



**XPDR/DME/TCAS
ADS-B/TIS/TIS-B
Test Set
IFR 6000**

Operation Manual

1002-5800-200

OPERATION MANUAL

XPDR/DME/TCAS/ADS-B/TIS/TIS-B

TEST SET

IFR 6000

PUBLISHED BY
Aeroflex

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Cable Statement:

For continued EMC compliance, all external cables must be double shielded.

For continued EMC compliance, all external cables must be 3 meters or less in length.

Nomenclature Statement:

In this manual Test Set or Unit refers to the IFR 6000 XPDR/DME/TCAS/ADS-B/TIS/TIS-B Test Set.



OPERATION MANUAL
IFR 6000

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SAFETY FIRST: TO ALL OPERATIONS PERSONNEL

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL. THIS UNIT CONTAINS NO OPERATOR SERVICEABLE PARTS.

WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.

CASE, COVER OR PANEL REMOVAL

Opening the Case Assembly exposes the operator to electrical hazards that can result in electrical shock or equipment damage. Do not operate this Test Set with the Case Assembly open.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards, that may exist when operating or servicing this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY SYMBOLS IN MANUALS AND ON UNITS



CAUTION: Refer to accompanying documents. (This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.)



AC OR DC TERMINAL: Terminal that may supply or be supplied with AC or DC voltage.



DC TERMINAL: Terminal that may supply or be supplied with DC voltage.



AC TERMINAL: Terminal that may supply or be supplied with AC or alternating voltage.

EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

USE OF PROBES

Check the specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

USE RECOMMENDED FUSES ONLY

Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

INTERNAL BATTERY

This unit contains a Lithium Ion Battery, serviceable only by a qualified technician.

CAUTION: SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND SHOULD TAKE NECESSARY PRECAUTIONS TO AVOID POTENTIAL COMMUNICATION INTERFERENCE PROBLEMS.



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INTRODUCTION

This manual contains operating instructions for the IFR 6000. It is strongly recommended that personnel be thoroughly familiar with the contents of this manual before attempting to operate this equipment.

Refer all servicing of unit to qualified technical personnel.

ORGANIZATION

This manual is divided into the following Chapters and Sections:

CHAPTER 1 - OPERATION

- Section 1 - DESCRIPTION and Quick Start (for operators familiar with avionics systems)
- Section 2 - OPERATION (installation, description of controls, connectors and indicators, performance evaluation and operating procedures)
- Section 3 - SPECIFICATIONS
- Section 4 - SHIPPING
- Section 5 - STORAGE



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SERVICE UPON RECEIPT OF MATERIAL

Unpacking

Special-design packing material inside this shipping carton provides maximum protection for the IFR 6000. Avoid damaging the carton and packing material during equipment unpacking. Use the following steps for unpacking the IFR 6000.

- Cut and remove the sealing tape on the carton top and open the carton.
- Grasp the IFR 6000 transit case firmly, while restraining the shipping carton, and lift the equipment and packing material vertically.
- Place the IFR 6000 transit case and end cap packing on a suitable flat, clean and dry surface.
- Remove the protective plastic bag from the IFR 6000 transit case. Place the desiccant bags back inside the protective plastic bag.
- Place protective plastic bag and end cap packing material inside shipping carton.
- Store the shipping carton for future use should the IFR 6000 need to be returned.

Checking Unpacked Equipment

- Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage to Aeroflex.
- Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies to Aeroflex.

DESCRIPTION	PART NUMBER	QTY
IFR 6000	9001-5802-000	1
POWER SUPPLY	7110-5600-200	1
ANTENNA	7005-5840-500	1
BREAKOUT BOX	7005-5841-000	1
ANTENNA SHIELD	7005-8142-200	1
12 IN. COAXIAL CABLE	6041-5880-800	1
72 IN. COAXIAL CABLE	6041-5880-900	1
5 A FUSE	5106-0000-057	1
TRANSIT CASE	1412-5853-000	1
POWER CORD (US ONLY)	6041-0001-000	1
POWER CORD (EUROPEAN)	7001-9903-000	1
OPERATION MANUAL (CD-ROM)	1002-5800-2CO	1
OPERATION MANUAL (PAPER)	(OPTIONAL)	



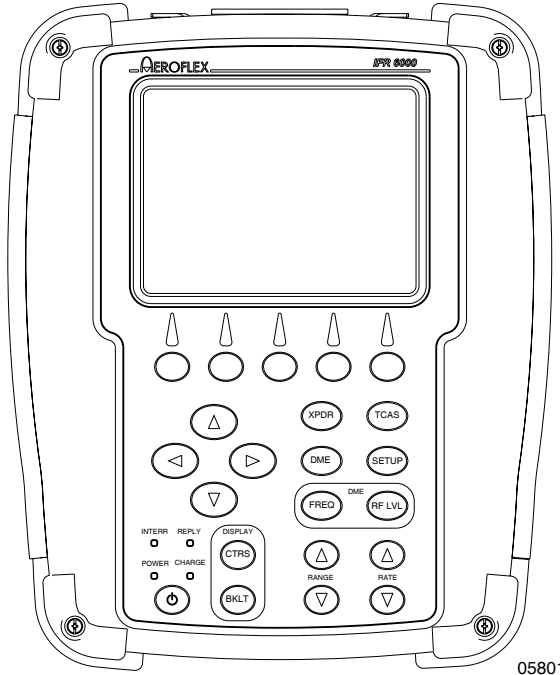


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SECTION 1 - DESCRIPTION

1. GENERAL DESCRIPTION AND CAPABILITIES

1.1 DESCRIPTION



The IFR 6000 is a precision simulator that enables one person to functionality test airborne transponder (XPDR) modes A/C/S, distance measuring equipment (DME) systems, TCAS I and II and ADS-B equipped transponders and 1090 MHz emitters.

The Test Set contains built-in signal generators and modulators for XPDR and selected DME frequencies. For ramp operation, the RF output is coupled to the airborne equipment by a lightweight directional antenna that may be mounted on the Test Set or tripod. For bench operation, coaxial cables are required between the Test Set and UUT.

1.2 FUNCTIONAL CAPABILITIES

The IFR 6000 has the following features and capabilities:

Functional Modes:

XPDR	Development Phase 1 and 2
DME	Phase 1 and 2
TCAS I and 2, TIS, TIS-B	Phase 3*
ADS-B RX	Phase 4*
ADS-B TX and GICB	Phase 5*

* Not in this manual release

- XPDR Auto Test provides a full FAR Part 43 Appendix F test. All normal user verified parameters are displayed on one screen.
- Parametric tests include ERP, MTL, Pulse Widths and Spacings.
- Separate screens for display of primary Elementary and Enhanced Surveillance parameters.
- Predetermined user selectable XPDR config files allow different classes of A/C/S and Mode S transponder to be tested.
- Altitude Encoder screen for monitoring encoding altimeter grey code.
- XPDR and DME Setup screens provide user defined operation parameters.
- Single DME test screen provides control over DME Frequency/Channel, Range, Rate, RF level, % reply, squitter, ident and echo. UUT frequency, ERP, PRF P1/P2 width and Spacing are also displayed.
- LCD Display with automatic light sensing illumination control (dark ambient equals bright backlight).
- Internal Battery allowing six hours operation before recharge.
- Automatic power shutdown after approximately 15 minutes of non-use when ac power is not connected.
- Compact size and lightweight allow one person operation.

1.3 REGULATORY RESPONSIBILITIES

Effective April 6, 1987, the Federal Aviation Administration (FAA) has required certain tests be performed on transponders, both conventional ATCRBS and Mode S. In preparation for the installation of new air traffic control radar facilities, the FAA required new measurements to be performed on existing transponders and instituted required tests for Mode S transponders. FAR (Federal Aviation Regulations) Part 43, Maintenance, Preventive Maintenance, Rebuilding and Alteration section has been modified to reflect current technologies and improvements. Aeroflex has met all FAA requirements and recommends that the user of this type of equipment review the appropriate FAR, or contact the manufacturer of their particular model of transponder to ensure that proper procedures are followed.

Eurocontrol and the JAA have also incorporated new regulations for Mode S Elementary and Enhanced Surveillance. These requirements include Selective Identifiers for high-density traffic areas and became mandatory in May, 2003 for Elementary Surveillance and March, 2005 for Enhanced Surveillance.

The IFR 6000 has the capability to thoroughly test these new functions to comply with upcoming requirements. For further information regarding these requirements, visit

www.eurocontrol.int/


2. QUICK START

The Quick Start is for operators who are familiar with avionics systems/test equipment and want to use the IFR-6000 before reading the complete Operation Manual. Refer to para 1-2-4.1 for detailed operation instructions.

2.1 CONTROLS



Controls
Figure 1

 Turns Test Set ON or OFF.

POWER: Indicator illuminates when Test Set is operational.

CHARGE: Indicator illuminates to show battery charge status; RED when charging, YELLOW when partially charged, GREEN when fully charged.

NOTE: Operates when External DC Power Supply is connected.

INTERR: Indicator illuminates when Test Set is interrogating (XPDR Mode) or receiving interrogations (DME Mode).

REPLY: Indicator illuminates when Test Set is receiving replies (XPDR Mode) or replying to interrogations (DME Mode).

CTRS: Adjusts display contrast.

BKLK: Adjusts display backlight.

RANGE ▲: Increases DME or TCAS range.

RANGE ▼: Decreases DME or TCAS range.

RATE ▲: Increases DME or TCAS rate.

RATE ▼: Decreases DME or TCAS rate.

FREQ: Frequency/channel selection for DME Mode only.

RF LVL: RF level setting for DME Mode only.

FUNCTIONAL MODES: XPDR, DME, TCAS. Each functional mode has a dedicated key.

SETUP: Displays the setup screens associated with the selected functional mode.

SOFT KEYS: Five Application dependent keys provide test specific information and movement between test screens.



Soft Keys
Figure 2



DATA Keys
Figure 3

DATA KEYS

▲ DATA KEY: Selects or slews data.

▼ DATA KEY: Selects or slews data.

◀ DATA KEY: Moves the cursor to the left in a data field.

▶ DATA KEY: Moves the cursor to the right in a data field.

2.2 TESTING OVER THE AIR

Refer to 1-1-2, Figure 4. Mount Directional Antenna on Test Set and position friction hinge so Directional Antenna is as shown. Connect short RF coaxial cable between ANT Connector and Test Set ANT Connector.



Antenna Mounting
Figure 4

2.3 TESTING VIA DIRECT CONNECT (XPDR)

Connect long RF coaxial cable between UUT Antenna port and the Test Set RF I/O Connector.

XPDR

1. Power Up: Press the POWER Key to power the Test Set.
2. Refer to 1-1-2, Figure 5. Press SETUP Control Key to display XPDR SETUP Screen. Use NEXT PARAM and PREV PARAM Soft Keys to select each parameter in sequence.

SETUP- XPDR		BAT 2.5 Hr	
ANTENNA: BOTTOM		RF PORT: ANTENNA	
ANT RANGE		ANT HEIGHT	
TOP: 30.0 ft		10.0 ft	
BOTTOM: 30.0 ft		4.0 ft	
CABLE LOSS: 1.3 dB		ANT GAIN (dBi)	
		1.03 GHz: 7.1	
		1.09 GHz: 6.1	
UUT ADDRESS: AUTO			
MANUAL AA: 123456			
DIVERSITY TEST: ON			
PREV PARAM	NEXT PARAM	TEST DATA	DIAG

XPDR SETUP Screen
Figure 5

Parameters:

ANTENNA: TOP or BOTTOM

RF PORT: ANTENNA or DIRECT CONNECT

CABLE LOSS: (normally set once; figure marked on supplied RF coaxial cable)

ANT GAIN (dBi): (normally set once; figures marked on supplied Directional Antenna)

ANT RANGE: Test Set antenna to transponder antenna range. Enter parameters for BOTTOM and TOP antenna if installation has diversity capability.

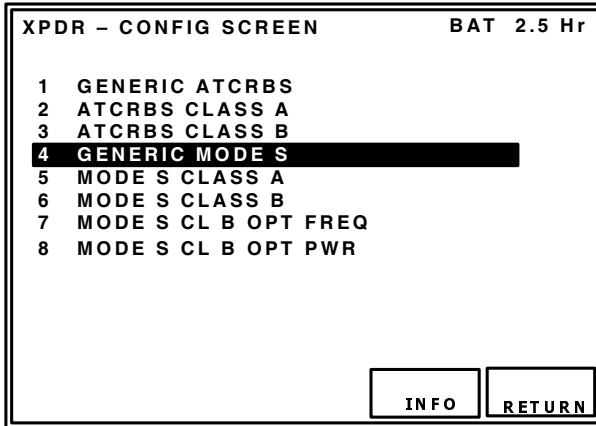
ANT HEIGHT: Test Set antenna to transponder antenna height difference. Enter parameters for BOTTOM and TOP antenna if installation has diversity capability.

UUT ADDRESS: MANUAL or AUTO (normally set to AUTO). UUT address obtained from reply to ATCRBS/Mode S All Call interrogation.

MANUAL ADDRESS: Six digit HEX user entered address is used if UUT ADDRESS: MANUAL is selected.

DIVERSITY TEST: ON or OFF (if testing transponders with single antenna systems, OFF should be selected).

3. Press XPDR Mode Key to return to XPDR Auto Test Screen.
4. Press CONFIG Soft Key to display XPDR CONFIG Screen (1-1-2, Figure 6). Use Data Keys to select configuration file. Press SELECT Soft Key to confirm selection. If transponder class is not known, select GENERIC ATRCBS or GENERIC MODE S configuration file.

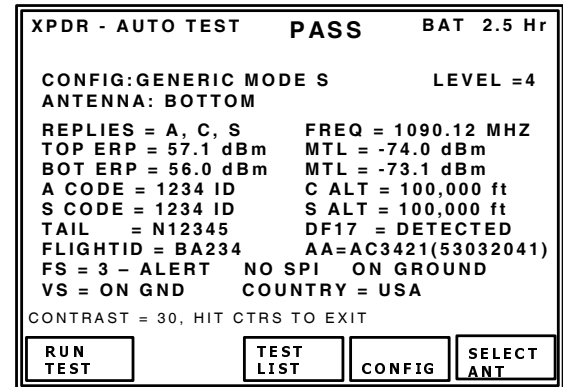


XPDR CONFIG Screen
Figure 6

5. To run a complete FAR Part 43 Appendix F Test, press RUN TEST Soft Key to start Auto Test (1-1-2, Figure 7). When Auto Test completes, a PASS or FAIL indication is displayed at the top of the screen.
6. Most UUT parameters requiring user verification are displayed on the Auto Test Screen.
7. VS and FS discretes: To verify status, ensure UUT is in airborne state prior to running test. Run test and confirm that VS and FS fields indicate IN AIR. Place UUT in ground state, repeat test and confirm VS and FS fields indicate ON GROUND.
8. TAIL: Displays the tail number decoded from Mode S discrete address and COUNTRY displays the country decoded from the Mode S discrete address. If the country selected has not adopted an encoding scheme, only the country is displayed.

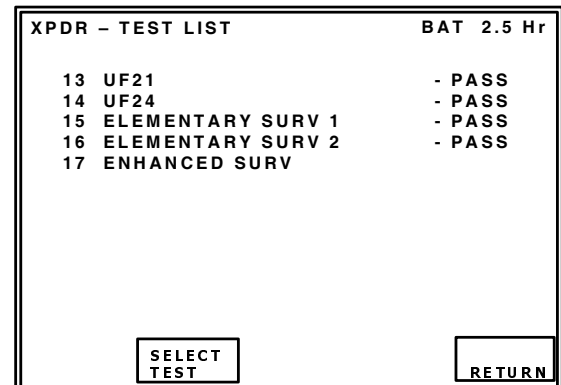
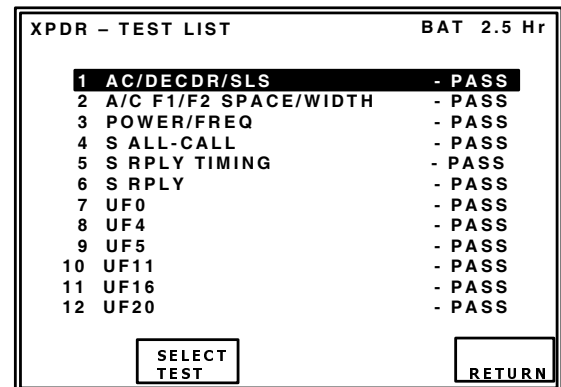
NOTE: Antenna Shield should be installed if Diversity Test is set to ON.

9. FLIGHT ID: UUT must have a valid source of Flight ID (internal or external to the UUT) to display data.



XPDR AUTO Test Screen
Figure 7

10. Press TEST LIST Soft Key to display complete Auto Test List (1-1-2, Figure 8). Use Data Keys to select desired test. Press SELECT Soft Key to display selected test.



XPDR Test List Screen
Figure 8

11. Press RETURN Soft Key to display Auto Test Screen.

2.4 TESTING VIA DIRECT CONNECT (DME)

Connect long RF coaxial cable between UUT Antenna port and Test Set RF I/O Connector.

DME

1. Power Up: Press the POWER Key to power the Test Set.
2. Functional Mode Selection: Press DME Mode Select Key to select DME Mode ; DME Test Screen is displayed. (All DME test data is displayed on this single screen.)
3. Press SETUP Key to display DME SETUP Screen (1-1-2, Figure 9). Use NEXT PARAM and PREV PARAM Soft Keys to select each parameter in sequence.

SETUP - DME		BAT 2.5 Hr	
RF PORT	:	DIRECT CONNECT	
ANT RANGE	:	10.5 m	
IDENT TONE	:	IFR	
CABLE LOSS	:	2.1 db	
MAX RANGE	:	200.00 nm	
		ANT GAIN (dbi)	
		0.96 GHz	:7.5
		1.03 GHz	:7.1
		1.09 GHz	:6.1
		1.15 GHz	:5.0
		1.22 GHz	:2.8
PREV PARAM		NEXT PARAM	
		DIAG	

DME SETUP Screen
Figure 9

Parameters:

RF PORT: ANTENNA or DIRECT CONNECT

CABLE LOSS: (normally set once, figure marked on supplied RF coaxial cable)

ANT GAIN (dBi): (normally set once, figure marked on supplied directional antenna)

ANT RANGE: Test Set antenna to DME antenna range.

MAX RANGE: Maximum range for DME distance simulation.

4. Press DME Mode Select Key to display DME Test Screen.

- Using NEXT PARAM and PREV PARAM Soft Keys to select each parameter in sequence (1-1-2, Figure 10). Use Data Keys to select data.

DME		BAT 2.5 Hr	
VOR: 108.00 MHz	RF LVL: -100 dBm		
FREQ: 978 MHz	RATE: 6500 kts	IN	
CHAN: 17X	RANGE: 450.00 nm		
% REPLY: 100	ECHO :OFF		
SQTR : OFF	IDENT: OFF		
TX FREQ =	MHZ	ERP=55.0 dBm	
P1 WIDTH =	us	PRF=150 Hz	
P2 WIDTH =	us		
P1-P2 =	us(Y)		
RUN TEST	PREV PARAM	NEXT PARAM	STOP RATE
			IN / OUT

DME Test Screen
Figure 10

VOR: Selects VOR pair DME channel. Displays CHAN (channel) number and Ground to Air FREQ in MHz.

RF LVL: Defaults to maximum, but may be adjusted for track sensitivity tests.

RANGE: 0.00 to 450.00 nm.

NOTE: Maximum range is preset in SETUP DME screen. Defaults to 400 nm.

RATE: Set range rate in kts. Use the IN/OUT Soft Key to change track direction.

% REPLY: Defaults to 100%, but may be set in 1% increments.

SQTR: Defaults to ON. Must be ON for interrogator to acquire Test Set.

IDENT: Defaults to OFF. May be set to ON to generate Ident Tone.

- Press RUN TEST Soft Key to start test. UUT parameters continue to update while test is running.
- Press STOP TEST Soft Key to stop test. Last UUT parameters are retained on display.



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SECTION 2 - OPERATION

1. INSTALLATION

1.1 GENERAL

The IFR 6000 is powered by an internal Lithium Ion battery pack. The Test Set is supplied with an external DC Power Supply that enables the operator to recharge the battery when connected to AC power.

NOTE: The IFR 6000 can operate continuously on AC power via the DC Power Supply, for servicing and/or bench tests.

Refer to 1-2-2, Figure 2 for location of controls, connectors or indicators.

1.2 BATTERY OPERATION

The internal battery is equipped to power the IFR 6000 for six hours of continuous use, after which time, the IFR 6000 battery needs recharging. Battery Operation Time Remaining (in Hours) is displayed on all screens.

The IFR 6000 contains an automatic time-out to conserve power. If a key is not pressed within a 5 to 20 minute time period, the Test Set shuts Off (only when using battery power). The Power Down Time may be set in the Setup Screen.

1.3 BATTERY CHARGING

The battery charger operates whenever DC power (11 to 32 Vdc) is applied to the Test Set with the supplied DC Power Supply or a suitable DC power source. When charging, the battery reaches a 100% charge in approximately four hours. The internal battery charger allows the battery to charge between a temperature range of 5° to 40°C. The IFR 6000 can operate, connected to an external DC source, outside the battery charging temperature range (5° to 40°C).

The battery should be charged every three months (minimum) or disconnected for long term inactive storage periods of more than six months. The Battery must be removed when conditions surrounding the Test Set are <-20°C or >60°C)

1.4 SAFETY PRECAUTIONS

The following safety precautions must be observed during installation and operation. Aeroflex assumes no liability for failure to comply with any safety precaution outlined in this manual.

1.4.1 Complying with Instructions

Installation/operating personnel should not attempt to install or operate the IFR 6000 without reading and complying with instructions contained in this manual. All procedures contained in this manual must be performed in exact sequence and manner described.

1.4.2 Grounding Power Cord

WARNING: DO NOT USE A THREE-PRONG TO TWO-PRONG ADAPTER PLUG. DOING SO CREATES A SHOCK HAZARD BETWEEN THE CHASSIS AND ELECTRICAL GROUND.

For AC operation, the AC Line Cable, connected to the DC Power Supply, is equipped with standard three-prong plug and must be connected to a properly grounded three-prong receptacle that is easily accessible. It is the customer's responsibility to:

- Have a qualified electrician check receptacle(s) for proper grounding.
- Replace any standard two-prong receptacle(s) with properly grounded three-prong receptacle(s).

1.4.3 Operating Safety

Due to potential for electrical shock within the Test Set, the Case Assembly must be closed when the Test Set is connected to an external power source.

Battery replacement, fuse replacement and internal adjustments must only be performed by qualified service technicians.

1.5 AC POWER REQUIREMENTS

The DC Power Supply, supplied with the IFR 6000, operates over a voltage range of 100 to 250 VAC at 47 to 63 Hz.

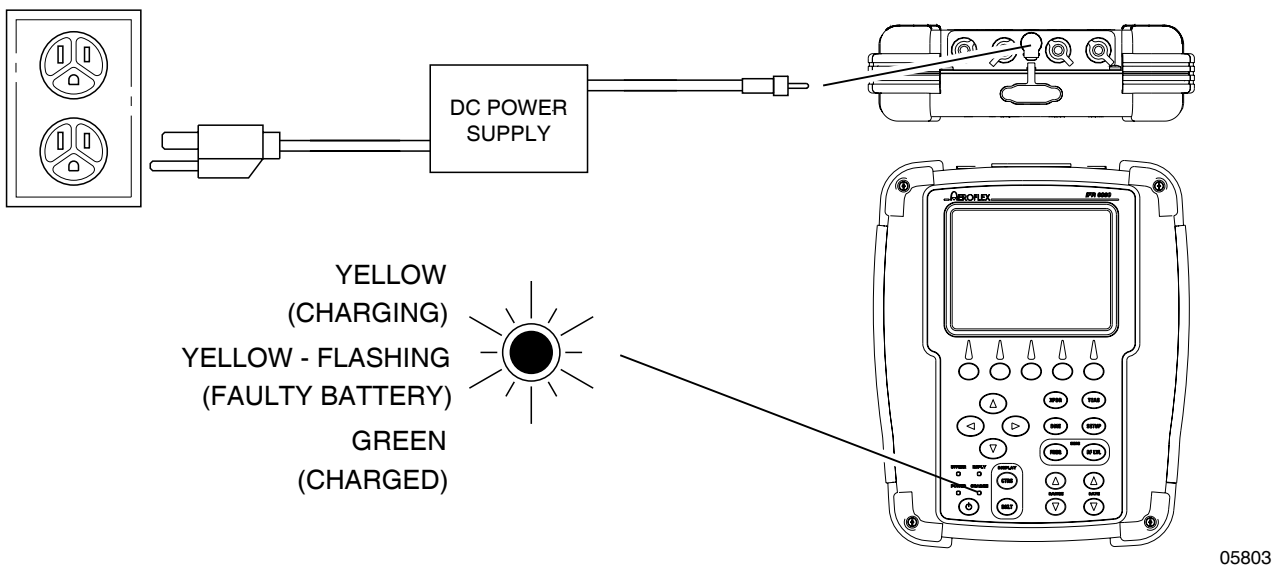
The battery charger operates whenever DC power (11 to 32 Vdc) is applied to the Test Set with the supplied DC Power Supply or a suitable DC power source. When charging, the battery reaches an 100% charge in approximately four hours. The Battery Charging temperature range is 5° to 40°C, controlled by an internal battery charger.

1.6 BATTERY RECHARGING

Refer to 1-2-1, Figure 1.

STEP	PROCEDURE
1.	Connect AC Line Cable to either: <ul style="list-style-type: none"> ● AC PWR Connector on the DC Power Supply and an appropriate AC power source ● Suitable DC power source
2.	Connect the DC Power Supply to the DC POWER Connector on the IFR 6000.
3.	Verify the CHARGE Indicator illuminates yellow.
4.	Allow four hours for battery charge or until the CHARGE Indicator illuminates green.

NOTE: If the CHARGE Indicator flashes yellow and/or the battery fails to accept a charge and the IFR 6000 does not operate on battery power, the battery, serviceable only by a qualified technician, requires replacement. Refer to Battery/Voltage Instructions.



Battery Recharging
Figure 1

1.7 EXTERNAL CLEANING

The following procedure contains routine instructions for cleaning the outside of the Test Set.

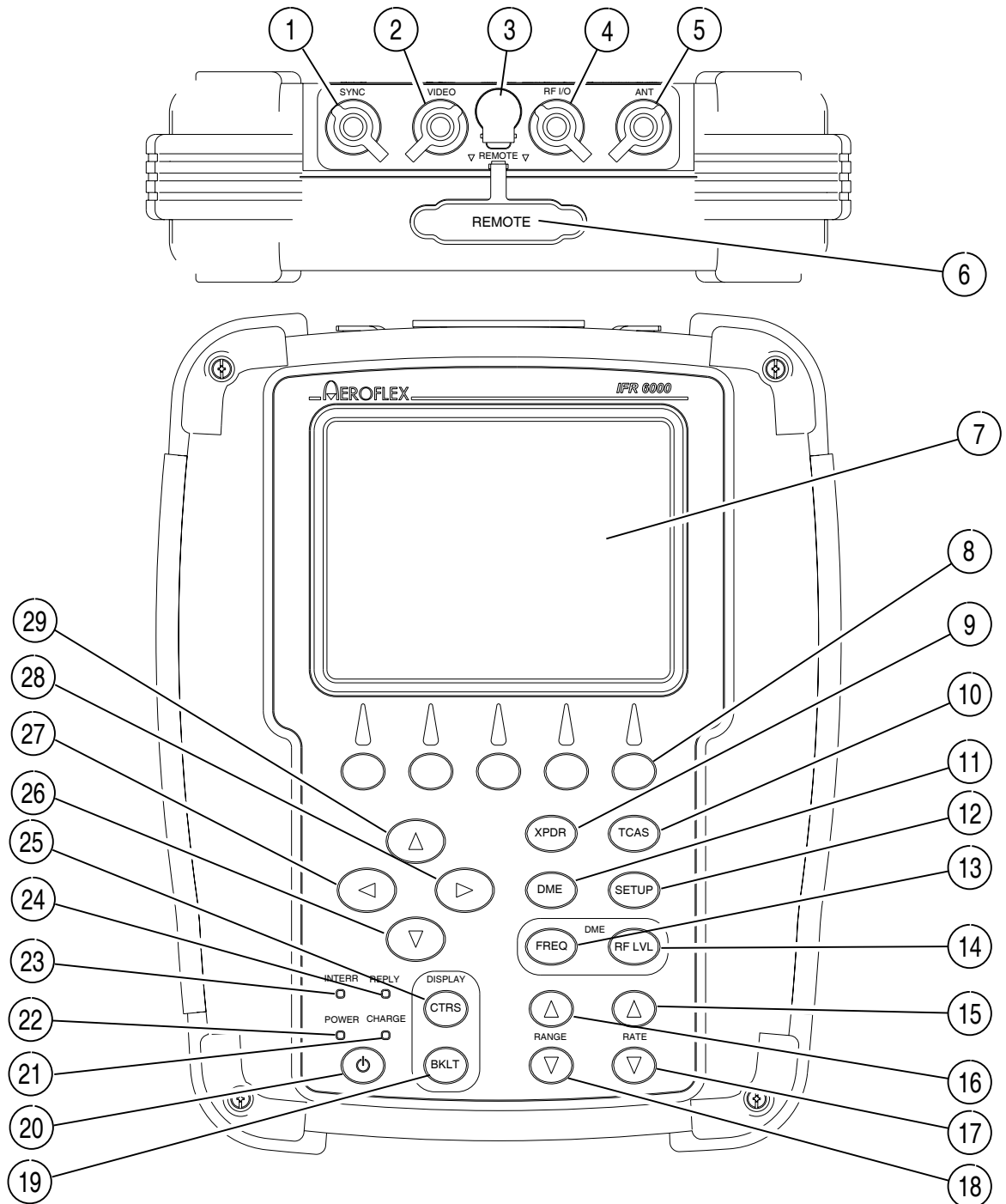
CAUTION: DISCONNECT POWER FROM TEST SET TO AVOID POSSIBLE DAMAGE TO ELECTRONIC CIRCUITS.

STEP	PROCEDURE
1.	Clean front panel buttons and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and a mild liquid detergent.
2.	Remove grease, fungus and ground-in dirt from surfaces with soft lint-free cloth dampened (not soaked) with isopropyl alcohol.
3.	Remove dust and dirt from connectors with soft-bristled brush.
4.	Cover connectors, not in use, with suitable dust cover to prevent tarnishing of connector contacts.
5.	Clean cables with soft lint-free cloth.
6.	Paint exposed metal surface to avoid corrosion.



