HD-710 High-speed Data Terminal

System Description, Installation, and Maintenance Manual

This Guide provides configuration and operation procedures for the equipment listed below.

Model	PN
HD-710 High-speed Data Terminal 115 V ac or 28 V dc	1252-A-3600-01

EMS SATCOM
1725 Woodward Drive
Ottawa, Ontario K2C 0P9
CANADA

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HD-710 High-speed Data Terminal System Description, Installation, and Maintenance Manual

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Revision Table		
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003	061177	Updated O&I drawings
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F indicates a right foldout page with a blank back.

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All	All	1 Dec 2006			

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INTRODUCTION

1. General

This manual provides the specifications, principles of operation, and information necessary to install an HD-710 High-speed Data terminal.

The information is presented in the following chapters:

- System Description
- System Operation
- Installation
- Test and Fault Isolation
- Maintenance and Repair
- Appendix A: Inmarsat Satellite Beam Coverage
- Appendix B: Troubleshooting Checklist
- Appendix C: RJ-45 Cable Termination Details
- Appendix D: Installation Planning Checklist
- Appendix E: Installation Checklist
- Appendix F: Point-to-Point Protocol Over Ethernet (PPPoE) Messaging

Note: An Illustrated Parts List is not included with this manual.

Only qualified avionics personnel, knowledgeable in the technical and safety issues related to the installation of aircraft communications equipment, should perform the installation procedures provided in this manual.

This manual includes general installation guidelines only; it is not intended to provide specific procedures for every type of installation.

If necessary, the information in this manual will be revised. Before attempting the installation procedures presented in this manual, verify that you have a complete and up-to-date release of this document.

Note: Depending on the version of software and configuration mode of installation of the HD-710 terminal, the actual (live) system messages, such as dialog boxes and screen displays, may differ slightly from the examples in this manual.

2. Illustration of Equipment

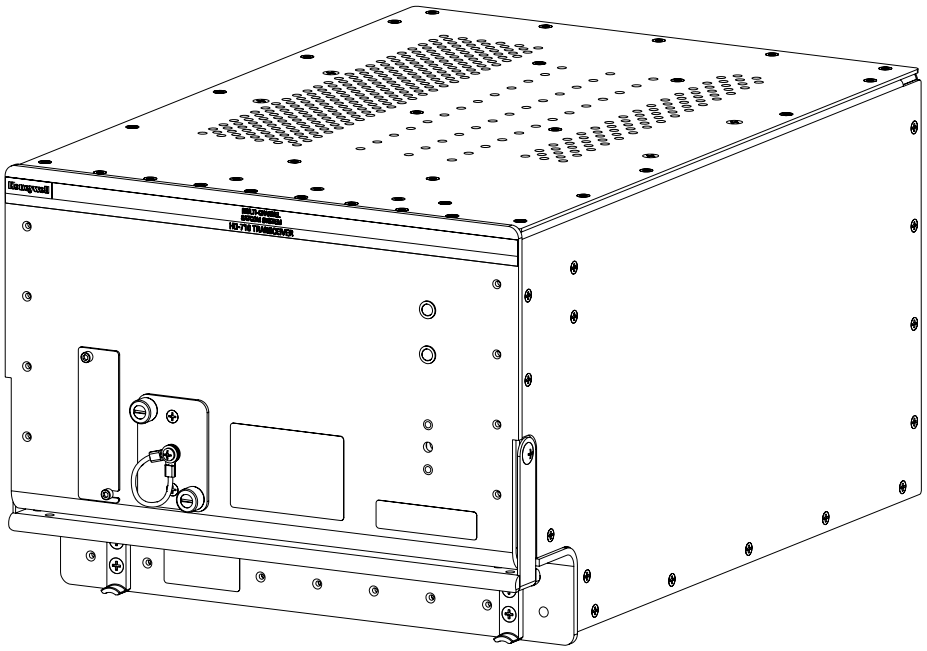


Figure INTRO-1. HD-710 Terminal

3. Product Terms and Conditions

As stipulated in the Terms and Conditions of Sale, which accompanied the Product, EMS SATCOM shall not at any time be liable for the activation, continuation, or cancellation of satellite airtime services relating to the Product nor be responsible for any Product-related airtime or network charges, however incurred. In the event EMS SATCOM is charged network or airtime fees relating to the customer's use of the Product, the customer shall immediately upon notification by EMS SATCOM reimburse EMS SATCOM in full for such charges.

4. Acronyms and Abbreviations

The following acronyms and abbreviations are used in this document.

ACARS Aircraft Communications and Reporting System

ACSE Access Control and Signalling Equipment

ACU Antenna Control Unit (also known as BSU or Driver)

AERO Aeronautical

AMBE Advanced Multi-Band Excitation

AWG American Wire Gauge

BGAN Broadband Global Area Network

BITE Built-In Test Equipment

BRI Basic Rate ISDN

bps Bits per second

BSU Beam Steering Unit (also known as ACU or Driver)

CCW Counter Clockwise

CMU Communications Management Unit

CW Clockwise

DLNA Diplexer/Low-Noise Amplifier

EMI Electromagnetic Interference

EST Eastern Standard Time

FAA Federal Aviation Authority (USA)

FET Field-Effect Transistor

GND Ground

HGA High Gain Antenna

HPA High Power Amplifier

HTML Hyper Text Markup Language

Hz Hertz

ICAO International Civil Aviation Organization

ICD Interconnect Drawing

IMBE™ Improved Multi-Band Excitation

INS Inertial Navigational System

I/O Input/Output

IRS Inertial Reference System

ISDN Integrated Services Digital Network

JAA Joint Aviation Authorities (EU)

kbps Kilobits per Second

LES Land Earth Station

LRU Line Replaceable Unit

LSB Least Significant Bit

Mbps Megabit per second

MCDU Multipurpose Control Display Unit

MCU Modular Concept Unit

MES Mobile Earth Station

MPDS Mobile Packet Data Services

MPU Maintenance Port Utility

ms Millisecond

MSB Most Significant Bit

NAT Network Address Translation

NT Network Terminator

OCXO Oven Controlled Crystal Oscillator

OEM Original Equipment Manufacturer

O&I Outline and Installation Drawing

PC Personal Computer (or Laptop)

PN Part Number

POTS Plain Old Telephone System

PPP Point-to-Point Protocol

PPPoE Point-to-Point Protocol over Ethernet

REA Responsible Engineering Authority

RF Radio Frequency

RFI Radio Frequency Interference

RFU Radio Frequency Unit

rms root mean square

RTN Return

Rx Receive

Satcom Satellite Communications

SBB SwiftBroadband

SCPC Single Channel per Carrier

SDI Source/Destination Identification

SDU Satellite Data Unit

SPID Service Profile Identifier (ISDN)

S/T (ISDN) ISDN ‘S interface’ refers to the electrical interface between NT1 and NT2 devices, such as a PBX. ISDN ‘T interface’ refers to the electrical interface between NT1 or NT2 and ISDN devices.

STBD Starboard

STE Secure Terminal Equipment

STU Secure Telephone Unit

TA Terminal Adapter

TE Terminal Equipment

Tx Transmit

USIM Universal Subscriber Identity Module

WOW Weight on Wheels

5. Safety Advisories

Warnings, cautions, and notes in this manual provide the reader with the following information:

- A WARNING describes an operation, procedure, or condition, which if not obeyed, could cause injury or death.
- A CAUTION describes an operation, procedure, or condition, which if not obeyed, could cause damage to the equipment.
- A NOTE provides supplementary information or explanatory text, which makes it easier to understand and perform procedures.

All personnel who install, operate, and maintain the HD-710 terminal and associated test equipment must know and obey the safety precautions listed below. The procedures provided in this manual assume that the person performing installation or maintenance tasks is familiar with, and obeys standard aviation shop and safety practices.

The general safety advisories include the following:

WARNING: SERVICE PERSONNEL MUST OBEY STANDARD SAFETY PRECAUTIONS, SUCH AS WEARING SAFETY GLASSES, TO PREVENT PERSONAL INJURY WHILE INSTALLING OR PERFORMING SERVICE ON THIS TERMINAL.

WARNING: ASSOCIATED SATCOM EQUIPMENT RADIATES HIGH FREQUENCY RADIATION AND POSES A RADIATION HAZARD OF 1.6 GHZ. SERVICE PERSONNEL MUST EXERCISE CARE TO KEEP CLEAR OF THE ANTENNA'S BEAM WHILE PERFORMING OPERATIONAL TESTS OR INSTALLATION VERIFICATION PROCEDURES.

DO NOT APPROACH WITHIN 8 FEET (2.5 METRES) OF THE ANTENNA DURING ANTENNA OPERATION (TRANSMISSION).

DURING ANTENNA OPERATION (TRANSMISSION), ENSURE MINIMUM EXPOSURE OF ANY REFLECTED, SCATTERED, OR DIRECT BEAMS TO ALL PERSONNEL.

WARNING: TURN OFF POWER BEFORE DISCONNECTING ANY TERMINAL FROM WIRING. DISCONNECTING THE TERMINAL WITHOUT TURNING POWER OFF MAY CAUSE VOLTAGE TRANSIENTS THAT CAN DAMAGE THE TERMINAL.

CAUTION: THIS EQUIPMENT INCLUDES ITEMS THAT ARE ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. ESDS DEVICES ARE SUBJECT TO DAMAGE BY EXCESSIVE LEVELS OF VOLTAGE AND/OR CURRENT. THE LOW-ENERGY SOURCE THAT MOST COMMONLY DESTROYS ESDS DEVICES IS THE HUMAN BODY WHICH, IN CONJUNCTION WITH NONCONDUCTIVE GARMENTS AND FLOOR COVERINGS, GENERATES AND RETAINS STATIC ELECTRICITY. TO ADEQUATELY PROTECT ESDS DEVICES, THE DEVICE AND EVERYTHING THAT CONTACTS IT MUST BE BROUGHT TO GROUND POTENTIAL BY PROVIDING A CONDUCTIVE SURFACE AND DISCHARGE PATHS. USE STANDARD INDUSTRY PRECAUTIONS TO KEEP RISK OF DAMAGE TO A MINIMUM WHEN TOUCHING, REMOVING, OR SERVICING THE EQUIPMENT.

SYSTEM DESCRIPTION

1. General

This section includes basic information about the HD-710 terminal, including the following sections:

- Purpose of Equipment
- Equipment Covered
- Equipment Description
- Inmarsat System Overview
- Modes of Operation

2. Purpose of Equipment

The HD-710 terminal is a scalable, high-speed-data, satellite communications terminal, which interfaces with an ARINC 741-compatible antenna subsystem to provide a high-speed data communication link with the Inmarsat satellite communication network.

The HD-710 terminal supports the following services and functions:

- Inmarsat ISDN SCPC (Single Channel Per Carrier) Service
- Inmarsat Serial MPDS (Mobile Packet Data Services)

3. Equipment Covered

A. Hardware

Table 1-1 provides basic information about HD-710 terminals and lists the applicable interconnection diagram. Table 1-2 describes the models of HD-710 terminals covered in this manual.

Table 1-1. Overview of HD-710 Terminals

Model	Assembly PN	Channel Card(s)	Reference Drawings	Voltage (nominal)	Power (min/max)
HD-710 terminal	1252-A-3600-01	2	1252-E-3600	115 V ac/400 Hz or 28 V dc	275/400 W

Table 1-2. Description of HD-710 Terminal

EMS SATCOM Part Number	Description
1252-A-3600-01	HD-710 terminal containing: • two (2) channel cards • data I/O card • control processor • HPA (High Power Amplifier) • 115 V ac, 400 Hz or +28 V dc power supply Operates with an Aero H (ARINC 741 and ARINC 781 compatible) antenna subsystem to provide circuit (Swift64 Mobile ISDN), and packet-switched HSD terminal (Swift64 MPDS) services over the Inmarsat satellite communications network.

B. Software Description

This section describes the software specifications and operational software components of the HD-710 terminals.

(1) Software Specifications

The software meets the following DO-178B standards:

- Swift64 to Level D

(2) Operational Software Part Numbers

Table 1-3 provides a list of software part numbers for the HD-710 terminal.

Table 1-3. HD-710 Terminal Operational Software

EMS SATCOM Part Number	Description
LI-1252-33005	HD-710 Terminal Software Control Document
1252-SW-1259	HD-710 Terminal LI Display File
1252-SW-1257	HD-710 Terminal Control Processor software
1252-SW-1250	HD-710 Terminal Data I/O software
1210-SW-1001	BGAN CPU Boot/Loader code
1210-SW-1028	Aero BGAN Channel Card software

4. Equipment Description

This section describes the physical and environmental specifications of the equipment.

A. Equipment Specifications

This section provides the equipment specifications for the HD-710 terminals.

Table 1-4 lists the physical and equipment specifications for the HD-710 terminal.

Table 1-4. HD-710 Terminal Equipment Characteristics and Specifications

Characteristic	Specification
Certification/related documents	
ARINC characteristics	600-12, Air Transport Avionics Equipment Interfaces, December 12, 1998
	Appendix 10 of the ARINC 704-7
RTCA documents	RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment, July 29, 1997
HD-710 Terminal Software	RTCA/DO-178B Level D
Physical Size	
Height	19.41 cm (7.64 in)
Width	25.91 cm (10.20 in)
Length	36.45 cm (14.58 in)
Weight	15.7 kg (34.7 lbs)
Mounting information	8-MCU Tray (per ARINC 600, 8-MCU LRU)
Maintenance requirements	No scheduled maintenance is required
Electrical specifications	
HD-710 terminal AC input power	
Voltage	Minimum:100 V rms
	Typical:115 V rms
	Maximum:122 V rms
Power dissipation	Minimum: 275 W
	Maximum: 400 W
Frequency	Minimum: 300 Hz
	Typical: 400 Hz
	Maximum: 800 Hz
HD-710 terminal DC input power	
Voltage	Minimum: 22 V dc
	Typical: 28 V dc
	Maximum: 30.3 V dc
Power dissipation	Minimum: 275 W
	Maximum: 400 W

Table 1-4. HD-710 Terminal Equipment Characteristics and Specifications (Continued)

Characteristic	Specification
Power requirements	
AC	115 V ac, 400 Hz nominal, @ 4 A (460 W maximum)
DC	+ 28 V dc @ 15.5 A (460 W maximum)
Wire gauge	DC power: 12 American Wire Gauge (AWG)
	AC power: 20 AWG (hot lead), 12 AWG (cold lead)
	Signals: Unless otherwise specified, use 22 AWG for all signal wires
Ground requirements	ARINC 741
Circuit Breakers	Install circuit breakers according to the maintenance requirements of the aircraft.
Heating and cooling requirements	
Cooling air	ARINC 600
Flow rate	88 kg/hr 185 lbs/hr
Pressure drop	5 ±3 mm (0.07 ±0.025 in.) H_2O
Receive input impedance	50 ohms
Transmit output impedance	50 ohms
VSWR	2:1 maximum
External interfaces	
External parameters	
Antenna gain	Minimum: 8 dB
	Maximum: 17 dB
Antenna-DLNA loss	Maximum: 0.3 dB
LNA gain	Minimum: 53 dB
	Maximum: 60 dB
LNA noise	Maximum: 1.8 dB
LNA-HSD terminal total loss	Minimum: 6 dB
	Maximum: 25 dB (Rx)
HSD-Antenna loss	Minimum: 1 dB
	Maximum: 2.5 dB (Tx) (including DLNA loss)
DLNA insertion loss	Maximum: 0.8 dB
External digital interfaces	
Control interface	ARINC 429 high-speed (100 kbps) data bus
RS-232 maintenance interface (rear and front connector)	19 200 kbps, N81, None
Ethernet user interface (2)	10BASE-T input and output for Single Channel Per Carrier (SCPC—Swift64 Mobile ISDN) and Mobile-Packet Data Service (MPDS) using Point-to-Point Protocol over Ethernet (PPPoE)

Table 1-4. HD-710 Terminal Equipment Characteristics and Specifications (Continued)

Characteristic	Specification
ISDN (2)	ISDN S/T physical interface supporting up to seven external connections to Terminal Adapter (TA) or Terminal Equipment (TE) devices
POTS tip/ring interface (2)	Plain Old Telephone System (POTS) analog interface

Table 1-5 lists the RTCA/DO-160D environmental characteristics and specifications for the terminal.

Table 1-5. HD-710 Terminal RTCA/DO-160D Environmental Characteristics

DO-160D Section	Test Description	Performance Requirement	DO-160D Category
4.0	Temperature and Altitude		A2F2
	Operating Low Temperature: -55 °C	Meet Specs	F2
	Operating High Temperature: 70 °C	Meet Specs	F2
	Short-Time Operating High: +70 °C	Meet Specs	F2
	Ground Survival Temperatures: -55 °C/+85 °C	Meet Specs	F2
	Altitude: 55,000 ft	Meet Specs	A2
	Decompression: 55,000 ft	Meet Specs	A2
	Overpressure: 170 kPa	Meet Specs	A2
	In-Flight Loss of Cooling: +40 °C	Function	W (90 min) (TBC)
5.0	Temperature Variation 5 °C per minute	Meet Specs	B
6.0	Humidity	Meet Specs	A
7.0	Shock and Crash Safety		B
	Operational: 6 g	No Damage	
	Crash Safety: 20 g	No Detachment	
8.0	Vibration	Meet Specs	S curve B
9.0	Explosion Proofness Non-hermetic, no explosion in a volatile atmosphere		E
10.0	Waterproofness Not Tested		X
11.0	Fluids Susceptibility		X
12.0	Sand And Dust		X
13.0	Fungus Resistance		F
14.0	Salt Spray		X
15.0	Magnetic Effect 1 degree deflection at less than 0.3 m		Z

Table 1-5. HD-710 Terminal RTCA/DO-160D Environmental Characteristics (Continued)

DO-160D Section	Test Description	Performance Requirement	DO-160D Category
16.0	Power Input		
	Power Input (115 V ac)		A(CF)
	Normal operating conditions: 100–122 V^{rms}, 390–410 Hz	Meet spec	A(CF)
	Normal operating conditions 100–122 V^{rms}, 360–800 Hz	Meet spec	N/A
	Momentary Power Interruption: < 20 ms interruption	Meet spec	A(CF)
	Momentary Power Interruption: > 20 ms, < 200 ms interruption	Function	A(CF)
	Abnormal operating conditions: 97–134 V^{rms}	Meet spec	A(CF)
	Power Input (28 V dc)		A
	Normal operating conditions: 22 V–30.3 V	Meet spec	A(CF)
	Momentary Power Interruption: < 20 ms interruption	Meet spec	A(CF)
	Momentary Power Interruption: > 20 ms, < 200 ms interruption	Function	A(CF)
	Abnormal operating conditions 20.5–32.2 V	Meet spec	A(CF)
	Abnormal Surge: 46.3 V for 100 ms, 37.8 V for 1 s	No damage	A(CF)
	Abnormal Surge: 80 V for 100 ms, 48 V for 1 s	No damage	
17.0	Voltage Spike		A
	600 V Peak for 10 µs	Meets Spec	
	Repeat at 1000 V peak	Meets Spec	
18.0	Audio Frequency Conducted Susceptibility		
	Power Input (115 V ac)	Meets Spec	A(NF)
	Power Input (28 V dc)	Meets Spec	A
19.0	Induced Signal Susceptibility		Z
	AC	Meet Specs	
	DC	Meet Specs	
20.0	Radio Frequency Susceptibility		RR
	Conducted susceptibility: 10 kHz to 400 MHz, CW and modulated; 0.6 mA at 10 kHz, 6 mA at 100 kHz, 30 mA from 500 kHz to 400 MHz; 100 mA max	Meet Specs	
	Radiated susceptibility: 100 MHz to 400 MHz, 20 V/m CW and modulated; 400 MHz to 8 GHz, 150 V/m with pulse modulation, 28 V/m with square wave modulation	Meet Specs	
	When inside receive band, the EUT shall not be damaged.	No Damage	

Table 1-5. HD-710 Terminal RTCA/DO-160D Environmental Characteristics (Continued)

DO-160D Section	Test Description	Performance Requirement	DO-160D Category
21.0	Emission of Radio Frequency Energy • Conducted RF interference: 150 kHz to 30 MHz • Radiated RF interference: 2 MHz to 6 GHz	Meet Specs	B
22.0	Lightning Induced Transient Susceptibility		X
23.0	Lightning Direct Effects		X
24.0	Icing		X
25.0	Electrostatic Discharge	No Damage	X
26.0	Fire Flammability		N/A

B. Mechanical Description

This section describes the mechanical characteristics of the HD-710 terminals.

(1) HD-710 Terminal

The HD-710 terminal is an 8-MCU sized unit with mounting requirements according to the ARINC 600 specification. The front panel has one, socket D-Type size B (25 contacts) maintenance port connector (under protective cover) for data loading and monitoring of the terminal. Two front-panel LEDs indicate terminal status.

The rear connector complies with ARINC 600, shell size 2 and has three inserts: upper, middle, and bottom. The upper and middle inserts each have one #1 coax contact and seventy, 22-gauge signal contacts. The bottom insert connector has contact with only positions 1, 2, 3, 7, 8, and 12. The rear panel has three polarization points.

Figure 3–5 and Figure 3–6 present the Outline and Installation Drawing for the HD-710 terminal. For detailed wiring information, refer to the interconnection diagrams and contact assignments presented in "Installation" on page 3-1 and shown in Table 1-6.

Table 1-6. HD-710 Terminal Installation Drawing Reference Matrix

Models	Figures
ALL	Outline and Installation: Figure 3–5 and Figure 3–6
	System Interconnect: Figure 3–7
	Contact Assignments: Figure 3–8

C. Electrical Description

This section describes the external electrical interfaces of the HD-710 terminal.

"Installation" on page 3-1 describes all ARNC 600 connector contact assignments and physical details, including part numbers, insert descriptions, and polarization keying.

The loading/gradient specifications for all HD-710 terminal installations are provided in table format in "Installation" on page 3-1. These tables list all of the ARINC Top, Middle, and Bottom Plug pin designations and provide installation connection details.

(1) General

The HD-710 terminal contains a communications switch (SW) that supports Inmarsat Swift64 Mobile ISDN and MPDS service within an 8-MCU assembly built in accordance to ARINC 600 specifications.

The HD-710 terminal L-Band Rx/Tx input and outputs interface directly with the DLNA.

(a) Combined Mode

The HD-710 terminal L-band Rx/Tx interface combiners are shared with those of the Aero H/H+ system via splitters after the DLNA and before the high power amplifier (HPA). The Aero H/H+ system, with which the HD-710 terminal is installed, controls the antenna subsystem and the RF transmit signal attenuation in the High-Gain Antenna HPA of the HD-710 terminal through the SDU multi-control ARINC 429 bus. The aircraft supplies either 28 V dc or 115 V ac 400 Hz power to the HD-710 terminal.

(2) Pin and Connector Descriptions

Detailed pin and connector descriptions for both HD-710 terminals are provided for all supported installation modes and configurations in "Installation" on page 3-1.

D. System Interface Descriptions

This section briefly describes the external HD-710 terminal system interfaces. The system interfaces are those required to control, monitor, maintain, and supplement the terminal's functionality. "Installation" on page 3-1 provides a detailed description of interface connections.

(1) Source Destination Identification (SDI)

The Source/Destination Identification (SDI) is provided to the HPA as per ARINC 741 specifications.

(2) IDs

The HD-710 terminal uses two 24-bit IDs called “Forward Link Pairs” (FRLPs) channel card: a Forward ID (FWD ID) and a Return (RTN) ID per pair. The HD-710 terminal reads the FWD ID and performs a look-up for the RTN ID. For security reasons, each assembly contains an encrypted look-up table with the whole addressing space assigned to the product by Inmarsat. To minimize the risk of unauthorized use of its contents, the table is not accessible to the user.

The ISN consists of the type approval number and the FWD ID address. Each FRLP is associated with Inmarsat Mobile Numbers (IMN), which are the numbers that a user dials from the ground to reach the terminal on an aircraft. There is a unique IMN for each of the service types (e.g. data, voice).

The multi-channel HD-710 terminal derives the Forward and Reverse IDs for all of its channels from this single set of program pins.

(3) WOW Pin Wiring

Weight-On-Wheel (WOW) discretes indicate when an aircraft is on the ground and are used for flight data-logging purposes. These discretes are not required if equivalent data indicating that an aircraft is airborne (for example, true track and

groundspeed IRS info is supplied to the HD-710 terminal). The HD-710 terminal receives and processes WOW discrete inputs per ARINC 741 Part 1 Attachments 1-3 and 1-4 Note 40.

(4) IRS ARINC 429 Interface

Table 1-7 shows the IRS ARINC 429 bus labels and associated data types. For more details on characteristics, refer to Appendix 10 of the ARINC 704-7, Inertial Reference System document.

Table 1-7. ARINC 429 IRS Navigational Requirements

Label (Octal)	Name	Interval Rate (ms)	
		Min	Max
310	Latitude	100	200
311	Longitude	100	200
312	Ground Speed	25	50
313	True Track	25	50
314	True Heading	25	50
324	Pitch Angle	10	20
325	Roll Angle	10	20

The HD-710 terminal uses aircraft IRS information to determine which satellite to use, as selected by the Aero H/H+ SDU.

(5) Antenna Interface

The ARINC 741 SDU controls the satellite selection and antenna pointing. The HD-710 terminal monitors traffic on the Multi-Control, BSU, and HPA mute buses to determine which satellite is used for the HD-710 terminal's channel card(s) communication links.

(6) Antenna Subsystem RF Interface

The system RF parameters, such as cable losses and antenna gain, are delimited to ensure that the HD-710 terminal performance requirements are met. Refer to "Installation" on page 3-1 for a definition of these parameters and their expected values.

(7) Remote Status Panel (Optional)

The outputs to the optional "Remote Status Panel" provide a visual indication of the operational status of the HD-710 terminal; they mirror the front panel LEDs labeled as Power (LED1) and Fault (LED2) as defined in Table 1-8. Refer to "Installation" on page 3-1 for detailed installation and circuit requirements.

Table 1-8. HD-710 Terminal LED Output Designations

LED Signal	Label	LED Color	Indication Description
LED1	Power	Green	Power On: HD-710 terminal supply voltage is active. Flashes at 1 Hz when the HPA is transmitting
LED2	Fault	Red	Fault: Fault condition as described in "Fault Conditions" on page 1-11

(8) Fault Conditions

A failure in the HD-710 terminal may be due to a number of fault conditions. Upon detection of a fault condition, the HD-710 terminal activates its red, Fault LED. The potential fault conditions are as follows:

- Channel Card Fault
- HPA Fault
- External Reference Fault
- Internal ROM Fault
- Internal RAM Fault
- Over Temperature Fault

(9) Remote Reset

The remote reset output provides an external reset function for the complete HD-710 terminal. Pressing the momentary “normally open” (NO) switch resets the system's processor-card circuitry.

The remote reset has the same functionality as pressing the “test” button on the front panel of the terminal.

CAUTION: Combined Mode installations DO NOT support the use of the remote reset function. If the HD-710 terminal is reset in Combined Mode installations, the communications between the HD-710 terminal HPA and the SDU of the Aero H/H+ system can be disrupted—potentially causing system faults that may require the complete reset of both systems.

E. User Interfaces

The HD-710 terminal can support multiple voice and data communication configurations.

The most likely user configurations include a networking device (such as a router) that allows multiple users to optimize and share the channel capability offered by the HD-710 terminal.

The selected networking device must be able to decide which combination of services is required at any particular moment and activate it accordingly.

A different way to achieve this functionality is for one of the Ethernet ports to carry a PPPoE virtual connection between the networking device (typically a file server) and the HD-710 terminal. Support for PPPoE is also required on the user's side. HD-710 terminals support two Ethernet interfaces.

Voice and fax devices are supported by direct connection to the HD-710 terminal using EURO ISDN telephones and fax machines, or by indirect connection to a router or terminal adapter using two-wire telephone handsets or machines connected to the POTS ports.

(1) Combined Mode User Interfaces

HD-710 terminals operate in Combined Mode. The HD-710 terminal provides two channels of Swift64 data service and Aero H/H+ call capability. Swift64 and Aero H/H+ calls are simultaneously possible providing the following system conditions are met:

- If a Swift64 call is in process and an Aero H/H+ call is attempted, either incoming or outgoing, the Aero H/H+ call is allowed to proceed, providing that there is sufficient HPA power available to process all calls.
- If any Aero H/H+ calls are in process, a Swift64 call is allowed, providing that there is sufficient HPA power available to process both the Swift64 and Aero H/H+ calls.
- If both call types are in process, and system resources become limited due to dropping antenna gain, then Aero H/H+ calls will maintain priority.

(2) ISDN Circuit-Switched Data Interface

HD-710 terminals connect to a variety of interface options. The physical interface for ISDN service is EURO S/T, which supports several types of connections to user equipment.

HD-710 terminals provide two ISDN S/T bus interfaces, each of which is capable of hosting up to seven external physical connections to EURO ISDN devices.

Each channel card supports communications with two, 64 kbps, ISDN B channels on an ISDN U interface bus. If the channel(s) is “busy” or “in-call”, the request for service is denied (the system is busy).

For incoming calls, each channel card (ISDN Bus) is assigned a Forward ID. The Forward ID is assigned Inmarsat Mobile Numbers (IMNs) for each service type. Each service type has an associated Multiple Subscriber Number (MSN). The MSNs are configured in the ISDN devices to direct incoming calls of different service types to the appropriate device.

Two IMNs are assigned for each service type. "System Operation" on page 2-1 provides examples and a detailed description of the routing assignments for the HD-710 terminal.

Several ISDN interface options are shown in Figure 1-1. In the illustrated example, the ISDN port is only used for circuit-switched services (Swift64 Mobile ISDN).

Note: Activating MPDS on a particular channel card temporarily disables the ISDN port on that channel card while MPDS service is in-use.

For connection to Inmarsat Mobile ISDN services, install an RJ-45 interface connector in the cabin area. "Installation" on page 3-1 describes the RJ-45 connector and cable termination.

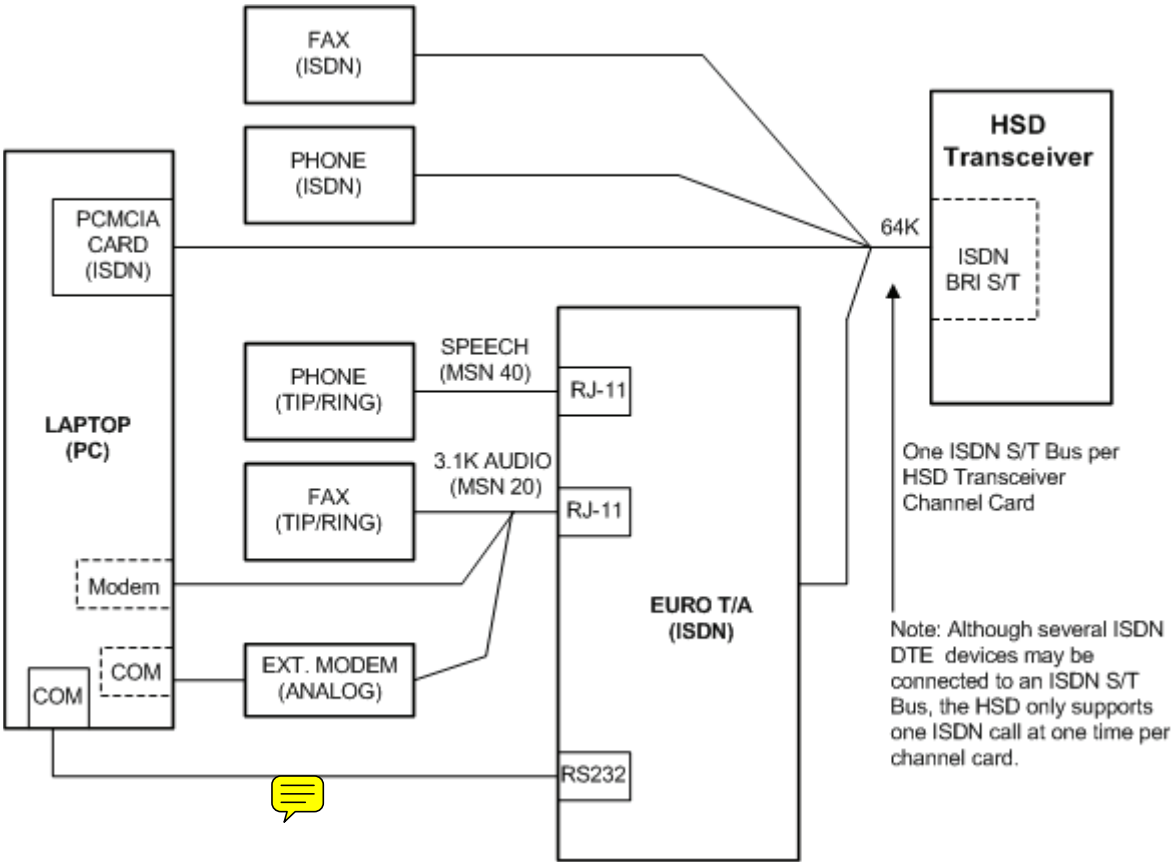


Figure 1-1. ISDN Connection Options

(3) Ethernet Data Interfaces

HD-710 terminals provide two Ethernet interfaces.

Each Ethernet port provides a 10 Mbps access, with a 10BASE-T physical interface. The HD-710 terminal Data I/O Controller takes the PPP data stream and directs it to the required port on the channel card, depending on the type of service selected by the user. PPP over Ethernet protocol (PPPoE) is required on the user equipment to allow the establishment of virtual connections to either service. Use the Ethernet ports for either Swift64 Mobile ISDN or MPDS service.

(4) ISDN S/T Interface

HD-710 terminals provide ISDN S/T physical interface that support up to seven external connections to Terminal Adapter (TA) or Terminal Equipment (TE) devices.

Note: An HD-710 terminal with a Data I/O Card Type 3 uses one S/T Bus “device connection” for system use.

Install RJ-45 interface connectors in the cabin area to facilitate connection to the ISDN interface. Refer to "Installation" on page 3-1 for a description of the RJ-45 connector and cable termination.

(5) POTS Tip/Ring Interfaces

The HD-710 terminal includes two Plain Old Telephone System (POTS) analog interfaces. Channel 1 is defaulted to 64 kbps speech, and channel 2 is defaulted to 3.1 kbps audio, which is appropriate for fax calls.

(6) Maintenance Port Interface

The HD-710 terminal is equipped with a maintenance port, located on the front panel of the HD-710 terminal with remote access also available through the rear ARINC 600 connector.

The maintenance port provides the physical connection to a password-protected, Maintenance Port Utility (MPU) that provides a system interface for users or service personnel who need to upgrade, monitor, or troubleshoot the system.

The user connects to the Maintenance Port either through the Maintenance 25-pin socket D-Sub (DB25) connector on the front panel of the HD-710 terminal, or through a remote 9-pin socket D-Sub (DB9) connector via the ARINC 600 connector, as described in "Test and Fault Isolation" on page 4-1.

A standard VT100 compatible terminal or computer (PC/laptop) running an emulator program such as HyperTerminal©, ProComm (PCPLUS)©, or another serial communication package provides the user interface to the HD-710 terminal MPU. Configure the connection as follows:

- Bits per second—19200
- Data bits—8
- Parity—none
- Stop bits—1
- Flow control—none

The HD-710 terminal supports two different end user access levels within the Maintenance Port architecture: End User or Field Representative.

(a) End User Access: **Level 1**

Password: *menu*

This limited-access level is for anyone without technical training on the product. It provides read-only access to help users diagnose problems with the assistance of product support personnel.

(b) Field Representative Access: **Level 2**

Password: *maint*

This level is for trained installers and product support personnel. This access level supports “read'” and limited “write” capabilities. Users are able to disable/mask/clear faults, change satellite or LES preferences, view and modify certain EEPROM parameters, and perform other maintenance or upgrade functions.

"Test and Fault Isolation" on page 4-1 provides a detailed description of the two levels of user access and of the menus, report selections, functionality, and system diagnostic procedures of the HD-710 terminal MPU.

F. Initiated-Self-Test

The Initiated-Self-Test occurs during the power up sequence or when the “TEST” button (located on the front panel of the terminal) is depressed and held down for three seconds or more. It provides the same functionality as the remote reset switch.

5. Inmarsat System Overview

A. General

This section provides an overview of the Inmarsat satellite communications system and networks.

B. Satellite Network Overview

The satellite communication system comprises global satellite networks, Land Earth Stations (LES), and Mobile Earth Stations (MES).

Satellite communication systems provide users with long-range voice and data communication by accessing global satellite and ground communications networks.

Inmarsat is an international organization that operates and maintains the satellites and satellite networks. Inmarsat operates multiple geostationary satellites. Each satellite is located over an oceanic region; the current ocean region names are:

- Atlantic Ocean Region-East (AOR-E)
- Atlantic Ocean Region-West (AOR-W)
- Indian Ocean Region (IOR)
- Pacific Ocean Region (POR)

These satellites provide worldwide telecommunication services for aviation, shipping, and land-mobile terminal users. The satellites connect to ground telecommunication systems through the LES.

The HD-710 terminal, in conjunction with an ARINC 741 Aero subsystem, acts as an MES. The combined system provides users with a data and voice communications link to the satellite network and global telecommunications system.

Figure 1-2 illustrates a simplified satellite communications system.

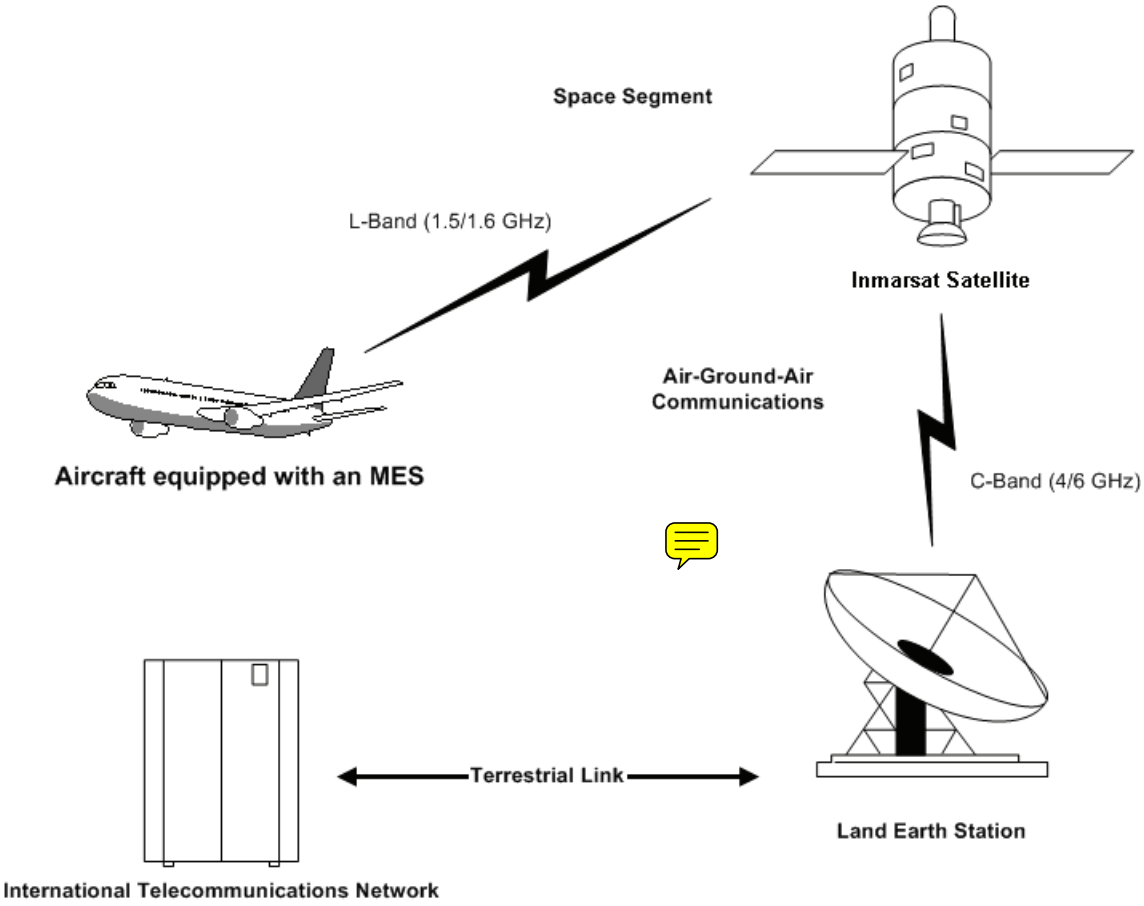


Figure 1-2. Simplified Aeronautical Satellite Communications System

6. Modes of Operation

The HD-710 terminal operates in Combined Mode only.

A. System Overview

The HD-710 terminal is a high-speed data terminal that contains two channel cards, a high stability reference oscillator, a high power amplifier, a data processor module, and a power supply. The HD-710 terminal receives power from the aircraft as either 28 V dc or 115 V ac, 400 Hz.

