APPLICATION		
DASH NO.	NEXT ASSY	USED ON

TITLE SHEET

INDEX **SHEET NO.**

REVISIONS - ALL SHEETS ARE SAME REVISION STATUS

SH	REV	DESCRIPTION	DATE	APPROVED

Typed signatures constitute approval. Actual signatures on file at Honeywell in Redmond WA.

CAD Prepared Drawing Using MSWord Software.
Not to be manually altered.

CONTRACT NO.

PRECIOUS METAL INDICATOR CODE:
NA

Honeywell International Inc.
Redmond, WA 98073-9701

Honeywell

DRAWN	Patrick Ludwig	
CHECK		
ENGR	Glenn Waddell	
MFG		
QA		
APVD		
APVD		

Wireless LAN Unit (WLU)
System Description and Installation Manual

SIZE	CAGE CODE	DWG NO.	REV.
A	**97896**	xxx-xxxx-xxx	-

SCALE: NONE

SHEET 1 OF 20

Table of Figures

Table of Tables

1. INTRODUCTION

This manual gives installation instructions and theory of operation for the Wireless LAN Unit (WLU), part number 965-1702-001. It also provides interface information and interconnects diagrams to permit a general understanding of the overall system.

The purpose of this manual is to help the user install, operate, maintain, and troubleshoot the WLU in the aircraft. Common system maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

2. REFERENCE DOCUMENTS

Table 2-1 Government and Regulatory Documents

Publication Number	Document Title
Title 14 CFR	Code of Federal Regulations Title 14 Program Regulations
Title 47 CFR	Code of Federal Regulations Title 47 which contains Federal Communication Commission Part 15, 22, and 24
Title 29 CFR	Code of Federal Regulations Title 29 Program Regulations

Table 2-2 Industry Standards or Specifications

Publication Number	Document Title
ARINC-664	Aircraft Data Network
ARINC-763-2	Network Server System
IEEE 802.11	Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. 1999
IEEE 802.11b	Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Higher-Speed Physical Layer Extension in the 2.4 GHz Band. 1999
IEEE 802.11d	Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 3: Specification for operation in additional regulatory domains. June 14, 2001
IEEE 802.11g	Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 4: Further Higher Data Rate Extension in the 2.4 GHz Band June 12, 2003
IEEE 802.11i Draft 3.0	Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Specifications for Enhanced Security. November 2003
RTCA DO-160D	Environmental Conditions and Test Procedures. July 1997, Change 1 December 2000, Change 2 June 2001, Change 3 December 2002
RTCA/EUROCAE DO-178B/ED-12B	Software Considerations in Airborne Systems and Equipment Certification December 1, 1992
Wi-Fi Protected Access Version 2.0	WPA Implemented Features of IEEE 802.11i Draft 3

3. ACRONYMS AND ABBREVIATIONS

Table 3-1 Acronyms and Abbreviations

Abbreviation	Definition
ACARS	Aircraft Communication Addressing and Reporting System
AEEC	Airlines Electronic Engineering Committee
AMG	ACARS Messaging over Gatelink
AMI	Airline Modifiable Information
ARINC	Aeronautical Radio, Incorporated
BITE	Built-In Test Equipment
CDU	Control Display Unit
CFR	Code of Federal Regulations
CIS	Crew Information System
CMCF	Central Maintenance Computer Function
CMU	Communications Management Unit
COTS	Commercial Off The Shelf
CRN	Current Return Network
CWLU	Crew Wireless LAN Unit

dB	Decibel
DiffServ	Differentiated Services (IP)
DSSS	Direct-sequence-spread-spectrum
EAP	Extensible Authentication Protocol
ESD	Electrostatic discharge
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FL	Flight Level
FSM	File Server Module
FTS	File Transfer Service
GDLM	Gatelink Dataloading Manager
HIRF	high intensity radiated electromagnetic frequencies
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
IPSec	IP Security
ISM	Industrial, Scientific and Medical
ISP	Internet Service Provider
JTAG	Joint Test Action Group
LAN	Local Area Network
LED	Light emitting diode
LRU	Line-Replaceable-Unit
LSAP	Loadable Software Airplane Part
MAC	Medium Access Control
MCDU	Multi-purpose Control & Display Unit
MS	Maintenance System
NAT	Network Address Translation
OHMF	On-board Health Management Function
OMS	On-board Maintenance System
PAT	Port Address Translation
PCS	Personal Communication Service
PHY	Physical Layer
QARF	FOQA Data Download
RADIUS	Remote Authentication Dial In User Service
RAM	Random Access Memory
RF	Radio Frequency
RPDU	Remote Power Distribution Unit
RTCA	Radio Technical Commission for Aeronautics
SDRAM	Synchronous Dynamic Random Access Memory
S.I.	Standard International
SMA	SubMiniature version A
SW	Software
TCP	Transport Control Protocol
TLS	Transport Layer Security
TNC	Threaded Neill-Concelman
TOS	Type of Service (IP)
TWLU	Terminal Wireless LAN Unit
UDP	User Datagram Protocol
uP	Microprocessor
VAC	Volts AC
VDC	Volts DC
VPN	Virtual Private Network
WLAN	Wireless Local Area Network
WLU	Wireless LAN Unit
Wi-Fi	Wireless Fidelity (Alliance)
WPA	Wi-Fi Protected Access
WPA2	Wi-Fi Protected Access 2
WOW	Weight on Wheels

4. SPECIAL PRECAUTIONS

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

- A WARNING is an operation or maintenance procedure or condition, which, if not obeyed, can cause injury or death.
- A CAUTION is an operation or maintenance procedure or condition, which, 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.

