AEROFLEX

Mode 5 Bench Test Set
IFF-45TS

Operation Manual

Issue 3

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THIS DOCUMENT CONTAINS NATO RESTRICTED INFORMATION

OPERATION MANUAL

MODE 5 BENCH TEST SET

IFF-45TS

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Electromagnetic Compatibility:

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

Nomenclature Statement:

In this manual, IFF-45TS, Test Set or Unit refers to the IFF-45TS Mode 5 Test Set.

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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

Removing protective covers, casings or panels from this Test Set exposes the operator to electrical hazards that can result in electrical shock or equipment damage. Do not operate this Test Set with the case, cover or panels removed.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

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

SWITCH OFF: AC line power to the device is OFF.

SWITCH ON: AC line power to the device is ON.

DANGEROUS VOLTAGE: Indicates electrical shock hazard due to high voltage levels.

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.

INTERNAL BATTERY

This unit contains a Lithium 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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DECLARATION OF CONFORMITY

The Declaration of Conformity Certificate included with the unit should remain with the unit.

Aeroflex recommends the operator reproduce a copy of the Declaration of Conformity Certificate to be stored with the Operation Manual for future reference.

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TABLE OF CONTENTS

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INTRODUCTION - MODE 5 TEST SET

This manual contains operating instructions for the IFF-45TS Mode 5 Bench Test Set. 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 this Unit to qualified technical personnel.

ORGANIZATION

This manual is divided into the following Chapters and Sections:

CHAPTER 1 - OPERATION

Section 1 - DESCRIPTION

Section 2 - OPERATION (installation; controls, connectors and indicators; performance evaluation; general operating procedures; remote operation)

Section 3 - SPECIFICATIONS

Section 4 - SHIPPING

Section 5 - STORAGE

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CHAPTER ONE

IFF-45TS MODE 5 BENCH TEST SET

OPERATION MANUAL

TABLE OF CONTENTS

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LIST OF ILLUSTRATIONS

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LIST OF TABLES

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SERVICE UPON RECEIPT OF MATERIAL

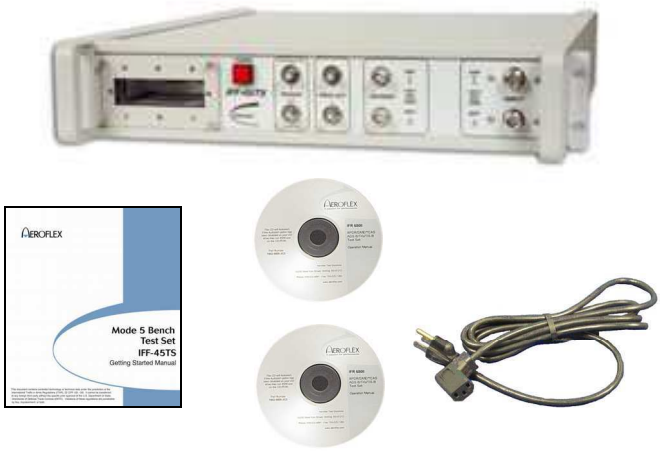
Unpacking

Special-design packing material inside this shipping carton provides maximum protection for the IFF-45TS. Avoid damaging the carton and packing material during equipment unpacking. Use the following steps for unpacking the IFF-45TS.

- Cut and remove the sealing tape on the carton top and open the carton.
- Grasp the IFF-45TS firmly, while restraining the shipping carton, and lift the equipment and packing material vertically.
- Place the IFF-45TS packing on a suitable flat, clean and dry surface.
- Remove the protective plastic bag from the IFF-45TS.
- Place protective plastic bag and end cap packing material inside shipping carton.
- Store the shipping carton for future use should the IFF-45TS 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.



IFF-45TS with Standard Accessories

DESCRIPTION	PART NUMBER	QTY
IFF-45TS	9001-6500-000	1
POWER CORD 110 or POWER CORD 220	6041-0001-000 6041-2000-200	1 1
PC USER INTERFACE (CD-ROM)	7112-6542-200	1
OPERATION MANUAL (CD-ROM)	1002-6500-2C0	1
GETTING STARTED GUIDE (PRINTED)	1002-6500-8P0	1

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SECTION 1 - DESCRIPTION

1. GENERAL DESCRIPTION AND CAPABILITIES

1.1 DESCRIPTION

The IFF-45TS Mode 5 Bench Test tests IFF transponder and interrogator systems as well as Tactical Air Navigation (TACAN) computer systems. The Test Set is controlled using an external PC to send commands via RS-232, GPIB or Ethernet.

For Interrogator testing, the user is able to configure up to 12 different replies for simultaneous operation. Each reply can be individually configured for reply mode, reply data and range. This allows the user to simulate multiple Transponders replying to the same type of interrogation or a single Transponder replying to multiple types of interrogations. The user selects the interrogation type and pulse to be measured for pulse width, power and frequency. In addition, interrogation rates are measured by interrogation type.

For Transponder testing, the user is able to configure up to 12 different interrogations. Each interrogation is individually configurable for interrogation type and data. The user selects which interrogation's reply to make pulse power, frequency, width and spacing measurements on. In addition to pulse measurements, percent reply and reply delay are measured.

For both modes of operation the user is allowed to vary the amplitude or location of up to three pulses or add an interfering pulse into the transmission.

In the TACAN mode of operation the IFF45TS emulates either a TACAN ground transponder or a TACAN airborne interrogator. The unit provides six TACAN test modes; Ground to Air (G/A), Inverse (G/A), Air to Air (A/A), Inverse (A/A), Beacon (G/A) and Beacon (A/A).

1.2 FUNCTIONAL CAPABILITIES

The IFF-45TS Mode 5 Bench Test Set has the following features and capabilities:

- Bench top or rack mountable.
- 115 to 240 VAC at 50-60 Hz.
- Tests Transponders and Interrogators.
- Tests SIF Modes 1, 2, 3/A and C.
- Tests Mode 4, Mode 5, Mode S and TCAS.
- Comprehensive built-in test and self-calibration capability.
- Supports direct or radiated (over-the-air) testing.
- Multipath, angle-fault detection (radiated test mode).

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SECTION 2 - OPERATION

1. INSTALLATION

1.1 GENERAL

The IFF-45TS requires continuous ac power to operate.

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

1.2 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.

1.2.1 Complying with Instructions

Installation/operating personnel should not attempt to install or operate the IFF-45TS 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.

1.2.2 Grounding Equipment and 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.

The power cord, equipped with standard three-prong plug, must be connected to a properly grounded three-prong receptacle. 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).

1.2.3 Operating Safety

Due to potential for electrical shock within test equipment, Test Set covers must not be removed by the operator. Internal adjustments must only be performed by qualified service personnel. Refer to the IFF-45TS Maintenance Manual for maintenance procedures.

1.2 CAUTION AND WARNING Labels

Exercise extreme care when performing operations preceded by a CAUTION or WARNING label. CAUTION labels appear where possibility of damage to equipment exists. WARNING labels denote conditions where bodily injury or death may result.

1.3 POWER REQUIREMENTS

The IFF-45TS operates over a voltage range of 115 to 240 VAC at 50 to 60 Hz. Instantaneous surge current at power up is ≤50 A.

There is a fuse located next to the AC INPUT Connector. Fuse rating is: 3 A, Type F, 250 V.

CAUTION: FOR CONTINUOUS PROTECTION AGAINST FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS.

1.4 INSTALLATION PROCEDURE

STEP	PROCEDURE

1. Place the IFF-45TS on the bench.

   CAUTION: AVOID RESTRICTION OF AIR FLOW TO INTAKE VENT. WHEN OPERATING IN THE NORMAL HORIZONTAL POSITION, MAINTAIN AT LEAST TWO INCHES (5 CM) OF CLEARANCE BETWEEN THE FAN SIDE OF THE EQUIPMENT AND OBJECTS OR WALLS. IF OPERATING IN A RACK, MAXIMUM AMBIENT TEMPERATURE MUST BE AT OR BELOW 40° C.

2. Connect the AC Power Cable from an AC Power Source to the AC INPUT Connector.

1.5 POWER-UP PROCEDURE

STEP	PROCEDURE
1.	Press the POWER Switch.
2.	Verify POWER Switch illuminates Red and fan is running.

NOTE: After cycling power, wait at least 30 seconds before establishing communication to ensure the instrument has finished booting up.

1.6 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, switches and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and a mild liquid detergent. Do not use soapy water to clean connectors.
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.
7.	Clean air inlet filters by pulling the filter through the wide slots at the front of the vents. Air inlet filters are located on the right and left front sides of the test set.

1.7 GRAPHICAL USER INTERFACE SOFTWARE (Optional)

Computer requirements:

- Pentium III or later
- Windows XP SP2 minimum operating system
- 1024 x 768 or higher graphics
- Serial Port – COMM1 thru COMM16 (if applicable)
- RS-232 Cable – DSub 9 Pin Male to DSub 9 Pin Female, thru pinout (if applicable)
- GPIB (IEEE 488) Controller (if applicable)
- 10/100 Ethernet LAN (if applicable)

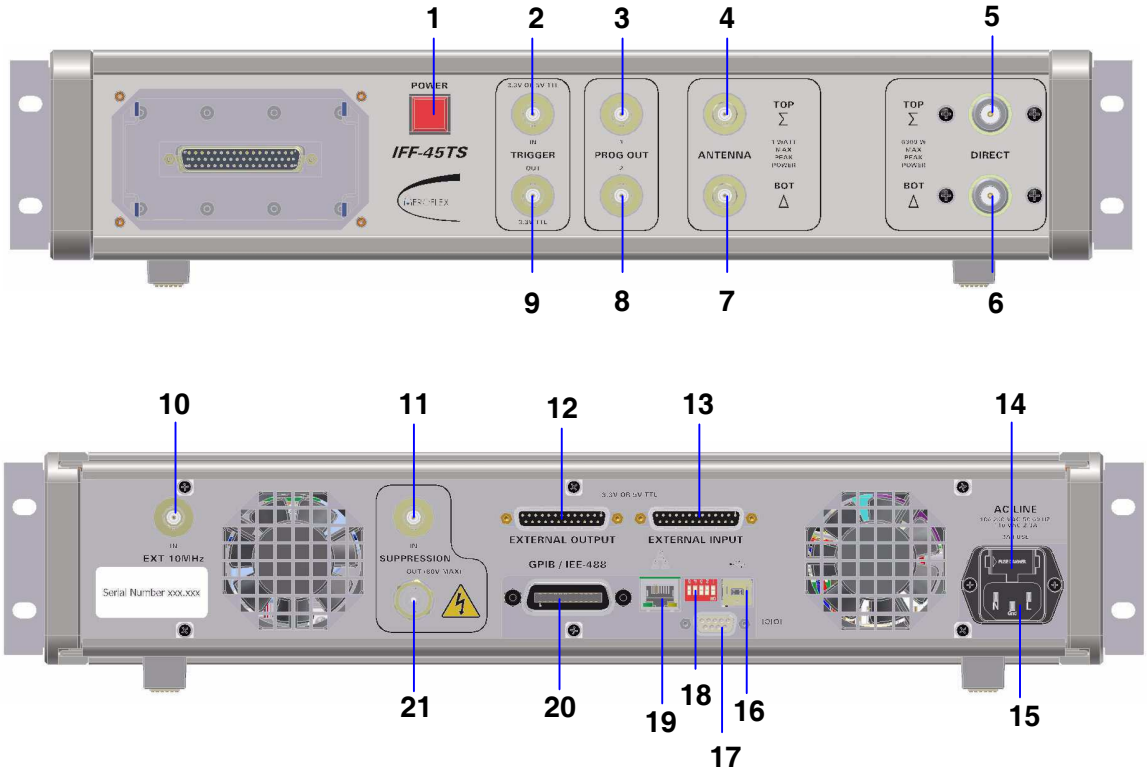
Installation:

If the installation does not start automatically after inserting the installation cd into the host computer, open the cd and double click ‘setup.exe’ to install the GUI. The default installation directory is: C:\Program Files\IFF-45TS. A program folder will be created under: Startup -> Programs -> IFF-45TS. And a shortcut icon will be created on the desktop.

Note:

If an earlier version is already installed, the IFF-45TS GUI may have to be uninstalled first. Consult the operating system help documentation regarding uninstalling programs.

2. CONTROLS, CONNECTORS AND INDICATORS



IFF-45TS Front and Rear Panels
Figure 1

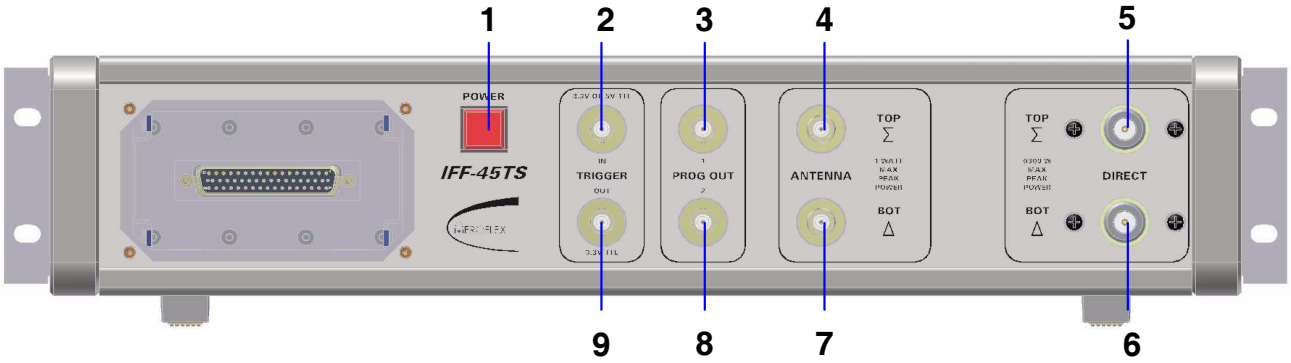
NUMERICAL LIST

1. POWER Switch
2. TRIGGER IN Connector
3. PROG OUT 1 Connector
4. ANTENNA TOP Connector
5. DIRECT TOP Connector
6. DIRECT BOTTOM Connector
7. ANTENNA BOTTOM Connector
8. PROG OUT 2 Conn
9. TRIGGER OUT Connector
10. EXT 10 MHz IN Connector
11. SUPPRESSION IN Connector
12. EXTERNAL OUTPUT Connector
13. EXTERNAL INPUT Connector
14. FUSES
15. AC IN Connector
16. USB Connector
17. RS-232 Connector
18. GPIB Address DIP Switches
19. ETHERNET Connector
20. GPIB/IEEE-488 Connector
21. SUPPRESSION OUT Connector

ALPHABETICAL LIST

15. AC IN Connector
7. ANTENNA BOTTOM Connector
4. ANTENNA TOP Connector
6. DIRECT BOTTOM Connector
5. DIRECT TOP Connector
19. ETHERNET Connector
10. EXT 10 MHz IN Connector
13. EXTERNAL INPUT Connector
12. EXTERNAL OUTPUT Connector
14. FUSES
18. GPIB Address DIP Switches
20. GPIB/IEEE-488 Connector
1. POWER Switch
3. PROG OUT 1 Connector
8. PROG OUT 2 Conn
17. RS-232 Connector
11. SUPPRESSION IN Connector
21. SUPPRESSION OUT Connector
2. TRIGGER IN Connector
9. TRIGGER OUT Connector
16. USB Connector

2.1 IFF-45TS FRONT PANEL



ITEM	DESCRIPTION

1. POWER Switch On or Off

   Connects (In) or disconnects (Out) external ac power to IFF-45TS.

   Switch illuminates Red when power is ON.

2. Trigger IN Connector.

   Trigger input, 3.3 V or 5 V TTL

3. PROG OUT 1 Connector

   Programmable video output, ±2.5 V DAC

4. ANTENNA TOP Connector ⚠

   CAUTION: MAXIMUM INPUT POWER MUST NOT EXCEED 1 W PEAK.

   RF Input / Output intended to be connected to an antenna for over the air communication with unit under test.

5. DIRECT TOP Connector ⚠

   CAUTION: MAXIMUM INPUT POWER MUST NOT EXCEED 4000 W PEAK OR 25 W AVERAGE.

   RF Input / Output intended to be connected directly the unit under test.

ITEM	DESCRIPTION

6. DIRECT BOTTOM Connector ⚠

   CAUTION: MAXIMUM INPUT POWER MUST NOT EXCEED 4000 W PEAK OR 25 W AVERAGE.

   RF Input / Output intended to be connected directly the unit under test.

7. ANTENNA BOTTOM Connector ⚠

   CAUTION: MAXIMUM INPUT POWER MUST NOT EXCEED 1 W PEAK.

   RF Input / Output intended to be connected to an antenna for over the air communication with unit under test.

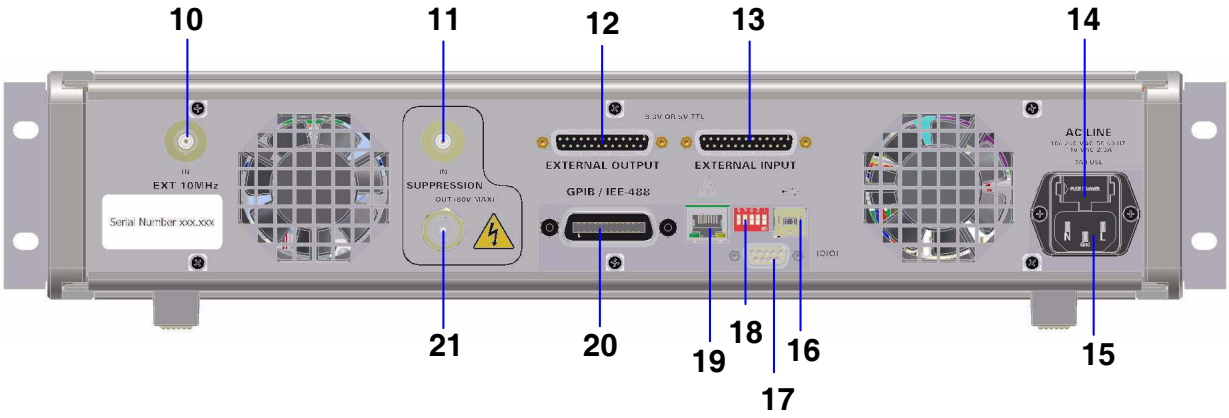
8. PROG OUT 2 Connector

   Programmable video output, ±2.5 V DAC.

9. TRIGGER OUT Connector

   Programmable Trigger Output, 3.3 V TTL .

2.2 IFF-45TS REAR PANEL



ITEM	DESCRIPTION
10.	EXT 10 MHz IN Connector External Time Reference Input. Requires +10 dBm level.
11.	SUPPRESSION IN Connector Suppresses replies to Interrogation. 0 to 80 V, Active High, 15 V typical threshold.
12.	EXTERNAL OUTPUT Connector LVTTL output.
13.	EXTERNAL INTPUT Connector LVTTL input.
14.	FUSES Uses Two 250 V, 3 A, 5x20 mm fast blo fuses. Aeroflex PN: 5106-0000-055.
15.	AC IN Connector ∿ Provides the input connection for 115 or 230 VAC single phase power.
16.	USB Connector Universal Serial Bus communication interface (NOT SUPPORTED at this time).

ITEM	DESCRIPTION
17.	RS-232 Connector Serial communication interface
18.	GPIB Address DIP Switches Provides a method to select the GPIB address and can also be set to enable a LAN and Serial baud rate reset function. GPIB Address: Valid addresses are from 1 to 30. The switches have binary weighting. The right most switch (S1) is the least significant bit. Setting this switch to the down (ON) position will yield an address of 1. Reset Function: The reset function will return the LAN settings and Serial baud rate to the default settings. This may be useful if the unit fails communicate after changing to a non standard LAN or serial baud rate. The reset function is enabled as follows: Turn off the unit and set all of the switches to the down (ON) position. Turn the unit on for 1 minute and turn the power off. Reset the GPIB address to the proper address.

ITEM	DESCRIPTION

19. ETHERNET Connector

    Ethernet communication interface.

20. GPIB/IEEE-488 Connector

    Provides a parallel interface for general purpose programmable instrumentation. Electrical characteristics conform to IEEE-488.1 specifications.

21. SUPPRESSION OUT Connector

    Provides a variable 12 to 80 V suppression pulse, width and position are also programmable.

3. SELF CALIBRATION

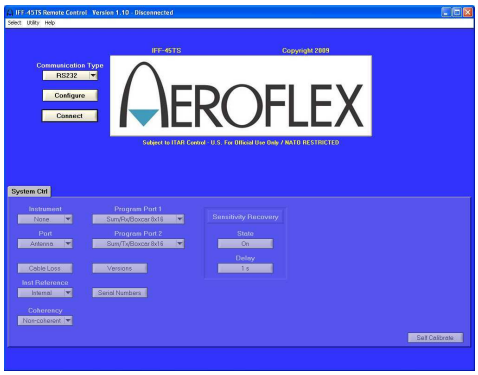
3.1 GENERAL

The IFF-45TS is equipped with a Self Calibration key for quick calibration of the IFF-45TS Test Set. An abbreviated Self Test is run at Power-Up. The full Self Test is initiated manually.

3.2. START-UP SELF CALIBRATION

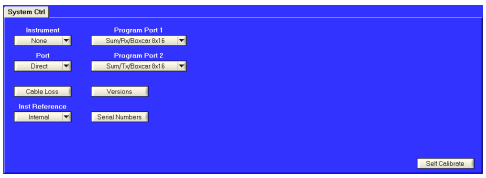
STEP	PROCEDURE

1. Press the POWER Key to power the Test Set On. Allow Test Set to warm up for 45 minutes.
2. To start the IFF-45TS GUI, double click the "IFF-45TS GUI" icon on the host computer desktop or select Start -> Programs -> IFF-45TS -> IFF-45TS GUI. The Startup Screen will appear with the lower part of the screen inactive.



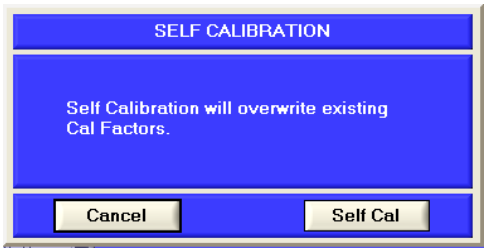
Select Connect to access the Self Calibration procedure.

3. Select Self Calibrate to initiate the Self Calibration process. A comfirmation popup will appear.

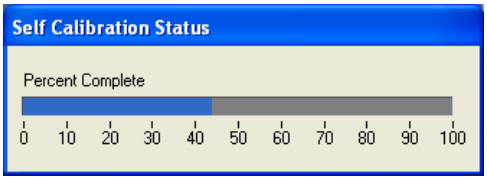


STEP	PROCEDURE

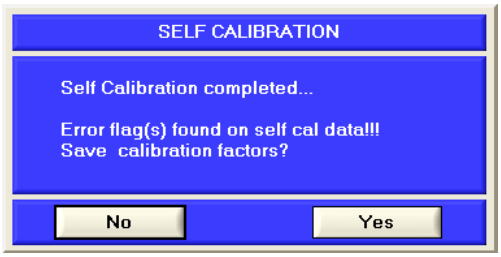
4. Select Self Cal to display the Self Calibration window.



5. A window will display the % of the Self Calibration currently completed. The entire Self Calibration procedure will take approximately 2 minutes.

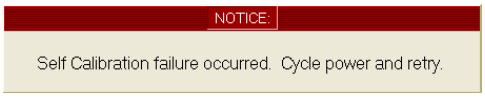


6. When the Self Calibration procedure is complete, a Pass or Error window will appear.



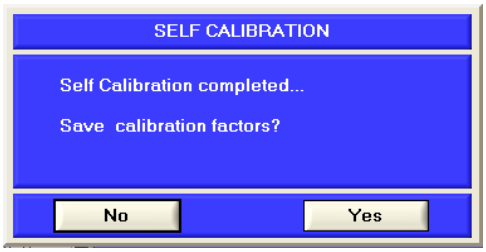
STEP PROCEDURE

A popup window will be displayed if an error(s) is found on the calibration factors.



The popup will be displayed momentarily if the Self Calibration process is unable to complete.

7. If a Pass window appears you will be prompted to save the data.



4. GENERAL OPERATING PROCEDURE

4.1 GENERAL

This section contains operating instructions for the IFF-45TS.

The IFF-45TS has three selectable instruments; Interrogator, Transponder and TACAN.

The IFF-45TS is controlled by PC based Windows GUI (General User Interface) and Direct Remote Control Commands.

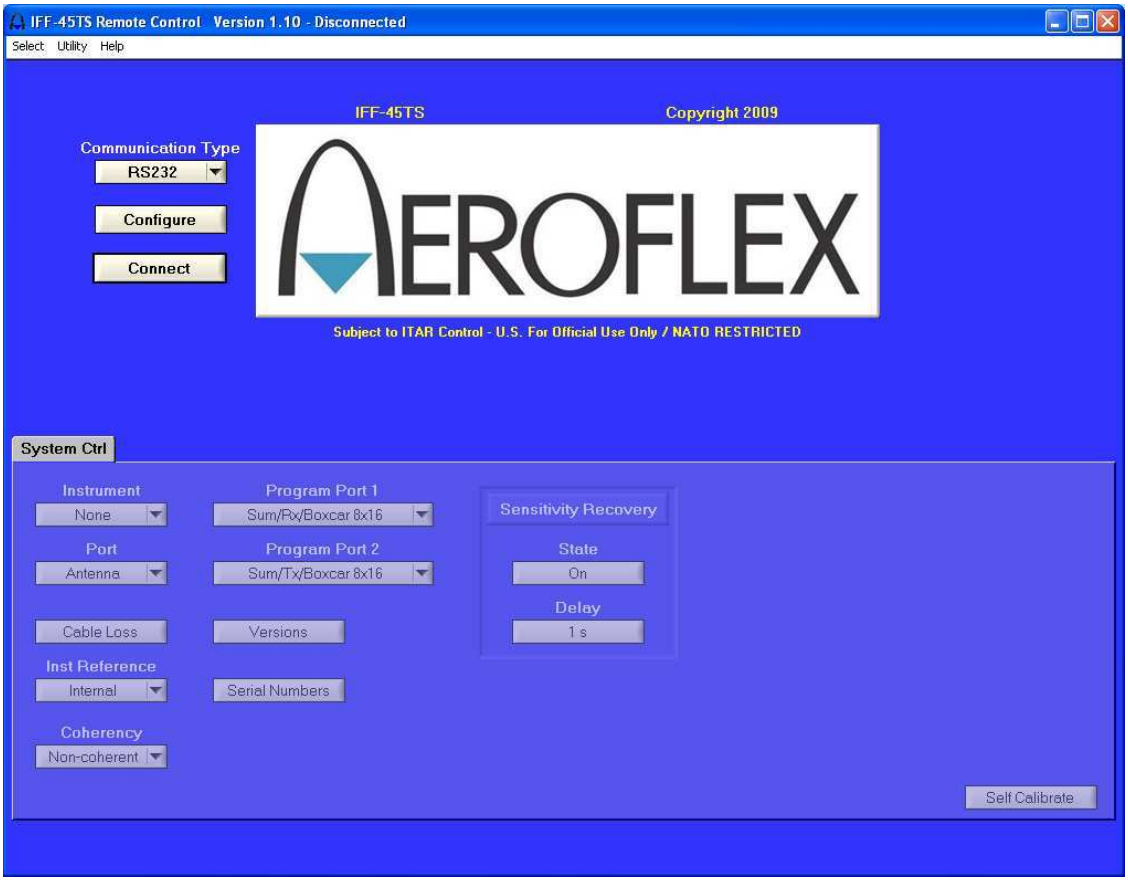
NOTE: After cycling power, wait at least 30 seconds before establishing communication to ensure the instrument has finished booting up.

4.1.2 Startup Screen Description

Upon executing the IFF-45TS GUI application the Startup Screen is displayed (1-2-4, Figure 1).

The Startup Screen allows the selection of communication type, configuration of the selected communication type and initiation of PC connection to IFF-45TS. The System Controls tab provides Instrument selection, IFF-45TS hardware configuration, test signal routing, software version and unit serial number report.

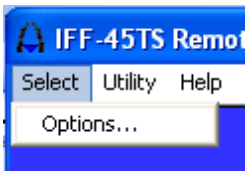
Move mouse to move cursor for field selection. *Left Click* = select.



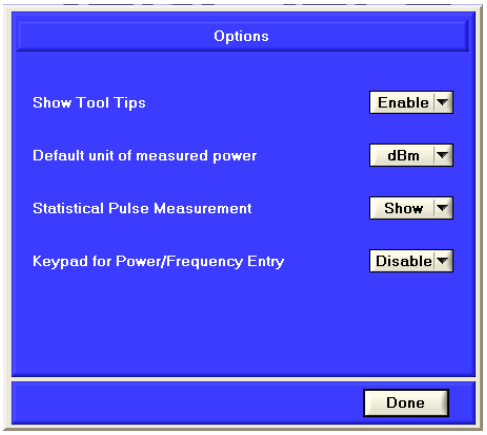
Startup Screen
Figure 1

4.1.3 Startup Screen Operation

Select window displays the Options field.



Select Options to display Options window.



The options window allows the Tool Tips function to be enabled or disabled and selection of the Default Unit of Measured Power either Watts or dBm. When Tool tips is enabled and the cursor is positioned over a field of interest, a small box of descriptive text is displayed automatically.

Show Tool Tips: Selections are Enable or Disable.

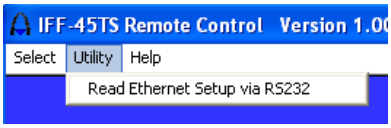
Default unit of measured power: Selections are Watts or dBm.

Statistical Pulse Measurement: Selections are Hide or Show.

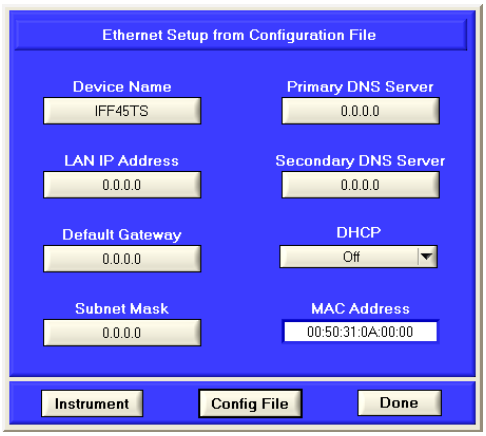
Keypad for Power/Frequency Entry: Selections are Enable or Disable.

Select *Done* to close window when finished.

Select Utility to open the Ethernet Setup window.

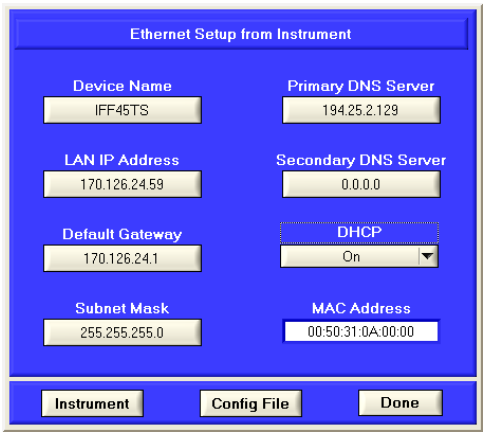


The Ethernet Setup window is accessible only when connected via RS-232.



The Ethernet setup is initially read from the configuration file. Selecting *Config File* forces the setup to be read from the configuration file.

Selecting *Instrument* reads the setup from the IFF-45TS.



The following information can be entered manually:

Device Name: Default. IFF-45TS limit 255 Characters.

Lan IP Address: No IP address entry range restriction is placed on this field.
Example: 192.168.1.101.

Default Gateway: No data entry range restriction is placed on this field.
Example: 192.168.1.100.

Subnet Mask: No data entry range restriction is placed on this field.
Example: 255.255.255.0.

Primary DNS Server: Primary DNS server IP address.

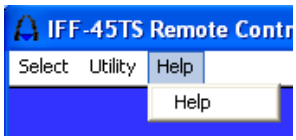
Second DNS Server: Secondary DNS server IP address.

DHCP Setting On: DHCP client (IFF-45TS) requests dynamic allocation of IP address.

DHCP Setting Off: Manually entered IP address used (LAN IP Address).

Select *Done* to close the window and save the setup to the configuration file.

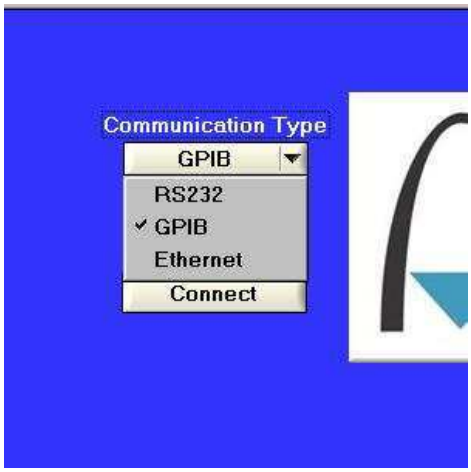
Help opens a PDF document containing general instrument help data.



Close Adobe Reader when finished.

4.1.4 Communication Type

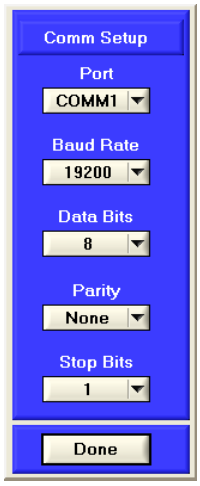
Communication Type selections are RS-232, GPIB and Ethernet.



After selecting *Communication Type* the selected interface is configured by selecting Configure.

RS-232 Comm Setup

The Comm Setup window displays the options for RS-232.



Port: Selections are COMM 1 to COMM 16

Baud Rate: Selections are 9600, 19200, 57600, 115200.

Data Bits: Selections are 5,6,7,8.

Parity: Selections are None, Odd, Even.

Stop Bits: Selections are 1, 2.

Select *Done* to close window when finished.

GPIB Comm Setup

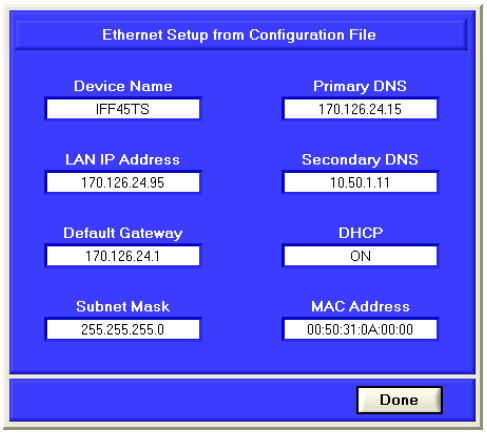
The Comm Setup window displays the options for GPIB.

GPIB Addr: Selections are 0 to 31.

Select *Done* to close window when finished.

Ethernet Communications Setup

The Comm Setup window displays the Ethernet setup from the configuration file.



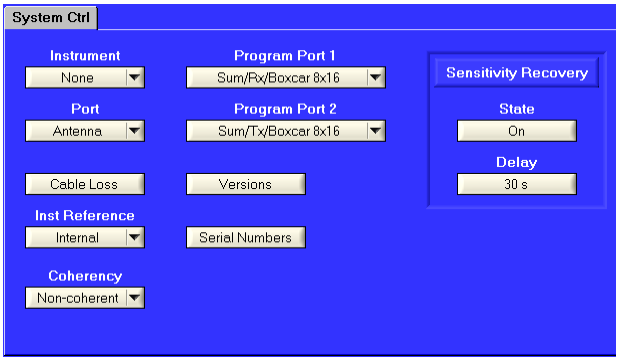
Select *Done* to close window when finished.

After selecting and configuring the communication type, select Connect to initiate connection between Host PC and IFF-45TS.

NOTE: When connecting to the IFF-45TS the lower portion of the GUI is accessible.

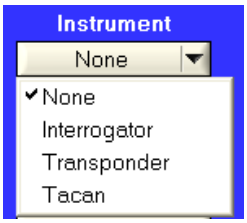
4.1.5 System Control

The System Control tab displays the fields Instrument, Port, Cable Loss, Inst Reference, Setup Bottom, Program Port 1, Program Port 2, Versions and Serial Numbers.



Instrument

The Instrument field allows the selection of the IFF-45TS operational modes.



Selections are:

None: Displays startup screen.

Interrogator: Initializes and displays Interrogator test screen.

Transponder: Initializes and displays Transponder test screen.

TACAN: Initializes and displays TACAN test screen.

Port

The Port field provides the selection of RF Port to be used for RF I/O.

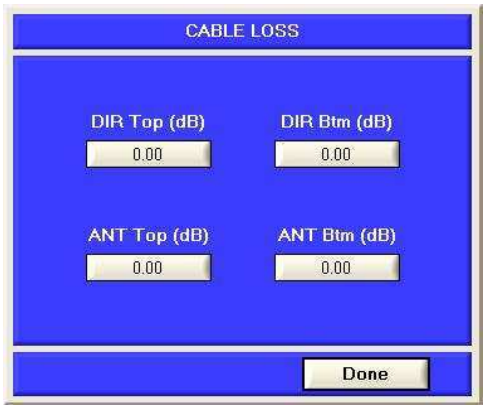
Selections are:

Direct: Direct connect RF I/O ports.

Antenna: Antenna RF I/ O ports.

Cable Loss

The Cable Loss field allows the entry of RF coax cable loss parameters in dB's for direct connect and antenna ports.



Selections are:

DIR Top (dB): -50.00 to 50.00

DIR Bot (dB): -50.00 to 50.00

ANT Top (dB): -50.00 to 50.00

ANT Bot (dB): -50.00 to 50.00

Select *Done* to close window when finished.

Inst Reference

The Inst (Instrument) Reference field provides selection of the 10 MHz reference signal source.

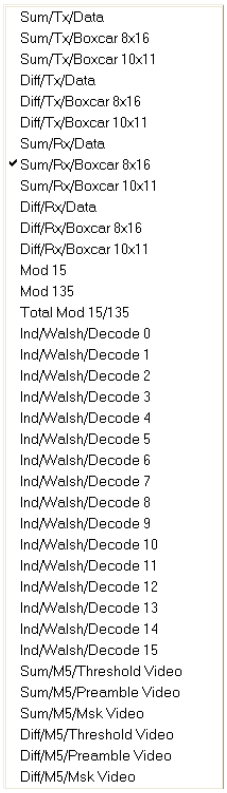
Selections are:

External: External 10 MHz source.

Internal: Internal 10 MHz source.

Program Port 1(2)

The Program Port 1(2) fields provide routing of various signals to front panel mounted BNC connectors labeled Prog Out 1(2)



Selections are:

Sum/TX/Data:

Raw sum channel transmit IF data.

Sum/TX/Boxcar 8X16:

The pulse envelope of the signal transmitted on the sum channel, generated by an 8 tap, followed by a 16 tap, two stage boxcar filter.

Sum/TX/Boxcar 10X11:

The pulse envelope of the signal transmitted on the sum channel, generated by a 10 tap, followed by an 11 tap, two stage boxcar filter.

Diff/TX/Data:

Raw diff channel transmit IF data.

Diff/TX/Boxcar 8X16:

The pulse envelope of the signal transmitted on the diff channel, generated by an 8 tap, followed by a 16 tap, two stage boxcar filter.

Diff/TX/Boxcar 10X11:

The pulse envelope of the signal transmitted on the diff channel, generated by a 10 tap, followed by an 11 tap, two stage boxcar filter.

Sum/Rx/Data:

Raw sum channel receive IF data.

Sum/RX/Boxcar 8X16:

The pulse envelope of the signal received on the sum channel, generated by an 8 tap, followed by a 16 tap, two stage boxcar filter.

Sum/RX/Boxcar 10X11:

The pulse envelope of the signal received on the sum channel, generated by a 10 tap, followed by an 11 tap, two stage boxcar filter.

Diff/Rx/Data:

Raw diff channel receive IF data.

Diff/RX/Boxcar 8X16:

The pulse envelope of the signal received on the diff channel, generated by an 8 tap, followed by a 16 tap, two stage boxcar filter.

Diff/RX/Boxcar 10X11:

The pulse envelope of the signal received on the diff channel, generated by a 10 tap, followed by an 11 tap, two stage boxcar filter.

Mod 15:

Video of the 15 Hz modulation.

Mod 135:

Video of the 135 Hz modulation.

Total Mod 15/135:

Combined video of the 15 Hz and 135 Hz modulations.

Ind/Walsh/Decode 0:

M5 walsh code 0 decode video.

Ind/Walsh/Decode 1:

M5 walsh code 1 decode video.

Ind/Walsh/Decode 2:

M5 walsh code 2 decode video.

Ind/Walsh/Decode 3:

M5 walsh code 3 decode video.

Ind/Walsh/Decode 4:

M5 walsh code 4 decode video.

Ind/Walsh/Decode 5:

M5 walsh code 5 decode video.

Ind/Walsh/Decode 6:

M5 walsh code 6 decode video.

Ind/Walsh/Decode 7:

M5 walsh code 7 decode video.

Ind/Walsh/Decode 8:

M5 walsh code 8 decode video.

Ind/Walsh/Decode 9:

M5 walsh code 9 decode video.

Ind/Walsh/Decode 10:

M5 walsh code 10 decode video.

Ind/Walsh/Decode 11:

M5 walsh code 11 decode video.

Ind/Walsh/Decode 12:

M5 walsh code 12 decode video.

Ind/Walsh/Decode 13:

M5 walsh code 13 decode video.

Ind/Walsh/Decode 14:

M5 walsh code 14 decode video.

Ind/Walsh/Decode 15:

M5 walsh code 53 decode video.

Sum/M5/Threshold_Video:

Sum channel M5 preamble detection threshold. The preamble video must exceed this threshold for detection.

Sum/M5/Preamble_Video:

Sum channel M5 preamble detection confidence.

Sum/M5/MSK_Video:

Sum channel M5 MSK video. Positive values represent F-Space and negative values represent F-Mark.

Diff/M5/Threshold_Video:

Diff channel M5 preamble detection threshold. The preamble video must exceed this threshold for detection.

Diff/M5/Preamble_Video:

Diff channel M5 preamble detection confidence.

Diff/M5/MSK_Video:

Diff channel M5 MSK video. Positive values represent F-Space and negative values represent F-Mark.

NOTE: A filter with a rectangle-shaped impulse response is called a boxcar or a sliding average filter. It is a simple *FIR* filter each tap of the filter equally weighted.

Versions

Select the versions field to display the version window. The versions window displays IFF-45TS software version numbers.

Versions displayed are:

Host: This software in Flash Memory, controls the user interface and communications between the various modules that comprise the IFF-45TS.

DSP: (Digital Signal Processor) This software in flash memory, controls the measurement functions of the IFF-45TS.

FPGA (Field Programmable Gate Array): This software in flash memory, controls the real-time processing of interrogations/replies and signal generation.

RF FPGA: This software in flash memory, processes commands from the DSP to control the RF hardware.

REAR I/O: This software that controls the signal routing for the rear I/O including the RS-232, GPIB and Ether Net interfaces.

RX GEN Module: Receive generator module hardware version.

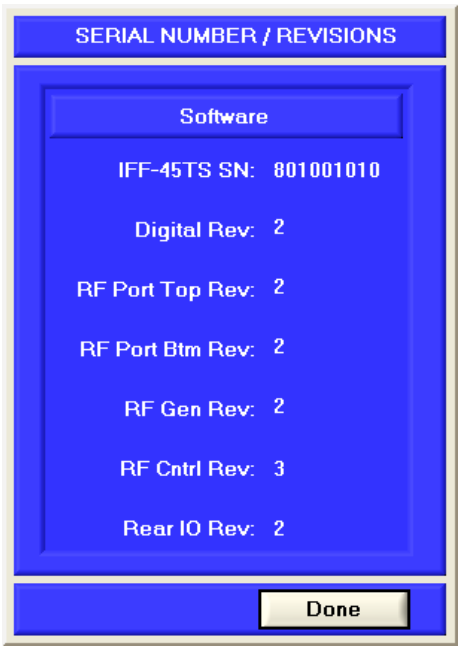
Top Port Module: Top port module hardware version.

Btm Port Module: Bottom port module hardware version.

RF Ctrl Module: RF controller module hardware version.

Serial Numbers

The Serial Numbers field displays IFF-45TS serial number and module revisions.



Numbers displayed are:

IFF-45TS SN: Test serial number

Digital Rev: Digital Board revision number

RF Port Top Rev: RF Port Top Module revision number.

RF Port Bottom Rev: RF Port Btm Module revision number.

RF Gen Rev: RF Generate Module revision number.

RF Cntrl Rev: RF Control Module revision number.

Rear I/ORev: Rear Input/Output Board revision number.

Coherency

The Coherency field controls the relative phase of the internal waveform generators.

Selections are:

Non-coherent: Internal waveform generator are unsynchronized.

Coherent: Internal waveform generators are in phase.

Sensitivity Recovery Group

The Sensitivity Recovery Group provides control functions for the instrument's receiver recovery state and delay.

State

The State field turns the Sensitivity Recover to either On or Off..

Selections are:

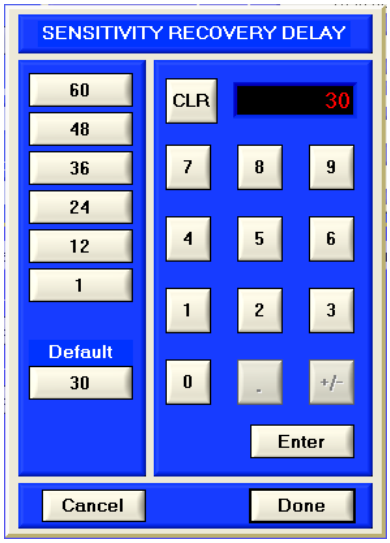
On: Sensitivity Recovery is active.

Off: Sensitivity Recovery is inactive.

Delay

The Delay field sets the time interval between sensitivity adjustments. The unit is in seconds.

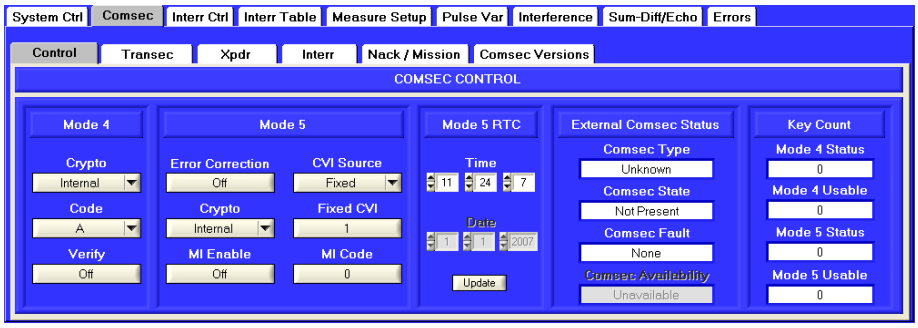
Selecting the Delay field will open the Sensitivity Recovery Delay entry window. Range is from 1 to 60 seconds.



4.2 COMSEC CONTROL

The COMSEC Control tab is common to both transponder and interrogator instruments (1-2-4, Figure 2).

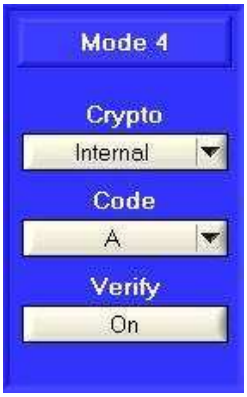
The COMSEC Control Tab displays the groups Mode 4, Mode 5, Mode 5 RTC and COMSEC Status.



COMSEC Control Tab
Figure 2

4.2.1 Mode 4 Group

The Mode 4 Group provides control functions for internal or external Mode 4 crypto.



Crypto

The Crypto field provides selection of the either an external Mode 4 crypto or internal Mode 4 crypto simulator.

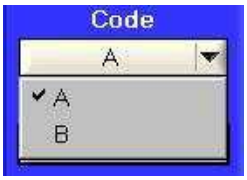
Selections are:

External: Utilize external crypto device.

Internal: Utilize internal crypto simulator.

Code

The Code field provides selection of Mode 4 Code A or Code B.



When external crypto is selected, the code selection refers to the A or B codes relevant to the current fill. When internal crypto is selected, the code selection refers to the Mode 4 A or B test words, as defined in NATO STANAG 4193 part III.

Selections are:

A: Select Code A.

B: Select Code B.

NOTE: The code does not refer to test words A and B when the internal crypto is in use. This option is only used for external crypto operation.

Verify

The Verify feature is only relevant to external crypto operation.

The Verify field allows verify bit 1 to be set in the external Mode 4 crypto.

When in transponder test mode, the external KIR-1C or KIV-6 crypto Mode 4 challenges will have verify bit 1 set. When in interrogator test mode, the external KIT-1C or KIV-6 crypto will only validate Mode 4 challenges with verify bit 1 set.

NOTE: When a KIV-77 is attached, setting the Mode 4 Verify On also configure the KIV-77 to operate in Mode 5 Flight Line Test Mode.

Selections are:

On: Set Verify Bit 1

Off: Clear Verify Bit 1

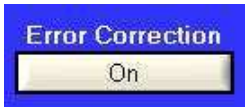
4.2.2 Mode 5 Group

The Mode 5 Group provides control functions for internal or external Mode 5 crypto.

Functions are Error Correction, Crypto, CVI Source, Fixed CVI, MI Flight and MI Code.

Error Correction

The Error correction field turns the EDAC "Error Detection and Correction" control On or Off.



Selections are:

Off: IFF-45TS does not perform EDAC on Mode 5 data

On: IFF-45TS performs EDAC on Mode 5 data.

Crypto

The Crypto field allows the selection of either an external Mode 5 crypto or internal Mode 5 crypto simulator.

Selections are:

External: Utilize external crypto device

Internal: Utilize internal crypto simulator

NOTE: The current external interface supports crypto devices conforming to AIMS 04-900A Option B.

CVI Source

The CVI Source field provides the selection of two Modes of operation.

RTC is "Real-Time-Clock" Mode. The CVI (COMSEC Validity Interval) is derived from the time-of-day in this mode. The other Mode is "Fixed", the CVI is fixed at a value set by the user in the Mode 5 CVI field.

Selections are:

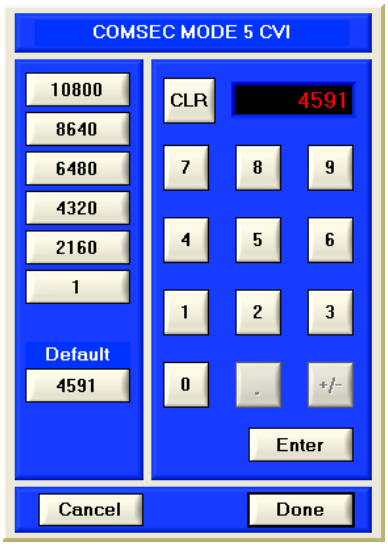
Fixed: Selects Fixed Clock

RTC: Selects Realtime Clock

Fixed CVI

The Fixed CVI field displays the selected CVI. Selecting the field will open the COMSEC Mode 5 CVI data entry window.

Selecting the field will open the COMSEC Mode 5 CVI data entry window.

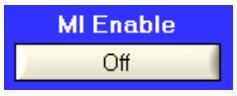


CVI range is 1 to 10800.

Select *Done* when finished to close window.

MI Enable

The MI Enable field allows the COMSEC Mode 5 Flight Line Test to be enabled. When active, the MI field flags the COMSEC to use an alternative cryptographic process to be applied to the data.



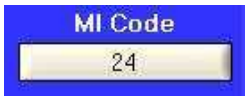
Selections are:

Off: COMSEC Mode 5 Flight Line test disabled.

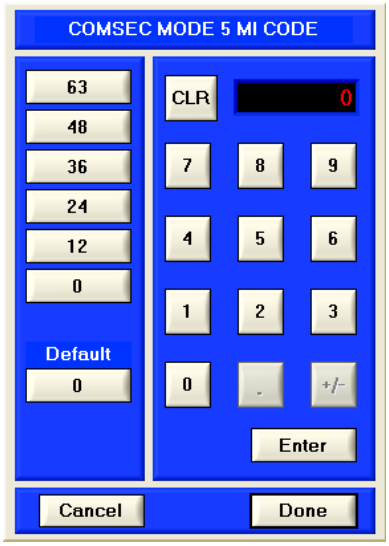
On: COMSEC Mode 5 Flight Line test enabled.

MI Code

The MI Code displays the selected Mode 5 COMSEC Flight Line Test Code.



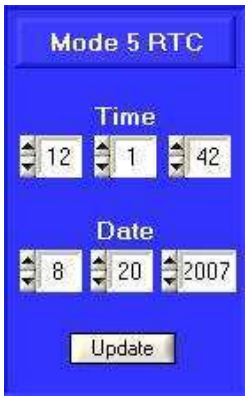
The MI Code data entry range is 0 to 63 and is entered via the Mode 5 MI Code Data Entry Window.



Select *Done* when finished to close window.

4.2.3 Mode 5 RTC Group

The Mode 5 RTC Group provides time and date entry for the IFF-45TS Real Time Clock. The RTC is provided to the Mode 5 crypto for synchronization of the COMSEC Validity Interval (CVI).



NOTE: Select *Update* to read the current IFF-45TS internal clock

Time

The Time field allows Zulu time to be set for the IFF-45TS Real Time Clock (RTC).

The Real Time clock is provided to either the external Mode 5 crypto or the internal crypto simulator. Time is entered in 24 Hr format. Time is entered in the format HH:MM:SS

Date

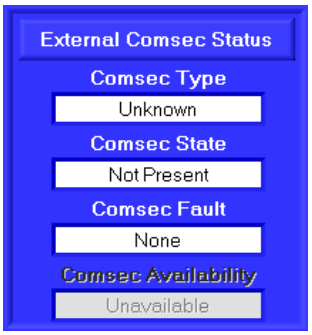
The Date field allows date to be set for the IFF-45TS Real Time Clock (RTC).

The Real Time Clock is provided to either the external Mode 5 crypto or the internal crypto simulator. Date is entered in the format MM:DD:YYYY

NOTE: Date is only available when CVI Source is set to RTC.

4.2.4 COMSEC Status Group

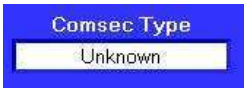
The COMSEC Status Group displays information concerning Crypto.



Information fields are Type, Serviceability, Connectivity and Fill Status.

COMSEC Type

The COMSEC Type field displays the crypto type connected to the IFF-45TS.



Indications are:

Unknown: Unknown or no crypto attached

KIV-77: KIV-77 crypto attached

KIT-1C: KIT-1C crypto attached

KIR-1C: KIR-1C crypto attached

COMSEC State

The COMSEC State field displays the crypto key status.

Indications are:

Not Present: Crypto not present

Present: Crypto present, but not available for Mode 4/5 and No Error state exists

Mode 4 Available: Mode 4 operation available

Mode 5 Available: Mode 5 operation available

Fully Operational: Crypto Fully Operational

Error: Crypto in Error condition

COMSEC Fault

The COMSEC Fault field displays the crypto Fault status.

Indications are:

None: No error condition exists

Tamper: Crypto detected Tamper condition

Maintenance: Crypto requires Maintenance

Engine: Fault with Crypto Engine

Power: Fault with internal crypto Power regulation

IBIT: Crypto Failed Internal BIT

Time: Crypto Time cannot be set

Real Time Clock: Crypto Real Time Clock failure

Alarm: Alarm condition

Zeroized: Crypto Zeroized

QKEK: Crypto missing QKEK key

Joseki: Crypto missing Joseki key

Mode 5 Keys: Crypto does not contain Mode 5 keys

Mode 4 Keys: Crypto does not contain Mode 4 keys

NACK: Crypto responded to a command with a NACK

Battery: Crypto has low Battery

Host Crypto: Host to Crypto communication problem

Crypto Host: Crypto to Host communication problem

COMSEC Availability

The COMSEC Availability field displays the crypto connectivity status. This field is valid only for COMSEC Type KIV-77.

Indications are:

Unavailable: Crypto Offline, Unavailable for operations

Hold Off: Crypto Offline due to emulator Hold Off (KIV-77 emulator only)

Zeroizing: Crypto Offline due to Zeroizing keys

Alarm: Crypto Offline due to Alarm condition

IBIT: Crypto Offline due to performing IBIT

KEYS: Crypto Offline due to processing Keys

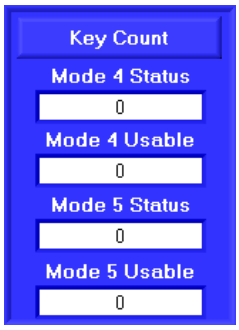
FILL: Crypto Offline due to key Filling

Error: Crypto Offline due to Error condition

Online: Crypto Online and available for operation

4.2.5 Key Count Group

The Key Count Group displays the information regarding COMSEC keys.



Information fields are Mode 4 Status, Mode 4 Usable, Mode 5 Status, and Mode 5 Usable.

Mode 4 Status

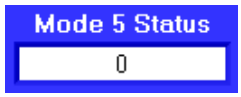
The Mode 4 Status field displays the number of Mode 4 keys loaded.

Mode 4 Usable

The Mode 4 Usable field displays the number of Mode 4 keys loaded that are usable.

Mode 5 Status

The Mode 5 Status field displays the number of Mode 5 keys loaded.



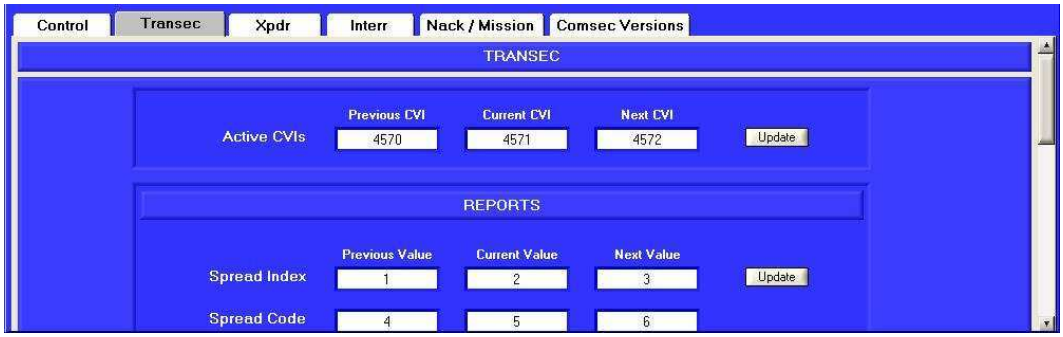
Mode 5 Usable

The Mode 5 Usable field displays the number of Mode 5 keys loaded that are usable.

4.3 TRANSEC

The TRANSEC tab is common to both transponder and interrogator instruments (1-2-4, Figure 3).

The TRANSEC Tab displays the group status of CVI, Reports and Interrogators.



TRANSEC Tab
Figure 3

4.3.1 Active CVI Group

The Active CVI's Group window displays the three active CVI's (COMSEC Validity Interval), as reported by the external crypto or internal crypto simulator.

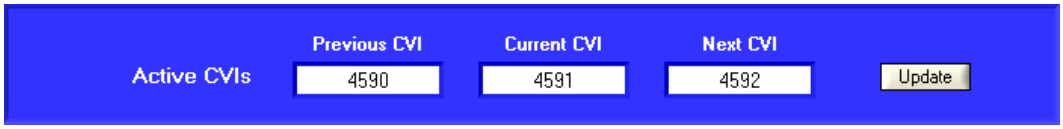
The fields displayed are:

Previous CVI: The CVI number previous to the current CVI.

Current CVI: The Current CVI

Next CVI: The CVI number after the current CVI.

Update: Updates CVI data fields.



4.3.2 Reports Group

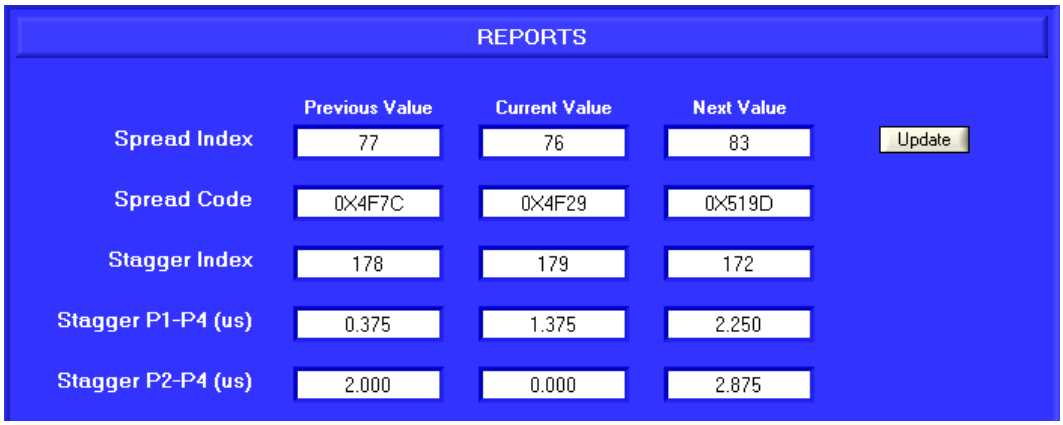
The Reports Group displays the crypto Report TRANSEC data relative to the Previous, Current and Next CVI's window (1-2-4, Figure 4).

When the transponder instrument is selected, the Reports Group relates to the Spread Index, Spread Code, Stagger Index and Preamble Stagger's applied to the received UUT Mode 5 transponder replies.

When the Interrogator instrument is selected, the Reports Group relates to the Spread Index, Spread Code, Stagger Index and Preamble Stagger's applied to the IFF-45TS simulated Mode 5 transponder replies.

NOTE: The update field will capture the TRANSEC parameters, relative to the CVI active at that instant.

NOTE: The Spread Code and Stagger parameters are read from a table internal to the IFF-45TS and referenced by the Spread and Stagger Index's.



Reports Group
Figure 4

Spread Index

The Spread Index fields display the spreading index's provided by the external crypto or internal crypto simulator, relative to the Previous, Current and Next CVI's.

Spread Code

The Spread Code fields display the spreading Code's provided by the external crypto or internal crypto simulator, relative to the Previous, Current and Next CVI's.

Stagger Index

The Stagger Index fields display the preamble stagger index's provided by the external crypto or internal crypto simulator, relative to the Previous, Current and Next CVI's.

Stagger P1-P4 (us)

The Stagger P1-P4 (us) fields display the preamble P1-P4 stagger timing, relative to the Previous, Current and Next CVI's.

Stagger P2-P4 (us)

The Stagger P2-P4 (us) fields display the preamble P2-P4 stagger timing, relative to the Previous, Current and Next CVI's.

Stagger P3-P4 (us)

The Stagger P3-P4 (us) fields display the preamble P3-P4 stagger timing, relative to the Previous, Current and Next CVI's.

4.3.3 Interrogators Group

The Interrogators Group window displays the Crypto Interrogator TRANSEC data relative to the Previous, Current and Next CVI's (1-2-4, Figure 5).

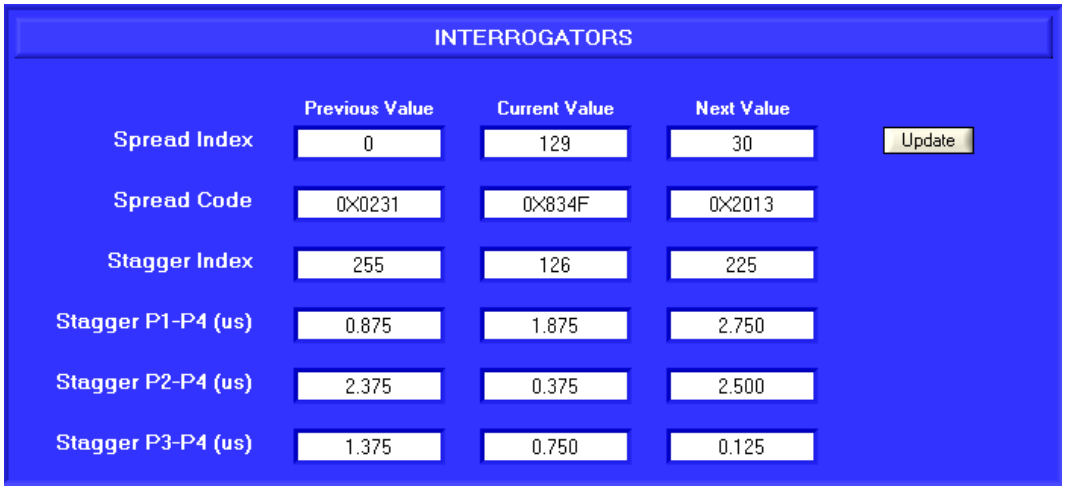
When the Transponder instrument is selected, the Interrogators Group relates to the Spread Index, Spread Code, Stagger Index and Preamble Stagger's applied to the IFF-45TS Mode 5 Interrogations.

When the Interrogator instrument is selected, the Reports Group relate to the Spread Index, Spread Code, Stagger Index and Preamble Stagger's applied to the received UUT Interrogator Mode 5 interrogations to provide access to the encrypted data.

Refer to 4.4.2 for details of the Spread Code, Stagger Index and Preamble Stagger parameters.

NOTE: The update field captures the TRANSEC parameters, relative to the CVI active at that instant.

NOTE: The Spread Code and Stagger parameters are read from a table internal to the IFF-45TS and referenced by the Spread and Stagger Index.

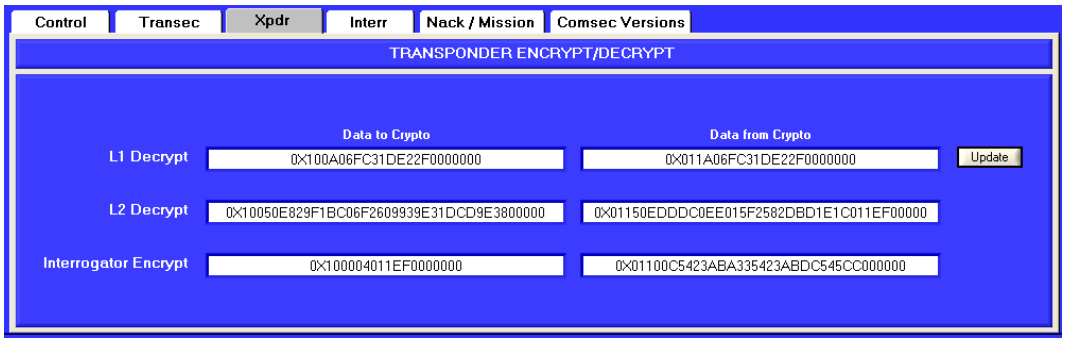


Interrogators Group
Figure 5

4.4 XPDR

The Xpdr Tab displays the latest Transponder Instrument Encrypt/Decrypt Data Packets to and from the IFF-45TS crypto (1-2-4, Figure 6).

Refer to AIMS 04-900A for details of these Data Packets.



Xpdr Tab
Figure 6

4.5 INTERR

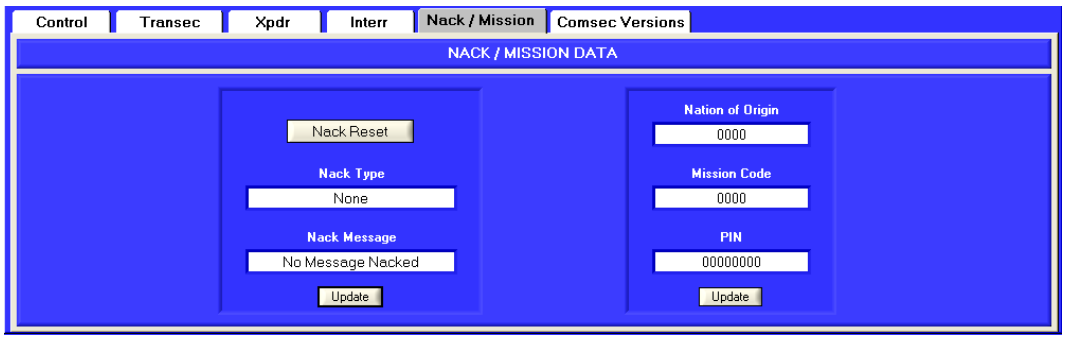
The Interr Tab displays the latest Interrogator Instrument Encrypt/Decrypt Data Packets to and from the IFF-45TS crypto (1-2-4, Figure 7).