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2. CONTROLS, CONNECTORS AND INDICATORS

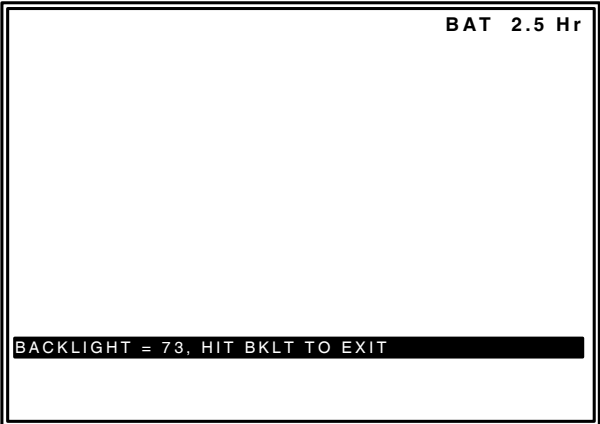


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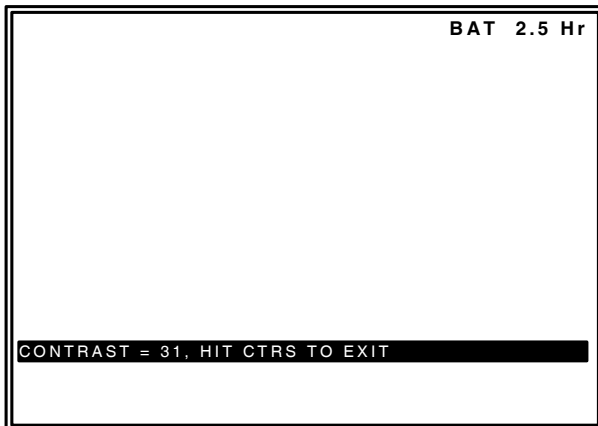
IFR 6000 Front Panel
Figure 2



NUMERICAL LOCATION LIST		ALPHABETICAL LOCATION LIST	
1.	SYNC Connector	ALTITUDE ENCODER Connector	37
2.	VIDEO Connector	ANT Connector	30
3.	DC POWER Connector	AUX IN Connector	38
4.	RF I/O Connector	AUX OUT Connector 1	31
5.	Test Set ANT Connector	AUX OUT Connector 2	32
6.	REMOTE Connector	AUX OUT Connector 3	33
7.	Display	AUX OUT Connector 4	34
8.	Multi-Function Soft Keys	BACKLIGHT Key	19
9.	XPDR Mode Select Key	CHARGE Indicator	21
10.	TCAS Mode Select Key	CONTRAST Key	25
11.	DME Mode Select Key	DC POWER Connector	3
12.	SETUP Select Key	DECREMENT/SELECT Data Key	26
13.	FREQ Select Key	RF LEVEL Key	14
14.	RF LVL Key	Display	7
15.	RATE INCREMENT Key	DME Mode Select Key	11
16.	RANGE INCREMENT Key	FREQ Select Key	13
17.	RATE DECREMENT Key	INCREMENT/SELECT Data Key	29
18.	RANGE DECREMENT Key	INTERR Indicator	23
19.	BACKLIGHT Key	Multi-Function Soft Keys	8
20.	POWER Key	POWER Indicator	22
21.	CHARGE Indicator	POWER Key	20
22.	POWER Indicator	RANGE DECREMENT Key	18
23.	INTERR Indicator	RANGE INCREMENT Key	16
24.	REPLY Indicator	RATE DECREMENT Key	17
25.	CONTRAST Key	RATE INCREMENT Key	15
26.	DECREMENT/SELECT Data Key	REMOTE Connector	6
27.	SELECT DATA UNIT MSB Key	REMOTE Connector	40
28.	SELECT DATA UNIT LSB Key	REPLY Indicator	24
29.	INCREMENT/SELECT Data Key	RF I/O Connector	4
30.	ANT Connector	RS-232 Connector	39
31.	AUX OUT Connector 1	SETUP Select Key	12
32.	AUX OUT Connector 2	SELECT DATA UNIT MSB Key	27
33.	AUX OUT Connector 3	SELECT DATA UNIT LSB Key	28
34.	AUX OUT Connector 4	SYNC Connector	1
35.	USB HOST Connector	TCAS Mode Select Key	10
36.	USB DEVICE Connector	Test Set ANT Connector	5
37.	Altitude Encoder Connector	USB DEVICE Connector	36
38.	AUX IN Connector	USB HOST Connector	35
39.	RS-232 Connector	VIDEO Connector	2
40.	REMOTE Connector	XPDR Mode Key	9

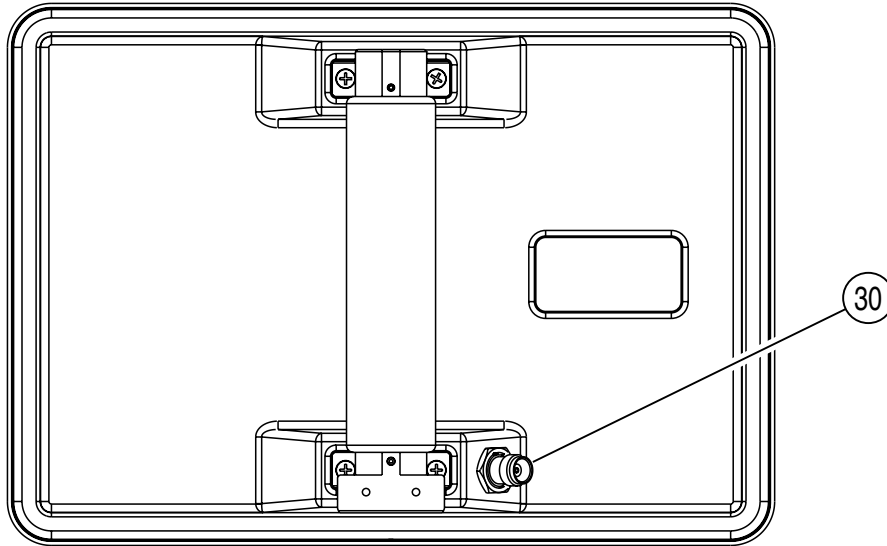
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1.	<p>SYNC Connector</p> <p>BNC type connector provides oscilloscope SYNC pulse for each interrogation.</p>	11.	<p>DME MODE Select Key</p> <p>Selects DME Test Screen.</p>
2.	<p>VIDEO Connector</p> <p>BNC type connector provides interrogation and reply pulses.</p>	12.	<p>SETUP Key</p> <p>Displays the SETUP Menu.</p>
3.	<p>DC POWER Connector</p> <p>Circular Type Connector (2.5 mm center, 5.5 mm outer diameter, center positive) used for battery charging or operation of Test Set.</p>	13.	<p>FREQ Select Key</p> <p>Selects DME Frequency as VOR Paired, TACAN Channel or MHz.</p>
4.	<p>RF I/O Connector</p> <p>CAUTION: MAXIMUM INPUT TO THE RF I/O CONNECTOR MUST NOT EXCEED 5 KW PEAK OR 30 W AVERAGE.</p> <p>TNC Type connector used for direct connection to UUT antenna connector.</p>	14.	<p>RF LVL Key</p> <p>DME mode function only. Selects DME range reply and squitter RF level.</p>
5.	<p>Test Set ANT Connector</p> <p>TNC Type Connector used for connection to the IFR 6000 directional antenna for over the air testing.</p>	15.	<p>RATE INCREMENT Key</p> <p>Increments DME or TCAS range rate.</p>
6.	<p>REMOTE Connector</p> <p>Type HD DB44 Connector used for remote operation and software upgrades. Contains RS-232, USB Host and USB Peripheral connections (altitude encoder inputs and SYNC outputs).</p>	16.	<p>RANGE INCREMENT Key</p> <p>Increments DME or TCAS range.</p>
7.	<p>Display (LCD)</p> <p>38 characters by 16 lines for main screen display with Soft Key boxes at the bottom of the screen.</p>	17.	<p>RATE DECREMENT Key</p> <p>Decrements DME or TCAS range rate.</p>
8.	<p>Multi-Function Soft Keys</p> <p>Legends for the five soft keys are displayed in boxes at the bottom of the Display (LCD) screen.</p>	18.	<p>RANGE DECREMENT Key</p> <p>Decrements DME or TCAS range.</p>
9.	<p>XPDR MODE Select Key</p> <p>Selects Transponder Auto Test Screen.</p>	19.	<p>BACKLIGHT Key</p> <p>Displays/exits the Backlight Adjust Field.</p> <p>INCREMENT/SELECT Data Key or DECREMENT/SELECT Data Key may be used to adjust the Backlight Intensity.</p> <p>The IFR 6000 powers up with the Backlight set to the setting of the previous session.</p>
10.	<p>TCAS MODE Select Key</p> <p>Selects TCAS Auto Test Screen.</p>		

ITEM	DESCRIPTION
20. POWER Key	Powers the IFR 6000 ON and OFF.
21. CHARGE Indicator	<p>Illuminated when external DC power is applied for Bench Operation or Battery charging.</p> <p>CHARGE Indicator is yellow when the battery is charging, flashing yellow when the battery needs replacing and Green when the battery is fully charged.</p>
22. POWER Indicator	Illuminated when the IFR 6000 is operational.
23. INTERR Indicator	Illuminated when Test Set is generating an interrogation signal (XPDR Mode) or receives an Interrogation (TCAS Mode) signal.
24. REPLY Indicator	Illuminated when the Test Set receives a valid reply signal (XPDR Mode) or generates a reply (TCAS Mode) signal.
25. CONTRAST Key	<p>Displays/exits the Contrast Adjust Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to adjust the Contrast.</p>



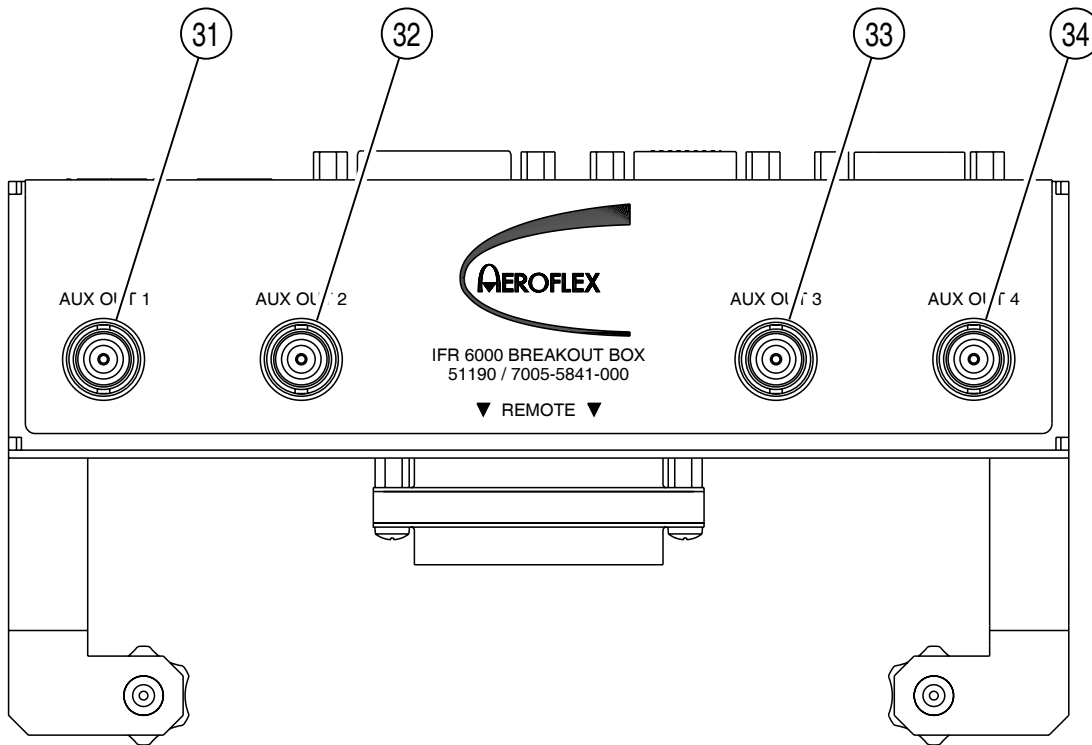
ITEM	DESCRIPTION
26. DECREMENT/SELECT Data Key	<p>Decrements data in slewable fields, such as RF LVL. This Key also selects data in fields that have fixed functions, such as ECHO and SQUITTER.</p>
27. SELECT DATA UNIT MSB Key	<p>Moves the slew cursor toward the MSB (Most Significant Bit) of the data field.</p> <p>Example: When DME or TCAS range is selected, the slew cursor can be moved from the 1.0 nm unit to the 10 nm, 0.1 nm or 0.01 nm unit.</p>
28. SELECT DATA UNIT LSB Key	<p>This Key moves the slew cursor toward the LSB (Least Significant Bit) of the data field.</p> <p>Example: When DME or TCAS range is selected, the slew cursor can be moved from the 1.0 nm unit to the 10 nm, 0.1 nm or 0.01 nm unit.</p>
29. INCREMENT/SELECT Data Key	<p>Increments data in slewable fields, such as RF LVL. This Key also selects data in fields that have fixed functions, such as ECHO and SQUITTER.</p>
30. ANT Connector	TNC Type Connector used for connection to the IFR 6000 for over the air testing.
31. AUX OUT Connector 1	ATCRBS interrogation trigger used for calibration.
32. AUX OUT Connector 2	ATCRBS interrogation trigger used for calibration.
33. AUX OUT Connector 3	Not Used
34. AUX OUT Connector 4	Not Used

ITEM	DESCRIPTION
35.	USB HOST Connector USB Jump Drive interface for software update and test data dump (not active in first release).
36.	USB DEVICE Connector Remote Control Interface.
37.	ALTITUDE ENCODER Connector Interface for external encoding altimeter.
38.	AUX IN Connector Not Used
39.	RS-232 Connector Used for remote control interface, software update and test data dump.
40.	REMOTE Connector Used to interface with the IFR 6000.



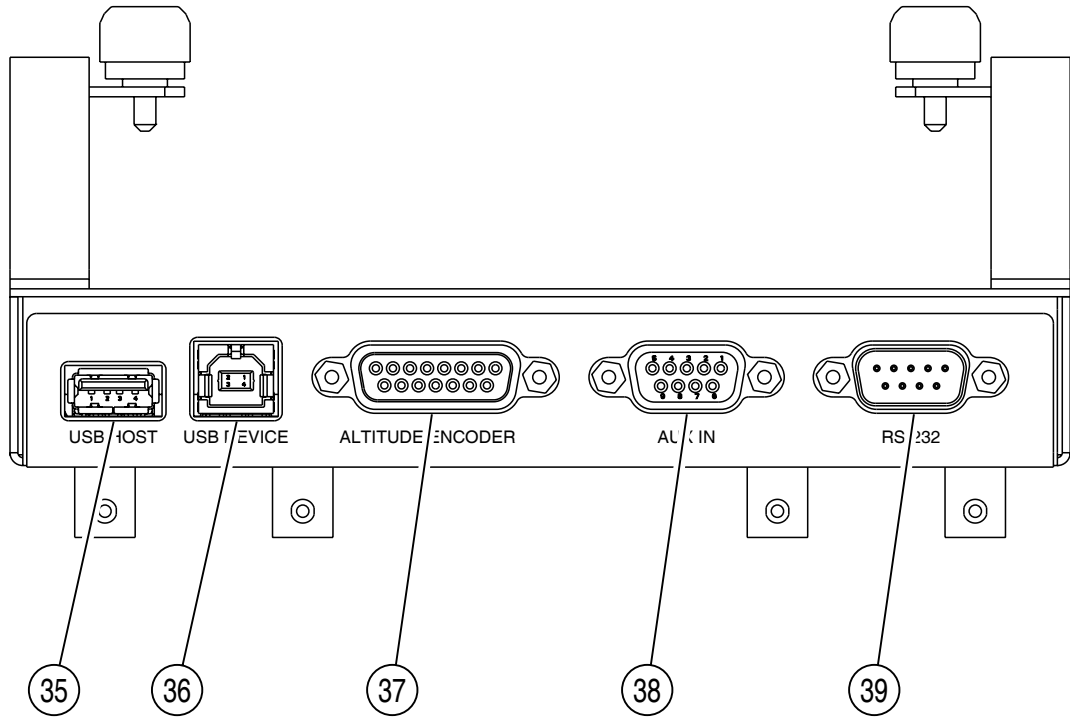
05822

Directional Antenna
Figure 3



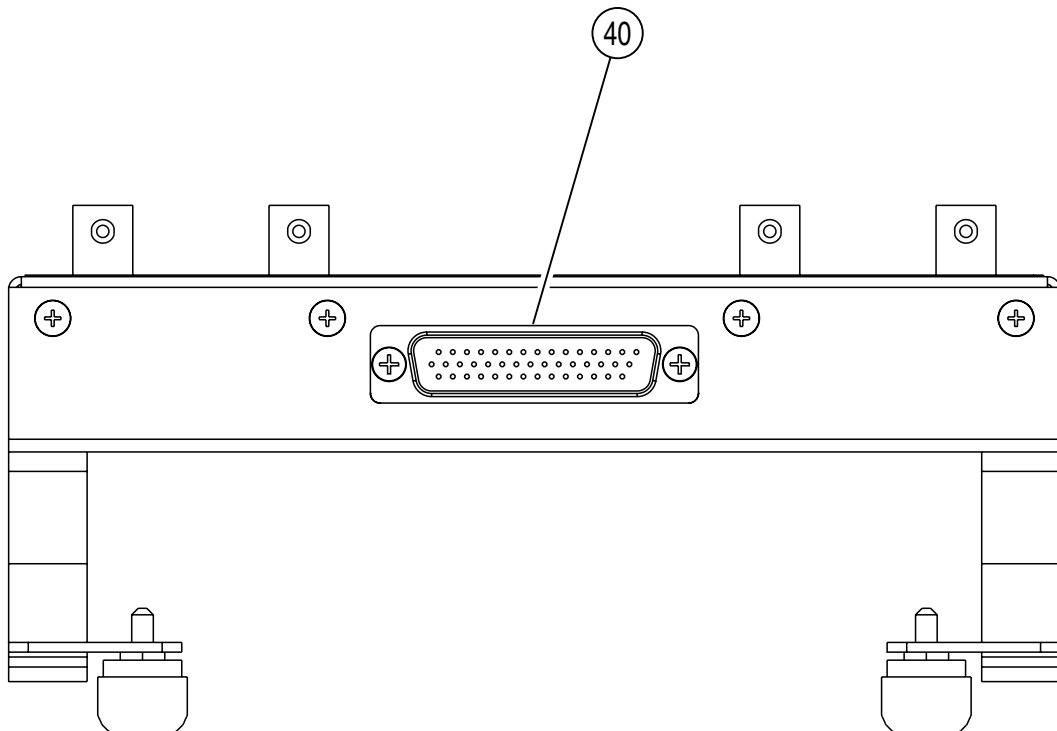
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Breakout Box - Front View
Figure 4



Breakout Box - Top View
Figure 5

05821A



Breakout Box - Bottom View
Figure 6

05821B



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3. PERFORMANCE EVALUATION

3.1 GENERAL

The IFR 6000 is equipped with a Self Test for quick performance evaluation. An abbreviated Self Test is run at Power-Up. The full Self Test is initiated manually.

Refer to 1-2-2, Figure 2 for location of controls, connectors and indicators.

3.2 SELF TEST

STEP	PROCEDURE
------	-----------

1. Press SETUP Key to display the Setup Menu.

SETUP - GENERAL		BAT 2.5 Hr	
PWR DOWN : 10 mins			
ERP UNITS : dBm		UNITS : FEET	
REMOTE OPERATION : RS232			
PREV PARAM	NEXT PARAM	H/W TOOLS	INFO

2. Press H/W TOOLS Soft Key to display the Hardware Tools Screen.

SETUP - HARDWARE TOOLS		BAT 2.5 Hr	
S/N 103009999			
MULTI-FUNCTION BOARD REV 0			
RF BOARD REV 1.00			
CPU BOARD REV 0			
RS232	SELF TEST	CAL	RETURN

STEP	PROCEDURE
------	-----------

3. Press SELF TEST Soft Key to display the Self Test Screen.

SETUP - SELF TEST		BAT 2.5 Hr	
CF RAM -	PPC COM -		
CF FL -	PPC RAM -		
CF CPLD -	PPC FL -		
NVR BAT -	PPC RMT -		
USB -	KEYPAD -		
FPGA -	BAT -		
CFPPC FL -	RF I/F -		
RTC -	RF MOD -		
EEPROM -			
DISCONNECT ALL CABLES BEFORE RUNNING			
RUN TEST	DUMP INFO	RETURN	

4. Press RUN TEST Soft Key to initiate the Self Test.
5. Verify that all the modules/assemblies pass the Self Test. If the Self Test indicates a failure, contact Aeroflex for additional information:

AEROFLEX

10200 West York
Wichita, KS 67215 U.S.A.

Phone: (800) 835-2350
FAX: (316) 524-2623
EMAIL: service@aeroflex.com

AEROFLEX INTL LTD

Units 14/15 Monks Brook Industrial Park,
School Close
Chandlers Ford, Hampshire
England A053 4RA

PHONE: 44-2380-273722
FAX: 44-2380-254015



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4. OPERATING PROCEDURES

4.1 GENERAL

This section contains operating instructions for the IFR 6000 ATCRBS/MODE S Transponder, DME, TCAS, ADS-B, TIS, TIS-B Test Set. The IFR 6000 replaces the IFR ATC-600A, ATC-601 and TCAS-201.

General procedures identify the controls, connectors, indicators and display screens used in individual test modes. For specific Unit Under Test (UUT) Procedures, refer to the UUT Manual.

For location of controls, connectors and indicators, refer to 1-2-2, Figure 2.

The IFR 6000 Test Set provides ATCRBS/Mode S Transponder and DME Test capability as standard modes.

Software options available are:

- TCAS 1, 2, TIS (Traffic Information Service) and TIS-B (Traffic Information Service Broadcast).
- ADS-B (DO-260/A) and GICB extracted Enhanced Surveillance DAP's (Downlinked Aircraft Parameters).

The IFR 6000 uses four functional modes:

- **TRANSPONDER** provides flight line test capability for ATCRBS and Mode S transponders. Testing is accomplished with an Auto Test, a series of tests displayed over several screens. All data normally required to verify transponder operation in accordance with FAR 91.413, Part 43, Appendix F, is displayed on one main Auto Test Screen.
- Different classes of transponders are tested to built-in test limits by selection of configuration files. If the class of transponder is unknown, generic config files are provided for ATCRBS and Mode S transponders that apply the widest system limits.

- Mode S Transponder level is automatically determined. European Enhanced Surveillance test capability allows decode and display of GICB derived BDS register contents (primary parameters only).
 - DME provides flight line test capability for Distance Measuring Equipment Interrogators. All parameters normally required for DME testing are displayed on one main screen. UUT interrogation parameters are clearly displayed in conjunction with Test Set reply parameters.
 - TCAS provides flight line test capability for TCAS 1, 2. ATCRBS and Mode S intruders are simulated, allowing the generation of proximity, TA and RA flight deck annunciations. TCAS Interrogator parametric measurements are displayed.
 - TIS Provides a five aircraft static flight simulation, using the Comm A protocol, to test the TIS (Traffic Information Service).
 - TIS-B provides a five aircraft static flight simulation, using DF17 extended squitter broadcasts, for testing TIS-B (Traffic Information Service Broadcast) systems.
- NOTE:** TIS and TIS-B operate as TCAS sub modes.
- ADS-B provides flight line test capability for receiving, decoding and displaying full DO-260/A DF17/18/19 extended squitter transmissions from Mode S transponder or 1090 MHz emitters. Capability to generate full DO-260/A DF17/18/19 extended squitter transmissions for testing ADS-B receivers is provided. A GICB mode decodes and displays all Enhanced Surveillance BDS register contents.
 - **SETUP** function sets various parameters used in testing, configuration and memory storage for each functional mode.

4.2 START-UP

Press POWER Key. Start-Up Screen appears on the DISPLAY. XPDR Auto Test Screen with blank data fields always displays on Power-up.

4.3 XPDR (TRANSPONDER)

Press XPDR Mode Key to select XPDR Functional Mode (1-2-4, Figure 7). XPDR Auto Test Screen is displayed

XPDR-AUTO TEST		PASS		BAT 2.5 Hr	
CONFIG:GENERIC MODE S		LEVEL=4			
ANTENNA: BOTTOM					
REPLIES =A,C,S		FREQ =1090.12 MHZ			
TOP ERP =57.1 dBm		MTL =-74.0 dBm			
BOT ERP =56.0 dBm		MTL =-73.1 dBm			
A CODE =1234		C ALT =35000 ft			
S CODE =1234		S ALT =35000 ft			
TAIL =N12345		DF17 DETECTED=NO			
FLT ID =AA-50		AA=AC3421(53032041)			
FS=5-NO ALERT		SPI IN AIR			
VS=IN AIR		COUNTRY=United States			
RUN TEST		TEST LIST		CONFIG	
				SELECT ANT	

XPDR Auto Test Screen
Figure 7

There are two versions of the Auto Test Screen, one for ATCRBS transponders and one for Mode S transponders. The number of additional screens displayed by the Test List feature depends on the configuration selected.

4.3.1 CONFIGURATIONS

Press CONFIG Soft Key to display CONFIG List (1-2-4, Figure 8). Use DATA Keys to select the desired config. Press RETURN Soft Key to display XPDR Auto Test Screen.

XPDR - CONFIG		BAT 2.5 Hr	
1	GENERIC ATCRBS		
2	ATCRBS CLASS A		
3	ATCRBS CLASS B		
4	GENERIC MODE S		
5	MODE S CLASS A		
6	MODE S CLASS B		
7	MODE S CL B OPT FREQ		
8	MODE S CL B OPT PWR		
		INFO	RETURN

XPDR Config Screen
Figure 8

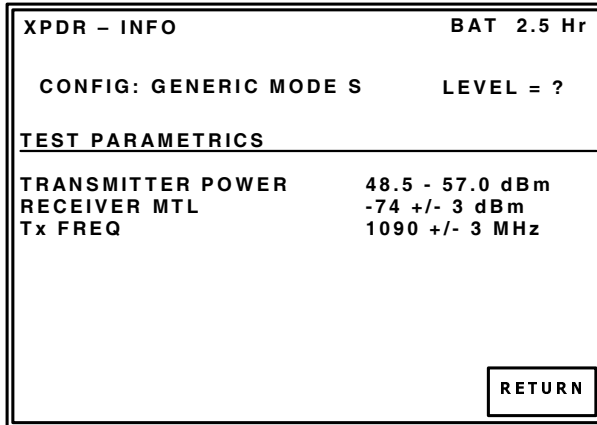
Eight predefined Configurations are provided to determine the PASS/FAIL limits applied to ERP, Frequency and MTL measurements. Configurations are named by class and option. Refer to Appendix F for predefined Configuration details

NOTE: Transponder class and option identification are found on the transponder's TSO label.

1. **GENERIC ATCRBS:** Tests ATCRBS transponders, specifically when the class of the transponder is unknown.
2. **ATCRBS CLASS A:** Tests ATCRBS Class A transponders.
3. **ATCRBS CLASS B:** Tests ATCRBS Class B transponders.
4. **GENERIC MODE S:** Tests Mode S transponders, specifically when the class of the transponder is unknown.
5. **MODE S CLASS A:** Tests Mode S Class A transponders.
6. **MODE S CLASS B:** Tests Mode S Class B transponders.
7. **MODE S CL B OPT FREQ:** Tests Mode S Class B transponders equipped with Class A frequency tolerance option.
8. **MODE S CL B OPT PWR:** Tests Mode S Class B transponders equipped with Class A power option.

NOTE: Level detection is automatic when running Auto Test.

Press INFO Soft Key to display XPDR INFO Screen. XPDR INFO Screen displays the PASS/FAIL limits for selected Configuration (1-2-4, Figure 9).



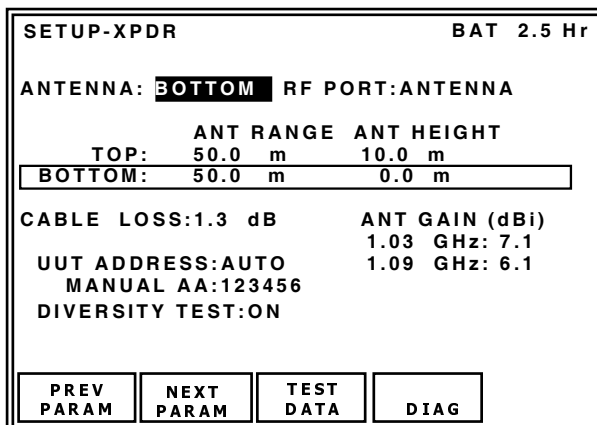
XPDR Config Info Screen
Figure 9

4.3.2 SETUP

Setup XPDR:

Setup XPDR Screen contains parameters which determine operational characteristics of the XPDR Functional Mode. Unless otherwise stated, last used values are retained on Power-up.

NOTE: Enter Setup Screen information before conducting test operations.



Setup XPDR Screen
Figure 10

STEP	PROCEDURE
------	-----------

1. Press SETUP Soft Key to display SETUP XPDR Screen (1-2-4, Figure 10).
2. Set the parameters by pressing NEXT PARAM. Press PREV PARAM to select the field. Use DATA Keys to slew the data. Parameters are:

- **ANTENNA:**
TOP or BOTTOM
- **RF I/O CONNECTOR:**
Selects Antenna (ANT CONNECTOR) or DIRECT CONNECT via RF I/O Connector.
- **CABLE LOSS:**
Entered in dB, figure (at 1090 MHz) marked on supplied RF coaxial cable.
- **ANT GAIN:**
Entered in dBi, gain figures for 1030 and 1090 MHz marked on supplied Directional Antenna
- **ANT RANGE:**
Test Set Antenna to transponder antenna horizontal range. Enter parameters for BOTTOM and TOP antenna if installation has diversity capability.

NOTE: UNITS parameter determines feet or meters (1-2-4, Figure 11).

- **ANT HEIGHT:**
Test Set Antenna to transponder antenna height difference. Enter parameters for BOTTOM and TOP antenna if installation has diversity capability.

NOTE: UNITS parameter determines feet or meters (1-2-4, Figure 11).

STEP	PROCEDURE
------	-----------

- **UUT ADDRESS:**
 MANUAL or AUTO (defaults to AUTO on power-up). AUTO selection Mode S address is obtained via ATCRBS/Mode S All Call (FAR Part 43, Appendix F approved method).

 On loss of ATCRBS/Mode S All Call reply (i.e. UUT placed in ground state) tests already running continue to use last ATCRBS/Mode S All Call obtained address. AUTO uses manually entered address if no reply is received.

 If test is started with installation in ground state, Test Set listens for squitters and displays squitter address for highest signal strength squitter received. Test continues after address displayed is accepted.

NOTE: ICAO amendment 77 transponders only replies to Mode S discrete interrogations when installation is in ground state.

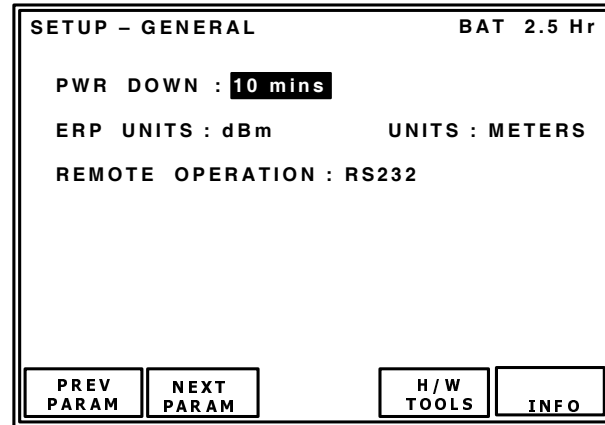
- **MANUAL ADDRESS:**
 A six digit HEX address is entered if UUT ADDRESS: MANUAL is selected.
- **DIVERSITY TEST:**
 ON or OFF. If testing transponders with single antenna systems, select OFF.

NOTE: If Diversity Isolation Test is enabled, ensure Antenna Shield is fitted to top or bottom UUT antenna prior to running test. Refer to Appendix J for Antenna Shield mounting procedure.

3. Press XPDR Mode Key to return to XPDR Auto Test Screen.

Setup General:

The Setup General Screen contains parameters that determine the common operational characteristics of each functional mode of the Test Set.



Setup General Screen
Figure 11

STEP	PROCEDURE
------	-----------

1. Repeatedly press SETUP Select Key until SETUP GENERAL Screen is displayed (1-2-4, Figure 11).
2. Set following parameters by pressing NEXT PARAM and PREV PARAM to select the field. Use DATA Keys to slew data.
 - **PWR DWN:**
 Selects battery saving power down time in minutes, ranging from 5 to 20 minutes or OFF.
 - **ERP UNITS:**
 Selects ERP units in dBm, dBW or WATTS (peak).
 - **UNITS:**
 Selects Setup XPDR Screen distance units in feet or meters.
 - **REMOTE OPERATION:**
 Selects Remote Operation type of RS-232, USB or OFF.
3. Press XPDR Mode Key to return to XPDR Auto Test Screen.

Setup Test Data:

The Setup Test Data Screen allows storage and recall of all transponder test screens, including measurement data (1-2-4, Figure 12). There are six storage memories. The first storage memory retains the last power down data and cannot be overwritten. The last five are defined by the Test Set operator.

```

SETUP - TEST                                BAT 2.5 Hr
1  Last power-down
2  TPR-920
3  TRA-67A
4
5
6

STORE  LOAD  DUMP STORE  DUMP LIVE  RETURN
    
```

Setup Test Data Screen
Figure 12

```

CONFIRM                                BAT 2.5 Hr

Overwrite existing store?

YES  NO
    
```

Confirm Screen
Figure 13

```

SETUP - STORE NAME                        BAT 2.5 Hr

ABCDEFGHIJKLMN OPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0234567889 ! ' " ( ) * , - . / : ; ? @ _

Fred -----

Please enter store name

ENTER  CHAR SELECT  BACK SPACE  CANCEL
    
```

Setup Store Name Screen
Figure 14

Data Storage Procedure:

- | STEP | PROCEDURE |
|------|---|
| 1. | Press SETUP Select Key to display SETUP - XPDR Screen (1-2-4, Figure 10). Press TEST DATA Soft Key to display SETUP TEST DATA Screen (1-2-4, Figure 12). |
| 2. | Use DATA Keys to select the required store. |
| 3. | Press STORE Soft Key. A confirm Screen is displayed (1-2-4, Figure 13). Press YES Soft Key to confirm overwrite. SETUP STORE NAME Screen is displayed (1-2-4, Figure 14). Software always prompts for overwrite. Store name can be blank. |
| 4. | Use DATA Keys to select the character line (1-2-4, Figure 14). Use DATA Keys to select desired character. |
| 5. | Press CHAR SELECT Soft Key to add selected character to the end of name string. Press BACK SPACE Soft Key to delete the selected character. |
| 6. | When name is complete, press ENTER Soft Key to store name and display SETUP TEST DATA Screen. |
| 7. | Press XPDR Mode Key to return to XPDR Auto Test Screen. |

Data Recall Procedure:

STEP	PROCEDURE
1.	Press SETUP Select Key until SETUP - XPDR Screen is displayed (1-2-4, Figure 10). Press TEST DATA Soft Key to display SETUP TEST DATA Screen (1-2-4, Figure 12).
2.	Use DATA Keys to select required store.
3.	Press RECALL Soft Key to recall test data.
4.	Press XPDR Mode Key to return to XPDR Auto Test Screen.

Data Dump Procedure:

1. Press SETUP Select Key until SETUP - XPDR Screen is displayed (1-2-4, Figure 10). Press TEST DATA Soft Key to display SETUP TEST DATA Screen (1-2-4, Figure 12).
2. Use DATA Keys (Increment/Select, Decrement/Select), to select and slew data.
3. Ensure that RS-232 interface parameters are set correctly for communication with printer or PC (1-2-4, Figure 11).
4. Press DUMP STORE Soft Key to send selected stored test data to the printer or PC via the RS-232 interface.
5. Press DUMP LIVE Soft Key to send current or live test data to the printer or PC via the RS-232 interface.
6. Press XPDR Mode Key to return to XPDR Auto Test Screen.

