognised by the State under whose authority the aircraft is operating, relative to the use of the AES; and

(c) all applicable national laws and regulations governing the use of radio communications of any State in which the AES is located at any time, and any applicable international regulations.

(2) The AES Owner shall indemnify the Company and any GES Operator concerned against any loss incurred by them as a result of any non-compliance with this paragraph (E). The Company shall hold the benefit of this indemnity as trustee for any such GES Operator.

Article 3
Financial Obligations

The establishment of charges for the telecommunications services provided by any ground earth station (GES) is the prerogative of the owner and/or operator of the GES. The AES Licensee without delay must pay all accounts for telecommunications services via any GES. In the event of delayed payment, the GES concerned may discontinue telecommunications services for the AES in default, except for the exchange of distress or safety-related traffic, as provided in Article 2 (D) (3) above. If a GES Operator is unable to collect charges from the Accounting Authority, ISP or other billing entity specified in the SARF, personal and corporate details of the AES Licensee may be disclosed to the GES Operator for the purposes of debt collection.

Article 4
Telecommunications Disclaimer

(A) This Article applies to the Company for itself and as trustee for the benefit of the lessors, manufacturers, or other providers of the Inmarsat space segment; the owners or operators of GESs; and the directors, officers, employees, agents or assignees, of any of them ("the other indemnities").

(B) Subject to paragraph (D) below, neither the Company nor any of the other indemnities shall be liable for any claims attributable to any unavailability, delay, interruption, disruption or degradation in or of the Inmarsat space segment capacity; modification, restriction, suspension or termination of the authorization in accordance with Article 2(D)(1) above, failure to restore access in accordance with Article 2(D)(2) or (3) above, or sharing of information about the status of the AES in accordance with Article 2(D)(4) or Article 3 above, regardless of the cause or causes thereof. Such waiver of claims shall also extend to any direct or consequential loss, damage, liability or expense, loss of revenue or business harm of any kind.

(C) The AES Licensee agrees to indemnify the Company and the other indemnities and hold them harmless from any claims that might be made by the AES Operator or any other entity or person, attributable to any of the causes referred to in paragraph (B) above.

(D) Nothing in this Article 4 shall exclude or limit liability for death or personal injury in any jurisdiction where, as a matter of law, such liability cannot be excluded or limited.

Article 5
Language and Communications

(A) These Terms and Conditions and all documentation and communications required there under shall be in the English language.

(B) All communications pertinent to the authorization or to these Terms and Conditions shall be made or confirmed by telex, facsimile, data transmission or other written form. Communications by the Company to the AES Licensee and the PSA shall be sent to their respective_addresses as specified in the SARF or other last known addresses. Communications to the AES Licensee shall be sent to the AES Operator.

Article 6
Amendments

The Terms and Conditions as herein stated are subject to amendment by the Company such amendment to become effective upon the date specified by the Company, but not less than thirty (30) days after the date of notification of the amendment to the AES Licensee and the PSA.

Article 7
Certification and Agreement

I the owner have read and agree to comply with the above Inmarsat "Terms and Conditions".

Name (Print) _____

Signed: _____

Date: _____

Relevant Aircraft TAIL Number _____

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Notes for Completing the Aeronautical Earth Station (AES) Service Activation Registration Form.

Introduction.

This registration Form applies to all Aeronautical customers. The Form should be completed and signed by the owner of the AES who will ultimately be responsible for the payment of communications traffic bills incurred by the AES.

To obtain the authorisation to activate the AES, this Registration Form should be submitted either directly to the Point of Service Activation (PSA) or to the Inmarsat Service Provider (ISP). For further information on PSAs and ISPs please contact the Inmarsat Customer Activation Unit at the following address:

Customer Activation Unit
Inmarsat
99 City Road
London EC1Y 1AX
United Kingdom

Telephone +44 207 728 1020
Facsimile +44 207 728 1142
Internet address: customer_services@inmarsat.com

Note A Your Details.

Enter the complete name and address of the Company, Organisation or Individual who will be ultimately responsible for the payment of bills for traffic incurred by this AES. Ensure that country and area codes are entered within the appropriate brackets for telephone and facsimile numbers. Enter the name of the contact person who will be responsible for dealing with queries concerning the AES.

Note B Paying the bill

Aero-C, Mini-M Aero and Swift64 only:
Enter the Inmarsat Service Provider (ISP) or Accounting Authority (AA) details that will be responsible for handling and managing your traffic account. This is the entity to which invoices from the LES will be sent. The customer must ensure that prior agreement with either the ISP or AA has been secured before completing this section.
Aero-H, -H+, -I and -L only:
Enter the entity that will be responsible for handling and managing the AES traffic account. This is the entity to which invoices from the GES will be sent. It can be **EITHER** an Accounting Authority (AA), **OR** the owner or operator of the AES. The AES operator may be a commercial aircarrier, private/corporate aircraft owner, government institution or other category. The AES operator may elect and agent to pay invoices on their behalf. If an AA is used the customer must ensure that prior agreement with the AA has been secured before completing this section.