Refer to AIMS 04-900A for details of these Data Packets.

Interrogator Tab
Figure 7

4.6 NACK/MISSION/DATA

The NACK/Mission Tab displays the Nack and Mission Data groups (1-2-4, Figure 8).



NACK/Mission Tab
Figure 8

4.6.1 Nack Group

The Nack Group displays information regarding any communication problems with the crypto.

The crypto issues a NACK (Negative Acknowledgement), when there is a problem processing a message from the IFF-45TS, (simulating a transponder or interrogator).

Nack Reset

The Nack reset field clears the Nack Group fields.

Nack Type

The Nack Type field displays Nack Types.

Nack Types are:

None: No Nack has occurred.

Unavailable: The crypto has responded to a message with an “unavailable” Nack.

Illegal: The crypto has responded to a message with an “illegal” Nack.

Busy: The crypto has responded to a message with a “busy” Nack.

Message: The crypto has responded to a message with a “Message” Nack.

CRC: The crypto has responded to a message with a “CRC” Nack.

Nack Message

The Nack Message field displays the message sent to the crypto that resulted in the crypto issuing a Nack.

Messages displayed are:

PG Interrogation Encrypt

PG Report Encryp

HD Interrogation Encrypt

HD Report Encrypt

PG Interrogation Decrypt

PG Report Decrypt

HD Interrogation Decrypt

HD Report Decrypt

ID Reply Encrypt

Data Reply Encrypt

Reply Decrypt

Generate TRANSEC

Key Rollover

Set Time of Day

Set Operating Mode

Zeroize

Run IBIT

Set Cryptonet Operation

Reset

Get Time of Day

Get Mission Data

Get Key and Fill Status

Get IBIT Results

Get Versions

Get Crypto Status

Unknown Message

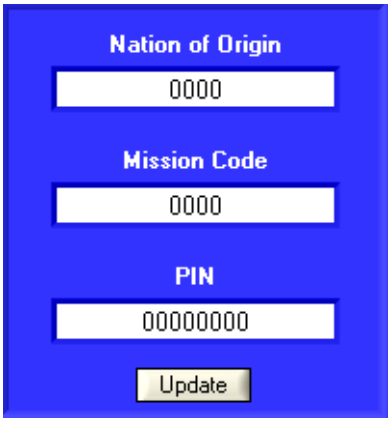
No Message Nacked

Refer to AIMS 04-900A for details of these messages.

NOTE: The update field, if selected, will refresh the Nack group fields with the current crypto Nack data.

4.6.2 Mission Group

The Mission Group displays the Mode 5 Mission data stored in the crypto, after keying.



The Transponder utilizes this information in Mode 5 Formats 4, 7, 16, 19, 20, 21, 22 and 23. The Mission Group displays Nation of Origin, Mission Code and PIN.

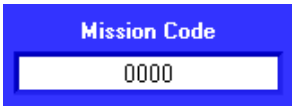
NOTE: The IFF-45TS provides reply table entries for mission data and does not utilize the crypto stored mission data. This allows multiple targets with individual mission data to be simulated.

Nation of Origin

The Nation of Origin field displays the Country Code for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000 or 0011. Range is 00 to 1F, hex.

Mission Code

The Mission field displays the Mission Code for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000 or 0011. Range is 00 to 3, Hex.



PIN

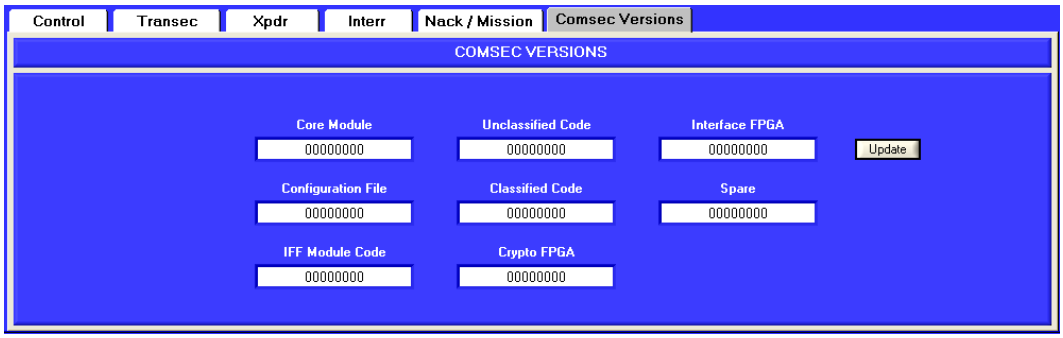
The PIN field displays the Platform Identification Number for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000, 0011 or 0100. Range is 00 to 0FFF, Hex.

NOTE: The update field updates the Mission Group fields with the Mission Data stored in the external Mode 5 crypto.

4.7 COMSEC VERSIONS

The COMSEC Versions Tab displays the software versions obtained from the external Mode 5 crypto (1-2-4, Figure 9).

NOTE: The update field updates the COMSEC Versions fields.

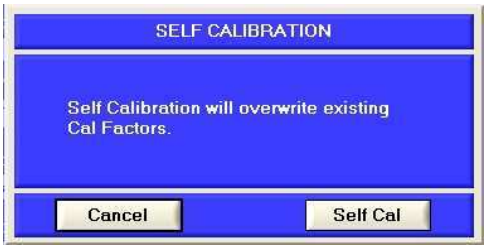


COMSEC Versions Tab
Figure 9

4.7.1 Self Calibrate

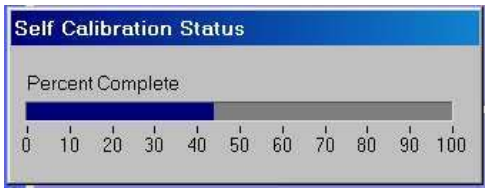
The Self Calibrate field provides access to the Self Calibration window. The Self Calibrate button is located on the System Control Tab (1-2-4.1.5)

Select the Self Calibrate field to display the Self Calibration window.

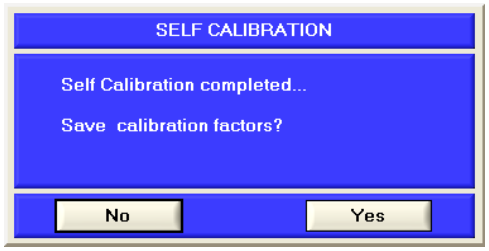


The selection of Self Cal initiates Self Calibration Sequence.

The Self Calibration Status bar is displayed, showing progress.



When the Self Calibration is completed, the Self Calibration Completion window is displayed to allow the user to save the calibration factors in memory.



4.8 INTERROGATOR INSTRUMENT

In this mode of operation the IFF-45TS emulates a transponder. When the configured interrogation is received the unit responds with the configured data.

The unit is capable of generating 12 different responses (targets). These responses may be to the same type of interrogation (multi-target) or to different interrogations.

4.8.1 Interrogator Test Screen General Description

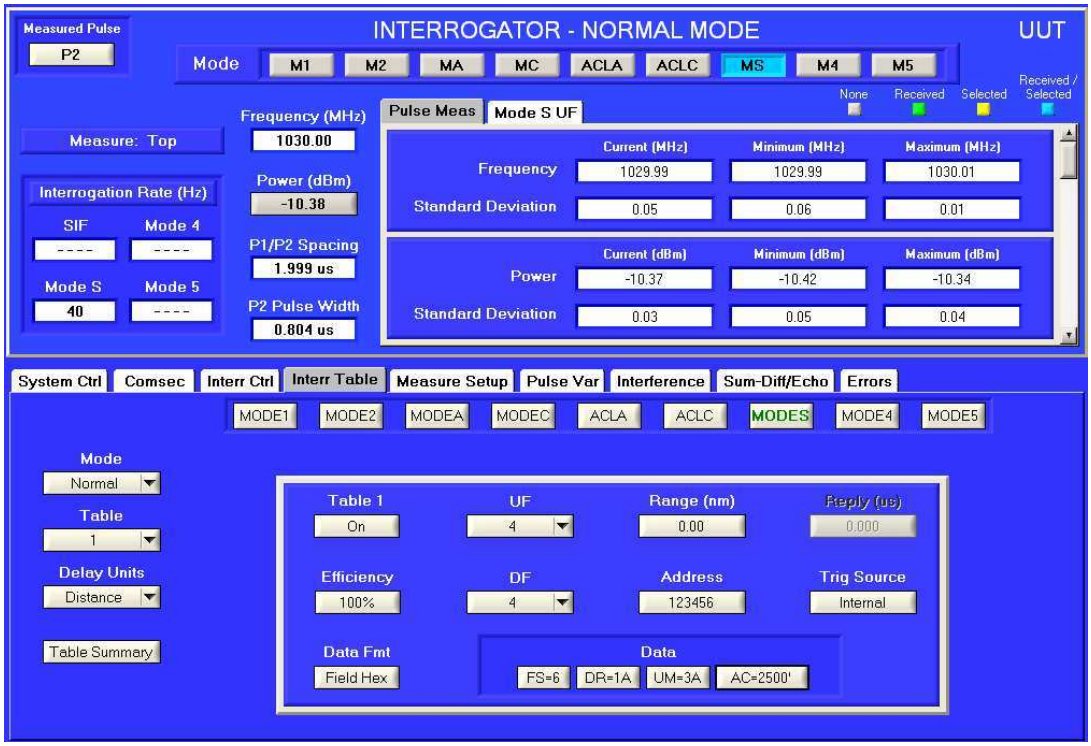
Upon selecting the Interrogator instrument, the Interrogator test screen is displayed (1-2-4, Figure 10).

The Interrogator Test Screen is divided into two sections, Upper and Lower.

The Upper section provides Interrogator UUT Mode, selected Mode Interrogation TX parameters, Frequency, Power, P1/Px Spacing, Px Pulse Width, Interrogation Rate and Data fields.

The Lower section provides the IFF-45TS control functions and consists of the tabs Systems Control, COMSEC, Interrogator Control, Interrogator Table, Measure Setup, Pulse Variable, Interference, Sum-Diff/Echo and Errors.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.



Interrogator Test Screen
Figure10

4.9 SYSTEM CONTROL

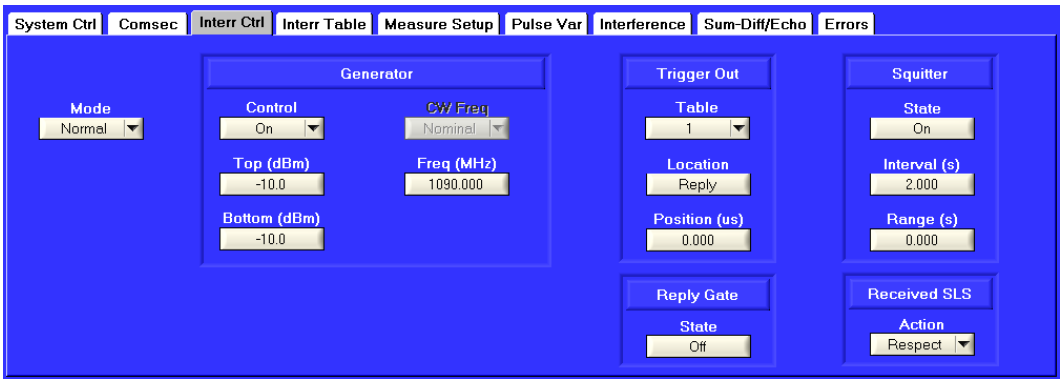
Refer to 1-2-4.2.4, Systems Control.

4.10 COMSEC CONTROL

Refer to 1-2-4.3, COMSEC Control.

4.11 INTERROGATOR CONTROL

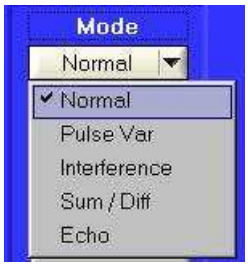
The Interrogator Control tab is divided into groups Generator, Trigger Out, Squitter, Reply Gate and Received SLS. Mode is displayed separately (1-2-4, Figure 11).



Interrogator Control Tab
Figure 11

4.11.1 Mode

The Mode field provides selection of reply characteristics.



Selections are Normal, Pulse Variance, Interference, Sum/Diff and Echo. Default is Normal. Each function may be turned On or Off from within their respective control tabs.

NOTE: The active mode is displayed to the right of the Interrogator heading on the UUT section of the display (i.e., INTERROGATOR NORMAL).

4.11.2 Generator Group

The Generator group provides control for the RF signal generator.

Fields are Control, Top (dBm), Bottom (dBm), CW Freq and Freq (MHz).

Control

The Control field controls the Sum and Difference ports (direct and antenna), replies.

Selections are:

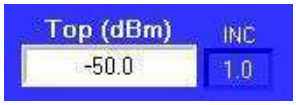
Off: Turns off reply modulation, disables RF.

On: Turns on reply modulation.

CW: Turns off reply modulation, CW only.

Top (dBm)

The Top (dBm) field allows the Top or Sum reply RF level to be set in 0.1 dB increments.



Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit. Default value is 1 dBm.

Bot (dBm)

The Bot (dBm) field Allows the Bottom or Diff reply RF level to be set in 0.1 dB increments.

Default value is -50.0 dBm. The RF level is slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit.

CW Freq

The CW Channel field is only active when CW is selected in the Power Control field. The field allows the CW frequency selections Space, Nominal and Mark.

Selections are:

Space: +4 MHz (F Space)

Nominal: User set Frequency(MHz), 1090 MHz default value.

Mark: -4 MHz (F Mark).

Freq (MHz) 1090

The Freq (MHz) 1090 field sets the IFF-45TS reply carrier frequency. Range of entry is 960.00 to 1220.00 MHz in 10 KHz increments. Default value is 1090 MHz.

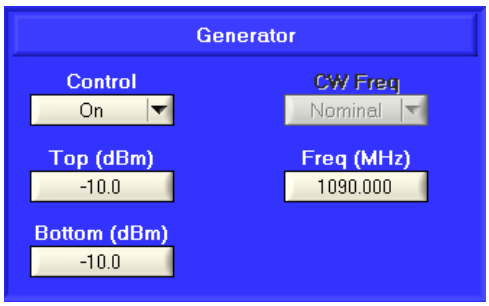
The frequency is slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

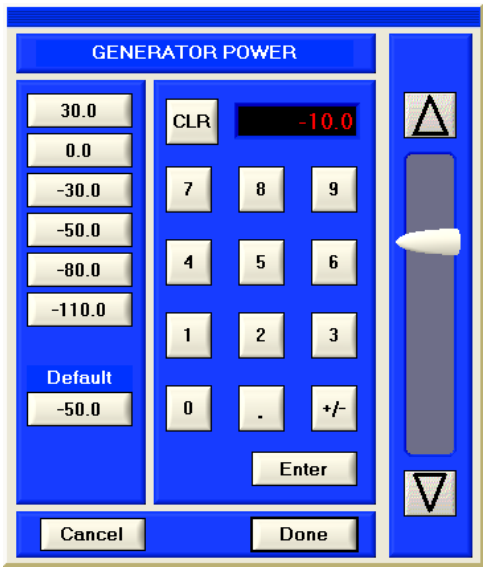
The INC field displays the currently selected Increment unit. Default value is 1 MHz.

Keypad Entry Option

On the Options menu, the *Keypad for Power/Frequency Entry* is enabled to allow popup keypad entry for generator power and frequency.



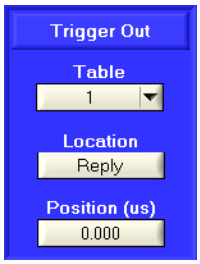
Selecting either Top (dBm), Bottom (dBm), or Freq (MHz) will display a popup keypad.



The desired value is entered by using the preselected values to the left, entering via keypad, or using the slider to the right.

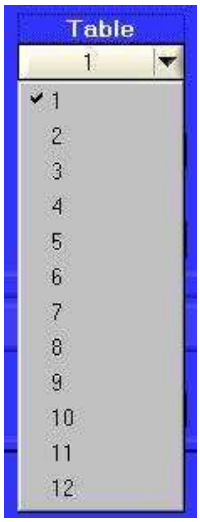
4.12 TRIGGER OUT GROUP

The Trigger Out Group allows an oscilloscope trigger pulse to be synchronized to an interrogation or to a selected reply.



Table

Reply type is selected by reply tables 1 to 12



Location

The Location field allows the Inter (interrogation) or Reply to be selected as a trigger source.

For interrogations the trigger is synchronized to with the detection of the interrogation, which occurs after either P3 pulse for SIF, P4 for M4, P4 timing reference for Mode 5, or SPR for Mode S interrogations. For the reply the reference is the first pulse of the reply.

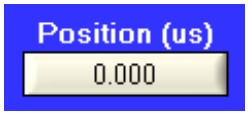
Selections are:

Inter:

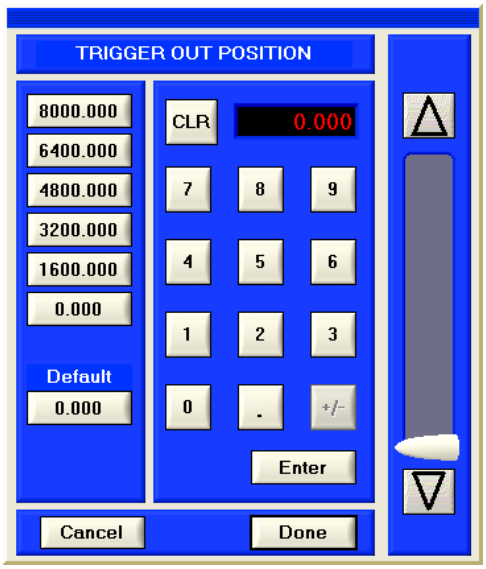
Reply:

Position (us)

The position (us) field allows the trigger pulse to be delayed with respect to the reference pulse.



Selecting Position(us) displays the Trigger Out Position Window.



Range is 0.000 us to 8000.000 us, in 1 ns increments. Default value is 0.000 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

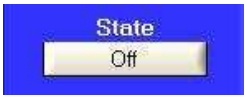
Select *Done* when finished to close window.

4.13 REPLY GATE STATE

The reply gate field controls the external TTL reply gate input.

State

The State field displays the external TTL reply gate input.



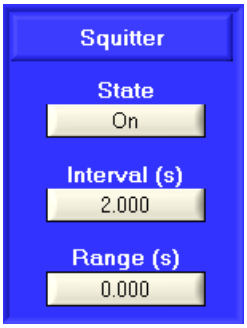
Selections are:

On: Replies gated by external reply gate input.

Off: Replies are ungated.

4.14 SQUITTER GROUP

The Squitter Group displays information or settings related to the squitter broadcast.



State

The State field turns MS or M5 Squitter on or off.

Selections are:

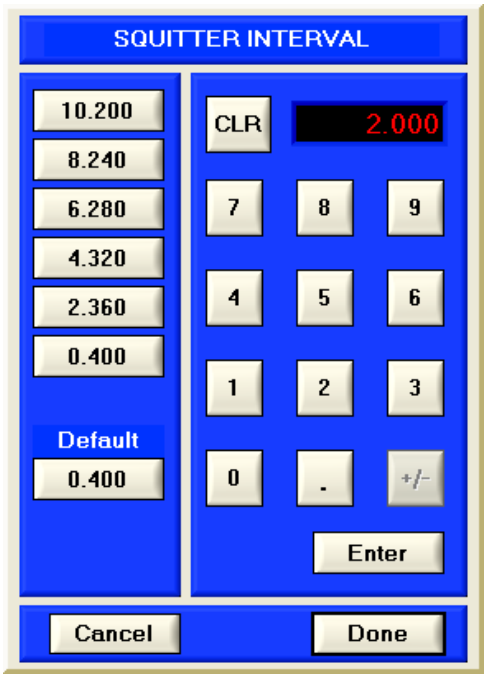
On: Turns Squitter On

Off: Turns Squitter Off

Interval (s)

The Interval (s) field sets the MS or M5 Squitter interval.

Selecting Interval (s) displays the Squitter Interval window.



Range is 0.40 to 10.2 s in 10 ms increments. Default value is 0.40 s.

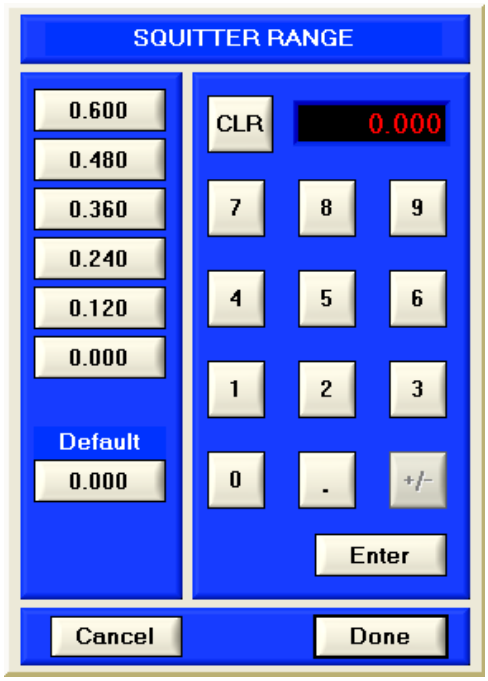
NOTE: Table entry number 12 defines the content and the type of squitter that is enabled by this group.

Select *Done* when finished to close window.

Range (s)

The Range(s) field sets the random deviation for MS or M5 Squitter interval.

Selecting the Range(s) field displays the Squitter Range window.



Range is 0 to 0.60 s in 10 ms increments. Default value is 0.00 s.

NOTE: Table entry number 12 defines the content and the type of squitter that is enabled by this group.

Select *Done* when finished to close window.

4.15 RECEIVED SLS GROUP

The Received SLS group allows the IFF-45TS to be configured to process Interrogator SLS or to ignore Interrogator SLS.

Action

The Action field controls IFF-45TS response to presence of ISLS.

Selections are:

Ignore: IFF-45TS replies to valid Mode Group interrogations received on Sum port, irrespective of the presence of ISLS pulse(s) received on Sum port. This selection should be made if a non monopulse interrogator is connected (i.e., where ISLS is transmitted on a single channel along with the Mode Group).

NOTE: Non monopulse types include those that switch ISLS at the antenna.

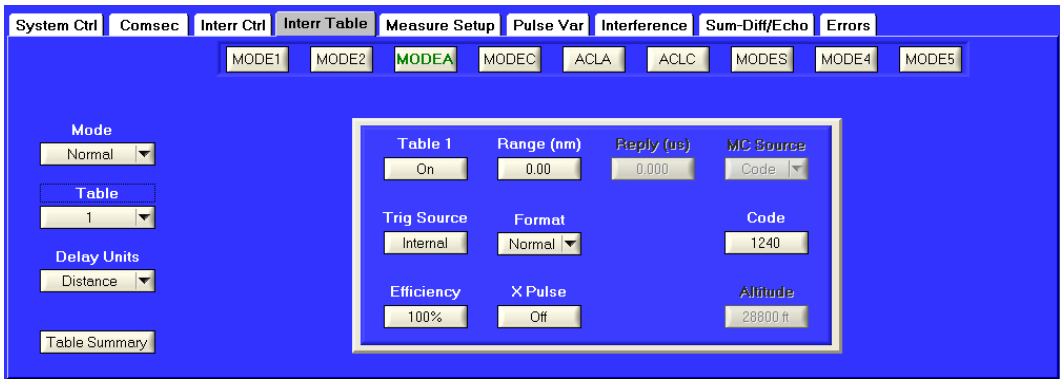
Respect: IFF-45TS does not reply to valid interrogations on Sum port if ISLS pulses are present on Sum port at an amplitude of ±3 dB relative to the reference pulse of the Mode Group.

NOTE: When the IFF-45TS is Directly connected to a monopulse Interrogator, ISLS pulses will be present on the Difference channel. These ISLS pulse are ignored.

4.16 INTERROGATOR TABLE

The Interrogator Table provides configuration for up to 12 targets. Each independent target may configured as specific reply mode (1-2-4, Figure 12).

The Interrogator Table tab is divided into two groups, Control and Table.



Interrogator Table Tab
Figure 12

4.16.1 Tables SIF M1, (M2),(M3A)

The Table content displayed varies according to selected Mode. The Mode selection fields are displayed in a row at the top of the window (1-2-4, Figure 12).

Selections are:

MODE1: Mode 1

MODE2: Mode 2

MODEA: Mode 3A

MODEC: Mode C

MODES: Mode S

ACLA: All-Call Long Mode A

ACLC: All-Call Long Mode C

MODE4: Mode 4

MODE5: Mode 5

Select the desired mode to set the mode for the currently displayed table.

The fields displayed for SIF Modes 1, 2, 3A and C are Trig Source, Format, X Pulse, Efficiency, Range, Reply, Code, Altitude, Mode and C Source.

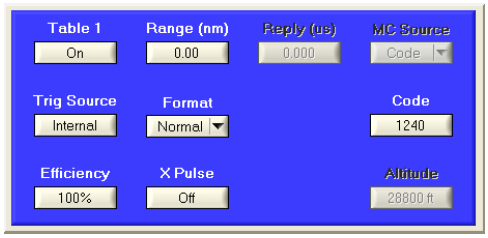


Table 1 – (12)

The Table 1-(12) field turns the table On or Off. The Table number is displayed above the field.

Selections are:

On: Table On

Off: Table Off

Trig Source

The Trig Source field provides the selection of Internal or External trigger source.

Selections are:

Internal: Reply trigger obtained from received and validated interrogation.

External: Reply trigger obtained from external TTL input.

Format

The Format field provides the selection of Normal, Ident or emergency replies.

Selections are:

Normal: SIF Mode 1, 2, 3A, C reply groups (i.e., F1-F2 with code pulses, encoded altitude for Mode C).

Ident: SIF Mode 1, two reply groups with the same data present (i.e., two sets of F1-F2 pulse with identical code pulses pulse present). SIF Modes 2 and 3A, a reply group with the SPI pulse (i.e., F1-F2 with code pulses pulse ident (SPI) pulse).

Emerg: SIF Mode 1, 2, 3A reply groups (i.e, F1-F2 with code pulses, followed by three sets of F1-F2 framing pulses without code pulses).

X Pulse

The X Pulse field turns the X pulse On or Off. The X pulse indicates the airframe is pilotless (i.e., UAV).

Selections are:

On: X Pulse On

Off: X Pulse Off

Efficiency

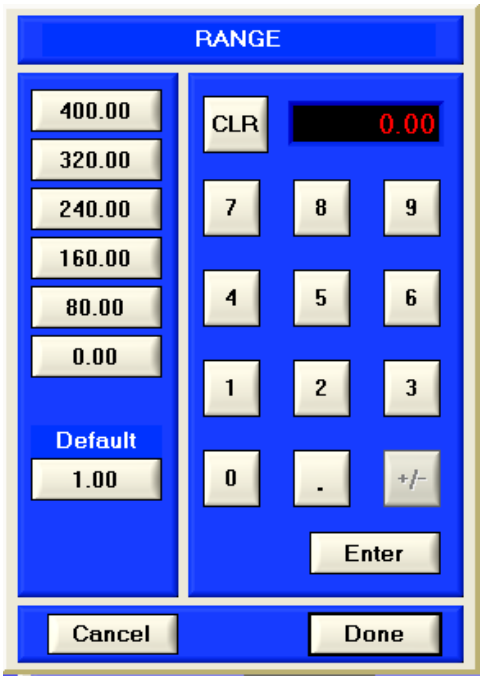
The Efficiency field allows the % reply to be set. Range is 0 to 100% in 1% steps.

Range (nm)

The Range field allows the setting of range delay in nm.

NOTE: Range (nm) is only selectable when Delay Source is set to Distance. Refer to 1-2-4.16.4, Delay Source.

Selection of Range (nm) displays the Range window.



Range is 0 to 400 nm in 1nm increments. Default value is 1 nm.

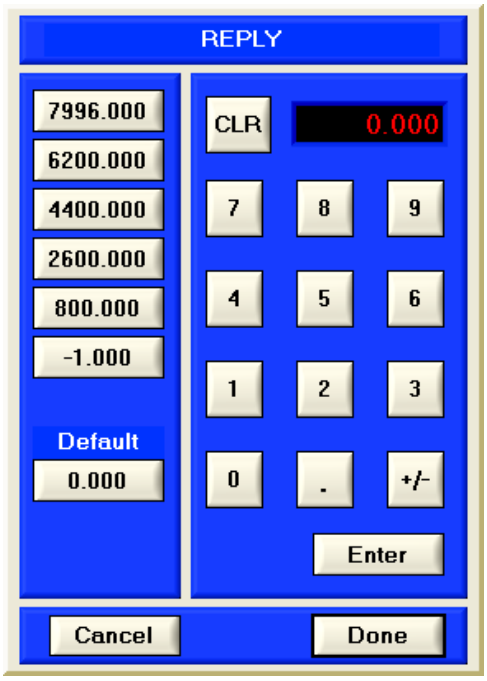
Select *Done* when finished to close window.

Reply (us)

The Reply (us) field allows reply delay to be entered in us.

NOTE: Reply (us) is only selectable when Delay Source is set to Time. Refer to 1-2-4.16.4, Delay Source.

Selection of Reply (us) displays the Reply window.



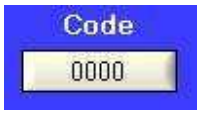
Range is 0 to 7996 us in 1 ns increments. Default value is 0 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 clock, resulting in a time resolution within the stated 10 ns specification.

Select *Done* when finished to close window.

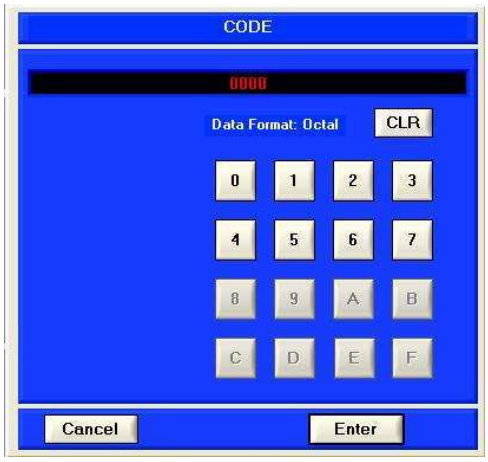
Code

The Code field allows 4096 code to be entered as 4 Octal digits.



NOTE: The MC Source field controls selection of this field.

Selecting the Code field displays the Data Bits Window.



Range is 0000 to 7777 (Octal). Default value is 0000.

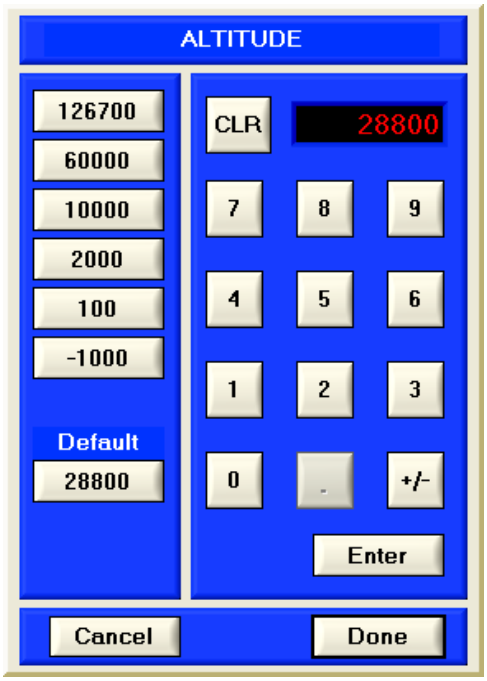
Select Enter when finished to close window.

Altitude

The Altitude field provides setting of Mode C altitude grey code.

NOTE: The MC Source field controls selection of this field.

Selecting the altitude field displays the Altitude Window.



Range is -1000 to 126,700 ft in 100 ft increments. Default value is 28800 ft.

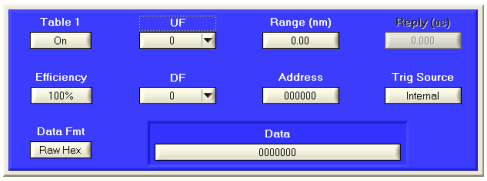
Mode C Source

The MC Source field provides data entry selection of either Mode C Octal code or Mode C altitude in ft.

The selections are Code and Alt.

4.16.2 Table ACLA, ACLC, MS

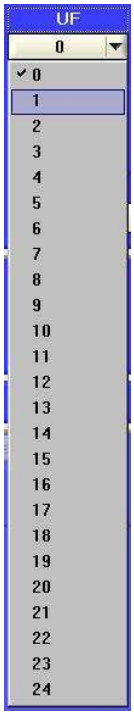
Table ACLA, ACLC, MS displays the fields for Mode selections All-Call Long A, All-Call Long C and Mode S.



NOTE: Table Setup common fields are Table 1-12, Trig Source, Range (nm), Reply (us) and Efficiency.

UF

The UF field provides the selection of Mode S Uplink Format (UF) to be monitored for reply trigger.

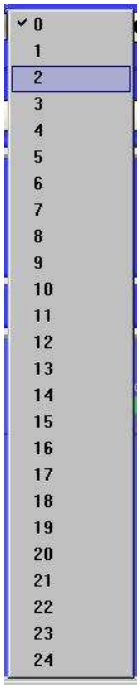


Selections are UF0 to UF24.

NOTE: UF field is not displayed when ACL-A and ACL-C Modes are selected.

DF

The DF Downlink format) field provides the selection of the Mode S Downlink Format to be utilized in the reply to the selected Uplink Format (UF) reply trigger.

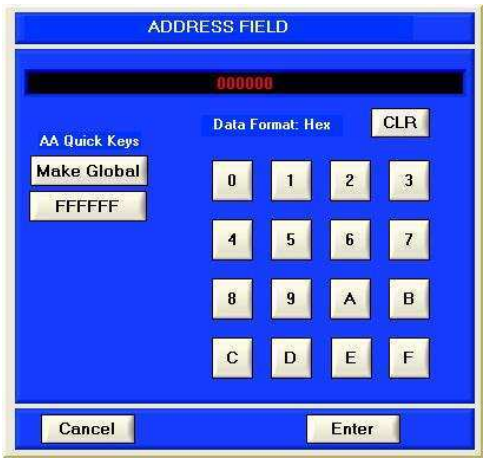


This allows the either same DF to be selected. For example, UF4 selected for reply trigger and DF4 (short reply) or DF20 (long reply), or an incorrect format for error generation.

Address

The Address field allows the DF Address to be set for the reply, either in Octal or Hex.

Selecting the Address field displays the Address Field Window.



Range Octal is 00000000 to 77777777 (default 77777777)

Range Hex is 000000 to FFFFFF (default FFFFFF)

NOTE: Selecting Global populates the address field for all tables configured for Mode S (except DF11), with the displayed address.

NOTE: The address is actually address overlaid with parity or AP.

77777777 is the Mode S Only all call address, used in DF11 replies.

Select *Enter* when finished to close window.

Data Fmt

The Data Fmt field allows the selection of Octal and Hex data formats for the Downlink (DF) Data and Address fields.

Selections are:

Field Hex: Address and data is entered in Hex format.

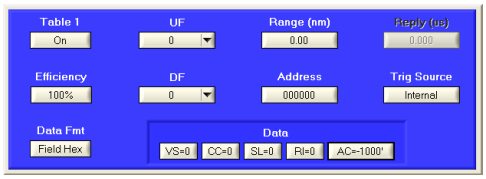
Field Octal: Address is entered in Octal format.

Raw Hex: Address is entered in Hex format and data is entered as one hex block.

Raw Octal: Address is be entered in Octal format and data is entered as one Octal block.

UF0 Data

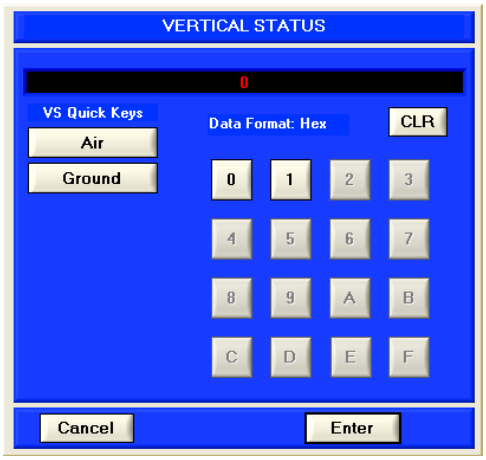
The UF 0 Data group displays the fields VS, CC, SL, RI and AC.



Select each field to open the data entry window.

VS

Select the VS (Vertical Status) field to display the Vertical Status Window.



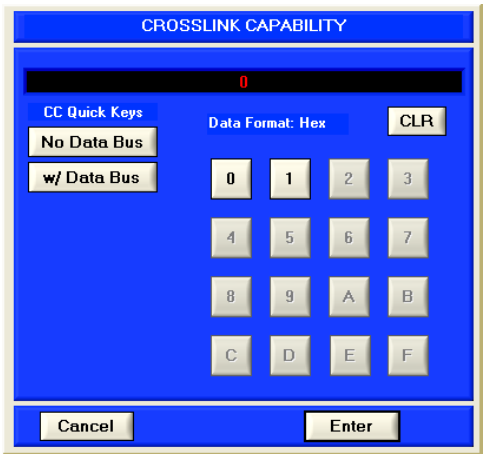
Selections are:

0: Airborne
1: Ground

Select *Enter* when finished to close window.

CC

Select the CC (Crosslink Capability) field to display the Crosslink Capability Window.



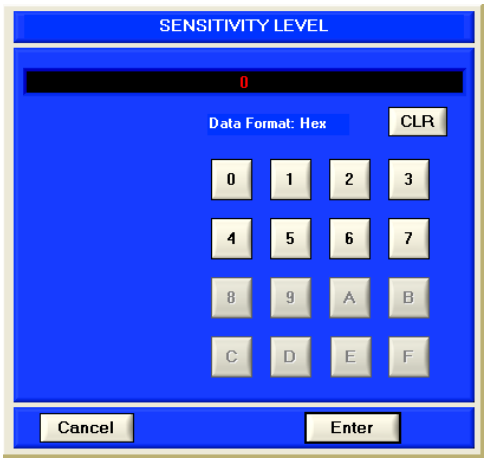
Selections are:

1: Crosslink data bus capability.
0: No Crosslink data bus capability.

Select *Enter* when finished to close window.

SL

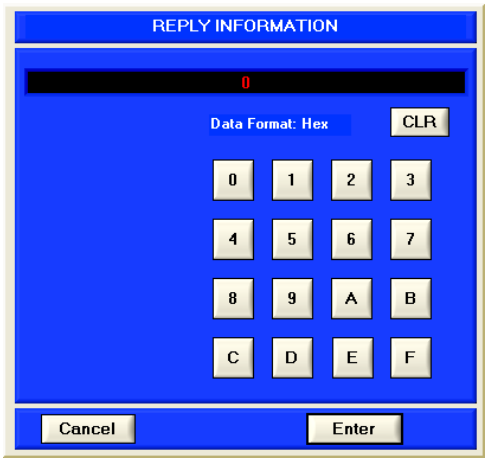
Select the SL (Sensitivity Level) field to display the Sensitivity Level Window. Range is 0 to 7 (Octal/Hex/Dec).



Select *Enter* when finished to close window.

RI

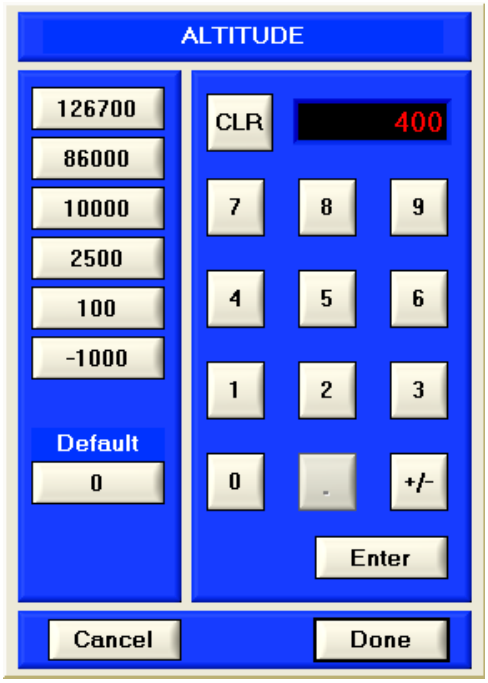
Select the RI (Reply Information) field to display the Reply Information Window. Range is 0 to 17 Octal, 0 to F Hex, 0 to 15 Decimal.



Select *Enter* when finished to close window.

AC

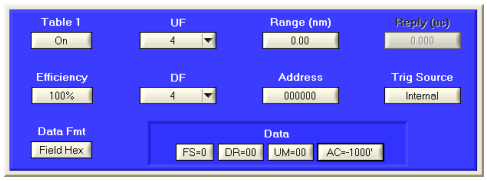
Select the AC field to display the Altitude Window. Range -1000 to 126,700 ft in 25 ft increments. Default value is 0 ft.



Select *Enter* when finished to close window.

UF4 Data

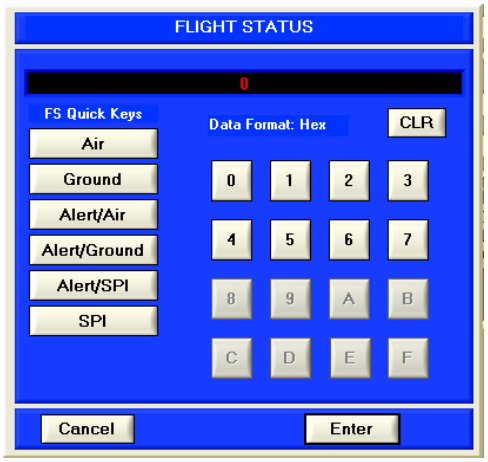
The UF 4 Data group displays the fields FS, DR, UM and AC.



Select each field to open the data entry window.

FS

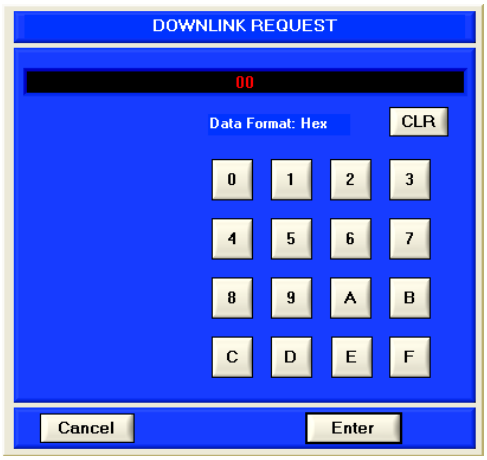
Select the FS (Flight Status) field to display the Flight Status Window. Range is 0 to 7 (Octal/Hex).



Select *Enter* when finished to close window.

DR

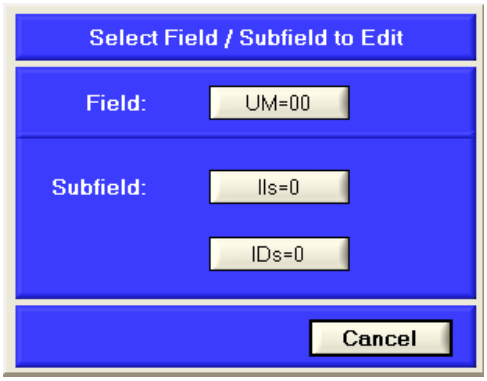
Select the DR (Downlink Request) field to display the Downlink Request Window. Range is 0 to 1F Hex, 0 to 37 Octal, and 0 to 31 Dec.



Select *Enter* when finished to close window.

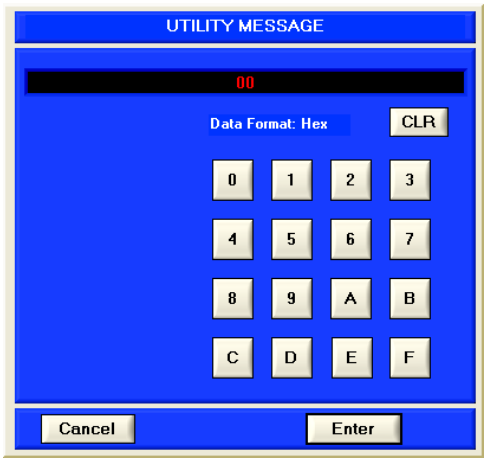
UM

Select the UM (Utility Message) field to display the Utility Message Window.



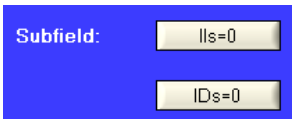
Select *Field: UM* to change the UM field.

Range is 0 to 3F Hex, 0 to 77 Octal.

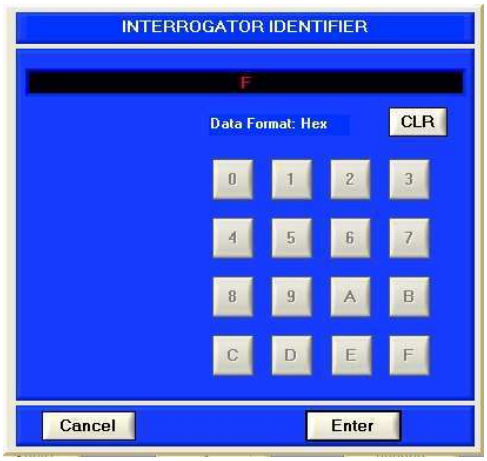


Select *Enter* when finished to close window.

Select either IIs or IDs to modify a subfield.



Select Field: IIs to display the Interrogator Identifier Window. Range is 0 to F Hex, 0 to 17 Octal.



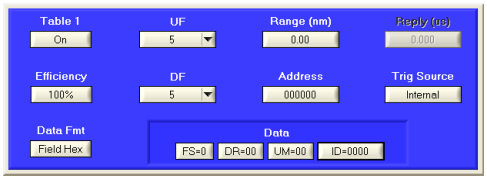
Select *Enter* when finished to close window.

Select Field: Ids to display the Identifier Designator Window. Range is 0 to 3 Hex and Octal.

Select *Enter* when finished to close window.

UF5 Data

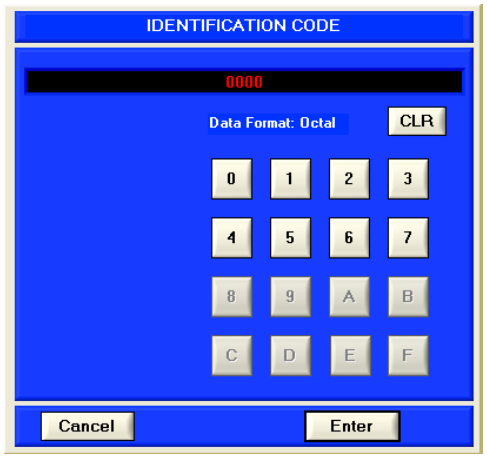
The UF 5 Data group displays the fields FS, DR, UM and ID.



Select each field to open the data entry window.

ID

Select the ID (Identity) field to display the Identification Code Window.

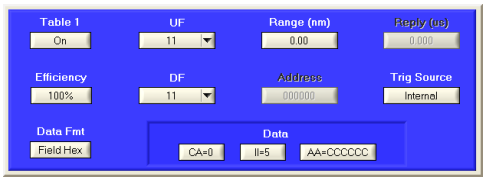


Range is 0000 to 7777 (Octal), 0000 to 1FFF Hex. Default value is 0000.

Select *Enter* when finished to close window.

UF11 Data

The UF 11 Data group displays the fields CA, II and AA.

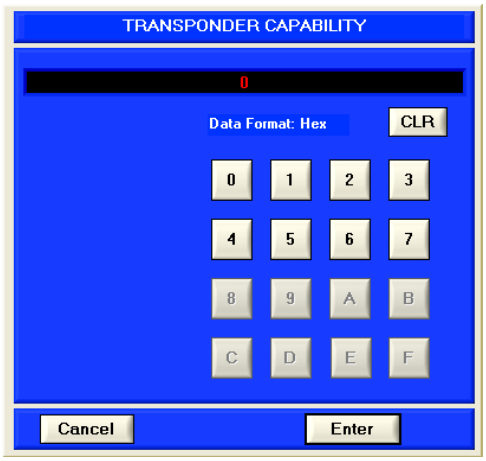


NOTE: The AA field is Address Announced in the clear.

Select each field to open the data entry window.

CA

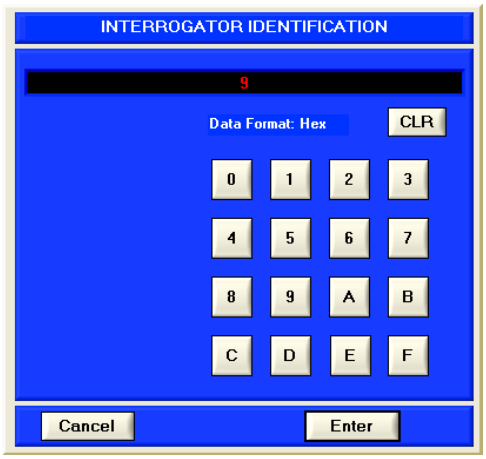
Select the CA (Capability) field to display the Transponder Capability Window. Range is 0 to 7 (Octal/Hex).



Select *Enter* when finished to close window.

II

Select the II (Interrogator Identity) field to display the Interrogator Identification Window.



Range is 0 to F Hex, 0 to 17 Octal.

Select *Enter* when finished to close window.

AA

Select AA (Address Announced) field to display the Address Field Window.

The AA field is the 24 bit Mode S all call address announced in the clear (i.e., no parity overlaid). This address is usually 77777777 Octal, FFFFFF Hex.

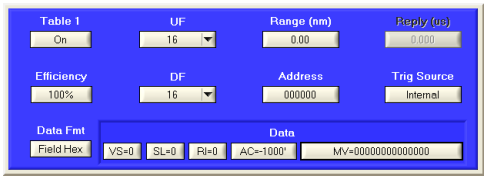
Range Octal is 00000000 to 77777777.

Range Hex is 000000 to FFFFFF.

Select *Enter* when finished to close window.

UF16 Data

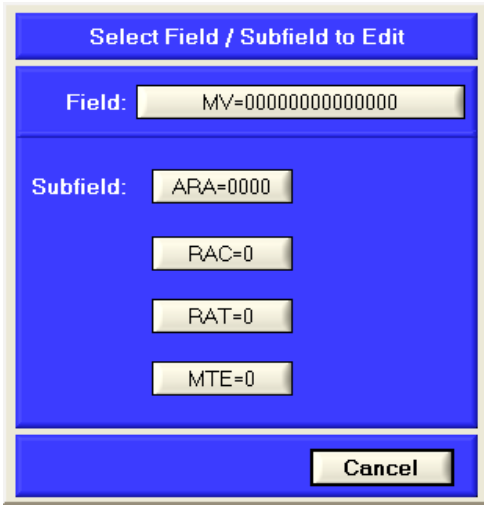
The UF 16 Data group displays the fields VS, CC, SL, RI, AC and MV.



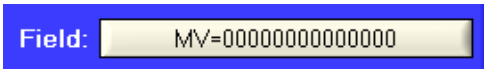
Select each field to open the data entry window.

MV

Select the MV (Message Comm V) field to display the Field/Subfield edit window.



Select *Field: MV* to change the field.

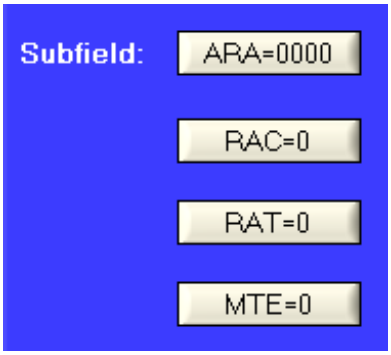


Select MV field to display the Air-Air Surveillance Window.

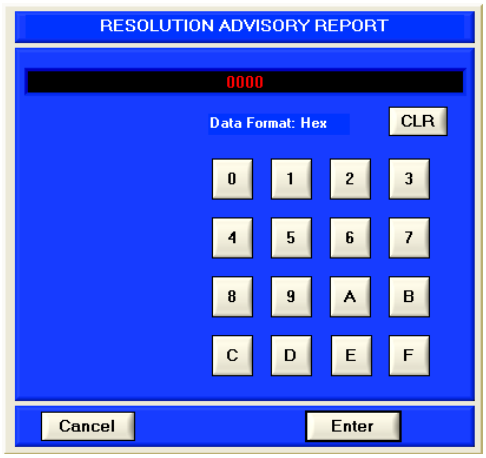
Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 00000000000000000 to 37777777777777777777 Octal.

Select *Enter* when finished to close window.

Select either ARA, RAC, RAT, or MTE to modify a subfield.



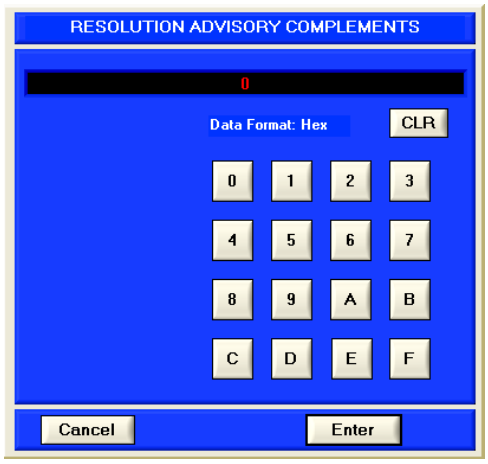
Select Subfield: ARA to display the Resolution Advisory Report window.



Range is 0000 to 3FFF Hex, 00000 to 37777 Octal

Select *Enter* when finished to close window

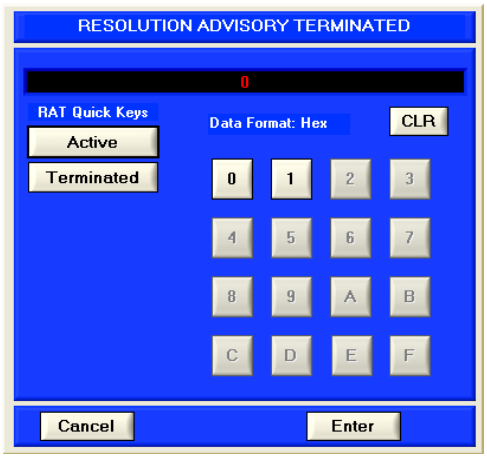
Select Subfield: RAC to display the Resolution Advisory Complements window.



Range is 0 to F Hex, 0 to 17 Octal.

Select *Enter* when finished to close window.

Select Subfield: RAT to display the Resolution Advisory Terminator window.



Selections are:

0: RA Active

1: RA Terminated

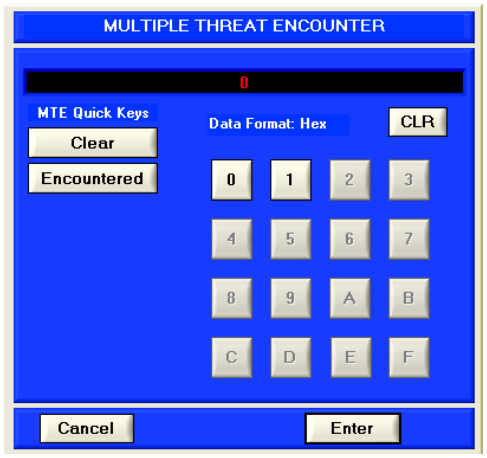
Select *Enter* when finished to close window.

Select Subfield: MTE to display the Multiple Threat Encounter window.

Selections are:

0: Multiple Threat Clear

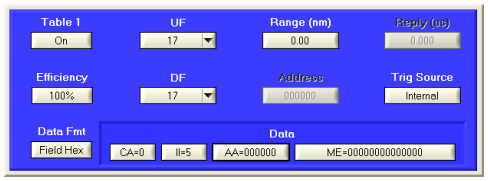
1: Multiple Threat Encountered



Select *Enter* when finished to close window.

UF17 Data

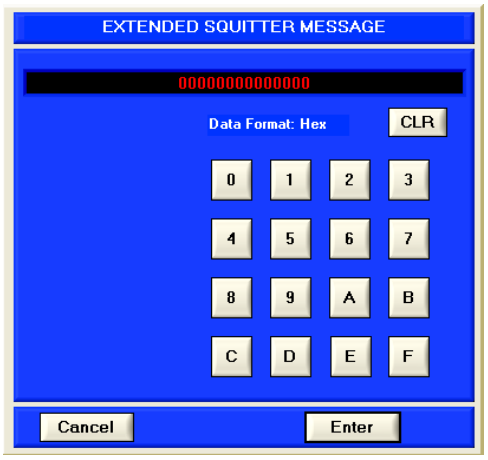
The UF 17 Data group displays the fields CA, II, AA and ME.



Select each field to open the data entry window.

ME

Select the ME Message Extended squitter) field to display the Ext Squitter Message Window.



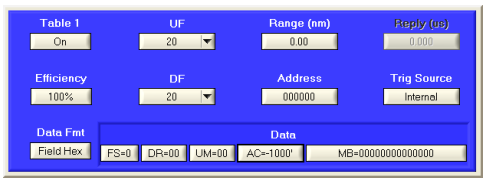
An example of ME field content would be airborne position (Latitude and Longitude).

Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 00000000000000000000 to 37777777777777777777 Octal.

Select *Enter* when finished to close window.

UF20 Data

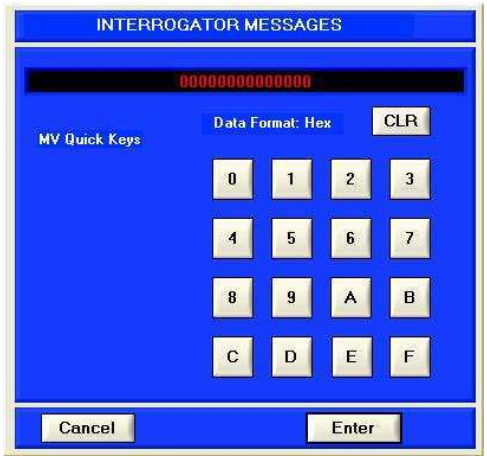
The UF 20 Data group displays the fields FS, DR, UM, AC and MB.



Select each field to open the data entry window.

MB

Select the MB field to display the Interrogator Messages Window.

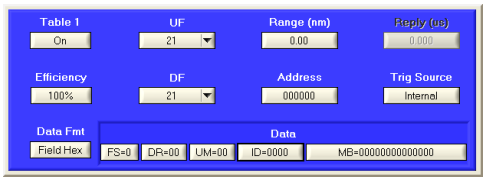


Range is 00000000000000 to FFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

Select *Enter* when finished to close window.

UF21 Data

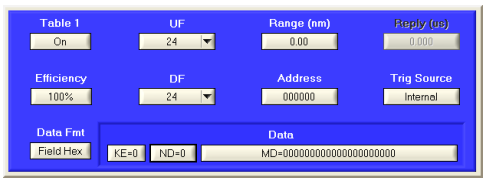
The UF 21 Data group displays the fields FS, DR, UM, ID and MB.



Select each field to open the data entry window.

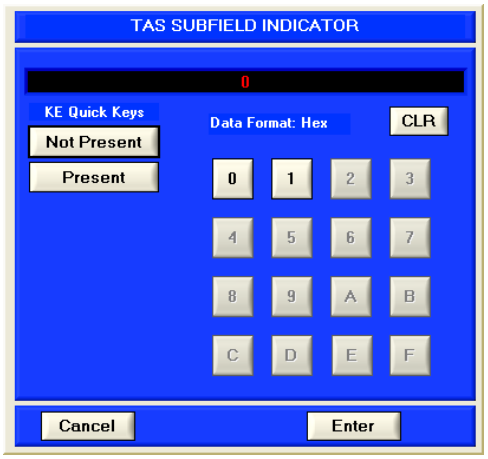
UF24 Data

The UF 24 Data group displays the fields KE, ND and MD.



KE

Select the KE field to display the TAS (Transmission Acknowledgement Subfield) Indicator Window.



Selections are:

0: TAS not present in MD Message field

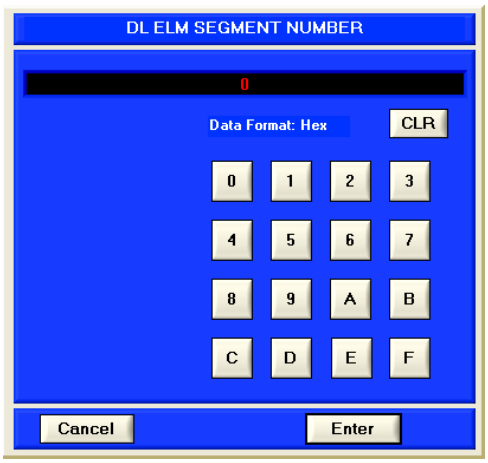
1: TAS present in MD Message field

NOTE: TAS is used in the Uplink ELM protocol (Comm C), to confirm the number of segment received so far in a Comm C sequence.

Select *Enter* when finished to close window.

ND

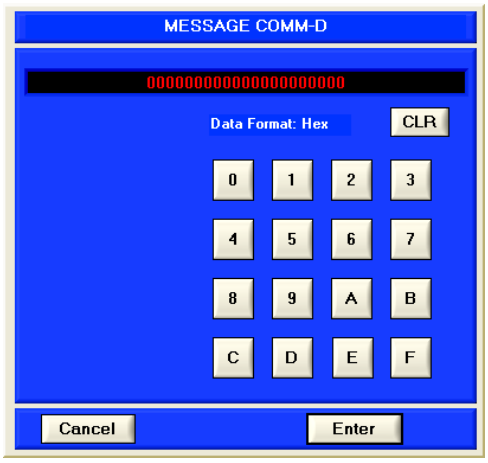
Select the ND (Control ELM) field to display the DL ELM Segment Number Window.



The ND field is used in downlink ELM protocol (Comm D), to confirm the segment number transmitted in the MD message field. Range is 0 to F Hex, 0 to 17 Octal and 0 to 15 Dec.

MD

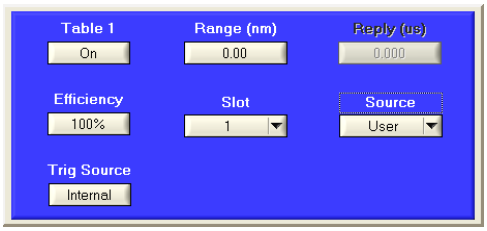
Select the MD (Message Comm D) field to display the Comm-D Window.



Range is 00000000000000 to FFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

Table M4

The Table Setup M4 window displays the fields, Table 1-12, Range(nm), Reply (us) and Efficiency.



Trig Source (Mode 4)

The Trig Source (Mode 4) field displays the selection of Internal or external trigger source.

Selections are:

Internal: Reply trigger obtained from received and validated interrogation. Internal crypto simulator is utilized to determine reply triplet slot.

External: Reply trigger obtained from external crypto device.

Source

The Source field displays the selection of Mode 4 reply slot to be user selected or determined by the received Mode 4 challenge.

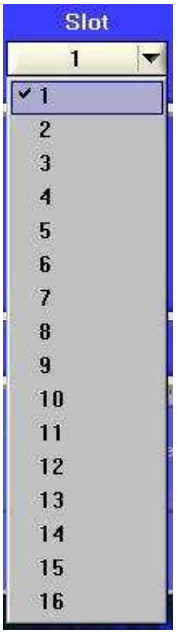
Selections are:

User: Mode 4 reply slot determined by user selection of slot field.

Challenge: Mode 4 reply slot determined by challenge content.

Slot

The Slot field provides the selection of Mode 4 reply triplet position. Selections are 1 to 16.

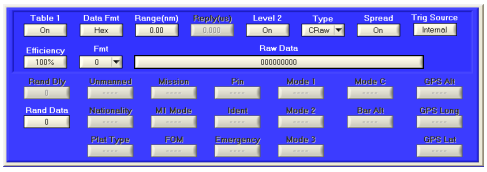


Each slot is spaced 4 us.

NOTE: This field is only available when Internal COMSEC and Trig Srce Internal are selected.

Table M5

The Table Setup M5 window displays the fields Table 1-12, Range(nm), Reply (us) and Efficiency.



Data Fmt

The Data Fmt field allows the selection of Octal, Hex data formats for the Mode 5 Downlink (DF) Data.

Selections are:

Field Hex: Data is entered in Hex format.

Field Octal: Data is entered in Octal format.

Level 2

The Level 2 field controls Mode 5 Level 2 reports.

Selections are:

On: Level 2 reports switched on. Level 2 replies are transmitted in response to Level 2 interrogations.

Off: Level 2 reports are switched off. Level 2 interrogations will receive the respective level 1 reply.

Type

The Type field provides selection of either Raw data for Mode 5 reply or Encrypted data for Mode 5 reply. This function is available when Reply field is set to User.

The interrogation data must be generated by the crypto, the directed reply data is generated by the user. This option is only valid with the Aeroflex internal crypto

Selections are:

Raw User: Reply Data will be encrypted by external crypto or internal crypto simulator, but the random reply delay is provided by the user.

Crypto User: Reply Data will be encrypted by external crypto or internal crypto simulator, but the random reply delay is selected by the crypto.

Encrypted: Reply Data is already encrypted and transmitted as is. Not recommended for use.

Spread

The Spread field turns the Mode 5 CVI dependant 16 bit spreading function on or off. The spreading function is applied via modulo 2 addition to the data symbol Walsh codes.

Selections are:

On: Spread function on.

Off: Spread function off.

Reply

The Reply field provides selection of either COMSEC (external Mode 5 crypto) or user (internal BAE Mode 5 crypto simulator).

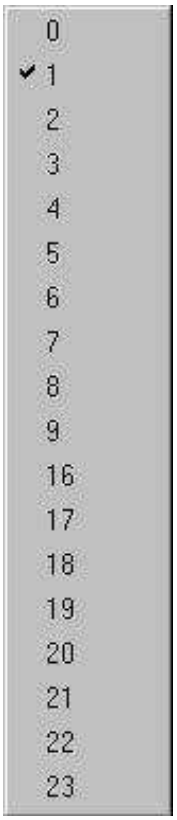
Selections are

COMSEC: External Mode 5 crypto device.

User: Internal BAE Mode 5 crypto simulator.

FMT

The FMT field provides the selection of Mode 5 interrogation format (0 to 31) to be used for reply trigger. Formats 0 to 15 are Mode 5 level 1.



Formats 16 to 31 are Mode 5 level 2. Refer to 1-2-4, Table 1.

NOTE: If a Mode 5 level 2 reply format is selected and the Level 2 field is set to 'Off' then the associated Level 1 reply is transmitted in lieu.

FMT	Lvl	Type	Data Content
0	1	ID	-
1	1	Data	M1/2
2	1	Data	M3/C
3	1	ID	-
4	1	Data	PIN/ NAT/ MISS
5	1	ID	-
6	1	ID	-
7	1	Data	PIN/ NAT/ MISS
8	1	ID	
9	1	ID	
10-15			Reserved Future Use
16	2	ID	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG
17	2	Data	M1/2
18	2	Data	M3/C
19	2	Lethal	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG
20	2	Data	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG
21	2	Lethal	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG Or.. PIN/ NAT/ MISS/ EM/ IP/ X/ LAT/ LONG
22	2	ID	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG Or.. PIN/ NAT/ MISS/ EM/ IP/ X/ LAT/ LONG
23	2	Data	PIN/ NAT/ MISS/ EM/ IP/ X/ ALT/ LAT/ LONG Or.. PIN/ NAT/ MISS/ EM/ IP/ X/ LAT/ LONG
24-31	2		Reserved Future Use

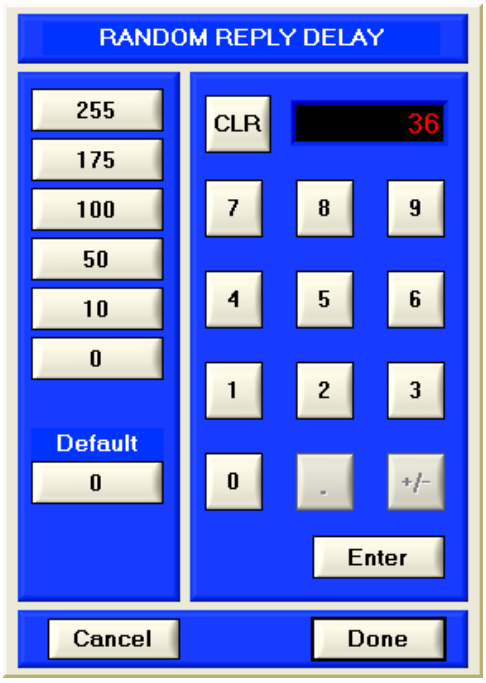
Mode 5 Reply Formats
Table 1

Random Delay

The Rand Dly field provides the selection of Mode 5 Random Reply Delay used in the Mode 5 Level 1 ID and Data replies.