4.3.3 AUTO TEST

Introduction:

XPDR Auto Test contains one main screen (the Auto Test Screen) and up to 16 additional test screens. Auto Test completes a full FAR Part 43, Appendix F Test, providing decode and display of Elementary and Enhanced surveillance GICB extracted DAP's (Downlinked Aircraft Parameters).

When first powered-up the Test Set displays blank data fields. The last test results are displayed while Test Set remains powered. The last test results are stored upon power-down.

Auto Test only displays items needed to visually confirm a FAR Part 43 Test. For detailed test explanations, refer to TEST DETAILS for each of the test list screens.

General Description:

Mode Test:

Identifies modes of operation. Mode Test interrogates with Mode A, Mode C and ATCRBS (Mode C)/Mode S All-Call to determine reply modes of the transponder. Mode A, Mode C and ATCRBS (Mode C)/Mode S All-Call modes are tested during Auto Test sequence.

NOTE: This is internal to software. No screen is displayed.

Transponder Level:

Transponder Level is automatically determined by requesting a BDS 1,0 Data Link Capability Report. Transponder level is displayed on Auto Test Screen.

Mode S UF Tests Run, based on XPDR Level:

Level 1: UF0,4,5,11,16

Level 2: UF0,4,5,11,16,20,21

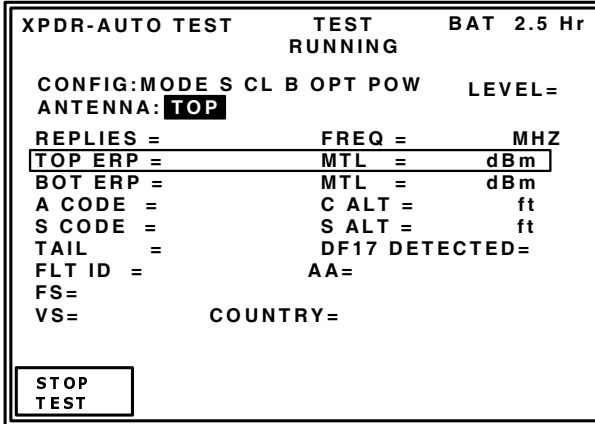
Level 3: UF0,4,5,11,16,20,21,(24 UELM)

Level 4: UF0,4,5,11,16,20,21,(24 UELM)

NOTE: Level 4 transponders support UF 24 DELM (not available in first release software).

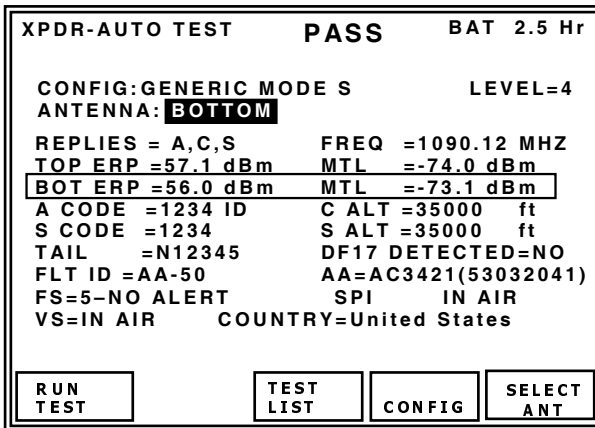
STEP PROCEDURE

1. Follow CONFIG selection procedure in para 1-2-4.3.1.
2. Press SELECT ANTENNA Soft Key to select TOP or BOTTOM antenna to be tested. Antenna selected in XPDR Setup Screen is displayed by default.



Auto Test Screen Test Running
Figure 15

3. Press RUN TEST Soft Key to start Auto Test (1-2-4, Figure 15). TEST RUNNING is displayed at top of screen.



Auto Test Screen PASS
Figure 16

4. Auto Test completes and displays Parameters tested (1-2-4, Figure 16). Failures are identified by a fail arrow symbol to left of failure item.

The Parameters displayed are:

Regulatory Test Requirements:

Tests identifier symbols:

- ◆ FAA FAR 91.413, Part 43, Appendix F
- Other Civil Aviation Authority Requirement
- ♣ Eurocontrol/JAA (Proposed)

◆ REPLIES: Transponder Modes replied to A,C,S.

◆ FREQ: Transponder TX frequency in MHz.

◆ TOP ERP: Top transponder antenna Effective Radiated Power in dB, dBW or WATTS peak.

NOTE: Units selected in SETUP GENERAL Screen.

◆ TOP MTL: Top transponder antenna Minimum Trigger Level.

◆ BOT ERP: Bottom transponder antenna Effective Radiated Power in dBm, dBW or WATTS peak.

NOTE: Units selected in SETUP GENERAL Screen.

◆ BOTTOM MTL: Bottom transponder antenna Minimum Trigger Level.

◆ A CODE: Mode A 4096 squawk code. Presence of Ident (SPI) pulse is indicated by display of 'ID' after the squawk code.

◆ S CODE: Mode S 4096 Identity Code. Presence of Ident (SPI) pulse indicated by display of 'ID' after the squawk code (obtained from DF5).

NOTE: The Mode A code is compared with Mode S code. Modes A and S codes Pass when in agreement.

◆ C ALT: Mode C altitude displayed (100 feet resolution).

◆ S ALT: Mode S altitude displayed (25 or 100 feet resolution, obtained from DF4).

NOTE: Mode C altitude is compared to Mode S altitude. Modes C and S altitudes Pass when in agreement of 100 feet.

◆ TAIL: Aircraft tail number decoded from Mode S discrete address (obtained from Mode S All Call DF11).

NOTE: Some countries have encoded the aircraft tail number into the Mode S discrete address. Refer to Appendix G for list of countries supported. If not supported only the country is displayed.

COUNTRY: Decoded from the Mode S discrete address (obtained from Mode S All Call DF11).

DF17 DETECTED: Indicates the presence of DF17 extended squitter.

NOTE: ADS-B option is required to decode and display DF17 squitter content.

♣**FLT ID:** Eight Character ICAO Flight ID.

♦**AA:** Aircraft Address (Mode S discrete address) displayed in HEX and (OCTAL)

♣**FS:** Flight Status. The number preceding the text identifies the RTCA DO-181C FS code assignment. Indications are:

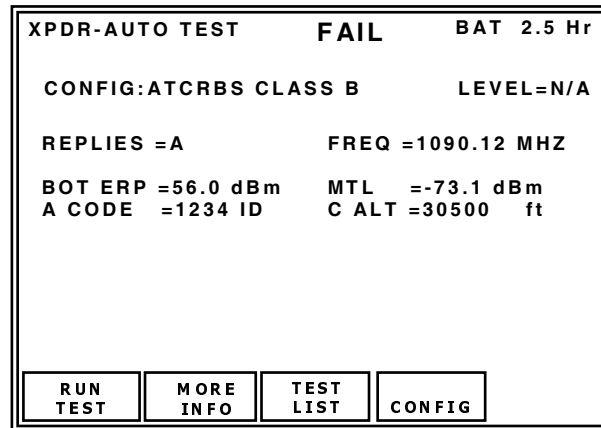
ALERT, NO ALERT, SPI, NO SPI, AIRBORNE, ON GROUND (obtained from DF0).

♣**VS:** Vertical Status either ON GND or IN AIR (obtained from DF0).

Testing FS (Flight Status) and VS (Vertical Status):

ICAO Amendment 77 transponders only reply to Mode S discrete interrogations when installation is in ground state. Refer to Setup for UUT ADDRESS settings (para 1-2-4.3.2).

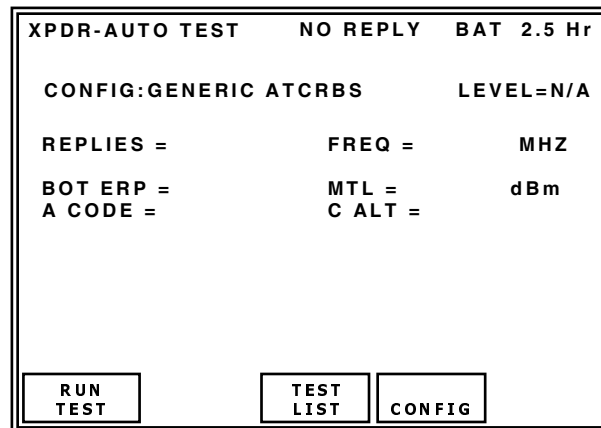
Auto Test Screen examples



Auto Test Screen FAIL
Figure 17

Refer to 1-2-4, Figure 17. ATCRBS CLASS B config selected with FAIL indication, in this case pressing the MORE INFO Soft Key displays the failures.

NOTE: Only ATCRBS parameters displayed.



Auto Test Screen NO REPLY
Figure 18

Refer to 1-2-4, Figure 18. GENERIC ATCRBS config selected with NO REPLY indication (No Reply From Transponder).

4.3.4 TEST LIST

Introduction:

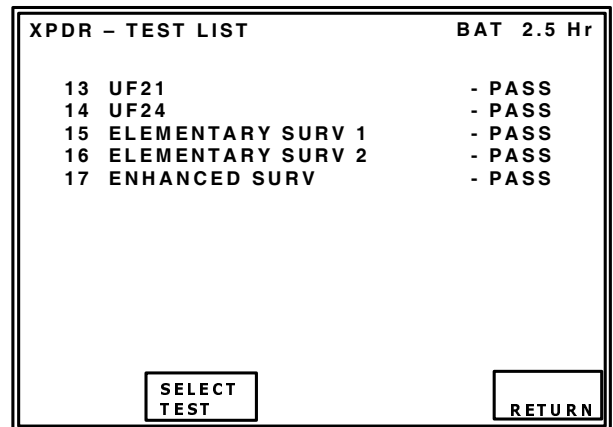
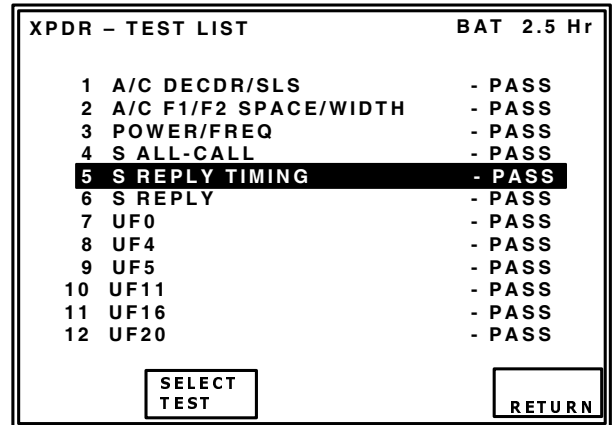
Auto Test Screen is the primary test screen. The complete Auto Test contains up to 16 additional test screens.

The Test Set displays blank data fields when first powered-up. While the Test Set remains powered the last test results are displayed.

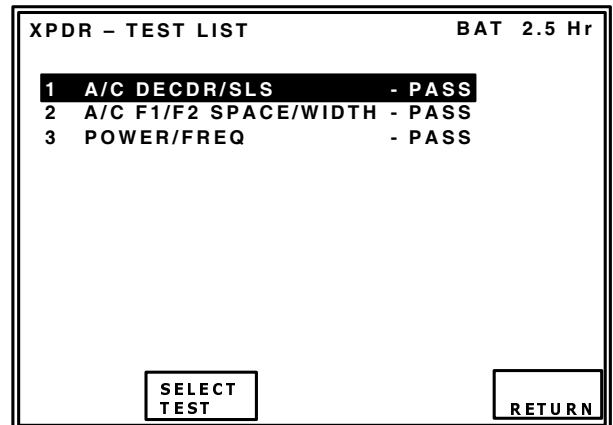
STEP	PROCEDURE
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1. Press TEST LIST Soft Key to display Test List. When a Mode S configuration is selected the test list is displayed over two screens (1-2-4, Figure 19). When an ATRCBS configuration is selected the test list is displayed on one screen.
2. Use DATA Keys to select desired test. Press SELECT TEST Soft Key to display selected test.
3. Press RETURN Soft Key to display XPDR Auto Test Screen.
4. Press RUN TEST Soft Key to start test.
5. Press STOP TEST Soft Key to stop test.
6. Press NEXT TEST Soft Key to display the next test.
7. Press PREV TEST Soft Key to display the previous test.
8. Press RETURN Soft Key to display the test list and choose desired test.

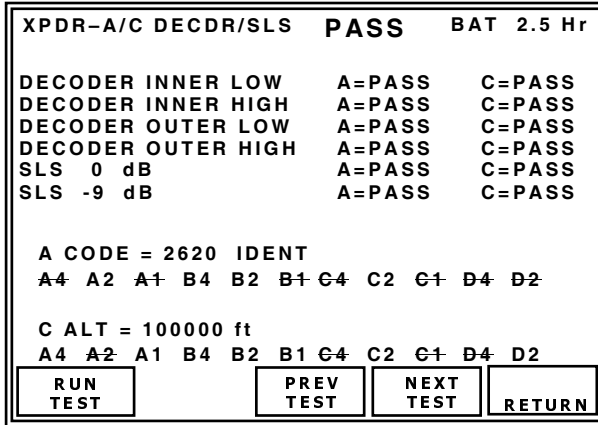
NOTE: The test runs until stopped. Each pass through the test sequence updates the PASS/FAIL indication. Each test item described in the Test Details section utilizes an average of 8 out of 13 replies, unless otherwise stated.



XPDR Test List Mode S
Figure 19



XPDR Test List ATRCBS
Figure 20



XPDR A/C Decoder/SLS Test Screen
Figure 21

XPDR A/C Decoder/SLS Test:

XPDR A/C Decoder/SLS Test (1-2-4, Figure 21) performs these functions:

- ◆ Verifies inner and outer windows for Mode A and C interrogations.
- ◆ Verifies the SLS performance for Mode A and C interrogations.
- ◆ Displays Mode A Squawk Code, Ident (SPI) and code binary bits.
- ◆ Decodes and displays the Mode C altitude in feet and code binary bits.

NOTE: Binary bits verify if specific control lines are incorrect.

Test Details:

Decoder:

The Test Set interrogates with valid Mode A and C interrogations, 6 dB above MTL.

Nominal spacing, P1 to P3, 8 μs for Mode A and 21 μs for Mode C. The test deviates the pulse spacings as follows:

Sets P1 to P3 pulse spacing to inner high "must reply" values (8.2 μs for Mode A and 21.2 μs for Mode C). The test indicates PASS if percent replies are >90% or FAIL if percent replies are ≤90%. An arrow identifies FAIL.

Sets P1 to P3 pulse spacing to inner low "must reply" values (7.8 μs for Mode A and 20.8 μs for Mode C). The test indicates PASS if percent replies are >90% or FAIL if percent replies are ≤90%. An arrow identifies FAIL.

Sets P1 to P3 pulse spacing to outer high "must not reply" values (9.0 μs for Mode A and 22 μs for Mode C). The test indicates PASS if percent replies are <10% or FAIL if percent replies are ≥10%. An arrow identifies FAIL.

Sets P1 to P3 pulse spacing to outer low "must not reply" values (7.0 μs for Mode A and 20 μs for Mode C). The test indicates PASS if percent replies are <10% or FAIL if percent replies are ≥10%. An arrow identifies FAIL.

SLS:

The Test Set interrogates with Mode A and C interrogations including the P2 SLS pulse. When P2 level is set at -9 dB and replies are ≥90%, the test indicates PASS. If replies are <90% the test indicates FAIL.

When P2 level is set at 0 dB and replies are >10%, the test indicates FAIL. If replies are ≤10% the test indicates PASS.

NOTE: Because interrogation with SLS at -9 dB is sent at MTL + 12 dB, the test must be run within 95 feet (28.96 meters) of UUT antenna being tested.

A Code:

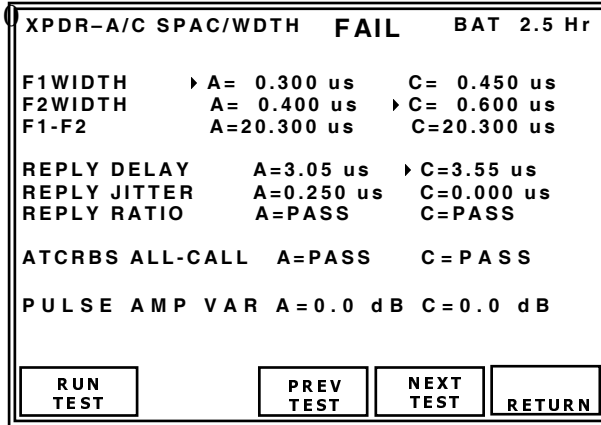
The Test Set interrogates with Mode A interrogations, 6 dB above MTL. Replies are monitored and transponder Squawk code is displayed in four digit octal and binary.

If Ident (SPI) is present in the reply, IDENT is displayed after the octal code.

C Altitude:

The Test Set interrogates with Mode C interrogations, 6 dB above MTL. The replies are monitored and transponder altitude code is displayed in feet to a resolution of 100 feet. Receiving an invalid input (no C bit or C1 and C4 are on at the same time) blanks out the altitude field. Regardless of validity, the Mode C information is shown in binary format (MSD to LSD):

A4, A2, A1, A, B4, B2, B1, B, C4, C2, C1, C, D4, D2.



XPDR A/C Spacing Width Test Screen
Figure 22

XPDR A/C Spacing Width Test:

XPDR A/C Spacing Width Test (1-2-4, Figure 22) performs these functions:

- ◆ Verifies and displays F₁/F₂ pulse width and spacing for Mode A and C replies.
- ◆ Verifies and displays reply delay for Mode A and C replies.
- ◆ Verifies and displays reply jitter for Mode A and C replies.
- ♣ Verifies reply ratio for Mode A and C interrogations.
- ◆ Verifies replies to ATCRBS all call Mode A and C interrogations.
- ♣ Verifies Mode A and C reply pulse droop.

Test Details:

F₁/F₂ Pulse Width and Spacing:

The IFR 6000 interrogates with Mode A and C interrogations, 6 dB above MTL. The test indicates F₁ to F₂ spacing, F₁ width and F₂ width values on the DISPLAY for Mode A and C replies. Measurements outside the following tolerances result in a FAIL and are identified by an arrow.

F₁ to F₂ spacing is 20.3 μs (±0.10 μs).

F₁/F₂ pulse widths are 0.45 μs (±0.10 μs).

Reply Delay:

The Test Set interrogates UUT with Modes A and C. The test verifies reply delay minus range delay is 3.00 μs (±0.50 μs).

Measurements outside the above tolerance result in a FAIL and are identified by an arrow.

Reply Jitter:

The Test Set interrogates UUT with Modes A and C. The test verifies reply jitter values (difference between shortest and longest reply delay) using the best 24 of 39 replies are ≤0.1 μs.

Measurements outside the above tolerance result in a FAIL and are identified by an arrow.

Reply Ratio:

The Test Set interrogates UUT with Modes A and C. The test verifies replies are ≥90% between MTL +3 dBm and not more than ≤10% for -81 dBm. Replies outside this tolerance results in a FAIL and are identified by an arrow.

NOTE: Reply Ratio Mode A and C Test is only run in direct connect. When Antenna is selected NOT RUN is displayed.

ATCRBS All Call:

The Test Set interrogates with ATCRBS (Mode A and C) only All-Call interrogations, 6 dB above MTL. Test verifies the following:

ATCRBS transponder must reply.

Mode S transponder - FAIL if reply Mode S.

Mode S transponder - FAIL if reply ATCRBS.

Reply criteria is ≥90%. No Reply criteria is <10%. A FAIL is identified by an arrow.

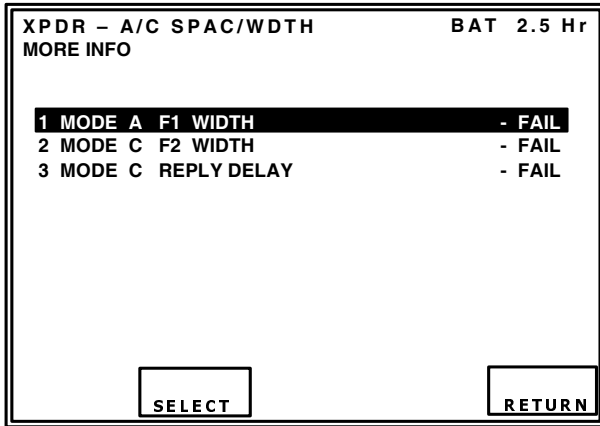
NOTE: The selected config file determines if an ATCRBS or Mode S transponder is being tested.

Pulse Amplitude Variation:

The Test Set interrogates with Mode A and C interrogations, 6 dB above MTL. The test verifies all pulses in the Mode A and C replies are within a 2 dB amplitude window (minimum to maximum). Replies outside the 2 dB window result in a FAIL indication and are identified by an arrow.

More Info Feature Example:

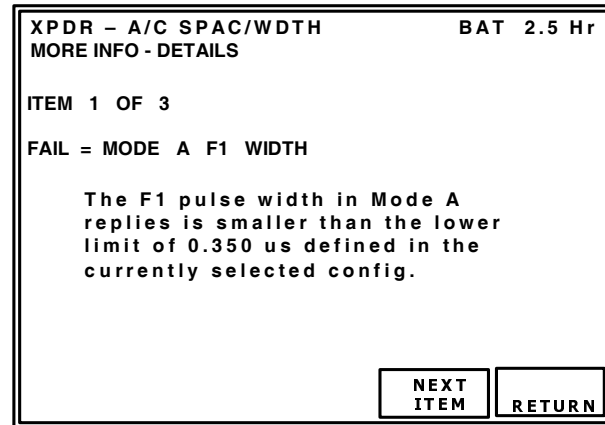
NOTE: Not implemented in first release.



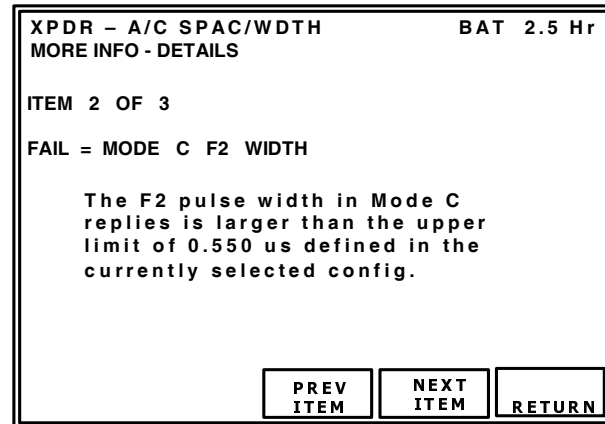
More Info Screen
Figure 23

STEP	PROCEDURE
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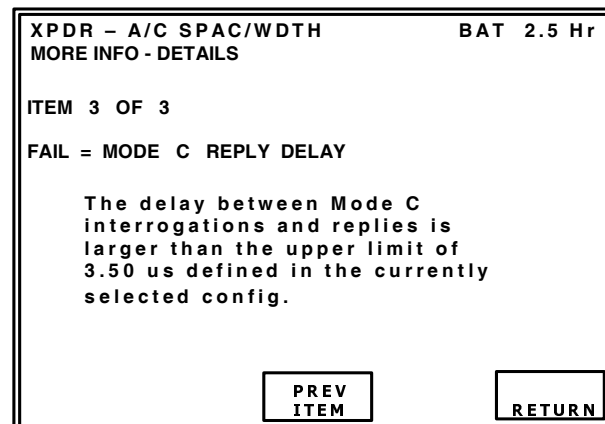
1. If any test item FAILS, a MORE INFO Soft Key is displayed (1-2-4, Figure 20). Press MORE INFO Soft Key to display More Info Screen (1-2-4, Figure 23).
2. Press the RETURN Soft Key to display previous test screen.
3. If more than one FAIL item is displayed, use DATA Keys to select FAIL item. Press SELECT Soft Key to display More Info Detail Screen (1-2-4, Figures 21, 22 and 23).
4. Review all fail items without returning to the More Info Screen by pressing NEXT ITEM or press PREV ITEM Soft Key.
5. Press RETURN Soft Key to display the More Info Screen.



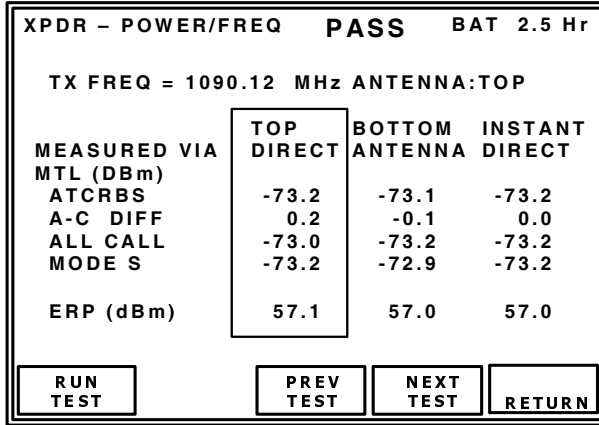
More Info Details Screen (Item 1)
Figure 24



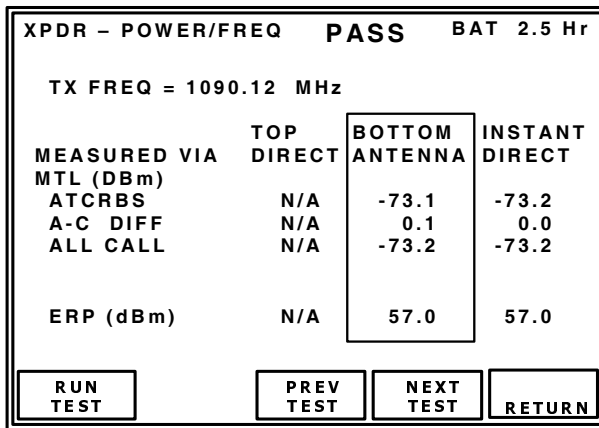
More Info Details Screen (Item 2)
Figure 25



More Info Details Screen (Item 3)
Figure 26



Power and Frequency (Mode S) Test Screen
Figure 27



Power and Frequency (ATCRBS) Test Screen
Figure 28

XPDR Power and Frequency Test:

Refer to 1-2-4, Figure 27. XPDR Power and Frequency Test performs these functions:

- ◆ Measures, verifies and displays TX Frequency.
- ◆ Measures, verifies and displays TX ERP for top and bottom antennas.
- ◆ Measures, verifies and displays MTL for top and bottom antennas, for ATCRBS, ATCRBS All-Call and Mode S (P6) interrogation types.

Top or Bottom antenna measurement is selected with DATA Keys. Top and Bottom measurements are averaged and values are displayed (1-2-4, Figure 28).

NOTE: When an ATCRBS config is selected (non diversity transponder) only the Bottom antenna measurement fields are used.

Test Details:

Frequency:

When a Mode S configuration is selected, the Test Set interrogates with UF4, 6 dB above MTL, verifying a DF4 reply is received.

With an ATCRBS config selected, the Test Set interrogates with Mode A, (or Mode C if no reply is received to a Mode A), 6 dB above MTL.

Test averages Frequency measurement over 40 replies. The value is updated every 40 replies. PASS/FAIL limits are applied.

NOTE: Frequency PASS/FAIL limits are determined by selected config. Refer to Appendix F.

ERP (Effective Radiated Power):

When a Mode S configuration is selected, the Test Set interrogates with UF4, 6 dB above MTL, verifying a DF4 reply is received.

When an ATCRBS configuration is selected, the Test Set interrogates with Mode A (or Mode C if no reply is received to a Mode A) 6 dB above MTL.

When the (peak) ERP is measured, two values for each measurement are displayed. INSTANT values are obtained from the average power measurement over five replies and updated every five replies.

TOP and BOTTOM values are obtained from the average power measurement over 40 replies. PASS/FAIL limits are applied and updated every 40 replies.

NOTE: ERP PASS/FAIL limits are determined by selected configuration. Refer to Appendix F.

MTL (Minimum Trigger Level):

When a Mode S configuration is selected the Test Set interrogates in sequence with UF4, Mode A (or Mode C if no reply is received to a Mode A) and an ATCRBS/Mode S All-Call, verifying MTL for each interrogation type.

When an ATCRBS configuration is selected the Test Set interrogates with Mode A (or Mode C if no reply is received to a Mode A) and an ATCRBS/Mode S All-Call, verifying MTL for each interrogation type.

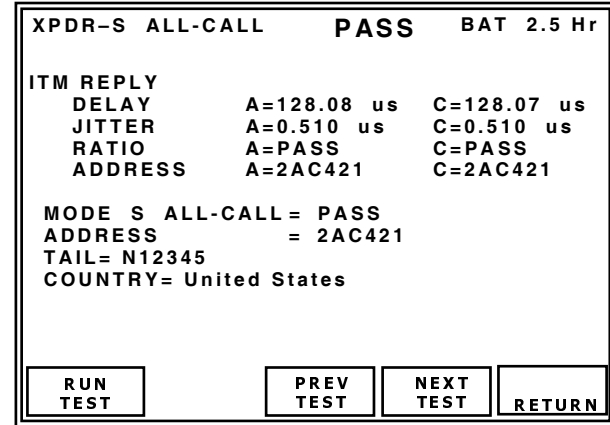
To determine MTL the test adjusts RF interrogation level for 90% replies. Two values for each measurement are displayed. INSTANT values are obtained from the MTL readings of the replies received to 100 interrogations. This value is updated every 100 interrogations. TOP and BOTTOM values are obtained from the average MTL readings of all replies received during the MTL Test sequence. PASS/FAIL limits are applied.

NOTE: MTL PASS/FAIL limits are determined by the selected configuration. Refer to Appendix F.

A-C Difference:

The Test Set interrogates with Mode A (or Mode C if no reply is received to a Mode A), verifying MTL for each interrogation type.

The test compares MTL measurements between Mode A and C. PASS is displayed when difference is <1 dB. FAIL is displayed when difference is >1 dB.



XPDR - S All Call Test Screen
Figure 29

XPDR - S All Call Test:

Refer to 1-2-4, Figure 29. The XPDR - S All Call Test performs these functions:

- Verifies and displays ITM Reply Delay Mode A and C.
- ♣ Verifies and displays ITM Reply Jitter Mode A and C.
- ♣ Verifies ITM Reply Ratio Mode A and C.
- ♦ Verifies ITM All Call Address.
- ♦ Verifies Mode S All Call.
- ♦ Verifies and displays Mode S All Call Address.
- Verifies Country and Tail Number.

Test Details:

ITM Reply Delay:

The Test Set interrogates UUT with an ATCRBS/Mode S All-Call, 6 dB above MTL, verifying DF11 replies are received. The test verifies reply delay minus range delay is:

128.00 μ s (± 0.25 μ s) for ITM Mode A and C.

Measurements outside this tolerance result in a FAIL and are identified by an arrow.

NOTE: Range delay is 2.03 ns/ft (6.67 ns/m), calculated from the values in the Setup Menu.

ITM Reply Jitter:

The Test Set interrogates UUT with a Mode S All-Call, 6 dB above MTL, verifying DF11 replies are received.

The test verifies reply jitter values (difference between shortest and longest reply delay) using the best 24 of 39 replies. Reply jitter (changes in reply delay) is:

$$\leq 0.08 \mu\text{s for ITM Mode A and C}$$

Measurements outside this tolerance result in a FAIL and are identified by an arrow.

ITM Reply Ratio:

The Test Set interrogates UUT with a Mode S All-Call, 6 dB above MTL, verifying DF11 replies are received. The test verifies that ITM Mode A and C replies are $\geq 90\%$ between MTL +3 dB and $\leq 10\%$ for -81 dBm. Replies outside these tolerances result in a FAIL and are identified by an arrow.

NOTE: ITM Reply Ratio Mode A and C Test is run only in direct connect. When Antenna is selected NOT RUN is displayed.

ITM Address:

The Test Set interrogates UUT with a Mode S All-Call, 6 dB above MTL, verifying DF11 replies are received.

The test decodes and displays the discrete address reported in the DF11 replies.

Mode S All-Call:

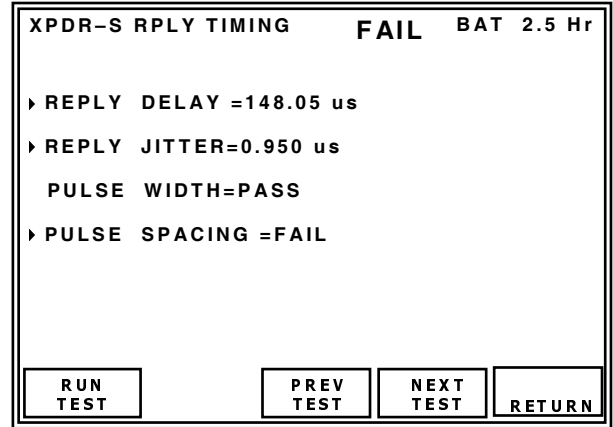
The Test Set interrogates UUT with a Mode S All-Call UF11, AA=FFFFFF, 6 dB above MTL, verifying DF11 replies are received.

The test interrogates with a UF4 using the discrete address obtained in the DF11 reply and confirms the DF4 reply contains the same address and displays a PASS. If an incorrect address is received the address and FAIL are displayed. A FAIL is identified by an arrow.

Address, Tail and Country:

The Test Set interrogates UUT with a Mode S All-Call UF11, AA=FFFFFF, 6 dB above MTL, verifying DF11 replies are received.

The test decodes and displays discrete address reported in the DF11 replies, country and tail number.



