



# eNfusion<sup>®</sup> HSD-440 Mark 2 Terminal

## *System Description, Installation, and Maintenance Manual*

MN-1252-33412, Revision 001

This document provides procedures for the equipment listed below.

<b>Model</b>	<b>Part Number</b>
eNfusion <sup>®</sup> HSD-440 Mark 2 Terminal 115 V ac or 28 V dc	1252-A-3820-01

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## INTRODUCTION

This manual provides the specifications, principles of operation, and information necessary to install the:

- HSD-440 Mark 2 Terminal, 1252-A-3820-01

This document is divided into the following sections:

- System Description
- System Operation
- Installation
- Test and Fault Isolation
- Maintenance and Repair
- Configuring the Owners Requirements Table (ORT)
- Appendix A: Inmarsat Satellite Beam Coverage
- Appendix B: Troubleshooting Checklist
- Appendix C: RJ45 Cable Termination Details
- Appendix D: Installation Planning Checklist
- Appendix E: Installation Checklist
- Appendix F: CMU Messages
- Appendix G: International Access and Country Codes
- Appendix H: Inmarsat Cause Codes
- Appendix I: CMC Messages

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

Only qualified avionics personnel who are 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 your HSD-440 Mark 2 Terminal's software version and configuration, the actual (live) system messages you see, such as dialog boxes and screen displays, may differ slightly from the examples in this manual.

## 1. Illustration of Equipment

Figure INTRO-1 shows the HSD-440 Mark 2 Terminal.

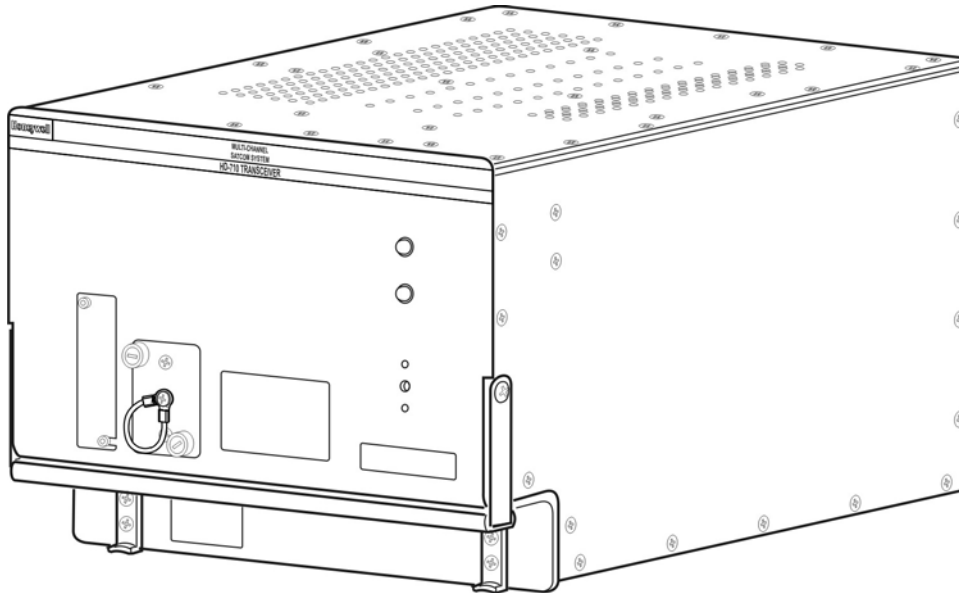


Figure INTRO-1 HSD-440 Mark 2 Terminal

## 2. Product Terms and Conditions

As stipulated in the Terms and Conditions of Sale, which accompanied the Product, EMS Aviation 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 Aviation is charged network or airtime fees relating to the customer's use of the Product, the customer shall immediately upon notification by EMS Aviation reimburse EMS Aviation in full for such charges.

## 3. Acronyms and Abbreviations

The following acronyms and abbreviations are used in this document.

AC	Access Concentrator
ac	Alternating Current
ACARS	Aircraft Communication Addressing and Reporting System
ACP	Audio Control Panel
ACSE	Access Control and Signalling Equipment
ACU	Antenna Control Unit (also known as BSU or Driver)
AERO	Aeronautical
AES	Aircraft Earth Station
AMBE	Advanced Multi Band Excitation

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Americas	Americas (satellite)
AMO	Approved Maintenance Organization
AOR-E	Atlantic Ocean Region-East
AOR-W	Atlantic Ocean Region-West
APAC	Asia-Pacific (satellite)
ATC	Air Traffic Control
AWG	American Wire Gauge
BGAN	Broadband Global Area Network
BITE	Built-In Test Equipment
BOP	Bit Oriented Protocol
bps	Bits per second
BRI	Basic Rate ISDN
BSU	Beam Steering Unit (also known as ACU or Driver)
C/No	Carrier-to-Noise
CCW	Counter Clockwise
CFDS	Centralized Fault Display System
CMC	Central Maintenance Computer
CMU	Communications Management Unit
CRC	Cyclic Redundancy Check
CW	Clockwise
dc	Direct Current
DITS	Digital Information Transfer System
DLNA	Diplexer/Low-Noise Amplifier
DSL	Digital Subscriber Line
D-UART	Dual Universal Asynchronous Receiver Transmitter
EIRP	Effect Isotropic Radiated Power
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
EST	Eastern Standard Time
EMEA	Europe / Middle East Africa (satellite)
FAA	Federal Aviation Authority
FET	Field-Effect Transistor
FMS	Flight Management System
FRLP	Forward Return Link Pair
FWD ID	Forward ID
GES	Ground Earth Station
GND	Ground
GNSS	Global Navigation Satellite System
HGA	High-gain Antenna
HPA	High Power Amplifier
HTML	Hyper Text Markup Language
Hz	Hertz

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I/O	Input/Output
ICAO	International Civil Aviation Organization
ICD	Interconnection Drawing
IMEI	International Mobile Equipment Identifier
IMSI	International Mobile Subscriber Identifier
IMN	Inmarsat Mobile Number
INS	Inertial Navigational System
IOR	Indian Ocean Region
IRS	Inertial Reference System
ISDN	Integrated Services Digital Network
ISN	Inmarsat Serial Number
ISP	Inmarsat Service Providers
ISP	Internet Service Provider
JAA	Joint Aviation Authorities
kbps	Kilobits per Second
LAN	Local Area Network
LES	Land Earth Station
LRU	Line Replaceable Unit
LS	line select
LSB	Least Significant Bit
MA	Mechanical Steered Antenna
Mbps	Megabit per second
MCDU	Multipurpose Control Display Unit
MCU	Modular Concept Unit
MES	Mobile Earth Station
M-ISDN	Mobile Integrated Services Digital Network
MPDS	Mobile Packet Data Services
MPU	Maintenance Port Utility
ms	Millisecond
MSB	Most Significant Bit
MSN	Mobile Serial Number
MSN	Multiple Subscriber Number
MTSAT	Meteorological Satellite
NAT	Network Address Translation
NO	normally open
NT	Network Terminator
O&I	Outline and Installation Diagram
OA	Other Antenna
OEXO	Oven Controlled Crystal Oscillator
OEM	Original Equipment Manufacturer
OR	Ocean Region
ORR	Ocean Region Registration

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ORT	Owner Requirements Table
PAST	Person Activated Self Test
PC	Personal Computer (or laptop)
PIM	Passive Intermodulation
PN	Part Number
POR	Pacific Ocean Region
POST	Power On Self Test
POTS	Plain Old Telephone System
PPP	Point-to-Point Protocol
PPPoE	Point-to-Point Protocol over Ethernet
PSTN	Public Switch Telephone Network
PTT	Push-to-Talk
RAM	Random Access Memory
REA	Responsible Engineering Authority
RF	Radio Frequency
RFI	Radio Frequency Interference
RFU	Radio Frequency Unit
rms	root mean square
ROM	Read-only Memory
RTN	Return
Rx	Receive
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.
SBB	SwiftBroadband
SCM	SDU Configuration Module
SCPC	Single Channel per Carrier
SDI	Source/Destination Identification
SDU	Satellite Data Unit
SNAC	Single Network Access Code
SPID	Service Profile Identifier
STBD	Starboard
STE	Secure Terminal Equipment
STU	Secure Telephone Unit
TA	Terminal Adapter
TE	Terminal Equipment
TFTP	Trivial File Transfer Protocol
Tx	Transmit
USIM	Universal Subscriber Identity Module
VHF	very high frequency
VSWR	Voltage Standing Wave Ratio
WOW	Weight on Wheels

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WSC Williamsburg SDU Controller  
WSC I Williamsburg SDU Controller Interface

#### **4. Safety Advisories**

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

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

All personnel who install, operate, and maintain the HSD-440 Mark 2 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: TO AVOID RISK OF INJURY FROM ELECTRIC SHOCK, DISCONNECT THE POWER FROM THE TERMINAL DURING INSTALLATION AND REMOVAL.**

**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 SATELLITE COMMUNICATIONS 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), MAKE SURE THAT PERSONNEL ARE EXPOSED TO A MINIMUM OF ANY REFLECTED, SCATTERED, OR DIRECT BEAMS.**

**CAUTION: 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.**

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**ATTENTION**

OBSERVE PRECAUTIONS  
FOR HANDLING  
ELECTROSTATIC  
SENSITIVE DEVICES

**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.

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## SYSTEM DESCRIPTION

This section includes basic information about HSD-440 Mark 2 Terminals, and includes the following sections:

- Inmarsat System Overview
- Equipment Overview
- Equipment Specifications
- System Interfaces
- User Interfaces
- Software Description

### 1. Inmarsat System Overview

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

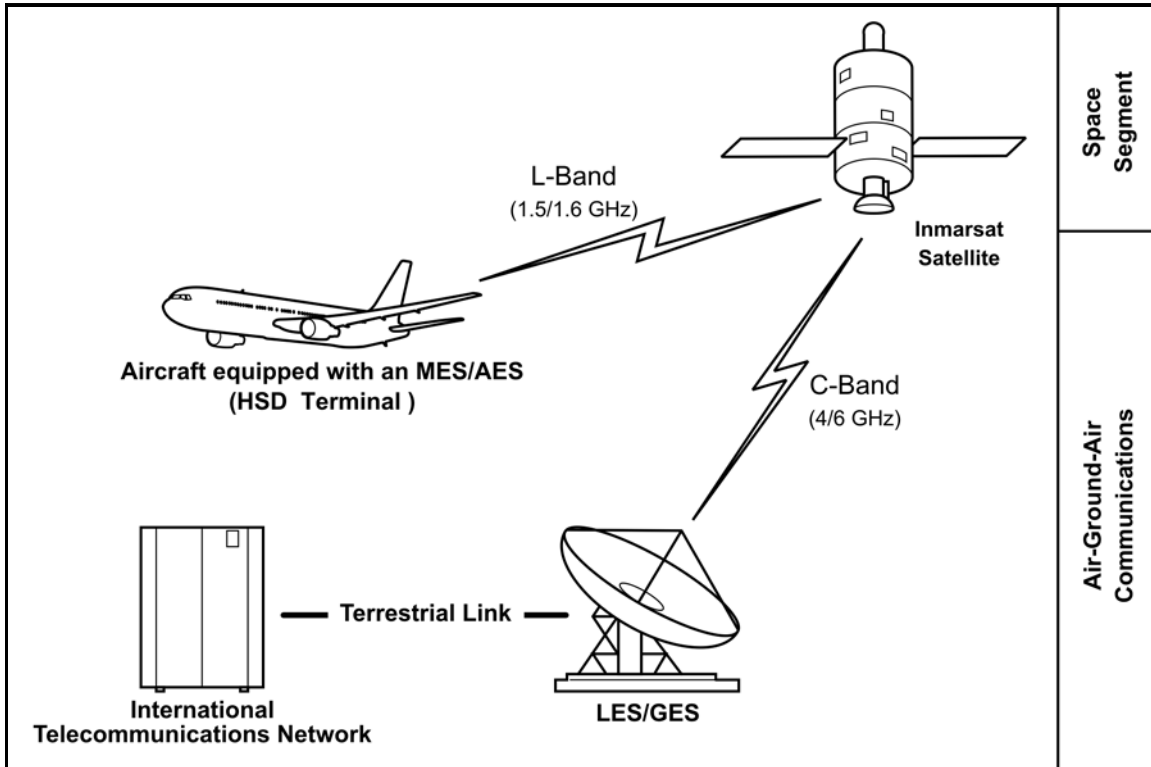
The satellite communication system includes global satellite networks, Land Earth Stations (LESs), Ground Earth Stations (GESs), Aircraft Earth Stations (AESs), and Mobile Earth Stations (MESs).

The LES/GES is the part of the satellite communication system that is on the ground. These numerous, international stations are responsible for routing voice and data calls from the MES/AES to their destinations around the world.

The MES/AES is the part of the satellite communication system that is on the aircraft. This station includes the following components:

- HSD-440 Mark 2 Terminal
- Antenna subsystem
- Cabin communications system
- Analog connected telephones
- Cockpit voice system
- Other aircraft avionics

Figure 1-1 illustrates a simplified satellite communications system.



**Figure 1-1 Simplified Aeronautical Satellite Communications System**

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 multiple geostationary satellites and satellite networks. Inmarsat networks provide services for aviation, shipping, and land-mobile terminals. Inmarsat provides information about satellite beam coverage at [www.inmarsat.com](http://www.inmarsat.com).

Inmarsat's I-3 satellites provide Aero H+ and Swift 64 services for aviation. The satellites connect to ground telecommunication systems through the LES/GES. Each satellite is located over an Ocean Region (OR)—the current OR names are:

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

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Inmarsat's I-4 satellites provide SwiftBroadband (SBB) services and Aero H+ services. The three I-4 satellites are:

- Americas
- EMEA (Europe, Middle East and Africa)
- Asia-Pacific

The HSD-440 Mark 2 Terminal, in conjunction with an ARINC 741/781 High-gain Antenna (HGA), acts as an MES/AES. The combined system provides users with a data and voice communications link to the satellite network and global telecommunications system.

## **2. Equipment Overview**

HSD-440 Mark 2 Terminals are scalable, high-speed data, satellite communications terminals that provide world-wide voice and data services to aircraft through high-speed communication links with the Inmarsat Satellite Network. HSD-440 Mark 2 Terminals interface with ARINC 741/781-compatible antenna subsystems to communicate with the space segment of the Inmarsat Satellite Network via L-band RF signals.

HSD-440 Mark 2 Terminals communicate with various avionics equipment, such as the aircraft's IRS and CMU, to coordinate and access a wide range of services. The HSD-440 Mark 2 Terminals also communicate with cabin and cockpit voice and data equipment to provide phone, fax, Internet connection, and other services on board the aircraft.

HSD-440 Mark 2 Terminals contain the following:

- One channel card for Swift 64 or SBB services
- One Classic Aero multi-channel channel card
- Data input/output (I/O) card
- High stability reference oscillator
- Control processor card
- High Power Amplifier (HPA)
- SDU Configuration Module (SCM)
- Universal (115 V ac 400 Hz / 28 V dc) power supply

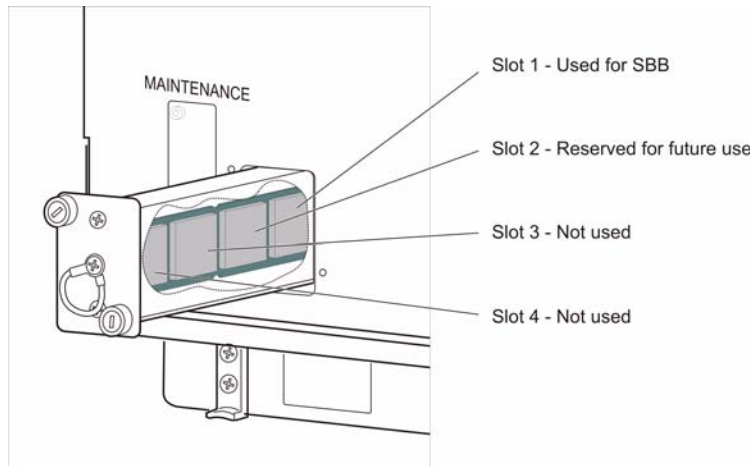
HSD-440 Mark 2 Terminals support the following services:

- Inmarsat Mobile Integrated Services Digital Network (M-ISDN) Single Channel Per Carrier (SCPC) Service
- Inmarsat Mobile Packet Data Services (MPDS) via PPPoE
- Inmarsat Aero P, R, T channel data
- Two channels of Inmarsat Aero C channel H+ voice

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- Cockpit communications for air-to-ground calls using the MCDU, or the WSC
- CEPT-E1
- SwiftBroadband (SBB) packet-switched and circuit-switched services

The HSD-440 Mark 2 Terminal contains a SCM that has four SIM card slots. Each slot (and each SIM card) is associated with a specific channel. To use the SBB service, the HSD-440 Mark 2 Terminal obtains subscriber information from the SIM card installed in Slot 1. Slot 2 is reserved for future use. Channel card two provides Classic services and as Classic services do not require a SIM card, slots 3 and 4 are not used. Figure 1-2 shows the HSD-440 Mark 2 Terminal SCM.



**Figure 1-2 HSD-440 Mark 2 Terminal SCM**

HSD-440 Mark 2 Terminals have four different types of ports that provide ISDN, CEPT-E1, Ethernet, and Plain Old Telephone Service (POTS) to users in the aircraft cabin. Although able to support multiple configurations depending on user needs, the following constraints apply:

- EURO ISDN S/T port supports:
  - In Swift 64 mode, one or two channels of 64kbps UDI, 56kbps Data, 64kbps 3.1kHz Audio, or 64kbps Speech
  - In SBB mode, one channel of 64kbps UDI, 56kbps Data, 64kbps 3.1kHz Audio, or 4kbps AMBE+2 Voice
- 10BASE-T port supports:
  - In Swift 64 mode, one or two channels of 64kbps data or MPDS through PPPoE
  - In SBB mode, up to 11 simultaneous packet-switched (PS) data calls and one circuit-switched (CS) call

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- POTS supports:
  - In Swift 64 mode, one or two channels of ISDN (speech) or 3.1kHz audio (fax)
  - In SBB mode, one channel AMBE+2 voice or 3.1kHz audio (fax)
- CEPT-E1 is offered through the Aero-H+ service and offers 1 or 2 channels of voice

NOTE: Only one service type can be used at one time on aHSD-440 Mark 2 Terminal channel. Channel card 1 can support two channels of Swift 64 service when in this mode or one channel of SwiftBroadband service.

### 3. Equipment Specifications

This section includes the physical and environmental characteristics of HSD-440 Mark 2 Terminals.

Table 1-1 lists the physical characteristics and specifications for HSD-440 Mark 2 Terminals.

**Table 1-1 HSD-440 Mark 2 Terminal Characteristics and Specifications**

<b>Characteristic</b>	<b>Specification</b>
Certification/related documents	
ARINC characteristics	600-12, Air Transport Avionics Equipment Interfaces, December 12, 1998 Attachment 10 of the ARINC 704-7
RTCA documents	RTCA/DO-160E, Environmental Conditions and Test Procedures for Airborne Equipment, July 29, 1997
HSD-440 Terminal Software	RTCA/DO-178B Level D/E (For more information, refer to "Software Specifications" on page 1-19)
Physical Size	
Height	19.41 cm (7.64 in)
Width	26.09 cm (10.27 in)
Length	38.66 cm (15.22 in)
Weight	16.1 kg (35.5 lbs)
Mounting information	8-MCU Tray (per ARINC 600, 8-MCU LRU)
Maintenance requirements	No scheduled maintenance is required
Electrical specifications	
HSD-440 Mark 2 Terminal AC input power	
Voltage	Minimum: 92 V rms—min start voltage: 100V rms Typical: 115 V rms Maximum: 122 V rms

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
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**Table 1-1 HSD-440 Mark 2 Terminal Characteristics and Specifications (Continued)**

<b>Characteristic</b>	<b>Specification</b>
Power consumption	Maximum: 460 W  <u>NOTE:</u> Of this power consumption, 400 W is dissipated internally and 60 W of RF power is dissipated externally.
Frequency	Minimum: 360 Hz Typical: 400 Hz Maximum: 800 Hz
Power Factor	Leading: >0.77 Lagging: >0.62
HSD-440 Mark 2 Terminal DC input power	
Voltage	Minimum: 22 V dc for startup, 20.5 V dc for operation Typical: 28 V dc Maximum: 33.2 V dc
Power consumption	Maximum: 460 W  <u>NOTE:</u> Of this power consumption, 400 W is dissipated internally and 60 W of RF power is dissipated externally.
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 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	As per ARINC 600 Section 3.5.1.6 (220 kg/(kW·hr))
Flow rate	88 kg/hr (194 lbs/hr) at air temperature 40°C
Pressure drop	5 ± 3 mm (0.20 ± 0.12 in.) of H <sub>2</sub> O
Frequency band	Tx: 1626.5 to 1660.5 MHz Rx: 1525.0 to 1559.0 MHz
Receive input impedance	50 ohms
Transmit output impedance	50 ohms
Transmit VSWR	2:1 maximum
External interfaces	
External parameters	

**Table 1-1 HSD-440 Mark 2 Terminal Characteristics and Specifications (Continued)**

<b>Characteristic</b>	<b>Specification</b>
Antenna gain (HGA)	Minimum: 12 dB Maximum: 17 dB
Antenna to DLNA loss	Maximum: 0.3 dB
DLNA gain	Minimum: 53 dB Maximum: 60 dB
DLNA noise	Maximum: 1.8 dB
DLNA to HSD-440 Mark 2 Terminal total loss	Minimum: 6 dB Maximum: 25 dB (Rx)
HSD-440 Mark 2 Terminal to antenna loss	Minimum: 1 dB Maximum: 2.5 dB (Tx) (including DLNA loss)
DLNA insertion loss	Maximum: 0.8 dB
<b>External digital interfaces</b>	
Control interface	up to three MCDU (speed configurable) two CMUs Multi-control bus Top/Port and Starboard antenna bus Top/Port and Starboard antenna mute two IRS buses—second port speed configurable
RS-232 maintenance interface (rear and front connector)	19 200 kbps (For connection specification, refer to "Maintenance Port Interface" on page 1-17)
Ethernet user interface (2)	10BASE-T input and output for SCPC (Swift 64 Mobile ISDN) and MPDS using Point-to-Point Protocol over Ethernet (PPPoE) Used for placing PPPoE calls using the MPDS, SCPC, SBB PS, SBB CS services Controls BGAN secondary contexts via the side AT handler Provides status information to the client system using SNMP
ISDN ()	ISDN S/T physical interface supporting up to six external connections to Terminal Adapter (TA) or Terminal Equipment (TE) devices One ISDN interface to high-speed data services
POTS tip/ring interface (2)	POTS analog interface provides access to services over Swift 64 or SBB
CEPT-E1	Provides priority 4 (public) calls to the cabin over the Aero H+ service
4-Wire interfaces	Providing cockpit voice services through the audio control panel over Aero-H+ services

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Table 1-2 lists the RTCA/DO-160E environmental characteristics for HSD-440 Mark 2 Terminals.

**Table 1-2 HSD-440 Mark 2 Terminal RTCA/DO-160E Environmental Characteristics**

<b>Section</b>	<b>Environmental Condition</b>	<b>Category/Comment</b>
4	Temperature and Altitude	
4.5.1	Ground Survival Low	F2
4.5.1	Short Time Operating Low	F2
4.5.2	Operating Low Temperature	F2
4.5.3	Ground Survival High Temperature	F2
4.5.3	Short Term Operating High Temperature	F2
4.5.4	Operating High Temperature	F2
4.5.5	In Flight Loss of Cooling	Z—Operate for 30 minutes @40°C with 10W Output RF power and 180 minutes @40C without damage and without producing smoke or fire
4.6.1	Altitude Test	F2
4.6.2	Decompression Test	A2—Modified to include an extra test of 4 hours at 10,000 ft.
4.6.3	Over Pressure Test	A2
5	Temperature Variation	A
6	Humidity	B
7	Operational Shock and Crash Safety	B—Modified to include an extra test after the 5th cycle
8	Vibration	S (CURVE B, C)—equipment exposed to 1 hour curve C (unpowered) prior to testing with curve B.
9	Explosive Atmosphere	E—Modified to test at 0 ft and 41000 ft.
10	Waterproofness	W
11	Fluids Susceptibility	Y
12	Sand and Dust	S
13	Fungus Resistance	F
14	Salt Spray	S
15	Magnetic Effect	Z
16	Power Input	
16.5	Power Input (ac)	A(WF)H
16.5.1.1	Normal Operating Conditions	A(WF)H
16.5.1.2	Voltage Modulation	A(WF)
16.5.1.3	Frequency Modulation	A(WF)
16.5.1.4	Momentary Power Interruptions	A(WF)
16.5.1.5	Transient/Voltage Surge—Normal	A(WF)



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**Table 1-2 HSD-440 Mark 2 Terminal RTCA/DO-160E Environmental Characteristics**

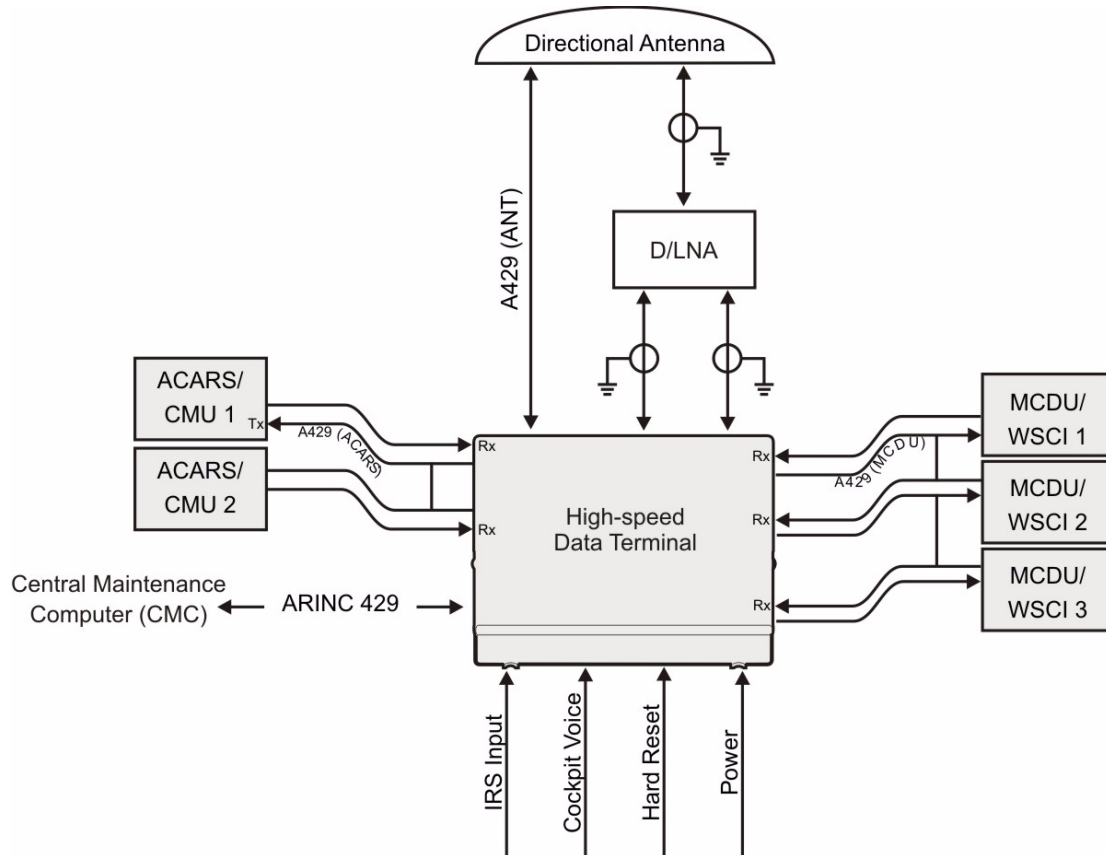
<b>Section</b>	<b>Environmental Condition</b>	<b>Category/Comment</b>
16.5.1.6	Normal Frequency Variation, 360 Hz to 800 Hz	A(WF)
16.5.1.7	DC Content	A(WF)
16.5.1.8	Voltage Distortion	A(WF)
16.5.2.1	Abnormal Operating Condition	A(WF)
16.5.2.2	Abnormal Frequency and Voltage Condition	A(WF)
16.5.2.3	Transient/Voltage Surge—Abnormal	A(WF)
16	Power Input (dc)	Z
16.6	Normal Operating Conditions	A
16.6.1.1	Emergency Operation	A
16.6.1.1	Ripple Voltage	A
16.6.1.3	Momentary Power Interruptions	A
16.6.1.4	Normal Surge Voltage	A
16.6.2.1	Abnormal Operating Conditions	A
16.6.2.3	Momentary Undervoltage Operation	A (No damage)
16.6.2.4	Abnormal Surge Voltage	Z
16.7.1	Current Harmonic Emissions from Loads (ac)	A(WF)H
17	Voltage Spike	A—600 V, and repeated at 1000 V
18	Audio Frequency Conducted Susceptibility	
	Power Input (115 V ac)	K(NF)
	Power Input (28 V dc)	Z
19	Induced Signal Susceptibility (ac)	ZW
	Induced Signal Susceptibility (dc)	ZC
20	Radio Frequency Susceptibility	RR
21	Emission of RF Energy	M
22	Lightning Induced Transient Susceptibility	A3J33
23	Lightning Direct Effects	X
24	Icing	X
25	Electrostatic Discharge (ESD)	A —Modified to apply 4kV to all connector pins connecting to other equipment
26	Fire Flammability	C—Modified to include compliance with 14 CFR (FAR) 25.853a and 25.869(a) including amendment 25-72

## 4. System Interfaces

This section briefly describes the external HSD-440 Mark 2 Terminal system interfaces required to control, monitor, maintain, and supplement the terminal. "Installation" on page 3-1 provides a detailed description of interface connections.

Figure 1-3 shows the system interfaces of the HSD-440 Stand-Alone terminal.

**Figure 1-3 HSD-440 Stand-Alone Terminal Interfaces**



### A. Central Maintenance Computer (CMC)

The CMC can include a video display system and keyboard or it can interface with a separate multi-purpose control display system, such as an MCDU. The HSD-440 Mark 2 Terminal supports CMC interfaces defined in ARINC 741 Part 1 Appendix 1, with minor customization as required.

The CMC receives BITE data using the standard ARINC 429 maintenance words from all subsystems attached to it. In turn, the CMC broadcasts data, such as time, date, flight number, flight phase, and aircraft ID, that the HSD-440 Mark 2 Terminals attached to it can use to log events.

The CMC enables you to query the equipment attached to it for BITE data and control the systems attached to it.

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For more information about using the CMC, refer to the CMC manufacturer's documentation.

**B. Source Destination Identification (SDI)**

The SDI is strapped to indicate the installation type.

**C. FWD IDs, ICAO IDs, and IMSI**

The HSD-440 Mark 2 Terminal uses two 24-bit IDs called Forward/Return Link Pairs (FRLPs) for the Swift 64 service: a Forward ID (FWD ID) and a Return ID (RTN ID). The HSD-440 Mark 2 Terminal reads the FWD ID from the EEPROM and performs a look-up for the RTN ID. The terminal obtains the second FRLP from the table based on the first FRLP. 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 (IMNs), which are the numbers that a user dials from the ground to reach a terminal on an aircraft. There is a unique IMN for each of the service types (for example, data or voice).

The HSD-440 Mark 2 Terminal provides IMEI and IMSI for SBB. The IMEI identifies the equipment type to the network. The equipment types identity is hard coded in the equipment. The IMSI identifies the subscriber. This identity is contained within the USIM housed in the SCM.

The HSD-440 Mark 2 Terminal provides two ways to define the ICAO ID—by strapping or over the secondary IRS bus. You can select strapping or the IRS bus as the source of the ICAO ID by the secure ORT parameter ICAO CODE SOURCE.

**NOTE:** If the ICAO address source is set to the IRS bus, the secondary IRS type ORT parameter must be set to AES ID.

The 24-bit ICAO ID forms part of the Inmarsat Serial Number (ISN).

The HSD-440 Mark 2 Terminal uses the International Mobile Subscriber Identity (IMSI) number for access to SBB services. The IMSI is stored in the terminal's SIM card, and is printed on the SCM. Register your IMSI with your service provider to begin using SBB services.

**D. Weight-On-Wheel (WOW) Pin Wiring**

WOW discrettes indicate when an aircraft is on the ground or in the air, and are used for flight data-logging purposes. Since data that the aircraft is airborne is supplied to the HSD-440 Mark 2 Terminal by other equipment, this information from the discrettes is not required. However, EMS Aviation recommends wiring the WOW discrettes if you plan to load software while the HSD-440 Mark 2 Terminal is installed in the aircraft.

WOW is only used to determine aircraft on-ground status if the Inertial Reference System (IRS) has no valid data, and the CMC is not installed, or if the CMC is not providing valid data.

Note 40 of the ARINC 741 specification documentation defines the requirement for WOW data.

**E. IRS ARINC 429 Interface**

The HSD-440 Mark 2 Terminal supports two IRS inputs and three types of labels:

- Inertial
- GNSS
- Hybrid

Table 1-3, Table 1-4, and Table 1-5 list the labels for both primary and secondary IRS inputs.

**NOTE:** The HSD-440 Mark 2 Terminal does not process the equipment ID label.

**Table 1-3 Inertial Type Labels**

<b>Label Type</b>	<b>Priority</b>	<b>Name</b>	<b>Label</b>
Latitude	N/A	AIRCRAFT_LATITUDE	310
Longitude	N/A	AIRCRAFT_LONGITUDE	311
Ground speed	N/A	AIRCRAFT_GROUND_SPEED	312
True track	N/A	AIRCRAFT_TRUE_TRAK	313
True heading	N/A	AIRCRAFT_HEADING	314
Pitch angle	N/A	AIRCRAFT_PITCH	324
Roll angle	N/A	AIRCRAFT_ROLL	325
Altitude	N/A	AIRCRAFT_ALTITUDE	361
Other	N/A	EQUIPMENT_ID	377

**Table 1-4 GNSS Type Labels**

<b>Label Type</b>	<b>Priority</b>	<b>Name</b>	<b>Label</b>
Latitude	N/A	GNSS_LATITUDE	110
Longitude	N/A	GNSS_LONGITUDE	111
Ground speed	N/A	GNSS_GROUND_SPEED	112
True track	N/A	GNSS_TRUE_TRAK	103
Altitude	1	GNSS_ALTITUDE_370	370
	2	GNSS_ALTITUDE_76	76
Other	N/A	GNSS_SENSOR_STATUS_WORD	273
	N/A	HDOP_WORD	101
	N/A	EQUIPMENT_ID	377

**Table 1-5 Hybrid Type Labels**

<b>Label Type</b>	<b>Priority</b>	<b>Name</b>	<b>Label</b>
Latitude	1	HYBRID_LATITUDE	254
	2	GNSS_LATITUDE	110
Longitude	1	HYBRID_LONGITUDE	255
	2	GNSS_LONGITUDE	111
Ground speed	1	HYBRID_GROUND_SPEED	175
	2	GNSS_GROUND_SPEED	112
True track	1	HYBRID_TRUE_TRAK	137
	2	GNSS_TRUE_TRAK	103
True heading	1	HYBRID_HEADING_132	132
	2	AIRCRAFT_HEADING	314
Pitch angle	N/A	AIRCRAFT_PITCH	324
Roll angle	N/A	AIRCRAFT_ROLL	325
Altitude	1	HYBRID_ALTITUDE_261	261
	2	GNSS_ALTITUDE_76	76
Other	N/A	HDOP_WORD	101
	N/A	GNSS_SENSOR_STATUS_WORD	273
	N/A	EQUIPMENT_ID	377

The HSD-440 Mark 2 Terminal uses the navigation data according to the following priority rules:

- For all labels other than Altitude, hybrid labels have the highest priority, followed by GNSS and inertial labels.
- For Altitude labels, the highest priority label is 370, followed by 261, 75, and 361.
- If both buses have the same label and label type, the HSD-440 Mark 2 Terminal control processor uses the 429 bus source of one of the labels as long as the label is present and valid.

The secondary IRS port set to AES ID mode provides the ICAO ID. Table 1-6 lists the AES ID type labels.

Table 1-6 AES ID Type Labels

Name	Label
ICAO Part 1	275
ICAO Part 2	276

#### F. Antenna Interface

The HSD-440 Mark 2 terminal interfaces to any mechanically-steered, conformal-array, or phased-array antenna subsystems that are compatible with ARINC 741 and 781. The antenna-pointing commands and status messages are communicated between the HSD-440 Mark 2 Terminal and antenna subsystem over ARINC 429, multi-control, top/port and/or starboard BITE and HPA mute buses, as defined in ARINC 741, Part 1.

HSD-440 Mark 2 Terminals support high gain antennas.

HSD-440 Mark 2 Terminals do not support the third MCDU when a side-mount antenna is installed.

#### G. CMU

Each HSD-440 Mark 2 Terminal can be connected to up to two ARINC 724B/758 CMUs. A CMU is a general purpose instrument used to create and direct low data rate messages to different ground-based systems, including airline headquarters and operations. The CMU also provides access to Aero H/H+ PRT channels.

The CMUs operate in two modes: it can select from a number of Satellite Service Providers rather than Inmarsat only, or it can operate with no preferred Satellite Service Provider.

The HSD-440 Mark 2 Terminal exchanges information with the CMU over ARINC 429 interfaces. The default speed is low, but you can set the speed of the buses to high through the ORT.

#### H. Antenna Subsystem RF Interface

The system RF parameters, such as cable losses and antenna gain, are delimited to make sure that the HSD-440 Mark 2 Terminal performance requirements are met. Refer to "Installation" on page 3-1 for a definition of these parameters and their expected values.

### 5. User Interfaces

This section describes the HSD-440 interfaces that enable users to access Inmarsat services and monitor the operation of the HSD-440 Mark 2 Terminal.

#### A. MCDU

The MCDU is a device that uses an ARINC 429 interface per ARINC 739, which lets you communicate with individual instruments on an aircraft, including the Flight Management System (FMS), very high frequency (VHF) radio, and the HSD-440 Mark 2 Terminal. You can make air-to-air and air-to-ground voice calls with the MCDU. You can also use the MCDU to answer ground-to-air and air-to-air voice calls.

The HSD-440 Mark 2 Terminal supports three MCDUs.

**B. WSC**

The WSC is a device that uses an ARINC 429 interface per ARINC 741 Part 2 Attachment 2F-42.1, which provides display functions similar to the MCDU. For more information about the WSC, see the WSC manufacturer's documentation and ARINC 741 Part 2 Attachment 2F-42.1.

**C. Remote Reset**

The remote reset output provides an external reset function for the complete HSD-440 Mark 2 Terminal. Pressing the momentary normally open (NO) switch resets the system's processor-card circuitry.

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

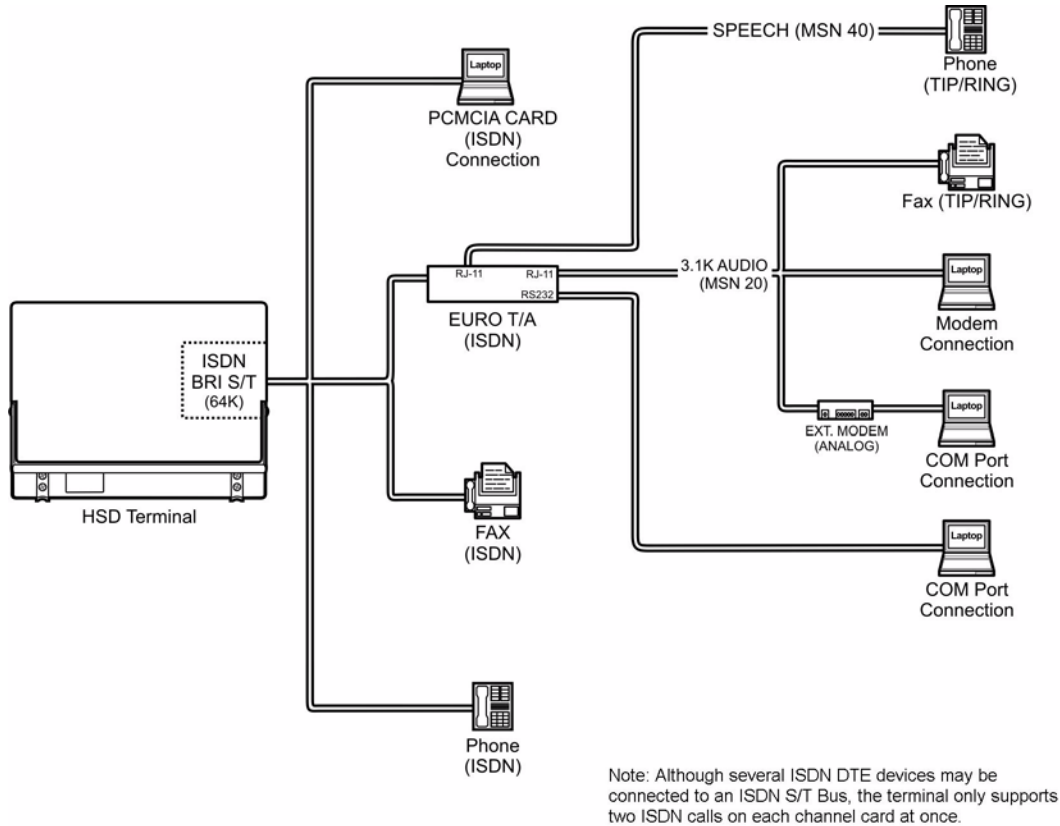
**D. ISDN Circuit-Switched Data Interface**

HSD-440 Mark 2 Terminals connect to a variety of interface options. The physical interface for ISDN BRI service is EURO S/T, which supports several types of connections to user equipment.

HSD-440 Mark 2 Terminals provide one ISDN S/T bus interface which is capable of hosting up to six external physical connections to EURO ISDN devices.

The ISDN BRI S/T bus accesses only the Swift 64/SBB channel card. In SBB mode, the interface provides one SBB circuit-switched connection. In Swift 64 mode, the interface provides two Swift 64 circuit-switched connections. If the channel is busy or in-call, the request for service is denied.

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**Figure 1-4 HSD-440 Mark 2 Terminal ISDN Connections**

You can install RJ45 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 RJ45 connector and cable termination.

**E. Ethernet Data Interfaces**

HSD-440 Mark 2 Terminals provide two Ethernet data interfaces. Each Ethernet port provides a 10 Mbps access with a 10BASE-T physical interface. The HSD-440 Mark 2 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. PPPoE is required on the user equipment to allow the establishment of virtual connections to either service. You can use the Ethernet ports for either Mobile ISDN or MPDS service when operating in Swift 64 mode, or PS (background or streaming) or CS (Mobile ISDN) when operating in SBB mode

The Ethernet interface also provides access to equipment monitoring functions through SNMP, and to the side AT handler for control of secondary contexts in SBB

**F. POTS Tip/Ring Interfaces**

The HSD-440 Mark 2 Terminal includes two POTS analog interfaces that connect to the Swift 64/SBB channel card. The default setting for POTS port 1 is 64 kbps Speech, and the default setting for POTS port 2 is 3.1 kbps Audio, which is appropriate for fax calls.



### G. CEPT-E1 Interface

The CEPT-E1 interface provides access to a maximum of two calls through Aero H+ voice services.

The CEPT-E1 interface connects to standard ITU or ARINC 746-compliant equipment. Users can select the equipment through an ORT parameter.

### H. Maintenance Port Interface

The HSD-440 Mark 2 Terminal is equipped with a maintenance port, located on the front panel of the HSD-440 Mark 2 Terminal, with remote access also available through the rear ARINC 600 connector. If the ports on both the front and back panels are connected, the front-panel connection has priority and the back-panel connection does not function.

The maintenance port provides the physical connection to a password-protected 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 HSD-440 Mark 2 Terminal or through a remote 9-pin socket D-Sub (DE9) connector via the ARINC 600 connector, as described in "Connection Requirements" on page 4-37.

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 HSD-440 Mark 2 Terminal MPU. Configure the connection as follows:

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

The HSD-440 Mark 2 Terminal supports two different end user access levels within the maintenance port architecture: End User and Field Representative.

#### (1) 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.

#### (2) 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/GES preferences, view and modify certain EEPROM parameters, and perform other maintenance or upgrade functions.

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"Test and Fault Isolation" on page 4-35 provides a detailed description of the two levels of user access and the menus, report selections, functions, and system diagnostic procedures of the HSD-440 Mark 2 Terminal MPU.

**I. Fault Indicator LED**

Table 1-7 provides a description of the fault indicator LED functions.

**Table 1-7 HSD-440 Mark 2 Terminal LED Output Designations**

<b>LED Signal</b>	<b>Label</b>	<b>Color</b>	<b>Indication Description</b>
LED1	Power On	Green	Normal operation: on. HPA output is greater than 30dBm: flashes at 1 Hz. Power on: HSD-440 Mark 2 Terminal supply voltage is active. Self-test: flashes at 1 Hz alternately with the Fault LED.
LED2	Fault	Red	Fault: Fault condition as described in "Fault Indicator LED" on page 1-18. Self-test: flashes once per second alternately with the Power On LED.

A failure in the HSD-440 Mark 2 Terminal may be due to a number of fault conditions. When fault condition is detected, the HSD-440 Mark 2 Terminal activates a red, Fault LED. Some of the potential fault conditions are:

- CP RAM
- CP Application code CRC
- CC power up
- CP D-UART
- CP ARINC Chipset
- PSU Power rail
- Previous Power Up CP RAM
- PSU Over temperature
- OCXO Warmup
- PA Over Current
- PA Voltage Driver
- PA Over temperature shutdown
- PA 12VDC STATUS DISCRETE
- SDU Configuration Module
- CP Boot Code CRC
- DIO Boot

- VP RAM
- VP Application Code CRC
- VP Kernel
- VP 4-Wire or POTS COM
- VP 4-Wire #1
- VP 4-wire #2

#### J. Self-Test

The self-test button activates the HSD-440 Mark 2 Terminal self-test.

The self-test button resets the HSD-440 Mark 2 Terminal. The HSD-440 Mark 2 Terminal performs a POST when the self-test button is pressed for over ten seconds.

#### K. Remote Status Panel (Optional)

In HSD-440 Stand-Alone terminals, the outputs to the optional remote status panel provide a visual indication of the operational status of the HSD-440 Mark 2 Terminal—they mirror the front panel LEDs labeled as Power (LED1) and Fault (LED2). Refer to "Installation" on page 3-1 for detailed installation and circuit requirements.