The HD-710 terminal supports channels of Inmarsat Swift64 MPDS or channels of Mobile ISDN 64 kbps data links. The HD-710 terminal has three different ports that support the following interfaces: EURO ISDN S/T and Ethernet (10BASE-T). Although able to support multiple configurations depending on user needs, the following constraints apply:

- EURO ISDN S/T port supports Swift64 Mobile ISDN (circuit-switched) only
- 10BASE-T port supports Swift64 Mobile ISDN or MPDS
- POTS supports ISDN speech or 3.1 kHz audio

Note: Only one service type can be used at one time on an HD-710 terminal channel. A channel card can support one channel of Swift64 or two channels of Mobile ISDN 64 kbps service.

The most likely configurations include connecting a networking device such as a router or a file server to allow multiple users to share the channel(s) provided by the HD-710 terminal.

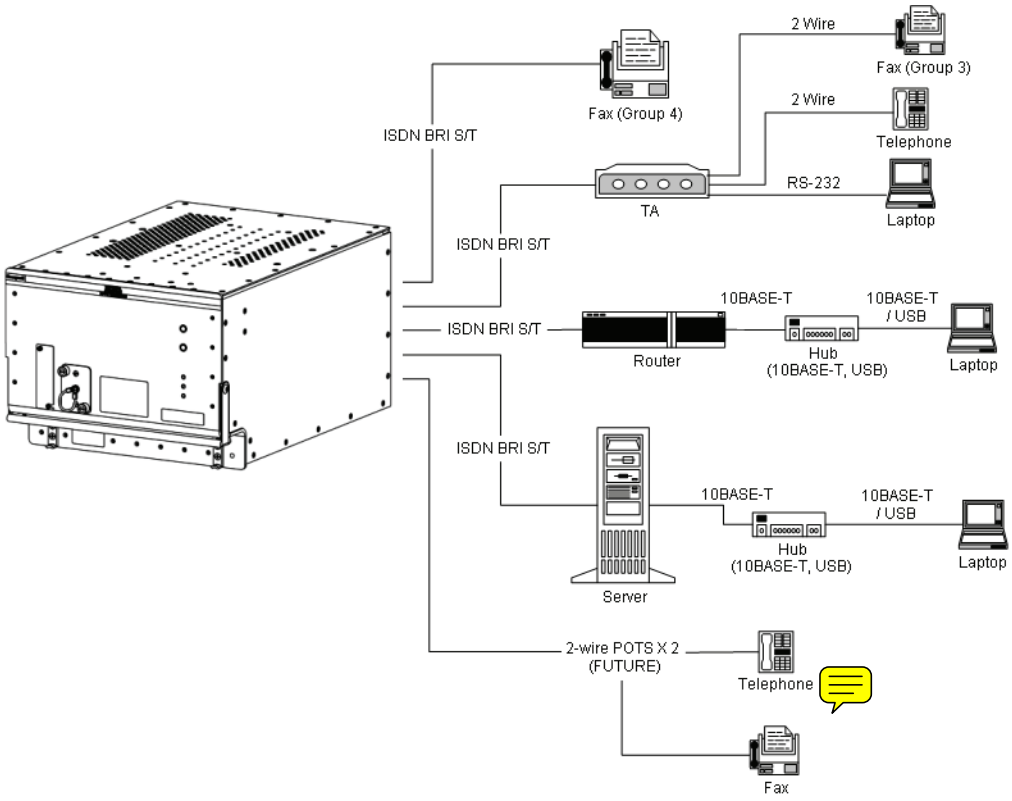


Figure 1-3. HD-710 Terminal User Configurations

B. Channel Card Configurations

In HD-710 terminals, both 64 kbps channels work either independently or as a bonded 128 kbps data-link to the Inmarsat Communications Network.

C. Installation Mode

HD-710 terminals are installed in Combined Mode configuration.

(1) Combined Mode

The HD-710 terminal hardware acts as the High Gain Antenna HPA for Aero H/H+ calls and provides one or two channels of Swift64 communications. In these configurations, the Aero H/H+ system provides the system interface to the aircraft antenna subsystem. The radio frequency (RF) from the HD-710 terminal and the Aero H/H+ system is combined in the HD-710 terminal. The receive RF from the antenna sub-system is split before being presented to the Aero H/H+ and HD-710 terminals.

HD-710 terminals are installed in Combined Mode and operate with the Honeywell Aero H/H+ MCS 3000/6000 and MCS 4000/7000 Multi-Channel Satellite Communication Systems. The HD-710 terminal hardware is installed in the HPA equipment position, replacing the Honeywell HPA.

This system configuration provides up to two channels of access to high-speed Swift64 Mobile ISDN or MPDS services as well as the existing Aero H/H+ communications simultaneously. Swift64 HD-710 terminal calls proceed even if an Aero H/H+ incoming or outgoing call is in progress—providing there is sufficient HPA power available to process all of the calls.

In Combined Mode (HCM) installations, the HD-710 terminal provides two channels of Swift64 data service and Aero H/H+ call capability. Swift64 and Aero H/H+ calls are possible simultaneously under the following conditions:

- If a Swift64 call is in process and an Aero H/H+ call is initiated, either incoming or outgoing, the Aero H/H+ call is allowed to proceed.
- If any Aero H/H+ calls are in process, a Swift64 call is allowed to proceed providing that there is sufficient HPA power available to process both the Swift64 and Aero H/H+ calls.
- If both call types are in process, and system resources become limited due to dropping antenna gain, Aero H/H+ calls will maintain priority.

SYSTEM OPERATION

1. General

This section provides basic information on registering and operating the HD-710 terminal, including the following sections:

- Activating Terminals
- Configuring Terminals
- Using the Terminal

2. Activating Terminals

To activate an HD-710 terminal:

- Obtain terminal information (Forward Identification Numbers and Terminal Type and Category information) from Honeywell.
- Obtain ICAO information from Honeywell.
- Register the terminal with an Inmarsat approved service provider and activate an account. See "Registering and Activating Terminals" on page 2-3.

A. Obtaining Terminal Information

Before installing the HD-710 terminal, contact Honeywell to obtain terminal information needed to register and activate the terminal with Inmarsat.

Honeywell Customer Care assigns an appropriate Terminal Type number and valid Forward IDs for the HD-710 terminal based on the intended installation configuration.

Note: Combined Mode installations are non-Stand-Alone Mode installations that operate with an Aero H/H+ system. Inmarsat does not support Mini-M Voice (4.8 kbps) service for Category B terminals. For more information on available services for Category B systems, contact your Inmarsat Service Provider.

When requesting terminal registration information, please have the following information available:

- End customer name, including contact information
- Purchase order number
- Tail registration number, aircraft type, and serial number of the aircraft on which the terminal is being installed
- Serial Number of HD-710 terminal(s)
- Intended installation configuration mode: Combined

For assistance with your HD-710 terminal, contact your local Honeywell Dealer or regional Honeywell Customer Support Engineer.

(1) Swift64 Service Categories

Inmarsat restricts the frequencies assigned to the HD-710 terminal to eliminate the possibility of intermodulation signals occurring and to avoid resulting interference problems with the GPS band signals.

Inmarsat split the band of frequencies assigned to Swift64 High-Speed Data into two separate categories: Category A and Category B. Category B frequencies are restricted to those that do not overlap with Aero H frequency allocations.

HD-710 terminals operate in Combined Mode installations; therefore, they must be registered as Category B systems.

To ensure the correct Category frequency assignments for HD-710 terminals, different terminal type numbers may be assigned to HD-710 terminals based on their intended installation configuration. (Future availability.)

The frequencies assigned to 4.8 kbps Low-Speed Voice (LSV) are not within the managed Category B frequency range. Therefore, LSV is not a service supported by Inmarsat in Combined Mode HD-710 terminals.

Secure communications in Category B, HD-710 terminals do not have access to Mini-M service. However, HD-710 terminals have both c8400 or c21000 M4 circuit-switched mode channels, which support secure communication operations.

Table 2-1 lists the frequency category and currently supported service types for HD-710 terminal installation modes. Please contact Honeywell Product Support for the terminal type information used in terminal activation.

Table 2-1. Swift64 Category and Service Matrix

Inmarsat Frequency Category	64 kbps Speech	3.1 kHz Audio	56 kbps Data	64 kbps UDI	mini-M Voice	MPDS
Category B	X	X	X	X	N/A	X

Note: Category B, Inmarsat terminals do not support Mini-M Voice (4.8 kbps LSV).

B. Selecting a Service Provider

Register the HD-710 terminal with an Inmarsat Service Provider. Contact Inmarsat for an up-to-date list of Inmarsat Swift64 service providers as follows:

Inmarsat
99 City Road, London
EC1Y 1AX

Tel: +44 20 7728 1000
Fax: +44 20 728 1044

Customer Care
Tel: +44 20 7728 1777
Fax: +44 20 7728 1142
Email: customer_care@inmarsat.com

Web addresses: www.inmarsat.com and www.inmarsat.com/swift64/supp_ser.htm

Note: Refer to Table 2-2, Table 2-3, and Table 2-4 for the default MSNs assigned within the HD-710 terminal.

C. Registering and Activating Terminals

Contact your Inmarsat service provider and ask for a “Registration for service activation of Aircraft Earth Station” form.

To complete the registration form, the following information is needed:

- Customer information (address and contact information)
- Service provider details (obtain from your Inmarsat service provider)
- System and terminal information (system terminal type, manufacturer, model number, serial number of terminal and Inmarsat Serial Number)
- Aircraft information (tail number, fuselage/airframe number, manufacturer and model, and country of registration)
- List of services required (e.g. Swift64 Mobile ISDN)

3. Configuring Terminals

This section provides basic information on how to configure HD-710 terminals for operation with user devices.

A. Setting up Networks

This section provides basic information on how to configure user connections and networks for operation with the HD-710 terminal and satellite communications network.

(1) Network Types

The samples in Figure 2-1 are simplified to illustrate different types of networks (including a basic, single-user connection).

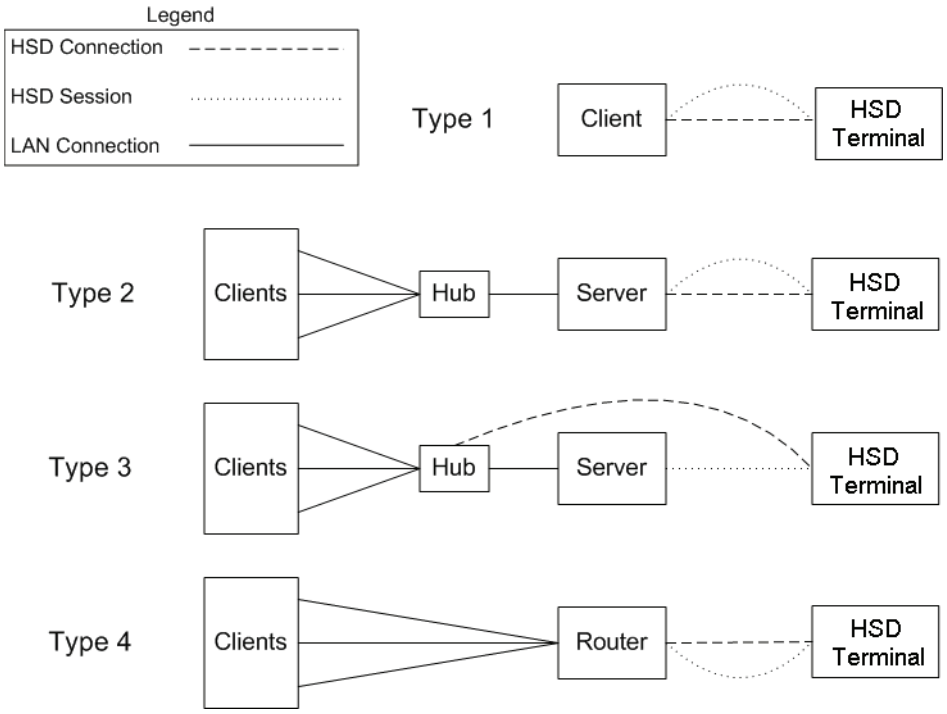


Figure 2-1. HD-710 Terminal Network Configurations

Note: A single client is a server that does not need to share the connection. A server connecting to a satcom through a hub still has the same logical session link. A router is equivalent to a server and a hub bundled into a single device.

(2) Networking Components

The network configurations illustrated in Figure 2-1 have common components that integrate and operate with HD-710 terminals.

- An interface connection to the HD-710 terminal:

  The HD-710 terminal supports the following interface connections: two 10BASE-T Ethernet interfaces, (MPDS or Swift64 Mobile ISDN), and two ISDN interfaces

(Swift64 Mobile ISDN only). The Ethernet interfaces are accessed through a direct connection (dedicated network card or straight-through cable) or through a hub.

- **A session over the HD-710 terminal:**

  This is the logical link between the server and the ground segment.

- **A connection to other local computers:**

  Connection to other local computers is usually achieved using a hub or router; however, the system supports any method that computers use to communicate with each other (such as wireless, dial-up).

- **A method of sharing the session with other computers:**

  Session sharing is accomplished using Network Address Translation (NAT), the method behind Internet Connection Sharing, although various proxies may also be used.

(3) Interface Options

The HD-710 terminal has five interface options ("Installation" on page 3-1 provides connection details):

(a) ISDN

The ISDN interface supports connections to Swift64 Mobile ISDN services only. Computers connect to the ISDN interface through a EURO ISDN S/T BRI terminal adapter or router. Euro ISDN S/T modem and drivers are required.

(b) Ethernet

The Ethernet interfaces support MPDS and Swift64 Mobile ISDN (M4 circuit-switched data) services. It supports longer cable lengths to accommodate extension through hubs and other networking devices.

Connect to the HD-710 terminal Ethernet interfaces either directly from a dedicated Ethernet card or hub using an Ethernet straight-through cable.

B. Mapping User Devices for ISDN Services

This section describes how the HD-710 terminal manages ISDN traffic for user devices connected to the network.

(1) Overview

HD-710 terminals support connection to a multitude of user devices, allowing the user to customize their system. Because each equipment setup is different, the HD-710 terminal uses routing codes to ensure that incoming calls (whether data or voice) reach the appropriate device. These same routing codes also direct outgoing calls to the appropriate Swift64 service type supported by the Inmarsat Satellite Communications Network (3.1 kHz Audio, 64 kbps Speech, 64 kbps Data, 56 kbps Data.

The physical interface for ISDN service is EURO S/T, which supports several types of connections to user equipment. HD-710 terminals provide two ISDN S/T (BRI) Bus interfaces.

Each bus is capable of hosting up to 8 EURO ISDN physical devices, which means a two-channel (2 ISDN S/T bus) system supports up to 16 physical connections to EURO ISDN devices. The HD-710 terminal uses one “device connection” on each channel card for system use, therefore providing up to 14 possible device connections.

Each channel card provides two 64 kbps ISDN B channels that are available to either ISDN Bus. If the channels are “busy” or “in-call”, the request for service is denied (the system is busy).

For ISDN data devices that support bonding, the device will attempt to use all four ISDN B channels to increase data throughput as long as no other devices are “in call”.

For incoming calls, each channel card (ISDN BUS) is assigned a Forward ID. The Forward IDs are assigned Inmarsat Mobile Numbers (IMNs) for each service type. Three IMNs are assigned 64 kbps data.

Each service type IMN has associated Multiple Subscriber Number (MSN). MSNs are used to configure the user devices so that incoming calls of different service types are routed to the appropriate device.

Two IMNs are assigned to 64 kbps Speech, 56 kbps Data, and 3.1 kHz Audio; six IMNs are assigned to 64 kbps Data.

Figure 2-2 illustrates the routing assignments for an HD-710 terminal with the following attached to the bus: two voice lines, one FAX line, and one data line device.

The following dialing instructions provide an example based on the system setup of Figure 2-2 and the mapping programming details provided in Table 2-2 and Table 2-3:

- To call ISDN Phone #1: Dial IMN of 60xxxxxx1 or 76xxxxxx7
- To call ISDN Phone #2: Dial IMN of 60xxxxxx6 or 76xxxxx29
- To call ISDN FAX: Dial IMN 60xxxxxx2
- To call ISDN FAX: Dial IMN 60xxxxx24

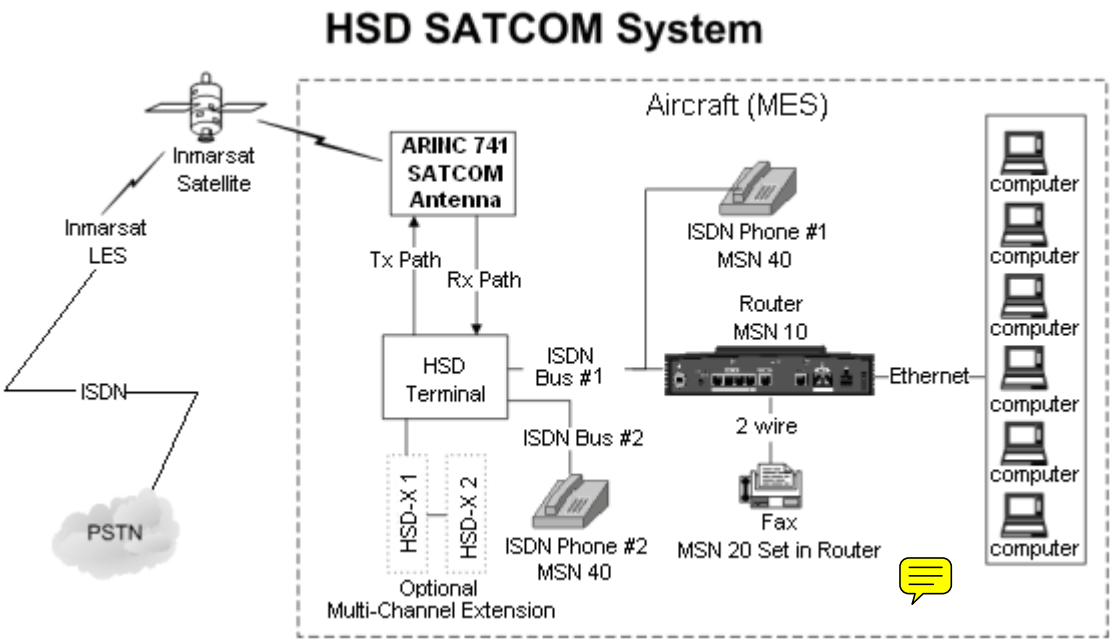


Figure 2-2. System Setup and Mapping for Incoming Calls

Note: Refer to Table 2-2, Table 2-3, and Table 2-4 for the default MSNs assigned within the HD-710 terminal.

Table 2-2. Service Types and MSNs

ISDN Bus #1		
Channel Card #1 Forward ID XAXXXX		
Service Type	**IMN**	**MSN**
64 kbps Speech	60xxxxxx1 (See Note below)	MSN 40
3.1 kHz Audio	60xxxxxx2	MSN 20
56 kbps Data	60xxxxxx3	MSN 30
64 kbps Data	60xxxxxx4 60xxxxxx5 60xxxxxx6	MSN 10 MSN 11 MSN 12
ISDN Bus #2		
Channel Card #2 Forward ID XBXXXX		
Service Type	**IMN**	**MSN**
64 kbps Speech	60xxxxx23 (See Note below)	MSN 40
3.1 kHz Audio	60xxxxx24	MSN 20

Table 2-2. Service Types and MSNs (Continued)

56 kbps Data	60xxxxx25	MSN 30
64 kbps Data	60xxxxx26	MSN 10
	60xxxxx27	MSN 11
	60xxxxx28	MSN 12

Note: IMNs shown are examples only. Actual IMNs may not be assigned in numerical sequence.

(a) Inmarsat Mobile Numbers

Inmarsat Mobile Numbers (IMNs) are unique routing numbers that act similarly to telephone numbers. IMNs are assigned by Inmarsat to each service type (64 kbps Speech, 3.1 kHz Audio, 56 kbps Data, and 64 kbps Data).

When registering your system, request IMNs for each service-type device attached to the HD-710 terminal on the Service Activation form. Although the service provider may support an unlimited number of IMNs assigned to a particular system, the number of physical connections available on a system defines the number of IMNs supported.

Note: To get assigned extra or multiple IMNs per service type, you must request them from your service provider when filling out your service registration and application form.

The numbering of IMNs varies from one type of Inmarsat service to another. For troubleshooting purposes, understanding the IMN format can assist in verifying that the correct service type is assigned to connecting devices. Inmarsat IMNs (for this type of terminal) use the following nine-digit format:

IMN Format: T1- T2- X1- X2 -X3 -X4 -X5- X6- X7

Numerical Example:600221989 (for 64 kbps Data)

T1 and T2 are two-digit identifiers for Inmarsat service types. X1 through X7 can be any digit between “0” and “9”. The IMNs for the 56 kbps and 64 kbps service types (including ISDN Speech and 3.1 kHz audio) are identified by the T1 and T2 numbers 6 and 0.

(b) Multiple Subscriber Numbers

Multiple Subscriber Numbers (MSNs) act as identification and routing codes for user devices attached to the HD-710 terminal. MSNs identify the device on the system so that incoming calls route to the appropriate device. Each device must be assigned an appropriate MSN to identify to the Inmarsat system what type of service that device needs on outgoing calls. The MSNs also provide routing information for incoming calls.

For a simplified understanding of MSNs, equate them to telephone extension numbers (where the IMN is the PBX telephone number and the MSN is the extension number).

1. Configuring MSNs

   Each HD-710 terminal channel card is assigned one Forward ID and an IMN for each service type the system is registered for with the service provider. Table 2-3 provides the list of the MSNs recognized by the HSD terminal. 64 kbps Data service supports multiple MSNs. The MSNs are assigned to each IMN as follows:

   - One MSN for the service types 64 kbps Speech, 3.1 kHz Audio, and 56 kbps Data
   - Three MSNs for 64 kbps Data

   The three MSNs assigned to 64 kbps ISDN support connection to three separate devices mapped to the same IMN. Therefore, in two-channel systems, three ISDN devices can be connected to each channel providing six separate mapping extensions.

   Note: Incoming voice calls will ring any phone devices not programmed with an MSN (left blank) including 64 kbps Speech and 3.1 kHz audio calls.

   Configure all devices (e.g. telephones, fax machines, laptops) connected to HSD terminals with an appropriate MSN. Refer to the device manufacturer's user documentation for specific instructions to enter or configure the MSN.

Table 2-3. Multiple Subscriber Numbers (MSNs)

Forward ID	Service Type	IMN	MSN
Channel Card #1 (XAXXXX)	64 kbps Speech	60xxxxxxx	40
Channel Card #2 (XBXXXX)	64 kbps Speech	60xxxxxxx	40
Channel Card #1 (XAXXXX)	3.1 kHz Audio	60xxxxxxx	20
Channel Card #2 (XBXXXX)	3.1 kHz Audio	60xxxxxxx	20
Channel Card # 1 (XAXXXX)	56 kbps Data	60xxxxxxx	30
Channel Card # 2 (XBXXXX)	56 kbps Data	60xxxxxxx	30
Channel Card # 1 (XAXXXX)	64 kbps Data	60xxxxxxx	10, 11, 12
Channel Card # 2 (XBXXXX)	64 kbps Data	60xxxxxxx	10, 11, 12

Table 2-4. System Assignments for Incoming Calls

Entry	Periph	MSN	TID	Call Type	Redir
2	ISDN	NO_ID\	91	800124	Mobile aero 64k speech
3	ISDN	10\	51	800622	Mobile aero 64k UDI
4	ISDN	11\	52	800622	Mobile aero 64k UDI
5	ISDN	12\	53	800622	Mobile aero 64k UDI
6	ISDN	NO_ID\	51	800622	Mobile aero 64k UDI
7	Bonded	NO_ID\	51	800622	Mobile aero 64k UDI
8	ISDN	20\	61	800625	Mobile aero 64k audio 3.1
9	ISDN	NO_ID\	61	800625	Mobile aero 64k audio 3.1

Table 2-4. System Assignments for Incoming Calls (Continued)

Entry	Periph	MSN	TID	Call Type	Redir
10	Bonded	NO_ID\	61	800625	Mobile aero 64k audio 3.1
11	ISDN	30\	71	800623	Mobile aero 56k UDI
12	ISDN	NO_ID\	71	800623	Mobile aero 56k UDI
13	Bonded	NO_ID\	71	800623	Mobile aero 56k UDI
14	ISDN	40\	91	800124	Mobile aero 64k speech
15	Bonded	NO_ID\	91	800124	Mobile aero 64k speech

C. Configuring System Parameters using the MPU

This section describes how to configure the system parameters using the Maintenance Port Utility (MPU). The system parameters contain information necessary for operating the HD-710 terminal.

Refer to "Test and Fault Isolation" on page 4-1 for detailed instructions on how to connect to and use the HD-710 terminal MPU.

When all the required system parameters have been configured, reset the power on the HD-710 to activate the new configuration.

To configure the required system parameters:

1. Connect a computer to the maintenance port of the HD-710 terminal as described in "Test and Fault Isolation" on page 4-1, and then power up the system.
2. Using a terminal emulation program, open the HD-710 MPU.
3. Type the password *maint*. (The password does not appear on the screen.)

   The HD-710 Maintenance Port Utility Program Menu 1 appears. You are now ready to begin configuring the system parameters.

(1) Configuring System Parameters for Combined Mode

To operate the HD-710 terminal in Combined Mode, you need to configure the following system parameters using the Honeywell SATCOM Direct Commissioning and Maintenance Terminal (CMT) and the MPU.

To configure the Honeywell System Parameters:

1. First, use the Honeywell CMT to:
   - Obtain the HPA to antenna loss from the Honeywell SDU
   - Configure High Rate Data Support settings (recommended—but not mandatory)
2. Then use the HSD Maintenance Port Utility to:
   - Configure the Terminal Category (only required when the recommended hardware strapping is not used)
   - Set Swift64 (M4) and Aero service priorities
   - Change the LES Access Codes
   - Reset the system to activate the new configuration.

(a) Step One: Honeywell System Configuration

Using the Honeywell SATCOM Direct CMT, obtain the antenna loss parameter and configure the High Rate Data Support settings.

The connection to the Honeywell SATCOM Direct CMT Port uses an RS-232 interface with any “VT-100” terminal emulator program. Configure your VT-100 terminal settings as follows: 9600 bps, no parity, 8 data bits, and 1 stop bit. Refer to Honeywell provided documentation for more information.

To configure the Honeywell System:

1. Obtain the HPA to Antenna Loss Parameter Value

   To maximize system performance, adjust the HPA-to-Antenna Loss parameter within the HSD system to accommodate the HPA to antenna loss from the Honeywell SDU.

   - Using the Honeywell CMT, obtain the value of the HPA to antenna loss from the Honeywell SDU.
   - Record the HPA to antenna loss value for future reference. Typically, the value is between 1.5 dB and 2.5 dB. Enter this antenna-loss value into the HSD system configuration using the HSD transceiver’s Maintenance Port Utility Program.

2. Configure the High Rate Data Support Settings

   Usually, the High Rate Data Support parameters of the Honeywell SDU (Global Beam, High Rate Data and Spot Beam, High Rate Data) are configured to “DIS/EN” (disabled/enabled). Although not mandatory, setting both parameters to “disabled” is recommended.

(b) Step Two: Configuring the HSD Transceiver for HCM Mode

This section describes how to use the HSD Maintenance Port Utility to configure the HSD system parameters for operation in HCM mode.

Refer to "Test and Fault Isolation" on page 4-1 for detailed instructions on how to connect to and use the HSD Maintenance Port Utility Program.

When all the required system parameters have been configured, the HSD must be “reset” to activate the new configuration.

To configure the required system parameters, establish a connection to the HSD Maintenance Port Utility program:

1. Connect a computer to the maintenance port of the HSD transceiver as described in "Test and Fault Isolation" on page 4-1, and then power up the system.
2. Using a terminal emulation program, open the HSD maintenance utility program.
3. Type the password *maint.* (The password does not appear on the screen.)

   The HSD Maintenance Port Utility Program menus appear. You are now ready to begin configuring the system parameters for HCM operation as described in the following sections.

1. Configuring the Terminal Category for Combined Mode

   If the HSD transceiver does not have the recommended hardware strapping for system configuration installed, configure the terminal category using the HSD Maintenance Port EEPROM parameters as described in the following procedure.

   To configure the Terminal Category:

   1. In Menu 3, to select misc. EEPROM parameters, press **M**.

      The Miscellaneous Parameters list appears. The available parameters may differ depending on the version of control processor software installed, as shown in Figure 2-3.

```
       MENU 3                                    FIRMWARE Vx.x
L     list EEPROM                          S     list event log
M     misc.  EEPROM parameter              F     list call log
O     list ORT                             P     ocean region parameter
I     set all LES id's
<CTRL> N  next menu      <CTRL> O  previous menu      =  select reports

MISCELLANEOUS PARAMETERS
 1  HPA-TO-ANTENNA TOTAL LOSS        11  FRONT PANEL LEDS ENABLED
 2  FORWARD ID                       14  MAINTENANCE PORT INVERSE VIDEO
 3  GPS PROTECTION ALGORITHMS        15  MAINTENANCE PORT DEGREES SYMBOL
 4  REGISTRATION REQ'D BEFORE CALLS  16  TERMINAL CATEGORY
10  NUMBER OF CHANNEL CARDS          17  VIPER ANTENNA GAIN

WHICH PARAMETER #  <CTRL> N for next page  ? 16
```

Figure 2-3. Miscellaneous Parameters list

   2. To select the Terminal Category, type *16* and then press **Enter**.

      The Terminal Category Menu appears, as shown in Figure 2-4.

```
TERMINAL CATEGORY  HCM COMBINED

=SAT906  1=STANDALONE  2=HW STRAPPING  3=MCS3000  4=MCS6000  5=MCS7000
6=MCS COMB  7=STANDALONE W/O ANTENNA  8=HCM COMBINED
9=COOPERATIVE ROCKWELL-COLLINS SAT906  10=OLD COMBINED MODE DEVELOP
11=HSD-X NETWORK 12=HSD-X NETWORK W/O ANTENNA 13=VIPER

EW TERMINAL CATEGORY = ?
```

Figure 2-4. Terminal Category Menu

   3. Type *8* for HCM Combined, and then press **Enter**.

      A system message appears stating that the EEPROM has been updated. This completes the configuration of the terminal category.

2. Configuring Antenna Loss

To configure the Antenna Loss:

1. In Menu 3, to select misc. EEPROM parameters, press **M**.

   The Miscellaneous Parameters list appears.

2. To select the HPA Antenna Cable Loss parameter, type *1*.

3. Press **Enter**.

   The current value for HPA to antenna cable loss appears, as shown in Figure 2-5.

```
HPA-ANTENNA CABLE LOSS 2.5 dB = ?
```

Figure 2-5. HPA to Antenna Cable Loss Value

4. Enter the "HPA to Antenna Cable Loss" value recorded from the Honeywell SDU, and then press ENTER.

   Note: The loss refers to the total loss from the HPA to the antenna, including the coax cable and the D/LNA insertion loss (typically 0.8 dB maximum).

   A system message appears stating that the EEPROM has been updated. This completes the configuration of the HPA to Antenna Cable Loss parameter.

3. Configuring Service Priority

The HSD system can be configured to give priority to either Aero H or M4 (HCM HSD Swif64) communications. The system default gives priority to Aero H communications.

If the HSD parameter is set to Aero priority, the SATCOM Aero H calls are given the priority for power consumption when HPA resources become limited. If the HSD parameter is set to M4 priority, M4 calls have priority when HPA resources become limited.

To configure the Service Priority:

1. In Menu 3, press **M** for misc. EEPROM parameters.

   The Miscellaneous Parameters List appears.

2. To select HCM Aero/M4 Prioritization, type *42* and then press **Enter**.

   The system prompts you to select a service priority, as shown in Figure 2-6.

```
HCM AERO/M4 PRIORITIZATION AERO  (1=M4  0=AERO)  = ? 0
 EEPROM UPDATED
```

Figure 2-6. Service Priority Selection

3. Set the service priority for the system as follows:
   - To select M4 services as the system priority, type *1* then press **Enter**.
   - To select Aero services as the system priority, type *0* (the number zero) then press **Enter** (as displayed in the example provided above).

   A system message appears stating that the EEPROM has been updated. This completes the configuration of service priority. You now need to configure the LES Access Codes.

D. Configuring LES Access Codes

This section describes how to configure the HD-710 terminal with Land Earth Station (LES) access codes provided by your Inmarsat service provider.

(1) General Overview

Inmarsat Service Providers (ISPs) operate LESs. The ISPs are typically public telephone companies of the country where the LES is located.

Using satellite communications antennas and up-and-downlink communications equipment, the LES converts the space segment to a format compatible with public and private telephone and data networks. Each satellite is associated with a number of LES that fall within its coverage.

Inmarsat assigns each LES an access code. These access codes are used by the Inmarsat system to route calls to the correct Ocean Region Satellite and LES.

Note: HD-710 terminals are shipped with the factory default LES Access Codes set to '0' (zero). All HD-710 terminals must be configured with the valid LES Access Codes provided by your Inmarsat Service Provider.

(2) Changing Default LESs Using the MPU

The LES access codes can be configured using the HD-710 terminal MPU accessed by connecting a computer running a VT100 terminal emulation program to the RS-232 Maintenance Port on the HD-710 terminals (refer to "Test and Fault Isolation" on page 4-1 for connection settings and cabling information).

Note: When configuring the LES access codes using the HD-710 terminal MPU, the application requests the input of a Secondary LES Access Code. At the time of writing, Inmarsat has not implemented the recognition of the secondary LES value in their systems. However, a valid Secondary LES Access Code must be entered in the HD-710 terminal. The Secondary LES Access Code must be the same as the Primary LES Access Code.

Inmarsat usually provides LES access codes for the ISPs providing Swift64 services. Contact Inmarsat directly for an up-to-date list of LES and Swift64 service providers.

For more information, visit Inmarsat's Web site at www.inmarsat.com/ or contact their Customer Care Service at:

Telephone:+44 20 7728 1777

Fax: +44 20 7728 1142

E-mail: customer_care@inmarsat.com

Table 2-5. Inmarsat Swift64 LES Operator and Access Codes

Land Earth Station Operator	Country	Ocean Region			
		AOR-E	AOR-W	IOR	POR
Telenor Satellite Services Inc.	USA	001	001	001	001
Stratos (Goonhilly LES)	United Kingdom	002	002	002	
Stratos (Auckland LES)	New Zealand	012	012		002
Xantic (Burum LES)	Netherlands			022/222	022/222
Xantic (Perth LES)	Australia				

(a) Equipment Required

The following equipment is required to change the default LES access code in an HD-710 terminal:

- Computer
- Windows 95® or later (Windows 2000® recommended)
- HD-710 terminal control processor software
- Terminal emulation program (e.g. HyperTerminal)

(b) Connecting to the Maintenance Port

Connect a PC or laptop running a terminal emulation program to the HD-710 terminal maintenance port, and then power up the system. (Refer to "Test and Fault Isolation" on page 4-1 for detailed connection information.)

(c) Changing LES access codes using control processor software

To change all of the LES Access Codes simultaneously to the same LES Access Code:

1. Connect to the HD-710 terminal Maintenance Port.
2. Type the password *maint*.
3. In Menu 3, press **I**.
4. Follow the application prompts and enter the LES access code.

The Menu 3, I command configures the Primary and Secondary LES Access Codes for all of the Ocean Regions to the same LES Access Code.

Note: In cases where the Service Provider requires different LES Access Codes for different Ocean Regions, each LES Access Code must be programmed individually using Menu 3, item P.

(d) Changing LES access codes on a call-by-call basis

The following procedure provides detailed instructions to change the LES default access code for the HD-710 terminal.

Note: You can also change the LES code on a call-by-call basis using the dial code prefix 901 when troubleshooting and diagnosing network problems.

To change the LES access code on a call-by-call basis in all control processor software versions:

- Enter the following dial-sequence (Xantic POR LES Access Code [022] as an example only):

901 + LES CODE + International Code + Country Code + Area Code + Telephone Number + # Example: 901 + 022 + 00 + 1+ 613+5551212 + #

E. Activating Configurations

After configuring the HD-710 terminal parameters, the HD-710 terminal must be reset using one of the following methods:

- In Menu 2, press **Z** to reset the system
- Cycle the power to the HD-710 terminal

When the “reset” or “restart” is completed, the configuration values and parameters are activated.

F. Verifying Configurations

This section describes how to view the HD-710 terminal configuration parameters.

To view the HD-710 terminal ORT system configuration:

1. In Menu 3, press **O**.

   The List ORT appears.

2. Press **O** to scroll through the listing until you see a table of ORT Ocean Regions.

   The LES Access Codes are listed in this table.

To view the new system configurations

- In Menu 3, select **List EEPROM**.

  The List EEPROM appears. Press **L** to scroll through the listing.

4. Using the Terminal

This section describes how to place voice and fax calls using the ISDN interface of the HD-710 terminal, and how to use the MPDS and Mobile ISDN data connections.

A. Placing Voice and Fax Calls

Placing voice and fax calls using the HD-710 terminal is similar to placing an international telephone call or entering a telephone number for dial-up networking data calls. Like international telephone numbers, the HD-710 terminal “dialing-number-sequence” includes different routing components or codes. Figure 2-7 illustrates the required order of the dialing components.

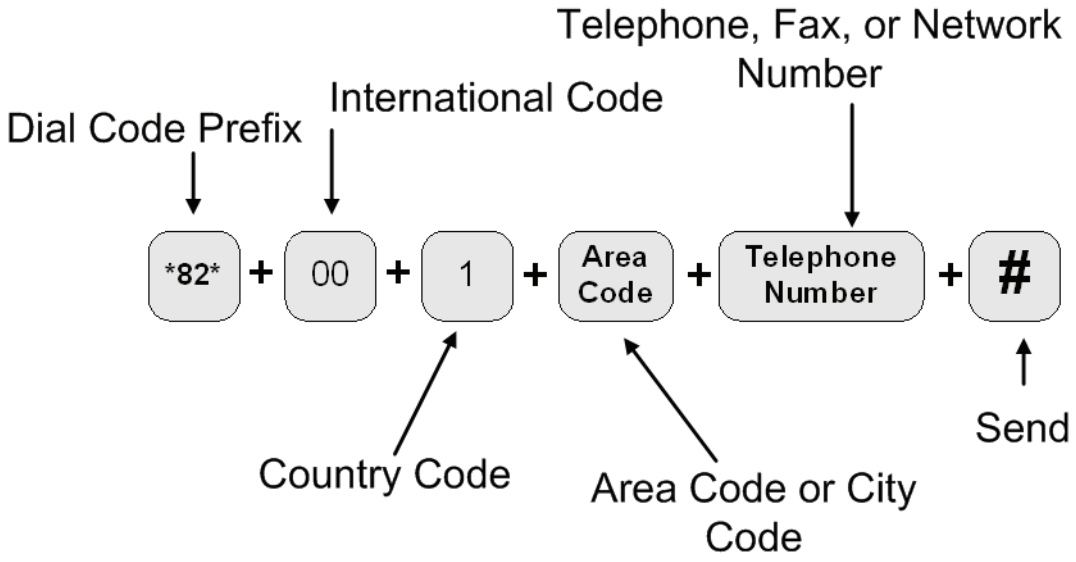


Figure 2-7. Dialing-Sequence Components

Each dialing sequence component serves a different routing function:

- **Dial Code Prefix:**

  Use service-specific dial code prefixes when sending a fax or using analog modems, or for overriding system defaults to force the system to request a specific service type. Figure 2-7 uses the dial code prefix for 3.1 KHz audio service type (*82*). See Table 2-6 for other dial code prefixes.

- **International Access Code:**

  Use the international code of the ground location where the call is originating when calling the aircraft during ground-to-air calls. The international access code for all airborne equipment is 00.

- **Country Code:**

  Use the Public Switch Telephone Network (PSTN) number assigned to the country of your call destination. (Example: “1” is the Country Code for North America.)

- **Area Code (and City Code, if applicable):**

  Use the PSTN routing number assigned to the area (and if applicable, city) of your call destination.

- **# (SEND):**

  Press # (or enter # at the end of the phone number field on data devices) to signal the system to send the call. Certain devices using the HD-710 terminal may not have the functionality to insert the # symbol at the end of the dialing sequence. For those devices, additional Dial Code Prefixes are required to override the send command requirement. Refer to Table 2-7 for more information.

(1) Dial Code Prefixes

Although the system automatically selects the appropriate service types on outgoing calls for ISDN devices, a Dial Code Prefix is required to send a fax, identify an analogue modem, or force the system to override the system defaults to select a specific service type (see Table 2-6).

The system requires the Dial Code Prefix *82* for sending fax or when using analogue modems. It forces the system to request the required 3.1 kHz audio service from the Inmarsat Satellite Communications Network. If required, use the Dial Code Prefixes to override the system defaults for selecting specific service types. Dial Code Prefixes for all service types require an asterisk (*) before and after the code number.