All personnel who operate and do maintenance on the WLU and applicable test equipment must know and obey the safety precautions. The warnings and cautions that follow apply to all parts of this manual:

WARNING: HIGH VOLTAGES MAY BE PRESENT ON SYSTEM INTERCONNECT CABLES. MAKE SURE THAT SYSTEM POWER IS OFF BEFORE YOU DISCONNECT LRU MATING CONNECTORS.

CAUTION: THE 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.

WARNING: THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

WARNING: THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. ACCORDING TO FCC PART 15.203, THE DEVICE AND ANTENNAS MUST BE PROFESSIONALLY INSTALLED ACCORDING TO THESE INSTRUCTIONS OUTLINED IN THIS DOCUMENT. THE ANTENNAS OUTLINED IN THIS DOCUMENT MUST BE USED WHEN INSTALLING THE EQUIPMENT. OTHERWISE, THIS DEVICE MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS.

NOTE: THE TESTS IN THE FAULT ISOLATION SECTION SHOULD BE DONE BEFORE THE UNIT IS DISASSEMBLED. THESE TESTS CAN TELL THE CONDITION OF THE WLU OR MOST PROBABLE CAUSE OF ANY MALFUNCTION. SHOULD ANY MALFUNCTION OCCUR, REPAIR AS NECESSARY.

5. CUSTOMER ASSISTANCE

For assistance with installation, operation, or maintenance of the WLU contact your local Honeywell Dealer or regional Honeywell Customer Support Engineer. Additional assistance can be obtained from Honeywell at the following locations:

Honeywell
Aerospace Electronic Systems
CES -- Phoenix
Customer Support Engineering
P. O. Box 21111
Phoenix, AZ 85036--1111
U.S.A.

TEL: (602) 436--3234
FAX: (602) 436—3165

Honeywell
Business, Regional and General Aviation (BRGA)
[formerly Business and Commuter Aviation Systems (BCAS)]
Customer Support Engineering
5353 W. Bell Road
Glendale, AZ 85308--9000
U.S.A.

TEL: (602) 436--4400
FAX: (602) 436--4100

6. SYSTEM DESCRIPTION AND OPERATION

6.1. General

This document covers the system description and installation for the Terminal Wireless LAN Unit (TWLU), Crew Wireless LAN Unit (CWLU), and the derived Wireless LAN Unit (WLU). The WLU is a Honeywell developed common hardware platform that can be configured to provide either Terminal Wireless LAN Unit (TWLU) or Crew Wireless LAN Unit (CWLU) functions. Figure 6-1 shows an exploded view of the WLU.

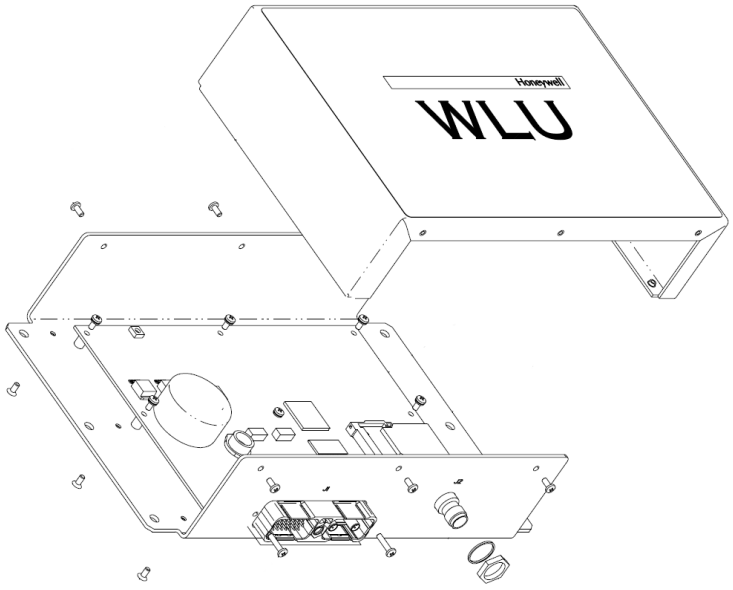

Figure 6-1 Wireless LAN Unit

There will be three CWLUs covering the cabin/flight deck, two CWLUs covering eebays/baggage areas, and one CWLU for external coverage. A single TWLU will provide a connection between the aircraft network and airport network at an airport terminal. CWLU and TWLU communications are based on the IEEE 802.11 wireless standard. It is intended that aircraft shall be able to connect through TWLU systems and then access their airline networks, as they move to different airports. Passenger devices are not permitted to send or receive data directly through the WLU.

The WLU provides NAT routing between an Ethernet based aircraft network and a ground-based network through the wireless interface. The Wi-Fi wireless interface along with separate internally and externally mounted aircraft antenna will act as 802.11 client stations and operate in IEEE 802.11b/g modes.

The Ethernet will support a 10/100 Mbps interface (IEEE 802.3) and be capable of supporting up to 4 Ethernet clients. The Wi-Fi primary mode of operation will be IEEE 802.11 infrastructure mode but may also participate in ad-hoc sessions.

The WLU was designed with the intent to support future changes in security, which were under development within the wireless network industry when this document was written. The WLU application software is field upgradeable via its Ethernet port. A diagram of the TWLU and CWLU typical communication links is shown in Figure 6-2.