## 6. Software Description

This section describes the software specifications and operational software components of HSD-440 Mark 2 Terminals.

#### A. Software Specifications

HSD-440 Mark 2 Terminal software meets the following DO-178B standards:

- SBB to Level E
- Swift 64 to Level
- Classic Aero voice and data to Level D

#### B. Operational Software Part Numbers

Table 1-8 provides a list of software part numbers for HSD-440 Mark 2 Terminals.

Table 1-8 HSD-440 Mark 2 Terminal Operational Software

HSD-440 Mark 2 Terminal Part Number	EMS Aviation Part Number	Description
1252-A-3800-01	LI-1252-38015	HSD-440 Mark 2 Terminal firmware assembly

**C. Owner Requirements Table (ORT)**

The HSD-440 Mark 2 Terminal includes an ORT that stores information relevant to the operation of the terminal. The ORT is divided into two parts: secure and user. The secured partition contains those items that are installation-dependent and crucial to the proper operation of the satellite communication system. End users cannot modify these parameters.

The user partition includes items that aircraft operators can modify, such as 4-wire headset speaker volume.

You can use the EMS ORT Application to change ORT parameters and to create ORT files on your computer. You can then load the ORT file to the HSD-440 Mark 2 Terminal through TFTP on an Ethernet connection. You can load the same ORT file to various HSD-440 Mark 2 Terminals in your fleet. Section "2. Configuring ORT Parameters Using the EMS ORT Application" on page 6-32 provides more information about the EMS ORT Application.

## SYSTEM OPERATION

This section provides basic information on registering and operating HSD-440 Mark 2 Terminals, including the following sections:

- Registering and Activating Terminals
- Configuring Terminals
- Using Terminals

### 1. Registering and Activating Terminals

Registering and activating HSD-440 Mark 2 Terminals has the following steps:

- Preparing Terminal Information
- Obtaining ICAO Addresses
- Choosing Service Providers
- Registering Terminals

#### A. Preparing Terminal Information

Before installing the HSD-440 Mark 2 Terminal, obtain an ISN and identify the Swift 64 terminal type and service category.

##### (1) Obtaining ISNs

Honeywell provides ISNs for the HSD-440 Mark 2 Terminal based on the intended installation configuration. The last six digits of the ISN form the Forward ID.

When requesting ISNs, have the following information available:

- End customer name, including contact information
- The part number of the HSD-440 Mark 2 Terminal
- Tail registration number, aircraft type, and serial number of the aircraft on which the terminal is being installed
- Serial number of the HSD-440 Mark 2 Terminals
- Intended installation configuration mode

##### (2) Identifying the Swift 64 Service Category and Terminal Type

Inmarsat divides the band of frequencies assigned to Swift 64 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/H+ frequency allocations. HSD-440 Mark 2 Terminals do not require restricted frequency allocations. Register HSD-440 Mark 2 Terminals as Category A systems.

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The Swift 64 terminal type for all modes of HSD-440 Mark 2 Terminals is 76HW07. Currently, supported service types for HSD-440 Mark 2 Terminals operating Swift 64 are:

- 64 kbps speech
- 3.1 kHz audio
- 56 kbps data
- 64 kbps UDI
- AMBE voice
- MPDS

**B. Obtaining ICAO Addresses**

Obtain your ICAO address from your local aeronautical authority. Your service provider will require this address when you register.

**C. Choosing Service Providers**

Contact Inmarsat for an up-to-date list of Inmarsat Service Providers using the following contact information:

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](mailto:customer_care@inmarsat.com)

Web address: [www.inmarsat.com](http://www.inmarsat.com)

**D. Registering Terminals**

Contact your Inmarsat service provider and ask for a registration for service activation of Aircraft Earth Station form. With this form, you can register for Swift 64, SBB, and Aero H+ services. The services available depend on your service provider.

To complete the registration form you need the following information:

- Customer information (address and contact information)
- Service provider details (obtained from your ISP)
- System and terminal information (terminal type, manufacturer, model number, serial number of terminal)
- ICAO 24 bit technical address for Aero H+ services
- ISN for Swift 64 services
- IMEI and IMSI (printed on the SCM label) for SBB services

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- Aircraft information (tail number, fuselage/airframe number, manufacturer and model, and country of registration)
- List of services required (for example, Swift 64 Mobile ISDN, Aero H+ data-2, SBB PS and SBB CS services)

**NOTE:** When requesting a logon class, you must request Class 3, even if your installation does not support data services. The channel card software does not support Class 2.

## **2. Configuring Terminals**

This section provides basic information on how to configure HSD-440 Mark 2 Terminals for operation with user devices.

### **A. Setting up Airborne Networks**

For information about setting up airborne networks that use Swift 64 and SBB services, refer to the HSD Terminal Developer's Guide, MN-1252-13005.

### **B. Mapping User Devices for ISDN Services**

HSD-440 Mark 2 Terminals support connection to a multitude of user devices, allowing the user to customize their system. The HSD Terminal Developer's Guide, MN-1252-13005, provides more information about ISDN devices and services.

### **C. IMNs**

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 HSD-440 Mark 2 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 HSD Terminal Developer's Guide, MN-1252-13005, provides more information about IMNs.

### **D. MSNs**

MSNs act as identification and routing codes for user devices attached to the HSD-440 Mark 2 Terminal ISDN bus. 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.

The HSD Terminal Developer's Guide, MN-1252-13005, provides more information about MSNs.

**E. Configuring User ORT Parameters with the Maintenance Port Utility (MPU)**

You can use the MPU to configure user-level parameters in the ORT. This feature will be available in a future release.

**F. Configuring Secure ORT Parameters with the Maintenance Port Utility (MPU)**

You can use the MPU to configure secure-level parameters in the ORT.

The Forward ID is a secure ORT parameter that you must configure in order to use Swift 64 services. Refer to section "K: Configuring Satellite Service ORT Parameters" on page 6-15.

**G. Creating ORTs with the Maintenance Port Utility (MPU)**

can use the MPU to configure the ORT. Refer to "Configuring the Owners Requirements Table (ORT)" on page 6-1 for instructions.

**H. Understanding CMU Messages**

The CMU communicates with the HSD-440 Mark 2 Terminal using two types of ARINC 429 messages: Broadcast messages and Bit Oriented Protocol (BOP) messages. Both types of communication are supported at the same time.

Appendix F: "CMU Messages" on page F-1 includes descriptions of the messages that the CMU will transmit to the HSD-440 Mark 2 Terminal and receive from the HSD-440 Mark 2 Terminal.

**I. Configuring Swift 64 LES Access Codes**

This section describes how to configure the HSD-440 Mark 2 Terminal with the LES Access Codes provided by your Inmarsat service provider to support Swift 64 service. Configure LES access codes only if you plan to use Swift 64 services. This configuration is not required for SBB or classic services.

**NOTE:** You can remove the label that covers the LES Access Codes LEDs once you have configured the LES Access Codes.

(1) General Overview

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 LESs 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 OR satellite and LES.

**NOTE:** HSD-440 Mark 2 Terminals are shipped with the factory default LES Access Codes set to 0 (zero). All HSD-440 Mark 2 Terminals must be configured with the valid LES Access Codes provided by your ISP.



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(2) Changing Default LESs Using the MPU

The LES Access Codes can be configured using the HSD-440 Mark 2 Terminal MPU. You can access the MPU by connecting a computer running a VT100 terminal emulation program to the RS-232 maintenance port on the HSD-440 Mark 2 Terminals. Refer to "Test and Fault Isolation" on page 4-35 for connection settings and cabling information).

**NOTE:** When configuring the LES Access Codes using the HSD-440 Mark 2 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 HSD-440 Mark 2 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 Swift 64 services. Contact Inmarsat directly for an up to date list of LES and Swift 64 service providers.

For more information, visit Inmarsat's Web site at [www.inmarsat.com](http://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](mailto:customer_care@inmarsat.com)

**Table 2-1 Inmarsat Swift 64 LES Operator and Access Codes**

Land Earth Station Operator	Country	OR			
		AOR-E	AOR-W	IOR	POR
Telenor Satellite Services Inc.	USA	001	001	001	001
Stratos	UK/Canada	002	002	002	002
Stratos (Auckland LES)	New Zealand				
Xantic (Burum LES)	Netherlands	012	012	012	012
Xantic (Perth LES)	Australia				

(a) Equipment Required

You need the following to change the default LES Access Code in an HSD-440 Mark 2 Terminal:

- Computer
- Terminal emulation program (e.g., HyperTerminal)

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(b) Connecting to the Maintenance Port

To connect to the maintenance port:

- Connect a computer running a terminal emulation program to the HSD-440 Mark 2 Terminal maintenance port, and then power up the system. (Refer to "Test and Fault Isolation" on page 4-35 for detailed connection information.)

(c) Changing LES Access Codes Using the Control Processor Software

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

1. Connect to the HSD-440 Mark 2 Terminal maintenance port.
2. Type the password **maint**.
3. To navigate to Menu 3, press CTRL + N.
4. In Menu 3, press i.
5. Follow the application prompts, and enter the LES Access Code.

The Menu 3, option i configures the Primary and Secondary LES Access Codes for all of the ORs to the same LES Access Code.

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

(d) Changing LES Access Codes on a Call-by-Call Basis

To change the LES Access Code on a call-by-call basis:

- Dial the 901 prefix before your dial sequence:  
901 + LES CODE + International Code + Country Code + Area Code + Telephone Number + POUND KEY  
Example: 901 + 012 + 00 + 1+ 613+5551212 + #

NOTE: The call connects only if the service is authorized by the LES. To obtain LES codes, call your Swift 64 service provider.

**J. Removing the LED Label**

A label covers the LES Access Codes LEDs. You can remove this label once you have configured the LES Access Codes.

**K. Activating Configurations**

After you configure the HSD-440 Mark 2 Terminal parameters, you must reset the HSD-440 Mark 2 Terminal using one of the following methods:

- In Menu 2, press **z**
- Cycle the power to the HSD-440 Mark 2 Terminal

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

## L. Verifying Configurations

This section describes how to view the HSD-440 Mark 2 Terminal configuration parameters.

To view the HSD-440 Mark 2 Terminal ORT system configuration:

1. In Menu 3, press **o**.  
The List ORT appears.
2. To scroll through the listing until you see a table of ORT ORs, press **o**.  
The LES Access Codes are listed in this table.

## 3. Using Terminals

This section describes how to perform the following tasks:

- Placing Swift 64 Voice, SwiftBroadband, and Fax Calls
- Placing Calls with the CEPT-E1 Interface
- Using Data Connections
- Operating the MCDU
- Operating the WSC
- Performing Cockpit Communications with the MCDU

### A. Placing Swift 64 Voice, SwiftBroadband, and Fax Calls

Placing voice and fax calls using the HSD-440 Mark 2 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 HSD-440 Mark 2 Terminal dialing-number-sequence includes different routing components or codes. Figure 2-1 illustrates the required order of the dialing components.

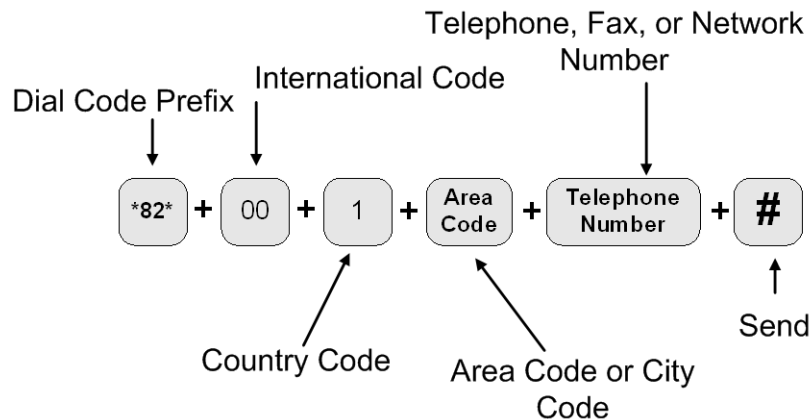


Figure 2-1 Dialing-Sequence Components

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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 2-1 uses the dial code prefix for 3.1 KHz audio service type (\*82\*). See Table 2-2 for other dial code prefixes.
- **International Access Code:**  
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.
- **Area Code (and City Code, if applicable):**  
Use the PSTN routing number assigned to the area (and if applicable, city) of your call destination.
- **POUND SIGN (#):**  
To signal the system to send the call, at the end of the telephone dial string, press or enter POUND SIGN (#). Certain devices using the HSD-440 Mark 2 Terminal may not have the function to insert the POUND SIGN (#) 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 2-3 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 2-2).

**Table 2-2 Dial Code Prefixes for Forcing Service Type Selection**

<b>Service Type</b>	<b>Service Description</b>	<b>Dial Code Prefix (Forces service selection)</b>
<b>Swift 64 Prefixes</b>		
Speech 64 kbps	High-speed voice	*81* or none
3.1 kHz audio	Fax, analogue modem, STU-III, STE	*82*
56 kbps data	High-speed data	*85*
64 kbps data	High-speed data	*84*

**Table 2-2 Dial Code Prefixes for Forcing Service Type Selection (Continued)**

Service Type	Service Description	Dial Code Prefix (Forces service selection)
<b>SBB Prefixes</b>		
Speech 64 kbps		N/A
3.1 kHz audio	Fax, analogue modem, STU-III, STE	*82* or none
56 kbps data	High-speed data	*83*
64 kbps data	High-speed data	*84*
Speech (AMBE+2)		*80* or none

The system requires the dial code prefix \*82\* for sending faxes 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 POUND SIGN (#) to the dialing string or devices that are slow dialing. Table 2-2 provides a description of the additional dial code prefixes used for system overrides. Table 2-1 provides a list of the LESs and their associated codes.

**Table 2-3 Dial Code Prefixes for System Overrides**

<b>Reason for Override</b>	<b>Dial Code Prefix</b>	<b>Example Dialing Sequence</b>
Use this dial code prefix to override the default LES/GES configured in the system. <i>This dial code prefix signals the system to override the default LES/GES and use the selected LES/GES instead. (See Figure 2-2 or contact Inmarsat for Swift 64 LES/GES codes)</i>	901 + LES/GES CODE	901 + LES/GES CODE + International Code + Country Code + Area Code + Telephone Number + POUND KEY 901 + 002 + 00 + 1+ 613 +5551212 + POUND KEY
Use with fast (e.g. automated) dialing devices that cannot produce or add a POUND SIGN to end the dialing sequence. <i>This dial code prefix signals the system to send the call after a specified delay in user input when the POUND SIGN cannot be entered (about 4 seconds).</i>	902	902 + International Code + Country Code + Area Code + Telephone Number 902 + 00 + 1+ 613 + 5551212
Use with slow (e.g. manual) dialing devices that cannot produce or add a POUND SIGN to end the dialing sequence. <i>This dial code prefix signals the system to send the call after a specified delay in user input (about 20 seconds).</i>	903	903 + International Code + Country Code + Area Code + Telephone Number 903 + 00 + 1+ 613 + 5551212

(2) Mobile-to-Mobile Communication

The HSD-440 Mark 2 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.

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



**Figure 2-2 Mobile-to-Mobile Dialing Sequence**

**B. Placing Calls with the CEPT-E1 Interface**

HSD-440 Mark 2 Terminal CEPT-E1 interface provides Cabin Telecommunication Unit (CTU) access to two Aero-H+ 4800 bps AMBE voice calls simultaneously. Since the CEPT-E1 interface shares the Aero H+ voice channels with the cockpit, CTU calls maybe preempted from either the air or ground by higher priority calls.

Air-to-ground and ground-to-air calls over the CEPT-E1 interface are priority 4 (public) calls.

For information on how to place a call over the CEPT-E1 interface, see the CTU documentation.

**C. Using Data Connections**

For information about data connections, optimizing your airborne network and selecting the service that best meets your needs, refer to the HSD High-speed Data Terminal Developer's Guide, MN-1252-13005.

**D. Operating the MCDU**

This section provides information about the MCDU and its interfaces—output and input ports, the screen, and the keyboard.

(1) Output Ports

The MCDU transfers its identification and commands to the HSD-440 Mark 2 Terminal using 32 bit words and a 12-14.5 kbps output port, as defined in ARINC Specification 429, Digital Information Transfer System (DITS).

(2) Input Ports

The MCDU receives identification information and displays data from individual subsystems using seven input ports, as defined by ARINC Specification 429. Ports 1 and 2 are reserved for FMSs, and they operate at 100 kbps. Ports 3 to 7 are available for the MCDU to communicate with the HSD-440 Mark 2 Terminal, and they operate at 12-14.5 kbps.

(3) Screen

The MCDU displays all data on the screen, as shown in Figure 2-3.



Figure 2-3 MCDU Screen

The top of the screen displays the title of the menu on the screen. The bottom of the screen (Line 14) is the scratchpad that displays information that you enter on the keyboard.

The MCDU has six buttons on each side of the screen that activate MCDU functions. Figure 2-3 displays these buttons on the left and right sides of the screen. When the functions corresponding to a button are available, the function's name appears beside the button—for example, in Figure 2-3, ANSWER CALL and REJECT (a call) are available functions for the incoming call on SAT 2.

Other lines on the MCDU screen display information relevant to the function or status of the HSD-440. In Figure 2-3, line 6 displays the phone number the HSD-440 Mark 2 Terminal will dial when the user presses the MAKE CALL button, and the number 3 under PRI in row 5 indicates that the priority of the outgoing call is 3.

(4) Keyboard

The MCDU's keyboard includes a set of numeric keys and a set of alphabetic keys, both of which you can use to enter data into the MCDU.

The keyboard may include preset keys, such as the following:

- The **IDX** or **MAIN MENU** key: this key returns you to the MCDU's main menu.
- The **CLR** key: this key clears any text you type into the scratchpad.
- The **NEXT PAGE** key: this key brings up the next page of a menu if one is available.

(5) Special Symbols

Because of space constraints on the screen, the MCDU uses a number of special symbols to indicate actions:

- < and > appear at the far left or right to indicate that another menu page is available in that direction.



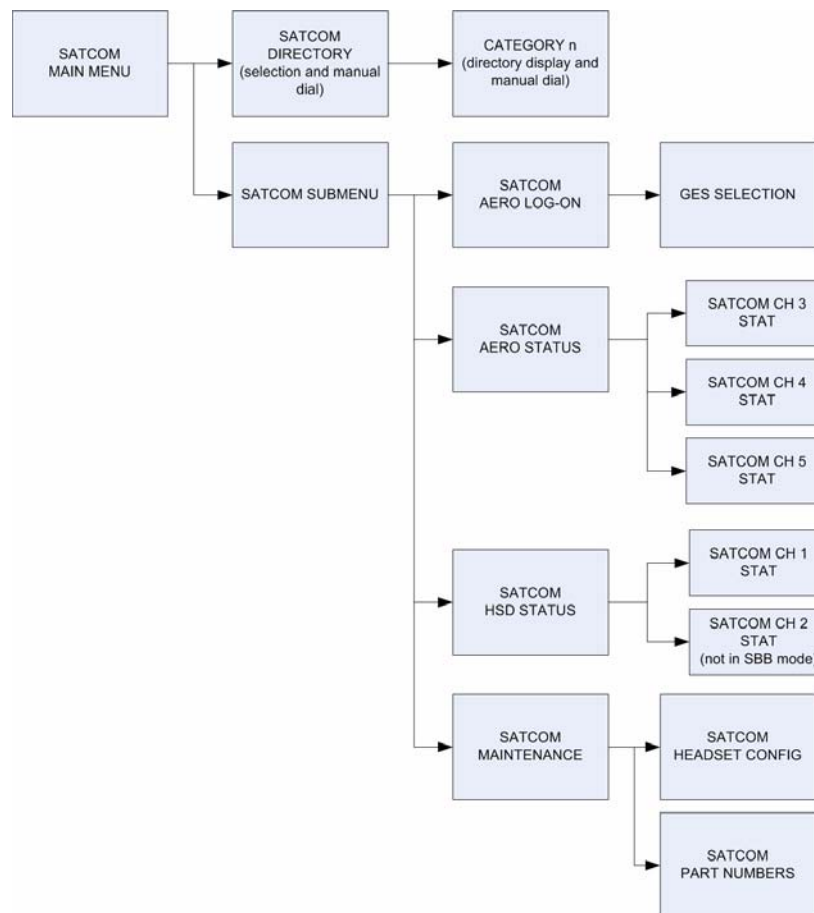
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- \* appears at the far left or right to indicate that pressing that key results in an action.
- **NUMBER/NUMBER** appears to tell you which page out of how many pages you are viewing. For example, **1/3** would appear when you are on page 1 of 3 pages in total.
- **[ and ]** appear around empty data fields where you can enter data. However, entering data is not mandatory in these fields.

(6) Navigating the MCDU

The MCDU includes a number of menus, as shown in Figure 2-4. There are four category pages in the address book and up to 25 pages (100 phone numbers) for each category.

NOTE: The SATCOM CH 2 STAT menu is not present when the HSD-440 Mark 2 Terminal is operating in SBB mode.



**Figure 2-4 MCDU Menus**

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This section will help you perform the following tasks:

- Viewing Flight Information
- Logging On and Off
- Viewing Channel Information
- Configuring Headsets

(7) Viewing Flight Information

You can view the flight identification from the MCDU.

To view flight information:

1. On the first page of the MCDU's main menu, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.

```
SATCOM SUBMENU
LOG - ON STATE
LOGGED - OFF

< LOG - ON

AERO CHANNEL
STATUS >
HSD CHANNEL
STATUS >

FLT ID
1 2 3 4 5

MAINTENANCE >

RETURN >
```

You can view the following information from this screen:

- Flight identification on the line below **FLT ID**

(8) Logging On and Off

You can use the MCDU to initiate a manual or automatic logon from the HSD-440 Mark 2 Terminal to the satellite network.

The HSD-440 Mark 2 Terminal boot-up logon mode is specified in the Logon/Handover Policy in the ORT. You can set this parameter to automatic or manual. After the terminal has finished the boot-up process, you can use the MCDU to log off (from an automatic logon) or to initiate a manual (constrained) logon.

During an automatic logon, the system selects the most appropriate GES depending on HSD-440 Mark 2 Terminal location.

During a manual logon, you must select the GES. Even if the ORT parameter is configured for automatic logon, you can still constrain the terminal to logon using a particular GES.

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(a) Viewing the Log Status

The log status defines whether the HSD-440 Mark 2 Terminal is currently logged on or logged off. The logon status can be:

- Logged-Off—The HSD-440 Mark 2 Terminal is logged off.
- Logged-Off Inop—The HSD-440 Mark 2 Terminal is configured to log on manually but the terminal is in an inoperable state. Clear all problems for the logon to continue.
- Logged-Off Rejected—The HSD-440 Mark 2 Terminal is logged on and a second logon attempt is made. The second attempt fails and the status is Logged-Off Rejected.
- Logging-On Inop—The HSD-440 Mark 2 Terminal is configured to log on automatically but the terminal is in an inoperable state. Clear all problems for the logon to continue.
- Logged-On Constrained—The HSD-440 Mark 2 Terminal is logged on manually.
- Logged-On Auto—The HSD-440 Mark 2 Terminal is logged on automatically.
- Logging-off—The HSD-440 Mark 2 Terminal is in the process of logging off.
- Logging-on—The HSD-440 Mark 2 Terminal is in the process of logging on.

To view the log status:

1. On the main page of the MCDU, press the key next to **SUBMENU**.

The SATCOM SUBMENU page appears.

The logon state appears on the line below LOG-ON STATE.

You can view additional details about the logon, including the GES and satellite name. To view additional logon details:

1. On the main page of the MCDU, press the key next to **SUBMENU**.

The SATCOM SUBMENU page appears.

2. On the **SUBMENU** page, press the key next to **LOG-ON**.

The SATCOM AERO LOG-ON screen appears as shown below. The logon state appears on the line below LOG-ON STATE. You can also view the GES name, satellite name, signal level, antenna type, azimuth and elevation, and 8-digit ICAO ID.

**NOTE:** If the HSD-440 Mark 2 Terminal is logged off, the LOG-OFF option is not available. If the HSD-440 Mark 2 Terminal is logged on, the AUTO LOG-ON option is not available.

(b) Initiating an Automatic Logon

When the HSD-440 Mark 2 Terminal logs on automatically, it selects an appropriate GES and satellite based on its position.

To log on automatically:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. On the **SUBMENU** page, press the key next to **LOG-ON**.  
The SATCOM AERO LOG-ON page appears.
3. On the **SATCOM AERO LOG-ON** page, press the key next to **AUTO LOG-ON**.

The HSD-440 Mark 2 Terminal logs on and the logon state is LOGGED-ON AUTO.

NOTE: The AUTO LOG-ON key is not available if the HSD-440 Mark 2 Terminal is already logged on.

(c) Selecting a GES (Initiating a Constrained Logon)

You can constrain the HSD-440 Mark 2 Terminal to logon using a particular GES.

If the HSD-440 Mark 2 Terminal is logged off, selecting a GES initiates a constrained log on (logon state is LOGGED-ON CONSTRAINED).

If the HSD-440 Mark 2 Terminal is already logged on and you select a new GES, the MCDU displays the SATCOM AERO LOG-ON page and automatically logs off the old GES and logs on to the new GES. This also results in a constrained logon.

To select a GES:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. On the **SUBMENU** page, press the key next to **LOG-ON**.  
The SATCOM AERO LOG-ON page appears.
3. On the **SATCOM AERO LOG-ON** page, press the key next to **GES SEL**.  
The GES SELECTION page appears.

```
      GES SELECTION  1 / 3
A O R W
* A U S S A G U E L      / 0 0 5
A O R W
* E I K                  / 0 0 2
A O R E
* A U S S A G U E L      / 1 0 3
A O R E
* E I K                  / 1 0 4
P O R
* P E R T H              / 2 0 5

                        R E T U R N >
```

4. To select a GES, press the button next to the GES name.  
A logon confirmation (LOG-ON) appears at the bottom of the screen.
5. To log on to the new GES, press the key next to **LOG-ON**.

(d) Logging Off

You can use the MCDU to initiate the HSD-440 Mark 2 Terminal logoff sequence.

To log off:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. Press the key next to **LOG-OFF**.  
The HSD-440 Mark 2 Terminal logs off.

(9) Viewing Channel Information

There are three Aero channels and two Swift 64 channels, or one SwiftBroadband channel, available with the HSD-440 Mark 2 Terminal. You can use the MCDU to view the following information about each of the channels:

- Logon status (Aero channels only)—Logon status may be Valid or Invalid.
- ORR status (Swift 64 channels only)—Ocean Region Registration (ORR) status may be Valid or Invalid.
- Attach status (SwiftBroadband channels only)—Attach status may be Valid or Invalid.
- Call Termination Code (CALL TERM)
- Transmitter Effect Isotropic Radiated Power (TX EIRP)
- Receiver carrier-to-noise ratio (RX C/NO)
- Service type—Possible service types are:
  - AERO P/R/T
  - AERO VOICE
  - SWIFT64

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- SBB (SwiftBroadband)
  - Number of bits transmitted per second (TX KBPS)—for Swift 64 MPDS or SBB background services, the number of bits being transmitted per second is expressed in kilobits per second (kbps). Otherwise, the number of bits transmitted is zero.
  - Number of bits received per second (RX KBPS)—for Swift 64 MPDS or SBB background services, the number of bits being received per second is expressed in kilobits per second (kbps). Otherwise, the number of bits received is zero.
  - Service information (CONNECTED)—For Aero service, service information includes the GES name and number. For GAN (Swift 64) service, service information includes the service provider number and name description. For SBB service, no information is provided.
  - Satellite ID (SAT)—Satellite ID includes the index number of each satellite, a mnemonic and abbreviated alphanumeric description, and the spot beam that the HSD-440 Mark 2 Terminal is currently using.
- (a) To view information about an Aero channel:
1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
  2. On the **SUBMENU** page, press the key next to **AERO CHANNEL STATUS**.  
The SATCOM AERO STATUS page appears.

```
SATCOM AERO STATUS
<CHAN 3 - ACARS DATA
<CHAN 4 - AERO VOICE
<CHAN 5 - AERO VOICE
RETURN >
```

3. On the **SATCOM AERO STATUS** page, press the key next to a channel.  
The SATCOM CH STAT page appears. (MCDU pages for Channel 3 and Channel 4 are shown below.)

```
SATCOM CH 3 STAT
LOGON
WAIT FOR P CHAN SYNC
CALL TERM TX KBPS
0.00
TX EIRP RX KBPS
13.5 0.00
RX C/N0 CONNECTED
50.0 EIK
SERV TYPE SAT
AERO P/R/T AORE B5

RETURN >
```

```
SATCOM CH 4 STAT
LOGON
VALID
CALL TERM TX KBPS
0.00
TX EIRP RX KBPS
0.0 0.00
RX C/N0 CONNECTED
0.0 EIK
SERV TYPE SAT
AERO VOICE AORE B5

RETURN >
```

(b) To view information about a Swift 64 channel:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. On the **SATCOM SUBMENU** page, press the key next to **HSD CHANNEL STATUS**.

The SATCOM HSD STATUS page appears.

```
SATCOM HSD STATUS
<CHAN 1 - SWIFT64
<CHAN 2 - SWIFT64

RETURN >
```

3. On the SATCOM HSD STATUS page, press the key next to a Swift 64 channel.

The SATCOM CH STAT page appears.

```
SATCOM CH 1 STAT
ORR STAT
REGISTERING
CALL TERM TX KBPS
0.00
TX EIRP RX KBPS
14.0 0.00
RX C/N0 CONNECTED
53.0 LES 1
SERV TYPE SAT
SWIFT64 AORE B5

RETURN >
```

(c) To view information about a SBB channel:

1. On the main page of the MCDU, press the key next to **SUBMENU**.

The SATCOM SUBMENU page appears.

2. On the **SATCOM SUBMENU** page, press the key next to **HSD CHANNEL STATUS**.

The SATCOM HSD STATUS page appears.



```
SATCOM HSD STATUS
<CHAN 1 - SBB
RETURN >
```

3. On the SATCOM HSD STATUS page, press the key next to the SBB channel.  
The SATCOM CH STAT page appears.

```
SATCOM CH 1 STAT
ATTACH
YES
CALL TERM TX KBPS
0.00
TX EIRP RX KBPS
20.0 0.00
RX C/N0 CONNECTED
72.2
SERV TYPE SAT
BGAN AORE B5
RETURN >
```

#### (10) Viewing Maintenance Information

The maintenance page provides information about:

- Terminal status
- Terminal part numbers

##### (a) Viewing Terminal Status

To view the terminal status:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. On the **SATCOM SUBMENU** page, press the key next to **MAINTENANCE**.  
The SATCOM MAINTENANCE page appears.

```
SATCOM MAINTENANCE

                STATUS
TERMINAL          TRANSMIT
OK                NORMAL

< HEADSET CONFIG

< PART NUMBERS

RESET SATCOM SYSTEM
NOT AVAIL - IN AIR

                RETURN >
```

The maintenance menu displays the following information:

- Terminal status on the line below **TERMINAL**—Terminal status may be OK or FAULT.
- Transmit status on the line below **TRANSMIT**—Transmit status may be NORMAL or INHIBITED.
- Air/Ground status on the line below **RESET SATCOM SYSTEM**—When set to ON GROUND, the system is on the ground and can be reset. When set to NOT AVAIL – IN AIR, the system is in the air and cannot be reset.

(b) Viewing Terminal Part Numbers

To view terminal part numbers:

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU page appears.
2. On the **SATCOM SUBMENU** page, press the key next to **MAINTENANCE**.  
The SATCOM MAINTENANCE page appears.
3. On the **SATCOM MAINTENANCE** page, press the key next to **PART NUMBERS**.

The SATCOM PART NUMBERS page appears.

The part numbers menu displays the following information:

- HSD-440 Mark 2 Terminal part number and version
- HSD-440 Mark 2 Terminal software load and version
- 8-digit ICAO ID
- 3-digit HSD-440 Mark 2 Terminal serial number
- 6-digit (hexadecimal) Forward IDs (FWD ID 1 and FWD ID 2)

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- 15-digit IMSI number

(11) Configuring Headsets

To configure the headset(s):

1. On the main page of the MCDU, press the key next to **SUBMENU**.  
The SATCOM SUBMENU appears.
2. On the **SATCOM SUBMENU** page, press the key next to **MAINTENANCE**.  
The SATCOM MAINTENANCE page appears.
3. Press the key next to HEADSET CONFIG.  
The SATCOM HEADSET CONFIG page appears.

NOTE: Toggle between the two 4-wire headsets by pressing the key next to **SAT**. When you toggle between headsets, the speaker, microphone, sidetone, and noise values are displayed for that headset.

```
SATCOM HEADSET CONFIG
SAT
* DEFAULT 1
SPEAKER
* DWN 50 UP *
MICROPHONE
* DWN 70 UP *
SIDETONE
* DWN 50 UP *
NOISE
* DWN -50 UP *
RETURN >
```

4. To increase or decrease the speaker, microphone, sidetone, and noise insertion levels, press the keys next to **DWN** and **UP**. When you change either of the levels, a **SAVE** label appears at the bottom of the screen.

NOTE: The speaker, microphone, and sidetone values move up and down by 5, and the noise value moves up and down through values -60, -50, -40, and OFF.

NOTE: To reset all the settings to the default values, press the key next to **DEFAULT**. Default values are speaker (50), microphone (70), sidetone (50), and noise (-50).

5. To save the new levels, press the key next to **SAVE**.

**E. Operating the WSC**

The WSC performs the same functions as the MCDU. For more information on operating the WSC, see the WSC manufacturer's documentation and ARINC 741 Part 2 Attachment 2F-42.1.

## F. Performing Cockpit Communications with the MCDU

This section provides instructions for making calls with the MCDU and 4-wire voice services available in the aircraft's cockpit. The cockpit communications system operates with one or two headsets in the aircraft's cockpit, depending on the operational mode.

### (1) Modes of Operation

The cockpit communication services are configured in one of two modes of operation before installation: Latched mode and Push-to-Talk (PTT) mode. These configurations are strapped at the terminal and cannot be changed without removing and rewiring the terminal.

In PTT mode, a telephone number can be dialed only using the MCDU keys, not with the switches on the cockpit communication console. In Latched mode, a call to a telephone number loaded into the MCDU can be initiated using the switches on the Audio Control Panel (ACP), and calls can be answered and ended with the switches or the MCDU buttons.

### (2) Accepting and Making Calls

You can accept and make voice calls using

- the HSD-440 Mark 2 Terminal, the MCDU, the ACP, and one or two 4-wire cockpit headsets
- or
- the HSD-440 Mark 2 Terminal, the WSC, the ACP, and one or two 4-wire cockpit headsets.

#### (a) Automatic Call Handling Priority and Preemption

The HSD-440 Mark 2 Terminal automatically disconnects (preempts) a call if it receives a higher priority call when both classic Aero channels are in use. When two calls are in progress, the HSD-440 Mark 2 Terminal preempts the lower priority call. If both calls are the same priority, the HSD-440 Mark 2 Terminal preempts the last call received.

When the HSD-440 Mark 2 Terminal preempts the lower priority call and connects the higher priority call, the caller in the aircraft does not receive a notice. The new, high priority call starts as soon as the HSD-440 receives it.

#### (b) Accepting and Making Calls

You can use the MCDU and ACP to accept calls, make air-to-ground calls, and make air-to-air calls. You can manually dial calls or dial previously saved telephone numbers from the MCDU's telephone directory.

The way in which you can accept or make calls depends on the mode in which your 4-wire cockpit headset is strapped (PTT mode or Latched mode) and the Cockpit Outgoing Call Pre-Select ORT parameter. Refer to "Configuring Outgoing Call Pre-Selection" on page 6-24.

The combination of lights and chimes that alert you to an incoming call depends on the way in which the HSD-440 Mark 2 Terminal Cockpit Call Signalling Mode ORT parameter is set. Refer to C. "Configuring Cockpit Communication Parameters" on page 6-5. If you use the alternate output discretets, the call discrete outputs are driven as per Table 2-4 instead of using lights and chimes.

**Table 2-4 Call Discrete Outputs in HSD-440 Mark 2 Terminal**

Channel State	Audio Discrete		Alternate Discrete	
	Digital Audio System Light	Digital Audio System Chime	Discrete 1	Discrete 2
On hook	Off	Off	Off	Off
Call initiated/connected	1 Hz flash	Off	On	Off
Call answered	Steady or 3 Hz flash	Off	Off	On
Incoming call	1 Hz flash	Single-stroke	On	On

To accept the call:

- On the first page of the MCDU's main menu, press the key next to **ANSWER CALL**.
  - Assert the **Place/End** switch.
  - Assert the **VoiceMic On** switch.
- or
- In Latched mode, on the ACP, assert the **SAT 1** or **SAT 2** switch.
  - In PTT mode, on the ACP, assert the **SAT 1** or **SAT 2** switch and press the PTT switch.

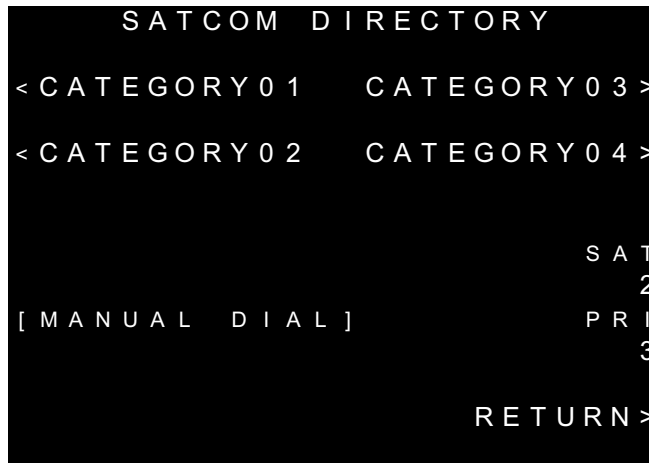
(c) Manual Dialing Calls

Making calls using the HSD-440 Mark 2 Terminal is similar to placing an international telephone call. Air-to-ground telephone numbers include an international access code, country code, and area code.

International access codes and country codes are shown in Appendix G: "International Access and Country Codes" on page G-1.

To manually dial a call:

1. On the main page of the MCDU, press the key next to **DIRECTORY**.  
The SATCOM DIRECTORY page appears.



2. To select a channel, on the **SATCOM DIRECTORY** page, press the key next to **SAT** (the channel number).
3. To set the priority for your call using Table 2-5, type the priority number on the MCDU scratchpad and press the key next to **PRI** (the priority value).

**Table 2-5 Priority Codes**

Call priority	Description
1	Emergency—used for distress or urgent calls
2	Operational-High—used for Flight Safety communications
3	Operational-Lo—used for Regularity of Flight, Meteorological or Administrative communications
4	Non-Operational—used for Non Safety of Flight or public phone call (cabin) communications

4. To dial the call, type the phone number into the scratchpad and press the key next to **MANUAL DIAL**.

With Pre-Select Mode disabled, the MCDU Main Menu page appears and the HSD-440 Mark 2 Terminal initiates the call. With Pre-Select Mode enabled, the MCDU Main Menu page appears.

- To start the call with Pre-Select mode enabled, in either Latched or PTT mode, press the key next to **MAKE CALL**.
- To start the call in PTT mode with Pre-Select mode enabled, on the ACP, assert the **PLACE/END CALL 1** or **PLACE/END CALL 2** switch.

or

assert the **SAT 1** or **SAT 2** switch and then press the **PTT** switch.

- To start the call In Latched mode with Pre-Select mode enabled, on the ACP, assert the **SAT 1** or **SAT 2** switch.

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(d) Making Calls from the Telephone Directory

You can make voice calls from the numbers you have saved in the MCDU's telephone directory.

The HSD-440 Mark 2 Terminal MCDU enables you to keep four separate telephone books for different uses. By default, these books are called Category 01, Category 02, Category 03, and Category 04. You can customize the directory names in the HSD-440 Mark 2 Terminal ORT.

To make a call from the telephone directory:

1. On the main page of the MCDU, press the key next to **DIRECTORY**.

The SATCOM DIRECTORY page appears.

```
SATCOM DIRECTORY
< CATEGORY 01    CATEGORY 03 >
< CATEGORY 02    CATEGORY 04 >
[ MANUAL DIAL ]
SAT
2
PRI
3
RETURN >
```

2. To access the phone numbers in a directory, press the key next to the directory name.

The selected directory appears.

```
CATEGORY 1 1 / 1
MAKE CALL : SAT
0 1 1 6 1 3 5 5 5 1 1 1 1 PRI
* 01 - LABEL 1 3
0 1 1 6 1 3 5 5 5 2 2 2 2
* 02 - LABEL 2 1
[ ]
[ ] [ ]
* SORT RETURN >
```

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3. To dial or load a telephone number, press the key next to the number.

With Pre-Select mode disabled, the MCDU main menu page appears and the HSD-440 Mark 2 Terminal starts the call.

With Pre-Select mode enabled, the MCDU main menu page appears.

```
SATCOM MAIN MENU

SAT 1 AVAILABLE          PRI
* MAKE CALL              3
0 0 1 6 1 3 5 5 5 1 1 1

SAT 2 INCOMING CALL
* ANSWER CALL           REJECT *
PUBLIC

< SUBMENU                DIRECTORY >
```

4. To dial the telephone number with Pre-Select mode enabled:

- In PTT or Latched mode, on the MCDU, press the key next to **MAKE CALL**.

or

- In PTT mode, on the ACP, assert the **PLACE/END CALL 1** or **PLACE/END CALL 2** switch or close the **SAT 1** or **SAT 2** switch, and then press the **PTT** switch.

or

- In Latched mode, on the ACP, close the **SAT 1** or **SAT 2** switch.

(e) Ending Calls

To end the call:

- In PTT or Latched mode, on the MCDU main menu, press the key next to **END CALL**.

or

- In PTT or Latched mode, assert the **PLACE/END CALL 1** or **PLACE/END CALL 2** switch.

or

- In Latched mode, on the ACP, assert the **VoiceMic On** switch for the active call.

(f) Saving Telephone Numbers in the Telephone Directory

You can save telephone numbers to the MCDU's telephone directory to use later, and you can dial telephone numbers from the telephone directory.



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To save telephone numbers to the telephone directory:

1. On the main page of the MCDU, press the key next to **DIRECTORY**.  
The SATCOM DIRECTORY page appears.
2. To view telephone numbers stored in a directory, press the key next to the directory name.  
The directory listing appears.
3. Navigate to the page with the last entry in the directory, type the phone number into the scratchpad, and then press the key next to the empty brackets on the MCDU screen.  
The telephone number appears in the brackets.
4. Type the name associated with the telephone number and then press the key next to the empty brackets on the MCDU screen.
5. Type the priority associated with the telephone number and then press the key next to the empty brackets on the MCDU screen.
6. To save the number, press the key next to **SAVE**. To cancel the new entry, press the key next to **CANCEL**.

**NOTE:** Press the key next to **SORT** to alphabetically sort the entries in the directory. Entries remain sorted even after the HSD-440 Mark 2 Terminal is rebooted.

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# INSTALLATION

This section provides procedures to install HSD-440 Mark 2 Terminals on an aircraft, including the following sections:

- Advisories
- Pre-Installation Inspection
- Mechanical Installation
- Electrical Installation
- Passive Intermodulation (PIM) Test
- Installation and Engineering Diagrams

## 1. Advisories

Read the safety advisories in the Introduction section on page INTRO-6 of this manual before you begin installing the terminal.

## 2. Pre-Installation Inspection

Inspect all parts before you install any HSD-440 Mark 2 Terminal, to make sure that no damage occurred during shipping.

### A. Unpacking and Inspecting Equipment

- Unpack the HSD-440 Mark 2 Terminals from the shipping containers.
- 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 HSD-440 Mark 2 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 to report the problem.

### B. Cabling Notes

Before proceeding with the installation of the HSD-440 Mark 2 Terminal, read all cabling notes provided on the HSD-440 Mark 2 Terminal Interconnection and Contact Assignment drawings at the end of this section.

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(1) Cabling

When installing the HSD-440 Mark 2 Terminal, follow the cabling requirements listed below:

- Maximum recommended length for Ethernet cables is 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 HSD-440 Mark 2 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.
- Receive cable: minimum loss is 6 dB, maximum loss is 25 dB (including any in-line attenuator), as per ARINC 741.

### **3. Mechanical Installation**

This section contains the information required to plan the physical placement of HSD-440 Mark 2 Terminals. The Outline and Installation diagrams, shown in Figure 3-6 and Figure 3-7, illustrate the physical and mechanical specifications of the HSD-440 Mark 2 Terminal.

In typical aircraft installations, the HSD-440 Mark 2 Terminal assembly fits into standard ARINC, 8-MCU mounting trays.

#### **A. Physical Placement**

When selecting a location for the HSD-440 Mark 2 Terminal, allow for adequate spacing for the installation while providing reasonable access for servicing. Leave a minimum gap of 0.5 inches between LRUs.

#### **B. Environmental Requirements**

The environmental requirements that must be considered during the physical placement of the HSD-440 Mark 2 Terminals are based on the RTCA/DO-160E Environmental Specifications detailed in "System Description" on page 1-1.

The mounting trays 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-160E Environmental Specifications for the HSD-440 Mark 2 Terminals.