Other Dial Code Prefixes provide system overrides required if you are using devices that cannot add a # symbol to the dialing string or devices that are slow dialing. Table 2-6 provides a description of the additional Dial Code Prefixes used for system overrides. Table 2-5 provides a list of the LESs and their associated codes.

Table 2-6. Dial Code Prefixes for Forcing Service Type Selection

Service Type	Service Description	Dial Code Prefix (Forces service selection)
Speech 64 kbps	High-Speed Voice	*81*
3.1 kHz audio	Fax, Analogue Modem, STU-III	*82*
56 kbps data	High-Speed Data	*83*
64 kbps data	High-Speed Data	*84*

Table 2-7. Dial Code Prefixes for System Overrides

Reason for Override	Dial Code Prefix	Example Dialing Sequence
Use this Dial Code Prefix to override the default LES configured in the system. *This Dial Code Prefix signals the system to override the default LES and use the selected LES instead. (See Table 2-6 or contact Inmarsat for Swift64 LES codes)*	901 + LES CODE	901 + LES CODE + International Code + Country Code + Area Code + Telephone Number + # 901 + 002 + 00 + 1+ 613 +5551212 + #
Use with devices that cannot produce or add a "#" character to end the dialing sequence. *This Dial Code Prefix signals the system to send the call after a specified delay in user input when the # symbol cannot be entered.*	902	902 + International Code + Country Code + Area Code + Telephone Number 902 + 00 + 1+ 613 + 5551212
Use with slow dialing devices that cannot produce or add a "#" character to end the dialing sequence. *This Dial Code Prefix signals the system to send the call after a specified delay in user input.*	903	903 + International Code + Country Code + Area Code + Telephone Number 903 + 00 + 1+ 613 + 5551212

Note: When using the System Override Dial-Code-Prefixes do not enter * before or after the Dial Code Prefix as with other dial code prefixes.

(2) Mobile-to-Mobile Communication

The HD-710 terminal provides a two-way link for aircraft-to-aircraft communication.

Calling aircraft-to-aircraft requires additional information. You need to know the IMN of the device or service on the aircraft you are calling. If your service provider does not support Inmarsat's Single Network Access Code (SNAC) 870, you also need to know the current Satellite Ocean Region of the aircraft you are calling. Table 2-8 lists the SNAC code and the Satellite Ocean Region numbers.

Table 2-8. Satellite Ocean Region Codes

Code Name	Code Number
Single Network Access Code	870
Atlantic Ocean Region East (AOR-E)	871
Atlantic Ocean Region West (AOR-W)	874
Pacific Ocean Region (POR)	872
Indian Ocean Region (IOR)	873

If SNAC is unsupported, use the Ocean Regions Number that the aircraft (based on its projected flight path) is probably logged on to. If the call fails to connect to the aircraft, re-try the call using an alternate Ocean Region Number.

Figure 2-8 illustrates the Mobile-to-Mobile dialing sequence.

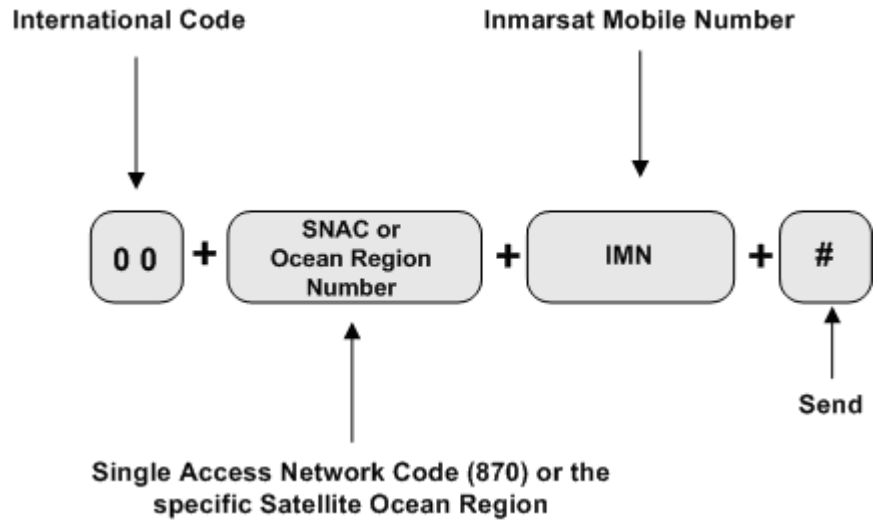


Figure 2-8. Mobile-to-Mobile Dialing Sequence

B. Using Data Connections

This section provides a basic overview of the requirements for making data connections using the HD-710 terminal.

(1) Mobile ISDN versus MPDS

Deciding which service type to use depends how you intend on using your data connections.

For surfing the Web (with high turnover of pages and graphics), video conferencing, video streaming, and large file transfers, Mobile ISDN is faster and more efficient. However, service charges for Mobile ISDN are time-based (based on the length of your total connection time).

MPDS provides a cost-effective solution for user applications that involve intermittent interaction or transmission of data, such as e-mail, database queries, and connectivity to IP/LAN and intranets.

MPDS also has an “always on” advantage over Mobile ISDN. Service charges for MPDS are based on the number of data bits transmitted over the system, not on the length of your connection time.

(2) Connecting to Inmarsat Mobile ISDN Service

This section provides tips for connecting to the Inmarsat Mobile ISDN service (M4 Circuit-Switched Service). The transmission of data over satellite networks differs from land-based ISDN applications. Factors inherent in satellite communications (signal fading, latency, and transmission blockages) can cause data transit delays and bit errors.

Because of these challenges, it is sometimes necessary to optimize the system to achieve peak performance over the satellite network.

ISDN protocols are not designed specifically for use over satellite communication networks. To improve data transfer rates most ISDN protocols require minor adjustments. For best results, consider how the ISDN protocol you intend to use sends data over the network.

As examples, consider the protocols TCP/IP (over PPP) and V.120. As a basic protocol, PPP operates under the networking protocol TCP/IP. PPP has error checking properties but does not offer flow control.

TCP/IP is flexible and designed to run over different networks, including the Internet (which like satellite networks experiences high transit delays). When used together, PPP and TCP/IP protocols perform well over the Inmarsat network.

Improve the performance of TCP/IP (over PPP) for Mobile ISDN by changing the default parameters. Increase the maximum size of data allowed in transit at one time to a value up to approximately 255,552 bytes.

The V.120 protocol includes error correction and flow control applications. Flow control limits the amount of data that can be in transit at any one time and waits for acknowledgment of receipt from the other end of the connection before sending more data.

The default parameters of V.120 limit the maximum transit size of the data package to approximately 1764 bytes, causing poor performance results over satellite ISDN networks. Improve the performance of V.120 over Mobile ISDN by changing the default parameters. Increase the maximum size of data allowed in transit at one time to a value up to approximately 8000 bytes. (Some applications of V.120 permit the user to change the “window size”.)

Both the HD-710 terminal ISDN and Ethernet (x2) interfaces support connections to Inmarsat's Mobile ISDN service.

(a) Using the ISDN Interface

The basic requirements for using the HD-710 terminal ISDN interface to access Swift64 Mobile ISDN services over the satellite network are listed below:

- A EURO ISDN terminal adapter or router
- An account with an Inmarsat Service Provider
- A computer
- Dial-up Networking capabilities

The following sections describe the three main components required for Swift64 Mobile ISDN service using the ISDN interface.

1. Terminal Adapters—ISDN Modem

   Terminal adapters are ISDN devices that function similarly to a modem; they dial and answer calls, and receive and transmit data. They are also referred to as TAs, ISDN cards, or ISDN modems.

   Note: The HD-710 terminal works with Euro S/T ISDN terminal adapters. Inmarsat Swift64 Mobile ISDN service and the HD-710 terminal do not support the North American ISDN variant.

2. ISDN Protocols

   Terminal adapters use ISDN protocols to format data between the ISDN line and the user's computer.

   The HD-710 terminal supports most ISDN protocols that run over a B channel on an ISDN line; however, it does not actually implement any of these protocols. The operating system of the user's computer implements the protocols.

3. ISDN Line

   This ISDN satellite link acts similarly to an ISDN landline providing the same service, but it supports only a single B channel and emulates the D channel.

   The B channel transmits data the same as an ISDN landline; it sends data at 64 kbps with full duplex. The MES translates the 16 kbps D Channel into an Inmarsat Mobile ISDN signaling system.

   Despite the differences between landline ISDN and the Inmarsat Mobile ISDN link, most ISDN applications run successfully over the Inmarsat network.

(b) Using the Ethernet Interface for Inmarsat Mobile ISDN

The basic requirements for using an HD-710 terminal Ethernet interface to access Swift64 Mobile ISDN services over the satellite network are listed below:

- A Point-to-Point Protocol over Ethernet (PPPoE) compatible router. All optional devices must be PPPoE compatible.
- An account with an Inmarsat Service Provider.
- A computer with PPPoE driver installed. PPPoE is the protocol most commonly used by Digital Subscriber Line (DSL) devices; it establishes the connection of the session and the exchanges of PPP frames over Ethernet.
- Dial-up Networking capabilities.

(3) Connecting to Inmarsat MPDS

MPDS service over the satellite network is available through two Ethernet (10BASE-T) physical connections.

(a) Using the Ethernet Interface

Connections using MPDS over the HD-710 terminal Ethernet port require the following:

- A PPPoE driver installed. PPPoE is the protocol most commonly used by Digital Subscriber Line (DSL) devices; it establishes the connection of the session and the exchanges of PPP frames over Ethernet.

- An activated account with an Inmarsat Service Provider that supports MPDS services
- A computer with an Ethernet port
- Dial-up Networking capabilities/Web browser
- Optional devices (e.g. router) must be PPPoE compatible

(b) Optimizing the System for MPDS

Any of the following options will optimize your system for MPDS. The more options you implement, the better your MPDS service becomes.

- Reduce the amount of unnecessary traffic. Ensure that the router configuration disables unnecessary Local Area Network (LAN) messages.
- Increase the window size in TCP/IP.
- Use DNS caching and Web caching. When using DNS and Web caching, the server only retrieves from the Internet IP addresses and Web pages not stored in the server cache.

  Note: DNS caching and Web caching is effective when using a LAN configuration on the aircraft. For stand-alone computers, use a personal Web browser cache.

To optimize your e-mail client when using MPDS, implement as many of the following options as possible.

- Compress attachments (zip files)
- Under Tools, in the Options of your e-mail client (e.g. Outlook®, Eudora®), customize the settings for MPDS based on the recommendations below:
  - Disable the read receipt option
  - Send messages in text format instead of HTML format and disable signatures to reduce message size
  - Disable the “automatic download of message when in viewing panel” feature
  - Increase the time period for automatic mail checks to reduce traffic
  - Use IMAP4 mail protocol to allow for header retrieval only
  - Disable the “Save copy of send messages in the 'Sent Items' folder” option

(c) Bonding Channel Cards in Two-Channel Card Systems

This section provides, as an example, detailed instructions on how to make bonded calls with an HD-710 terminal using a DIVA T/A ISDN modem.

Bonded calls are possible with HD-710 terminals. Bonded calls utilize both 64 kbps channels to provide a single 128 kbps data channel. The terminal adapter or router places two separate calls to combine the data transfer over both channels.

Although bonded calls provide a single 128 kbps channel, the actual link capacity is application and protocol dependant. Throughput on a Multilink PPP TCP/IP connection is typically 80 to 90 % of the link capacity (running Windows 2000®).

The system can only make internally bonded calls if both channels are available. If another device is using one of the B Channels, then the data call proceeds—but as a single channel call.

If a bonded call is in progress, (using both B channels) the system is busy and denies all other calls until a channel is free.

INSTALLATION

1. Introduction

This section describes the procedures required to install HD-710 terminals on an aircraft, including the following sections:

- Advisories
- Pre-Installation Inspection
- Mechanical Installation
- Electrical Installation
- Installation and Engineering Diagrams

2. Advisories

Before performing any installation procedures, read "Safety Advisories" on page INTRO-7.

3. Pre-Installation Inspection

Before installing any HD-710 equipment, conduct a pre-installation inspection of all parts to ensure that no damage occurred during shipping.

A. Unpacking and Inspecting Equipment

- Unpack the HD-710 terminal(s) from the shipping container(s).
- Verify that the part number displayed on the shipping box and equipment component matches the model and part number ordered. If components are missing from the shipment, contact the supplier or Honeywell Product Support immediately and report the problem.
- Visually inspect the terminal for any shipping damage. If any shipping damage has occurred, contact the shipping carrier immediately and report the problem.
- Check the HD-710 terminal connectors for corrosion and damage. If damage is noted, do not apply power to the terminal. Contact the supplier or Honeywell Product Support immediately and report the problem.

B. Cabling Notes

Before proceeding with the installation of the HD-710 terminal, read all cabling notes provided on the HD-710 Terminal System Interconnection Diagram (refer to Figure 3–7 and Figure 3–8).

(1) Cabling

When installing the HD-710 terminal, follow the cabling requirements listed below:

- Maximum recommended cable length should not exceed 50 feet.
- LAN cables must meet flammability, TIA/EIA568-A CAT 5 requirements, and conform to ARINC 628 specifications.
- Wire size recommendations:
  - For +28 V dc HOT (BP2), +28 V dc RTN GND (BP3), 115 V ac COLD (BP7), and Chassis GND (BP8), use 12 AWG
  - For 115 V ac HOT (BP1), use 20 AWG
  - Unless otherwise specified, for signaling use 22 AWG

(2) Coaxial Cable Loss Considerations

When installing HD-710 terminals, consider the following coaxial cable loss requirements:

- Transmit cable: Maximum loss is 2.5 dB including DLNA (typically <0.8 dB), as per ARINC 741. In installations that use a high power relay, the high power relay loss must be included.

4. Mechanical Installation

This section describes the mechanical installation requirements for the HD-710 terminals. The Outline and Installation drawing is provided at the end of this section, in Figure 3–5 and Figure 3–6.

A. General

This section contains the information required to plan the physical placement of the HD-710 terminals.

The Terminal Installation and Outline Drawings, as shown in Figure 3–5 and Figure 3–6, illustrate the physical and mechanical specifications of the HD-710 terminal.

In typical aircraft installations, the HD-710 terminal assembly fits into standard ARINC, 8-MCU HPA mounting trays.

B. Physical Placement

When selecting a location for the HD-710 terminal, allow for adequate spacing for the installation while providing reasonable access for servicing. Leave a minimum gap of 0.5 inches between LRUs.

C. Environmental Requirements

The environmental requirements that must be considered during the physical placement of the HD-710 terminals are based on the RTCA/DO-160D Environmental Specifications detailed in "System Description" on page 1-1.

The standard mounting trays for the HD-710 terminal offer a number of fan configuration options depending on the physical placement of the LRU in the aircraft.

(1) Heating and Cooling

Refer to "System Description" on page 1-1 for a complete listing of the RTCA/DO-160D Environmental Specifications for the HD-710 terminals.

When selecting an installation location for the HD-710 terminal, consider the heating and cooling requirements listed below:

- Power Dissipation (AC/DC models): 275 Watts nominal, 400 Watts maximum
- Cooling Air: per ARINC 600
- Recommended Flow rate: 185 lbs/hr
- Pressure drop: 5 ±3 mm (0.07 ±0.025 in.) H_2O

(2) Fan Tray Requirements

WARNING: FAILURE TO INSTALL AND CONFIGURE THE FAN TRAY ASSEMBLY AS INSTRUCTED MAY SERIOUSLY COMPROMISE THE HD-710 TERMINAL'S EXTREME TEMPERATURE OPERATION.

Fan tray assemblies may be shipped with or without hole-plug-buttons installed. For adequate airflow to the HD-710 terminal subassemblies, the plugs must be installed or removed in the fan/tray configuration as illustrated in Figure 3-1.

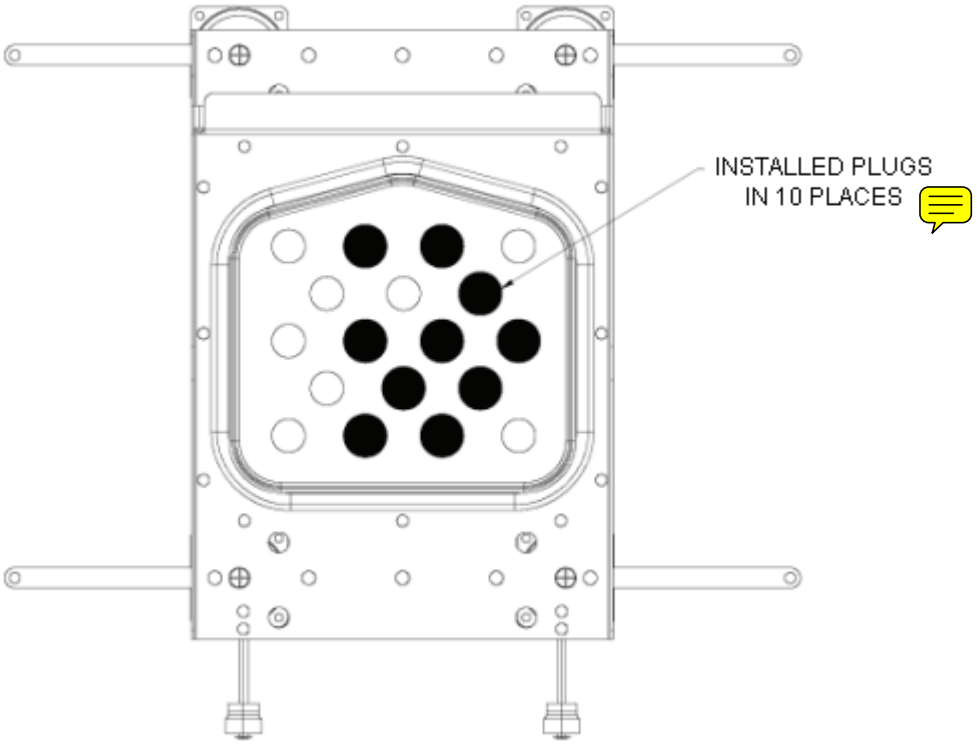


Figure 3-1. Fan Tray Plug Configuration (black = installed, white = removed)

D. Chassis Grounding

The HD-710 terminal tray-mounted assemblies must be electrically bonded to the airframe. Ensure the mating surfaces are free from contaminants such as paints or other non-conductive elements. Where surface preparations are insufficient to ensure a proper bond, the use of a short, tin-coated, copper bonding strap of at least 6.35 mm (0.25 in.) wide is recommended. The LRU and tray assemblies should provide a low impedance path of <0.2 ohms.

5. Electrical Installation

This section provides electrical installation details for HD-710 terminals. This section is divided into sub-sections that provide the wiring details for the currently supported modes of operation.

A. Combined Mode Installation

This section provides detailed information on the external interface and system connections involved in the installation of an HD-710 terminal in Combined Mode.

Note: All connections, except power and RF, are HD-710 terminal specific. Refer to other satcom and antenna manufacturers' installation documentation for interconnection wiring details.

(1) Combined Mode Maintenance Port Interface

The HD-710 terminal has an RS-232 Maintenance Port interface that provides access to the Maintenance Port Utility (MPU) for data loading, system monitoring, and testing purposes.

Access to the HD-710 terminal MPU is achieved by connecting an RS-232, VT-100 terminal (PC or Laptop operating a terminal emulation program) to the RS-232 Maintenance Port.

The HD-710 terminal Maintenance port is available at the front of the HD-710 terminal and at the rear ARINC 600 connector. Connection on the front of the HD-710 terminal is accessible via a DB25S connector for local maintenance of the terminal. Remote access is provided for cases where local access is unavailable. For remote access, install an accessible DB9S connector in the cabin area.

Note: The front panel and remote connections to the maintenance port cannot be used simultaneously.

Refer to "Test and Fault Isolation" on page 4-1 for information on how to connect and use the maintenance port, including equipment requirements, connection and cabling requirements, software loading instructions, and configuration details.

(2) Combined Mode Antenna Subsystem RF Interface

Several external RF parameters (such as cable losses and antenna gain), that must be delimited to ensure proper operation, dictate the HD-710 terminal performance requirements.

Table 3-1 defines the RF parameters and their expected values.

Table 3-1. RF Parameters Definitions

Parameter	Min. Value (DB)	Max. Value (DB)
Antenna Gain	8	17
Antenna-DLNA Loss	0.1	0.3
DLNA Gain	53	60
DLNA Noise Figure	1.5	1.8
DLNA-HD-710 terminal (Rx) Loss	6	25

Table 3-1. RF Parameters Definitions (Continued)

Parameter	Min. Value (DB)	Max. Value (DB)
HD-710 terminal-Antenna (Tx) Loss	1	2.5 (including DLNA loss)
DLNA Insertion Loss (Tx to Antenna Port)	–	0.8

(3) Combined Mode WOW Pin Wiring

In Combined Mode installations, WOW1, WOW2, and WOW Program Select are reserved for future use. Table 3-3 shows the pin wiring.

(4) Combined Mode Forward and Return Address IDs

Figure 3-2 provides an example of a Forward ID address. The Forward ID is a Hex number (example: ABC123) that must be converted into a binary number for strapping.

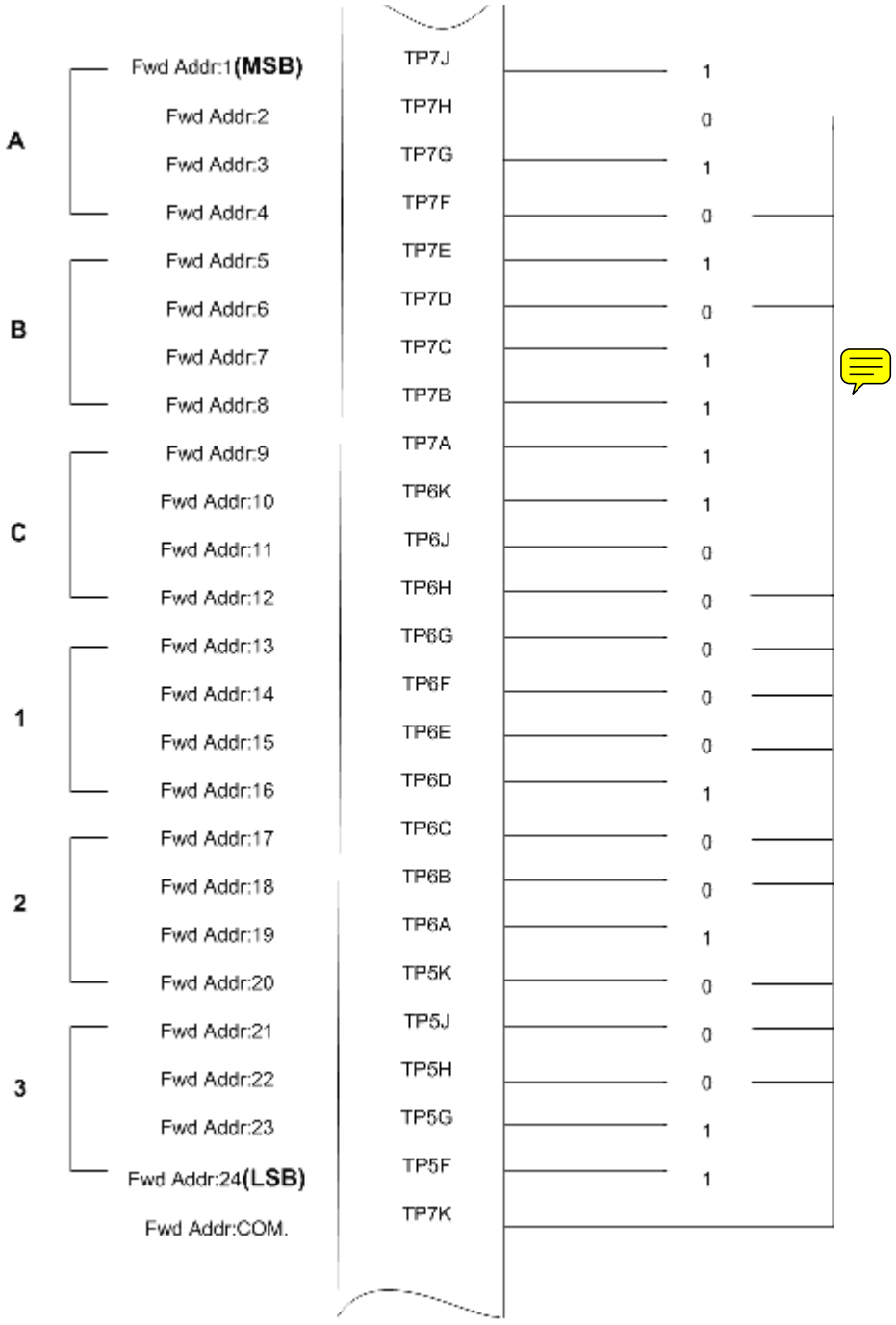


Figure 3-2. Forward ID, Hex to Binary Conversion

A pin strapped to the same potential as T7K (Forward address common) is considered as a logical “0”, whereas an open circuit pin is considered as a logical “1”.

Note: MSB is the Most Significant Bit and LSB is the Least Significant Bit.

(5) Combined Mode Remote Status Panel (Optional)

An optional “remote status panel” may be installed when the HD-710 terminals are located in inaccessible or remote locations. The installation of a “remote status panel” is recommended as it provides visual indications of the power and faults for each terminal.

A “remote reset switch” for HD-710 terminals can also be installed and located with the Remote Status Panel.

(a) Remote LED Driver Circuit Requirements

The circuit requirements for the HD-710 terminal Remote Status LED drivers are shown in Figure 3-3. Each LED driver circuit provides an open-drain FET (Field-Effect Transistor) interface that has a maximum continuous drain-to-source voltage of 35 V dc and drain-to-source current of 0.5 A dc. These circuits are designed to sink current to ground only. Any external lamps or LEDs connected to these driver circuits require the appropriate external voltage and series impedance to be connected.

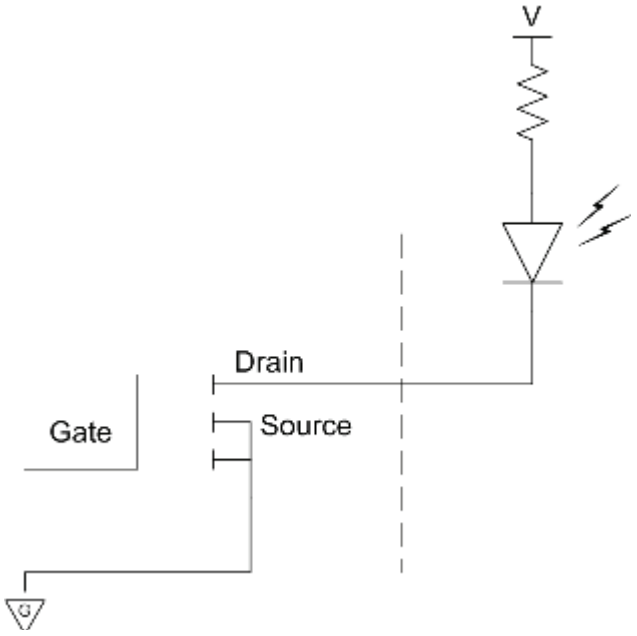


Figure 3-3. Remote LED Panel Circuit

(6) Combined Mode User Interfaces

To facilitate user access to the HD-710 terminal interfaces, install the following connectors in the appropriate cabin area.

(a) ISDN Interface

Install an RJ-45 connector in the cabin area for user connections to the ISDN interface.

(b) Ethernet Data Interface

Install one or two RJ-45 interface connectors in the cabin area for user access to the Ethernet interfaces.

(c) RJ-45 Connector Termination Details

Details relating to the RJ-45 cable terminations, required for both the ISDN and/or 10BASE-T services, are shown in Table 3-2 and Figure 3-4.

Table 3-2. RJ-45 Wiring Details

SIGNAL	Service					
	EURO ISDN			ETHERNET 10BASE-T		
	PIN	CABLE		PIN	CABLE	
		ECS	OTHER		ECS	OTHER
RX +	3	White	White/Green	3	White	White/Orange stripe
RX	6	Blue	Green	6	Green	Orange/White stripe or solid Orange
TX+	4	White	Blue	1	White	White/Green stripe
TX	5	Orange	White/Blue	2	Brown	Green/White stripe or solid Green

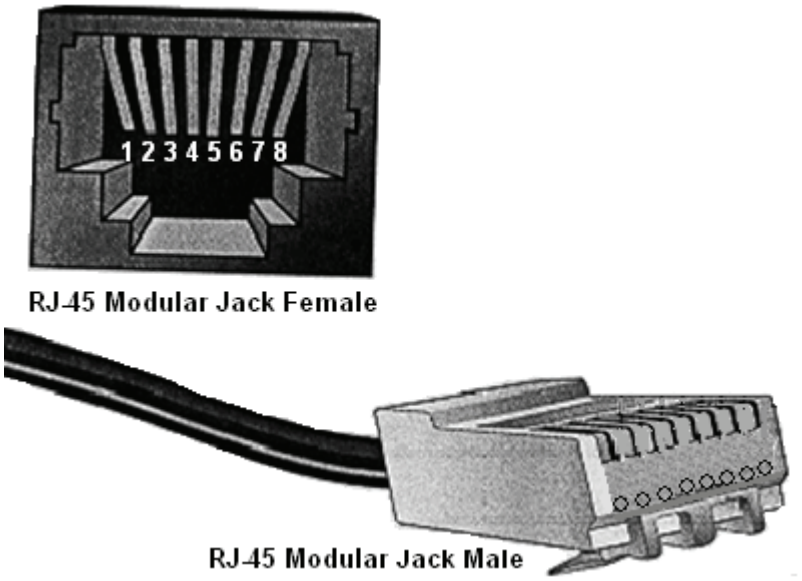


Figure 3-4. RJ-45 Connector Terminator Details

Use LAN cables that meet flammability and TIA/EIA568-A CAT-5 requirements. Cables #922404 (4 conductor) and # 922408 (8 conductor), as supplied by Electronics Cable Specialists, are acceptable. Equivalent substitutions from other manufacturers may be used.

(d) System Configuration Pin Strapping

The HD-710 terminal adjusts its configuration according to the status of several strap pins on the rear ARINC 600 connector.

Configuration pins are assigned based on system mode configuration selection and data input/output (I/O) requirements as shown in Table 3-3. Detailed pin assignment is shown in Table 3-4.

Table 3-3. Configuration Pin Summary

Pin #	Name	Function
TP4A to D	System Config #1 to #4	System Mode
TP4E to H	System Config #5 to #8	Not assigned (set to “1”)

Note: The logic for the System Configuration pins is reverse to the logic explained in ARINC 741 Characteristic Attachment 1-4, Note 19.

- Pins marked “0” are signaled by strapping to “Fwd Address Common” (T7K).
- Pins marked “1” are signaled by an open circuit-no connection.
- Configurations resulting in all ones (“1") are invalid.

(e) System Mode Strap Pins Coding

The HD-710 terminal must be externally strapped according to its intended operational configuration mode. Table 3-4 illustrates the system pin strapping for currently supported HD-710 terminal operational modes and configurations.

Table 3-4. System Pin Strapping

	Pin Status			
System Modes	TP4A	TP4B	TP4C	TP4D
	1	2	3	4
INVALID	1	1	1	1
Combined	1	1	1	0

Note: The logic for the System Configuration pins is reverse to the logic explained in ARINC 741 Characteristic Attachment 1-4, Note 19.

- Pins marked “0” are signaled by strapping to “Fwd Address Common” (TP7K).
- Pins marked “1” are signaled by an open circuit—no connection.
- Configurations resulting in all ones (1) are invalid.

(f) User Data I/O Mode Pin Strapping

Data I/O strapping is no longer required.

(7) Combined Mode ARINC 429 IRS Bus Interface

In Combined Mode installations, navigational information is provided to the HD-710 terminal through the high-speed ARINC 429 IRS bus interface. Refer to "System Description" on page 1-1 for more information. The IRS bus connects through the top plug of the ARINC 600 connector to the HD-710 terminal as follows:

- IRS A to TP4J
- IRS B to TP4K

(8) Combined Mode Antenna Interface

The SATCOM Aero H/H+ system provides the interface to the antenna. Refer to Honeywell documentation for specific details.

(9) Rx RF Splitter and Tx RF Combiner

An RF splitter is provided for the Rx RF signal, which is received on ARINC 600 connector pin BP12 (HD-710 terminal input from DLNA). This splitter splits the Rx RF signal between the internal HD-710 terminal channel modules and the output to the SDU; the latter signal is on ARINC 600 connector pin BP13 (HD-710 terminal output to SDU).

The interface on these pins has the following characteristics:

- Frequency Band: 1530–1559 MHz
- RF Power Range: -23 to -74 dBm within the frequency band
- Insertion Loss: 7 dB (BP12 to BP13)
- Cable and Connector: Per ARINC 600 Attachment 19 Figure 19-60.2
- VSWR: 2.0: 1 maximum
- Characteristic Impedance:50 ohms

The insertion loss is sized to prevent adverse ripple under conditions where the SDU port of the splitter is not terminated. This insertion loss reduces the SDU receive path attenuation due to cable loss from a maximum of 25 dB to 18 dB.

A Tx RF combiner is integrated in the HD-710 terminal. This combines the L-band output from the SDU (received on ARINC 600 connector pin TPC1) and the HD-710 terminal's own channel cards to the HPA component.

(a) Installing an External RF Splitter (optional)

Refer to Figure 3–7 and Figure 3–8 for cabling details. Table 3-5 shows a list of the required cable assembly parts. Substitutions using different parts of equivalent functionality are acceptable.

Note: Before installing the RF splitter, read all of the steps included in the following splitter installation procedure.

Note: Actual splitter mounting location may vary depending on the placement of the existing RFU and HPA assemblies.

Table 3-5. Cable Assembly Parts

Item	Manufacturer Part Number	EMS SATCOM Part Number	Description
RF Splitter	ZAPD-2-TNC	32800004	Mini-Circuit, 2-way 0°, TNC, Splitter
Receive Coax	432101	-	ECS, Coax Cable, 0.130 O.D., 50 ohms, 17.5 dB/100 ft @ 1.5 GHz
Connector (@ Splitter)	CTS522	-	ECS, TNC, Straight Plug
Connector (@ BP12)	P522	-	ECS, ARINC 600, Size 5, Socket

To install the RF Splitter:

1. Determine a suitable location near the RFU to secure the splitter.
2. Cut the receive coax cable at the splitter mounting location.
3. Re-terminate the cut ends with TNC coax connectors.
4. Connect the end coming from the antenna subsystem to the splitter input (S) connector.
5. Connect the end going to TPC1 of the RFU to one of the output ports of the splitter, one or two.
6. Run a new coax cable (length is installation specific) from the unused splitter output port to BP-12 of the ARINC 600 connector of the HD-710 terminal tray assembly.

(10)Combined Mode Connection Details

The tables in this section provide all top, middle, and bottom plug connection details for Combined Mode installations.

Table 3-6. Combined Mode ARINC 600 Top Plug Connection Details

I/O	From Top Plug	Signal Name	To	Description
I/O	1A to 1D	Multi-Control IN and BITE OUT	As per avionics manufacturer's documentation	Multi-Control and BITE
I	2A	BSU Top/Port BITE A	SDU, MP7G	ARINC Tx-HI BITE From Top/Port BSU
I	2B	BSU Top/Port BITE B	SDU, MP7H	ARINC Tx-LO BITE From Top/Port BSU

Table 3-6. Combined Mode ARINC 600 Top Plug Connection Details (Continued)

I/O	From Top Plug	Signal Name	To	Description
I	2C	BSU STBD BITE A	Mechanically Steered Antenna[1] (MA): Not required Other Antenna[2] (OA): SDU, MP7J	ARINC Tx-HI BITE From STBD BSU
I	2D	BSU STBD BITE B	MA: Not required OA: SDU, MP7K	ARINC Tx-LO BITE From STBD BSU
I	3A to 3D	HPA MUTE	MA: Not required As per avionics manufacturer's documentation	HPA Mute-A & B to BSU
I	2K	Remote Reset	Normally Open momentary switch—open side (Closed side to MP1F)	Remote System Reset (Optional)
I	3G	WOW 1	TP3G	Weight On Wheel, as defined in Note 40 of ARINC 741
I	3K	WOW2	TP3K	
I	3J	WOW Program Select	TP3J	
I	4A to 4D	System Config 1 to 4		System Mode Configurations
I	4F to 4H			Reserved
I	4J	IRS-A	Aircraft main IRS	IRS 429 Data, Rx HI
I	4K	IRS-B	Aircraft main IRS	IRS 429 Data, Rx LO
I	5A, 5B, & 5D	SDI 1, SDI 2, & SDI Common	As per avionics manufacturer's documentation	HPA Select Code for HGA
I	5F	FWD Address, BIT 24 (LSB)	1=no connection, 0=Common (TP7K)	Six digit Hex ID assigned by Inmarsat / Honeywell
I	5G	FWD Address, BIT 23	1=no connection, 0=Common (TP7K)	
I	5H	FWD Address, BIT 22	1=no connection, 0=Common (TP7K)	
I	5J	FWD Address, BIT 21	1=no connection, 0=Common (TP7K)	
I	5K	FWD Address, BIT 20	1=no connection, 0=Common (TP7K)	
I	6A	FWD Address, BIT 19	1=no connection, 0=Common (TP7K)	
I	6B	FWD Address, BIT 18	1=no connection, 0=Common (TP7K)	

Table 3-6. Combined Mode ARINC 600 Top Plug Connection Details (Continued)

I/O	From Top Plug	Signal Name	To	Description
I	6C	FWD Address, BIT 17	1=no connection, 0=Common (TP7K)	
I	6D	FWD Address, BIT 16	1=no connection, 0=Common (TP7K)	
I	6E	FWD Address, BIT 15	1=no connection, 0=Common (TP7K)	
I	6F	FWD Address, BIT 14	1=no connection, 0=Common (TP7K)	
I	6G	FWD Address, BIT 13	1=no connection, 0=Common (TP7K)	
I	6H	FWD Address, BIT 12	1=no connection, 0=Common (TP7K)	
I	6J	FWD Address, BIT 11	1=no connection, 0=Common (TP7K)	
I	6K	FWD Address, BIT 10	1=no connection, 0=Common (TP7K)	
I	7A	FWD Address, BIT 9	1=no connection, 0=Common (TP7K)	
I	7B	FWD Address, BIT 8	1=no connection, 0=Common (TP7K)	
I	7C	FWD Address, BIT 7	1=no connection, 0=Common (TP7K)	
I	7D	FWD Address, BIT 6	1=no connection, 0=Common (TP7K)	
I	7E	FWD Address, BIT 5	1=no connection, 0=Common (TP7K)	
I	7F	FWD Address, BIT 4	1=no connection, 0=Common (TP7K)	
I	7G	FWD Address, BIT 3	1=no connection, 0=Common (TP7K)	
I	7H	FWD Address, BIT 2	1=no connection, 0=Common (TP7K)	
I	7J	FWD Address, BIT 1 (MSB)	1=no connection, 0=Common (TP7K)	
I	7K	FWD Address, Common		Common GND connection for system and I/O configuration and FWD ID

Table 3-7. Combined Mode ARINC 600 Middle Plug Connection Details

I/O	From Middle Plug	Signal Name	To	Description
O	1A	Discrete 1	Remote Status Panel	
O	1B	Discrete 2	Remote Status Panel	
O	1F	Discrete Common	Remote Status Panel	Discrete Common
O	1G	Maint Port Tx	Maint Port serial data, DB9S-2	Maintenance Laptop/PC, for "Remote" access
I	1H	Maint Port Rx	Maint Port serial data, DB9S-3	
	1J	Maint Port Signal GND	Maint Port serial data, DB9S-5	
O	2A	Data I/O Tx	Satcom Configuration Module (SCM)	User Mobile Packet Data (MPDS), RS-232, DTE-1A
I	2B	Data I/O Rx	SCM	
I	2C	SDU data to SCM A	SCM	
O	2D	SDU data to SCM B	SCM	
I	2E	SCM data to SDU A	SCM	
O	2F	SCM data to SDU B	SCM	
O	2G	SCM Power +12 V	SCM	
O	2H	SCM Power Return 0 V	SCM	
I/O	2J	DIO GND	SCM	
I	6A	BRI RX+	RJ45-3	User Data, ISDN–1 Refer to User Interfaces
I	6B	BRI RX-	RJ45-6	
O	6C	BRI TX+	RJ45-4	
O	6D	BRI TX-	RJ45-5	
I	5G to 5K			Reserved
I	6G	10BASE-T Rx +	Ethernet 10BASE-T, RJ45-1	User Data, Ethernet 10BASE-T (Available in models 1252-A-1561, 1252-A-1501, and in terminals with Service Bulletin 1110-SB-0004 accomplished)
	6H	10BASE-T Rx -	Ethernet 10BASE-T, RJ45-2	
	6J	10BASE-T Tx +	Ethernet 10BASE-T, RJ45-3	
	6K	10BASE-T Tx -	Ethernet 10BASE-T, RJ45-6	
I	4G	BRI Rx+	ISDN, RJ45-3	User Data, ISDN–2 (Provisional)
I	4H	BRI Rx-	ISDN RJ45-6	
O	4J	BRI Tx+	ISDN, RJ45-4	
O	4K	BRI Tx-	ISDN, RJ45-5	

Table 3-7. Combined Mode ARINC 600 Middle Plug Connection Details (Continued)

I/O	From Middle Plug	Signal Name	To	Description
I	7A	10BASE-T Rx+	Ethernet 10BASE-T, RJ45-3	User Data, Ethernet 10BASE-T (Available in models 1252-A-1561, 1252-A-1501, and in terminals with Service Bulletin 1110-SB-0004 accomplished)
I	7B	10BASE-T Rx-	Ethernet 10BASE-T, RJ45-6	
O	7C	10BASE-T Tx+	Ethernet 10BASE-T, RJ45-1	
O	7D	10BASE-T Tx-	Ethernet 10BASE-T, RJ45-2	
O	C1	RF Tx Output	Antenna Subsystem-DLNA	Coax Cable, RF Transmit

Table 3-8. Combined Mode ARINC 600 Bottom Plug Connection Details

I/O	From Bottom Plug	Signal Name	To	Description
I	2	+28 V dc HOT	Aircraft Power Source, HOT	+28 V dc supply
I	3	+28 V dc Rtn GND	Aircraft Power Source, Rtn	
I	8	Chassis GND	Aircraft Ground	Aircraft Chassis Ground
I	1	115 V ac HOT	Aircraft Power Source, HOT	115 V ac 400 Hz supply
I	7	115 V ac COLD	Aircraft Power Source, COLD	
I	12	RF Rx Input	RF Rx Splitter output port	RF Receive from Antenna Subsystem

6. Installation and Engineering Diagrams

This section contains the Outline and Installation drawings and Interconnection and Contact Assignment diagrams for HD-710 terminals.