XPDR - S Reply Timing Test Screen
Figure 30

XPDR - S REPLY TIMING TEST:

Refer to 1-2-4, Figure 30. XPDR - S Reply Timing Test performs these functions:

- ◆ Verifies Mode S Reply Delay.
- ♣ Verifies Mode S Reply Jitter.
- ♣ Verifies Mode S Reply Pulse Width (all pulses).
- ♣ Verifies Mode S Reply Pulse Spacing (all pulses).

Test Details

Reply Delay:

The Test Set interrogates UUT with UF4, 6 dB above MTL, verifying reply is received with the same address and correct format. The test verifies if reply delay minus range delay is:

$$128.00 \mu\text{s} (\pm 0.25 \mu\text{s}) \text{ for Mode S}$$

Measurements outside this tolerance result in a FAIL and are identified by an arrow.

NOTE: Range delay is 2.03 ns/ft (6.67 ns/m), calculated from the values in the Setup Menu.

Reply Jitter:

The Test Set interrogates UUT with UF4, 6 dB above MTL, verifying reply is received with the same address and correct format.

The test verifies reply jitter values (difference between shortest and longest reply delay) using the best 24 of 39 replies. Reply jitter (changes in reply delay) is:

$$\leq 0.08 \mu\text{s}$$

Measurements outside this tolerance result in a FAIL and are identified by an arrow.

Pulse Width:

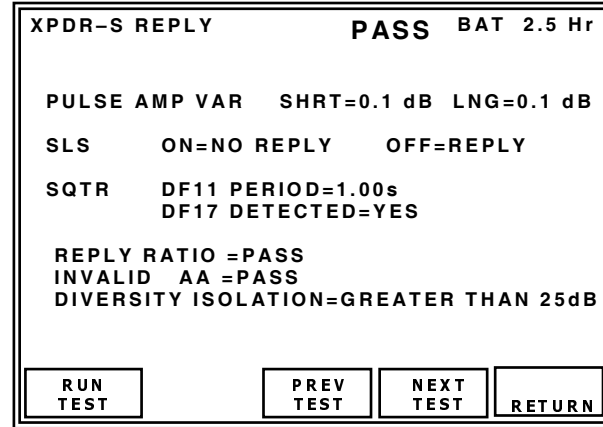
The Test Set interrogates UUT with UF4, 6 dB above MTL, verifying reply is received with the same address and correct format. Test verifies that the width of 70% of reply pulses are:

$$0.5 \mu\text{s} (\pm 0.05 \mu\text{s}) \text{ or } 1.0 \mu\text{s} (\pm 0.05 \mu\text{s})$$

Pulse Spacing:

The Test Set interrogates UUT with UF4, 6 dB above MTL. Verifying reply is received with the same address and correct format. The test verifies that the pulse spacing of 70% of reply pulses are within $\pm 0.05 \mu\text{s}$ of nominal values.

NOTE: Pulse width spacing measured on preamble only (first release).



XPDR - S Reply Test Screen
Figure 31

XPDR - S REPLY Test:

Refer to 1-2-4, Figure 31. The XPDR - S Reply Test performs these functions:

- ♣ Verifies Mode S Pulse Amplitude Variation Short Reply.
- ♣ Verifies Mode S Pulse Amplitude Variation Long Reply.
- ♣ Verifies Mode S SLS Level.
- ♣ Verifies Mode S Reply Ratio.
- ♦ Verifies and displays Mode S DF11 Squitter Period.
- ♣ Verifies Mode S DF11 Squitter Distribution.
- ♦ Verifies Mode S Invalid AA.
- Verifies S DF17 Detect.
- ♦ Verifies and displays Mode S Diversity Isolation.

Test Details:

Pulse Amplitude Variation Short:

The Test Set interrogates with UF4 (reply length short) interrogations, 6 dB above MTL. The test verifies all pulses in the DF4 replies are within a 2 dB amplitude window. Replies outside the 2 dB window result in a FAIL indication and are identified by an arrow. The measured variation is displayed.

Pulse Amplitude Variation Long:

The Test Set interrogates with UF4 (reply length long) interrogations, 6 dB above MTL. The test verifies all pulses in the DF20 replies are within a 2 dB amplitude window. Replies outside the 2 dB window result in a FAIL indication and are identified by an arrow. The measured variation is displayed.

SLS Level:

The Test Set interrogates with UF4 interrogations including the P5 SLS pulse. When P5 level is set at -12 dB and replies are $\geq 99\%$, the test indicates PASS. If replies are $< 99\%$ the test indicates a FAIL.

When P5 level is set at +3 dB and replies are $\geq 10\%$, the test indicates FAIL. If replies are $< 10\%$ the test indicates a PASS.

NOTE: Because interrogation with SLS at -12 dB is sent at MTL + 12 dB, SLS Test must be run within 95 feet (28.96 meters) of UUT antenna being tested.

Reply Ratio:

The Test Set interrogates UUT with UF4. The test verifies that replies are $\geq 99\%$ between MTL +3 dB and $\leq 10\%$ for -81 dBm. Replies outside this tolerance result in a FAIL and are identified by an arrow.

NOTE: Reply Ratio Test is only run in direct connect. When Antenna is selected NOT RUN is displayed.

Squitter Period:

The Test Set monitors the UUT DF11 acquisition squitters and verifies that the period is 0.6 s to 2.4 s. A Squitter period outside this tolerance results in a fail and is identified by an arrow.

AA:

The Test Set interrogates with UF4 interrogations, 6 dB above MTL. Test uses default addresses that are 1 and 256 greater than the correct address. Test displays PASS if no replies are received and FAIL if replies are received.

DF17:

The Test Set monitors the UUT DF17 extended squitters and confirms detection by displaying YES. Test displays NO if DF17's are not detected.

Diversity Isolation:

The Test Set monitors the UUT DF11 acquisition squitters. The test verifies UUT diversity isolation (difference between "On" antenna squitters and "Off" antenna squitters) is ≥ 20 dB. Values < 20 dB result in a FAIL and are identified with an arrow.

Indications:

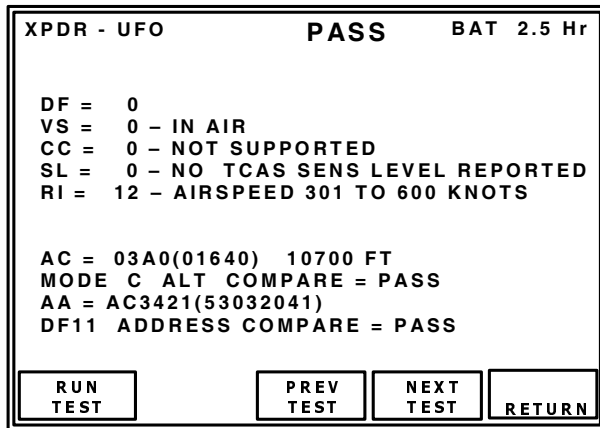
- OFF is displayed if diversity isolation is not selected in setup menu.
- Greater than 25dB.
- Value in dB.

NOTE: For > 20 dB dynamic range, test must be run within 50 feet (15.24 meters) of UUT antenna being tested.

NOTE: When Diversity Isolation Test is enabled, make sure Antenna Shield is fitted to top or bottom UUT antenna prior to running test. It is important that only one UUT antenna is seen during the Diversity Test. Make sure Test Set Directional Antenna is pointed at unshielded antenna. Refer to Appendix J for Antenna Shield mounting procedure.

NOTE: This test must be enabled on the XPDR Setup Screen to display diversity isolation parameter.

NOTE: Some countries have encoded the aircraft tail number into the Mode S discrete address. Refer to Appendix G for list of countries supported. If not supported only the country is displayed.



UF0 Test Screen
Figure 32

UF0 Test:

Refer to 1-2-4, Figure 32. The UF0 (Short Air to Air Surveillance) Test performs these functions:

- ◆ Verifies replies to Mode S UF0 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF0 data fields.
- ◆ Compares Mode S altitude to Mode C altitude.

Test Details:

The Test Set interrogates with UF0, 6 dB above MTL, verifying a UF0 reply is received.

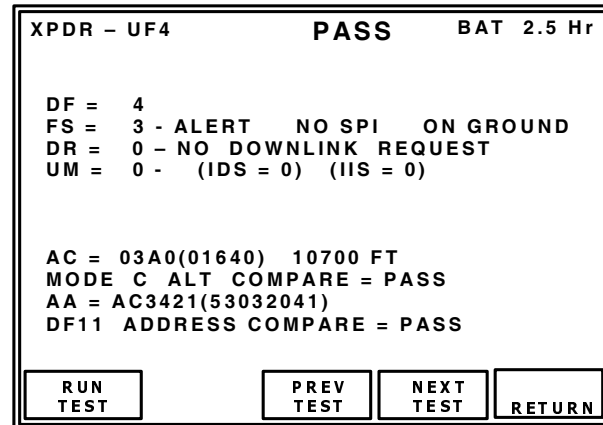
Altitude reported in DF0 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Altitudes must agree within 100 feet.

Address is compared with address reported during Mode Test in DF11 reply. DISPLAY indicates the Downlink Format Fields. If test fails due to incorrect altitude, Mode C altitude is displayed. If test fails due to wrong address, DF11 address is displayed. UF0 AQ bit is "1" for requesting airspeed information in DF0 RI field.

NOTE: AC field blanks out if invalid data is received for that field.

Testing VS (Vertical Status):

ICAO amendment 77 transponders only replies to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.



UF4 Test Screen
Figure 33

UF4 Test:

Refer to 1-2-4, Figure 33. UF4 (Short Surveillance Altitude) Test performs these functions:

- ◆ Verifies replies to Mode S UF4 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF4 data fields.
- ◆ Compares Mode S altitude to Mode C altitude.

Test Details:

The Test Set interrogates with UF4, 6 dB above MTL, verifying a DF4 reply is received.

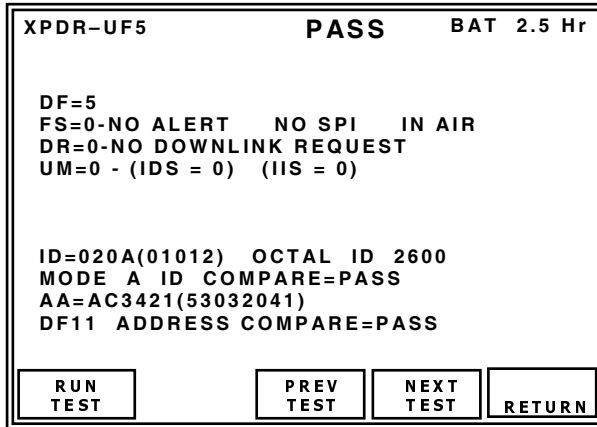
Altitude reported in DF4 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Altitudes must agree within 100 feet.

Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect altitude, Mode C altitude is displayed. If test fails because of wrong address, DF11 address is displayed.

NOTE: AC field blanks out if invalid data is received for that field.

Testing FS (Flight Status):

ICAO amendment 77 transponders only reply to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.



UF5 Test Screen
Figure 34

UF5 Test:

Refer to 1-2-4, Figure 34. The UF5 Test (Short Surveillance Identity) performs these functions:

- ◆ Verifies replies to Mode S UF5 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF5 data fields.
- ◆ Compares Mode S Identity Code to Mode A Squawk Code.

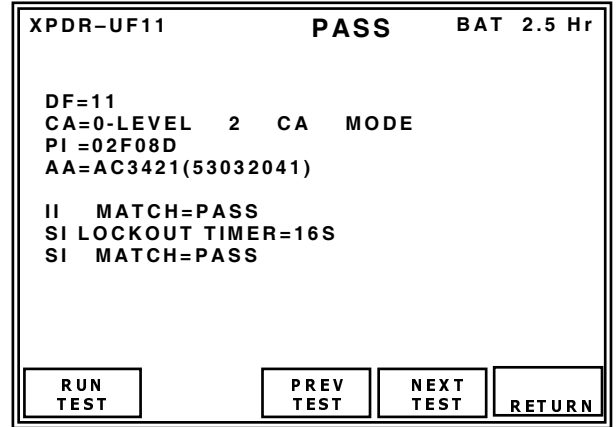
Test Details:

The Test Set interrogates with UF5, 6 dB above MTL, verifying a DF5 reply is received.

ID code reported in DF5 is compared with ID code reported during Mode Test in valid ATCRBS Mode A reply. Address is compared with address reported during Mode Test in DF11 reply. DISPLAY indicates the Downlink Format Fields. If test fails due to incorrect ID code, Mode A, ID code is displayed. If test fails due to wrong address, DF11 address is displayed.

Testing FS (Flight Status):

ICAO amendment 77 transponders only reply to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.



UF11 Test Screen
Figure 35

UF11 Test:

Refer to 1-2-4, Figure 35. UF11 Test performs these functions:

- ◆ Interrogates with Mode S UF11, AP set FFFFFFFF. Decodes and displays DF11 replies.
- ♣ Performs comprehensive II and SI Match Test.
- Performs SI lockout Timer Test.

Test Details:

The Test Set interrogates with UF11, 6 dB above MTL, verifying a DF11 reply is received.

Address is compared with address reported during Mode Test in DF11 reply (1-2-4, Figure 32). Test interrogates with a UF11, using the 15 II codes, in sequence from 1 to 15. If all codes are correct PASS is displayed. If the transponder supports SI (Surveillance Identifier) each of the 63 SI codes from 1 to 63 are tested. When all codes are correct PASS is displayed. BDS 1,0 is verified to determine SI support.

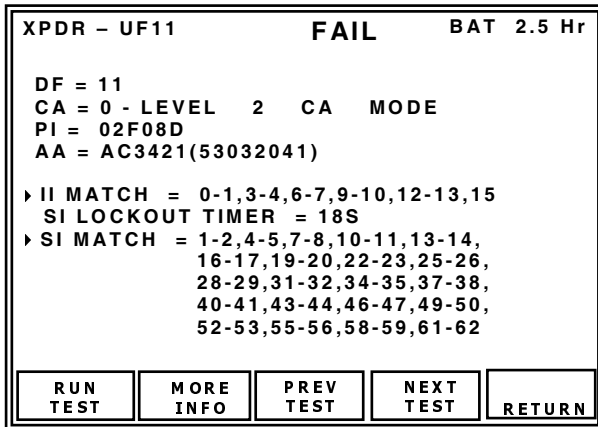
NOTE: When a single code fails it is displayed. When more than one code fails, the range of codes are displayed. An arrow identifies a FAIL.

The multi-site lockout protocol is utilized in conjunction with an SI code to verify lockout (not accept any Mode S only All-Call) time. If lockout time is 18 s (± 1 s), PASS is displayed. FAIL is displayed if lockout time is outside this window

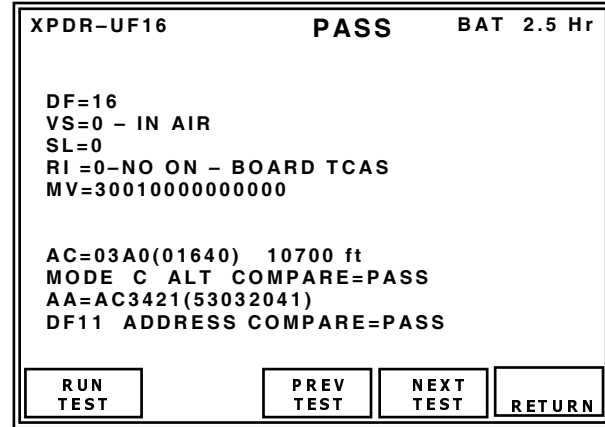
The test interrogates during the lockout period with a different SI code to confirm interrogation acceptance.

NOTE: Due to long test time required, lockout timer test is not run as part of Auto Test. Test is run only if UF11 Test is performed separately.

The DISPLAY indicates Downlink Format Fields. If fails due to wrong address, DF11 address is displayed (1-2-4, Figure 36).



UF11 FAIL Test Screen
Figure 36



UF16 Test Screen
Figure 37

UF16 Test:

Refer to 1-2-4, Figure 37. UF16 Test (Long Air to Air Surveillance) performs these functions:

- ◆ Verifies replies to Mode S UF16 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF16 data fields.
- ◆ Compares Mode S Altitude to Mode C Altitude.

Test Details:

The Test Set interrogates with UF16, 6 dB above MTL, verifying a DF16 reply is received.

Altitude reported in DF16 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Altitudes must agree within 100 feet.

Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect altitude, Mode C altitude is displayed. If test fails due to wrong address, DF11 address is displayed.

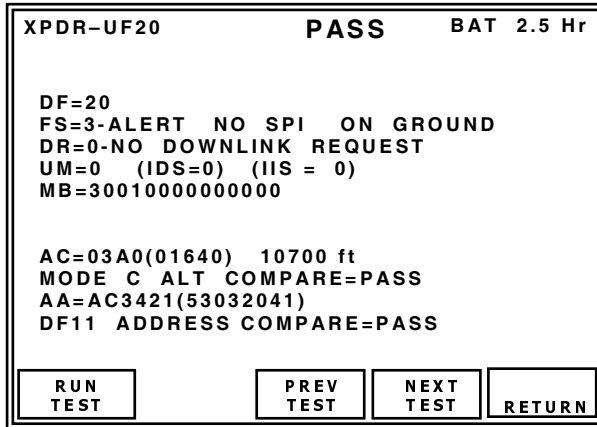
NOTE: AC field blanks out if invalid data is received for that field.

NOTE: No reply to UF16 results in Mode S pass in Auto Test.

NOTE: Replies to UF16 are received only if an active TCAS II system is installed.

Testing VS (Vertical Status):

ICAO amendment 77 transponders only replies to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.



UF20 Test Screen
Figure 38

UF20 Test:

Refer to 1-2-4, Figure 38. UF20 (Long Surveillance Altitude) Test performs these functions:

- ◆ Verifies replies to Mode S UF20 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF20 data fields. Displays MB message field in HEX.
- ◆ Compares Mode S altitude to Mode C altitude.

Test Details:

The Test Set interrogates with UF20 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, requesting a BDS 1,0 data link capability report, 6 dB above MTL, verifying a DF20 reply is received. If reply is not received, the test interrogates for BDS 3,0 TCAS sensitivity status message.

Altitude reported in DF20 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Altitudes must agree within 100 feet.

Address is compared with address reported during Mode Test in DF11 reply. DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect altitude, Mode C altitude is displayed. If test fails due to wrong address DF11 address is displayed.

NOTE: The BDS 3,0 TCAS sensitivity status message interrogates with Mode S UF20 (Comm A, altitude request), RR=19 (long reply), DI=7, RRS=0, MA=05000000000000, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format.

NOTE: Data displayed in MB message field is not decoded.

NOTE: The Datalink Capability Report determines the level of transponder under test. If level 1 is reported, test is not run and NOT CAPABLE is displayed.

NOTE: AC field blanks out if invalid data is received for that field.

NOTE: Transponders without active subsystems capable of accepting Comm A data do not reply to UF20 interrogations.

Testing FS (Flight Status):

ICAO amendment 77 transponders only reply to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.

XPDR-UF21	PASS	BAT 2.5 Hr	
DF=21 FS=3-ALERT NO SPI ON GROUND DR=0-NO DOWNLINK REQUEST UM=0 (IDS=0) (IIS = 0) MB=30010000000000			
ID=03A0(01640) OCTAL ID 6140 MODE A ID COMPARE=PASS AA=AC3421(53032041) DF11 ADDRESS COMPARE=PASS			
RUN TEST	PREV TEST	NEXT TEST	RETURN

UF21 Test Screen PASS
Figure 39

UF21 Test:

Refer to 1-2-4, Figure 39. UF21 (Long Surveillance Identity) Test performs these functions:

- ◆ Verifies replies to Mode S UF21 interrogations and compares discrete address with DF11.
- ◆ Decodes and displays DF21 data fields. Displays MB message field in HEX.
- ◆ Compares Mode S Identity Code to Mode A Squawk Code.

Test Details:

The Test Set interrogates with UF21 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, requesting a BDS 1,0 data link capability report, 6 dB above MTL, verifying a DF21 reply is received. If reply is not received, the test interrogates for BDS 3,0 TCAS sensitivity status message.

ID code reported in DF21 is compared with ID code reported during Mode Test in valid ATCRBS Mode A reply.

Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect ID code, Mode A, ID code is displayed. If test fails due to wrong address, DF11 address is displayed.

NOTE: The BDS 3,0 TCAS sensitivity status message interrogates with Mode S UF20 (Comm A, altitude request), RR=19 (long reply), DI=7, RRS=0, MA=05000000000000, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format.

NOTE: Data displayed in MB message field is not decoded.

NOTE: BDS 1,0 Datalink Capability Report determines the level of transponder under test. If level 1 is reported, test is not run and NOT CAPABLE is displayed (1-2-4, Figure 40).

XPDR-UF21	NOT RUN	BAT 2.5 Hr	
DF= FS= DR= UM= (IDS=) (IIS=) MB=			
ID= () OCTAL ID MODE A ID COMPARE= AA= () DF11 ADDRESS COMPARE=			
RUN TEST	PREV TEST	NEXT TEST	RETURN

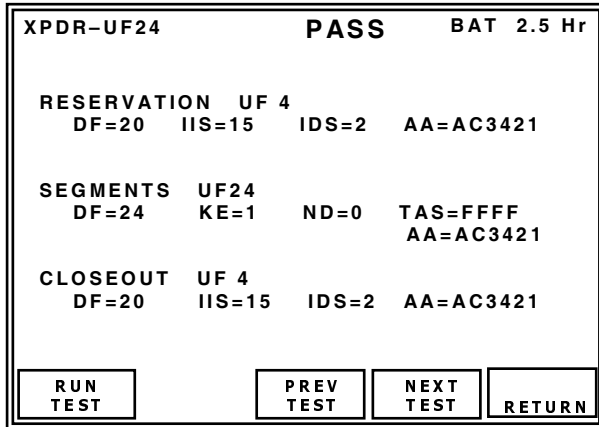
UF21 Test Screen NOT RUN
Figure 40

NOTE: Transponders without active subsystems capable of accepting Comm A data does not reply to UF21 interrogations.

Testing FS (Flight Status):

ICAO amendment 77 transponders only reply to Mode S discrete interrogations when installation is in ground state. Refer to para 1-2-4.3.2 for UUT ADDRESS and MANUAL AA settings.

NOTE: BDS 1,0 Datalink Capability Report determines the level of transponder under test. If level <3 is reported, test is not run and NOT CAPABLE is displayed.



UF24 Test Screen
Figure 41

UF24 Test:

The UF24 Test (1-2-4, Figure 41) completes the 16 segment data transfer (UELM protocol) verifying UF24.

Test Details:

Interrogates with Mode S UF4 UELM reservation, verifying reply received is a DF20 UELM Reservation (Comm-B).
Interrogates with Mode S UF24 (Comm-C) UELM segments, one initial, 14 intermediate and one final interrogation. Verifies reply received is a Mode S DF24 (Comm-D) acknowledgment.

When the close-out is successfully completed, the IIS displayed should equal the IIS displayed in the reservation.

Interrogates with Mode S UF4, 6 dB above MTL, UELM close-out and verifies reply received is a DF20 UELM close-out (Comm-B).

TAS Field displays the number of transferred segments. TAS data consists of 16 bits, each bit representing a segment, displayed as four hex digits.

No reply to the UELM Test sequence does not fail Mode S in Auto Test.

XPDR - ELEMENT SURV1 PASS BAT 2.5 Hr			
DF=20			
BDS=1,0	SUBNETWORK VER =1		
	ENH PROT IND =LVL 2-4		
	SPEC SERV CAP =YES		
	UELM CAPABILITY =16/1 s		
	DELM CAPABILITY =16/500 ms		
	AIRCRAFT ID CAP =YES		
	SURV IDENT CAP =YES		
BDS=2,0	FLIGHT ID=UA661	RAC=1010	
BDS=3,0	ARA=11101010000000	RAT=0	
RUN TEST	PREV TEST	NEXT TEST	RETURN

XPDR Elementary Surveillance 1 Test Screen
Figure 42

XPDR Elementary Surveillance 1 Test:

Refer to 1-2-4, Figure 42. XPDR Elementary Surveillance Test performs these functions:

- ♣ Verifies, decodes and displays BDS 1,0 Data Link Capability Report.
- ♣ Verifies, decodes and displays BDS 2,0 Aircraft Identification (Flight ID).
- ♣ Verifies, decodes and displays BDS 3,0 ACAS Resolution Advisory.

NOTE: Only the primary data fields are displayed. For full decode and display of GICB extracted BDS registers, the ADS-B option is required.

NOTE: BDS Data Items not available are identified by N/A in the data field.

Test Details:

Data Link Capability Report BDS 1,0:

The Test Set Interrogates with UF4 RR=17 DI=7 RRS=0, decodes DF20 reply and displays data link capability report comprising the following fields:

SUBNETWORK VER:

(Mode S Subnetwork Version Number)
N_AVL (Not Available) or three Digit Version Number (currently only Version 001 defined).

ENH PROT IND:
(Enhanced Protocol Indicator)
2-4 (Transponder Level 2-4) or **5**
(Transponder Level 5 Enhanced Protocol)

SPEC SER CAP:
(Mode S Specific Services Capability Report):
YES or **NO**

UELM SEG CAP:
(Uplink Extended Length Message Segment Capability)
NO UELM, 16/1 S, 16/500 mS, 16/250 mS, 16/125 mS, 16/60 mS or 16/30 mS

(Example: 16 segments transferred in 500 ms.)

DELM SEG CAP:
(Downlink Extended Length Message Segment Capability)
NO DELM, 4/1 S, 8/1 S, 16/1 S, 16/500 mS, 16/250 mS, 16/125 mS or 7 to 15 (unassigned)
(Example: Eight segments transferred in 1s.)

AIRCRAFT ID CAP:
(Aircraft Identification Capability)
YES or **NO**

SURV IDENT CAP:
(Surveillance Identifier Code Capability)
YES or **NO**

Aircraft Identification (Flight ID) BDS 2,0:

The Test Set Interrogates with Mode S UF4 (Comm A Identity request), RR=18 (long reply) to request DF20 with AIS reply. Verifies reply received is a DF20 (Comm-B) with an AIS field containing valid characters.

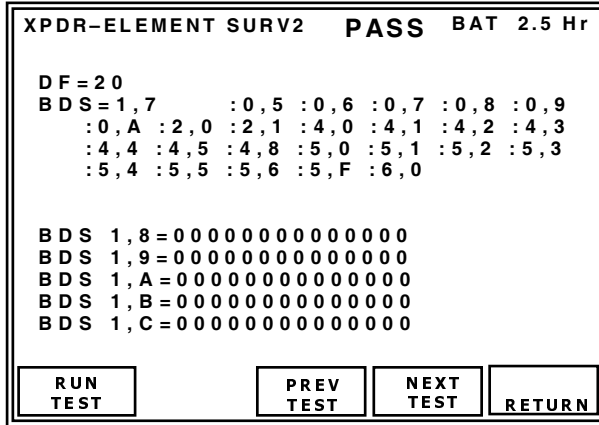
NOTE: If Flight ID is not entered into transponder or linked subsystem, AIS is zero (0).

NOTE: Transponder Level =>2 required, test verifies BDS 1,7 to confirm capability.

ACAS Resolution Advisory BDS 3,0:

Test Set Interrogates with UF4, 6 dB above MTL, RR=19 DI=7 RRS=0, decodes DF20 reply and displays active resolution advisory data, including RAT (Resolution Advisory Terminated) bit.

NOTE: TCAS II must be installed and a resolution advisory must be in progress for data to be displayed on this Screen. RA may be stimulated by Test Set or a TCAS-201 Test Set running a collision scenario.



XPDR Elementary Surveillance 2 Test Screen
Figure 43

XPDR Elementary Surveillance 2 Test:

Refer to 1-2-4, Figure 43. XPDR Elementary Surveillance Test performs these functions:

- ♣ Verifies, decodes and displays BDS 1,7 Common Usage GICB Capability Report.
- ♣ Verifies, decodes and displays BDS 1,8-1,9-1,A-1,B-1,C Specific Services Capability Report.

NOTE: Only primary data fields are displayed. For full decode and display of GICB extracted BDS registers, the ADS-B option is required.

Test Details:

GICB Common Usage Capabilities Report:

Interrogates with UF4 RR=16 DI=7 RRS=7, decodes DF20 reply and displays common usage GICB capability report.

The Screen displays BDS Numbers for the common usage GICB services currently supported by the transponder and decodable by the Test Set.

BDS	DESCRIPTION
0,5	Ext Squitter Airborne Position
0,6	Ext Squitter Surface Position
0,7	Ext Squitter Status
0,8	Ext Squitter Type and Identification
0,9	Ext Squitter Airborne Velocity Information
0,A	Ext Squitter Event Driven Information
1,0	Data Link Capability Report
1,7	Common Usage GICB Capability Report
2,0	Aircraft Identification (Flight ID)
2,1	Aircraft Registration Number
3,0	ACAS Resolution Advisory
4,0	Aircraft Vertical Intention
4,1	Next Way Point Identifier
4,2	Next Way Point Position
4,3	Next Way Point Information
4,4	Meteorological Routine Report
4,5	Meteorological Hazard Report
4,8	VHF Channel Report
5,0	Track and Turn Report
5,1	Position Coarse
5,2	Position Fine
5,3	Air Referenced State Vector
5,4	Way Point 1
5,5	Way Point 2
5,6	Way Point 3
5,F	Quasi-Static Parameter Monitoring
6,0	Heading and Speed Report

Common Usage GICB BDS
Table 1

NOTE: Shaded BDS in 1-2-4, Table 1 are those not supported by current IFR 6000 software.

Specific Services GICB Capability Report BDS 1,8 to 1,C:

Interrogates with UF4 RR=17 DI=7 and RRS=8. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 0,1 to 3,8.

Interrogates with UF4 RR=17 DI=7 and RRS=9. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 3,9 to 7,0.

Interrogates with UF4 RR=17 DI=7 and RRS=10. DF20 reply BDS register content displayed as 14 HEX digits.

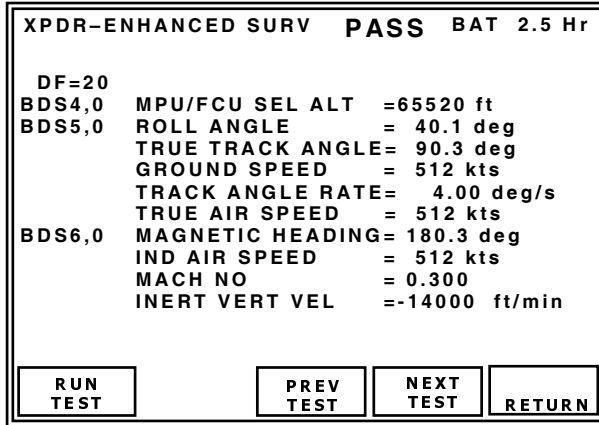
Each bit set indicates capability supported for BDS 7,1 to A,8.

Interrogates with UF4 RR=17 DI=7 and RRS=11. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS A,9 to E,0.

Interrogates with UF4 RR=17 DI=7 and RRS=12. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS E,1 to F,F.



Enhanced Surveillance Test Screen
Figure 44

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

XPDR Enhanced Surveillance Test:

Refer to 1-2-4, Figure 44. XPDR Enhanced Surveillance Test performs these functions:

- ♣ Verifies, decodes and displays BDS 4,0 Aircraft Vertical Intention.
- ♣ Verifies, decodes and displays BDS 5.0 Track and Turn Report.
- ♣ Verifies, decodes and displays BDS 6,0 Heading and Speed Report.

NOTE: Only primary data fields are displayed. For full decode and display of GICB extracted BDS registers, the ADS-B option is required.

NOTE: BDS Data Items not available are identified by displaying N/A in the data field.

NOTE: BDS 1,7 is verified to confirm availability of:

- BDS 4,0
- BDS 5,0
- BDS 6,0

Test Details:

Aircraft Vertical Intention BDS 4,0:

The Test Set Interrogates with UF4 RR=20 DI=7 RRS=0, decodes DF20 reply and displays vertical intent report data.



MCP/FCU SEL ALT:

(Mode Control Panel/Flight Control Unit Selected Altitude) displayed in feet.

FMS SEL ALT:

(Flight Management System) displayed in feet.

NOTE: MCP/FCU SEL ALT or FMS SEL ALT is displayed.

Track and Turn Report BDS 5,0:

The Test Set Interrogates with UF4 RR=21 DI=7 RRS=0, decodes DF20 reply and displays Track and Turn Report data.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

ROLL ANGLE:

± 90.0 deg

TRUE TRACK ANGLE:

(True Track Angle)
 0 to 359 deg

GROUND SPEED:

(Ground Speed)
 0 to 2048 Kts (2 Kt resolution)

TRUE TRACK ANGLE RATE:

(True Track Angle Rate)
 ± 0.0 to 16.0 deg/sec

TRUE AIR SPEED:

(True Air Speed)
 0 to 2048 Kts (2 Kt resolution)

Heading and Speed Report BDS 6, 0:

The Test Set Interrogates with UF4 RR=22 DI=7 RRS=0, decodes DF20 reply and displays Heading and Speed Report data.