The random reply delay is normally determined by transponder and used by the interrogator to determine the correct reply (range delay). Range is 0 to 255 (8 bits).

Select the Random Dly field to display the Random Reply Delay Window.



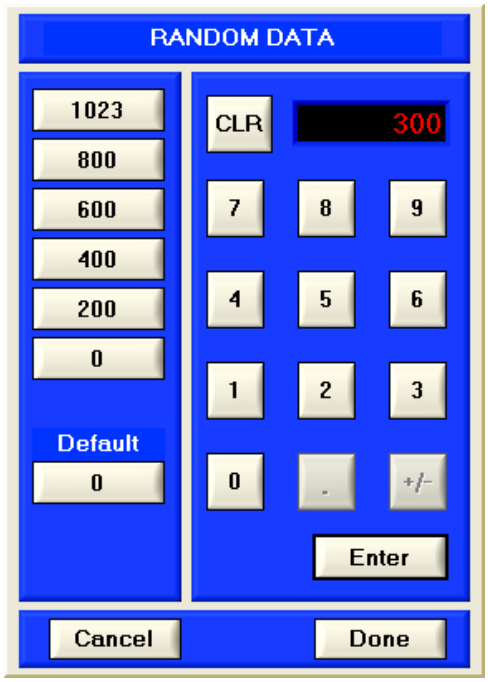
Select *Done* when finished to close window.

Random Data

The Random Data field provides the selection of 10 bit random data that is inserted in Mode 5 Level 1 ID and Data replies.

The random data is normally generated by transponder as a protection measure. Range is 0 to 1023 (10 bits). Default value is 0.

Select the Rand Data field to display the Random Data Window.



Select *Done* when finished to close window.

Unmanned

The Unmanned field allows the X bit to be set in a Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply,

Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

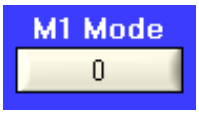
Selections are:

0: X bit not set (Manned)

1: X bit set (Unmanned)

M1 Mode

The M1 Mode field allows the Mode 1 indicator bit to be set for Mode 5 Level 2 Pin Report format 0001.



Selections are:

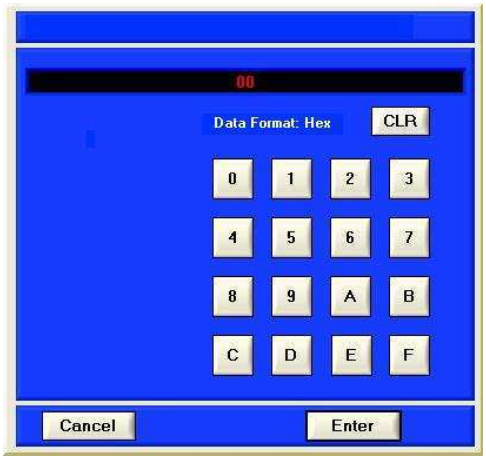
0: M1 Mode bit not set

1: M1 Mode bit set

Nationality

The Nationality field allows the National Origin field to be entered for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000 or 0011. Range is 000 to 7FF, hex.

Select the Nationality field to display the Hex data entry window,

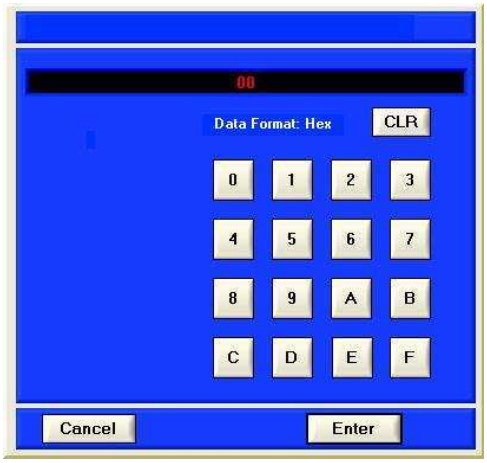


Select *Enter* when finished to close window.

PIN

The PIN field allows the Platform Identification Number to be entered for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000, 0011 or 0100. Range is 00 to 0FFF, Hex.

Select the Pin field to display the Hex data entry window,



Select *Enter* when finished to close window.

Ident

The Ident field allows the I/P Identification of Position bit to be set for Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Selections are:

0: I/P bit not set

1: I/P bit set

Emergency

The Emergency field allows the Military Emergency bit to be set for Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 and 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Selections are:

0: Emergency bit not set

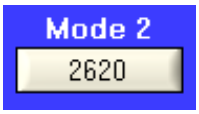
1: Emergency bit set

Mode 1 (Oct)

The M1 (Oct) field allows the Mode 1 squawk code to be entered in Octal for Mode 5 Level 1 Mode 1/2 data reply. Range is 0000 to 7777.

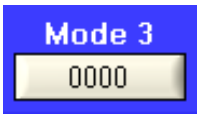
Mode 2 (Oct)

The M2 (Oct) field allows the Mode 2 squawk code to be entered in Octal for Mode 5 Level 1 Mode 1/2 data reply. Range is 0000 to 7777.



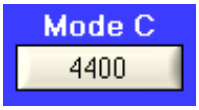
Mode 3 (Oct)

The M3 (Oct) field allows the Mode 3 squawk code to be entered in Octal for Mode 5 Level 1 Mode 3/C data reply. Range is 0000 to 7777.



Mode C (Oct)

The MC (Oct) field allows the Mode C squawk code to be entered in Octal for Mode 5 Level 1 Mode 3/C data reply. Range is 0000 to 7777.



Platform

The Platform Type field allows the Platform Type bit to be set for Mode 5 Level 2 Pin Report formats 0011.

Selections are:

0: Ground / Air bit not set

1: Ground / Air bit set

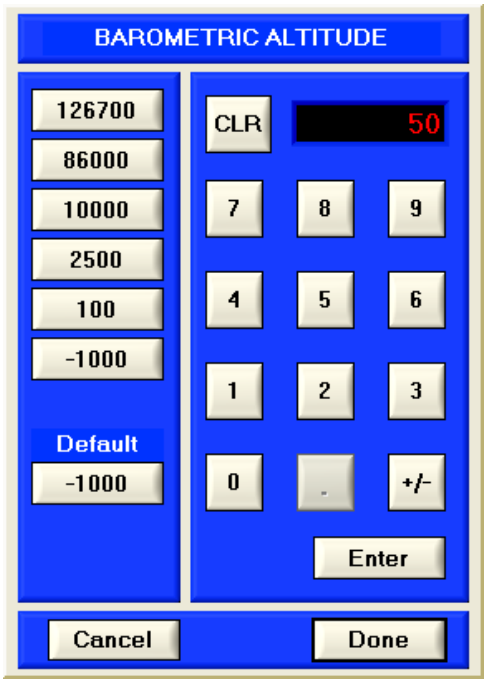
FOM

The FOM field allows the Figure of Merit Type Code to be entered in Hex for Mode 5 Level 2 Report format 0011 or 0100. Range is 0x0 to 0x1F.

Bar Alt (ft)

The Bar Alt(ft) field allows the Mode C Altitude to be entered in ft for Mode 5 Level 2 Pin Report, formats 0000 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Select the MC Alt (ft) field to display the Barometric Altitude Data Window.

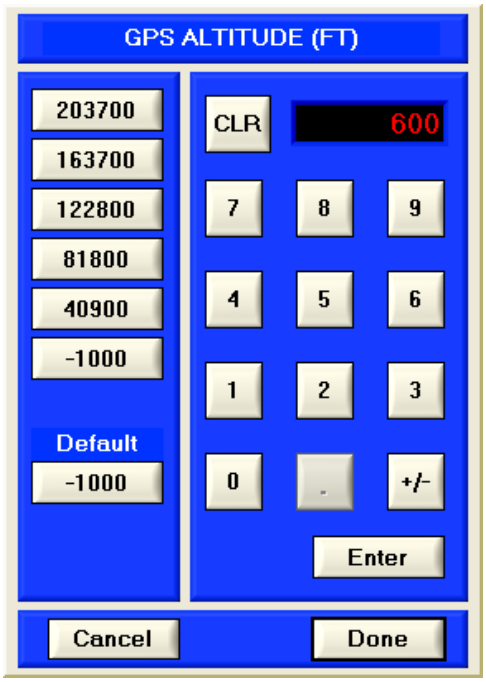


Select *Enter* when finished to close window.

GPS Alt (ft)

The GPS Alt(ft) field allows GNSS Altitude to be entered in ft for Mode 5 Level 2 Pin Report, formats 0100 Range is 126,700 to -1000 ft.

Select the GPS Alt (ft) field to display the GPS Altitude Data Window.

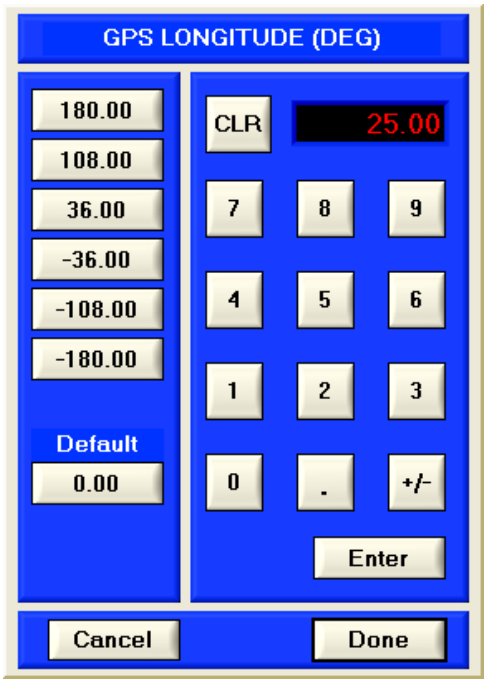


Select *Done* when finished to close window.

GPS Long

The GPS Long field allows the entry of Longitude data in Hex format. Longitude is displayed in degrees to three decimal places in the lower window. GPS Longitude data is transmitted in Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Select the GPS Long field to display the GPS Longitude entry Window.

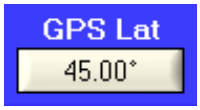


Select *Done* when finished to close window.

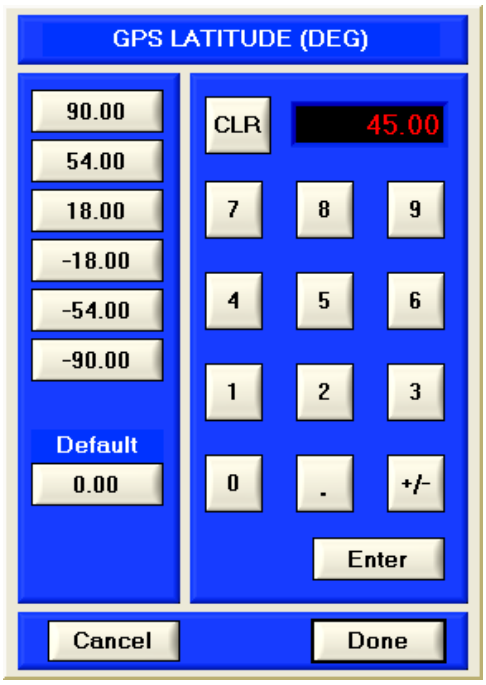
GPS Lat

The GPS Lat field allows the entry of Latitude data in Hex format. Latitude is displayed in degrees to three decimal places in the lower window.

GPS Latitude data is transmitted in Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.



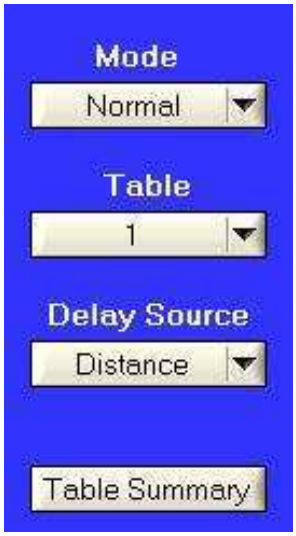
Select the GPS Lat field to display the GPS Latitude entry Window.



Select *Enter* when finished to close window.

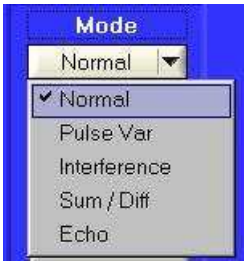
Control Group

The Control group displays the fields Mode, Table, Delay Source and Table Summary.



Mode

The Mode field provides selection of reply characteristics.



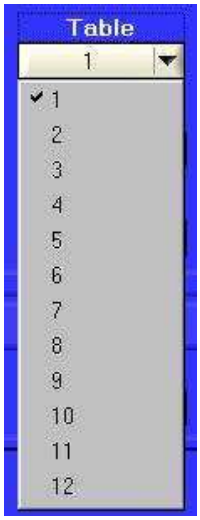
Selections are Normal, Pulse Variance, Interference, Sum/Diff and Echo. Default is Normal.

NOTE: Each of the above functions may also be turned On or Off, from within their respective control tabs.

NOTE: The active mode is displayed to the right of the Interrogator heading on the UUT section of the display (i.e., INTERROGATOR NORMAL).

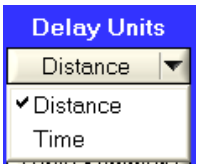
Table

Select the Table field to display the Table Window and select the current Table.



Delay Units

The Delay Units field allows the selection of the delay units source for the range delay within the reply tables.



Selections are:

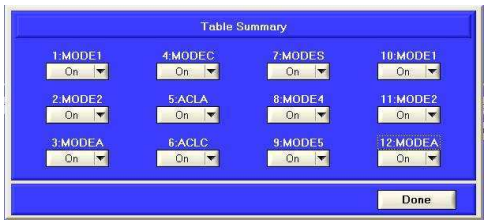
Distance: Delay is entered in nm

Time: Delay is entered in us

Table Summary

The Table Summary window provides access to the Table Summary Window.

Select Table Summary to display Table Summary Window.



The Table Summary window allows 12 individual replies or targets to be configured.

Each reply is a single interrogation mode reply, for example. If a user wishes to simulate a single transponder with Modes 1, 2, 3 and Mode S UF4, 5, 11 replies active, 6 replies will be used for the simulation. In this example, each reply would have the same range set.

Example: a user may wish to simulate 12 individual Mode 1 targets. Each reply would be set to the same mode and each reply would have a different code and range delay set.

The Table Summary window is organized as 4 columns of 3 rows of reply table fields. First column; tables 1 to 3, second column; tables 4 to 6, third column; tables 7 to 9 and fourth column tales10 to 12. Each numbered table field has a Mode Identification and On/Off selection.

Select *Done* when finished to close window.

4.17 MEASURE SETUP TAB

The Measure Setup tab displays four setup fields (1-2-4, Figure 13).

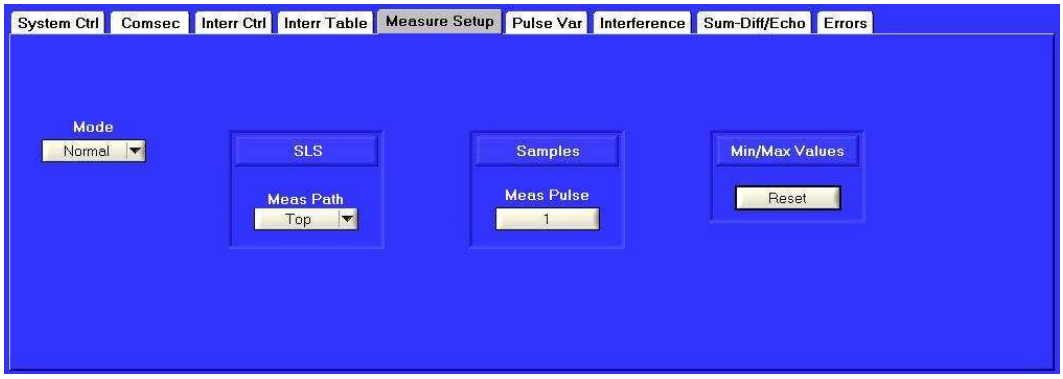
Fields displayed are:

Mode: Selects RF Channel/Pulse functionality.

SLS Measured Path: Sets the measurement path for ISLS.

Samples Measured Pulse: Sets the number of measurement samples to be averaged over.

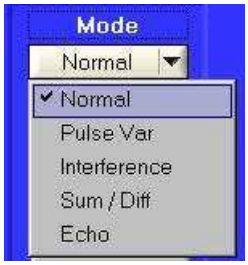
Min/Max Values Reset: Resets average measurement buffer.



Measure Setup Tab
Figure 13

4.17.1 Mode

The Mode field provides selection of reply characteristics.



Selections are Normal, Pulse Variance, Interference, Sum/Diff and Echo. Default is Normal.

NOTE: Each of the above functions may also be turned On or Off, from within their respective control tabs.

NOTE: The active mode is displayed to the right of the Interrogator heading on the UUT section of the display (i.e., INTERROGATOR NORMAL).

4.17.2 SLS Meas Path

The SLS Meas Path field selects either the Top or Bottom port for ISLS measurements.

Selections are:

Top: Selects Top Port

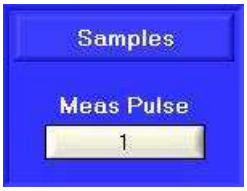
Bottom: Selects Bottom Port

NOTE: Measured path defaults to Top.

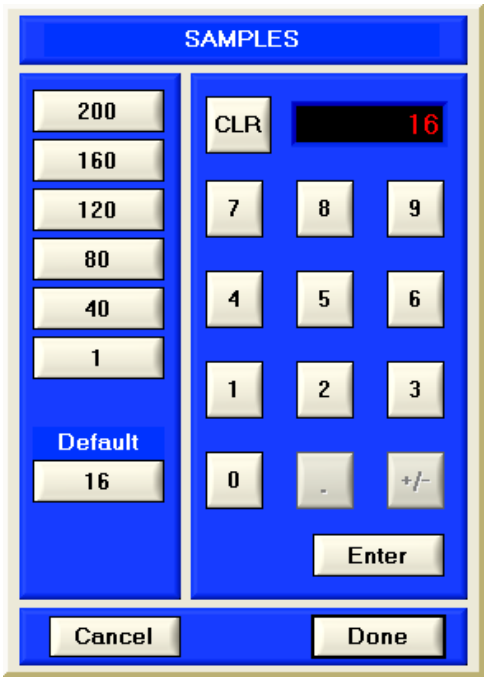
NOTE: Top selected for non-monopulse interrogators, where ISLS is transmitted on the same channel as the mode group. Bottom is selected for monopulse interrogators, where ISLS is transmitted on the difference channel.

4.17.3 Samples Meas Pulse

The Meas Pulse field sets the number of samples for the buffer, averaging UUT Interrogation Power, Frequency, Pulse Width and Pulse Spacing for the pulse selected in the Measured Pulse field.



Selecting Meas Pulse field displays the Samples window.



Range is 1 to 200. Default value is 16.

Select *Done* when finished to close window.

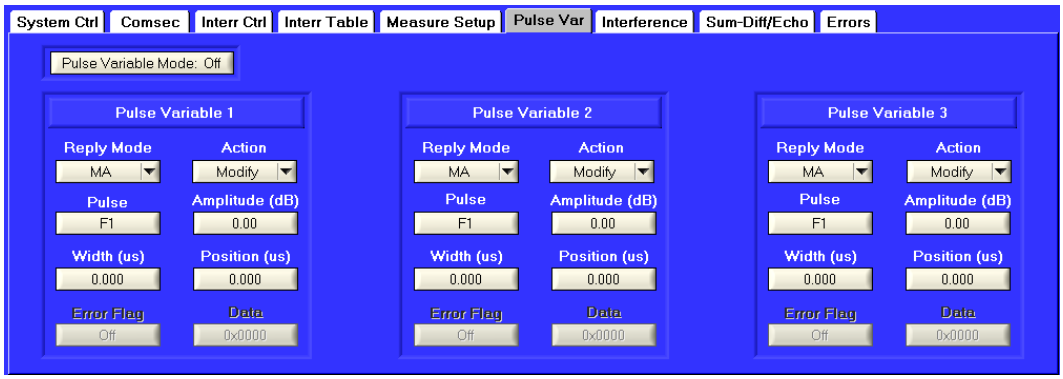
4.17.4 Min/Max Values

Selecting the Reset field, Resets average and max/min measurement buffers.

4.18 PULSE VARIABLE

The Pulse Variable tab displays the groups Pulse Variable 1, Pulse Variable 2 and Pulse Variable 3 (1-2-4, Figure 14).

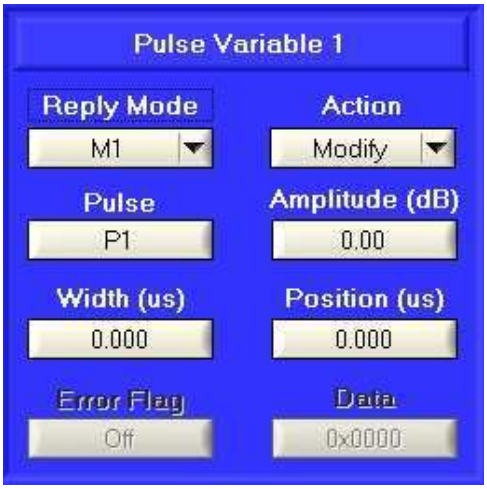
Each group has fields for controlling selected Reply Mode pulse widths, spacing and amplitude and Mode 5, symbol data. A Pulse Variable Mode On/Off control is also provided.



Pulse Variable Tab
Figure 14

4.18.1 Pulse Variable Groups

Each Pulse Variable Group may control an individual selected pulse, within a selected Reply Mode. Each group is identical and displays the fields Reply Mode, Pulse, Width, Amplitude (dB), Position (us), Error Flag, Data and Action.



NOTE: Pulse Variable Mode must be turned on for variable parameters to become effective.

Reply Mode

The Reply Mode field allows the selection of the reply mode for pulse parameter variations.

Selections are:

M1: Mode 1

M2: Mode 2

MA: Mode3/A

MC: Mode C

MS: Mode S

ACLA: All-Call Long Mode A

ACLC: All-Call Long Mode C

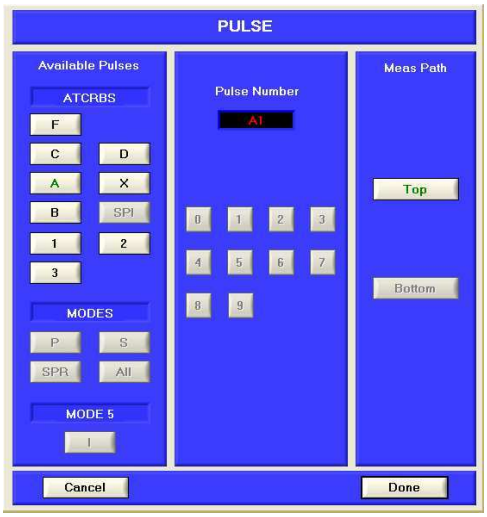
M4: Mode 4

M5L1: Mode 5 Level 1

M5L2: Mode 5 Level 2

Pulse

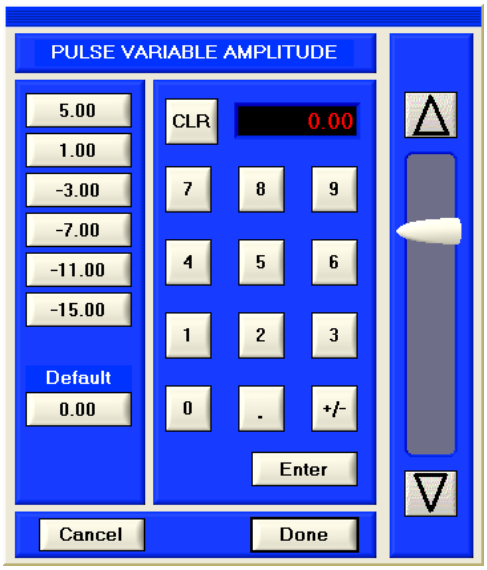
The Pulse field allows the selection of a specific pulse (symbol Mode 5), within the selected mode. Only pulses (symbols Mode 5) relevant to the reply mode will be available for selection.



Select *Done* when finished to close window.

Pulse Variable Amplitude

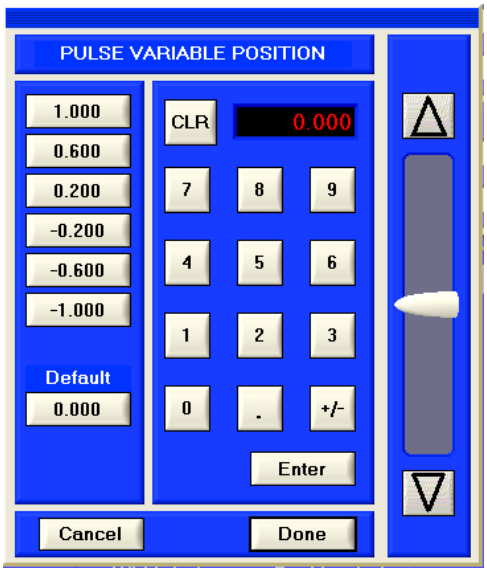
The Pulse Variable Amplitude Field allows the setting of Pulse amplitude in dB relative to the Reply RF level setting. Range is -15 to +5 dB in 0.01 dB increments.



Select *Done* when finished to close window.

Pulse Variable Position

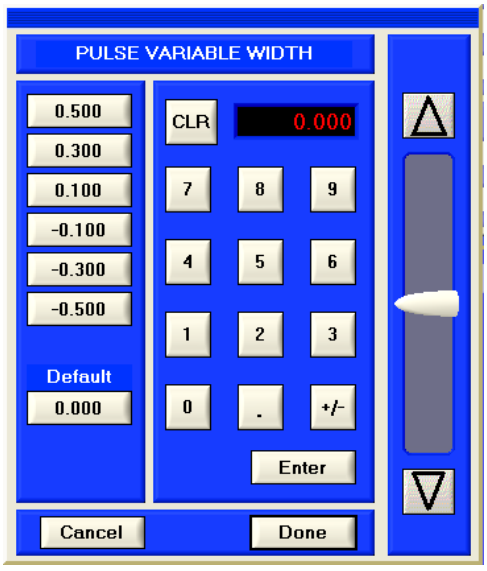
The Pulse Variable Position Field allows the deviation of Pulse Position relative to the nominal position Range
-1.000 to +1.000 us in 1 ns increments.



Select *Done* when finished to close window.

Pulse Variable Width

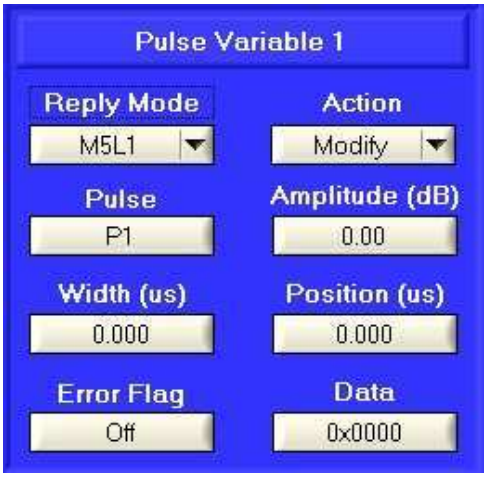
The Pulse Variable Width Field allows the deviation of Pulse Width relative to the nominal width. Range is -0.5 to +0.5 us in 1 ns increments.



Select *Done* when finished to close window.

Pulse Variable Data 1,(2),(3) Mode 5

When Reply M5L1 or M5L2 is selected, the Pulse Variable group displays a 4 HEX character Data entry field for Mode 5 Symbol data.



When the Error Flag field is set to On, an error is inserted into the Mode 5 symbol.

Pulse Variable Action

The Pulse Variable Action Field switches the parameter variation Off or On.

Selections are:

Modify: Parameter variation on.

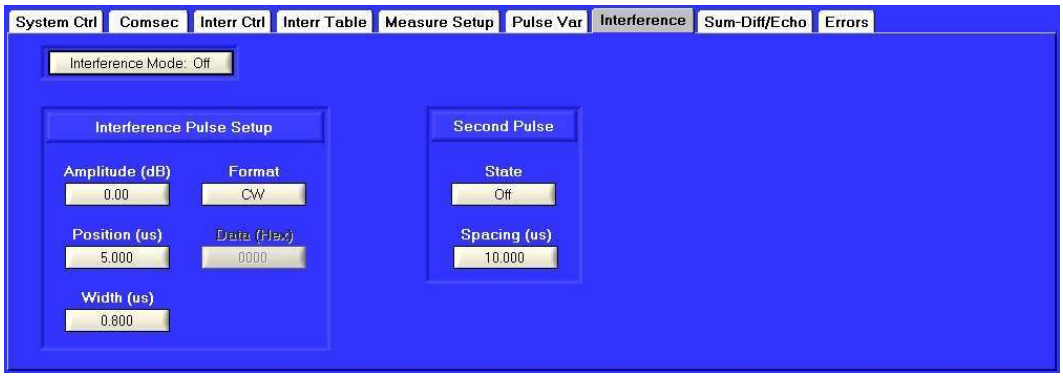
Delete: Parameter variation off and pulse is removed from reply pulse train.

4.19 INTERFERENCE

The Interference Tab controls 1 or 2 interference pulses of definable width, position and amplitude (1-2-4, Figure 15).

The Interference tab is divided into 2 groups, Interference Pulse Setup and Second Pulse.

Interference Mode On/Off control is also provided.

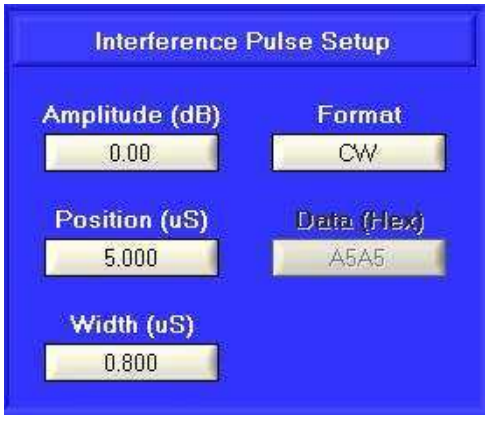


Interference Tab
Figure 15

4.19.1 Interference Pulse Setup Group

The interference pulse may be a single or double pulse timed to the leading edge of the first pulse in the reply group. In Mode 5 the pulse(s) may be CW or contain 16 bits of MSK data.

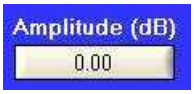
The Interference Pulse Setup Group displays the fields Amplitude and Position. Width, Format and Data (Hex) are Mode 5 only fields.



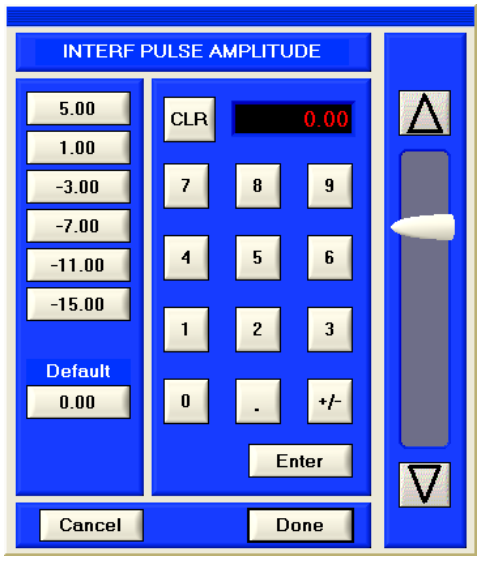
NOTE: Interference Pulse Mode must be turned on for variable parameters to become effective.

Amplitude (dB)

The Amplitude (dB) field sets amplitude relative to reply amplitude.



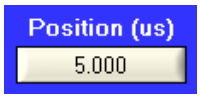
Selecting Amplitude (dB) field displays the Interference Pulse Amplitude data entry window. Range is -15 to +5 dB in 0.01 dB increments. Default is 0.0 dB.



Select *Done* when finished to close window.

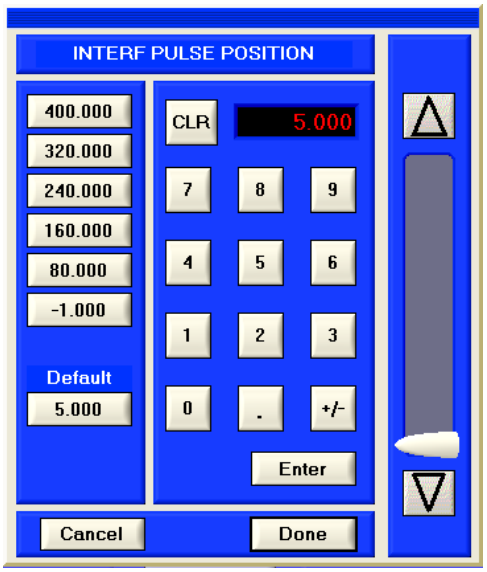
Position (us)

The Position (us) field sets interference pulse position relative to reply group reference pulse.



Selecting Position (us) field displays the Interference Pulse Position data entry window. Range is -1.000 to +400.000 us in 1 ns increments. Default is 5.000 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.



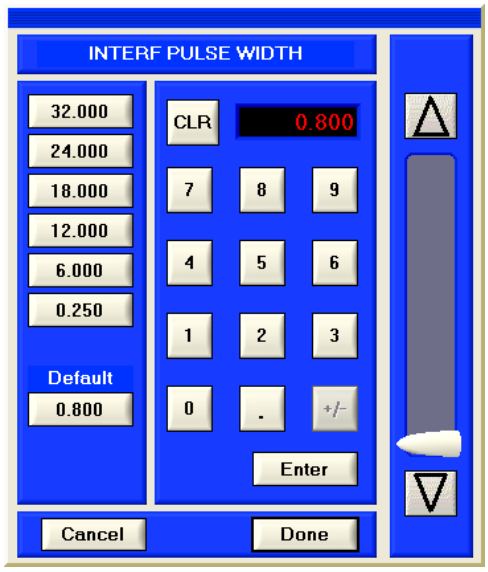
Select *Done* when finished to close window.

Width (us)

The width field sets interference pulse(s) width offset from nominal width.

Selecting Width (us) field displays the Interference Pulse Width data entry window. Range is +0.250 to +32.000 us in 1 ns increments. Default is 0.800 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.



Select *Done* when finished to close window.

Format

The Format field is available in Mode 5 only.

Selections are:

CW: CW pulse

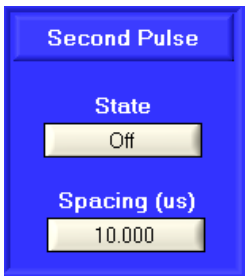
MSK: Mode 5 Symbol.

Data (Hex)

The Data (Hex) field is available in with Format set to MSK only. MSK Data entry 16 bits as 4 Hex digits, providing an interfering Mode 5 symbol.

14.19.2 Second Pulse Group

The Second Pulse Group controls the second interference pulse and displays the fields State and Spacing (us).



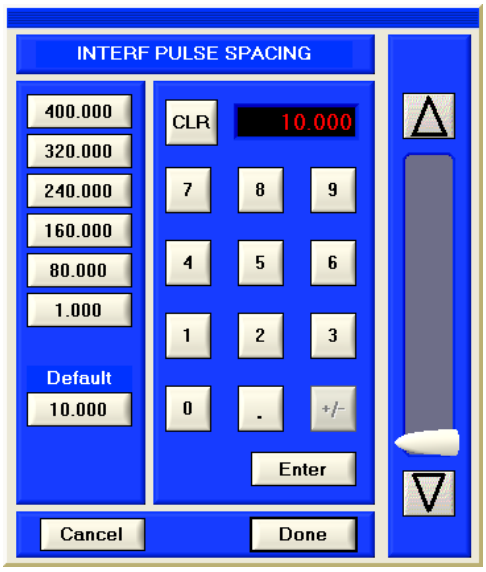
The State field turns the second interference pulse On or OFF.

Spacing (us)

The Spacing field sets spacing between first and second interference pulses.

NOTE: The interference pulses may not overlap.

Selecting Spacing (us) field displays the Interference Pulse Spacing data entry window.



Range from trailing edge of first interference pulse is 1.000 us to 400.000 us in 1 ns increments. Default is 10.000 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

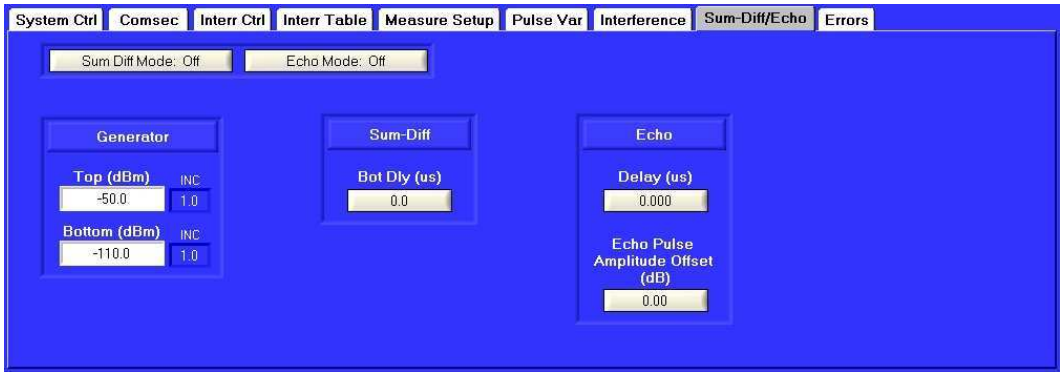
Select *Done* when finished to close window.

4.20 SUM-DIFF / ECHO TAB

The Sum and Difference/Echo Tab controls the reply RF level, Sum and Difference channel delay and Echo reply simulation (1-2-4, Figure 16).

The Sum and Difference/Echo tab is divided into three groups; Generator, Echo and Sum-Diff.

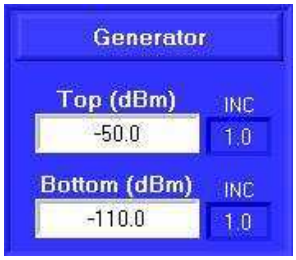
Sum Diff Mode On/Off control and Echo Mode On/Off control is also provided.



Sum-Diff/Echo Tab
Figure 16

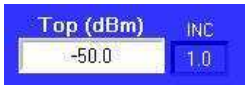
4.20.1 Generator Group

The Generator group provides control for the RF signal generator and displays the fields Top (dBm) and Bottom (dBm).



Top (dBm)

The Top (dBm) field allows the Top or Sum reply RF level to be set in 0.1 dB increments. Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.



NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit. Default value is 1 dBm.

Bot (dBm)

The Bot (dBm) field allows the Bottom or Diff reply RF level to be set in 0.1 dB increments.

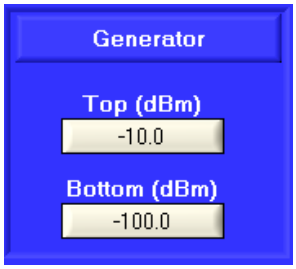
Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

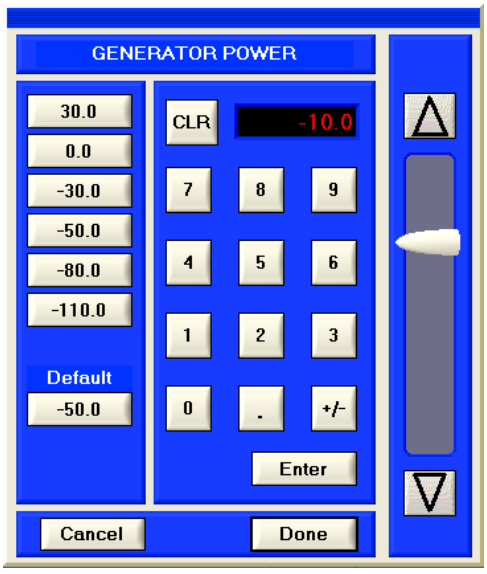
The INC field displays the currently selected increment unit.

Keypad Entry Option

On the Options menu, the *Keypad for Power/Frequency Entry* is enabled to allow popup keypad entry for generator power.



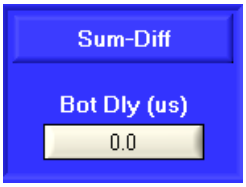
Selecting either Top (dBm) or Bottom (dBm) will display a popup keypad.



The desired value is entered by using the preselected values to the left, entering via keypad, or using the slider to the right.

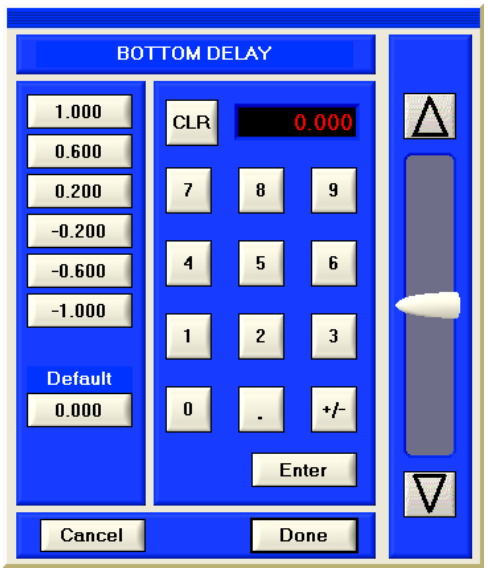
4.20.2 Sum-Diff

The Sum-Diff field allows a delay in us to be entered between the Bottom (Diff) port and the Top (Sum) port replies.



NOTE: Sum-Diff Mode must be turned on for variable parameters to become effective.

Selecting Bot Dly displays the Bottom Delay data entry window.

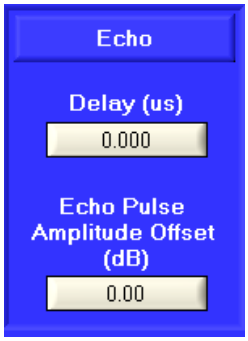


Range is ±1.0 us in 1 ns increments. Default value is 0.0 us.

Select *Done* when finished to close window.

4.20.3 Echo Group

The Echo group controls an echo reply generated on the Top (Sum) and Bottom (Diff) ports and consist of the fields Delay (us) and Echo Pulse Amplitude Offset (dB).

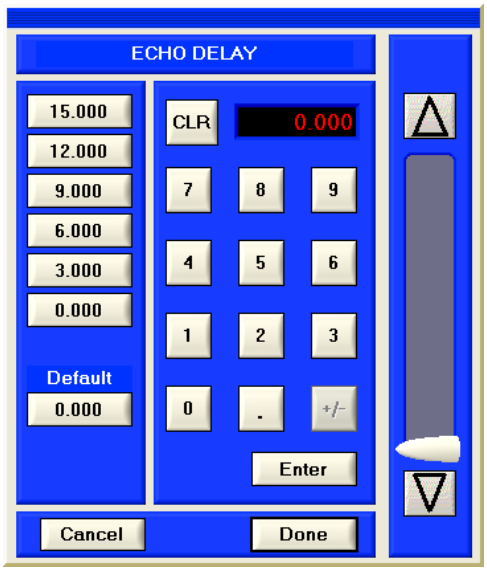


NOTE: Echo Mode must be turned on for variable parameters to become effective.

Delay (us)

The Delay field sets the spacing of the Echo relative to the first pulse of the main reply.

Selecting Delay (us) displays the Echo Delay data entry window.



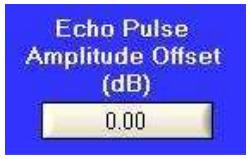
Range is 0.000 to +15.000 us in 1 ns increments. Default value is 0.000 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

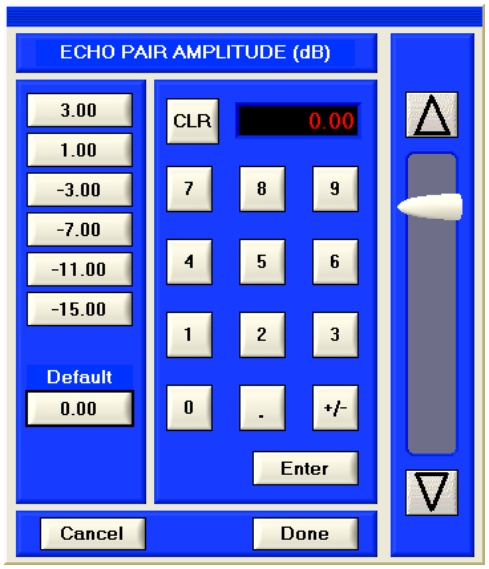
Select *Done* when finished to close window.

Echo Pulse Amplitude Offset (dB)

The Echo Pulse Amplitude Offset (dB) field, sets echo pulse amplitude offset relative to main reply RF Level.



Selecting Echo Pulse Amplitude Offset (dB) field displays the Echo Pair Amplitude (dB) data entry window.



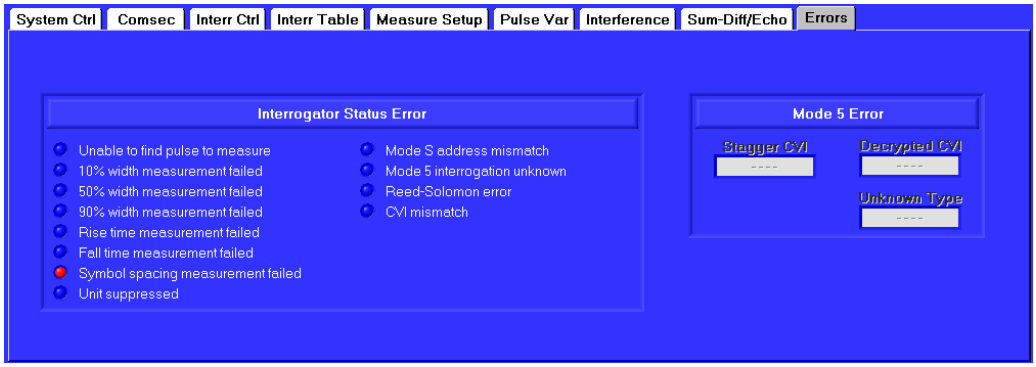
Range is -15.00 to +3.00 dB in 0.01 dB increments. Default value is 0.00 dB.

Select *Done* when finished to close window.

4.21 ERRORS TAB

The Errors Tab displays Interrogator status errors, which may be parametric or protocol errors and Mode 5 specific errors (1-2-4, Figure 17).

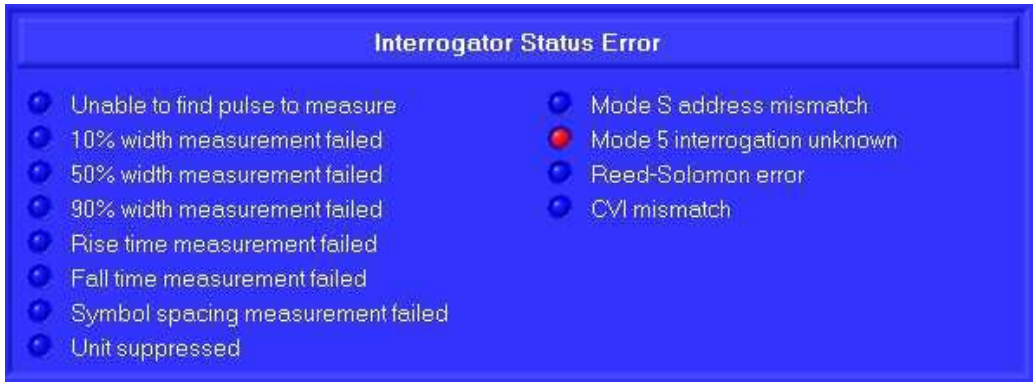
The Errors Tab is divided into 2 groups, Interrogator Status Error and Mode 5 Error.



Errors Tab
Figure 17

4.21.1 Interrogator Status Error Group

The Interrogator Status Error Group, displays errors relating to received interrogations.



Interrogator Status Errors

Unable to find pulse to measure:

The unit could not locate the pulse that the user wants to measure.

10% width measurement failed:

The unit could not measure the width between the 10% points of the rising and falling edges of the pulse.

50% width measurement failed:

The unit could not measure the width between the 50% points of the rising and falling edges of the pulse.

90% width measurement failed:

The unit could not measure the width between the 90% points of the rising and falling edges of the pulse.

Rise time measurement failed:

The unit could not measure the rise time of the measured pulse.

Fall time measurement failed:

The unit could not measure the fall time of the measured pulse.

Symbol spacing measurement failed:

The unit was unable to decode the Mode 5 symbol data and could not measure the spacing between symbols.

Unit is suppressed:

The unit is suppressed because it is receiving interrogations with an SLS pulse and is configured to respect the SLS.

Mode S address mismatch:

A received Mode S uplink has been received that contained an address that does not match any of the configured Mode S downlink targets.

Mode 5 interrogation unknown:

A Mode 5 interrogation has been received that requests an undefined reply/report format and cannot build a response.

Reed-Solomon error:

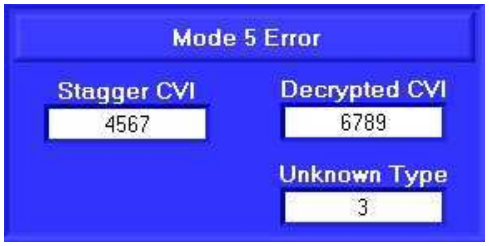
If the error detection and correction (EDAC) is turned off, this means that the received data contains a decode error and cannot be decrypted. If the error detection and correction is turned on, this means that the received data contains too many errors for correction and cannot be decrypted.

CVI mismatch:

The CVI decrypted from the interrogation does not match the CVI indicated by the detected stagger pattern. For example, if the interrogation had an encrypted CVI of 4591, the detected stagger pattern should use the stagger for CVI 4591 as well. If a CVI mismatch occurs, the interrogation will not be validated and replies will not be generated.

Mode 5 Error Group

The Mode 5 Error Group displays errors relating to Mode 5 interrogations.



Mode 5 Errors are:

Stagger CVI:

The CVI represented by the detected stagger that did not match the CVI decrypted from the interrogation.

Decrypted CVI:

The CVI decrypted from the received interrogation that did not match the CVI of the detected stagger.

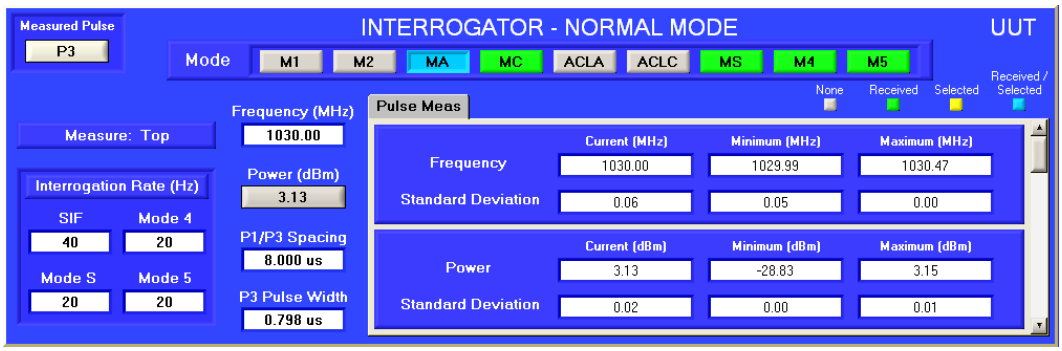
Unknown Type:

The format of the interrogation that requested an unknown reply/report format.

4.22 INTERROGATOR UUT

The upper section of the Interrogator test screen, displays UUT parameters for a selected mode (1-2-4, Figure 18).

The upper section the Interrogation Rate (Hz) group and five fields; Measured Pulse, Frequency (MHz), Power (dBm), P1/Px Spacing and Px Pulse width. Two tabs are displayed for Pulse Meas and Mode S UF or Mode 5 FMT.



Interrogator UUT TX Parameters
Figure 18

4.22.1 Mode

The Mode field provides selection for the required Mode to be monitored. Only one Mode may be monitored at one time.

Each Mode selected is color coded as shown the displayed legend.

Mode Legend

Grey = None: Not selected for interrogation count. Interrogation mode for this reply, has not been received.

Yellow = Selected: Selected for interrogation count. Interrogation mode for this reply has not been received.

Green = Received: Not selected for interrogation count. Interrogation mode for this reply has been received.

Cyan = Received/Selected: Selected for interrogation count. Interrogation mode for this reply has been received.

Mode selections are:

M1: Mode 1

M2: Mode 2

MA: Mode 3/A

MC: Mode C

ACLA: All-Call Long Mode A

ACLC: All-Call Long Mode C

MS: Mode S

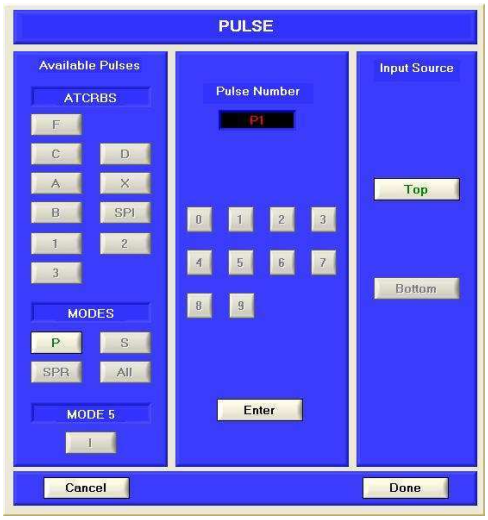
M4: Mode 4

M5: Mode 5

4.22.2 Measured Pulse

The Measured Pulse field provides selection of a specific pulse within a selected Mode interrogation.

Select the Measured Pulse field to display the Pulse Data Window.



The available pulses for selection are mode dependent.

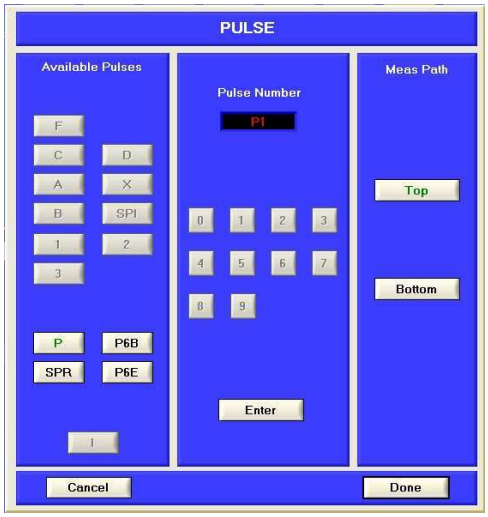
The selected pulse is used for power, frequency and pulse width measurement, also for spacing measurement relative to the reference pulse for the selected mode. This feature is used in conjunction with the Samples Meas Pulse field, located in the Measure Setup Tab.

All measurements are averaged over the selected number of samples. The Meas Pulse field sets the number of samples for the buffer, averaging UUT Interrogation Power, Frequency, Pulse Width and Pulse Spacing for the pulse selected in the Measured Pulse field.

Additional pulse selections for Mode S..SPR (1st Sync Phase Reversal), P6B (beginning of P6 DPSK block) P6E (end of P6 DPSK block).

NOTE: All-Call Long P4 pulses cannot be measured if an ATCRBS target is configured to reply at 0 nm. An ATCRBS target at 0 nm will start to reply during the interrogation's P4 pulse, suppressing part of P4. The All-Call Long P4 pulse is measured by increasing the range of the ATCRBS reply or by turning it off while measurements are being made on P4.

NOTE: The measured pulse must be reselected when the measured mode or the measured channel is changed.



Select *Done* when finished to close window.

4.22.3 Frequency (MHz)

The Frequency (MHz) field displays the TX Frequency of the selected pulse within the selected Mode. Measurement is displayed in MHz, resolution is 10 KHz.

4.22.4 Power (dBm)

The Power (dBm) field displays the TX Peak Power of the selected pulse within the selected Mode. Resolution is 0.1 dBm.

4.22.5 Px Pulse Width

The Px Pulse Width field displays the pulse width of the selected pulse within the selected Mode. Measurement is displayed in us, resolution is 25 ns.

4.22.6 Py/Px Spacing

The Py/Px Spacing field displays the pulse spacing between the reference pulse (Py) and the selected pulse (Px), within the selected Mode. Measurement is displayed in us, resolution is 10 ns.

NOTE: The IFF-45TS will display measurements to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

Reference pulses for each Mode are:

M1: *P1*

M2: *P1*

MA: *P1*

MC: *P1*

ACLA: *P1*

ACLC: *P1*

ACLC: *P1*

MS: *P1*

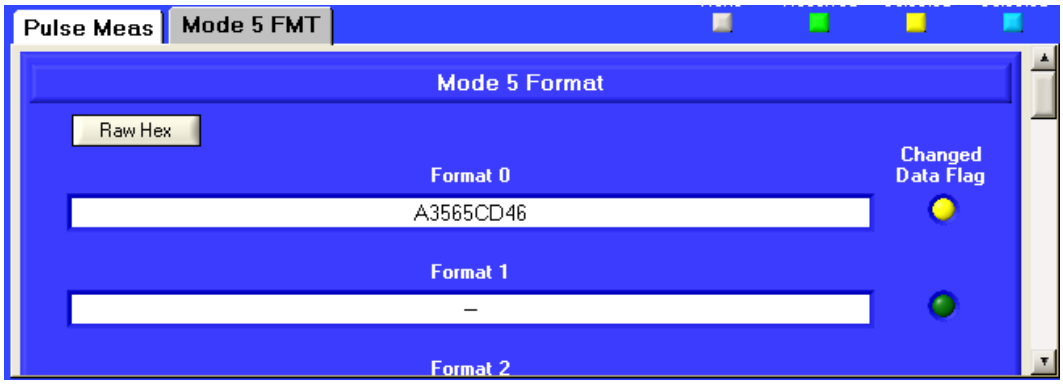
M4: *P1*

M5: *P4*

4.22.7 Mode 5 FMT

The Mode 5 FMT window is active when selected Mode is Mode 5. Each Mode 5 interrogation format data, is displayed in an individual field, accessible via a scrollable window from Format 0 to Format 23 (1-2-4, Figure 19).

Data is displayed in either Raw Hex 9 character or Raw Octal 12 character format. To the right of each Format field is a Changed Data Flag, which is set to yellow every time the Format data content changes; otherwise, it is green to indicate no data change.

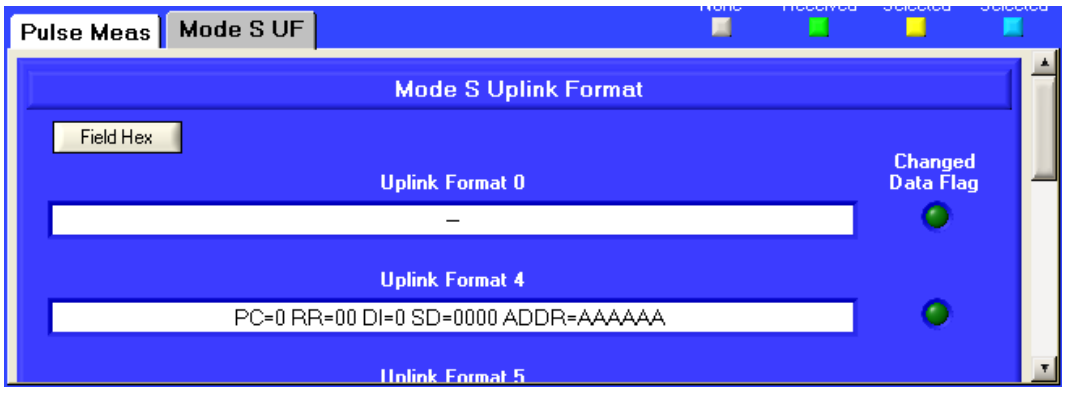


Mode 5 FMT
Figure 19

4.22.8 Mode S UF

The Mode S UF or Uplink Format window is active when selected Mode is Mode S. Each Mode S interrogation Uplink Format is displayed in an individual field, accessible via a scrollable window. Data is displayed in either Raw Hex 14 character or Raw Octal 19 character format (1-2-4, Figure 20).

To the right of each Format field is a Changed Data Flag, which is set to yellow every time the Format data content changes; otherwise, it is green to indicate no data change.



Mode S UF
Figure 20

UF fields displayed are:

UF0: *RL=1 AQ=1 BD=FF*

UF4: *PC=7 RR=1F DI=7 SD=FFFF*

UF5: *PC=7 RR=1F DI=7 SD=FFFF*

UF11: *PR=F IC=F CL=7*

UF16: *RL=1 AQ=1 MU=FFFFFFFFFFFFFF*

UF20: *PC=7 RR=1F DI=7 SD=FFFF MA=FFFFFFFFFFFFFF*

UF21: *PC=7 RR=1F DI=7 SD=FFFF MA=FFFFFFFFFFFFFF*

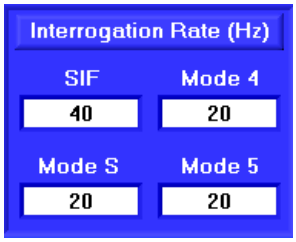
UF24: RC=3 NC=F MC=FFFFFFFFFFFFFFFFFFFF

NOTE: Maximum data range in Hex for each Mode S data field shown above. Refer to Appendix A for detailed description of Mode S Uplink Format Data.

NOTE: Only Mode S formats currently defined in RTCA DO-181 are displayed in field form. All unassigned Mode S formats are displayed in raw hex or octal data format.

4.22.9 Interrogation Rate (Hz) Group

The Interrogation Rate group displays the measured interrogation rate for each group of interrogations seen.



Groups are:

SIF: Modes 1, 2, 3/A, C

Mode S: MS, ACL-A, ACL-C

Mode 4:

Mode 5:

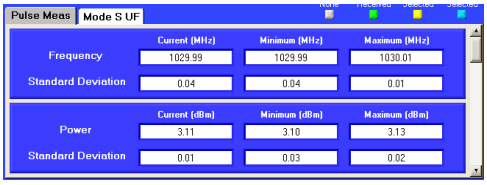
Range is 0 to 10,000 Hz, resolution 1 Hz.

4.22.10 Pulse Measure

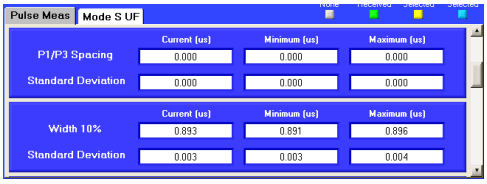
The pulse measure window is displayed for each selected Mode reply. Current, Minimum and Maximum measurements are displayed along with the standard deviations for each parameter. The measurements displayed in the scrollable window are those acquired since the last buffer reset. Refer to 1-2-4.17.4, for details of buffer resetting.

The parameters measured and displayed are:

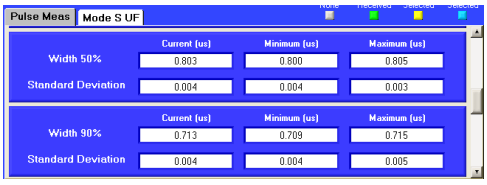
Frequency and Power



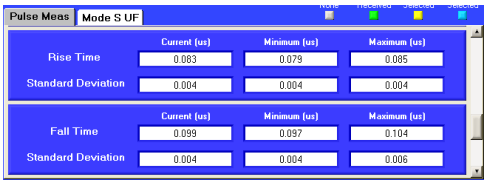
Pulse Spacing and Width 10%



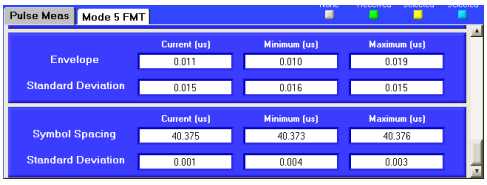
Width 50% and Width 90%



Rise Time and Fall Time



(Mode 5 only) Envelope and Symbol Spacing



4.23 TRANSPONDER INSTRUMENT

In the Transponder mode of operation the IFF-45TS emulates an interrogator. The unit generates configured interrogations and monitors the transponder replies.

The unit is capable of generating 12 different interrogations. These interrogations may be the same type of interrogation or different types of interrogations. Interrogations may be Burst, Interleaved or Double.

4.23.1 Transponder Test Screen

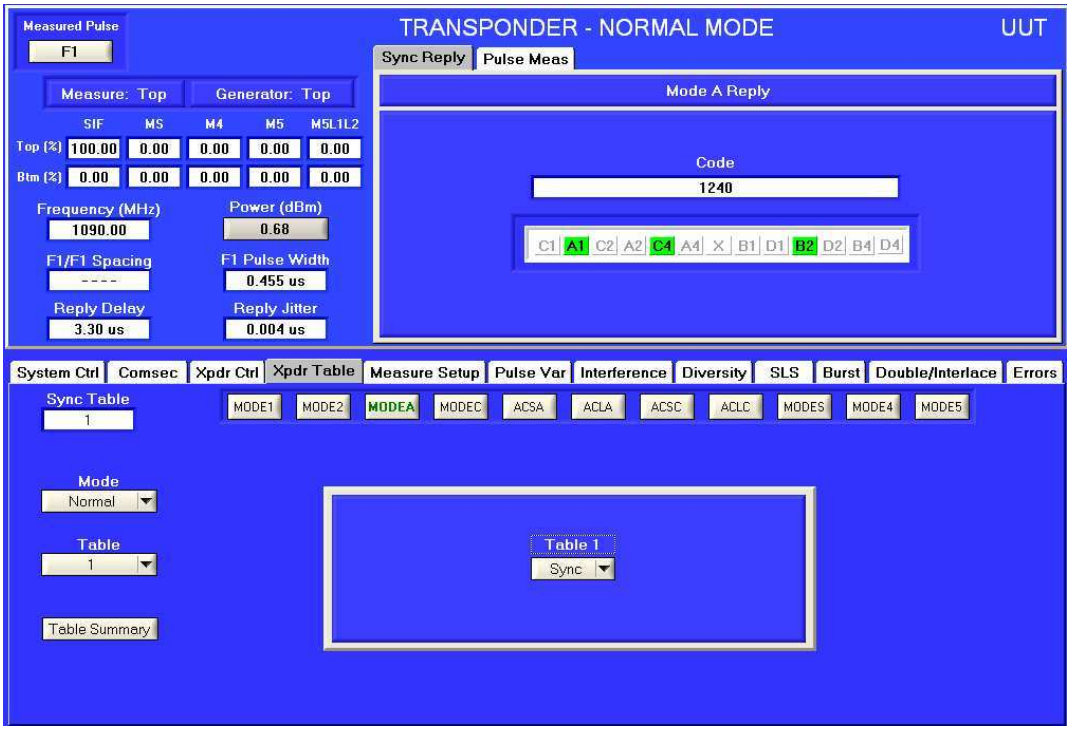
Select the Transponder instrument to display the Transponder test screen (1-2-4, Figure 21).

The Transponder Test Screen is divided into two sections; Upper and Lower.

The Upper section provides display of Transponder UUT TX parametric and data parameters. Each of the 12 interrogation tables may have a mutually exclusive sync set. The exclusive synchronized interrogation determines which transponder replies are monitored for TX Peak Power, TX Frequency, Pulse Spacing, Pulse Width, Reply Delay, Reply Jitter, % Reply and Data. The Measured Pulse field determines which pulses in the reply are monitored.

The Lower section provides the IFF-45TS control functions and displays the tabs Systems Control, COMSEC, Xpdr Control, Xpdr Table, Measure Setup, Pulse Variable, Interference, Diversity, SLS, Burst, Double/Interlace and Errors

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.