A. Outline and Installation Diagrams

Figure 3–5 and Figure 3–6 illustrate the physical characteristics of the HD-710 terminal and provides installation data for the terminal.

All foldout pages are odd-numbered and “not-backed” for print production purposes.

B. Interconnection and Contact Assignment Drawings

Figure 3–7 illustrates the interconnection details for HD-710 terminals.

Figure 3–8 provides the contact assignments for HD-710 terminals.

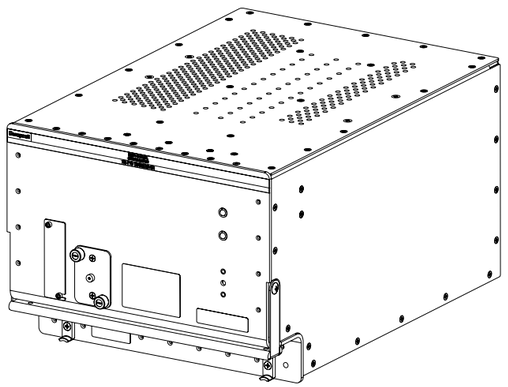
All foldout pages are odd-numbered and “not-backed” for print production purposes.

NOTES:

1. THIS UNIT MEETS THE DIMENSIONAL REQUIREMENTS OF ARINC SPECIFICATION 600-13.
2. MAXIMUM WEIGHT IS 15.7 kg (34.7 LBS).
3. APPROXIMATE CENTER OF GRAVITY IS INDICATED BY ⊕.
4. THIS UNIT SHALL BE INSTALLED IN AN 8 MCU TRAY. PER ARINC 600-13 SPEC.
5. COOLING AIR REQUIREMENTS PER ARINC 600:
   -FLOW RATE : 88 kg/hr
   -PRESSURE DROP: 5 ±3 mm OF WATER.

TABLE 1. VARIANTS

TRANSCEIVER MODEL	CHANNELS	OPERATION MODE	ASSEMBLY PART NO.	INTERCONNECTION DIAGRAM
HD-710	2	COMBINED	1252-A-3600-01	1252-B-3501



3D VIEW

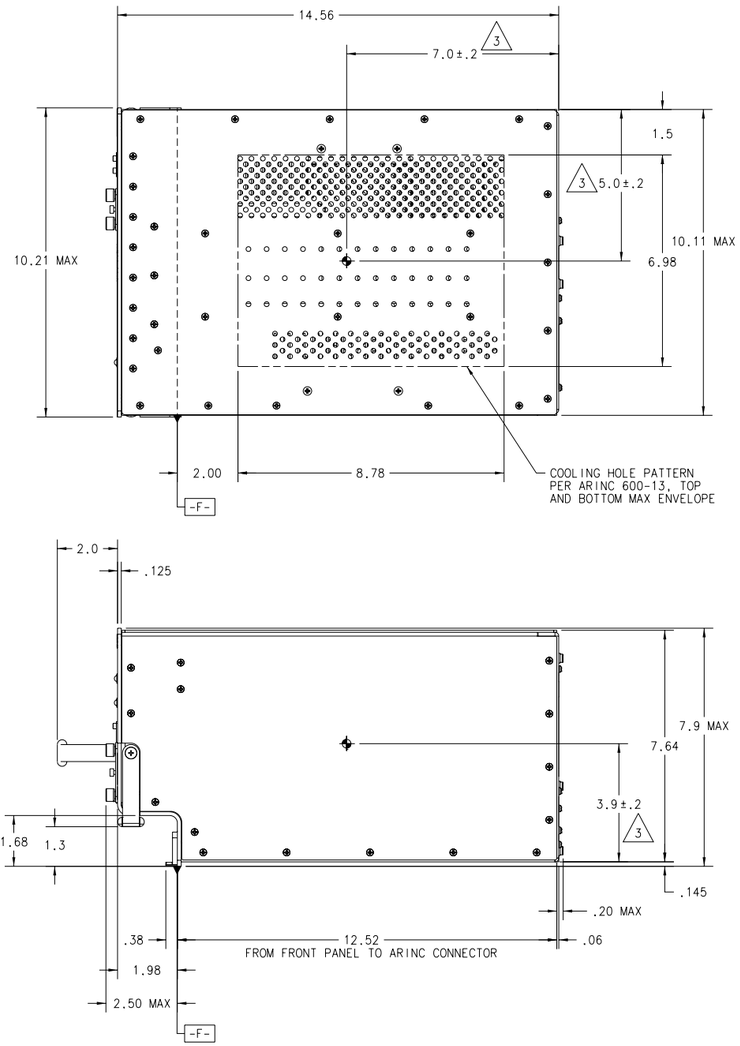


Figure 3–5 (Sheet 1). HD-710 Terminal Outline and Installation Drawing (1252-E-3600, Rev A)

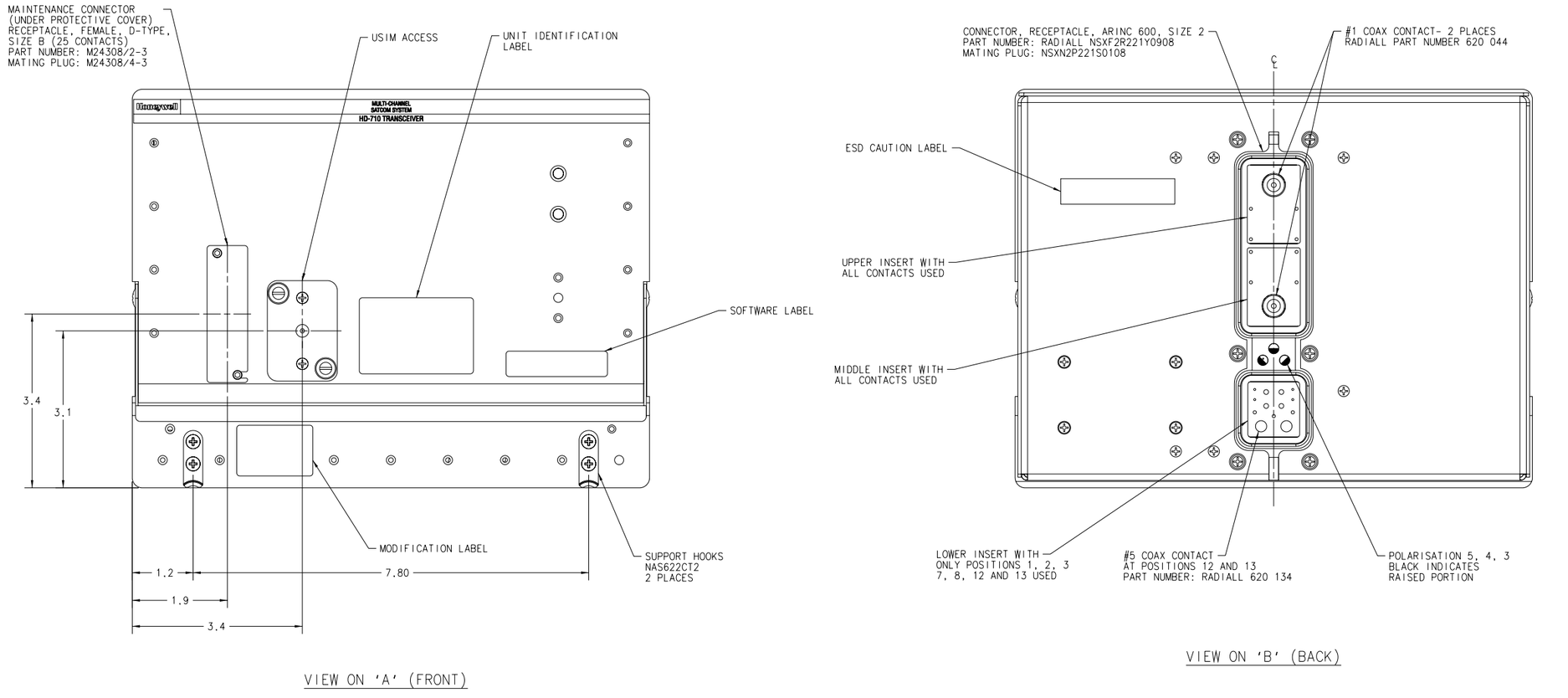


Figure 3–6 (Sheet 2). HD-710 Terminal Outline and Installation Drawing (1252-E-3600, Rev A)

NOTES:

1. TRANSMIT CABLE: MAX LOSS: 2.5dB INCLUDING LNA/DIPLEXER PER ARINC 741.
2. RECEIVE CABLES: MAX COMBINED LOSS: 0-18dB. THE HD-710 COMPRISES AN INTERNAL RF SPLITTER HAVING 6-7dB OF ADDITIONAL LOSS.
3. THE HD-710 24-BIT FWD ID ADDRESS SHALL BE WIRED AS FOLLOWS: PINS MARKED "0" SHALL BE CONNECTED TO FWD ID COMMON PIN TP7K. PINS MARKED "1" SHALL BE LEFT OPEN.
4. SYSTEM CONFIG 1 THRU SYSTEM CONFIG 4 DEFINE HD-710 SYSTEM CONFIGURATION PER TABLE 1.
5. REMOVED.
6. WIRE SIZE SPECIFICATIONS:
   - +28 VDC HOT (BP2), +28V RTN GND (BP3), 115 VAC COLD (BP7) AND CHASSIS GND (BP8) SHALL BE 12 AWG.
   - 115 VAC HOT (BP1) SHALL BE 20 AWG.
   - UNLESS OTHERWISE SPECIFIED ALL SIGNAL WIRES SHALL BE 22 AWG.
7. ROW (1) NOMENCLATURE, AS PER EMS ANTENNA CONTROL UNIT (ACU). OTHER ACU OR BEAM STEERING UNIT (BSU) MANUFACTURERS MAY USE THOSE OF ROW (2).
8. IN WOW PROGRAM SELECT (TP3J) SHALL BE STRAPPED TO FWD ID COMMON (TP7K) IF IN WOW (TP3G AND TP3K) IS OPEN WHEN ON THE GROUND, OTHERWISE DO NOT CONNECT IN WOW PROGRAM SELECT.
9. MAXIMUM SUGGESTED CABLE RUN SHOULD NOT EXCEED 50 FEET.
10. CONFIG PIN WIRING IS RECOMMENDED BUT OPTIONAL BECAUSE FUNCTIONALITY IS PROGRAMMABLE AND HAS SOFTWARE OVERRIDE. FOR ADDITIONAL CONFIG PIN WIRING DETAILS, REFER TO THE HD-710 SYSTEM DESCRIPTION AND INSTALLATION MANUAL EMS-MN-1252-11153.
11. LAN CABLES MUST MEET FLAMMABILITY AND TIA/EIA568-A CAT 5 REQUIREMENTS. CABLES 922404, 4 COND. AND 922408, 8 COND., AS SUPPLIED BY ELECTRONIC CABLE SPECIALISTS ARE ACCEPTABLE.
12. TWISTED SHIELDED PAIRS AS PER ARINC 741 WIRING REQUIREMENTS OR EQUIVALENT.
13. THESE ANTENNA CONTROL SIGNALS ARE COMMON TO BOTH THE HD-710 TRANSCEIVER AND THE SDU OF THE OTHER SATCOM SYSTEM.
14. REFER TO "OTHER" MANUFACTURER'S INSTALLATION DOCUMENTATION FOR INTERCONNECTION WIRING DETAILS.
15. TRANSMIT CABLE: MAX LOSS: 19-25 dB PER ARINC 741.

TABLE 1. SYSTEM CONFIGURATION STRAPPING (10)

SYSTEM MODE	PIN STATUS			
	TP4A	TP4B	TP4C	TP4D
	1	2	3	4
INVALID	1	1	1	1
RESERVED	1	1	0	1
RESERVED	1	0	1	1
RESERVED	1	0	0	1
RESERVED	0	1	1	1
HCM	1	1	1	0
NOT ASSIGNED	0	0	1	1
RESERVED	0	0	0	1

0=FWD ID COMMON, 1=NO CONNECTION

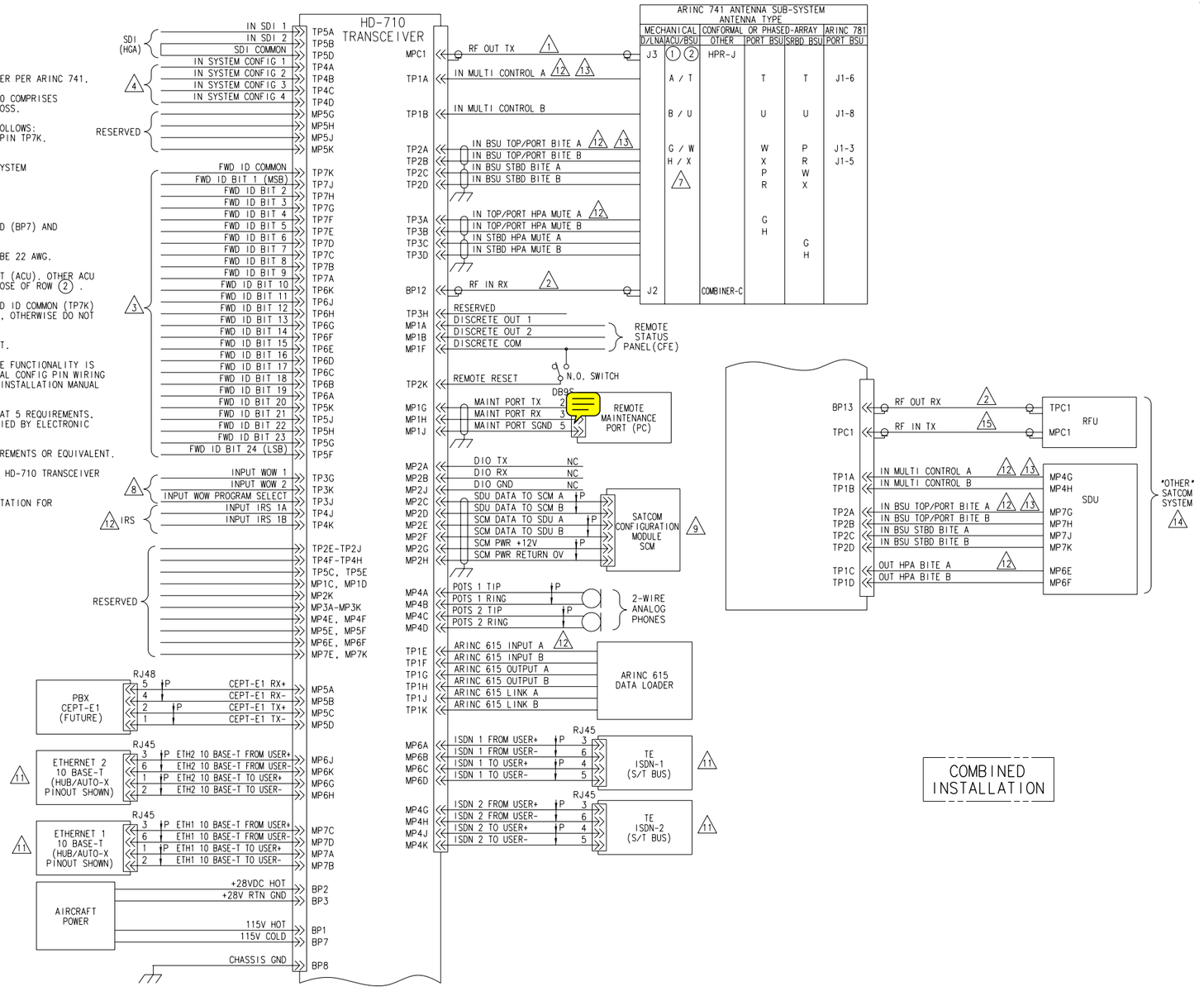
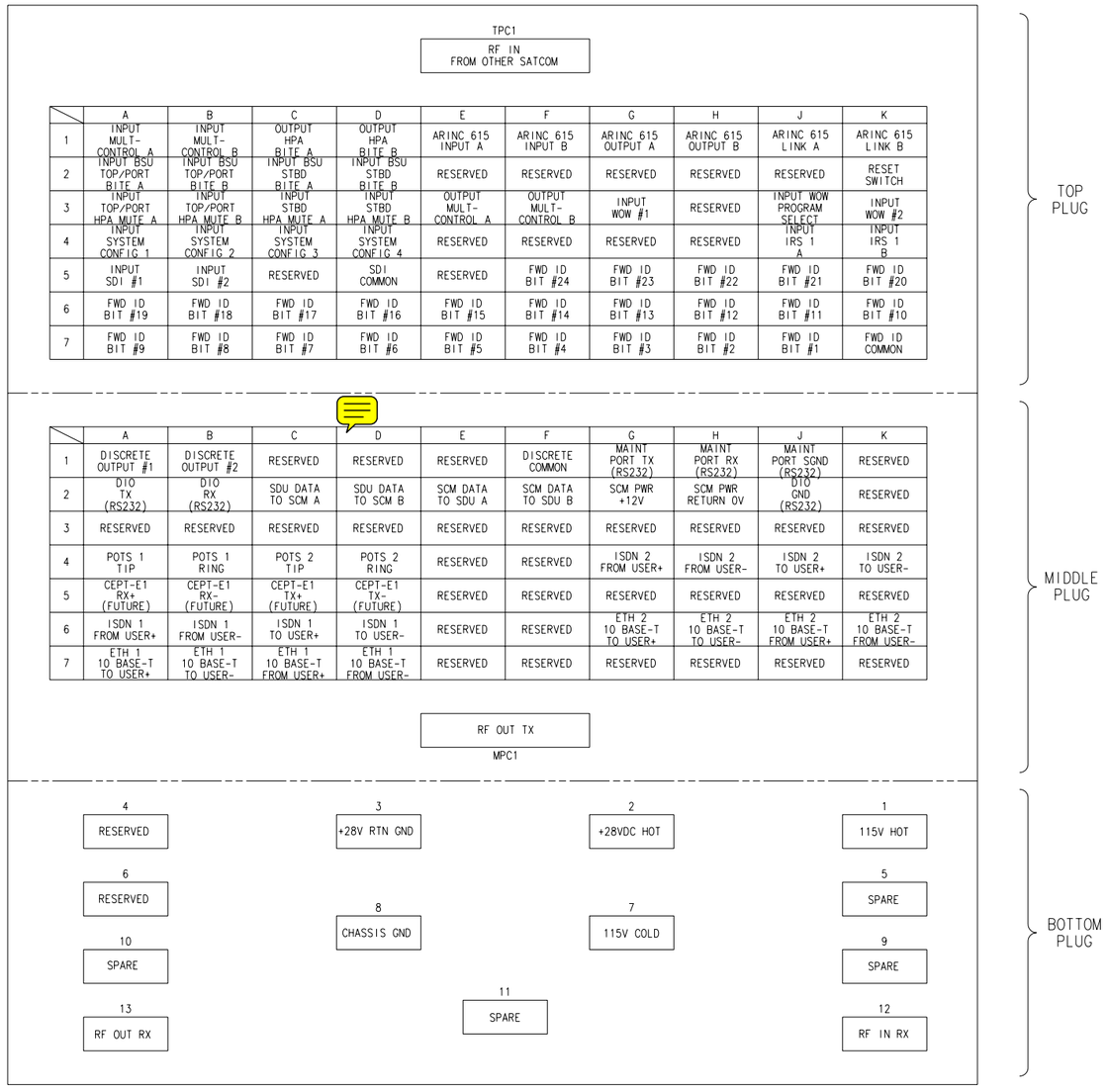


Figure 3–7 (Sheet 1). HD-710 Terminal Interconnection Drawing (1252-B-3501, Rev C)



	A	B	C	D	E	F	G	H	J	K
1	INPUT MULT-CONTROL A	INPUT MULT-CONTROL B	OUTPUT HPA BITE A	OUTPUT HPA BITE B	ARINC 615 INPUT A	ARINC 615 INPUT B	ARINC 615 OUTPUT A	ARINC 615 OUTPUT B	ARINC 615 LINK A	ARINC 615 LINK B
2	INPUT BSU TOP/PORT BITE A	INPUT BSU TOP/PORT BITE B	INPUT BSU STBD BITE A	INPUT BSU STBD BITE B	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESET SWITCH
3	INPUT TOP/PORT HPA MUTE A	INPUT TOP/PORT HPA MUTE B	INPUT STBD HPA MUTE A	INPUT STBD HPA MUTE B	OUTPUT MULT-CONTROL A	OUTPUT MULT-CONTROL B	INPUT WOW #1	RESERVED	INPUT WOW PROGRAM SELECT	INPUT WOW #2
4	INPUT SYSTEM CONFIG 1	INPUT SYSTEM CONFIG 2	INPUT SYSTEM CONFIG 3	INPUT SYSTEM CONFIG 4	RESERVED	RESERVED	RESERVED	RESERVED	INPUT IRS 1 A	INPUT IRS 1 B
5	INPUT SDI #1	INPUT SDI #2	RESERVED	SDI COMMON	RESERVED	FWD ID BIT #24	FWD ID BIT #23	FWD ID BIT #22	FWD ID BIT #21	FWD ID BIT #20
6	FWD ID BIT #19	FWD ID BIT #18	FWD ID BIT #17	FWD ID BIT #16	FWD ID BIT #15	FWD ID BIT #14	FWD ID BIT #13	FWD ID BIT #12	FWD ID BIT #11	FWD ID BIT #10
7	FWD ID BIT #9	FWD ID BIT #8	FWD ID BIT #7	FWD ID BIT #6	FWD ID BIT #5	FWD ID BIT #4	FWD ID BIT #3	FWD ID BIT #2	FWD ID BIT #1	FWD ID COMMON

	A	B	C	D	E	F	G	H	J	K
1	DISCRETE OUTPUT #1	DISCRETE OUTPUT #2	RESERVED	RESERVED	RESERVED	DISCRETE COMMON	MAINT PORT TX (RS232)	MAINT PORT RX (RS232)	MAINT PORT SGND (RS232)	RESERVED
2	DIO TX (RS232)	DIO RX (RS232)	SDU DATA TO SCM A	SDU DATA TO SCM B	SCM DATA TO SDU A	SCM DATA TO SDU B	SCM PWR +12V	SCM PWR RETURN 0V	DIO GND (RS232)	RESERVED
3	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
4	POTS 1 TIP	POTS 1 RING	POTS 2 TIP	POTS 2 RING	RESERVED	RESERVED	ISDN 2 FROM USER+	ISDN 2 FROM USER-	ISDN 2 TO USER+	ISDN 2 TO USER-
5	CEPT-E1 RX+ (FUTURE)	CEPT-E1 RX- (FUTURE)	CEPT-E1 TX+ (FUTURE)	CEPT-E1 TX- (FUTURE)	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
6	ISDN 1 FROM USER+	ISDN 1 FROM USER-	ISDN 1 TO USER+	ISDN 1 TO USER-	RESERVED	RESERVED	ETH 2 10 BASE-T TO USER+	ETH 2 10 BASE-T TO USER-	ETH 2 10 BASE-T FROM USER+	ETH 2 10 BASE-T FROM USER-
7	ETH 1 10 BASE-T TO USER+	ETH 1 10 BASE-T TO USER-	ETH 1 10 BASE-T FROM USER+	ETH 1 10 BASE-T FROM USER-	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED

Figure 3–8 (Sheet 2). HD-710 Terminal Interconnection Drawing (1252-B-3501, Rev C)

TEST AND FAULT ISOLATION

1. General

This section provides the information required to determine the operational readiness of the HD-710 terminals and to aid service personnel in diagnosing system faults, including the following sections:

- Operational and Diagnostic Testing
- Troubleshooting and Fault Isolation
- Adjustment/Alignment Procedures
- Modification History

The operational and diagnostic tests described in this section require using the HD-710 terminals built-in diagnostic tool referred to as the HD-710 terminal Maintenance Port Utility (MPU). This section provides detailed descriptions of the HD-710 terminal MPU menus, reports, and basic user instructions. See "Cabling Notes" on page 4-3 for maintenance port cabling notes.

Note: Depending on the version of software installed, the MPU report and menu screens displayed may differ from those shown as examples in this manual.

2. Operational and Diagnostic Testing

A. General

Usually, terminals require testing for one of the following reasons:

- To verify the operational readiness of the terminal during and after installation on an aircraft
- To verify that a fault exists and produce system reports for troubleshooting purposes
- To verify the operational readiness of repaired LRUs during re-installation on an aircraft

This section presents software loading and test and fault isolation procedures for the HD-710 terminals. All test and load procedures require the HD-710 terminal MPU, which is accessed by connecting to the maintenance port of the terminal.

B. Test and Fault Isolation Equipment Requirements

Table 4-1 lists the equipment required to access the HD-710 terminal MPU and perform operational and diagnostic testing and software loads on the HD-710 terminal.

Table 4-1. List of Required Test Equipment

Item	Equipment	Specification	Quantity
Computer	Standard	VT-100 386 CPU, 20 MHz or higher	1
VT-100 terminal emulation program	HyperTerminal©, ProComm Plus©, or equivalent	Serial communication program using an RS-232 port	1
Cable, maintenance port interface cable	Special See "Connection Requirements" on page 4-3	Remote access maximum cable length 25 ft. (From ARINC 600 connector to DB9 breakout connector) Test cable maximum length 25 ft. (From HD-710 terminal to management computer) Front Panel access maximum cable length 50 ft.	1
Multimeter	Standard	–	1
General purpose toolset	Standard	–	1

Table 4-2 lists the optional equipment or information that, although not required, may increase test efficiency or allow for optional diagnostic procedures. Equivalent substitutions may be used.

Table 4-2. List of Optional Test Equipment

Item	Equipment	Specification	Quantity
Service Provider Information Package	Special	Inmarsat service provider	1
Internet access	Standard	Inmarsat Swift64 high-speed-data	1
Time Domain Refectometer	Standard	–	1

C. Terminal MPU

This section describes the HD-710 terminal MPU and provides the connection and cabling details required to access and use the program.

(1) General Overview

The MPU, built into the HD-710 terminal's operational software, provides a system interface for fault isolation and diagnostic procedures. Connection to this program is made through the RS-232 maintenance port interface.

To use the HD-710 terminal MPU, an RS-232, VT-100 terminal (PC or Laptop operating a terminal emulation program) must be connected to the HD-710 terminal.

The maintenance port on the front panel of HD-710 terminals provides a direct connection to the HD-710 terminal MPU using a DB25 connector. Optionally, remote cabin access is possible using a DB9 connector via the ARINC 600 connector.

(2) Connection Requirements

This section describes specific cabling requirements needed to connect to and use the HD-710 terminal MPU.

(a) Cabling Notes

The HD-710 terminals provide two options for physical connection to the HD-710 terminal maintenance port and MPU: direct connection and remote connection.

Table 4-3, Table 4-4, Figure 4-1, and Figure 4-2 provide cabling details for the HD-710 terminal for both direct and remote connection types. Select one of these connection options to access the HD-710 terminal MPU.

Note: The direct and remote connection points to the HD-710 terminal maintenance port cannot be used simultaneously.

Table 4-3. Remote Connection Cabling

Remote Access				
Pin Definition	**ARINC Connector (Rear)**	**Remote (DB9)**	**Cable (See Figure 4-1)**	**Computer (DB9P)**
Maint Port SGND	(MP1J)	5		5
Maint Port Rx	(MP1H)	3		3
Maint Port Tx	(MP1G)	2		2

Table 4-4. Direct Connection Cabling

Direct Connection				
Pin Definition	**Front Panel**	**Maintenance Cable Connector (DB25P)**	**Cable (See Figure 4-2)**	**Computer (DB9P)**
Maint Port SGND	10	10		5
Maint Port Rx	12	12		3
Maint Port Tx	11	11		2

(b) Maintenance Port Cable Assembly

HD-710 terminal maintenance cable connections may vary in length, type of connection used, and pinouts-depending on the access point used.

The cable assembly for HD-710 terminals assumes that the computer's COM Port interface is a 9-Pin, D-Sub connector (DB9). Cable assembly details for HD-710 terminals are presented in Figure 4-1 and Figure 4-2.

Note: The maximum cable length, shown in Figure 4-1 and Figure 4-2, assumes that the length is measured from the ARINC 600 connector to the DB9 breakout connector.

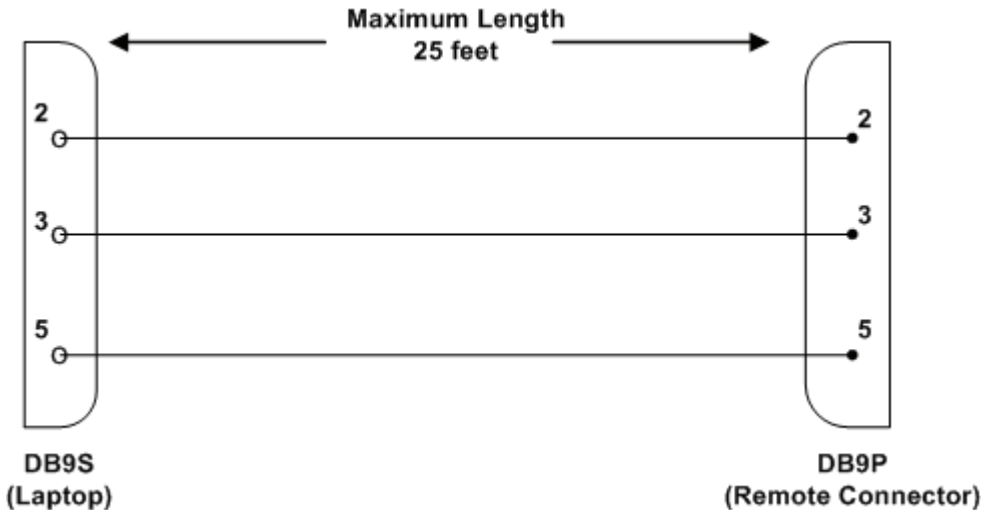


Figure 4-1. Remote Connection, Maintenance Cable

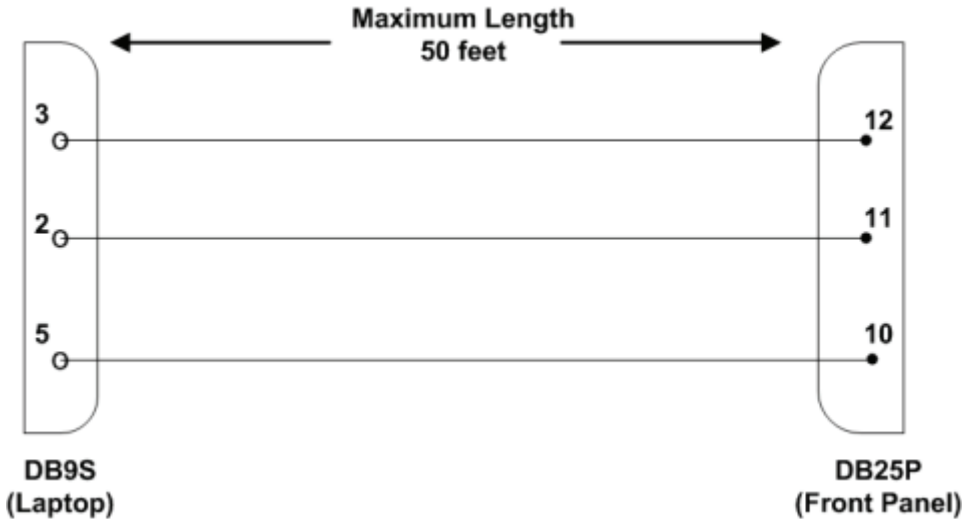


Figure 4-2. Direct Connection, Maintenance Cable

(c) Interface Requirements

A standard VT100 compatible terminal running an emulator program (such as HyperTerminal, ProComm Plus, or similar) provides the user interface to the HD-710 terminal MPU. The RS-232 terminal connection settings for HD-710 terminal maintenance ports are listed in Table 4-5.

Table 4-5. Terminal Connection Settings

Parameter	Setting
Character Format	ASCII
Baud Rate	19200 bps
No. of bits	8
Parity	None
Stop bits	1
Flow Control	None

(3) Accessing the MPU

Access to the MPU menus is password protected. Each password permits access to a different level of program functionality.

This document describes End User and Field Representative access levels for operational testing and verification, software updates, and the basic system monitoring and troubleshooting procedures provided in this manual.

(a) Level 1 End User Access—Password: *menu*

This limited-access level is for anyone without technical training on the product. It provides read-only access to help users diagnose problems with the assistance of product support personnel.

(b) Level 2 Field Representative Access—Password: *maint*

This level is for trained original equipment manufacturer (OEM) installers and product support personnel. This access level supports “read” and limited “write” capabilities. Users are able to disable, mask, or clear faults, change satellite or LES preferences, view and modify certain EEPROM parameters, and perform other maintenance or upgrade functions.

(4) Using the Terminal MPU

This section describes the basic procedures for using and navigating the HD-710 terminal MPU.

(a) Entering Passwords

- For untrained users, use Level 1 access: Type *menu*, and then press **Enter**.
- For trained technicians and product support personnel, use Level 2 access: Type *maint*, and then press **Enter**.

Note: The typed password does not appear on the screen.

(b) Navigating the Terminal MPU

- To scroll through the available menus, press **Ctrl+N**.
- To go to the previous menu, press **Ctrl+O**.
- To refresh the menu screen or exit from a Reports Menu, press **Esc**.

(c) Selecting MENU Items

To enable test or data entry functions, press the letter associated with the menu items. When a menu item is selected, the application may prompt the user for additional inputs or selections.

(d) Selecting Report Items

The reports available through the MPU enable users to view information about the configuration and status of the HD-710 terminal. This information is used to troubleshoot the communication system on board aircraft.

1. To open the list of possible system reports, press **=** (equal sign).

   A list of report items appears. Active reports show as toggled “ON.” Inactive reports show as toggled “OFF.”

2. To activate a report item, type the report item number, and then press **Enter**.

   Note: Multiple report items can be activated at the same time; type and enter each report item number separately.

3. To turn off individual, active report items, type the report item number you want to toggle off, and then press **Enter**.

4. To turn off all active report items, press **=** (equals sign) to display the report item list, and then press **X**.

(5) Menu Item Descriptions

This section provides a brief description of the Level 2, MPU menu items used for test and fault isolation procedures.

Although this section only provides illustrations and descriptions for Level 2 access, all Level 1 access menu items are covered. (All Level 1 menus are included in Level 2 Menus.)

In active HD-710 terminals, menu screens display the firmware version.

Note: Depending on the version of software installed and the system configuration, the menu and report items available to users may differ slightly from the illustrations shown and described in this document.

(a) Menu 1

Figure 4-3 shows the HD-710 terminal MPU Menu 1 screen display. Table 4-6 describes the items available in Menu 1.

```
       MENU 1                                  FIRMWARE Vx.x

X     override forward id                L     test LEDs
Y     explain hpa error status           U     list event logs
F     print equipment stats              M     clear equipment stats

<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-3. Menu 1 Screen Display

Table 4-6. Menu 1 Item Descriptions

Menu Item	Description
X: override forward id	Used in testing and fault isolation Enter a “test or alternate” Forward ID to use during fault isolation procedures. Resetting the terminal or cycling the power cancels this function.
Y: explain hpa error status	Reports HPA status: Displays HPA OK when no error codes are reported from the system's power up test Displays HPA error code message if system's power up test fails
F: print equipment stats	Displays equipment statistics, such as hours up, number of powerups, temperature, and duration.
L: test LEDs	Toggles the “Power ON” (LED 1) and “Fault” (LED 2) LEDs ON (A) and OFF (D) or returns them to software control (X).
U: list event log	Lists the current event log.
M: clear equipment stats	Resets the equipment statistics. (See Item F.)

(b) Menu 2

Figure 4-4 shows the HD-710 terminal MPU Menu 2 screen display. Table 4-7 describes the items available in Menu 2.

```
       MENU 2                                    FIRMWARE Vx.x

A     set veh-relative azimuth          E     set veh-relative elevation
K     desired az veh-rel velocity       R     resume automatic steering
T     enter time of day                 N     annotate log file
L     re-enter logon password           V     get firmware versions
Z     reset HD-710                      S     set satellite longitude
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-4. Menu 2 Screen Display

Table 4-7. Menu 2 Item Descriptions

Menu Item	Description
NOTE: Menu 2 selections E and K are used to manually input navigational data to point the antenna to a preferred satellite location and /or peak for a maximum signal reception. These commands are typically used where no IRS data is available.	
A: set veh-relative azimuth	Antenna azimuth pointing offset with reference to the front centerline of the aircraft Offset value entered in degrees from 0 to 180, where a positive entry is clockwise (cw) and a negative entry is counterclockwise (ccw)
K: desired az veh-rel velocity	Activates continuous antenna azimuth sweep at a set elevation, as entered with menu item “E” Azimuth sweep velocity entered as deg/sec value **Note:** When combined with a signal-monitoring “reports” selection, sweep the antenna for maximum signal strength to determine optimum location coordinates
T: enter time of day	Permits on-board entry of date and time for initial one-time setting of the “Real Time Clock”
L: re-enter logon password	Permits a user to enter a new access level password: menu or maint
Z: reset	Enables a complete, soft reset of the LRU; once reset, the menu access password must be re-entered
E: set veh-relative elevation	Antenna elevation pointing offset with respect to the aircraft horizontal “rest” position; i.e., assumed to have no pitch or roll offset Offset value entered in degrees from 0 to 90
R: resume automatic steering	Re-activates programmed automatic antenna-steering in both azimuth and elevation
N: annotate log file	Allows input of text into a log file This feature can be used to document information such as test conditions, system or aircraft identification or any pertinent information needed for later review
V: get firmware versions	Displays the system Kernel and Application software versions, and the channel card(s) and HPA firmware revisions
S: set satellite longitude	Sets the satellite longitude

(c) Menu 3

Figure 4-5 shows the HD-710 terminal MPU Menu 3 screen display. Table 4-8 describes the items available in Menu 3. Figure 4-6 shows the Menu 3, Item M: Miscellaneous parameters screen display. Table 4-9 describes the items available in Menu 3, Item M.

```
       MENU 3                                    FIRMWARE Vx.x

L      list EEPROM                          S     list event log
C      clear event log                      M     misc. EEPROM parameter
F      list call log                        G     clear call log
O      list ORT                             P     ocean region parameter
I      set all LES id's
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-5. Menu 3 Screen Display

Table 4-8. Menu 3 Item Descriptions

Menu Item	Description
L: list EEPROM	Displays a list of all system EEPROM parameters and their corresponding values (this function is READ only) Certain parameters are set using menu 3, item M selection
C: clear event log	Clears the current events and system fault codes stored in non-volatile RAM
F: list call log	Displays call log files for HD-710 terminal. When selected, three options are available: Press **F** to display complete list of all log files Press **X** to list extended EIRP trace data Press **.** to list all remaining entries
O: list ORT	Displays all EEPROM parameters, including all cable losses and LES configurations
I: set all LES id's	Configures all ocean regions to the same LES access code and service provider (including primary and secondary service providers)
S: list event log	Lists all events and system fault codes stored in non-volatile RAM When selected, several options are available: 0 = Most recent saved entry is displayed S = Displays next most recent entry saved . = Displays all remaining logged entries 1 = Special events (Does not include Ocean Region Registration entries)
M: misc. EEPROM parameter	Enables entry or entry changes to some of the EEPROM parameters listed in function 'L' **Note:** Parameters 5,6,7,8, 9, 13, 25, 26, 27, and 28 are not accessible using Level 1 or Level 2 passwords

Table 4-8. Menu 3 Item Descriptions (Continued)

Menu Item	Description
G: clear call log	Clears call log files for HD-710 terminal
P: ocean region parameter	Configures LES access codes (primary and secondary service providers) for individual ocean regions

```
MISCELLANEOUS PARAMETERS
 1  HPA-TO-ANTENNA TOTAL LOSS            17  VIPER ANTENNA GAIN
 2  FORWARD ID                           18  VIPER HPA/ANT LOSS
 3  GPS PROTECTION ALGORITHMS            19  AUTO-ACTIVATE WINTERM
 4  REGISTRATION REQ'D BEFORE CALLS      20  CARD 1 IP ADDRESS
10  NUMBER OF CHANNEL CARDS              22  TRANSMIT IF WEIGHT-ON-WHEELS
11  FRONT PANEL LEDS ENABLED             29  DEFAULT LATITUDE
14  MAINTENANCE PORT INVERSE VIDEO       30  DEFAULT LONGITUDE
15  MAINTENANCE PORT DEGREES SYMBOL      31  OBEY OXCO STATUS
16  TERMINAL CATEGORY                   34  CO-OP MODE BACKOFF ADJUSTMENT

WHICH PARAMETER #  <CTRL> N for next page ?