MAG HDG:

(Magnetic Heading)
 0 to 359 deg

IND AIR SPEED:

(Indicated Air Speed)
 0 to 1023 Kts (1 Kt resolution)

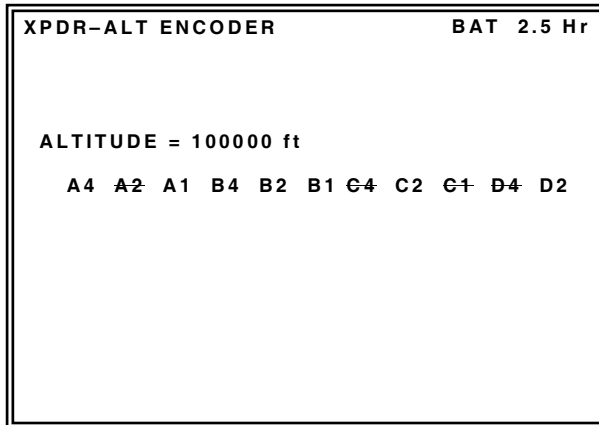
MACH NO:

(Mach Number)
 0 to 4.096 (Mach Number)

INERT VERT VEL:

(Inertial Vertical Velocity)
 -16384 to $+16352$ feet/min (32 feet/min resolution)

4.3.4 Altitude Encoder



Altitude Encoder Test Screen
Figure 45

Altitude Encoder:

Refer to 1-2-4, Figure 45. Altitude Encoder performs these functions:

Decodes and displays altitude (grey code) from encoding altimeters.

Displays in binary the altitude (grey code) from encoding altimeters.

Test Details:

Altitude:

Encoding altimeter is connected via user manufactured cable to Remote Connector. Altitude is decoded and displayed in feet and binary lines are monitored and displayed as A4, A2, A1, B4, B2, B1, C4, C2, C1, D4, D2. A logic 0 is displayed by a strike through (A4).

4.3.5 Direct Connect Procedure

STEP	PROCEDURE
1.	Connect UUT to Test Set RF I/O Connector via 72 in coaxial cable. CAUTION: TO PREVENT DAMAGE TO TEST SET, DO NOT CONNECT UUT TO TEST SET ANT CONNECTOR.
2.	Press XPDR Mode Key to display XPDR Auto Test Screen. The Test Set displays the results of last XPDR Auto Test if run since last Power-up.)
3.	Perform XPDR Setup Screen procedure, setting RF I/O Connector to DIRECT CONNECT (para 1-2-4.3.2).
4.	Perform CONFIG selection procedure (para 1-2-4.3.1).
5.	Press RUN/STOP Soft Key to run XPDR Auto Test. TEST RUNNING in top line of DISPLAY indicates test is running.
6.	Press RUN/STOP Soft Key at any time to stop test (non-resumable).
7.	Verify XPDR Auto Test indicates PASS or FAIL on DISPLAY. Verify squawk codes, altitudes, Mode S address, VS and FS status, country and tail number. If XPDR Auto Test fails press MORE INFO Soft Key to review failures.

STEP	PROCEDURE
1.	Press XPDR Mode Key until the XPDR ENCODER Screen is displayed (1-2-4, Figure 45).
2.	Connect Test Set. Remote Connector, Altitude Encoder inputs to UUT Encoding Altimeter via user provided cable. Refer to Appendix A for remote connector pinouts.
3.	Use Barometric Test Set to pump up UUT Encoding Altimeter to desired test altitudes and confirm altitude on display.

4.3.6 "Over the Air" Ground Test Procedure (UUT Aircraft Altitude Reporting System \leq Airfield Altitude)

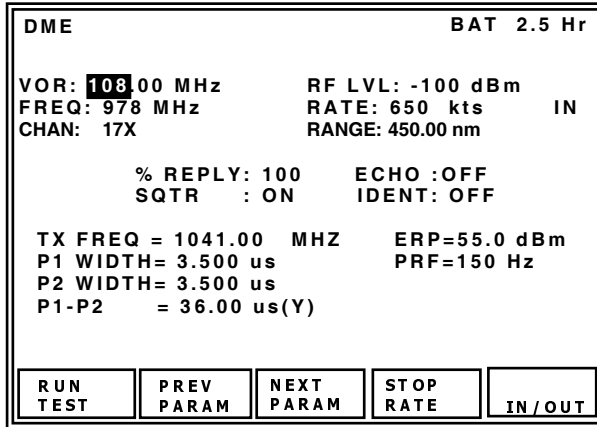
STEP	PROCEDURE
1.	Press XPDR Mode Key to display XPDR Auto Test Screen. The Test Set shows displays the results of the last XPDR Auto Test if run since last Power-up.
2.	Perform XPDR Setup Screen procedure (para 1-2-4.3.2) setting RF I/O Connector to ANTENNA.
3.	Perform CONFIG selection procedure (para 1-2-4.3.1).
4.	Perform Directional Antenna Use procedure (para 1-2-4.5). Position Test Set Antenna facing UUT antenna at XPDR Setup Screen ANT RANGE.
5.	Shield with Antenna Shield or disconnect and terminate UUT antenna not being tested. Refer to Appendix J. Deactivate other area transponders or position transponders at least three times the XPDR Setup Screen ANT RANGE from the Test Set Antenna.
6.	Press RUN/STOP Soft Key to run XPDR Auto Test. TEST RUNNING in top line of DISPLAY indicates test is running.
7.	Press RUN/STOP Soft Key at any time to stop test (non-resumable).
8.	Verify XPDR Auto Test indicates PASS or FAIL on DISPLAY. Verify squawk codes, altitudes, Mode S address, VS and FS status, country and tail number. If XPDR Auto Test fails press MORE INFO Soft Key to review failures.

4.3.7 "Over the Air" Simulated Altitude Test Procedure (UUT Aircraft Altitude Reporting System $>$ Airfield Altitude ["Pumped Up"])

STEP	PROCEDURE
1.	Press XPDR Mode Key to display XPDR Auto Test Screen. Test Set displays results of last XPDR Auto Test if run since last Power-up.
2.	Perform XPDR Setup Screen procedure, setting RF I/O Connector to ANTENNA (para 1-2-4.3.2). Set ANT RANGE to ≤ 20 feet (6.1 meters).
3.	Perform CONFIG selection procedure (para 1-2-4.3.1).
4.	Perform Directional Antenna Use procedure (para 1-2-4.5). Position Test Set Antenna facing UUT antenna at XPDR Setup Screen ANT RANGE.
5.	Shield with Antenna Shield or disconnect and terminate UUT antenna not being tested. Deactivate other area transponders or position transponders > 50 feet (15.24 meters) from the Test Set Antenna.
6.	Press RUN/STOP Soft Key to run XPDR Auto Test. TEST RUNNING in top line of DISPLAY indicate test is running.
7.	Press RUN/STOP Soft Key at any time to stop test (non-resumable).
8.	XPDR Auto Test indicates a FAIL on DISPLAY.
	NOTE: The Antenna Shield causes failure indications for Diversity, MTL Difference and Power Tests. The Antenna Shield may cause failure indications for the Frequency Test. Disregard these failure indications. Frequency, Diversity, MTL Difference and Power Tests are verified without the Antenna Shield.
9.	Verify squawk codes, altitudes, Mode S address, VS and FS status, country and tail number. Press MORE INFO Soft Key to review failures note.

4.4.4 DME

Press DME Mode Key to select DME functional mode. DME Test Screen is displayed (1-2-4, Figure 46).



DME Screen
Figure 46

DME functional mode has a single test screen that provides all required control functions and measurement display. A Setup DME Screen allows user parameters to be entered.

User Controls:

Soft Keys:

RUN TEST:

Starts the DME Test. TEST RUNNING is displayed at the top of Screen.

NEXT PARAM:

Selects next control field. Includes selection of fields that have dedicated Keys.

PREV PARAM:

Selects previous control field. Includes selection of fields that have dedicated Keys.

STOP(START) RATE:

Stops or starts Range Rate.

IN/OUT:

Reverses distance track inbound or outbound.

Dedicated Keys and Control Fields:

FREQ:

Test Set reply Frequency is displayed in three linked units.

CHN (DME channel number)

VOR (paired frequency MHz)

FREQ (ground to air frequency MHz)

Press Frequency Key to select each unit in sequence. Press DATA Key to select X or Y channel.

RF LVL (RF Level):

Selects RF LVL field.

Press DATA Key to change RF LVL in 1 dB steps. RF LVL defaults to maximum on Power-up, actual value dependant on Test Set distance from DME UUT.

RANGE:

RANGE Keys change RANGE in 1.00 nm steps. Press DATA Key to change nm unit to 10 nm, 0.10 nm or 0.01 nm.

RATE:

RATE Keys change RATE in 1 kt steps (10 to 6500 kts).

Control Fields Selected with NEXT/PREV PARAM Soft Keys:

% REPLY:

Selectable in 1% steps. Range is 0% to 100%.

SQTR:

Selectable ON or OFF. Squitter must be on for DME to search and acquire track.

ECHO:

Selectable ON or OFF. Multi-path Reply Echo simulation at Fixed 30 nm, RF level -11 dB relative to RF LVL selected (Main Reply).

IDENT:

Selectable ON, OFF. 1350 Hz tone three letter station Ident defined in Setup DME Screen (1-2-4, Figure 47).

Control Field Power Up Defaults:

FREQ: Last Used

RF LVL: Maximum

RATE: 0 kts IN

RANGE: 0 nm

% REPLY: 100

ECHO: OFF

SQTR: ON

IDENT: OFF

UUT Measurement Parameters:

TX FREQ:

Measures and displays Interrogation Frequency in MHz.

ERP:

Measures and displays Interrogator ERP (Effective Radiated Power) in dBm, dBW or WATTS peak. Units are selected in SETUP GENERAL Screen (1-2-4, Figure 11).

PRF:

Measures and displays interrogator Pulse Repetition Frequency.

P1 WIDTH:

Measures and displays Interrogator P1 width in us.

P2 WIDTH:

Measures and displays Interrogator P2 width in us.

P1/P2:

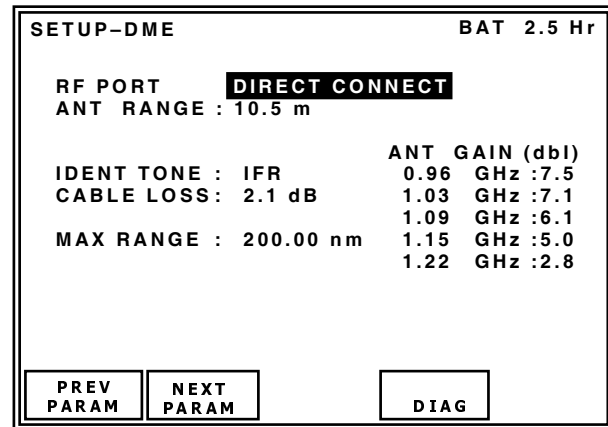
Measures and displays interrogator P1 to P2 spacing and displays Mode X or Y, depending on spacing.

4.4.1 SETUP

Setup DME:

Setup DME Screen contains parameters which determine the operational characteristics of each functional mode of the Test Set.

NOTE: Setup Screen information is entered before conducting test operations.



Setup DME Screen
Figure 47

STEP	PROCEDURE
------	-----------

1. Press SETUP Select Key to display SETUP DME Control Screen (1-2-4, Figure 47).
2. Set following parameters by pressing NEXT PARAM and PREV PARAM to select field. Use DATA Keys to slew the data.
 - **RF I/O CONNECTOR:**
Selects Antenna (ANT CONNECTOR) or DIRECT CONNECT via RF I/O Connector.
 - **CABLE LOSS:**
Entered in dB, normally this is set once, figure marked on supplied RF coaxial cable.
 - **ANT RANGE:**
Test Set Antenna to transponder antenna range. Enter parameters for BOTTOM antenna and TOP antenna if installation has diversity capability.

STEP	PROCEDURE	STEP	PROCEDURE
	<p>NOTE: SETUP GENERAL Screen UNITS parameter determines feet or meters (1-2-4, Figure 8).</p> <ul style="list-style-type: none"> ● ANT GAIN: Entered in dBi and normally set once, the five gain figures for frequencies are: 0.96 GHz 1.03 GHz 1.09 GHz 1.15 GHz 1.21 GHz Gain figures are also marked on the Directional Antenna. ● IDENT TONE: Sets the three letter IDENT tone. Default is IFR. ● MAX RANGE: Limits the maximum simulated range. Default is 400 nm. 		
3.	<p>Press DME Mode Key to return to DME Test Screen.</p> <p>DME Test Guidelines:</p> <ol style="list-style-type: none"> 1. Press DME Mode Key to display DME Test Screen (1-2-4, Figure 44). 2. Set Test Set controls as follows: RF LVL: Maximum Output RF FREQ: To desired channel RANGE: 0.00 nm RATE: STOP IN/OUT: OUT ECHO: OFF SQTR: OFF % REPLY: 70 IDENT: ON 3. Set SQTR to ON and verify UUT DME searches and locks on within 1.5 s. 4. Verify Range displayed on UUT DME distance indicator is 0 nm (± 0.5 nm). 5. Verify Track PRF is ≤ 30 Hz. 	6.	Verify TX Frequency is within ± 0.07 MHz of assigned channel.
		7.	Verify P1 to P2 Pulse Widths are 3.5 μ s (± 0.5 μ s).
		8.	Verify P1 to P2 Pulse Spacing is: X channel 12.0 μ s (± 0.5 μ s) Y Channel 36.0 μ s (± 0.5 μ s)
		9.	Verify ERP is for: TSO'd DME >18,000 feet ≥ 250 W (+54 dBm) TSO'd DME <18,000 feet ≥ 50 W (+47dBm)
		10.	Set RATE to 600 kts and verify UUT DME distance indicator displays an outbound track, without breaking lock.
		11.	Set IN/OUT to IN and verify UUT DME distance indicator displays an inbound track, without breaking lock. Set RATE to 0 kts.
		12.	Set %REPLY to 0. Verify distance continues to be displayed and flag remains out of view for 8 s ± 4 s. After memory times out, verify on UUT DME distance indicator that distance is not displayed and flag is in view. Verify that Search PRF is ≤ 150 Hz.
		13.	Set %REPLY to 70 and RF LVL to -79 dBm, verify UUT DME locks on. Set IDENT tone to ON. Verify 1350 Hz Ident morse is present on UUT DME audio. Set IDENT to OFF.
		14.	Set RANGE 40 nm. Set ECHO to ON. Verify UUT DME does not break lock and range displayed on UUT DME indicator is 40 nm ± 0.5 nm. Set ECHO to OFF.
		15.	Set RF LVL to -79 dBm and %REPLY to 70. Verify UUT DME is locked on. Adjust RF LVL in -1 dB steps, allowing 15 s in between steps, until UUT DME breaks lock. Verify RF LVL is ≥ -83 dBm.
		NOTE:	OEM Test procedures should be followed.
		NOTE:	For Radiated Testing, Maximum RF LVL settable depends on distance of Test Set from UUT and Setup DME Screen settings.

4.5 DIRECTIONAL ANTENNA USE

The Directional Antenna is used three ways.



Directional Antenna Mounted on Test Set
Figure 48

Mount Directional Antenna on friction hinge and connect Directional Antenna ANT Connector to Test Set ANT Connector via 12 in coaxial cable (1-2-4, Figure 48).



Hand Held Directional Antenna
Figure 49

Connect Directional Antenna ANT Connector to Test Set ANT Connector via 72 inch coaxial cable. Point Directional Antenna at UUT antenna (1-2-4, Figure 49).



Tripod Mounted Directional Antenna
Figure 50

Connect Directional Antenna ANT Connector to Test Set ANT Connector via 72 in coaxial cable. Mount Directional Antenna on tripod and point at UUT antenna (1-2-4, Figure 50).

XPDR:

XPDR antennas are top and bottom mounted on airframe. Verify which antenna(s) is transponder antenna(s) as the DME antenna(s) look similar.

Position Directional Antenna in direct sight of UUT antenna, avoiding close obstructions such as gantries, ladders and tool chests etc., to minimize multi-path reflections which cause random test failures.

Distance for testing top UUT antenna should be sufficient so UUT antenna is visible (1-2-4, Figures 48 and 49). Supplied Antenna Shield should be mounted on bottom UUT antenna to avoid unwanted replies.

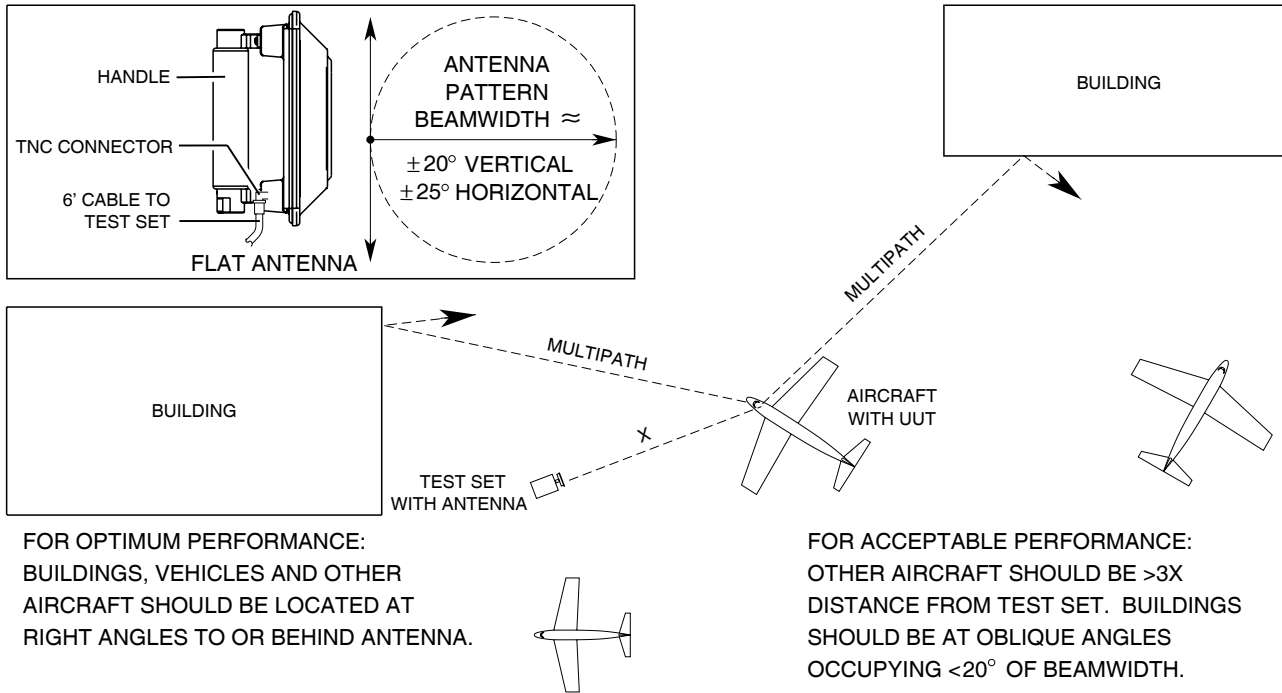
Distance for testing bottom UUT antenna should be close enough so that top UUT antenna is not visible.

DME:

DME Antennas are bottom mounted on airframe. Verify which antenna(s) is DME Antenna(s) as the transponder lower antenna(s) look similar.

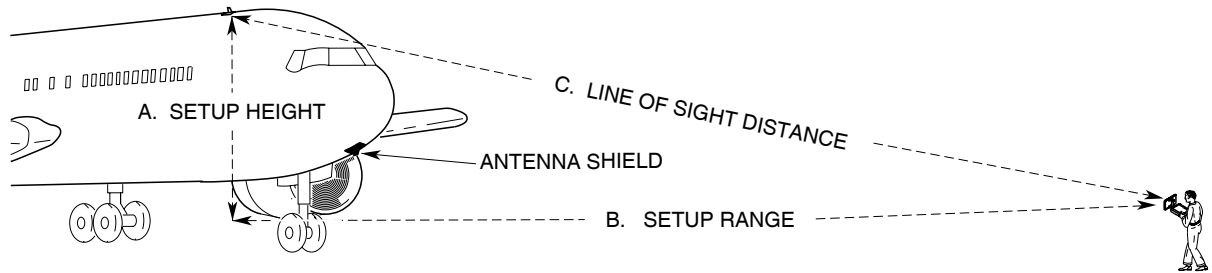
Position Directional Antenna in direct sight of UUT antenna, avoiding close obstructions such as gantries, ladders and tool chests etc., to minimize multipath reflections which cause random test failures. Usual distance from UUT antenna is approximately 10 to 20 feet.

NOTE: Directional Antenna should not be positioned closer than 6 feet, to ensure that the antenna far field is tested.

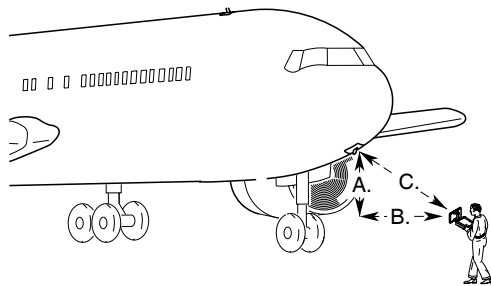


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Suggested Layout to Reduce Multipath Errors
Figure 51



TESTING TOP ANTENNA



WHEN DESELECTING, TERMINATING OR SHIELDING TOP ANTENNA IS NOT POSSIBLE OR PRACTICAL, USE SETUP POSITION THAT HAS AIRCRAFT BLOCKING LINE OF SIGHT TO TOP ANTENNA.

TESTING BOTTOM ANTENNA

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Ramp Testing
Figure 52

4.6 BREAKOUT BOX

The Breakout Box accessory provides access to individual user interfaces via standard connectors (1-2-4, Figure 53). The Test Set Remote Connector provides the main user signal interface for the Breakout Box.



IFR 6000 with Breakout Box
Figure 53

SECTION 3 - SPECIFICATIONS

NOTE: A 5 minute warm-up period is required for all specifications.

NOTE: Specifications are subject to change without notice.

DME MODE SIGNAL GENERATOR

Output Frequency:

Reply Frequency:

Range: 962 to 1213 MHz

Accuracy: ± 10 kHz

Output Level:

Ant Connector:

Range: -65 to -2 dBm at ANT Connector

Resolution: 1 dB

Accuracy: ± 2 dB

Distance to UUT Antenna: 6 to 300 ft with supplied antenna

RF I/O Connector:

Range: -115 to -47 dBm

Resolution: 1 dB

Accuracy:

-95 dBm to -47 dBm: ± 1 dB

-115 dBm to <-95 dBm: ± 2 dB

Reply Pulse Spacing:

P₁ to P₂: 12 μ s (± 100 ns) (X Channel) at 50% peak

P₁to P₂: 30 μ s (± 100 ns) (Y Channel) at 50% peak

Reply Pulse Width:

P₁/P₂: 3.5 μ s (± 0.5 μ s)

Echo Reply:

Control: On/Off

Position: 30 nmi (± 1 nmi)

Amplitude: -11 dB (± 1 dB) relative to reply level

DME MODE SIGNAL GENERATOR (cont)

Reply Pulse Rise and Fall Times:

All Pulses:

Rise Time: 2.5 μ s (\pm 0.25 μ s) (10% to 90%)Fall Time: 2.5 μ s (\pm 0.25 μ s) (90% to 10%)

Reply Delay:

X Channel:

Fixed Reply Delay: 50 μ s (\pm 100 ns)

Y Channel:

Fixed Reply Delay: 56 μ s (\pm 100 ns)

Range Delay:

X and Y Channel:

Range: 0 to 450.00 nmi

Resolution: 0.01 nmi

Accuracy: \pm 0.01 nmi

Squitter:

PRF: 2700 Hz

Accuracy: \pm 2%

Distribution: Per ARINC 568

Reply Efficiency:

Range: 0 to 100%

Resolution: 1% increments

Accuracy: \pm 0.5%

Ident Tone:

Selection: Selectable three letter code

Frequency: 1350 Hz

Accuracy: \pm 2 Hz

UUT MEASUREMENTS

ERP:

Range:	+47 to +64 dBm
Resolution:	0.1 dB
Accuracy:	±2 dB

Direct Connection Peak Pulse Power:

Range:	+47 to +64 dBm
Resolution:	0.1 dB
Accuracy:	±1 dB

Frequency:

Range:	1025.00 to 1150.00 MHz
Resolution:	10 kHz
Accuracy:	±20 kHz

Interrogation Pulse Width:

P1 and P2 Pulse Widths:

Range:	2.00 to 5.00 μ s
Resolution:	1 ns
Accuracy:	±50 ns

Interrogation Pulse Spacing:

P1 to P2 Spacing:	10 to 14 μ s (X Channel) 34 to 38 μ s (Y Channel)
Resolution:	10 ns
Accuracy:	±20 ns

Interrogation PRF:

Range:	1 to 300 Hz
Resolution:	1 Hz
Accuracy:	±2 Hz



TRANSPONDER MODE SIGNAL GENERATOR

RF Output Frequency:

Interrogation Frequency: 1030 MHz
Accuracy: ± 10 kHz

RF Output Level:

Ant Connector: MTL +6 dB typical, automatically controlled for a MTL range of -83 to -68 dBm
Range: -65 to -2 dBm at ANT Connector
Resolution: 0.5 dB
Accuracy: ± 2 dB
Distance to UUT Antenna: 6 to 200 ft with supplied antenna

RF I/O Connector:

MTL + 6 dB typical, automatically controlled
Range: -115 to -47 dBm
Resolution: 0.5 dB
Accuracy:
-95 to -47 dBm: ± 1 dB
-115 to <-95 dBm: ± 2 dB

ATCRBS/Mode S Interrogation Pulse Spacing:

Mode A:

P₁ to P₂: 2.00 μ s (± 25 ns)
P₁to P₃: 8.00 μ s (± 25 ns)

Mode C:

P₁to P₂: 2.00 μ s (± 25 ns)
P₁to P₃: 21.00 μ s (± 25 ns)

Mode S:

P₁to P₂: 2.00 μ s (± 25 ns)
P₁to P₆: 3.50 μ s (± 25 ns)
P₁to SPR: 4.75 μ s (± 25 ns)
P₅to SPR: 0.40 μ s (± 50 ns)

Intermode Interrogation Pulse Spacing:

Mode A:

P₁to P₃: 8.00 μ s (± 25 ns)
P₁to P₄: 10.00 μ s (± 25 ns)

TRANSPONDER MODE SIGNAL GENERATOR (cont)

Intermode Interrogation Pulse Spacing (cont):

Mode C:

P1 to P3: 21.00 μ s (\pm 25 ns)

P1 to P4: 23.00 μ s (\pm 25 ns)

Interrogation Pulse Widths:

Mode A, C, S, Intermode:

P1, P2, P3: 0.80 μ s (\pm 50 ns)

Mode S:

P6 (Short DPSK Block): 16.25 μ s (\pm 50 ns)

P6 (Long DPSK Block): 30.25 μ s (\pm 50 ns)

P5: 0.80 μ s (\pm 50 ns)

Intermode:

P4 (Short): 0.80 μ s (\pm 50 ns)

P4 (Long): 1.60 μ s (\pm 50 ns)

Interrogation Pulse Rise and Fall Times:

All Modes:

Rise Time: 50 to 100 ns

Fall Time: 50 to 200 ns

Phase Modulation:

All Modes:

Transition Time: \leq 80 ns

Phase Shift: 180° (\pm 10°)

SLS Levels:

ATCRBS:

SLS Level (P2) : -9 dB, -1 to +0 dB relative to P1 level

0 dB, -0 to +1 dB relative to P1 level

Off

Mode S:

SLS Level (P5) : -12 dB, -1 to +0 dB relative to P6 level

+3 dB, -0 to +1 dB relative to P6 level

Off

NOTE: DME or TCAS rate level is automatically controlled in the SLS LEVEL test.



TRANSPONDER MODE SIGNAL GENERATOR (cont)

Interrogation Test Signals:

Mode S:

PRF: 50 Hz (± 5 Hz)

ATCRBS:

PRF: 235 Hz (± 5 Hz)

UUT MEASUREMENTS

ERP (at 1090 MHz):

Range:	+45.5 to +59 dBm (35.5 to 800 W)
Resolution:	0.1 dB
Accuracy:	±2 dB

Direct Connection Peak Pulse Power
at (1090 MHz) :

Range:	+46.5 to +59 dBm (45 to 800 W)
Resolution:	0.1 dB
Accuracy:	±1 dB

Transmitter Frequency:

Range:	1087.000 to 1093.000 MHz
Resolution:	10 kHz
Accuracy:	±50 kHz

Receiver Sensitivity, Radiated MTL:

Range:	-67 to -79 dBm into 0 dBi antenna
Resolution:	0.1 dB
Accuracy:	±2 dB, typical

Receiver Sensitivity, Direct Connection
MTL:

Range:	-67 to -79 dBm
Resolution:	0.1 dB
Accuracy:	±2 dB

Reply Delay:

ATCRBS:

Range:	1.80 to 7.00 μ s
Resolution:	10 ns
Accuracy:	±50 ns

Mode S and ATCRBS Mode S
All-Call:

Range:	125.00 to 131.00 μ s
Resolution:	10 ns
Accuracy:	±50 ns

UUT MEASUREMENTS (cont)

Reply Delay Jitter:

ATCRBS:

Range: 0.00 to 2.30 μ s
 Resolution: 1 ns
 Accuracy: \pm 20 ns

Mode S and ATCRBS Mode S
All-Call:

Range: 0.00 to 6.00 μ s
 Resolution: 1 ns
 Accuracy: \pm 20 ns

Pulse Spacing:

F1 to F2:

Range: 19.70 to 21.60 μ s
 Resolution: 1 ns
 Accuracy: \pm 20 ns

Mode S Preamble:

Range:

P1 to P2: 0.8 to 1.2 μ s
 P1 to P3: 3.3 to 3.7 μ s
 P1 to P4: 4.3 to 4.7 μ s

Resolution: 1 ns
 Accuracy: \pm 20 ns

Pulse Widths:

F1 and F2:

Range: 0.25 to 0.75 μ s
 Resolution: 1 ns
 Accuracy: \pm 20 ns

Mode S Preamble:

Range: 0.25 to 0.75 μ s
 Resolution: 1 ns
 Accuracy: \pm 20 ns

UUT MEASUREMENTS (cont)

Pulse Amplitude Variation:

Range:

Mode S (Relative to P₁): +3 to -3 dBATCRBS (Relative to F₁): +3 to -3 dB

Resolution: 0.1 dB, (0.01 dB via RCI)

Accuracy: ±0.5 dB

DF 11 Squitter Period:

Range: 0.10 to 4.88 sec

Resolution: 10 ms

Accuracy: ±10 ms

Diversity Isolation:

Range: 0 to >20 dB (Depending on Test Distance)
Test Distance is 1.83 m (6 ft) to 28.96 m (95 ft)

Resolution: 0.1 dB

Accuracy: ±3 dB

TCAS MODE SIGNAL GENERATOR

Output Frequency:

Reply Frequency: 1090 MHz
Accuracy: ± 10 kHz

Output Level (Simulated ERP) :

ANT Connector: Simulates a 50.5 dBm XPDR ERP at 10 nmi range.
Radiated pwr at 0dBi UUT Antenna: -68 dBm typical, automatically controlled
Range: -65 to -2 dBm at ANT Connector
Resolution: 0.5 dB
Accuracy: ± 1 dB
Distance to UUT Antenna: 6 to 300 ft with supplied antenna

RF I/O Connector:

Automatic mode: -68 dBm
Manual Mode Range -115 to -47 dBm
Resolution: 0.5 dB
Accuracy:
-95 to -47 dBm: ± 1 dB
-115 to <-95 dBm: ± 2 dB

Reply Pulse Spacing:

Mode C:

F1 to F2: 20.30 μ s (± 25 ns)
F1 to C1: 1.45 μ s (± 25 ns)
F1 to A1: 2.90 μ s (± 25 ns)
F1 to C2: 4.35 μ s (± 25 ns)
F1 to A2: 5.80 μ s (± 25 ns)
F1 to C4: 7.25 μ s (± 25 ns)
F1 to A4: 8.70 μ s (± 25 ns)
F1 to B1: 11.60 μ s (± 25 ns)
F1 to D1: 13.05 μ s (± 25 ns)
F1 to B2: 14.50 μ s (± 25 ns)
F1 to D2: 15.95 μ s (± 25 ns)
F1 to B4: 17.40 μ s (± 25 ns)
F1 to D4: 18.85 μ s (± 25 ns)

TCAS MODE SIGNAL GENERATOR (cont)

Reply Pulse Spacing (cont)

Mode S:

P1 to P2:	1.00 μ s (\pm 25 ns)
P1 to P3:	3.50 μ s (\pm 25 ns)
P1 to P4:	4.50 μ s (\pm 25 ns)
P1 to D1:	8.00 μ s (\pm 25 ns)
D1 to Dn (n = 2 to 112):	1.00 μ s times (n-1) (\pm 25 ns)

Reply Pulse Widths:

Mode C:

All Pulses:	0.45 μ s (\pm 50 ns)
-------------	-----------------------------

Mode S:

P1 through P4:	0.50 μ s (\pm 50 ns)
D1 through D112:	0.50 μ s (\pm 50 ns), 1 μ s chip width

Reply Modes

TCAS I / II Mode C (with altitude reporting)

TCAS II Mode S formats 0, 11, 16

Reply Pulse Amplitudes:

ATCRBS:	\pm 1 dB relative to F1
Mode S:	\pm 1 dB relative to P1

Reply Pulse Rise and Fall Times:

All Modes:

Rise Time:	50 to 100 ns
Fall Time:	50 to 200 ns

Percent Reply:

Range:	0 to 100%
Resolution:	10%
Accuracy:	\pm 1%

Reply Delay

ATCRBS:	3.0 μ s (\pm 50 ns)
Mode S:	128 μ s (\pm 50 ns)

Range Delay:

Range:	0 to 99 nmi
Resolution:	0.1 nmi
Accuracy:	\pm 0.02 nmi

TCAS MODE SIGNAL GENERATOR (cont)

Range Rate:

Range:	-1200 to +1200 kts
Resolution:	10 kts
Accuracy:	10%

Altitude Range:

Range:	-1000 to 126,000 ft
Resolution:	
Mode C:	100 ft
Mode S:	25 ft

Altitude Rate:

Range:	-10,000 to +10,000 fpm
Resolution:	100 fpm
Accuracy:	10%

Squitter:

Control:	On/Off
Rate:	1.0 second
Accuracy:	±10 ms

Receiver Sensitivity (Simulated MTL):

Radiated:	Level automatically controlled based on actual distance to UUT antenna.
Automatic Mode:	-72 dBm at 10 nmi range using supplied antenna
Accuracy:	±2.0 dB

RF I/O Connector:

Range:	
Level Auto Controlled:	-72 dBm
Level Manual Controlled:	-85 to -40 dBm in 0.5 dB steps
Accuracy:	±1.0 dB

UUT MEASUREMENTS

ERP:

ATCRBS:

Range:	+43 to +58 dBm (20 to 631 W)
Resolution:	0.1 dB
Accuracy:	±2 dB

Mode S:

Range:	+43 to +58 dBm (20 to 631 W)
Resolution:	0.1 dB
Accuracy:	±2 dB

Direct Connection Peak Pulse Power
(at 1030 MHz):

ATCRBS:

Range:	+43 to +58 dBm (20 to 631 W)
Resolution:	0.1 dB
Accuracy:	±1 dB

Mode S:

Range:	+43 to +58 dBm (20 to 631 W)
Resolution:	0.1 dB
Accuracy:	±1 dB

Frequency:

Range:	1029.900 to 1030.100 MHz
Resolution:	1 kHz
Accuracy:	±10 kHz

TCAS Broadcast Interval:

Range:	1.0 to 12.0 sec
Resolution:	0.1 sec
Accuracy:	±0.2 sec

Whisper-Shout Interval:

Range:	0.53 to 1.27 sec
Resolution:	10 ms
Accuracy:	±20 ms

Whisper-Shout Step Spacing:

Range:	0.1 ms to 1.27 sec
Resolution:	0.1 ms
Accuracy:	±0.2 ms

MISCELLANEOUS

Inputs/Outputs:

RF I/O:

Type:	Input/Output
Impedance:	50 Ω typical
Maximum Input Level:	4 kW peak 10 W average
VSWR:	<1.3:1

Antenna:

Type:	Input/Output
Impedance:	50 Ω typical
Maximum Input Level:	10 W peak 1/2 W average

Test Antenna:

VSWR:	<1.5:1
Gain:	10 dB, Typical

Time Base (TCXO):

Temperature Stability:	± 1 ppm
Aging:	± 1 ppm per year
Accuracy:	± 1 ppm
Test Limit:	± 0.3 ppm

Battery:

Type:	Li Ion
Duration:	>4 hrs continuous operation >6 hrs, Typical

Input Power (Test Set):

Input Range:	11 to 32 Vdc
Power Consumption:	55 W Maximum 16 W Nominal at 18 Vdc with charged battery
Fuse Requirements:	5 A, 32 Vdc, Type F

Input Power (Supplied External AC to DC Converter):

Input Range:	100 to 250 VAC, 1.5 A Max, 47 to 63 Hz
Mains Supply Voltage Fluctuations:	$\leq 10\%$ of the nominal voltage
Transient Overvoltages:	According to Installation Category II

MISCELLANEOUS (cont)

Environmental (Test Set):

Use:	Pollution Degree 2
Altitude:	≤4800 m
Operating Temperature:	-20°C to 55°C

NOTE: Battery charging temperature range is 5° to 40°C (controlled by internal charger).