Transponder Test Screen
Figure 21

4.24 SYSTEM CONTROLS

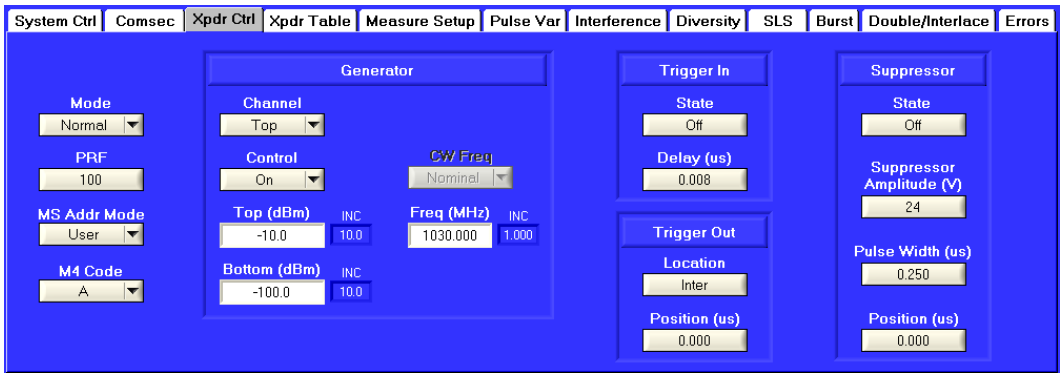
Refer to 1-2-4.1.5, Systems Controls.

4.25 COMSEC CONTROL

Refer to 1-2-4.2, COMSEC Control.

4.26 TRANSPONDER CONTROL TAB

The Xpdr Control tab is divided into four groups; Generator, Trigger In, Trigger Out, Suppressor and four fields that are mode specific; Mode 4 Code (1-2-4, Figure 22).



Xpdr Control Tab
Figure 22

4.26.1 Generator Group

The Generator group provides control for the RF signal generator and displays the fields Channel, Control, Top (dBm), Bottom (dBm), CW Freq and Freq (MHz).

Freq (MHz) 1030

The Freq(MHz) 1030 field sets the IFF-45TS reply carrier frequency.

Range of entry is 960.00 to 1220.00 MHz in 10 KHz increments. Default value is 1030 MHz. The frequency maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected Increment unit. Default value is 1 MHz.

Control

The Control field controls the Top and Bottom ports (direct and antenna), interrogations.

Selections are:

Off: Turns off interrogation modulation, disables RF.

On: Turns on interrogation modulation

CW: Turns off interrogation modulation, CW only.

Top (dBm)

The Top (dBm) field Allows the Top Interrogation RF level to be set in 0.1 dB increments.

Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory “Out of Range” text message being displayed.

The INC field displays the currently selected increment unit. Default value is 1 dBm.

Bot (dBm)

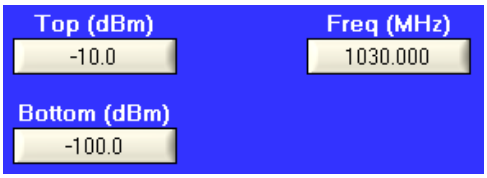
The Top (dBm) field Allows the Top interrogation RF level to be set in 0.1 dB increments. Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory “Out of Range” text message being displayed.

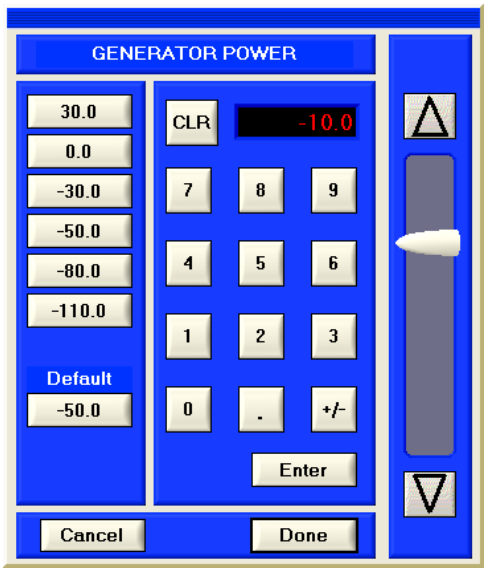
The INC field displays the currently selected increment unit.

Keypad Entry Option

On the Options menu, the *Keypad for Power/Frequency Entry* is enabled to allow popup keypad entry for generator power or frequency.



Selecting either Top (dBm), Bottom (dBm), or Freq (MHz) will display a popup keypad.



The desired value is entered by using the preselected values to the left, entering via keypad, or using the slider to the right.

Channel

The field controls which channel the test is performed on. Interrogations are transmitted on this channel and replies are monitored on this channel.

Selections are:

Top: Monitor top port

Bottom: Monitor on bottom port

CW Freq

The CW Freq field is only active when CW is selected in the Control field.

The field displays the CW frequency selections.

Selections are:

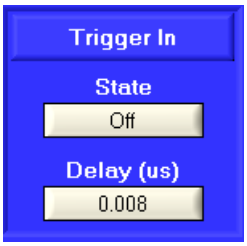
Space: +4 MHz

Nominal: User set Frequency (MHz), 1030 MHz default value.

Mark: -4 MHz

4.26.2 Trigger In Group

The Trigger In group provides control for an external TTL interrogation trigger input and displays the fields State and Delay (us).



State

The State field controls the trigger input.

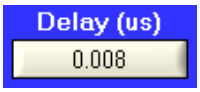
Selections are:

On: External TTL input active.

Off: Internal PRF generator active.

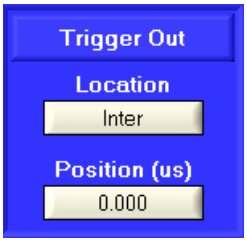
Delay (us)

The TTL trigger in may be delayed from 0.008 to 20.000 us in 1 ns increments. Default value is 0.008 us.



4.26.3 Trigger Out Group

The Trigger Out group allows an oscilloscope TTL trigger pulse to be synchronized to an interrogation (Xpdr) table or to the associated reply.



For interrogations the trigger is synchronized to the reference pulse, which is either P3 pulse for SIF, P4 for M4, P4 trailing edge for Mode 5, or 1st SPR for Mode S interrogations.

For replies, the Trigger Output Pulse is synchronous with the test set's detection of the reply.

NOTE: For interrogation (Xpdr) table sync details refer to 1-2-4.16.

Location

The Location field allows the Inter (interrogation) or Reply to be selected as a trigger source.

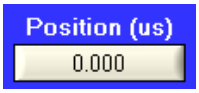
Selections are:

Inter:

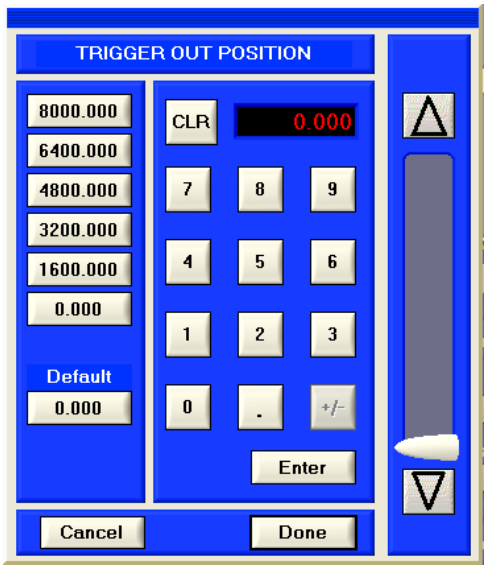
Reply:

Position (us)

The Position field allows the trigger out pulse to be delayed with respect to the interrogation or reply reference pulse.



Select the Position (us) field to display the Trigger Out Position data entry window.

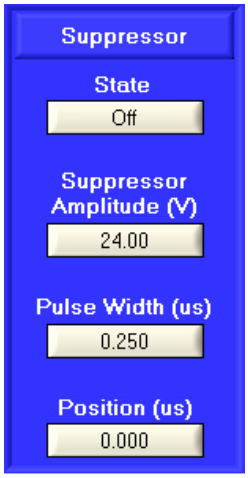


Range is 0.000 to 8000.000 us in 1 ns increments. Default value is 0.000 us.

Select *Done* when finished to close window.

4.26.4 Suppressor Group

The Suppressor group provides control for the suppression pulse and displays the fields On/Off, Suppressor Amplitude (V), Pulse Width (us) and Position (us).



State

The State field controls the suppressor output.

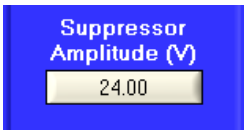
Selections are:

On: Suppressor Pulse on.

Off: Suppressor pulse off.

Suppressor Amplitude (V)

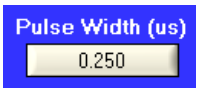
The Suppressor Amplitude (V) field controls the suppressor pulse amplitude.



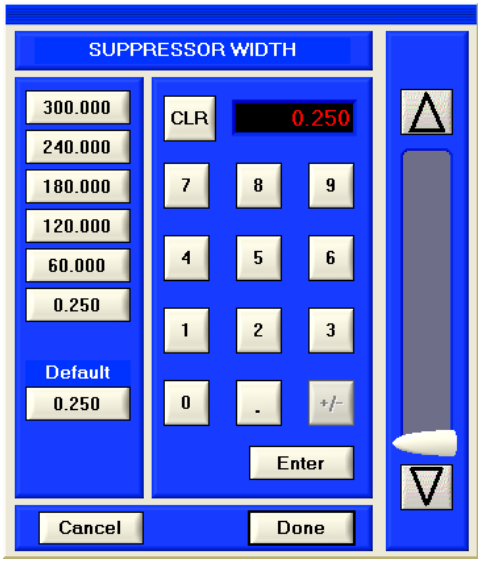
Range 12 to 80 volts peak in 0.01 V increments. Default value is 24 V.

Pulse Width (us)

The Pulse Width (us) field sets the suppressor pulse width.



Select the Pulse Width (us) field to display the Suppressor Width data entry window.

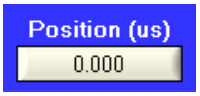


Range is 0.250 us to 300.000 us in 1 ns increments. Default value is 0.250 us.

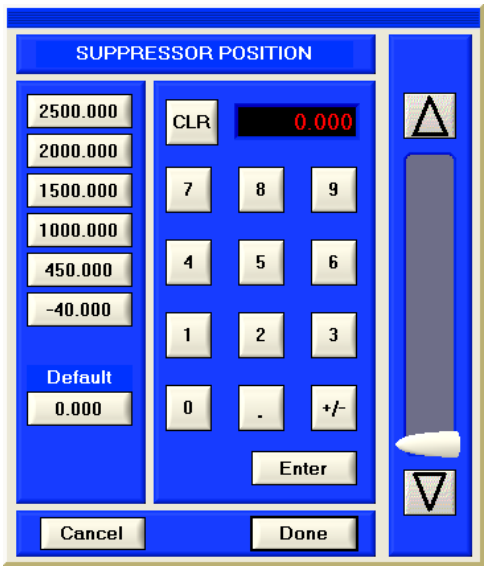
Select *Done* when finished to close window.

Position (us)

The Position (us) field adjusts the suppressor pulse spacing relative to the mode group reference pulse, which is either P3 pulse for SIF, P4 for M4, P4 trailing edge for Mode 5, or SPR for Mode S interrogations.



Select the Position (us) field to display the Suppressor Position data entry window.

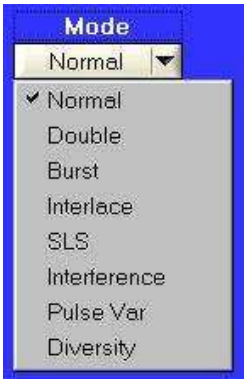


Range is -40.000 to +2500.000 us, in 1 ns increments. Default value is 0.000 us.

Select *Done* when finished to close window.

4.26.5 Mode

The mode control field turns on the various transponder instrument modes of operation. Each Mode is mutually exclusive.



The selections are:

Normal: Normal interrogations (i.e., a single mode group set at a set PRF rate).

Double: Double Interrogations.

Burst: Burst Interrogations.

Interlace: Interlaced Interrogations.

SLS: SLS interrogations.

Interference: Interference pulse.

Pulse Var: Pulse Variable.

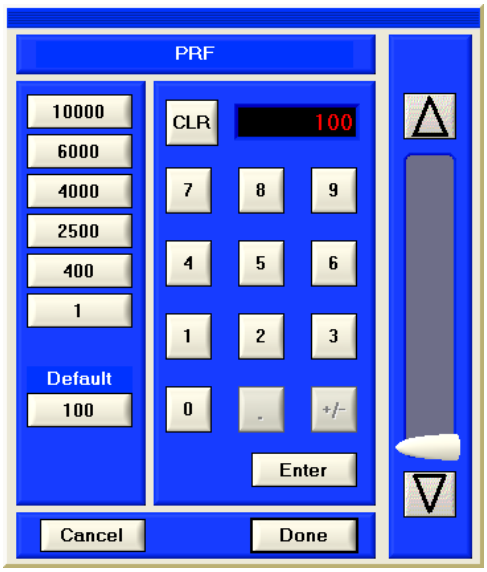
Diversity: Diversity.

NOTE: Each mode also may be turned on or off in the respective tabs.

4.26.6 PRF

The PRF field allows the Pulse Repetition Rate to be set for interrogation mode group.

Selecting the PRF field displays the PRF Window.



Select the PRF field to display the PRF data entry window.

Range is 1 to 10000Hz. Default value is 100Hz.

Select *Done* when finished to close window.

4.26.7 MS Addr Mode

The Mode S Address Mode field allows the selection of either a user defined Mode S address (i.e., the address set in the Mode S interrogation table, or the Mode S address obtained from transponder DF11 squitter). The Transponder Mode S address is used in all Uplink Format (UF) interrogations.

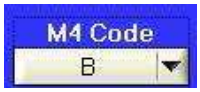
Selections are:

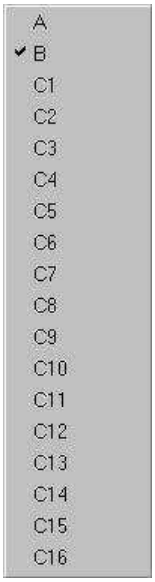
User: Mode S address is obtained from user entered address in Mode S interrogation table.

Squitter: Mode S address is obtained from transponder DF11 squitter.

4.26.8 M4 Code

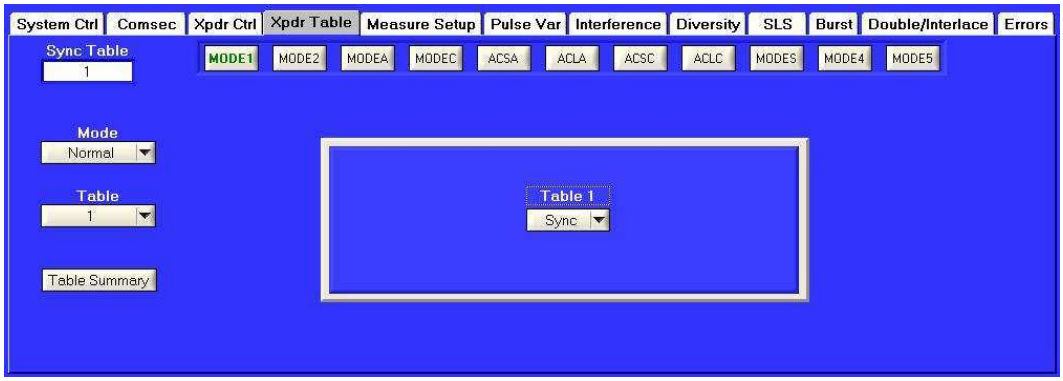
The M4 Code field provides selection of the Mode 4 A or B interrogation test word, or C1 to C16 triplet reply slot, used in Mode 4 interrogation tables (internal crypto only). Refer to NATO STANAG 4193 for details.





4.27 TRANSPONDER TABLE TAB

The Xpdr Table tab provides configuration for up to 12 interrogations. Each independent interrogation may configured as a specific mode. The Xpdr Table tab is divided into two groups, Control and Table (1-2-4, Figure 23).

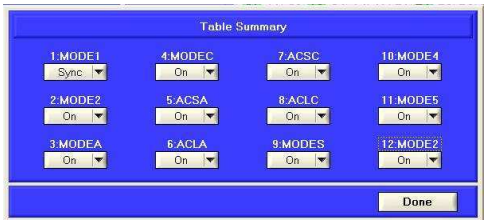


Xpdr Table Tab
Figure 23

4.27.1 Table Summary

The Table Summary Field allows access to the Interrogation Summary window.

Select the Table Summary Field to display the Table Summary window.

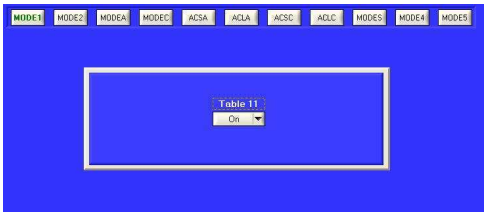


The Table Summary window is organized as 4 columns of 3 rows of interrogation table fields. First column; tables 1 to 3, second column; tables 4 to 6, third column; tables 7 to 9 and fourth column tales10 to 12. Each numbered table field has a Mode

Identification and On/Off selection. If a user wishes to simulate a single interrogator with Modes 1, 2, 3 and Mode S UF4, 5, 11 interrogations active, 6 interrogations will be used for the simulation. A user may wish to simulate 12 individual Mode 1 interrogations. Each interrogation would be set to the same mode.

4.27.2 TABLE SIF M1, M2,M3/A,MC, ACSA, ACSC, ACLA, ACLC

The Table content displayed varies according to selected Mode. The Mode selection fields are displayed in a row at the top of the window.



Selections are:

MODE1: Mode 1

MODE2: Mode 2

MODEA: Mode 3/A

MODEC: Mode C

ACSA: All-Call Short Mode A

ACSC: All-Call Short Mode C

ACLA: All-Call Long Mode A

ACLC: All-Call Long Mode C

MODES: Mode S

MODE4: Mode 4

MODE5: Mode 5

4.27.3 Table 1 – (12)

The Table 1-(12) field selects the table to be On, Off or Sync.

Selections are:

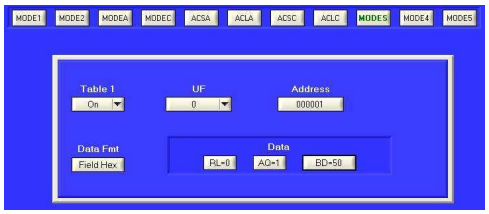
On: Table On

Off: Table Off

Sync: Replies received to this interrogation table are displayed in UUT section Reply window.

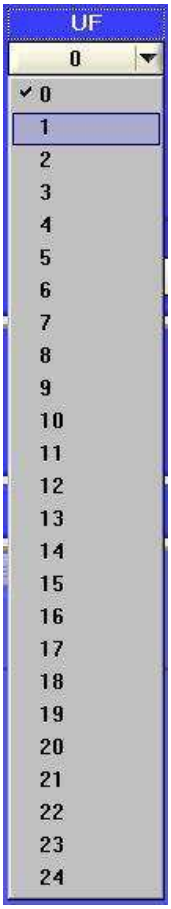
4.27.3 Table Mode S

The Table Mode S window displays the fields for Mode S.



UF

The UF field provides the selection of Mode S Uplink Format (UF) to be used for interrogation.



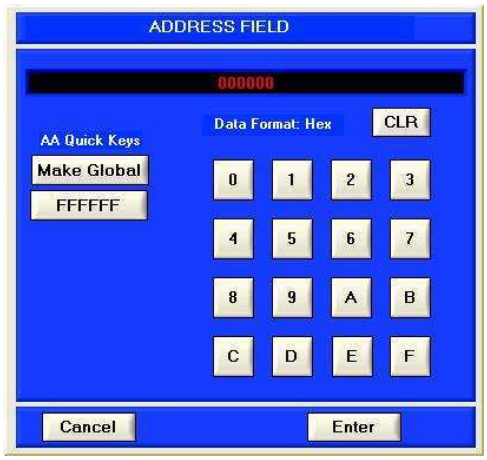
Selections are UF0 to UF24.

NOTE: Refer to RTCS DO-181C/D. The currently defined formats are UF0, 4, 5, 11, 16, 20, 21 and 24. All other formats may be configured in raw Hex or Octal.

Address

The Address field allows the DF Address to be set for the reply, either in Octal or Hex.

Selecting the Address field displays the Address Field data entry window.



Range Octal is 00000000 to 77777777, Range Hex is 000000 to FFFFFF

NOTE: Selecting Global populates the address field for all tables configured for Mode S (except DF11), with the displayed address.

NOTE: The address is actually address overlaid with parity or AP.

77777777 is the Mode S Only all call address, used in DF11 replies.

Select *Enter* when finished to close window.

Data Fmt

The Data Fmt field allows the selection of Octal and Hex data formats for the Uplink (UF) Data and Address fields.

Selections are:

Field Hex: Address and data is entered in Hex format.

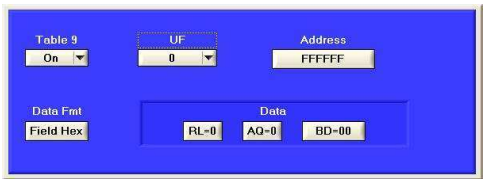
Field Octal: Address is entered in Octal format.

Raw Hex: Address is entered in Hex format and data is entered as one hex block.

Raw Octal: Address is be entered in Octal format and data is entered as one Octal block.

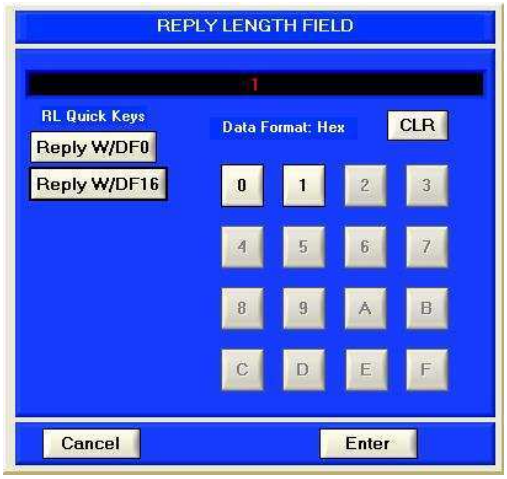
4.27.4 UF0 Data

UF0 is the short surveillance special, used by TCAS II systems. The UF0 Data group displays the fields RL, AQ and BD.



RL

Select the RL field to display the Reply Length data entry Window.



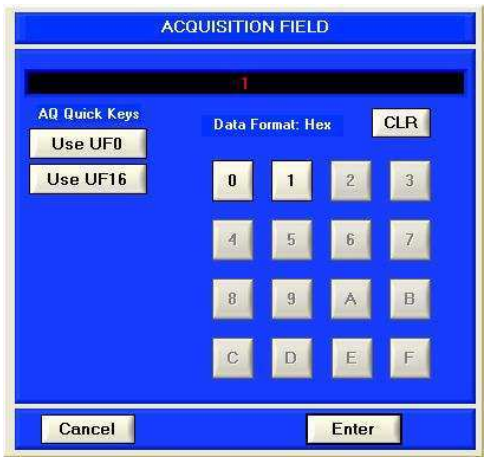
Selections are:

1: Long Reply 112 bits (DF16)
0: Short Reply 56 bits (DF0)

Select *Enter* when finished to close window.

AQ

The Acquisition Special field instructs the transponder to utilize either UF0 or UF 16. Select the AQ field to display the Acquisition Field window.



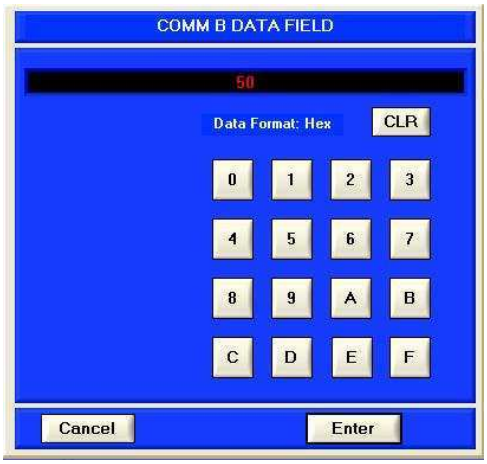
Selections are:

1: Use UF16 and reply with DF16.
0: Use UF0 and reply with DF0.

Select *Enter* when finished to close window.

BD

Select the BD field to display the Comm B Data Field window.



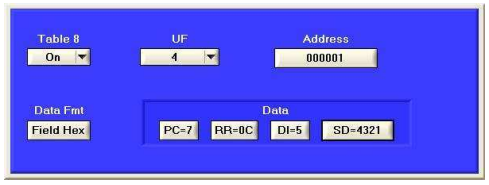
The BD field is actually the BDS-B Definition Subfield, used in a GICB transaction to request the downlink of specific transponder BDS register contents.

The first Hex digit represents BDS1 and the second Hex digit represents BDS2. Example: 50 would make a GICB request for BDS register 5,0 (track and turn report) to be transmitted in the downlink Comm B message field.

Select *Enter* when finished to close window.

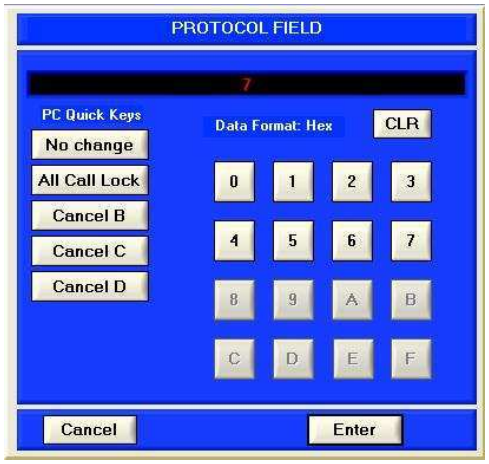
4.27.5 UF4 Data

UF4 is the Surveillance Altitude request, used by ground interrogators. The UF4 Data group displays the fields PC, RR, DI and SD.



PC

Select the PC field to display the Protocol Field window.



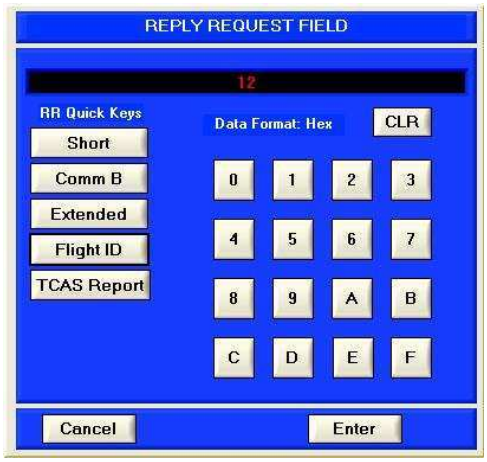
The PC field may be set by using the PC quick keys.

NOTE: The PC field is ignored if DI=3.

Select *Enter* when finished to close window.

RR

Select the RR field to display the Reply Request Field window.

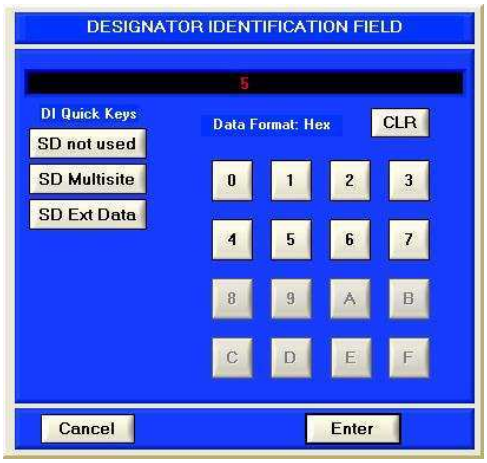


The RR field may be set by using the RR quick keys. The RR field contains the length and content of the reply requested by the interrogator.

Select *Enter* when finished to close window.

DI

Select the DI field to display the Designator Identification Field window.

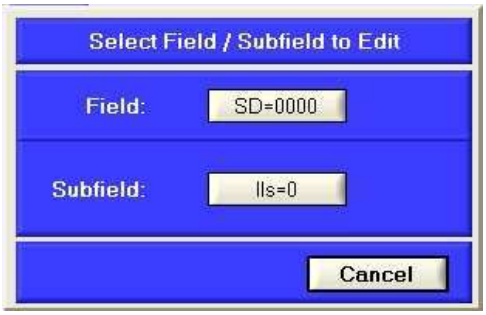


The DI field may be set by using the DI quick keys. The DI field identifies the coding contained in the SD field in formats UF4, 5, 20 and 21.

Select *Enter* when finished to close window.

SD

Select SD field to display Select Field / Subfield to Edit Window.

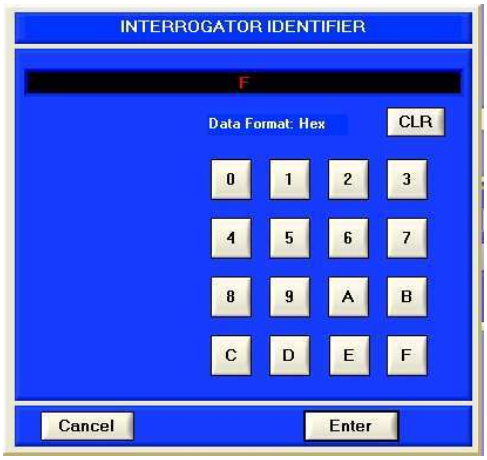


The SD message field may be entered as raw data and the IIs and SIs subfields are provided for ease of use.

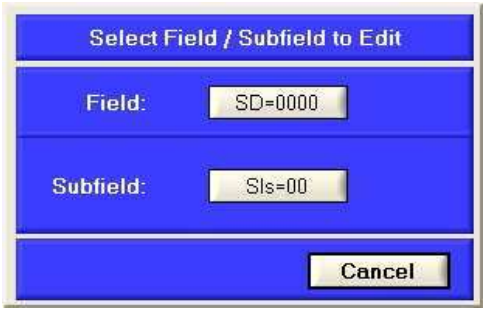
NOTE: The IIs (Interrogator Identity) subfield is displayed if DI= 0,1 or 7

Select Subfield IIs to display Interrogator Identifier Window.

Range is 0 to F Hex, 0 to 17 Octal



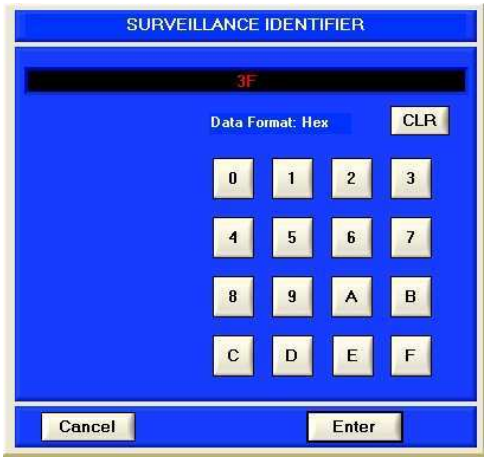
Select SD to display Select Field / Subfield to Edit Window.



NOTE: The SIs (Surveillance Identifier) subfield is displayed if DI= 3.

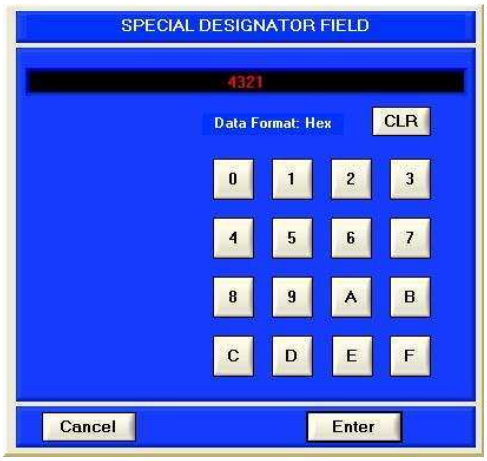
Select the SIs field to display the Surveillance Identifier Window.

Range is 0 to 3F Hex, 0 to 77 Octal.



Select *Enter* when finished to close window.

Select the SD field to display the Special Designator Field Window.

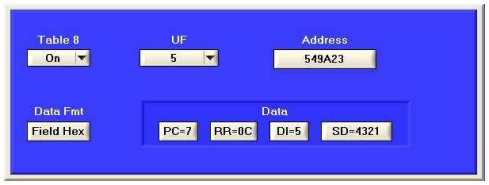


The SD field contains control codes effecting transponder protocol.

Select *Enter* when finished to close window.

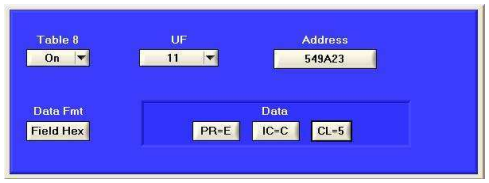
4.27.6 UF5 Data

UF5 is the Surveillance Identity request, used by ground interrogators. The UF5 Data group displays of the fields PC, RR, DI and SD.



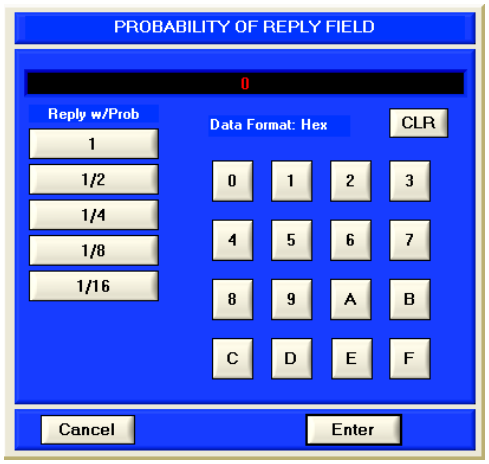
4.27.7 UF11 Data

UF11 is the Mode S Only All Call, used by ground interrogators. The UF11 Data group displays the fields PR, IC and CL.



PR

Select the PR field to display the Probability of Reply Field window.

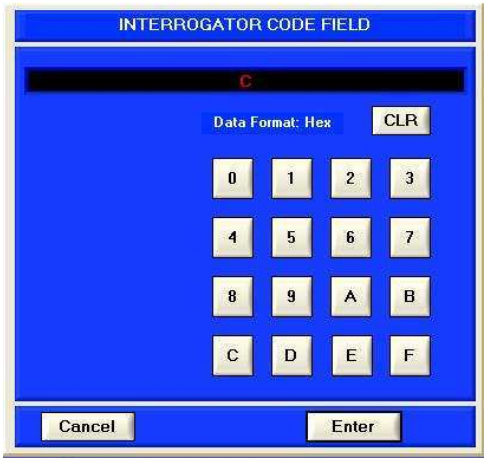


The PR field contains commands to the transponder which specify the reply probability to the Mode S Only All Call interrogation UF11. The PR field may be set by using the PR quick keys, which specify some of the defined commands.

Select *Enter* when finished to close window.

IC

Select the IC field to display the Interrogator Code Field window.



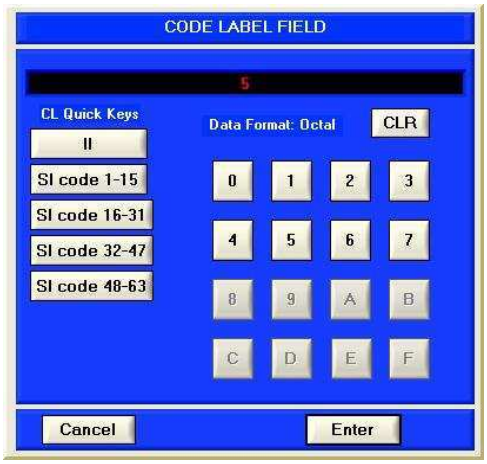
IF the CL field is 000, then the IC field contains the 4 bit II (interrogator Identity) code (Dec 0 to15) entered as Hex 0 to F or Octal 0 to 17. If the CL field is 001 to 100, then the IC field contains the lower 4 bits of the 6 bit SI (Surveillance Identifier) field.

NOTE: The SL field is use to overcome the 1 to 15 II codes restriction allowing ground interrogators to have SI codes from 1 to 63.

Select *Enter* when finished to close window.

CL

Select the CL field to display the Code Label Field window.

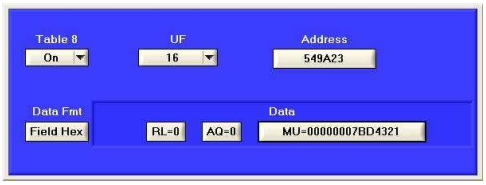


The CL field allows either II to be set via the IC field or SI code to be entered via the CL quick keys.

Select *Enter* when finished to close window.

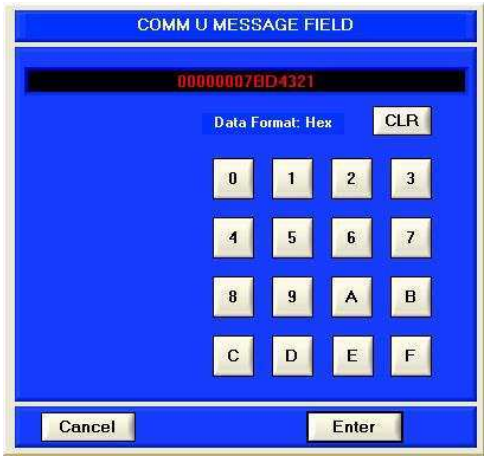
4.27.8 UF16 Data

UF16 is the long surveillance special, used by TCAS II systems. The UF16 Data group displays of the fields RL, AQ and BD.



MU

Select the MU field to display the Comm U Message Field window.

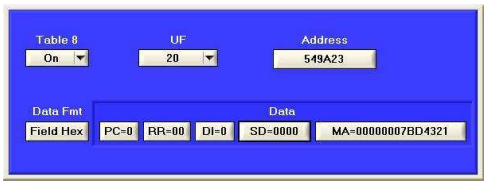


The MU field is a 56 bit message used by TCAS II for air to air data exchanges.

Select *Enter* when finished to close window.

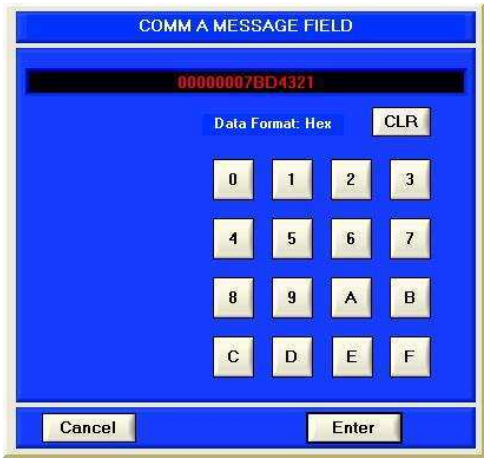
4.27.9 UF20 Data

UF20 is the Comm A Surveillance Altitude request, used by ground interrogators. The UF20 Data group displays the fields PC, RR, DI, SD and MA.



MA

Select the MA field to display the Comm A Message Field window.

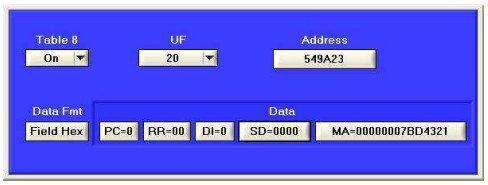


The MA field is a 56 bit message used by ground interrogators to send data to the transponder sub systems. An example of this would be sending data that is directed to the TCAS II system to command a specific sensitivity level to be set.

Select *Enter* when finished to close window.

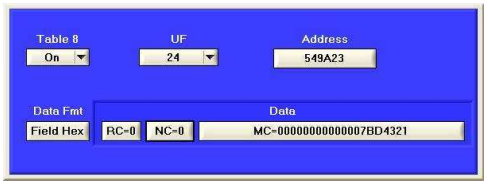
4.27.10 UF21 Data

UF21 is the Comm A Surveillance Identity request, used by ground interrogators. The UF21 Data group displays the fields PC, RR, DI, SD and MA.



4.27.11 UF24 Data

The UF24 data group displays the fields RC, NC and MC.

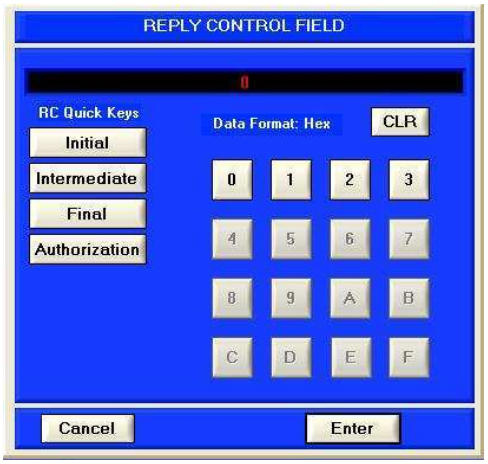


UF24 is used as part of Comm C/D ELM (Extended Length Message) transactions. Refer to 1-2-4.7 Datalink for UELM (Uplink Extended Length Message)/DELM Downlink Extended Length Message) testing using the Comm C/D protocol.

Select *Enter* when finished to close window.

RC

Select the RC field to display the Reply Control Field window.

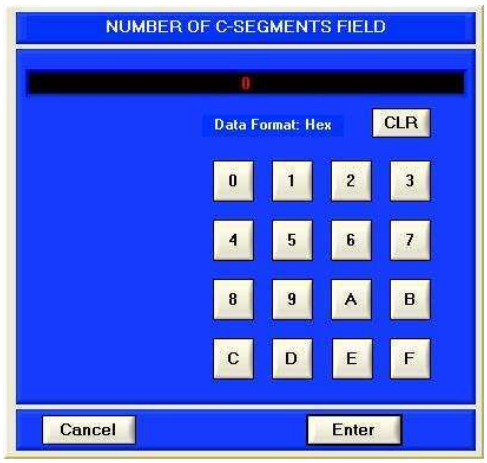


In the Comm C interrogation, the RC field is used to designate the transmitted message segment as initial, intermediate or Final. RC is also used to authorize Comm D downlink action.

Select *Enter* when finished to close window.

NC

Select the NC field to display the Number of C Segments Field window.

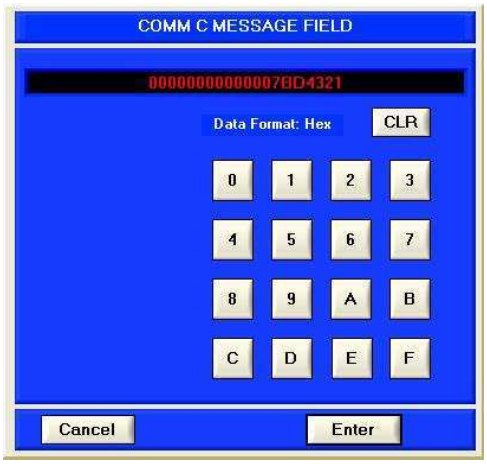


In the Comm C interrogation, the NC field is used to specify the number of a segment transmitted in an uplink ELM. Range is 0 to F Hex.

Select *Enter* when finished to close window.

MC

Select the MC field to display the Comm C Message Field window.



In the Comm C interrogation, the MC field contains one of the segments of a sequence used to transmit an uplink ELM and control fields for requesting one or more downlink ELM segments.

Select *Enter* when finished to close window.

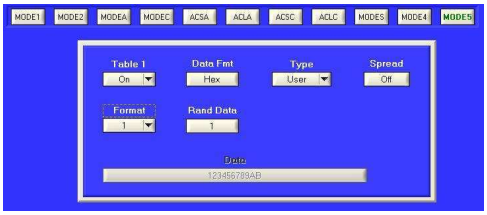
4.27.12 Table Mode 4

The Table Mode 4 displays the fields for Mode 4.

NOTE: Mode 4 challenge content is determined by Xpdr Control tab, M4 Code field (internal crypto only). With external crypto, challenge content is determined by crypto.

4.27.13 Table Mode 5

The Table Mode 5 displays the fields for Mode 5.



When the table entry is set to Encrypted, this data field is used as the data source for the interrogation. This mode of operation is not recommended for use.

Type

The Type field provides selection of either User data, Encrypted data or COMSEC for Mode 5 interrogation.

Selections are:

User: Only valid with internal crypto simulator. User can select the directed reply spread and stagger by setting the random data.

Encrypt: Data is already encrypted. IFF-45TS builds this exact message.

COMSEC: Directed reply spread and stagger comes from crypto. Valid with internal and external crypto.

Spread

The Spread field turns the Mode 5 CVI dependant 16 bit spreading function on or off. The spreading function is applied via modulo 2 addition to the data symbol Walsh codes.

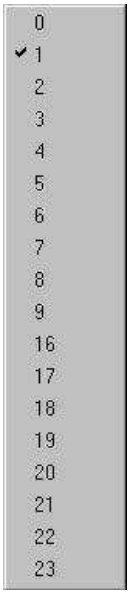
Selections are:

On: Spread function on.

Off: Spread function off.

Format

The Format field provides the selection of Mode 5 interrogation format (0 to 23).



Formats 0 to 15 are Mode 5 level 1. Formats 16 to 23 are Mode 5 level 2.

Directed Stagger

The Directed Stagger field provides access to the lower 4 bits of the Random Data upper byte.

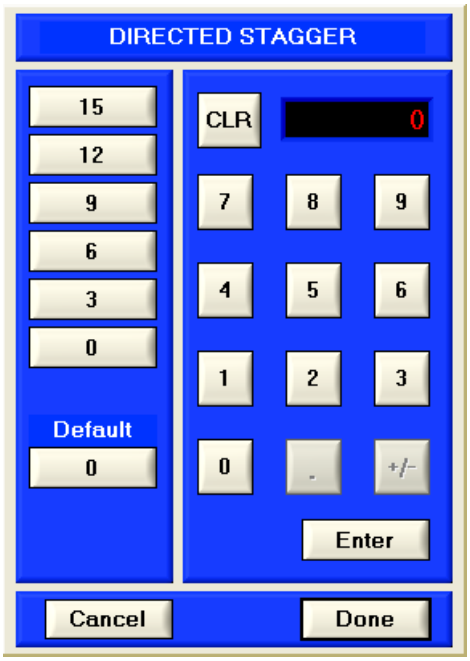
The Random Data provides the selection of Mode 5 directed reply stagger and spread code data used in Mode 5 Level 1 ID interrogations. This data is normally obtained from the Mode 5 crypto.

When Type field = User, the interrogation is unencrypted and directed reply and stagger data may be entered by the user. Range is 0 to 65535 (internal crypto only).

When Type field = Encrypt, interrogation is already encrypted and user must provide the same directed reply and spread code used in the interrogation.

When Type= COMSEC, is the directed reply stagger and spread code controlled by the Mode 5 crypto.

Select the Directed Stagger field to display the data entry window,



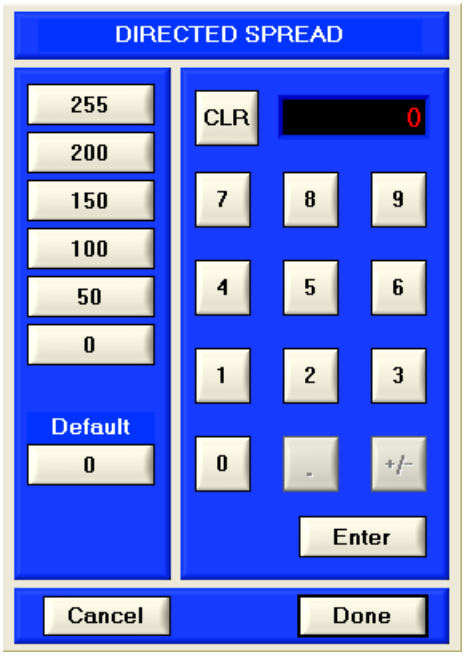
Random Data does not control Random Reply Delay, but controls the stagger and spread code used by the test set when it builds the reply.

Select *Done* when finished to close window.

Directed Stagger

The Directed Spread field provides access to the Random Data lower byte.

Select the Directed Spread field to display the data entry window,



Random Data does not control Random Reply Delay, but controls the stagger and spread code used by the test set when it builds the reply.

Select *Done* when finished to close window.

4.28 MEASURE SETUP TAB

The Measure Setup tab displays three measure setup fields (1-2-4, Figure 24).

Fields are:

Mode: Selects RF Channel/Pulse functionality.

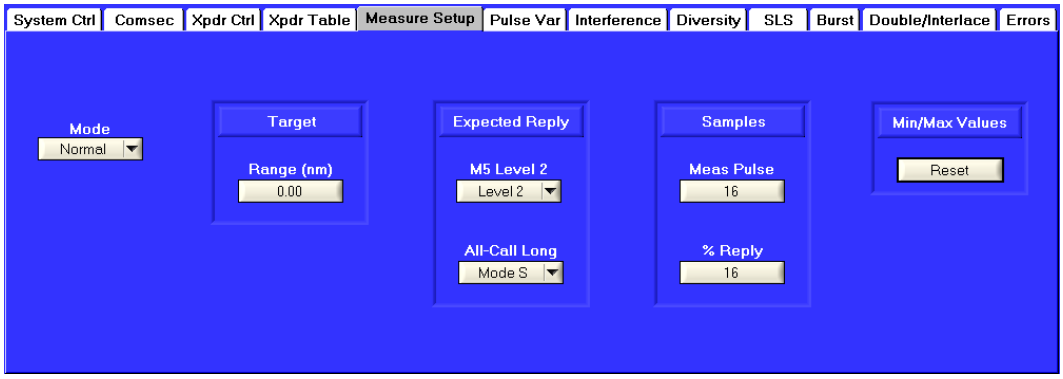
Target: Sets range window for received replies.

Min/Max Values Reset: Resets average measurement buffer.

Min/Max Values Reset displays two fields:

Samples: Sets the number of samples for pulse characteristics and % reply averaging.

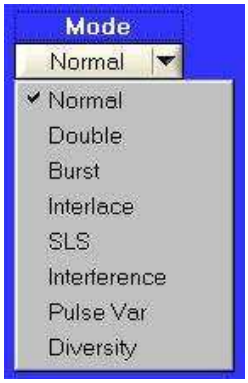
Expected Reply: Set which Mode 5 and Mode S all-call reply type to measure.



Measure Setup Tab
Figure 24

4.28.1 Mode

The mode control field turns on the various transponder instrument modes of operation. Each Mode is mutually exclusive.



Selections are:

Normal: Normal interrogations (i.e., a single mode group set at a set PRF rate).

Double: Double Interrogations.

Burst: Burst Interrogations.

Interlace: Interlaced Interrogations.

SLS: SLS interrogations.

Interference: Interference pulse.

Pulse Var: Pulse Variable.

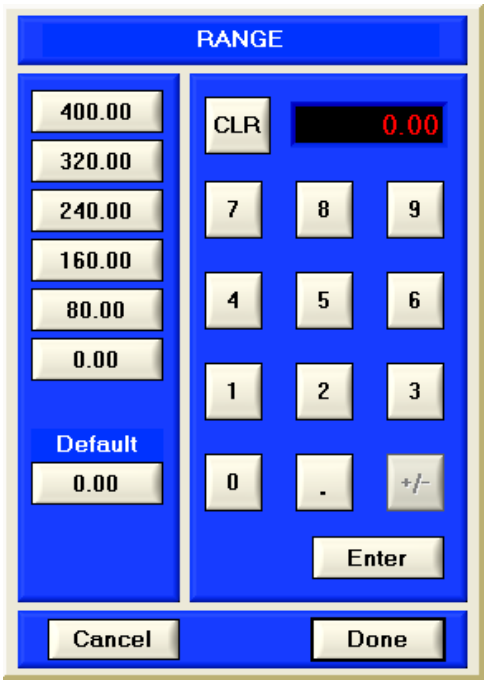
Diversity: Diversity.

NOTE: Each mode also may be turned on or off in the respective tabs.

4.28.2 Target Range (nm)

The Range (nm) field allows a range gate to bet set for transponder replies, as an anti garbling measures when testing transponders at range via the antenna port. When testing directly coupled Range should be set to 0.00nm.

Selecting the Range field displays the Range Window.



Range is 0 to 400.00 nm. Default value is 0.00 nm.

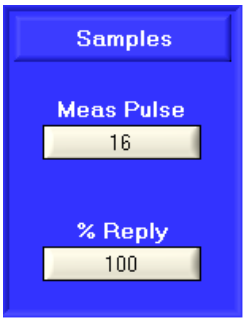
Select *Done* when finished to close window.

4.28.3 Min/Max Values

Selecting the Reset field Resets average and max/min measurement buffers.

4.28.4 Samples Group

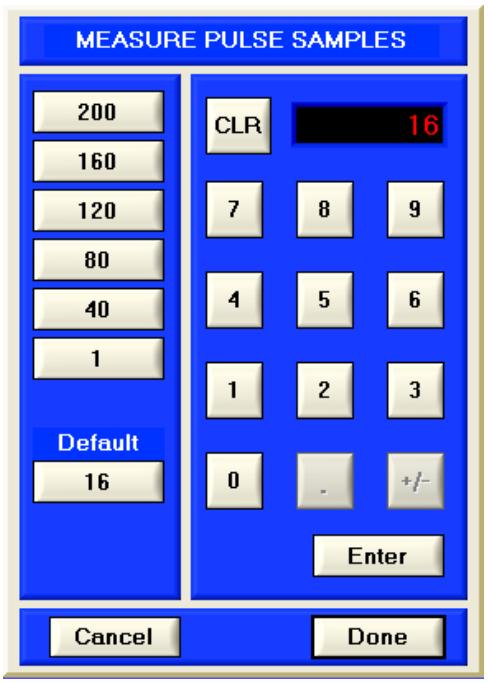
The samples group displays the Meas Pulse and % Reply fields.



Meas Pulse

The Meas Pulse field sets the number of samples for averaging Reply Power, Frequency, Pulse Width and Pulse Spacing measurements.

Selecting Meas Pulse field displays the Samples data entry window.



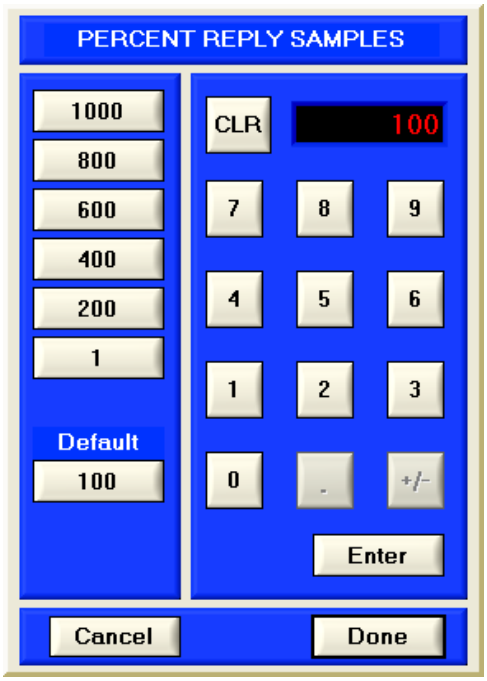
Range is 1 to 200. Default value is 16.

Select *Done* when finished to close window.

% Reply

The % Reply field sets the number of samples for averaging % Reply measurements.

Selecting Meas Pulse field displays the Samples data entry window.



Range is 1 to 1000. Default value is 100.

Select *Done* when finished to close window.

4.28.5 Expected Reply Group

The Expected Reply group displays the M5 Level 2 and All-Call Long fields.

M5 Level 2

Mode 5 replies maybe Level 1 or Level 2. The M5 Level 2 field sets which reply Level to measure.

Selections are:

Level 1: Mode 5 Level 1 measured.

Level 2: Mode 5 Level 2 measured.

All-Call Long

The All-Call Long field provides the selection of which reply type to monitor in the UUT section.

For example, ATCRBS, MK10A, MK12 and (MK12/S, MK12A transponders with Mode S turned off), will reply to an ACLA /ACLC with Mode A/C. In this case Sif should be selected. Mode S, (MK12/S and MK12A with Mode S turned on), will reply with a DF11. In this case Mode S should be selected.

Selections are:

Sif: Monitors Mode A/C replies.

Mode S: Monitors Mode S DF11 replies.

4.29 PULSE VAR TAB

The Pulse Var tab displays three pulse variable groups (1-2-4, Figure 25).

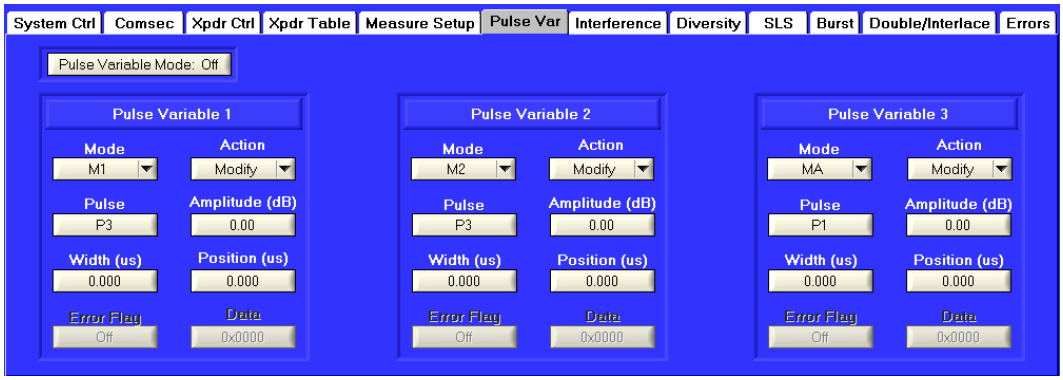
Groups are:

Pulse Variable 1

Pulse Variable 2

Pulse Variable 3

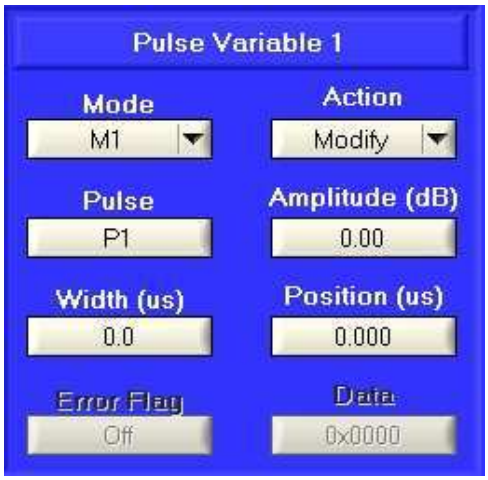
Each Pulse Variable group provides interrogation pulse parameter control within a selected mode.



Pulse Var Tab
Figure 25

4.29.1 Pulse Variable 1,(2),(3) Groups

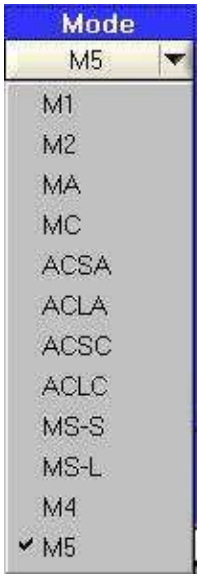
Each Pulse Variable Group may control an individual selected pulse, within a selected Reply Mode. Each group is identical and displays the fields Reply Mode, Pulse, Width, Amplitude (dB), Position (us), Error Flag and Data.



NOTE: Pulse Variable Mode must be turned on for variable parameters to become effective.

Mode

The Mode field allows the selection of the interrogation mode for pulse parameter variations.



Selections are:

M1: Mode 1

M2: Mode 2

MA: Mode:3/A

MC: Mode C

ACSA: All-Call Short Mode A

ACLA: All-Call Long Mode A

ACSC: All-Call Short Mode C

ACLC: All-Call Long Mode C

MS-S: Mode S Short

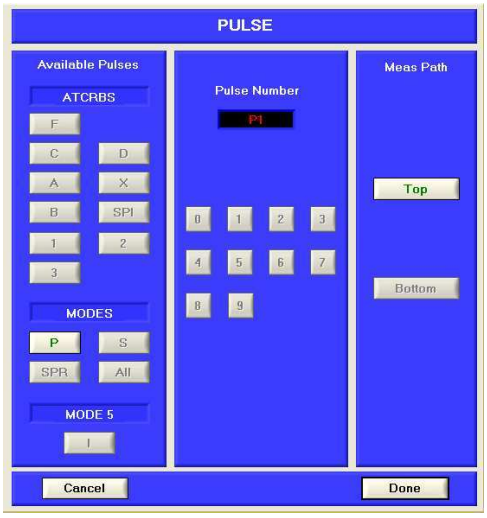
MS-L: Mode S Long

M4: Mode 4

M5: Mode 5

Pulse

Select the Pulse field to display the Pulse data entry window.



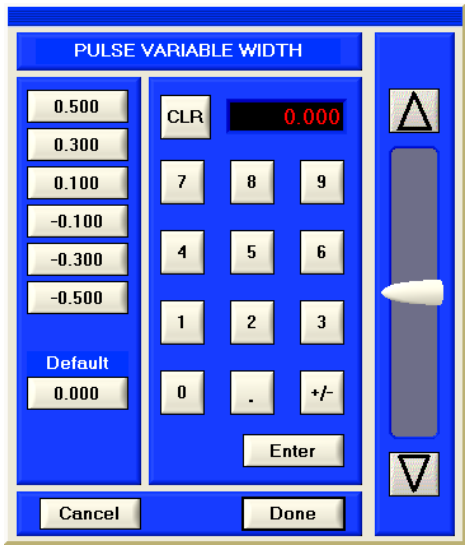
The Pulse field allows the selection of a specific pulse (symbol for Mode 5), within the selected mode. Only pulses (symbols Mode 5) relevant to the reply mode will be available for selection.

Select *Done* when finished to close window.

Pulse Variable Width

The Width field allows the pulse width to be set as an offset from nominal pulse width.

Selecting Width field displays the Pulse Variable Width data entry window.



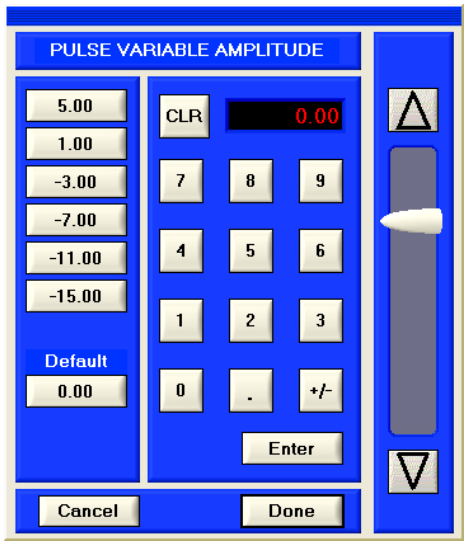
Range is -0.5 to +0.5 us in 1 ns increments. Default value is 0.

Select *Done* when finished to close window.

Pulse Variable Amplitude

The Pulse Variable Amplitude Field allows the setting of Pulse amplitude in dB relative to the generator RF level setting. Range is -15 to +5 dB in 0.01 dB increments. Default value is 0.0 dB.

Selecting Pulse Variable Amplitude field displays the Pulse Variable amplitude data entry window.

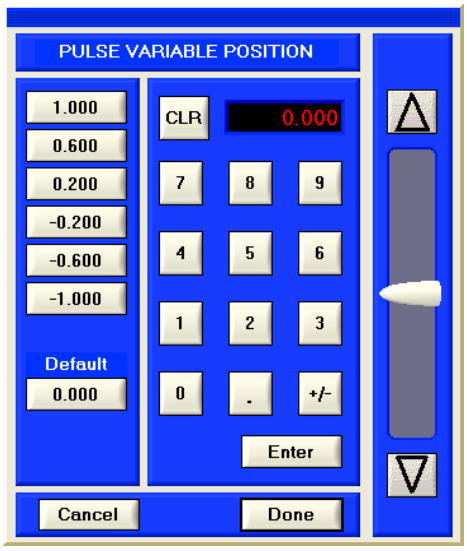


Select *Done* when finished to close window.

Pulse Variable Position

The Pulse Variable Position Field allows the deviation of Pulse Position relative to the nominal position. Range is -1.000 to +1.000 us in 1 ns increments. Default value is 0.000 us.

Selecting Pulse Variable Position field displays the Pulse Variable Width data entry window.



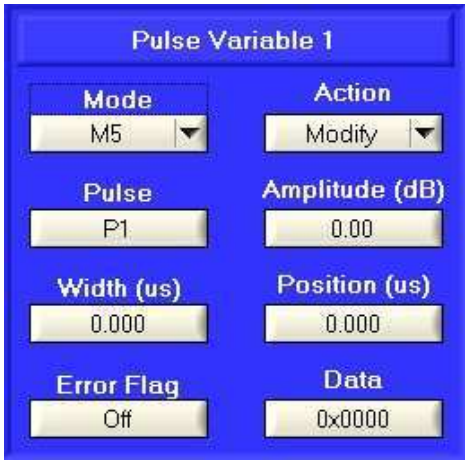
Select *Done* when finished to close window.

Pulse Variable 1,(2),(3) Mode 5 Group

When Mode= M5, the Pulse Variable 1,(2),(3) group displays a 4 HEX character Data entry field for Mode 5 Symbol data.

When the Error Flag field is set to On, the data field is used to generate the selected pulse, otherwise the nominal data is used.

Selecting Pulse Variable 1,(2),(3) Mode 5 field displays the Pulse Variable 1,(2),(3) Mode 5 data entry window.



Pulse Variable Action

The Pulse Variable Action Field switches the parameter variation Off or On.

Selections are:

Modify: Parameter variation on.

Delete: Parameter variation off. And pulse is removed from interrogation pulse train.

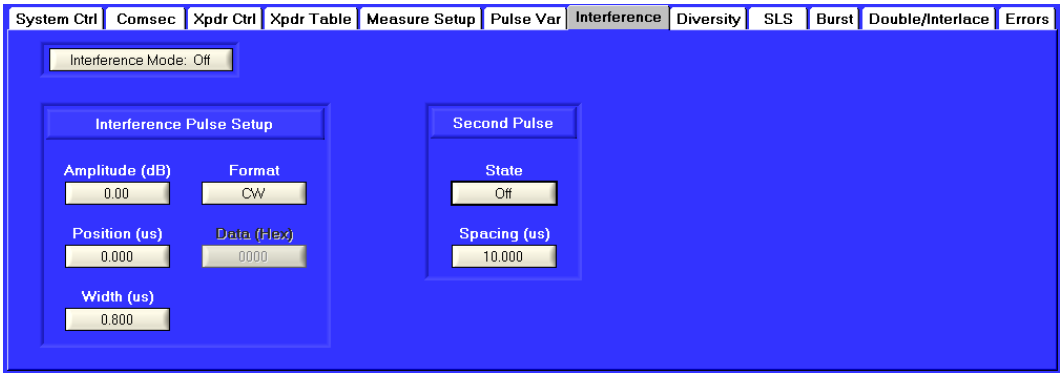
4.30 INTERFERENCE TAB

The Interference tab displays two interference groups (1-2-4, Figure 26).

Groups are:

Interference Pulse Setup: Controls pulse Position, Amplitude, Width and Mode 5 symbol data content.

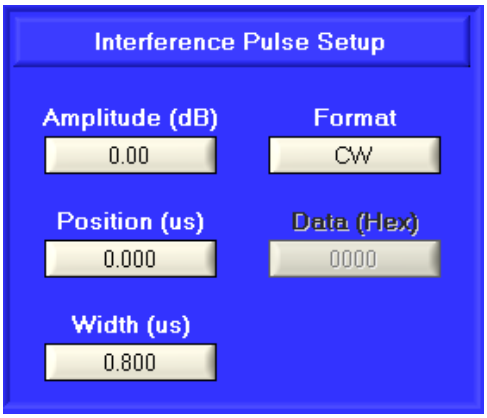
Second Pulse: Controls pulse spacing of duplicate pulse relative to the first interference pulse.



Interference Tab
Figure 26

4.30.1 Interference Pulse Setup Group

The Interference Pulse Setup group controls an additional one or two definable pulses or Mode 5 symbols that may be overlaid anywhere before, during or after the Top channel mode group.



If two pulses/Mode 5 symbols are generated the spacing between the pulses/Mode 5 symbols may be set. The pulse(s)/Mode 5 Symbol(s) amplitude and width may also be set.

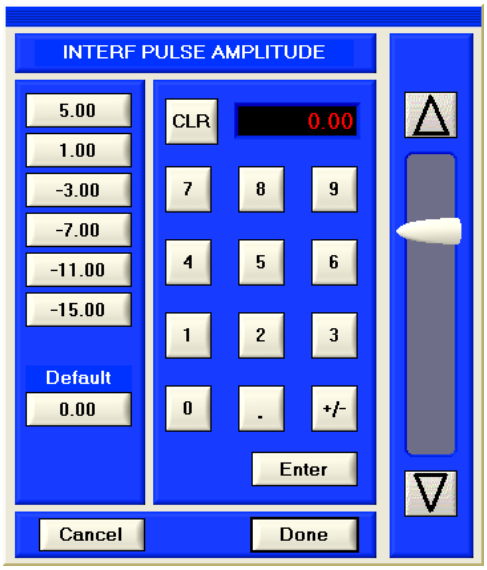
The group displays the fields Amplitude (dB), Position (us), Width (us), Format and Data (Hex).