36  CO-OP MODE DUAL CHANNEL              55  REFLECTED POWER INTERCEPT
42  HCM AERO/M4 PRIORITIZATION           56  PSU CURRENT SLOPE
45  CATEGORY B LOWER FREQUENCY LIMIT     57  PSU CURRENT INTERCEPT
46  CATEGORY B UPPER FREQUENCY LIMIT     58  QUAL PA BACKOFF
50  HST 2120 INTERFACE                   59  CLASSIC AERO MANUAL BOOT
51  SDU INPUT POWER OFFSET               60  CH CARD GATEWAY ADDRESS
52  OUTPUT POWER COUPLING CONST          61  IMEI KEY
53  REFLECTED POWER COUPLING CONST       62  SDU-TO-PA GAIN
54  REFLECTED POWER SLOPE

WHICH PARAMETER #   <CTRL> N for next page  ?
```

Figure 4-6. Menu 3—Item M: Miscellaneous Parameters

Table 4-9. Menu 3, Item “M” EEPROM Parameter Descriptions

Parameter#	Parameter Name	Description
1	HPA-to-antenna total loss	Defines transmit coax cable loss from the terminal at MPC1 to the antenna including the DLNA loss-maximum is 2.5 dB
2	Forward ID	Entry required ONLY if the ID is not strapped Refer to "Installation" on page 3-1 for strapping details
3	GPS protection algorithms	Disables the GPS algorithms the terminal uses to prevent calls from interfering with the GPS navigational system on the aircraft
4	Registration required before calls	Changes Terrestrial Network ID (where applicable)

Table 4-9. Menu 3, Item "M" EEPROM Parameter Descriptions (Continued)

Parameter#	Parameter Name	Description
10	Number of channel cards	Selects the number of channel cards for which the system is configured
11	Front panel LEDs enabled	Future consideration is provided for additional LEDs, beyond the two currently activated—default is "2"'
14	Maintenance port inverse video	Enables a selected "reports" item to be highlighted in Inverse Video when it is activated—default is "1" (activated)
15	Maintenance port degrees symbol	Offers a choice of displaying the letter D or the degree symbol ° when viewing the lat/long information displayed in the 'Reports' output: Select "0" to use the letter D; e.g., 180.0 D Select "1" to use a degree symbol °; e.g., 180.0°
16	Terminal category	Offers an LRU configuration choice of: 0 for SAT-906 1 for Stand-Alone 2 for HW Strapping 3 for MCS3000 4 for MCS6000 5 for MCS7000 6 for MCS Combined 7 for Stand-Alone without antenna 8 for HCM Combined (Honeywell Combined Mode) 9 for Cooperative Rockwell Collins SAT-906 10 not used 11 not used (HSD-X terminal Network, Multi-Channel Aero) 12 not used (HSD-X terminal Network without antenna, Multi-Channel Non Aero) 13 for VIPER Default is "2" (where hardware is read on power-up)
17	Viper antenna gain	Not applicable in Combined Mode installations
18	Viper HPA/ANT loss	Not applicable in Combined Mode installations
20	Card 1 IP address	IP address of channel card #1
21	Card 2 IP address	IP address of channel card #2
22	Transmit if weight-on-wheels	Allows the system to transmit when it is on the ground
29	Default latitude	Allows user to enter a default latitude value Reset the terminal to activate revised default values
30	Default longitude	Allows user to enter a default longitude value Reset the terminal to activate revised default values

Table 4-9. Menu 3, Item "M" EEPROM Parameter Descriptions (Continued)

Parameter#	Parameter Name	Description
31	Obey OXCO status	Prevents system operation until OCXO is warmed up (unless overridden) Use parameter setting to override warm-up during testing procedures
34	Co-op Mode backoff adjustment	Not applicable in Combined Mode installations
36	Co-op Mode dual channel	Not applicable in Combined Mode installations
42	HCM Aero/M4 prioritization	Sets HPA power allocation to Aero H/H+ or Swift64 call priority (1=M4, 0=Aero H) Default set to Aero priority
45	Category B lower frequency limit	Specifies category B terminal lower frequency range. Calls transmitting outside of this specified range may interfere with the GPS navigational system if an Aero H call occurs simultaneously; however, in this event, the GPS protection algorithm usually tears down the call.
46	Category B upper frequency limit	Specifies category B terminal upper frequency range. Calls transmitting outside of this specified range may interfere with the GPS navigational system if an Aero H call occurs simultaneously; however, in this event, the GPS protection algorithm usually tears down the call.
50	HST 2120 interface	Not applicable in Combined Mode installations
51	SDU input power offset	Manufacturer reserved
52	Output power coupling const	Manufacturer reserved
53	Reflected power coupling const	Manufacturer reserved
54	Reflected power slope	Manufacturer reserved
55	Reflected power intercept	Manufacturer reserved
56	PSU current slope	Manufacturer reserved
57	PSU current intercept	Manufacturer reserved
58	Qual PA backoff	Manufacturer reserved
59	Classic AERO manual boot	Manufacturer reserved
60	Ch card gateway address	Manufacturer reserved

Table 4-9. Menu 3, Item "M" EEPROM Parameter Descriptions (Continued)

Parameter#	Parameter Name	Description
61	IMEI key	Manufacturer reserved
62	SDU-to-PA gain	Manufacturer reserved

(d) Menu 4

Figure 4-7 shows the HD-710 terminal MPU Menu 4 screen display. Table 4-10 describes the items available in Menu 4.

```
       MENU 4                                    FIRMWARE Vx.x

Q     channel card forward ID's          O     set Ocean Region
S     change spot beam                   J     toggle ISDN connection
M     report MUX stats
<CTRL> N next menu      <CTRL> O previous menu      = select reports

TERMINAL: COMBINED MODE     HCM MODULE DETECTED
```

Figure 4-7. Menu 4 Screen Display

Table 4-10. Menu 4 Item Descriptions

Menu Item	Item Description
Q: channel card forward IDs	Enables viewing of channel cards # 1 and # 2 Forward IDs
S: change spot beam	Enables manual selection of specific spot beams independently assigned for each channel card
M: report MUX stats	Not applicable Used for engineering debugging purposes only
O: set Ocean Region	Allows for manual selection of satellite Ocean Regions: AORW: "0" AORE: "1" POR: "2" IOR: "3" To revert to programmed selection, type *-1* and press **Enter** for AUTO selection
J: toggle ISDN connection	Used for testing and fault isolation Connects ISDN 1 lines to Channel Card 2 (Does not work in reverse-ISDN 2 to ISDN 1) Redirection only applies until the system is reset

(e) Menu 10

Menu 10 items are used to manually enter INS parameters to simulate the INS data required for HD-710 terminal operation when INS data is unavailable. Figure 4-8 shows the HD-710 terminal MPU Menu 10 screen display. Table 4-11 describes the items available in Menu 10.

```
       MENU 10                                  FIRMWARE Vx.x

L     simul INS lat                      G     simul INS long
H     simul INS heading                  T     simul INS true track
P     simul INS pitch                    R     simul INS roll
S     simul INS speed                    Q     simul INS altitude
A     activate INS simul words           C     simul port ACU status
B     simul sb ACU status              M     activate antenna status words
N     deactivate antenna status words    D     toggle active antenna
X     deactivate INS simul words
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-8. Menu 10 Screen Display

Table 4-11. Menu 10 Item Descriptions

Menu Item	Description
L: simul INS lat	Simulates a latitude by overriding the data received from the aircraft INS
H: simul INS heading	Simulates aircraft heading by overriding the data received from the aircraft INS
P: simul INS pitch	Simulates aircraft pitch by overriding the data received from the aircraft INS
S: simul INS speed	Simulates aircraft speed by overriding the data received from the aircraft INS
A: activate INS simul words	Activates all input simulate parameters overriding the INS data received from the aircraft Lat and Long values from the EEPROM values set in Menu 3
B: simul sb ACU status	Enter the starboard antenna gain in dB and the message rate in Hz
N: deactivate antenna status words	De-activates all set antenna status words
X: deactivate INS simul words	De-activates all simulated parameters reverting the HD-710 terminal back to using the INS data received from the aircraft
G: simul INS long	Simulates aircraft longitude by overriding the data received from the aircraft INS
T: simul INS true track	Simulates true track by overriding the data received from the aircraft INS

Table 4-11. Menu 10 Item Descriptions (Continued)

Menu Item	Description
R: simul INS roll	Simulates aircraft roll by overriding the data received from the aircraft INS
Q: simul INS altitude	Simulates aircraft altitude by overriding the data received from the aircraft INS
C: simul port ACU status	Enter both the port antenna gain in dB and the message rate in Hz
M: activate antenna status words	Activates all set antenna status words
D: toggle active antenna	Changes the current simulated active antenna. Choose starboard, port, or automatic. Note that this change will only take effect if antenna status words are activated using menu item “M”.

(f) Menu 13

Menu 13 items are used to query and debug the Data I/O Card.

Figure 4-9 shows the HD-710 terminal MPU Menu 13 screen display. Table 4-12 describes the items available in Menu 13.

```
       MENU 13                                  FIRMWARE Vx.x

T     query DATA IO elapsed time        V     query DATA IO version
S     query DATA IO services            F     DATA IO fault logging level
X     DATA IO console mode              G     print DATA IO call database
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-9. Menu 13 Screen Display

Table 4-12. Menu 13 Item Descriptions

Menu Item	Description
T: query DATA IO elapsed time	Displays the time (in seconds) since the last Data I/O reset
S: query DATA IO services	Displays active interfaces
X: DATA IO console mode	Opens a virtual TTY session to the Data I/O maintenance port on the HD-710 terminal
V: query DATA IO version	Displays the firmware version of the Data I/O card
F: DATA IO fault logging level	Sets the level of minimum severity of events that are reported to the Data I/O card
G: print DATA IO call database	Displays the calls made and recorded in the Data I/O database

(g) Menu 14

Menu 14 items are used for debugging and clarifying call routing issues.

Figure 4-10 shows the HD-710 terminal MPU Menu 14 screen display. Table 4-12 describes the items available in Menu 14.

```
       MENU 14                                  FIRMWARE Vx.x

N     num entries in call table         L     list call table
T     get call table
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-10. Menu 14 Screen Display

Table 4-13. Menu 14 Item Descriptions

Menu Item	Item Description
N: num entries in call table	Displays the call table number entries for fixed-originated or mobile-originated calls for either channel card 1 or channel card 2
T: get call table	Displays the call table lists for fixed-originated or mobile-originated calls for either channel card 1 or channel card 2
L: list call table	Displays the call table for fixed-originated or mobile-originated calls for either channel card 1 or channel card 2

(h) Menu 15

Figure 4-11 shows the HD-710 terminal MPU Menu 15 screen display.

Table 4-14 describes the items available in Menu 15.

```
       MENU 15                                  FIRMWARE Vx.x

V     request channel card versions     D     channel card serial number
B     channel card RSSI mode            G     A_TI query
W     request burst counter
<CTRL> N next menu      <CTRL> O previous menu      = select reports
```

Figure 4-11. Menu 15 Screen Display

Table 4-14. Menu 15 Item Descriptions

Menu Item	Item Description
V: request channel card versions	Displays software versions for a selected channel card
B: channel card RSSI mode	Places the channel card in Received Signal Strength Indicator mode As requested, enter the channel number, the Ocean Region, the channel type, and the RSSI period in milliseconds
W: request burst counter	Displays the burst counter information
D: channel card serial number	Displays the serial number of the selected channel card
G: A_T1 query	Manually sends an A_T1 query to the requested channel card to check on the alive/dead status of the channel card processors. As requested, enter a channel card number and service type to query.

(6) Report Item Descriptions

When testing or troubleshooting the HD-710 terminal, monitoring real-time system data is sometimes required. Figure 4-12 shows all the report items potentially available to a Level 2 user.

Most reports are used for factory debugging purposes only. This document describes only the reports typically used in the field for operational and fault isolation testing.

Note: Depending on the version of software installed, the MPU report items displayed may differ from those shown in Figure 4-12.

```
 1 OFF OFF messages to channel card #1      13 OFF OFF messages to channel card #2
 2 OFF OFF hex output to channel card #1    14 OFF OFF hex output to channel card #2
 3 OFF OFF responses from channel card #1   15 OFF OFF responses from channel card #2
 4 OFF OFF hex input from channel card #1   16 OFF OFF hex input from channel card #2
 5 OFF OFF card #1 misc info                17 OFF OFF card #2 misc info
 6 OFF sb antenna arinc input               18 OFF port antenna arinc input
 7 OFF sb antenna maintenance word          19 OFF port antenna maintenance word
 8 OFF sb antenna status word               20 OFF port antenna status word
 9 OFF channel card call status             21 OFF call codes
10 OFF channel card THA codes               22 OFF spot beam selection
11 OFF channel card errors                  23 OFF standard output
12 OFF INS input                            24 OFF doppler, antenna az/el

25 OFF HPA arinc i/o                        37 OFF combined-mode spoofed output
26 OFF HPA error status                     38 OFF combined-mode power allotment
27 OFF HPA/channel card backoffs            39 OFF combined-mode debugging
28 OFF miscellaneous digital inputs         40 OFF enthusiastic combined-mode debug
29 OFF channel card A_AM msgs               41 OFF delta combined-mode debugging
30 OFF multi-control arinc bus              43 OFF sdu path cable calibration
31 OFF ocean region info                    44 OFF hpa calibration (gain droop)
32 OFF hex input from data i/o              45 OFF combined mode ocean region debug
33 OFF hex output to data i/o               46 OFF hpa resets
34 OFF input from data i/o                  47 OFF channel card temperature
35 OFF changes in multi-control bus         48 OFF hexadecimal INS input
36 OFF unit test call setup                 49 OFF main loop latency

50 OFF main loop timing                     69 OFF vt100 scenario
51 OFF one second tick                      72 OFF DATA I/O events
52 OFF extended call codes                  76 OFF HSD-X arinc messages
54 OFF RC SDU time and date                 77 OFF HSD-X net configuration
60 OFF OFF debug channel card power         78 OFF vt100 eirp/power
61 OFF non-zero channel card power          79 OFF dialtone debugging
62 OFF m4 availability status               86 OFF Channel card rx attenuation
64 OFF channel card frequencies             87 OFF interworking report
65 OFF enthusiastic messages from HPA       88 OFF all words to SDU
66 OFF channel card boot sequence           89 OFF debug call teardown
67 OFF debug honeywell combined mode        90 OFF debug cc backoff
68 OFF CFDS debugging                       91 OFF HSD frequencies

92 OFF intermod debugging                  112 OFF arinc labels
93 OFF spot beam debugging                 113 OFF channel card SW loads
94 OFF vt100 channel card info             114 OFF all channel card THA codes
95 OFF vt100 debugging                     115 OFF OCXO state toggles
96 OFF INS data rate                       116 OFF DATA I/O passthrough mode
97 OFF enthusiastic RC coop-mode debug     117 OFF output to data i/o (ascii)
98 OFF RC coop-mode debugging              118 OFF channel card rf loopback
107 OFF unusual channel card msgs          119 OFF 12C controller i/o
108 OFF channel card rf pwr detect         120 OFF 12C controller hex i/o
109 OFF channel card power SU's            121 OFF 12C slave status
110 OFF underdraft debugging               122 OFF 12C miscellaneous input
111 OFF miscellaneous digital outputs      123 OFF enthusiastic backoff
```

Figure 4-12. HD-710 Terminal MPU: Report Items

(7) Activating Maintenance Reports

In Level 1 menu access, report item 23 (standard output) is automatically generated when the equals sign (=) is pressed. Once activated, the report data output is repeated on the computer display at one-second intervals.

Level 2 maint access provides more flexibility in the use of the reports function. This access level permits the activation or deactivation of any one of the report items (toggle ON and OFF).

(a) Report Items: General Guidelines

- Press **=** to open the Report Item menu.
- To activate a report, type the number of the report item needed, and then press **Enter**. This toggles ON the report number entered. To toggle the report OFF, type in the report number again and press **Enter**.
- Press **X** to disable all report items (toggles all reports OFF).
- Press **Ctrl+N** to display the next group of report items.
- Press **S** to save all selected report items to EEPROM. The selected reports will then be output automatically when the Maintenance port is accessed. If the items selected are not saved, they are “de-activated” when the system is reset or power is cycled to the terminal.
- Press **Esc** (in Level 2 access only) to start the scrolling report display. Press **Esc** again to return to the MENU selection screen.

(b) Report Items: Descriptions

Not all the report items are used in the testing or troubleshooting of the system. This section describes only the more commonly used report items.

1. Report Item: 23

Use report item 23 (the most comprehensive report) to get an overall general impression of the HD-710 terminal health. An example of the contents of report item 23 is shown in Figure 4-13. Table 4-15 provides a brief description of the parameters. Each distinct parameter is numbered for description purposes.

```
[1]45D20'47.7"N 75D47'29.1"W [2]PT 0.0D [3]RL 0.0D [4]HD 0.0D [5]TK 0.0D [6]0 knots [7]0 ft
[8]10:47:07 [9]dop 0 ppb [10]az 146.2 deg  [11]el 35.8 deg [12]AORE [13]ant gain 16 (p/t)
[14]CHAN #1: [15]C/No=53.6 dB Hz [16]sig=-34.5 dB  [17]32.0 C [18]no call [19]beam=5
[14]CHAN #2: [15]C/No=53.8 dB Hz [16]sig=-33.2 dB  [17]32.0 C [18]no call [19]beam=5
[14]CHAN #3: [15]C/No=53.5 dB Hz [16]sig=-34.5 dB  [17]32.0 C [18]no call [19]beam=5
[14]CHAN #4: [15]C/No=53.8 dB Hz [16]sig=-34.7 dB  [17]32.0 C [18]no call [19]beam=5
```

Figure 4-13. Example of Report 23 Output

Table 4-15. Report 23 Item Descriptions

Report 23 Item Number	Description
1	IRS lat/long as interpreted by the HD-710 terminal
2	Aircraft pitch angle, where “UP” is +ve
3	Aircraft roll angle, where clockwise (cw) is +ve
4	Aircraft true heading; where the nose of the aircraft is pointing, based on yaw offset
5	Aircraft true track; direction the aircraft is flying—not necessarily the direction it is pointing (see note below)
6	Aircraft velocity
7	Aircraft altitude
8	Time, based on the system real time clock
9	Doppler frequency offset; increases with velocity (see note below)
10	Antenna azimuth pointing to the satellite, with respect to the nose of the aircraft
11	Antenna elevation angle to the satellite, with respect to the horizontal position of the aircraft
12	Ocean Region the system is logged-on to
13	Reported antenna gain for the selected antenna: starboard (sbd) or port (p/t)
14	Indicates the channel card for which results 14 to 17 relate.
15	RF input Carrier-to-Noise (C/No) level; typically 50.0 to 55.0
16	RF input signal level; not to exceed 0 when “in-call”
17	HD-710 terminal internal LRU temperature
18	System call status
19	Satellite beam the card is registered on

Note: When the aircraft is stationary, the field may appear as a series of asterisks (*).

2. Report Items: 5 & 17

   Report 5 displays information for channel card #1 and report 17 displays information for channel card #2.

   These reports are commonly used for testing and troubleshooting the system and are only available to Level 2, maint access users.

   You are prompted to select the channel(s) for which to generate a report:

Select channel 1 or X to deselect all channels. For Channel Card 2, select channel 3 or X to deselect all channels.

Note: Depending on the version of software installed and the user's selection of reports, the MPU report items displayed may differ from those shown in Figure 4-14.

```
CHAN #3: C/No=54.0 dB Hz sig=-15.0 dB no call beam=8 AORE bt=OK oc=OK
     tx     0 Hz burst 0  33.5 C int=8080
CHAN #3: C/No=54.0 dB Hz sig=-15.0 dB no call beam=8 AORE bt=OK oc=OK
     tx     0 Hz burst 0  33.5 C int=8080
CHAN #3: C/No=54.0 dB Hz sig=-15.0 dB no call beam=8 AORE bt=OK oc=OK
     tx     0 Hz burst 0  33.5 C int=8080
```

Figure 4-14. Example of Report 17, Channel Card 2, Channel 3

Table 4-16. Report 5 and 17 Item Descriptions

Reports 5 & 17	Channel card miscellaneous information:
(C/No) -	RF input carrier to noise level (value displayed is typically 50 to 55 when not "in-call" and 55 to 65 when "in-call"—may also show as "0s")
(sig) -	RF input signal level
(beam) -	Satellite Beam the card is registered on
(oc) -	Ocean region to which the card is logged-on
(bt) -	Card boot-up status
(oc) -	Ocean region registration status
(int) -	Interface status (=8080 means the card is ready for dialing)

3. Report Items: 8 & 20

   Report item 8 displays the status of the starboard antenna, and report item 20 displays the status of the port antenna.

   These reports are commonly used for testing and troubleshooting the system and are only available to Level 2, maint access users.

   Note: Depending on the version of software installed and the user's selection of reports, the MPU report items displayed may differ from those shown in the example in Figure 4-15.

```
port status $600241  SDI: PORT/TOP  SSM: NORMAL gain=0.0
OMNIDIRECTIONAL MODE  open loop tracking  starboard active   HGA   LNA=off
```

Figure 4-15. Example of Report 20

Table 4-17. Reports 8 & 20 Item Descriptions

Reports 8 & 20	Starboard and Port Antenna Status
(Hex code) -	Raw hex code of the 32-bit ARINC word-decoded message follows code
(SDI) -	Antenna being used (for mechanically steered, only Port data is valid)
(SSM) -	Antenna serviceability
(Gain) -	Reported antenna gain (may vary with increased blockage or keyhole pointing)
(Mode) -	Reports tracking status, antenna selection, and high gain mode
(LNA) -	Power-on status

4. Report Item: 21

   Report item 21 displays the call code information for the HD-710 terminal.

```
11:41:26 #1 ABC123 W5 start 400110 14.00 dBW CT SP ocean region registration 33.5
C 54 dB Hz
11:41:29 #1 ABC123 W5 stop 8301 14.00 dBW  ACSE successful ORR  33.5 C  54 dB Hz
11:41:30 #1 ABC123 W5 start 400110 14.00 dBW CT SP ocean region registration 33.5
C 54 dB Hz
11:41:35 #1 ABC123 W5 stop 8301 14.00 dBW  ACSE successful ORR  33.5 C  54 dB Hz
11:41:25 #2 ABC123 W5 start 400110 14.00 dBW CT SP ocean region registration 33.5
C 54 dB Hz
11:41:30 #2 ABC123 W5 stop 8301 14.00 dBW  ACSE successful ORR  33.5 C  54 dB Hz
11:41:31 #2 ABC123 W5 start 400110 14.00 dBW CT SP ocean region registration 33.5
C 54 dB Hz
11:41:36 #2 ABC123 W5 stop 8301 14.00 dBW  ACSE successful ORR  33.5 C  54 dB Hz
```

Figure 4-16. Example Report 21

Table 4-18. Report 21 Item Descriptions

Report 21	Call Codes
(Time) -	Time based on the system real time clock
(Fwd Addr) -	Forward Address ID assigned to the system channel cards
(Alpha/no.) -	Ocean region and beam the card is logged-on to
(Call) -	Call real-time status, service type code, and Inmarsat Cause Code (see Table 4-19)
(RF power) -	LES requested HPA power in dBW
(OR status) -	Ocean region registration status
(Call orig)	Call originating from MES (mobile) or from a fixed location.
(Call type)	Call types (for example: speech)

D. Fault Definitions

(1) Inmarsat Cause Codes

The fault definitions that appear in the HD-710 terminal Maintenance Menu logs are based directly on the cause code definitions provided by Inmarsat. Table 4-19 defines the Maintenance Port Menu fault codes of the HD-710 terminal.

Table 4-19. Inmarsat Cause Code Definitions

Inmarsat Cause Code	Code Definition
1001	Call cleared by MES terminal (normal termination of call)
1011	Call failed, MES terminal busy
1012	Call cleared, MES terminal busy
1021	Call failed, MES time-out (no answer)
1081	Call failed, MES terminal not installed
1091	Call failed, MES terminal out-of-service
1092	Call cleared, MES terminal out-of-service
1141	MES preempted clear by higher priority call
1142	MES preempted fixed call by higher priority call
1143	Offered call cleared, pre-empted at MES
1144	Call cleared, MES initiated preemption
1145	Attempted call cleared, pre-empted at MES
1146	Attempted call abandoned by MES terminal
11A0	Call cleared, credit card not accepted
11D1	Call failed, Request data invalid
11D2	Call failed, insufficient digits in service address
11D3	Call failed, invalid service address
11D4	Call cleared, credit card data information invalid
11D5	Call cleared, invalid country code
11D6	Call cleared, PID information is not consistent
11D7	Call rejected, invalid service for Pri.1 or 2 call
11D8	Call cleared, dialed number not 2 or 3 digits for Pr.1 or 2 call
11E0	Call cleared, invalid credit card PIN at this LES
11E1	Call cleared, too many invalid credit card call attempts
1202	Handover, MES ready
1281	Call failed, MES cannot accept
1291	Call failed, MES cannot accept at present
12B1	Call cleared by MES for unspecified reason, for example: • GPS conflict • Insufficient HPA power available to make call • HPA over current

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
12C2	Call cleared, no credit card valid message received
12C3	Call failed, MES time-out (no terrestrial answer)
12C4	Call cleared, authentication query not received (usually caused by call setup failure)
12C5	Call cleared, MES missing sup service SU
12C6	Call cleared, MES missing sup service 2 SU
12C7	Call cleared, MES missing SCPC channel release SU sup service
12C8	Handover failed, LES not detected
12D1	Call failed, Spot-beam data invalid
12D2	Call failed, invalid scrambling vector
1351	Call cleared, insufficient free memory
1361	Call cleared by MES cable unwrap
1362	Call cleared, long interruption in reception at MES
1363	MES secondary clear due to repoint OR
1391	Call cleared, traveled distance exceeds 700 km
1392	Call cleared, spot beam transition (call terminated because aircraft left spot beam)
1393	Call cleared, cooperative mode
1451	Call failed, terrestrial circuits congested
1452	Call failed, LES congested (no channel and no circuit)
1502	Handover, LES Ready, normal clear
1551	Call failed, LES congested (no channel)
1581	Call failed, service not provided at this LES
1591	Call failed, service temporarily not available at this LES
1592	Call cleared, credit card type not supported
15A1	Call failed, MES not authorized at this LES
15A2	Call failed, service not authorized at this LES
15A3	Call cleared, credit card not authorized
15A4	Call cleared, authentication reply invalid
15A5	Call failed, PID not authorized for any service
15A6	Call failed, PID not authorized for requested service
15B1	Call cleared by LES for unspecified reason
15C1	Call failed, LES time-out (no assignment)
15C2	Call failed, LES time-out (no service address)
15C3	Call failed, LES time-out (no scrambling vector)
15C4	Call failed, no service address and no scrambling vector
15C5	Call cleared, incomplete credit card data information

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
15C7	Call failed, LES time-out (no MES Connect)
15C9	Call cleared, no authentication reply
15CA	Call cleared, notification ack not received
15CB	Call cleared, invalid sequence number in notification ack
15CC	Handover failed, no response to request
15CD	Handover failed, MES not ready
15D1	Call failed, LES time-out (invalid assignment)
15D2	LES MES already busy
15E1	Call cleared but MES still transmitting (FAULT)
1651	Call failed, LES congested (no channel terminal)
1661	Call failed, long interruption in reception at LES
1662	LES long term blockage of SCPC MES
16C2	LES missing MES SCPC
16C3	Handover failed, MES not detected
1790	Call cleared, failure credit card validation process
1791	Call cleared, failure authentication process
1811	NCS MES ID busy
1812	NCS MES ID busy IPDS
1841	Call cleared, NCS initiated preemption for incoming Pri.1 call
1842	Call cleared, NCS initiated preemption for incoming Pri.2 call
1843	Call cleared, NCS initiated preemption for incoming Pri.3 call
1844	Call cleared, NCS initiated preemption
1851	Call failed, satellite congestion NCS reject no SCPC available
1852	Call failed, satellite congestion NCS reject SCPC does not match request
1853	Call failed, lease channel congestion
1854	Call failed, MES outside spot beam coverage area
1855	Call rejected, preemption failed, no channel available
1856	Call rejected, spot beam selection failed
1857	Handover failed, channel not available
18A1	NCS MES ID not found
18A2	Call failed, MES not authorized
18A3	Call failed, LES not authorized
18B1	Call failed by NCS for unspecified reason
18B2	Call rejected, invalid service requested
18C1	NCS MES burst missing
18C3	NCS MES busy preemption failed

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
18D1	Call failed, invalid call request
18E1	NCS MES busy already
18E2	NCS MES busy already MPDS
1F01	Call cleared by terrestrial circuit (normal call termination from ground source)
1F11	Call failed, terrestrial party busy
1F21	Call failed, LES time-out (no answer)
1F61	Call failed, terrestrial circuit failure (call attempted during ORR)
1F62	Call failed, early clear by terrestrial circuit
2000	MES int reject MES RQ invalid CNO
2001	MES int reject MES RQ failed qualification
2010	MES int reject MES RP invalid CNO
2011	MES int reject MES RP failed qualification
2012	MES int reject MES RP operation timeout
2020	MES int reject NCSA missing
2021	MES int reject NCSA invalid CNO
2022	MES int reject NCSA failed qualification
2023	Call failed, Signal lost on NCSA during call setup, check antenna and try again
2024	Call failed, Missing channel assignment, try again
2025	Call failed, Signal lost on NCSC during call setup, check antenna and try again
2030	MES int reject LES ID failed qualification
2040	MES int reject SCCS invalid CNO
2041	MES int reject SCCS not paired
2048	Call failed, invalid number dialed
2049	Call failed, terminal not ready for call, try later
2050	Call failed, Not allowed to make another mobile call yet, wait 20 seconds and try again
2051	Call failed, dialed number is barred
2052	Call failed, LES selected is barred
2053	Call failed, number dialed must be in a phonebook
2053	Call failed, terminal can only be used with a valid SIM
2055	Call failed, user not logged in
2056	Call failed, user not logged in to SIM
2057	Call failed, LES is not in SIM allowed list
2058	Call cleared, SIM removed during call

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
2059	Call failed, terminal is locked for outgoing calls
2060	MES int reject NCSS failed qualification
2061	MES int reject spot beam invalid
2062	Call failed, no spot beams in the ocean region, select another OR
2063	Terminal ID is not set correctly, check with dealer
2070	Lost NCSC signal, seeking
2071	Stand-Alone Mode finished, seeking network
2080	SIM error, check SIM is inserted correctly
2090	MES int reject ORR query invalid
2091	MES int reject ORR invalid
2092	MES int reject MES RR failed qualification
2093	MES int reject MES RR invalid CNO
2094	MES int reject NCRA missing
2095	MES int reject NCRA lost lock
2100	MES int reject illegal call type
2101	MES Int reject illegal peripheral
2102	Call request failed, call already in progress
2103	Call failed, star code is badly formatted
2104	Call failed, cannot accept two address book star codes
2105	Call failed, address book entry not found
2106	Call failed, star code does not exist
2120	MES int reject no transmit power available
2200	Battery flat for terminal operation
2201	Call cleared, used all allocated time for call type
2300	MES int reject no coop response
2301	MES int reject no power
2302	MES int reject no location report
2400	MES int reject no ORA SU found
2F00	LES int reject lack of MES RESP response
2F01	LES int reject lack of MES ARN response
2F02	LES int reject incorrect SVECSCPC
8000	ACSE Recycling
8001	ACSE Top Of Find BB
8002	ACSE Top Of Process BB
8010	ACSE Finding Primary NCS Long
8011	ACSE Finding Secondary NCS Short

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
8012	ACSE Finding Primary Standalone Short
8013	ACSE Finding Primary NCS Short
8014	ACSE Finding Primary Standalone Long
8018	ACSE Finding Secondary Standalone Short
8019	ACSE Finding Secondary Standalone Long
8020	ACSE Found Primary NCS
8021	ACSE Found Secondary NCS
8022	ACSE Found Primary Standalone
8023	ACSE Found Secondary Standalone
8024	ACSE found primary NGNCS
8025	ACSE found secondary NGNCS
8030	ACSE NSR Invalid
8040	ACSE Inert
8041	ACSE ODU Status
8080	ACSE NSR Valid
8081	ACSE NSR Valid LES A
8100	ACSE Booting
8110	ACSE Booted
8120	ACSE FIDR ID Invalid
8200	ACSE Spot Beam Selection
8201	ACSE Next Spot Beam
8202	ACSE Successful Spot Beam Selection
8203	ACSE Failed To Find Spot Beam
8204	ACSE Spot Beam Selective Clear
8210	ACSE Spot Beam Reject Mobile Call No ID
8211	ACSE Spot Beam Reject Mobile Call No TDM
8300	ACSE ORR
8301	ACSE Successful ORR
8302	ACSE Failed ORR
8303	ACSE No ORR
8304	ACSE ORR Tune NCRA
8305	ACSE ORR MES RR
8306	ACSE failed retry ORR
8306	ACSE failed retry ORR
8310	ACSE ORR Query Begin
8311	ACSE ORR Query Burst
8312	ACSE ORR Query Successful

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
8313	ACSE ORR Query Failed
8400	ACSE Fixed Begin
8401	ACSE Fixed MESRP
8402	ACSE Fixed Call Type Set
8410	ACSE Fixed Tune NCSA
8411	ACSE Fixed Channel Assignment
8420	ACSE Fixed Clearing Call
8421	ACSE Fixed Selective Clear
8480	ACSE Fixed SCPC Begin
8481	ACSE Fixed SCPC Transmitting
8482	ACSE Fixed Authentication Begin
8483	ACSE Fixed Authentication End
8484	ACSE Fixed Power Control
8485	ACSE Fixed MES Connect
8486	ACSE Fixed Ringing Begin
8500	ACSE Mobile Begin
8501	ACSE Mobile MES RQ1
8502	ACSE Mobile MES RQ2
8503	ACSE Mobile Call Type Set
8510	ACSE Mobile Tune NCSA
8511	ACSE Mobile Channel Assignment
8520	ACSE Mobile Clearing Call
8521	ACSE Mobile Selective Clear
8580	ACSE Mobile SCPC Begin
8581	ACSE Mobile SCPC Transmitting
8582	ACSE Mobile Authentication Begin
8583	ACSE Mobile Authentication End
8584	ACSE Mobile Power Control
8585	ACSE Mobile LES Connect
8586	ACSE Mobile Ringing Begin
8600	MPDS SCPC Mode Selected
8800	ACSE cable call begin
8801	ACSE cable call successful
8900	ACSE Logoff Begin
8901	ACSE Successful Logoff
8902	ACSE No ORR Logoff
9000	ACSE accepts call

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
9003	ACSE accepted
9004	ACSE rejected
9020	ACSE call waiting
9021	ACSE idle selective clear
9022	ACSE TDM not found
9080	ACSE rejected fixed call due to invalid NSR
9081	ACSE In MRSi
9082	ACSE sounder turned on
9083	ACSE sounder turned off
9084	ACSE in lock
9085	ACSE out of lock
9086	ACSE ext sounder turned on
9087	ACSE ext sounder turned off
9088	ACSE timer about to expire
9090	ACSE Smartcard activated
9091	ACSE Smartcard removed
9092	ACSE Smartcard error
90A0	EXPPORT bonding started
90A1	EXPPORT bonding ended
90A2	EXPPORT remote panel present
90A3	EXPPORT remote panel removed
90B0	ACSE MPDS mode selected
90B1	ACSE SCPC mode selected
90C0	ACSE transmit on
90C1	ACSE transmit off
90D0	ACSE spot beam handover started
90D1	ACSE spot beam termination timer started
90F0	Event log wiped
9100	Peripheral on hook
9101	Peripheral off hook
9102	Peripheral connected
9103	Peripheral ringing
9104	Peripheral ready
9105	Peripheral hanging up
9106	Peripheral hang up
9107	Peripheral not responding
9108	Peripheral dialing

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
9109	Peripheral abort dialing
9120	Peripheral DTMF accepted
9121	Peripheral DTMF rejected
9122	Peripheral invalid request
9123	Peripheral valid request
9124	Peripheral bonding auto
9125	Peripheral bonding slave
9126	Peripheral bonding none
9130	Peripheral STU enabled
9131	Peripheral STU disabled
9200	MSG T_AM received
9201	MSG A_AM received
9202	MSG T_HA received
9203	MMI normal
9204	MMI inert
9205	MMI programming
9206	MMI reboot
9207	MMI powerdown
9208	MMI accepted
9209	MMI rejected
B000	MOD error, general
B001	MOD error, tune failed
B002	MOD error, mode failed
B003	MOD error, mmr failed
B004	MOD error, not responding
B010	MOD Invalid Mode
B011	MOD Command Invalid
B020	MOD error, su underflow
B021	MOD Su overflow
B022	MOD Su not transmitted
B024	MOD invalid frame no
B025	MOD invalid slot no
B028	MOD cannot Tx Su while tuning
B030	MOD channel out of range
B032	MOD cannot tune while Tx
B033	MOD tuning in progress
B040	MOD error watchdog

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
B100	DEMOD error, general
B101	DEMOD error, tune failed
B102	DEMOD error, mode failed
B110	DEMOD invalid mode
B130	DEMOD channel out of range
B133	DEMOD tuning in progress
B200	Generic modem error
B201	RF error RX VHF
B202	RF error RX Lband
B204	RF error RX VHF
B208	RF error TX Lband
B210	RF error RF error
B220	RF error Ref error
B27F	Mod watchdog tripped
B280	Generic voice codec errors
B281	TMS spurious interrupt
B300	Outdoor terminal failure, check connections to ODU
B301	ODU error cannot set cable attenuator
B310	ODU error power response missing
B311	ODU error tune response missing
B312	ODU error HPA control response missing
B313	ODU error HPA status response missing
B314	ODU error alarm response missing
B315	ODU error burst timer response missing
B316	ODU error HPA backoff response missing
B320	ODU error alarm heat
B321	ODU error alarm burst
B322	ODU error alarm power
B323	ODU error alarm over voltage
B324	ODU error alarm reverse power
B328	ODU failed due to tx power check
B329	ODU error alarm timeout
B330	ODU error alarm timeout no trip
B400	Internal temperature of terminal too high, turn off for 10 minutes
B401	Internal temperature sensor failed
B410	Mod error, handshake failure, power down/up and try again

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
B500	Battery charging communication failure
B501	Power supply error
B580	Battery is over temperature, charging disabled
B581	Battery temperature is now ok, charging enabled
FFFD	ACSE end marker
FFFE	Status undefined
FFFF	Status OK
400000	CT SP bad
400000	No call pending
400001	CT SP good
400002	CT SP full
400003	CT SP access denied
400080	CT SP find
400081	CT SP enumerate
400082	CT SP no entries
400090	CT SP delete
4000A0	CT SP any
4000F0	CT Terminal ID
4000F1	CT Options
4000F2	CT config names
400100	CT SP spot beam selection
400105	CT SP MPDS
400110	CT SP ocean region registration
400111	CT SP ORR query
400112	CT SP log off
400120	CT SP cable call
400200	CT SP go idle
400201	CT SP go idle due to configuration
400202	CT SP selective clear
400208	CT SP go idle clear spot beam
400209	CT SP go idle clear NSR
400210	CT SP go inert
400211	CT SP go inert Smartcard
400212	CT SP go inert DDS poll
400900	CT SP ODU status
400901	CT SP ODU status no alarms
400902	CT SP ODU status DDS

Table 4-19. Inmarsat Cause Code Definitions (Continued)

Inmarsat Cause Code	Code Definition
400910	CT SP prod test
400911	CT SP prod test ODU
401000	CT SP clear spot beam
80010F	Mobile 64 k speech
800124	Mobile aero 64 k speech
800404	Mobile data
800504	Mobile facsimile
800606	Mobile 64 k UDI
800607	Mobile 56 k UDI
800610	Mobile 64 k audio 3 k1
800622	Mobile aero 64 k UDI
800623	Mobile aero 56 k UDI
800625	Mobile aero 64 k audio 3 k1
8E0FFF	Mobile HSD
8F0FFF	Mobile
C0010F	Fixed 64 k speech
C00124	Fixed aero 64 k speech
C00404	Fixed data
C00504	Fixed facsimile
C00606	Fixed 64 k UDI
C00607	Fixed 56 k UDI
C00610	Fixed 64 k audio 3 k1
C00622	Fixed aero 64 k UDI
C00623	Fixed aero 56 k UDI
C00625	Fixed aero 64 k audio 3 k1
CE0FFF	Fixed HSD
CF0FFF	Fixed

E. Operational and Diagnostic Test Procedures

(1) General

Perform all test procedures presented in this section to test the total operational status of the HD-710 terminal. Conduct these operational tests for all terminals returned to service after repair.