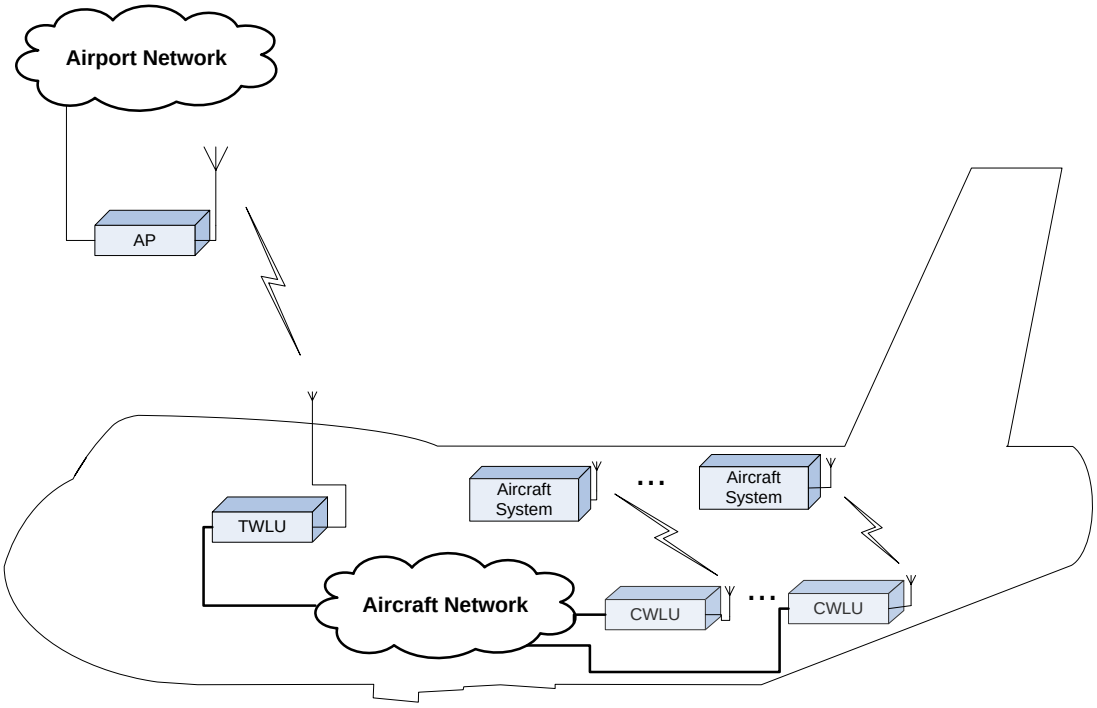

Figure 6-2 WLU System Diagram

7. SYSTEM COMPONENTS

The part numbers of the components that are not supplied by Honeywell but are required for proper setup of the WLU are given in Table 7-1.

Table 7-1 Components/Parts Not Supplied by Honeywell

Component	Manufacturer	Manufacturer Part Number	Honeywell Part Number
Wi-Fi Antenna CWLU	Sensor Systems	S65-5366-715	956-0033-002
Wi-Fi Antenna TWLU	Sensor Systems	S65-5366-71S	956-0033-001

7.1. System Functional Description

7.1.1. TWLU Functional Description

The wireless connection established between the airplane and airport networks is referred to as Gatelink. Gatelink is a ground based WLAN network designed to connect aircraft. Gatelink networks can connect to airline networks, etc. Gatelink is intended to be implemented at airports but may also be applied at aircraft support facilities. Gatelink is described in the AEEC standard, ARINC 763, Aircraft Network Server System. It is based on the IEEE 802.11 wireless standard. It is intended that aircraft shall be able to connect to Gatelink systems and then access their airline networks, as they move to different airports. Gatelink may be implemented by an airport authority, which then shares the resource across all airlines.

7.1.2. CWLU Functional Description

The CWLU provides wireless connectivity to crew and maintenance applications within the aircraft. Enforcement of which wireless users can use the CWLU system is performed by a combination of CWLUs and an aircraft On-board Authentication Server that supports the RADIUS protocol with WPA2 extensions. The CWLU is configured and radio enabled after landing or after reaching altitude threshold. The CWLU begins sending IEEE802.11 beacons. Wireless computers detect CWLU beacons and initiate association.

7.2. Component Description

The WLU is shown in Figure 6-1 and the WLU specifications and tolerances are listed below in Tables 7-2. Table 7-3 gives the environmental categories that the WLU is tested to. Table 7-4 gives the electromagnetic categories that the WLU is tested to. Table 7-4 gives the FCC license requirements this equipment meets or exceeds.

Table 7-2 WLU Leading Particulars

Parameter	Specification
Dimensions (maximum):	
• Height	2.5 in. (68.5 mm)
• Width.	6.85 in. (174.0 mm)
• Length	11.5 in. (292.1 mm)
Weight (maximum)	4.0 lb (2.3 kg)
Power Requirements:	
• Nominal	28 V dc
• Maximum	29.5 V dc
• Minimum	22 V dc
Average Power Dissipation (DC)	Less than 10 W
Cooling Requirements:	
• The WLU is passively cooled	Max Operating Temp = 80 degree C
Connectors:	
• J1	See SYSTEM INTERFACES
• J2	See SYSTEM INTERFACES
Mounting:	See MECHANICAL INSTALLATION
• The WLU is a bolt-down package	