NOTE: Interference Mode must be turned on for interference pulse(s)/Mode 5 Symbol(s) to be generated.

NOTE: Second Pulse/Mode 5 symbol is switched on/off in the Second Pulse group.

Amplitude

Range is -15 to +5 dB in 0.01 dB increments, relative to Mode Group Amplitude.

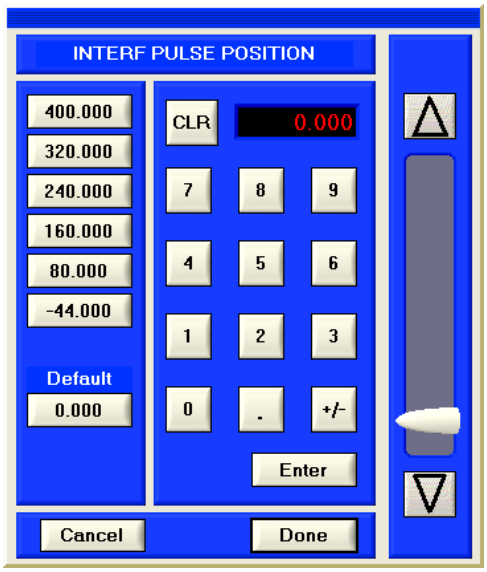


Default value is 0.00 dB

Select *Done* when finished to close window.

Position

Range is -44.000 to +400.000 us, in ns increments, relative to the mode group reference pulse, which is either P3 pulse for SIF, P4 for M4, P4 trailing edge for Mode 5, or 1st SPR for Mode S interrogations.

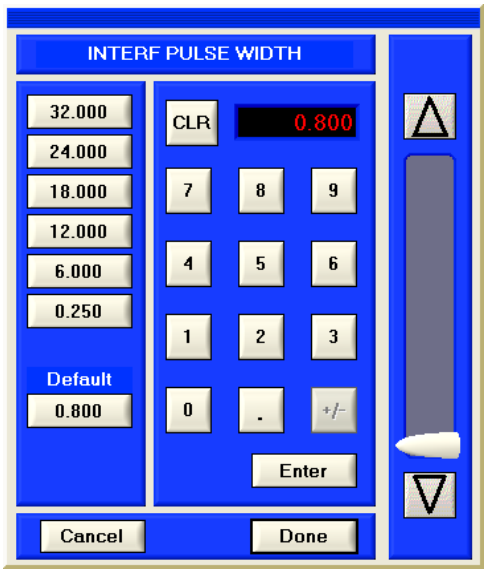


Default value is 0.000 us.

Select *Done* when finished to close window.

Width

Range is 0.250 to +32.000 us, in 1 ns increments.

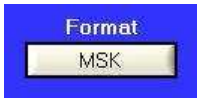


Default value is 0.800 us.

Select *Done* when finished to close window.

Format

The Format field is used to select either a CW pulse or an MSK (Mode 5 interference symbol).



NOTE: The Mode 5 symbol is independent of mode and may be over laid as an interference symbol within any interrogation Mode.

Selections are:

MSK: Mode 5 symbol data generated

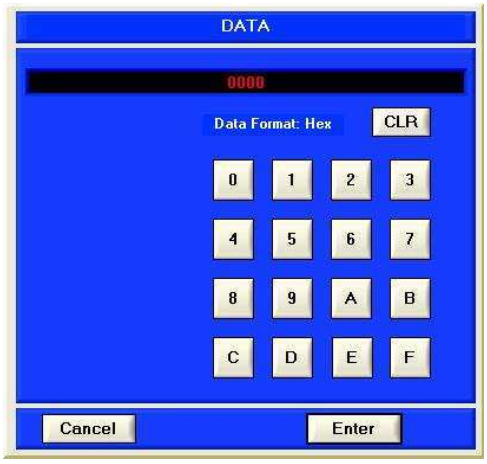
CW: CW pulse generated

Data (Hex)

The Data (Hex) field allows the Mode 5 interference MSK symbol data to be entered as four hex digits.

NOTE: This field is only active when Format field is set to MSK.

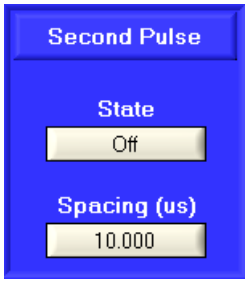
Select Data Hex field to display Hex data window.



Enter Mode 5 interference MSK symbol data as 4 hex digits.

4.30.2 Second Pulse Group

The Second Pulse Group controls a second identical interference pulse or Mode 5 interference symbol, that may be spaced relative to the first interference pulse or Mode 5 interference symbol. The group displays the fields State and Spacing (us).



State

The State field turns the second interference pulse or Mode 5 interference symbol, on or off.

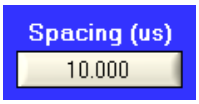
Selections are:

On: Second interference pulse or Mode 5 interference symbol is On

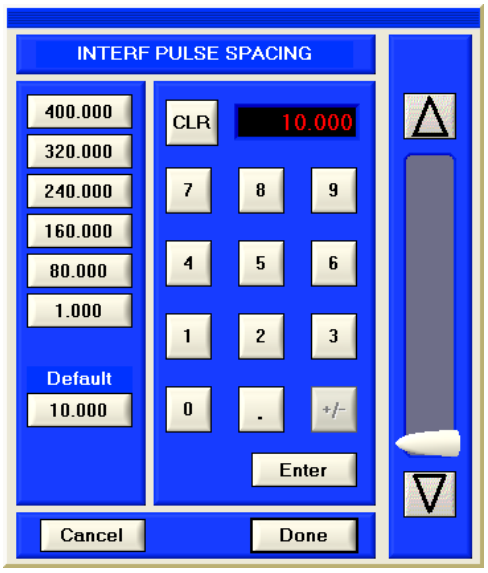
Off: Second interference pulse or Mode 5 interference symbol is Off.

Spacing

The Spacing field sets the spacing between the first and second interference pulses or Mode 5 interference symbols.



Select Spacing (us) field to display Interference Pulse Spacing window.



Range is 1.000 to +400.000 us in 1 ns increments.

Default value is 10.000 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

Select done when finished to close window.

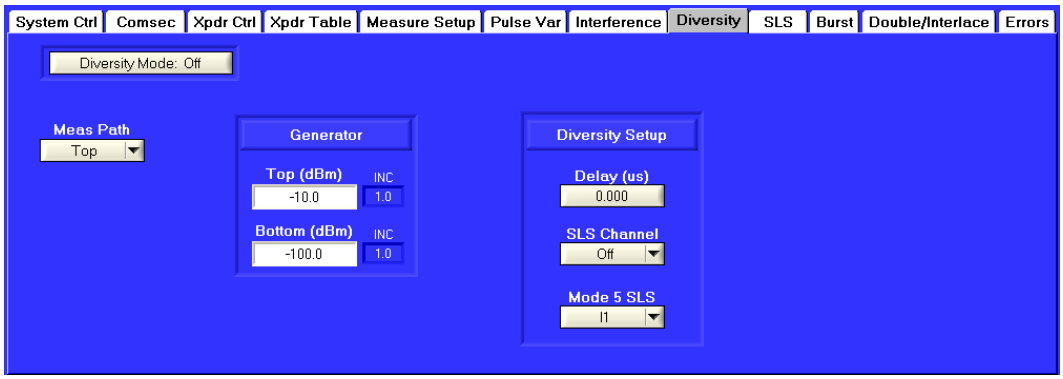
4.31 DIVERSITY TAB

The Diversity tab displays the Meas Path field and the Generator and Diversity Setup groups (1-2-4, Figure 27).

Meas Path: Sets the UUT measurement path to top or bottom channel.

Generator: Controls generator RF level.

Diversity Setup: Controls top and bottom delay, SLS channel and Mode 5 SLS symbol(s) selection.



Diversity Tab
Figure 27

4.31.1 Meas Path

The Meas Path field selects either the Top or Bottom port for measurements.

NOTE: With Diversity Mode switch Off, measurement path defaults to Top.

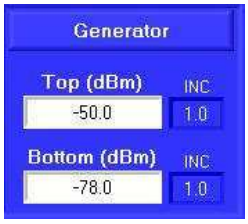
Selections are:

Top: Selects Top Port

Bottom: Selects Bottom Port

4.31.2 Generator Group

The Generator group controls the Top and Bottom RF levels and displays the fields Top (dBm) and Bot (dBm).



Top (dBm)

The Top (dBm) field Allows the Top Interrogation RF level to be set in 0.1 dB increments.

Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

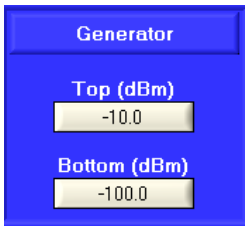
NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit. Default value is 1 dBm.

Bot (dBm)

The Top (dBm) field Allows the Top interrogation RF level to be set in 0.1 dB increments. Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

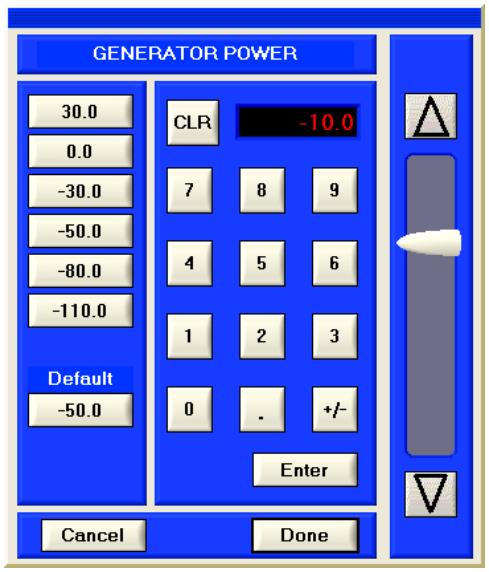
NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.



Keypad Entry Option

On the Options menu, the *Keypad for Power/Frequency Entry* is enabled to allow popup keypad entry for generator power.

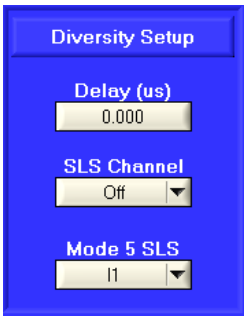
Selecting either Top (dBm) or Bottom (dBm) will display a popup keypad.



The desired value is entered by using the preselected values to the left, entering via keypad, or using the slider to the right.

4.31.3 Diversity Setup Group

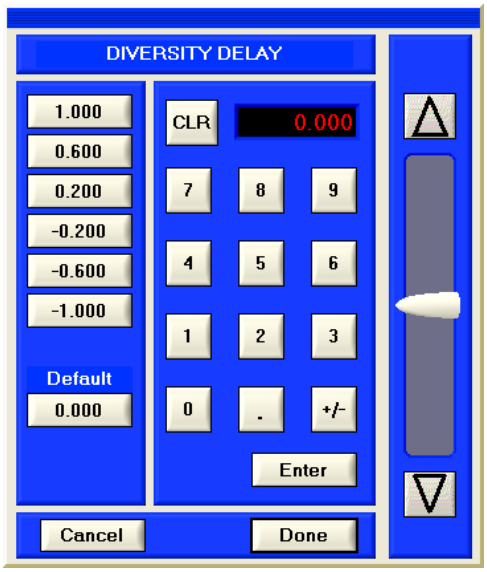
The selection of Diversity generates two mode groups, one group on the Top channel (normally present) and one group on the bottom channel (only present during diversity). The Diversity group displays the fields Delay (us), SLS Channel and Mode 5 SLS.



Delay (us)

The diversity delay is the time specified between the top channel mode group and the bottom channel mode group. This feature is used for time dependent diversity tests.

Select Diversity (us) field to display Diversity window.



Range is -1.000 to +1.000 us in 1 ns increments. Default Value is 0.000 us

Select *Done* when finished to close window.

SLS Channel

The SLS Channel field is used to switch on the SLS pulse(s) either on the Top or Bottom channel.

NOTE: Nominal pulse width and 0 dB amplitude is applied to Diversity SLS pulse(s).

The selections are:

Off : (Diversity ISLS Off)

Top: (Diversity ISLS on Top Channel)

Bottom: (Diversity ISLS on Bottom Channel)

Mode 5 SLS

The Mode 5 SLS field is used to switch on I1, I2 or both I1 and I2 Mode 5 ISLS symbols.

Selections are:

I1: Mode 5 ISLS Symbol I1 is On

I2: Mode 5 ISLS Symbol I2 is On

I1I2: Mode 5 ISLS Symbols I1 and I2 are On

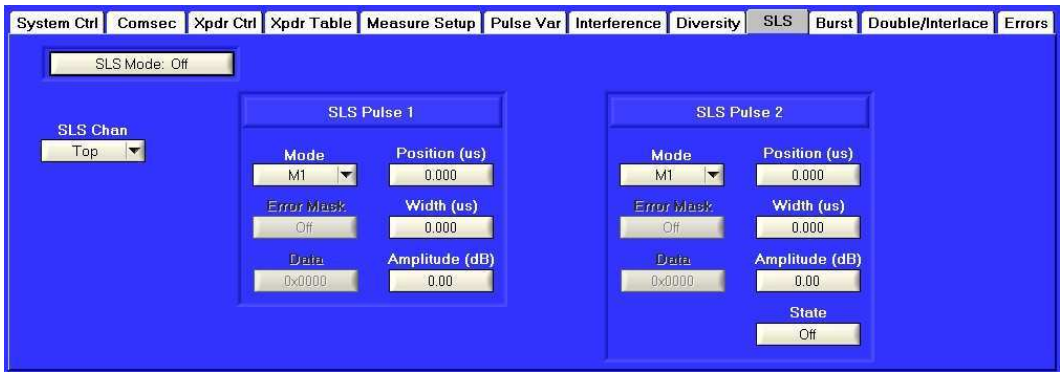
4.32 SLS TAB

The Diversity tab displays one field and two groups (1-2-4, Figure 28).

SLS Channel: Selects the channel that SLS is applied to.

SLS Pulse 1: Controls Mode, Position, Width, Amplitude and Error Mask/Data for Mode 5 SLS symbols.

SLS Pulse 2: Controls Mode, Position, Width, Amplitude and Error Mask/Data for Mode 5 SLS symbols.



SLS Tab
Figure 28

4.32.1 SLS Channel

The SLS Channel field selects the SLS Channel to apply SLS pulses to.

Selections are:

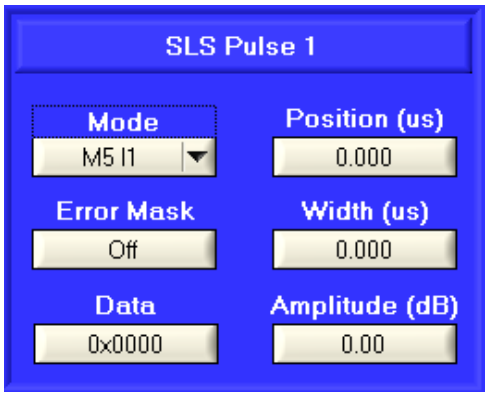
Top: SLS is applied to Top channel.

Bottom: SLS is applied to Bottom channel.

4.32.2 SLS Pulse 1,(2) Group

Two SLS pulse settings are provided SLS Pulse 1 and SLS Pulse 2. This allows SLS pulses to be set in 2 different modes. The position, width and amplitude of each pulse may be set and for Mode 5 interrogations, the parameters for I1 (SLS Pulse 1) and I2 (SLS Pulse 2) ISLS symbols may be set.

An error mask may also be set for a Mode 5 I1 or I2 ISLS symbol, which introduces invalid symbol data.

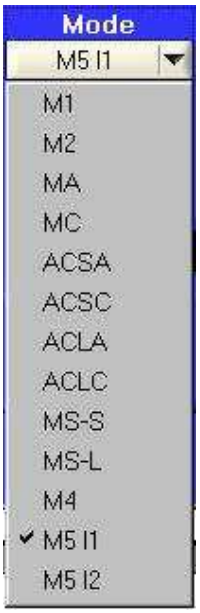


NOTE: SLS Mode must be turned on for SLS pulse(s)/Mode 5 Symbol(s) to be generated.

The SLS Pulse 1,(2) group displays the fields Mode, Position (us), Width (us), Amplitude (dB), Error Mask and Data.

Mode

The Mode field provides selection of the specific Mode that the SLS pulse setting applies to.



The selections are:

M1: Mode 1

M2: Mode 2

MA: Mode A

MC: Mode C

ACSA: Mode S all-call Short Mode A

ACSC: Mode S all-call Short Mode C

ACLA: Mode S all-call Long Mode A

ACLC: Mode S all-call Long Mode C

MS-S: Mode S Short message

MS-L: Mode S long message

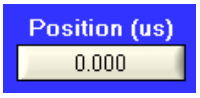
M4: Mode 4

M5 I1: Mode 5 ISLS I1 symbol

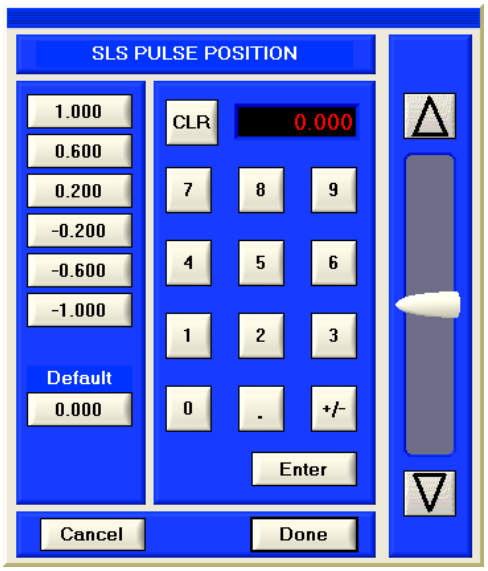
M5 I2: Mode 5 ISLS I2 symbol

Position (us)

The Position (us) field is used to control the spacing of the SLS pulse or Mode 5 SLS Symbol with respect to it's nominal position relative to the mode group.



Select Position (us) field to display SLS Pulse Position window.



Range is -1.000 to +1.000 us, relative to nominal spacing, in 1 ns increments. Default value is 0.000 us.

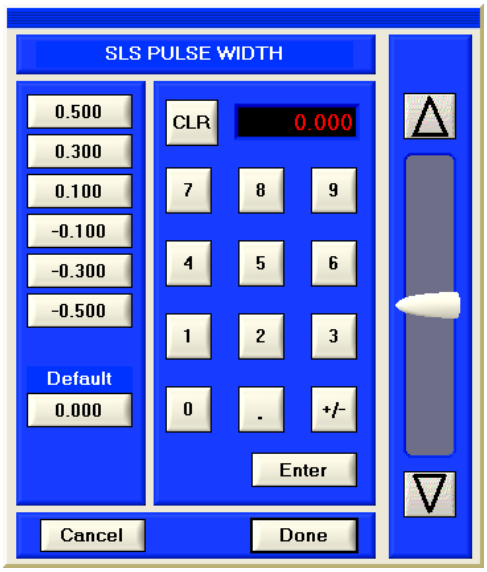
NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

Select *Done* when finished to close window.

Width (us)

The Width (us) field is used to control the SLS pulse width.

Select Width (us) field to display SLS Pulse Width window.

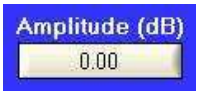


Range is -0.500 to +0.500 us from nominal spacing, in 1 ns increments. Default value is 0.000 us.

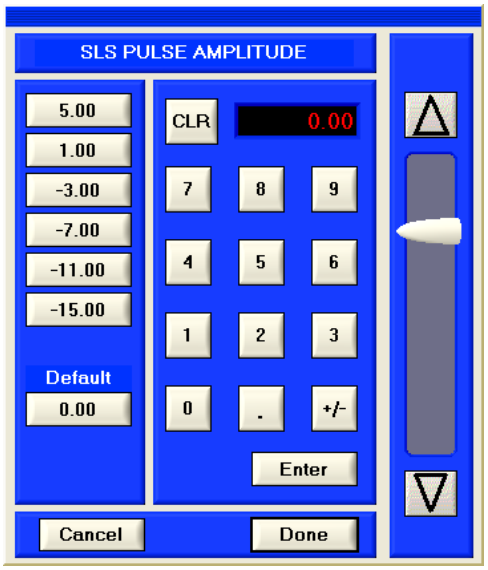
Select *Done* when finished to close window.

Amplitude (dB)

The Amplitude (dB) field is used to control the SLS pulse/Mode 5 symbol amplitude, relative to the interrogation mode group amplitude.



Select Amplitude (dB) field to display SLS Pulse Amplitude window.



Range is -15 to +5 dB in 0.01 dB increments. Default value is 0.0 dB.

Select *Done* when finished to close window.

Error Mask

The Error mask field turns On or Off an error in the MSK data content of the Mode 5 I1/I2 SLS symbol.

Selections are:

On: SLS Symbol data error is On.

Off: SLS Symbol data error is Off.

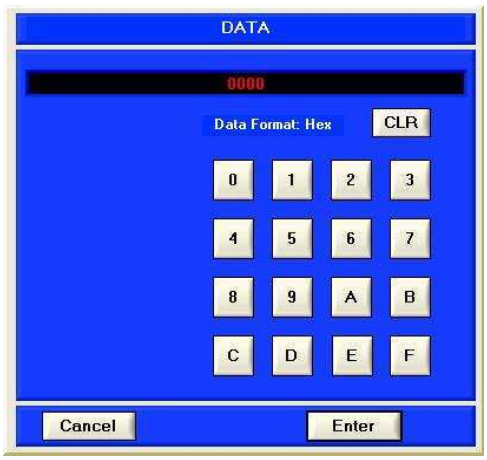
Data

The Data field allows the MSK data content of the Mode 5 I1/I2 SLS symbol to be entered as four hex digits.

NOTE: This field is only active when Mode is set to M5 I1 or M5 I2.

Select Data Hex field to display Hex data window.

Enter Mode 5 I1/I2 SLS MSK symbol data as 4 hex digits.



State (SLS Pulse 2 only)

The State field turns the second SLS pulse/Mode 5 symbol on or off.

NOTE: This field is only provided in SLS Pulse 2 Group.

Selections are:

On: Second SLS pulse/Mode 5 symbol is On

Off: Second SLS pulse/Mode 5 symbol is Off.

4.33 BURST TAB

The Burst tab displays two fields and two groups (1-2-4, Figure 29).

Fields are:

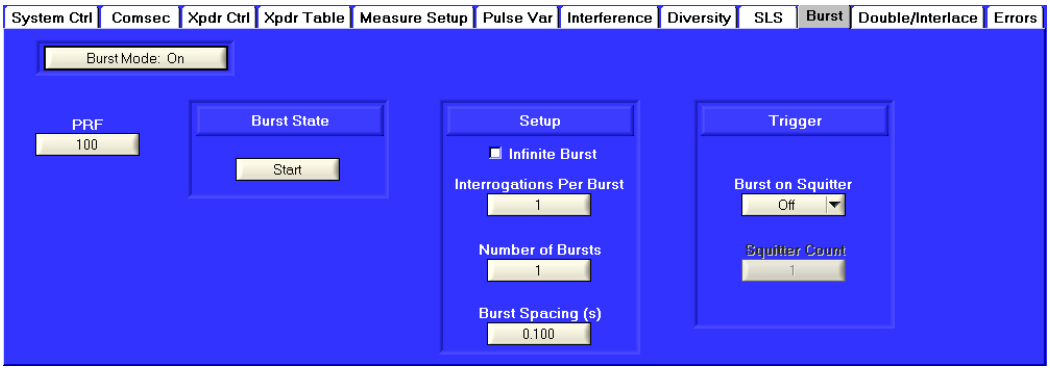
PRF: Sets the interrogation PRF.

Burst State: Provides Burst Start/Stop control.

Groups are:

Setup: controls the interrogations per burst, number of bursts, burst spacing and burst repetition.

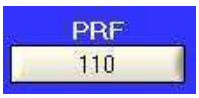
Trigger: Controls burst trigger on reception of squitter.



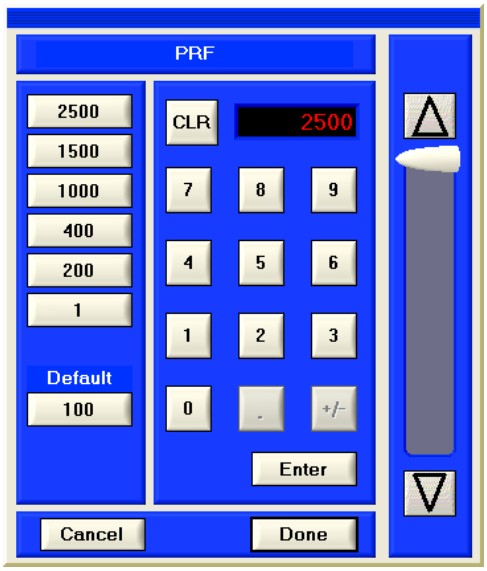
Burst Tab
Figure 29

4.33.1 PRF

The PRF field controls the interrogation PRF (Pulse Repetition Frequency).



Select PRF field to display PRF window.



Range is 1 to 2500Hz in 1Hz increments. Default value is 100Hz.

Select *Done* when finished to close window.

4.33.2 Burst State

The Burst State field sets burst state to stop or start.

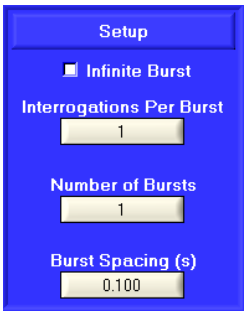
Selections are:

Start: Start bursts.

Stop: Stop bursts.

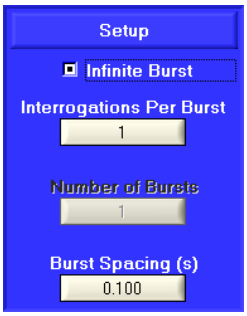
4.33.3 Setup Group

The Setup group provides control of interrogations per burst, number of bursts, burst spacing and burst control. The group displays the f fields Inifinite Burst, Interrogations Per Burst, Number of Bursts and Burst Spacing (s).



Infinite Burst

The Infinite Burst field controls how the burst are generated. If Infinite Burst is not selected, then the Number of Bursts field setting determines the number of generated bursts.

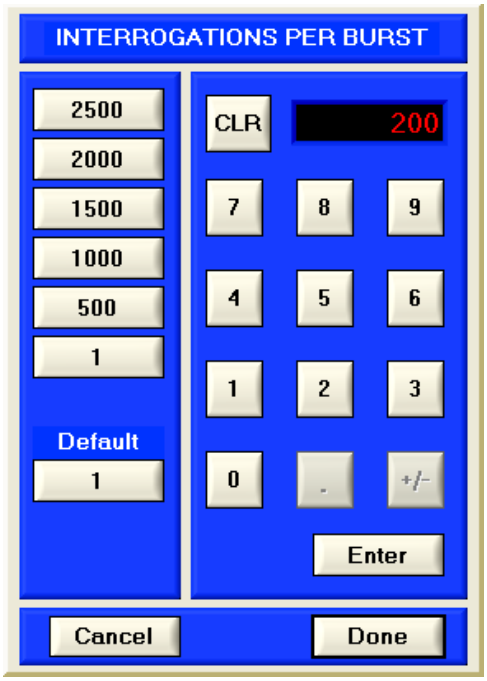


If the Infinite Burst field is selected then the Number of Bursts field is grayed out and bursts will be continuously generated.

Interrogations Per Burst

The Interrogations Per Burst field selects the number of interrogations to be generated within the burst.

Select the Interrogations Per Burst field to display Interrogations Per Burst Window.



Range is 1 to 2500. Default value is 1.

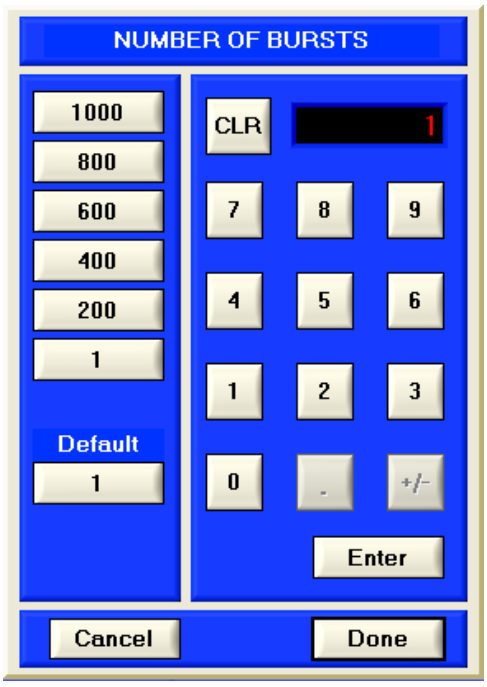
Select *Done* when finished to close window.

Number of Bursts

The Number of Bursts field selects the number of burst to be generated.

NOTE: This field is only active when Infinite Bursts field is not selected.

Select Number of Bursts field to display Number of Burst Window.



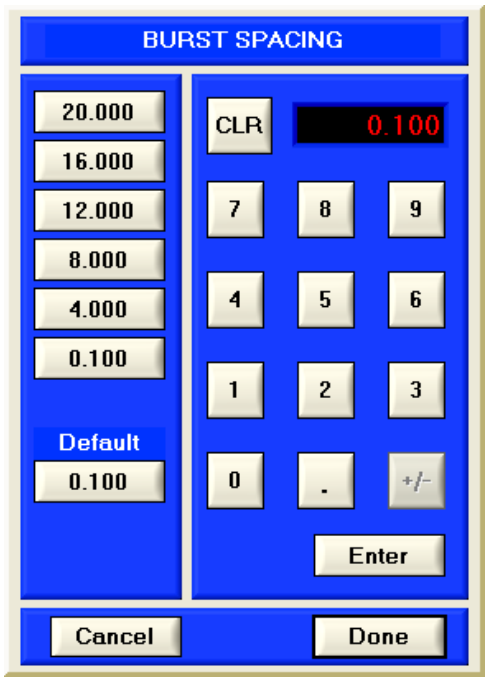
Range is 1 to 1000. Default value is 1.

Select *Done* when finished to close window.

Burst Spacing (s)

The Burst Spacing (s) field selects the spacing between bursts.

Select Burst Spacing (s) field to display Burst Spacing Window.

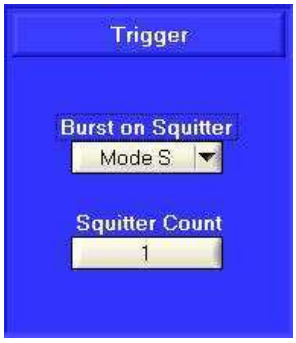


Range is 0.100 to 20.000 s. Default value is 0.100 s in 1 ms increments.

Select *Done* when finished to close window.

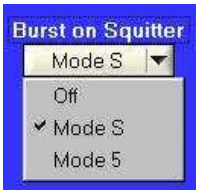
4.33.4 Trigger Group

The Trigger Setup group selects burst generation upon reception of either a Mode S fields Burst on Squitter and Squitter Count.



Burst on Squitter

This field controls burst generation after receipt of a defined number of either Mode S or Mode 5 squitters.



Selections are:

Off: Bursts not generated upon receipt of squitter.

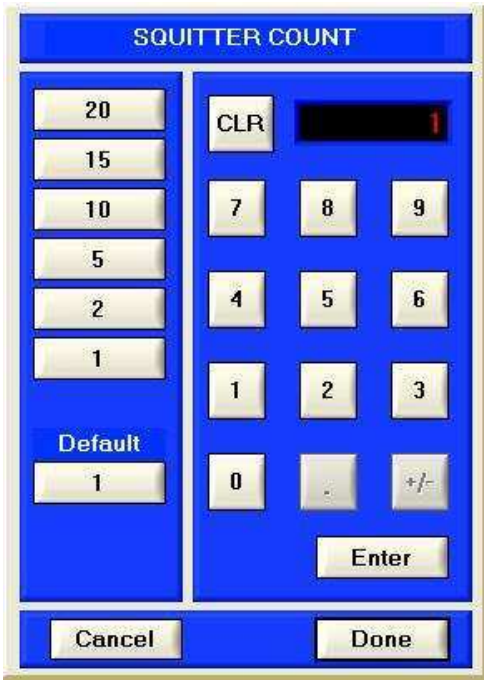
Mode S: Bursts generated upon receipt of Mode S squitter.

Mode 5: Bursts generated upon receipt of Mode 5 squitter.

Squitter Count

The Squitter Count field selects the number of squitter to be received before triggering a burst.

Select Squitter Count field to display Squitter Count Window.



Range is 1 to 20. Default value is 1.

Select *Done* when finished to close window.

4.34 DOUBLE/INTERLACE TAB

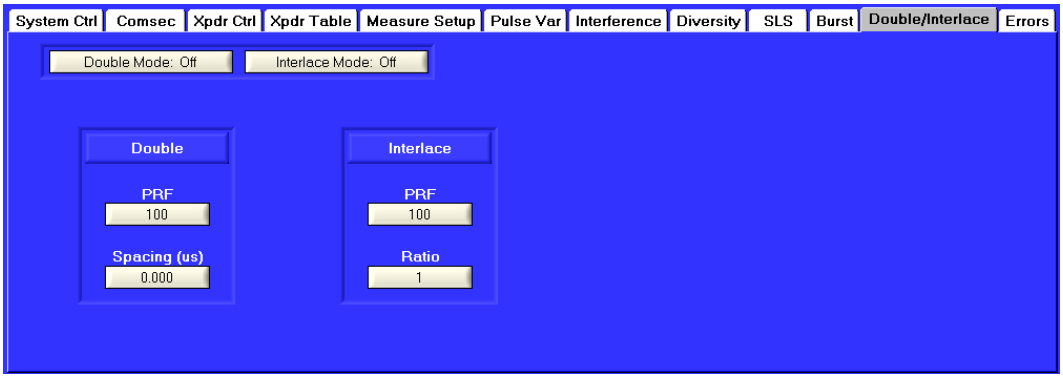
The Double/Interlace tab displays two mode groups (1-2-4, Figure 30).

Groups are:

Double: Controls double interrogation generation.

Interlace: Controls the interlace of interrogation modes.

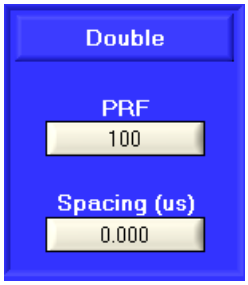
NOTE: The Double and Interlace modes are mutually exclusive.



Double/Interlace Tab
Figure 30

4.34.1 Double Group

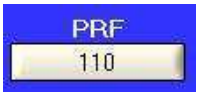
The Double group controls a second interrogation mode group, spaced by a value in us from the first mode group.



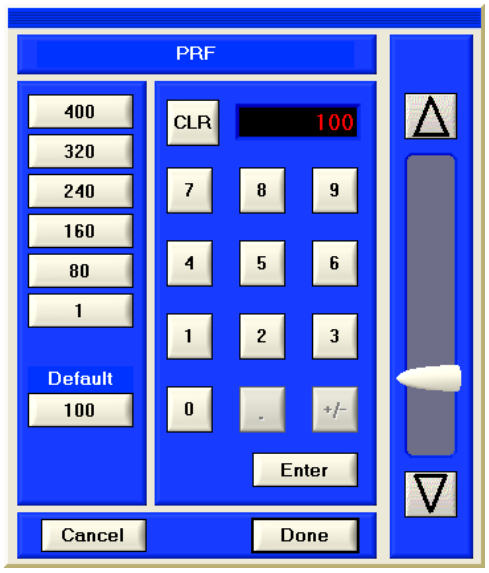
NOTE: Double Mode must be turned On to be active.

PRF

The PRF field sets the interrogation PRF (Pulse Repetition Frequency).



Select PRF field to display PRF Window.

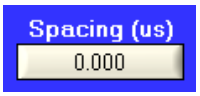


Range is 1 to 400Hz. Default value is 100Hz.

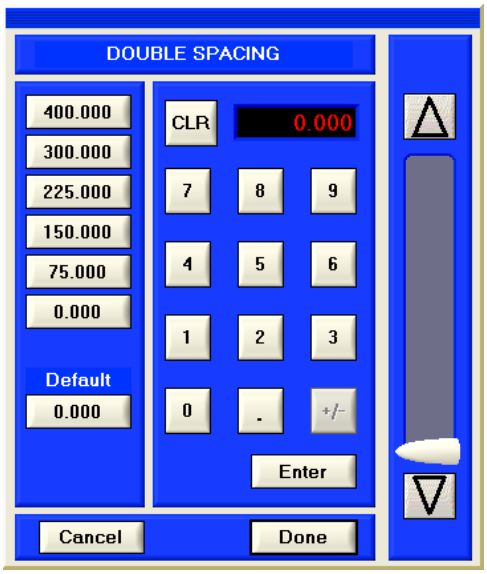
Select *Done* when finished to close window.

Spacing (us)

The Spacing field sets the spacing between the first mode group and the second mode group. The spacing is relative to the reference pulse, which is either P3 pulse for SIF, P4 for M4, P4 trailing edge for Mode 5, or 1st SPR for Mode S interrogations.



Select Spacing (us) to display Double Spacing Window.



Range is 0 to 400 us in 1 ns increments. Default value is 0 us.

NOTE: The GUI allows data entry in 1 ns increments. However, the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

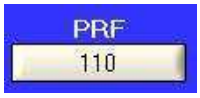
Select *Done* when finished to close window.

4.34.2 Interlace Group

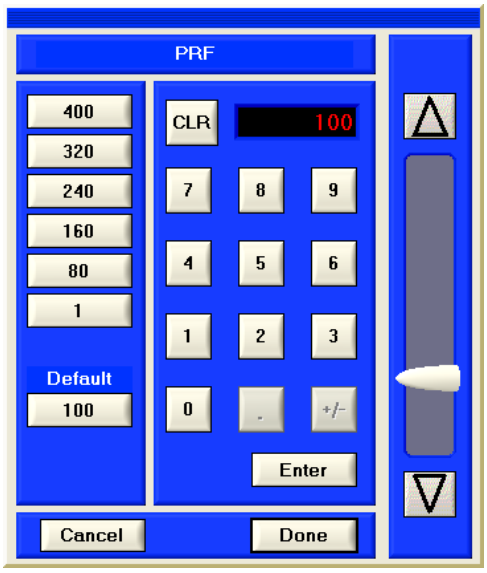
This selection provides control for interlace interrogations between table 1 and table 2.

PRF

The PRF field sets the interrogation PRF (Pulse Repetition Frequency).



Select PRF field to display PRF Window.



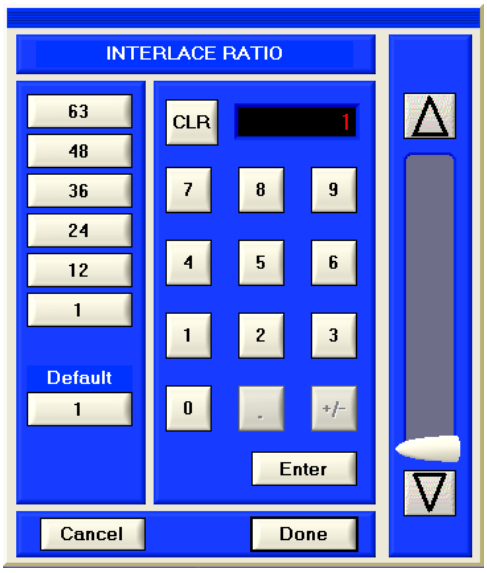
Range is 1 to 400 Hz. Default value is 100 Hz.

Select *Done* when finished to close window.

Ratio

The Ratio field sets the number of interrogations in table 2 that will be generated for every interrogation in table 1.

Select Ratio field to display Interlace Ratio Window.



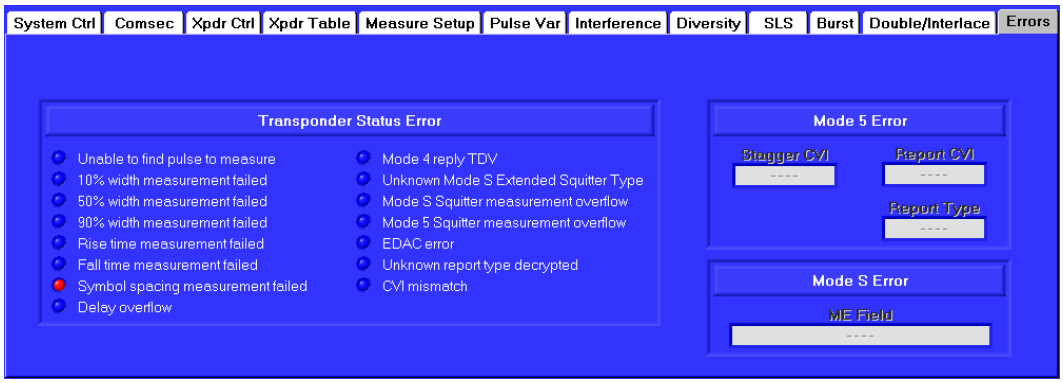
Range is 1 to 63. Default value is 1.

Select *Done* when finished to close window.

4.35 ERRORS TAB

The Errors Tab displays Transponder status errors, which may be parametric or protocol errors and Mode 5 specific errors (1-2-4, Figure 31).

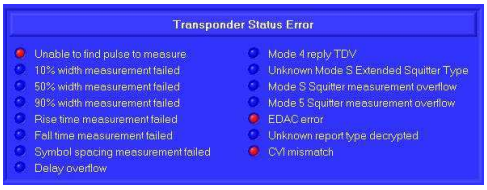
The Errors Tab is divided into two groups, Transponder Status Error and Mode 5 Error.



Errors Tab
Figure 31

4.35.1 Transponder Status Error Group

The Transponder Status Error Group displays errors relating to received replies.



The Transponder Status Errors are:

Unable to find pulse to measure:

The unit could not locate the pulse that the user wants to measure.

10% width measurement failed:

The unit could not measure the width between the 10% points of the rising and falling edges of the pulse.

50% width measurement failed:

The unit could not measure the width between the 50% points of the rising and falling edges of the pulse.

90% width measurement failed:

The unit could not measure the width between the 90% points of the rising and falling edges of the pulse.

Rise time measurement failed:

The unit could not measure the rise time of the measured pulse.

Fall time measurement failed:

The unit could not measure the fall time of the measured pulse.

Symbol spacing measurement failed:

The unit was unable to decode the Mode 5 symbol data and could not measure the spacing between symbols.

Delay Overflow:

The reply delay was too large and the replay delay of the target cannot be measured.

Mode 4 reply TDV:

The TDV was not found and the reply delay cannot be measured.

Unknown Mode S Extended Squitter Type:

An unknown Mode S extended squitter type was received. Data cannot be reported for this squitter.

Mode S Squitter Measurement Overflow:

The delay between subsequent Mode S squitters was too large and resulted in a timer overflow that caused a squitter rate measurement to be skipped.

Mode 5 Squitter Measurement Overflow:

The delay between subsequent Mode 5 squitters was too large and resulted in a timer overflow that caused a squitter rate measurement to be skipped.

EDAC Error:

If the error detection and correction is turned off, this means that the received data contains a decode error and cannot be decrypted. If the error detection and correction is turned on, this means that the received data contains too many errors for correction and cannot be decrypted.

Unknown Report Type Detected:

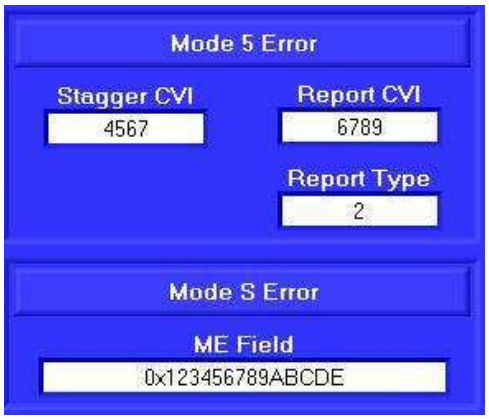
A report of unknown type was decrypted. The unit will not store the data.

CVI mismatch:

The CVI decrypted from the report/squitter does not match the CVI indicated by the detected stagger pattern. For example, if the report/squitter had an encrypted CVI of 4591, the detected stagger pattern should use the stagger for CVI 4591 as well. If a CVI mismatch occurs, the report/squitter will not be validated and data will not be recorded.

4.35.2 Mode 5 Error Group

The Mode 5 Error Group, displays errors relating to Mode 5 replies.



The Mode 5 Errors are:

Stagger CVI:

The CVI represented by the detected stagger that did not match the CVI decrypted from the report.

Report CVI:

The CVI decrypted from the received report that did not match the CVI of the detected stagger.

Report Type:

The report type of the unknown report.

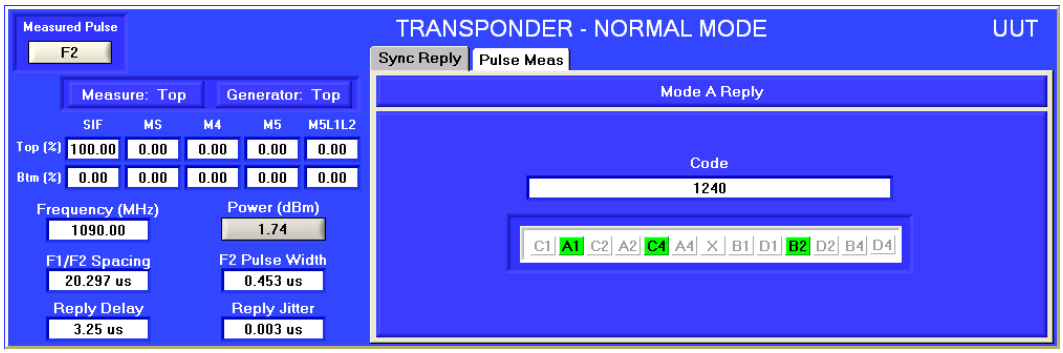
ME Field:

The ME field of the unknown Mode S extended squitter type.

4.36 TRANSPONDER UUT

The upper section of the Transponder test screen, displays Transponder UUT TX reply parameters for a selected (sync) mode (1-2-4 Figure 32).

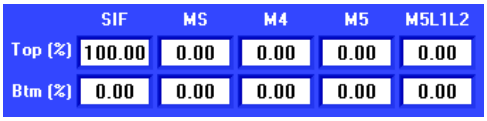
The upper section is divided into the group % Reply and the fields Measured Pulse, Frequency (MHz), F1/F2 Spacing, Reply Delay, Power (dBm), F1 Pulse Width and Reply Jitter. Two tabs are displayed for Sync Reply and Pulse Meas.



Transponder UUT TX Parameters
Figure 32

4.36.1 % Reply Group

The % Reply group displays the percentage replies from each interrogation type received on Top and Bottom channels.



Types displayed are:

SIF: Modes 1,2,3/A,C

MS: Mode S, ACLA, ACLC

M4: Mode 4

M5: All Mode 5 replies

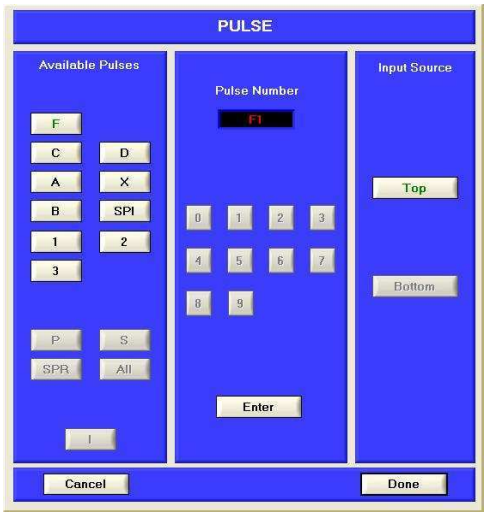
M5L1L2: Level 1 replies to Level 2 interrogations

NOTE: The percent reply is generated for all interrogation and reply types at all times. If two Mode S interrogations are being transmitted and a reply to only one of the two interrogations is received the percent reply will be 50%.

4.36.2 Measured Pulse

The Measured Pulse field provides selection of a specific pulse within a selected Mode reply.

Select the Measured Pulse field to display the Pulse Data Window.



The available pulses for selection are mode dependent and the channel measured is indicated in the Measure: Top/Bottom field (1-2-4.31).

NOTE: Bottom channel may only be selected for measurement when Diversity Mode is On.

The selected pulse is used for power, frequency and pulse width measurement, also for spacing measurement relative to the reference pulse for the selected mode. This feature is used in conjunction with the Meas Pulse Samples field in Transponder Controls 1.

All measurements are averaged over the selected number of samples (1-2-4.17).

Select *Done* when finished to close window.

4.36.3 Frequency (MHz)

The Frequency (MHz) field displays the TX Frequency of the selected pulse within the selected Mode. Measurement is displayed in MHz, resolution is 10 KHz.

4.36.4 Power (dBm)

The Power (dBm) field displays the TX Peak Power of the selected pulse within the selected Mode. Resolution is 0.1 dBm.

4.36.5 Px Pulse Width

The Px Pulse Width field displays the pulse width of the selected pulse within the selected Mode. Measurement is displayed in us, resolution is 10 ns.

4.36.6 Py/Px Spacing

The Py/Px Spacing field displays the pulse spacing between the reference pulse (Py) and the selected pulse (Px), within the selected Mode. Measurement is displayed in us, resolution is 10 ns.

The reference pulses for each Mode are:

M1: F1

M2: F1

M3/A: F1

MC: F1

ACLA: F1 (sif) P1 (Mode S)

ACLC: F1 (sif) P1 (Mode S)

ACSA: F1

MS: P1

M4: R1

M5: P4

4.36.7 Reply Delay

The Reply Delay field displays the Reply Delay for the select Mode. Measurement is displayed in us, resolution is 10 ns.

NOTE: The Mode 5 reply delay is adjusted for the Random Reply Delay so that the reply delay should be reported as a reply in 1st slot without any additional Random Reply Delay.

NOTE: The Mode 4 reply delay is adjusted for the slot in which the reply was received so that the reply delay should be reported as a reply in the first slot.

NOTE: The Mode 4 reply delay is not adjusted for the slot in which the reply was received so that the reply delay should be reported as a 0 nm reply with some additional slot delay (4 us/slot).

NOTE: Replies can only be detected in the first or last reply slots. The Mode 4 Codeword (A or B) determines where the test set expects the reply to occur. Codeword A is the first slot and Codeword B is the last slot.

Reply Delay for each mode is measured between:

M1: P3 - F1

M2: P3 - F1

M3/A: P3 - F1

MC: P3 - F1

ACLA: P3- F1 (sif) P4 (Mode S)

ACLC: P3 - F1 (sif) P4 (Mode S)

ACSA: P3 - F1

MS: P4 - P1

M4: P4 - R1

M5: P4 - P4

4.36.8 Reply Jitter

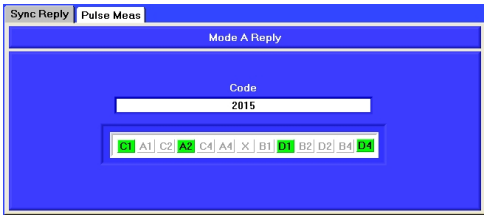
The Reply Jitter field displays the pulse jitter for selected pulse (Px), within the selected Mode. Measurement is displayed in us, resolution is 10 ns.

4.36.9 Sync Reply Tab (SIF and Mode S)

The Sync Reply Tab displays mode specific reply parameters and content, dependent on the selected sync table. The All Call Long reply format monitored is dependent on the setting of the Measure Setup Tab, Expected reply, All Call Long field.

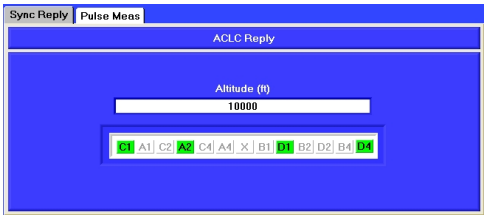
SIF Modes 1,(2),(3/A), (ACSA), (ACLA) Sync Reply

The SIF Modes 1,2,3/A, ACSA, ACLA Reply displays 4096 Code in Octal, and Binary. The Binary bits active are highlighted in green.



SIF Modes C, (ACSC), (ACLC) Sync Reply

The SIF Modes C, ACSC, ACLC Reply displays Altitude in Feet, and Binary. The Binary bits active are highlighted in green.



Sync Reply Fields General Description

The Mode S (ACLA), (ACLC) and Mode S Sync replies, display data in Hex/Octal and Raw/Field formats.

Hex/Octal:

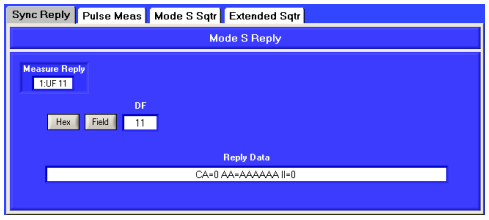
The Hex/Octal field is used to change the displayed data format.

Raw/Field:

The Raw/Field is used to display the 56 or 112 bit Mode S Reply Data either in Raw Hex or Octal format.

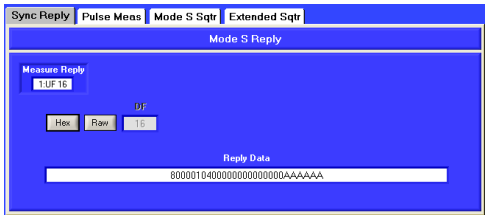
Mode S (ACLA), (ACLC) Sync Reply

The Mode S (ACLA), (ACLC) Sync Reply monitors the DF11 reply data.



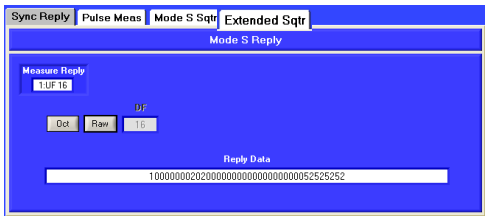
Raw Hex

Raw Hex displays the data in Hex format.



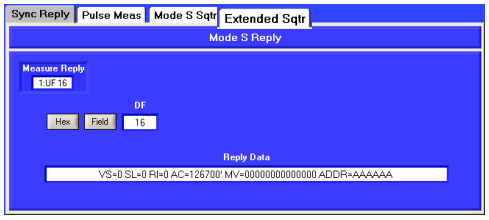
Raw Octal

Raw Octal displays the data in Octal format.



Field Hex

Field Hex displays the data as Field (RTCA DO-181C/D engineering units).



Measure Reply

The Measure Reply field displays the Synchronized Table number and the Mode S Interrogation Uplink Format UF, ACLA or ACLC selected in the table. The DF field displays the Mode S Reply Downlink DF format received.

4.36.10 DF0 Reply Data

DF0 is the short surveillance special reply, used by TCAS II systems.

The DF0 Data group displays the fields VS, SL, RI, AC, and ADDR.

VS:

The VS field displays the Vertical Status bit.

0: Airborne
1*:* Ground

CC:

The CC field displays the Crosslink Capability bit.

1: Crosslink data bus capability.
0: No Crosslink data bus capability.

SL:

The SL field displays TCAS II Sensitivity Level. Range is 0 to 7 (Octal/Hex/Dec).

RI:

The RI field displays Reply Information. Range is 0 to 17 Octal, 0 to F Hex, 0 to 15 Decimal.

AC:

The AC field displays the Altitude Code in ft. Range is -1000 to 126,700ft in 1ft increments.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.11 DF4 Reply Data

DF4 is the Surveillance Altitude reply, used by ground interrogators. The DF4 Data group displays the fields FS, DR, UM, AC and ADDR.

FS:

The FS field displays Flight Status. Range is 0 to 7 (Octal/Hex).

DR:

The DR field displays Downlink Request. Range is 0 to 7 (Octal/Hex/Dec).

UM:

The UM field displays the Utility Message. Range is 0 to 3F Hex, 0 to 77 Octal.

AC:

The AC field displays the Altitude Code in ft. Range is -1000 to 126,700 ft.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.12 DF5 Reply Data

DF5 is the Surveillance Identity reply, used by ground interrogators. The DF5 Data group displays the fields FS, DR, UM, ID and ADDR.

FS:

The FS field displays Flight Status. Range is 0 to 7 (Octal/Hex/Dec).

DR:

The DR field displays Downlink Request. Range is 0 to 7 (Octal/Hex/Dec).

UM:

The UM field displays the Utility Message. Range is 0 to 3F Hex, 0 to 77 Octal.

ID:

The ID field displays the 4096 Identification code. Range is 0000 to 7777 (Octal), 0000 to 1FFF Hex. Default value is 0000.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.13 DF11 Reply Data

The DF11 Data group displays the fields CA, II and AA.

NOTE: The AA field is Address Announced in the clear

CA:

The CA field displays Transponder Capability. Range is 0 to 7 (Octal/Hex/Dec).

II:

The II field displays Interrogator Identification. Range is 0 to F Hex, 0 to 17 Octal, 0 to 15 Dec.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.14 DF16 Reply Data

DF16 is the Long surveillance special reply, used by TCAS II systems. The DF0 Data group displays the fields VS, SL, RI, AC, MV and ADDR.

VS:

The VS field displays the Vertical Status bit.

0: Airborne
1*:* Ground

CC:

The CC field displays the Crosslink Capability bit.

1: Crosslink data bus capability.
0: No Crosslink data bus capability.

SL:

The SL field displays TCAS II Sensitivity Level. Range is 0 to 7 (Octal/Hex/Dec).

RI:

The RI field displays Reply Information. Range is 0 to 17 Octal, 0 to F Hex, 0 to 15 Decimal.

AC:

The AC field displays the Altitude Code in ft. Range is -1000 to 126,700 ft in 1 ft increments.

MV:

The MV field displays the 56 bit Comm V, Air to Air Surveillance message used by TCAS II. Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 00000000000000000000 to 37777777777777777777 Octal.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.15 DF20 Reply Data

DF20 is the Comm B Altitude reply, used by ground interrogators. The DF20 Data group displays the fields FS, DR, UM, AC, MB and ADDR.

FS:

The FS field displays Flight Status. Range is 0 to 7 (Octal/Hex/Dec).

DR:

The DR field displays Downlink Request. Range is 0 to 7 (Octal/Hex/Dec).

UM:

The UM field displays the Utility Message. Range is 0 to 3F Hex, 0 to 77 Octal.

AC:

The AC field displays the Altitude Code in ft. Range is -1000 to 126,700 ft in 1 ft increments.

MB:

The MB field displays the 56 bit Comm B message field used by ground interrogator GICB (Ground Initiated Comm B) protocol, for extracting DAP's (Downlink Aircraft Parameters). Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.16 DF21 Reply Data

DF5 is the Surveillance Identity reply, used by ground interrogators. The DF5 Data group displays the fields FS, DR, UM, ID and ADDR.

FS:

The FS field displays Flight Status. Range is 0 to 7 (Octal/Hex/Dec).

DR:

The DR field displays Downlink Request. Range is 0 to 7 (Octal/Hex/Dec).

UM:

The UM field displays the Utility Message. Range is 0 to 3F Hex, 0 to 77 Octal.

ID:

The ID field displays the 4096 Identification code. Range is 0000 to 7777 (Octal), 0000 to 1FFF Hex. Default value is 0000.

MB:

The MB field displays the 56 bit Comm B message field used by ground interrogator GICB (Ground Initiated Comm B) protocol, for extracting DAP's (Downlink Aircraft Parameters). Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.36.17 DF24 Reply Data

DF24 is used for Comm D, DELM (Downlink Extended Length Messages).The DF24 Data group displays the fields KE, ND, MD and ADDR.

KE:

The KE field displays the TAS (Transmission Acknowledgement Subfield.

1: TAS present in MD Message field

0: TAS not present in MD Message field

TAS is used in the Uplink ELM protocol (Comm C), to confirm the number of segment received so far in a Comm C sequence.

ND:

The ND field displays the DL ELM Segment Number. The ND field is used in downlink ELM protocol (Comm D), to confirm the segment number transmitted in the MD message field. Range is 0 to F Hex, 0 to 17 Octal and 0 to 15 Dec.

MD:

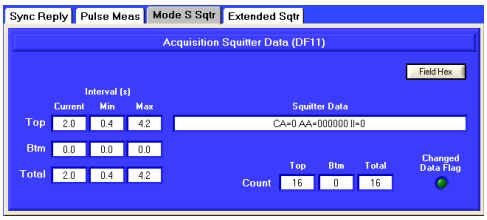
The MD field displays the 80 bit Comm-D message, which contains one segment of a sequence of segments downlinked by the transponder. Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

ADDR:

The ADDR field displays the reply DF Address, either in Octal or Hex. Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

4.37 MODE S SQUITTER TAB

The Mode S Squitter Tab displays the DF11 Acquisition Squitter.



Each squitter window may display data in either Hex or Octal Engineering units or as Hex/Octal Raw Data.

CA:

The CA field displays the Transponder Capability. Range is 0 to 7 (Octal/Hex/Dec).

II:

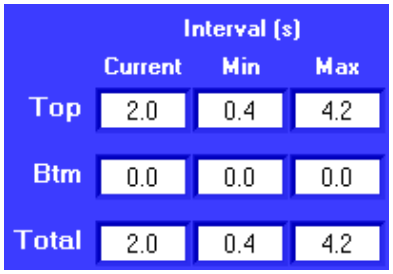
The II field displays the Interrogator Identification. Range is 0 to F Hex, 0 to 17 Octal, 0 to 15 Dec.

AA:

The AA field is the 24 bit Mode S all call address announced in the clear (i.e., no parity overlaid). Range Octal 00000000 to 77777777. Range is Hex 000000 to FFFFFF.

4.37.1 Interval (S) Group

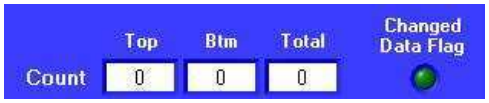
The Interval (S) group is common to all squitter windows and displays the current, maximum and minimum DF11 squitter period in seconds, for DF11 squitters received on Top and Bottom Channels .



The Total field displays the total DF11 squitters received on both Top and Bottom channels.

4.37.2 Count Group

The Count group displays the number of DF11 squitters received on the Top and Bottom channels. The total field displays the total DF11squitters received on both Top and Bottom channels.



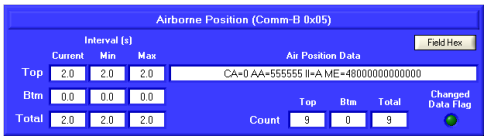
The Change Data Flag illuminates yellow when the squitter data has changed; otherwise, it is green to indicate no change in data.

4.38 EXTENDED SQUITTER TAB

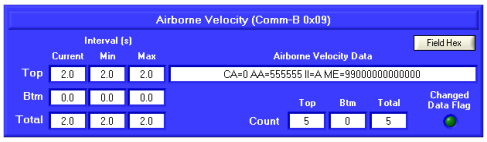
The Extended Squitter Data is captured and displayed by a screen for each Extended Squitter Data Type.

The fields displayed are:

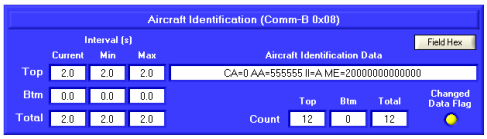
Airborne Position



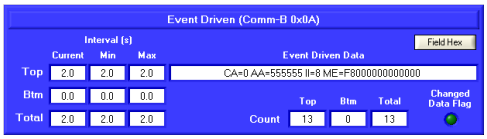
Airborne Velocity



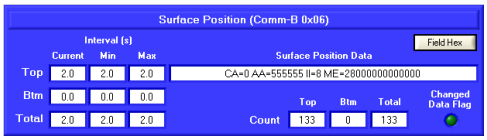
Aircraft Identification



Event Driven



Surface Position



The DF17 Data group displays the fields CA, AA, II and ME.

CA:

The CA field displays the Transponder Capability. Range is 0 to 7 (Octal/Hex/Dec).

II:

The II field displays the Interrogator Identification. Range is 0 to F Hex, 0 to 17 Octal, 0 to 15 Dec.

AA:

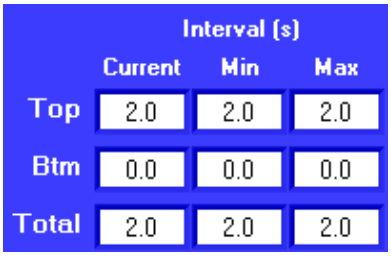
The AA field is the 24 bit Mode S all call address announced in the clear (i.e., no parity overlaid). Range Octal is 00000000 to 77777777. Range Hex is 000000 to FFFFFF.

ME:

The ME field displays the 56 bit Extended Squitter Message. The data determined by the Type field is captured and displayed in raw Hex or Octal format. Range is 00000000000000 to FFFFFFFFFFFFFF Hex, 0000000000000000000 to 3777777777777777777 Octal.

4.38.1 Interval (s) Group

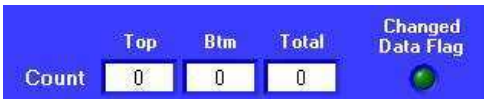
The Interval (s) group is common to all squitter windows and displays the current, maximum and minimum DF17 extended squitter period in seconds, for DF17 extended squitters received on Top and Bottom Channels .



The Total field displays the total DF17 extended squitters received on both Top and Bottom channels.

4.38.2 Count Group

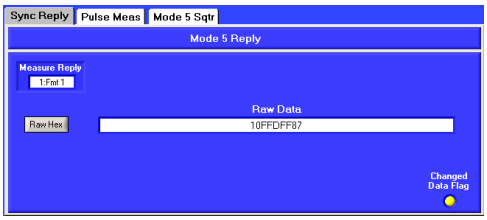
The Count group displays the number of DF17 extended squitters received on the Top and Bottom channels. The total field displays the total DF17 extended squitters received on both Top and Bottom channels.



The Change Data Flag illuminates yellow when the squitter data has changed. Green indicates no change in data.

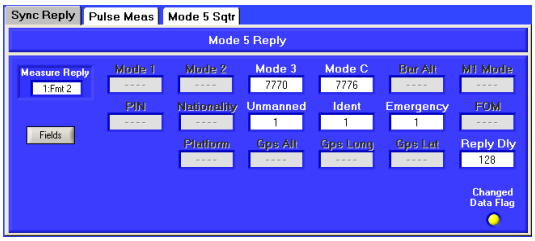
4.39 MODE 5 SYNC REPLY TAB

The Mode 5 Sync Reply Tab displays Mode 5 Level 1 Raw Data.



Raw Hex/Fields:

The Raw Hex/Fields field is used to display the Mode 5 Level 1 Reply Data either in Raw Hex or as Field (AIMS 03-1000A STANAG 4193 Part V, engineering units).



Measure Reply:

The Measure Reply field displays the synchronized Table number and the Mode 5 Interrogation Format FMT selected in the table.

Refer to 1-2-4, Table 1, Mode 5 Reply Formats.

Unmanned:

The Unmanned field displays the X bit in a Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Indications are:

0: X bit not set (Manned)

1: X bit set *(*Unmanned)

Nationality:

The Nationality field displays the National Origin field for Mode 5 Level 1 Pin Data Replies andLevel 2 Pin Report, formats 0000 or 0011. Range is 000 to 7FF, hex.

PIN:

The Pin field displays the Platform Identification Number for Mode 5 Level 1 Pin Data Replies and Level 2 Pin Report, formats 0000, 0011 or 0100. Range is 00 to 0FF, Hex.

Ident:

The Ident field displays the I/P Identification of Position bit for Mode 5 Level 1 Mode 1/2 Mode 3/C or Pin data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Indications are:

0: I/P bit not set

1: I/P bit set

Emergency:

The Emergency field displays the Military Emergency bit for Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 and 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

Indications are:

0: Emergency bit not set

1: Emergency bit set

FOM:

The FOM (Figure of Merit Code) field, displays the estimated position error in Mode 5 Level 2 PIN Report, formats 0000, 0011, 0100. Refer to DoD AIMS 03-1000A Para 3.5.16.1 Figure of Merit, Table 12

Range is 0 to 22.