Storage Temperature:	-30°C to 71°C
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NOTE: Li Ion Battery must be removed below -20°C and above 60°C.

Relative Humidity:	95% (±5%) from 5° to 30°C
	75% (±5%) from 30° to 40°C
	45% (±5%) from 40° to 55°C

Environmental (Supplied External AC
to DC Converter):

Use:	Indoors
Altitude:	≤10,000 m
Operating Temperature:	0° to 40°C
Storage Temperature:	-20°C to 71°C

Physical Characteristics:

Dimensions:	
Height:	11.2 in (28.5 cm)
Width:	9.1 in (23.1 cm)
Depth:	2.7 in (6.9 cm)

Weight (Test set only):	<8 lbs. (3.6 kg)
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SUPPLEMENTAL INFORMATION:

Test Set Certifications:

Altitude, Operating:	MIL-PRF-28800F, Class 2
Altitude, Non-Operating:	MIL-PRF-28800F, Class 2
Bench Handling:	MIL-PRF-28800F, Class 2
Drip Proof:	MIL-PRF-28800F, Class 2
Explosive Atmosphere:	MIL-STD-810F, Method 511.4, Procedure 1
Relative Humidity:	MIL-PRF-28800F, Class 2
Shock, Functional:	MIL-PRF-28800F, Class 2
Vibration Limits:	MIL-PRF-28800F, Class 2
Temperature, Operating:	MIL-PRF-28800F, Class 2

NOTE: Temperature range extended to -20°C to 55°C.

Temp, Non-Operating:	MIL-PRF-28800F, Class 2
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NOTE: Temperature range reduced to -30°C to 71°C.

Transit Drop:	MIL-PRF-28800F, Class 2
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Safety Compliance:	UL-61010B-1 EN 61010-1 CSA 22.2 No 61010-1
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EMC:	EN 61326
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External AC-DC Converter Certifications:

Safety Compliance:	UL 1950 DS CSA 22.2 No. 234 VDE EN 60 950
EMI/RFI Compliance:	FCC Docket 20780, Curve "B"
EMC:	EN 61326

Transit Case Certifications:

Drop Test:	FED-STD-101C, Method 5007.1, Paragraph 6.3, Procedure A, Level A
Falling Dart Impact:	ATA 300, Category I
Vibration, Loose Cargo:	FED-STD-101C, Method 5019
Vibration, Sweep:	ATA 300, Category I
Simulated Rainfall:	MIL-STD-810F, Method 506.4, Procedure II of 4.1.2 FED-STD-101C, Method 5009.1, Sec 6.7.1
Immersion:	MIL-STD-810F, Method 512.4

SECTION 4 - SHIPPING

1. SHIPPING TEST SETS

1.1 INFORMATION

Aeroflex Test Sets returned to factory for calibration, service or repair must be repackaged and shipped according to the following conditions:

Authorization

Only return products to factory after first receiving authorization from Aeroflex Customer Service Department.

CONTACT: Aeroflex
Customer Service

Telephone: (800) 835-2350
FAX: (316) 524-2623
email: service@aeroflex.com

Tagging Test Sets

All Test Sets must be tagged with:

- Identification and address of owner
- Nature of service or repair required
- Model Number
- Serial Number

Shipping Containers

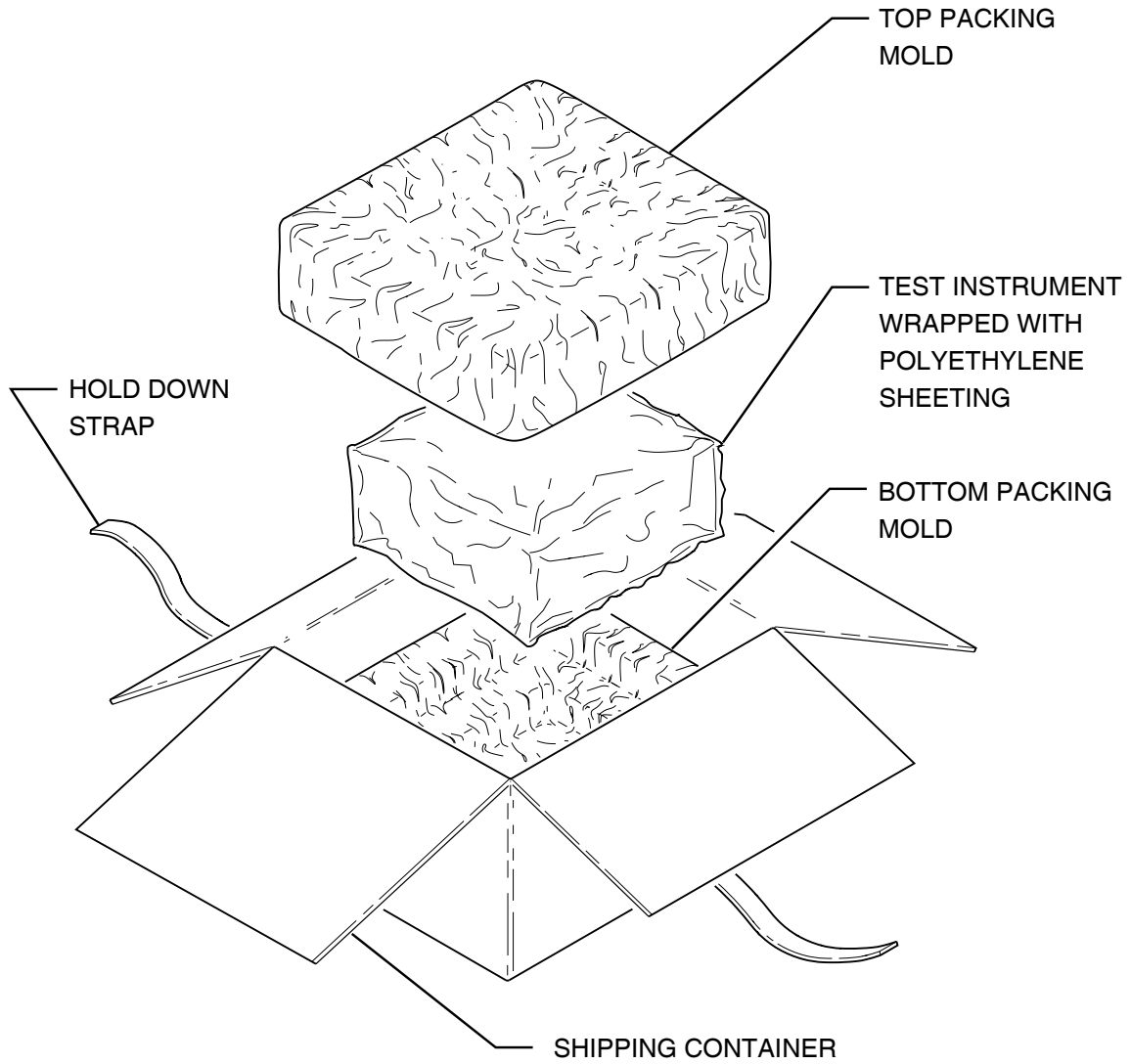
Test Sets must be repackaged in original shipping containers using Aeroflex packing molds. If original shipping containers and materials are unavailable, contact Aeroflex Customer Service for shipping instructions.

Freight Costs

All freight costs on non-warranty shipments are assumed by the customer. (See "Warranty Packet" for freight charge policy on warranty claims.)

1.2 REPACKING PROCEDURE

- Make sure bottom packing mold is seated on floor of shipping container.
- Carefully wrap Test Set with polyethylene sheeting to protect finish.
- Place Test Set into shipping container, making sure Test Set is securely seated in bottom packing mold.
- Place top packing mold over top of Test Set and press down until mold rests solidly in bottom packing mold.
- Close shipping container lids and seal with shipping tape or an industrial stapler. Tie all sides of container with break resistant rope, twine or equivalent.



Repacking Procedure
Figure 1

SECTION 5 - STORAGE

Perform the following storage precautions whenever the Test Set is stored for extended periods:

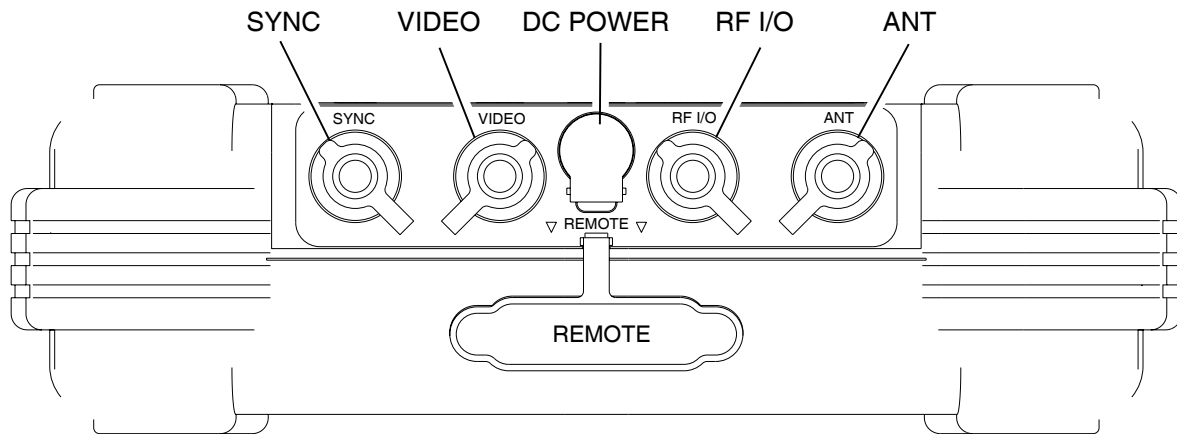
- Disconnect Test Set from any electrical power source.
- Disconnect and store ac power cable and other accessories with Test Set.
- Cover Test Set to prevent dust and debris from covering and entering Test Set.



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APPENDIX A - CONNECTOR PIN-OUT TABLES

1. I/O CONNECTORS

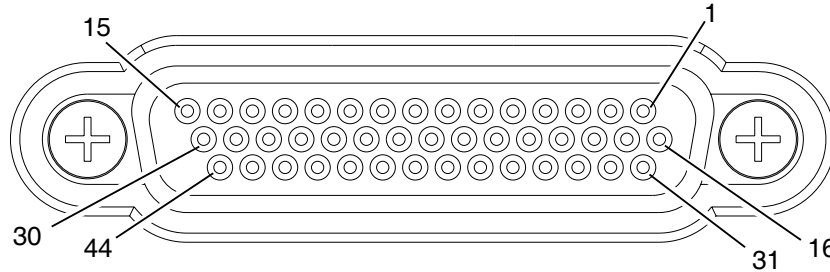


05806

CONNECTOR	TYPE	SIGNAL TYPE	INPUT/OUTPUT
SYNC	BNC	TTL	OUTPUT
VIDEO	BNC	TTL	OUTPUT
DC POWER	2.5 mm CIRCULAR (2.5 mm center, 5.5 mm outer diameter, center positive)	11 to 32 Vdc	INPUT
RF I/O	TNC	RF, 30 W CW MAX	INPUT/OUTPUT
ANT	TNC	RF, 0.5 W CW MAX	INPUT/OUTPUT
REMOTE	44-Pin Female	MIXED	INPUT/OUTPUT
	Refer to Appendix A, Table 2 for REMOTE Connector description		

I/O Connectors
Table 1

2. REMOTE CONNECTOR PIN-OUT TABLE



05807

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	VBUS_DN1	Supply	+5V supply for USB device port
2	GND_DN1	Ground	Ground for USB device port
3	VBUS_UP	Supply	+5V supply input from USB host
4	GND_UP	Ground	Ground for USB host port
5	GND	Ground	System Ground
6	HOST-RTS	Output	RS-232 Request to send
7	A2	Input	Altitude Encode Input
8	A4	Input	Altitude Encode Input
9	C2	Input	Altitude Encode Input
10	C4	Input	Altitude Encode Input
11	GND	Ground	System Ground
12	REM_IN1	Input	General Purpose Input
13	REM_OUT2	Output	General Purpose Output
14	GND	Ground	System Ground
15	GND	Ground	System Ground
16	H_D-	In/Out	USB Host Data Compliment
17	H_D+	In/Out	USB Host Data True
18	D_D-	In/Out	USB Host Data Compliment
19	D_D+	In/Out	USB Host Data True
20	GND	Ground	System Ground
21	HOST_TXD	Output	RS-232 Data Output
22	HOST_CTS	Input	RS-232 Clear to send
23	B1	Input	Altitude Encode Input
24	B2	Input	Altitude Encode Input
25	D2	Input	Altitude Encode Input

REMOTE Connector Pin-Out Table
Table 2

2. REMOTE CONNECTOR PIN-OUT TABLE (cont)

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
26	GND	Ground	System Ground
27	REM_IN2	Input	General Purpose Input
28	REM_IN3	Input	General Purpose Input
29	REM_OUT4	Output	General Purpose Output
30	GND	Ground	System Ground
31	VBUS_DN1	Supply	+5V supply for USB device port
32	VBUS_DN1	Supply	+5V supply for USB device port
33	VBUS_UP	Supply	+5V supply input from USB host
34	GND_UP	Ground	Ground for USB host port
35	GND	Ground	System Ground
36	HOST_RXD	Input	RS-232 Data Input
37	A1	Input	Altitude Encode Input
38	B4	Input	Altitude Encode Input
39	C1	Input	Altitude Encode Input
40	REM_SP1		Spare Pin
41	D4	Input	Altitude Encode Input
42	REM_IN4	Input	General Purpose Input
43	REM_OUT1	Output	General Purpose Output
44	REM_OUT3	Output	General Purpose Output

REMOTE Connector Pin-Out Table (cont)
Table 2



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**APPENDIX B - METRIC/BRITISH IMPERIAL CONVERSION TABLE
WITH NAUTICAL DISTANCE CONVERSIONS**

TO CONVERT:	INTO:	MULTIPLY BY:	TO CONVERT:	INTO:	MULTIPLY BY:
cm	feet	0.03281	meters	feet	3.281
cm	inches	0.3937	meters	inches	39.37
feet	cm	30.48	m/sec	ft/sec	3.281
feet	meters	0.3048	m/sec	km/hr	3.6
ft/sec	km/hr	1.097	m/sec	miles/hr	2.237
ft/sec	knots	0.5921	miles	feet	5280
ft/sec	miles/hr	0.6818	miles	km	1.609
ft/sec ²	cm/sec ²	30.48	miles	meters	1609
ft/sec ²	m/sec ²	0.3048	miles	nmi	0.8684
grams	ounces	0.03527	miles/hr	ft/sec	1.467
inches	cm	2.54	miles/hr	km/hr	1.609
kg	pounds	2.205	miles/hr	knots	0.8684
kg/cm ²	psi	0.0703	nmi	feet	6080.27
km	feet	3281	nmi	km	1.8532
km	miles	0.6214	nmi	meters	1853.2
km	nmi	0.5396	nmi	miles	1.1516
km/hr	ft/sec	0.9113	ounces	grams	28.34953
km/hr	knots	0.5396	pounds	kg	0.4536
km/hr	miles/hr	0.6214	psi	kg/cm ²	0.0703
knots	ft/sec	1.689	100 ft	km	3.048
knots	km/hr	1.8532	100 ft	miles	1.894
knots	miles/hr	1.1516	100 ft	nmi	1.645



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APPENDIX C - FACTORY/POWER UP PRESETS

Setup General

CONTROL	FACTORY	POWER UP
Power Down	10 mins	Last Used
ERP Units	dBm	Last Used
Units	Feet	Last Used
Remote Operation	RS-232	Last Used

Setup XPDR Screen

FIELD	FACTORY	POWER UP
Antenna Selection	Bottom	Last Used
RF Port	Antenna	Last Used
Antenna Range	12 feet	Last Used
Antenna Height	1 foot	Last Used
Cable Loss	1.3 dB	Last Used
Ant Gain 1.03 GHz	7.1 dB	Last Used
Ant Gain 1.09 GHz	6.1 dB	Last Used
UUT Address	AUTO	AUTO
Manual AA	000000	Last Used
Diversity Test	ON	Last Used
Config Type	GENERIC MODE S	Last Used

Setup DME Screen

FIELD	FACTORY	POWER UP
RF Port	Antenna	Last Used
Antenna Range	12 feet	Last Used
Ident Tone	IFR	Last Used
Cable Loss	1.3dB	Last Used
Ant Gain 0.96 GHz	7.5 dB	Last Used
Ant Gain 1.03 GHz	7.1 dB	Last Used
Ant Gain 1.09 GHz	6.1 dB	Last Used
Ant Gain 1.15 GHz	5.0 dB	Last Used
Ant Gain 1.22 GHz	2.8 dB	Last Used
Max Range	400nm	Last Used



DME Screen

FIELD	FACTORY	POWER UP
VOR / Freq / Chan	978/108.00/17X	978/108.00/17X
RF LVL	Maximum	Maximum
Range	0nm	0nm
Rate	10kts	10kts
Rate Direction	OUT	OUT
% Reply	100%	100%
Echo	OFF	OFF
Ident	ON	ON
SQTR	ON	ON

XPDR Auto Test Screen

FIELD	FACTORY	POWER UP
Config	GENERIC MODE S	Last Used
Antenna	Bottom	Last used
Level	Blank	Blank
Replies	Blank	Blank
FREQ	Blank	Blank
TOP ERP	Blank	Blank
TOP MTL	Blank	Blank
BOT ERP	Blank	Blank
BOT MTL	Blank	Blank
A Code	Blank	Blank
C Alt	Blank	Blank
S Code	Blank	Blank
S Alt	Blank	Blank
Tail	Blank	Blank
DF17	Blank	Blank
Flight ID	Blank	Blank
AA	Blank	Blank
FS	Blank	Blank
VS	Blank	Blank
Country	Blank	Blank

APPENDIX D - ABBREVIATIONS

A		C	
A	Amperes	C	Celsius or Centigrade
AA	Address Announced	CA	Transponder Capability
AC	Altitude Code	CC	Crosslink Capability
AC	Alternating Current	ccw	Counterclockwise
ac	Alternating Current	CFS	Continuation Subfield
ACAS	Airborne Collision Avoidance System	CHAN	Channel
ACS	Comm-A Capability Subfield	CHC	Cancel Horizontal Resolution Advisory
A/D	Analog to Digital	CLOS	Closeout
ADC	Analog to Digital Converter	cm	Centimeter (10 ⁻² Meters)
ADDR	Address	Cont	Continued
ADLP	Airborne Data Link Processor	CPU	Central Processing Unit
ADS	A-Definition Subfield	CrLf	Carriage Return and Line Feed
AIS	Comm-A Capability Subfield	CTRL	Control
ALT	Altitude	CTS	Clear to Send/(One-way hardware)
AP	Address Parity	CTS/DTR	Two-way hardware
AQ	Acquisition Special	CVC	Cancel Vertical Resolution Advisory Complement
ASCII	American National Standard Code for Information Interchange	CW	Continuous Wave
ATC	Air Traffic Control	cw	Clockwise
ATC	ATCRBS (screen abbreviation)		
ATCRBS	Air Traffic Control Radar Beacon System	D	
ATE	Automatic Test Equipment	D/A	Digital to Analog
ATTEN	Attenuation	DABS	Discrete Address Beacon System
AUTO	Automatic	DAC	Digital to Analog Converter
AVG	Average	dB	Decibel
B		dB _i	Decibels above isotropic
BAT	Battery	dB _m	Decibels above one milliwatt
BCS	Comm-B Capability Subfield	dB W/m ²	Decibels above one watt per square meter
BD	Comm-B Data	DCD	Data Carrier Detect
BDS	B-Definition Subfield	DCXO	Digitally Compensated Crystal Oscillator
BIT	Built In Test	DELM	Downlink Extended Length Message
BOT	Bottom	DF	Downlink Format
bps	Bits per Second	DI	Designator Identification
BR	Bridge Rectifier	DMM	Digital Multimeter
BT	Battery	DPSK	Differential Phase Shift Keying
		DR	Downlink Request
		DSP	Digital Signal Processor
		DSR	Data Set Ready
		DTR	Data Terminal Ready

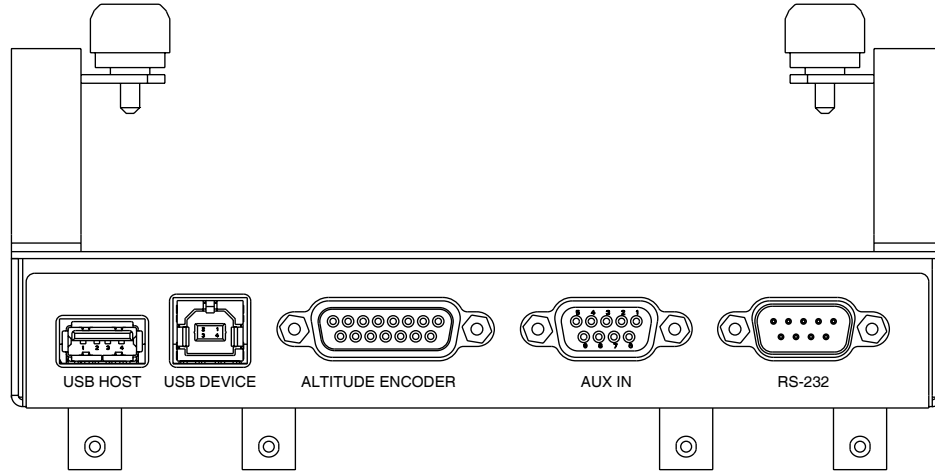
E		L	
ECS	Extended Capability Subfield	LCA	Logic Cell Array
ELM	Extended Length Message	LCD	Liquid Crystal Display
EMC	Electromagnetic Compatibility	LED	Light Emitting Diode
EMI	Electromagnetic Interference	LF	Line Feed
EOL	End of Line	LO	Local Oscillator
ERP	Effective Radiated Power	LOS	Lockout Subfield
ESB	Encoded Sense Bits	LSB	Least Significant Bit
ESD	Electrostatic Discharge	LSD	Least Significant Digit
EXT	External		
F		M	
FCC	Federal Communications Commission	m	Meters
FPM	Feet Per Minute	MA	Message, COMM-A
FREQ	Frequency	MAX	Maximum
FS	Flight Status	MB	Message, COMM-B
FT	Foot/Feet	MBS	Multisite COMM-B Subfield
Ft	Foot/Feet	MC	Message, COMM-C
G		MD	Message, COMM-D
GEN	Generator	ME	Message, COMM-E
GND	Ground	MEAS	Measuring
H		MES	Multisite ELM Subfield
h	Hexadecimal	MHz	Megahertz (10^6 Hertz)
Hz	Hertz	μ s	Microsecond (10^{-6} Seconds)
HRC	Horizontal Resolution Advisory Complement	MID	Mode S Address
I		MIN	Minimum
ID	Identification	MPU	Microprocessing Unit
IDS	Identifier Designators Subfield	ms	Millisecond (10^{-3} Seconds)
IFF	Identification Friend or Foe	MTB	Multiple Threat Bit
II	Interrogator Identification	MTE	Multiple Threat Encounter
IIS	Interrogator Identification Subfield	MTL	Minimum Threshold Level
IN	Input	MU	Message, COMM-U
INTERR	Interrogation	MV	Message, COMM-V
I/O	Input/Output	N	
ITM	Intermode	N/A	Not Applicable
K		NC	C-Segment Number
KE	Control, ELM	ND	D-Segment Number
kg	Kilogram (10^3 Grams)	nmi	Nautical Miles
kHz	Kilohertz (10^3 Hertz)	No	Number
km	Kilometer (10^3 meters)	ns	Nanosecond (10^{-9} Seconds)
Kts	Knots (Velocity)	O	
		o	Octal
		OUT	Output
		Ω	Ohm

P		T	
PC	Personal Computer	TAS	Transmission Acknowledgment Subfield
PC	Printed Circuit	TCAS	Traffic Alert and Collision Avoidance System
PC	Protocol	TID	Threat Identity Data
PI	Parity/Interrogator Identity	TMS	Tactical Message Subfield
PLCS	Places	Trig	Trigger
PN	Part Number	TTI	Threat Type Indicator
PPM	Pulse Position Modulation	TTL	Transistor-Transistor Logic
ppm	Parts per Million	TX	Transmit
PR	Probability of Reply	TXD	Transmit Data
PRF	Pulse Repetition Frequency		
PROM	Programmable Read Only Memory	U	
psi	Pounds per Square Inch	UDS	U-Definition Subfield
PWM	Pulse Width Modulation	UELM	Uplink Extended Length Message
PWR	Power	UF	Uplink Format
R		UM	Utility Message
RAM	Random Access Memory	UUT	Unit Under Test
RAC	Resolution Advisory Complement	V	
RAT	Resolution Advisory Termination	V	Volt
RC	Reply Control	VAC	Volts, Alternating Current
RCI	Remote Control Interface	VCO	Voltage Controlled Oscillator
RCVD	Received	Vdc	Volts, Direct Current
RCVR	Receiver	VDS	V-Definition Subfield
Ref	Reference	VERS	Version
RF	Radio Frequency	VRAM	Video Random Access Memory
RI	Reply Information Air-to-Air	VRC	Vertical Resolution Advisory Complement
RL	Reply Length	Vrms	Volts Root Mean Square
RMS	Root Mean Square	VS	Vertical Status
ROM	Read Only Memory	VSB	Vertical Sense Bits
RR	Reply Request	VSWR	Voltage Standing Wave Ratio
RRS	Reply Request Subfield	W	
RSS	Reservation Status Subfield	W	Watt
RTCA	Requirements and Technical Concepts for Aviation organization	X	
RTS	Request to Sent	XMTR	Transmitter
RX	Receive	Xon/Xoff	Software Handshake
RXD	Receive Data	XPDR	Transponder
S			
SCOPE	Oscilloscope		
SCPI	Standard Commands for Programmable Instruments organization		
SD	Special Designator		
Sec	Second		
SL	Sensitivity Level		
SLM	Standard Length Message		
SLS	Side-Lobe Suppression		
SPI	Special Identifier Pulse		
SQTR	Squitter		
SRQ	Service Request		
SRS	Segment Request Subfield		
SSR	Secondary Surveillance Radar		
SYNC	Synchronous		



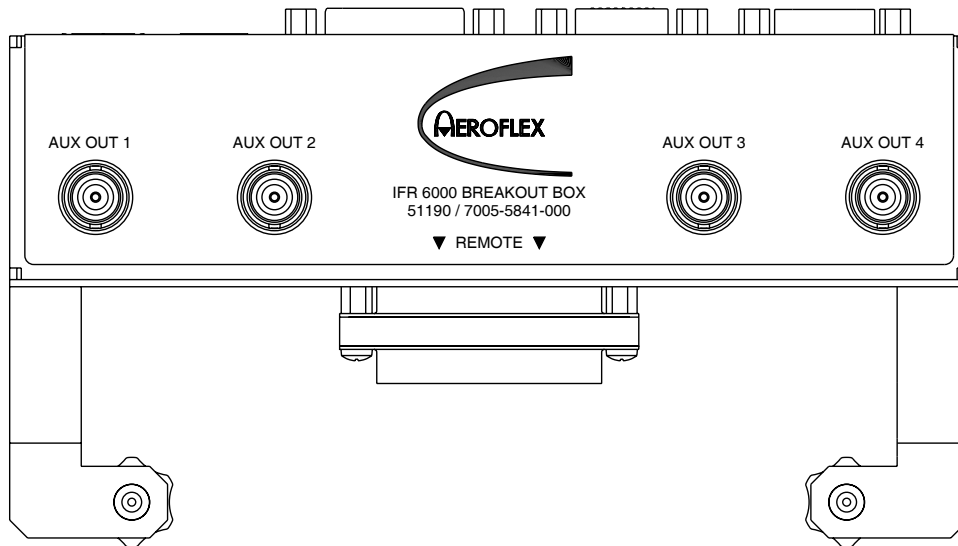
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APPENDIX E - BREAKOUT BOX



05821

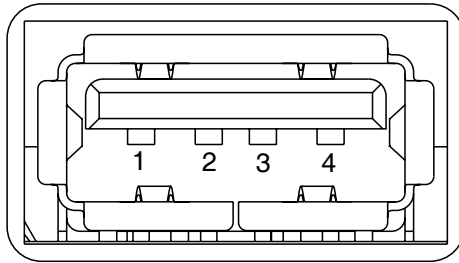
Breakout Box - Top View
Figure 1



05815

Breakout Box - Front View
Figure 2

1. USB HOST CONNECTOR

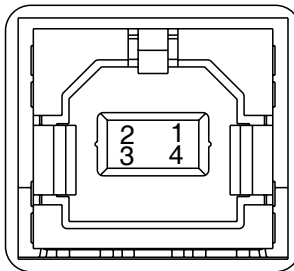


05810

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	VBUS_DN1	Supply	+5V supply for USB device port
2	H_D-	In/Out	USB Host Data Compliment
3	H_D+	In/Out	USB Host Data True
4	GND_DN1	Ground	Ground for USB device port

USB HOST Connector Table
Table 1

2. USB DEVICE CONNECTOR

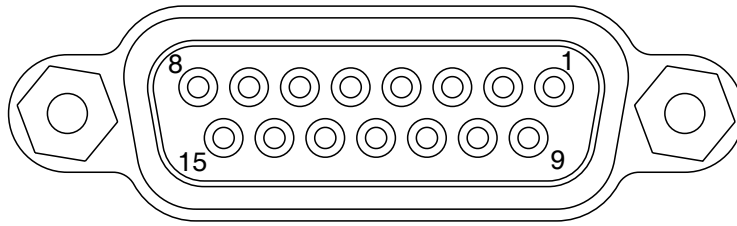


05811

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	VBUS_UP	Supply	+5V supply input from USB host
2	D_D-	In/Out	USB Host Data Compliment
3	D_D+	In/Out	USB Host Data True
4	GND_UP	Ground	Ground for USB host port