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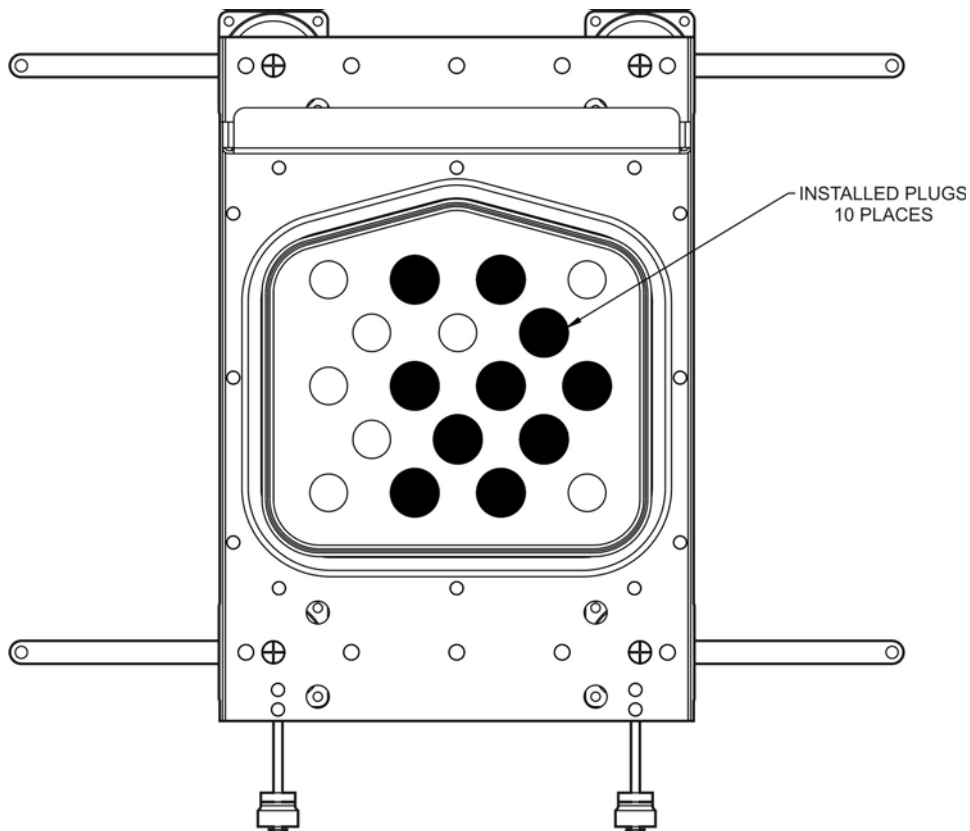
When selecting an installation location for the HSD-440 Mark 2 Terminal, consider the heating and cooling requirements listed below:

- Power Dissipation (AC/DC models): 275 Watts nominal, 400 Watts maximum
- Cooling Air: per ARINC 600
- Recommended Flow rate: 88 kg/hr (185 lbs/hr)
- Pressure drop: 5 ±3 mm (0.07 ±0.025 in.) H<sub>2</sub>O

(2) Fan Tray Requirements

**WARNING: FAILURE TO INSTALL AND CONFIGURE THE FAN TRAY ASSEMBLY AS INSTRUCTED MAY SERIOUSLY COMPROMISE THE HSD-440 TERMINAL'S EXTREME TEMPERATURE OPERATION.**

For adequate airflow to the HSD-440 Mark 2 Terminal subassemblies, install plugs in the fan/tray configuration as illustrated in Figure 3-1. Fan tray assemblies may be shipped with or without plugs. If required, order additional plugs from your fan tray manufacturer.



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

### C. Chassis Grounding

The HSD-440 Mark 2 Terminal tray-mounted assemblies must be electrically bonded to the airframe. Make sure that 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, EMS Aviation recommends using a short, tin-coated, copper bonding strap of at least 6.35 mm (0.25 in.) in width. The LRU and tray assemblies should provide a low impedance path of <0.2 ohms.

## 4. Electrical Installation

This section provides electrical installation details for HSD-440 Mark 2 Terminals.

### A. Cabling and Connector Requirements

This section provides general electrical installation information on power, ground, shielding requirements, and cabling.

#### (1) Power Requirements

The HSD-440 Mark 2 Terminal can operate from the aircraft's +28 V dc or 115 V ac, 400 Hz (nominal) power supply. If both power sources are connected, the terminal will use the 115 V ac supply.

#### (2) Ground Requirements

Improper grounding can lead to ground loops and induced Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI). When installing an HSD-440 Mark 2 Terminal, follow standard grounding practices for both chassis and cabling shields. Refer to "Chassis Grounding" on page 3-4 for chassis and tray grounding instructions.

#### (3) Cable Shielding and Termination

The preferred method of cable shield termination is in accordance with NEMA WC 27500:2000 and ARINC 741. ARINC Report 413A—Guidance for Aircraft Electrical Power Utilization and Transient Protection provides more detailed information in Attachment 3-2, Wire Shielding and Grounding Requirements and in Appendix 7.

Unless otherwise stated, all cable shields must be connected to the closest aircraft ground at both ends of the cable and on both sides of any production break in the cable. Where applicable, terminate shields with connectors via the backshell or via a pigtail with a suitable termination to the closest aircraft ground.

General aviation cable-routing guidelines apply. See Table 3-1 for detailed information.

**NOTE:** Typically, Ethernet and ISDN cables have multiple shields; terminate each shield separately.

**Table 3-1 Cable Shielding and Termination Specifications**

<b>Cable Function</b>	<b>Conductor Type (Typical)</b>	<b>Single Point</b>	<b>Multiple Point</b>	<b>Minimum Conductor Coverage By Shield</b>
Power Lines	Single conductor, stranded	N/A	N/A	N/A
Digital Control	Twisted pair, stranded		Yes	85%
Serial Data	Twisted pair, stranded		Yes	85%
Ethernet Data	Twisted pair, stranded		Yes	85%
ISDN Data	Twisted pair, stranded		Yes	85%
Discrete Lines	Single conductor, stranded	N/A	N/A	N/A
RF TX and RX	Coaxial		Yes	95%

**Single Point:** Cable shield terminated at one end only via a connector or suitable crimp terminal.  
**Multiple Point:** Cable shield terminated at both ends via a connector or suitable crimp terminal, usually at both ends of the cable and at both sides of any production break.  
**N/A:** Not applicable.

To minimize Passive Intermodulation (PIM), the coaxial cable between the DLNA and the antenna must be double-shielded (braid and foil wrap) with gold-plated and soldered (not crimped) connector contacts. Do not use nickel, nickel plating, or stainless steel.

**B. Installation Wiring Notes**

This section includes wiring notes and connection details about strapping.

(1) Source/Destination Identification

Source/Destination Identification (SDI) is provided for the HPA as per ARINC 741 specifications. Pins marked 0 are left open-circuit and pins marked 1 are strapped on the airframe side of the connector to the pin assigned as SDI Common (TP5D). For this HGA application, strap pin TP5B (1) and leave TP5A (0) open.

NOTE: The logic for the SDI/WOW is explained in ARINC 741 Characteristic Attachment 1-4, Note 19. The SDI/WOW logic in this case (where 0=open and 1=strapped to common) is the reverse of the logic applied to all other HSD-440 Mark 2 Terminal connectors, FWD ID, system configuration, and data I/O configuration, where 0=strapped to common and 1=open.

(2) Maintenance Port Interface

The HSD-440 Mark 2 Terminal has an RS-232 maintenance port interface that provides access to the MPU for data loading, system monitoring, and testing purposes.

Access to the HSD-440 Mark 2 Terminal MPU is achieved by connecting an RS-232, VT-100 terminal (computer operating a terminal emulation program) to the RS-232 maintenance port.

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The HSD-440 Mark 2 Terminal maintenance port is available at the front of the HSD-440 Mark 2 Terminal and at the rear ARINC 600 connector. Connection on the front of the HSD-440 Mark 2 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 operate simultaneously.

Refer to "Test and Fault Isolation" on page 4-35 for information on how to connect and use the maintenance port, including equipment requirements, connection and cabling requirements, software loading instructions, and configuration details.

(3) 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 HSD-440 Mark 2 Terminal performance requirements.

Table 3-2 defines the RF parameters and their expected values.

**Table 3-2 RF Parameters Definitions**

<b>Parameter</b>	<b>Min. Value (dB)</b>	<b>Max. Value (dB)</b>
Antenna Gain	12	17
Antenna to DLNA Loss		0.3
DLNA Gain	53	60
DLNA Noise Figure		1.8
DLNA to HSD-440 Mark 2 Terminal (Rx) Loss	6	25
HSD-440 Mark 2 Terminal to Antenna (Tx) Loss	0	5 (including DLNA loss)
DLNA Insertion Loss (Tx to Antenna Port)	–	0.8

(4) WOW Pins

The WOW1 and WOW2 pins are either left open circuit or connected to the airframe DC ground through a ground proximity switch. The WOW Program Select (PGM) pin is either left open circuit or connected to the Forward Address Common. The two ground states for any pin are open and closed circuit.

Resolve any conflict between WOW1 and WOW2 by assuming the aircraft is in-air. The interpretation of the state of the WOW1 and WOW2 pins is defined by the state of the WOW program select pin. Refer to Table 3-3 for details.



Table 3-3 WOW Pin Wiring

Pin Name and Location			Aircraft Status
WOW1	WOW2	PGM	
TP3G	TP3K	TP3J	
CLOSED	CLOSED	CLOSED	In-air
OPEN	CLOSED	CLOSED	Not valid—Default in-air
CLOSED	OPEN	CLOSED	Not valid—Default in-air
OPEN	OPEN	CLOSED	On-ground
CLOSED	CLOSED	OPEN	On-ground
OPEN	CLOSED	OPEN	Not valid—Default in-air
CLOSED	OPEN	OPEN	Not valid—Default in-air
OPEN	OPEN	OPEN	In-air

WOW discretes indicate when an aircraft is on the ground and are used for flight data-logging purposes. Since data that the aircraft is airborne is supplied to the HSD-440 Mark 2 Terminal by other equipment, this information from the discretes is not required. WOW is only used to determine aircraft on-ground status, if the Inertial Reference System (IRS) has no valid data, and the CMC is not installed, or if the CMC is not providing valid data.

The function of WOW can inhibit RF transmission when the aircraft is on the ground. This function is disabled by default and must be enabled through the ORT parameter TRANSMIT ON GROUND—see "Configuring Transmit on Ground" on page 6-27.

**NOTE:** If the WOW function is disabled, do not perform normal maintenance when the system is active to avoid RF exposure. Follow normal safety procedures and disable the system before performing antenna maintenance.

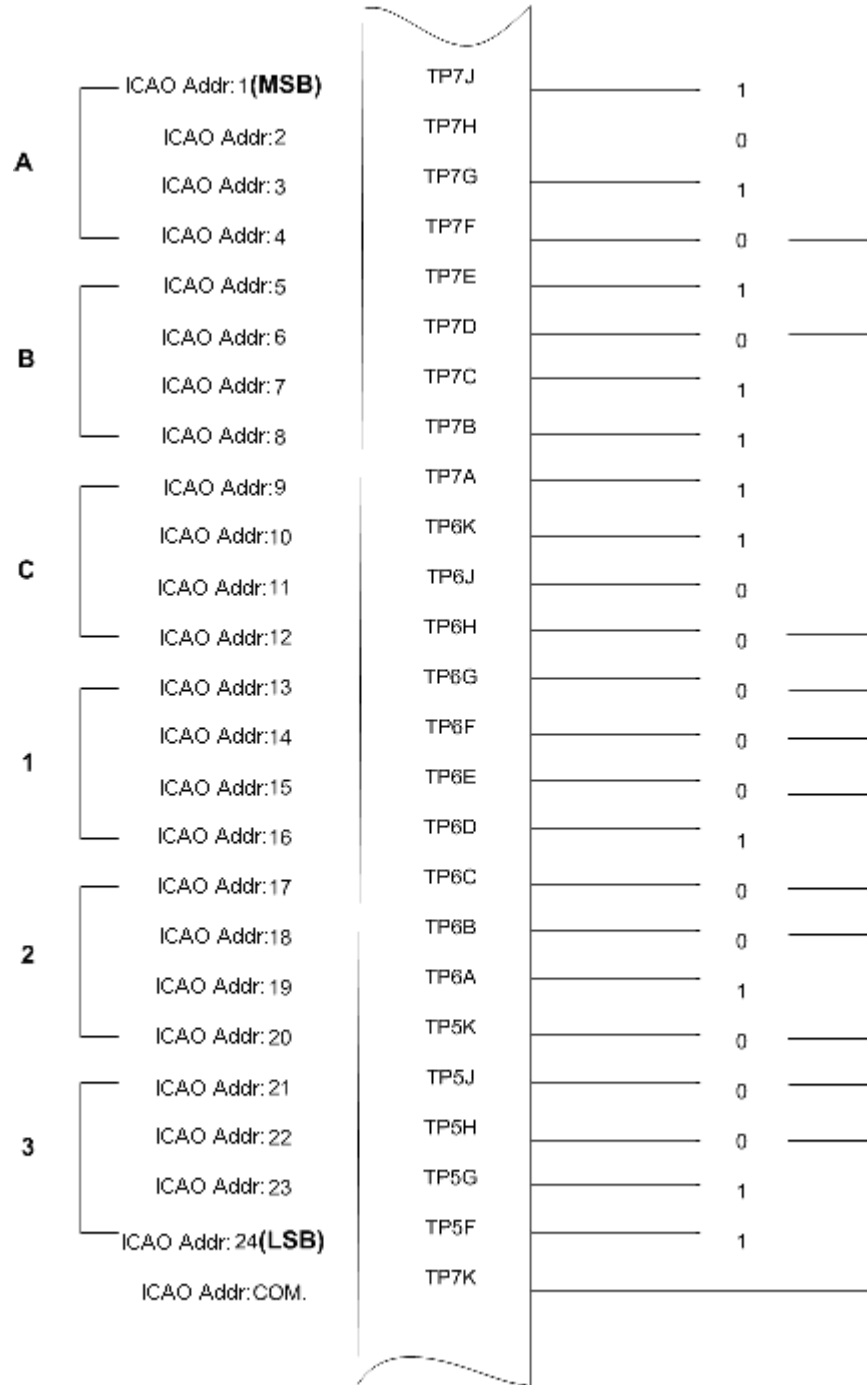
(5) ICAO IDs

The HSD-440 Mark 2 Terminal requires an ICAO ID to operate and access classic services. The HSD-440 Mark 2 Terminal receives the ICAO ID either from discrete strapping or from an ARINC 429 source as determined by the ICAO CODE SOURCE ORT parameter—see "Configuring the ICAO Code Source" on page 6-15.

Figure 3-2 provides an example of a strapped ICAO ID address. This number (for example: Decimal 11256099, Hex ABC123, or Octal 52740443) must be converted into a binary number for strapping.

**NOTE:** MSB is the Most Significant Bit and LSB is the Least Significant Bit.

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**Figure 3-2 ICAO ID, Hex to Binary Conversion**

A pin strapped to the same potential as TP7K is considered a logical 0, whereas an open circuit pin is considered a logical 1.

(6) Remote Status Panel (Optional)

An optional remote status panel may be installed when HSD-440 Mark 2 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 HSD-440 Mark 2 Terminals can also be installed and located with the remote status panel. Figure 3-3 illustrates a typical wiring diagram for the remote reset circuit.

(a) Remote Reset Circuit Switch Requirements

HSD-440 Mark 2 Terminals support the installation of a Remote Reset Switch circuit as shown in Figure 3-3.

The HSD-440 Mark 2 Terminal Remote Reset circuit requires less than 100 ohms between TP1K (RESET) and MP1F(COM) to be asserted and greater than 10 kilohms to be de-asserted (includes all cable and switch contact resistance).

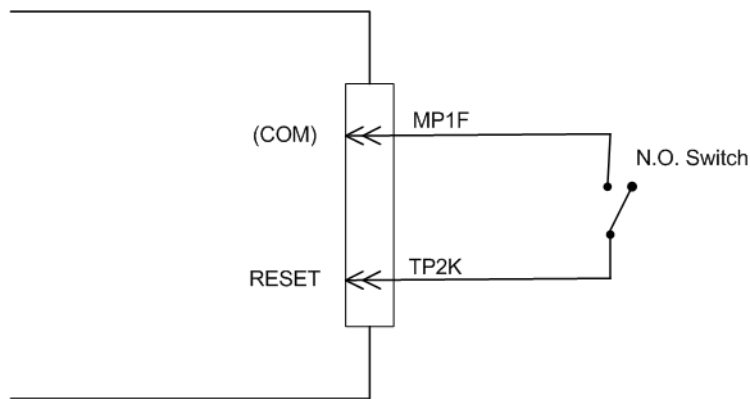
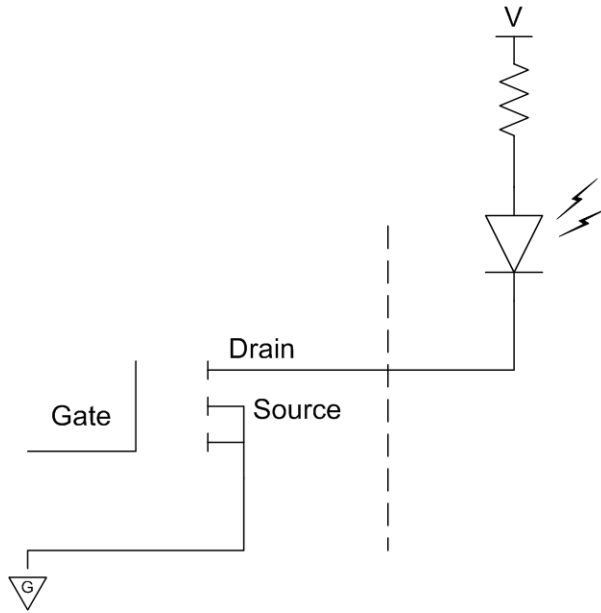


Figure 3-3 Remote Reset Circuit Switch

(b) Remote LED Driver Circuit Requirements

The circuit requirements for the HSD-440 Mark 2 Terminal Remote Status LED drivers are shown in Figure 3-4. Each LED driver circuit provides an open-drain Field-Effect Transistor (FET) 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 3-4 Remote LED Panel Circuit**

(7) System Configuration Strapping

The HSD-440 Mark 2 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 I/O requirements, as shown in Table 3-4. Detailed pin assignment is shown in Table 3-5.

**Table 3-4 Configuration Pin Summary**

Pin Number	Name	Function
TP4A to D	System Config 1 to 4	System Mode Strap Pins
MP5G to K	I/O config 1 to 4	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 Address Common (TP7K).
- Pins marked 1 are signaled by an open circuit-no connection.
- Configurations resulting in all ones (1) are invalid.

(8) System Mode Strap Pins Coding

The HSD-440 Mark 2 Terminal must be externally strapped according to its intended operational configuration mode. Table 3-5 illustrates the system pin strapping for currently supported HSD-440 Mark 2 Terminal operational modes and configurations.

**Table 3-5 System Pin Strapping**

System Mode	Pin Status			
	TP4A	TP4B	TP4C	TP4D
Valid - provides Aero H+ services only	0	1	0	0
Valid - provides Aero H+ and Swift services	0	1	0	1

All other combinations are invalid and could cause an operating failure.

**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 Address Common (TP7K).
- Pins marked 1 are signaled by an open circuit—no connection.
- Configurations resulting in all ones (1) are invalid.

(9) Call Light Activation Strapping

Table 3-6 shows the configuration strapping for call light activation.

**Table 3-6 Call Light Activation Configuration Strapping**

Pin Number	Name	Function
TP4E	Call Light Activation	Determines whether the call light illuminates on call activation or initialization. Activation occurs when the GES is responding to the call request, and initialization occurs the moment the call is placed. (1=Activation; 0=Initialization)

(10) Hookswitch Strapping

Table 3-7 shows the configuration strapping for the hookswitch method.

**Table 3-7 Hookswitch Configuration Strapping**

Pin Number	Name	Function
TP2G	Hookswitch Method	Determines Push To Talk (PTT) or Latched Mode (0=Latched; 1=PTT)

(11) Priority 4 Call Strapping

Table 3-8 shows the configuration strapping for priority 4 calls.

**Table 3-8 Priority 4 Call Configuration Strapping**

<b>Pin Number</b>	<b>Name</b>	<b>Function</b>
TP4F	Inhibit Priority 4 Calls	Determines whether priority 4 calls are inhibited to and from the cockpit. When these calls are inhibited, incoming calls are not allowed, and outgoing priority 4 calls are rejected. (1=Uninhibited; 0=Inhibited)

(12)Cockpit Voice Strapping

The HSD-440 Mark 2 Terminal announces incoming calls with chimes and lights or the Call Control (CD) discrettes, as determined by the Cockpit Call Signaling Mode ORT parameter. If set to Light/Chime, the strapping for this function is shown in Table 3-9.

**Table 3-9 Chime and Light Strapping for Cockpit Voice**

<b>TP4G</b>	<b>TP4H</b>	<b>Lights</b>	<b>Chime</b>
Strapped	Strapped	Spare	
Strapped	Open	Steady	Multi-stroke (chime sounds every 0.5 to 1 second)
Open	Strapped	Flashing	Single-stroke (chime sounds once)
Open	Open	Steady	Single-stroke

(13)User Interfaces

To facilitate access to the HSD-440 Mark 2 Terminal interfaces, install the following connectors in the appropriate cabin area.

(a) ISDN Interface

Install an RJ45 connector in the cabin area for user connections to the ISDN interface.

(b) Ethernet Data Interface

Install one or two RJ45 interface connectors in the cabin area for user access to the Ethernet interfaces.

(c) RJ45 Connector Termination Details

Details relating to the RJ45 cable terminations required for both the ISDN and/or 10BASE-T services are shown in Figure 3-5 and Table 3-10.

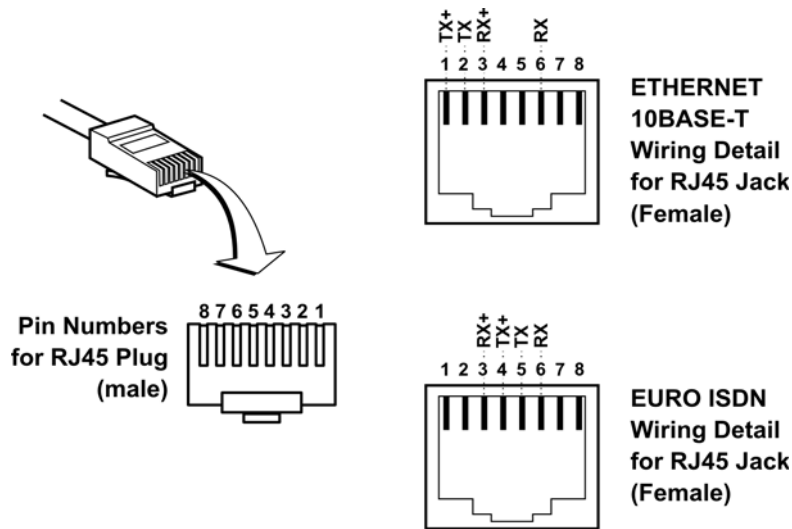


Figure 3-5 RJ45 Connector Terminator Details

Table 3-10 RJ45 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

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.

(14)System Interfaces

(a) ARINC 429 IRS Bus Interface

Navigational information is provided to the HSD-440 Mark 2 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 HSD-440 Mark 2 Terminal as follows:

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- IRS#1 A TP4J
- IRS#1 B TP4K
- IRS#2 A TP5C\*
- IRS#2 B TP5E\*

You can configure IRS#2 as a secondary IRS bus, or an input bus for the AES ID.

(b) Antenna Interface

The ARINC 741 antenna subsystem BSU is connected to the HSD-440 Mark 2 Terminal as specified in Table 3-11.

**Table 3-11 HSD-440 Mark 2 Terminal to BSU Interconnects**

Signal Name	Signal Source			Signal Destination
	HSD-440 Mark 2 Terminal	Mechanical HGA	Phased-Array or Conformal HGA	
HPA MUTE A			Top/Port BSU-G	TP3A
			STBD BSU-G	TP3C
HPA MUTE B			Top/Port BSU-H	TP3B
			STBD BSU-H	TP3D
BSU BITE A		BSU-W(G)*	Port BSU-W	TP2A
			STBD BSU-W	TP2C
BSU BITE B		BSU-X(H)	Port BSU-X	TP2B
			STBD BSU-X	TP2D
Multi-Control A	TP3E			BSU-T(A)
Multi-Control B	TP3F			BSU-U(B)

\*Letters in (brackets) represent EMS Aviation AMT-50 BSU pin designations

Top/Port (T/P): Refers to Mechanical (fin-mount) HGA Subsystem

Port: Refers to Phased Array (Fuselage-mount) or Port side of Dual (side) Conformal-mount, HGA subsystem

Starboard (STBD): Refers to starboard side of Dual (side) Conformal-mount HGA subsystem

NOTE: If a third MCDU is installed, the HSD-440 cannot use the side mount antennas because the input is allocated to either the third MCDU or the starboard BSU Bite.



(c) CMU Interface

Data rates, voltage thresholds, and electrical interface specifications are per ARINC Specification 429. (741 p2-7 p4.7.2). The ARINC 600 wiring interconnections for the HSD-440 Mark 2 Terminal and each CMU are shown in Table 3-12.

**Table 3-12 CMU Strapping**

<b>Pin</b>	<b>Name</b>	<b>To</b>
TP1A	CMU 1 Input A	CMU 1 TP1A
TP1B	CMU 1 Input B	CMU 1 TP1B
TP1C	CMU 1/2 Output A	CMU 1/2 MP2C
TP1D	CMU 1/2 Output B	CMU 1/2 MP2D
MP1K	CMU 2 Input A	CMU 2 TP1A
MP2K	CMU 2 Input B	CMU 2 TP1B

You can set the bus speed either low or high. Both the transmit and receive ports of the HSD-440 Mark 2 Terminal ARINC 429 CMU ports operate together at either low speed or high speed. Both CMUs therefore work at either low speed or high speed, but not at different speeds. You can select the speed by setting a flag in the ORT parameter CMU INPUT SPEED SELECT and CMU OUTPUT SPEED SELECT instead of setting a program pin on the HSD-440 Mark 2 Terminal A600 connector (there are no pins available). If information is not available from the ORT, the bus speed default is low.

(d) MCDU Interface

Table 3-13 shows the strapping for the MCDU.

**Table 3-13 MCDU Strapping**

<b>Pin</b>	<b>Name</b>
TP2C	MCDU 3 input A
TP2D	MCDU 3 input B
MP3E	MCDU 2 input A
MP3F	MCDU 2 input B
MP7G	MCDU 1 input A
MP7H	MCDU 1 input B
MP7J	MCDU 1/2/3 output A
MP7K	MCDU 1/2/3 output B

**C. Connection Details**

"Connection Details" on page 3-19 provides all top, middle, and bottom plug connection details for all installations.

## 5. Passive Intermodulation (PIM) Test

This section describes the passive intermodulation (PIM) test. You must execute the PIM test after installation, if the HSD-440 Mark 2 Terminal operates in SwiftBroadband mode.

### A. Overview

To meet Inmarsat requirements for SBB operation, the HSD-440 Mark 2 Terminal can test for passive intermodulation effects. The PIM test verifies that the transmit signal from the HSD-440 Mark 2 Terminal does not degrade or interfere with the receive signals as a result of PIM.

The HSD-440 Mark 2 Terminal can only perform the PIM test when the aircraft is on the ground.

When the HSD-440 Mark 2 Terminal logs on to the SBB network, the network assigns the terminal two channels for PIM testing. These channels are not used by other terminals so that the HSD-440 Mark 2 Terminal can transmit the test frequencies without interfering with other satellite communication equipment or the Inmarsat satellite.

**NOTE:** You can monitor the progress of the PIM test by turning on report 208 in the HSD-440 Mark 2 Terminal MPU. When report 208 is not running, the terminal displays only the results of the test, not the progress.

### B. PIM Requirements

In order to successfully perform the PIM test, the aircraft and the satellite communication system must meet the following requirements:

- The HSD-440 Mark 2 Terminal must have successfully logged on to a satellite that is visible at the test location within the last 168 hours (8 days).
- The aircraft must not be near any sources of PIM, such as hangars and towers.
- The aircraft must be facing due north in the northern hemisphere, and due south in the southern hemisphere.

### C. PIM Test

To start the PIM test:

1. In the HSD-440 Mark 2 Terminal MPU, navigate to Menu 30.

MENU 30	FIRMWARE Vx.x GND
L list PIMBIT parameters	M initiate manual PIMBIT
F fakeout PIMBIT parameters	P initiate/stop PIMBIT
<CTRL> N next menu	<CTRL> O previous menu = select reports

2. To start the PIM test, press **p**.

The PIM test starts. The test takes about five minutes.

**D. PIM Test Results**

(1) PIM Test Overall Status

At the end of the PIM test, the HSD-440 Mark 2 Terminal displays the test results. Figure 3-6 shows an example of the test results.

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```
PIMBIT REPORT:  OVERALL STATUS PASS
TEST STARTED:   Jan 16 08:15:58 2001   TEST ENDED:    Jan 16 08:20:36 2001

ICAO ADDRESS:  NOT OBTAINED   ANTENNA SERIAL NUMBER: 456

TESTED USING MANUALLY ENTERED FREQUENCIES
TRANSMIT CHANNEL 1 = $1CE8 (1630.000 MHz)
TRANSMIT CHANNEL 2 = $4268 (1654.000 MHz)
RECEIVE CHANNEL   = $4B00 (1558.000 MHz)
INTERMOD ORDER    = 7.00
LAST INFORMATION RECEIVED (APPROX) 8:00:00 Tue Jan 16, 2001
PARAMETERS UNCHANGED SINCE          8:00:00 Tue Jan 16, 2001

DIRECTION 1:  STATUS PASS

GEOGRAPHIC AZ=-11.00 DEG EL=12.50  VEH-REL AZ=-162.50 EL=12.50
SIGNAL DEGRADATION:  MEAN 0.14 dB  STD DEV 0.03 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL BEFORE TEST: -17.19 dBm  NOISE BEFORE TEST: -32.71 dBm
  SIGNAL AFTER TEST:  -17.05 dBm  NOISE AFTER TEST: -32.85 dBm
DIRECTION 2:  STATUS PASS

GEOGRAPHIC AZ=0.00 DEG EL=18.00  VEH-REL AZ=-151.50 EL=18.00
SIGNAL DEGRADATION:  MEAN 0.07 dB  STD DEV 0.01 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL BEFORE TEST: -16.66 dBm  NOISE BEFORE TEST: -32.92 dBm
  SIGNAL AFTER TEST:  -17.23 dBm  NOISE AFTER TEST: -33.05 dBm
DIRECTION 3:  STATUS PASS

GEOGRAPHIC AZ=11.00 DEG EL=12.50  VEH-REL AZ=-140.50 EL=12.50
SIGNAL DEGRADATION:  MEAN 0.14 dB  STD DEV 0.02 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL BEFORE TEST: -16.01 dBm  NOISE BEFORE TEST: -32.96 dBm
  SIGNAL AFTER TEST:  -17.21 dBm  NOISE AFTER TEST: -32.94 dBm
DIRECTION 4:  STATUS PASS

GEOGRAPHIC AZ=-11.00 DEG EL=18.00  VEH-REL AZ=-162.50 EL=18.00
SIGNAL DEGRADATION:  MEAN 0.13 dB  STD DEV 0.01 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL AFTER TEST:  -16.04 dBm  NOISE AFTER TEST: -32.84 dBm
DIRECTION 5:  STATUS PASS

GEOGRAPHIC AZ=0.00 DEG EL=12.50  VEH-REL AZ=-151.50 EL=12.50
SIGNAL DEGRADATION:  MEAN 0.12 dB  STD DEV 0.01 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL BEFORE TEST: -17.00 dBm  NOISE BEFORE TEST: -32.73 dBm
DIRECTION 6:  STATUS PASS