M1 Mode:

The M1 Mode bit is used to indicate the Mode 5 Ramp Test Mode is active.

Platform:

The Platform Type bit is used to indicate if the platform is in the Ground or Airborne state.

Mode 1:

The Mode 1 (Oct) field displays the Mode 1 squawk code in Octal for Mode 5 Level 1 Mode 1/2 data reply. Range is 0000 to 7777.

Mode 2:

The Mode 2 (Oct) field displays the Mode 2 squawk code in Octal for Mode 5 Level 1 Mode 1/2 data reply. Range is 0000 to 7777.

Mode 3:

The Mode 3 (Oct) field displays the Mode 3 squawk code in Octal for Mode 5 Level 1 Mode 3/C data reply. Range is 0000 to 7777.

Mode C:

The Mode C (Oct) field displays the Mode C squawk code in Octal for Mode 5 Level 1 Mode 3/C data reply. Range is 0000 to 7777.

Bar Alt:

The Bar Alt field displays the Mode C Altitude for Mode 5 Level 2 Pin Report, formats 0000 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

GPS Alt:

The GPS Alt field displays GNSS Altitude in ft for Mode 5 Level 2 Pin Report, formats 0100 Range 126,700 to -1000 ft.

GPS Long:

The GPS Long field displays Longitude in degrees to three decimal places. GPS Longitude data is transmitted in Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data report.

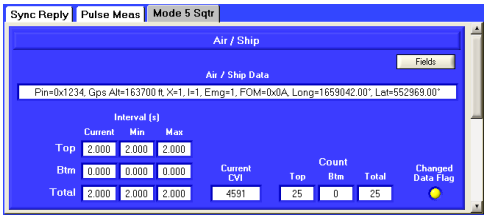
GPS Lat:

The GPS Lat field displays Latitude in degrees to three decimal places. GPS Latitude data is transmitted in Mode 5 Level 1 Mode 1/2 Mode 3/C or PIN data Reply, Mode 5 Level 2 Pin Report, formats 0000, 0011 or 0100 and Mode 5 Level 2 Mode 1/2 and Mode 3/C Data reports.

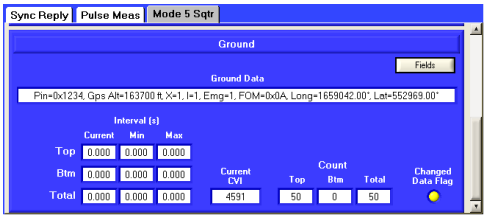
4.40 MODE 5 SQUITTER TAB

The Mode 5 Squitter Tab displays captured Mode 5 Level 2 Squitter Reports Formats 0100 and 0011.

The Air/Ship Data Squitter window displays the data received from Mode 5 Format 0100 squitter report. Refer to 1-2-4.4.38 for field descriptions.

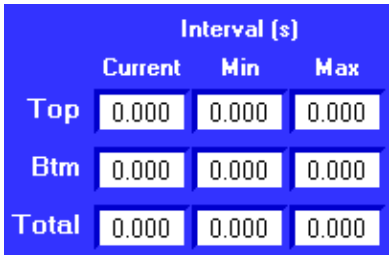


The Ground Data Squitter window displays the data received from Mode 5 Format 0011 squitter report. Refer to 1-2-4.4.38 for field descriptions.



4.40.1 Interval (s) Group

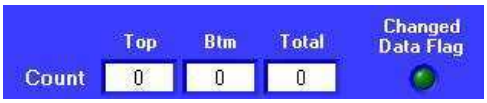
The Interval (s) group is common to all squitter windows and displays the current, maximum and minimum Mode 5 Squitter period in seconds, for Mode 5 Squitters received on Top and Bottom Channels.



The Total field displays the total Mode 5 squitters received on both Top and Bottom channels.

4.40.2 Count Group

The Count group displays the number of Mode 5 squitters received on the Top and Bottom channels. The total field displays the total Mode 5 squitters received on both Top and Bottom channels.



The Change Data Flag illuminates yellow when the squitter data has changed; otherwise, it is green to indicate no data change.

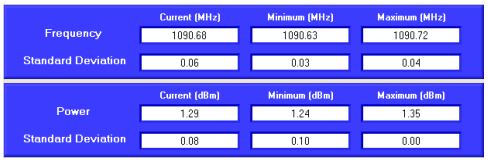
4.40.3 Pulse Measure

The pulse measure window is displayed for each selected Mode Reply. Current, Minimum and Maximum measurements are displayed along with the standard deviations for each parameter.

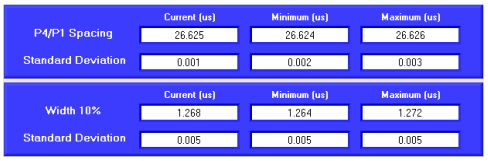
The Pulse Measure Tab is displayed for each selected Mode Reply. Current, Minimum and Maximum measurements are displayed along with the standard deviations for each parameter. The measurements displayed in the scrollable window, are those acquired since the last buffer reset. Refer to 1-2-4.17.4, for details of buffer resetting.

The parameters measured and displayed are:

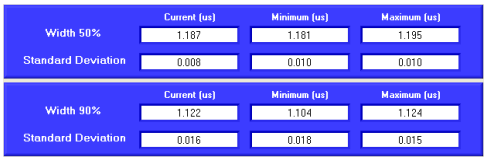
Frequency and Power



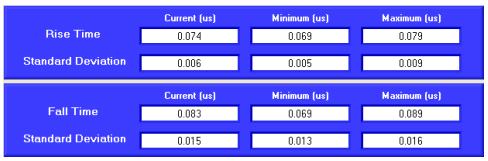
Pulse Spacing and Width 10%



Width 50% and Width 90%

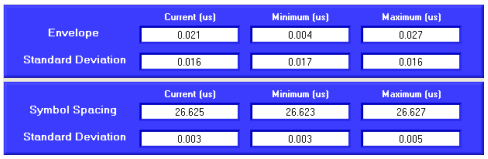


Rise Time and Fall Time



Reply Delay and Reply Jitter

Envelope and Symbol Spacing (Mode 5 only)



4.41 TACAN INSTRUMENT

In the TACAN mode of operation the IFF-45TS emulates either a TACAN ground transponder or a TACAN airborne interrogator. The unit provides six TACAN test modes; Ground to Air (G/A), Inverse (G/A), Air to Air (A/A), Inverse (A/A), Beacon (G/A) and Beacon (A/A)

The unit is also capable of testing diversity airborne TACAN interrogators.

4.41.1 TACAN Test Screen

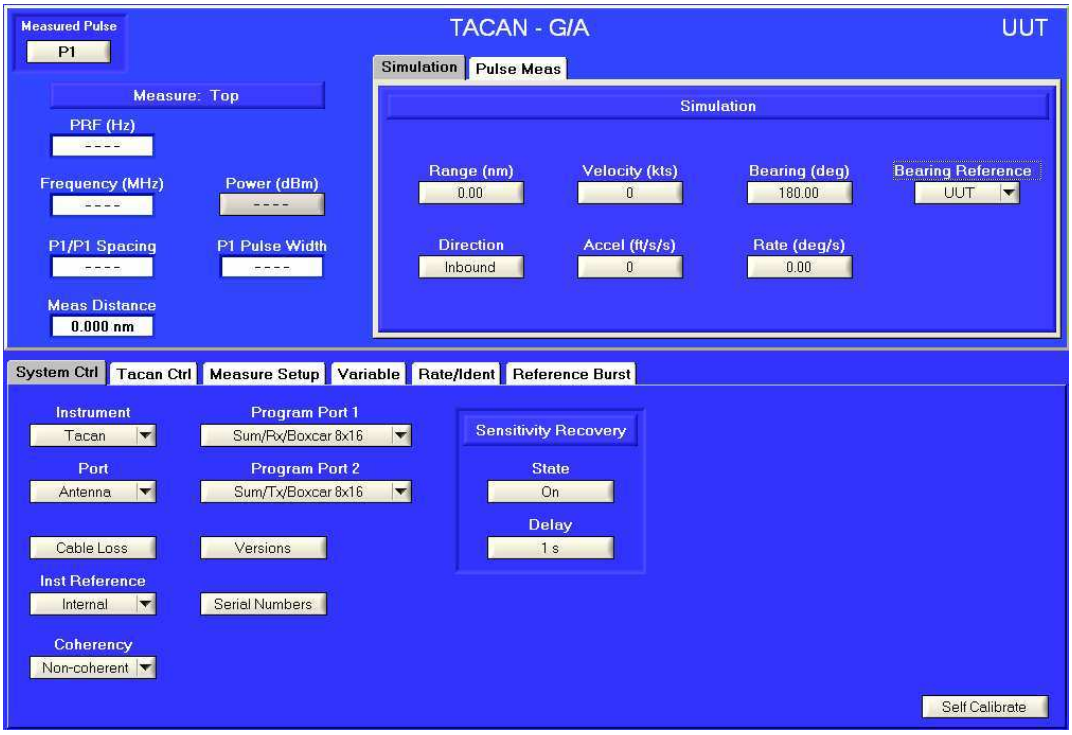
Upon selecting the TACAN instrument, the TACAN test screen is displayed. The selected TACAN test mode is displayed top-mid screen (1-2-4, Figure 33).

The TACAN Test Screen is divided into two sections.

The upper section provides TACAN Interrogator UUT measured pulse parameters and simulation parameters.

The lower section provides the IFF-45TS control functions and consists of the tabs Systems Control, TACAN Ctrl, Measure Setup, Variable, Rate/Ident and Reference Burst.

NOTE: The GUI allows data entry in 1 ns increments; however the IFF-45TS will build the pulse at the spacing, or width, to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.



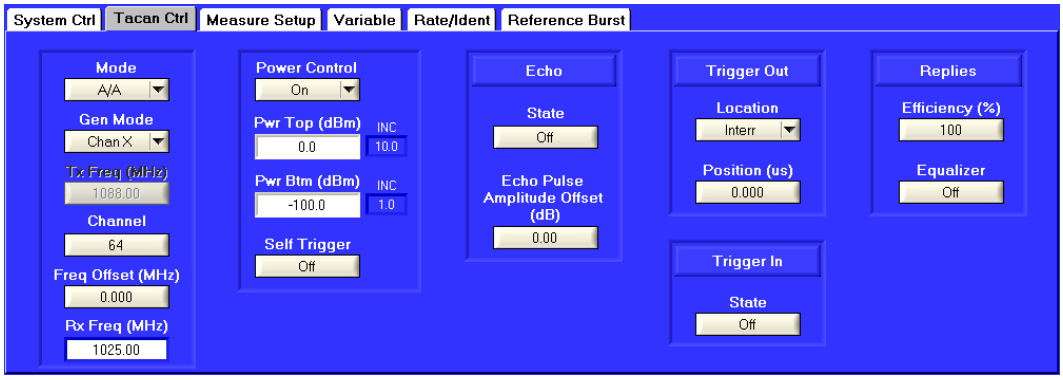
TACAN Test Screen
Figure 33

4.41.2 System Controls

Refer to 1-2- 4.1.5, Systems Controls.

4.42 TACAN CONTROL TAB

The TACAN Control tab is divided into six groups: TACAN, Generator, Echo, Trigger Out, Replies, and Trigger In (1-2-4, Figure 34).



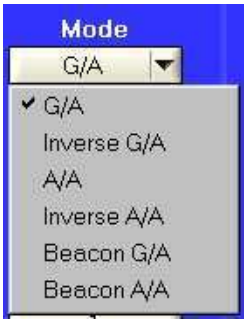
TACAN Control Tab
Figure 34

4.42.1 Mode/Channel Group

The Mode/Channel group provides selection and indication of TACAN Mode and Channel, and consists of the fields Mode, Gen Mode, TX Freq MHz, Channel, Frequency Offset (MHz) and RX Frequency.

4.42.2 Mode

The Mode field displays and selects the currently selected TACAN Mode.



Selections are:

(G/A) Ground to Air: In this mode the IFF-45TS simulates a DME ground station providing range replies.

Inverse G/A: In this mode the IFF-45TS simulates the signals a TACAN Beacon Antenna would supply to the TACAN R/T. The TACAN uses the directionality of its 15Hz AM cardioid antenna pattern to determine the angle of arrival of DME squitter and range replies. The phase of the 15Hz modulation relative to the North Reference Trigger (NRT) changes with selected IFF-45TS Bearing; the 135Hz modulation provides finer bearing accuracy.

Air to Air (A/A): In this mode the IFF-45TS simulates an A/A TACAN providing A/A interrogations and monitoring of single pulse A/A range replies.

Inverse A/A: In this mode the IFF-45TS simulates the signals a TACAN Beacon Antenna would supply to the TACAN R/T. The TACAN uses the directionality of its 15Hz AM cardioid antenna pattern to determine the angle of arrival of single pulse range replies and squitter, either from a TACAN in A/A or BCN mode. The phase of the 15Hz modulation relative to the NRT, changes with selected IFF-45TS Bearing.

Beacon G/A: In this mode the IFF-45TS simulates a TACAN Ground Beacon providing simulated bearing (15/135Hz and MRB/ARB), also providing range replies.

Beacon A/A: In this mode the IFF-45TS simulates an A/A TACAN Beacon providing a simulated bearing (15Hz and MRB), also providing A/A interrogations and monitoring of single pulse A/A range replies.

4.42.3 Gen Mode

The Gen Mode field is used to select the Generator frequency in MHz X, Y or by TACAN Channel number X, Y. The field displays the currently selected Generator Mode.

Selections are:

Freq X: *Gen* Freq in MHz X Channel

Freq Y: Gen Freq in MHz Y Channel

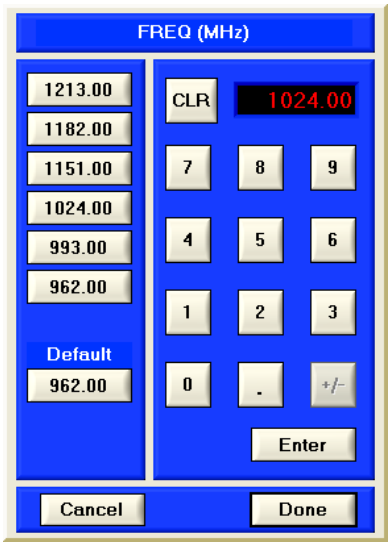
Chan X: Gen Freq by X Channel Number

Chan Y: Gen Freq by Y Channel Number

4.42.4 Tx Freq (MHz)

The Tx Freq (MHz) field is displayed when Gen Mode: Freq X/Y is selected and is used to enter Generator frequency in MHz.

Selecting the Tx Freq (MHz) field displays the Freq MHz Window.



Range:

Freq X: 962.00 to 1213.00 MHz in 10KHz increments. Default value is 962.00 MHz.

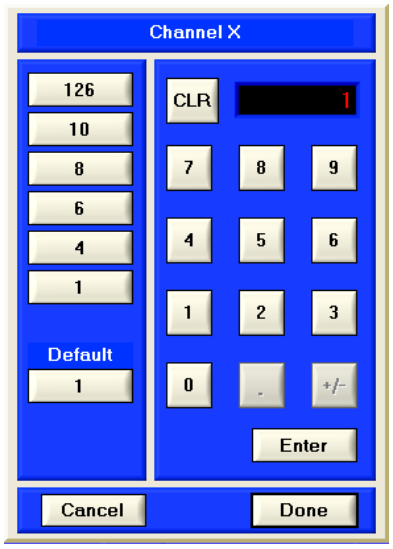
Freq Y: 1025.00 to 1150.00 MHz in 10KHz increments. Default value is 1025.00 MHz.

Select Done when finished to close window.

4.42.5 Channel

The Channel field is displayed when Gen Mode: Chan X/Y is selected.

Selecting the Channel field displays the Channel X/Y Window.

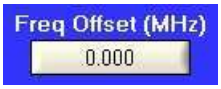


Range is 1 to 126. Default value is 1.

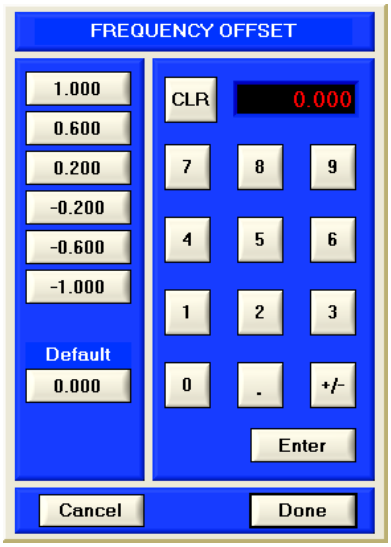
Select Done when finished to close window.

4.42.6 Freq Offset (MHz)

When Channel X/Y is selected, a Frequency Offset may also be entered in the Frequency Offset (MHz) field.



Selecting the Freq Offset (MHz) field displays the Frequency Offset Window.



Range is -1.000 to +1.000 MHz in 1 KHz increments. Default value is 0.000 MHz.

Select Done when finished to close window.

4.43 POWER CONTROL GROUP

The Power Control group controls the Top and Bottom signal generator RF levels and consists of the fields Pwr Top (dBm) and Pwr Bot (dBm), Power Control and Self trigger.

4.43.1 Power Control

The Power Control field controls the Top and Bottom port (direct and antenna) replies.

Selections are:

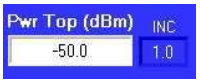
Off: Turns off reply modulation, disables RF.

On: Turns on reply modulation

CW: Turns off reply modulation, CW only.

4.43.2 Pwr Top (dBm)

The Pwr Top (dBm) field allows the Top or Sum reply RF level to be set in 0.1 dB increments.



Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit. Default value is 1 dBm.

4.43.3 Pwr Btm (dBm)

The Pwr Bot (dBm) field allows the Bottom or Diff reply RF level to be set in 0.1 dB increments.

Default value is -50.0 dBm. The RF level maybe slewed using the Left/Right cursor keys to select the units and the Up/Down cursor keys to increment the value.

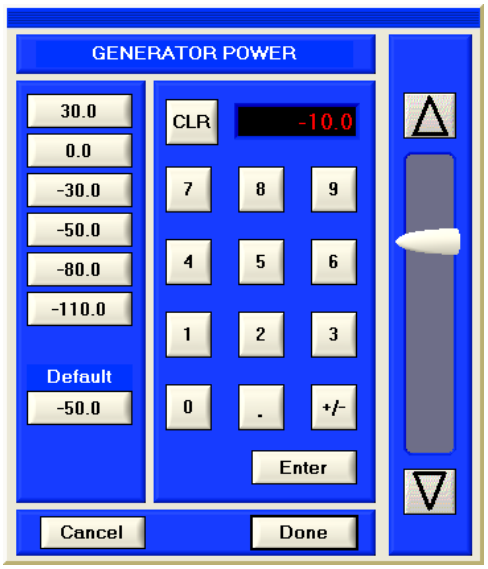
NOTE: Attempts to enter values outside of the stated range will result in an advisory "Out of Range" text message being displayed.

The INC field displays the currently selected increment unit.

Keypad Entry Option

On the Options menu, the *Keypad for Power/Frequency Entry* is enabled to allow popup keypad entry for generator power.

Selecting either Top (dBm) or Bottom (dBm) will display a popup keypad.



The value is entered by using the preselected values to the left, entering via keypad, or using the slider to the right.

4.43.4 Self Trigger

The Self Trigger field controls how range replies are generated.

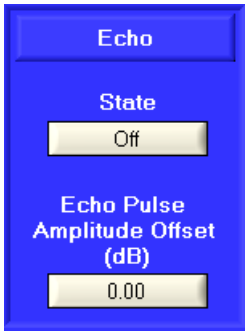
Selections are:

Off: Turns off Self Trigger,(range replies are synchronized to range interrogations).

On: Turns on Self Trigger, (range replies are triggered by internal trigger generator).

4.44 ECHO GROUP

The Echo group controls echo range replies which are fixed at 30nm after the main range replies to simulated multipath reflections. The Echo Group consists of the fields Delay (us) and Echo Pulse Amplitude Offset (dB).



4.44.1 Delay

The delay field switches the Echo range replies on or off.

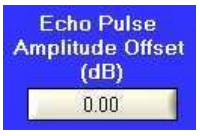
Selections are:

Off: Turns off Echo range replies.

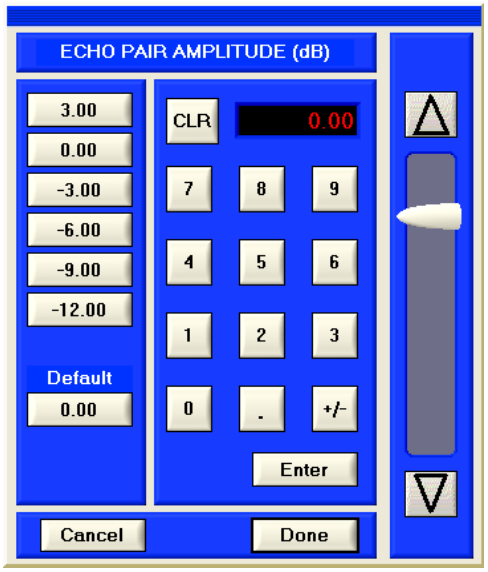
On: Turns on Echo range replies.

4.44.2 Echo Pulse Amplitude Offset (dB)

The Echo Pulse Amplitude Offset (dB) field controls the amplitude of the Echo range replies with respect to the amplitude of the main range replies.



Select Echo Pulse Amplitude Offset (dB) to display Echo Pair Amplitude (dB) data entry window.

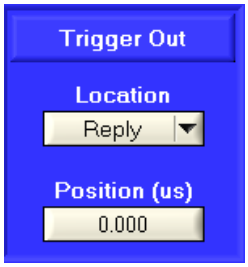


Range is -12 dB to +3 dB in 0.01 dB increments. Default value is 0.0 dB.

Select *Done* when finished to close window.

4.45 TRIGGER OUT GROUP

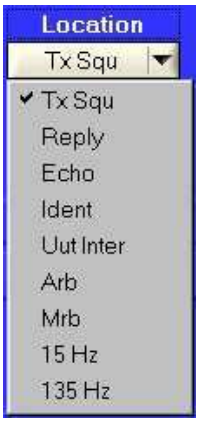
The Trigger Out group allows an oscilloscope TTL trigger pulse to be synchronized to TACAN interrogation or reply component.



The trigger is synchronized to the reference point, which is the first pulse in an interrogation, range reply, Ident, Echo, Squitter, MRB or ARB, and to the zero crossing of the 15Hz or 135Hz bearing signals. The Trigger Out Group consists of the fields Location and Position (us).

4.45.1 Location

The Location field allows the trigger source to be selected.



Selections are:

Tx Squ: Interrogation squitter.

Reply: Main range replies

Echo: Echo range replies

Ident: Ident replies

Uut Inter: Range interrogation

Arb: Auxiliary reference burst

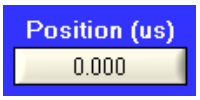
Mrb: Main reference burst

15 Hz: 15Hz bearing signal

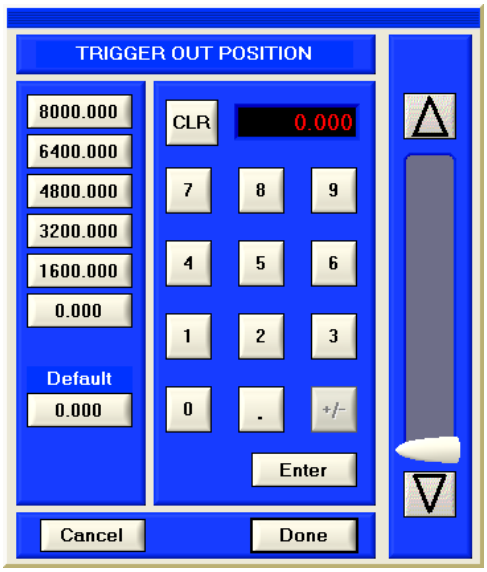
135 Hz: 135Hz bearing signal

4.45.2 Position

The Position (us) field sets the trigger out position relative to the reference point for each TACAN interrogation or reply component identified.



Select Position (us) field to display Trigger Out Position window.



Range is 0.000 to +8,000.000 us, relative to reference point, in 1 ns increments. Default value is 0.000 us.

NOTE: Refer to 4.5.1 Note 1 regarding Pulse Spacing/Widths and Delays.

Select *Done* when finished to close window.

4.46 TRIGGER IN STATE

The Trigger In State field controls an external TTL reply trigger input.

Selections are:

On: External TTL reply trigger input activated.

Off: External TTL reply trigger input deactivated.

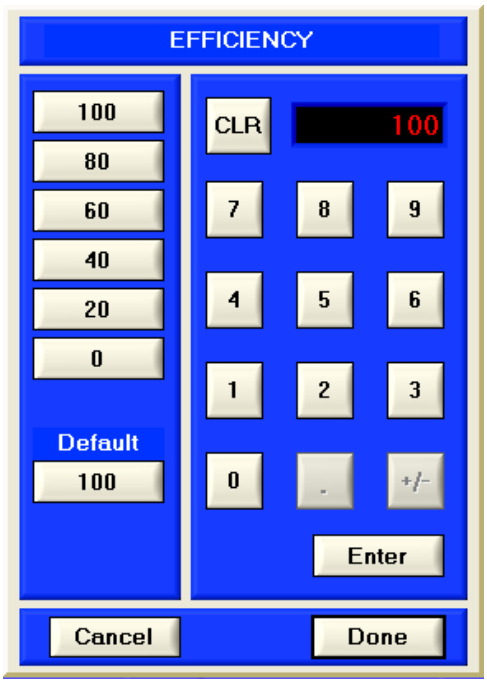
4.47 REPLIES GROUP

The Replies group controls % Reply Efficiency and Equalizer Pulses. The Replies Group consists of the fields Efficiency (%) and Equalizer.

4.47.1 Efficiency (%)

The Efficiency (%) field controls the % reply efficiency for range replies.

Select Efficiency (%) field to display the Efficiency data entry window.



Range is 0 to 100, in 1% increments. Default value is 100.

Select *Done* when finished to close window.

4.47.2 Equalizer

The Equalizer field controls the equalizer pulses. Equalizer pulses are generated 100 us after Ident pulses.

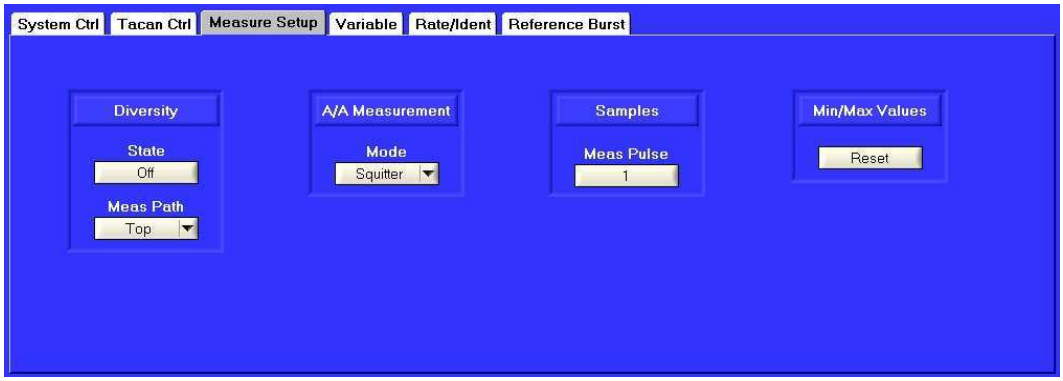
Selections are:

On: Equalizer pulse on.

Off: Equalizer pulses off.

4.48 MEASURE SETUP TAB

The Measure Setup tab controls which ports/signals are used for measurement. The Measure Setup tab is divided into one group, Diversity, and three fields: A/A Measurement, Samples and Min/Max Values (1-2-4, Figure 35).



Measure Setup Tab
Figure 35

4.49 DIVERSITY GROUP

The Diversity group controls the diversity operation and measurement path.

4.49.1 State

The state field turns the bottom port on or off.

Selections are:

On: Turns Bottom port On

Off: Turns Bottom port Off

4.49.2 Meas Path

The Meas Path field selects either the Top or Bottom port for measurements. The selected port is displayed in the UUT section, refer to 1-2-4 4.5.8.1 Measured Pulse Group.

NOTE: With State set to Off, measurement path defaults to Top.

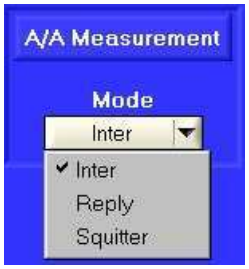
Selections are:

Top: Selects Top Port

Bottom: Selects Bottom Port

4.50 A/A MEASUREMENT MODE

The A/A Measurement Mode field controls the selection of either A/A interrogations, A/A replies, or A/A 1350Hz squitter for measurement and display in the UUT section.



Selections are:

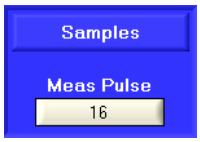
Inter: Interrogations used for measurement.

Reply: Replies used for measurement.

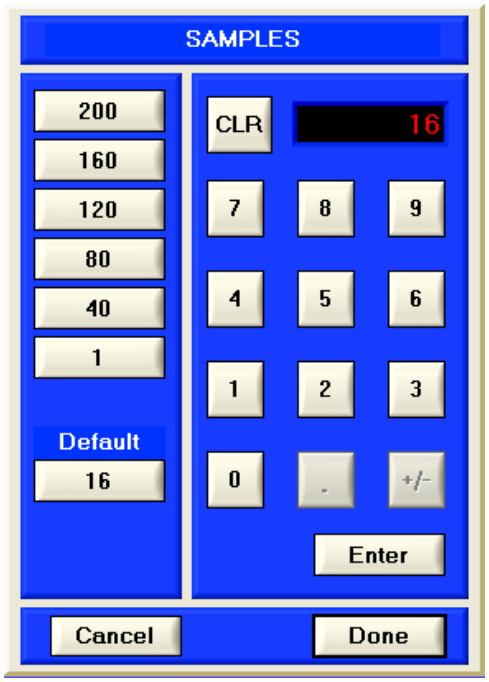
Squitter: Squitters used for measurement

4.51 SAMPLES MEAS PULSE

The Meas Pulse field sets the number of samples for the buffer, averaging UUT Interrogation, (A/A Interrogation, Reply or Squitter), Power, Frequency, Pulse Width and Pulse Spacing for the pulse selected in the Measured Pulse field .



Selecting Meas Pulse field displays the Samples window.



Range is 1 to 200. Default value is 16.

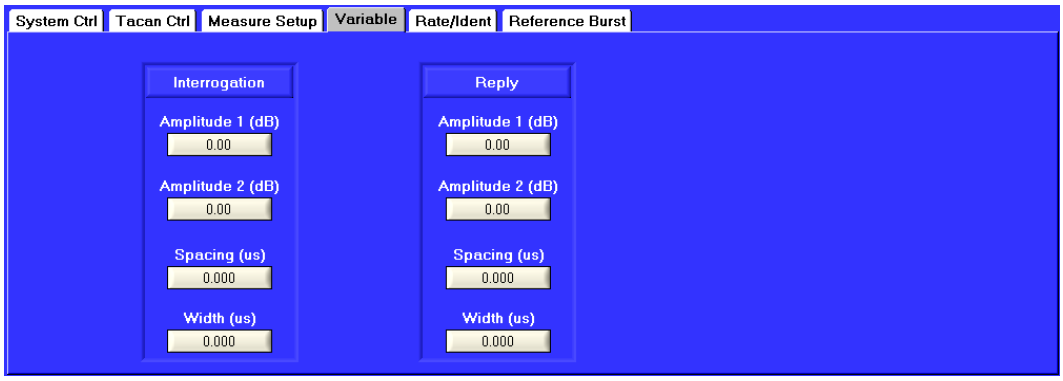
Select *Done* when finished to close window.

4.52 MIN/MAX VALUES

Selecting the Reset field, Resets average and max/min measurement buffers.

4.53 VARIABLE TAB

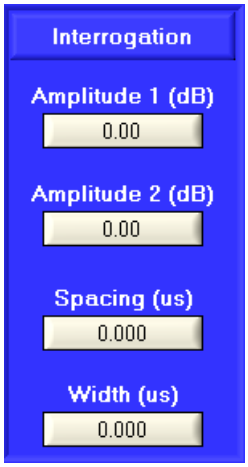
The Variable tab controls interrogation and reply pulse parameters. The Variable tab is divided into two groups, consisting of Interrogation and Reply (1-2-4, Figure 36).



Variable Tab
Figure 36

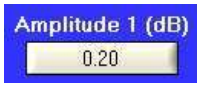
4.54 INTERROGATION GROUP

The Interrogation group controls the A/A TACAN interrogation pulse parameters and consists of the fields Amplitude 1 (dB), Amplitude 2 (dB), Spacing (us) and Width (us).

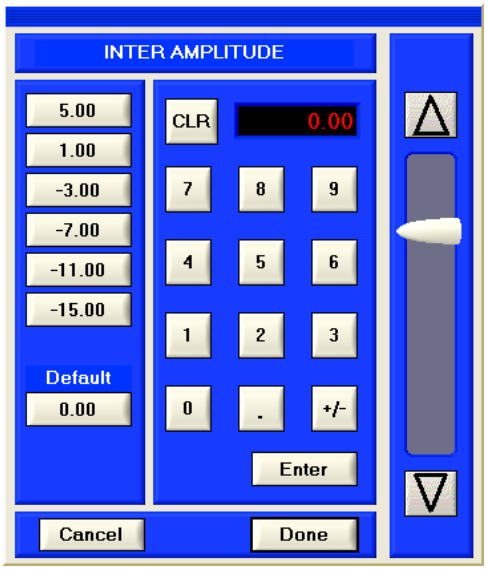


4.54.1 Amplitude 1,(2) (dB)

The Amplitude 1,(2) field controls the P1/P2 pulse amplitude offset, with respect to the generator nominal pulse level.



Selecting Amplitude 1,(2) (dB) field displays the Inter Amplitude Data Entry window.



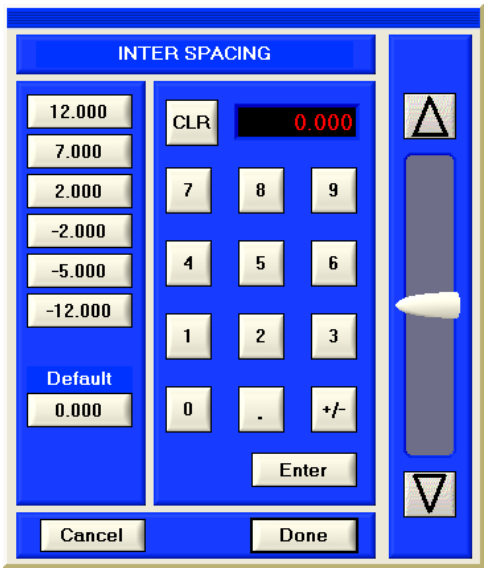
Range is -15.00 to +5.00 in 0.01 dB increments. Default value is 0.00 dB.

Select *Done* when finished to close window.

4.54.2 Spacing (us)

The Spacing (us) field sets the spacing offset from nominal between P1 and P2 of an A/A interrogation.

Select Spacing (us) to display Inter Spacing (us) Window.



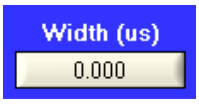
Range is -12.000 to +12.000 us in 1 ns increments, relative to nominal spacing for X channel (12.0 us) and Y channel (24.0 us). Default value is 0.000 us.

NOTE: Refer to 4.5.1 Note 1 regarding Pulse Spacing/Widths and Delays.

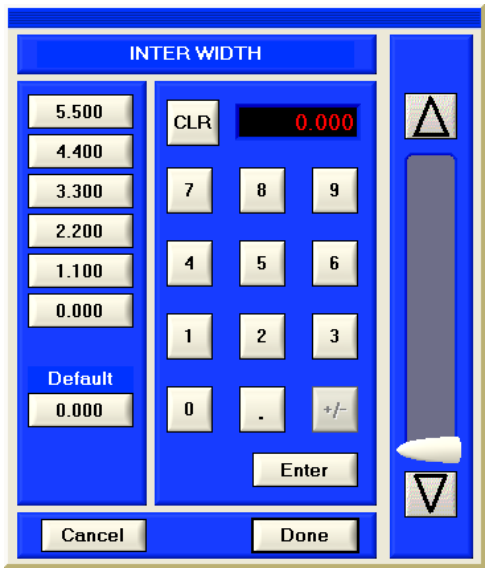
Select *Done* when finished to close window.

4.54.3 Width (us)

The Width (us) field sets the P1 and P2 pulse width of an A/A interrogation.



Select Width (us) to display Width (us) Window.



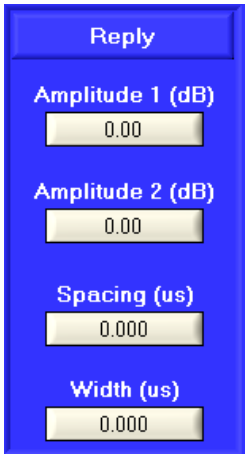
Range is 0 to +5.500 us in 1 ns increments. Default value is 0.000 us.

NOTE: Refer to 4.5.1 Note 1 regarding Pulse Spacing/Widths and Delays.

Select *Done* when finished to close window.

4.55 REPLY GROUP

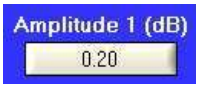
The Reply group controls the TACAN reply pulse parameters and consists of the fields Amplitude 1 (dB), Amplitude 2 (dB), Spacing (us) and Width (us).



4.55.1 Amplitude 1,(2) (dB)

The Amplitude 1,(2) field controls the P1/P2 pulse amplitude offset, with respect to the generator nominal pulse level.

Selecting Amplitude 1,(2) (dB) field displays the Inter Amplitude data entry window.

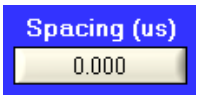


Range is -15.00 to +5.00 in 0.01 dB increments. Default value is 0.00 dB.

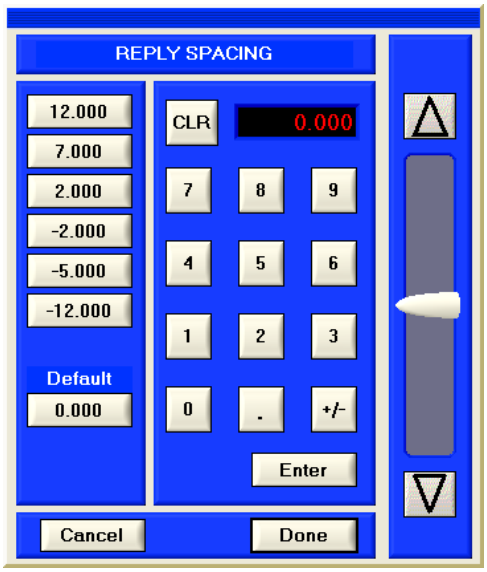
Select *Done* when finished to close window.

4.55.2 Spacing (us)

The Spacing (us) field sets the spacing offset from nominal between P1 and P2 of a TACAN reply.



Select Spacing (us) to display Reply Spacing (us) Window.



Range is -12.000 to +12.000 us in 1 ns increments, relative to nominal spacing for X channel (12.0 us) and Y channel (30.0 us). Default value is 0.000 us.

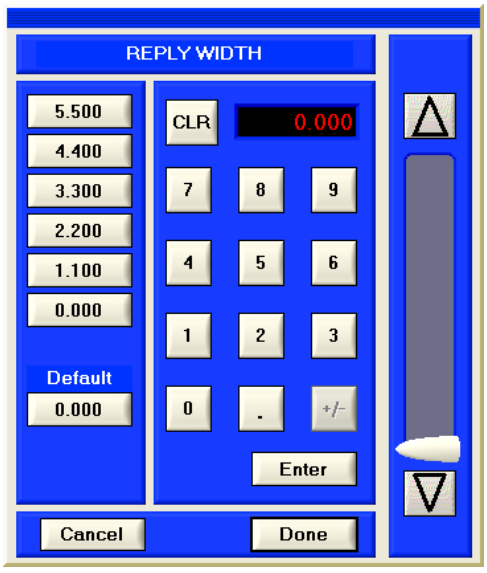
NOTE: Refer to 4.5.1 Note 1 regarding Pulse Spacing/Widths and Delays.

Select *Done* when finished to close window

4.55.3 Width (us)

The Width (us) field sets the P1 and P2 pulse width of a TACAN reply.

Select Width (us) to display Reply Width (us) Window.



Range is 0 to +5.500 us in 1 ns increments. Default value is 0.000 us.

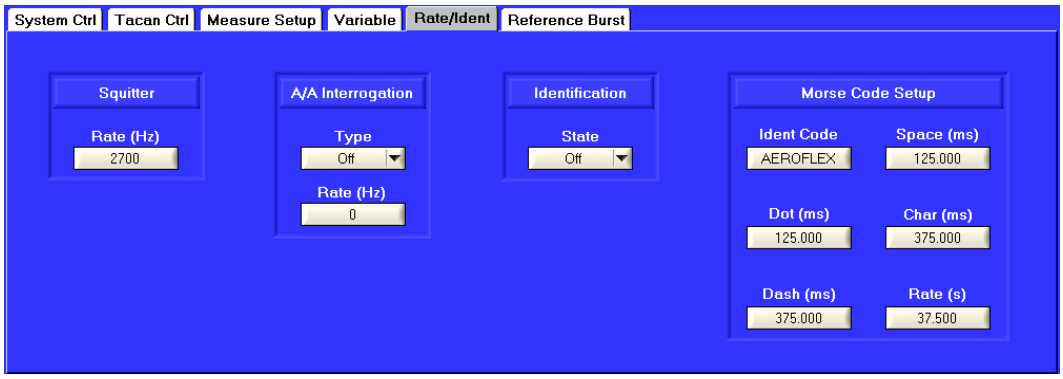
NOTE: Refer to 4.5.1 Note 1 regarding Pulse Spacing/Widths and Delays.

Select *Done* when finished to close window.

4.56 RATE/IDENT TAB

The Rate/Ident tab controls Squitter, A/A interrogation, Identification and Morse Code parameters.

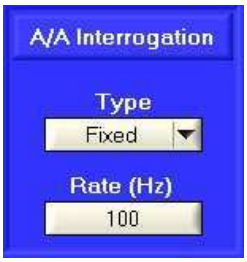
The Rate/Ident tab is divided into two groups, A/A Interrogation and Morse Code Setup, and two fields, Squitter and Identification (1-2-4, Figure 37).



Rate/Dent Tab
Figure 37

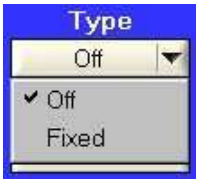
4.57 A/A INTERROGATION GROUP

The A/A Interrogation group controls A/A interrogation rate and type and consists of the Type and Rate (Hz) fields.



4.57.1 Type

The Type field controls the type of A/A Interrogation Rate.



Selections are:

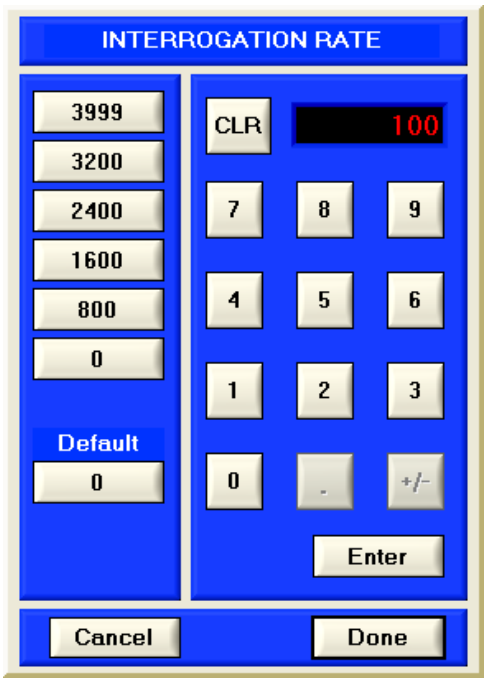
Off: A/A interrogations are turned off

Fixed: A/A Interrogations are generated at the rate set by the Rate (Hz) field.

4.57.2 Rate (Hz)

The Rate (Hz) field controls the A/A Interrogation Rate.

Select Rate (Hz) field to display Interrogation Rate Window.

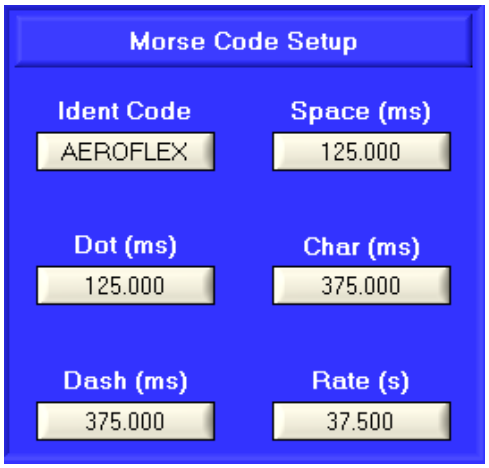


Range is 0 to 3999 Hz. Default value is 0 Hz.

Select done when finished to close window.

4.58 MORSE CODE SETUP GROUP

The Morse Code Setup Group controls the 1350Hz ident Morse signal.



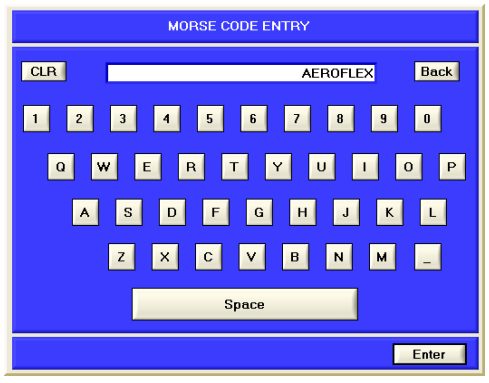
NOTE: Code must be selected in the Identification State field for Morse ident to be active.

The Morse Code Setup group consists of six fields: Ident code, Dot (ms), Dash (ms), Space (ms), Char (ms) and Rate (s).

4.58.1 Ident Code

The ident code field is used to enter the Morse letters to be transmitted as station Identity Code.

Select Ident code field to display Morse Code Entry Window.



Range is 1 to 8 characters (alpha/numeric).

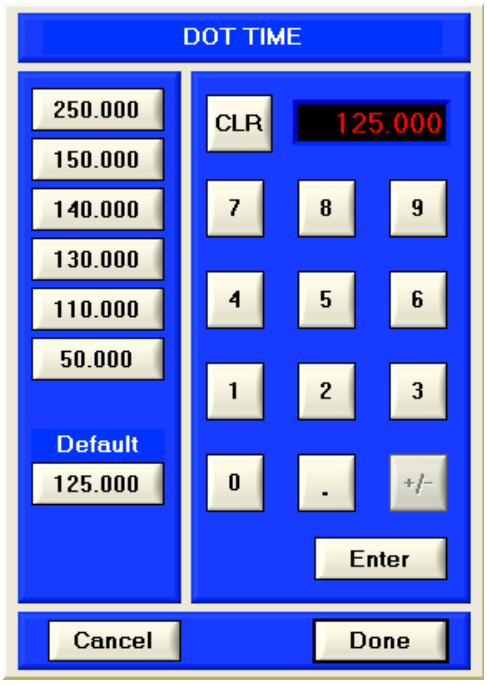
NOTE: Only the last 8 characters are accepted.

Select *Enter* when finished to close window

4.58.2 Dot (ms)

The Dot (ms) field allows the Morse code dot duration to be set.

Select Dot (ms) field to display Dot Time Window.



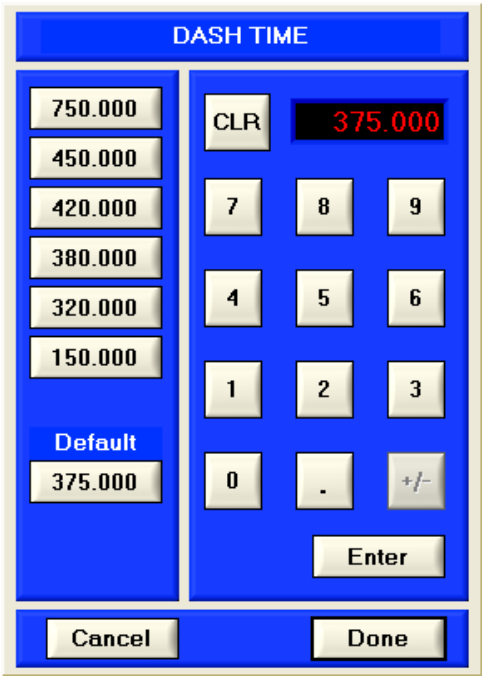
Range is 50.000 to 250.000 ms in 1 us increments. Default value is 125.000 ms.

Select done when finished to close window.

4.58.3 Dash (ms)

The Dash (ms) field allows the Morse code dash duration to be set.

Select Dash (ms) field to display Dash Time Window.



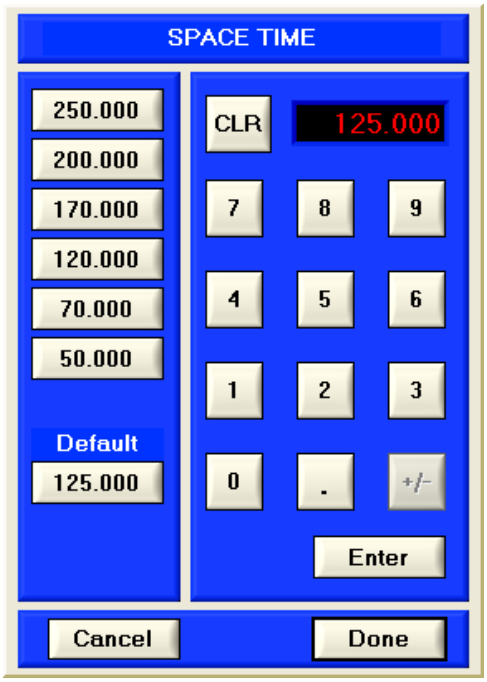
Range is 150.000 to 750.000 ms in 1 us increments. Default value is 375.000 ms.

Select done when finished to close window.

4.58.4 Space (ms)

The Space (ms) field allows the Morse code Space duration to be set.

Select Space (ms) field to display Space Time Window.



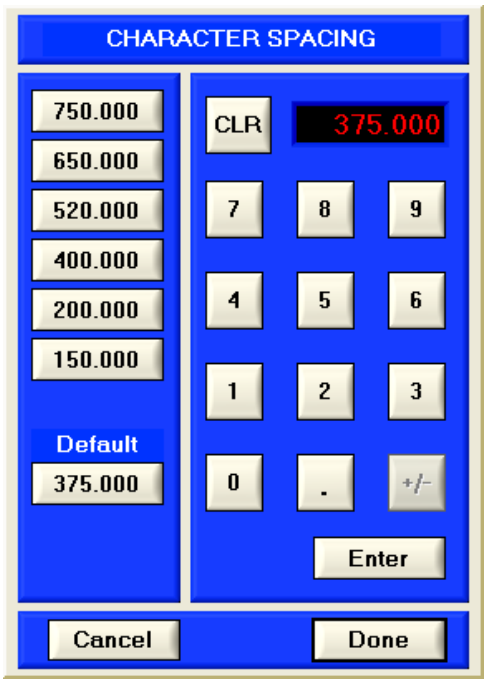
Range is 50.000 to 250.000ms in 1 us increments. Default value is 125.000 ms.

Select done when finished to close window.

4.58.5 Char (ms)

The Char (ms) field allows the Morse code Character spacing to be set.

Select Char (ms) field to display Character Spacing Window.



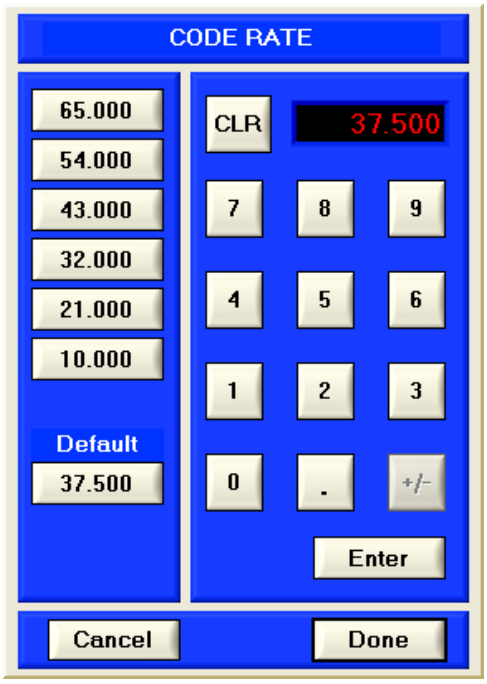
Range is 150.000 to 750.000ms in 1 us increments. Default value is 375.000 ms.

Select done when finished to close window.

4.58.6 Rate (s)

The Rate (s) field allows the Morse code rate to be set.

Select Rate (s) field to display Code Rate Window.



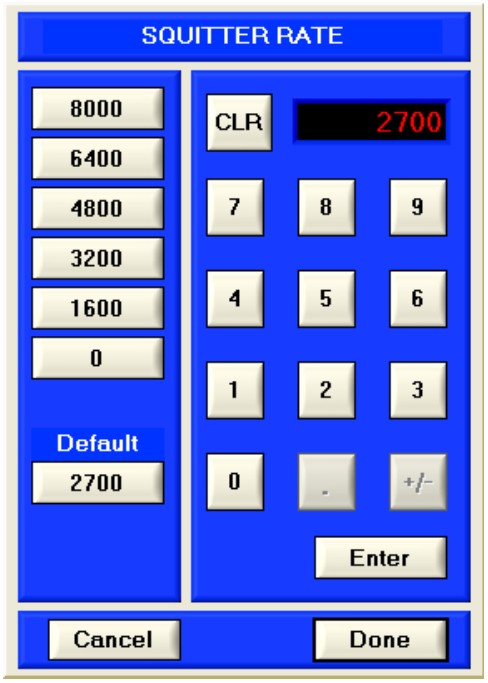
Range is 10.000 to 65.000 s in 1ms increments. Default value is 37.500 s.

Select done when finished to close window.

4.59 SQUITTER

The Squitter field allows the Squitter rate to be set.

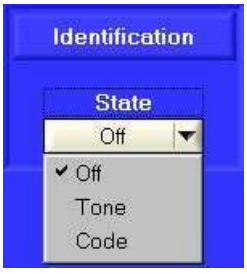
Select Squitter field to display Squitter Rate Window.



Range is 0 to 8000 Hz in 1 Hz increments. Default value is 2700 Hz.

4.60 IDENTIFICATION

The Identification field allows the 1350 Hz Ident tone state to be set.



Selections are:

Off: Ident signal turned off.

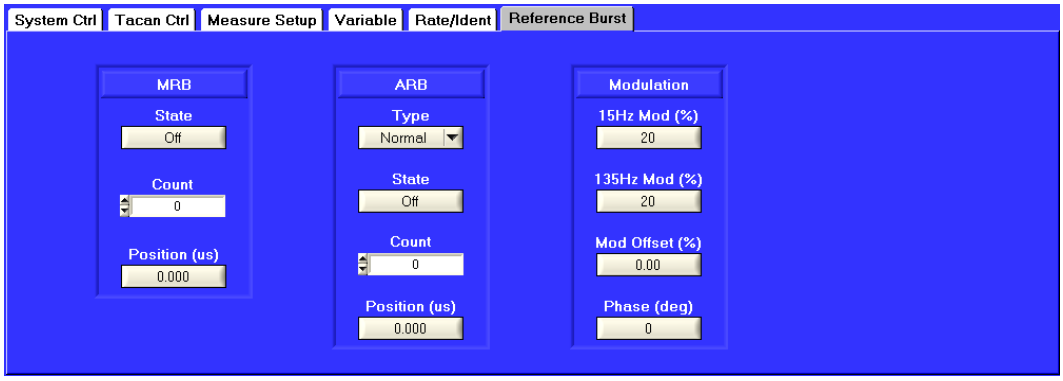
Tone: Continuous 1350Hz Ident.

Code: Morse code.

4.61 REFERENCE BURST TAB

The reference Burst tab controls the MRB, ARB and 15 and 135 Hz parameters.

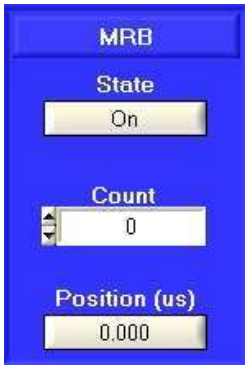
The Reference Burst tab is divided into the groups MRB, ARB and Modulation (1-2-4, Figure 38).



Reference Burst Tab
Figure 38

4.61.1 MRB Group

The MRB group controls the Main Reference Burst parameters and consists of the State, Count and Position (us) fields.



State

The State field allows the MRB to be turned On or Off.

Selections are:

Off: MRB turned Off.

On: MRB turned On.

Count

The Count field controls the number of pulse pairs (G/A X Mode) or single pulses (G/A Y, A/A X or A/A Y Mode) in the MRB.

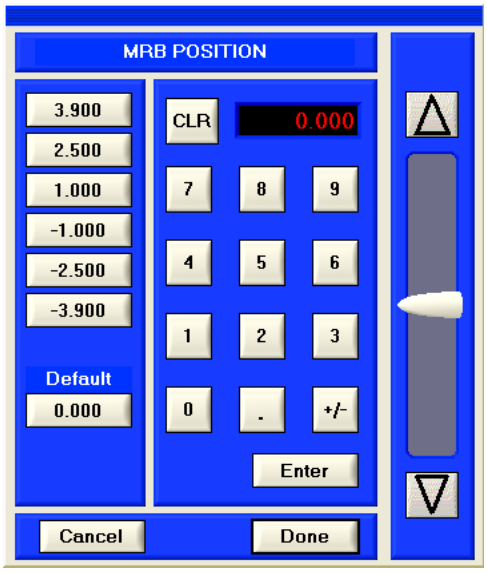
One or two pulse pairs (single pulses) may be added to or subtracted from the nominal value.

Range is ±2 pulses.

Position (us)

The Position (us) field allows the MRB pulses to be deviated from their nominal positions

Select Position (us) to display MRB position Window.



Beacon G/A X Mode:

Adjusts the deviation between the pairs of pulses comprising the MRB. Range is ±.900 us in 1 ns increments from the nominal value. Default value is 0.000 us.

Beacon G/A Y, BEACON A/A X or BEACON A/A Y Mode:

Adjusts the deviation between the single pulses comprising the MRB. Range is ±3.900 us in 1 ns increments from the nominal value. Default value is 0.000 us.

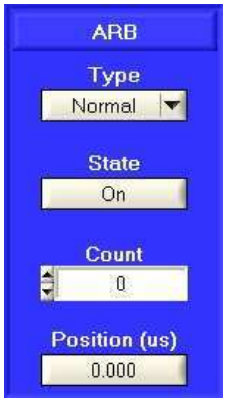
A/A, INVERSE A/A, INVERSE G/A, G/A Mode:

The MRB is not present.

Select done when finished to close window.

4.61.2 ARB Group

The ARB group controls the Auxiliary Reference Burst parameters and displays the fields Type, State, Count and Position (us).



Type

The Type field allows the first ARB after the MRB to be turned On or Off.

Selections are:

Missing: First ARB after MRB turned Off.

Normal: First ARB after MRB turned On.

State

The State field allows the ARB to be turned On or Off.

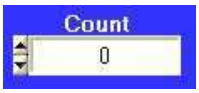
Selections are:

Off: ARB turned Off.

On: ARB turned On.

Count

The Count field controls the number of pulse pairs (G/A X Mode) or single pulses (G/A Y Mode) in the ARB.



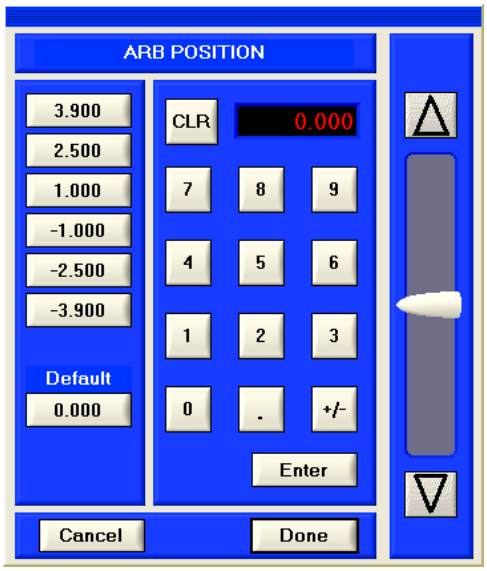
One or two pulse pairs (single pulses) may be added to or subtracted from the nominal value.

Range is ±2 pulses.

Position (us)

The Position (us) field allows the ARB pulses to be deviated from their nominal positions.

Select Position (us) to display ARB position Window.



G/A X Mode:

Adjusts the deviation between the pairs of pulses comprising the ARB. Range is ±3.900 us in 1 ns increments from the nominal value. Default value is 0.000 us.

G/A Y Mode:

Adjusts the deviation between the single pulses comprising the ARB. Range is ±3.900 us in 1 ns increments from the nominal value. Default value is 0.000 us.

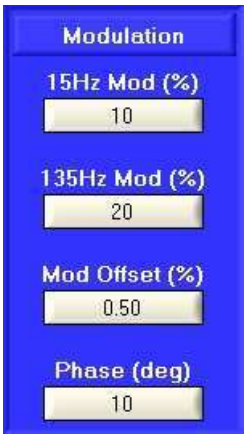
A/A, INVERSE A/A, BEACON A/A, INVERSE G/A, BEACON G/A Mode:

The ARB is not present.

Select done when finished to close window.

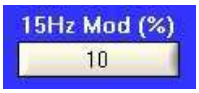
4.61.3 Modulation Group

The Modulation group controls the 15 and 135Hz Modulation parameters and consists of the 15Hz Mod (%), 135Hz Mod (%), Mod Offset (%), Phase (deg).

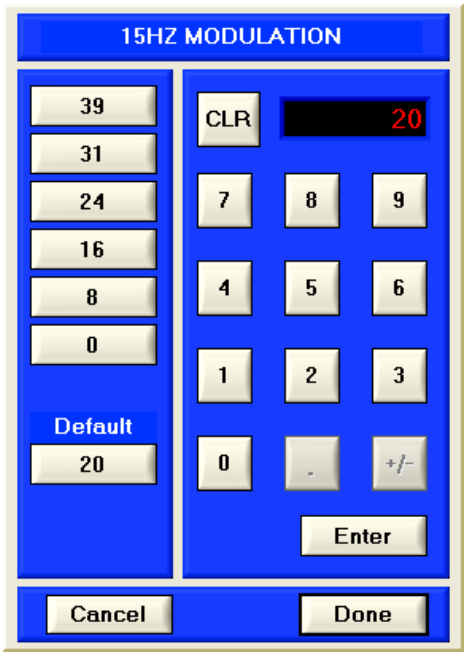


15Hz Mod (%)

The 15Hz Mod (%) field allows the 15Hz Modulation Depth to be set.



Select 15Hz Mod (%) field to display 15Hz Modulation Window.



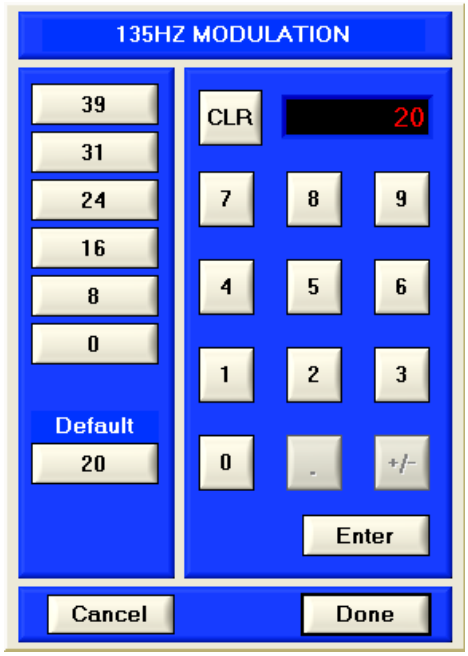
Range is 0 to 39% in 1% increments. Default value is 20%.

Select *Done* when finished to close window.

135Hz Mod (%)

The 135Hz Mod (%) field allows the 135Hz Modulation Depth to be set.

Select 135Hz Mod (%) field to display 135Hz Modulation Window.

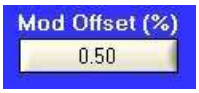


Range is 0 to 39% in 1% increments. Default value is 20%.

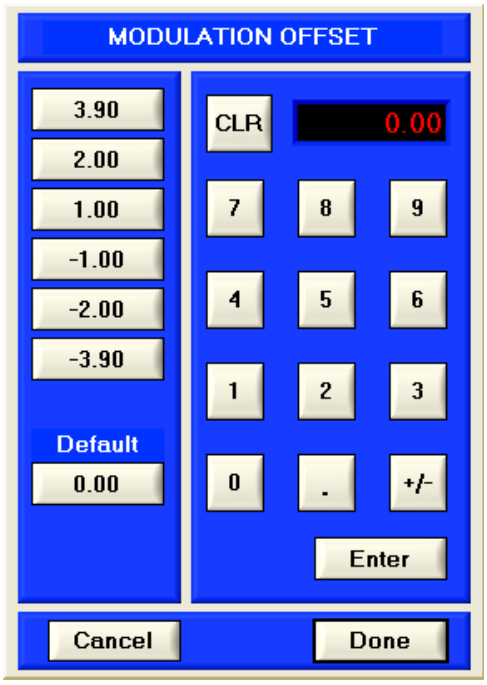
Select *Done* when finished to close window.

Mod Offset (%)

The Mod Offset (%) field allows the 15 and 135Hz Tone frequency to be deviated from nominal.



Select 135Hz Mod (%) field to display Modulation Offset Window.

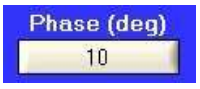


Range is ± 3.90% in 0.01% increments. Default value is 0.00%.

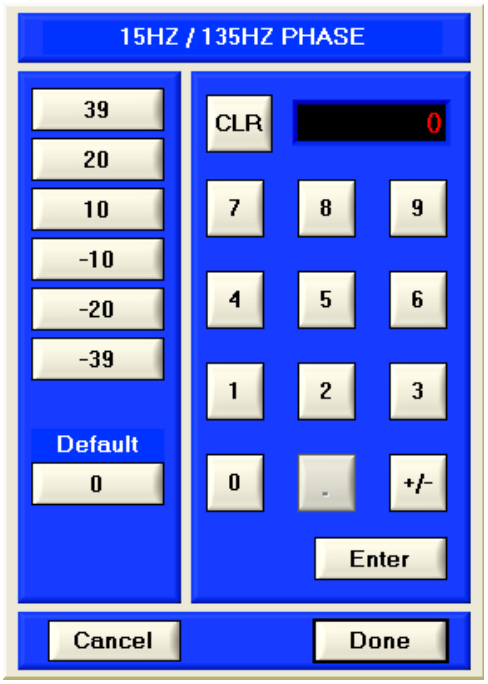
Select done when finished to close window.

Phase (deg)

The Phase (deg) field allows the 15 and 135Hz Tone phase to be deviated from nominal.



Select Phase (deg) field to display 15Hz/135Hz Phase Window.



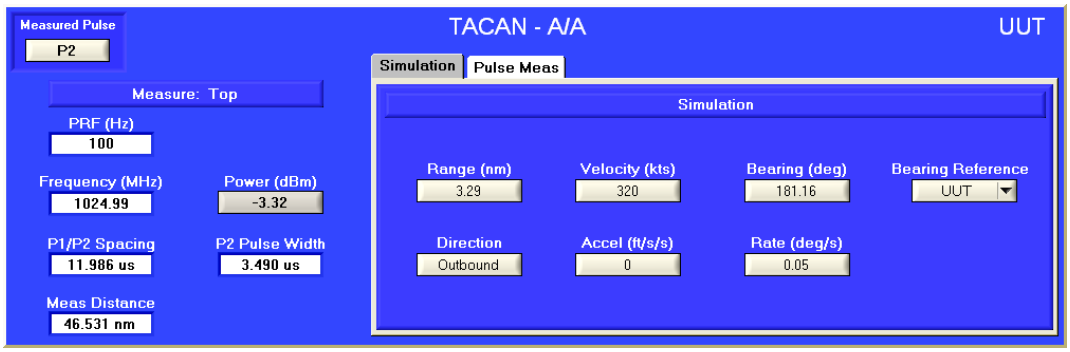
Range is ± 39 deg in 1 deg increments. Default value is 0 deg

Select *Done* when finished to close window.