The procedures assume that the technical personnel are familiar with the test equipment used and can operate the equipment to produce the required inputs and obtain the required results (indications). Refer to the detailed operating procedures and descriptions of the HD-710 terminal MPU included in this section.

CAUTION: ONLY AUTHORIZED TECHNICAL PERSONNEL, TRAINED IN GENERAL AVIATION WORKMANSHIP, WHO HAVE A BASIC UNDERSTANDING OF SATCOM SYSTEMS, SHOULD PROCEED WITH THE OPERATIONAL AND DIAGNOSTIC TEST PROCEDURES PRESENTED IN THIS MANUAL.

CAUTION: CHANGES TO DEFAULT VALUES FOR SOME MENU FUNCTIONS MAY SERIOUSLY DEGRADE SYSTEM OPERATION.

Note: This manual describes the basic MPU functions, menus, and reports required for the testing and fault isolation procedures presented in this section. Please consult Honeywell support personnel before entering any unfamiliar menu selections not described in this manual.

Note: Using a terminal emulation program, open a log file and save all test results for future reference and test records.

Note: The procedures presented in this section aid technical personnel in upgrading, maintaining, or troubleshooting an HD-710 terminal. Maintenance does not imply lubrication or adjustment activities.

Refer to the Outline and Installation drawings and the Interconnection diagrams presented in "Installation" on page 3-1 for additional information.

(2) Test Setup Procedure

The test setup procedure is presented in Table 4-20. For detailed connection of test equipment and operating instructions for the HSD terminal MPU program see "Terminal MPU" on page 4-3.

Table 4-20. Test Setup Procedure

Step	Action
1.0	Ensure that the HD-710 terminal is neither powered up nor connected to a power source before proceeding.
2.0	Connect a maintenance cable to the HD-710 terminal front-panel or remote maintenance port connector.
3.0	Connect the other end of the cable to the serial port of the computer.
4.0	Open a log file to capture all test data.

(3) Post Test

When testing is completed follow the steps in Table 4-21.

Table 4-21. Post Test Procedure

Step	Action
1.0	Save the log file of the test results (or data) for future reference.
2.0	Remove power from the terminal under test and all other test equipment.

Table 4-21. Post Test Procedure (Continued)

Step	Action
3.0	Disconnect test equipment from the HD-710 terminal.
4.0	Replace the maintenance-port connector cover (if previously removed during the test setup).

(4) Installation and Operational Verification Tests

The test procedures assume that an approved ARINC 741 compatible Antenna Subsystem has been completely installed and tested as per the manufacturer's instructions.

To facilitate and document the installation of the equipment, refer to "Installation Checklist" on page E-1.

(a) Pre Power-up Checks

Carry out all mechanical and electrical verification tests in the systematic order presented in this document.

(b) Mechanical Verification

Refer to "Installation" on page 3-1 for detailed mechanical information. Table 4-22 itemizes recommended mechanical checks.

Table 4-22. HD-710 Terminal Mechanical Verification

STEP	Item Checked	Verification Description
1. 0	Mounting Tray	Ensure service/maintenance accessibility
	Physical Placement	Check environmental considerations are met
		Cooling, air-flow, and pressure
2. 0	Fan Tray	Confirm plug configuration is correct
		Check chassis bonding
		Ensure fan rotation is unobstructed and rotates freely
3. 0	ARINC 600 Connector	Check polarized pints

(c) Electrical Verification

Refer to "Installation" on page 3-1 for detailed electrical information. Table 4-23 itemizes the recommended electrical checks.

When conducting the following tests, do not rack the HD-710 terminal.

WARNING: TO AVOID PERSONAL INJURY AND/OR EQUIPMENT DAMAGE, USE EXTREME CAUTION DURING THE VOLTAGE LEVELS MEASUREMENTS.

Table 4-23. HD-710 Terminal Electrical Verification Checklist

STEP	Item Checked	Verification Description
1.0	Power connections	28 V dc polarity or 115 V ac polarity
		Chassis Ground @ BP8—resistance measurement
2.0	Voltage levels	**CAUTION:** When power is applied to the rack, the fan energizes. Check voltage levels: 28 V dc: between BP2 (+ve) and BP3 (return) or 115 V ac: between BPI (115-H) and BP7 (115-C)
3.0	IRS Input	IRS wiring: Inertial system wired to TP4J (A) and TP4K (B)
		IRS format: ARINC 429 Interface
4.0	Configuration Strap Pins	SDI: Strapped for HGA, Pin TP5B to TP5D
		System Configuration: Strapped for System Mode, Pins TP4A, TP4B, TP4C, and/or TP4D strapped to TP7K
		Data I/O: User specific, default to unrestricted pins MP5G and MP5J to TP7K
		Forward Address: User specific address obtained from Honeywell
		WOW: (Optional)
5.0	Ethernet 1 and 2	Strapped to RJ45 distribution points Optional-other service may be preferred.
6.0	ISDN 1 and 2	Strapped to RJ45 distribution points Optional-other service may be preferred.
7.0	DTE—MPDS (RS-232)	Strapped to DB9 distribution connector Optional-other service may be preferred.
8.0	Remotes (optional but recommended)	Remote Reset switch
		Maintenance Port, remote access
		Power and Fault indicators
9.0	RF Coax	Rx input cable loss from DLNA J2 to HSD terminal at BP12
		Tx output cable loss from HSD terminal at MPC1 to DLNA J3
10.0	Antenna Connection	Antenna manufacturer and model
		Multi-Control loopbacks installed from TP3E to TP1A and TP3F to TP1B (Stand-Alone Mode)

(5) Configuration Parameters Verification

The system configuration parameters can now be verified. For additional connection and access information, see "Connection Requirements" on page 4-3. Verify and document using "Installation Checklist" on page E-1.

(6) System Power-up Checks

Note: Before proceeding, ensure that all pre power-up, mechanical, and electrical verifications have been successfully performed and documented using "Installation Checklist" on page E-1.

(a) Preparation

The following tests serve primarily to confirm proper system power-up; therefore, they can be performed while the aircraft is still in the hangar. Ensure that a computer is available for testing.

(b) Initial Visual LED Verification

The system's Power ON and Fault LEDs provide a visual status indication on the HD-710 terminal front panel and on the optional remote panel.

1. Verify that the LED indicators (at both locations) repeatedly cycle ON/OFF when power is applied.
2. Once the cycle has completed (~5 seconds), verify that the LED power indicator remains illuminated.

(c) Initial Computer Power up Display

With the computer connected and configured to accept Maintenance Port data, power-up the HD-710 terminal and verify the initial power-up screen displays as shown in Figure 4-17.

```
V1.1 -- Thu Jun 22 11:27:40 2006
TESTING RAM ......RAM OK.

HD-710 APPLICATION V9.7 -- Wed Oct 18 10:52:05 2006
VALIDATING DETECTOR CALIBRATION TABLES....
REFLECTED POWER CALIBRATION MISSING
VALIDATING ATTENUATOR CALIBRATION TABLE AT $608000.... OK
ORT OCEAN REGIONS:           SAT LONG     LES ID  SECONDARY LES ID  TNID
    W AORW         (region #0)  54.0W        1          1             0
    E AORE         (region #1)  15.5W        1          1             0
    P POR          (region #2) 178.0E        1          1             0
    I IOR          (region #3)  64.0E        1          1             0

REAL TIME CLOCK PRESENT:   14:38:57 Thu Nov 9, 2006
FORWARD ID TABLE -- VERSION 1

channel card #1 forward id ABC123
2.1 SECONDS: EEPROM FORCES HONEYWELL COMBINED MODE


FIRMWARE VERSIONS:
  KERNEL:           V1.1 -- Thu Jun 22 11:27:40 2006
  APPLICATION:      V9.7 -- Wed Oct 18 10:52:05 2006
  CHANNEL CARD #1:  0.5.3.0 9040 -- 0.0.0.29 -- 1.8.0.A -- 665428 0.2.0.0
  CHANNEL CARD #2:  0.5.3.0 9040 -- 0.0.0.29 -- 1.8.0.A -- 665428 0.2.0.0
  DATA I/O CARD:    Version 1.2.1.0 built on Jul 8 2002 08:4


CHANNEL CARD STATISTICS
CARD #1  SWIFT64  (SERIAL 64649):
   3.1 hrs powered   0.1 hrs in call since 14:13:08 Nov 7, 2006
CARD #2  SWIFT64  (SERIAL 64651):
   2.1 hrs powered   0.1 hrs in call since 15:08:49 Nov 8, 2006


Type "menu" to activate the maintenance port menus.
Other passwords provide different levels of authorization.
```

Figure 4-17. HD-710 Terminal Power-up Display Example

(7) System On-Air Checks

Conduct system on-air checks to confirm voice and data call capabilities through the satellite and ground station (LES) network. Additional testing confirms that proper signal level parameters are obtained through the antenna subsystem.

(a) Preparation

Before attempting on-air testing procedures:

1. Complete and confirm all service provider registration and activation.
2. Complete and document all pre power-up and power-up checks.
3. Position the aircraft outside, away from all obstructions in the line-of-site to the satellite used.

4. Apply the aircraft power source.
5. Power on and wait for the IRS to align.
6. Connect a computer (with a terminal emulation program) to the HD-710 terminal maintenance port.

   Note: Several system parameters, such as IRS data, RF signal quality, and log-on messaging, appear on the maintenance port display. Capture and save this maintenance port information to a file for later review or to serve as an historical test record.

(b) On-Air Power up and Logon Procedure

For this test procedure, use the Level 2, maint password to access the HD-710 terminal Maintenance Utility Program. For information on how to connect, access, and use the HD-710 terminal MPU program, see "Connection Requirements" on page 4-3.

1. With the computer connected, powered-up, and ready to accept maintenance port data, power up the HD-710 terminal.
2. Once the power up messages appear, type the Level 2 password *maint*.
3. Press **=** (equal sign) to access the "reports" menu, then activate report items **21** (call codes) and **23** (standard output).

   Remember to save these selected items by pressing **S** (save to EEPROM).
4. In Menu 2, press **Z** to reset the HSD.

   The system resets and displays the power up equivalent reset messages.
5. After the reset messages appear, immediately type the password *maint*.

   The data from the previously selected report items 21 and 23 appears. This data refreshes on-screen every second. For easier reading of the data, capture this information in a log file for later review or pause the display by pressing 'scroll lock' or by highlighting part of the viewed data.
6. Compare the output data to the sample shown in Figure 4-18.

   Several parameters need to be reviewed and documented for operational verification purposes. Refer to "Installation Checklist" on page E-1 for a detailed list of parameters.
7. Verify that the following system information, as shown on the "System Initialization Display" during the test, is accurate for the HSD terminal under test.
   - Correct forward ID displayed
   - Correct installation mode displayed
   - Correct number of channel cards listed
   - All channel cards trigger ocean region registration

The example figure has been edited for clarity. A successful log on is confirmed when the message "ACSE Successful ORR" and valid "beam" numbers are reported, e.g. beam 4.

```
HD-710 APPLICATION V9.7 -- Wed Oct 18 10:52:05 2006
VALIDATING DETECTOR CALIBRATION TABLES.... OK
VALIDATING ATTENUATOR CALIBRATION TABLE AT $608000.... OK
ORT OCEAN REGIONS:           SAT LONG     LES ID  SECONDARY LES ID  TNID
    W AORW         (region #0)  54.0W        2          2             0
    E AORE         (region #1)  15.5W        2          2             0
    P POR          (region #2) 178.0E        2          2             0
    I IOR          (region #3)  64.0E        2          2             0

REAL TIME CLOCK INITIALIZATION: REGISTER = 25
REAL TIME CLOCK INITIALIZATION: REGISTER = 7
REAL TIME CLOCK NOT DETECTED
FORWARD ID TABLE -- VERSION 101

**** strapping identifies forward id ABC123 -- not in table ****
7.0 SECONDS: EEPROM FORCES HONEYWELL COMBINED MODE


FIRMWARE VERSIONS:
    KERNEL:           V1.1 -- Thu Jun 22 11:27:40 2006
    APPLICATION:      V9.7 -- Wed Oct 18 10:52:05 2006
    CHANNEL CARD #1:  4.9.5.0 -- 0.3.7.1 -- 2.1.0.0 -- 4.1.1.0
    CHANNEL CARD #2:  4.9.5.0 -- 0.3.7.1 -- 2.1.0.0 -- 4.1.1.0
    DATA I/O CARD:    Version 1.35.0.0 built on Oct 16 2006 12:


CHANNEL CARD STATISTICS
CARD #1 SWIFT64/TAL1   (SERIAL 7700):
   60.7 hrs powered   46628.7 hrs in call since 0:00:36 Jan 1, 2000
CARD #2 SWIFT64/TAL1   (SERIAL 7699):
   32684.6 hrs powered   0.3 hrs in call since 0:00:36 Jan 1, 2000


HARDWARE:
            PART NUMBER       REVISION
      EMS:  1252-A-3600-01    01


SOFTWARE:
            PART NUMBER       REVISION
      EMS:  *************     ***


Type "menu" to activate the maintenance port menus.
Other passwords provide different levels of authorization.
```

Figure 4-18. Log-on Initialization Display Example

(c) On-Air Voice/Data Call Verification

Once the system has logged on, place a test voice and/or data call. Refer to "System Operation" on page 2-1 for detailed call procedures. Verification of all aircraft communication functions is recommended. Record the test call result on "Installation Checklist" on page E-1.

Note: For the purposes of providing a sample display, an ISDN voice call is documented.

(d) On-Air Voice/Data Call Verification Procedure

1. Ensure the maintenance port report items 21 and 23 are activated.
2. Place a test call.
3. Observe and verify the maintenance port messages are similar to the sample provided in Figure 4-19.

```
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=54.8 dB Hz  sig=-32.2 dB    28.0 C no call beam=7
CHAN #3: C/No=54.4 dB Hz  sig=-31.8 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
#1 ABC123 W7 start 800124 14.00 dBW mobile aero 64k speech 28.0 C 55 dB Hz
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=54.8 dB Hz  sig=-32.1 dB    28.0 C speech  beam=7
CHAN #3: C/No=54.4 dB Hz  sig=-31.1 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
#1 ABC123 W7 start 800124 22.50 dBW mobile aero 64k speech 28.0 C 55 dB Hz
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=61.5 dB Hz  sig=-24.3 dB    29.5 C speech  beam=7
CHAN #3: C/No=54.0 dB Hz  sig=-32.0 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
#1 ABC123 W7 start 800124 17.50 dBW mobile aero 64k speech 29.5 C 62 dB Hz
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=57.7 dB Hz  sig=-29.8 dB    30.5 C speech beam=7
CHAN #3: C/No=54.0 dB Hz  sig=-31.9 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
#1 ABC123 W7 start 800124 18.50 dBW mobile aero 64k speech 31.0 C 0 dB Hz
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No= 0.0 dB Hz  sig=-1000 dB    31.0 C speech  beam=7
CHAN #3: C/No=54.4 dB Hz  sig=-32.1 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
#1 ABC123 W7 stop 1001 call cleared by MES terminal 31.0 C 0 dB Hz
dop 0 ppb  az 68.6 deg    el 34.5 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No= 0.0 dB Hz  sig=-32.6 dB    31.0 C no call beam=7
CHAN #3: C/No=54.5 dB Hz  sig=-31.8 dB    29.0 C no call beam=7
45D6'29.3"N  75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots  *********
```

Figure 4-19. HD-710 Terminal Call Display Example

(8) Optional System Checks

The following procedures are recommended—but not essential; however, they serve to confirm successful completion of all previous tests.

(a) Preparation

Activate report items 21 and 23 for the following checks.

(b) Optional Voice/Data Calls Procedure

Note: As in previous tests, open a log file to capture all maintenance port activity during aircraft taxiing, flight, and landing segments.

- Voice/data calls—ground segment:

  Place any combination of voice and/or data calls while the aircraft is taxied in a full circle and/or and figure 8 pattern. Note any voice or data anomalies.

- Voice/data calls—in flight:

  Place any combination of voice and/or data calls during any of the segments listed above. The flight pattern may include "standard rate of turn", figure 8, or circles. Note any voice or data anomalies.

(9) Operational Mode and Configuration System Checks

This section describes system checks designed for specific HD-710 terminal modes of operation.

(a) Verifying Honeywell Combined Mode System Operation

This section provides system operational verification procedures that are specific to Honeywell Combined Mode installations.

The following system verification procedures use the HD-710 terminal MPU program to access system information.

Note: Record all test results on "Installation Checklist" on page E-1.

1. Checking HPA Status

   To check the HPA Status:

   1. With the MPU program activated (MAINT password access), press the equals sign (=) to activate the reports.
   2. Press **Ctrl+N** to scroll to report 25.
   3. Type *25* to toggle on the HPA ARINC I/O report.

      Report 25 toggles ON.

   4. Press **Esc**.

      The “Reports” for HPA Status appears on screen. The screen refreshes every few seconds.

```
HPA maintenance word 600002: SSM: NORMAL OPERATION  SDI: HGA HPA
HPA status word 64137a: SSM: NORMAL OPERATION  SDI: HGA HPA
OUTPUT POWER: 28.0 dB LESS THAN 40W
MAX. AVAILABLE RMS POWER: 2.0 dB GREATER THAN 40W
HELD POWER    LINEAR    CARRIER OFF    BACKOFF RANGE= 31 dB
```

5. Confirm that the report shows SSM as “normal operation” and that SDI appears configured as HGA HPA.
6. Press **=**, then type *25* to toggle OFF report 25.

   Report 25 appears as “OFF”.

2. Checking EIRP power

   Check EIRP power values during system operation using the HD-710 terminal MPU program. Place a number of call types and combinations while using the “reports” function of the HD-710 terminal MPU program and record the reported values on "Installation Checklist" on page E-1.

3. Test Set-up Procedure

   1. With the MPU program activated (MAINT password access), press the equals sign (=) to activate the reports.
   2. Press **Ctrl+N** to scroll to report 78.
   3. Type *78* to toggle on the vt100 EIRP/power report.

      Report 78 toggles ON.

   4. Press **Esc**.

      The reports for vt100 EIRP/power appear on screen. The Reports screen refreshes every few seconds.

4. EIRP Test Procedures

   1. Place an HD-710 terminal ISDN voice call using channel card one (repeat procedure placing a call using the second channel card), and then place a multi-link PPP ISDN data call (128 kbps ISDN) to confirm bonding is operational.

      - Confirm that the EIRP/Watts value begins at approximately 20 to 22.5 W until it stabilizes to a lower power usage value of approximately 17.0 W until the end of the call.
      - Confirm that the HPA value is in the range of 11 W to 16 W during the call.

   2. Place two simultaneous HD-710 terminal Swift64 ISDN voice calls (one call from each channel card) and while both calls are connected, confirm that the EIRP/Watts value is reported similar to the values presented in Figure 4-21 and Figure 4-22.
   3. Place one Aero H/H+ call.

      The Aero Watts value should initially increase to a value of 8 to 10 W and then stabilize to lower watt value of 1.5 to 2.5 W when the call has stabilized. Refer to Figure 4-23 and Figure 4-24.

4. Place two simultaneous Aero H/H+ calls.

   The Aero H/H+ Watts value should initially increase to a value of 8 to 10 W and then stabilize to lower watt value of 1.5 to 2.5 W when the call has stabilized. Refer to Figure 4-25. Keeping the two Aero H/H+ calls up, place one HD-710 terminal Swift64 ISDN call. Refer to Figure 4-26.

5. Place two HD-710 terminal Swift64 ISDN voice calls (one call from each channel card) and while both calls are connected, place an Aero H/H+ voice call.

6. The Aero Watts value should initially increase to a value of 8 to 10 W and then stabilize to lower watt value of 1.5 to 2.5 W when the call has stabilized. Refer to Figure 4-27.

7. Place two HD-710 terminal Swift64 ISDN voice calls (one call from each channel card) and while both calls are connected, place two Aero H/H+ voice calls.

   The Aero Watts value should initially increase to a value of 8 to 10 W and then stabilize to lower watt value of 1.5 to 2.5 W when the call has stabilized. Refer to Figure 4-28 and Figure 4-29.

8. Press **=**, then type *78* to toggle OFF report 78.

   Report 78 appears as “OFF”.

5. Verifying System Operation when “In-Call” (Report 78)

   The values shown in the following examples of the HD-710 terminal Maintenance Port Utility, Report 78, are derived from an HCM system operating with a 12 dBW gain and 2.5 dBW HPA-to-antenna-loss and assumes good beam coverage.

```
CHANNEL CARD    #1       #2
EIRP/WATTS    0.0/0    17.5/6
HPA (ITS):  11.3 WATTS A    CHANNEL CARDS:  6.3 WATTS ANT GAIN: 12
15:05:55 PERMITTED UNDERDRAFT: 5.0 dB  ADD M4 CALL: 06 WATTS
AERO WATTS:  USED=00  RESERVED=13  HPA=36 WATTS  HPA GAIN=62.0 dB
```

Figure 4-20. Stable Connection with One M4 (Swift64) Call

```
CHANNEL CARD   #1        #2
EIRP/WATTS  18.5/8     22.5/20
HPA (ITS):  35.7 WATTS A  CHANNEL CARDS: 27.9 WATTS  ANT GAIN: 12
12:05:31 PERMITTED UNDERDRAFT: 0.0 dB  ADD M4 CALL: 20 WATTS
AERO WATTS:  USED=00  RESERVED=13  HPA=36 WATTS  HPA GAIN=62.8 dB
```

Figure 4-21. Initial Connection with Two M4 (Swift64) Calls

```
CHANNEL CARD   #1        #2
EIRP/WATTS  17.5/6    17.5/6
HPA (ITS):  15.9 WATTS A  CHANNEL CARDS: 12.5 WATTS  ANT GAIN: 12
12:07:33 PERMITTED UNDERDRAFT: 4.0 dB  ADD M4 CALL: 08 WATTS
AERO WATTS:  USED=00  RESERVED=13  HPA=36 WATTS  HPA GAIN=62.4 dB
```

Figure 4-22. Stable Connection with Two M4 (Swift64) Calls

```
CHANNEL CARD   #1        #2
EIRP/WATTS   0.0/0     0.0/0
HPA (ITS):  9.0 WATTS A  CHANNEL CARDS: 0.0 WATTS  ANT GAIN: 12
15:10:02 PERMITTED UNDERDRAFT: 0.0 dB  ADD M4 CALL: 20 WATTS
AERO WATTS:  USED=10  RESERVED=23  HPA=36 WATTS  HPA GAIN=62.2 dB
```

Figure 4-23. Call Initialization (Aero H/H+ Call)

```
CHANNEL CARD   #1        #2
EIRP/WATTS  0.0/0     0.0/0
HPA (ITS):  2.2 WATTS H  CHANNEL CARDS: 0.0 WATTS  ANT GAIN: 12
15:11:24 PERMITTED UNDERDRAFT: 0.0 dB  ADD M4 CALL: 20 WATTS
AERO WATTS:  USED=02  RESERVED=14  HPA=36 WATTS  HPA GAIN=61.2 dB
```

Figure 4-24. Stable Connection with One Aero H/H+ Call

```
CHANNEL CARD   #1        #2
EIRP/WATTS   0.0/0     0.0/0
HPA (ITS):  4.0 WATTS A  CHANNEL CARDS: 0.0 WATTS  ANT GAIN: 12
15:14:09 PERMITTED UNDERDRAFT: 0.0 dB  ADD M4 CALL: 20 WATTS
AERO WATTS:  USED=04  RESERVED=16  HPA=36 WATTS  HPA GAIN=61.7 dB
```

Figure 4-25. Connection with Two Aero H/H+ Calls

```
CHANNEL CARD   #1        #2
EIRP/WATTS  17.5/6     0.0/0
HPA (ITS):  15.9 WATTS A  CHANNEL CARDS: 6.2 WATTS  ANT GAIN: 12
15:15:48 PERMITTED UNDERDRAFT: 3.0 dB  ADD M4 CALL: 10 WATTS
AERO WATTS:  USED=04  RESERVED=17  HPA=36 WATTS  HPA GAIN=62.3 dB
```

Figure 4-26. Connection with Two Aero H/H+ Calls and One M4 (Swift64) Call

```
CHANNEL CARD   #1        #2
EIRP/WATTS  18.5/8    18.5/8
HPA (ITS):  17.9 WATTS A  CHANNEL CARDS: 15.7 WATTS  ANT GAIN: 12 =04
RESERVED=17 HPA=36 WATTS HPA GAIN=62.6 dB
12:16:10 PERMITTED UNDERDRAFT: 4.0 dB  ADD M4 CALL: 08 WATTS
AERO WATTS:  USED=02  RESERVED=15  HPA=36 WATTS  HPA GAIN=62.6 dB
```

Figure 4-27. Connection with Two M4 (Swift64) Calls and One Aero H Call

```
CHANNEL CARD   #1        #2
EIRP/WATTS  18.5/8    17.5/6
HPA (ITS):  22.5 WATTS A  CHANNEL CARDS: 14.2 WATTS  ANT GAIN: 12
12:10:22 PERMITTED UNDERDRAFT: 5.0 dB  ADD M4 CALL: 06 WATTS
AERO WATTS:  USED=11  RESERVED=24  HPA=36 WATTS  HPA GAIN=62.8 dB
```

Figure 4-28. Initial Connection with Two Aero H/H+ Calls and Two M4 (Swift64) Calls

```
CHANNEL CARD   #1        #2
EIRP/WATTS  18.5/8    17.5/6
HPA (ITS):  17.9 WATTS A  CHANNEL CARDS: 14.3 WATTS  ANT GAIN: 12
12:12:01 PERMITTED UNDERDRAFT: 5.0 dB  ADD M4 CALL: 06 WATTS
AERO WATTS:  USED=02  RESERVED=15  HPA=36 WATTS  HPA GAIN=62.5 dB
```

Figure 4-29. Stable Connection with Two Aero H/H+ Calls and Two M4 (Swift64) Calls

If the HD-710 terminal Honeywell Combined Mode system does not pass the system operational verification procedure, or if the system fails, refer to the test and fault isolation checks presented in Table 4-24.

Table 4-24. Honeywell Combined Mode Basic Fault Checks

SYMPTOM	CHECK
System “not working”	Strapping and SDI – HPA Status
No communication with avionics	Check multi-control wiring
Unable to place an HD-710 terminal Swift64 call	Activate Report 38 and check for power request value. Check RF connections between the Transmit cable and the HD-710 terminal DLNA Check the connection of the receive cable between the HD-710 terminal and the splitter

Table 4-24. Honeywell Combined Mode Basic Fault Checks (Continued)

SYMPTOM	CHECK
Unable to place an Aero H/H+ call	Check transmit cable between the Aero H RFU and the HD-710 terminal HPA If a low receive value is indicated on either the HD-710 terminal or Honeywell SDU, check splitter connections (receive cable from DLNA to the splitter) Check the connection on the Aero H RFU receive cable connector
Calls dropping when placing multiple calls	HPA to antenna, cable loss value may not be accurate. Re-measure the HPA to antenna cable loss and re-configure the HD-710 terminal to match the revised value.

F. Software Load Procedures

The manufacturer or supplier may occasionally release new software for the HD-710 terminal.

CAUTION: Software must not be loaded to the HD-710 terminal when the terminal is fully installed in the aircraft.

Load new software with a laptop or computer connected to the maintenance port of the HD-710 terminal, using the EMS Loader application.

Note: Refer to the applicable software release note or service bulletin for a specific list of the software files that need to be loaded. If in doubt, verify with Honeywell Product Support that the software version being loaded is the latest release.

Note: When loading channel card software to HD-710 terminals in installation environments where the SDU has been disabled or removed, the channel card (or cards) must be manually powered up using the HD-710 terminal MPU program.

(1) Loading Channel Card Software

CAUTION: Software must not be loaded to the HD-710 terminal when the terminal is fully installed in the aircraft.

This section describes how to load channel card software to HD-710 terminals using the EMS Loader.

To load channel software:

1. Remove power from the HD-710 terminal.
2. Connect a computer to the maintenance port of the HD-710 terminal.
3. Turn on the computer.
4. Save the EMS Loader application file (ADT_LOAD.exe) to the same folder on your computer that contains the software files. (Recommended: Create a folder named HSD Load in the root directory and save the load program file and the software files to this folder.)

5. Apply power to the HD-710 terminal.
6. Close all other applications running on the computer. The load program will not execute successfully if other programs are using the com port.
7. In the HSD folder, double-click **ADT_LOAD.exe**.

   The EMS Loader opens in a DOS window, displays the "Load Target" menu, and prompts you to select a ”target” for the software.
8. To load all software on channel card #1, type *22*. To load all software on channel card #2, type *23*.
9. Press **Enter**.

   The EMS Loader prompts you to select a COM port.
10. Type the COM port connected to the HD-710 terminal and press **Enter**.

    The EMS Loader prompts you to type in a filename.
11. Type *config.hex*, and then press **Enter**.

    The prompt asks if this is RF control software for TAL2 (channel card #1) or TAL4 (channel card #2).
12. Press **Enter** to indicate the default, **N** (No).

    The EMS Loader will continue to prompt for the next filename.
13. Enter the following file names one at a time, press **Enter** after each one, type *Y* or *N*, and press **Enter** again.
    - release.hex, N, Enter
    - cpumain.hex, N, Enter
    - tmsc33.hex, N, Enter
    - tmsc64.hex, N, Enter
    - rfcontrol.hex, N, Enter
    - rfcontrol2.hex, Y, Enter
14. When finished, press **Enter** at the prompt to terminate the list.

    Communication with the HD-710 terminal is established. A percentage (%) load status indicator appears on the screen. Once the load is complete, a confirmation message briefly appears on the screen indicating that the file has been successfully loaded. The DOS window closes and the HD-710 terminal resets.
15. Repeat this procedure to load software to Channel Card 2.
16. If no other software loads are required, proceed to "Verifying Software Loads" on page 4-52.

Note: If the load fails, restart the load from the beginning of the Loading Channel Card Software procedure. If after two attempts the load still does not complete successfully, assume that the software disks or files may have been corrupted or the software is incompatible with the hardware configuration. Contact Honeywell Product Support for assistance.

(2) Loading Control Processor Software

CAUTION: Software must not be loaded to the HD-710 terminal when the terminal is fully installed in the aircraft. The HD-710 terminal must be unplugged before software is loaded.

This section describes how to load control processor software on to HD-710 terminals.

1. Remove power from HD-710 terminal.
2. Connect a computer to the Maintenance Port of the HD-710 terminal.
3. Turn on the computer.
4. Save **ADT_LOAD.exe** to the same folder on your computer that contains the software files. (Recommended: Create a folder named **HSD Load** in the root directory and save the load program file and the software files to this folder.)
5. Apply power to the HD-710 terminal.
6. Close all other applications running on the computer. The load program will not execute successfully if other programs are using the com port.
7. In the HSD folder, double-click **ADT_LOAD.exe** to launch the load application.

   The EMS Loader opens in a DOS window, displays the "Load Target" menu, and prompts you to select a ”target” for the software.
8. To load control processor software to the control processor, press **0** (zero).
9. Press **Enter**.

   The load application prompts you to type in a filename.
10. Type the filename for the software being loaded to the HD-710 terminal Control Processor, and then press **Enter**.

    The EMS Loader prompts you to select a COM port.
11. Type the COM port connected to the HD-710 terminal, and then press **Enter**.
12. To start the load, press **Enter**. (To abort the software load, press **Esc**.)

    Communication with the HSD terminal is established. A percentage (%) load status indicator appears on the screen. Once the load is complete, a confirmation message briefly appears on the screen indicating that the file has been successfully loaded. The DOS window closes and the HD-710 terminal resets.
13. If no other software loads are required, proceed to "Verifying Software Loads" on page 4-52.

Note: If the load fails, restart the load from the beginning of the Loading Control Processor Software procedure. If after two attempts the load still does not complete successfully, assume that the software disks or files may have been corrupted or the software is incompatible with the hardware configuration. Contact Honeywell Product Support for assistance.

(3) Updating Displayed Software Versions

Once you have uploaded the major software to the HD-710 terminal, you must load a BIN file to display the new versions. Load this file as required according to the applicable software service bulletin as released by the manufacturer or supplier.

To update displayed software versions:

1. Remove power from HD-710 terminal.
2. Connect a computer to the Maintenance Port of the HD-710 terminal.
3. Turn on the computer.
4. Save **ADT_LOAD.exe** to the same folder on your computer that contains the software files. (Recommended: Create a folder named **HSD Load** in the root directory and save the load program file and the software files to this folder.)
5. Apply power to the HD-710 terminal.
6. Close all other applications running on the computer. The load program will not execute successfully if other programs are using the com port.
7. In the HSD folder, double-click **ADT_LOAD.exe** to launch the load application.

   The EMS Loader opens in a DOS window, displays the "Load Target" menu, and prompts you to select a ”target” for the software.
8. To load application software, type *24*.
9. Press **Enter**.

   The system prompts you for a filename.
10. Type the filename of the software.

    Note: The filename follows the format **li_XX.bin**.
11. Press **Enter**.

    The program prompts you to select a COM port.
12. Type the COM port connected to the HD-710 terminal, and press **Enter**.
13. To start the load, press **Enter**.

    A percentage (%) progress indicator appears on the screen. A confirmation message briefly appears on the screen indicating that the file has been successfully loaded, and then the DOS window closes. This completes the file load.

If all loads are finished, verify the success of the software load by following the instructions provided in "Verifying Software Loads" on page 4-52.

In the event that the load fails, restart from the beginning of "Updating Displayed Software Versions" on page 4-51. If after two attempts the load still does not complete successfully, assume that the software disks may have been corrupted or the software is incompatible with the hardware configuration. Contact Honeywell Product Support for assistance.

(4) Verifying Software Loads

After loading all software as specified in the applicable software service bulletin, released by the manufacturer or supplier, verify that all software loaded successfully.

WARNING: IN SYSTEMS WITH DISABLED OR REMOVED SDU, THE CHANNEL CARD OR CARDS MUST BE MANUALLY POWERED ON TO ENABLE THE VERIFICATION OF THE SOFTWARE LOAD.

Note: The screens shown in this procedure are examples only. The software and other versions may differ from your terminal.

1. Apply power to the HD-710 terminal.
2. Open HyperTerminal (or similar) on the computer and start the HD-710 terminal Maintenance Utility Program.
3. Connect the computer to the Maintenance Port of the HSD terminal.
4. Enter the Maintenance Utility Program password: Type *maint* and then press **Enter**.

   Menu 1 appears.
5. Press **Ctrl+N** to scroll to MENU 2.

   Menu 2 appears.

```
     MENU 2                                FIRMWARE Vx.x

A   set veh-relative azimuth           E   set veh-relative elevation
K   desired az veh-rel velocity        R   resume automatic steering
T   enter time of day                  N   annotate log file
L   re-enter logon password            V   get firmware versions
Z   reset HD-710                       S   set satellite longitude
<CTRL> N next menu     <CTRL> O previous menu     = select reports
```

6. To display the versions of software loaded onto the HSD, press **V**.

   A list of Firmware Versions appears similar to the example provided below (actual versions will differ depending on the software installed on the terminal).

```
FIRMWARE VERSIONS:
   KERNEL:           V1.1 -- Thu Jun 22 11:27:40 2006
   APPLICATION:      V9.7 -- Wed Oct 18 10:52:05 2006
   CHANNEL CARD #1:  0.5.3.0 9040 -- 0.0.0.29 -- 1.8.0.A -- 665428 0.2.0.0
   CHANNEL CARD #2:  0.5.3.0 9040 -- 0.0.0.29 -- 1.8.0.A -- 665428 0.2.0.0
   DATA I/O CARD:    Version 1.2.1.0 built on Jul 8 2002 08:43:16
```

7. Verify that all software has loaded successfully to both channel cards. Verify that the software versions (Firmware Versions) shown match the versions listed on the load disk (or files) and in the software service bulletin.
8. Close the HyperTerminal session.
9. Remove power from the HSD terminal.

   This completes the software load verification. "Disconnecting Load Equipment" on page 4-54 explains how to disconnect the software load equipment.

(5) Disconnecting Load Equipment

After completing all required software loads and load verification:

1. Remove power from the HD-710 terminal (if applicable).
2. Turn off the computer (if applicable).
3. Disconnect the serial cable connector from the computer COM port.
4. Disconnect the serial cable connector from the HSD terminal maintenance port.

3. Troubleshooting and Fault Isolation

This section provides troubleshooting procedures for HD-710 terminal experiencing faults during the commissioning process or previously operational terminals now considered as "not working".

Troubleshooting procedures require data obtained using the MPU feature of the HD-710 terminals. For specific instructions on how to access and use the Maintenance Port and MPU of the terminal, refer to "Connection Requirements" on page 4-3.

A. Troubleshooting Practices

Troubleshooting practices for the HD-710 terminal fall into two categories: non-specific and specific complaints.

(1) Non-specific Complaints

When troubleshooting terminals with non-specific complaints, complete all system verification and functional tests starting on page 4–35. Document whether the terminal passes or fails each test.

If the terminal passes all tests and no fault is discovered, all associated equipment and aircraft wiring should be tested.

If the terminal fails a specific test, isolate the actual fault or faults by performing troubleshooting procedures provided in this section.

(2) Specific Complaints

When troubleshooting terminals with specific complaints, service personnel may choose not to complete some or all of the diagnostic tests and proceed directly to the applicable troubleshooting and fault isolation procedure provided in this section.

B. Equipment Required

Equipment required for troubleshooting and fault isolation is the same as the equipment required for test purposes as listed in "Test and Fault Isolation Equipment Requirements" on page 4-2.

C. Troubleshooting Aids

This section presents examples of maintenance screens and troubleshooting tables to assist in troubleshooting and fault isolation activities. The exact screen display may vary depending on the version of the terminal's operational software and installation configuration mode.

Note: The screens used in the figures presented in this section may have been edited for clarity and for illustrative purposes.