GEOGRAPHIC AZ=11.00 DEG EL=18.00  VEH-REL AZ=-140.50 EL=18.00
SIGNAL DEGRADATION:  MEAN 0.10 dB  STD DEV 0.01 dB
?[7m!! POSSIBLE INTERFERENCE !!?[0m
  SIGNAL BEFORE TEST: -17.14 dBm  NOISE BEFORE TEST: -33.03 dBm
  SIGNAL AFTER TEST:  -17.87 dBm  NOISE AFTER TEST: -33.02 dBm
PIMBIT COMPLETE
```

**Figure 3-6 Example PIM Test Results**

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The first line of the PIMBIT report displays the overall PIM status. If the overall status is PASS, the HSD-440 can continue to use SBB services.

If the overall status is FAIL:

- Check the cable connections of the antenna and the HSD-440 Mark 2 Terminal.
- Check the direction in which the test failed and verify that the antenna is not blocked in that direction—see "Directional PIM Test Results" on page 3-19.

(2) **Directional PIM Test Results**

The HSD-440 Mark 2 Terminal performs the PIM test with the antenna pointing in different directions and displays the results of the test in each direction. If the overall status of the PIM test is FAIL, you can check the specific directions in which the test failed.

For each direction, the PIM test results provide:

- Overall Status—pass or fail.
- The direction coordinates.
- The signal degradation—the maximum value to pass the test is 3 dB.
- Possible interference—interference caused by environmental factors, not the HSD-440 Mark 2 Terminal transmit frequencies. Interference indicates that the HSD-440 Mark 2 Terminal received a signal in the receive band even when it wasn't transmitting, therefore an external signal may be interfering with communication in that direction.
- Signal and noise levels before and after the test—the HSD-440 Mark 2 Terminal uses this information to check for possible interference.

## **6. Installation and Engineering Diagrams**

This section contains the Outline and Installation diagrams, and Interconnection and Contact Assignment drawings for HSD-440 Mark 2 Terminals.

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

### **A. Outline and Installation Diagrams**

Figure 3-7 and Figure 3-8 illustrate the physical characteristics of the HSD-440 Mark 2 Terminal and provides installation data for the terminal.

### **B. Interconnection and Contact Assignment Drawings**

Figure 3-9 and Figure 3-10 show the Interconnection details for the HSD-440 Mark 2 Terminals.

## **7. Connection Details**

Table 3-14, Table 3-15, and Table 3-16 show the top, middle, and bottom plug connection details for HSD-440 Stand-Alone terminals.

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**Table 3-14 HSD-440 Stand-Alone Terminal Top Plug Connection Details**

<b>I/O</b>	<b>From Top Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
I	1A	CMU 1 Input A	CMU 1 TP1A	CMU 1 RX A
I	1B	CMU 1 Input B	CMU 1 TP1B	CMU 1 RX B
O	1C	CMU 1/2 Output A	CMU 1/2 MP2C	CMU 1/2 TX A
O	1D	CMU 1/2 Output B	CMU 1/2 MP2D	CMU 1/2 TX B
I	1E	ARINC 615 Input A	ARINC 615 Data Loader	
I	1F	ARINC 615 Input B		
O	1G	ARINC 615 Output A		
O	1H	ARINC 615 Output B		
I	1J	ARINC 615 Link A		
O	1K	ARINC 615 Link B (GND)		
I	2A	BSU Top/Port BITE A	Mech. Steered Antenna (MA): BSU, Pin G or W or Other Antenna (OA): BSU, PORT-W and starboard-P	ARINC Tx-HI BITE from BSU
I	2B	BSU Top/Port BITE B	MA: BSU, Pin H or X, or OA: BSU, PORT-X and STBD-R	ARINC Tx-LO BITE from BSU
I	2C	BSU Starboard (STBD) BITE A or MCDU 3 Input A	MA: Not required OA: BSU, PORT-P and STBD-W	ARINC Tx-HI BITE from BSU
I	2D	BSU STBD BITE B or MCDU 3 Input B	MA: Not required OA: BSU, PORT-R and STBD-X	ARINC Tx-LO BITE from BSU
O	2E	Spare 1 ARINC 429 Output A		
O	2F	Spare 1 ARINC 429 Output B		
	2G	Hookswitch method		
I	2H	Spare 2 ARINC 429 Input A		
I	2J	Spare 2 ARINC 429 Input B		
I	2K	Remote Reset	Normally open momentary switch-open side. (Closed side to MP1F)	Remote System Reset

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**Table 3-14 HSD-440 Stand-Alone Terminal Top Plug Connection Details (Continued)**

<b>I/O</b>	<b>From Top Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
I	3A	Top/Port HPA MUTE A	MA: Not required OA: BSU, PORT-G	HPA Mute-A, Port BSU
I	3B	Top/Port HPA MUTE B	MA: Not required OA: BSU, PORT-H	HPA Mute-B, Port BSU
I	3C	STBD HPA MUTE A	MA: Not required OA: BSU, STBD G	HPA Mute-A, STBD BSU
I	3D	STBD HPA MUTE B	MA: Not required OA: BSU, STBD-H	HPA Mute-B, STBD BSU
O	3E	Multi-Control A	MA: BSU, Pin A or T, or OA: BSU, PORT-T and STBD-T	Multi-Control-HI to HSD-440 Mark 2 Terminal and antenna subsystem
O	3F	Multi-Control B	MA: BSU, Pin B or U, or OA: BSU, PORT-U and STBD-U	Multi-Control-LO to HSD-440 Mark 2 Terminal and antenna subsystem
I	3H	Tx Disable		
I	3G	WOW 1	TP3G	Weight On Wheel, as defined in Note 40 of ARINC 741, Part 1. Refer to "WOW Pins" on page 3-6
I	3K	WOW 2	TP3K	
I	3J	WOW Program Select	TP3J	
I	4A-4D	System Config 1 to 4	4A and 4C=0 (TP7K common), 4B, 4D=1(open) for standalone mode  and  Wire 4A 4C, 4D =0 (TP7K common), 4B =1 (open) for Aero only operation	
I	4E	Call light activation		Open for Call light On at Call Connection  Closed for Call Light on at Call Initiation
I	4F	Priority 4 Calls		Open Allow Priority 4 calls to and from Cockpit  Closed Inhibit Priority 4 calls to and from Cockpit

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**Table 3-14 HSD-440 Stand-Alone Terminal Top Plug Connection Details (Continued)**

<b>I/O</b>	<b>From Top Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
I	4G	Chime/light option MS		G=0(strapped), 4H=1(open) Steady lamp, multi-stroke chime  4G=1(open), 4H=0(strapped) Flashing lamp, single stroke chime  4G=1(open), 4H=1(open) Steady lamp, single-stroke chime
I	4H	Chime/light option LS		
I	4J	IRS 1A	Aircraft main IRS	IRS 429 data, Rx HI
I	4K	IRS 1B	Aircraft main IRS	IRS 429 data, Rx LO
I	5A	SDI 1	Not connected	HPA Select Code for HGA
I	5B	SDI 2	SDI common (TP5D)	HPA Select Code for HGA
I	5C	Spare 1 ARINC 429 Input A		
I	5D	SDI Common	5C IRS #2 Input A 5E IRS #2 Input B	SDI Common for HPA select codes
I	5E	Spare 1 ARINC 429 Input B		
I	5F-7J	ICAO Address, BITS 24 to 1		
I	7K	ICAO Address, Common	1 = no connection 0 = common (TP7K)	Common GND connection for system and I/O configuration and ICAO ID



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**Table 3-15 HSD-440 Stand-Alone Terminal Middle Plug Connection Details**

<b>I/O</b>	<b>From Middle Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
<b>O</b>	1A	Discrete output 1	Remote status panel	HSD-440 Mark 2 Terminal-Power On (Optional)
<b>O</b>	1B	Discrete output 2	Remote status panel	HSD-440 Mark 2 Terminal-Fault (Optional)
	1C	Spare		
	1D	Switch HI current from chime		
	1E	1D 1E outputs to Audio control panel		
<b>O</b>	1F	Discrete Common	Remote status panel	Discrete Common
<b>O</b>	1G	Maint Port Tx	Maint Port serial data, DB9S-2	Maintenance computer (laptop/PC), for Remote access
<b>I</b>	1H	Maint Port Rx	Maint Port serial data, DB9S-3	
<b>I/O</b>	1J	Maint Port Signal Ground	Maint Port serial data, DB9S-5	
<b>I</b>	1K	CMU 2 Input A	CMU 2 TP1A	CMU 2 RX A
<b>O</b>	2A	Data I/O Tx	No connection	
<b>I</b>	2B	Data I/O Rx	No connection	
<b>O</b>	2C	SDU data	Future	
<b>O</b>	2D	SDU data	Future	
<b>I</b>	2E	SCM data	Future	
<b>I</b>	2F	SCM data	Future	
<b>O</b>	2G	SCM power +12 V	Future	
<b>O</b>	2H	SCM power return 0 V	Future	
	2J	Data I/O Ground	No connection	
<b>I</b>	2K	CMU 2 Input B	CMU 2 TP1B	CMU 2 RX B
<b>O</b>	3A	Call light 1	Audio Control Panel	
<b>I</b>	3B	Mic on 1	Audio Management System	
<b>I</b>	3C	Chime light inhibit	Audio Control Panel	

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**Table 3-15 HSD-440 Stand-Alone Terminal Middle Plug Connection Details (Continued)**

<b>I/O</b>	<b>From Middle Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
I	3D	Place/end 1	Audio Management System	
I	3E	MCDU 2 input A	MCDU 2 J4-27	MCDU 2 RX A
I	3F	MCDU 2 input B	MCDU 2 J4-28	MCDU 2 RX B
O	3G	Call light 2	Audio Control Panel	
I	3H	Mic on 2	Audio Management System	
I	3J	Go-ahead / Chime reset	Audio Control Panel	
I	3K	Place/End 2	Audio Management System	
I/O	4A	POTS 1 TIP	2-wire Analog Phone TIP (RJ-11, Pin 3)	POTS Line 1
I/O	4B	POTS 1 RING	2-wire Analog Phone RING (RJ-11, Pin 2)	
I/O	4C	POTS 2 TIP	2-wire Analog Phone TIP (RJ-11, Pin 3)	POTS Line 2
I/O	4D	POTS 2 RING	2-wire Analog Phone RING (RJ-11, Pin 2)	
I	4E	Input Audio 1 HI	cockpit headset 1	cockpit headset 1
I	4F	Input Audio 1 LO	cockpit headset 1	
I/O	4G–4K			Reserved
I	5A	CEPT-E1 Rx+	CTU Satcom1 E1 TX+	CTU E1 Bus
I	5B	CEPT-E1 Rx-	CTU Satcom1 E1 TX-	CTU E1 Bus
O	5C	CEPT-E1 Tx+	CTU Satcom1 E1 RX+	CTU E1 Bus
O	5D	CEPT-E1 Tx-	CTU Satcom1 E1 RX-	CTU E1 Bus
O	5E	Output Audio 1 HI	Cockpit Headset 2 Microphone HI	Cockpit Headset 1 Speaker
O	5F	Output Audio 1 LO	Cockpit Headset 2 Microphone LO	
I/O	5G–5K			Reserved

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**Table 3-15 HSD-440 Stand-Alone Terminal Middle Plug Connection Details (Continued)**

<b>I/O</b>	<b>From Middle Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
I	6A	ISDN 1 Rx+	ISDN, RJ45-3	User data, ISDN-1 Refer to "User Interfaces" on page 3-12
I	6B	ISDN 1 Rx-	ISDN, RJ45-6	
O	6C	ISDN 1 Tx+	ISDN, RJ45-4	
O	6D	ISDN 1 Tx-	ISDN, RJ45-5	
I	6E	Input Audio 2 HI		
I	6F	Input Audio 2 LO		
O	6G	10BASE-T Tx+	Cockpit Headset 2 Microphone HI  Cockpit Headset 2 Microphone LO	Cockpit Voice Microphone 2
O	6H	10BASE-T Tx-	Ethernet 10BASE-T RJ45, Pin 2	
I	6J	10BASE-T Rx+	Ethernet 10BASE-T RJ45, Pin 3	
I	6K	10BASE-T Rx-	Ethernet 10BASE-T RJ45, Pin 6	
O	7A	10BASE-T Tx+	Ethernet 10BASE-T, RJ45-1	Port 1 User data Ethernet 10BASE-T
O	7B	10BASE-T Tx-	Ethernet 10BASE-T, RJ45-2	
I	7C	10BASE-T Rx+	Ethernet 10BASE-T, RJ45-3	
I	7D	10BASE-T Rx-	Ethernet 10BASE-T, RJ45-6	
O	7E	Output Audio 2 HI	Cockpit Headset 2 Speaker HI	
O	7F	Output Audio 2 LO	Cockpit Headset 2 Speaker LO	
I	7G	MCDU 1 Input A		
I	7H	MCDU 1 Input B		
O	7J	MCDU 1/2 Output A		
O	7K	MCDU 1/2 Output B		
O	C1	RF Tx Output	Antenna subsystem-DLNA or HPR-J	Coaxial cable, RF Transmit

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**Table 3-16 HSD-440 Stand-Alone Terminal Bottom Plug Connection Details**

<b>I/O</b>	<b>From Bottom Plug</b>	<b>Signal Name</b>	<b>To</b>	<b>Description</b>
<b>I</b>	BP2	+28 V dc HOT	Aircraft power source, HOT	+28 V dc supply
<b>I</b>	BP3	+28 V dc return GND	Aircraft power source, return	
<b>I</b>	BP8	Chassis GND	Aircraft ground	Aircraft Chassis Ground
<b>I/O</b>	BP4			Reserved
<b>I/O</b>	BP5			Spare
<b>I/O</b>	BP6			Reserved
<b>I</b>	BP1	115 V ac HOT	Aircraft power source, HOT	115 V ac 400 Hz supply
<b>I</b>	BP7	115 V ac COLD	Aircraft power source, COLD	
<b>I/O</b>	BP9–BP11			Spare
<b>I</b>	BP12	RF Rx Input	Antenna subsystem-DLNA	Coaxial cable, RF Receive
<b>O</b>	BP13			Reserved

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**NOTES:**


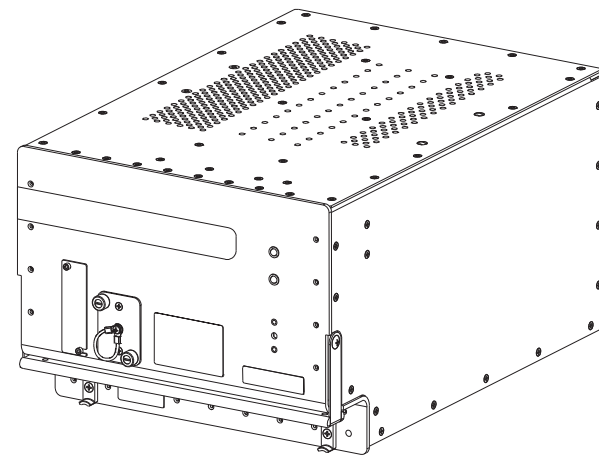
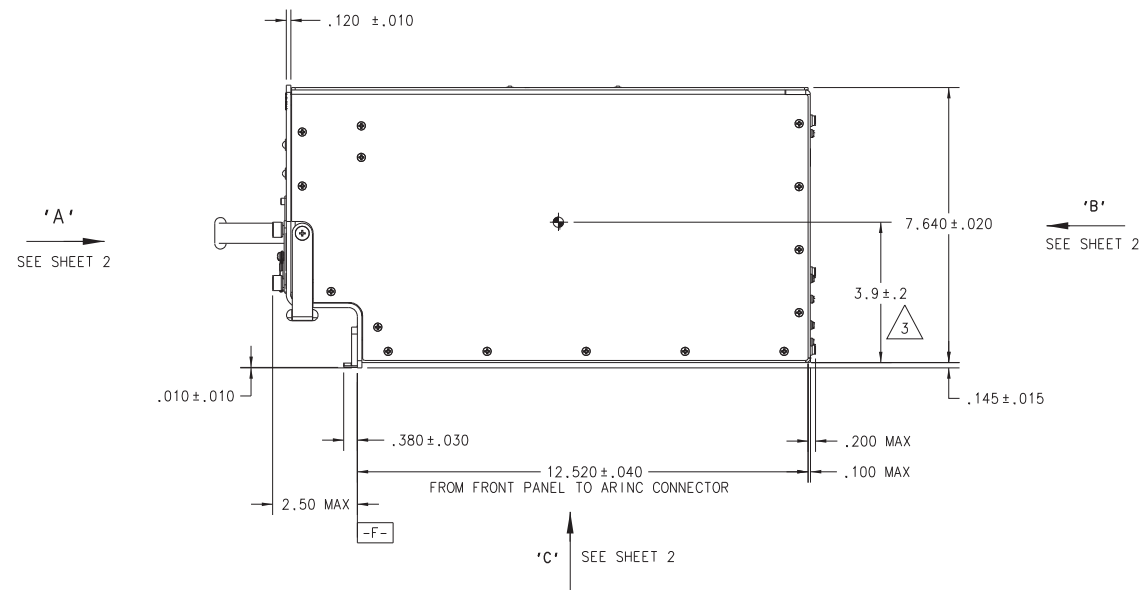
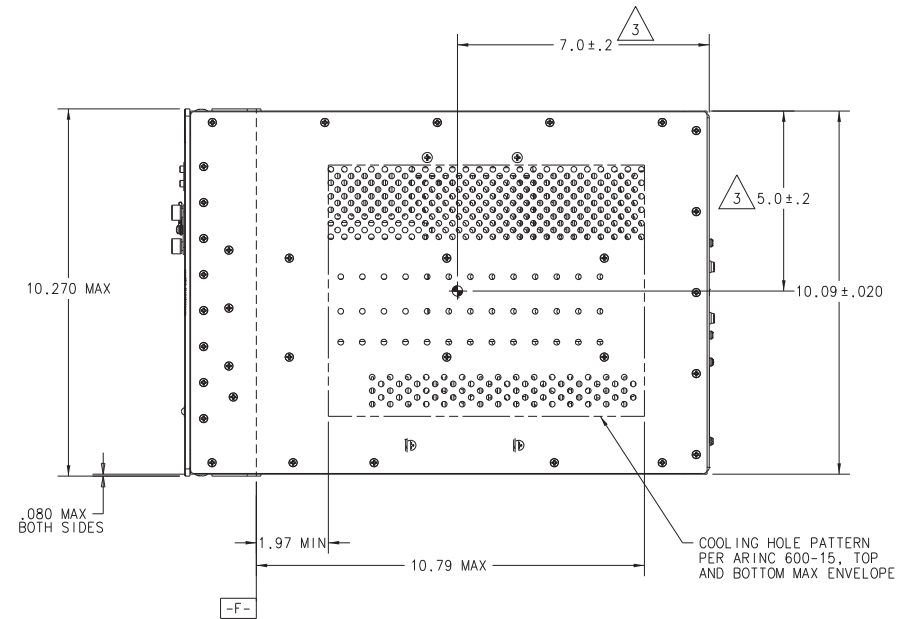
1. THIS UNIT MEETS THE DIMENSIONAL REQUIREMENTS OF ARINC SPECIFICATION 600-15.
2. MAXIMUM WEIGHT IS 16.1 kg (35.5 LBS).
3. APPROXIMATE CENTER OF GRAVITY IS INDICATED BY .
4. THIS UNIT SHALL BE INSTALLED IN AN 8 MCU TRAY PER ARINC 600-15 SPEC.
5. COOLING AIR REQUIREMENTS PER ARINC 600:  
 -FLOW RATE : 88 kg/hr  
 -PRESSURE DROP: 5 ±3 mm OF WATER.
6. LABELING NOT APPLICABLE TO PN 1252-A-3850-01.

TABLE 1. VARIANTS

TRANSCIVER MODEL	CHANNELS	OPERATION MODE	ASSEMBLY PART NO.	INTERCONNECTION DIAGRAM
HSD-440	5	STAND-ALONE	1252-A-3820-01	1252-B-3820
HSD MK2	5	HW SUB-ASSY HSD MK2	1252-A-3850-01	1252-B-3852



3D VIEW

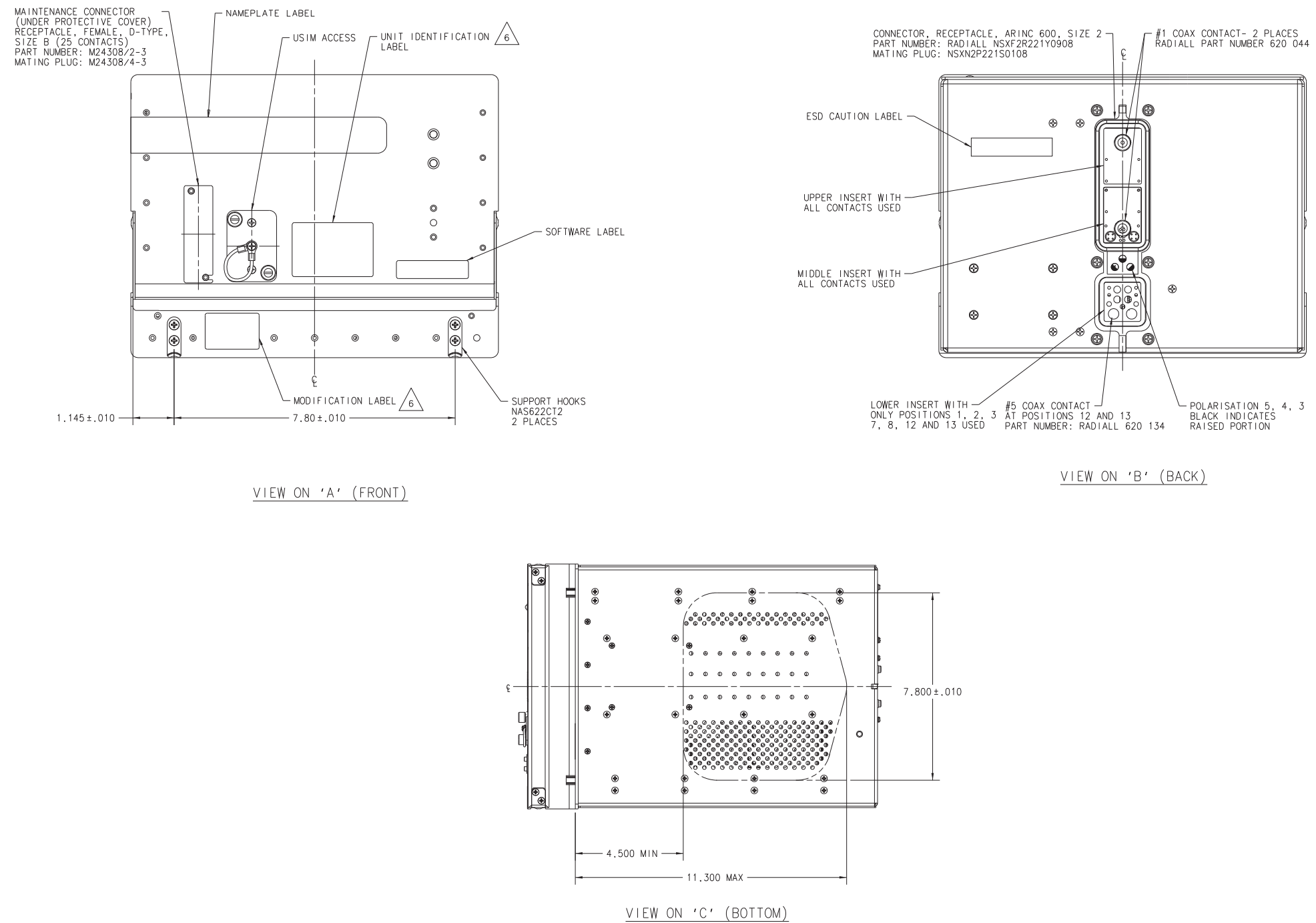


DWG No 1252-E-3820-01  
 REV A  
 SH 1

**Figure 3-7 (Sheet 1). HSD-440 Mark 2 Terminal Outline and Installation Diagram (1252-E-3820-01, Rev A)**

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**Figure 3-8 (Sheet 2). HSD-440 Mark 2 Terminal Outline and Installation Diagram (1252-E-3820-01, Rev A)**

Dwg No 1252-E-3820-01 REV A SH 2

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**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
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**NOTES:**

1. TRANSMIT CABLE: MAX LOSS: 2.5dB INCLUDING DIPLEXER PER ARINC 741.
2. RECEIVE CABLE: MAX LOSS: 6-25dB PER ARINC 741.
3. THE AIRCRAFT 24-BIT ICAO AIRFRAME ADDRESS SHALL BE WIRED AS FOLLOWS:  
 PINS MARKED \*0\* SHALL BE CONNECTED TO ICAO ADDRESS COMMON PIN TP7K.  
 PINS MARKED \*1\* SHALL BE LEFT OPEN.
4. SYSTEM CONFIG 1 THRU SYSTEM CONFIG 4 DEFINE HSD-440 SYSTEM CONFIGURATION PER TABLE 1 IN CONJUNCTION WITH SDI PER TABLE 2.
5. WIRE SIZE RECOMMENDATIONS:  
 - +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.
6. ROW (1) NOMENCLATURE, AS PER EMS ANTENNA CONTROL UNIT (ACU), OTHER ACU OR BEAM STEERING UNIT (BSU) MANUFACTURERS MAY USE THOSE OF ROW (2).
7. IN WOW PROGRAM SELECT (TP3J) SHALL BE STRAPPED TO ICAO ADDRESS COMMON (TP7K) IF IN WOW (TP3G AND TP3K) IS OPEN WHEN ON THE GROUND, OTHERWISE DO NOT CONNECT IN WOW PROGRAM SELECT.
8. MAXIMUM SUGGESTED CABLE RUN SHOULD NOT EXCEED 50 FEET.
9. FOR ADDITIONAL CONFIG AND SDI PIN WIRING DETAILS, REFER TO THE HSD-440 SYSTEM DESCRIPTION AND INSTALLATION MANUAL EMS-MN-1252-33412.
10. 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.
11. TWISTED SHIELDED PAIRS AS PER ARINC 741 WIRING REQUIREMENTS OR EQUIVALENT.
12. IN COCKPITS THAT USE CD1/CD2 CALL DISCRETE SIGNALING MPIE IS TO BE EXTERNALLY WIRED TO GROUND.
13. CONFIGURATION TO ALLOW CD1/CD2 CALL DISCRETE SIGNALING RATHER THAN STANDARD CHIME AND LIGHT IS VIA AN ORT SETTING.
14. CONFIGURATION TO ALLOW FOR THIRD MCDU RATHER THAN SIDE MOUNT AND ANTENNA IS VIA AN ORT SETTING.
15. WIRE ACCORDING TO DESIRED UNIT CONFIGURATION.

**TABLE 1. CONFIGURATION STRAPPING** <sup>9</sup>

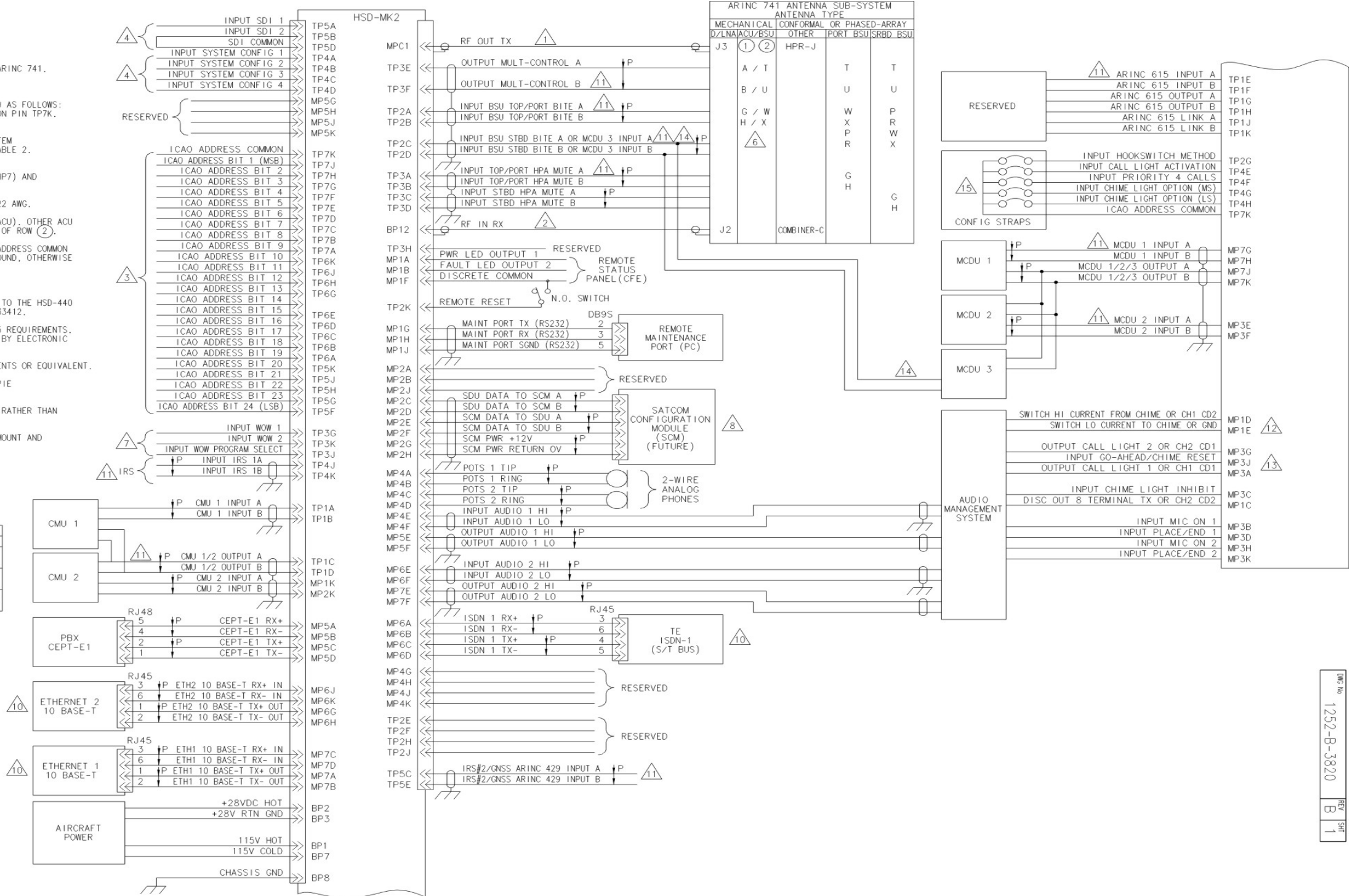
SYSTEM MODE	PIN STATUS			
	TP4A SYS_CFG 1	TP4B SYS_CFG 2	TP4C SYS_CFG 3	TP4D SYS_CFG 4
STAND-ALONE OR DUAL INDEPENDENT	STRAPPED	OPEN CIRCUIT	STRAPPED	OPEN CIRCUIT
AERO ONLY	STRAPPED	OPEN CIRCUIT	STRAPPED	STRAPPED

NOTE: PINS THAT ARE STRAPPED SHOULD BE CONNECTED TO ICAO ADDRESS COMMON (TP7K)

**TABLE 2. SDI CONFIGURATION STRAPPING** <sup>9</sup>

INSTALL TYPE	TP5B PIN STATUS	TP5A PIN STATUS
DUAL #1 OF 2	OPEN CIRCUIT	OPEN CIRCUIT
RESERVED	OPEN CIRCUIT	STRAPPED
SINGLE	STRAPPED	OPEN CIRCUIT
DUAL #2 OF 2	STRAPPED	STRAPPED

NOTE: PINS THAT ARE STRAPPED SHOULD BE CONNECTED TO ICAO ADDRESS COMMON (TP7K)

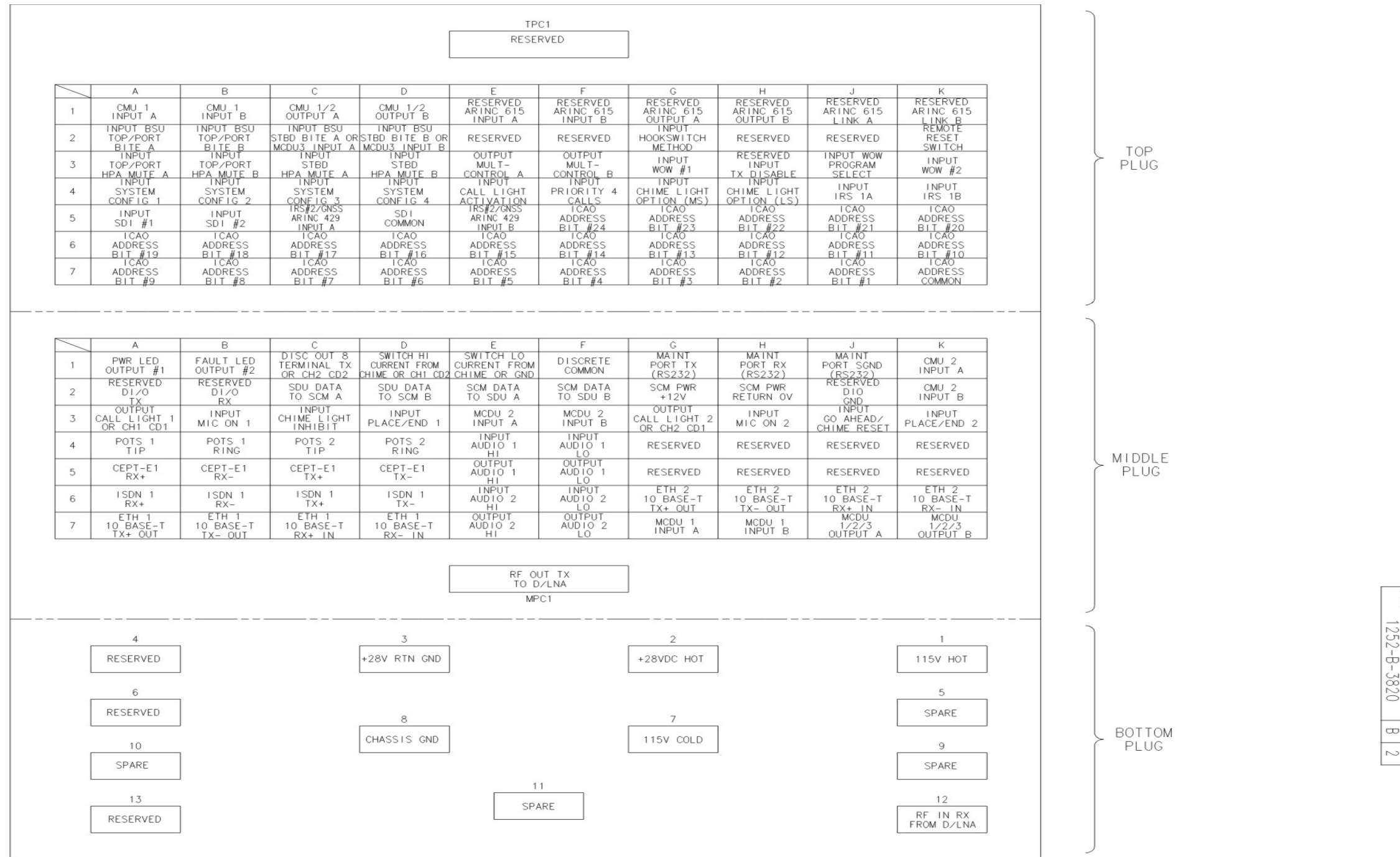


**Figure 3-9 (Sheet 1). HSD-440 Mark 2 Terminal System Interconnection Diagram (1252-B-3820, Rev B)**

REV No 1252-B-3820 B 1

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**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
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**Figure 3-10 (Sheet 2). HSD-440 Mark 2 Terminal System Interconnection Diagram (1252-B-3820, Rev B)**

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## TEST AND FAULT ISOLATION

This chapter provides information required to determine the operational readiness of HSD-440 Mark 2 Terminals and aid service personnel in diagnosing system faults. The operational and diagnostic tests described in this section require using the HSD-440 Mark 2 Terminal's built-in diagnostic tool, the MPU.

This chapter includes:

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

**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. The menu screens in this section correspond to the HSD-440 Stand-Alone terminal in maintenance user mode.

### 1. Operational and Diagnostic Testing

This section includes the following sections:

- General
- Test and Fault Isolation Equipment Requirements
- Terminal Maintenance Port Utility
- Inmarsat Cause Codes
- Operational and Diagnostic Test Procedures

#### 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 includes test and fault isolation procedures for the HSD-440 Mark 2 Terminals. All test and load procedures require the HSD-440 Mark 2 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 HSD-440 Mark 2 Terminal MPU and perform operational and diagnostic testing and software loading on the HSD-440 Mark 2 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 4-37	Remote access maximum cable length 25 ft. (From ARINC 600 connector to DB9 breakout connector) Test cable maximum length 25 ft. (From HSD-440 Mark 2 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 is not required, but 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 Swift 64 high-speed data	1
Time Domain Reflectometer	Standard	–	1

### **C. Terminal Maintenance Port Utility**

This section describes the HSD-440 Mark 2 Terminal MPU and provides the connection and cabling details required to access and use the program.

#### **(1) General Overview**

The MPU, built into the HSD-440 Mark 2 Terminal's operational software, provides a system interface for fault isolation and diagnostic procedures.

To use the HSD-440 Mark 2 Terminal MPU, connect an RS-232, VT-100 terminal (computer operating a terminal emulation program) to the RS-232 maintenance port interface of the HSD-440 Mark 2 Terminal.

The maintenance port on the front panel of HSD-440 Mark 2 Terminals provides a direct connection to the HSD-440 Mark 2 Terminal MPU using a DB25 connector. Optionally, remote cabin access is possible using a DB9 connector via the ARINC 600 connector.

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(2) Connection Requirements

This section describes specific cabling requirements needed to connect to and use the HSD-440 Mark 2 Terminal MPU.

(a) Cabling Notes

The HSD-440 Mark 2 Terminals provide two options to connect to the HSD-440 Mark 2 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 HSD-440 Mark 2 Terminal for both direct and remote connection types. Select one of these connection options to access the HSD-440 Mark 2 Terminal MPU.

**NOTE:** The direct and remote connection points to the HSD-440 Mark 2 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

HSD-440 Mark 2 Terminal maintenance cable connections may vary in length, type of connection used, and connector pin call outs, depending on the access point used.

The cable assembly for the HSD-440 Mark 2 Terminal assumes that the computer's COM port interface is a 9-Pin, D-Sub connector (DB9). Cable assembly details for HSD-440 Mark 2 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.

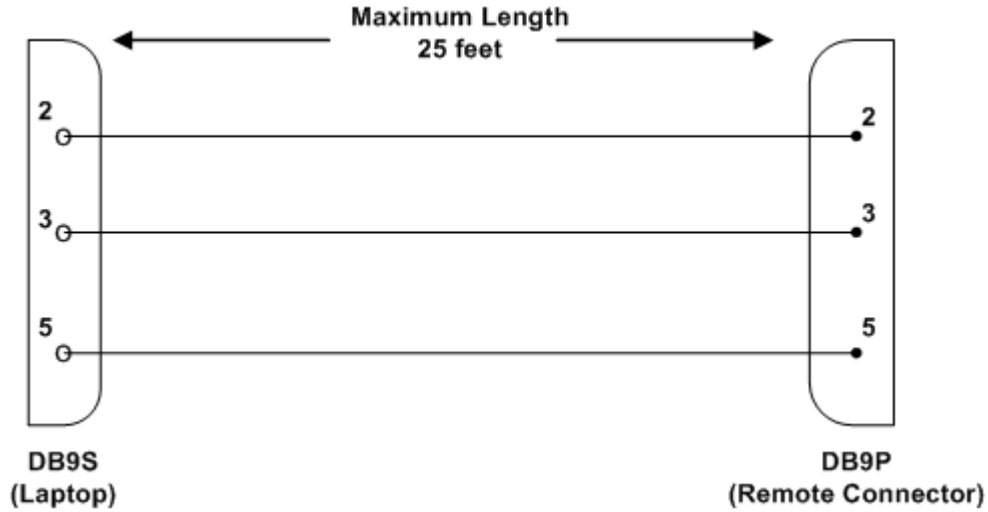


Figure 4-1 Remote Connection, Maintenance Cable

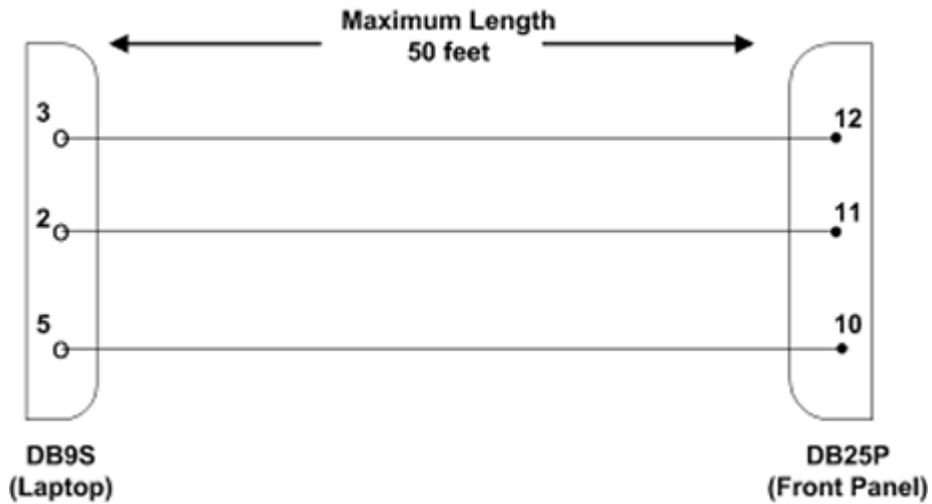


Figure 4-2 Direct Connection, Maintenance Cable

(c) Interface Requirements

A standard VT-100 compatible terminal running an emulator program (such as HyperTerminal, ProComm Plus, or similar) provides the user interface to the HSD-440 Mark 2 Terminal MPU. The RS-232 terminal connection settings for HSD-440 Mark 2 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

There are various levels of access to the MPU. Each level is protected by a different password.

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

(a) Level 1 Access

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.

The password for access to this level is menu.

(b) Level 2 Access

This level is for trained original equipment manufacturer (OEM) installers and product support personnel. This access level supports read and limited write capabilities. Users can disable, mask, or clear faults, change satellite or LES/GES preferences, view and modify certain EEPROM parameters, and maintain and upgrade the HSD-440 Mark 2 Terminal.

The password for this level is maint.

(4) Using the Terminal MPU

This section describes the basic procedures for using and navigating the HSD-440 Mark 2 Terminal MPU.

(a) Entering Passwords

You can enter the password any time after the HSD-440 Mark 2 Terminal boots.

- To access Level 1 functions, type **menu**.
- To access Level 2 functions, type **maint**.

NOTE: The password does not appear on the screen when you type it.

(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.

(d) Selecting Reports

The reports available through the MPU enable users to view information about the configuration and status of the HSD-440 Mark 2 Terminal. This information is used to troubleshoot the communication system on the aircraft.

"Report Descriptions" on page 4-53 provides more information about reports.

To access reports:

1. In the MPU, press EQUAL SIGN.

A list of reports appears. Active reports show as toggled on. Inactive reports show as toggled off.

2. To activate a report, type the report number, and then press ENTER.

**NOTE:** Multiple reports can be activated at the same time; type and enter each report number separately.

3. To turn off individual, active reports, type the report number you want to toggle off, and then press ENTER.

4. To turn off all active reports, press EQUAL SIGN, 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 HSD-440 Mark 2 Terminals, menu screens display the firmware version.

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

(a) Menu 1

Figure shows an example Menu 1 screen display. Table 4-6 describes the items available in Menu 1.

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MENU 1		FIRMWARE Vx.x GND	
X	override forward id/ICAO address	L	test LEDs
Y	explain error status	U	list event log (hex)
F	print equipment stats	M	clear equipment stats
N	permit TFTP software loads		
<CTRL>	N next menu	<CTRL>	O previous menu = select reports

**Menu 1 Screen Display**

**Table 4-6 Menu 1 Item Descriptions**

Menu Item	Description
X: override forward id/ICAO address	Used in testing and fault isolation. Enter a test or alternate FWD ID or ICAO ID to use during fault isolation procedures. Resetting the HSD-440 Mark 2 Terminal or cycling the power cancels this function.
Y: explain error status	Reports error status when failure LED is illuminated.
F: print equipment stats	Prints a list of the current equipment statistics.
N: permit TFTP software loads	Upgrade or load HSD software using the EMS serial data loader connected to the HSD terminal maintenance port and using TFTP over the front panel Ethernet port.  Note: When this option is enabled, software loads start within the next 10 minutes. To enable this option, the aircraft air/ground status must be on-ground.
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 4-3 shows an example MPU Menu 2 screen display. Table 4-7 describes the items available in Menu 2.

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MENU 2	FIRMWARE Vx.x GND
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 1252-A-3800-01	S set satellite longitude
G manual antenna steering	
<CTRL> N next menu	<CTRL> O previous menu = select reports

**Figure 4-3 Menu 2 Screen Display**

**Table 4-7 Menu 2 Item Descriptions**

Menu Item	Description
<p><b>NOTE:</b> Menu 2 selections A and E are used to manually input navigational data to point the antenna to a preferred satellite location and/or peak for maximum signal reception. These commands are typically used where no IRS data is available.</p>	
A: set veh-relative azimuth	<p>Antenna azimuth pointing offset with reference to the front centerline of the aircraft.</p> <p>Offset value entered in degrees from 0 to 180, where a positive entry is clockwise (cw) and a negative entry is counterclockwise (ccw).</p>
K: desired az veh-rel velocity	<p>Activates continuous antenna azimuth sweep at a set elevation, as entered with menu item E.</p> <p>Azimuth sweep velocity entered as deg/sec value.</p> <p><b>NOTE:</b> When combined with a signal-monitoring reports selection, sweep the antenna for maximum signal strength to determine optimum location coordinates.</p>
T: enter time of day	Permits the 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: <b>menu</b> or <b>maint</b> .
Z: reset terminal	Enables a complete, soft reset of the LRU; once reset, the menu access password must be re-entered.
G: manual antenna steering	<p>Set manual antenna-steering in both azimuth and elevation.</p> <p>Four options:</p> <ul style="list-style-type: none"> <li>• I increases elevation 0.5 deg</li> <li>• M decreases elevation 0.5 deg</li> <li>• L increases azimuth 0.5 deg</li> <li>• J decreases azimuth 0.5 deg</li> </ul>
E: set veh-relative elevation	<p>Antenna elevation pointing offset with respect to the aircraft horizontal rest position; i.e., assumed to have no pitch or roll offset.</p> <p>Offset value entered in degrees from 0 to 90.</p>

**Table 4-7 Menu 2 Item Descriptions (Continued)**

Menu Item	Description
R: resume automatic steering	Re-activates programmed automatic antenna-steering in both azimuth and elevation.
N: annotate log file	Allows for 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 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

Table 4-7Figure 4-4 shows the menu 3 screen display. Table 4-8 describes the items available in Menu 3.

<pre> MENU 3 L   list EEPROM C   clear event log F   list call log O   list ORT I   set all LES id's K   set CP ORT parameter T   write defaults to CP ORT D   output binary ORT B   list channel card event log &lt;CTRL&gt; N next menu         </pre>	<pre> FIRMWARE Vx.x S   list event log M   misc. EEPROM parameter G   clear call log P   ocean region parameter H   list SCM/CP ORT R   copy CP ORT to SCM U   clear SCM ORT V   bulletin board satellite data =   select reports         </pre>
--	--

**Figure 4-4 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 all events stored in non-volatile RAM.
F: list call log	Displays call log files for HSD-440 Mark 2 Terminal. When selected, three options are available: <ul style="list-style-type: none"> <li>• To display complete list of all log files, press F.</li> <li>• To list extended EIRP trace data, press X.</li> <li>• To list all remaining entries, press PERIOD.</li> </ul>

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

Menu Item	Description
O: list ORT	Displays all EEPROM parameters, including all cable losses and LES/GES configurations.
I: set all LES id's	Displays all ORT parameters to the same LES/GES access code and service provider (including primary and secondary service providers). Certain parameters are set using Menu 3, set CP ORT parameter.
K: set CP ORT parameter	Use the ORT parameters to configure parameters for the HSD-440 Mark 2 Terminal.
T: write defaults to CP ORT	Each SDU stores a copy of the User, Secure, and Manufacturer Specific ORT parameter defaults in its software load.
V: bulletin board satellite data	The HSD-440 Mark 2 Terminal stores the updated satellite longitude from the bulletin board.
S: list event log	Lists all events and system fault codes stored in non-volatile RAM. When selected, several options are available: <ul style="list-style-type: none"> <li>• 0 displays the most recent saved entry.</li> <li>• S displays next most recent entry saved.</li> <li>• PERIOD displays all remaining logged entries.</li> <li>• 1 displays special events (does not include ORR entries).</li> </ul>
M: misc. EEPROM parameter	Enables entry or entry changes to some of the EEPROM parameters listed in function L.
G: clear call log	Clears call log files for HSD-440 Mark 2 Terminal.
P: ocean region parameter	Configures LES access codes (primary and secondary service providers) for individual ORs.
H: list SCM/CP ORT	Lists the values contained in both SCM and the CP ORT.
R: copy CP ORT to SCM	Copies values stored in the CP ORT to the SCM. This may take several minutes. To indicate progress, the HSD-440 Mark 2 Terminal displays the number of bytes remaining to transfer.
U: clear SCM ORT	Clear the ORT parameter from the SCM.
B: list channel card event log	Lists the event log for individual channel cards.

For more information about ORT parameters, see "Configuring the Owners Requirements Table (ORT)" on page 6-1.

Figure 4-5 shows an example Menu 3, Item M: Miscellaneous EEPROM parameters screen display for the HSD-440 Mark 2 Terminal.

Table 4-9 describes the items available in Menu 3, Item M.

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MISCELLANEOUS PARAMETERS		
1	HPA-TO-ANTENNA TOTAL LOSS	21 CARD 2 IP ADDRESS
2	FORWARD ID	22 TRANSMIT IF WEIGHT-ON-WHEELS
3	GPS PROTECTION ALGORITHMS	29 DEFAULT LATTITUDE
11	FRONT PANEL LEDS ENABLED	30 DEFAULT LONGITUDE
14	MAINTENANCE PORT INVERSE VIDEO	31 OBEY OXCO STATUS
15	MAINTENANCE PORT DEGREES SYMBOL	63 CARD 1 SUBNET MASK
16	TERMINAL CATEGORY	64 CARD 2 SUBNET MASK
20	CARD 1 IP ADDRESS	65 AIR/GROUND BEHAVIOUR
WHICH PARAMETER # <CTRL> N for next page ?		
73	CP AUTO ATTACH	90 BGAN/SWIFT64 CONGESTION THRESHOLD
74	CC SBB CIPER PARAMETER	91 BGAN/SWIFT64 AUTO HANDOVER
83	IP HEADER COMPRESSION	95 OVER-POWER MARGIN
84	SW64 POSITION REPORTING	97 CHANNEL CARD CONFIGURATION
85	APAC TEST BEARER LONGITUDE	100 MIN SAT LOOK ANGLE
86	EMEA TEST BEARER LONGITUDE	101 PREEMPTABLE CALLS
87	AMERICAS TEST BEARER LONGITUDE	102 BGAN/SWIFT64 HYSTERESIS TIMEOUT
89	BGAN/SWIFT64 CONGESTION TIMEOUT	103 ANTENNA MOUNTING ANGLE (ROLL)
WHICH PARAMETER # <CTRL> N for next page ?		
104	ANTENNA MOUNTING ANGLE (PITCH)	114 MAX ORDER FOR INTERMOD CHECK
105	ANTENNA MOUNTING ANGLE (ROTATION)	115 ENABLE PAP
106	RT-CHANNEL RESERVED POWER	116 PAP USER NAME
108	USWR ERROR THRESHOLD	117 PAP PASSWORD
109	IRS1 TYPE	118 VOICE PROCESSOR IP ADDRESS
110	IRS2 TYPE	119 LNA TO SDU RX THRESHOLD
113	MAXIMUM IGA POWER	

**Figure 4-5 Menu 3 - Item M: Miscellaneous EEPROM Parameters**

**Table 4-9 Menu 3, Item M EEPROM Parameter Descriptions**

Parameter Number	Parameter Name	Description
1	HPA-to-antenna total loss	Defines transmit coaxial cable loss from the HSD-440 Mark 2 Terminal at MPC1 to the antenna, including the DLNA loss—maximum is 2.5 dB (includes DLNA loss of 0.8 dB).
2	Forward ID	The Forward ID is not strapped, therefore you must enter it using this parameter.
3	GPS protection algorithms	Disables the GPS algorithms the HSD-440 Mark 2 Terminal uses to prevent calls from interfering with the GPS navigational system on the aircraft.
10	Number of channel cards	Selects the number of channel cards for which the system is configured. Default is 2.
11	Front panel LEDs enabled	Future consideration is provided for additional LEDs, beyond the two currently activated—default is 2.

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

<b>Parameter Number</b>	<b>Parameter Name</b>	<b>Description</b>
14	Maintenance port inverse video	Enables a selected report 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: <ul style="list-style-type: none"> <li>• Select 0 to use the letter D; e.g., 180.0 D.</li> <li>• Select 1 to use a degree symbol °; e.g., 180.0°.</li> </ul>
16	Terminal category	Configure the LRU type. Default is 2 (HW Strapping) — hardware is read on power-up.
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 HSD-440 Mark 2 Terminal to activate revised default values.
30	Default longitude	Allows user to enter a default longitude value. Reset the HSD-440 Mark 2 Terminal to activate revised default values.
31	ObeY OXCO status	Prevents system operation until OXCO is warmed up (unless overridden). Use parameter setting to override warm-up during testing procedures.
60	Ch card gateway address	Manufacturer-specific - do not modify.
61	IMEI number	Manufacturer-specific - do not modify.
62	SDU-to-PA gain	Manufacturer-specific - do not modify.
63	Card 1 subnet address	Subnet address of channel card 1.
64	Card 2 subnet address	Subnet address of channel card 2.
65	Air/ground behavior	Determines the function of WOW strapping.
66	#2 IMEI number	Manufacturer-specific - do not modify.
67	#3 IMEI number	Manufacturer-specific - do not modify.
68	#4 IMEI number	Manufacturer-specific - do not modify.
73	CP auto attach	To ensure that the terminal registers on the SwiftBroadband Circuit-Switched and Packet-Switched core network, set this option to CS PS. Network Registration is essential to access network resources to make calls.
74	CC SBB cipher parameter	Ciphers the messages between the terminal and the core network.



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

<b>Parameter Number</b>	<b>Parameter Name</b>	<b>Description</b>
83	IP Header Compression	Turns on IP header compression. Valid values: C (channel card default = Off), 0 (Off), and 4 through 9 (On)
95	Over Power Margin	Do not change. <sup>2</sup>
97	Channel Card Configuration	Configures channel cards for Swift64, SBB, or classic service. <sup>2</sup>
101	Preemptable Calls	Configures which calls can be preempted when performing a satellite handover.
102	BGAN/SWIFT64 Hysteresis Timeout	Configures the time it will take to perform a satellite handover once a new satellite is visible. <sup>2</sup> Default is 120.0 SEC.
103	Antenna Mounting Angle (Roll)	Configures the physical antenna mounting angle (Roll). <sup>2</sup>
104	Antenna Mounting Angle (Pitch)	Configures the physical antenna mounting angle (Pitch). <sup>2</sup>
105	Antenna Mounting Angle (Rotation)	Configures the physical antenna mounting angle (Rotation). <sup>2</sup>
106	RT Channel Reserved Power	Do not change. <sup>2</sup>
108	VSWR Error Threshold	Do not change. <sup>2</sup>
109	IRS1 Type	Configures the navigation data type for the ARINC 429 IRS receiver 1. <sup>2</sup>
110	IRS2 Type	Configures the navigation data type for the ARINC 429 IRS receiver 2. <sup>2</sup>
113	Maximum IGA Power	Do not change. <sup>2</sup>
115	Enable PAP	Enables PAP authentication. For configuration instructions, refer to the HSD Terminal Developer's Guide, MN-1252-13005. <sup>2</sup>
116	PAP User Name	Configures PAP authentication username. Refer to the HSD Terminal Developer's Guide, MN-1252-13005. <sup>2</sup>
117	PAP Password	Configures PAP authentication password. Refer to the HSD Terminal Developer's Guide, MN-1252-13005. <sup>2</sup>
118	Voice Processor IP Address	Do not change. <sup>2</sup>
119	LNA to SDU RX Threshold	Do not change. <sup>2</sup>

(d) Menu 4

Figure 4-6 shows an example MPU Menu 4 screen display for an HSD-440 Mark 2 Terminal. Table 4-10 describes the items available in Menu 4.

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```

MENU 4                                1252-A-3800-01 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

```

**Figure 4-6 Menu 4 Screen Display**

**Table 4-10 Menu 4 Item Descriptions**

Menu Item	Item Description
Q: channel card forward IDs	Enables viewing of ISDN channels 1 and 2 FWD IDs in Swift64 mode, IMSI in SBB mode, and ICAO for the classic channel card.
S: change spot beam	Enables manual selection of specific spot beams independently assigned for each ISDN channel.
M: report MUX stats	Not applicable: Used for engineering debugging purposes only.
O: set Ocean Region	Allows for manual selection of satellite ORs:  AORW: 0 AORE: 1 POR: 2 IOR: 3 MTSAT: 4 APAC: 5 EMEA: 6 AMERICAS: 7  To revert to programmed selection, type -1, and then press ENTER for AUTO selection.

(e) Menu 10

Menu 10 items are used to manually enter INS or IRS parameters to simulate the data required for HSD-440 Mark 2 Terminal operation when INS or IRS data is unavailable. Figure 4-7 shows an example HSD-440 Mark 2 Terminal MPU Menu 10 screen.

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MENU 10		1252-A-3800-01 FIRMWARE Vx.x	
A	activate IRS simul words	X	deactivate IRS simul words
F	IRS bus #1	L	simul IRS lat
G	simul IRS long	H	simul IRS heading
T	simul IRS true track	P	simul IRS pitch
R	simul IRS roll	S	simul IRS speed
Q	simul IRS altitude	C	port ACU status
B	sb ACU status	M	activate antenna status words
N	deactivate antenna status words	D	toggle active antenna
<CTRL> N next menu      <CTRL> O previous menu      = select reports			

**Figure 4-7 Menu 10 Screen Display**

Table 4-11 describes the items available in Menu 10.

**Table 4-11 Menu 10 Item Descriptions**

<b>Menu Item</b>	<b>Description</b>
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 HSD-440 Mark 2 Terminal back to using the INS data received from the aircraft.
G: simul INS/IRS long	Simulates aircraft longitude by overriding the data received from the aircraft INS.
T: simul INS/IRS true track	Simulates true track by overriding the data received from the aircraft INS.
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.

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

Menu Item	Description
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: IRS bus #1	Do not change

(f) Menu 13

Menu 13 items are used to query and debug the data I/O card.

Figure 4-8 shows an example Menu 13 screen display. Table 4-12 describes the items available in Menu 13.

MENU 13	1252-A-3800-01 FIRMWARE Vx.x
T query DATA IO elapsed time	V query DATA IO version
S query DATA IO services	D DATA IO test
F DATA IO fault logging level	X DATA IO console mode
G print DATA IO call database	Y disable output to DATA I/O
<CTRL> N next menu	<CTRL> O previous menu = select reports

**Figure 4-8 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.
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.
V: query DATA IO version	Displays the firmware version of the data I/O card.
D: DATA IO test	Tests individual interfaces of the data I/O.
X: DATA IO console mode	Opens a virtual TTY session to the data I/O maintenance port on the HSD-440 Mark 2 Terminal.
Y: disable output to DATA I/O	Disables output to data I/O from control processor.

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(g) Menu 14

Menu 14 items are used only by professional installers for debugging and clarifying call routing issues.

Figure 4-9 shows an example HSD-440 Mark 2 Terminal MPU Menu 14 screen display. Table 4-13 describes some of the items available in Menu 14.

```

MENU 14                                1252-A-3800-01 FIRMWARE Vx.x
N    num entries in call table      L    list call table
T    get call table                 E    list eeprom call mapping edits
G    modify eeprom call mapping edits
<CTRL> N next menu      <CTRL> O previous menu      = select reports

```

**Figure 4-9 Menu 14 Screen Display**

**Table 4-13 Menu 14 Item Descriptions**

Menu Item	Item Description
G: modify eeprom call mapping edits	Do not change.
E: list eeprom call mapping edits	Do not change.

(h) Menu 15

Figure 4-10 shows an example HSD-440 Mark 2 Terminal MPU Menu 15 screen display.