USB DEVICE Connector Table
Table 2

3. ALTITUDE ENCODER CONNECTOR

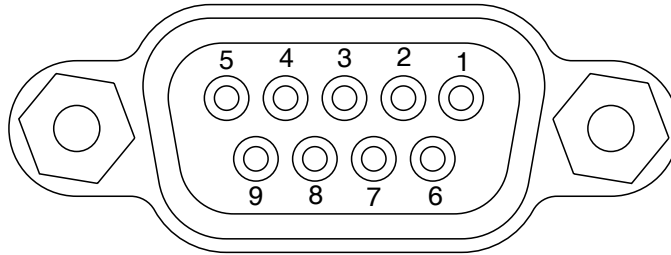


05814

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	A1	Input	Altitude Encode Input
2	A2	Input	Altitude Encode Input
3	A4	Input	Altitude Encode Input
4	B1	Input	Altitude Encode Input
5	B2	Input	Altitude Encode Input
6	B4	Input	Altitude Encode Input
7	C1	Input	Altitude Encode Input
8	C2	Input	Altitude Encode Input
9	C4	Input	Altitude Encode Input
10			
11	D2	Input	Altitude Encode Input
12	D4	Input	Altitude Encode Input
13	GND	Ground	System Ground
14			
15			

ALTITUDE ENCODER Connector Table
Table 3

4. AUX IN CONNECTOR

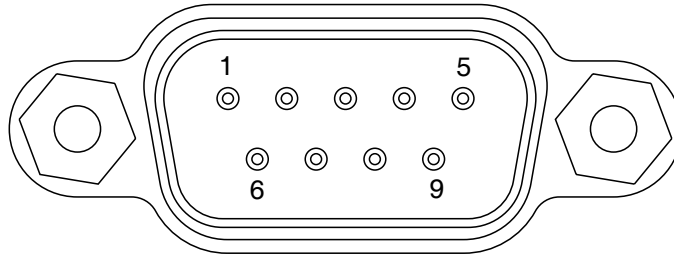


05813

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	REM_IN1	Input	General Purpose Input
2	REM_IN2	Input	General Purpose Input
3	REM_IN3	Input	General Purpose Input
4	REM_IN4	Input	General Purpose Input
5	GND	Ground	System Ground
6	GND	Ground	System Ground
7	GND	Ground	System Ground
8	GND	Ground	System Ground
9	DNU	Supply	Do Not Use, reserved

AUX IN Connector Table
Table 4

5. RS-232 CONNECTOR

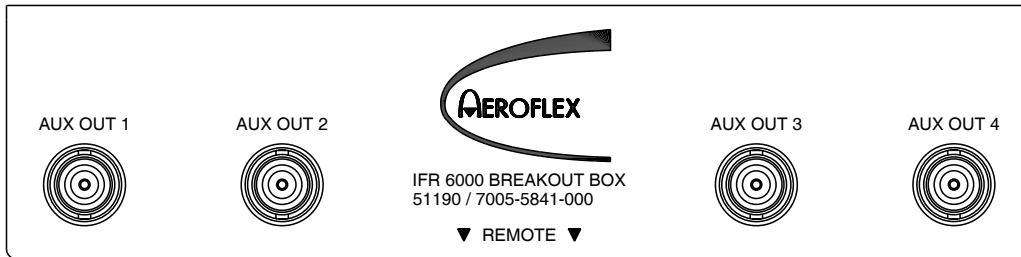


05812

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1			
2	HOST_TXD	BIPOLAR	RS-232 Data Output
3	HOST_RXD	BIPOLAR	RS-232 Data Input
4			
5	GND	Ground	System Ground
6			
7	HOST_CTS	BIPOLAR	RS-232 Clear to Send (Input)
8	HOST_RTS	BIPOLAR	RS-232 Clear to Send (Output)
9			

RS-232 Connector Table
Table 5

6. AUX OUT CONNECTORS

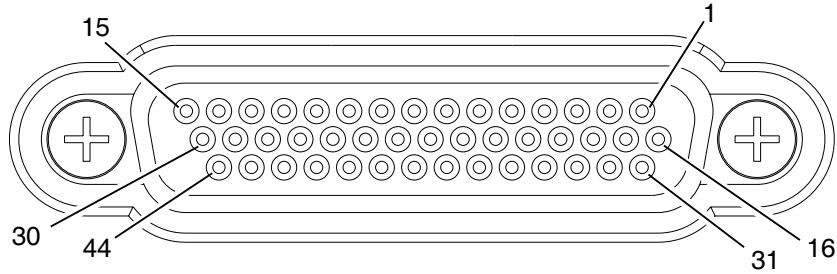


05816

CONNECTOR	SIGNAL TYPE	DESCRIPTION
AUX OUT 1	Output	Mode S Interrogation Trigger
AUX OUT 2	Output	ATCRBS Interrogation Trigger
AUX OUT 3	Output	Not Used
AUX OUT 4	Output	Not Used

Remote OUT Connector Table
Table 6

7. REMOTE CONNECTOR



05807

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
1	VBUS_DN1	Supply	+5V supply for USB device port
2	GND_DN1	Ground	Ground for USB device port
3	VBUS_UP	Supply	+5V supply input from USB host
4	GND_UP	Ground	Ground for USB host port
5	GND	Ground	System Ground
6	HOST-RTS	Output	RS-232 Request to send
7	A2	Input	Altitude Encode Input
8	A4	Input	Altitude Encode Input
9	C2	Input	Altitude Encode Input
10	C4	Input	Altitude Encode Input
11	GND	Ground	System Ground
12	REM_IN1	Input	General Purpose Input
13	REM_OUT2	Output	General Purpose Output
14	GND	Ground	System Ground
15	GND	Ground	System Ground
16	H_D-	In/Out	USB Host Data Compliment
17	H_D+	In/Out	USB Host Data True
18	D_D-	In/Out	USB Host Data Compliment
19	D_D+	In/Out	USB Host Data True
20	GND	Ground	System Ground
21	HOST_TXD	Output	RS-232 Data Output
22	HOST_CTS	Input	RS-232 Clear to send
23	B1	Input	Altitude Encode Input
24	B2	Input	Altitude Encode Input
25	D2	Input	Altitude Encode Input

REMOTE Connector Pin-Out Table
Table 2

7. REMOTE CONNECTOR (cont)

PIN NO.	SIGNAL NAME	SIGNAL TYPE	DESCRIPTION
26	GND	Ground	System Ground
27	REM_IN2	Input	General Purpose Input
28	REM_IN3	Input	General Purpose Input
29	REM_OUT4	Output	General Purpose Output
30	GND	Ground	System Ground
31	VBUS_DN1	Supply	+5V supply for USB device port
32	VBUS_DN1	Supply	+5V supply for USB device port
33	VBUS_UP	Supply	+5V supply input from USB host
34	GND_UP	Ground	Ground for USB host port
35	GND	Ground	System Ground
36	HOST_RXD	Input	RS-232 Data Input
37	A1	Input	Altitude Encode Input
38	B4	Input	Altitude Encode Input
39	C1	Input	Altitude Encode Input
40	REM_SP1		Spare Pin
41	D4	Input	Altitude Encode Input
42	REM_IN4	Input	General Purpose Input
43	REM_OUT1	Output	General Purpose Output
44	REM_OUT3	Output	General Purpose Output

REMOTE Connector Pin-Out Table (cont)
Table 2



APPENDIX F - CONFIGS

Config	TX Power dBm	RX MTL dBm	TX Freq MHz
GENERIC ATCRBS	48.5 to 57.0	-73 (± 4)	1090 (± 3)
ATCRBS CLASS A	51.0 to 57.0	-73 (± 4)	1090 (± 3)
ATCRBS CLASS B	48.5 to 57.0	-73 (± 4)	1090 (± 3)
GENERIC MODE S	48.5 to 57.0	-73 (± 4)	1090 (± 3)
MODE S CLASS A	51.0 to 57.0	-73 (± 4)	1090 (± 3)
MODE S CLASS B	48.5 to 57.0	-73 (± 4)	1090 (± 3)
MODE S CL B OPT FRQ	48.5 to 57.0	-73 (± 4)	1090 (± 3)
MODE S CL B OPT POW	51.0 to 57.0	-73 (± 4)	1090 (± 3)



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APPENDIX G - MODE S ADDRESS BLOCKS

This table contains Mode S address blocks for countries whose tail numbers are decoded by the IFR 6000. For an expanded list of Mode S codes, refer to Appendix H.

COUNTRY	ADDRESS BLOCK
Belgium	448000 - 448FFF
Canada	C00000 - C3FFFF
Denmark	458000 - 45FFFF
France	380000 - 3AFFFF
Germany	3C0000 - 3FFFFF
Poland	488000 - 48FFFF
Switzerland	4B0000 - 4B7FFF
USA	A00000 - AFFFFFF



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APPENDIX H - MODE S ADDRESS BLOCKS

This table contains a complete list of Mode S address blocks. For countries whose tail numbers are decoded by the IFR 6000, refer to Appendix G.

COUNTRY	ADDRESS BLOCK
Afghanistan	70000 - 700FFF
Albania	501000 - 5013FF
Algeria	0A0000 - 0A7FFF
Angola	090000 - 090FFF
Antigua and Barbuda	0CA000 - 0CA3FF
Argentina	E00000 - E3FFFF
Armenia	600000 - 6003FF
Australia	7C0000 - 7FFFFF
Austria	440000 - 447FFF
Azerbaijan	600800 - 600BFF
Bahamas	0A8000 - 0A8FFF
Bahrain	894000 - 894FFF
Bangladesh	702000 - 702FFF
Barbados	0AA000 - 0AA3FF
Belarus	510000 - 5103FF
Belgium	448000 - 448FFF
Belize	0AB000 - 0AB3FF
Benin	094000 - 0943FF
Bhutan	680000 - 6803FF
Bolivia	E94000 - E94FFF
Bosnia and Herzegovina	513000 - 5133FF
Botswana	030000 - 0303FF

COUNTRY	ADDRESS BLOCK
Brazil	E40000 - E4FFFF
Brunei Darassalam	895000 - 8953FF
Bulgaria	450000 - 457FFF
Burkin Faso	09C000 - 09CFFF
Burundi	032000 - 032FFF
Cambodia	70E000 - 70EFFF
Cameroon	034000 - 034FFF
Canada	C00000 - C3FFFF
Cape Verde	096000 - 096FF
Central African Republic	06C000 - 06CFFF
Chad	084000 - 084FFF
Chile	E80000 - E80FFF
China	780000 - 78BFFF
Colombia	0AC000 - 0ACFFF
Comoros	035000 - 0353FF
Congo	036000 - 036FFF
Cook Islands	901000 - 9013FF
Costa Rica	0AE000 - 0AEFFF
Côte d'Ivoire	038000 - 038FFF
Croatia	501C00 - 501FFF
Cuba	0B0000 - 0B0FFF
Cyprus	4C8000 - 4C83FF

COUNTRY	ADDRESS BLOCK
Czech Rep	498000 - 49FFFF
Dem Republic Korea	72000 - 727FFF
Dem Republic Congo	08C000 - 08CFFF
Denmark	458000 - 45FFFF
Djibouti	098000 - 0983FF
Dominican Rep	0C4000 - 0C4FFF
Ecuador	E84000 - E84FFF
Egypt	010000 - 017FFF
El Salvador	0B2000 - 0B2FFF
Equatorial Guinea	042000 - 042FFF
Eritrea	202000 - 2023FF
Estonia	511000 - 5113FF
Ethiopia	040000 - 040FFF
Fiji	C88000 - C88FFF
Finland	460000 - 467FFF
France	380000 - 3AFFFF
Gabon	03E000 - 03EFFF
Gambia	09A000 - 09AFFF
Georgia	514000 - 5143FF
Germany	3C0000 - 3FFFFF
Ghana	044000 - 044FFF
Greece	468000 - 46FFFF
Grenada	0C000 - 0CC3FF
Guatemala	0B4000 - 0B4FFF
Guinea	046000 - 046FFF

COUNTRY	ADDRESS BLOCK
Guinea-Bissau	048000 - 0483FF
Guyana	0B6000 - 0B6FFF
Haiti	0B800 - 0B8FFF
Honduras	0BA000 - 0BAFFF
Hungary	470000 - 477FFF
Iceland	4CC000 - 4CCFFF
India	800000 - 83FFFF
Indonesia	8A0000 - 8A7FFF
Iran, Islamic Rep	730000 - 737FFF
Iraq	728000 - 72FFFF
Ireland	4CA000 - 4CAFFF
Israel	738000 - 73FFFF
Italy	300000 - 33FFFF
Jamaica	0BE000 - 0BEFFF
Japan	840000 - 87FFFF
Jordan	740000 - 747FFF
Kazakhstan	683000 - 6733FF
Kenya	04C000 - 04CFFF
Kiribati	C8E000 - C8E3FF
Kuwait	706000 - 706FFF
Kyrgyzstan	601000 - 6013FF
Lao Dem Rep	708000 - 708FFF
Latvia	502C0 - 502FFF
Lebanon	748000 - 74FFFF
Lesotho	04A000 - 04A3FF

COUNTRY	ADDRESS BLOCK
Liberia	050000 - 050FFF
Libyan Arab Jam	018000 - 01FFFF
Lithuania	503C00 - 503FFF
Luxembourg	4D0000 - 4D03FF
Madagascar	054000 - 054FFF
Malawi	057000 - 058FFF
Malaysia	75000 - 757FFF
Maldives	05A000 - 05A3FF
Mali	05C000 - 05CFFF
Malta	4D2000 - 4D23FF
Marshall Islands	900000 - 9003FF
Mauritania	05E000 - 05D3FF
Mauritius	060000 - 0603FF
Mexico	0D0000 - 0D7FFF
Micronesia, Federal States	681000 - 6813FF
Monaco	4D4000 - 4D43FF
Mongolia	682000 - 6823FF
Morocco	020000 - 027FFF
Mozambique	006000 - 006FFF
Myanmar	704000 - 704FFF
Namibia	201000 - 2013FF
Nauru	C8A000 - C8A3FF
Nepal	70A000 - 70AFFF
Netherlands, Kingdom	480000 - 487FFF

COUNTRY	ADDRESS BLOCK
New Zealand	C80000 - C87FFF
Nicaragua	0C0000 - 0C0FFF
Niger	062000 - 062FFF
Nigeria	064000 - 064FFF
Norway	478000 - 47FFFF
Oman	70C000 - 70C3FF
Pakistan	760000 - 767FFF
Palau	684000 - 6843FF
Panama	0C2000 - 0C2FFF
Papua New Guinea	898000 - 898FFF
Paraguay	E88000 - E88FFF
Peru	E8C000 - E8CFFF
Philippines	758000 - 75FFFF
Poland	488000 - 48FFFF
Portugal	490000 - 497FFF
Qatar	06A000 - 06A3FF
Rep of Korea	718000 - 71FFFF
Rep of Moldova	504C00 - 504FFF
Romania	4A0000 - 4A7FFF
Russian Fed	100000 - 1FFFFFFF
Rwanda	06E000 - 06EFFF
Saint Lucia	C8C000 - C8C3FF
St Vincent and Grenadines	0BC000 - 0BC3FF
Samoa	902000 - 9023FF



COUNTRY	ADDRESS BLOCK
San Marino	500000 - 5003FF
Sao Tome and Principe	09E000 - 09E3FF
Saudi Arabia	710000 - 717FFF
Senegal	070000 - 070FFF
Seychelles	074000 - 0743FF
Sierra Leone	076000 - 0763FF
Singapore	768000 - 76FFFF
Slovakia	505C00 - 505FFF
Slovenia	506C00 - 506FFF
Solomon Islands	897000 - 8973FF
Somalia	078000 - 078FFF
South Africa	008000 - 00FFFF
Spain	340000 - 37FFFF
Sri Lanka	770000 - 777FFF
Sudan	07C000 - 07CFFF
Suriname	0C80000 - 0C8FFF
Swaziland	07A000 - 07A3FF
Sweden	4A8000 - 4AFFFF
Switzerland	4B0000 - 4B7FFF
Syrian Arab Rep	778000 - 77FFFF
Tajikistan	515000 - 5153FF
Thailand	880000 - 887FFF

COUNTRY	ADDRESS BLOCK
The Former Yugoslav Republic of Macedonia	512000 - 5123FF
Togo	08800 - 088FFF
Tonga	C8D000 - C8D3FF
Trinidad and Tobago	0C6000 - 0C6FFF
Tunisia	028000 - 02FFFF
Turkey	4B8000 - 4BFFFF
Turkmenistan	601800 - 601BFF
Uganda	068000 - 068FFF
Ukraine	508000 - 50FFFF
United Arab Emirates	896000 - 896FFF
United Kingdom	400000 - 423FFFF
United Rep of Tanzania	080000 - 080FFF
United States	A00000 - AFFFFFF
Uruguay	E90000 - E00FFF
Uzbekistan	507C00 - 507FFF
Vanuatu	C90000 - C903FF
Venezuela	0D8000 - 0DFFFF
Viet Nam	888000 - 88FFFF
Yemen	890000 - 890FFF
Zambia	08A000 - 08AFFF
Zimbabwe	004000 - 0043FF

COUNTRY	ADDRESS BLOCK
Non-Contracting States	
Yugoslavia	4C0000 - 4C7FFF
Other Allocations	
ICAO (1)	F00000 - F07FFF
ICAO (2)	899000 - 8993FF
ICAO (2)	F09000 - F093FF

- (1) ICAO or its designate administers this block for assigning temporary aircraft addresses if and when an immediate action is to be taken to avoid the assignment of an unauthorized 24-bit aircraft address.

It is intended that the temporary address is to be relinquished as soon as practicable when the 24-bit aircraft address is assigned by a Stat of Registry or common mark registering authority in conformance with the provisions in 4, 5 and 6 of the ICAO Annex 10 Vol. III.

The State concerned is then expected to inform ICAO or its designate regarding the release of the temporary address.

- (2) Block allocated for special use in the interest of flight safety



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APPENDIX I - SIGNAL FORMATS

1. OPERATING GOALS

Mode S combines secondary surveillance radar and a ground-air-ground data link system to provide aircraft surveillance and communications necessary for supporting automated ATC in dense traffic environments. Mode S provides common-channel interoperation with the ATC beacon system and may be implemented over an extended ATCRBS-to-Mode S transition period. In supporting ATC automation, Mode S provides the reliable communications necessary for data link services.

2. MODE S MESSAGE CONTENT

2.1 ADDRESS/PARITY (FIELD AP)

All discrete Mode S interrogations (56-bit or 112-bit) and replies (except the All Call reply) contain the 24-bit discrete address of the Mode S transponder upon which 24 error-detecting parity check bits are overlaid. In the All Call reply, the 24 parity check bits are overlaid on the address of the Mode S interrogator. The text of the reply includes the discrete address of the transponder.

2.2 SURVEILLANCE

The primary function of Mode S is surveillance. For the Mode S transponder, this function is accomplished by using short (56-bit) transmissions in both directions. In these transmissions, the aircraft reports altitude (DF04) or ATCRBS 4096 code as well as flight status (airborne, on the ground, alert, Special Position Identification [SPI], etc.).

2.3 DATA LINK COMMUNICATIONS

The discrete addressing and digital encoding allow Mode S transmissions to be used as digital data links. Interrogation and reply formats of the Mode S system contain sufficient coding space to transmit data. Most Mode S data link transmissions are handled as one 56-bit message included as part of long 112-bit interrogations or replies. The transmissions include the message in addition to surveillance data, and is generally used in place of a surveillance interrogation and/or reply.

An efficient transmission of longer messages is accomplished by the extended length message (ELM) capability (UF24 and DF24). Using this capability, a sequence of up to sixteen 80-bit message segments (each with a 112-bit transmission) is transmitted, either ground-to-air or air-to-ground and is acknowledged with a single reply/interrogation. ELMs do not contain surveillance data and thus cannot substitute for a surveillance interrogation-reply cycle.

3. SIGNAL FORMATS

Signal formats for uplink and downlink messages are outlined in Chapter 2, RTCA DO-181 and Chapter 2, Volume I of RTCA DO-185. Tables 1, 2, 3, 4 and 5 in Appendix B contain the signal formats and definitions. Data is expressed in decimal unless otherwise specified. Refer to Appendix B, Table 6 for conversion to hexadecimal, octal or binary. Appendix B, Table 7 shows the ATC-601-2 fixed formats for Mode S using Front Panel operation.

NOTE: TCAS operates in Mode S and many signals pertain only to TCAS.

FORMAT
NO. UF

0	(0 0000)	— 3 —(RL:1)— 4 —(AQ:1) (BD:8)— 10 — (AP:24).....	Short Air-Air Surveillance
1	(0 0001)	————— 27 or 83 —————	(AP:24)
2	(0 0010)	————— 27 or 83 —————	(AP:24)
3	(0 0011)	————— 27 or 83 —————	(AP:24)
4	(0 0100)	(PC:3) (RR:5) (DI:3) (SD:16) (AP:24)..	Surveillance, Altitude Request
5	(0 0101)	(PC:3) (RR:5) (DI:3) (SD:16) (AP:24)..	Surveillance, Identity Request
6	(0 0110)	————— 27 or 83 —————	(AP:24)
7	(0 0111)	————— 27 or 83 —————	(AP:24)
8	(0 1000)	————— 27 or 83 —————	(AP:24)
9	(0 1001)	————— 27 or 83 —————	(AP:24)
10	(0 1010)	————— 27 or 83 —————	(AP:24)
11	(0 1011)	(PR:4) (II:4)————— 19 —————	(AP:24).....Mode S Only All Call
12	(0 1100)	————— 27 or 83 —————	(AP:24)
13	(0 1101)	————— 27 or 83 —————	(AP:24)
14	(0 1110)	————— 27 or 83 —————	(AP:24)
15	(0 1111)	————— 27 or 83 —————	(AP:24)
16	(1 0000)	— 3 —(RL:1)— 4 —(AQ:1)— 18 —(MU:56) (AP:24).....	Long Air-Air Surveillance
17	(1 0001)	————— 27 or 83 —————	(AP:24)
18	(1 0010)	————— 27 or 83 —————	(AP:24)
19	(1 0011)	————— 27 or 83 —————	(AP:24)
20	(1 0100)	(PC:3) (RR:5) (DI:3) (SD:16) (MA:56) (AP:24).....	Comm-A, Altitude Request
21	(1 0101)	(PC:3) (RR:5) (DI:3) (SD:16) (MA:56) (AP:24).....	Comm-A, Identity Request
22	(1 0110)	————— 27 or 83 —————	(AP:24)
23	(1 0111)	————— 27 or 83 —————	(AP:24)
24	(1 1xxx)	(RC:2) (NC:4) (MC:80) (AP:24).....	Comm-C (ELM)

NOTE: (XX:M) represents a field designated XX containing M number of assigned bits.

NOTE: —N— represents free coding space with N available bits, coded as Zeros for transmission.

NOTE: For Uplink Formats (UF) 0 through 23, the format number corresponds to the binary code in the first 5 bits of the interrogation. Format number 24 is arbitrarily defined as the format beginning with Ones in the first two bit positions. The following three bits (xxx) vary with the interrogation content.

NOTE: All formats are shown for completeness, although a number of them are unused.

Overview of Mode S Interrogation Formats
Table 1



FORMAT

NO.	DF	
0	(0 0000)	(VS:1) (CC:1)-1-(SL:3)-2-(RI:4)-2-(AC:13) (AP:24) Short Air-Air Surveillance
1	(0 0001)	_____ 27 or 83 _____ (P:24)
2	(0 0010)	_____ 27 or 83 _____ (P:24)
3	(0 0011)	_____ 27 or 83 _____ (P:24)
4	(0 0100)	(FS:3) (DR:5) (UM:6) (AC:13) (AP:24) Surveillance, Altitude Reply
5	(0 0101)	(FS:3) (DR:5) (UM:6) (ID:13) (AP:24) Surveillance, Identity Reply
6	(0 0110)	_____ 27 or 83 _____ (P:24)
7	(0 0111)	_____ 27 or 83 _____ (P:24)
8	(0 1000)	_____ 27 or 83 _____ (P:24)
9	(0 1001)	_____ 27 or 83 _____ (P:24)
10	(0 1010)	_____ 27 or 83 _____ (P:24)
11	(0 1011)	(CA:3) (AA:24) (PI:24) All Call Reply/Squitter
12	(0 1100)	_____ 27 or 83 _____ (P:24)
13	(0 1101)	_____ 27 or 83 _____ (P:24)
14	(0 1110)	_____ 27 or 83 _____ (P:24)
15	(0 1111)	_____ 27 or 83 _____ (P:24)
16	(1 0000)	(VS:1)-2-(SL:3)-2-(RI:4)-2-(AC:13)(MV:56)(AP:24) Long Air-Air Surveillance
17	(1 0001)	(CA:3) (AA:24) (ME:56) (PI:24) Extended Squitter
18	(1 0010)	_____ 27 or 83 _____ (P:24)
19	(1 0011)	_____ 27 or 83 _____ (P:24)
20	(1 0100)	(FS:3) (DR:5) (UM:6) (AC:13) (MB:56) (AP:24) Comm-B, Altitude Reply
21	(1 0101)	(FS:3) (DR:5) (UM:6) (ID:13) (MB:56) (AP:24) Comm-B, Identity Reply
22	(1 0110)	_____ 27 or 83 _____ (P:24)
23	(1 0111)	_____ 27 or 83 _____ (P:24)
24	(1 1xxx)	(KE:1) (ND:4) (MD:80) (AP:24) Comm-D (ELM)

NOTE: (XX:M) represents a field designated XX containing M number of assigned bits.

NOTE: (P:24) represents a 24-bit field reserved for parity information.

NOTE: —N— represents free coding space with N available bits, coded as Zeros for transmission.

NOTE: For Downlink Formats (DF) 0 through 23, the format number corresponds to the binary code in the first 5 bits of the reply. Format number 24 is arbitrarily defined as the format beginning with Ones in the first two bit positions. The following three bits (xxx) vary with the reply content.

NOTE: All formats are shown for completeness, although a number of them are unused.

Overview Of Mode S Reply Formats
Table 2

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
AA		24	9-32	X	The aircraft address announced in the clear, used in DF=11, 17.
AC		13	20-32	X	The altitude code used in formats DF=0, 4, 16 and 20. All bits are Zeros if altitude information is not available. Contains metric altitude if M-bit (26) is One.
AP		24 24	33-56 89-112	X	Parity overlaid on the Address appears at the end of all transmissions, uplink and downlink, with the exception of format DF=11.
AQ		1	14	X	Designates formats UF=0, 16 as acquisition transmissions. Bit 14 (RI, DF=0, 16), repeats AQ as received by transponder.
BD		8	15-22	X	Contains the identity of the ground-initiated Comm-B register contents to appear in the MV field of the corresponding reply, used in UF=0.
CA		3	6-8	X	Used in DF=11, Acquisition Squitter & DF17 Extended Squitter or All Call reply, to report transponder capability. Codes are: 0 = Signifies no communications capability (surveillance only,) no ability to set CA code 7, either on the ground or airborne. 1 = Not Used 2 = Not Used 3 = Not Used 4 = Level 2, 3 or 4; ability to set code 7, and is on the ground. 5 = Level 2, 3 or 4; ability to set code 7, and is airborne. 6 = Level 2,3 or 4; ability to set code 7. 7 = DR≠0 or FS=3,4 or 5. NOTE: Codes 1 to 3 were used by earlier Mode S transponders that did not use CA code 7.
CC		1	7	X	Indicates transponder has ability to support crosslink capability (decode the contents of the UF=0 BD field and respond with the contents of the specified ground-initiated Comm-B register in the MV field of the corresponding DF=16 reply. Used in DF=0. 0= Aircraft Cannot Support 1= Aircraft Can Support

Overview of Format Definitions
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
CL		3	14-16	X	Coding in Binary 000=IC Field contains the II code 001=IC Field contains SI codes 1 to 15 010=IC Field contains SI codes 16 to 31 011=IC Field contains SI codes 32 to 47 100=IC Field contains SI codes 48 to 63
DF		5	1-5	X	The first field in all downlink formats is the transmission descriptor.
DI		3	14-16	X	Identifies coding contained in the SD codes are: 0 = SD has Interrogator Identifier (IIS). 1 = SD contains (IIS, MBS, MES, LOS, RSS, TMS). 2 = SD used for extended squitter surface control 3 = SD contains SIS, LSS, RRS 4-6 = Not assigned. 7 = SD contains IIS, RRS, LOS, TMS
DR		5	9-13	X	Requests extraction of downlink messages from the transponder by the interrogator and appears in formats DF=4, 5, 20, 21. The codes are: 0 = No downlink request. 1 = Request to send Comm-B message (B bit set), 2 = TCAS information available. 3 = TCAS information available and request to send Comm-B message. 4 = Comm-B Broadcast #1 available. 5 = Comm-B Broadcast #2 available. 6 = TCAS information and Comm-B Broadcast #1 available. 7 = TCAS information and Comm-B Broadcast #2 available. 8-15 = Not assigned. 16-31 = Request to send n-segments, signified by 15 + n. Codes 1-15 take priority over codes 16-31.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT																																													
FS		3	6-8	X	Reports flight status of aircraft and is used in formats DF=4, 5, 20, 21. Codes are:																																													
					<table border="1"> <thead> <tr> <th>CODE</th> <th>ALERT</th> <th>SPI</th> <th>AIRBORNE</th> <th>ON THE GROUND</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>no</td> <td>no</td> <td>yes</td> <td>no</td> </tr> <tr> <td>1</td> <td>no</td> <td>no</td> <td>no</td> <td>yes</td> </tr> <tr> <td>2</td> <td>yes</td> <td>no</td> <td>yes</td> <td>no</td> </tr> <tr> <td>3</td> <td>yes</td> <td>no</td> <td>no</td> <td>yes</td> </tr> <tr> <td>4</td> <td>yes</td> <td>yes</td> <td colspan="2">either</td> </tr> <tr> <td>5</td> <td>no</td> <td>yes</td> <td colspan="2">either</td> </tr> <tr> <td colspan="5">6 -Reserved</td> </tr> <tr> <td colspan="5">7- Not assigned.</td> </tr> </tbody> </table>	CODE	ALERT	SPI	AIRBORNE	ON THE GROUND	0	no	no	yes	no	1	no	no	no	yes	2	yes	no	yes	no	3	yes	no	no	yes	4	yes	yes	either		5	no	yes	either		6 -Reserved					7- Not assigned.				
CODE	ALERT	SPI	AIRBORNE	ON THE GROUND																																														
0	no	no	yes	no																																														
1	no	no	no	yes																																														
2	yes	no	yes	no																																														
3	yes	no	no	yes																																														
4	yes	yes	either																																															
5	no	yes	either																																															
6 -Reserved																																																		
7- Not assigned.																																																		
ID		13	2-32	X	The 4096 identification code, numbers , as, set by the pilot, in DF=5, 21.																																													
IC		4	10-13	X	<p>Contains II or SI depending on value of CL field.</p> <p>II: Identifies the interrogator and appears in UF=11, the Mode S Only All Call.</p> <p>NOTE: The same information may also appear in the IIS subfields.</p> <p>SI: Surveillance Identifier (lower 4 bits of 6 bit SI code)</p> <p>NOTE: Surveillance Identifier is derived from CL and IC fields of UF11, or directly in the SIS subfield of SD field value of CL field in formats UF4,5,20 and 21</p>																																													
KE		1	4	X	Defines the content of the ND and MD fields in Comm-D replies, DF=24.																																													
MA		56	33-88	X	Messages directed to the aircraft, part of Comm-A interrogations, UF=20, 21.																																													
	ADS	8	33-40	X	Defines the content of the MA message field in Comm-A requests and is expressed in two groups of 4 bits each, ADS1 (33-36) and ADS2 (37-40).																																													
	ADS1	4	33-36	X	Part of the A-Definition Subfield and is set to 0 for TCAS Sensitivity Level Commands.																																													
	ADS2	4	37-40	X	Part of the A-Definition Subfield and is set to 5 for TCAS Sensitivity Level Commands.																																													

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MA	SLC	4	41-44	X	Sensitivity Level Command for the TCAS aircraft. The codes are: 0 = No command. 1 = Not Assigned. 2 = Select TA_ONLY mode of operation. 3 = Set TCAS Sensitivity Level to 3. 4 = Set TCAS Sensitivity Level to 4. 5 = Set TCAS Sensitivity Level to 5. 6 = Set TCAS Sensitivity Level to 6. 7 = Set TCAS Sensitivity Level to 7. 8-14 = Not Assigned. 15 = Cancel previous Sensitivity Level.
MB		56	33-88	X	Messages to be transmitted to interrogator, part of the Comm-B replies, DF=20, 21. The field contains Data Link, Capability Reports or Aircraft Identification Reports or TCAS Resolution Advisory Reports.
	ACS	20	45-64	X	Comm-A capability subfield reports data link service(s) supported by the installation. If all bits are Zeros, no Comm-A data link services are supported.
	AIS	48	41-88	X	Aircraft Identification, reported when a surveillance or Comm-A interrogation (UF=4, 5, 20, 21) contains RR=18 and DI=anything but 7. AIS contains up to eight 6-bit characters as defined in Table 4.
MB	ARA	14	41-54	X	TCAS Resolution Advisory Report indicating current Active Resolution Advisories (if any) generated by own TCAS unit against one or more threat aircraft. Each bit indicates a specific resolution advisory with One being active and Zero being inactive. Bit indications are: 41-Climb. 42-Don't descend. 43-Don't descend faster than 500 FPM. 44-Don't descend faster than 1000 FPM. 45-Don't descend faster than 2000 FPM. 46-Descend. 47-Don't climb. 48-Don't climb faster than 500 FPM. 49-Don't climb faster than 1000 FPM. 50-Don't climb faster than 2000 FPM. 51-Turn left. 52-Turn right. 53-Don't turn left. 54-Don't turn right.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MB	BCS	16	65-80	X	Comm-B capability subfield reports installed data sources that can be accessed by the ground for transmission via a ground-initiated Comm-B. If all bits are Zeros, no data is accessible by a ground-initiated Comm-B.
	BDS	8	33-40	X	Defines the content of the MB message field in reply to ground-initiated Comm-B and is expressed in two groups of 4 bits each, BDS1 (33-36) and BDS2 (37-40).
	BDS1	4	33-36	X	Corresponds with RR in UF=4, 5, 20, 21. The codes are: 0 = MB contains Air-initiated Comm-B. 1 = MB contains Data Link Capability Report. 2 = MB contains Aircraft Identification. 3 = MB contains TCAS Resolution Advisory. 4-15 = Not assigned.
	BDS2	4	37-40	X	Basic report uses BDS2=0. More complex Mode S installations report additional capabilities in various formats assigned to BDS2 codes other than 0 as requested by interrogator, specified in the RRS subfield of SD.
	CFS	4	41-44	X	Continuation subfield contains the BDS2 value of the next additional capability report available from the installation.
MB	ECS	8	81-88	X	Data Link Capability subfield reports ELM capability of installation. No ELM data link services are supported if all bits are Zeros.
	MTE	1	60	X	Multiple Threat Encounter bit indicates ≥ 2 simultaneous TCAS threats.
	RAC	4	55-58	X	Resolution Advisory Complements subfield indicates currently active resolution, advisory complements (if any) received from all other TCAS aircraft with on-board resolution capability. Bits are set to One when active and Zero when inactive. Bit indications are: 55-Don't descend. 56-Don't climb. 57-Don't turn left. 58-Don't turn right.
	RAT	1	59	X	Resolution Advisory Terminated indicator is set to One for 18 seconds (± 1 second) following termination of a previously reported resolution advisory.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MB	TID	26	33-88	X	Threat Identity Data subfield contains data according to TTI field. If TTI=1, TID contains Mode S address of threat in bits 63-85 (bits 87-88 are Zero). If TTI=2, TID contains altitude, range and bearing data.
	TIDA	13	63-75	X	Threat Identity Data, Altitude subfield reports Mode C altitude code of the threat.
	TIDB	6	83-88	X	Threat Identity, Bearing subfield reports most recent bearing of the threat.
	TIDR	7	76-82	X	Threat Identity, Range subfield reports most recent range of the threat.
	TTI	2	61-62	X	Threat Type Indicator subfield defines type of data in TID field.
MC		80	9-88	X	Comm-C field contains one segment of a sequence of segments transmitted to the transponder in the ELM mode. MC is part of UF=24.
	IIS	4	9-12 (if RC=0 to 2) or 25-28 (if RC=3)	X	Interrogator Identifier subfield reports the identity of the interrogator (See SD and UM fields).
	SRS	16	9-24	X	If a Comm-C interrogation (UF=24) contains RC=3, the SRS subfield contains a list of segment request-authorizations for DELMs in the 16-bit (9-24) SRS subfield. Starting with bit 9, denoting the first segment, each of the following bits is set to One if the transmission of the corresponding segment is requested. Refer to Table 5.
MD		80	9-88	X	Comm-D field, part of DF=24, contains one segment of a sequence of segments transmitted by the transponder in the ELM mode. It may contain a summary of received MC segments of an uplink ELM.
	TAS	16	17-32	X	Reports segments received in a Comm-C sequence. Starting with bit 17 denoting the first segment, each successive bit is One if the corresponding segment was received. TAS appears if KE=1 in the same reply. Refer to Table 5 for values.
ME		56	33-88	X	Extended squitter message, part of DF=17, contains broadcast messages.
MU		56	33-88	X	Field, part of the long air-air surveillance interrogation UF=16, contains information used in air-to-air exchanges (TCAS, Resolution Messages and TCAS Broadcast Messages).