Table 7-3 Environmental Categories

Test Name	DO-160D	Category	Boeing Requirements
Ground Survival Low Temperature Test	4.5.1	A1	-55°C, non-powered.
Short-Time Operating Low Temperature Test	4.5.1	A1	-40°C to -15°C, over a period of 30 Minutes. Degraded operation may include no RF Tx.
Operating Low Temperature Test	4.5.2	A1	-15°C
Ground Survival High Temperature Test	4.5.2	A1	+85°C, unpowered.
Short-Time Operating High Temperature Test	4.5.3	A1	+70°C
Operating High Temperature Test	4.5.4	A1	+70°C
Altitude Test	4.6.1	A1	-2,000 ft to +25,000 ft, 2 hours.
Decompression Test	4.6.2	A1	+6,000 ft to +25,000 ft, reduction within 15 seconds, maintain for 10 minutes.
Overpressure Test	4.6.3	A2	28 PSIA (~ 196 kPa)
Temperature Variation	5.0	C	-15°C to +70°C; +2°C/min; 24 cycles.
Humidity	6.0	A	DO-160E Standard Humidity Environment, 2 cycles.
Bench Handling Shock	N/A	N/A	D6-81926 Rev G, Section 3.1
Shipping Container Shock	N/A	N/A	D6-81926 Rev G, Section 3.2
Acceleration	N/A	N/A	D6-81926 Rev G Section 4.1, Zone 1 (Acceleration Load Factors) Section 4.2 (Emergency Landing Loads)
Vibration	Boeing Req.	Boeing Req.	D6-81926 Section 6, Zone 4, Category C
Waterproofness	10.0	W	DO-160E

Table 7-4 Power and EMC Categories

Test Name	Source	Category	Boeing Requirements
Normal Steady State Voltage	Boeing 787B3-0147 Rev C, Sect 3.3.3.1.B.5.5.1		QTPR Sect 8.2. Test (32.8VDC) exceeds SCD WLANU180 (29.5VDC)
Voltage Ripple	Boeing 787B3-0147 Rev C, Sect 3.3.3.1.B.5.5.2		QTPR Sect 8.4.
Normal Voltage Transients	Boeing 787B3-0147 Rev C, Sect 3.3.3.1.B.6.1		QTPR Sect 8.5. SCD WLANU181 requires longer transient (150mS) than Boeing 787B3-0147 Rev-C (50mS).
Voltage Spike	Boeing 787B3-0147 Rev C, Sect 3.3.3.1.B.6.2 which is equivalent to DO-160 (E)		QTPR Sect 8.6.
Supplementary Voltage Transients	Boeing 787B3-0147 Rev C, Sect 3.3.3.1.1.		QTPR Sect 8.7
Supplementary Trapezoidal Transients	Boeing 787B3-0147 Rev C, Sect 3.3.3.2.B.7.1.		QTPR Sect 8.8
Abnormal Steady-State And Abnormal Transients	Boeing 787B3-0147 Rev C, Sect 3.3.3.2.B.8.1.		QTPR Sect 8.9 and 8.10
DC Reverse Polarity	Boeing 787B3-0147 Rev C, Sect 3.4.2.		QTPR Sect 8.11
Load Equipment Influence	Boeing 787B3-0147 Rev C, Sect 3.4.3.		QTPR Sect 8.12
EME Related Tests			
Electrostatic Discharge (ESD) Susceptibility	Boeing D6-16050-5 Rev C, Section 7.1		QTPR Sect 11
AF Electric Field Susceptibility - Wiring	Boeing D6-16050-5 Rev C, Section 7.2.1		QTPR Sect 9.4
AF Magnetic Field Susceptibility - Wiring	Boeing D6-16050-5 Rev C, Section 7.2.2		QTPR Sect 9.3
AF Magnetic Field Susceptibility - Equipment	Boeing D6-16050-5 Rev C, Section 7.2.3		QTPR Sect 9.2
Conducted RF Susceptibility	Boeing D6-16050-5 Rev C, Section 7.3.1		QTPR Sect 9.6
Radiated RF Susceptibility	Boeing D6-16050-5 Rev C, Section 7.3.2		QTPR Sect 9.7
Ground Injected Transient Susceptibility	Boeing D6-16050-5 Rev C, Section 7.4.1		QTPR Sect 10.3
Pin-Injected Transient Susceptibility	Boeing D6-16050-5 Rev C, Section 7.4.2		QTPR Sect 10.1
Cable-Injected Transient Susceptibility	Boeing D6-16050-5 Rev C, Section 7.4.3		QTPR Sect 10.2
Lightning Induced Multiple-Burst Transient Susceptibility	Boeing D6-16050-5 Rev C, Section 7.4.4		QTPR Sect 10.4
Induced Spikes Susceptibility	Boeing D6-16050-5 Rev C, Section 7.5		QTPR Sect 9.5
AF Capacitive Coupling	Boeing D6-16050-5 Rev C, Section 8.1.1.		QTPR Sect 9.9
AF Inductive Coupling	Boeing D6-16050-5 Rev C, Section 8.1.2		QTPR Sect 9.10
RF Conducted Emissions	Boeing D6-16050-5 Rev C, Section 8.2.1	X	QTPR Sect 9.11
RF Radiated Emissions	Boeing D6-16050-5 Rev C, Section 8.2.2	X	QTPR Sect 9.12

Table 7-5 FCC License

Description	FCC CFR
Wi-Fi Operation	47 CFR 15.247

7.3. System Operation

There are no user controls located on the WLU. The TWLU and CWLUs are managed, monitored, configured, and controlled by the WLAN Manager function. WLAN Manager is hosted on the CIS-MS Server. These wireless devices need to be configured dynamically so that they comply with country regulations when the aircraft lands.