4.62 TACAN UUT

The upper section of the TACAN test screen, displays TACAN UUT TX interrogation parameters (1-2-4, Figure 39).

The upper section displays the fields Measured Pulse, PRF (Hz), Frequency (MHz), P1/P2 Spacing, Meas Distance, Power (dBm) and P1,(P2) Pulse Width. Two tabs are displayed for Simulation and Pulse Meas.

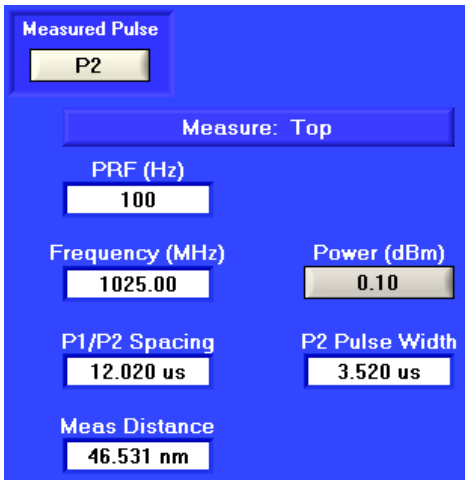


TACAN UUT TX Parameters
Figure 39

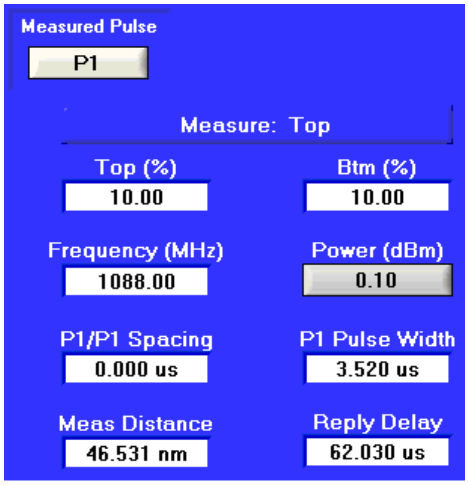
4.62.1 Measured Pulse Group

The Measured Pulse Group displays measured parameters of either P1 or P2 pulse within an interrogation. When TACAN A/A modes are selected, pulses may be measured within an interrogation, reply or squitter.

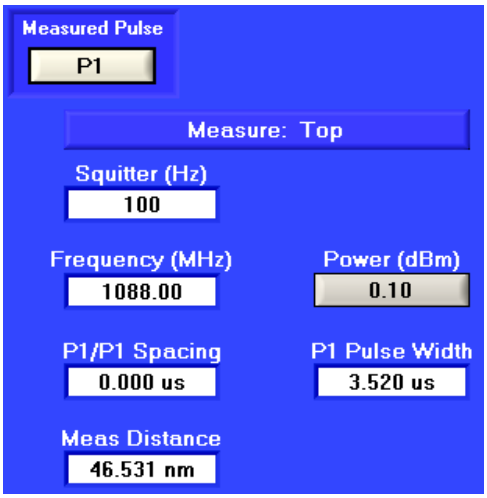
In G/A, Inverse G/A, Beacon G/A TACAN modes and A/A Modes with A/A Measurement Mode= Interrogation (Measure Setup Tab), the fields displayed are PRF (Hz), Frequency (MHz), P1/P2 Spacing, Power (dBm), and P2 Pulse Width and Meas Distance.



In A/A, Inverse A/A and Beacon A/A TACAN modes, with A/A Measurement Mode= Reply (Measure Setup Tab), the fields displayed are Top (%), Btm (%), Reply Delay (us), Frequency (MHz), P1/P2 Spacing, Power (dBm), P2 Pulse Width and Meas Distance.



In A/A, Inverse A/A and Beacon A/A TACAN modes, with A/A Measurement Mod = Squitter (Measure Setup Tab), the fields displayed are Top (%), Btm (%), Reply Delay (us), Frequency (MHz), P1/P2 Spacing, Power (dBm), P2 Pulse Width and Meas Distance.



Measured Pulse

The Measured Pulse field provides selection of either P1 or P2 pulse within an interrogation, reply or squitter. Refer to A/A Measurement Mode for details.

Selections are:

P1: Selects P1 pulse for measurement

P2: Selects P2 pulse for measurement

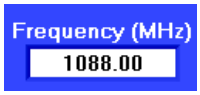
The port measured is indicated in the Measure: Top/Bottom field. Refer to Meas Path for more details.

NOTE: Bottom port may only be selected for measurement when Diversity Mode is On.

The selected pulse is used for power, frequency and pulse width measurement, and pulse spacing measurement. This feature is used in conjunction with the Meas Pulse Samples field in TACAN. All measurements are averaged over the selected number of samples. Refer to Samples Meas Pulse for more details.

Frequency (MHz)

The Frequency (MHz) field displays the TX Frequency of the selected pulse P1, (P2), within the interrogation, reply or squitter. Measurement is displayed in MHz, resolution is 10 KHz.



Power (dBm)

The Power (dBm) field displays the TX Peak Power of selected pulse P1, (P2), within the interrogation, reply or squitter.

Resolution is 0.1 dBm.

P1,(P2) Pulse Width

The P1,(P2) Pulse Width field displays the pulse width of the selected pulse within the selected interrogation, reply or squitter.

Measurement is displayed in us, resolution is 10 ns.

NOTE: The IFF-45TS will display measurements to the closest multiple of the internal 7.8125 ns clock, resulting in a time resolution within the stated 10 ns specification.

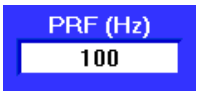
P1/P2 Spacing

The P1/P2 Spacing field displays the pulse spacing between the P1 and P2 pulses within the selected interrogation, reply, or squitter.

Measurement is displayed in us, resolution is 10 ns.

PRF (Hz)

The PRF (Hz) field displays the interrogation pulse repetition Frequency.



Measurement is displayed in Hz, resolution is 1Hz.

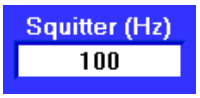
Measured Distance

The Measured Distance field displays the UUT ARINC 568 distance data.

Measurement range is 0.00 to 399.99 nm in 0.01 nm increments.

Squitter (Hz)

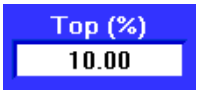
The Squitter (Hz) field displays the A/A Squitter Rate.



Measurement is displayed in Hz, resolution is 1Hz.

Top (%)

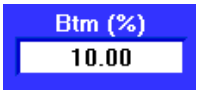
The Top (%) field displays the A/A percent reply for the top port.



Measurement is displayed in %, resolution is 1%.

Btm (%)

The Btm (%) field displays the A/A percent reply for the Btm port.

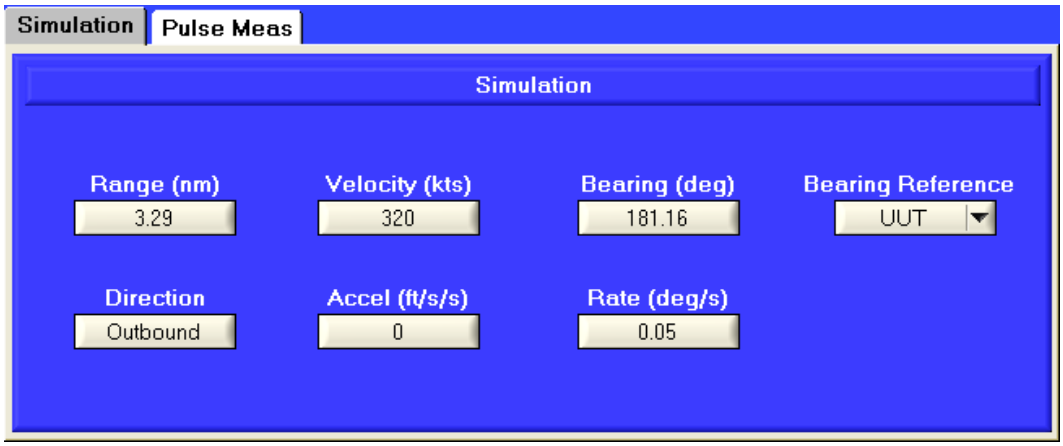


Measurement is displayed in %, resolution is 1%.

4.63 SIMULATION TAB

The Simulation Tab provides control for reply Range, Direction, Velocity, Acceleration, Bearing and Bearing Rate.

The tab consists of the fields Range (nm), Direction, Velocity (kts0, Accel (ft/s/s), Bearing (deg), and Rate (deg/s) (1-2-4, Figure 40).

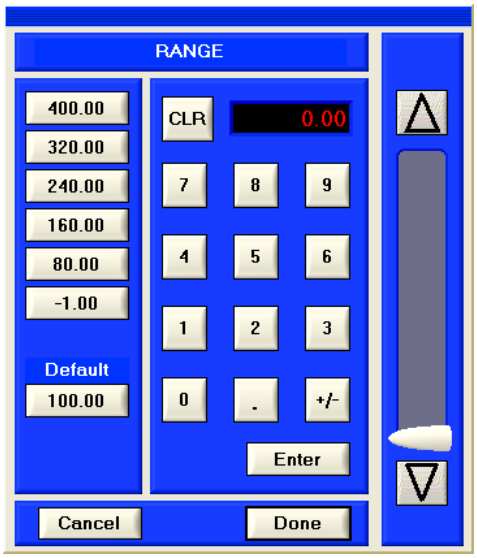


Simulation Tab
Figure 40

4.63.1 Range (nm)

The Range (nm) field allows the user entry of range and displays the current range.

Select Range (nm) field to display Range Window.



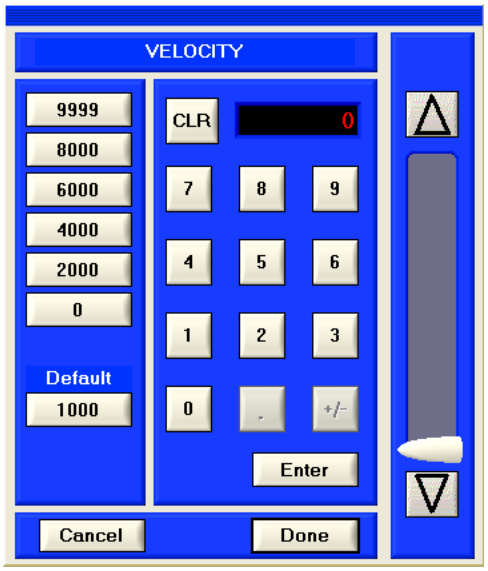
Range is 0.00 to 399.00 nm in 0.01 nm increments. Default Value is 100.00 nm.

Select *Done* when finished to close window.

4.63.2 Velocity (kts)

The Velocity (kts) field allows the user entry of velocity and displays the current velocity.

Select Velocity (kts) field to display Velocity Window.



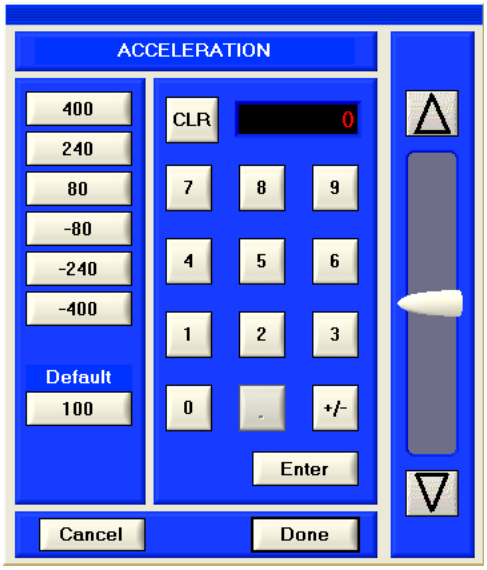
Range is 0 to 9999 kts in 1kt increments. Default Value is 1000 kts.

Select *Done* when finished to close window.

4.63.3 Accel (ft/s/s)

The Accel (ft/s/s) field allows the user entry of acceleration.

Select Accel (ft/s/s) field to display Accel (ft/s/s) Window.



Range is -400 to +400 ft/s/s in 1 ft/s/s increments. Default Value is 100 ft/s/s.

Select *Done* when finished to close window.

Direction

The Direction field selects inbound or outbound range.

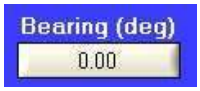
Selections are:

Inbound: Range slews inbound.

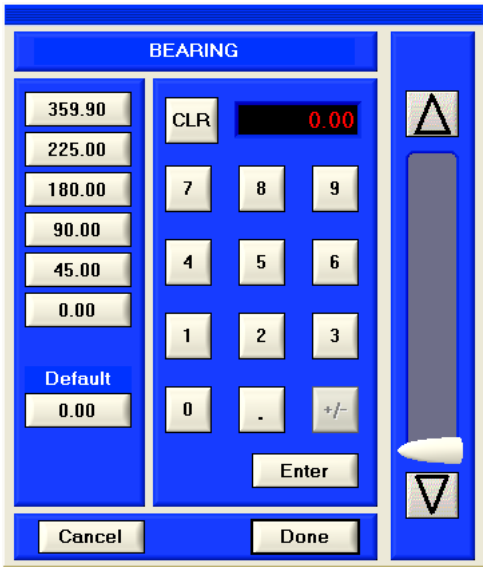
Outbound: Range slews outbound.

Bearing (deg)

The Bearing (deg) field allows the user entry of bearing and displays the current bearing.



Select Bearing (deg) field to display Bearing Window.

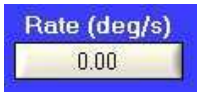


Range is 0.00 to 359.90 deg in 0.01 deg increments. Default Value is 0.00 deg.

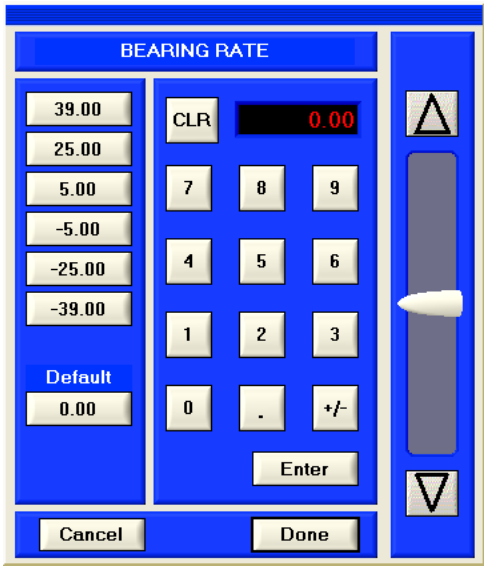
Select *Done* when finished to close window.

Rate (deg/s)

The Rate (deg/s) field allows the user entry of bearing rate.



Select Rate (deg/s) field to display Bearing Rate Window.



Range is +39.00 to -39.00 deg in 0.01 deg increments. Default Value is 0.00 deg.

Select *Done* when finished to close window.

Bearing Reference

The Bearing Reference field selects UUT or Station reference.

Selections are:

UUT: UUT is bearing reference.

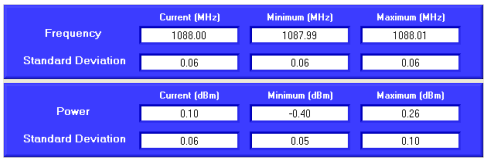
Station: Ground Station is bearing reference.

Pulse Meas Tab

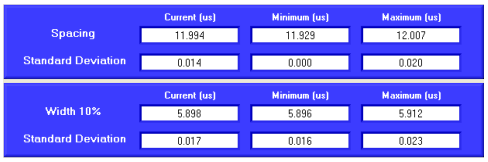
The Pulse Meas Tab displays statistical pulse measurements. Current, Minimum, and Maximum measurements are displayed along with the standard deviations for each parameter. The measurements displayed in the scrollable window are those acquired since the last buffer reset. Refer to Min/Max Values for details of buffer resetting.

The parameters measured and displayed are:

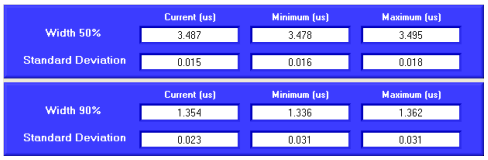
Frequency and Power



Pulse Spacing and Width 10%



Width 50% and Width 90%



Rise Time and Fall Time

5. REMOTE OPERATION

5.1 GENERAL

The IFF45TS is controlled through a serial interface using the remote command set as defined in this document. This remote command set is organized into a menu hierarchy as defined by the IEEE 488.2 specification.

All commands and data are printable ASCII characters.

Commands have two forms, short or long. The parser only accepts the exact short or long form.

EXAMPLE

`:INSTrument`

This command can be input as `:INSTRUMENT` or `:INST`.

EXAMPLE

`:SYSTem:BIT:STATus?`

This command can be input as `:SYST:BIT:STAT?` or `:SYSTEM:BIT:STATUS?`

When sending multiple commands for the same menu, the first command needs the full command. Any additional commands can continue from the last menu.

EXAMPLE

`INST:DIR:BOT -12`

This sets the DIRECT BOTTOM Connector power level.

EXAMPLE

`TOP -20`

This sets the DIRECT TOP Connector power level.

All commands written to the IFF45TS must be properly terminated as follows:

RS232: Carriage Return (CR) Line Feed (LF).

GPIB: CRLF and EOI asserted on the last byte.

VXI-11: The data within the Parameters packet must terminate with a CRLF

NOTE: Attempting to perform two consecutive GPIB read operations from the M5 Bench Tester causes the GPIB Bus to suspend.

5.2 REMOTE OPERATION CONFIGURATION

Baud Rate
19,200

Bits
8

Parity
None

Stop Bit
1

Echo
OFF

Flow Control
RTS (Hardware Handshaking On)

GPIB
The GPIB address is set using the GPIB address switches on the rear of the IFF45TS. The address switches consist of 5 slide switches numbered 1 through 5.

Switch 1 is the least significant bit and has a value of 1. Number 5 switch is the most significant bit with a value of 16. The dip switch is configured so the on condition is enabling that bit.

The GPIB address can be set to any value between 1 and 32. However with all switches in the off position disables the address selection and results in no communication (invalid address). The off condition is the up position and down is the on.

The address selection can be changed without cycling the power on the IFF45TS 1`and is immediately available after configuration.

5.3 COMMAND QUICK REFERENCE LIST

COMMAND	RANGE	DESCRIPTION
COMMON COMMANDS		
*CLS		Clears the status and event registers but not the enable register or the output queue.
*ESE	0 to 255	Allows the user to set the contents of the Standard Event Status Enable Register. The input is limited to an unsigned 8-bit integer.
*ESE?		Returns the contents of the Standard Event Status Enable Register. The response is a singe integer value.
*ESR?		Returns the contents of the Standard Events Status Register as a single unsigned 8-bit integer.
*IDN?		Causes the unit to return its identity over the bus. The response separates into four fields. Field 1 Manufacturer Field 2 Model Field 3 Serial Number Field 4 Firmware Level (command set version number) Reply: “AEROFLEX,IFF45TS,123456789,0.15”
*OPC		Tells the unit to set bit 0 of the Standard Event Status Register when it completes all pending operations.
*OPC?		Tells the unit to print a “1” to the output queue when it completes all pending operations.
*OPT?		Tells the device to identify any reportable device options.
*RST		Causes a system reset of the unit. It will put the unit in the power-on state.
*SRE	0 to 255	Allows the user to set the contents of the Service Request Enable Register. The input is limited to an unsigned 8-bit integer.
*SRE?		Returns the contents of the Service Request Enable Register as a single unsigned 8-bit integer.
*STB?		Returns the contents of the Status Byte Register as a single unsigned 8-bit integer.
*TST?		Currently not supported.

COMMAND	RANGE	DESCRIPTION
COMMON COMMANDS (cont)		
*WAI		Makes the unit wait until all pending operations are complete before executing any further commands or queries.

COMMAND	RANGE	DESCRIPTION
INSTrument COMMANDS		
:INSTrument?		Returns current instrument state.
:INSTrument	NONE, TRAN, INT, TAC or CW	Selects the IFF-45TS Instrument to measure.
:COHerency?		Returns the current waveform generator coherency.
:COHerency	COH or NCOH	Sets the waveform generator to be in phase (coherent) or unsynchronized (noncoherent).
:PORT?		Returns the configured signal communications ports to enable.
:PORT	DIR or ANT	Sets the active RF signal communications ports.
:PROGout?		Returns the configuration of the front panel's programmable video output ports.
:PROGout	<1, 2> or 0-37	Selects the video output source for the two Front panel programmable video signal outputs, PROG1 and PROG2.
:SRECovery?		Returns the configured sensitivity recovery.
:DELay	1 to 60	Sets the sensitivity recovery delay in seconds.
:STATe	OFF or ON	Sets the sensitivity recovery state.
:TBASe?		Returns the configured frequency reference source.
:TBASe	INT or EXT	Sets the frequency reference source.

COMMAND	RANGE	DESCRIPTION
SYSTem COMMANDS		
:BIT		Currently not supported.
:BUSY?		Currently not supported.
:RESult?		Currently not supported.
:ERRor?		Returns the next item from the error queue.
:HARDware		
:TEMPerature?		Returns the top and bottom port module's temperature reading in degrees Celsius.
:VERSions?		Returns the hardware revision numbers for each module within the unit.
:VOLTage?		Returns the voltage readings in hundredths of a volt.
:LAN?		
:DGATeway	<dec1>.<dec2>.<dec3>.<dec4>	Part of the unit's static LAN configuration.
:DHCP	OFF or ON	Enables or disables the use of DHCP to configure the LAN settings.
:DNAMe <string>		Sets the unit's identifying string.
:IPADdress	<dec1>.<dec2>.<dec3>.<dec4>	Sets the unit's identifying string.
:PDNS	<dec1>.<dec2>.<dec3>.<dec4>	Part of the unit's static LAN configuration.
:SAVE		Note: Two to three seconds of inactivity on the communication bus are required after sending the command.
:SDNS	<dec1>.<dec2>.<dec3>.<dec4>	Part of the unit's static LAN configuration.
:SMASk	<dec1>.<dec2>.<dec3>.<dec4>	Part of the unit's static LAN configuration.
:MODule?		Returns the revision number of the module boards.
:RESet		Resets the unit's configuration structure to the power on state.
:RTC?		Returns the instrument's real-time-clock reading.

COMMAND	RANGE	DESCRIPTION
SYSTem COMMANDS (cont)		
:RTC?		
:TIMe	HH:MM:SS	Sets the instrument's time.
:DATE	MM-DD-YYYY	Sets the instrument's date.
:SERial?		Returns the serial RS232 communications settings.
:BAUD	300 to 256000	Sets the serial RS232 communications baud rate.
:DBITs	7 or 8	Sets the number of data bits (word length) for the RS232 communications port.
:PARity	ODD, EVEN or NONE	Sets the type of parity used in serial RS232 communications.
:SBITs	1 or 2	Sets the number of stop bits used in serial RS232 communications.
:SAVE		Stores the serial RS232 communications settings to memory. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.
:SNUMber?		Returns the unit's unique electronic serial number.
:STATus?		Reports the current state of the self calibration process.
:ERRor?		Returns device specific errors.
:VERSion?		Returns the software version numbers for each programmable device within the unit.

COMMAND	RANGE	DESCRIPTION
CALibration COMMANDS		
:MANual		
:CLOSs		Describes the compensation factors that must be used to account for signal loss through the cable connected to the unit.
:ANTenna?		Returns the external cable loss/gain calibration factors for the antenna port top and bottom channels in dB.
:BOTTom	-50.00 to 50.00	Sets the antenna port bottom channel's cable loss/gain calibration factor in dB.
:TOP	-50.00 to 50.00	Sets the antenna port top channel's cable loss/gain calibration factor in dB.
:DIRect?		Returns the external cable loss/gain calibration factors for the direct port top and bottom channels in dB.
:BOTTom	-50.00 to 50.00	Sets the direct port bottom channel's cable loss/gain calibration factor in dB.
:TOP	-50.00 to 50.00	Sets the direct port top channel's cable loss/gain calibration factor in dB.
:SAVE		Saves the current manual calibration settings. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.
:SELF		Allows the unit to self-adjust the transmitter and receiver parameters to the current conditions.
:DATA?		Queries the results of the last self calibration preformed.
:RESult?		Returns error flags as decimal integers for each calibration frequency.
:SAVE		Saves the current self calibration settings. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.
:STATus?		Reports the current state of the self calibration process.

COMMAND	RANGE	DESCRIPTION
COMSec COMMANDS		
:CVI?		Returns the indexes of the three Mode 5 CVI's currently in use.
:INTerrogator		
:DECRypt?		Returns the last interrogation decryption message sent to and the response from the COMSEC.
:ENCRypt?		Returns the last interrogation encryption message sent to and the response from the COMSEC.
:LEVel1		
:DECRypt?		Returns the last level 1 reply decryption message sent to and response from the COMSEC.
:ENCRypt		
:DATA?		Returns the last level 1 reply data encryption message sent to and response from the COMSEC.
:IDENt?		Returns the last level 1 reply ID encryption message sent to and response from the COMSEC.
:LEVel2		
:DECRypt?		Returns the last level 2 report decryption message sent to and response from the COMSEC.
:ENCRypt?		Returns the last level 2 report encryption message sent to and response from the COMSEC.
:MDATa?		Returns the COMSEC's configured nation of origin, mission and platform identification number data.
:MODE4?		Returns the current settings of the COMSEC's Mode 4 parameters.
:CWORd	A or B	Sets the state of the external COMSEC's Mode 4 Code A/B selection line.
:TYPE	INT or EXT	Sets the selects whether the unit uses an internal or the externally attached COMSEC for Mode 4 operations.
:VBIT	OFF or ON	Sets the state of the external COMSEC's Mode 4 Verification Bit 1 selection line.

COMMAND	RANGE	DESCRIPTION
COMSec COMMANDS (cont)		
:MODE5		
:CVI		
:FIXed?		Returns the current settings of the COMSEC's Mode 5 Fixed CVI mode parameters.
:FIXed	1 to 10800	Sets the fixed CVI integer.
:MODE?		Returns the operational mode for the calculation of the current Mode 5 CVI.
:MODE	RTC or FIX	Sets the operational mode for the calculation of the current Mode 5 CVI.
:RTC?		Returns the current time for the internal Real-Time-Clock of the unit.
:DATE	MM-DD-YYYY	Sets the current date for the internal Real-Time-Clock of the unit.
:TIME	HH:MM:SS	Sets the current time for the internal Real-Time-Clock of the unit.
:EDAC?		Returns the Error Detection And Correction setting for the unit.
:EDAC	OFF or ON	Sets the Error Detection And Correction state for the unit.
:KEY?		Returns the COMSEC key status.
:MI?		Returns the Message Indicator enable and code data of the external COMSEC.
:CODE	0 to 63	Sets the Message Indicator code for the External COMSEC.
:ENABle	OFF or ON	Sets the Message Indicator state for the External COMSEC.
:TYPE?		Returns whether the unit uses an internal or the externally attached COMSEC for Mode 5 operations.
:TYPE	INT or EXT	Selects whether the unit uses an INTernal or the EXTernal attached COMSEC for Mode 5 operations.

COMMAND	RANGE	DESCRIPTION

COMSec COMMANDS (cont)

:MODE5 (cont)		
:NACK?		Returns the last negative acknowledge response from the COMSEC.
:RESet		Clears the NACK message buffer.
:STAGger		
:INTerrogator?		Returns the current spread code and stagger information for Mode 5 interrogations.
:REPort?		Returns the current spread code and stagger information for Mode 5 level 2 reports.
:STATus?		Returns the status of the external COMSEC.
:VERSion?		Returns the version number information of the COMSEC.

COMMAND	RANGE	DESCRIPTION
CW COMMANDS		
:GENerator?		Returns the state of the CW generator.
:GENerator	OFF or ON	Sets the state of the CW generator.
:FREQuency?		Returns the CW instrument's transmitter and receiver frequencies (in MHz).
:FREQuency	952.00 to 1225.00	Returns the CW instrument's transmitter and receiver frequencies (in MHz).
:OFFSet?		Returns the generator offset from the nominal generator frequency selection.
:OFFSet	MARK, NOM or SPAC	Sets the generator offset from the nominal generator frequency selection.
:POWer?		Returns the current power settings for the CW instrument.
:BOTTom		
:ANTenna	-110.00 to 30.00	Sets the transmit power level for the Bottom Antenna port of the CW instrument.
:DIRect	-110.00 to 0.00	Sets the transmit power level for the Bottom Direct port of the CW instrument.
:TOP		
:ANTenna	-110.00 to 30.00	Sets the transmit power level for the Top Antenna port of the CW instrument.
:DIRect	-110.00 to 0.00	Sets the transmit power level for the Top Direct port of the CW instrument.
:MEASure?		Returns the measured frequency and power of the CW input.
:SETup?		Returns the measurement system configuration for the CW instrument.
:CHANnel	TOP or BOTT	Sets the channel to be measured by the measurement subsystem.
:MMReset		Clears all measurement results.
:SAMPles	1 to 200	Sets the number of samples to average for a measurement.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS		
:BURSt?		Returns the current settings of the Burst sub-mode parameters.
:ABORt		Aborts the burst cycle.
:COUNt	1 to 2500	Sets the Burst Count.
:GAP	0.100 to 20.000	Sets the Burst repetition gap time.
:MODE	NORM or INF	Sets the burst mode.
:NUMBer	1 to 1000	Sets the Burst Number.
:SQUitter	OFF, MODES or MODE5	Sets the trigger source for a burst cycle.
:COUNt	1 to 20	Sets the number of received squitters that are required to trigger an appropriate number of squitters to receive.
:STARt		Starts the burst cycle.
:DIVersity?		Returns the current settings of the diversity sub-mode parameters.
:MODE5	I1, I2 or I1I2	Controls which Mode5 SLS pulse is generated for diversity sub-mode.
:TIME	-1.000 to 1.000	Sets the timing differential between the interrogations on the top and bottom channels.
:SLS	OFF, TOP or BOTT	Controls the generation of SLS pulses in diversity sub-mode.
:DOUBle		
:SPACing?		Returns the spacing between the first and second interrogations in double sub-mode.
:SPACing	0.000 to 400.000	Sets the spacing between the timing references of the first and second interrogations in double sub-mode in uS.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:GENerator		
:CHANnel?		Returns the interrogation transmission channel.
:CHANnel	BOTT or TOP	Selects the channel on which the interrogation is transmitted.
:CONTrol?		Returns the generator control parameters.
:CONTrol	OFF, ON or CW	Controls the output of the generator.
:CW?		Returns the frequency offset of the generated CW.
:CW	MARK, NOM or SPAC	Sets the frequency offset of the generated CW.
:FREQuency?		Returns the current transmit frequency.
:FREQuency	952.000 to 1225.000	Sets the current transmit frequency.
:POWer?		Returns the transmit power levels for the top and bottom channels on the direct and antenna ports.
:BOTTom		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the bottom channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the top channel on the direct port.
:TOP		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the top channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the top channel on the direct port.
:SUPPressor?		Returns the configured suppression pulse parameters.
:SUPPressor	OFF or ON	Turns the suppressor ON and OFF.
:AMPLitude	12 to 80	Sets the amplitude of the suppressor pulse in volts.
:POSition	-40.000 to 2500.000	Sets the position of the suppressor pulse.
:WIDTh	0.250 to 300.000	Sets the width of the suppressor pulse.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:INTerference?		Returns the current settings of the interference sub-mode parameters.
:AMPLitude	-15.00 to 5.00	Sets the amplitude of the interference pulses.
:DATA	0 to 65535	Sets the MSK modulation data if the pulse format is MSK.
:FORMat	CW or MSK	Selects the pulse modulation format.
:POSition	-44.000 to 400.000	Sets the position of the first interference pulse relative to the interrogation timing reference in uS.
:SPACing	1.000 to 400.000	Sets the spacing between the first and second interference pulses in uS.
:STATe	OFF or ON	Controls the state of the of second interference pulse.
:WIDTh	0.250 to 32.000	Sets the width of the interference pulses in uS.
:IRATio?		Returns the current settings of the interlace sub-mode parameters.
:IRATio	1 to 63	Sets the ratio of the first interrogation to the second interrogation.
:MEASure		
:MODE5		
:LEVel2		
:SEQuence?		Returns the sequence of received Mode 5 Level 2 reports.
:SQUitter		
:ASHip?		Returns the received Mode 5 Air/Ship Squitter data.
:GROund?		Returns the received Mode 5 Ground Squitter data.
:REPLy?		The received Mode 5 Level 1 Reply data elicited by the synchronized interrogation.
:REPort?		The received Mode 5 Level 2 Report data elicited by the synchronized interrogation.
:MODES		
:EXTended		Returns Mode S extended squitter (DF17) information.

COMMAND	RANGE	DESCRIPTION

TRANsponder COMMANDS (cont)

:MEASure (cont)		
:MODES (cont)		
:ACIDent?		Returns the received Mode S Aircraft Identification Extended Squitter data.
:ACQuisition?		Returns the received Mode S Acquisition Extended Squitter data.
:APOSition?		Returns the received Mode S Aircraft Position Extended Squitter data.
:AVELocity?		Returns the received Mode S Airborne Velocity Extended Squitter data.
:EDRiven?		Returns the received Mode S Event Driven Extended Squitter data.
:SPOSition?		Returns the received Mode S Surface Position Extended Squitter data.
:REPLy?		The received Mode S Reply data elicited by the synchronized interrogation.
:SQUitter?		Returns the received Mode S Acquisition (DF11) Squitter data.
:PREPly		
:BOTTom?		Returns the percent reply on the bottom channel.
:TOP?		Returns the percent reply on the top channel.
:PULSe		
:ENVelope?		Returns the spacing between the decoded Mode 5 symbol reference position and the 90% point of the falling edge of the pulse in uS.
:FALL?		Returns the fall time of the pulse in uS.
:FREQuency?		Returns the measured frequency of the pulse in MHz.
:IDENt?		Identifies the pulse being measured.
:POWer?		Returns the measured power of the pulse in dBm.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:PULSe (cont)		
:RIPPle?		Returns the measured ripple of the pulse in dB.
:RISE?		Returns the rise time of the pulse in nS.
:SPACing?		Returns the measured spacing of the pulse from the reference pulse in the reply in uS.
:SSPacing?		Returns the spacing between the decoded Mode 5 symbol and the decoded preamble symbol in the reference pulse in uS.
:WIDTh10?		Returns the width of the pulse at the 10% points in uS.
:WIDTh50?		Returns the width of the pulse at the 50% points in uS.
:WIDTh90?		Returns the width of the pulse at the 90% points in uS.
:REPLy?		Returns both the reply delay and jitter measurements in microseconds.
:DELay?		
:JITTer?		Returns the current, minimum and maximum reply delay jitter measurements in nanosecond resolution.
:STABility?		Returns the Mode 4 TDV stability flag.
:SETup?		Returns the configured measurement setup parameters.
:ACL	MODES or SIF	Elicit Mode S or SIF replies.
:CHANnel	TOP or BOTT	Controls which channel is selected for measurements.
:M5L1	P<1 to 2> or D<1 to 9>	Selects the Mode 5 Level 1 reply pulse that will be measured.
:M5L2	P<1to4> or D<1 to 33>	Selects the Mode 5 Level 2 report/squitter pulse that will be measured.
:MMReset		Clears the current measurements, resets the minimum and maximum values, and clears the error flags.
:MODE4	R<1 to 4>	Selects the Mode 4 reply pulse that will be measured.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:SETup?(cont)		
:MODES	P<1 to 4> or S<1 to 112>	Selects the Mode S reply/squitter pulse that will be measured.
:RANGe	0.00 to 400.00	Sets the range to target in NMIs.
:REPort	LEV2 or LEV1	Elicits Level 2 reports or Level 1 replies.
:SAMPles		
:PULSe		1 to 1000 Sets the size of the sample set used for calculating the pulse parametric measurement results.
:REPLy		1 to 8000 Sets the size of the sample set used for calculating the percent reply.
:SIF	A1, A2, A4, B1, B2, B4, C1, C2, C4, D1, D2, D4,F1, F2, X, 1A1, 1A2, 1A4,1B1, 1B2, 1B4, 1C1, 1C2,1C4, 1D1, 1D2, 1D4, 1F1,1F2, 1X, 2F1, 2F2, 3F1 or 3F2	Selects the SIF reply pulse that will be measured.
:SYNC	1 to 12	Selects which interrogation is the synchronized interrogation.
:SIF?		Selects the SIF reply pulse that will be measured.
:MODE?		Returns the current operating mode of the Transponder instrument.
:MODE	NORM, DOUB, INTL, BURS, SLS, PAMP, INT or DIV	Sets the operating mode of the Transponder instrument.
:MODE4?		Returns the configured Mode 4 challenge code that will be transmitted to the UUT when an external crypto is not in use.
:MODE4	A, B or C<1 to 16>	Selects which Mode 4 internal challenge code will be transmitted to the UUT when an external crypto is not used to generate the challenge.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:PRF?		Returns the configured PRF parameters.
:BURSt	1 to 2500	Sets the PRF for burst mode in 1Hz resolution.
:DOUBle	1 to 400	Sets the PRF for double mode in 1Hz resolution.
:INTerlace	1 to 400	Sets the PRF for interlace mode in 1Hz resolution.
:NORMal	1 to 10000	Sets the PRF for all modes but burst, double and interlace modes in 1Hz resolution.
:SLS		
:CHANnel?		Provides the capability to transmit the SLS pulse on the same channel as the interrogation or on the other channel.
:CHANnel	BOTT or TOP	Returns the configured SLS pulse transmission channel parameters.
:PULSe<[1] | 2>?		Returns the configured parameters of the first SLS pulse.
:PULSe<[1] | 2>		
:AMPLitude	-15.00 to 5.00	Sets the amplitude of the SLS pulse relative to the amplitude, in dB, of the other pulses in the interrogation.
:DATA	0 to 65535	Sets the MSK error state data pattern of the transmitted Mode 5 SLS pulse, when enabled.
:ERRor	OFF or ON	Enables or disables the presence of an error in Mode 5 SLS pulses.
:MODE	NONE, MODE1, MODE2, MODEA, MODEC, ACSA, ACLA, ACSC, ACLC, MSSH, MSL, MODE4, M5I1 or M5I2	Selects the type of interrogations that will include this SLS pulse mode.
:POSition	-1.00 to 1.00	Selects the position of the SLS pulse relative to its nominal position in uS.
:STATe	OFF or ON	Sets where the second SLS pulse is generated.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:SLS (cont)		
:PULSe<[1] | 2> (cont)		
:WIDTh	-0.500 or 0.500	Selects the relative width of the SLS pulse by setting an offset from the nominal width of the SLS pulse in uS.
:STATus?		Returns the status of the burst mode sequence.
:ERRor?		Returns the Transponder instrument error flags.
:MODE5?		Returns additional error details when Error Bit 13 is set.
:MODES?		Returns additional error details when Error Bit 9 is set.
:TABLe?		Returns the current table's entries configuration.
:TABLe	1 to 12	Sets which table entry will be modified or queried with the rest of the table commands.
:MODE	NONE,MODE1,MODE2, MODEA,MODEC,ACSA, ACLA,ACSC,ACLC, MODES,MODE4 or MODE5	Sets the type of interrogation by the table entry.
:MODE5?		Returns the Mode 5 specific interrogation configuration for the table entry.
:DATA	1 to 11 symbols	Sets the eleven interrogation data symbols.
:TYPE	URAW, CRAW or ENCR	Selects which interrogation building method is to be used.
:FORMat	0 to 31	Sets the format field data for the interrogation.
:RANDom	0 to 65535	Sets the directed spread and stagger index for the Mode 5 level 1 reply.
:SPRead	OFF or ON	Enables or disables the use of the Mode 5 spreading function.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:TABLe (cont)		
:MODES?		Returns the Mode S specific interrogation configuration for the table entry.
:ADDRess	1 to 7 symbols	Sets the user defined address for the interrogation.
:SOURce	SQU or USER	Sets the source of the address data for the interrogation.
:DATA		
:LONG	1 to 21 symbols	Sets the 83 data bit of the long interrogation formats between the format and address fields.
:SHORt	1 to 7 symbols	Sets the 27 data bit of the long interrogation formats between the format and address fields.
:UF	0 to 31	Sets the 5 bit interrogation format field.
:STATe	OFF or ON	Enables or disables the interrogation slot.
:TRIGger		
:IN?		Returns the external trigger input configuration.
:IN	OFF or ON	Controls the use of the external input port.
:DELay	0.008 to 20.000	Sets the delay between the input trigger and the start of the transmit sequence of the interrogation.
:OUT?		Returns the trigger out configuration.
:LOCation	INT or REPL	Sets the reference position for the trigger output.
:POSition	0.000 to 8000.000	Sets the position of the trigger out relative to the timing reference.

COMMAND	RANGE	DESCRIPTION
TRANsponder COMMANDS (cont)		
:VARiable [1], 2 or 3>?		Returns the configuration of the three variable pulses.
:ACTion	MOD or DEL	Selects whether to modify or delete the specified pulse.
:AMPLitude	-15.00 to 5.00	Sets the relative amplitude of the modified pulse in dB.
:DATA	0 to 65535	Sets the MSK error state data pattern of the transmitted Mode 5 pulse, when enabled.
:ERRor	OFF or ON	Enables or disables the presence of an error in Mode 5 pulses.
:MODE	NONE, MODE1, MODE2, MODEA, MODEC,ACSA, ACLA, ACSC, ACLC, MSSH, MSL, MODE4 or MODE5	Selects the type of interrogations that will include this pulse mode.
:MODE4	P<1 to 5>, D<1 to 32> or All<1 to 31>	Selects which pulse of a Mode 4 interrogation to modify or delete.
:MODE5	P<1 to 4>, I<1 to 2> or D<1 to 11>	Selects which pulse of a Mode 5 interrogation to modify or delete.
:MODES	P<1to2>, SPR, P5 or| P6	Selects which pulse of a Mode S interrogation to modify or delete.
:POSition	-1.00 to 1.00	Sets the relative position offset from the pulses nominal position in uS.
:SIF	P<1 to 4>	Selects which pulse of a Mode 4 interrogation to modify or delete.
:WIDTh	-0.500 to 0.500	Sets the relative width offset from the pulses nominal width in uS.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS		
:ECHO?		Sets up the Interrogator Instrument for testing an Interrogator.
:AMPLitude	-15.00 to 3.00	Sets the relative amplitude of the echo response in dB.
:DELay	0 to 15.000	Sets the delay between the normal response and the echo response.
:GATE?		Returns the configuration of the external reply gate.
:GATE	OFF or ON	Sets the units response to the external gate input.
:GENerator		
:BDELay?		Returns the delay of the bottom channel.
:BDELay	-1.000 to 1.000	Sets the relative delay of the bottom channel in Sum/Difference operation.
:CONTrol?		Returns the generator control parameters.
:CONTrol	OFF, ON or CW	Controls the output of the generator.
:CW?		
:CW	MARK, NOM or SPAC	Returns the frequency offset of the generated CW.
:FREQuency?		Returns the current transmit frequency.
:FREQuency	952.000 to 1225.000	Sets the current transmit frequency.
:POWer?		Returns the transmit power levels for the top and bottom channels on the direct and antenna ports.
:BOTTom		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the bottom channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the bottom channel on the direct port.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:GENerator (cont)		
:POWer? (cont)		
:TOP		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the top channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the top channel on the direct port.
:INTerference?		Returns the current settings of the interference sub-mode parameters.
:AMPLitude	-15.00 to 5.00	Sets the amplitude of the interference pulses.
:DATA	0 to 65535	Sets the MSK modulation data if the pulse format is MSK.
:FORMat	CW or MSK	Selects the pulse modulation format.
:POSition	-1.000 to 400.000	Sets the position of the first interference pulse relative to the interrogation timing reference.
:SPACing	1.000 to 400.000	Sets the spacing between the first and second interference pulses.
:STATe	OFF or ON	Controls the state of the of second interference pulse.
:WIDTh	0.250 to 32.000	Sets the width of the interference pulses.
:MEASure		
:MODE5?		
:FORMat	<0 to 9, 16 to 23>?	Returns all the Mode 5 interrogation data sorted by the decoded format of the interrogation.
:MODES?		Returns all the Mode S interrogation data sorted by the decoded format of the interrogation.
:UF	<0,4,5,11,16,20,21,24>?	Returns the Mode S interrogation data for specified decoded uplink format.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:MEASure (cont)		
:PRF?		Returns the measured pulse repetition rates, PRFs, for the received interrogations.
:PULSe		
:ENVelope?		Returns the spacing between the decoded Mode 5 symbol reference position and the 90% point of the falling edge of the pulse in uS.
:FALL?		Returns the fall time of the pulse in uS.
:FREQuency?		Returns the measured frequency of the pulse in MHz.
:IDENt?		Identifies the pulse being measured.
:POWer?		Returns the measured power of the pulse in dBm.
:RIPPle?		Returns the measured ripple of the pulse in dB.
:RISE?		Returns the rise time of the pulse in nS.
:SPACing?		Returns the measured spacing of the pulse from the reference pulse in the reply in uS.
:SSPacing?		Returns the spacing between the decoded Mode 5 symbol and the decoded preamble symbol in the reference pulse in uS.
:WIDTh10?		Returns the width of the pulse at the 10% points in uS.
:WIDTh50?		Returns the width of the pulse at the 50% points in uS.
:WIDTh90?		Returns the width of the pulse at the 90% points in uS.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:MEASure (cont)		
:RECeive?		Returns the interrogation types are currently being received.
:SETup?		Returns the configured measurement setup parameters.
:CHANnel	TOP or BOTT	Allows the user to select the channel to measure the SLS pulse.
:MMReset		Clears the current measurements, resets the minimum and maximum values, and clears the error flags.
:MODE	MODE1, MODE2, MODEA, MODEC MODES, MODE4, MODE5 ACLC or ACLA	Sets the interrogation mode to be measured.
:MODE4	P<1 to 5>, D<1 to 32> or All<1 to 31>	Selects the Mode 4 interrogation pulse to be measured.
:MODE5	P<1to 4>, I<1 to 2> or D<1 to 11>	Selects the Mode 5 interrogation pulse to be measured.
:MODES	P<1 to 2>, P6B, SPR, P5 or P6E	Selects the Mode S interrogation pulse to be measured.
:SAMPles	1 to 200	Sets the size of the sample set used for calculating the pulse parametric measurement results.
:SIF	P<1 to 4>	Selects the SIF interrogation pulse to be measured.
:MODE?		Returns the sub-operating mode of the interrogator instrument.
:MODE	NORM, PAMP, INT, SDIF or ECHO	Sets the sub-operating mode of the interrogator instrument.
:SLS?		Returns the units operation when receiving an interrogation with an SLS pulse present.
:SLS	IGN or RESP	Sets the units operation with respect to a received SLS pulse.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:SQUitter?		Returns the squitter configuration.
:SQUitter	OFF or ON	Determines if the 12th target is controlled by received interrogations or by the periodic squitter timer.
:NOMinal	0.400 to 10.200	Sets the nominal time between squitters in mS.
:RANGe	0.000 to 0.600	Sets the randomized range for the squitter interval in mS.
:STATus?		Returns the number of interrogation received by type and the number of responses generated for that type.
:ERRor?		Returns the Interrogator instrument error flags.
:MODE5?		Returns additional error details when Error Bit 13 is set.
:TABLe?		Returns the current table's entries configuration.
:TABLe	1 to 12	Sets which table entry will be modified or queried with the rest of the table commands.
:EFFiciency	1 to 100	Sets the reply efficiency of the target in percent.
:MODE	NONE, MODE1, MODE2, MODEA, MODEC, MODES, MODE4, MODE5, ACLC or ACLA	Sets the type of interrogation the target will reply to.
:MODE4?		Returns the table entries Mode 4 specific configuration.
:SOURce	USER or CHAL	Selects the Mode 4 reply delay source setting for the target.
:SLOT	1 or 16	Sets the USER mode replay delay slot for the target.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:TABLe (cont)		
:MODE5?		Returns the table entries Mode 5 specific configuration.
:DATA		
:LEVel1		
:ENCRypted	1 to 9 symbols	Sets the 9 data symbol reply.
:RAW	1 to 9 symbols	The 9 data symbol reply transmission.
:LEVel2		
:ENCRypted	1 to 33 symbols	Allows the user to set the encrypted 33 data symbols for the report transmission.
:RAW	1 to 20 symbol>	Allows the user to set the 77 bits of tactical data for the report transmission.
:TYPE	URAW, CRAW or ENCR	Sets the data source for the Mode 5 replies.
:FORMat	0 to 31	Sets the interrogation format that elicits the target's reply.
:LEVel2	OFF or ON	Enables or disables Mode 5 level 2 reports to format 16 and above interrogations.
:SPRead	OFF or ON	Enables or disables the use of the Mode 5 spreading function for the replies/reports.
:MODES?		Returns the table entries Mode 5 specific configuration.
:ADDRess	1 to 6 symbols	Sets the 24 bits of Mode S address for the target.
:DATA		
:LONG	1 to 21 symbols	Sets the 83 bits of Mode S long format data for the target.
:SHORt	1 to 7 symbols	Sets the 27 bits of Mode S long format data for the target.
:DF	0 to 31	Sets the downlink format field data for the target.
:UF	0 to 31	Sets the uplink format that elicits the target's reply.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:TABLe (cont)		
:RDELay		
:DISTance	0.00 to 400.00	Sets the reply delay as a function of target distance.
:SOURce	DIST or TIME	Selects the reply delay data source.
:TIME		
:MODE4	-1.000 to 7798.000	Sets the reply delay time for a Mode 4 target in uS.
:MODE5	-1.000 to 7520.000	Sets the reply delay time for a Mode 5 target in uS.
:MODES	-1.000 to 7872.000	Sets the reply delay time for a Mode S target in uS.
:SIF	-1.000 to 7996.000	Sets the reply delay time for an SIF target in uS.
:SIF?		Command returns the table entries SIF specific configuration.
:CODE	0000 to 7777	Sets the SIF reply code for the target.
:FORMat	NORM, IDEN or EMER	Sets the response type for the target.
:MODEC		
:ALTitude	-1000 or 126700	Sets the Mode C altitude in Ft.
:SOURce	CODE or ALT	Selects the SIF data source as the code or the altitude.
:XPULse	OFF or ON	Sets the state of the X-pulse.
:SOURce	INT or EXT	Sets the trigger source for the target.
:STATe	OFF or ON	Enables or disables the target.
:TRIGger		
:OUT?		Returns the output trigger configuration.
:LOCation	INT or REPL	Sets the output trigger's reference location.
:POSition	0.000 to 8000.000	Sets the delay from the trigger source to the trigger output.
:TARGet	1 to 12	Sets the reply target that initiates the trigger output.

COMMAND	RANGE	DESCRIPTION
INTerrogator COMMANDS (cont)		
:VARiable	<[1], 2 or 3>?	
:ACTion	MOD or DEL	Selects whether to modify or delete the specified pulse.
:AMPLitude	-15.00 to 5.00	Sets the relative amplitude of the modified pulse in dB.
:DATA	0 to 65535	Sets the MSK error state data pattern of the transmitted Mode 5 pulse, when enabled.
:ERRor	OFF or ON	Enables or disables the presence of an error in Mode 5 pulses.
:M5L1	P<1 to 2> or D<1 to 9>	Selects which pulse of a Mode 5 Level 1 reply to modify or delete.
:M5L2	P<1 to 4> or D<1 to 33>	Selects which pulse of a Mode 5 Level 2 report to modify or delete.
:MODE	NONE, MODE1, MODE2, MODEA, MODEC, MODES, MODE4, M5L1, M5L2, ACLC or ACLA	Selects the type of reply that will include this pulse mode.
:MODE4	R<1 to 4>	Selects which pulse of a Mode 4 reply to modify or delete.
:MODES	P<1 to 4> or D<1 to 113>	Selects which pulse of a Mode S reply to modify or delete.
:POSition	-1.00 to 1.00	Sets the relative position offset from the pulses nominal position in uS.
:MODE5	-0.25 to 0.25	Sets the relative position offset from the pulses nominal position in uS.
:SIF	A1, A2, A4, B1, B2, B4, C1, C2, C4, D1, D2, D4, F1, F2, X, 1A1, 1A2,1A4, 1B1, 1B2, 1B4, 1C1, 1C2, 1C4, 1D1, 1D2, 1D4, 1F1, 1F2, 1X, 2F1, 2F2, 3F1 or 3F2	Selects which pulse of a SIF reply to modify or delete.
:WIDTh	-0.500 to 0.500	Sets the relative width offset from the pulses nominal width in uS.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS		
:ARB?		Returns the status of the ARB configuration.
:ARB	NORM or MISS	Configures the ARB for normal mode or missing pulse mode.
:COUNt	-2 to 2	Sets the number of transmitted ARB pulses.
:POSition	-3.900 to 3.900	Sets the position of the ARB pulses.
:STATe	OFF or ON	Sets the enabled state of the ARB pulses.
:DIVersity?		Returns the status of Diversity mode.
:DIVersity	OFF or ON	Sets the status of Diversity mode.
:ECHO?		Returns the status of the echo configuration for TACAN.
:AMPLitude	-12.00 to 3.00	Sets the amplitude of the echo pulses.
:CONTrol	OFF or ON	Sets the enabled status of echo pulses.
:EFFiciency?		Returns the percent reply efficiency for TACAN replies.
:EFFiciency	0 to 100	Sets the percent reply efficiency for TACAN Replies.
:EQUalizer?		Returns the enabled status of equalizer pulses in TACAN.
:EQUalizer	OFF or ON	Sets the enabled status of equalizer Functionality.
:GENerator		
:CHANnelX	1 to 126	Sets the channel for Channel-X operation in TACAN mode.
:OFFSet	-1.000 to 1.000	Sets an available offset for Channel-X mode Operation.
:CHANnelY	1 to 126	Sets the channel for Channel-Y operation in TACAN mode.
:OFFSet	-1.000 to 1.000	Sets an available offset for Channel-Y mode Operation.
:CONFig?		Returns the current transmit/receive configuration for TACAN generation.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:GENerator (cont)		
:CONTrol?		Returns the generator control parameters.
:CONTrol	OFF, ON or CW	Controls the output of the generator.
:FREQuency	960.000 or 1220.000	Sets the current transmit freq.
:MODE?		Returns information about the TACAN generation modes.
:MODE	CHANX, CHANY, FREQX or FREQY	Sets the TACAN frequency selection operating mode.
:POWer?		Returns the transmit power levels for the top and bottom channels on the direct and antenna ports.
:BOTTom		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the bottom channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the bottom channel on the direct port.
:TOP		
:ANTenna	-110.00 to 30.00	Sets the transmit power of the top channel on the antenna port.
:DIRect	-110.00 to 0.00	Sets the transmit power of the top channel on the direct port.
:IDENt?		Returns the identification pulse configuration parameters.
:CHARacter	150.000 to 750.000	Sets the character time in ms.
:CODE	<1 to 8 characters>	Sets the ident code, or the 8 character ASCII code transmitted for ident mode.
:DASH	150.000 to 750.000	Sets the dash time in mS.
:DOT	50.000 to 250.000	Sets the dot time in mS.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:IDENt? (cont)		
:MODE	OFF, TONE or CODE	Sets the ident generation mode.
:RATE	10.000 to 65.000	Sets the ident code repetition in seconds.
:SPACe	50.000 to 250.000	Sets the space time in ms.
:INTerrogation?		Returns the current interrogation parameters.
:RATE	0 to 3999	Sets the given interrogation rate.
:TYPE	OFF or FIX	Sets the mode of interrogations.
:MEASure		
:DELay?		Returns the measured reply delay.
:PREPly?		Returns the measured percent reply.
:PRF?		Returns the measured pulse repetition frequency for the received interrogations and squitters.
:PULSe		
:FALL?		Returns the fall time of the pulse in uS.
:FREQuency?		Returns the measured frequency of the pulse in MHz.
:IDENt?		Identifies the pulse being measured.
:POWer?		Returns the measured power of the pulse in dBm.
:RISE?		Returns the rise time of the pulse in uS.
:SPACing?		Returns the measured spacing of the pulse from the reference pulse in the reply in uS.
:WIDTh10?		Returns the width of the pulse at the 10% points in uS.
:WIDTh50?		Returns the width of the pulse at the 50% points in uS.
:WIDTh90?		Returns the width of the pulse at the 90% points in uS.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:MEASure (cont)		
:RANGe?		Returns the measured percent reply.
:SETup?		Returns the current measurement configuration.
:AA		
:MODE	INT, REPL or SQU	Sets the type of signal to be measured.
:CHANnel	TOP or BOTT	Sets the channel to be examined for measurement data.
:MMReset		Resets the minimum and maximum averages and information for all applicable measurements.
:PULSe	P1 or P2	Sets the pulse to be examined for measurements.
:SAMPles	1 to 200	Sets the number of samples to take per measurement.
:MODE?		Returns the current TACAN operating mode.
:MODE	GA, IGA, BGA, AA, IAA or BAA	Sets the current TACAN operating mode.
:MODulation?		Returns the current TACAN modulation control settings.
:135HZ	0 to 39	Sets the 135Hz Percent Modulation.
:15HZ	0 to 39	Sets the 15Hz Percent Modulation.
:OFFSet	-3.90 to 3.90	Sets the audio frequency offset percentage for both the 15 Hz and 135 Hz controls.
:PSHift	-39 to 39	Sets the phase shift between the 15 Hz and 135 Hz modulation control.
:MRB?		Returns the status of the MRB configuration.
:COUNt	-2 to 2	Sets the number of transmitted MRB pulses.
:POSition	-3.900 to 3.900	Sets the position of the ARB pulses.
:STATe	OFF or ON	Sets the enabled state of the MRB pulses.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:PULSe		
:INTerrogator?		Returns the variable pulse characteristics for interrogator pulses.
:AMPLitude[1]	-15.00 to 5.00	Sets the amplitude of P1.
:AMPLitude2	-15.00 to 5.00	Sets the amplitude of P2.
:SPACing	-12.000 to 12.000	Sets the pulse spacing between pulse pairs.
:WIDTh	0.000 to 5.500	Sets the width of each pulse.
:REPLy?		Returns the variable pulse characteristics for reply pulses.
:AMPLitude[1]	-15.00 to 5.00	Sets the amplitude of P1.
:AMPLitude2	-15.00 to 5.00	Sets the amplitude of P2.
:SPACing	-12.000 to 12.000	Sets the pulse spacing between pulse pairs.
:WIDTh	0.000 to 5.500	Sets the width of each pulse.
:SIMulation?		Returns the current state of the simulation variables for TACAN range and bearing simulation for one target.
:ACCeleration?		Returns the current simulation acceleration in ft/s/s.
:ACCeleration	-400 to 400	Sets the current simulation acceleration.
:BEARing?		Returns only the bearing parameters.
:BEARing	0.00 to 359.90	Sets the bearing for a generated simulated target.
:RATE	-39.00 to 39.00	Sets the bearing rate of change for a generated simulated target in degrees/second.
:RANGe?		Returns the current range for a normal or simulated target.
:RANGe	-1.00 to 400.00	Returns the current range for a normal or simulated target.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:SIMulation? (cont)		
:VELocity?		Returns the current velocity and direction.
:VELocity	0 to 9999	Sets the current velocity for a simulated target.
:DIRection	IN or OUT	Sets the current direction of the target.
:SQUitter?		Returns the current squitter rate in Hz.
:SQUitter	0 to 8000	Sets the current squitter rate in Hz.
:STATus?		Sets the current status rate.
:ERRor?		Returns measurement error fields that express measurement failures.
:TRIGger		
:IN?		Returns the enabled status of the external trigger system.
:IN	OFF or ON	Sets the enabled status of the external trigger system.
:OUT?		Returns the trigger position offset as well as the current trigger out mode for each TACAN operating mode.
:LOCation		
:AA	INT, UUTI, REPL, UUTR, ECHO, IDEN, TSQU, RSQU, MRB or 15HZ	Sets the Air to Air mode trigger out mode.
:BAA	INT, UUTI, REPL, UUTR, ECHO, IDEN or TSQU	Sets the Beacon Air to Air mode trigger out Mode.
:BGA	UUTI, REPL, ECHO, IDEN or TSQU	Sets the Beacon Ground to Air mode trigger out mode.
:GA	UUTI, REPL, ECHO, IDEN, TSQU, MRB, ARB, 15HZ or 135HZ	Sets the Ground to Air mode trigger out mode.
:IAA	INT, UUTI, REPL, UUTR, ECHO, IDEN, TSQU, RSQU, 15HZ or NREF	Sets the Inverse Air to Air mode trigger out mode.

COMMAND	RANGE	DESCRIPTION
TACan COMMANDS (cont)		
:OUT? (cont)		
:LOCation (cont)		
:IGA	UUTI, REPL, ECHO, IDEN, TSQU, 15HZ or NREF	Sets the Inverse Ground to Air mode trigger out mode.
:POSition	0.000 to 8000.000	Sets the position offset for the currently active output trigger.
:SELF?		Returns the enabled status of the self interrogation functionality of the unit.
:SELF	OFF or ON	Sets the enabled status for self interrogate mode.

5.4 COMMAND DESCRIPTIONS

5.4.1 INSTrument Commands

The IFF45TS supports three instruments: Transponder, Interrogator, and TACAN. The functionality of each instrument is not available simultaneously; one instrument must be selected to operate. The instrument section of the remote command set provides a means for selecting instruments by name. Once an instrument is selected, it will respond to commands from that instrument's section, such as INTerrogator.

The other supported commands in this section allow the user to select the instrument's signal port and change the video output selections. The signal port is the front panel port, antenna sum/top and difference/bottom or direct sum/top and difference/bottom, on which the radio signal is received and transmitted. The video output selections control the programmable output ports of the front panel.

:INSTrument?

The instrument query returns the configured instrument to test. Each instrument is selected using the INSTrument command.

"INST=<string>"

Keyword	Meaning
INSTrument	The instrument to test
NONE	No instrument selected (default)
TRANsponder	Test a transponder
INTerrogator	Test an interrogator
TACan	Test a TACAN system
CWave	Continuous wave generator

:INSTrument

{ NONE | TRAN | INT | TAC | CW }

The instrument command selects the instrument to measure. The functionality of each instrument is not available simultaneously, so this selection enables the measurement commands for that instrument only.

Keyword	Meaning
NONE	No instrument selected (default)
TRANsponder	Test a transponder
INTerrogator	Test an interrogator
TACan	Test a TACAN system
CWave	Continuous wave generator

5.4.1 INSTrument Commands (cont)

:INSTrument

:COHerency?

The current waveform generator phase setting.

"COH=<string>"

Keyword	Meaning
COH	Coherent
NCOH	Non-coherent

:COHerency { COH | NCOH }

The instrument command selects the waveform generator phase relationship.

Keyword	Meaning
COH	Coherent (in phase)
NCOH	Non-coherent

:PORT?

The port query returns the configured signal communications ports to enable.

"PORT=<string>"

Keyword	Meaning
PORT	Selected signal communications port
DIRect	RF I/O direct connection ports
ANTenna	Antenna ports

:PORT { DIR | ANT }

This command sets the active RF signal communications ports.

:PROGout?

This command returns the configuration of the front panel's programmable video output ports. The configuration is returned as an 8-bit unsigned decimal number which has the following meanings.

"PROG1=<dec1>; PROG2=<dec2>"

5.4.1 INSTrument Commands (cont)

<decX>	Channel	Group	Video Selection	Video Description
1	SUM	TX	DATA	SUM channel transmit IF data
2	SUM	TX	BOXCAR 8x16	SUM channel 8x16 boxcar filtered Tx data
3	SUM	TX	BOXCAR 10x11	SUM channel 10x11 boxcar filtered Tx data
4	DIFF	TX	DATA	DIFF channel transmit IF data
5	DIFF	TX	BOXCAR 8x16	DIFF channel 8x16 boxcar filtered Tx data
6	DIFF	TX	BOXCAR 10x11	DIFF channel 10x11 boxcar filtered Tx data
7	SUM	RX	DATA	SUM channel receive IF data
8	SUM	RX	BOXCAR 8x16	SUM channel 8x16 boxcar filtered Rx data
9	SUM	RX	BOXCAR 10x11	SUM channel 10x11 boxcar filtered Rx data
10	DIFF	RX	DATA	DIFF channel receive IF data
11	DIFF	RX	BOXCAR 8x16	DIFF channel 8x16 boxcar filtered Rx data
12	DIFF	RX	BOXCAR 10x11	DIFF channel 10x11 boxcar filtered Rx data
13		TACAN	MOD 15Hz	TACAN 15Hz Modulation
14		TACAN	MOD 135Hz	TACAN 135Hz Modulation
15		TACAN	MOD 15+135Hz	TACAN combined 15 and 135Hz Modulation
16	IND	WALSH	DECODE 0	Mode 5 Walsh symbol 0 decode video
17	IND	WALSH	DECODE 1	Mode 5 Walsh symbol 1 decode video
18	IND	WALSH	DECODE 2	Mode 5 Walsh symbol 2 decode video
19	IND	WALSH	DECODE 3	Mode 5 Walsh symbol 3 decode video
20	IND	WALSH	DECODE 4	Mode 5 Walsh symbol 4 decode video
21	IND	WALSH	DECODE 5	Mode 5 Walsh symbol 5 decode video
22	IND	WALSH	DECODE 6	Mode 5 Walsh symbol 6 decode video
23	IND	WALSH	DECODE 7	Mode 5 Walsh symbol 7 decode video
24	IND	WALSH	DECODE 8	Mode 5 Walsh symbol 8 decode video
25	IND	WALSH	DECODE 9	Mode 5 Walsh symbol 9 decode video
26	IND	WALSH	DECODE 10	Mode 5 Walsh symbol 10 decode video
27	IND	WALSH	DECODE 11	Mode 5 Walsh symbol 11 decode video
28	IND	WALSH	DECODE 12	Mode 5 Walsh symbol 12 decode video
29	IND	WALSH	DECODE 13	Mode 5 Walsh symbol 13 decode video
30	IND	WALSH	DECODE 14	Mode 5 Walsh symbol 14 decode video

5.4.1 INSTrument Commands (cont)

:INSTrument

:PROGout? (cont)

31	IND	WALSH	DECODE 15	Mode 5 Walsh symbol 15 decode video
32	SUM	M5	THRESHOLD VIDEO	SUM channel Mode 5 preamble detection threshold. The preamble video must exceed this threshold for detection
33	SUM	M5	PREAMBLE VIDEO	SUM channel Mode 5 preamble detection confidence
34	DIFF	M5	MSK VIDEO	Sum channel Mode 5 MSK video. Positive values represent F-Space and negative values represent F-Mark
35	DIFF	M5	THRESHOLD VIDEO	DIFF channel Mode 5 preamble detection threshold. The preamble video must exceed this threshold for detection
36	DIFF	M5	PREAMBLE VIDEO	DIFF channel Mode 5 preamble detection confidence
37	DIFF	M5	MSK VIDEO	DIFF channel Mode 5 MSK video. Positive values represent F-Space and negative values represent F-Mark

:PROGout <1 | 2> or { 0 ~ 37 }

This command selects the video output source for the two front panel programmable video signal outputs, PROG1 and PROG2.

:SRECovery?

This command returns the configured sensitivity recovery state and delay.

"STAT=<string>;DEL-<dec1>"

Keyword	Meaning
STATe	Sensitivity Recovery state
OFF	Sensitivity recovery is inactive
ON	Sensitivity recovery is active
DELay	Sensitivity Recovery delay
1 to 60	Delay in seconds

:SRECovery

:DELay { 0 ~ 60 }

The command sets the sensitivity recovery time interval.

:STATe { OFF | ON }

The command sets the sensitivity recovery state.

5.4.1 INSTrument Commands (cont)

:INSTrument (cont)

:TBASe?