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

```

MENU 15                                1252-A-3800-01 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 4-10 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 OR, 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_TI query	Manually sends an A_TI 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.

(i) Menu 21

Figure 4-11 shows an example Menu 21 screen display.

Table 4-15 describes some of the items available in Menu 21.

MENU 21	1252-A-3800-01 FIRMWARE Vx.x
P get channel card ethernet parms	I get channel card IMEI number
B request SBB configuration	L list spotbeam table
G logoff SBB spotbeam	N GPS-assisted IRS data
Q query channel card flashprom	Y activate ZB burst status
J inquire for spot beam map	
<CTRL> N next menu	<CTRL> O previous menu = select reports

**Figure 4-11 Menu 21 Screen Display**

**Table 4-15 Menu 21 Item Descriptions**

Menu Item	Item Description
P: get channel card ethernet parms	Displays the Ethernet parameters of the channel card, including the MAC address, the IP address, the gateway IP address, the host name, the DHCP status, and the DHCP server IP address.
B: request SBB configuration	Displays the SwiftBroadband configuration.
I: get channel card IMEI key	Displays the IMEI key of the channel card.
N: GPS-assisted IRS data	Displays the GPS-assisted precision configuration for SBB.

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(j) Menu 30

Figure 4-12 shows an example HSD-440 Mark 2 Terminal MPU Menu 30 screen display.

Table 4-16 describes some of the items available in Menu 30.

**NOTE:** For more information about PIM testing, refer to "Passive Intermodulation (PIM) Test" on page 3-16.

MENU 30	FIRMWARE Vx.x GND
L list PIMBIT parameters	M initiate manual PIMBIT
F fakeout PIMBIT parameters	P initiate/stop PIMBIT
<CTRL> N next menu	<CTRL> O previous menu = select reports

**Figure 4-12 Menu 30 Screen Display**

**Table 4-16 Menu 30 Item Descriptions**

Menu Item	Item Description
L: list PIMBIT parameters	List the parameters used during PIM testing including transmit and receive channel frequencies.
M: initiate manual PIMBIT	Start the manual PIM test. Do not use.
N: initiate/stop PIMBIT	Start the automatic PIM test.

(6) Report Descriptions

When testing or troubleshooting the HSD-440 Mark 2 Terminal, monitoring real-time system data is sometimes required. Figure 4-13 shows all the reports 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 reports that appear may differ from those shown as an example in Figure 4-13.

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1 OFF OFF messages to card #1	13 OFF messages to card #2
2 OFF OFF hex output to card #1	14 OFF hex output to card #2
3 OFF OFF responses from card #1	15 OFF responses from card #2
4 OFF OFF hex input from card #1	16 OFF hex input from card #2
5 OFF OFF card #1 misc info	17 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 IRS input	24 OFF doppler, antenna az/el
Enter 1 thru 203 to toggle report on/off	
X turn off all reports <CTRL> N show next page S save to EEPROM	
ESC return to PREVIOUS MENU	
25 OFF HPA arinc i/o	39 OFF combined-mode debugging
27 OFF HPA/channel card backoffs	40 OFF enthusiastic combined-mode debug
28 OFF miscellaneous digital inputs	41 OFF delta combined-mode debugging
29 OFF channel card A_AM msgs	43 OFF sdu path cable calibration
30 OFF multi-control arinc bus	44 OFF hpa calibration (gain droop)
31 OFF ocean region info	45 OFF combined mode ocean region debug
32 OFF hex input from data i/o	46 OFF hpa resets
33 OFF hex output to data i/o	47 OFF channel card temperature
34 OFF input from data i/o	48 OFF hexadecimal IRS input
35 OFF changes in multi-control bus	49 OFF main loop latency
36 OFF unit test call setup	50 OFF main loop timing
38 OFF combined-mode power allotment	51 OFF one second tick
Enter 1 thru 203 to toggle report on/off	
X turn off all reports <CTRL> N show next page S save to EEPROM	
ESC return to PREVIOUS MENU	
52 OFF extended call codes	76 OFF HSD-X arinc messages
54 OFF multi-control 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	89 OFF debug call teardown
66 OFF channel card boot sequence	91 OFF HSD frequencies
67 OFF debug honeywell combined mode	92 OFF intermod debugging
68 OFF CFDS debugging	93 OFF spot beam debugging
69 OFF vt100 scenario	94 OFF vt100 channel card info
72 OFF DATA I/O events	95 OFF vt100 debugging
Enter 1 thru 203 to toggle report on/off	
X turn off all reports <CTRL> N show next page S save to EEPROM	
ESC return to PREVIOUS MENU	



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96 OFF IRS data rate	118 OFF channel card rf loopback
107 OFF unusual channel card msgs	119 OFF I2C controller i/o
108 OFF channel card rf pwr detect	120 OFF I2C controller hex i/o
109 OFF channel card power SU's	121 OFF I2C slave status
110 OFF underdraft debugging	122 OFF I2C miscellaneous input
111 OFF miscellaneous digital outputs	123 OFF enthusiastic backoff
112 OFF arinc labels	124 OFF PA mute debugging
113 OFF channel card sw loads	125 OFF PA BITE status
114 OFF all channel card THA codes	126 OFF calibrated power detectors
115 OFF OCXO state toggles	127 OFF power supply dc current
116 OFF DATA I/O passthrough mode	128 OFF VSWR monitoring
117 OFF output to data i/o (ascii)	129 OFF I2C output to PA

Enter 1 thru 203 to toggle report on/off

X turn off all reports <CTRL> N show next page S save to EEPROM  
ESC return to PREVIOUS MENU

130 OFF misc temperatures	143 OFF next W'burg LDU
131 OFF duart channel hex input	144 OFF W'burg state changes
133 OFF LES access codes	145 OFF all input from CMU (hex)
134 OFF MCDU/WSC #1 arinc input	146 OFF periodic messages from CMU
135 OFF MCDU/WSC #2 arinc input	147 OFF arinc hex output to CMU
136 OFF arinc output to MCDU/WSC	148 OFF USIM heater control
137 OFF MCDU/WSC state machine	149 OFF AERO logging text -- no SU
138 OFF ascii digital inputs	150 OFF ACARS P-channel RX data
139 OFF W'burg messages to CMU	151 OFF all AERO SUs
140 OFF W'burg messages from CMU (hex)	152 OFF AERO msg acks
141 OFF W'burg messages from CMU	154 OFF non-periodic msgs to aero card
142 OFF lo-level W'burg labels from CMU	155 OFF AES status table queries

Enter 1 thru 203 to toggle report on/off

X turn off all reports <CTRL> N show next page S save to EEPROM  
ESC return to PREVIOUS MENU

156 OFF MCDU driver errors	168 OFF channel card reset cycles
157 OFF ADC raw values	169 OFF CMC arinc in
158 OFF classic AERO call progress	170 OFF CMC arinc out
159 OFF AES status	171 OFF WSC data structs
160 OFF AERO SUs for this terminal	172 OFF CMC data structs
161 OFF 1252-A-3400 status	173 OFF vt100 CUG info
162 OFF vt100 mcdu	174 OFF BGAN registrations
163 OFF periodic messages to CMU	175 OFF Alt Discrete status
164 OFF enthusiastic digital inputs	176 OFF CP/SCM ORT I/O
165 OFF 615 data loader upgrades	178 OFF power bursts
166 OFF 615 data loader debugging	179 OFF channel card burst stats
167 OFF max 615 debugging	180 OFF channel card burst trace

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```
Enter 1 thru 203 to toggle report on/off
X  turn off all reports    <CTRL> N  show next page    S    save to EEPROM
ESC return to PREVIOUS MENU
181 OFF data i/o call reports          194 OFF PA reset cycles
182 OFF recovery after BGAN inert      195 OFF sys table protection algorithm
183 OFF debug CC#1 rx parser          199 OFF classic AERO call status
184 OFF debug CC#2 rx parser          202 OFF CFDS pages sent to CMC
185 OFF dio / cc call matchup         203 OFF generic HD710 faults
187 OFF antenna steering OLS labels
188 OFF over-power protection algorithm 1 OFF OFF messages to card #1
189 OFF expanded IRS input            2 OFF OFF hex output to card #1
190 OFF miscellaneous debugging       3 OFF OFF responses from card #1
191 OFF WSCI telephony                4 OFF OFF hex input from card #1
192 OFF CMU status words               5 OFF OFF card #1 misc info
193 OFF output to antenna controller   6 OFF sb antenna arinc input
```

**Figure 4-13 HSD-440 Mark 2 Terminal MPU Reports**

**(7) Activating Maintenance Reports**

To automatically generate report 23 (standard output) in Level 1 menu access, press the EQUAL SIGN. The report data output is repeated on the computer display at one-second intervals.

Level 2 maintenance access provides more flexibility in the use of the reports function. This access level permits the activation or deactivation of any one of the reports (toggle on and off).

**(a) Reports General Guidelines**

- To open the report menu, press EQUAL SIGN.
- To activate a report, type the number of the report needed, and then press ENTER. This toggles on the report number entered. To toggle the report off, type the report number again, and then press ENTER.
- To disable all reports (toggles all reports off), press X.
- To display the next group of reports, press CTRL+N.
- To save all selected reports to EEPROM, press S. 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.
- To start the scrolling report display, press ESC (in Level 2 access only). To return to the menu selection screen, press ESC again.

**(b) Report Descriptions**

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

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1. Reports 23 and 94

Report 23 is the most comprehensive report, giving a general impression of the HSD-440 Mark 2 Terminal health. An example of the contents of report 23 is shown in Figure 4-14. Table 4-17 provides an example and a brief description of the parameters. Each distinct parameter is numbered for description purposes.

The output of report 23 scrolls continuously on screen and disrupts other items on screen. Report 94 provides identical information that does not disrupt other items on screen.

```
18:42:31 dop **** az 0.0 deg el 45.0 deg ant gain 12.0 (p/t)
CHAN #1: C/No=40.6 dB Hz sig=-42.4 dB 39.0 C no dial beam=255
CHAN #2: C/No=40.7 dB Hz sig=-41.4 dB 39.0 C no dial beam=255
CHAN #3: C/No= 0.0 dB Hz sig= 0.0 dB 38.0 C log off beam=0
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 39.0 C no call beam=0
44D0'0.3"N 74D51'8.8"W PT 0.0D RL 0.0D HD 83.9D TK 0.0D 0 knots *****
```

**Figure 4-14 Example Report 23 Output**

**Table 4-17 Report 23 Item Descriptions**

Report 23 Text	Description
18:42:31	Time based on the system real time clock
dop ****	Doppler frequency offset; increases with velocity (see note below)
az 0.0 deg	Antenna azimuth pointing to the satellite, with respect to the nose of the aircraft
el 45.0 deg	Antenna elevation angle to the satellite, with respect to the horizontal position of the aircraft
ant gain 12.0 (p/t)	Reported antenna gain for the selected antenna: starboard (sbd) or port (p/t)
CHAN #1:	Indicates the channel card for which results 14 to 17 relate
C/No=40.6 dB Hz	RF input Carrier-to-Noise (C/No) level; typically 50.0 to 55.0
sig=-42.4 dB	RF input signal level; not to exceed 0 when in-call Note: The signal level for channels 1, 2, 3,4, and 5 may be different.
39.0 C	HSD-440 Mark 2 Terminal internal LRU temperature Note: Operating the terminal above 55C is not recommended.
no dial	System call status
beam=255	Satellite beam on which the card is registered
44D0'0.3"N 74D51'8.8"W	IRS lat/long as interpreted by the HSD-440 Mark 2 Terminal
PT 0.0D	Aircraft pitch angle, where UP is positive
RL 0.0D	Aircraft roll angle, where clockwise is positive

**Table 4-17 Report 23 Item Descriptions (Continued)**

Report 23 Text	Description
HD 83.9D	Aircraft true heading; where the nose of the aircraft is pointing, based on yaw offset
TK 0.0D	Aircraft true track; direction the aircraft is flying—not necessarily the direction it is pointing (see note below)
0 knots	Aircraft velocity

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

2. Reports 5 and 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, maintenance access users.

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

```
5 WHICH GAN CHANNEL (1,2,B,X) ?
```

**Figure 4-15 Prompt to Select Channel for Report Generation**

The options are:

- 1 for channel 1
- 2 for channel 2
- B for both channels
- X to deselect all channels

In report 17 for channel card 2, you can select channel 3, channel 4, both channels, or deselect all channels.

**NOTE:** Depending on the version of software installed and the user's selection of reports, the MPU reports displayed may differ from those shown in the example in Figure 4-16.

```
CHAN #3: C/No= 0.0 dB Hz sig= 0.0 dB log off beam=0 bt=OK oc=NA
tx          0 Hz burst 0 38.0 C int=8080
```

**Figure 4-16 Example of Report 17, Channel Card 2, Channel 3**

3. Reports 8 and 20

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

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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 reports displayed may differ from those shown in the example in Figure 4-17.

```
port status $608033 SDI: ACU SSM: NORMAL gain=12.0
OMNIDIRECTIONAL MODE open loop tracking port/top active HGA LNA=on
```

**Figure 4-17 Example of Report 20**

Table 4-18 shows descriptions of the items in reports 8 and 20.

**Table 4-18 Reports 8 and 20 Item Descriptions**

<b>Report 8 and 20</b>	<b>Starboard and Port Antenna Status</b>
(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 21

Report 21 displays the call code information for the HSD-440 Mark 2 Terminal.

Figure 4-18 shows an example of report 21. Table 4-19 describes the items in report 21.

```
23:48:36 #1 123ABC E4 start 400110 14.00 dBW CT SP ocean region registration
41.5 C 51 dB Hz
23:48:39 #1 123ABC E4 stop 8301 ACSE successful ORR 41.5 C 51 dB Hz
23:49:20 #2 456DEF E5 start 400110 14.00 dBW CT SP ocean region registration
41.5 C 52 dB Hz
23:49:24 #2 456DEF E5 stop 8306 ACSE failed retry ORR 41.5 C 51 dB Hz
23:49:27 #2 456DEF E5 start 400110 14.00 dBW CT SP ocean region registration
41.5 C 52 dB Hz
23:49:32 #2 456DEF E5 stop 8306 ACSE failed retry ORR 41.5 C 51 dB Hz
23:49:36 #2 456DEF E5 start 400110 14.00 dBW CT SP ocean region registration
41.5 C 51 dB Hz
23:49:40 #2 456DEF E5 stop 8301 ACSE successful ORR 41.5 C 52 dB Hz
```

**Figure 4-18 Example Report 21**

**Table 4-19 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.) -	OR and beam the card is logged on to
(Call) -	Call real-time status, service type code, and Inmarsat Cause Code (see Appendix H: Inmarsat Cause Codes on page H-1)
(RF power) -	LES/GES requested HPA power in dBW
(OR status) -	OR registration status
(Call orig)	Call originating from MES or from a fixed location
(Call type)	Call types (for example, speech)

**D. Inmarsat Cause Codes**

The fault definitions that appear in the HSD-440 Mark 2 Terminal maintenance menu logs are based directly on the cause code definitions provided by Inmarsat. Appendix H: Inmarsat Cause Codes on page H-1 defines the maintenance port menu fault codes of the HSD-440 Mark 2 Terminal.

**E. Operational and Diagnostic Test Procedures**

You can perform all test procedures presented in this section to test the total operational status of the HSD-440 Mark 2 Terminal. You can 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 HSD-440 Mark 2 Terminal MPU included in this section.

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

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**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 Product Support 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 HSD-440 Mark 2 Terminal. Maintenance does not imply lubrication or adjustment activities.

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

(1) 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-440 Mark 2 Terminal MPU, see "Terminal Maintenance Port Utility" on page 4-36

**Table 4-20 Test Setup Procedure**

<b>Step</b>	<b>Action</b>
1.0	Make sure that the HSD-440 Mark 2 Terminal is powered down and disconnected from the power source.
2.0	Connect a maintenance cable to the HSD-440 Mark 2 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.

(2) Post Test

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

**Table 4-21 Post Test Procedure**

<b>Step</b>	<b>Action</b>
1.0	Save the log file of the test results (or data) for future reference.
2.0	Remove power from the HSD-440 Mark 2 Terminal that was tested and from all other test equipment.
3.0	Disconnect test equipment from the HSD-440 Mark 2 Terminal.
4.0	Replace the maintenance-port connector cover (if it was removed during the test setup).

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(3) 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 HSD-440 Mark 2 Terminal Mechanical Verification**

<b>STEP</b>	<b>Item Checked</b>	<b>Verification Description</b>
1. 0	Mounting tray	Make sure that service/maintenance ports are accessible.
	Physical placement	Check that environmental characteristics and specifications are met, including cooling, air-flow, and pressure
2. 0	Fan tray	Confirm plug configuration is correct.
		Check chassis bonding.
		Make sure that fan rotation is unobstructed and rotates freely.
3. 0	ARINC 600 connector	Check polarized pins.

(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 HSD-440 Mark 2 Terminal.

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

**Table 4-23 HSD-440 Mark 2 Terminal Electrical Verification Checklist**

<b>STEP</b>	<b>Item Checked</b>	<b>Verification Description</b>
1.0	Power connections	28 V dc polarity or 115 V ac polarity
		Chassis ground @ BP8—resistance measurement



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**Table 4-23 HSD-440 Mark 2 Terminal Electrical Verification Checklist (Continued)**

<b>STEP</b>	<b>Item Checked</b>	<b>Verification Description</b>
2.0	Voltage levels	<u>CAUTION:</u> WHEN POWER IS APPLIED TO THE RACK, THE FAN ENERGIZES.  Check voltage levels: 28 V dc: between BP2 (positive) 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: Figure 3-9 and Figure 3-10
		ICAO ID: User specific address obtained from the aircraft registration
		WOW: optional
5.0	Ethernet 1 and 2	Wired or strapped to RJ45 distribution points Optional—other service may be preferred
6.0	ISDN 1	Wired or strapped to RJ45 distribution points Optional—other service may be preferred
7.0	CEPT-E1	Wired to CTU - optional
8.0	Remotes (optional but recommended)	Remote reset switch
		Maintenance port, remote access
		Power and fault indicators
9.0	RF coaxial	Rx input cable loss from DLNA J2 to HSD-440 Mark 2 Terminal at BP12
		Tx output cable loss from HSD-440 Mark 2 Terminal at MPC1 to DLNA J3
10.0	Multi-control and BITE from antenna subsystem	Antenna manufacturer and model Multi-Control loopbacks installed at TP3E and TP3F

(4) Configuration Parameters Verification

You can verify the system configuration parameters. For additional connection and access information, see "Connection Requirements" on page 4-37. Verify and document the parameters using the lists in "Installation Checklist" on page E-1.

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
**eNfusion® HSD-440 Mark 2 Terminal**

(a) Parameter Verification Procedure

- From Menu 3, press **H** (list SCM/CP ORT), and then press **1** (CP EEPROM ORT).

The ORT listing appears on the screen, as shown in Figure 4-19. Verify that the correct system configuration parameters are listed in the ORT.

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**eNfusion® HSD-440 Mark 2 Terminal**

```

0 lists SCM ORT -- 1 lists CP EEPROM ORT -- 2 lists CP ORT OPTIONS ?
CP EEPROM ORT: ID A8E09293    VERSION 30026

4-WIRE #1 NOISE LEVEL:    -50                SET BY MCDU
4-WIRE #1 SPEAKER LEVEL:  50                SET BY MAINT PORT
4-WIRE #1 MIC LEVEL:     70                SET BY MAINT PORT
4-WIRE #1 SIDETONE LEVEL: 50                SET BY MCDU
4-WIRE #2 NOISE LEVEL:    -50                SET BY MAINT PORT
4-WIRE #2 SPEAKER LEVEL:  50                SET BY MAINT PORT
4-WIRE #2 MIC LEVEL:     70                SET BY MAINT PORT
4-WIRE #2 SIDETONE LEVEL: 50                SET BY MAINT PORT
MCDU TYPE:                HONEYWELL NOT DEFAULT SET BY MAINT PORT
HSD SAL:                  307                SET BY MAINT PORT
LOG-ON/HANDOVER POLICY:   MANUAL NOT DEFAULT SET BY MAINT PORT
HIGH RATE R/T IN GLOBAL BEAM: DISABLED      SET BY MAINT PORT
RESPONSE TO LOG-ON INTERROGATION: DISABLED  SET BY MAINT PORT
CMU INPUTS SPEED SELECT:  LOW RATE          SET BY MAINT PORT
FORWARD ID:               123ABC NOT DEFAULT SET BY MAINT PORT
AIR/GROUND STATUS RESTRICTIONS: DISABLED    SET BY MAINT PORT
HSD (HPA) - ANTENNA LOSS: 2.5 dB           SET BY MAINT PORT

HIT 'H' for MORE

MAINT CMD EXECUTION IN AIR: DISABLED        SET BY MAINT PORT
TRANSMIT ON GROUND:       DISABLED          SET BY MAINT PORT
MCDU/WSCI #1 WIRED:       YES               SET BY MAINT PORT
MCDU/WSCI #2 WIRED:       YES               SET BY MAINT PORT
MCDU/WSCI #3 WIRED:       NO               SET BY MAINT PORT
CMU #1 WIRED:             YES               SET BY MAINT PORT
CMU #2 WIRED:             NO NOT DEFAULT    SET BY MAINT PORT
A/C GNSS EQUIPMENT:      GPS               SET BY MAINT PORT
PRIMARY IRS TYPE:         INERTIAL          SET BY MAINT PORT
SECONDARY IRS TYPE:       AES ID NOT DEFAULT SET BY MAINT PORT
CMC TYPE:                 BOEING           SET BY MAINT PORT
MCDU/WSCI CONTROLLER TYPE: MCDU           SET BY MAINT PORT
MCDU/WSCI INPUT SPEED:    LOW RATE         SET BY MAINT PORT
MCDU/WSCI OUTPUT SPEED:  LOW RATE NOT DEFAULT SET BY MAINT PORT
SECONDARY IRS INPUT SPEED SELECT: HIGH RATE SET BY MAINT PORT
COCKPIT CALL SIGNALLING MODE: CD1/CD2 DISCRETE NOT DEFAULT SET BY MAINT PORT
INSTALLED DIPLEXER TYPE:  TYPE F           SET BY MAINT PORT

HIT 'H' for MORE

ANTENNA TYPE:             ARINC 741 HGA, TOP MOUNT SET BY MAINT PORT
ALLOW MANUAL DIAL:       ENABLED           SET BY MAINT PORT
SELF-TEST IN AIR:        ENABLED NOT DEFAULT SET BY MAINT PORT
ANTENNA MOUNTING ROTATION ANGLE: 0.0 deg   SET BY MAINT PORT
ANTENNA MOUNTING PITCH ANGLE:    0.0 deg   SET BY MAINT PORT
ANTENNA MOUNTING ROLL ANGLE:     0.0 deg   SET BY MAINT PORT
CMU-SDU HARD CODED SAL:    NO NOT DEFAULT  SET BY MAINT PORT
MCDU PAST:                ENABLED          SET BY MAINT PORT
CMU-SDU JOIN/LEAVE WORD TRANSMISSION: PERIODIC SET BY MAINT PORT
NUMBER CG-710 INSTALLED:  0               SET BY MAINT PORT
NUMBER CR-710 INSTALLED:  0               SET BY MAINT PORT
CARD #1 SBB/S64 PRIORITY:  "SWIFTBROADBAND CLASS 6 REVERTING TO SWIFT64" SET BY MAINT PORT
SWIFTBROADBAND TIMING MODE: NOT ASSISTED    SET BY MAINT PORT
SW FIELD LOADABLE:       ENABLED NOT DEFAULT SET BY MAINT PORT
SERVICE TYPE PRIORITY:   PUBLIC CORRESPONDENCE SET BY MAINT PORT
CEPT E1 WIRED:         YES               SET BY MAINT PORT
CMC WIRED:               YES NOT DEFAULT  SET BY MAINT PORT

HIT 'H' for MORE

CMC MASK FAULT:          DISABLED          SET BY MAINT PORT
MASK POSITION IN LOGS:    DISABLED          SET BY MAINT PORT
ICAO CODE SOURCE:       STRAP             SET BY MAINT PORT
CMU OUTPUT SPEED SELECT: LOW RATE         SET BY MAINT PORT
POTS SERVICE:           ENABLED           SET BY MAINT PORT
CEPT E1 INTERFACE TYPE: ARINC 746       SET BY MAINT PORT
GROUND TO COCKPIT CALL ROUTING PREFERENCE: 4-WIRE #2 NOT DEFAULT SET BY MAINT PORT
GROUND PUBLIC ROUTING PREFERENCE: COCKPIT NOT DEFAULT SET BY MAINT PORT
4-WIRE #2 WIRED:        YES NOT DEFAULT  SET BY MAINT PORT
ETHERNET #1 WIRED:      NO NOT DEFAULT  SET BY MAINT PORT
ETHERNET #2 WIRED:      YES              SET BY MAINT PORT

```

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
**eNfusion® HSD-440 Mark 2 Terminal**

```

MCDU FONT COLOUR:      ENABLED NOT DEFAULT      SET BY MAINT PORT
COCKPIT OUTGOING CALL SIGNALING:  DISABLED      SET BY MAINT PORT
COCKPIT OUTGOING CALL PRE-SELECT:  ENABLED      SET BY MAINT PORT
PIMBIT AZIMUTH OFFSET ANGLES:      SET BY MAINT PORT
                                     HGA = 11.0 DEG NOT DEFAULT
                                     IGA = 15.0 DEG NOT DEFAULT
PIMBIT IGA ELEVATION ANGLES:      SET BY MAINT PORT
                                     ANGLE 1 = 18.0 DEG NOT DEFAULT
                                     ANGLE 2 = 12.5 DEG NOT DEFAULT

PIMBIT HGA ELEVATION ANGLES:      SET BY MAINT PORT
                                     ANGLE 1 = 27.6 DEG NOT DEFAULT
                                     ANGLE 2 = 12.5 DEG NOT DEFAULT

HIT 'H' for MORE

PIMBIT TEST CRITERIA:      SET BY MAINT PORT
                             MEASUREMENT DISCARD RATIO = 25.5% NOT DEFAULT
                             FAILURE THRESHOLD = 25.5 dB NOT DEFAULT
                             POINTING FAILURE THRESHOLD = 255 NOT DEFAULT

HIT 'H' for MORE

DIO BLOCK:  86 BYTES -- TYPE 1 CRC D3CD
de 8e 6a 67 00 50 de 96 e9 74 00 39 1c b6 5b b5      ..jg.P...t.9...[.
0c 8f 09 6e 1c d2 5b 2e de 92 88 f0 00 09 0c 96      ...n..[.....
e8 62 87 a2 fc f4 79 de ce eb 70 00 0e ac d3 2c      .b....y...p....,
29 c0 a8 00 05 9b d3 2c 30 00 a1 de 82 6d 30 00      ).....,0.....m0.
04 1c d2 69 6e de c3 0b e5 00 0b c7 86 3b ad 06      ...in.....;...
44 61 74 61 49 4f                                     DataIO

ETHERNET 1 ADDRESS 192.168.0.1
ETHERNET 1 MASK 255.255.255.0
ETHERNET 2 ADDRESS 0.0.0.0
ETHERNET 2 MASK 255.255.255.0
DHCP CLIENT DISABLED
HOST NAME DataIO
DHCP SERVER DISABLED
START OF MANAGED RANGE 192.168.0.100
SNMP SERVER ENABLED
SNMP COMMUNITY STRING public
NUMBER OF MANAGED ADDRESSES 50
TFTP SERVER DISABLED
ETHERNET DUPLEX MODE 0
TELNET ACCESS ENABLED
ALLOW SCPC SESSIONS TRUE
ALLOW MPDS SESSIONS TRUE
ALLOW BGAN SESSIONS TRUE
ACCESS CONCENTRATOR NAME DataIO
DEFAULT PPPOE SERVICE PacketData
ACCESS POINT NAME
AT WELCOME MESSAGE

HIT 'H' for MORE

VP BLOCK:  MISSING

TOOL VERSION = XXXX
TOOL NAME = EMBEDDED ORT TOOL
TOOL PART NUMBER = jaytool
SECURE ORT PART NUMBER = sss123
USER ORT PART NUMBER = uuu456
SATELLITE TABLE:
REGION 0:  AORW (W) 52.0W CLASSIC AERO SWIFT64
REGION 1:  AORE (E) 15.5W CLASSIC AERO SWIFT64
REGION 2:  POR (P) 178.0E CLASSIC AERO SWIFT64
REGION 3:  IOR (I) 64.0E CLASSIC AERO SWIFT64
REGION 4:  MTSAT (4) 142.5E CLASSIC AERO
REGION 5:  APAC (5) 143.5E CLASSIC AERO BGAN
REGION 6:  EMEA (6) 25.0E CLASSIC AERO BGAN
REGION 7:  AMERICAS (7) 98.0W CLASSIC AERO BGAN

```

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
**eNfusion® HSD-440 Mark 2 Terminal**

```

LES INFORMATION:
  AORW: LES 2   NETWORK ID 0   LES 2
  AORE: LES 2   NETWORK ID 0   NO NAME
  POR:  LES 2   NETWORK ID 0   NO NAME
  IOR:  LES 2   NETWORK ID 0   NO NAME

SATELLITE FREQUENCY TABLE:
REGION 0: GLOBAL BEAM FREQS: $FFFF,$FFFF AERO PSID FREQS: $3702,$6B8 NCS FREQS: $24EC,$4EC
REGION 1: GLOBAL BEAM FREQS: $FFFF,$FFFF AERO PSID FREQS: $36FE,$6B6 NCS FREQS: $2504,$B60
REGION 2: GLOBAL BEAM FREQS: $FFFF,$FFFF AERO PSID FREQS: $36B4,$700 NCS FREQS: $FFFF,$FFFF
REGION 3: GLOBAL BEAM FREQS: $FFFF,$FFFF AERO PSID FREQS: $36B2,$6FC NCS FREQS: $FFFF,$FFFF
REGION 4: GLOBAL BEAM FREQS: $FFFF,$FFFF AERO PSID FREQS: $38F7,$8F7 NCS FREQS: $FFFF,$FFFF
REGION 5: GLOBAL BEAM FREQS: $2AF2,$2A AERO PSID FREQS: $36DA,$6DA NCS FREQS: $FFFF,$FFFF REGION 6:
GLOBAL BEAM FREQS: $2BA0,$9E AERO PSID FREQS: $36DE,$6DE NCS FREQS: $FFFF,$FFFF
REGION 7: GLOBAL BEAM FREQS: $2A4C,$4 AERO PSID FREQS: $36DC,$6DC NCS FREQS: $FFFF,$FFFF

HIT 'H' for MORE

GES PRIORITY TABLE:
ENTRY #1 AORW Aussaguel (GES 5) PRIORITY 5
ENTRY #2 AORW Eik (GES 2) PRIORITY 5
ENTRY #3 AORE Aussaguel (GES 103) PRIORITY 5
ENTRY #4 AORE Eik (GES 104) PRIORITY 5
ENTRY #5 POR Perth (GES 205) PRIORITY 5
ENTRY #6 POR Santa Paula (GES 202) PRIORITY 5
ENTRY #7 IOR Perth (GES 305) PRIORITY 5
ENTRY #8 IOR Eik (GES 301) PRIORITY 5
ENTRY #9 APAC Hawaii (GES 120) PRIORITY 5
ENTRY #10 EMEA Fucino (GES 220) PRIORITY 5
ENTRY #11 AMERICAS Hawaii (GES 320) PRIORITY 5
ENTRY #12 MTSAT Kobe (GES 161) PRIORITY 5

PHONE BOOK CATEGORY 1 (CATEGORY01):
 95 AAAAB 0016135919208 OP-LO
 96 JJJJJ 666666 OP-LO
 97 CCCC 5555 OP-LO
 98 QQQQQ 55555555 NON-OP
 99 ALPHATEXT 999999 OP-LO
100 DDDDD 99999 OP-LO

PHONE BOOK CATEGORY 2 (CATEGORY02):
 91 HHHHH 22222 OP-LO
 92 KKKKK 11111 OP-LO
 94 BBBA 22222 OP-LO
 95 CCCC 9999 OP-LO
 96 AAAAB 11111 OP-LO
 97 LLLLL 33333 OP-LO
 98 AAAAA 22222 OP-LO
 99 AAAA 66666 OP-LO
100 01-NUM IN CAT2 0116135601122 OP-HI

PHONE BOOK CATEGORY 3 (CATEGORY03):
 96 BBBB 88888 OP-LO
 97 AAAAC 2222 OP-LO
 98 BBBBA 22222 OP-LO
 99 AAAAA 22222 OP-LO
100 01-NUM IN CAT3 0116135601123 OP-LO

PHONE BOOK CATEGORY 4 (CATEGORY04):
 95 AAAAAB 77777 OP-LO
 96 CCCCC 11114 OP-LO
 97 AAAAC 33333 OP-LO
 99 AAAA 5555 OP-LO
100 01-NUM IN CAT4 0116135601124 NON-OP

DONE

```

**Figure 4-19 HSD-440 Mark 2 Terminal ORT Display Example**

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
**eNfusion® HSD-440 Mark 2 Terminal**

(5) System Power-up Checks

NOTE: Before proceeding, make sure 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. Make sure 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 HSD-440 Mark 2 Terminal front panel and on the optional remote panel.

To visually verify LEDs:

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 HSD-440 Mark 2 Terminal, and verify the initial power-up screen displays, as shown in Figure 4-20.

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KERNEL V1.7 -- Wed Mar 24 13:09:23 2010  
TESTING RAM .....RAM OK.

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HSD APPLICATION V22.006 -- Wed Apr 07 10:01:30 2010

CMC INTERFACE: SUPPORTED                      WSC INTERFACE: SUPPORTED

VALIDATING DETECTOR CALIBRATION TABLES.... OK  
VALIDATING ATTENUATOR CALIBRATION TABLE AT \$608000.... OK  
RAM RUN-TIME DATABASE

OCEAN REGION	SAT	LONG	LES	ID	TNID	SERVICES
**W AORW	(region #0)	54.0W	2	0	0	SW64/AERO
**E AORE	(region #1)	15.0W	2	0	0	SW64/AERO
**P POR	(region #2)	178.5E	2	0	0	SW64/AERO
**I IOR	(region #3)	64.5E	2	0	0	SW64/AERO
**4 MTSAT	(region #4)	142.5E				AERO
**5 APAC	(region #5)	144.0E				AERO/SBB
**6 EMEA	(region #6)	25.5E				AERO/SBB
**7 AMERICAS	(region #7)	97.5W				AERO/SBB

\*\* LONGITUDE UPDATED FROM AERO BULLETIN BOARDS

REAL TIME CLOCK PRESENT: 12:50:18 Wed Jan 2, 2001  
FORWARD ID TABLE -- VERSION 1

CHANNEL #1 FORWARD ID 442BF5  
4.7 SECONDS: STAND-ALONE MODE

FIRMWARE VERSIONS:  
KERNEL: V1.7 -- Wed Mar 24 13:09:23 2010  
APPLICATION: V22.006 -- Wed Apr 07 10:01:30 2010  
CHANNEL CARD #1: 4.9.G.0 -- 1.0.2.0 -- 2.1.0.0 -- 4.2.3.0  
CHANNEL CARD #2: 31.5.0.1 --  
DATA I/O CARD: Version 1.87.0.0 built on Mar 16 2010 12:15:16  
VOICE PROCESSOR: Version 1.2.3.DEV built on Mar 31 2010 at 23:27:20  
VP BOOT LOADER: Version 1.2.1 built on Wednesday October 21 2009 at 14:04:24  
SPOTBEAM TABLE: PROVIDED BY SATELLITE

CHANNEL CARD STATISTICS  
CARD #1 BGAN 6X (SERIAL 6203):  
3036.1 hrs powered 266.6 hrs in call since 10:40:26 Feb 12, 2009  
CARD #2 CLASSIC AERO (SERIAL 36500):  
2635.1 hrs powered 1507.3 hrs in call since 10:17:37 Feb 27, 2001

BGAN INTERFACE                      IMEI                      SVN                      IMSI  
CARD #1                      12345678912345                      01                      987654321123456  
CHECKING FLASHPROM CONFIGURATION .....

HARDWARE:  
PART NUMBER                      REVISION  
EMS: 1252-A-3800-01                      A01

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
**eNfusion® HSD-440 Mark 2 Terminal**

```
SOFTWARE:
PART NUMBER      REVISION
EMS:  LI-1252-38015  XXX

BOOT CRC:  5249CAFF
APP. CRC:  A3A3D6B7
CC #1 CRC:  CBA1
CC #2 CRC:  9F4E

SECURE ORT:  sss123          ** MODIFIED **
USER ORT:  uuu456          ** MODIFIED **

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

time 21.5 seconds: powering on channel card 2
time 23.1 seconds: powering on channel card 1
```

**Figure 4-20 HSD-440 Mark 2 Terminal Power-Up Display Example**

(6) System On-Air Checks

Conduct system on-air checks to confirm voice and data call capabilities through the satellite and ground station 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-sight to the satellite.
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 HSD-440 Mark 2 Terminal maintenance port.

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

(b) On-Air Power up and Logon Procedure

For this test procedure, use the Level 2 password to access the HSD-440 Mark 2 Terminal MPU. For information on how to connect to, access, and use the HSD-440 Mark 2 Terminal MPU, see "Connection Requirements" on page 4-37.

To perform an on-air power up and logon:

1. With the computer connected, powered up, and ready to accept maintenance port data, power up the HSD-440 Mark 2 Terminal.
2. Once the power up messages appear, type the Level 2 password **maint**.



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3. To access the reports menu, press EQUAL SIGN, and then activate reports 21 (call codes) and 23 (standard output).

Remember to save these selected items by pressing S (save to EEPROM).

4. To reset the HSD-440 Mark 2 Terminal, in Menu 2, press Z, and then immediately type the password **maint** when the reset messages appear.

The data from the previously selected reports 21 and 23 appears. This data refreshes on-screen every second. You can capture this information in a log file for later review or pause the display by pressing SCROLL LOCK or highlighting part of the viewed data.

5. Compare the output data to the sample shown in Figure 4-21.

You can review and document several parameters for operational verification purposes. Refer to "Installation Checklist" on page E-1 for a detailed list of parameters.

6. Verify that the following system information, as shown on the System Initialization Display during the test, is accurate for the HSD-440 Mark 2 Terminal under test.

- FWD ID
- Installation mode
- Number of channel cards
- All channel cards trigger OR registration

(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

To place an on-air voice or data call:

1. Make sure that the maintenance port reports 21 and 23 are activated.
2. Place a test call.
3. Observe the maintenance port messages, and verify that they are similar to the sample provided in Figure 4-21.

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```

45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:39 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No=51.4 dB Hz sig=-31.4 dB 41.5 C no call beam=4
CHAN #2: C/No=51.5 dB Hz sig=-32.6 dB 41.5 C no call beam=5
CHAN #3: C/No=48.9 dB Hz sig=-26.1 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:40 #1 ABC123 E4 start 800124 14.00 dBW mobile aero 64k speech 41.5 C 52 dB Hz
17:12:40 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No=51.5 dB Hz sig=-32.2 dB 41.5 C speech beam=4
CHAN #2: C/No=51.6 dB Hz sig=-32.9 dB 41.5 C no call beam=5
CHAN #3: C/No=49.3 dB Hz sig=-26.2 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:42 #1 ABC123 E4 start 800124 22.50 dBW mobile aero 64k speech 41.5 C 52 dB Hz
17:12:42 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No= 0.0 dB Hz sig=-1000 dB 41.5 C speech beam=4
CHAN #2: C/No=51.6 dB Hz sig=-33.7 dB 41.5 C no call beam=5
CHAN #3: C/No=49.3 dB Hz sig=-26.2 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:44 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No= 0.0 dB Hz sig=-19.6 dB 41.5 C speech beam=4
CHAN #2: C/No=51.6 dB Hz sig=-32.7 dB 41.5 C no call beam=5
CHAN #3: C/No=48.9 dB Hz sig=-25.8 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:49 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No=62.2 dB Hz sig=-19.9 dB 41.5 C speech beam=4
CHAN #2: C/No=51.8 dB Hz sig=-32.6 dB 41.5 C no call beam=5
CHAN #3: C/No=48.9 dB Hz sig=-25.9 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:51 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No=61.8 dB Hz sig=-19.8 dB 41.5 C speech beam=4
CHAN #2: C/No=51.7 dB Hz sig=-32.9 dB 41.5 C no call beam=5
CHAN #3: C/No=48.9 dB Hz sig=-25.9 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
17:12:52 #1 ABC123 E4 stop 1001 call cleared by MES terminal 41.5 C 0 dB Hz
17:12:52 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (sbd)
CHAN #1: C/No= 0.0 dB Hz sig=-1000 dB 41.5 C no call beam=4
CHAN #2: C/No=51.8 dB Hz sig=-32.6 dB 41.5 C no call beam=5
CHAN #3: C/No=48.8 dB Hz sig=-26.1 dB 40.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 40.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft

```

**Figure 4-21 HSD-440 Mark 2 Terminal Call Display Example**

**(7) Antenna Tracking Checks**

As a final ground-based system check, verify the antenna tracking. This confirms proper signal reception and transmission for all aircraft headings.

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(a) Preparation

- Perform all previous tests and document the results before proceeding.
- As directed in previous tests, connect a computer to the maintenance port and use the Level 2 password to access the HSD-440 Mark 2 Terminal MPU.
- Power up all avionics and align the IRS.
- Taxi or tow the aircraft to an unobstructed, line-of-sight location where a complete 360° rotation is possible.

(b) Antenna Tracking Verification Procedure

To verify antenna tracking:

NOTE: Report 8 (starboard antenna status word) is only required where conformal antennas are installed.

1. From the reports menu, toggle on reports **8**, **20**, and **23**.
2. Position the aircraft at a baseline, start-of-test heading (0 degrees true heading is recommended).
3. Confirm that the baseline heading, as reported by the aircraft IRS, is similar to that reported from the "HD" entry in report 23.
4. Record the following data on the "Installation Checklist" on page E-1:
  - Antenna selected—port or starboard (conformal only)
  - Antenna gain and azimuth angle
  - Heading
  - Channel card C/No and signal levels
5. Rotate the aircraft through a full 360° circle while stopping to record data at the following heading intervals:
  - For conformal or phased arrays: every 15°
  - For mechanically steered antenna: every 30°

(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 reports 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 a figure 8 pattern. Note any voice or data anomalies.

- Voice/data calls—in flight:  
Place any combination of voice and/or data calls during flight. The flight pattern may include "standard rate of turn," figure 8, or circles. Note any voice or data anomalies.

## **2. Troubleshooting and Fault Isolation**

This section provides troubleshooting procedures for HSD-440 Mark 2 Terminals experiencing faults during the commissioning process or previously operational terminals now considered as not working.

Troubleshooting procedures require data obtained using the MPU of the HSD-440 Mark 2 Terminals. For specific instructions on how to access and use the maintenance port and MPU, refer to "Connection Requirements" on page 4-37.

### **A. Troubleshooting Practices**

Troubleshooting practices for the HSD-440 Mark 2 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 4–60. 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 the troubleshooting procedures provided in this section.

#### **(2) Specific Complaints**

When troubleshooting terminals with specific complaints, you can proceed directly to the applicable troubleshooting and fault isolation procedure provided in this section.

### **B. Equipment Required**

The 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 4-35.

### **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 illustrative purposes.

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(1) Fault Isolation Screen Displays

Figure 4-22 to Figure 4-31 provide example maintenance screens for reference and illustration purposes.

```
time 8.6 seconds: powering on channel card #2
card is already on
SENDING FIRST OC_RESTART COMMAND
time 22.1 seconds CHAN #2 CONTROL PROCESSOR TRIGGERING ORR IN AORE!!
SENDING FIRST OC_RESTART COMMAND
time 22.5 seconds CHAN #1 CONTROL PROCESSOR TRIGGERING ORR IN AORE!!
10:45:14 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration
32.0 C 54 dB Hz
10:45:15 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration
32.0 C 55 dB Hz
10:45:18 #2 ABC456 E5 stop 8301 ACSE successful ORR 32.0 C 54 dB Hz
10:45:19 #1 ABC123 E5 stop 8306 ACSE successful ORR 32.0 C 54 dB Hz
```

**Figure 4-22 Successful OR Registration (report 21 activated)**

```
10:45:14 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration
32.0 C 54 dB Hz
10:45:15 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration
32.0 C 55 dB Hz
10:45:18 #2 ABC456 E5 stop 8301 ACSE failed retry ORR 32.0 C 54 dB Hz
10:45:19 #1 ABC123 E5 stop 8306 ACSE failed retry ORR 32.0 C 54 dB Hz
```

**Figure 4-23 Failed OR Registration**

```
15:14:08 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (p/t)
CHAN #1: C/No=51.8 dB Hz sig=-32.2 dB 42.5 C no call beam=4
CHAN #2: C/No=51.5 dB Hz sig=-32.6 dB 42.5 C no call beam=4
CHAN #3: C/No=48.9 dB Hz sig=-24.2 dB 41.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 41.5 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
```

**Figure 4-24 No Call (report 23)**

```
15:15:04 #1 442BF5 E4 start 800124 14.00 dBW mobile aero 64k speech 42.5 C 52 dB Hz
15:15:03 dop 0 ppb az 112.2 deg el 12.2 deg AORE ant gain 12.0 (p/t)
CHAN #1: C/No=51.8 dB Hz sig=-32.6 dB 42.5 C speech beam=4
CHAN #2: C/No=51.6 dB Hz sig=-33.4 dB 42.5 C no call beam=4
CHAN #3: C/No=48.9 dB Hz sig=-24.5 dB 41.0 C log on beam=4
CHAN #4: C/No= 0.0 dB Hz sig= -0.0 dB 41.0 C no call beam=4
45D0'0.0"N 75D0'0.2"W PT 0.0D RL 0.0D HD 0.0D TK 0.0D 0 knots 0 ft
```

**Figure 4-25 In Call—Swift 64 Voice Call on Channel 1 (reports 21 and 23)**



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```
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
G    clear call log

<CTRL> N next menu                    <CTRL> O previous menu      = select reports
HPA ERROR CODE 1800

hit '0' for complete log   '1' for 'special' events   '-' for specific entry

FAULT (ENTRY #1428):  address ABC123: 30 seconds after powerup
powerup #204 389 hours operation Jan 01 14:19:39 2006
ERROR CODE 40
HPA FAULT -- 0x1800
HPA MAINTENANCE WORD NOT REPORTING HGA ANTENNA
HPA STATUS WORD NOT REPORTING HGA ANTENNA

Continuous Power Requests From LES, Report 21 activated:

10:51:26 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration 30 C
C 54 dB/Hz
10:51:26 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration 29 C
C 54 dB/Hz
10:51:27 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration 30 C
10:51:27 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration 29 C
10:51:27 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration 29
C 0 dB/Hz
10:51:27 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration 30
C 0 dB/Hz
10:51:29 #1 ABC123 E5 start 400110 14.00 dBW CT SP ocean region registration 29
C 54 dB/Hz
10:51:29 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration 30
C 54 dB/Hz
10:51:29 #2 ABC456 E5 start 400110 14.00 dBW CT SP ocean region registration 30 C
```

**Figure 4-28 No Strap on SDI Lines, Open (no reports activated)**

**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
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```
Log-on password entered: "Maint"

      MENU 1                                FIRMWARE Vx.x

X      override forward id                  L      test LEDs
Y      explain error status                 U      list event log (hex)
F      print equipment stats                M      clear equipment stats
<CTRL> N next menu          <CTRL> O previous menu      = select reports
HPA UNCONTROLLED

Y command entered:

HPA MAINTENANCE WORD REPORTING ARINC ERROR
HPA MAINTENANCE WORD NOT REPORTING HGA ANTENNA
HPA STATUS WORD REPORTING INVALID SSM 1 (NO COMPUTED DATA)
HPA STATUS WORD NOT REPORTING HGA ANTENNA

Event log messages:

      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

FAULT (ENTRY #1422):  address ABC123: 30 seconds after powerup
powerup #203 389 hours operation Jun 03 11:15:07 2003
ERROR CODE 40
HPA FAULT -- 0x1c80
HPA MAINTENANCE WORD REPORTING ARINC ERROR
HPA MAINTENANCE WORD NOT REPORTING HGA ANTENNA
HPA STATUS WORD REPORTING INVALID SSM 1 (NO COMPUTED DATA)
HPA STATUS WORD NOT REPORTING HGA ANTENNA
```

**Figure 4-29 Wrong Strap on SDI Lines (TP5A to GND)**

```
11:47:43 #2 ABC456 E4 stop 8301 ACSE successful ORR 30 C 50 dB/Hz
11:47:46 #1 ABC123 E5 stop 8301 ACSE successful ORR 28 C 50 dB/Hz
11:47:55 #1 ABC123 E5 start 800124 14.00 dBW mobile aero 64k speech 29 C 47 dB/Hz
11:47:57 #1 ABC123 E5 start 800124 22.50 dBW mobile aero 64k speech 28 C 47 dB/Hz
calling 0116135919064#
11:48:10 #1 ABC123 E5 stop 11d2 call failed, insufficient digits in service address
28 C 0
calling 0116135919064#
```

**Figure 4-30 Incorrect Dialing Format (report 52 enabled)**



**SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE MANUAL**  
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```
OMNIDIRECTIONAL MODE open loop tracking port/top active HGA LNA on
port maintenance 0x00600003
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port status: 0x608033 SDI: ACU SSM: NORMAL OPERATION gain: 12
OMNIDIRECTIONAL MODE open loop tracking port/top active HGA LNA on
port maintenance 0x00600003
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
port ant: status 608033 SDI=ACU gain 12 maint 600003 SDI=ACU
```

**Figure 4-31 Top/Port Antenna Status (reports 18, 19, and 20 activated)**

(2) Troubleshooting Table

Table 4-24 provides troubleshooting procedures for basic HSD-440 Mark 2 Terminal faults. Before starting a troubleshooting procedure, access the HSD-440 Mark 2 Terminal MPU using the **maint** password. For detailed connection and user instructions, see "Connection Requirements" on page 4-37.