Boeing decides what the correct country settings need to be and agree on the parameters and rules Honeywell uses to decide when to change the configurations. Airport identifiers shall map to configuration settings. Airlines need be able to configure parameters that vary based on where the aircraft is used and security. Examples of this include which airports provide Gatelink to the airline, what the associated ESSID are, TWLU and CWLU digital certificate keys. An overview of the two modes of operation is given below.

7.3.1. TWLU Operation

The TWLU radio is enabled when the aircraft is on the ground, at approved airports, that the airline has Gatelink agreements with. It is disabled while the aircraft is in the air. The WLAN Manager monitors, configures, and controls the TWLU.

After an aircraft lands, the WLAN Manager:

- detects aircraft is on ground (Aircraft parameter:: in air)
- determines which airport the aircraft is at (Aircraft parameter: airport identifier parameter)
- looks up the airport settings in the CISS AMI
- configures the TWLU at that airport with:
    - ESSID, RF power/mode, encryption setting, etc.
    - Uploads necessary Gatelink public key certificate trust anchor
- verifies TWLU configuration and enables RF radio

An aircraft lands at a Gatelink enabled airport that it is registered to use. The TWLU is configured and radio enabled after landing. The TWLU begins sending IEEE802.11 probes. Gatelink APs send beacons and probe responses. The TWLU associates with a Gatelink Access Point. IEEE802.11i/WPA2 authentication and encryption is performed. Upon successful completion, the TWLU obtains an IP address from Gatelink and begins its operation as a NAT/PAT network router. The wireless connection can roam to other Gatelink Access Points as the aircraft moves.

7.3.2. CWLU Operation

The CWLAN is available during ground and cruising flight phases. CWLUs are configured to their default country settings, for operation in the air. They are disabled when the aircraft is below an altitude threshold level (e.g. 10,000 AGL).

After aircraft landing, the WLAN Manager:

- detects aircraft is on ground (CDN parameter In Air)
- determines which airport the aircraft is at (CDN avionics airport identifier parameter)
- looks up the airport in its tables
- configures the CWLU:
    - RF power/mode, encryption setting, etc.
- verifies CWLU configuration
- enables RF radio

After aircraft take off, the WLAN Manager:

- detects aircraft is in the air (CDN parameter In Air)
- disables the CWLU RF outputs
- configures the CWLUs to default settings:
    - RF power/mode, encryption setting, etc.
- verifies CWLU configuration
- after reaching altitude threshold (CDN altitude parameter, 10,000 AGL), enables CWLU RF radios

An aircraft lands at an airport in a country that allows CWLAN operation. The CWLU is configured and radio enabled after landing. The CWLU begins sending IEEE802.11 beacons. Wireless computers detect CWLU beacons and initiate association.

IEEE802.11i/WPA2 authentication and encryption is performed. Upon successful completion, the CWLU permits valid Wireless computers CWLAN access.

8. SYSTEM INTERFACES

8.1. High Level Functionality

8.1.1. Wireless Interface

The WLU supports an 802.11b/g interface.

8.1.2. Protocol

The WLU Wi-Fi interface is compatible with IEEE 802.11b/g mode.

8.1.3. Data Rate

The WLU Wi-Fi interface supports all data rates specified in IEEE 802.11b and 802.11g up to a 54 mbps raw data rate.

8.1.4. Frequency Assignment

The WLU Wi-Fi interface operates in the ISM Band in accordance with IEEE 802.11 specifications.

8.1.5. Power Input

The power supply accommodates 28 VDC sources that meet the requirements in Table 2-3.

The TWLU is capable of operating through a 300 millisecond power interrupt on the 28VDC input.

8.1.6. Ethernet

The WLU provides two IEEE802.3 10/100BTX Ethernet interfaces capable of switching Ethernet traffic between them.The WLU Ethernet interfaces meet LRU link budget guidance per ARINC 664 Part 2.

8.2. Discrete Interfaces

8.2.1. The WLU supports three input discretes to configure itself. (See 8.3, Position Pin Discretes)

8.2.2. The WLU provides an open/ground discrete input interface for Default Reset. The Default Reset discrete will command the WLU to be returned to factory defaults if grounded when the WLU starts up.

8.2.3. The WLU provides an open/ground discrete input interface for powering the unit on and off with ON being the OPEN state.

8.2.4. The WLU provides an open/ground discrete output interface for indicating microprocessor valid status.

8.2.5. The WLU provides an open/ground discrete output interface for indicating Ethernet activity.

8.2.6. The WLU indicates that each IEEE 802.3 interface is operational and electrically connected to another IEEE 802.3 device (or compatible) by setting to a logic high state the Ethernet Activity Discrete.

8.2.7. The WLU indicates that the selected RF Interface is operational and connected to a ground station by setting to a logic high state the RF Activity Discrete.

8.2.8. When the selected RF Interface is operational and connected to a ground device the WLU momentarily sets the RF Activity Discrete to ground to indicate network traffic on this interface.

8.2.9. The WLU provide an open/ground discrete output interface for indicating internal power rail status.

8.3. Position Pin Discretes

The WLU shall have three position pins defined. The WLU shall select its IP address and core functionality (TWLU or CWLU), based on position pin grounding. Table 8-1 shows function and IP address assignments by position pin settings.