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MU	CHC	3	47-49	X	Cancel Horizontal Resolution Advisory Complement. In TCAS Resolution Messages transmitted by TCAS without horizontal resolution capability, CHC is set to 0. The codes are: 0 = No cancellation. 1 = Cancel, don't turn left. 2 = Cancel, don't turn right. 3-7 = Not assigned.
	CVC	2	43-44	X	Cancel Vertical Resolution Advisory Complement. The codes are: 0 = No cancellation. 1 = Cancel, don't descend. 2 = Cancel, don't climb. 3 = Not assigned.
	HRC	3	50-52	X	Horizontal Resolution Advisory Complement. In TCAS Resolution Messages transmitted by TCAS without horizontal resolution capability, HRC is set to 0. The codes are: 0 = No horizontal resolution advisory complement sent. 1 = Intruder TCAS sense is turn left/do not turn left. 2 = Intruder TCAS sense is turn left/do not turn right. 3-4 = Not assigned. 5 = Intruder TCAS sense is turn right/do not turn left. 6 = Intruder TCAS sense is turn right/do not turn right. 7 = Not assigned.
	HSB	5	56-60	X	Encoded Sense Bits for Horizontal Resolution Complements provide a parity coding field protecting the six horizontal sense bits (CHC and HRC) and are used in TCAS III Resolution Messages.
	MID	24	65-88	X	Contains discrete address of interrogating aircraft and is in TCAS Resolution Advisories Lock Requests, TCAS Resolution Messages and TCAS Broadcast Messages. NOTE: TCAS Broadcast Message is sent at 10-second intervals.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT																																																																																																																																								
MU	MTB	1	42	X	Multiple Threat Bit indicates more than one TCAS threat when set to One and no more than one threat when set to Zero.																																																																																																																																								
	UDS	8	33-40	X	Defines the content of the MU message field and is expressed in two 4-bit groups, UDS1 (33-36) and UDS2 (37-40).																																																																																																																																								
	UDS1	4	33-36	X	Is set to 3 for TCAS Resolution Messages and TCAS Broadcast Messages.																																																																																																																																								
	UDS2	4	37-40	X	Is set to 0 for TCAS Resolution Messages or set to 2 for TCAS Broadcast Messages.																																																																																																																																								
	VRC	2	45-46	X	Vertical Resolution Advisory, Complement. The codes are: 0 = No vertical resolution advisory complement sent. 1 = Don't descend. 2 = Don't climb. 3 = Not assigned.																																																																																																																																								
	VSB	4	61-64	X	Encoded Sense Bits for Vertical Resolution Complements provide a parity coding field to protect four vertical sense bits (CVC and VRC) in all TCAS Resolution Messages. If bits 43-46 do not agree with bits 61-64, the TCAS receiver assumes an error and disregards message. Bits are as follows:																																																																																																																																								
					<table border="1"> <thead> <tr> <th>43</th> <th>44</th> <th>45</th> <th>46</th> <th>61</th> <th>62</th> <th>63</th> <th>64</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	43	44	45	46	61	62	63	64	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	1	1	1	0	0	1	1	1	0	0	1	0	1	0	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	1	0	1	1	0	0	0	1	1	1	0	0	1	0	1	0	0	0	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	0	1	1	0	0	0	1	1	0	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1
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Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MV		56	33-88	X	Field, part of the long air-air surveillance reply DF=16, contains information used in air-to-air exchanges (Coordination Reply Message).
	ARA	14	41-54	X	Same as in MB field.
	MTE	1	60	X	Same as in MB field.
	RAC	4	55-58	X	Same as in MB field.
	RAT	1	59	X	Same as in MB field.
MV	VDS	8	33-40	X	Defines the content of the MV message field and is expressed in two 4-bit groups, VDS1 (33-36) and VDS2 (37-40).
	VDS1	4	33-36	X	Is set to 3 for Coordination Reply Message.
	VDS2	4	37-40	X	Is set to 0 for Coordination Reply Message.
NC		4	5-8	X	Provides the segment number transmitted in an uplink ELM and is part of a Comm-C interrogation, UF=24.
ND		4	5-8	X	Provides the segment number transmitted in a downlink ELM and is part of a Comm-D reply, DF=24.
PC		3	6-8	X	Contains operating commands to the transponder and is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21. The codes are: 0 = No changes in transponder state. 1 = Non-selective All Call lockout. 2 = Not assigned. 3 = Not assigned. 4 = Cancel B. 5 = Cancel C. 6 = Cancel D. 7 = Not assigned.
PI		24	33-56	X	Contains the parity overlaid on the interrogator identity code. PI is part of the reply, DF=11, to the Mode S Only All Call.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
PR		4	6-9	X	<p>Field contains commands to the transponder specifying the reply probability to the Mode S Only All Call interrogation, UF=11 containing the PR. A command to disregard any lockout state can also be given. The assigned codes are:</p> <p>0 = Reply with probability = 1. 1 = Reply with probability = 1/2. 2 = Reply with probability = 1/4. 3 = Reply with probability = 1/8. 4 = Reply with probability = 1/16. 5,6,7 = Do not Reply. 8 = Disregard lockout, reply with probability = 1. 9 = Disregard lockout, reply with probability = 1/2. 10 = Disregard lockout, reply with, probability = 1/4. 11 = Disregard lockout, reply with probability = 1/8. 12 = Disregard lockout, reply with probability = 1/16. 13, 14, 15 = Do not reply.</p> <p>NOTE: On receipt of a Mode S Only All Call containing a PR code other than 0 or 8, transponder executes a random process and makes a reply decision for the interrogation in accordance with the commanded probability. Random occurrence of replies enables interrogator to acquire closely spaced aircraft when replies would otherwise synchronously garble each other.</p>
RC		2	3-4	X	<p>Designates transmitted segment as initial, intermediate or final if coded 0, 1 or 2 respectively. RC=3 is used to request Comm-D DELMs by the transponder. RC is part of Comm-C interrogation, UF=24.</p>

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT																					
RI		4	14-17	X	Information in DF=0, 16. The codes are: 0 = No on-board TCAS. 1 = Not assigned. 2 = On-board TCAS with resolution capability inhibited. 3 = On-board TCAS with vertical-only resolution capability. 4 = On-board TCAS with vertical and horizontal resolution capability. 5-7 = Not assigned. 8 = No maximum airspeed data available. 9 = Airspeed is ≤ 75 kts. 10 = Airspeed is > 75 kts and ≤ 150 kts. 11 = Airspeed is > 150 kts and ≤ 300 kts. 12 = Airspeed is > 300 kts and ≤ 600 kts. 13 = Airspeed is > 600 kts and ≤ 1200 kts. 14 = Airspeed is > 1200 kts. 15 = Not assigned.																					
RL		1	9	X	Command, sent in UF=0, 16; solicits DF=0 reply if Zero and DF=16 reply if One (only if transponder is associated with Airborne Collision Avoidance System [ACAS] equipment). Otherwise, in UF=0, Zero solicits DF=0 reply and One solicits no reply. In UF=16, Zero solicits DF=16 reply and One solicits no reply.																					
RR		5	9-13	X	Contains length and content of interrogator requested reply. RR is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21.																					
					<table border="1"> <thead> <tr> <th>RR CODE</th> <th>REPLY LENGTH</th> <th>MB CONTENT</th> </tr> </thead> <tbody> <tr> <td>0-15</td> <td>Short</td> <td>N/A</td> </tr> <tr> <td>16</td> <td>Long</td> <td>Air initiated Comm-B</td> </tr> <tr> <td>17</td> <td>Long</td> <td>Data link capability</td> </tr> <tr> <td>18</td> <td>Long</td> <td>Aircraft Identification</td> </tr> <tr> <td>19</td> <td>Long</td> <td>Resolution Advisories</td> </tr> <tr> <td>20-31</td> <td>Long</td> <td>Not Assigned</td> </tr> </tbody> </table> <p>NOTE: If first bit of RR code is One, decimal equivalent of last four bits of RR code designates code for BDS1 in reply (ground initiated). BDS2 is assumed to be Zero if not specified by DI=7 and RRS.</p>	RR CODE	REPLY LENGTH	MB CONTENT	0-15	Short	N/A	16	Long	Air initiated Comm-B	17	Long	Data link capability	18	Long	Aircraft Identification	19	Long	Resolution Advisories	20-31	Long	Not Assigned
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20-31	Long	Not Assigned																								

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD		16	17-32	X	Contains control codes, as specified by the DI field affecting transponder protocol and is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21.
	IIS	4	17-20	X	Interrogator Identifier subfield contains the self-identification code of the interrogator and is numerically identical to the II code transmitted by the interrogator in Mode S Only All Calls. IIS codes are 0 through 15; IIS=0 is not a valid interrogator identifier for multisite purposes. IIS is sent only when DI=0, 1 or 7.
	LOS	1	26	X	Lockout subfield, if set to One, initiates a multisite All Call lockout to Mode S Only All Calls (UF=11) from the Interrogator indicated in IIS of the interrogation. If LOS is set to Zero, no change in lockout state is commanded. LOS is sent only if DI=1 or 7.
	LSS	1	23	X	Lockout surveillance subfield, if set to One, shall signify a multisite lockout command from the interrogator indicated in SIS. LSS set to zero shall be used to signify that no change in lockout state is commanded.
	MBS	2	21-22	X	Multisite Comm-B subfield, sent when DI=1, is assigned the following codes: 0 = No Comm-B action. 1 = Comm-B reservation. 2 = Comm-B closeout.
	MES	3	23-25	X	Multisite ELM subfield, sent when DI=1, contains reservation and closeout commands for ELM as follows: 0 = No ELM action. 1 = Comm-C reservation. 2 = Comm-C closeout. 3 = Comm-D reservation. 4 = Comm-D closeout. 5 = Comm-C reservation and Comm-D closeout. 6 = Comm-C closeout and Comm-D reservation. 7 = Comm-C and Comm-D closeouts.

Overview of Format Definitions (cont)

Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD	RCS	3	24-26	X	Rate control subfield shall control the squitter rate of the transponder when it is reporting the surface format. The codes are: 0 = No squitter rate command 1 = Report high surface squitter rate for 60 seconds 2 = Report low surface squitter rate for 60 seconds 3 = Suppress all surface squitters for 60 seconds 4 = Suppress all surface squitters for 120 seconds 5-7 Not assigned
	RRS	4	21-24	X	Reply Request subfield, sent when DI=7, contains coding corresponding to the requested BDS2 code.
	RRS	4	24-27	X	Reply Request subfield, sent when DI=3, contains coding corresponding to the requested BDS2 code.
	RSS	2	27-28	X	Reservation Status subfield, sent when DI=1, requests transponder to report reservation status in the UM field. The codes are: 0 = No request. 1 = Report Comm-B reservation status. 2 = Report Comm-C reservation status. 3 = Report Comm-D reservation status.
	SAS	2	27-28	X	Surface Antenna Subfield, shall control the diversity antenna that is used for the acquisition and extended squitters when the aircraft is reporting the surface format. The codes are: 0 = No antenna command, use the top antenna 1 = Alternate top and bottom antennas for 120 seconds 2 = Use bottom antenna for 120 seconds 3 = Return to the default
	SIS	6	17-22	X	Surveillance Identifier Subfield, shall contain an assigned SI code of the interrogator.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD	TCS	3	21-23	X	Type Control Subfield, shall control the position type reported by the transponder. The codes are: 0 = No position type command 1 = Use surface position type for the next 15 seconds 2 = Use surface position type for the next 60 seconds 3 = Cancel surface type command 4-7 = Not assigned.
	TMS	4	29-32	X	Tactical Message subfield, sent when DI=1 or 7, contains coding for linking the Comm-A message segments. The codes are: 0 = No Action. 1 = Unlinked, Priority. 2 = Unlinked, Acknowledge. 3 = Unlinked, Priority, Acknowledge. 4 = Linked 1st Segment, Single ADS. 5 = Linked 1st Segment, Single ADS Priority. 6 = Linked 1st Segment, Single ADS Acknowledge. 7 = Linked 1st Segment, Single ADS, Priority, Acknowledge. 8 = Linked 1st Segment, Multiple ADS. 9 = Linked 1st Segment, Multiple ADS, Priority. 10 = Linked 1st Segment, Multiple ADS, Acknowledge. 11 = Linked 1st Segment, Multiple ADS, Priority, Acknowledge. 12 = Second Segment. 13 = Third Segment. 14 = Final Segment. 15 = Not Assigned.

Overview of Format Definitions (cont)
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SL		3	9-11	X	<p>Reports the current operating sensitivity level of the TCAS unit and is a part of air-air surveillance replies, DF=0, 16. The codes are:</p> <p>0 = No TCAS sensitivity level reported. 1 = TCAS operates at sensitivity level 1. 2 = TCAS operates at sensitivity level 2. 3 = TCAS operates at sensitivity level 3. 4 = TCAS operates at sensitivity level 4. 5 = TCAS operates at sensitivity level 5. 6 = TCAS operates at sensitivity level 6. 7 = TCAS operates at sensitivity level 7.</p> <p>NOTE: The SL field has no meaning for aircraft with RI=0 (no on-board capability to generate resolution, advisories).</p>
UF		5	1-5	X	The first field in all uplink formats is the transmission descriptor in all interrogations.
UM		6	14-19	X	Contains transponder status readouts in replies DF=4, 5, 20, 21.
	IDS	2	18-19	X	<p>Identifier Designator subfield reports the type of reservation made by the interrogator identified in IIS and corresponds with the RSS subfield of SD. Assigned coding is:</p> <p>0 = No information available. 1 = Comm-B reservation active. 2 = Comm-C reservation active. 3 = Comm-D reservation active.</p>
	IIS	4	14-17	X	Interrogator Identifier subfield reports the identity of the interrogator that has made a multisite reservation.
VS		1	6	X	Indicates aircraft is airborne when Zero or aircraft is on the ground when One. VS is a part of DF=0, 16.

Overview of Format Definitions (cont)
Table 3

				B5	0	0	1	1				
				B6	0	1	0	1				
B4	B3	B2	B1									
0	0	0	0						P	SP		0
0	0	0	1						A	Q		1
0	0	1	0						B	R		2
0	0	1	1						C	S		3
0	1	0	0						D	T		4
0	1	0	1						E	U		5
0	1	1	0						F	V		6
0	1	1	1						G	W		7
1	0	0	0						H	X		8
1	0	0	1						I	Y		9
1	0	1	0						J	Z		
1	0	1	1						K			
1	1	0	0						L			
1	1	0	1						M			
1	1	1	0						N			
1	1	1	1						O			
SP=SPACE code												

6-Bit Character Set for AIS Subfield
Table 4

SRS OR TAS SUBFIELD VALUE		NUMBER OF SEGMENTS
OCTAL	HEXADECIMAL	
100000	8000	1
140000	C000	2
160000	E000	3
170000	F000	4
174000	F800	5
176000	FC00	6
177000	FE00	7
177400	FF00	8
177600	FF80	9
177700	FFC0	10
177740	FFE0	11
177760	FFF0	12
177770	FFF8	13
177774	FFFC	14
177776	FFFE	15
177777	FFFF	16

Valid Values for SRS and TAS Subfields
Table 5



BINARY	OCTAL	DECIMAL	HEXADECIMAL
000	0	0	0
001	1	1	1
010	2	2	2
011	3	3	3
100	4	4	4
101	5	5	5
110	6	6	6
111	7	7	7
1000	10	8	8
1001	11	9	9
1010	12	10	A
1011	13	11	B
1100	14	12	C
1101	15	13	D
1110	16	14	E
1111	17	15	F
10000	20	16	10

Number Systems Conversion
Table 6

UF#	FIELDS							
0	VS(b)	CC(b)	SL(d)	RI(d)			AC(h&o)	AA(h&o)
4	FS(d)	DR(d)	UM(h)	IDS(d)	IIS(d)		AC(h&o)	AA(h&o)
5	FS(d)	DR(d)	UM(h)	IDS(d)	IIS(d)		ID(h&o)	AA(h&o)
11	CA(d)	PI(h)						AA(h&o)
16	VS(b)		SL(d)	RI(d)	MV(h)		AC(h&o)	AA(h&o)
20	FS(d)	DR(d)	UM(h)	IDS(d)	IIS(d)	MB(h)	AC(h&o)	AA(h&o)
21	FS(d)	DR(d)	UM(h)	IDS(d)	IIS(d)	MB(h)	ID(h&o)	AA(h&o)
24	KE(b)	ND(d)		IDS(d)	IIS(d)			AA(h&o)
	h=hex b=binary d=decimal							

IFR 6000 Mode S UF Fields Numeric Units
Table 7

APPENDIX J - STANDARD ACCESSORIES

1. AUXILIARY EQUIPMENT

Refer to Appendix J, Figure 1.

ITEM	DESCRIPTION	ITEM	DESCRIPTION
● DC Power Supply	Used to power the Test Set.	● 72 in. Coaxial Cable	Used to connect the Test Set to the UUT.
● Antenna	RF antenna used with Test Set when power accuracy is most critical.	● 5 A Fuse	Spare Fuse
● Breakout Box	Provides means of accessing individual user interfaces via standard connectors	● Power Cord (US Only)	Used to connect AC power from an external AC power source to AC PWR Connector.
● Antenna Shield	Used with Antenna Clamp Assembly to cover UUT Antenna not being tested.	● Power Cord (European)	Used to connect AC power from an external AC power source to AC PWR Connector.
● 12 in. Coaxial Cable	Used to connect Test Set ANT Connector to Directional Antenna ANT Connector.		

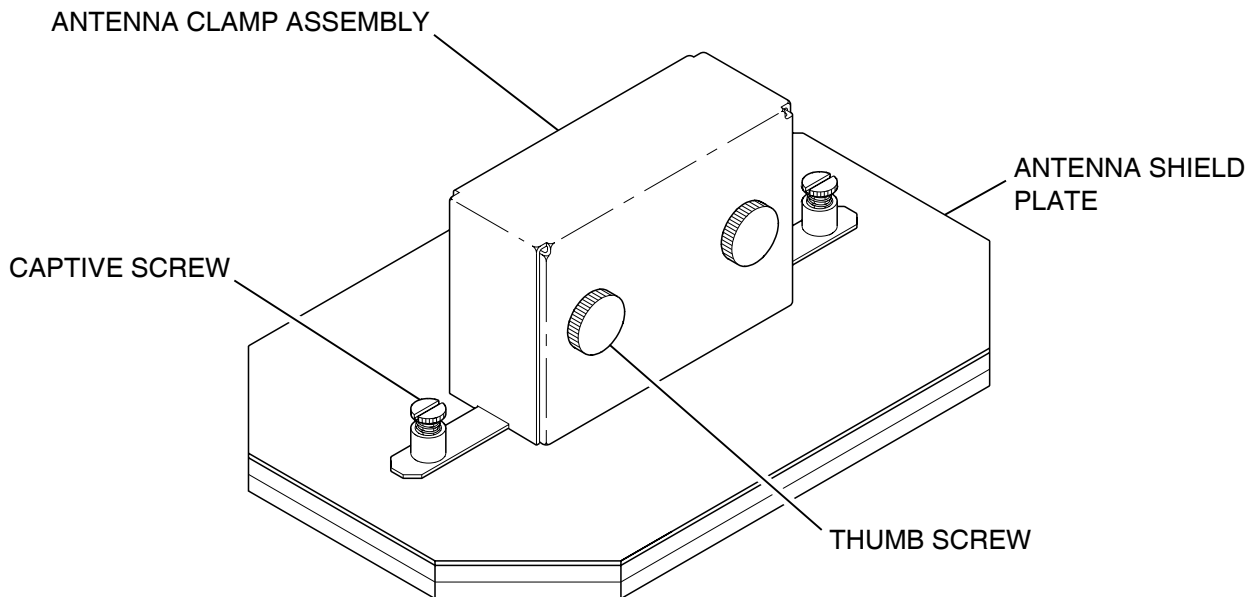


Auxiliary Equipment
Figure 1

2. ANTENNA SHIELD PROCEDURE

Refer to Appendix J, Figure 2.

STEP	PROCEDURE	STEP	PROCEDURE
1.	Position Antenna Clamp Assembly inside the slot in the Antenna Shield Plate, aligning captive screws into the respective screw holes.	3.	Cover UUT Antenna with Antenna Shield. Loosen Thumbscrews if necessary.
2.	Tighten captive screws.	NOTE:	It may be necessary to remove UUT Antenna Guard if access to UUT Antenna is restricted.
		4.	Secure Antenna Shield by tightening thumbscrews.



8107007

Antenna Shield
Figure 2

INDEX

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OPERATION MANUAL
IFR 6000

FOR QUALIFIED SERVICE PERSONNEL ONLY

BATTERY/VOLTAGE INSTRUCTIONS



OPERATION MANUAL
IFR 6000

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SAFETY FIRST: TO ALL SERVICE PERSONNEL

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL.

WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.

CASE, COVER OR PANEL REMOVAL

Opening the Case Assembly exposes the technician to electrical hazards that can result in electrical shock or equipment damage.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards, that may exist when operating or servicing this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY SYMBOLS IN MANUALS AND ON UNITS



CAUTION: Refer to accompanying documents. (This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.)



AC OR DC TERMINAL: Terminal that may supply or be supplied with ac or dc voltage.



DC TERMINAL: Terminal that may supply or be supplied with dc voltage.



AC TERMINAL: Terminal that may supply or be supplied with ac or alternating voltage.

EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

USE OF PROBES

Check specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

USE RECOMMENDED FUSES ONLY

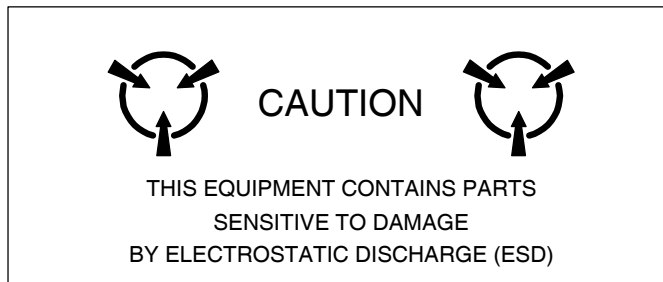
Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

WARNING: THE IFR 6000 USES A LITHIUM ION BATTERY PACK. THE FOLLOWING WARNINGS CONCERNING LITHIUM ION BATTERIES MUST BE HEHEDED:

- DO NOT RECHARGE OUTSIDE THE IFR 6000.
- DO NOT CRUSH, INCINERATE OR DISPOSE OF IN NORMAL WASTE.
- DO NOT SHORT CIRCUIT OR FORCE DISCHARGE AS THIS MIGHT CAUSE THE BATTERY TO VENT, OVERHEAT OR EXPLODE.

CAUTION: INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FETS, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, THE USE OF UNGROUNDED TOOLS AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

- BEFORE USE IN A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER EITHER BY THE USE OF VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.
- WHEN REMOVING DEVICES FROM THEIR CONTAINERS, GROUND THE HAND BEING USED WITH A CONDUCTIVE WRISTBAND.
- TIPS OF SOLDERING IRONS AND/OR ANY TOOLS USED MUST BE GROUNDED.
- DEVICES MUST NEVER BE INSERTED INTO NOR REMOVED FROM CIRCUITS WITH POWER ON.
- PC BOARDS, WHEN TAKEN OUT OF THE SET, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG. REMOVE ANY BUILT-IN POWER SOURCE, SUCH AS A BATTERY, BEFORE LAYING PC BOARDS ON A CONDUCTIVE MAT OR STORING IN A CONDUCTIVE BAG.
- PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CONDUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING CONTAINER.



CAUTION: SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND ENSURE COMPLIANCE WITH INSTRUCTIONS IN FAA CIRCULAR AC 170-6C, DATED FEBRUARY 19, 1981.

FOR QUALIFIED SERVICE PERSONNEL ONLY


FUSE REPLACEMENT

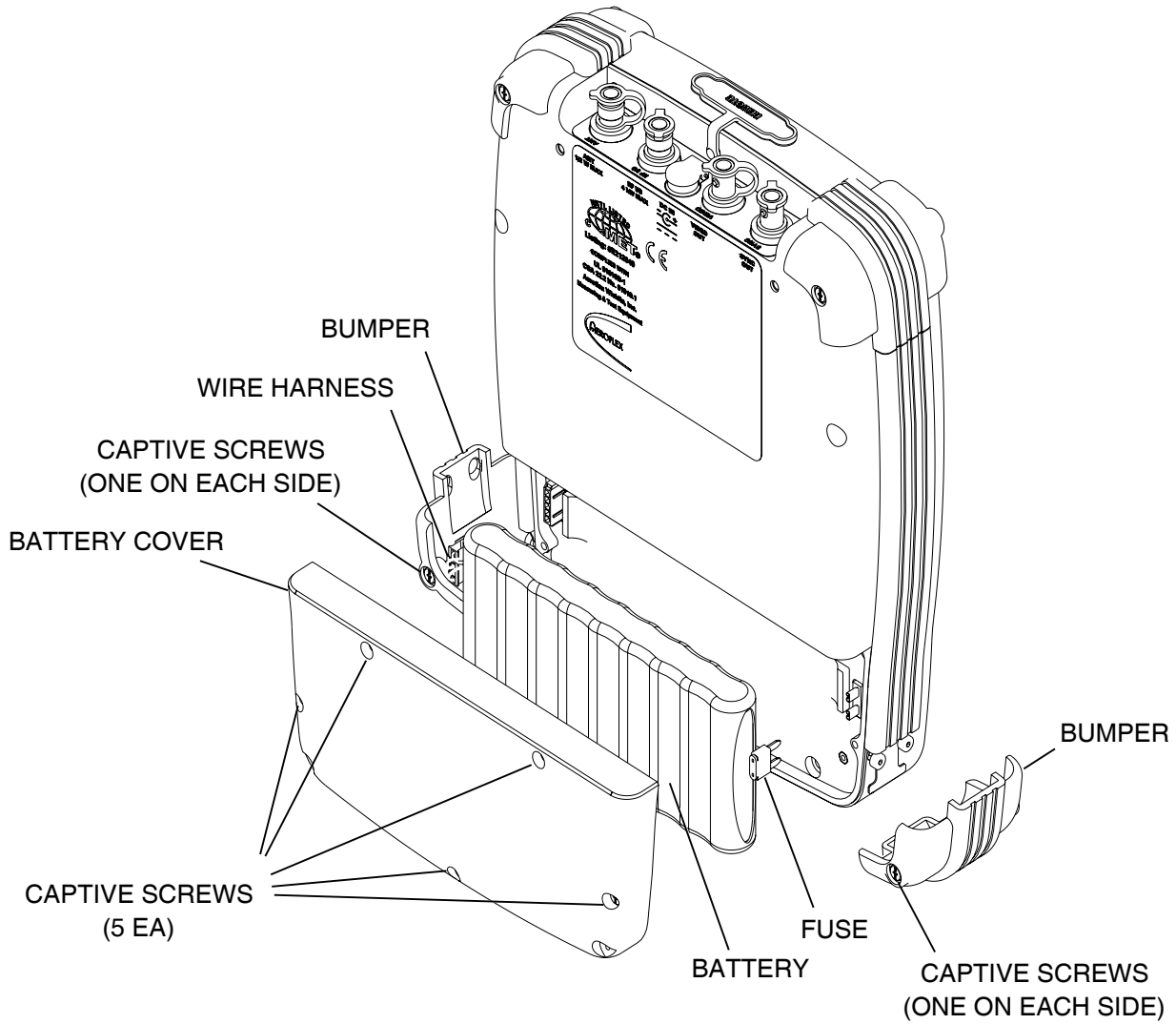
Refer to Figure 1.

STEP	PROCEDURE
1.	Verify the IFR 6000 is OFF and not connected to AC power.
2.	Fully loosen two captive screws in the two lower bumpers and remove the bumpers.
3.	Fully loosen five captive screws and lift the Battery Cover from the Case Assembly.
4.	Replace fuse: 5 A, 32 Vdc, Type F (Mini Blade Fuse) (Aeroflex PN: 5106-0000-057)
	CAUTION: FOR CONTINUOUS PROTECTION AGAINST FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS.
5.	Install the Battery Cover on the Case Assembly and tighten the five captive screws (8 in/lbs.).
6.	Install the two lower bumpers and tighten the two captive screws in each bumper (8 in/lbs.).

BATTERY REPLACEMENT

Refer to Figure 1.

STEP	PROCEDURE
1.	Verify the IFR 6000 is OFF and not connected to AC power.
2.	Fully loosen two captive screws in the two lower bumpers and remove the bumpers.
3.	Fully loosen five captive screws and lift the Battery Cover from the Case Assembly.
4.	Disconnect the wire harness connecting the battery to the Test Set and remove the battery.
5.	Install new battery and reconnect the wire harness.
6.	Install the Battery Cover on the Case Assembly and tighten the five captive screws (8 in/lbs.).
7.	Install the two lower bumpers and tighten the two captive screws in each bumper (8 in/lbs.).
	WARNING: DISPOSE OF OLD BATTERY ACCORDING TO LOCAL STANDARD SAFETY PROCEDURES.
	 CAUTION: REPLACE ONLY WITH THE BATTERY SPECIFIED BY AEROFLEX. DO NOT ATTEMPT TO INSTALL A NON-RECHARGEABLE BATTERY.



0580E

Battery and Fuse Replacement
Figure 1

As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice.

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The logo for AEROFLEX features a stylized 'A' with a blue triangle at its base, followed by the word 'AEROFLEX' in a bold, sans-serif font. The logo is set against a white background with a blue swoosh underneath.

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven, customer-focused.