**Table 4-24 Troubleshooting and Fault Isolation**

<b>Fault</b>	<b>Description</b>	<b>Maintenance Report</b>	<b>Check</b>
Red LED remains on after power-up	<ul style="list-style-type: none"> <li>• HPA uncontrolled</li> <li>• HPA fault</li> </ul>	View power-up display of the MPU	<ul style="list-style-type: none"> <li>• Verify that the multicontrol, loopback is wired (out to in).</li> </ul>
HPA error status	<ul style="list-style-type: none"> <li>• reporting invalid SSM</li> <li>• HPA not reporting status word 143</li> <li>• HPA not reporting maintenance word 350</li> <li>• HPA maintenance word reporting ARINC error</li> <li>• HPA maintenance word not reporting HGA antenna</li> <li>• HPA maintenance word reporting VSWR error</li> <li>• HPA maintenance word reporting RAM error</li> <li>• HPA reporting ROM error</li> <li>• HPA maintenance word reporting power supply error</li> <li>• HPA maintenance word reporting temperature error</li> </ul>	To obtain an explanation of the HPA error status, in Menu 1, press Y	<ul style="list-style-type: none"> <li>• Check that the external power source is properly connected and meets installation requirements.</li> <li>• Check that the transmit path from HSD-440 Mark 2 Terminal output (MPC1) to the antenna subsystem (e.g., coaxial cables, splitters, and relays).</li> <li>• Check that the installation location meets the RTCA/DO-160E environmental specifications.</li> <li>• Check for proper fan-tray operation and air-cooling.</li> <li>• Verify the fan-tray plug distribution is as per the installation requirements.</li> </ul>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

<b>Fault</b>	<b>Description</b>	<b>Maintenance Report</b>	<b>Check</b>
Call failure	IRS information not available	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check that the IRS systems are powered on and aligned.</li> <li>• Check that connections to the IRS systems are secured.</li> <li>• Check the polarity of IRS input lines.</li> <li>• 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.</li> </ul>
	System does not log on to the global beam	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check that the IRS data is received and valid.</li> <li>• Make sure that a valid FWD ID is read.</li> <li>• Verify that the antenna is pointing in the correct direction.</li> <li>• Make sure that LES/GES access codes are configured correctly.</li> <li>• Verify all coaxial connections.</li> </ul>
	System does not log on to the correct OR	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check that the IRS data is received and valid.</li> <li>• Check for antenna line-of-sight interference.</li> </ul>
	Terminal is not transmitting	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check for a defective or loose RF cable.</li> <li>• Verify that the Rx RF level is acceptable.</li> <li>• Check RF power level displayed in maintenance port menu report 21; the EIRP should be requested at 14.00 dBW, but when in call, power level should increase to 22.5 dBW and then level off to approximately 16 dBW.</li> <li>• Make sure that the HSD-440 Mark 2 Terminal is secured properly to the ARINC connector in the tray.</li> </ul>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

Fault	Description	Maintenance Report	Check
Call failure (cont'd)	ICAO is invalid or strapped incorrectly	<p>Activate maintenance report 21</p> <p>To check ICAO, in Menu 4, press Q</p>	<ul style="list-style-type: none"> <li>• The account registration process has not been completed. Check your account status with your service provider to make sure that the account registration has been processed into the LES/GES databases and your account is valid.</li> <li>• If the message, <b>Channel card stuck in boot state</b> appears in the event log, check that the assigned ICAO is strapped correctly.</li> </ul>
	Terminal is strapped to an incorrect system mode of installation	In Menu 3, press L (List EEPROM)	<ul style="list-style-type: none"> <li>• Verify the system mode strapping is correct.</li> <li>• Reset the system and observe the initialization display; it shows that the HSD-440 Mark 2 Terminal is powering up and displays the terminal's self-test results. The Initialization display lists the installation mode configuration for the terminal.</li> <li>• If the mode displayed is not strapped or is incorrectly strapped, a temporary setting may be used. In Menu 3, press M (misc. EEPROM parameters), then type <b>16</b> (channel card category) and configure the HSD-440 Mark 2 Terminal to the correct mode. Reset the terminal and try the call again.</li> </ul>
	SBB IMSI not registered		<ul style="list-style-type: none"> <li>• Call service provider</li> </ul>
	Dialing sequence was incomplete or incorrect	Activate reports 21 and 52	<ul style="list-style-type: none"> <li>• Verify the number you are calling and try the number again.</li> <li>• Make sure that you end the dialing sequence by pressing POUND KEY. Pressing POUND KEY at the end of the dialing string signals the system to send the call.</li> </ul>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

Fault	Description	Maintenance Report	Check
Logon request fails	Terminal is not transmitting	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check for defective or loose cables.</li> <li>• Check for antenna line-of-sight interference.</li> <li>• Check for HPA fault.</li> <li>• Make sure that the HSD-440 Mark 2 Terminal is secured properly to the ARINC connector in the tray.</li> <li>• Make sure that your account is current and active.</li> </ul>
	Terminal is not receiving	Activate maintenance reports 21 and 23	<ul style="list-style-type: none"> <li>• Check for defective or loose cables.</li> <li>• Make sure that the antenna subsystem DLNA is powered.</li> <li>• Check for antenna line-of-sight interference.</li> <li>• Verify that the ICAO is valid, activated, and strapped correctly.</li> <li>• Make sure that your account is current and active.</li> <li>• Make sure that the HSD-440 Mark 2 Terminal is secured properly to the ARINC connector in the tray.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Check the connection between the HSD-440 Mark 2 Terminal and the external device.</li> <li>• Check configuration of external devices is correct. MSN must be configured correctly for each device connected to the system.</li> <li>• If MSNs are not programmed in the user devices, incoming calls will ring all devices.</li> </ul> <p><b>NOTE:</b> Zero is an invalid entry.</p>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

Fault	Description	Maintenance Report	Check
Logon successful, but fails to complete call	Authorization error (fault code 12C4)	Activate reports 21 and 23	<ul style="list-style-type: none"> <li>• Contact your service provider to verify that the ICAO, FWD ID, and IMSI are activated.</li> <li>• Check that the ICAO is strapped correctly.</li> <li>• Check that IRS data is available and correct.</li> <li>• Check that the Veh Rel Az/EL to Satellite is correct.</li> <li>• Check that all coaxial cable connections are secure.</li> <li>• Check that the Rx C/No value is greater than 50 dB/Hz.</li> <li>• Check that the antenna is functioning.</li> <li>• Check that the primary and secondary LES/GES access codes are valid.</li> <li>• Contact your service provider and verify that they can "see" your Tx signal. To contact the LES/GES operator, dial 33, POUND KEY.</li> <li>• Contact service provider and request that they place an incoming call to the terminal.</li> <li>• Check the reported HPA back-off in report 21. The S64 signal should initialize at 14 dBW and increase after handshake to approximately 22.5 dBW, then slowly decrease (typically to between 16.5 dBW and 21.5 dBW with a lower limit of 14.5 dBW).</li> </ul>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

<b>Fault</b>	<b>Description</b>	<b>Maintenance Report</b>	<b>Check</b>
HSD-440 Mark 2 Terminal is operating outside the normal environmental specifications	Channel card temperature fault	Activate report 21 or 23	<ul style="list-style-type: none"> <li>• Check channel card temperature; temperatures over 50° C may cause the HSD-440 Mark 2 Terminal to shut down.</li> <li>• Check that the fan tray is operational.</li> <li>• Verify that the tray plug distribution is the same as presented in the installation requirements.</li> </ul>
Calls do not complete and connection is not established	Channel Congestion (fault code 2024) Note: applies to Swift 64 only.	Activate reports 21 and 23	<ul style="list-style-type: none"> <li>• Wait five minutes and try the call again.</li> <li>• Contact the LES/GES to verify congestion. To contact the LES/GES operator, dial 33, POUND KEY.</li> </ul>
	No call request sent	Activate report 52	<ul style="list-style-type: none"> <li>• Verify that the call dial string is correct; pressing POUND KEY at the end of the dialing string signals the system to send the call.</li> <li>• Check that the HSD-440 Mark 2 Terminal is transmitting by ensuring the LED power indicator flashes on and off (1 Hz) during a call request.</li> <li>• Check that the ISDN, Ethernet, or POTS cable is connected correctly and securely.</li> </ul>
No dial tone heard in handset		Activate report 21	<ul style="list-style-type: none"> <li>• Confirm that ISDN lines are wired correctly.</li> <li>• Verify that handset connection is secure.</li> <li>• Wait a few minutes for the system to warm up, then log on and try your call again.</li> <li>• Check that IRS data is available.</li> <li>• Verify that the terminal has completed beam registration.</li> </ul>

**Table 4-24 Troubleshooting and Fault Isolation (Continued)**

Fault	Description	Maintenance Report	Check
Call drops after successful connection	<p>If the RF signal fades significantly (during a call), the connection may drop.</p> <p><u>NOTE:</u> A sudden, severe aircraft banking angle may obstruct the signal long enough (&gt;15 sec.) to drop a call.</p>	Activate reports 21 and 23	<ul style="list-style-type: none"> <li>• Check signal strength. For Swift 64, C/No greater than or equal to 53.2 dB.</li> <li>• Make sure that there is a clear, unobstructed, line of sight to the satellite.</li> <li>• Select an alternate satellite or beam and try your call again.</li> </ul> <p><u>NOTE:</u> This troubleshooting procedure works if you are located where more than one beam overlaps or satellite is in view.</p>

**D. Fault Isolation and Diagnostic Procedures**

This section provides basic information required for technical personnel to isolate faults in HSD-440 Mark 2 Terminals. Where needed, refer to other sections of this manual (which contain important information to aid in understanding the function 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

CAUTION: BEFORE PROCEEDING WITH FAULT ISOLATION PROCEDURES, REFER TO THE "SAFETY ADVISORIES" ON PAGE INTRO-6.

(1) General

When performing fault isolation and diagnostic procedures, record and document all test results, including LED functions and maintenance port data outputs (reports 21 and 23).

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

(2) Saving a Diagnostic Reports File

Maintenance reports are helpful in troubleshooting the HSD-440 Mark 2 Terminal. Capturing maintenance port information from the HSD-440 Mark 2 Terminal and forwarding the file to Honeywell technical support staff will assist in troubleshooting suspected HSD-440 Mark 2 Terminal problems.



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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.
4. To activate reports 21 and 23 and toggle off all other reports, press EQUAL SIGN.
5. To save these reports as default, press **S**. This enables the user to view these reports on subsequent HSD-440 Mark 2 Terminal power-ups or Reset entries.
6. Reset the system by cycling the power to the terminal; pressing the reset button on the HSD-440 Mark 2 Terminal front panel; or, in Menu 2, pressing **Z**.

NOTE: The HSD-440 Mark 2 Terminal must be logged on to the Aero H+ service.

7. Log on to the maintenance port using the password: **maint**  
The system restarts and ocean registration takes place (approximately two minutes).
8. To display Menu 2, press CTRL+N.
9. To display the software versions of the system, press **V**.
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 a dial tone? Was the call successful?
11. If applicable, attempt calls from the remaining three channels.
12. To display the current reports profile of the system (as noted in step 4), press EQUAL SIGN.
13. To save an alternate reports configuration, activate the required items, and then, to save to EEPROM, press **S** in the reports menu.
14. To display the ORT List, press CTRL+N until Menu 3 appears, and then press **O**. (The ORT list displays one terminal screen of information at a time. To display the next screen, press **O**.)
15. To list the complete event log, in Menu 3:
  - press **S** (list event log)
  - press **0** (list complete log)
  - press PERIOD (list all remaining entries)
16. To list the complete call log, in Menu 3:
  - press **F** (list call log)
  - press **F** again (list complete log)
  - press PERIOD (list all remaining entries)
  - for extended information, press **X**
17. Close the log file on the terminal program.

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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 ID and customer name
- Any notes about the problems encountered
- Contact name, telephone number, and e-mail address
- Any system anomalies or unique operating environments that may in any way affect the system's function (e.g., physical location of aircraft or terminal, LES being used, list of connected devices)

19. Save the file with the date of the report in the file name.

20. E-mail the log file to Honeywell technical support.

### **3. Adjustment/Alignment Procedures**

There are no adjustment/alignment procedures required for HSD-440 Mark 2 Terminals.

### **4. Modification History**

The HSD-440 Mark 2 Terminal currently has no history of modifications.

## MAINTENANCE AND REPAIR

This section provides maintenance and repair information for the HSD-440 Mark 2 Terminal, including the following sections:

- Maintenance
- Repair
- Instructions for Continued Airworthiness

### 1. Maintenance

The HSD-440 Mark 2 Terminal does not require routine maintenance.

### 2. 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.

HSD-440 Mark 2 Terminals that require service must be returned to Honeywell or to an Honeywell-approved service center. Refer to "Test and Fault Isolation" on page 4-35 for terminal testing requirements and procedures.

#### B. Repair Procedures

This equipment does not require any special repair procedures.

#### C. Battery Replacement

The internal battery of the HSD-440 terminal cannot be replaced in the field. The unit must be returned to factory to have the internal battery replaced.

#### D. Removal Procedures

If an HSD-440 Mark 2 Terminal must be removed from service for repair, remove power, disconnect all equipment from the terminal and then remove it from the ARINC tray. Remove the SCM from the terminal before returning the terminal for repair. You can insert the SCM into the repaired terminal before installing it in the aircraft.

#### E. Repair Facility Approvals

EMS Aviation, located at 400 Maple Grove Road in Ottawa, Ontario, Canada, is a Transport Canada Approved Maintenance Organization (AMO). In accordance with the Technical Arrangement on Maintenance between Canada and the European aviation authority JAA, and due to the Bilateral Agreement between Canada and the United States aviation authority FAA, EMS Aviation conforms to the maintenance requirements of JAR 145 and FAR 145 respectively.

#### **F. Return for Repair Information**

Contact Honeywell International about return for repair instructions.

### **3. Instructions for Continued Airworthiness**

This section presents the instructions for continued airworthiness, as per FAR 25.1529, of the HSD-440 Mark 2 Terminal.

Installation of the HSD-440 Mark 2 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.

The following paragraphs describe all maintenance requirements and instructions for continued airworthiness of the HSD-440 Mark 2 Terminal.

- 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.
- HSD-440 Mark 2 Terminals are considered on-condition units. No additional or routine maintenance is required.
- If an HSD-440 Mark 2 Terminal is not operating, 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).
- HSD-440 Mark 2 Terminals can not be repaired in the field. 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 4-35. 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.

## CONFIGURING THE OWNERS REQUIREMENTS TABLE (ORT)

There are two methods of configuring ORT parameters:

- Configuring ORT Parameters Using the MPU
- Configuring ORT Parameters Using the EMS ORT Application

When your computer is connected to the HSD-440 Mark 2 Terminal through the serial maintenance connection, you can set ORT parameters one at a time.

Using the EMS ORT Application, you can edit various ORT parameters in one session, save and export an ORT file, and then load the file into the HSD-440 Mark 2 Terminal.

### 1. Configuring ORT Parameters Using the MPU

For information on creating ORTs using the MPU , see "Creating ORTs with the Maintenance Port Utility (MPU)" on page 2-4.

This section lists the parameters you can configure in both the secure partition and the user partition of the ORT. See the individual procedure for more information.

You can use the MPU to configure the secure parameters described in Table 6-1:

**Table 6-1 Configuring Secure ORT Parameters**

Category	Section
ORT Part Number	Configuring the ORT Part Number (secure)
Cockpit Communications	Configuring the Call Signaling Mode
	Configuring Outgoing Call Signaling
	Configuring Ground Public Routing
4-wire	Configuring 4-wire Wiring
	Configuring Ground-to-Cockpit Call Routing
	Configuring 4-wire Parameters
POTS	Configuring POTS Parameters
CEPT-E1	Configuring CEPT-E1 Interface
	Configuring the CEPT-E1 Interface Type
High Speed Data Services	Configuring the Default PPPoE Service
	Configuring SCPC High Speed Service
	Configuring MPDS High Speed Service
	Configuring SBB High Speed Service
Ethernet	Configuring Ethernet Wiring
	Configuring Ethernet Duplex Mode
	Configuring the Ethernet Port Address
	Configuring the Ethernet Mask

**Table 6-1 Configuring Secure ORT Parameters (Continued)**

<b>Category</b>	<b>Section</b>
Networking Parameters for Ethernet 1 and Ethernet 2	Configuring the Host Name
	Configuring the Access Concentrator Name
	Configuring the SNMP Server
	Configuring the SNMP Community String
	Configuring the TFTP Server
	Configuring the DHCP Client
	Configuring the DHCP Server
	Configuring Telnet Access
	Configuring the Managed Range
	Configuring the Number of Managed Addresses
	Configuring the Access Point Name
Avionics	Configuring the Primary Inertial Reference System (IRS)
	Configuring the Secondary IRS
	Configuring the Secondary IRS Input Speed
	Configuring GNSS Equipment
	Configuring the ICAO Code Source
Satellite Service	Configuring the Forward ID
	Configuring Satellite Information
	Configuring GES Service Provider Information
	Configuring the Frequency Table
	Configuring LES Service Provider Information
	Configuring the SwiftBroadband Timing Mode
	Configuring the Priority Service for Channel Card One
	Configuring the Service Type Priority
Antenna	Configuring the Antenna Type
	Configuring the Antenna Mounting Rotation Angle
	Configuring the Antenna Mounting Pitch Angle
	Configuring the Antenna Mounting Roll Angle
	Configuring the HPA to Antenna Loss
	Configuring the Diplexer

**Table 6-1 Configuring Secure ORT Parameters (Continued)**

<b>Category</b>	<b>Section</b>
MCDU	Configuring MCDU Wiring
	Configuring the MCDU Input Speed
	Configuring the MCDU Output Speed
	Configuring the MCDU Controller Type
	Configuring the MCDU Type
	Configuring the MCDU Font Colour
	Configuring Manual Dialing
	Configuring Outgoing Call Pre-Selection
	Configuring the Address Book Categories
CMU	Configuring CMU Wiring
	Configuring the CMU Input Speed
	Configuring the CMU Output Speed
	Configuring the CMU-SDU Join/Leave Word
	Configuring Hardcoded SAL
Terminal Operation	Configuring Air/Ground Status Restrictions
	Configuring Transmit on Ground
	Configuring Self-test in Air
	Configuring Maintenance Command Execution in Air
	Configuring MCDU PAST
	Configuring Field Loadable Software
	Configuring the Logon/Handover Policy
	Configuring Logon Interrogation
	Configuring High-rate R/T in Global Beam
	Masking Position in Logs
	Configuring HSD SAL
Passive Intermodulation (PIM)	Configuring PIMBIT HGA Azimuth Offset Angle
	Configuring PIMBIT IGA Azimuth Offset Angle
	Configuring PIMBIT IGA Elevation Offset Angle1
	Configuring PIMBIT IGA Elevation Offset Angle2
	Configuring PIMBIT HGA Elevation Offset Angle1
	Configuring PIMBIT HGA Elevation Offset Angle2
	Configuring PIMBIT Measurement Discard Ratio
	Configuring PIMBIT Failure Threshold
	Configuring PIMBIT Pointing Failure Threshold

You can use the MPU to configure the user parameters described in Table 6-2:

**Table 6-2 User ORT Parameters**

Category	User ORT Parameter
User Parameters	Configuring the ORT Part Number (user)
	Configuring the Service Type Priority
	Configuring the Logon/Handover Policy
	Configuring Logon Interrogation
	Configuring High-rate R/T in Global Beam
	Masking Position in Logs

**A. Connecting to the MPU**

You can configure ORT parameters manually or using the EMS ORT Application through the HSD-440 terminal MPU.

To connect to the MPU:

1. Connect your computer to the maintenance port of the HSD-440 Mark 2 Terminal with a maintenance cable.
2. Start a terminal emulator session with the following parameters:
  - Baud rate—19200
  - No. of bits—8
  - Parity—None
  - Stop bits—1
  - Flow control—None
3. When the HSD-440 Mark 2 Terminal boots, type the password **maint**.

NOTE: The password does not appear on the screen.

NOTE: You can configure secure and user ORT parameters using maintenance-level access. The user-level access password, **user**, allows you to see all the ORT parameters but you can only configure the user-level parameters.

Menu 1 of the MPU appears. You can navigate the menus to configure ORT parameters.

4. To navigate to **Menu 3**, press CTRL + N.
5. In Menu 3, type the number next to **set CP ORT parameter**, and then press ENTER.  
A list of ORT parameters appears.

**B. Configuring the ORT Part Number**

You can configure a part number for the secure and user ORT. The HSD-440 Mark 2 Terminal displays the part number when it boots up.



When you configure the parameter for the part number, the HSD-440 Mark 2 Terminal calculates a CRC value for the overall ORT. The HSD-440 Mark 2 Terminal uses the CRC value to indicate when the ORT has changed.

To configure the secure ORT part number or the user ORT part number:

1. In the list of ORT parameters, type the number next to the **SECURE ORT P/N** parameter, or the **USER ORT P/N** parameter, and then press ENTER.
2. At the **SECURE ORT P/N** or the **USER ORT P/N** prompt, type in the part number, and then press ENTER.

You can type up to 20 characters. The default is blank.

### **C. Configuring Cockpit Communication Parameters**

#### **(1) Configuring the Call Signaling Mode**

The HSD-440 Mark 2 Terminal can announce an incoming call in the aircraft cabin with a chime and light of ARINC 741—the default setting, or with the CD1/CD2 discretes. The call signaling parameter is in the secure ORT.

To configure the call signaling mode:

1. In the list of ORT parameters, type the number next to the **COCKPIT CALL SIGNALING MODE** parameter, and then press ENTER.
2. To use chime and light signaling, type **0**, or to use CD1/CD2 discrete signaling, type **1**, and then press ENTER.

The default is CHIME/LIGHT.

#### **(2) Configuring Outgoing Call Signaling**

The HSD-440 Mark 2 Terminal can signal an outgoing call with a chime and a flashing light. The outgoing call signaling parameter enables and disables these signals. This parameter is in the secure ORT.

To configure outgoing call signaling:

1. In the list of ORT parameters, type the number next to the **COCKPIT OUTGOING CALL SIGNALING** parameter, and then press ENTER.
2. To announce outgoing air to ground calls with a chime and light, type **1**, or to disable the chime and light, type **0**, and then press ENTER.

The default is DISABLED.

#### **(3) Configuring Ground Public Routing**

The HSD-440 Mark 2 Terminal can route public calls from the ground to the cockpit, to the CEPT-E1 interface, or not route the call (disallowed). The ground public routing preference parameter is in the secure ORT.

To configure ground public routing preferences:

1. In the list of ORT parameters, type the number next to the **GROUND PUBLIC ROUTING PREFERENCE** parameter, and then press ENTER.
2. To disallow all incoming public calls, type **1**, or to route public calls to the cockpit, type **2**, or to route public calls to the CEPT-E1, type **3**, and then press ENTER.

The default is DISALLOWED.

#### D. Configuring 4-wire Parameters

##### (1) Configuring 4-wire Wiring

The 4-wire #2 wired ORT parameter defines whether the second 4-wire equipment is installed. The 4-wire #2 wired parameter is in the secure ORT.

**NOTE:** If the '4-WIRE #2 WIRED' ORT parameter is set to NO then the GROUND TO COCKPIT ROUTING PREF parameter is automatically set to 4-WIRE #1.

To configure 4-wire #2 wiring:

1. In the list of ORT parameters, type the number next to the **4-Wire #2 Wired** parameter, and then press ENTER.
2. To set the preference to NO, type **0**, or to set the preference to YES, type **1**, and then press ENTER.

The default is NO.

##### (2) Configuring Ground-to-Cockpit Call Routing

The HSD-440 Mark 2 Terminal can route calls from the ground to the cockpit through either of the two supported 4-wire phones. The call routing parameter is in the secure ORT.

To configure ground-to-cockpit call routing:

1. In the list of ORT parameters, type the number next to the **GROUND TO COCKPIT CALL ROUTING PREF** parameter, and then press ENTER.
2. To route the calls to 4-WIRE #1, type **1**, or to route the calls to 4-WIRE #2 (if wired) type **2**, and then press ENTER.

The default is 4-WIRE #1.

##### (3) Configuring 4-wire Parameters

You can configure the noise, speaker, microphone, and sidetone level settings of the 4-wire phones. These 4-wire parameters are in the user ORT.

**NOTE:** To configure the 4-wire #2 parameters, repeat the following four procedures.

To configure the 4-wire noise level:

1. In the list of ORT parameters, type the number next to the **4-WIRE #1 NOISE LEVEL** parameter, and then press ENTER.
2. At the prompt, define the default setting for the 4-wire #1 comfort noise insertion level by typing one of the following values: 0, -40, -50, or -60, and then press ENTER.

The default level is -50.

To configure the 4-wire speaker level:

1. In the list of ORT parameters, type the number next to the **4-WIRE #1 SPEAKER LEVEL** parameter, and then press ENTER.
2. At the prompt, define the 4-wire #1 speaker volume, by typing a value between 0 and 100, and then press ENTER.

The default level is 50, which equals a 2.5 mW output.

To configure the 4-wire microphone level:

1. In the list of ORT parameters, type the number next to the **4-WIRE #1 MIC LEVEL** parameter, and then press ENTER.
2. At the prompt, type in a value between 1 and 100, and then press ENTER.

The default level is 70.

To configure the 4-wire sidetone level:

1. In the list of ORT parameters, type the number next to the **4-WIRE #1 SIDETONE LEVEL** parameter, and then press ENTER.
2. At the prompt, define the default setting for the 4-wire #1 sidetone level by typing a value between 1 and 100, and then press ENTER.

The default level is 50.

## **E. Configuring POTS Parameters**

### **(1) Configuring POTS**

You can enable and disable POTS with the POTS service parameter. The POTS service parameter is in the secure ORT.

To configure POTS:

1. In the list of ORT parameters, type the number next to the **POTS SERVICE** parameter, and then press ENTER.
2. To enable POTS, type **1**, or to disable POTS, type **0**, and then press ENTER.

The default is ENABLED.

## **F. Configuring CEPT-E1 Parameters**

You can enable the CEPT-E1 interface with the MPU.

(1) Configuring CEPT-E1 Interface

The CEPT-E1 wiring parameter indicates whether the CEPT-E1 interface is wired. The CEPT-E1 wiring parameter is in the secure ORT.

To configure CEPT-E1 wiring:

1. In the list of ORT interface parameters, type the number next to the **CEPT E1 WIRED** parameter, and then press ENTER.
2. To indicate the CEPT-E1 interface is wired, type **1**, or to indicate the CEPT-E1 interface is not wired, type **0**, and then press ENTER.

The default is YES.

(2) Configuring the CEPT-E1 Interface Type

The CEPT-E1 interface can connect to a variety of equipment. The available options are:

- Not installed
- ARINC 746
- ITU

The CEPT-E1 interface type parameter is in the secure ORT.

To configure the CEPT-E1 interface type:

1. In the list of ORT parameters, type the number next to the **CEPT E1 INTERFACE TYPE** parameter, and then press ENTER.
2. To indicate that the CEPT-E1 interface type is not installed, type **0**, or to indicate the CEPT-E1 interface type is ARINC 746, type **1**, or to indicate the CEPT-E1 interface type is ITU, type **2**, and then press ENTER.

The default is ARINC 746.

## G. Configuring High Speed Data Services

(1) Configuring the Default PPPoE Service

The HSD-440 Mark 2 Terminal can use a default PPPoE service name if the client does not provide the service name. The default PPPoE service parameter is in the secure ORT.

To configure the default PPPoE service:

1. In the list of ORT parameters, type the number next to the **DEFAULT PPPOE SERVICE** parameter, and then press ENTER.
2. Type a default service name, up to 60-characters in length, and then press ENTER.

The default PPPoE service name is PacketData.

(2) Configuring SCPC High Speed Service

The HSD-440 Mark 2 Terminal can provide access to Swift 64 SCPC service through Ethernet. The parameter to allow SCPC sessions is in the secure ORT.

To configure SCPC high speed service:

1. In the list of ORT parameters, type the number next to the **ALLOW SCPC SESSIONS** parameter, and then press ENTER.
2. To enable SCPC services, type **1**, or to disable SCPC services, type **0**, and then press ENTER.

The default is YES.

(3) Configuring MPDS High Speed Service

The HSD-440 Mark 2 Terminal can provide access to Swift 64 MPDS service through Ethernet. The parameter to allow MPDS sessions is in the secure ORT.

To configure MPDS high speed service:

1. In the list of ORT parameters, type the number next to the **ALLOW MPDS SESSIONS** parameter, and then press ENTER.
2. To enable MPDS high speed service, type **1**, or to disable MPDS high speed service, type **0**, and then press ENTER.

The default is YES.

(4) Configuring SBB High Speed Service

The HSD-440 Mark 2 Terminal can provide access to SBB service through Ethernet. The parameter to allow SBB sessions is in the secure ORT.

To configure SBB high speed service:

1. In the list of ORT parameters, type the number next to the **ALLOW BGAN SESSIONS** parameter, and then press ENTER.
2. To enable SBB high speed service, type **1**, or to disable SBB high speed service, type **0**, and then press ENTER.

The default is YES.

## H. Configuring Ethernet Parameters

(1) Configuring Ethernet Wiring

The HSD-440 Mark 2 Terminal uses the parameters for Ethernet #1 and #2 wiring in conjunction with the Ethernet link status to determine whether to raise and transmit Ethernet faults to the CMU. If the Ethernet wiring parameters are set to NO, the parameters for the Ethernet address and Ethernet mask have no effect.

The Ethernet wiring parameter is in the secure ORT.

To configure Ethernet wiring:

1. In the list of ORT parameters, type the number next to the **ETHERNET #1 WIRED** parameter, and then press ENTER.
2. To specify that a device is wired to the Ethernet #1 port, type **1**, or to specify that no device is wired to the Ethernet #1 port, type **0**, and then press ENTER.

The default is YES, wired.

3. Repeat steps 1 and 2 to configure the **ETHERNET #2 WIRED** parameter.

(2) Configuring Ethernet Duplex Mode

You can define the duplex mode for the Ethernet ports. The available options are:

- ETH1=HALF Duplex, ETH2=HALF Duplex
- ETH1=FULL Duplex, ETH2=HALF Duplex
- ETH1=HALF Duplex, ETH2=FULL Duplex
- ETH1=FULL Duplex, ETH2=FULL Duplex

The parameter for the Ethernet duplex mode is in the secure ORT.

To configure Ethernet duplex mode:

1. In the list of ORT parameters, type the number next to the **ETHERNET DUPLEX MODE** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, **2**, or **3**, and then press ENTER, where:
  - 0—half duplex for both ports
  - 1—full duplex mode for Ethernet 1 only
  - 2—full duplex mode for Ethernet 2 only
  - 3—full duplex mode for both Ethernet 1 and Ethernet 2

The default is 0.

A message similar to the following appears:

PROCEEDING TO STORE DATA

(3) Configuring the Ethernet Port Address

You can configure the base IP address for each of the two Ethernet ports. The parameters that define the Ethernet port addresses are in the secure ORT.

To configure the Ethernet port addresses:

1. In the list of ORT parameters, type the number next to the **ETHERNET 1 ADDRESS** parameter, and then press ENTER.
2. Type an IP address using decimals ranging from 0-255, in the format xxx.xxx.xxx.xxx, and then press ENTER.

The default address for Ethernet 1 is 192.168.0.1. The default address for Ethernet 2 is 0.0.0.0.

(4) Configuring the Ethernet Mask

You can configure the network mask for each of the two Ethernet ports. The parameters that define the Ethernet port network masks are in the secure ORT.

To configure the Ethernet port masks:

1. In the list of ORT parameters, type the number next to the **ETHERNET 1 MASK** parameter.
2. Type an IP address using decimals ranging from 0-255, in the format xxx.xxx.xxx.xxx, and then press ENTER.

The default subnet mask for both Ethernet ports is 255.255.255.0.

## I. Configuring Networking Parameters For Ethernet 1 and Ethernet 2

### (1) Configuring the Host Name

You can configure the host name for the HSD-440 terminal with a string of up to 20 characters. The parameter for the host name is in the secure ORT.

To configure the host name:

1. In the list of ORT parameters, type the number next to the **HOST NAME** parameter, and then press ENTER.
2. At the prompt, type the host name for the HSD-440 terminal using a maximum of up to 20 characters, and then press ENTER.

The default is DataIO.

### (2) Configuring the Access Concentrator Name

The HSD-440 Mark 2 Terminal uses the access concentrator name parameter to differentiate between PPPoE devices. The access concentrator name can include up to 20 characters. The access concentrator name parameter is in the secure ORT.

To configure the access concentrator name:

1. In the list of ORT parameters, type the number next to the **ACCESS CONCENTRATOR NAME** parameter, and then press ENTER.
2. At the prompt, type a name of up to 20 characters, and then press ENTER.

A message indicating that the DATA I/O parameter block is updated appears.

The default is DataIO.

### (3) Configuring the SNMP Server

The SNMP server parameter enables and disables the SNMP server. This parameter is in the secure ORT.

To enable the SNMP server:

1. In the list of ORT parameters, type the number next to the **SNMP SERVER** parameter, and then press ENTER.
2. At the prompt, type the number next to the enabled or disabled option, and then press ENTER.

The default is ENABLED.

### (4) Configuring the SNMP Community String

You can define an SNMP community string with up to 32 characters. This parameter is in the secure ORT.

To configure the SNMP community string:

1. In the list of ORT parameters, type the number next to the **SNMP COMMUNITY STRING** parameter, and then press ENTER.
2. At the prompt, type a name up to 32 characters in length, and then press ENTER.

The default is PUBLIC.

(5) Configuring the TFTP Server

You can enable and disable the TFTP server. The TFTP server parameter is in the secure ORT.

To configure the TFTP server:

1. In the list of ORT parameters, type the number next to the **TFTP SERVER** parameter, and then press ENTER.
2. To enable the TFTP server, at the prompt, type **yes**, or to disable the TFTP server, type **no**, and then press ENTER.

The default is ENABLED.

(6) Configuring the DHCP Client

You can enable and disable the DHCP client on Ethernet port one. The DHCP client parameter is in the secure ORT.

To configure the DHCP client:

1. In the list of ORT parameters, type the number next to the **ENABLE DHCP CLIENT** parameter, and then press ENTER.
2. To enable the DHCP client, at the prompt, type **yes**, or to disable the DHCP client, type **no**, and then press ENTER.

The default is DISABLED.

(7) Configuring the DHCP Server

You can enable and disable the DHCP server on Ethernet port one. The DHCP server parameter is in the secure ORT.

To configure the DHCP server:

1. In the list of ORT parameters, type the number next to the **ENABLE DHCP SERVER** parameter, and then press ENTER.
2. To enable the DHCP server, at the prompt, type **yes**, or to disable the DHCP server, type **no**, and then press ENTER.

The default is DISABLED.

(8) Configuring Telnet Access

You can enable and disable the Telnet server. The Telnet server parameter is in the secure ORT.

To configure Telnet access:

1. In the list of ORT parameters, type the number next to the **TELNET ACCESS** parameter, and then press ENTER.
2. To enable the Telnet server, at the prompt, type **yes**, or to disable the Telnet server, type **no**, and then press ENTER.

The default is ENABLED.

(9) Configuring the Managed Range

You can configure the starting IP address provided to DHCP clients if the DHCP server is enabled. The managed range parameter is in the secure ORT.



To configure the managed range:

1. In the list of ORT parameters, type the number next to the **START OF MANAGED RANGE** parameter, and then press ENTER.
2. At the prompt, type the starting address in the format xxx.xxx.xxx.xxx, and then press ENTER.

The default is 192.168.0.100.

#### (10) Configuring the Number of Managed Addresses

You can configure the number of managed addresses provided to DHCP clients if the DHCP server is enabled. The parameter for the number of managed addresses is in the secure ORT.

1. In the list of ORT parameters, type the number next to the **NUMBER OF MANAGED ADDRESSES** parameter, and then press ENTER.
2. At the prompt, type a value between 1 and 100, and then press ENTER.

The default value is 50.

#### (11) Configuring the Access Point Name

When configuring SBB services, you can configure the access point name in the secure ORT.

1. In the list of ORT parameters, type the number next to the **ACCESS POINT NAME** parameter, and then press ENTER.
2. At the prompt, type a name, and then press ENTER. An example name is stratos.bgan.inmarsat.com.

The default value is null.

### J. Configuring Avionics Parameters

#### (1) Configuring the Primary Inertial Reference System (IRS)

You can configure the type of equipment that provides input to the primary IRS (IRS #1). The available options are:

- Inertial—default
- GNSS
- Hybrid

The primary IRS parameter is in the secure ORT.

To configure the primary IRS type:

1. In the list of ORT parameters, type the number next to the **PRIMARY IRS TYPE** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, or **2**, and then press ENTER, where:
  - 0—INERTIAL (default)
  - 1—GNSS
  - 2—HYBRID

(2) Configuring the Secondary IRS

You can configure the type of equipment that provides input to the secondary IRS (IRS #2). The available options are:

- Not installed—default
- Inertial
- AES ID
- GNSS
- Hybrid

The secondary IRS parameter is in the secure ORT.

To configure the secondary IRS type:

1. In the list of ORT parameters, type the number next to the **SECONDARY IRS TYPE** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, **2**, **3**, or **4**, and then press ENTER, where:
  - 0—NOT INSTALLED (default)
  - 1—INERTIAL
  - 2—AES ID
  - 3—GNSS
  - 4—HYBRID

The default is Not Installed.

(3) Configuring the Secondary IRS Input Speed

You can set the receive data rate for the secondary IRS ARINC 429 bus. This parameter is in the secure ORT.

To set the secondary IRS input speed:

1. In the list of ORT parameters, type the number next to the **SECONDARY IRS INPUT SPEED SELECT** parameter, and then press ENTER.
2. To set the IRS ARINC 429 bus data receive speed rate to high rate, type **1**, or to set the bus speed to low rate, type **0**, and then press ENTER.

The default speed is high rate.

(4) Configuring GNSS Equipment

You can enable and disable the GPS protection algorithm depending on the GPS/GLONASS equipment installed in the aircraft. The available options are:

- None
- GPS—default
- GPS Augmented by GLONASS

The parameter for GNSS equipment is in the secure ORT.

To configure GNSS equipment:

1. In the list of ORT parameters, type the number next to the **A/C GNSS EQUIPMENT** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, or **2**, and then press ENTER, where:
  - 0—disables GPS protection on an aircraft that does not have GPS augmented by GLONASS navigation equipment installed
  - 1—enables GPS protection on an aircraft that has GPS navigation equipment installed
  - 2—enables GPS protection on an aircraft that has GPS augmented by GLONASS navigation equipment installed

The default is GPS.

(5) **Configuring the ICAO Code Source**

You can provide the ICAO code by strapping or from the ARINC 429 source. You can use the ARINC 429 source only if the Secondary IRS Type parameter is set to AES ID.

The ICAO code source parameter is in the secure ORT.

To configure the ICAO code source:

1. In the list of ORT parameters, type the number next to the **ICAO CODE SOURCE** parameter, and then press ENTER.
2. To configure A429 SOURCE as the source, type **1**, or to configure STRAP inertial as the source, type **0**, and then press ENTER.

The default is STRAP.

**K. Configuring Satellite Service ORT Parameters**

(1) **Configuring the Forward ID**

You can configure the six-digit hexadecimal Forward ID required for Swift 64 services. The Forward ID is in the secure ORT.

To configure the Forward ID:

1. In the list of ORT parameters, type the number next to the **FORWARD ID** parameter, and then press ENTER.
2. To define the forward ID, type the forward ID, then press ENTER.

The default forward ID is 000000—this forward ID does not allow access to the satellite network.

**NOTE:** Power cycle the HSD-440 Mark 2 Terminal to activate the new Forward ID.

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**eNfusion® HSD-440 Mark 2 Terminal**

(2) Configuring Satellite Information

You can configure the name, location, and service available from up to eight satellites. This does not allow access to the satellite network. Satellite information is in the secure ORT. The default settings are:

Entry #	Region	Satellite Name and Longitude	Services
1	0	AORW (W) 53.0W	CLASSIC AERO, SWIFT64
2	1	AORE (E) 15.5W	CLASSIC AERO, SWIFT64
3	2	POR (P), 178.0E	CLASSIC AERO, SWIFT64
4	3	IOR (I) 64.0E	CLASSIC AERO, SWIFT64
5	4	MTSAT (4) 142.5E	CLASSIC AERO
6	5	APAC (5), 144 E	CLASSIC AERO, BGAN
7	6	EMEA (6), 25.0E	CLASSIC AERO, BGAN
8	7	AMERICAS (7) 98.0 W	CLASSIC AERO, BGAN

To configure satellite information:

1. In the list of ORT parameters, type the number next to the **SATELLITE NAMES** parameter, and then press ENTER.
2. Type the number of the **ENTRY** you want to modify, and then press ENTER.  
A prompt appears. For example:  
EDITING ENTRY #1 REGION 0:  
NAME [AORW] ?
3. At the **NAME** prompt, type the satellite name and then press ENTER.
4. At the **ABBREVIATION** prompt, type an abbreviation for the satellite name and then press ENTER.
5. At the **LONGITUDE** prompt, type the longitude and then press ENTER.
6. At the **SATELLITE SERVICES** prompt, identify the service and then press ENTER. You can specify one or more of the following:
  - Type A for AERO
  - Type S for SWIFT64
  - Type B for SBB

NOTE: To specify more than one service, for example, classic AERO and Swift 64, type **AS**.
7. At the **SAVE ENTRY** prompt, to save the changes, type **Y**, or to cancel, type **N**.

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(3) Configuring GES Service Provider Information

You can configure the GES Name, satellite ID, GES ID, and priority for up to 33 GESs. GES information is in the secure ORT. Note the GES ID in the following table is an Octal number. The default settings are:

<b>GES Name</b>	<b>Satellite ID</b>	<b>GES ID</b>	<b>Priority</b>
Aussaguel	0	05	5
Eik	0	02	5
Aussaguel	1	103	5
Eik	1	104	5
Perth	2	205	5
Santa Paula	2	202	5
Perth	3	305	5
Eik	3	301	5
Hawaii	5	120	5
Fucino	6	220	5
Hawaii	7	320	5

To configure GES service provider information:

1. In the list of ORT parameters, type the number next to the **GES SERVICE PROVIDER TABLE** parameter, and then press ENTER.  
A prompt appears. For example:  
OTHER ENTRIES ARE EMPTY -- ENTER NUMBER OF ENTRY TO EDIT (1,33) ?
2. At the **ENTRY** prompt, type the entry number to add or edit and then press ENTER.
3. At the **SATELLITE** prompt, type the number of the satellite ID and then press ENTER.
4. At the **GES [octal]?** prompt, type the number (in Octal) of the GES ID and then press ENTER.
5. At the **PRIORITY** prompt, type a number between 1 and 10 and then press ENTER.
6. At the **GES NAME** prompt, type in the GES name and then press ENTER.
7. At the **SAVE ENTRY** prompt, to save the changes, type **Y**, or to cancel, type **N**.