Table 8-1 WLU Position Pin Functions

Pin3	Pin2	Pin1	OP mode	IP addr/nmask	Functional Behavior
open	open	open	off-airplane	10.128.0.1	Target loader and diagnostic interfaces only
open	open	gnd	Factory Test	F10.128.0.1	Factory Test Functionality
open	gnd	open	CWLU-FWD CABIN	172.20.30.2	full aircraft functions
open	gnd	gnd	CWLU-AFT CABIN	172.20.30.3	full aircraft functions
gnd	open	open	CWLU-FWD CARGO	172.20.30.4	full aircraft functions
gnd	open	gnd	CWLU-AFT CARGO	172.20.30.5	full aircraft functions
gnd	gnd	open	CWLU-AFT EXTERNAL	172.20.30.6	full aircraft functions
gnd	gnd	gnd	TWLU	172.27.60.2	full aircraft functions

8.4. Antenna

The WLU uses one standard TNC female type connector for the 802.11 antenna interface. The WLU is FCC certified with multiple Wi-Fi antennas listed in Table 7-1. The RF cables used to connect the unit to the antennas should be chosen to minimize weight and signal attenuation. The Wi-Fi RF connector is labeled J2.

8.5. Electrical Specifications

8.5.1. Main Connector

The WLU uses a single connector for signal and power. The connector is labeled, J1. Figure 8-1 shows the physical pinout of the main connector from the rear view.

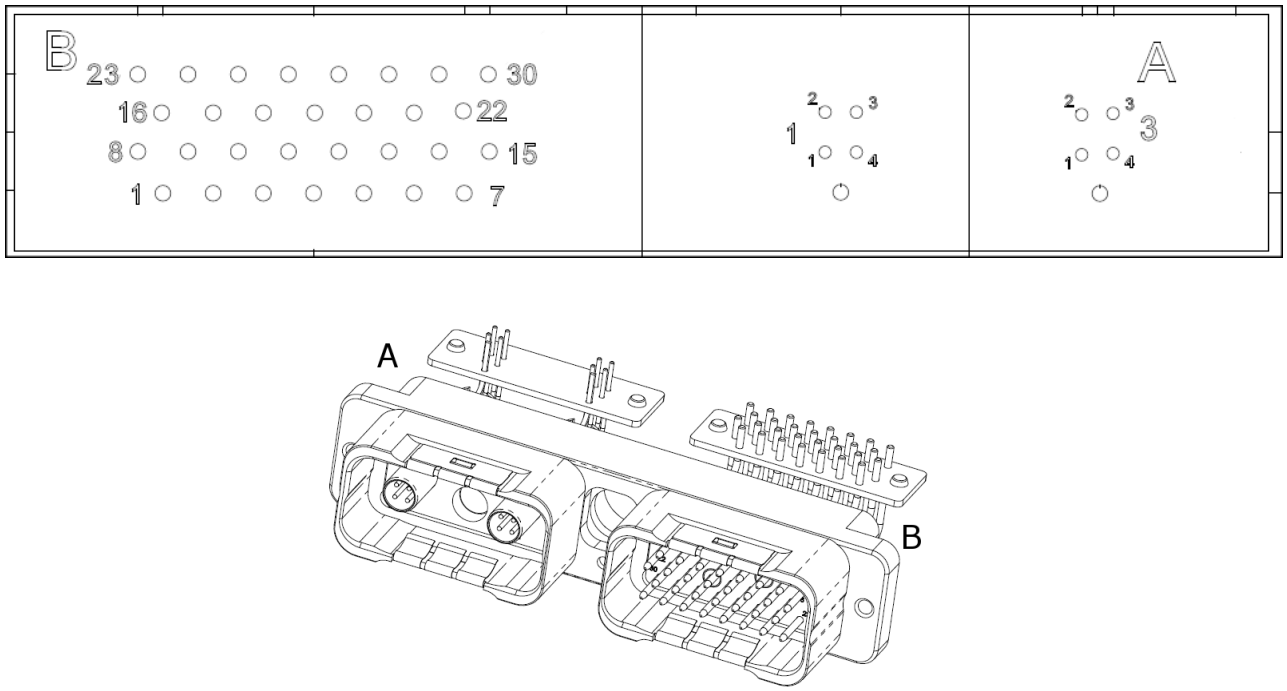

Figure 8-1 LRU Connector (J1) Physical Pinout

The WLU has a main connector to provide power/ground pins, discrete pins, and quadrax inserts for two Ethernets. The baseline connector is Radiall RP58736. Power and signal wires have physical separation within the connector by using spare pins as a spatial separator.

Table 8-2 Connector Names and Part Numbers for WLU

965-1702-001 Connectors			
Name	**Honeywell P/N**	**Type**	**Mating Connector Type**
J1	440-2042-002	EPX, Male	EPX, Female
J2	315-5186-001	TNC Female	TNC Male

8.5.2. Signals, Power and Ground

Table 3-2 gives a description, lists the pin number, and labels the pin as an input or output. Refer to Figure 8-1 for a diagram of the connector.

Table 8-3 LRU Connector (J1-B) Pin Assign

Pin Number	Signal Name	Comments	I/O
1		Spare	
2		Spare	I
3	DISC_IN	Spare	I
4	FACTORY_DEFAULT_RST		I
5	POSITION 1		I
6	POSITION 2		I
7	POSITION 3		I
8	POWER_SUPPLY_OFF		I
9	uP_GOOD		O
10	PRI_LAN_LINK_STAT		O
11	SEC_LAN_LINK_STAT		O

12	WLAN_LINK_STAT		O
13	POWER_GOOD		O
14	DISC_OUT_1	Spare	O
15	DISC_OUT_2	Spare	O
16	DISC_OUT_3	Spare	O
17	JTAG_EXT_EN		I
18	FL_UNPROTECT		I
19	EE_UNPROTECT		I
20	JTAG_AW_EXT		I
21	+28VDC RTN		GND
22	+28VDC		I
23	CHASSIS_GND		GND
24	JTAG_TDO_EXT		O
25			GND
26	JTAG_TCK_EXT		I
27			GND
28	JTAG_TDI_EXT		I
29			GND
30	JTAG_TMS_EXT		I

Table 3-3 gives the name and position and describes where the Ethernets are located on the main connector.