Note C What type of Aeronautical Earth Station (AES) are you registering?

This section determines the environment where the AES will be used, the system applied for, and the primary use of the AES. This section also identifies the model of the AES and the country where it will be registered.
Indicate whether the AES will be installed on an Aircraft or at a Fixed Location.

The System:-	Under System, enter the type of AES to be activated
Primary use of the AES:-	Tick the box that represents the primary use of the AES
Country of Registry:-	The country of registry is the country where the Aircraft is registered

Note D Technical Details for H, H+, I and L Services

AES Manufacturer and Model:
Enter the name of the AES manufacturer and the complete AES Model name, which is also known as the Access Approval Number. The manufacturer must supply this. Additionally, the Antenna type must also be entered by the applicant.

IMPORTANT: What services are you applying for? The Customer should complete the section pertaining to the type of the AES

Note E Aero-C Aircraft Earth Stations (AES)

Enter the AES Serial Number, which should be found, on the outside casing of the AES.
Enter the privacy required by entering 'Y' or 'N' on the Privacy box. . (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)
Enter the 4-letter telex answerback. (Numbers and special characters are not allowed.)
Leave the Inmarsat Mobile Number (IMN) blank. The PSA will assign the IMN for each service requested.

Note F Mini-M Aero, Swift64 and SIM card services

If applying for activation of a Mini-M Aero or Swift 64, enter the Inmarsat Serial Number (ISN) that should be found on the outside casing of the AES. The first two digits have been entered for you. If applying for a SIM Card enter the SIM Card Serial Number (SSN).
Enter the services required by ticking the corresponding boxes and entering 'Y' or 'N' on the Privacy box. (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)
Enter the service code if known. If not, the PSA or ISP will provide the service code.
Leave the Inmarsat Mobile Number (IMN) blank. The PSA will assign the IMN for each service requested. If applying for both Mini-M Aero and SIM Card, the AES and the SIM card will be allocated separate IMNs.

Note G Aero H, H+, I and L Services

When the aircraft is registered, the Civil Aviation Authority in the country of registry will provide the ICAO technical address, which will also be used for other communication systems on board. This is a 24-bit binary number that will be converted into an equivalent eight digit octal number. This number which is preceded by the "T" digit "5" forms the Primary ID and will be known as the IMN. This number will be confirmed to the applicant by the PSA.
Enter the number of voice channels, either 9600bps or 4800bps as applicable. Aero-I operates at the lower voice rate of 4800bps only. Aero-L does not have a voice channel and this information must then be left blank.
The IMN is used for communications with the AES that originate from the ground. If required, however, the AES may be assigned a Direct Dialling-In (DDI) number, sometimes known as an Alternate ID, which is assigned by the PSA. The PSA provides the first 6 digits whilst the owner or operator of the AES provides the last 2 digits. This will enable multiple ground-to-air communications with the AES. For Aero-I and Aero-H+ AESs the applicant may request additional DDI's for Fax and/or Data. The Applicant must indicate with a Y if a DDI number is required and for which services it is required.
Mark 'YES' if credit cards are to be used for payment for the use of the AES as this facility must be tested. This test is normally conducted with the AES calling the commissioning desk at the GES
Mark 'YES or NO' if this is to be a Dual Installation. Make a duplicate of this page and complete the second ICAO 24-bit code for the 2nd installation on the copied page and insert this page here.
Enter the services required by ticking the corresponding box(es) and entering 'Y' or 'N' on the Privacy box. (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)

Note H Emergency Contact Details

All AES users must complete this section for emergency contact details. You must provide the complete information required.

Note I Installation Details

If the AES is installed on an aircraft, the aircraft tail number (registration number), the country where the aircraft is registered, the name of the aircraft manufacturer, aircraft model and the airframe number must be entered.

If the AES is being installed in a fixed location, the location of the AES and description of its use should be entered in this part of the form.

Note J Integrator Details

Enter the name of the organisation that is providing maintenance and support to the AES operations. Ensure that country and area codes are entered within the appropriate brackets for telephone and facsimile numbers. Enter the name of the contact person who will be responsible for dealing with queries concerning maintenance and support.

Note K Certification and Agreement.

To assist the PSA's, this is an entry for the AA to verify they accept the account, by placing their code and signature in the required sections.
This section must be signed by the person who owns the AES and has the ultimate responsibility for ensuring payment of traffic incurred by the AES.
This section must be signed by the PSA to whom this form has been submitted for approval and activation.