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(4) Configuring the Frequency Table

The Frequency Table defines the Global Band (SBB) and PSID (Aero H/H+) frequencies for up to eight satellites. You can configure two or more frequency pairs and NCS (S64) for each service type. The Frequency Table is in the secure ORT. The default settings are:

Entry #	Region	Service Type Frequencies	Frequencies
1	0	AERO PSID FREQS: \$3702, \$36B8	NCS FREQS: \$2AAC,\$30E0
2	1	AERO PSID0 FREQS: \$36FE, \$36B6	NCS FREQS: \$2AB0,\$30E4
3	2	AERO PSID FREQS: \$36B4, \$3700	
4	3	AERO PSID FREQS: \$36B2, \$36FC	
5	4	AERO PSID FREQS: \$38F7, \$38F7	
6	5	Global Beam FREQS: \$2AF2, \$302A	AERO PSID FREQS: \$36DA, \$36DA
7	6	Global Beam FREQS: \$2BA0, \$309E	AERO PSID FREQS: \$36DE, \$36DE
8	7	Global Beam FREQS:\$2A4C, \$3004	AERO PSID FREQS: \$36DC,\$36DC

To configure the Frequency Table:

1. In the list of ORT parameters, type the number next to the **FREQUENCY TABLE** parameter, and then press ENTER.
2. Type the **ENTRY** number you want to edit and then press ENTER.
3. At the **SBB GLOBAL BEAM FREQS** prompt, type the frequency pair and then press ENTER.
4. At the **AERO PSID FREQS** prompt, type the frequency pair and then press ENTER.
5. At the **SWIFT64 NCS FREQS** prompt, type the frequency pair and then press ENTER.
6. At the **SAVE ENTRY** prompt, to save the changes, type **Y**, or to cancel, type **N**.

**NOTE:** You must enter a minimum of two frequency pairs per service type for each satellite up to a maximum of eight satellites. Frequency pairs are hexadecimal, with values separated by a comma, for example, \$3702, \$36B8.

(5) Configuring LES Service Provider Information

The LES Service Provider Table can hold LES parameters for up to eight satellites. The LES parameters are the satellite name and LES ID. The LES service provider information is in the secure ORT. The default settings are:

Entry #	Satellite	LES ID
1	AORW	LES 0
2	AORE	LES 0
3	POR	LES 0
4	IOR	LES 0
5	MTSAT	LES 0
6	APAC	LES 0
7	EMEA	LES 0
8	AMERICAS	LES 0

To configure LES service provider information:

1. In the list of ORT parameters, type the number next to the **LES SERVICE PROVIDER TABLE** parameter, and then press ENTER.
2. Type the **ENTRY** number you want to edit and then press ENTER.
3. At the **LES** prompt, type the LES number and then press ENTER.
4. At the **NETWORK ID** prompt, type the network ID and then press ENTER.
5. At the **LES NAME** prompt, type the LES name and then press ENTER.
6. At the **SAVE ENTRY** prompt, to save the changes, type **Y**, or to cancel, type **N**.

(6) Configuring the SwiftBroadband Timing Mode

The SBB timing mode determines the timing precision used by the Radio Access Network. The timing modes are: GPS Assisted, Not Assisted, and Auto Determination. The default setting is Not Assisted. The SBB timing mode is in the secure ORT.

To configure the SBB timing mode:

1. In the list of ORT parameters, type the number next to the **SWIFTBROADBAND TIMING MODE** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, or **2**, and then press ENTER, where:
  - 0—Not Assisted—default
  - 1—GPS Assisted
  - 2—Auto Determination

The auto determination state uses a lookup of the primary IRS type and secondary IRS type ORT parameters. If either specifies GNSS, or HYBRID type labels, the SwiftBroadband timing mode is GPS assisted. If GNSS, or HYBRID

is not specified, is not assisted. If the timing mode is not assisted, the HSD-440 Mark 2 Terminal is set as Aeronautical Class without GPS BGAN terminal.

(7) Configuring the Priority Service for Channel Card One

Channel card one can access SBB and Swift 64 services. You can assign the priority service with the following options:

- SWIFT64 ONLY
- SWIFTBROADBAND CLASS 6 REVERTING TO SWIFT64—default
- SWIFTBROADBAND CLASS 6 ONLY
- SWIFT64 REVERTING TO SWIFTBROADBAND CLASS 6

The priority service is in the secure ORT.

To configure the priority service for channel card one:

1. In the list of ORT parameters, type the number next to the **CARD #1 SBB/S64 PRIORITY** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, **2**, or **3** and then press ENTER, where:
  - 0—SWIFT64 only on CC1
  - 1—SWIFTBROADBAND CLASS 6 REVERTING TO SWIFT64
  - 2—SWIFTBROADBAND CLASS 6 ONLY
  - 3—SWIFT64 REVERTING TO SWIFTBROADBAND CLASS 6

The default priority service is SWIFTBROADBAND CLASS 6 REVERTING TO SWIFT64.

(8) Configuring the Service Type Priority

The service type priority parameter defines which service gets second priority for power when the requirements for priority three and above Aero H calls are satisfied. The service type priority parameter is in the secure ORT.

To configure the service type priority:

1. In the list of ORT parameters, type the number next to the **SERVICE TYPE PRIORITY** parameter, and then press ENTER.
2. To configure PUBLIC CORRESPONDENCE, type **0**, or to configure SBB/S64, type **1**, and then press ENTER.

The default is PUBLIC CORRESPONDENCE.

**L. Configuring Antenna ORT Parameters**

(1) Configuring the Antenna Type

The antenna type parameter defines the type of antenna installed on the aircraft. The available options are:

- ARINC 781 HGA
- ARINC 781 IGA
- ARINC 741 HGA, Top Mount—default



- ARINC 741 HGA, Side Mount

If a third MCDU is installed, the HSD-440 Mark 2 Terminal cannot use the side-mount antenna.

The antenna type parameter is in the secure ORT.

To configure the antenna type:

1. In the list of ORT parameters, type the number next to the **ANTENNA TYPE** parameter, and then press ENTER.
2. At the prompt, type **2**, **4**, or **5** and then press ENTER, where:
  - 2—ARINC 781 HGA
  - 4—ARINC 741 HGA, TOP MOUNT
  - 5—ARINC 741 HGA, SIDE MOUNT

The default is set to ARINC 741 HGA, TOP MOUNT.

(2) Configuring the Antenna Mounting Rotation Angle

The antenna mounting rotation angle defines the difference between the fore-aft axis of the antenna reference plane and the fore-aft axis of the aircraft. The rotation is measured counter-clockwise from the aircraft forward axis toward the antenna forward axis (or the port side).

The antenna mounting rotation angle parameter is in the secure ORT.

To configure the antenna mounting rotation angle:

1. In the list of ORT parameters, type the number next to the **ANTENNA MOUNTING ROTATION ANGLE** parameter, and then press ENTER.
2. Type a value between 0 and 360, to one decimal place, and then press ENTER.

The default is 0.0.

(3) Configuring the Antenna Mounting Pitch Angle

The antenna mounting pitch angle defines the difference between the fore-aft axis of the antenna reference plane and the fore-aft axis of the aircraft. The pitch is measured in the nose-up direction from the aircraft forward axis toward the antenna forward axis.

The antenna mounting pitch angle parameter is in the secure ORT.

To configure the antenna mounting pitch angle:

1. In the list of ORT parameters, type the number next to the **ANTENNA MOUNTING PITCH ANGLE** parameter, and then press ENTER.
2. Type a value between 0 and 360, to one decimal place, and then press ENTER.

The default is 0.0.

(4) Configuring the Antenna Mounting Roll Angle

The antenna mounting roll angle defines the difference between the port-starboard axis of the antenna reference plane and the port-starboard axis of the aircraft. The roll is measured in the starboard-up direction from the aircraft starboard axis toward the antenna starboard axis.

The antenna mounting roll angle parameter is in the secure ORT.

To configure the antenna mounting roll angle:

1. In the list of ORT parameters, type the number next to the **ANTENNA MOUNTING ROLL ANGLE** parameter, and then press ENTER.
2. Type a value between 0 and 360, to one decimal place, and then press ENTER.

The default is 0.0.

(5) Configuring the HPA to Antenna Loss

The HPA to antenna loss parameter defines the total loss (in dB) from the HSD-440 Mark 2 Terminal to the antenna input port, including the DLNA and DLNA to antenna cable losses. The HPA to antenna loss parameter is in the secure ORT.

To configure the HPA to antenna loss:

1. In the list of ORT parameters, type the number next to the **HSD (HPA)-ANTENNA LOSS** parameter, and then press ENTER.
2. Type a value between 0 and 5.0, to one decimal place, and then press ENTER.

The default is 2.5.

(6) Configuring the Diplexer

You can configure the type of diplexer installed in the aircraft. The available options are:

- Type A
- Type A Modified
- Type D
- Type F—default

Type F diplexers support SBB service.

The diplexer parameter is in the secure ORT.

To configure the diplexer:

1. In the list of ORT parameters, type the number next to the **INSTALLED DIPLEXER TYPE** parameter, and then press ENTER.
2. At the prompt, type **0**, **1**, **2**, or **3** and then press ENTER, where:
  - 0—diplexer TYPE A
  - 1—diplexer TYPE A MODIFIED
  - 2—diplexer TYPE D
  - 3—diplexer TYPE F

The default is TYPE A.

## M. Configuring MCDU ORT Parameters

### (1) Configuring MCDU Wiring

The MCDU wiring parameter defines whether the MCDU can be wired or not wired. There is a parameter for each of the devices. The MCDU wired parameters are in the secure partition of the ORT.

To configure the MCDU interface on the HSD-440 Mark 2 Terminal:

1. In the list of ORT parameters, type the number next to the **MCDU/WSCI #x WIRED** parameter, and then press ENTER.

The prompt: MCDU/WSCI #x WIRED where x equals 1 appears.

2. To indicate that the MCDU #1 device is wired, type **1**, or to indicate that it is not wired, type **0**, and then press ENTER.

The default for the MCDU/WSCI #1 WIRED parameter is Yes.

### (2) Configuring the MCDU Input Speed

You can configure the input bus speed to high or low. The input speed parameter is in the secure ORT.

To configure MCDU input speed:

1. In the list of ORT parameters, type the number next to the **MCDU/WSCI INPUT SPEED** parameter, and then press ENTER.
2. To set the input bus data speed to high rate, type **1**, or to set the bus speed to low rate, type **0**, and then press ENTER.

The default speed is low rate.

### (3) Configuring the MCDU Output Speed

You can configure the output bus speed to high or low. The output speed parameter is in the secure ORT.

To configure MCDU output speed:

1. In the list of ORT parameters, type the number next to the **MCDU/WSCI OUTPUT SPEED** parameter, and then press ENTER.
2. To set the output bus speed to high rate, type **1**, or to set the output bus speed to low, type **0**, and then press ENTER.

The default output speed is set to high rate.

### (4) Configuring the MCDU Controller Type

You can select the type of controller installed on the aircraft. The controller type parameter is in the secure ORT.

To configure the MCDU controller type:

1. In the list of ORT parameters, type the number next to the **MCDU/WSCI CONTROLLER TYPE** parameter, and then press ENTER.
2. To select the controller type MCDU, type **0**, and then press ENTER.

The default is MCDU.

(5) Configuring the MCDU Type

You can select the type of MCDU installed in the aircraft. The MCDU type parameter is in the secure partition of the ORT.

To configure the MCDU type:

1. In the list of ORT parameters, type the number next to the **MCDU TYPE** parameter, and then press ENTER.
2. At the prompt, type **1**, **2**, **3**, or **6** and then press ENTER, where:
  - 1—UNILINK
  - 2—SMITHS
  - 3—HONEYWELL
  - 6—BOEING TECHSAT SIM

The default is UNILINK.

(6) Configuring the MCDU Font Colour

You can change the color of text on the MCDU screen. The MCDU font colour parameter enables the MCDU to display colours other than white. The MCDU FONT COLOUR is in the secure partition of the ORT.

To configure the MCDU font colour:

1. In the list of ORT parameters, type the number next to the **MCDU FONT COLOUR** parameter, and then press ENTER.
2. To enable the MCDU font colour, type **1**, or to disable the MCDU font colour, type **0**, and then press ENTER.

The default is DISABLED.

(7) Configuring Manual Dialing

You can manually dial numbers using the MCDU keyboard. The manual dialing can be enabled or disabled. The ALLOW MANUAL DIAL parameter is in the secure partition of the ORT.

To configure manual dialing:

1. In the list of ORT parameters, type the number next to the **ALLOW MANUAL DIAL** parameter, and then press ENTER.
2. To enable manual dialing, type **1**, or to disable manual dialing, type **0**, and then press ENTER.

The default is ENABLED.

(8) Configuring Outgoing Call Pre-Selection

The COCKPIT OUTGOING CALL PRE-SELECT parameter enables users to pre-select air-to-ground calls and then dial the number using the Mic-On input or MAKE CALL button on the MCDU. When this parameter is disabled, the HSD-440 Mark 2 Terminal dials air-to-ground calls immediately.

To configure outgoing call pre-selection:

1. In the list of ORT parameters, type the number next to the **COCKPIT OUTGOING CALL PRE-SELECT** parameter, and then press ENTER.
2. To enable pre-selection, type **1**, or to disable pre-selection, type **0**, and then press ENTER.

The default is DISABLED.

(9) Configuring the Address Book Categories

The address book defines a table that can hold up to 400 telephone numbers in 4 categories of up to 100 entries. Each entry includes:

- A phone number (maximum of 18 digits).
- A name (maximum of 14 alphanumeric characters).
- A priority for the phone number. The priority can be EMG, OP-HI, OP-LO, and NON-OP, which correspond to priority (Q) numbers 15, 12, 10, and 9.
- A parameter to indicate whether the entry can be edited via the MCDU.
- A parameter to indicate the phone book category to which the entry belongs.

You can define up to four phone book categories in the MCDU address book. The category name can be up to ten characters in length. The category name parameters are in the secure partition of the ORT.

**NOTE:** If the ORT entry is empty, **CATEGORY #x** appears, where **x** is the number of the phone book category, between 1 and 4.

To configure the address book categories:

1. In the list of ORT parameters, type the number next to the **PHONEBOOK CAT NAME 1** parameter.
2. Type the category name and then press ENTER.
3. In the list of ORT parameters, type the number next to the **PHONEBOOK CAT NAME 2** parameter.
4. Type the category name and then press ENTER.
5. In the list of ORT parameters, type the number next to the **PHONEBOOK CAT NAME 3** parameter.
6. Type the category name and then press ENTER.
7. In the list of ORT parameters, type the number next to the **PHONEBOOK CAT NAME 4** parameter.

## N. Configuring the CMU

(1) Configuring CMU Wiring

You can configure if either of the two available CMUs is wired. The CMU #x WIRED parameter is in the secure partition of the ORT.

To configure the CMU wiring:

1. In the list of ORT parameters, type the number next to the **CMU #x WIRED** parameter, and then press ENTER.

The prompt: CMU #x WIRED? where x equals 1 or 2 appears.

2. To indicate that the **CMU #1** or **CMU #2** can be wired, type **1**, or to indicate that the **CMU #1** or **CMU #2** cannot be wired, type **0**, and then press ENTER.

The default for the CMU #1 WIRED parameter is YES (wired) and for the CMU #2 WIRED parameter is NO (not wired).

(2) Configuring the CMU Input Speed

You can configure the input bus speed to high rate or low rate. The input speed parameter is in the secure partition of the ORT.

To configure CMU input speed:

1. In the list of ORT parameters, type the number next to the **CMU INPUT SPEED SELECT** parameter, and then press ENTER.

2. To set the CMU input bus speed to a high rate, type **1**, or to set the CMU input bus speed to a low rate, type **0**, and then press ENTER.

The default is low rate.

(3) Configuring the CMU Output Speed

You can configure the output bus speed to high rate or low rate. The output speed parameter is in the secure partition of the ORT.

To configure CMU output speed:

1. In the list of ORT parameters, type the number next to the **CMU OUTPUT SPEED SELECT** parameter, and then press ENTER.

2. To set the CMU output bus speed to a high rate, type **1**, or to set the CMU output bus speed to a low rate, type **0**, and then press ENTER.

The default is low rate.

(4) Configuring the CMU-SDU Join/Leave Word

The HSD-440 Mark 2 Terminal can send join/leave words periodically or only on logon and logoff events. The CMU-SDU join/leave word parameter is in the secure partition of the ORT.

**NOTE:** This parameter supports Universal brand CMU that reports a SAL that is different than the one it accepts when using a Williamsburg protocol.

To configure the CMU-SDU join/leave word:

1. In the list of ORT parameters, type the number next to the **CMU-SDU JOIN/LEAVE WORD TRANSMISSION** parameter, and then press ENTER.

2. To transmit join/leave words periodically, type **1**, or to transmit join/leave words on events, type **0**, and then press ENTER.

The default is PERIODIC.

(5) Configuring Hardcoded SAL

The CMU-SDU hardcoded SAL parameter determines the SAL used in SDU to CMU Williamsburg messages. If this parameter is set to YES, a SAL of 304 is used regardless of the SAL reported to the CMU. If this parameter is set to NO, the SDU uses the SAL reported by the CMU. If a SAL is not present on the bus after one minute, the CMU uses a SAL of 304. The CMU-SDU HARD CODED SAL parameter is in the secure partition of the ORT.

To configure the hardcoded SAL:

1. In the list of ORT parameters, type the number next to the **CMU-SDU HARD CODED SAL** parameter, and then press ENTER.
2. To enable hardcoded SAL, type **1**, or to disable hardcoded SAL, type **0**, and then press ENTER.

The default is ENABLED.

**O. Configuring Terminal Operation**

(1) Configuring Air/Ground Status Restrictions

Restrictions to the HSD-440 Mark 2 Terminal operation are based on whether the terminal is on the ground or in the air. This parameter enables or disables those restrictions. The parameter for air/ground status restrictions is in the secure partition of the ORT.

When the air/ground status restriction parameter is enabled, the parameters for self-test in air and transmit on ground behave normally. If the air/ground status restriction parameter is disabled, the parameters for self-test in air and transmit on ground act as if they are enabled.

To configure air/ground status restrictions:

1. In the list of ORT parameters, type the number next to the **AIR/GROUND STATUS RESTRICTIONS** parameter, and then press ENTER.
2. To enable the air/ground status restrictions, type **1**, or to disable the air/ground status restrictions, type **0**, and then press ENTER.

The default is DISABLED.

(2) Configuring Transmit on Ground

You can restrict the ability of the HSD-440 Mark 2 Terminal to transmit on the ground. The parameter for transmitting on the ground is in the secure partition of the ORT.

To configure transmit on ground:

1. In the list of ORT parameters, type the number next to the **TRANSMIT ON GROUND** parameter, and then press ENTER.
2. To enable HSD-440 Mark 2 Terminal transmission on the ground, type **1**, or to disable HSD-440 Mark 2 Terminal transmission on the ground type **0**, and then press ENTER.

The default is DISABLED.

(3) Configuring Self-test in Air

The HSD-440 Mark 2 Terminal's MCDU or MPU can request a power-on self-test. The ORT parameter Self-test in Air determines if the self-test is permitted or not when the aircraft is in the air. This parameter is in the secure partition of the ORT.

To configure self-test in air:

1. In the list of ORT parameters, type the number next to the **SELF-TEST IN AIR** parameter, and then press ENTER.
2. To enable the self-test in air type **1**, or to disable the self-test in air, type **0**, and then press ENTER.

The default is DISABLED.

(4) Configuring Maintenance Command Execution in Air

You can reset the HSD-440 Mark 2 Terminal using the MPU if you are logged into the MPU at the MENU or USER level. The Maintenance Command Execution in Air determines if the reset is permitted or not when the aircraft is in the air. The MAINT CMD EXECUTION IN AIR parameter is in the secure partition of the ORT.

To configure maintenance command execution in air:

1. In the list of ORT parameters, type the number next to the **MAINT CMD EXECUTION IN AIR** parameter, and then press ENTER.
2. To enable maintenance commands in the air, type **1**, or to disable this feature, type **0**, and then press ENTER.

The default is DISABLED.

(5) Configuring MCDU PAST

The HSD-440 Mark 2 Terminal can perform a power-on self-test according to a command from an MCDU. You can enable and disable this function with the MCDU PAST parameter. This parameter is in the secure partition of the ORT.

To configure MCDU PAST:

1. In the list of ORT parameters, type the number next to the **MCDU PAST** parameter, and then press ENTER.
2. To enable the MCDU PAST, type **1**, or to disable the MCDU PAST, type **0**, and then press ENTER.

The default is ENABLED.

(6) Configuring Field Loadable Software

The HSD-440 terminal can accept file transfers from user equipment connected to Ethernet port one. You can enable and disable this function with the field loadable software parameter. This parameter is in the secure partition of the ORT.



To configure field loadable software:

1. In the list of ORT parameters, type the number next to the **SW FIELD LOADABLE** parameter, and then press ENTER.
2. To enable the file transfers, type **1**, or to disable the file transfers, type **0**, and then press ENTER.

The default is DISABLED.

(7) Configuring the Logon/Handover Policy

The logon/handover policy determines if the equipment automatically logs on, or waits to log on, or changes satellite when the instruction is received from the pilot. The policy options are automatic and manual. The default policy is automatic. The logon/handover policy parameter is in the user partition of the ORT.

To configure the logon/handover policy:

1. In the list of ORT parameters, type the number next to the **LOG-ON/HANDOVER POLICY** parameter, and then press ENTER.
2. To select automatic logon, type **1**, or to select manual logon, type **0**, and then press ENTER.

The default is AUTOMATIC.

(8) Configuring Logon Interrogation

The response to logon interrogation enables the AES to be interrogated. The logon interrogation parameter is in the user partition of the ORT.

To enable the logon interrogation:

1. In the list of ORT parameters, type the number next to the **RESPONSE TO LOG-ON INTERROGATION** parameter, and then press ENTER.
2. To enable interrogation, type **1**, or to disable interrogation, type **0**, and then press ENTER.

The default is DISABLED.

(9) Configuring High-rate R/T in Global Beam

The High-rate R/T in global beam parameter enables or disables high-rate in Global Beam. The high-rate R/T is in the user partition of the ORT.

To enable or disable high-rate R/T:

1. In the list of ORT parameters, type the number next to the **HIGH RATE R/T IN GLOBAL BEAM** parameter, and then press ENTER.
2. To enable high-rate in Global Beam, type **1**, or to disable high-rate in Global Beam, type **0**, and then press ENTER.

The default is DISABLED.

(10) Masking Position in Logs

The HSD-440 terminal can record the position of the aircraft in the HSD-440 terminal logs. You can enable and disable the recording of position information with the mask position in logs parameter. This parameter is in the user partition of the ORT.

NOTE: This is the first of several checks that are performed before field software can be loaded.

To mask position in logs:

1. In the list of ORT parameters, type the number next to the **MASK POSITION IN LOGS** parameter, and then press ENTER.
2. To enable position masking in logs, type **1**, or to disable position masking in logs, type **0**, and then press ENTER.

The default is DISABLED.

(11) Configuring HSD SAL

This parameter defines the SAL the terminal uses. This parameter is in the secure partition of the ORT.

To configure the HSD SAL:

1. In the list of ORT parameters, type the number next to the **HSD SAL** parameter, and then press ENTER.
2. Type a three-digit hex value, and then press ENTER.

The default is 307.

**P. Configuring Passive Intermodulation (PIM) Parameters**

Inmarsat requires terminals to perform PIM tests before using SBB services. Section 5: "Passive Intermodulation (PIM) Test" on page 3-16 provides instructions for performing the PIM test. This section describes ORT parameters related to the PIM test.

(1) Configuring PIMBIT HGA Azimuth Offset Angle

This parameter defines the azimuth point angle for PIMBIT offset from true north or true south when the terminal is configured to operate with an HGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT HGA Azimuth Offset Angle:

1. In the list of ORT parameters, type the number next to the **PIMBIT HGA AZIMUTH OFFSET ANGLE** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 15.0.

(2) Configuring PIMBIT IGA Azimuth Offset Angle

This parameter defines the azimuth point angle for the PIM test offset from true north or true south when the terminal is configured to operate with an IGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT IGA Azimuth Offset Angle:

1. In the list of ORT parameters, type the number next to the **PIMBIT IGA AZIMUTH OFFSET ANGLE** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 11.0.

(3) Configuring PIMBIT IGA Elevation Offset Angle1

This parameter defines the first elevation pointing angle for PIM test offset when the terminal is configured to operate with an IGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT IGA Elevation Offset Angle1:

1. In the list of ORT parameters, type the number next to the **PIMBIT IGA ELEVATION OFFSET ANGLE1** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 12.5.

(4) Configuring PIMBIT IGA Elevation Offset Angle2

This parameter defines the second elevation pointing angle for PIM test offset when the terminal is configured to operate with an IGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT IGA Elevation Offset Angle2:

1. In the list of ORT parameters, type the number next to the **PIMBIT IGA ELEVATION OFFSET ANGLE2** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 18.0.

(5) Configuring PIMBIT HGA Elevation Offset Angle1

This parameter defines the first elevation pointing angle for PIM test offset when the terminal is configured to operate with an HGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT HGA Elevation Offset Angle1:

1. In the list of ORT parameters, type the number next to the **PIMBIT HGA ELEVATION OFFSET ANGLE1** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 12.5.

(6) Configuring PIMBIT HGA Elevation Offset Angle2

This parameter defines the first elevation pointing angle for PIM test offset when the terminal is configured to operate with an HGA. This parameter is in the secure partition of the ORT.

To configure the PIMBIT HGA Elevation Offset Angle2:

1. In the list of ORT parameters, type the number next to the **PIMBIT HGA ELEVATION OFFSET ANGLE2** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 27.5.

(7) Configuring PIMBIT Measurement Discard Ratio

This parameter defines the number of computed samples to discard from the PIM test calculations.

To configure the PIMBIT Measurement Discard Ratio:

1. In the list of ORT parameters, type the number next to the **PIMBIT MEASUREMENT DISCARD RATIO** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 5.0.

(8) Configuring PIMBIT Failure Threshold

This parameter defines the failure threshold level for the PIM test in dBs of channel degradation.

To configure the PIMBIT Failure Threshold:

1. In the list of ORT parameters, type the number next to the **PIMBIT FAILURE THRESHOLD** parameter, and then press ENTER.
2. Type a positive decimal number, and then press ENTER.

The default is 3.0.

(9) Configuring PIMBIT Pointing Failure Threshold

This parameter defines the antenna beam pointing fail threshold for the PIM test.

To configure the PIMBIT Pointing Failure Threshold:

1. In the list of ORT parameters, type the number next to the **PIMBIT POINTING FAILURE THRESHOLD** parameter, and then press ENTER.
2. Type a positive whole number, and then press ENTER.

The default is 1.

## **2. Configuring ORT Parameters Using the EMS ORT Application**

The ORT application provides a Graphical User Interface (GUI) for creating and saving ORT configuration files, modifying ORT parameters, and loading ORT configurations into the HSD-440 Mark 2 Terminal.

Using the ORT application, you can modify all of the same parameters (secure and user) that are available through the HSD-440 Mark 2 Terminal MPU, as described in "Configuring ORT Parameters Using the MPU" on page 6-1. After you modify ORT parameters, you must export the changed configuration before loading it into the HSD-440 Mark 2 Terminal.

This section provides information and instructions on how to use the ORT application, including:

- Creating an ORT Configuration
- Opening a Saved ORT Configuration
- Importing a Phone Book Into the ORT Configuration
- Exporting an ORT File
- Loading an ORT File into the HSD-440 Mark 2 Terminal

- Searching for an ORT Parameter

#### A. Creating an ORT Configuration

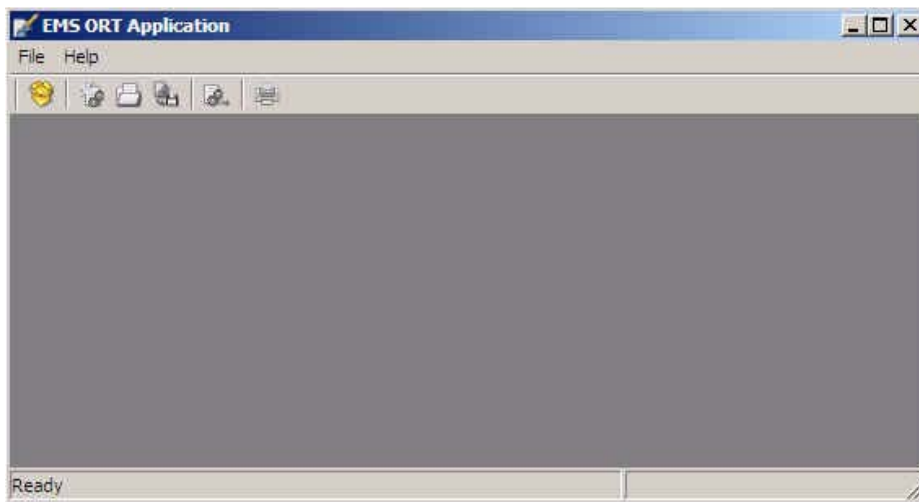
Creating an ORT configuration includes:

- Opening the ORT file template
- Editing parameters
- Saving the ORT configuration

To open an ORT configuration template:

1. Double-click on the **ortedit.exe** file.

The EMS ORT Application opens.



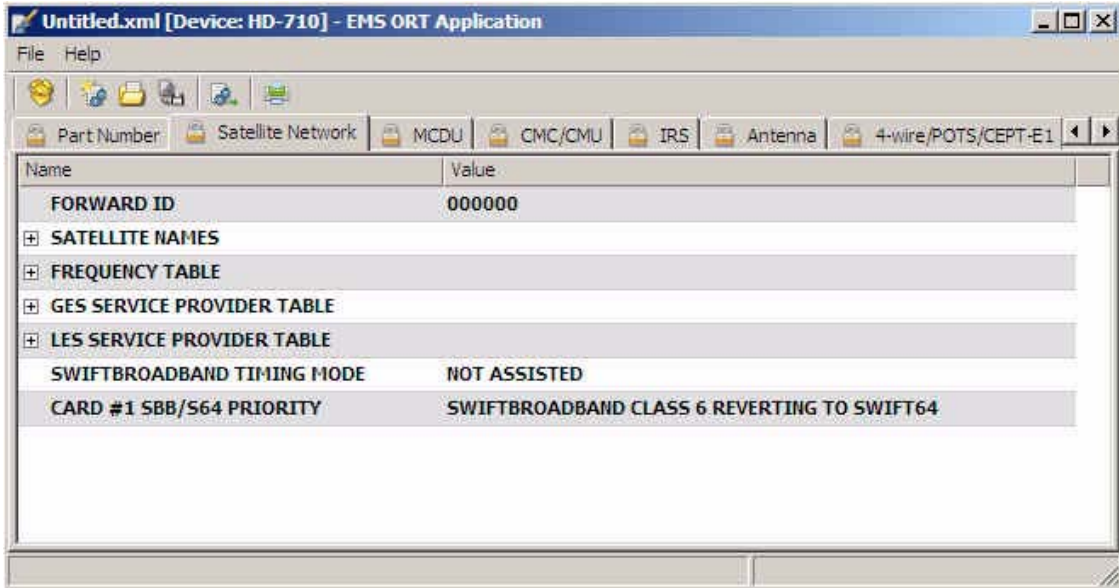
2. Click **File**, and then click **Open Package**.

The Choose ORT Package dialog box opens.

3. Navigate to the **HSD440.ort** file and click **Open**.

The default ORT parameters appear in the EMS ORT Application window.

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The EMS ORT Application organizes ORT parameters into functional groups. You can access each group by clicking on its tab at the top of the window. A lock symbol marks groups of secure ORT parameters, and an open lock symbol marks the group of user ORT parameters. Click the left and right arrows to see more tabs.

The functional groups of parameters are:

- Part Number—the part number of the Secure ORT
- Satellite Network
- MCDU
- CMC/CMU
- IRS
- Antenna
- 4-wire/POTS/CEPT-E1
- Routing
- Ethernet
- System
- User—all User parameters

To edit ORT parameters:

1. Click on the tab for the functional group that contains the parameter you wish to edit.
2. Click on a parameter name in the **Name** column, then click on the parameter value in the **Value** column.

For parameters with text or numerical values, the cursor appears. For parameters with preset options, a menu appears.

**NOTE:** Some parameters are expandable. Click on the plus sign to the left of the parameter name to expand the parameter. Alternatively, right-click on the parameter name and click **Expand all**.

3. Type or select the new value for the parameter.

**NOTE:** To reset a parameter to its default value, right-click on the parameter and click **Reset to default**.

The ORT application can save an ORT configuration as an XML file. If you do not finish editing all the ORT parameters in one session, you can save the ORT configuration file and re-open it at a later time. The XML file is not uploaded to the HSD-440 Mark 2 Terminal, it can only be opened in the ORT application for parameter editing.

To save an ORT configuration file:

1. In the EMS ORT Application, click **File**, and then click **Save As**.  
The Save As dialog box opens.
2. In the **File name** field, type a name for the new ORT configuration, and then click **Save**.

The new ORT configuration is saved as an XML file.

## B. Opening a Saved ORT Configuration

The EMS ORT Application saves ORT configurations as XML files. You can open these XML files in the EMS ORT Application.

To open a saved ORT configuration:

1. In the EMS ORT Application, click **File**, and then click **Open**.  
The Select a file dialog box appears.
2. Click on a saved ORT configuration and then click **Open**.

The saved ORT configuration appears in the EMS ORT Application window.

## C. Importing a Phone Book Into the ORT Configuration

The EMS ORT Application can import data into its Address book parameter. The data in the Address book parameter includes:

- Name—the name displayed to identify the address book entry
- Number—the phone number
- Priority—the priority setting for calls to this number
- MCDU Editable—enables and disables changes to this entry from the MCDU

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The ORT Address book parameter includes four categories with 100 entries in each category. You can create and import a separate file for each category.

The EMS ORT Application creates address book entries from imported Comma Separated Value (CSV) files that have the .csv file extension. You can create .csv files with Microsoft® Excel®.

Importing a phone book includes:

- Creating a .csv file
- Importing the .csv file into the EMS ORT Application

To create a .csv file:

1. Open Microsoft Excel.
2. Type the following into the specified cells, as shown below:
  - cell A1—addressBook/addressBookCategory[1]
    - The EMS ORT Application adds the entries in this file into Category 1 of the Address book.
    - To create categories two, three, and four, change the category number inside the square brackets. You need to create a separate .csv file for each category.
  - cell A2—abeName
  - cell B2—abeNumber
  - cell C2—abePriority
  - cell D2—abeMCDUEditable

	A	B	C	D
1	addressBook/addressBookCategory[1]			
2	abeName	abeNumber	abePriority	abeMCDUEditable

3. For each entry you want to add to the address book, type data in the columns abeName, abeNumber, abePriority, and abeMCDUEditable. Each row represents one address book entry:
  - In column abeName, type the name of the address book entry. The maximum length of the name is 14 alphanumeric characters.
  - In column abeNumber, type the phone number without hyphens or spaces. The maximum length of the phone number is 18 digits.
  - In the column abePriority, type the priority of this entry. Priority may be one of OP-HI, OP-LO, NON-OP, or EMG.
  - In the abeMDCUEditable column, type YES or NO to indicate if this entry is editable from the MCDU.



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	A	B	C	D
1	addressBook/addressBookCategory[1]			
2	abeName	abeNumber	abePriority	abeMCDUEditable
3	Office1	5551234	NON-OP	YES
4	Office2	5556789	OP-LO	YES
5	HomeOffice	5550000	EMG	NO

4. Save the spreadsheet as a .csv file.

To import a .csv file:

1. Open the EMS ORT Application.
2. Open an ORT file or create a new file—refer to “Creating an ORT Configuration” on page 6-33 and “Opening a Saved ORT Configuration” on page 6-35.
3. In the EMS ORT Application, click **File**, and then click **Import Phonebook**.  
The Choose CSV File dialog box appears.
4. Click on the CSV file and then click **Open**.

The Import Phonebook message confirms the number of entries imported from the CSV file, and the EMS ORT Application adds the entries to the ORT configuration.

#### **D. Exporting an ORT File**

The HSD-440 Mark 2 Terminal control processor uses a special file type that you can export from the EMS ORT Application. When you export a file, the EMS ORT Application creates two files—one for the control processor and one text (.txt) file for your reference.

To export an ORT file:

1. In the EMS ORT Application, click **File**, and then click **Export**.  
The Choose Output File dialog box appears.
2. Type a new file name (no extension) in the **File name** box and then click **Save**.  
The ORT configuration is exported (two files are created) and the Export Document dialog box appears.
3. Click **OK**.

#### **E. Loading an ORT File into the HSD-440 Mark 2 Terminal**

You can load an exported ORT file into the HSD-440 Mark 2 Terminal through the Ethernet connection.

To load the ORT file you'll need:

- A computer with the tftp application  
An ethernet cable
- A serial cable—see section b: "Maintenance Port Cable Assembly" on page 4-37.
- The IP address of the terminal's Ethernet 1 port

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To load an ORT file into the HSD-440 Mark 2 Terminal:

1. Connect a computer to an Ethernet port and the Maintenance Port on the HSD-440 Mark 2 Terminal.
2. Copy the ORT file to the computer.
3. Start a HyperTerminal session to the Maintenance port of the HSD-440 Mark 2 Terminal.

Section c: "Interface Requirements" on page 4-38 provides the settings for this connection.

4. To access the Maintenance Port Utility, type the password **maint**.

The password does not appear on the screen.

5. To navigate to Menu 2, press CTRL + N.
6. To allow tftp access to the terminal, in Menu 2, press I.
7. At the prompt, type the new password **allowtftp**.

A message confirms that tftp is allowed for ten minutes.

8. On your computer, click **Start**, and then click **Run**.

The Run dialog box appears.

9. In the **Open** field, type **cmd**.

The Command window appears.

10. Navigate to the directory that includes the new ORT file.

11. To load the ORT file, type **tftp -i xxx.xxx.xxx.xxx put filename**.

- xxx.xxx.xxx.xxx represents the IP address of the Ethernet 1 port.
- filename represents the name of the new ORT file.

When the tftp application loaded the file to the HSD-440 Mark 2 Terminal, a short message confirms the number of bytes transferred.

12. To transfer the ORT parameters to the SCM, in Menu 3, press r.

13. At the prompt to transfer the ORT parameters to the SCM, type **yesido**.

The number of transferred bytes indicates the transfer progress.

The ORT file load is complete.

# APPENDIX A: INMARSAT SATELLITE BEAM COVERAGE

Inmarsat operates strategically placed geostationary satellites called I-3 and I-4. I-3 satellites provide access to services such as Swift 64 and Aero H/H+, and I-4 satellites provide access to SBB and Aero H/H+ services.

## 1. I-3 Satellites

Each I-3 satellite is located over and named after an OR. The four satellite ORs are:

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

Figure A-1 represents the ORs with approximate transfer coordinates for satellite transitions.

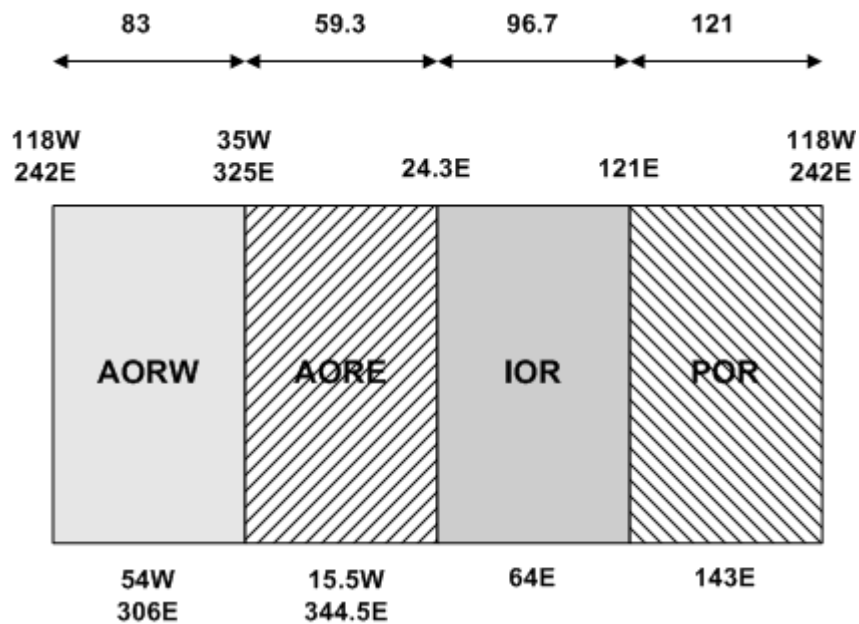
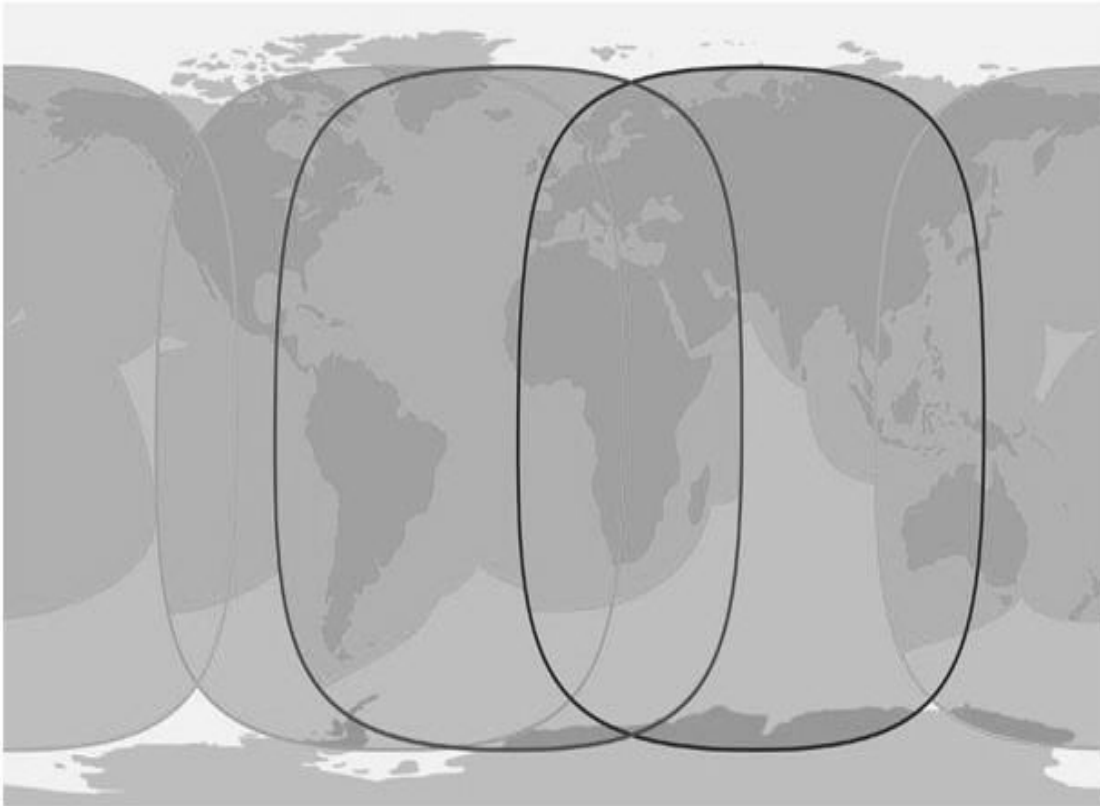


Figure A-1 ORs

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The four satellite ORs are made up of smaller, spot-beam coverage areas. The following maps show the Inmarsat satellite spot-beam coverage for the four ORs, and a composite map of the four regions combined.

NOTE: Figure A-2 and Figure A-3 depict Inmarsat's expectations of coverage but do not represent a guarantee of service and should not be relied upon. The availability of service at the edge of coverage areas fluctuates depending upon a variety of conditions.



**Figure A-2 Inmarsat I-3 Satellite Beam Coverage—Composite Map**

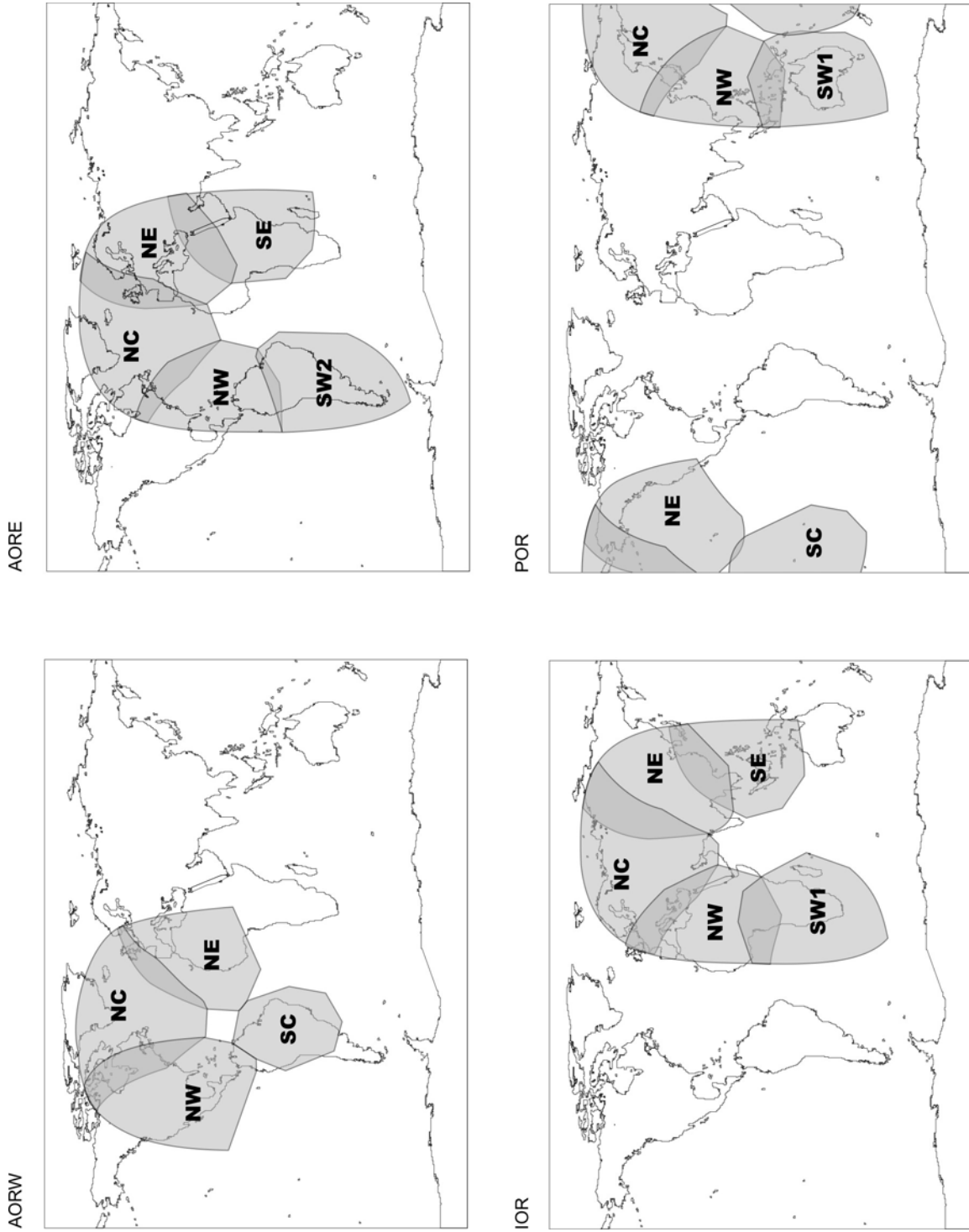


Figure A-3 Inmarsat I-3 Satellite Beam Coverage—OR Maps

## 2. I-4 Satellites

There are three I-4 satellites in service:

- I-4 Americas (98W)
- I-4 EMEA (25E)
- I-4 Asia-Pacific (143.5E)

Figure A-4 shows the I-4 satellite coverage regions.