Table 8-4 J1-A Quadrax Insert Positions

Position	Name	Description
1	Eth1 (Primary)	CIS Server Port
2	(Filled with alum. Plug)	
3	Eth2 (Secondary)	CWLU Port

Table 3-4 gives the name and position of the Ethernet pins to describe how they will be electrically connected.

Table 8-5 J1-A Insert Quadrax Pinout

Quadrax Pin	Signal	Labels
1	TX+	PRI_10_100_TX_A/SEC_10_100_TX_A
2	RX+	PRI_10_100_RX_A/SEC_10_100_RX_A
3	TX-	PRI_10_100_TX_B/SEC_10_100_TX_B
4	RX-	PRI_10_100_RX_B/SEC_10_100_RX_B
Shell	Shield	Ground

9. MECHANICAL INSTALLATION

9.1. General

This section contains information on the necessary information to mount the WLU.

Figure 9-1 shows the WLU mounting hole dimensions, as well as the mechanical outline. The depth or protrusion of the J1 and J2 connectors are 0.78 inches maximum. The WLU is a bolt-down low profile package with the footprint defined in ARINC 763.

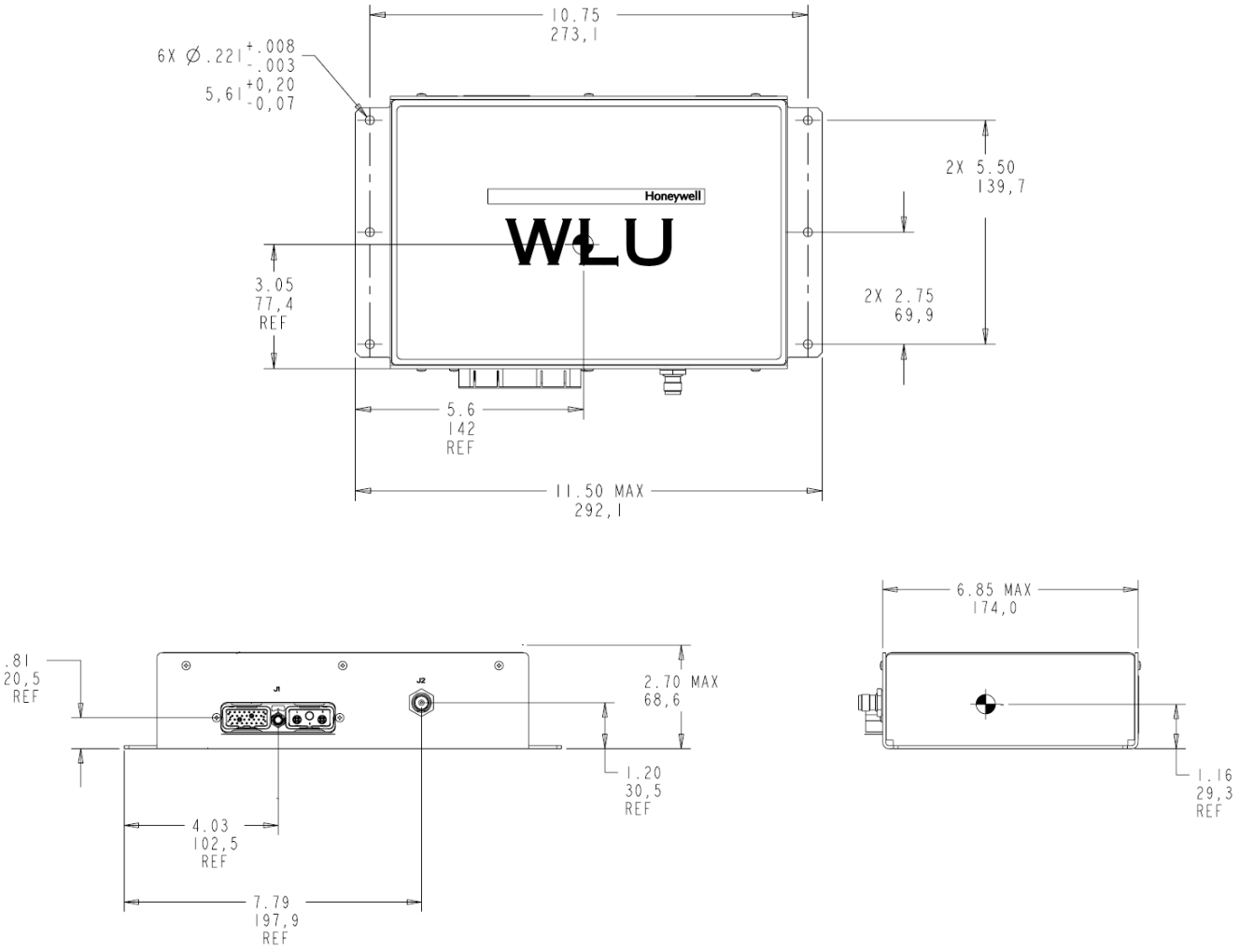

Figure 9-1 Mechanical Outline of WLU

9.2. Equipment and Materials

The TWLU should be mounted with six screws and washers. The necessary screws and washers will be certified by Boeing to be flight worthy.