(1) Fault Isolation Screen Displays

Figure 4-30 to Figure 4-36 provide example maintenance screens for reference and illustration purposes.

```
#1 ABC123 W7 start 400110 14.00 dBW CT SP ocean region registration 33.5 C 53 dB Hz
#1 ABC123 W7 stop 8301  ACSE successful ORR  33.5 C 53 dB Hz
#3 ABC456 W7 start 400110 14.00 dBW CT SP ocean region registration 33.5 C 54 dB Hz
#3 ABC456 W7 stop 8301  ACSE successful ORR  33.5 C 53 dB Hz
```

Figure 4-30. Successful Ocean Region Registration (report 21 activated)

```
#1 ABC123 W7 start 400110 14.00 dBW CT SP ocean region registration 35.0 C  53 dB Hz
#1 ABC123 W7 stop 8306  ACSE failed retry ORR  35.0 C 53 dB Hz
#3 ABC456 W7 start 400110 14.00 dBW CT SP ocean region registration 29.0 C  54 dB Hz
#3 ABC456 W7 stop 8306  ACSE failed retry ORR  29.0 C 53 dB Hz
```

Figure 4-31. Failed Ocean Region Registration

```
dop 0 ppb az 68.6 deg  el 34.3 deg AORW ant gain 12.0 (p/t)
CHAN #1: C/No=54.4 dB Hz sig=-32.8 dB  31.5 C no call beam=7
CHAN #3: C/No=54.7 dB Hz sig=-32.3 dB  29.0 C no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.3 deg AORW ant gain 12.0 (p/t)
CHAN #1: C/No=54.1 dB Hz sig=-32.5 dB  31.5 C no call beam=7
CHAN #3: C/No=54.4 dB Hz sig=-31.7 dB  29.0 C no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.3 deg AORW ant gain 12.0 (p/t)
CHAN #1: C/No=54.1 dB Hz sig=-32.9 dB  31.5 C no call beam=7
CHAN #3: C/No=54.6 dB Hz sig=-31.6 dB  29.0 C no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
```

Figure 4-32. No Call (report 23)

```
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=54.1 dB Hz  sig=-33.7 dB   31.5 C  no call beam=7
CHAN #3: C/No=54.2 dB Hz  sig=-32.3 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
#1 ABC123 W7 start c00124 14.00 dBW fixed aero 64k speech 31.5 C 54 dB Hz
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=54.1 dB Hz  sig=-33.1 dB   31.5 C  speech beam=7
CHAN #3: C/No=54.2 dB Hz  sig=-32.7 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=54.1 dB Hz  sig=-33.0 dB   31.5 C  speech beam=7
CHAN #3: C/No=54.4 dB Hz  sig=-32.2 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=53.9 dB Hz  sig=-33.0 dB   31.5 C  speech beam=7
CHAN #3: C/No=54.4 dB Hz  sig=-32.3 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
#1 ABC123 W7 start c00124 22.50 dBW fixed aero 64k speech 31.5 C 54 dB Hz
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No= 0.0 dB Hz  sig=-1000 dB   31.5 C  speech beam=7
CHAN #3: C/No=53.9 dB Hz  sig=-32.1 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No= 0.0 dB Hz  sig=-26.6 dB   35.0 C  speech beam=7
CHAN #3: C/No=53.7 dB Hz  sig=-32.2 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No= 0.0 dB Hz  sig=-26.7 dB   35.0 C  speech beam=7
CHAN #3: C/No=53.5 dB Hz  sig=-32.1 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
#1 ABC123 W7 stop 1f01 call cleared by terrestrial circuit 35.0 C 59 dB Hz
dop 0 ppb az 68.6 deg  el 34.1 deg  AORW  ant gain 12.0 (p/t)
CHAN #1: C/No=58.6 dB Hz  sig=-26.1 dB   35.0 C  no call beam=7
CHAN #3: C/No=54.0 dB Hz  sig=-32.3 dB   29.0 C  no call beam=7
45D6'29.3"N 75D25'58.2"W PT 0.0D RL 0.0D HD 80.0D TK 0.2D 0 knots *********
```

Figure 4-33. In Call—Swift64 Voice Call on Channel 1 (reports 21 and 23)

```
************  ************  *******  *******  *******  *******  *******  ******
0:32:50 dop 0 ppb  az 150.7 deg   el 33.5 deg  AORW  ant gain 8.0 (min)
CHAN #1: C/No= 0.0 dB Hz  sig=-1000 dB    33.0 C  no dial beam=255
CHAN #3: C/No= 0.0 dB Hz  sig=-1000 dB    32.5 C  no dial beam=255
************  ************  *******  *******  *******  *******  *******  ******
0:32:51 dop ****  az 150.7 deg   el 33.5 deg  AORW  ant gain 8.0 (min)
CHAN #1: C/No= 0.0 dB Hz  sig=-1000 dB    33.0 C  no dial beam=255
CHAN #3: C/No= 0.0 dB Hz  sig=-1000 dB    32.5 C  no dial beam=255
************  ************  *******  *******  *******  *******  *******  ******
0:32:52 dop ****  az 150.7 deg   el 33.5 deg  AORW  ant gain 8.0 (min)
CHAN #1: C/No= 0.0 dB Hz  sig=-1000 dB    33.0 C  no dial beam=255
CHAN #3: C/No= 0.0 dB Hz  sig=-1000 dB    32.5 C  no dial beam=255
```

Figure 4-34. No IRS Data (report 23 activated)

```
#1 45A0E5 W7 start 800124 14.00 dBW mobile aero 64k speech 34.0 C 54 dB Hz
#1 45A0E5 W7 start 800124 22.50 dBW mobile aero 64k speech 34.0 C 54 dB Hz
calling 011613726277#
#1 45A0E5 W7 stop 11d2 call failed, insufficient digits in service address
34.0 C 62 dB Hz
calling 011613726277#
```

Figure 4-35. Incorrect Dialing Format (reports 21 and 52 enabled)

```
port maintenance $600001 SDI: PRT/TOP SSM: NORMAL
port ant: status $608031 SDI=PRT/TOP gain=12 maint $600001 SDI=PRT/TOP
port ant: status $608031 SDI=PRT/TOP gain=12 maint $600001 SDI=PRT/TOP
port ant: status $608031 SDI=PRT/TOP gain=12 maint $600001 SDI=PRT/TOP
port ant: status $608031 SDI=PRT/TOP gain=12 maint $600001 SDI=PRT/TOP
port status $608031 SDI: PRT/TOP SSM: NORMAL gain=12.0
OMNIDIRECTIONAL MODE open loop tracking port/top active  HGA  LNA=on
```

Figure 4-36. Top/Port Antenna Status (reports 18, 19, and 20 activated)

(2) Troubleshooting Table

Table 4-25 provides fixes for basic HD-710 terminal faults. Before completing any fix, activate the HSD terminal MPU using the maint password. For detailed connection and user instructions, see "Connection Requirements" on page 4-3.

Table 4-25. Troubleshooting and Fault Isolation

Fault	Description	Maintenance Report	Check
RED LED remains on after powering up sequence	• HPA Uncontrolled • HPA Fault	View initial power-up display of the HSD terminal MPU Program	
HPA Error Status	• reporting invalid SSM • HPA not reporting status word 143 • HPA not reporting maintenance word 350 • HPA maintenance word reporting ARINC error • HPA maintenance word not reporting HGA antenna • HPA maintenance word reporting VSWR error • HPA maintenance word reporting RAM error • HPA reporting ROM error • HPA maintenance word reporting power supply error • HPA maintenance word reporting temperature error	In menu 1, press **Y** to obtain an explanation of the HPA error status	• Check the external power source is properly connected and meets installation requirements. • Check transmit path from HSD terminal output (MPC1) to the antenna subsystem (coax cables, splitters, relays, etc…). • Check installation location meets the RTCA/DO-160D environmental specifications. • Check for proper fan-tray operation and air-cooling. • Verify the fan-tray plug distribution is as per the installation requirements.

Table 4-25. Troubleshooting and Fault Isolation (Continued)

Fault	Description	Maintenance Report	Check
Call Failure	IRS information not available	Activate maintenance reports 21 and 23 See Figure 4-34	• Check that the IRS systems are powered on and aligned. • Check that connections to the IRS systems are secured. • Check the polarity of IRS input lines. • If no IRS data is available, use Menu 10 to manually input navigational data to point the antenna to a preferred satellite location and try the call again.
	System does not log onto the broadbeam	Activate maintenance reports 21 and 23 See Figure 4-31	• Check that the IRS data is received and valid. • Ensure that a valid FWD ID is read. • Verify correct antenna pointing. • Ensure LES Access codes are configured correctly. • Verify all coax connections.
	System does not log onto the correct Ocean Region	Activate maintenance reports 21 and 23 See Figure 4-31	• Check that the IRS data is received and valid. • Check for antenna line-of-sight interference.
	Terminal is not transmitting	Activate maintenance reports 21 and 23	• Check for a defective or loose RF cable. • Verify the Rx RF level is acceptable. • Check RF power level displayed in Maintenance Port Menu Report Item 21; the EIRP should be requested at 14.00 dBW but in call should increase to 22.5 dBW then level off to approximately 16 dBW. • Ensure the HSD terminal is secured properly to the ARINC connector in the tray.

Table 4-25. Troubleshooting and Fault Isolation (Continued)

Fault	Description	Maintenance Report	Check
Call failure (cont'd)	Forward ID is invalid or strapped incorrectly	Activate maintenance report 21 To check FWD ID, in Menu 4, press **Q**	• The account registration process has not been completed. Check your account status with your service provider to ensure that the account registration has been processed into the LES databases and that your account is valid. • If the message, "Channel card stuck in boot state" appears in the event log, check that the assigned FWD IDs are strapped correctly. • If fault code 12B1 appears in the event log, ensure FWD ID is valid for the Inmarsat Terminal Category.
	Terminal is strapped to an incorrect system mode of installation	In menu 3, select Item L (List EEPROM)	• Verify the system mode strapping is correct. • Reset the system and observe the initialization display; it shows the HSD terminal's powering up, self-test results. The Initialization display lists the installation mode configuration for the terminal. • If the mode displayed is not strapped or is incorrectly strapped, a temporary setting may be used. In Menu 3, select M (misc. EEPROM parameters), then select parameter 16 (Channel Card Category) and configure the HSD terminal to the correct mode. Reset the terminal and try the call again.
	Dialing sequence was incomplete or incorrect	Activate reports 21and 52 See Figure 4-32	• Verify the number you are calling and try the number again. • Ensure that you end the dialing sequence by pressing # (pound key). Pressing # at the end of the dialing string signals the system to "send" the call.

Table 4-25. Troubleshooting and Fault Isolation (Continued)

Fault	Description	Maintenance Report	Check
Log-on request fails	Terminal is not transmitting	Activate maintenance reports 21 and 23 See Figure 4-31	• Check for a defective or loose cable. • Check for antenna line of sight interference. • Check for HPA fault. • Ensure the HSD terminal is secured properly to the ARINC connector in the tray. • Ensure your account is current and active.
	Terminal is not receiving	Activate maintenance reports 21 and 23	• Check for a defective or loose cable. • Ensure the antenna subsystem DLNA is powered. • Check for antenna line of sight interference. • Verify that the Forward ID is valid, activated, and strapped correctly. • Ensure your account is current and active. • Check for antenna line-of-sight interference. • Ensure the HSD terminal is secured properly to the ARINC connector in the tray.
Incoming call failure	Incoming call shows as a successful connection in report 23, but call does not ring through to the external device (telephone, computer, fax).	Activate reports 21 and 23	• Check the connection between the HSD terminal and the external device. • Check configuration of external devices is correct. MSN must be configured correctly for each device connected to the system. • If MSNs are not programmed in the user devices, incoming calls will ring all devices. **Note**: Zero is an invalid entry.

Table 4-25. Troubleshooting and Fault Isolation (Continued)

Fault	Description	Maintenance Report	Check
Log-on successful, but fails to complete call	Authorization error (fault code 12C4)	Activate reports 21 and 23 See Figure 4-31 See Figure 4-34	• Contact your service provider to verify that the forward ID is activated. • Check that the Forward ID is strapped correctly. • Check that IRS data is available and correct. • Check that the Veh Rel Az/EL to Satellite is correct. • Check that all coax cable connections are secure. • Check that the Rx C/No value is greater than 50 dB. • Check antenna status is okay. • Check that the primary and secondary LES access codes are valid. • Contact your service provider and verify that they can "see" your Tx signal. To contact the LES operator dial 33 #. • Contact service provider and request that they place an incoming call to the terminal. • Check the reported HPA back-off in report 21; Signal should initialize at 14 dBW and increase after handshake to approximately 22.5 dBW—then slowly decrease (Range typically between 16.5 dBW to 21.5 dBW with a lower limit of 14.5 dBW).
HSD terminal is operating outside the normal environmental specifications	Channel card temperature fault	Activate report 21 or 23	• Check channel card temperature; temperatures of over 50° C to 60° C may cause the HD-710 terminal to shut down. • Check that the fan tray is operational. • Verify that the tray plug distribution is the same as presented in the installation requirements.

Table 4-25. Troubleshooting and Fault Isolation (Continued)

Fault	Description	Maintenance Report	Check
Calls do not complete and connection is not established	Channel Congestion (fault code 2024)	Activate reports 21 and 23	• Wait five minutes and try the call again. • Contact the LES to verify congestion. To contact the LES operator, dial 33 #.
	No call request sent	Activate report 52	• Verify that the call dial string is correct; Pressing # at the end of the dialing string signals the system to "send" the call. • Check that the HD-710 terminal is transmitting by ensuring the LED power indicator flashes on and off (1 Hz) during a call request. • Check that the ISDN, Ethernet, or MPDS cable is connected correctly and securely.
No dial tone heard in handset	-	Activate report 21	• Confirm ISDN lines are wired correctly. • Verify handset connection is secure. • Wait a few minutes for the system to warm-up, then log-on and try your call again. • Check that IRS data is available. • Verify that the terminal has completed beam registration.
Call drops after successful connection	If the RF signal fades significantly (during a call), the connection may drop. **Note**: A sudden, severe aircraft banking angle may obstruct the signal long enough (>15 sec.) to drop a call.	Activate reports 21 and 23	• Check signal strength (C/No greater than or equal to 50 dB). • Ensure there is a clear, unobstructed, line of sight to the satellite. • Select an alternate satellite or beam and try your call again (Note: works if you are located where more than one beam overlaps or satellite is in view.)

D. Fault Isolation and Diagnostic Procedures

This section provides basic information required for technical personnel to isolate faults in HD-710 terminals. Where needed, refer to other sections of this manual (which contain important information to aid in understanding the functionality of the terminal) for additional information.

Fault isolation procedures are usually conducted on equipment that falls within one of the following categories:

- Terminals that have failed to pass operational and installation verification procedures

- Terminals that have failed during service
- Terminals repaired and returned to service

Maintenance reports are helpful in troubleshooting the HD-710 terminal. Capturing maintenance port information from the HD-710 terminal and forwarding the file to Honeywell technical support staff will assist in troubleshooting suspected HSD terminal problems. Instructions on how to activate and save "reports" information is provided in "Saving a Diagnostic 'Reports' File" on page 4-65.

Perform all fault isolation procedures provided in this section. Record and document all test results including: LEDs function and maintenance port data outputs (report items 21 and 23).

Enable report items 18, 19, and 20 (Port) or items 6, 7, and 8 (Starboard) to record antenna, ACU, and DLNA related faults. Enable other report items as required.

Conduct the fault isolation procedures provided in this section and record the resulting system information. Then send the system information collected to Honeywell Product Support for analysis.

CAUTION: BEFORE PROCEEDING WITH FAULT ISOLATION PROCEDURES, REFER TO THE "SAFETY ADVISORIES" ON PAGE INTRO-7.

(1) Saving a Diagnostic 'Reports' File

Use the following procedure to save or capture a troubleshooting report for the HD-710 terminal. Remember to date and save the file. Annotate the file with any system anomalies or unique operating environments that may in any way affect system functionality (e.g., physical location of aircraft or terminal, Land Earth Station being used, list of connected devices).

To save a diagnostics ‘reports’ file:

1. Open a log file on the maintenance port, terminal program. (If you are using HyperTerminal, use the "Transfer, capture text" function.)
2. Power the system on or if applicable reset the system.
3. Enter maintenance mode on the maintenance port using maint as the password. (Access level can be changed using menu 1, L command if the system is running and the password level is menu.)
4. Press **=** to activate reports 21 and 23 (toggle off all other report items).
5. Press **S** to save these reports as default. This enables the user to view these reports on subsequent HSD terminal power-ups or "Reset" entries.
6. Reset the system by: cycling the power to the terminal; pressing the reset button on the HSD terminal front panel; or in menu 2, press **Z** to reset the system.
7. Log on to the maintenance port using the password: *maint*.

   The system should restart and ocean registration will take place (approximately two minutes).
8. After the Beam Registration process completes, press **Ctrl+N** to display menu 2.
9. Press **V** to display the software versions of the system.

10. Make a call from the system or execute the procedure or sequence that causes the call failure. Make a note of the call progress. For example: Did you get dial tone? Was the call successful?
11. If applicable, attempt calls from the remaining channel.
12. Press **=** to display the current "reports" profile of the system (as noted in step 4).
13. To save an alternate "reports" configuration, activate the required items and then press **S** (in the "reports" menu) to save to EEPROM.
14. Using **Ctrl+N**, go to menu 3 and press **O** to display the ORT List. (The ORT list displays one terminal screen of information at a time. Press **O** to display the next screen.)
15. To list the complete event log, in menu 3:
    - press **S** (list event log)
    - press **0**
    - press the period key "**.**"
16. To list the complete call log, in menu 3:
    - press **F** (list call log)
    - press **F** again (complete log)
    - press the period key "**.**"
    - for extended information, press **X**
17. Close the log file on the terminal program.
18. The log file is in text format (.txt file). Open the file and add notes to the beginning of the file indicating:
    - System serial number (from the label on the front of the terminal)
    - Aircraft and customer name
    - Any notes about the problems encountered
    - Contact name, telephone number, and e-mail address 

4. Adjustment/Alignment Procedures

A. General

There are no adjustment/alignment procedures required for HD-710 terminals.

5. Modification History

The HD-710 terminal currently has no modifications.

MAINTENANCE AND REPAIR

1. General

This section provides maintenance and repair information for the HD-710 terminal, including the following sections:

- Maintenance
- Repair
- Instructions for Continued Airworthiness

2. Maintenance

The HD-710 terminal does not require routine maintenance.

3. Repair

All repair procedures must be completed by Honeywell approved repair facilities.

A. Repair Tools and Supplies

No special supplies are required to repair this equipment.

HD-710 terminals that require servicing must be returned to Honeywell or to a Honeywell approved service center. Refer to "Test and Fault Isolation" on page 4-1 for terminal testing requirements and procedures.

B. Repair Procedures

This equipment does not require any special repair procedures.

C. Removal Procedures

If an HD-710 terminal must be removed from service for repair, with power removed, disconnect all equipment from the terminal and then remove it from the ARINC tray.

D. Repair Facility Approvals

TBD

E. Return for Repair Information

TBD

(1) Warranty Returns

TBD

(2) Non-Warranty Returns

TBD

(3) Repackaging Requirements

TBD

(4) Return Materials Authorization (RMA) Procedure

TBD

4. Instructions for Continued Airworthiness

This section presents the instructions for continued airworthiness, as per FAR 25.1529, of the HD-710 terminal.

Installation of the HSD terminal on an aircraft by supplemental type certificate (STC) or Form 337 obligates the aircraft operator to include the maintenance information supplied by this manual in the operator's Aircraft Maintenance manual and the operator's Aircraft Scheduled Maintenance Program.

A. Continued Airworthiness Procedures

The following paragraphs describe all maintenance requirements and instructions for continued airworthiness of the HD-710 terminal.

- This manual contains maintenance information for the HD-710 terminals (including system description, system operation, removal, installation, test and fault isolation, and maintenance and repair).
- Add the LRU part numbers and other necessary part numbers contained in this manual to the aircraft operator's appropriate, aircraft illustrated parts catalog (IPC).
- Add all wiring diagram information contained in this manual to the aircraft operator's appropriate aircraft Wiring Diagram Manuals.
- HD-710 terminals are considered on-condition units. No additional or routine maintenance is required.
- If an HD-710 terminal is inoperative, remove the terminal, secure cables and wiring, collar applicable switches and circuit breakers, and placard them as “inoperative.” Before flight, revise the equipment list and weight and balance data as applicable and record the removal of the terminal in the log book [refer to section 91.213 of the FAR or the aircraft's minimum equipment list (MEL)].
- HD-710 terminals are not field-repairable. All terminals must be returned to the Honeywell factory or authorized repair centers for repair.
- Repaired terminals must be re-installed on the aircraft in accordance with the instructions provided in this manual. The operation of all repaired terminals must be verified using the operational verification tests and procedures provided in this manual before being approved for return to service. All special tools required to test the terminal for approval for return to service are listed and described in "Test and Fault Isolation" on page 4-1. Approval for return to service must be entered in the logbook as required by section 43.9 of the FAR.
- The following scheduled maintenance tasks must be added to the aircraft operator's appropriate aircraft maintenance program:
  - Recommended periodic scheduled servicing tasks: None required.
  - Recommended periodic inspections: None required.
  - Recommended periodic scheduled preventative maintenance tests (tests to determine system condition and/or latent failures): None required.

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APPENDIX A: INMARSAT SATELLITE BEAM COVERAGE

Inmarsat currently operates four strategically placed geostationary satellites (I-3). Each satellite is located over and named after an oceanic region. The four satellite ocean regions are:

- Atlantic Ocean Region-East (AOR-E)
- Atlantic Ocean Region-West (AOR-W)
- Indian Ocean Region (IOR)
- Pacific Ocean Region (POR)

The diagram below represents the satellite ocean regions with approximate transfer coordinates for satellite transitions.

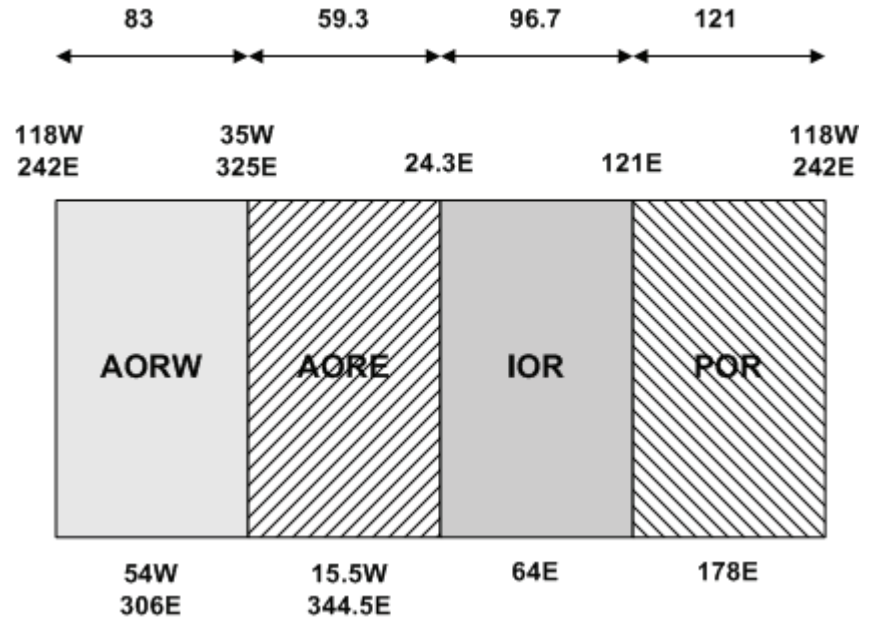

Figure A-1. Satellite Ocean Regions

The four satellite ocean regions are made up of smaller, spot-beam coverage areas. The following maps show the Inmarsat satellite spot-beam coverage for the four ocean regions, and a composite map of the four regions combined.

Note: Maps are close approximations only. Please contact Inmarsat for detailed beam information.

Note: As of print time, Inmarsat has launched the first of three I-4 satellites that will provide increased global coverage and transmission speeds. Visit www.inmarsat.com for updates and details.

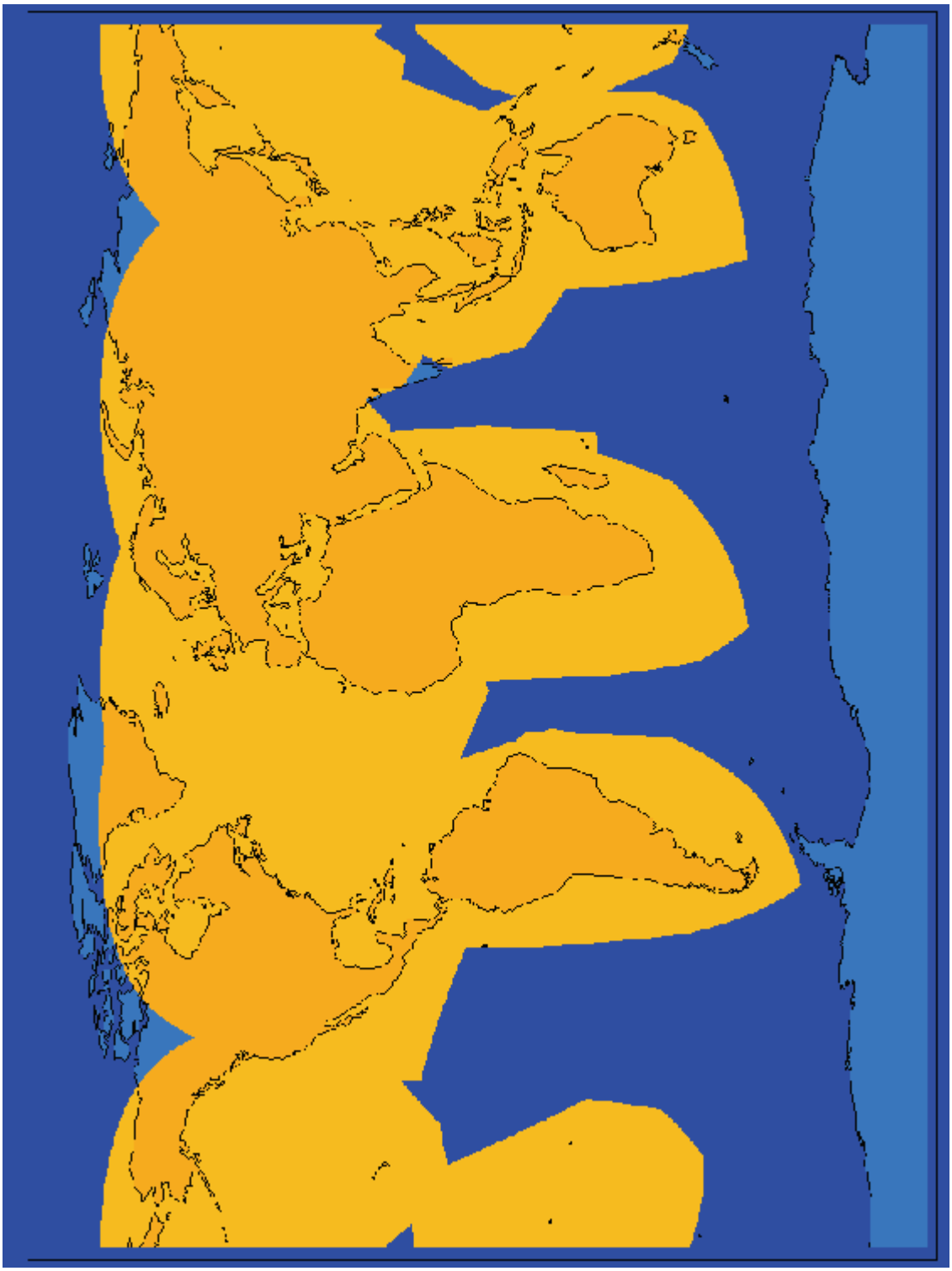

Figure A-2. Inmarsat Satellite Beam Coverage—Composite Map

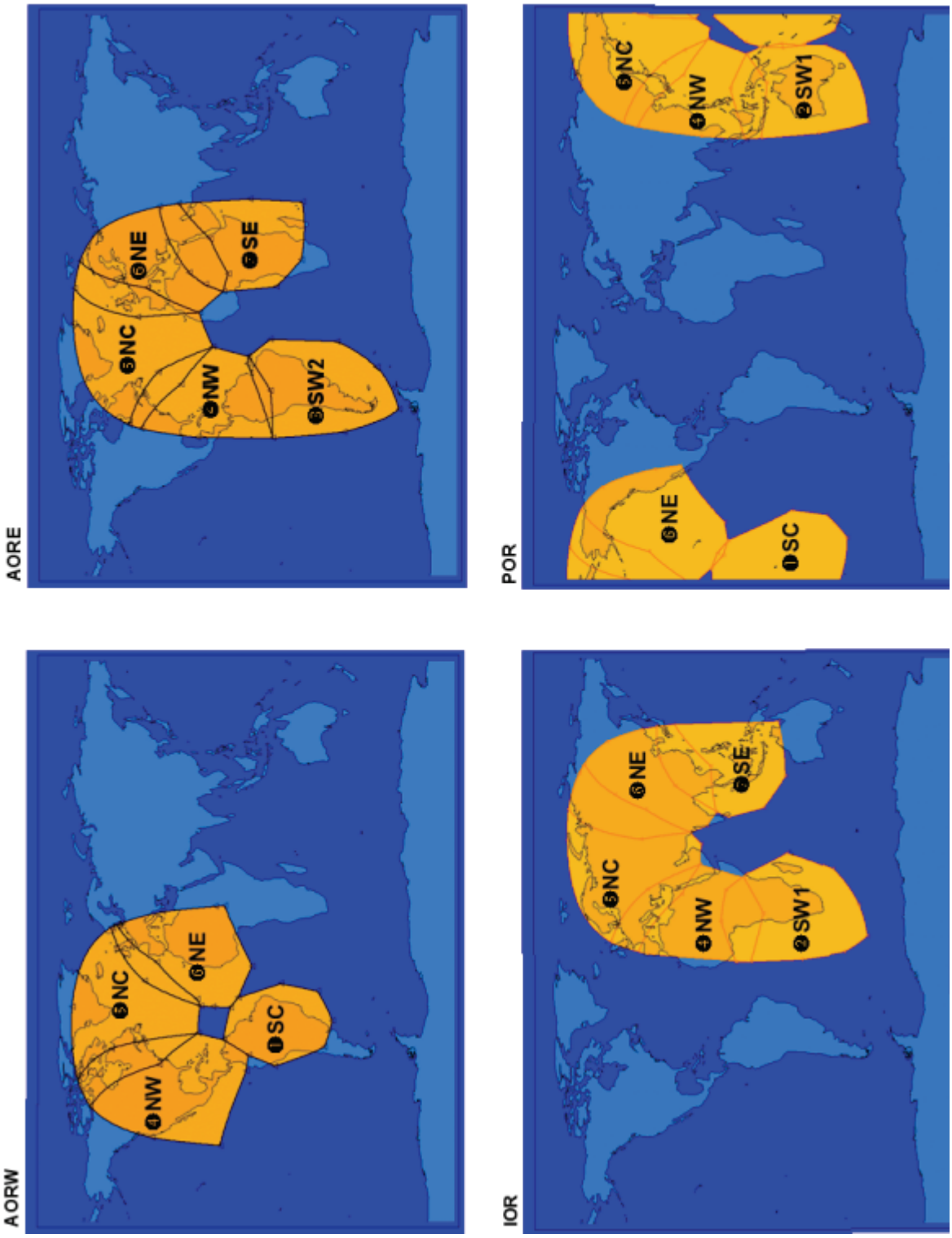

Figure A-3. Inmarsat Satellite Beam Coverage—Ocean Region Maps

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APPENDIX B: TROUBLESHOOTING CHECKLIST

Before performing the detailed testing and troubleshooting procedures provided in this manual, read the following Troubleshooting Checklist. Use the Troubleshooting Checklist to ensure you have not missed any key steps in the HD-710 terminal setup.

1. **Have you registered with a service provider to activate service?**

   You must register with an Inmarsat-authorized service provider to activate an account to access the Satellite Communications network using an HD-710 terminal. Contact Inmarsat for a list of available service providers at:

   Inmarsat Customer Care
   99 City Road, London, EC1Y 1AX

   Tel: +44 20 7728 1777
   Fax: +44 20 7728 1142

   E-mail: customer_care@inmarsat.com

2. **Has your account been activated?**

   Once registered, your HD-710 terminal is assigned terminal identification numbers called Forward IDs (FWD ID). The HD-710 terminal must be strapped accordingly. Refer to "Installation" on page 3-1 for detailed strapping and installation instructions.

   Note: The service registration information may take a few days to be incorporated into the system databases at the Land Earth Station (LES) level. New terminals being commissioned are not validated by the LES until their customer database has been updated by Inmarsat to reflect the registration and activation of your terminal.

   Note: To verify that the service registration information has been validated at the LES, call 33 # for assistance. Confirm with the LES operator that the forward IDs assigned to your terminal are valid and active.

3. **Is the HD-710 terminal seated properly?**

   In cases where the HD-710 terminal is not fully seated into the ARINC 600 connector (to the rear of the Fan Tray), the user may experience intermittent system operation. If intermittent system operation occurs:

   - Check that the polarization pins are installed correctly as indicated on the applicable Outline and Installation drawing.
   - Ensure the HD-710 terminal is fully inserted into the tray and that the front hold-down screws are properly tightened to secure the terminal.

4. **Is all cabling attached correctly and securely?**

   Broken connections and improper cabling are the most common causes of HD-710 terminals' not functioning. Before proceeding with testing and troubleshooting, complete the following checks:

   - Check that all cables and wiring are routed and connected correctly and securely.
   - Ensure the terminal is installed with correct power source.

- Verify that all external user and networking devices (for example: terminal adapters, routers, fax, telephones, computers) are connected and configured properly.

5. **Have any changes to the system been made?**

   For previously installed and functional terminals, make note of any changes made to the system since the last time the terminal functioned without problems.

   - Were any new devices or systems connected to the terminal?
   - Have any connecting devices or equipment been removed or replaced? If so, check that all new or replaced connections are attached and configured correctly.
   - Have you changed service providers or re-configured the system in any way?

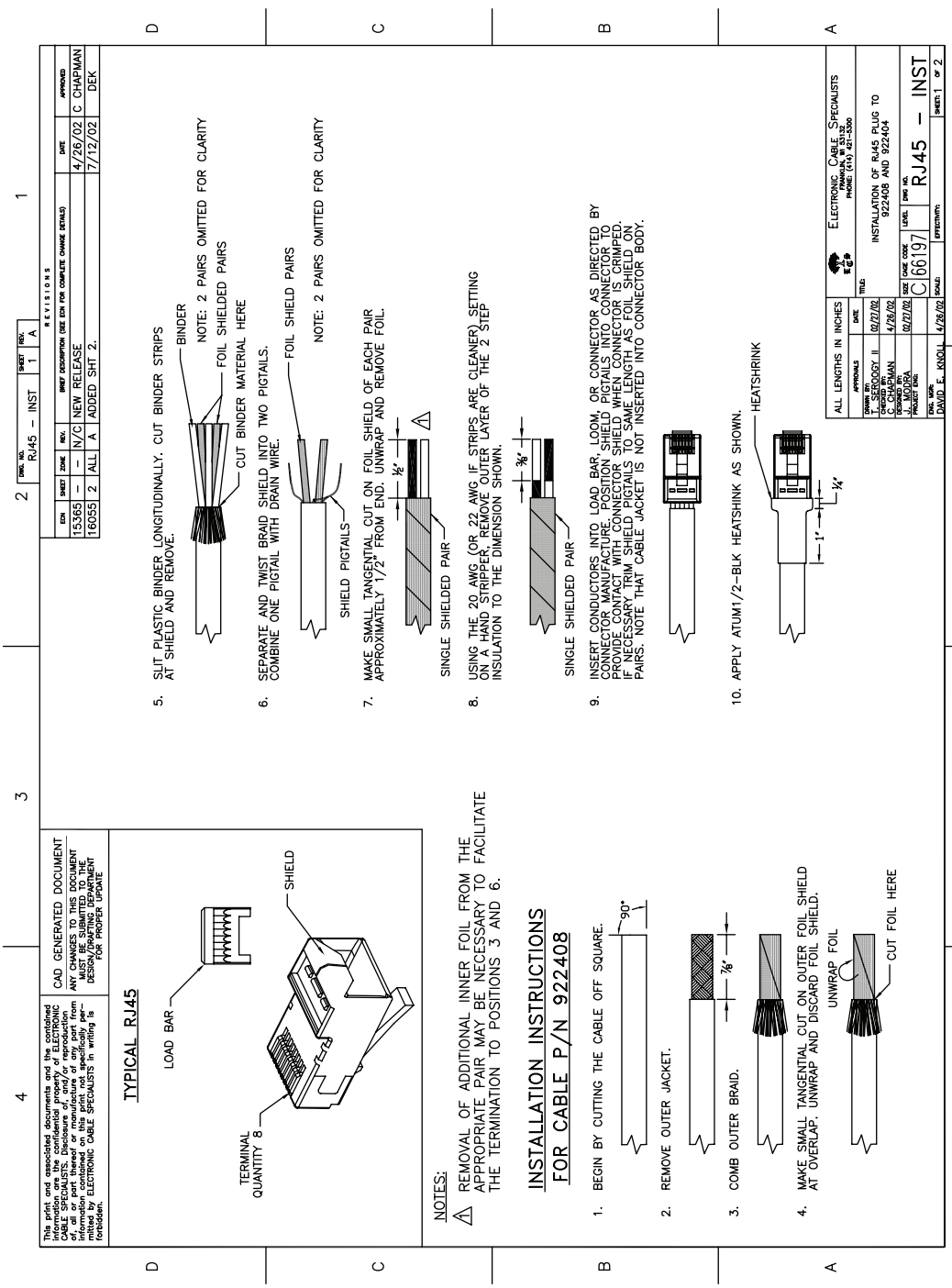
6. **Are your Primary and Secondary LES Access Codes programmed for all Ocean Regions?**

   The system default for LES access codes is set to “0” (zero), which must be configured to valid LES access codes before operation. Refer to "System Operation" on page 2-1 for details.

7. **Was the operational mode of the system strapped or configured correctly?**

   Verify that the System Mode wiring straps match the installation configuration mode.