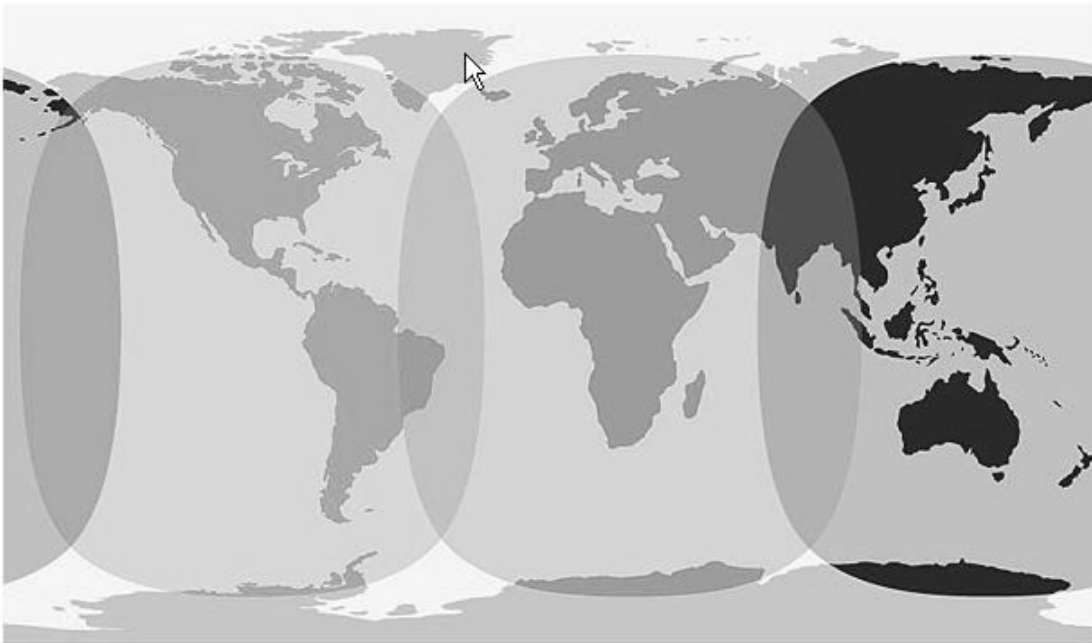


Figure A-4 Inmarsat I-4 Satellite Beam Coverage Map

## 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 make sure that you have not missed any key steps in the HSD-440 Mark 2 Terminal setup.

### 1. Have you registered with a service provider to activate service?

You must activate an account with an Inmarsat-authorized service provider to access the Satellite Communications network using an HSD-440 Mark 2 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](mailto:customer_care@inmarsat.com)

### 2. Has your account been activated?

Once registered, your HSD-440 Mark 2 Terminal is assigned terminal identification numbers called FWD IDs. If you have SBB service, service information also includes IMSI. The HSD-440 Mark 2 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 LESGES level. New terminals being commissioned are not validated by the LES/GES 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/GES, call 33 POUND KEY for assistance. Confirm with the LES/GES operator that the FWD IDs assigned to your terminal are valid and active.

### 3. Is the HSD-440 Mark 2 Terminal seated properly?

In cases where the HSD-440 Mark 2 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 diagram.
- Make sure that the HSD-440 Mark 2 Terminal is fully inserted into the tray and that the front hold-down screws are securely tightened.

**4. Is all cabling attached correctly and securely?**

Broken connections and improper cabling are the most common causes of HSD-440 Mark 2 Terminal malfunctions. Before proceeding with testing and troubleshooting, complete the following checks:

- Check that all cables and wiring are routed and connected correctly and securely.
- Make sure that the terminal is installed with the correct power source.
- Verify that all external user and networking devices (for example: TAs, 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/GES Access Codes programmed for all ORs?**

The system default for LES/GES access codes is set to 0 (zero), which must be configured to valid LES/GES 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.

**8. Are the SIM cards activated?**

Activate report 69 and check that the OC column of the report shows ATCH (attached) then dial a SBB call.

**9. Is the APN set?**

Verify that the APN is set.

1. Navigate to Menu 3 in the Maintenance Port Utility.
2. In the list of ORT parameters, navigate to and type the number next to the miscellaneous EEPROM settings.
3. To view or set the APN, type the number next to the **APN** and then press ENTER.

**10. Are GES preferences correctly set?**

To verify GES preferences:

1. Navigate to Menu 3 in the Maintenance Port Utility.
2. In the list of ORT parameters, navigate to and type the number next to the **Ocean Region** parameters.



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3. To view GES preferences, type the number next to the GES preference, and then press ENTER.

The GES priority table appears.

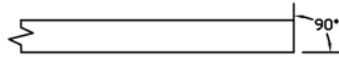
The eNfusion® HSD High-speed Data Terminal Developer's Guide, MN-1252-13005, provides more information about GES preferences.

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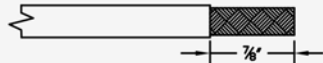
# APPENDIX C: RJ45 CABLE TERMINATION DETAILS

## INSTALLATION INSTRUCTIONS FOR CABLE P/N 922408

1. BEGIN BY CUTTING THE CABLE OFF SQUARE.



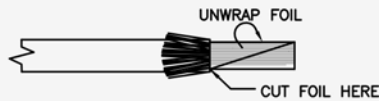
2. REMOVE OUTER JACKET.



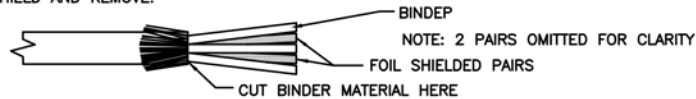
3. COMB OUTER BRAID.



4. MAKE SMALL TANGENTIAL CUT ON OUTER FOIL SHIELD AT OVERLAP. UNWRAP AND DISCARD FOIL SHIELD.



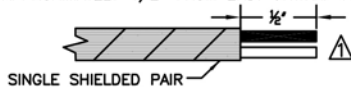
5. SLIT PLASTIC BINDER LONGITUDINALLY. CUT BINDER STRIPS AT SHIELD AND REMOVE.



6. SEPARATE AND TWIST BRAID SHIELD INTO TWO PIGTAILS. COMBINE ONE PIGTAIL WITH DRAIN WIRE.



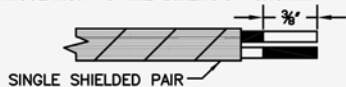
7. MAKE SMALL TANGENTIAL CUT ON FOIL SHIELD OF EACH PAIR APPROXIMATELY 1/2" FROM END. UNWRAP AND REMOVE FOIL.



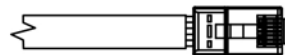
**NOTE**

⚠ REMOVAL OF ADDITIONAL INNER FOIL FROM THE APPROPRIATE PAIR MAY BE NECESSARY TO FACILITATE THE TERMINATION TO POSITIONS 3 AND 6.

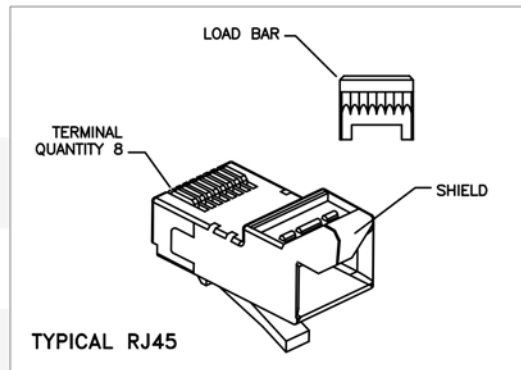
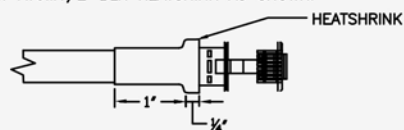
8. USING THE 20 AWG (OR 22 AWG IF STRIPS ARE CLEANER) SETTING ON A HAND STRIPPER, REMOVE OUTER LAYER OF THE 2 STEP INSULATION TO THE DIMENSION SHOWN.



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. NOTE THAT CABLE JACKET IS NOT INSERTED INTO CONNECTOR BODY.



10. APPLY ATUM1/2-BLK HEATSHINK AS SHOWN.



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## APPENDIX D: INSTALLATION PLANNING CHECKLIST

<b>Installation Planning Steps</b>					
<b>1. Register the terminal for services (if applicable)</b>					
Record the following information (provided by Honeywell upon purchase)					
					<input type="checkbox"/>
Inmarsat Serial Numbers (ISN) x	1				<input type="checkbox"/>
	2				
IMSI #1					
Contact your Service Provider and provide the 12-digit ISNs from above					
Record the FWD IDs received (from your Service Provider or from Inmarsat) and corresponding Inmarsat Mobile Numbers (IMN)					<input type="checkbox"/>
FWD IDs (last 6 digits of ISN)					
IMNs					
ISDN Speech					
ISDN (3.1 kHz audio)					
ISDN 56 kbps					
ISDN 64 kbps					
MPDS					
Service Provider					<input type="checkbox"/>
AOR-W					<input type="checkbox"/>
AOR-E					<input type="checkbox"/>
IOR					<input type="checkbox"/>
POR					<input type="checkbox"/>
<b>2. Register the terminal for SBB services (if applicable)</b>					
APN					<input type="checkbox"/>
Master MSISDN					<input type="checkbox"/>
AMSISDN 1 ISDN 56 (RDI)					<input type="checkbox"/>
AMSISDN 1 ISDN64 (UDI)					<input type="checkbox"/>

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<b>Installation Planning Steps</b>			
AMSISDN 5 CSFAX (3.1 kHz audio)			<input type="checkbox"/>
<b>3. Pin Strapping</b>			
The following strapping is required			
Item	Strapped pins, e.g., TP1A to BP1A		
System Mode			<input type="checkbox"/>
Data I/O (if applicable)			<input type="checkbox"/>
<b>4. Wiring</b>			
Antenna	Multi-Control		<input type="checkbox"/>
	BITE A/B		<input type="checkbox"/>
	HPA Mute A/B		<input type="checkbox"/>
Power			<input type="checkbox"/>
ISDN: Wire ISDN line. Channel 1 operates over ISDN 1 and channel 3 over ISDN 2.	ISDN-1		<input type="checkbox"/>
	ISDN-2		<input type="checkbox"/>
Ethernet: Wire both Ethernet ports for SBB capability Wire both Ethernet ports to deploy 2 separate networks	Ethernet-1		<input type="checkbox"/>
	Ethernet-2		<input type="checkbox"/>
Inertial Navigation System (INS)			<input type="checkbox"/>
Analog Tip/Ring			<input type="checkbox"/>
<b>5. Configuration</b>			
Program the Land Earth Station (LES)/Ground Earth Station (GES) Access Codes			<input type="checkbox"/>
Program devices with the Multiple Subscriber Numbers (MSN)			<input type="checkbox"/>
Configure the CNX Cabin Gateway if required			<input type="checkbox"/>

## APPENDIX E: INSTALLATION CHECKLIST

<b>Aircraft Identification:</b>		<b>HSD-440 Mark 2 Terminal Model No:</b>	
<b>HSD-440 Mark 2 Terminal Installation Mode:</b>		<b>HSD-440 Mark 2 Terminal Serial No:</b>	
	<b>Name</b>	<b>Signature</b>	<b>Date</b>
<b>Checks completed by:</b>			
<b>Approved/Witnessed by:</b>			

Section	Parameter	Item	N/A	✓	Value
<b>Installation / Mechanical</b>	Physical	Service/maintenance access			
		Environmental considerations—see "Environmental Requirements" on page 3-2			
	Fan Tray	Plug configuration—see "Fan Tray Requirements" on page 3-3			
		Chassis bonding—see "Chassis Grounding" on page 3-4			
		Fan rotation—unobstructed			
	ARINC 600 Con.	Polarized pins			

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Section	Parameter	Item	N/A	✓	Value
<b>Installation / Electrical</b>	Power Connections	+ 28 V dc polarity			
		115 V ac polarity			
		Chassis grounding			
	Voltage Levels	+ 28 V dc level			
		115 V ac level			
	IRS Input (x2)	IRS wiring			
		IRS format			
	Config. Strap Pins	SDI			
		System configuration			
		ICAO address			
		WOW (optional)			
	Ethernet	Wired to RJ45 distribution points (x2)			
	ISDN	Wired to RJ45 distribution points			
	Remotes	Manual reset switch operation			
		Maintenance port (DB9 access)			
		Power and fault indicators			
	RF Coaxial	Rx input cable loss			
		Tx output cable loss			
	Antenna	Antenna manufacturer and type			
		Wired as per manufacturer			
Configuration	LES/GES access codes				
	ICAO ID				
	CEPT	Wired to distribution point			
	CMU/CMC	Wired to equipment			
	MCDU/WSCI	Wired to equipment			
	4-Wire (x2)	Wired to equipment			
	POTS	Wired to distribution point			
<b>Test</b>	System Power-Up	Visual LED indications			
		Power-up computer display			
<b>Test On-Air</b>	System Logon	Reset message observed			
		Logon verified for Swift 64 and SBB			
<b>Test</b>	Optional Checks	Ground segment			
		Flight segment			

Move the aircraft in a circle and check the signal and C/No.



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Heading (Deg)	Antenna Selected	Antenna Azimuth	HSD-440 Mark 2 Terminal									
			Swift 64 or SBB					Classic				
			CH 1	CH 2	CH 3	CH 4	CH 5					
			Note: Channels 3, 4, and 5 can be different than channels 1, and 2.									
			C/No	Signal	C/No	Signal	C/No	Signal	C/No	Signal	C/No	Signal
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: CMU MESSAGES

The CMU communicates with the HSD-440 Mark 2 Terminal using two types of communications: Broadcast messages and Bit Oriented Protocol (BOP) messages. Both types of communication are supported at the same time.

This section includes descriptions of the messages that the CMU will transmit to the HSD-440 Mark 2 Terminal and receive from the HSD-440 Mark 2 Terminal.

In this communication type, the CMU uses an ARINC 429 bus to convey status word exchanges, join/leave words, and other control and command communications to the HSD-440 Mark 2 Terminal using conventional ARINC 429 broadcast techniques.

The CMU can transmit messages to the HSD-440 Mark 2 Terminal and receive messages from the HSD-440 Mark 2 Terminal using this communication type.

### 1. Understanding Messages Transmitted to the HSD-440 Mark 2 Terminal

This section provides details about the words sent to the HSD-440 Mark 2 Terminal from the CMUs:

- Understanding System Identification Label 172
- Understanding Status Word 1; Label 270
- Understanding Status Word 2; Label 276
- Understanding Protocol File Transfer to CMU via Williamsburg

#### A. Understanding System Identification Label 172

Each CMU transmits system identification label 172 (SAL 304) to the HSD-440 Mark 2 Terminal. Attachment 6 from ARINC Characteristic 758 describes the word format of this label. Any other SAL is ignored.

#### B. Understanding Status Word 1; Label 270

Each CMU transmits status word 1 to the HSD-440 Mark 2 Terminal. The standby CMU checks to see if its status words are the same as the active CMU using its cross-talk connections.

**Table F-1 Status Word 1**

Bit	Label	Meaning
9	270	Determines the position of the CMU in the cockpit; see Table F-2
10	270	Determines the position of the CMU in the cockpit; see Table F-2
20	270	Determines which CMU is active and which is on standby

The HSD-440 terminal uses bit 20 to determine which CMU is active. When bit 20 is set, that CMU is active, and the other CMU should have its bit 20 cleared. In the event of an error and both CMUs are shown as active, the CMU on input port 1 is considered active.

The CMU transmits its position in the cockpit to the HSD-440 Mark 2 Terminal using bits 9 and 10, as shown in Table F-2.

**Table F-2 Bits 9 and 10 Positions**

<b>SDI 1 (bit 9)</b>	<b>SDI 2 (bit 10)</b>	<b>Position</b>
0	0	Single
0	1	Left
1	0	Right
1	1	Not used

Attachment 6 from ARINC Characteristic 758 describes the word format of this label.

**C. Understanding Status Word 2; Label 276**

Each CMU transmits status word 2 to the HSD-440 Mark 2 Terminal. The HSD-440 Mark 2 Terminal determines which CMU is sending the message based upon bits 9/10 (the SDI) as detailed in Table F-2.

The HSD-440 Mark 2 Terminal uses the SAT Link parameter (bit 19) to determine if the CMU is receiving the appropriate link status from the HSD-440 terminal.

Attachment 6 from ARINC Characteristic 758 describes the word format of this label.

**D. Understanding Protocol File Transfer to SDU1 via Williamsburg**

Data is transferred to the HSD-440 Mark 2 Terminal using Williamsburg protocol. Williamsburg messages use the SAL of the equipment they are talking to as the label. In this case, the label is 307 as the sub-system identifier label sent from the HSD-440 to the CMU is 307. For more information, refer to "Understanding Word Format" on page F-7.

**2. Understanding Messages Received from the HSD-440 Mark 2 Terminal**

This section provides details about the words sent from the HSD-440 Mark 2 Terminal from the CMUs:

- Understanding System Identification Label 172
- Understanding Status Word 1; Label 270
- Understanding Join/Leave Word; Label 271
- Understanding Protocol File Transfer to CMU via Williamsburg

**A. Understanding System Identification Label 172**

The HSD-440 Mark 2 Terminal transmits subsystem identifier label 172 which contains the subsystem SAL in bits 9 to 16. The SAL is set to 307 (octal). Also:

- Bit 17 is set to indicate Inmarsat Aero
- Bits 18-31 are used for other Satcom services (or are spare) and are set to 0

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- Bit 32 indicates parity

You can find the HSD-440 Mark 2 Terminal identity information in the ORT. If no information is available, the terminal identifies itself as SAL 307 by default.

ARINC 781 Supplement 1 describes the word format of these labels.

**B. Understanding Status Word 1; Label 270**

Bits are defined as shown in Table F-3.

**Table F-3 Status Word 1 Bits**

<b>Bit(s)</b>	<b>Description</b>	<b>If Set</b>
9–10	SDI (per ARINC Specification 429 Section 2.1.4)	<ul style="list-style-type: none"> <li>• Set to <b>00</b>, all call</li> </ul>
11	Data Link via CMU Inactive	<ul style="list-style-type: none"> <li>• HSD-440 Mark 2 Terminal is not able to offer Aero H data services (due to a hardware fault or terminal is not logged on)</li> <li>• ORT indicates that only CMU #1 is wired and label 270 is missing for 3 or more seconds</li> <li>• ORT indicates that only CMU #2 is wired and label 270 is missing for 3 or more seconds</li> <li>• ORT indicates that both CMU #1 and CMU #2 are wired and both label 270 are missing for 3 ore more seconds</li> </ul>
12	CMU 1 Inactive	<ul style="list-style-type: none"> <li>• CMU #1 bus label 270 is missing for 3 or more seconds</li> <li>• Label 270 SSM coded to fail</li> <li>• Label 270 bit 20 is not set</li> </ul>
13	Voice Unavailable	<ul style="list-style-type: none"> <li>• Class Aero is not logged on</li> <li>• Login Class is 1 or 4 (data only)</li> </ul>
14	SELCAL	<p>This bit is set during the period when a ground to air call, including a preemptive call, is being signaled but unanswered. If set:</p> <ul style="list-style-type: none"> <li>• Indicates that a new cockpit voice circuit has been established for a ground-initiated call</li> <li>• Depending on the aircraft setting, this bit may result in a visual annunciation of the new call on the EICAS/ECAM/EDU and activation of the cockpit chime</li> <li>• Crew should refer to the EICAS/ECAM/EDU to determine which system is annunciating the call</li> <li>• Bit should remain set until an appropriate acknowledgement is received</li> <li>• Crew should make sure that the bit has been cleared in all transmitted samples for at least two seconds prior to being set, and then set for at least four seconds or until the annunciation is acknowledged, whichever occurs last</li> </ul>

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**Table F-3 Status Word 1 Bits (Continued)**

<b>Bit(s)</b>	<b>Description</b>	<b>If Set</b>
15	Message Alert with Chime	<ul style="list-style-type: none"> <li>Refer to MCDU messages for timely information</li> <li>Terminal should clear this bit once positive pilot response has been detected</li> </ul>
16	Message Alert without Chime	<ul style="list-style-type: none"> <li>This bit is never set, it is reserved for future use.</li> </ul>
17	Not Logged-On	<ul style="list-style-type: none"> <li>Terminal is not logged onto a ground station</li> </ul>
18	Master/Slave	<ul style="list-style-type: none"> <li>This bit is never set, slave operation is not supported.</li> <li></li> </ul>
19	CMU 2 Inactive	<ul style="list-style-type: none"> <li>CMU 2 transmission of valid Label 270 is detected inactive</li> <li>Label 270 SSM coded to fail on CMU #2</li> <li>Label 270 bit 20 is not set</li> </ul>
20	Cockpit Fault	<ul style="list-style-type: none"> <li>Not used</li> </ul>
21	Cockpit Voice Fault	<ul style="list-style-type: none"> <li>Not used</li> </ul>
22	Voice Call 1	<ul style="list-style-type: none"> <li>Terminal has detected a low priority (4) flight deck incoming voice call on channel 1</li> </ul>
23	Voice Call 2	<ul style="list-style-type: none"> <li>Terminal has detected a low priority (4) flight deck incoming voice call on channel 2</li> </ul>
24	Voice Alert 1	<ul style="list-style-type: none"> <li>Terminal has detected a high priority (1, 2, or 3) flight deck incoming voice call on channel 1</li> </ul>
25	Voice Alert 2	<ul style="list-style-type: none"> <li>Terminal has detected a high priority (1, 2, or 3) flight deck incoming voice call on channel 2</li> </ul>
26	Cockpit Voice Communication 1	<ul style="list-style-type: none"> <li>A cockpit voice communication is connected on channel 1</li> </ul>
27	Cockpit Voice Communication 2	<ul style="list-style-type: none"> <li>A cockpit voice communication is connected on channel 2</li> </ul>
28		<ul style="list-style-type: none"> <li>Never set</li> </ul>
29	Data	<ul style="list-style-type: none"> <li>No active CMU is available at the SDU, or the active CMU does not respond with a Loop Word in response to a Test Word</li> <li>This bit being set can be caused by the following: <ul style="list-style-type: none"> <li>Bus inactivity on all CMU inputs</li> <li>Bus activity, but no declared active CMU</li> </ul> </li> <li>Bit may be used to set a cockpit advisory message (for example, &gt;SATCOM DATA) indicating to the flight crew a loss of data link capability due to a failure in the CMU interface.</li> </ul>

\* These bits are cleared when the chime light inhibit discrete signal is asserted.

**C. Understanding Join/Leave Word; Label 271**

Each of the Aeronautical Telecommunications Network (ATN) subnetworks transmits join and leave words to the CMU whenever a path to a specified ground address changes.

The join event notifies the CMU that a new path to a specified ground address is available, triggering ATN air-to-ground communications. The leave event notifies the CMU that a path to a specified ground address has been closed, ending ATN air-to-ground communications.

The Join/Leave word (label 271) is transmitted on the CMU bus at a minimum rate of once per second or be event driven based on log on and log off events as specified by the 'CMU - SDU JOIN/LEAVE WORD TRANSMISSION' ORT parameter.

Table F-4 shows the definitions of the bits in the join/leave word.

**Table F-4 Join/Leave Word Bits**

Bits	Defines
Bits 8–1	Word Label 271: <ul style="list-style-type: none"> <li>• Uses the A429 convention</li> <li>• Coded as 10011101</li> </ul>
Bits 16–9	GES ID: <ul style="list-style-type: none"> <li>• 0 is an invalid ID</li> <li>• FF is used for all GESs</li> <li>• ID numbers between 1 and FE are valid GES IDs</li> <li>• GES ID is known to the HSD-440 Mark 2 Terminal</li> <li>• Bits are cleared when the HSD-440 Mark 2 Terminal is not logged on</li> </ul>
Bits 22–17	Satellite ID
Bits 25–23	Inmarsat Service: <ul style="list-style-type: none"> <li>• Aero H+ 011</li> </ul>
Bits 28–26	Not used; padded with zeros
Bit 29	Data link from the AES to the GES: <ul style="list-style-type: none"> <li>• Available (a Join message; Bit = 1)</li> <li>• Not Available (a Leave message; Bit = 0)</li> <li>• Identified by the GES ID and Satellite ID fields</li> <li>• CMU uses this information to initiate network layer virtual circuits with available ground routers by determining the ground routers' DTE addresses from the provided GES identity</li> <li>• Bits 9–16, (GES) and Bits 17–22 (Satellite ID) uniquely identify a GES</li> <li>• Aero Service Type field may be used by the CMU to make routing decisions</li> <li>• Bit is cleared when the HSD-440 Mark 2 Terminal is not logged on.</li> </ul>
Bits 31–30	SSM information (ARINC 429 para 2.1.5.2)

**D. Understanding Protocol File Transfer to CMU via Williamsburg**

Data is transferred to the CMU using Williamsburg protocol. Williamsburg messages use the SAL of the equipment they are talking to as the label. In this case, the label is 304 as the sub-system identifier label sent from the HSD-440 to the CMU is 304. For more information, refer to "Understanding Word Format" on page F-7.

NOTE: Universal brand CMUs broadcast a different SAL in Label 172, but expect transmission on a SAL of 304. This is achieved through the use of the CMU-SDU HARD CODED SAL ORT parameter.

**3. Understanding BOP Options**

The HSD-440 Mark 2 Terminal uses the following BOP options for the CMU interface. The ORT specifies the values for these options. If no information is available, then the options default to the values shown in Table F-5.

**Table F-5 BOP Option Defaults**

<b>Option</b>	<b>Value</b>	<b>Notes</b>
O1	Half	Half or Full Duplex Operation
O2	ORT value	High or Low Speed Bus Low speed is default
O3	No	Automatic CTS when ready
O4	No	Accept Automatic CTS
O5	Yes (high-speed data terminal)	System Priority to Resolve RTS Conflict
O6	--	Spare
O7	--	Spare
O8	Yes	Use of SOLO word (TEST/LOOP)
O9	--	Spare
O10	Yes	Destination code in RTS/CTS /NCTS/BUSY Used
O11	Yes	Bit-Protocol verification
O12	No	Use subsystem SAL from ALO word



#### 4. Understanding LDUs and File Size

BOP messages use Link Data Units (LDUs) encoded in binary octets to transmit data. LDUs conform to the following rules:

- The data is transmitted from a source and is received by a sink.
- LDUs consist of a set of contiguous ARINC 429 32 bit data words.
- The initial data word of each LDU shall be a Start of Transmission (SOT) word.
- The end data word of each LDU shall be an End of Transmission (EOT).
- No data file shall exceed 255 LDUs.

#### 5. Understanding LDU Size and Word Count

LDUs may vary in size from 3 to 255 ARINC 429 words. The minimum LDU consists of one SOT word, one data word, and one EOT word, and the maximum LDU consists of one SOT, 253 data words, and one EOT.

The HSD-440 Mark 2 Terminal calculates word count when it organizes an LDU for transmission. The word count appears in the RTS and CTS data words. See "Understanding Protocol Words" on page F-9.

#### 6. Understanding Word Format

The general word format of a BOP word is given in ARINC 429 (Attachment 11, Table 11-A). The bit definitions are shown in Table F-6.

Table F-6 BOP Word Format

Bit Position	Description
8-1	SAL
24-9	Data (28-9 for full data words)
28-25	GFI, control data or word type extensions
31-29	Word type
32	Parity bit

##### A. Understanding SALs

The HSD-440 Mark 2 Terminal sends LDUs by point to point by using a label field to carry the destination SAL; therefore, each LDU that the HSD-440 Mark 2 Terminal sends is prefixed by the SAL for the CMU, SAL 304.

The SAL for the HSD-440 Mark 2 Terminal is 307 (if designated SDU 1) or 173 (if designated SDU 2). See ARINC 429, Part 1, attachment 1-1 for a complete list of all SALs.

##### B. Understanding Data

Data is sent in 4 or 5 nibble words. See "Understanding Word Types" on page F-8

**C. Understanding General Format Identifier (GFI) Definitions**

Table F-7 defines the GFI definitions.

**Table F-7 GFI Definitions**

File Type	To				GFI
	CMU		HSD-440 Mark 2 Terminal		
	Label	Destination Code	Label	Destination Code	
Data 2 enveloped message	304	M	307 (1)	S	1110b (Eh)

A GFI of 1110 b indicates a data 2 Enveloped ACARS Message. This message indicates to the HSD-440 Mark 2 Terminal that this message is to be passed on through the ACARS network. Only one message is transferred per link layer ARINC 429 file. If the HSD-440 Mark 2 Terminal is unable to deliver an enveloped message to its destination (CMU or GES), the HSD-440 Mark 2 Terminal discards the message.

A data-2 HSD-440 Mark 2 Terminal transmits to the GES all messages passed from the avionics network interface during the time that the HSD-440 Mark 2 Terminal is logged on. If the HSD-440 Mark 2 Terminal is not logged on, any messages passed to the HSD-440 Mark 2 Terminal shall be discarded. While the HSD-440 Mark 2 Terminal is logged on, any messages received from the GES shall be forwarded to the avionics network interface regardless of the state or availability of the destination avionics equipment.

Any CMU message contains a destination code of M if it arrives from the ground to the CMU. Similarly, any message originating from the CMU that is destined for a GES contains a destination code of S. These codes are embedded in the RTS, CTS, and NCTS protocol words (See "Understanding Protocol Words" on page F-9).

**7. Understanding Word Types**

The word types in Table F-8 are valid. For a full definition, see ARINC 429 P3, attachment 11.

**Table F-8 Word Types**

31	30	29	WORD TYPE
0	0	0	Full Binary Data Word
0	0	1	Partial Binary Data Word
0	1	0	Start of Frame—Version 3
0	1	1	End of Frame—Version 3
1	0	0	Protocol Word
1	0	1	Solo Word
1	1	0	Start Of Transmission—Version 1
1	1	1	End Of Transmission—Version 1

**A. Understanding the Full Binary Data Word**

This word shall transmit 5 nibbles of data. See ARINC 429P3 Attachment 11 for details.

**B. Understanding the Partial Binary Data Word**

This word shall transmit 4 or less nibbles of data. See ARINC 429P3 Attachment 11 for details.

**C. Understanding Protocol Words**

The protocol words are shown in Table F-9. The protocol identifier occupies bits 28-25 of the protocol word.

**Table F-9 Protocol Words and Uses**

Protocol word	Uses
RTS (Request to Send)	The HSD-440 Mark 2 Terminal issues an RTS to the CMU when it is ready to send an LDU. The RTS contains a destination code (bits 24–17) and a word count (bits 16–9).
CTS (Clear to Send)	When the HSD-440 Mark 2 Terminal receives an RTS, it issues a CTS to the CMU when the CMU is ready to send an LDU. The CTS contains the same destination code and word count as the HSD-440 Mark 2 Terminal received in the RTS.  Bit 11 of the Status Word Label 270 from the HSD-440 Mark 2 Terminal indicates when a satellite link is available to proceed if this is a ground destination message.
NCTS (Not Clear to Send)	When the HSD-440 Mark 2 Terminal either receives a valid RTS and is not ready to accept data or receives an RTS with an invalid destination or word count, it responds with an NCTS. The NCTS contains a destination code (bits 24–17).
NAK (negative acknowledgement)	If the HSD-440 Mark 2 Terminal notes a missing SOT or EOT word, parity error, word count error, CRC error, or time out error, it will respond with a NAK. The NAK contains the same file sequence number in bits 24–17 as the SOT word.
ACK (acknowledgement)	If the HSD-440 Mark 2 Terminal transfers each word within the designated time and with odd parity, correct word count, and verified CRC. The LDU is either next, first, or a duplicate. Then the HSD-440 Mark 2 Terminal sends an ACK. The ACK word contains the file sequence number (bits 24–17) and the LDU sequence number (bits 16–9).
ALO (aloha)	The HSD-440 Mark 2 Terminal can initiate BOP V1 communication by sending an ALO word out on the bus.  The first ALO word that the HSD-440 Mark 2 Terminal transmits contains the highest version number it supports (bits 12–9). This word determines the correct protocol to use for the exchange. The ALO also sends its own SAL (bits 24–17).
ALR (aloha response)	When the HSD-440 Mark 2 Terminal receives an ALO word, it leaves its present task and responds with an ALR word. The response contains the protocol version level supported.

**Table F-9 Protocol Words and Uses (Continued)**

Protocol word	Uses
SYN	The HSD-440 Mark 2 Terminal transmits a SYN word to inform the CMU that the construction of the last file that was transmitted is confused. The reception of a SYN word causes the CMU to abort any reception or transmission in progress. In addition, if the CMU was transmitting, it should re-initiate transmission of the file that was aborted.
Destination code	RTS, CTS, and NTCS words use a destination code. The destination code field (when used, bits 24–17) indicates the final destination of the LDU. If the LDU will be used in the HSD-440 Mark 2 Terminal, the destination code can be set to 00h. If the LDU is intended to be passed on to another onboard system, the destination code indicates that system.
Word count	RTS and CTS words use a word count. The word count field (bits 16–9) reflects the number of ARINC 429 words that will be transmitted in a subsequent LDU. The maximum word count value is 255 ARINC 429 words.

**D. Understanding the Solo Word**

If the data the HSD-440 Mark 2 Terminal is sending consists of only 1 or 2 octets, then the data can be sent blind using the solo word instead of obtaining a CTS. Solo words conform to the following rules:

- The solo word contains a 16 bit data field in bits 24–9
- Bits 31–29 are permanently set to 101b
- Solo words are not acknowledged at the link level
- Solo words are not interleaved with data file words during a data file transfer, however if the HSD-440 Mark 2 Terminal receives a solo word during data transfer, the HSD-440 Mark 2 Terminal shall process the solo word normally and resume file transmission or reception.

The solo word also performs test and loop back functions to test the integrity of the ARINC 429 bus interconnection between the HSD-440 Mark 2 Terminal and the CMU.

The HSD-440 Mark 2 Terminal can send a 16 bit loop test pattern word (TEST) on the ARINC 429 TX bus. The CMU then responds with the identical loop test pattern word (LOOP) on the ARINC 429 RX bus. If the LOOP does not match the TEST, the HSD-440 Mark 2 Terminal indicates a TEST failure.

If the HSD-440 Mark 2 Terminal receives a TEST on its ARINC 429 RX bus, it responds by transmitting an identical LOOP on the ARINC 429 TX bus.

A 4 bit identifier (bits 28–25) identifies the nature of the data being sent by the solo word. The three types of data are shown in Table F-10.

**Table F-10 Data Types**

Purpose	Bits 28-25b	Description
Test	0000b	16 Bit Test Pattern

**Table F-10 Data Types (Continued)**

Loop	0001b	16 Bit Loop Back
Solo Word	ID	16 Bit Data Filed

**E. Understanding Start of Transmission (SOT)**

When the HSD-440 Mark 2 Terminal receives a valid CTS with the destination code and word count of the previous RTS, then it responds by sending an SOT word immediately before the LDU. The SOT contains the file sequence number, the GFI, and the LDU sequence number.

The file sequence number (bits 24–17) of the SOT word is an 8 bit number assigned to the data file. It is initialized to 00h and increments by 1h for each new file sent over the link. After reaching FFh, the file sequence number returns to 01h and recommences incrementing by 1h for each new file sent. A file consisting of multiple LDUs has the same file sequence number in each SOT word of each LDU. The file sequence number is also used in ACK and NAK words.

The LDU sequence number (bits 16–9) of the SOT word is an 8 Bit number assigned to the LDU. It is initialized to 00h and increments by 1h for each LDU sent (of the same file). The LDU sequence number resets to 00h at the beginning of each new file. The LDU sequence number is also used in the ACK word.

**F. Understanding End of Transmission (EOT)**

Each LDU is terminated by an EOT word. Bit 25 indicates if this LDU is the final LDU of the transfer. If it is, then this bit shall be set to 1; if it is not the final LDU, it shall be set to 0. The EOT also contains the CRC word in bits 24–9. See ARINC 429 P3, paragraph 2.5.12, for details on generating and decoding the CRC word.

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## APPENDIX G: INTERNATIONAL ACCESS AND COUNTRY CODES

Table G-1 shows a list of countries with their associated country codes and international access codes.

**Table G-1 International Access and Country Codes**

Country	Country Code	International Access Code
Afghanistan	93	00
Albania	355	00
Algeria	213	00
Angola	244	00
Anguilla	+1 (264)	011
Antigua	+1 (268)	011
Argentina	54	00
Armenia	374	00
Aruba	297	00
Australia	61	00 11
Austria	43	00
Bahamas	+1 (242)	011
Bahrain	973	00
Bangladesh	880	00
Barbados	+1 (246)	011
Belarus	375	810
Belgium	32	00
Belize	501	00
Benin	229	00
Bermuda	+1 (441)	011
Bolivia	591	00 10
Bosnia and Hercegovina	387	99
Botswana	267	00
Brazil	55	00
British Virgin Islands	+1 (284)	011
Bulgaria	359	00
Burkina Faso	226	00
Burma (Myanmar)	95	00
Burundi	257	90
Cambodia	855	001

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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
Cameroon	237	00
Canada	1	011
Cape Verde	238	0
Cayman Islands	+1 (345)	011
Central African Republic	236	19
Chad	235	15
Chile	56	00
China	86	00
Colombia	57	009
Comoros	269	00
Congo (Brazzaville)	242	00
Congo (Kinshasa, formerly Zaire)	243	00
Cook Islands	682	00
Costa Rica	506	00
Cote d'Ivoire (Ivory Coast)	225	00
Croatia	385	99
Cuba	53	119
Cyprus	357	00
Czech Republic	420	00
Denmark	45	00
Diego-Garcia	246	00
Djibouti	253	00
Dominica	+1 (767)	011
Dominican Republic	+1 (809), +1 (829)	011
East Timor	670	00
Ecuador	593	00
Egypt	20	00
El Salvador	503	0
Equatorial Guinea	240	00
Eritrea	291	00
Estonia	372	810
Ethiopia	251	00
Falkland Islands	500	01
Faroe Islands	298	009
Fiji	679	5
Finland	358	00
France	33	00



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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
French Antilles	590	00
French Guiana	594	00
French Polynesia	689	00
Gabon	241	00
Gambia	220	00
Germany	49	00
Ghana	233	00
Gibraltar	350	00
Greece	30	00
Greenland	299	009
Grenada	+1 (473)	011
Guam	+1 (671)	011
Guatemala	502	00
Guinea	224	00
Guinea-Bissau	245	00
Guyana	592	001
Haiti	509	00
Honduras	504	00
Hong Kong	852	001
Hungary	36	00
Iceland	354	90
India	91	900
Indonesia	62	001, 008
Iran	98	00
Iraq	964	00
Ireland	353	00
Israel	972	00
Italy	39	00
Ivory Coast (Cote d'Ivoire)	225	00
Jamaica	+1 (876)	011
Japan	81	010
Jordan	962	00
Kazakstan	7	810
Kenya	254	000
Kuwait	965	00
Kyrgyz Republic	996	00
Laos	856	00

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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
Latvia	371	810
Lebanon	961	00
Lesotho	266	00
Liberia	231	00
Libya	218	00
Liechtenstein	423	00
Lithuania	370	00
Luxembourg	352	00
Macao	853	00
Macedonia	389	00
Madagascar	261	16
Malawi	265	101
Malaysia	60	00
Maldives	960	00
Mali	223	00
Malta	356	356
Marshall Islands	692	011
Martinique	596	00
Mauritania	222	00
Mauritius	230	00
Mayotte and Reunion	262	10
Mexico	52	98
Micronesia	691	011
Moldova	373	00
Monaco	377	00
Mongolia	976	001
Montenegro	382	00
Montserrat	+1 (664)	011
Morocco	212	00
Mozambique	258	00
Namibia	264	00
Nauru	674	00
Nepal	977	00
Netherlands	31	00
New Caledonia	687	00
New Zealand	64	00
Nicaragua	505	00

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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
Niger	227	00
Nigeria	234	009
Niue Island	683	00
North Korea	850	00
Northern Mariana Islands (Commonwealth of)	+1 (670)	011
Norway	47	095
Oman	968	00
Pakistan	92	00
Palau	680	011
Palestine	970	00
Panama	507	00
Papua New Guinea	675	05
Paraguay	595	002
Peru	51	00
Philippines	63	00
Poland	48	00
Portugal	351	00
Puerto Rico	+1 (787)	011
Qatar	974	00
Romania	40	71
Russia	7	810
Rwanda	250	00
Samoa	685	0
San Marino	378	00
Saudi Arabia	966	00
Senegal	221	00
Serbia	381	99
Seychelles	248	00
Sierra Leone	232	00
Singapore	65	001
Slovakia	421	00
Slovenia	386	99
Solomon Islands	677	00
Somalia	252	00
South Africa	27	00
South Korea	82	00

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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
Spain	34	00
Sri Lanka	94	00
St Helena and Tristan da Cunha	290	00
St Kitts	+1 (869)	011
St Lucia	+1 (758)	011
St Pierre and Miquelon	508	00
St Vincent	+1 (784)	011
Sudan	249	00
Suriname	597	002
Swaziland	268	00
Sweden	46	00
Switzerland	41	00
Syria	963	00
Taiwan	886	002
Tajikistan	992	810
Tanzania	255	000
Thailand	66	001
Togolese Republic	228	00
Tokelau	690	00
Tonga	676	09
Trinidad and Tobago	+1 (868)	011
Tunisia	216	00
Turkey	90	99
Turkmenistan	993	810
Turks and Caicos	+1 (649)	011
Tuvalu, Ellice Islands	688	00
U.S. Pacific Islands	+1 670, +1 671, +1 684	011
U.S. Virgin Islands	+1 (340)	011
Uganda	256	000
Ukraine	380	810
United Arab Emirates	971	00
United Kingdom	44	00
United States	1	011
Uruguay	598	00
Uzbekistan	998	810
Vanuatu	678	00

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**Table G-1 International Access and Country Codes (Continued)**

<b>Country</b>	<b>Country Code</b>	<b>International Access Code</b>
Vatican City	+39, +379	00
Venezuela	58	00
Vietnam	84	00
Wallis and Futuna	681	19
Yemen	967	00
Yugoslavia	(+38 discontinued)	99
Zambia	260	00
Zimbabwe	263	110

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## APPENDIX H: INMARSAT CAUSE CODES

Table H-1 defines the maintenance port menu fault codes of the HSD-440 Mark 2 Terminal.

**Table H-1 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
1202	Handover, MES ready
1281	Call failed, MES cannot accept
1291	Call failed, MES cannot accept at present
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 re-point OR
1391	Call cleared, traveled distance exceeds 700km
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)

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
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
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



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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
8012	ACSE Finding Primary Standalone Short
8013	ACSE Finding Primary NCS Short
8014	ACSE Finding Primary Standalone Long
8018	ACSE Finding Secondary Standalone Short

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
8310	ACSE ORR Query Begin
8311	ACSE ORR Query Burst
8312	ACSE ORR Query Successful
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

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
9100	Peripheral on hook

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
400000	CT SP bad

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
400910	CT SP prod test
400911	CT SP prod test ODU
401000	CT SP clear spot beam
800124	Mobile Aero 64k speech

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
800404	Mobile data
800504	Mobile facsimile
800606	Mobile 64k UDI
800607	Mobile 56k UDI
800610	Mobile 64k audio 3k1
800622	Mobile Aero 64k UDI
800623	Mobile Aero 56k UDI
800625	Mobile Aero 64k audio 3k1
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
12B1	Call cleared by MES for unspecified reason, for example: <ul style="list-style-type: none"> <li>• GPS conflict</li> <li>• Insufficient HPA power available to make call</li> <li>• HPA over current</li> </ul>
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 2SU
12C7	Call cleared, MES missing SCPC channel release SU sup service



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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
12C8	Handover failed, LES not detected
12D1	Call failed, Spot-beam data invalid
12D2	Call failed, invalid scrambling vector
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
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)
16C2	LES missing MES SCPC
16C3	Handover failed, MES not detected
18A1	NCS MES ID not found
18A2	Call failed, MES not authorized
18A3	Call failed, LES not authorized

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
2F00	LES int reject lack of MES RESP response
2F01	LES int reject lack of MES ARN response
2F02	LES int reject incorrect SVECSCPC
4000A0	CT SP any
4000F0	CT Terminal ID
4000F1	CT Options
4000F2	CT config names
80010F	Mobile 64k speech
8D0FFF	Mobile Mini-M
8E0FFF	Mobile HSD
8F0FFF	Mobile
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

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
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
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
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

**Table H-1 Inmarsat Cause Code Definitions (Continued)**

Inmarsat Cause Code	Code Definition
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

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**Table H-1 Inmarsat Cause Code Definitions (Continued)**

<b>Inmarsat Cause Code</b>	<b>Code Definition</b>
B500	Battery charging communication failure
B501	Power supply error
B580	Battery is over temperature, charging disabled
B581	Battery temperature is now ok, charging enabled
C0010F	Fixed 64k speech
C00124	Fixed Aero 64k speech
C00404	Fixed data
C00504	Fixed facsimile
C00606	Fixed 64k UDI
C00607	Fixed 56k UDI
C00610	Fixed 64k audio 3k1
C00622	Fixed Aero 64k UDI
C00623	Fixed Aero 56k UDI
C00625	Fixed Aero 64k audio 3k1
CD0FFF	Fixed Mini-M
CE0FFF	Fixed HSD
CF0FFF	Fixed
FFFD	ACSE end marker (MPDS)
FFFE	Status undefined (MPDS)
FFFF	Status OK (MPDS)

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