10. ELECTRICAL INSTALLATION

10.1. General

These sections give electrical installation procedures, power distribution, and interconnect information for the WLU. Procedures for proper shield, power, and signal grounding are also provided in this section. In addition, procedures for the various buses are included.

10.2. Power requirements

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

10.2.1. DC Power

The aircraft DC power supply must be 28 V DC (nominal). The normal minimum and maximum voltages permitted are 22 and 29.5 V DC respectively. The maximum current drawn by WLU is 0.32 +/- 0.03 Amps at 28 VDC, equivalent to a maximum power consumption of 10 watts.

10.2.2. Ground Requirements

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 Shielded Grounds. Installation of this system into aircraft manufactured prior to the FAA requirements adheres to these practices whenever feasible.

All electrical conductors, terminals posts and component parts that are not at ground potential shall be insulated or otherwise protected to prevent hardware from creating a short circuit or a spark ignition source. The WLU is designed to be grounded by the chassis to the ground structure directly. The WLU allows a total DC voltage drop of less than or equal to 0.7VDC for the 28V DC return path to the RPDU.

11. ANTENNA INSTALLATION

11.1. General

WARNING: This equipment complies with FCC radiation exposure limits set forth for uncontrolled environment. This equipment must be installed and operated with a minimum distance of 20 cm between the radiator/antenna and your body.

This section provides general guidelines for installing Wi-Fi antennas with the WLU. Due to the wide variation of wireless regulations from country to country, the exact model antennas to be used with the WLU are left to the customer/installer and country regulations. Honeywell has certified the Sensor Systems antennas listed in Table 7-1.

The maximum power output of the TWLU before cable loss is equal to 18 dBm. The RF cable used between the TWLU and antenna is should have insertion of approximately 3 dB. The maximum gain of the Wi-Fi Antenna listed in Table 7-1 is equal to 5 dBi. Figure 11-1 shows an overall diagram representing the gain and loss of the system. The maximum Effective Radiated Power (ERP) at the antenna should be 20 dBm if installing an antenna other than the Wi-Fi antennas listed in Table 7-1.

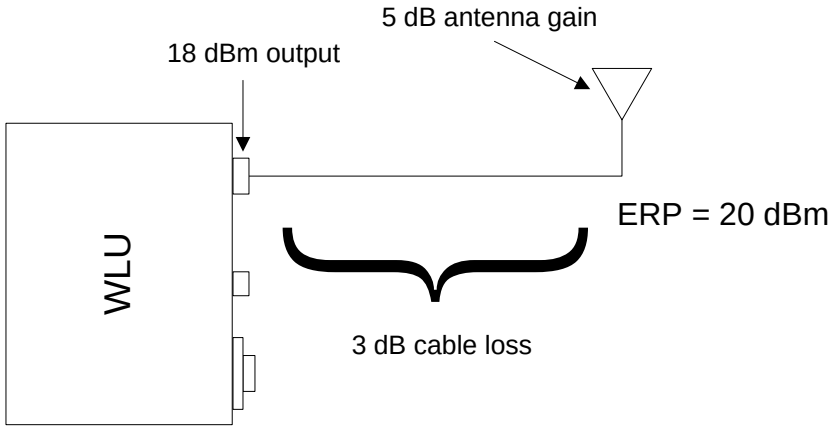

Figure 11-1 Example ERP of the WLU with Sensor System Wi-Fi antenna

12. FAULT ISOLATION

12.1. General

This section describes the built-in test equipment (BITE) function for the WLU.

System BITE contributes to a number of maintenance functions:

- Detection of internal and external faults
- Reporting failure status in the air and on the ground
- Ground test capability for isolating faults, performance verification, and system level testing.

12.2. Fault Detection

The WLU detects faults using continuous monitors in all system modes where the fault is detectable. The WLU continuously monitors for internal hardware, software and interface faults and sends fault messages via WLAN Manager, when they occur.

The WLU automatically detects each fault condition that causes either:

- One or more digital output signals to be identified as failed or invalid
- Loss or significant degradation in other outputs to other systems.

A fault is defined and set for each of the test components. Fault Monitor Data may include up to 600 characters of free text to add details relevant to failures. The continually monitored tests cover the following components:

- Power Supply (fault if power supply output is outside accepted range)
- Processor (fault if processor error or overheat condition occurs)
- Memory (volatile and non-volatile, fault if memory error occurs)
- Software execution (fault is software error occurs)
- Configuration (fault if configuration is corrupted)

- Radio Functional (fault if Radio doesn't respond to processor)
- Ethernet interface (fault if interface is down)
- Discrete interfaces (fault is interfaces are in invalid configuration)
- WLAN Manager Authentication State (fault if Manager authentication fails)
- WLAN Authentication State (fault if WLAN authentication fails)
- WLAN Encryption State (fault if encryption fails)
- WLAN Connection State (fault if connection fails)
- Gatelink Connection State (fault if connection fails when Gatelink is available)
- Router State(fault if router function fails in TWLU when Gatelink is connected)
- DHCP State (fault if DHCP client in TWLU does not get IP address from Gatelink
- Bridge State (fault if bridge function in CWLU fails)

13. DATA LOADING

13.1. General

The WLU applications are data loaded on to the WLU directly by a ARINC 615A data loader. The WLAN Manager must first notify the TWLU that the aircraft is in Maintenance Mode, before an aircraft data load is accepted. Data loading is performed on the aircraft by the CIS Server Data Loader application, while in maintenance mode. It can also be performed off the aircraft with a Data Loader.