APPENDIX C: RJ-45 CABLE TERMINATION DETAILS


DWG. NO. RJ45 – INST
SHEET 1
REV. A
REVISIONS
ECN | SHEET | ZONE | REV. | BRIEF DESCRIPTION (SEE ECN FOR COMPLETE CHANGE DETAILS) | DATE | APPROVED
15365 | – | – | N/C | NEW RELEASE | 4/26/02 | C CHAPMAN
16055 | 2 | ALL | A | ADDED SHT 2. | 7/12/02 | DEK
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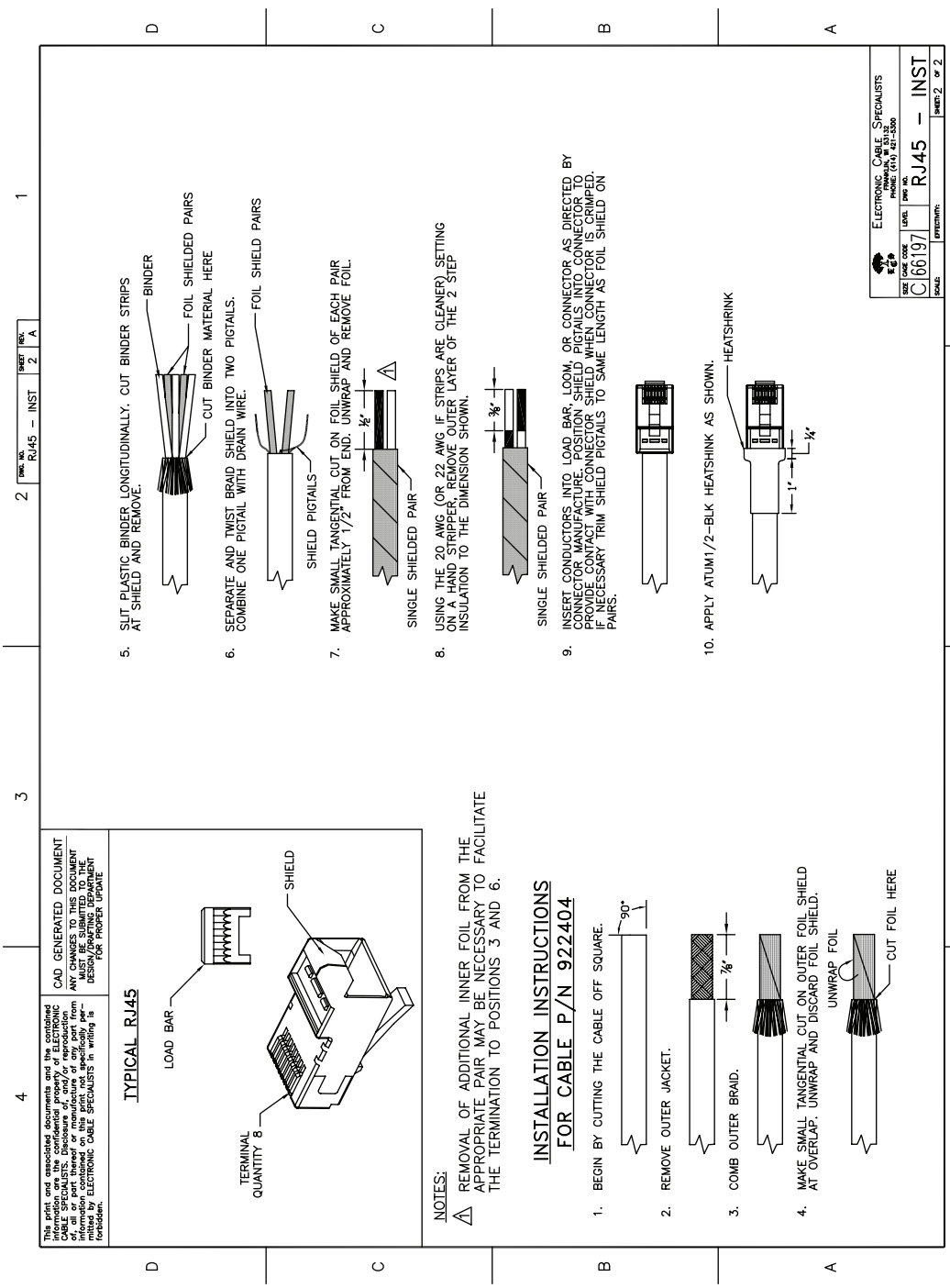
CAD GENERATED DOCUMENT
ANY CHANGES TO THIS DOCUMENT MUST BE SUBMITTED TO THE DESIGN ACTIVITY/DEPARTMENT FOR PROPER UPDATE.
TYPICAL RJ45
LOAD BAR
SHIELD
TERMINAL QUANTITY 8
NOTES:
⚠ REMOVAL OF ADDITIONAL INNER FOIL FROM THE APPROPRIATE PAIR MAY BE NECESSARY TO FACILITATE THE TERMINATION TO POSITIONS 3 AND 6.
INSTALLATION INSTRUCTIONS
FOR CABLE P/N 922408
1. BEGIN BY CUTTING THE CABLE OFF SQUARE.
90°
2. REMOVE OUTER JACKET.
⅞"
3. COMB OUTER BRAID.
4. MAKE SMALL TANGENTIAL CUT ON OUTER FOIL SHIELD AT OVERLAP. UNWRAP AND DISCARD FOIL SHIELD.
UNWRAP FOIL
CUT FOIL HERE
5. SLIT PLASTIC BINDER LONGITUDINALLY. CUT BINDER STRIPS AT SHIELD AND REMOVE.
BINDER
NOTE: 2 PAIRS OMITTED FOR CLARITY
FOIL SHIELDED PAIRS
CUT BINDER MATERIAL HERE
6. SEPARATE AND TWIST BRAID SHIELD INTO TWO PIGTAILS. COMBINE ONE PIGTAIL WITH DRAIN WIRE.
FOIL SHIELD PAIRS
NOTE: 2 PAIRS OMITTED FOR CLARITY
SHIELD PIGTAILS
7. MAKE SMALL TANGENTIAL CUT ON FOIL SHIELD OF EACH PAIR APPROXIMATELY 1/2" FROM END. UNWRAP AND REMOVE FOIL.
½"
SINGLE SHIELDED PAIR
8. USING THE 20 AWG (OR 22 AWG IF STRIPS ARE CLEANER) SETTING ON A HAND STRIPPER, REMOVE OUTER LAYER OF THE 2 STEP INSULATION TO THE DIMENSION SHOWN.
⅜"
SINGLE SHIELDED PAIR
9. INSERT CONDUCTORS INTO LOAD BAR, LOOM, OR CONNECTOR AS DIRECTED BY CONNECTOR MANUFACTURE. POSITION SHIELD WHEN CONNECTOR IS CRIMPED. PROVIDE 360° CONTACT. TRIM CONDUCTORS TO SAME LENGTH AS FOIL SHIELDED PAIRS. NOTE THAT CABLE JACKET IS NOT INSERTED INTO CONNECTOR BODY.
10. APPLY ATUM1/2-BLK HEATSHRINK AS SHOWN.
HEATSHRINK
1"
¼"
ALL LENGTHS IN INCHES
APPROVALS | DATE
DRAWN BY: SERGOOEY II | 09/21/02
DESIGNED BY: C. CHAPMAN | 4/26/02
CHECKED BY: J. MOORA | 09/21/02
PROJECT ENG:
ENG. MGR: DAVID E. KNOLL | 4/26/02
ELECTRONIC CABLE SPECIALISTS
FRANKLIN, WI 53132
PHONE: (414) 421-3300
TITLE: INSTALLATION OF RJ45 PLUG TO 922408 AND 922404
SIZE C | CAGE CODE 66197 | LEVEL | DWG NO. RJ45 – INST
SCALE: | APPROVED: | SHEET 1 OF 2


DWG. NO. RJ45 – INST
SHEET 2
REV. A
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CAD GENERATED DOCUMENT
ANY CHANGES TO THIS DOCUMENT MUST BE SUBMITTED TO THE DESIGN/DRAFTING DEPARTMENT FOR PROPER UPDATE
TYPICAL RJ45
LOAD BAR
SHIELD
TERMINAL QUANTITY 8
NOTES:
⚠ REMOVAL OF ADDITIONAL INNER FOIL FROM THE APPROPRIATE PAIR MAY BE NECESSARY TO FACILITATE THE TERMINATION TO POSITIONS 3 AND 6.
INSTALLATION INSTRUCTIONS
FOR CABLE P/N 922404
1. BEGIN BY CUTTING THE CABLE OFF SQUARE.
90°
2. REMOVE OUTER JACKET.
3. COMB OUTER BRAID.
⅛"
4. MAKE SMALL TANGENTIAL CUT ON OUTER FOIL SHIELD AT OVERLAP. UNWRAP AND DISCARD FOIL SHIELD.
UNWRAP FOIL
CUT FOIL HERE
5. SLIT PLASTIC BINDER LONGITUDINALLY. CUT BINDER STRIPS AT SHIELD AND REMOVE.
BINDER
FOIL SHIELDED PAIRS
CUT BINDER MATERIAL HERE
6. SEPARATE AND TWIST BRAID SHIELD INTO TWO PIGTAILS. COMBINE ONE PIGTAIL WITH DRAIN WIRE.
FOIL SHIELD PAIRS
SHIELD PIGTAILS
7. MAKE SMALL TANGENTIAL CUT ON FOIL SHIELD OF EACH PAIR APPROXIMATELY 1/2" FROM END. UNWRAP AND REMOVE FOIL.
½"
SINGLE SHIELDED PAIR
8. USING THE 20 AWG (OR 22 AWG IF STRIPS ARE CLEANER) SETTING ON A HAND STRIPPER, REMOVE OUTER LAYER OF THE 2 STEP INSULATION TO THE DIMENSION SHOWN.
¾"
SINGLE SHIELDED PAIR
9. INSERT CONDUCTORS INTO LOAD BAR, LOOM, OR CONNECTOR AS DIRECTED BY CONNECTOR MANUFACTURE. POSITION SHIELD PIGTAILS INTO CONNECTOR TO PROVIDE CONTACT WITH CONNECTOR SHIELD WHEN CONNECTOR IS CRIMPED. IF NECESSARY TRIM SHIELD PIGTAILS TO SAME LENGTH AS FOIL SHIELD ON PAIRS.
10. APPLY ATUM1/2-BLK HEATSHINK AS SHOWN.
HEATSHRINK
1"
¼"
ELECTRONIC CABLE SPECIALISTS
PHOENIX, AZ 85043-3330
SIZE C
CAGE CODE 66197
DWG NO. RJ45 – INST
SCALE:
APPROVED:
SHEET 2 OF 2

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APPENDIX D: INSTALLATION PLANNING CHECKLIST

1. Register the terminal					
Record the following information (provided by Honeywell upon purchase)					
Terminal Category Type					☐
Inmarsat Serial Numbers (ISN) x 4		1.			☐
		2.			
		3.			
		4.			
Contact your Service Provider and provide the 4 x 12 digit ISNs from above					
Record the Forward IDs received + corresponding Inmarsat Mobile Numbers (IMN)					☐
	1	2	3	4	
Forward ID					
ISDN Speech					
ISDN Audio 3.1 kHz					
ISDN 56 kbps					
ISDN 64 kbps					
MPDS					
Service Provider					☐
LES Access Codes					
AOR-W					
AOR-E					
IOR					
POR					
2. Pin Strapping					
The following strapping is required					
Item	Strapped pins, e.g., TP1A to BP1A				
Fwd ID					☐
System Mode					☐
Data I/O					☐
SDI					☐
3. Wiring					
Antenna				Multi-Control	☐
				BITE A/B	☐
				HPA Mute A/B	☐

ISDN: Wire both ISDN lines. Channel 1 operates over ISDN#1 and channel 3 over ISDN#2.	ISDN-1	☐
	ISDN-2	☐
Ethernet: Wire both Ethernet ports for future SBB capability Wire both Ethernet ports to deploy 2 separate networks	Ethernet-1	☐
	Ethernet-2	☐
Inertial Navigation System (INS)		☐
Analog Tip/Ring (POTS)		☐
CEPT-E1, *Future PBX applications (optional)*		☐
4. Configuration		
Program the Land Earth Stations (LES) Access Codes		☐
Program devices with the Multiple Subscriber Numbers (MSN)		☐
Configure the CNX Cabin Gateway if required		☐

APPENDIX E: INSTALLATION CHECKLIST

Aircraft Identification:		**HD-710 Terminal Model No.:**	
HD-710 Terminal Install. Mode:		**HD-710 Terminal Serial No.:**	

	Name	**Signature**	**Date**
Checks completed by:			
Approved/Witnessed by:			

Section	**Parameter**	**Item**	**N/A**	**✓**	**Value**
Installation / Mechanical	Physical	Service/maintenance access			
		Environmental considerations			
	Fan Tray	Plug configuration			
		Chassis bonding			
		Fan rotation			
	ARINC 600 Con.	Polarized pins			

Section	Parameter	Item	N/A	✓	Value
Installation / Electrical	Power Connections	+ 28 V dc polarity			
		115 V ac polarity			
		Chassis grounding			
	Voltage Levels	+ 28 V dc level			
		115 V ac level			
	IRS Input	IRS wiring			
		IRS format			
	Config. Strap Pins	SDI			
		System configuration			
		Data I/O			
		Forward address			
		WOW (optional)			
	Ethernet	Strapped to RJ-45 distribution points			
	ISDN	Strapped to RJ-45 distribution points			
	Remotes	Manual reset switch operation			
		Maintenance port (DB9 access)			
		Power and Fault indicators			
	RF Coax	Rx i/p cable loss			
		Tx o/p cable loss			
	Antenna	Antenna manufacturer and type			
		Wired as per manufacturer			
	Configuration	LES Access codes			
		Combined Mode			
		Valid beams			
		Forward ID			
Test	System Power-Up	Visual LED indications			
		Power-up computer display			
Test On-Air	System Log-on	Reset message observed			
		Log-on verified			
Test	Optional Checks	Ground segment			
		Flight segment			

	Heading (Deg)	Antenna Selected	Antenna Azimuth	HD-710 terminal							
				CH 1		CH 2		CH 3		CH 4	
				C/No	Signal	C/No	Signal	C/No	Signal	C/No	Signal
Operational Test	15										
	30										
	45										
	60										
	75										
	90										
	105										
	120										
	135										
	150										
	165										
	180										
	195										
	210										
	225										
	240										
	255										
	270										
	285										
	300										
	315										
	330										
	345										
	360										

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APPENDIX F: POINT-TO-POINT PROTOCOL OVER ETHERNET (PPPOE) MESSAGING

The following subsections define the format and services for the Point-to-Point over Ethernet (PPPoE) discovery packets, as defined in RFC 2516.

A. PPPoE Active Discovery Offer (PADO)

The HD-710 terminal will respond to PPPoE Active Discovery Initiation (PADI) packets in accordance with RFC 2516. If the requested service in not available, the HD-710 terminal will not provide a PADO response.

The HD-710 terminal will support service names of length less than or equal to 64 characters. The conditions for the PADO response and the PADO content are specified in Table F-1.

Table F-1. PADO Services

PADI Service Name	PADO Response	Controlling Condition
No service name tag	Null terminated, or PacketData, or Swift64	If all services are available or if SwiftBroadband PS services are available or if MPDS services are available. This PADI may be used as a status poll from a server.
PacketData	PacketData	SwiftBroadband PS services or MPDS services are available on at least one channel.
MPDS	MPDS	MPDS service available on at least one channel.
MPDS-1	MPDS-1	MPDS service available on at least on channel of Channel Card 1 (HD-710 terminal channel 1).
MPDS-2	MPDS-2	MPDS service available on at least on channel of Channel Card 2 (HD-710 terminal channel 3).
123	123	MPDS service available on at least one channel.
28#	28#	M-ISDN service is available on at least one channel.
Numeric digits (See below)	Numeric digits (See below)	SwiftBroadband CS or M-ISDN service available on at least one channel.

The PADI response to a series of numeric digits is detailed in the following:

1. Definitions:
   - “Dialed” digits are defined as the set { 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, *}
   - “Dial Termination” characters are defined as the set { # (octothorp, ASCII 23x), : (colon, ASCII 3Ax) }
   - “Unrecognized” characters are defined as the rest of the ASCII character set.

- "Filtered Service Name" is the service name with unrecognized characters removed, stopping at (but not including) the first dial termination character, if any.

2. If the PADI service name contains up to the first dial termination character, no unrecognized characters, and consists of two (2) or more dialed digits, and if SwiftBroadband CS or Swift64 M-ISDN service is available on a channel, the HD-710 terminal will respond with a PADO echoing the service name.
3. If the PADI filtered service name consists of seven (7) or more dialed digits, and if SwiftBroadband CS or Swift64 M-ISDN service is available on a channel, the HD-710 terminal will respond with a PADO echoing the service name.
4. If the PADI service name consists of the specific string "123", and if MPDS service is available on any available channel, the HD-710 terminal will respond with a PADO echoing the service name.

B. PPPoE Active Discovery Request (PADR)

The HD-710 terminal will respond to PPPoE Active Discovery Request (PADR) packets in accordance with RFC 2516. If the requested service is not available, the HD-710 terminal will not initiate a PPP session and will send a PPPoE Active Discovery Session-Confirmation (PADS) packet with a service-name error tag.

The HD-710 terminal will support service names of length less than or equal to 64 characters.

The HD-710 terminal response to the PADR packet is specified in Table F-2.

Table F-2. PADR Services

PADR Service Name	HD-710 terminal response
No service name tag	If SwiftBroadband services are available, a PS session is initiated using the PDP parameters provided by the SDU. If SwiftBroadband services are not available and MPDS services are available, an MPDS session will be initiated.
PacketData	If SwiftBroadband services are available, a PS session is initiated using the PDP parameters provided by the SDU. If SwiftBroadband services are not available and MPDS services are available, an MPDS session will be initiated.
MPDS	An MPDS session is initiated on an available channel.
MPDS -1	An MPDS session is initiated on Channel Card 1 (HD-710 terminal channel 1).
MPDS -2	An MPDS session is initiated on Channel Card 2 (HD-710 terminal channel 3).
123	MPDS session is initiated on any available channel.

Table F-2. PADR Services (Continued)

PADR Service Name	HD-710 terminal response
28#	M-ISDN 64k UDI session initiated to called party number “28” on any available channel.
Numeric digits (See below)	If SwiftBroadband services are available, a CS session is initiated on any available channel to the called party number defined below. If SwiftBroadband services are not available and M-ISDN service is available, a 64 kbps UDI session is initiated on any available channel to the called party number defined below.

The HD-710 terminal will determine the called party number from the PADR service name as detailed in the following:

1. Definitions:
   - “Dialed” digits are defined as the set { 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, *}
   - “Dial Termination” characters are defined as the set { # (octothorp, ASCII 23x), : (colon, ASCII 3Ax) }
   - “Unrecognized” characters are defined as the rest of the ASCII character set.
   - “Filtered Service Name” is the service-name with unrecognized characters removed, stopping at (but not including) the first dial termination character, if any.
2. If the PADR service name contains up to the first dial termination character, no unrecognized characters, and consists of two (2) or more “dialed” digits, and if SwiftBroadband CS service is available, the HD-710 terminal will initiate a SwiftBroadband CS session on an available channel using the service name as the called party number.
3. If the PADR service name contains up to the first dial termination character, no unrecognized characters, and consists of two (2) or more “dialed” digits, and SwiftBroadband CS service is not available, and Swift64 M-ISDN is available, the HD-710 terminal will initiate a M-ISDN 64 kbps UDI session on an available channel using the service name as the called party number.
4. If the PADR filtered service name contains up to seven (7) or more “dialed” digits, and if SwiftBroadband CS service is available, the HD-710 terminal will initiate a SwiftBroadband CS session on an available channel using the filtered service name as the called party number.
5. If the PADR filtered service name contains up to seven (7) or more “dialed” digits, and SwiftBroadband CS service is not available, and Swift64 M-ISDN is available, the HD-710 terminal will initiate an M-ISDN 64 kbps UDI session on an available channel using the filtered service name as the called party number.
6. If the PADR service name consists of the specific string “123”, and if MPDS service is available on any channel, the HD-710 terminal will initiate an MPDS session on an available channel.

C. PPPoE Active Discovery Session-Confirmation (PADS)

The HD-710 terminal will provide PPPoE Active Discovery Session-Confirmation (PADS) packets in response to PADR packets in accordance with RFC 2516.

If the requested service in not available, the HD-710 terminal will not initiate a PPP session and will send a PPPoE Active Discovery Session-Confirmation (PADS) packet with a service name error tag specified in Table F-3.

The HD-710 terminal may provide a PADS response prior to the establishment of the over-the-satellite call connection.

Table F-3. Service Name Error

PADR Service Name	Service Name Error Tag
No Service Name tag	Missing Service Name
No Service Name tag (and default service is disabled by a HD-710 terminal configuration item)	Default service disabled
Service Name not recognized (not from set in Table F-2)	Unrecognized service
Requested Service Name is disabled or not available	Service disabled or unavailable
Requested Service Name became unavailable after PADR received, but before PPP session established	Unable to reserve the channel

D. PPPoE Active Discovery Termination (PADT)

The HD-710 terminal will provide a PPPoE Active Discovery Termination (PADT) packet in response to termination of the PPPoE session.

The PPPoE session may be terminated by the HD-710 terminal or by a PADT from the host.

The HD-710 terminal will send periodic Echo-Request packets to the host to assess continued connectivity.

The HD-710 terminal will generate a Generic Error tag upon termination of every session, including those that terminate normally. The Generic Error tag is of the following format:

SLCV – nnnn/dddd: SLCV_cause_string [detailed_cause_string]

Where:

- nnnn is the Inmarsat SLCV termination code, as defined in Table F-4.
- dddd is the detailed cause code, as defined in Table F-4.
- SLCV_cause_string is the (modified) Inmarsat standard cause code wording, as defined in Table F-4.
- detailed_cause_string is extended cause description, as defined in Table F-4.

The HD-710 terminal will generate an AC-System-Error tag upon termination of every session, including those that terminate normally. The AC-System-Error tag is as defined below.

If the PPPoE session was a Swift64 64 kbps UDI session, the AC-System-Error tag will be of the following format:

Q850 – qqq: Q.850_string

Where:

- qqq is the ISDN Q.850 cause code, as defined in Table F-5.
- Q.850_string is the Q.850 cause string, as defined in Table F-5.

If the PPPoE session was a Swift64 MPDS session, the AC-System-Error tag will be of the following format:

MPDS – mmm: +WQ_cause_string, as defined in Table F-6.

Where:

- qqq is the MPDS AT +WQ cause number, as defined in Table F-6.
- +WQ_cause_string is the MPDS AT +WQ cause string, as defined in Table F-6.

Table F-4. SLCV Cause Codes and Strings

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1001	0000	call cleared by MES terminal		
1011	0000	call failed, MES terminal busy		
1012	0000	call cleared, MES terminal busy		
1021	0000	call failed, MES time-out (no answer)		
1081	0000	call failed, MES terminal not installed		
1091	0000	call failed, MES terminal out-of-service		
1092	0000	call cleared, MES terminal out-of-service		
1141	0000	MES preempted clear by higher priority call		
1142	0000	MES preempted fixed call by higher priority call		
1143	0000	offered call cleared, pre-empted at MES		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1144	0000	call cleared, MES initiated preemption		
1145	0000	attempted call cleared, pre-empted at MES		
1146	0000	attempted call abandoned by MES terminal		
1191	0000	MES outside spot beam		
11A0	0000	call cleared, credit card not accepted		
11D1	0000	call failed, LES service call type Incorrect		
11D2	0000	call failed, insufficient digits in service address		
11D3	0000	call failed, invalid service address		
11D4	0000	call cleared, credit card data information invalid		
11D5	0000	call cleared, invalid country code		
11D6	0000	call cleared, PID information is not consistent		
11D7	0000	call rejected, invalid service for pri. 1 or 2 call		
11D8	0000	call cleared, dialed number not 2 or 3 digits for pri. 1 or 2 call		
11E0	0000	call cleared, invalid credit card PIN at this LES		
11E1	0000	call cleared, too many invalid credit card call attempts		
1202	0000	handover, MES ready		
1262	0000	MES distress timeout		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1281	0000	call failed, MES cannot accept		
1291	0000	call failed, MES cannot accept at present		
1291	0034	call failed, MES cannot accept at present	Call cleared, SDU not logged On	Cooperative Preempt: Not Logged On
1291	0035	call failed, MES cannot accept at present	Call cleared, GNSS frequency check error	Cooperative Preempt: GNSS Frequency Check Error
1291	4	call failed, MES cannot accept at present	Call cleared, SDU not logged On	Ruthless Preempt: Not Logged On
1291	5	call failed, MES cannot accept at present	Ruthless Preempt: GNSS Frequency Check Error	Call cleared, GNSS frequency check error
1291	0054	call failed, MES cannot accept at present	EIRP Request rejected due to: Not Logged On	Call rejected, SDU not logged On
1291	0055	call failed, MES cannot accept at present	Call rejected, GNSS frequency check error	EIRP Request rejected due to: GNSS Frequency Check Error
12B1	0000	call cleared by MES for unspecified reason		
12B1	0024	call cleared by MES for unspecified reason	HSU Equipment Failure	
12B1	0032	call cleared by MES for unspecified reason	Call cleared, SDU reporting system failure	Cooperative Preempt: System Failure
12B1	0036	call cleared by MES for unspecified reason	Call cleared, pre-empted by SDU for undeclared reason	Cooperative Preempt: Spare
12B1	0037	call cleared by MES for unspecified reason	Call cleared, pre-empted by SDU for invalid parameter	Cooperative Preempt: Invalid Parameter

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
12B1	2	call cleared by MES for unspecified reason	Call cleared, SDU reporting system failure	Ruthless Preempt: System Failure
12B1	6	call cleared by MES for unspecified reason	Call cleared, pre-empted by SDU for undeclared reason	Ruthless Preempt: Spare
12B1	7	call cleared by MES for unspecified reason	Call cleared, pre-empted by SDU for invalid parameter	Ruthless Preempt: Invalid Parameter
12B1	0052	call cleared by MES for unspecified reason	Call rejected, SDU reporting system failure	EIRP Request rejected due to: System Failure
12B1	0056	call cleared by MES for unspecified reason	Call rejected, pre-empted by SDU for undeclared reason	EIRP Request rejected due to: Spare
12B1	0057	call cleared by MES for unspecified reason	Call rejected, pre-empted by SDU for invalid parameter	EIRP Request rejected due to: Invalid Parameter
12C2	0000	call cleared, no credit card valid message received		
12C3	0000	call failed, MES time-out (no terrestrial answer)		
12C4	0000	call cleared, authentication query not received		
12C5	0000	call cleared, MES missing sup service SU		
12C6	0000	call cleared, MES missing sup service 2 SU		
12C7	0000	call cleared, MES missing SCPC channel release SU sup service		
12C8	0000	handover failed, LES not detected		
12D1	0000	call failed, spot beam data invalid		
12D2	0000	call failed, invalid scrambling vector		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1351	0000	call cleared, insufficient free memory		
1361	0000	call cleared by MES cable unwrap		
1362	0000	call cleared, long interruption in reception at MES		
1363	0000	MES secondary clear due to repoint OR		
1363	0031	MES secondary clear due to repoint OR	Call cleared, SDU re-pointing antenna to different Ocean Region	Cooperative Preempt: Ocean Region Handover
1363	1	MES secondary clear due to repoint OR	Call cleared, SDU re-pointing antenna to different Ocean Region	Ruthless Preempt: Ocean Region Handover
1363	0051	MES secondary clear due to repoint OR	Call rejected, SDU re-pointing antenna to different Ocean Region	EIRP Request rejected due to: Ocean Region Handover
1391	0000	call cleared, traveled distance exceeds 700km		
1392	0000	call cleared, spot beam transition		
1393	0000	call cleared, cooperative mode		
1393	0030	call cleared, cooperative mode	Call cleared, pre-empted by higher priority call	Cooperative Preempt: High Priority Call
1393	0033	call cleared, cooperative mode	Call cleared, no power available from SDU	Cooperative Preempt: No Power Available
1393	0	call cleared, cooperative mode	Call cleared, pre-empted by higher priority call	Ruthless Preempt: High Priority Call
1393	3	call cleared, cooperative mode	Call cleared, no power available from SDU	Ruthless Preempt: No Power Available

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1393	4	call cleared, cooperative mode	Channel cleared, SDU not logged on	Ruthless Preempt: Not Logged On
1393	0050	call cleared, cooperative mode	Call rejected, pre-empted by higher priority call	EIRP Request rejected due to: High Priority Call
1393	0053	call cleared, cooperative mode	Call rejected, no power available from SDU	EIRP Request rejected due to: No Power Available
1451	0000	call failed, terrestrial circuits congested		
1452	0000	call failed, LES congested (no channel and no circuit)		
1502	0000	spotbeam handover, LES ready, normal clear		
1551	0000	call failed, LES congested (no channel)		
1581	0000	call failed, service not provided at this LES		
1591	0000	call failed, service temporarily not available at this LES		
1592	0000	call cleared, credit card type not supported		
15A1	0000	call failed, MES not authorised at this LES		
15A2	0000	call failed, service not authorised at this LES		
15A3	0000	call cleared, credit card not authorised		
15A4	0000	call cleared, authentication reply invalid		
15A5	0000	call failed, PID not authorised for any service		
15A6	0000	call failed, PID not authorised for requested service		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
15B1	0000	call cleared by LES for unspecified reason		
15C1	0000	call failed, no channel assignment from LES		
15C2	0000	call failed, LES time-out (no service address)		
15C3	0000	call failed, LES time-out (no scrambling vector)		
15C4	0000	call failed, no service address and no scrambling vector		
15C5	0000	call cleared, incomplete credit card data information		
15C7	0000	call failed, LES time-out (no MES connect)		
15C9	0000	call cleared, no authentication reply		
15CA	0000	call cleared, notification ack not received		
15CB	0000	call cleared, invalid sequence number in notification ack		
15CC	0000	handover failed, no response to request		
15CD	0000	handover failed, MES not ready		
15D1	0000	call failed, LES time-out (invalid assignment)		
15D2	0000	LES MES already busy		
15E1	0000	call cleared but MES still transmitting (FAULT)		
1651	0000	call failed, LES congested (no channel unit)		
1661	0000	call failed, long interruption in reception at LES		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1662	0000	LES long term blockage of SCPC MES		
16C2	0000	LES missing MES SCPC		
16C3	0000	handover failed, MES not detected		
1790	0000	call cleared, failure credit card validation process		
1791	0000	call cleared, failure authentication process		
1811	0000	NCS MES ID busy		
1812	0000	NCS MES ID busy MPDS		
1813	0000	Call waiting request rejected, MES not accepted call		
1814	0000	Call waiting request rejected, RLES shows MES busy		
1841	0000	call cleared, NCS initiated preemption for incoming pri.1 call		
1842	0000	call cleared, NCS initiated preemption for incoming pri.2 call		
1843	0000	call cleared, NCS initiated preemption for incoming pri.3 call		
1844	0000	call cleared, NCS initiated preemption		
1851	0000	call failed, satellite congestion NCS reject no SCPC available		
1852	0000	call failed, satellite congestion NCS reject SCPC does not match request		
1853	0000	call failed, lease channel congestion		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1854	0000	call failed, MES outside spot beam coverage area		
1855	0000	call rejected, preemption failed, no channel available		
1856	0000	call rejected, spot beam selection failed		
1857	0000	handover failed, channel not available		
185A	0000	NCS Reject Lease-marked MES -- No Matching SCPC channel		
18A1	0000	NCS MES ID not found		
18A2	0000	call failed, MES not authorised		
18A3	0000	call failed, LES not authorised		
18B1	0000	call failed by NCS for unspecified reason		
18B2	0000	call rejected, invalid service requested		
18C1	0000	NCS MES burst missing		
18C3	0000	NCS MES busy preemption failed		
18D1	0000	call failed, invalid call request		
18E1	0000	NCS MES busy already		
18E2	0000	NCS MES busy already MPDS		
1D61	0000	Call wait failed, fixed line hung up		
1F01	0000	call cleared by terrestrial circuit		
1F11	0000	call failed, terrestrial party busy		

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
1F21	0000	call failed, LES time-out (no answer)		
1F61	0000	call failed, terrestrial circuit failure		
1F62	0000	call failed, early clear by terrestrial circuit		
0000	0000	MPDS channel cleared		No Inmarsat SLCV for termination of MPDS session
0000	0064	MPDS channel cleared	MPDS Port error code 100 401	
0000	01F4	MPDS channel cleared	Unknown Error 500	
0000	01F5	MPDS channel cleared	LES Access Code does not support MPDS	
0000	01F6	MPDS channel cleared	Network does not recognise Mobile ID	
0000	01F7	MPDS channel cleared	Network does not recognise Sim Card	
0000	01F8	MPDS channel cleared	Authentication Failed to Complete	
0000	01F9	MPDS channel cleared	Authentication Failure	
0000	01FA	MPDS channel cleared	Authorisation Failure	
0000	01FB	MPDS channel cleared	Authorisation Failure - Mobile Barred	
0000	01FC	MPDS channel cleared	Authorisation Failure - Mobile Barred on this LES Access Code	
0000	01FD	MPDS channel cleared	Authorisation Failure - SIM Card Barred on this LES Access Code	
0000	01FE	MPDS channel cleared	Authorisation Failure - Temporarily Unable to Accept Credit Cards	

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
0000	01FF	MPDS channel cleared	Authorisation Failure - Unable to Accept Credit Cards	
0000	0200	MPDS channel cleared	Authorisation Failure - Credit Card Refused	
0000	0201	MPDS channel cleared	Authorisation Failure - This Service not Allowed	
0000	0202	MPDS channel cleared	Authorisation Failure - Service Option(s) not Allowed	
0000	0203	MPDS channel cleared	Authorisation Failure - QoS not Allowed	
0000	0204	MPDS channel cleared	Authorisation Failure - Unsupported Service Option(s)	
0000	0205	MPDS channel cleared	QoS Option(s) Unsupported By Mobile	
0000	0206	MPDS channel cleared	QoS Option(s) Unsupported By Network	
0000	0207	MPDS channel cleared	Satellite Network Congestion	
0000	0208	MPDS channel cleared	Satellite Network Unavailable	
0000	0209	MPDS channel cleared	Service Congestion	
0000	020A	MPDS channel cleared	Service Unavailable	
0000	020B	MPDS channel cleared	Terrestrial Network Congestion	
0000	020C	MPDS channel cleared	Terrestrial Network Unavailable	
0000	020D	MPDS channel cleared	Terrestrial Network Destination - Busy	

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
0000	020E	MPDS channel cleared	Terrestrial Network Destination - No Answer	
0000	020F	MPDS channel cleared	Terrestrial Network Destination - Unavailable	
0000	0210	MPDS channel cleared	Terrestrial Network Destination - No Carrier	
0000	0211	MPDS channel cleared	Service Timed Out	
0000	0212	MPDS channel cleared	Terminated by Network Operator	
0000	0213	MPDS channel cleared	Insufficient Resources at Mobile	
0000	0214	MPDS channel cleared	Mobile Failure	
0000	0215	MPDS channel cleared	Mobile - Connection to DTE Lost	
0000	0216	MPDS channel cleared	Mobile - Unrecoverable DTE Protocol Error	
0000	0217	MPDS channel cleared	Mobile Reset	
0000	0218	MPDS channel cleared	User Cancellation of Connection Establishment	
0000	0258	MPDS channel cleared	Unable to Find Satellite Access Node	
0000	0259	MPDS channel cleared	Unable to Establish Communication with Satellite Access Node	
0000	025A	MPDS channel cleared	Link with Satellite Access Node Lost	
0000	02BC	MPDS channel cleared	Reason Unspecified	
0000	02BD	MPDS channel cleared	L3 Release	
0000	02BE	MPDS channel cleared	L3 Deregister	
0000	02BF	MPDS channel cleared	L3 Reject	

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
0000	02CC	MPDS channel cleared	SAN Idle Timer Expiry	
0000	02CD	MPDS channel cleared	MAN Idle Timer Expiry	
0000	02CE	MPDS channel cleared	SAN Connect Timer	
0000	02CF	MPDS channel cleared	SAN Modify Timer	
0000	02D0	MPDS channel cleared	SAN Handover Timer	
0000	02D1	MPDS channel cleared	SAN Connection Timer	
0000	02D2	MPDS channel cleared	MAN Connection Timer	
0000	02DC	MPDS channel cleared	Insufficient operating system resources at MAN	
0000	02DD	MPDS channel cleared	Insufficient memory at MAN	
0000	02EC	MPDS channel cleared	Invalid L3 Call Ref in Establish SDU	
0000	02ED	MPDS channel cleared	Invalid L3 Call Ref in Modify SDU	
0000	02FC	MPDS channel cleared	Unsupported MPDS MAC version	
0000	02FD	MPDS channel cleared	Invalid Bearer Connection type in Establish SDU	
0000	02FE	MPDS channel cleared	Invalid Bearer Control type in Establish SDU	
0000	02FF	MPDS channel cleared	Invalid Bearer Connection ID in Establish SDU	
0000	0300	MPDS channel cleared	Invalid Bearer Connection type in Modify SDU	
0000	0301	MPDS channel cleared	Invalid Bearer Control type in Modify SDU	
0000	0302	MPDS channel cleared	Invalid Bearer Connection ID in Modify SDU	

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
0000	0303	MPDS channel cleared	Invalid Handover SDU	
0000	0304	MPDS channel cleared	Invalid SDU type	
0000	0305	MPDS channel cleared	SDU Incorrectly Formatted	
0000	030C	MPDS channel cleared	Connection sub-layer protocol failure (MAN specific signaling)	
0000	030D	MPDS channel cleared	Connection sub-layer protocol failure (HDLC signaling)	
0000	031C	MPDS channel cleared	Control sub-layer protocol failure	
0000	032C	MPDS channel cleared	Channel Unit failure	
0000	032D	MPDS channel cleared	Hardware failure	
0000	032E	MPDS channel cleared	MAN not responding to frequency corrections	
0000	032F	MPDS channel cleared	MAN not responding to power corrections	
0000	0330	MPDS channel cleared	MAN not responding to timing corrections	
0000	033C	MPDS channel cleared	Internal SAN failure	
0000	033D	MPDS channel cleared	SAN Shutting Down	
0000	034C	MPDS channel cleared	Bearer Control - No satellite link	
0000	034D	MPDS channel cleared	Bearer Control - No suitable contention slot	
0000	034E	MPDS channel cleared	Bearer Control - Status Acknowledgement failure	
0000	034F	MPDS channel cleared	Bearer Control - Incorrect SAN ID	

Table F-4. SLCV Cause Codes and Strings (Continued)

SLCV	dddd	SLCV cause string	Detailed cause string	Comments
0000	035C	MPDS channel cleared	No such MAN	
0000	035D	MPDS channel cleared	Invalid L3 Call Reference	

Table F-5. Q.850 Cause Codes and Strings

Q.850 Value (qqq)	Q.850 string
1	Unallocated number
2	No route to specified transit network
3	No route to destination
4	Send special information tone
5	Misdialed trunk prefix
6	Channel unacceptable
7	Call awarded and being delivered in an established channel
8	Preemption
9	Preemption - circuit reserved for reuse
10	Normal call clearing
16	Normal call clearing
17	User busy
18	No user responding
19	No answer from user
20	Subscriber absent
21	Call rejected
22	Number changed
26	Non-selected user clearing
27	Destination out of order

Table F-5. Q.850 Cause Codes and Strings (Continued)

Q.850 Value (qqq)	Q.850 string
28	Invalid number format - address incomplete
29	Facility rejected
30	Response to a status enquiry
31	Normal, unspecified
34	No circuit/channel available
38	Network out of order
39	Permanent frame mode connection out-of-service
40	Permanent frame mode connection operational
41	Temporary failure
42	Switching equipment congestion
43	Access information discarded
44	Request channel not available
46	Precedence call blocked
47	Resource not available
49	Quality of service unavailable
50	Requested facility not subscribed
52	Outgoing calls barred
53	Outgoing calls barred within CUG
54	Incoming calls barred
55	Incoming calls barred within CUG
57	Bearer capability not authorized
58	Bearer capability not presently available
62	Inconsistency in designated outgoing access information and subscriber class
63	Service or option not available

Table F-5. Q.850 Cause Codes and Strings (Continued)

Q.850 Value (qqq)	Q.850 string
65	Bearer capability not implemented
66	Channel type not implemented
69	Request facility not implemented
70	Only restricted digital information bearer capability is available
79	Service or option not implemented, unspecified
81	Invalid call reference value
82	Identified channel does not exist
83	Suspended call exists, but call identity does not
84	Call identity in use
85	No call suspended
86	Call with the specified call identity is cleared
87	User not a member of CUG
88	Incompatible destination
90	Non-existent CUG
91	Invalid transit network selection
95	Invalid message, unspecified
96	Mandatory information element is missing
97	Message type non-existent or not implemented
98	Message not compatible with call state or message type non-existent
99	Information element non-existent or not implemented
100	Invalid information element contents
101	Message not compatible with call state
102	Recovery on timer expiry
103	Parameter non-existent or not implemented - passed on
110	Message with unrecognized parameter, discarded

Table F-5. Q.850 Cause Codes and Strings (Continued)

Q.850 Value (qqq)	Q.850 string
111	Protocol error, unspecified
127	Internetworking, unspecified

Table F-6. MPDS +WQ Cause Codes and Strings

mmm	+WQ cause code string
100	MPDS Port error code 100 401
500	Unknown Error 500
501	LES Access Code does not support MPDS
502	Network does not recognize Mobile ID
503	Network does not recognize Sim Card
504	Authentication Failed to Complete
505	Authentication Failure
506	Authorization Failure
507	Authorization Failure - Mobile Barred
508	Authorization Failure - Mobile Barred on this LES Access Code
509	Authorization Failure - SIM Card Barred on this LES Access Code
510	Authorization Failure - Temporarily Unable to Accept Credit Cards
511	Authorization Failure - Unable to Accept Credit Cards
512	Authorization Failure - Credit Card Refused
513	Authorization Failure - This Service not Allowed
514	Authorization Failure - Service Option(s) not Allowed
515	Authorization Failure - QoS not Allowed
516	Authorization Failure - Unsupported Service Option(s)
517	QoS Option(s) Unsupported By Mobile
518	QoS Option(s) Unsupported By Network

Table F-6. MPDS +WQ Cause Codes and Strings (Continued)

mmm	+WQ cause code string
519	Satellite Network Congestion
520	Satellite Network Unavailable
521	Service Congestion
522	Service Unavailable
523	Terrestrial Network Congestion
524	Terrestrial Network Unavailable
525	Terrestrial Network Destination - Busy
526	Terrestrial Network Destination - No Answer
527	Terrestrial Network Destination - Unavailable
528	Terrestrial Network Destination - No Carrier
529	Service Timed Out
530	Terminated by Network Operator
531	Insufficient Resources at Mobile
532	Mobile Failure
533	Mobile - Connection to DTE Lost
534	Mobile - Unrecoverable DTE Protocol Error
535	Mobile Reset
536	User Cancellation of Connection Establishment
600	Unable to Find Satellite Access Node
601	Unable to Establish Communication with Satellite Access Node
602	Link with Satellite Access Node Lost
700	Reason Unspecified
701	L3 Release
702	L3 Deregister
703	L3 Reject

Table F-6. MPDS +WQ Cause Codes and Strings (Continued)

mmm	+WQ cause code string
716	SAN Idle Timer Expiry
717	MAN Idle Timer Expiry
718	SAN Connect Timer
719	SAN Modify Timer
720	SAN Handover Timer
721	SAN Connection Timer
722	MAN Connection Timer
732	Insufficient operating system resources at MAN
733	Insufficient memory at MAN
748	Invalid L3 Call Ref in Establish SDU
749	Invalid L3 Call Ref in Modify SDU
764	Unsupported MPDS MAC version
765	Invalid Bearer Connection type in Establish SDU
766	Invalid Bearer Control type in Establish SDU
767	Invalid Bearer Connection ID in Establish SDU
768	Invalid Bearer Connection type in Modify SDU
769	Invalid Bearer Control type in Modify SDU
770	Invalid Bearer Connection ID in Modify SDU
771	Invalid Handover SDU
772	Invalid SDU type
773	SDU Incorrectly Formatted
780	Connection sub-layer protocol failure (MAN specific signaling)
781	Connection sub-layer protocol failure (HDLC signaling)
796	Control sub-layer protocol failure
812	Channel Unit failure

Table F-6. MPDS +WQ Cause Codes and Strings (Continued)

mmm	+WQ cause code string
813	Hardware failure
814	MAN not responding to frequency corrections
815	MAN not responding to power corrections
816	MAN not responding to timing corrections
828	Internal SAN failure
829	SAN Shutting Down
844	Bearer Control - No satellite link
845	Bearer Control - No suitable contention slot
846	Bearer Control - Status Acknowledgement failure
847	Bearer Control - Incorrect SAN ID
860	No such MAN
861	Invalid L3 Call Reference

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