This command returns the configured frequency reference source.

"TBAS=<string1>"

Keyword	Meaning
TBASe	Frequency reference source
INTernal	Internal time base reference
EXTernal	External time base reference

:TBASe { INT | EXT }

The command sets the frequency reference source.

5.4.2 SYSTem Commands

The system section of the remote command set controls settings not directly associated with a particular instrument. These settings include the serial communications port configuration, unit reset, and built-in-test commands. Unit status and version numbers are also provided in this section of the command set.

:BIT

This command is currently not supported.

:BUSY?

This command is currently not supported.

:RESult?

This command is currently not supported.

:ERRor?

The system error query returns the next item from the error queue. The error queue will store up to 20 errors before overflowing. When a message error occurs, an entry will be generated in the error queue and bit 2 of the Status Byte register will be set to a value of 1.

"<code>,<description>,[<command>],[<err position>]"

Field	Meaning
Code	The error code.
description	Error description string
command	Optional command text
err position	Optional character position of the invalid mnemonic

:HARDware

:TEMPerature?

The system temperature query returns the top and bottom port module's temperature reading in degrees Celsius.

"TOP=<deg1>; BOTT=<deg2>; AMB=<deg3>"

Keyword	Meaning
TOP	Top port module temperature in °C
BOTTom	Bottom port module temperature in °C
AMBient	Ambient unit temperature in °C

:VERSion?

The system module query returns the hardware revision numbers for each module within the unit.

"GEN =<val1>; TOP=<val2>; BOTT=<val3>; CONT=<val4>"

Keyword	Meaning
GENerator	Receiver generator board
TOP	TOP channel port board
BOTTom	Bottom channel port board
CONTrol	Receiver control board

5.4.2 SYSTem Commands (cont)

:HARDware (cont)

:VOLTage?

The system voltage query returns the voltage readings in hundredths of a volt.

"VOLT2.5=<volt1>; VOLT3.3=<volt2>; VOLT-5=<volt3>; VOLT5=<volt4>; VOLT12=<volt5>; VOLT32=<volt6>"

Keyword	Meaning
VOLT2.5	Self measurement of the 2.5V supply.
VOLT3.3	Self measurement of the 3.3V supply.
VOLT-5	Self measurement of the -5V supply.
VOLT5	Self measurement of the 5V supply.
VOLT12	Self measurement of the 12V supply.
VOLT32	Self measurement of the 32V supply.

:LAN?

The system Local Area Network (LAN) query returns the unit's LAN settings. These settings are used to communicate with the unit using a VXI-11 connection. When the Dynamic Host Configuration Protocol (DHCP) is enabled, the static configuration will be ignored. The static configuration consists of the Internet Protocol (IP) address, default gateway address, subnet mask, primary Domain Name System (DNS) server address, and secondary DNS server address. The device name is used by the DNS server(s) to translate the unit's name to its IP address. The Media Access Control (MAC) address is set by the factory and is unique for each unit. Each address in the return string is formatted as four 8-bit decimal integers separated by periods (.): <dec1>.<dec2>.<dec3>.<dec4>

"IPAD=<ip_adr>; DGAT=<dgat_adr>; SMAS=<sub_mask>; PDNS=<pdns_adr>; SDNS=<sdns_adr>; DNAM=<name>; DHCP=<enable>; MAC=<mac_adr>"

Keyword	Meaning
IPADdress	Unit IP address
DGATeway	Network default gateway address
SMASk	Subnet mask
PDNS	Primary DNS address
SDNS	Secondary DNS address
DNAMe	Device name
DHCP	DHCP enable/disable
MAC	MAC address

:DGATeway { <DEC1>.<DEC2>.<DEC3>.<DEC4> }

The default gateway command is part of the unit's static LAN configuration. The input parameter is a string of four 8-bit decimal integers and is used to identify the unit's default gateway to the network.

:DHCP { OFF | ON }

The DHCP command enables or disables the use of DHCP to configure the LAN settings. The input parameter selects between the static and dynamic LAN configurations.

5.4.2 SYSTem Commands (cont)

:LAN (cont)

:DNAMe <string>

The device name command sets the unit's identifying string. This name string is a single word consisting of no more than 12 characters, and can be used by the network to identify the unit. This feature only works when a valid DNS server address has been entered.

:IPADdress { <DEC1>.<DEC2>.<DEC3>.<DEC4> }

The IP address command is part of the unit's static LAN configuration. The input parameter is a string of four 8-bit decimal integers and is used to identify the IP address of the unit.

:PDNS { <DEC1>.<DEC2>.<DEC3>.<DEC4> }

The primary DNS command is part of the unit's static LAN configuration. The input address identifies the primary DNS server. A DNS address is optional but must be valid for the domain name system to work, i.e. the device name command will do nothing without this configuration. The input parameter is a string of four 8-bit decimal integers.

:SAVE

The system LAN save command stores the current LAN configuration to memory. This configuration will be loaded upon unit reset. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.

:SDNS { <DEC1>.<DEC2>.<DEC3>.<DEC4> }

The secondary DNS command is part of the unit's static LAN configuration. The input address identifies the secondary DNS server. Not all networks have a secondary DNS server; thus, this command is optional. The input parameter is a string of four 8-bit decimal integers.

:SMASk { <DEC1>.<DEC2>.<DEC3>.<DEC4> }

The subnet mask command is part of the unit's static LAN configuration. The input parameter is a string of four 8-bit decimal integers and is the networks subnet mask. The IP address must fit within this range.

:MODule? The system module query returns the corresponding module board revision number.

"DIG=<val1>; TOP=<val2>; BOTT=<val3>; GEN=<val4>; CONT=<val5>; RIO=<val6>"

Keyword	Meaning
DIGital	Digital board revision number
TOP	Top module board revision number
BOTTom	Bottom module board revision number
GENerator	Generator module board revision number
CONTroller	Controller board revision number
RearInputOutput	Rear IO board revision number

:RESet

The system reset command resets the unit's configuration structure to the power on state. This command also clears the status registers and serial buffers.

5.4.2 SYSTem commands (cont)

:RTC?

The system RTC query returns the instruments time and date.

"RTC=<MM>-<DD>-<YYYY>, <HH>:<MM>:<SS>":

Keyword	Meaning
RTC	Real-time-clock date and time

:TIMe { HH:MM:SS }

The RTC time command sets the real-time-clock time.

:DATE { MM-DD-YYYY }

The RTC time command sets the real-time-clock date.

:SERial?

The system serial query returns the serial RS232 communications settings. This includes the baud rate, number of data bits, parity type, and the number of stop bits.

"BAUD=<dec1>; PAR=<string1>; SBIT=<dec2>; DBIT=<dec3>"

Keyword	Meaning
BAUD	Communications baud rate
PARity	Parity type
ODD	Odd parity
EVEN	Even parity
NONE	No parity
SBIT	Number of stop bits
DBIT	Number of data bits

:BAUD { 300 ~ 256000 }

The serial baud rate command sets the serial RS232 communications baud rate. Note if this command is sent over the RS232 port, the return string will be sent at the new baud rate. The unit will accept the following baud rates:

300	450	500	600	900	1000
1200	1800	2000	**2400**	3600	4000
4800	7200	8000	**9600**	14400	16000
19200	28800	32000	**38400**	**57600**	64000
76800	**115200**	128000	153600	**230400**	256000

:DBITs { 7 | 8 }

The serial data bits command sets the number of data bits (word length) for the RS232 communications port.

:PARity { ODD | EVEN | NONE }

The parity command sets the type of parity used in serial RS232 communications.

5.4.2 SYSTem commands (cont)

:SERial? (cont)

:SBITs { 1 | 2 }

The stop bits command set the number of stop bits used in serial RS232 communications.

:SAVE The save command stores the serial RS232 communications settings to memory.
Note: Two to three seconds of inactivity on the communication bus are required after sending the command.

:SNUMber?

The serial number query returns the unit's unique electronic serial number.

"SNUM=<val>"

Keyword	Meaning
SNUMber	9 character serial number

:ERRor?

The system status error query returns device specific errors. The return string consists of a 16-bit hexadecimal value which has the following meanings:

"ERR=<hex1>"

Bit Position	Meaning
0	Self calibration failed
1	PLL failed to lock
2	Multi-path error
3	Signal under driven
4	Receiver front end overdriven
5	DSP BIOS abort
6	DSP BIOS exit
7	DSP BIOS error
8	FPGA fan failure
9-15	Reserved for future use

:VERSion?

The system version query returns the software version numbers for each programmable device within the unit.

"HOST=<val1>; DSP=<val2>; FPGA=<val3>; RF:FPGA=<val4>; RIO=<val5>"

Keyword	Meaning
Host	Host micro-processor software version number
DSP	DSP software version number
FPGA	Digital board FPGA image number
RF:FPGA	RF control board FPGA image number

5.4.3 GPIB Common Commands

The IEEE 488.2 Standard defines a set of commands that each device must support. These common commands provide a means to read and enable events within the device, read the device identity, reset the device, and cause the device to execute an internal self-test.

STATUS AND EVENT COMMANDS

***CLS**

The Clear Status Command clears the status register and all associated status data structures detailed in the Status Byte, such as the Event Status Register. It also clears all status related queues, but does not clear the output queue.

***ESE** { 0 ~ 255 }

The Standard Event Status Enable Command sets the Standard Event Status Enable Register bits. The parameter data is defined as an unsigned 8-bit decimal integer. This number represents the individual bits of the Standard Event Status Enable Register. Setting a bit to the value '1' will enable that event while clearing the bit to the value '0' will disable that event.

***ESE?**

The Event Status Enable Query reads the contents of the Standard Event Status Enable Register (SESER). In response to this query the device sends the contents of the SESER in integer format:

"<dec1>"

***ESR?**

The Event Status Register Query reads the contents of the Standard Event Status converted to a binary number, represents the contents of the individual bits of the register:

"<dec1>"

***SRE** { 0 ~ 255 }

The Service Request Enable command sets the Service Request Enable Register which determines what bits in the Status Byte will cause a service request from the device. The parameter data is defined as an unsigned 8-bit decimal integer. This number represents the individual bits of the Service Request Enable Register. Setting a bit to the value '1' will enable that event while clearing the bit to the value '0' will disable that event.

***SRE?**

The Service Request Enable query reads the contents of the Service Request Enable Register. This command returns an integer, which when converted to a binary number, represents the contents of the individual bits of the register:

"<dec1>"

***STB?**

The Status Byte query reads the contents of the Status Byte Register. This command returns an integer, which when converted to a binary number, represents the contents of the individual bits of the register:

"<dec1>"

5.4.3 GPIB Common Commands (cont)

SYSTEM DATA COMMANDS

The system data commands give the user the ability to gain further information about the devices within a system. This information includes the device identity and what device options are installed.

***IDN?**

The Identification Query causes the device to send its “identity” over the bus. The below and the device will respond with the following string:

"AEROFLEX, IFF45TS,<val1>,<val2>"

Field	Description	IFF45TS Implementation
1	Manufacturer	AEROFLEX
2	Model	IFF45TS
3	Serial Number	9 digit serial number
4	Firmware Level	RCI version number

***OPT?**

The Option Identity Query tells the device to identify any reportable device options. The device responds with a list of fields separated by commas which detail the installed options. If an option is not installed an ASCII ‘0’ is inserted into that field. This device will respond with the following string:

“<string1>,<string2>,<string3>,<string4>”

String	Meaning
1	Transponder Mode 5 option
TM5	Enabled
0	Disabled
2	Interrogator option
INT	Enabled
0	Disabled
3	Interrogator Mode 5 option
IM5	Enabled
0	Disabled
4	TACAN option
TAC	Enabled
0	Disabled

5.4.3 GPIB Common Commands (cont)

SYNCHRONIZATION COMMANDS

The synchronization commands enable the user to insure commands are executed in unison on all devices. It does this by instructing units to halt the execution of any further commands until it has completed all commands that it is presently working on.

***OPC**

The Operation Complete command tells the device to set bit 0 in the Standard Event Status Register when all pending operations have been completed.

***OPC?**

The Operation Complete query tells the device to place an ASCII '1' in the device's output queue when all pending operations have been completed.

***WAI**

The Wait to Continue command forces the device to wait until all pending operations have been completed before executing any commands received after this command.

INTERNAL OPERATION COMMANDS

***RST**

The Reset command resets the device to its power-on state by resetting the configuration data to their default values.

***TST?**

This command is currently not supported.

5.4.4 CALibration Commands

:MANual

:CLOSs

The cable loss/gain calibration commands describe the compensation factors that must be used to account for signal loss through the cable connected to the unit.

:ANTenna?

The antenna query returns the external cable loss/gain calibration factors for the antenna port top and bottom channels in dB.

"TOP=<dec1>; BOTT=<dec2>"

Keyword	Meaning
TOP	Top channel cable loss/gain calibration factor
BOTTom	Bottom channel cable loss/gain calibration factor

:BOTTom { -50.00 ~ 50.00 }

The bottom command sets the antenna port bottom channel's cable loss/gain calibration factor in dB. A negative value is a loss and a positive value is a gain.

:TOP { -50.00 ~ 50.00 }

The top command sets the antenna port top channel's cable loss/gain calibration factor in dB. A negative value is a loss and a positive value is a gain.

:DIRect?

The direct query returns the external cable loss/gain calibration factors for the direct port top and bottom channels in dB.

"TOP=<dec1>; BOTT=<dec2>"

Keyword	Meaning
TOP	Top channel cable loss/gain calibration factor
BOTTom	Bottom channel cable loss/gain calibration factor

:BOTTom { -50.00 ~ 50.00 }

The bottom command sets the direct port bottom channel's cable loss/gain calibration factor in dB. Note: a negative value is a loss and a positive value is a gain.

:TOP { -50.00 ~ 50.00 }

The top command sets the direct port top channel's cable loss/gain calibration factor in dB. A negative value is a loss and a positive value is a gain.

5.4.4 CALibration Commands (cont)

:MANual (cont)

:SAVE

This command saves the current manual calibration settings so they will be used the next time the unit is powered up. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.

:SELF

The self calibration system allows the unit to self-adjust the transmitter and receiver parameters to the current conditions. This command should be run whenever the unit environment changes (i.e. the ambient temperature changes). The user has the option of saving the results of the calibration, allowing the factors to be reloaded as the default values on power-up.

:DATA?

This command queries the results of the last self calibration preformed.

:SAVE

This command saves the current self calibration settings so they will be used the next time the unit is powered up. Note: Two to three seconds of inactivity on the communication bus are required after sending the command.

:STATus?

This command reports the current state of the self calibration process.

"STAT=<dec1>"

<dec1>=0 or 1; 0=self cal in progress, 1=self cal complete

5.4.5 COMSec Commands

These commands control the operation of and report the status of the attached COMSEC.

:CVI?

This command returns the indexes of the three Mode 5 CVI's currently in use.

"CVI=<dec1>,<dec2>,<dec3>"

<dec1>= CVI with modulus 3 = 0; <dec2>= CVI with modulus 3 = 1;
<dec3>= CVI with modulus 3 = 2

:INTerrogator

:DECRypt?

This command returns the last interrogation decryption message sent to and the response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:ENCRypt?

This command returns the last interrogation encryption message sent to and the response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:LEVel1

:DECRypt?

This command returns the last level 1 reply decryption message sent to and response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:ENCRypt

:DATA?

This command returns the last level 1 reply data encryption message sent to and response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:IDENt?

This command returns the last level 1 reply ID encryption message sent to and response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit id; <hex2>=receive id

5.4.5 COMSec Commands (cont)

:LEVel2

:DECRypt?

This command returns the last level 2 report decryption message sent to and response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:ENCRypt?

This command returns the last level 2 report encryption message sent to and response from the COMSEC.

"TRAN=<hex1>; REC=<hex2>"
<hex1>=transmit data; <hex2>=receive data

:MDATa?

This command returns the COMSEC's configured nation of origin, mission and platform identification number data.

"NOR=<hex1>; MCOD=<hex2>; PIN=<hex3>"

Keyword	Meaning
NOR	The Nation of origin field data.
MCOD	The Mission Code field data.
PIN	The Platform Identification Number.

:MODE4?

This command returns the current settings of the COMSEC's Mode 4 parameters. The returned parameters are:

"TYPE=<string1>; CODE=<string2>; VER=<string3>"

Keyword	Meaning
TYPE	COMSEC emulation Type
INTernal	The internal emulator is selected.
EXTernal	The external COMSEC is used.
CODE	The state of the code A/B control line of the COMSEC.
A	The external COMSEC is set for code A.
B	The external COMSEC is set for code B.
VERify bit 1	The state verification bit 1 of the COMSEC.
SET	The external COMSEC has verification bit 1 selected.
CLEar	The external COMSEC has verification bit 1 not selected.

:CWORd { A | B }

This command sets the state of the external COMSEC's Mode 4 Code A/B selection line.

Parameters	Function
A	Sets the line HIGH (open circuit) to select code word A.
B	Sets the line LOW (ground) to select code word B.

5.4.5 COMSec Commands (cont)

:MODE4?

:TYPE { INT | EXT }

This command sets the selects whether the unit uses an internal or the externally attached COMSEC for Mode 4 operations.

Parameters	Function
INTernal	The internal COMSEC emulator is used for Mode 4 operations.
EXTernal	The externally attached COMSEC is used for Mode 4 operations.

:VBIT { OFF | ON }

This command sets the state of the external COMSEC's Mode 4 Verification Bit 1 selection line.

Parameters	Function
OFF	Sets the line LOW (ground) to set the verification bit 1 OFF.
ON	Sets the line HIGH (open circuit) to set the verification bit 1 ON.

:MODE5

:CVI

:FIXed?

This command returns the current settings of the COMSEC's Mode 5 Fixed CVI mode parameters. The returned parameters are:

"CVI=<dec1>; TIME=<HH>:<MM>:<SS>"

Parameters	Function
CVI	The current CVI for fixed mode operation.
TIME	The time of day equivalent for this current configured CVI. (hh:mm:ss)

:FIXed { 1 ~ 10800 }

This command sets the current Mode 5 CVI for Fixed mode operation.

:MODE?

This command returns the operational mode for the calculation of the current Mode 5 CVI. The returned parameters are:

"MODE=<string1>"

Parameters	Function
MODE	The CVI control mode.
RTC	The current CVI is controlled by the current time of the Real-Time-Clock.
FIX	The current CVI is fixed to the commanded "fixed" value.

:MODE { RTC | FIX }

This command sets the operational mode for the calculation of the current Mode 5 CVI.

5.4.5 COMSec Commands (cont)

:MODE5

:CVI

:RTC?

This command returns the current time for the internal Real-Time-Clock of the unit. The returned parameters are:

"CVI=<dec1>; RTC=<MM>-<DD>-<YYYY>,<HH>:<MM>:<SS>"

Parameters	Function
CVI	The current CVI index.
RTC	The current Real-Time-Clock value(mm-dd-yyyy, hh:mm:ss).

:DATE { MM-DD-YYYY }

This command sets the current date for the internal Real-Time-Clock of the unit. The returned parameters are:

MM=decimal month: 1-12, DD=decimal day: 1-31, YYYY=decimal year

:TIME { HH:MM:SS }

This command sets the current time for the internal Real-Time-Clock of the unit. The returned parameters are:

HH=decimal hour: 0-23, MM=decimal minute: 0-59, SS=decimal second: 0-59

:EDAC?

This command returns the Error Detection And Correction setting for the unit. When EDAC is ON the unit can correctly decode a transmitted Mode 5 message with up to one error in the transmission. The returned parameters are:

"EDAC=<string1>"

Parameters	Function
EDAC	Error Detection And Correction
ON	The error diction and correction is enabled.
OFF	The error diction and correction is disabled.

:EDAC { OFF | ON }

This command sets the Error Detection And Correction state for the unit. When EDAC is ON the unit can correctly decode a transmitted Mode 5 message with up to one error in the transmission.

5.4.5 COMSec Commands (cont)

:MODE5

:KEY?

This command returns the COMSEC key status.

"M5K=<dec1>; M5U=<dec2>; M4K=<dec3>; M4U<dec4>"

Parameters	Function
M5Key	Number of Mode 5 keys loaded
M5Usable	Number of Mode 5 keys loaded that are usable
M4Key	Number of Mode 4 keys loaded
M4Usable	Number of Mode 4 keys loaded thar are usable

:MI?

This command returns the Message Indicator enable and code data of the external COMSEC. The returned parameters are:

"ENAB=<string>; CODE=<val>"

Parameters	Function
ENAB	The flight line test mode enable setting of the COMSEC.
ON	Flight line test mode is ON.
OFF	Flight line test mode is OFF.
CODE	The flight line test code of the external COMSEC.

:CODE { 0 ~ 63 }

This command sets the Message Indicator code for the External COMSEC.

:ENABle { OFF | ON }

This command sets the Message Indicator state for the External COMSEC.

:TYPE?

This command returns the whether the unit uses an internal or the externally attached COMSEC for Mode 5 operations. The returned parameters are:

"TYPE=<string1>"

Parameters	Function
TYPE	The type of COMSEC to use for Mode 4 operations
INTernal	Use the internal COMSEC emulator.
EXTernal	Use the externally attached COMSEC.

:TYPE { INT | EXT }

This command selects whether the unit uses an INTernal or the EXTernal attached COMSEC for Mode 5 operations.

5.4.5 COMSec Commands (cont)

:NACK?

This command returns the last negative acknowledge response from the COMSEC. The returned parameters are:

"NTYP=<string1>; MESS=<string2>"

Parameters	Function
NTYP	
NONE	The unit has not received an error indication from the COMSEC.
UNAV	The COMSEC has reported this command is currently unavailable.
ILL	The COMSEC has reported this command is illegal.
BUSY	The COMSEC has reported it is currently busy and could not process this command.
MESS	The COMSEC has reported a Message Error.
CRC	The COMSEC has reported this command had a CRC error.
MESS	
NONE	
COP	Set Cryptonet Operation Command
DREN	Data Reply Encrypt Command
GBIT	Get BIT results message
GCST	Get Crypto Status message
GTOD	Get Time Of Day message
GVER	Get Versions message
HDID	High Density Interrogation Decrypt Command
HDIE	High Density Interrogation Encrypt Command
HDRD	High Density Report Decrypt Command
HDRE	High Density Report Encrypt Command
IREN	ID Reply Encrypt Command
KFST	Get Key Fill and Status Request
KROL	Key Rollover Command
MDAT	Get Mission Data Request
OMOD	Set Operating Mode Command
PGID	Process Gain Interrogation Decrypt Command
PGIE	Process Gain Interrogation Encrypt Command
PGRD	Process Gain Report Decrypt Command
PGRE	Process Gain Report Encrypt Command
RBIT	Run Built-In-Test
RDEC	Reply Decrypt Command
RES	Crypto Reset Command
STOD	Set Time of Day Command
TRAN	TRANSEC Request
UNKN	Unknown Command
ZER	Zeroize the Crypto Command

:RESet

This command clears the NACK message buffer.

5.4.5 COMSec Commands (cont)

:STAGger

:INTerrogator?

This command returns the current spread code and stagger information for Mode 5 interrogations.

"SPR:IND=<dec1>,<dec2>,<dec3>;
SPR:CODE=<hex1>,<hex2>,<hex3>;
STAG:IND=<dec4>,<dec5>,<dec6>;
STAG:CVI0=<dec7>,<dec8>,<dec9>;
STAG:CVI1=<dec7>,<dec8>,<dec9>;
STAG:CVI2=<dec7>,<dec8>,<dec9>"

Parameters	Function
SPR	The Mode 5 interrogation spread indexes and codes.
IND	The Mode 5 interrogation spread indexes (modulus 0, modulus 1, modulus 2)
CODE	The Mode 5 interrogation spread codes (modulus 0, modulus 1, modulus 2)
STAG	The Mode 5 interrogation stagger indexes and values.
IND	The Mode 5 interrogation stagger indexes (modulus 0, modulus 1, modulus 2)
CVI0	The Mode 5 interrogation stagger values for modulus 0 (P1 stagger value, P2 stagger value, P3 stagger value)
CVI1	The Mode 5 interrogation stagger values for modulus 1 (P1 stagger value, P2 stagger value, P3 stagger value)
CVI2	The Mode 5 interrogation stagger values for modulus 2 (P1 stagger value, P2 stagger value, P3 stagger value)

:REPort?

This command returns the current spread code and stagger information for Mode 5 level 2 reports.

"SPR:IND=<dec1>,<dec2>,<dec3>;
SPR:COD=<hex1>,<hex2>,<hex3>;
STAG:IND=<dec4>,<dec5>,<dec6>;
STAG:CVI0=<dec7>,<dec8>,<dec9>;
STAG:CVI1=<dec7>,<dec8>,<dec9>;
STAG:CVI2=<dec7>,<dec8>,<dec9>"

Parameters	Function
SPR	The Mode 5 report spread indexes and codes.
IND	The Mode 5 report spread indexes (modulus 0, modulus 1, modulus 2)
CODE	The Mode 5 report spread codes (modulus 0, modulus 1, modulus 2)
STAG	The Mode 5 report stagger indexes and values.
IND	The Mode 5 report stagger indexes (modulus 0, modulus 1, modulus 2)
CVI0	The Mode 5 report stagger values for modulus 0 (P1 stagger value, P2 stagger value, P3 stagger value)
CVI1	The Mode 5 report stagger values for modulus 1 (P1 stagger value, P2 stagger value, P3 stagger value)
CVI2	The Mode 5 report stagger values for modulus 2 (P1 stagger value, P2 stagger value, P3 stagger value)

5.4.5 COMSec Commands (cont)

:STATus?

This command returns the status of the external COMSEC.

"TYPE=<string1>; STAT=<string2>; FAUL=<string3>; AVA=<string4>"

Parameters	Function
TYPE	Type of COMSEC attached
UNKNOWN	
KIV-77	
KIT-1(A/C)	
KIR-1(A/C)	
STATus	Status of attached COMSEC
NPR	COMSEC is Not Present
PRES	COMSEC is Present but not keyed properly.
M4AV	Only Mode 4 is available
M5AV	Only Mode 5 is available
FOP	Both Modes 4 and 5 are available
ERR	COMSEC is reporting an error
FAULt	Highest Fault reported
NONE	
TAMP	Tamper fault reported
MAIN	Maintenance required reported
ENG	Crypto engine fault reported
POW	Power-up fault reported
IBIT	IBIT test fault reported
TIME	Time has not been loaded fault reported
RTC	Real Time Clock fault reported
ALARm	Alarm state reported
ZERo	Zeroized fault reported
QKEK	QKEK fault reported
JOS	JOSEKI Key fault reported
M5K	Mode 5 Keys fault reported
M4K	Mode 4 Keys fault reported
NACK	A message negative acknowledge has been received
BATT	Battery low fault reported
HCRY	A host to crypto timeout has occurred
CHOS	A crypto to host timeout has occurred
AVA	COMSEC availability
UNAV	COMSEC is unavailable
HOFF	COMSEC is holding off the host
ZER	COMSEC is zeroized
ALAR	COMSEC is in Alarm
IBIT	COMSEC is performing it's Built-In-Test
KEYS	COMSEC is processing key information
FILL	COMSEC is in the process of a key fill
ERR	COMSEC is reporting an error
ONL	COMSEC is online

5.4.5 COMSec Commands (cont)

:VERSion?

This command returns the version number information of the COMSEC.

"CMOD=<hex1>; CFIL=<hex2>; IMC=<hex3>; UCC=<hex4>;
CCOD=<hex5>; CFPGA=<hex6>; IFPGA=<hex7>; SPAR=<hex8>"

Parameters	Function
CMOD	Core module version number
CFIL	Configuration file version number
IMC	IFF module version number
UCC	Unclassified code version number
CCOD	Classified code version number
CFPGA	Crypto FPGA version number
IFPGA	Interface FPGA version number
SPAR	Spare

5.4.6 CW Commands

This instrument is for generating and measuring CW power.

:GENerator?

This command returns the state of the CW generator. The state of the generator affects the ability of the unit to make measurements on the antenna ports but not on the direct ports. This is because the antenna ports are utilize a transmit / receive switch making them simplex ports.

"GEN=<string1>"

Parameters	Function
GEN	State of the CW Generator
ON	The CW generator is enabled.
OFF	The CW generator is disabled.

:GENerator { OFF | ON }

This command sets the state of the CW generator. The state of the generator affects the ability of the unit to make measurements on the antenna ports but not on the direct ports. This is because the antenna ports are utilize a transmit/receive switch making them simplex ports.

:FREQuency?

This command returns the CW instrument's transmitter and receiver frequencies (in MHz).

"FREQ=<dec1>"

:FREQuency { 952.00 ~ 1225.00 }

This command returns the CW instrument's transmitter and receiver frequencies (in MHz). The frequency is settable in 10kHz steps.

:OFFSet?

This command returns the generator offset from the nominal generator frequency selection.

"CW=<string1>"

Parameters	Function
MARK	The generator frequency is offset by -4 MHz.
NOM	The generator frequency is at the set frequency.
SPAC	The generator frequency is offset by +4 MHz.

:OFFSet { MARK | NOM | SPAC }

This command sets the generator offset from the nominal generator frequency selection.

5.4.6 CW Commands (cont)

:GENerator

:POWer?

This command returns the current power settings for the CW instrument. The power is settable in 0.01dB steps.

"DTOP=<dec1>; DBOT=<dec2>; ATOP=<dec3>; ABOT=<dec4>"

Parameters	Function
DTOP	The Top Direct ports Generator level.
DBOT	The Bottom Direct ports Generator level.
ATOP	The Top Antenna ports Generator level.
ABOT	The Bottom Antenna ports Generator level.

:BOTTom

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power level for the Bottom Antenna port of the CW instrument. The power is settable in 0.01dB steps from -110.0 to 30.0dBm.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power level for the Bottom Direct port of the CW instrument. The power is settable in 0.01dB steps from -110.0 to 0.0dBm.

:TOP

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power level for the Top Antenna port of the CW instrument. The power is settable in 0.01dB steps from -110.0 to 30.0dBm.

:DIRect {-110.00 ~ 0.00 }

This command sets the transmit power level for the Top Direct port of the CW instrument. The power is settable in 0.01dB steps from -110.0 to 0.0dBm.

5.4.6 CW Commands (cont)

:MEASure?

This command returns the measured frequency and power of the CW input.

"FREQ=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>;
POW=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Parameters	Function
FREQ	Frequency measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)
Power	Power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:SETup?

This command returns the measurement system configuration for the CW instrument.

"CHAN=<string1>; SAMP=<dec1>"

Parameters	Function
CHAN	The measurement channel (TOP, BOTTom)
SAMP	The number of samples to average for a measurement.

:CHANnel { TOP | BOTT }

This command sets the channel to be measured by the measurement subsystem.

:MMReset

This command clears all measurement results.

:SAMPles { 1 ~ 200 }

This command sets the number of samples to average for a measurement.

5.4.7 TRANsponder Commands

These commands set up the Transponder Instrument for testing a Transponder.

:BURSt?

This command returns the current settings of the Burst sub-mode parameters. The returned parameters are:

"STAT=<string1>; NUMB=<dec1>; ICO=<dec2>; GAP=<dec3>; SQU=<string2>; SCO=<dec4>; MODE=<string3>"

Keyword	Meaning
STATus	The status of the burst cycle, active or idle.
ACTive	The burst cycle is active
IDLE	The burst cycle is idle
NUMBer	The number of bursts in a cycle.
ICOunt	The number of interrogations per burst
GAP	The spacing between bursts in a cycle.
SQUitter	Will a sequence of received squitters trigger a burst?
OFF	Received squitters will not trigger a burst cycle
MODES	Received Mode S squitters will trigger a burst cycle.
MODE5	Received Mode 5 squitters will trigger a burst cycle.
SCOunt	How many squitters must be received before a burst is triggered?
MODE	Is a single burst cycle performed or a infinite series of burst cycles?
NORMal	A single burst cycle will be transmitted.
INFinite	Repeated burst cycles will be transmitted until a burst abort command is received.

:ABORt

This command aborts the burst cycle. Parameters are not allowed for this command. For more information on the burst cycle see :TRANs:BURST:MODE.

:COUNt { 1 ~ 2500 **}**

This command sets the Burst Count which is the number of interrogations in each burst within the burst cycle.

:GAP { 0.100 ~ 20.000 }

This command sets the Burst repetition gap time, which is the delay between consecutive sets of Burst interrogations.

:MODE { NORM | INF }

This command set the burst mode which defines the burst cycle, whether the unit will burst infinitely, until told to abort, or burst as configured by the :TRANs:BURST:NUM command. When in infinite mode, the burst cycle will repeat continually as configured. When in normal mode, the burst cycle will perform one burst cycle as configured and complete. If a configuration change executes during an active burst cycle, the unit will abort the burst. If the mode is set to infinite, the burst cycle will restart after the configuration change. A configuration change consists of a change to any one of the following: table, PRF, burst, double, diversity, variable pulse, interference pulse, SLS, interlace mode.

Keyword	Function
NORMal	A single burst cycle will be transmitted.
INFinite	An infinite number of bursts will be transmitted until an abort command is issued.

5.4.7 TRANsponder Commands (cont)

:BURSt?

:NUMBer { 1 ~ 1000 }

This command set the Burst Number which is the number of bursts that will be sent once a burst cycle starts.

:SQUitter { OFF | MODES | MODE5 }

This command sets the trigger source for a burst cycle. A burst can be triggered by the user, or by a received sequence of Mode S or Mode 5 squitters.

Parameters	Function
OFF	The burst cycle starts as soon as the user sends the start command.
MODES	The burst cycle starts after the user sends the start command and a specific number of Mode S squitters have been received.
MODE5	The burst cycle starts after the user sends the start command and a specific number of Mode 5 squitters have been received.

:COUNt { 1 ~ 20 }

This command sets the number of received squitters that are required to trigger an appropriate number of squitters has been received.

:STARt

This command starts the burst cycle. Parameters not allowed for this command. For more information on the burst cycle see :TRANSs:BURST:MODE.

:DIVersity?

This command returns the current settings of the diversity sub-mode parameters. The returned parameters are:

"TIME=<dec1>; SLS=<string1>; MODE5=<string2>"

Keyword	Meaning
TIME	The timing of the interrogation on the bottom channel relative to the interrogation on the top channel.
OFF	Neither Interrogation contains an SLS pulse.
TOP	The interrogation on the top channel contains an SLS pulse and the interrogation on the bottom channel does not.
BOTTom	The interrogation on the bottom channel contains an SLS pulse and the interrogation on the top channel does not.
SLS	Does an interrogation on one of the two channels contain an SLS pulse?
MODE5	If an SLS pulse is present, which Mode 5 SLS pulse is inserted into the interrogation?
I1	The I1 SLS pulse is present in a Mode 5 Interrogation.
I2	The I2 SLS pulse is present in a Mode 5 Interrogation.
I1I2	The I1 and I2 SLS pulses are present in a Mode 5 Interrogation.

:MODE5 { I1 | I2 | I1I2 }

Controls which Mode5 SLS pulse is generated for diversity sub-mode. There is no parametric control over the SLS pulse in diversity sub-mode.

5.4.7 TRANsponder Commands (cont)

:DIVersity?

:TIME { -1.000 ~ 1.000 }

This command sets the timing differential between the interrogations on the top and bottom channels. The timing of the interrogation on the bottom channel is relative to the interrogation on the top channel.

:SLS { OFF | TOP | BOTT }

This command controls the generation of SLS pulses in diversity sub-mode. A nominal SLS pulse can be transmitted with the interrogation on either channel, or neither channel. For Mode S diversity interrogations with an SLS present, the presence of an SLS pulse is simulated by not building an SPR in the interrogation. There is no parametric control over the SLS pulse in diversity sub-mode.

:DOUBle

:SPACing?

This command returns the spacing between the first and second interrogations in double sub-mode. This spacing is the spacing between the interrogation timing reference of the first interrogation and the timing reference of the second interrogation.

"SPAC=<dec1>"

Keyword	Meaning
SPACing	The timing between the first and second interrogations in the double pair.

:SPACing { 0.000 ~ 400.000 }

This command sets the spacing between the timing references of the first and second interrogations in double sub-mode in uS.

:GENerator

:CHANnel?

This command returns the interrogation transmission channel.

"CHAN=<string1>"

Keyword	Meaning
CHANnel	The interrogation transmission channel.
BOTTom	Interrogations are transmitted on the bottom channel.
TOP	Interrogations are transmitted on the top channel.

:CHANnel {BOTT | TOP}

This command selects the channel on which the interrogation is transmitted. Interrogations can be transmitted on the top or bottom channels. UUT measurement data comes from the same channel that the interrogation is transmitted on. This command is not supported in diversity sub-mode because interrogations are transmitted on both channels.

5.4.7 TRANsponder Commands (cont)

:GENerator

:CONTrol?

This command returns the generator control parameters.

"CONT=<string>"

Keyword	Meaning
CONTrol	The generator control settings
OFF	The generator is off, no RF power is emitted.
ON	The generator is on, interrogation RF power is emitted.
CW	The generator is generating an CW waveform.

:CONTrol { OFF | ON | CW }

This command controls the output of the generator. The generator can be turned OFF, no RF power will be emitted even if interrogations are being generated. The generator can be turned ON, RF power will be emitted when interrogations are generated. The generator can generate a continuous waveform.

:CW?

This command returns the frequency offset of the generated CW.

"CW=<string1>"

Keywords	Meanings
CW	The frequency offset of the CW from the transmit frequency.
MARK	The CW is generated 4 MHz below the transmit frequency.
NOMinal	The CW is generated at the transmit frequency.
SPACe	The CW is generated 4 MHz above the transmit frequency.

:CW { MARK | NOM | SPAC }

This command sets the frequency offset of the generated CW.

:FREQuency?

This command returns the current transmit frequency.

"FREQ=<dec1>"

Keyword	Meaning
FREQuency	The transmit frequency (in MHz)

:FREQuency { 952.000 ~ 1225.000 }

This command sets the current transmit frequency.

5.4.7 TRANsponder Commands (cont)

:GENerator

:POWer?

This command returns the transmit power levels for the top and bottom channels on the direct and antenna ports.

"DTOP=<dec1>; DBOT=<dec2>; ATOP=<dec3>; ABOT=<dec4>"

Keyword	Meaning
DTOP	Transmit power on the top channel of the direct port.
DBOTtom	Transmit power on the bottom channel of the direct port.
ATOP	Transmit power on the top channel of the antenna port.
ABOTtom	Transmit power on the bottom channel of the antenna port.

:BOTTom

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the bottom channel on the antenna port.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the bottom channel on the direct port.

:TOP

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the top channel on the antenna port.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the top channel on the direct port.

:SUPPressor?

This command returns the configured suppression pulse parameters. The returned parameters are:

"CONT=<string1>; AMPL=<dec1>; POS=<dec2>; WIDT=<dec3>"

Keyword	Meaning
CONTrol	State of the suppressor pulse gerenation.
OFF	The suppressor is OFF.
ON	The suppressor is ON.
AMPLitude	The amplitude of the suppressor pulse in volts.
POSition	The position of the suppressor pulse relative to the timing reference of the interrogation.
WIDTh	The width of the suppressor pulse.

:SUPPressor { OFF | ON }

This command turns the suppressor ON and OFF.

:AMPLitude { 12 to 80 }

This command sets the amplitude of the suppressor pulse in volts.

5.4.7 TRANsponder Commands (cont)

:GENerator

:SUPPressor

:POSition { -40.000 to 2500.000 }

This command sets the position of the suppressor pulse. The position is relative to the timing reference of the interrogation

:WIDTh { 0.250 ~ 300.000 }

This command sets the width of the suppressor pulse.

:INTerference?

This command returns the current settings of the interference sub-mode parameters. The returned parameters are:

"AMPL=<dec1>; POS=<dec2>; WIDT=<dec3>; SPAC=<dec4>; STAT=<string1>; DATA=<hex1>; FORM=<string2>"

Keywords	Meaning
AMPLitude	The amplitude of the interference pulses relative to the interrogation.
POSition	The position of the first interference pulse relative to the timing reference of the interrogation.
WIDTh	The width of the interference pulses.
SPACing	The spacing between the first and second interference pulses.
STATe	The state of the second interference pulse.
OFF	The second interference pulse is off.
ON	The second interference pulse is on.
DATA	The MSK Data if the interference pulses are MSK pulses.
FORMat	The modulation format.
CW	The interference pulse modulation is CW.
MSK	The interference pulse modulation is MSK.

:AMPLitude { -15.00 ~ 5.00 }

This command sets the amplitude of the interference pulses. The amplitude is relative to the amplitude of the interrogation.

:DATA { 0 ~ 65535 }

This command sets the MSK modulation data if the pulse format is MSK. This data determines the frequency content of the interference pulse.

:FORMat { CW | MSK }

This command selects the pulse modulation format. Interference pulses can be modulated as CW or MSK pulses.

Keyword	Meaning
CW	The interference pulses will be modulated as CW pulses.
MSK	The interference pulses will be modulated as Minimum Shift Keying pulses.

5.4.7 TRANsponder Commands (cont)

:INTerference?

:POSition { -44.000 ~ 400.000 }

This command sets the position of the first interference pulse relative to the interrogation timing reference in uS.

:SPACing { 1.000 ~ 400.000 }

This command sets the spacing between the first and second interference pulses in uS.

:STATe { OFF | ON }

This command controls the state of the of second interference pulse. The second interference pulse can be turned on and off independently from the first interference pulse.

:WIDTh { 0.250 ~ 32.000 **}**

This command sets the width of the interference pulses in uS.

:IRATio?

This command returns the current settings of the interlace sub-mode parameters. The returned parameters are:

"RAT=<dec1>"

Keyword	Meaning
RATio	The ratio of the first interrogation to the second interrogation.

:IRATio { 1 ~ 63 }

This command sets the ratio of the first interrogation to the second interrogation. See :DOUBLe:SPACing for information regarding the separation between interrogations.

:MEASure

:MODE5

:LEVel2

:SEQuence?

This command returns the sequence of received Mode 5 Level 2 reports. The reported sequence is relative to the synchronized interrogation. The values indicate which channel the Report was received (TOP, BOTTom) and the Report Type. The returned values are:

"<string1><dec1>; …; CDAT=<dec2>"

Keyword	Meaning
	Report channel (TOP, BOTTom) concatenated with the Report Type (0~4)
ChangeDATa	A change in the report sequence has been detected.

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODE5

:LEVel2

:SQUitter

:ASHip?

This command returns the received Mode 5 Air/Ship Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

:GROund?

This command returns the received Mode 5 Ground Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODE5

:REPLy?

The received Mode 5 Level 1 Reply data elicited by the synchronized interrogation. The reply data is:

"FORM=<dec1>; DATA=<hex1>; CDAT=<dec2>"

Keywords	Meaning
FORMat	The received reply format
DATA	The 36-bits of reply data.
ChangeDATa	A change in the reply data has been detected.

:REPort?

The received Mode 5 Level 2 Report data elicited by the synchronized interrogation. The report data is:

"TYPE=<dec1>;DATA=<hex1>;COUN=<dec2>;CDAT=<dec3>;
INT=<dec4>,<dec5>,<dec6>; DEL=<dec4>,<dec5>,<dec6>"

Keywords	Meaning
TYPE	The received report type.
DATA	The 108 bits of received report data.
COUNt	The number of received reports of this type.
ChangeDATa	A change in the received data has been detected.
INTerval	The interval between reports of this type (current, minimum, maximum).
DELay	The delay between the synchronized interrogation and the first report (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODES

:EXTended

This command group returns Mode S extended squitter (DF17) information.

:ACIDent?

This command returns the received Mode S Aircraft Identification Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

:ACQuisition?

This command returns the received Mode S Acquisition Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODES

:EXTended

:APOSition?

This command returns the received Mode S Aircraft Position Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

:AVELocity?

This command returns the received Mode S Airborne Velocity Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODES

:EXTended

:EDRiven?

This command returns the received Mode S Event Driven Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

:SPOSition?

This command returns the received Mode S Surface Position Extended Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:MODES

:REPLy?

The received Mode S Reply data elicited by the synchronized interrogation. The reply data is:

"DF=<dec1>; DATA=<hex1>; CDAT=<dec2>"

Keywords	Meaning
DownlinkFormat	The received downlink format
DATA	The 56-bits or 112-bits of reply data.
ChangeDATa	A change in the reply data has been detected.

:SQUitter?

This command returns the received Mode S Acquisition (DF11) Squitter data. The returned values are:

"CDAT=<dec1>;DATA=<hex1>;COUN=<dec2>,<dec3>,<dec4>;
RTOP=<dec5>,<dec6>,<dec7>;RBOT=<dec5>,<dec6>,<dec7>;
RCOM=<dec5>,<dec6>,<dec7>"

Keywords	Meaning
ChangeDATa	A change in the received data has been detected.
DATA	The received squitter data.
COUNt	The number of received squitters received (TOP channel, BOTTom channel, and total).
RateTOP	The squitter rate of squitters received on the TOP channel (current, minimum, maximum).
RateBOTtom	The squitter rate of squitters received on the bottom channel (current, minimum, maximum).
RateCOMbined	The overall squitter rate from both channels (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:PREPly

:BOTTom?

This command returns the percent reply on the bottom channel. The current, minimum and maximum percent reply is reported for each mode.

"SIF=<dec1>,<dec2>,<dec3>;MODES=<dec1>,<dec2>,<dec3>;
MODE4=<dec1>,<dec2>,<dec3>;MODE5=<dec1>,<dec2>,<dec3>;
M5L1L2=<dec1>,<dec2>,<dec3>; DOUB=<dec1>,<dec2>,<dec3>"

Keywords	Meaning
SIF	The percent reply for SIF replies (current, minimum, maximum).
MODES	The percent reply for Mode S replies (current, minimum, maximum).
MODE4	The percent reply for Mode 4 replies (current, minimum, maximum).
MODE5	The percent reply for Mode 5 Level 1 replies to Mode 5 Level 1 Interrogations (current, minimum, maximum).
Mode5Level1Level2	The percent reply for Mode 5 Level 1 replies to Mode 5 Level 2 Interrogations (current, minimum, maximum).
DOUBle	The percent reply for the reply to the second interrogation in a double interrogation pair. (current, minimum, maximum).

:TOP?

This command returns the percent reply on the top channel. The current, minimum and maximum percent reply is reported for each mode.

"SIF=<dec1>,<dec2>,<dec3>;MODES=<dec1>,<dec2>,<dec3>;
MODE4=<dec1>,<dec2>,<dec3>;MODE5=<dec1>,<dec2>,<dec3>;
M5L1L2=<dec1>,<dec2>,<dec3>; DOUB=<dec1>,<dec2>,<dec3>"

Keywords	Meaning
SIF	The percent reply for SIF replies (current, minimum, maximum).
MODES	The percent reply for Mode S replies (current, minimum, maximum).
MODE4	The percent reply for Mode 4 replies (current, minimum, maximum).
MODE5	The percent reply for Mode 5 Level 1 replies to Mode 5 Level 1 Interrogations (current, minimum, maximum).
Mode5Level1Level2	The percent reply for Mode 5 Level 1 replies to Mode 5 Level 2 Interrogations (current, minimum, maximum).
DOUBle	The percent reply for the reply to the second interrogation in a double interrogation pair. (current, minimum, maximum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:PULSe

:ENVelope?

This command returns the spacing between the decoded Mode 5 symbol reference position and the 90% point of the falling edge of the pulse in uS. The returned data is:

"ENV=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
ENVelope	The Mode 5 envelope measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:FALL?

This command returns the fall time of the pulse in uS. The fall time is the time between the 90% and 10% points on the falling edge of the pulse. The returned data is:

"FALL=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
FALL	The pulse's fall time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:FREQuency?

This command returns the measured frequency of the pulse in MHz.
The returned data is:

"FREQ=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
FREQuency	The selected pulse's frequency measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:IDENt?

This command identifies the pulse being measured. The returned data is:

"IDEN=<string1>"

Keyword	Meaning
IDENt	The pulse that is currently being measured.

:POWer?

This command returns the measured power of the pulse in dBm. For Mode 5 this is the average power of the pulse top. For all other modes this is the peak value of the pulse top. The returned data is:

"POW=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
POWer	The selected pulse's power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

5.4.7 TRANsponder Commands (cont)

:MEASure

:PULSe

:RIPPle?

This command returns the measured ripple of the pulse in dB. The returned data is:

"RIPP=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
RIPPle	The selected pulse's ripple power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:RISE?

This command returns the rise time of the pulse in nS. The rise time is the time between the 10% and 90% points on the rising edge of the pulse. The returned data is:

"RISE=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
RISE	The pulse's rise time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:SPACing?

This command returns the measured spacing of the pulse from the reference pulse in the reply in uS. The returned data is:

"SPAC=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
SPACing	The selected pulse's pulse spacing measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:SSPacing?

This command returns the spacing between the decoded Mode 5 symbol and the decoded preamble symbol in the reference pulse in uS. The returned data is:

"SSP=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
SymbolSPacing	The Mode 5 symbol spacing (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:PULSe

:WIDTh10?

This command returns the width of the pulse at the 10% points in uS. The returned data is:

"WIDT10=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh10	The width of the pulse measured from the 10% point on the rising edge to the 10% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:WIDTh50?

This command returns the width of the pulse at the 50% points in uS. The returned data is:

"WIDT50=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh50	The width of the pulse measured from the 50% point on the rising edge to the 50% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:WIDTh90?

This command returns the width of the pulse at the 90% points in uS. The returned data is:

"WIDT90=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh90	The width of the pulse measured from the 90% point on the rising edge to the 90% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

5.4.7 TRANsponder Commands (cont)

:MEASure

:REPLy?

This command returns both the reply delay and jitter measurements in microseconds. The returned data is:

"DEL=<dec1>,<dec2>,<dec3>; JITT=<dec1>,<dec2>,<dec3>; STAB=<dec4>"

Keyword	Meaning
DELay	The reply delays measurement (current, minimum and maximum).
JITTer	The reply jitter measurement (current, minimum and maximum).

:DELay?

This command returns the current, minimum and maximum reply delay measurements in nanosecond resolution. The returned data is:

"DEL=<dec1>,<dec2>,<dec3>"

Keyword	Meaning
DELay	The reply delay measurement (current, minimum and maximum).

:JITTer?

This command returns the current, minimum and maximum reply delay jitter measurements in nanosecond resolution. The returned data is:

"JITT=<dec1>,<dec2>,<dec3>"

Keyword	Meaning
JITTer	The reply jitter measurement (current, minimum and maximum).

:STABility?

This command returns the Mode 4 TDV stability flag. If the TDV jitter is less than 0.250 uS the stability flag is set. The returned data is:

"STAB=<dec1>"

Keyword	Meaning
STABility	The Mode 4 TDV is stable (1) or unstable (0).

5.4.7 TRANsponder Commands (cont)

:MEASure

:SETup?

This command returns the configured measurement setup parameters. The returned parameters are:

"SYNC=<dec1>; CHAN=<string1>; SPUL=<dec2>; SREP=<dec3>; SIF=<string2>; MODES=<string3>; MODE4=<string4>; M5L1=<string5>; M5L2=<string6>; ACL=<string7>; REP=<string8>; RANG=<dec4>"

Keyword	Meaning
SYNC	The synchronized interrogation number.
CHANnel	The measured reply channel in diversity mode.
TOP	Replies received on the top channel will be measured in diversity mode.
BOTTom	Replies received on the bottom channel will be measured in diversity mode.
SamplesPULse	The number of samples used for averaging pulse measurements.
SamplesREPly	The number of interrogations to send for calculating percent reply.
SIF	The measured SIF reply pulse. (A<1,2,4>,B<1,2,4>,C<1,2,4>,D<1,2,4>,F<1,2>,X, 1A<1,2,4>,1B<1,2,4>,1C<1,2,4>,1D<1,2,4>,1F<1,2>,1X, 2F<1,2>, 3F<1,2>)
MODES	The measured Mode S reply/squitter pulse (P<1~4>,S<1~112>).
MODE4	The measured Mode 4 reply pulse (R<1~4>).
Mode5Level1	The measured Mode 5 Level 1 reply pulse (P<1~2>,D<1~9>).
Mode5Level2	The measured Mode 5 Level 2 report/squitter pulse (P<1~4>,D<1~33>).
ACL	The expected reply to an All-Call Long interrogation.
MODES	Measure Mode S replies in response to All-Call Long interrogations.
SIF	Measure SIF replies response to All-Call Long interrogations.
REPort	The expected reply to Mode 5 Level 2 interrogations.
LEVel1	Measure Level 1 replies in response to Level 2 interrogations.
LEVel2	Measure Level 2 reports in response to Level 2 interrogations.
RANGe	The reply delay range to target in NMI.

5.4.7 TRANsponder Commands (cont)

:MEASure

:SETup?

:ACL { MODES | SIF }

All-Call Long interrogations can elicit Mode S or SIF replies. This command controls which reply type is expected in response to an All-Call Long interrogation. Only the reply type that has been selected will be processed for pulse parametric measurements.

:CHANnel { TOP | BOTT }

In diversity mode, replies can be received on either channel, this command controls which channel is selected for measurements. Only replies that are received on the selected channel will be processed for pulse parametric measurements. In all non-diversity modes, the measured channel is always the same as the generator channel.

:M5L1 { P<1~2> | D<1~9> }

This command selects the Mode 5 Level 1 reply pulse that will be measured.

:M5L2 { P<1~4> | D<1~33> }

This command selects the Mode 5 Level 2 report/squitter pulse that will be measured.

:MMReset

This command clears the current measurements, resets the minimum and maximum values, and clears the error flags.

:MODE4 { R<1~3> }

This command selects the Mode 4 reply pulse that will be measured.

:MODES { P<1~4> | S<1~112> }

This command selects the Mode S reply/squitter pulse that will be measured.

:RANGe { 0.00 ~ 400.00 }

This command sets the range to target in NMIs. The range to target must be set for the IFF-45TS to recover replies from the UUT.

:REPort { LEV2 | LEV1 }

Mode 5 Level 2 interrogations can elicit Level 2 reports or Level 1 replies. This command controls which reply type is expected in response to a Mode 5 Level 2 interrogation. Only the reply type that has been selected will be processed for pulse parametric measurements.

:SAMPles

:PULSe { 1 ~ 1000 }

This command sets the size of the sample set used for calculating the pulse parametric measurement results.

:REPLy { 1 ~ 8000 }

This command sets the size of the sample set used for calculating the percent reply.

5.4.7 TRANsponder Commands (cont)

:MEASure

:SETup?

:SIF { A1 | A2 | A4 | B1 | B2 | B4 | C1 | C2 | C4 | D1 | D2 | D4 | F1 | F2 | X | 1A1 | 1A2 | 1A4 | 1B1 | 1B2 | 1B4 | 1C1 | 1C2 | 1C4 | 1D1 | 1D2 | 1D4 | 1F1 | 1F2 | 1X | 2F1 | 2F2 | 3F1 | 3F2 }

This command selects the SIF reply pulse that will be measured. Where "F1" refers to the first reply group, "1F1" refers to the second reply group or first set of three emergency pulse pairs, "2F1" refers to the second emergency pulse pairs, and "3F1" refers to the last set of emergency pulse pairs.

:SYNC { 1 ~ 12 }

This command selects which interrogation is the synchronized interrogation. The synchronized interrogation is the interrogation of which the replies are measured for pulse parametric.

:SIF?

The SIF Reply data elicited by the synchronized interrogation. The reply data is:

"CODE=<hco1>; X=<string1>; FORM=<string2>; ALT=<dec1>"

Keyword	Meaning
CODE	The 4096 code of the received SIF reply.
X	The state of the X-pulse in the received SIF reply.
OFF	The X-pulse is off
ON	The X-pulse is on
FORMat	The format of the received SIF reply.
NORMal	A normal format SIF reply was received.
IDENt	An identification formatted SIF reply was received.
EMERgency	An emergency formatted SIF reply was received.
ALTitude	The altitude of the Mode C reply.

:MODE?

This command returns the current operating mode of the Transponder instrument. The returned data is:

"MODE=<string1>"

Keyword	Meaning
MODE	The current operating mode of the Transponder Instrument
NORMal	The Transponder instrument is in normal mode.
DOUBle	The Transponder instrument is in double mode.
INTerLace	The Transponder instrument is in interlace mode.
BURSt	The Transponder instrument is in burst mode.
SideLobSuppression	The Transponder instrument is in SLS mode.
PulseAmplitude	The Transponder instrument is in pulse amplitude mode.
INTerference	The Transponder instrument is in interference pulse mode.
DIVersity	The Transponder instrument is in diversity mode.

5.4.7 TRANsponder Commands (cont)

:MODE { NORM | DOUB | INTL | BURS | SLS | PAMP | INT | DIV }

This command sets the operating mode of the Transponder instrument.

:MODE4?

This command returns the configured Mode 4 challenge code that will be transmitted to the UUT when an external crypto is not in use. The returned data is:

"CHAL=<string1>"
mode4 internal challenge code: "A", "B", "C<1~16>"

Keyword	Meaning
CHALlenge	The challenge generated when an external crypto is not used to generate the challenge.
A	Non-Radiated Test Word A challenge (0x85A21E8C)
B	Non-Radiated Test Word B challenge (0xC271507A)
Cx	These challenges are from the COMSEC maintenance key (AKZT-3662 AB Segment 1A) that elicit replies in the respective slots.(C1=Slot1…C16=Slot16)
C1	Challenge 1 (0xAB587E02)
C2	Challenge 2 (0x9AF21DAE)
C3	Challenge 3 (0xABD148D3)
C4	Challenge 4 (0x30145010)
C5	Challenge 5 (0xA4126646)
C6	Challenge 6 (0x11F4D1FE)
C7	Challenge 7 (0x0708D8A9)
C8	Challenge 8 (0x49235A5F)
C9	Challenge 9 (0x4EBFCC12)
C10	Challenge 10 (0x12E7D5A6)
C11	Challenge 11 (0xABBAF7E4)
C12	Challenge 12 (0x6F072AD8)
C13	Challenge 13 (0xE7A8C5BE)
C14	Challenge 14 (0xFB8C4ECF)
C15	Challenge 15 (0xA4C8D464)
C16	Challenge 16 (0x4A4DA3A0)

:MODE4 { A | B | C<1~16> }

This command selects which Mode 4 internal challenge code will be transmitted to the UUT when an external crypto is not used to generate the challenge.

5.4.7 TRANsponder Commands (cont)

:PRF?

This command returns the configured PRF parameters. The returned parameters are:

"NORM=<dec1>; BURS=<dec2>; DOUB=<dec3>; INT=<dec4>"

Keyword	Meaning
NORMal	The PRF setting for normal mode, pulse amplitude mode, SLS mode, interference mode, and diversity mode.
BURSt	The PRF setting for burst mode.
DOUBle	The PRF setting for double mode.
INTerlace	The PRF setting for interlace mode.

:BURSt { 1 ~ 2500 }

This command sets the PRF for burst mode in 1Hz resolution.

:DOUBle { 1 ~ 400 }

This command sets the PRF for double mode in 1Hz resolution.

:INTerlace { 1 ~ 400 }

This command sets the PRF for interlace mode in 1Hz resolution.

:NORMal { 1 ~ 10000 }

This command sets the PRF for all modes but burst, double and interlace modes in 1Hz resolution.

:SLS

:CHANnel?

This command returns the configured SLS pulse transmission channel parameters. The returned parameters are:

"CHAN=<string1>"

Keyword	Meaning
CHANnel	The SLS transmission channel.
BOTTom	The SLS pulse will be transmitted on the bottom channel.
TOP	The SLS pulse will be transmitted on the top channel.

:CHANnel { BOTT | TOP }

SLS pulses can be transmitted on either channel. This provides the capability to transmit the SLS pulse on the same channel as the interrogation or on the other channel. The parameters for this command are:

5.4.7 TRANsponder Commands (cont)

:SLS

:PULSe<[1] | 2>?

This command returns the configured parameters of the first SLS pulse. The returned parameters are:

"MODE=<string1>; AMPL=<dec1>; POS=<dec2>; WIDT=<dec3>; ERR=<string2>; DATA=<hex1>; STAT=<string3>"

Keyword	Meaning
MODE	The SLS pulse id.
NONE	This SLS pulse is off.
MODE1	This SLS pulse is a Mode 1 P2
MODE2	This SLS pulse is a Mode 2 P2
MODEA	This SLS pulse is a Mode A P2
MODEC	This SLS pulse is a Mode C P2
AllCallShortA	This SLS pulse is an All-Call Short Mode A P2
AllCallLongA	This SLS pulse is an All-Call Long Mode A P2
AllCallShortC	This SLS pulse is an All-Call Short Mode C P2
AllCallLongC	This SLS pulse is an All-Call Long Mode C P2
ModeSSHort	This SLS pulse is a Mode S Short Interrogation P5
ModeSLong	This SLS pulse is a Mode S Long Interrogation P5
MODE4	This SLS pulse is a Mode 4 P5
Mode5I1	This SLS pulse is a Mode 5 I1
Mode5I2	This SLS pulse is a Mode 5 I2
AMPLitude	The amplitude of the SLS pulse relative to the amplitude of the other pulses in the interrogation.
POSition	The position of the SLS pulse relative to its nominal position.
WIDTh	The width of the SLS pulse relative to its nominal width.
ERRor	Does the MSK data of a Mode 5 SLS pulse contain an error? (applies only to Mode 5 modes).
ON	This SLS pulse is generated using the error data.
OFF	This SLS pulse is generated with the normal data.
DATA	The error MSK value to be built in the Mode 5 SLS pulse instead of the nominal value.
STATe	The generation state of the second SLS pulse. NOTE: This parameter is only returned for the SLS pulse2.

:PULSe<[1] | 2>

:AMPLitude { -15.00 to 5.00 }

This command sets the amplitude of the SLS pulse relative to the amplitude, in dB, of the other pulses in the interrogation.

:DATA { 0 to 65535 }

This command sets the MSK error state data pattern of the transmitted Mode 5 SLS pulse, when enabled. This parameter can be entered in decimal, hex, or octal.

:ERRor { OFF | ON }

This command enables or disables the presence of an error in Mode 5 SLS pulses.

5.4.7 TRANsponder Commands (cont)

:SLS

:PULSe<[1] | 2>

:MODE { NONE | MODE1 | MODE2 | MODEA | MODEC | ACSA | ACLA | ACSC | ACLC | MSSH | MSL | MODE4 | M5I1 | M5I2 }

This command selects the type of interrogations that will include this SLS pulse mode.

:POSition { -1.00 ~ 1.00 }

This command selects the position of the SLS pulse relative to its nominal position in uS.

:STATe { OFF | ON }

This command sets where the second SLS pulse is generated (only valid for the SLS pulse2).

:WIDTh { -0.500 ~ 0.500 }

This command selects the relative width of the SLS pulse by setting an offset from the nominal width of the SLS pulse in uS.

:STATus?

This command returns the status of the burst mode sequence. The returned data is:

"BURS=<string1>"

Keyword	Meaning
BURSt	State of the burst sequence.
ACTive	The burst sequence is active and interrogations are being transmitted.
IDLE	The burst sequence is idle and interrogations are not being transmitted.

:ERRor?

This command returns the Transponder instrument error flags. The returned error flags are:

"ERR=<hex1>"

Error Bit	Meaning
15 (MSB)	Reserved for future use
14	CVI mismatch
13	Unknown Mode 5 report type was decrypted
12	EDAC detected an error
11	M5 squitter measurement failed due to overflow
10	MS squitter measurement failed due to overflow
9	Unknown MS extended squitter type
8	M4 reply TDV
7	delay overflow
6	Mode 5 symbol spacing measurement failed
5	Fall time measurement failed
4	Rise time measurement failed
3	90% width measurement failed
2	50% width measurement failed
1	10% width measurement failed
0 (LSB)	Unable to find pulse to measure

5.4.7 TRANsponder Commands (cont)

:STATus?
:ERROR?
:MODE5?

This command returns additional error details when Error Bit 13 is set. The returned data is:

"SCVI=<dec1>; RCVI=<dec2>; TYPE=<dec3>"

Keyword	Meaning
StaggerCVI	The CVI of the reports stagger pattern that was in error.
ReportCVI	The decrypted CVI from the message data of the report that was in error.
TYPE	The decrypted report Type from the message data of the report that was in error.

:MODES?

This command returns additional error details when Error Bit 9 is set. The returned data is the ME field of the unknown received squitter. "ME=<string1>"

:TABLe?

This command returns the current table's entries configuration. The returned data is:

"TABL=<dec1>; MODE=<string1>; STAT=<string2>"

Keyword	Meaning
TABLe	The table index.
MODE	The configured interrogation mode.
NONE	This table entry is not configured.
MODE1	This table entry is configured for a Mode 1 Interrogation
MODE2	This table entry is configured for a Mode 2 Interrogation
MODEA	This table entry is configured for a Mode A Interrogation
MODEC	This table entry is configured for a Mode C Interrogation
AllCallShortA	This table entry is configured for an All-Call Short Mode A Interrogation
AllCallLongA	This table entry is configured for an All-Call Long Mode A Interrogation
AllCallShortC	This table entry is configured for an All-Call Short Mode C Interrogation
AllCallLongC	This table entry is configured for an All-Call Long Mode C Interrogation
ModeS	This table entry is configured for a Mode S Interrogation
MODE4	This table entry is configured for a Mode 4 Interrogation
MODE5	This table entry is configured for a Mode 5 Interrogation
STATe	The state of the table entry
ON	This entry will be used to generate interrogations.
OFF	This entry will be ignored.

5.4.7 TRANsponder Commands (cont)

:TABLe { 1 ~ 12 }

This command sets which table entry will be modified or queried with the rest of the table commands.

:MODE { NONE | MODE1 | MODE2 | MODEA | MODEC | ACSA | ACLA | ACSC | ACLC | MODES | MODE4 | MODE5 }

This command sets the type of interrogation generated by the table entry.

:MODE5?

This command returns the Mode 5 specific interrogation configuration for the table entry. The returned data is:

"FORM=<dec1>; SPRE=<string1>; RDAT=<hex1>; TYPE=<string2>; DATA=<hex2>"

Keyword	Meaning
FORMat	The format of the Mode 5 interrogation.
SPREad	Configures the operation of the spread code.
ON	This interrogation will be spread using the spread code.
OFF	This interrogation will not be spread using the spread code.
RandomDATa	This value populates the random data field of the interrogation, only in the user raw, URAW, data type
TYPE	The configuration type for the Mode 5 interrogation.
UserRAW	In this mode the interrogation is created using the format and Random Data fields and information from the crypto.
CryptoRAW	In this mode the interrogation is created using the format field and crypto data.
ENCRypted	In this mode the interrogation is created from the table entry's data field. NOTE: In this mode the unit is not possible to receive Mode 5 replies. NOTE: Not recommended for use.
DATA	The eleven encrypted data symbols for use in Encrypted data mode.

:DATA { <1 ~ 11 symbols> }

This command sets the eleven interrogation data symbols.
This data is only when the interrogation is configured for encrypted data (ENCR) mode

:TYPE { URAW | CRAW | ENCR }

This command selects which interrogation building method is to be used.

:FORMat { 0 ~ 31 }

This command sets the format field data for the interrogation.

5.4.7 TRANsponder Commands (cont)

:TABLE

:MODE5?

:RANDom { 0 ~ 65535 }

This command sets the directed spread and stagger index for the Mode 5 level 1 reply.

Bit Fields	Meaning
15 (MSB) – 12	Reserved for future use
11 – 8	Level 1 Directed Stagger index
7 – 0(LSB)	Level 1 Directed Spread index

:SPRead { OFF | ON }

This command enables or disables the use of the Mode 5 spreading function.

:MODES?

This command returns the Mode S specific interrogation configuration for the table entry. The returned data is:

"UF=<dec1>; SOUR=<string1>; UADD=<hex1>; SADD=<hex2>; DSH=<hex3>; DLON=<hex4>"

Keyword	Meaning
UF	Interrogation Format
SOURce	Interrogation address source
USER	Use the user entered Mode S address
SQUitter	Use the received squitter address
UserADDress	User entered Mode S address
SquitterADDress	Received squitter Address
DataSHort	Mode S short interrogation data (27 bits)
DataLONg	Mode S long interrogation data (83 bits)

:ADDRess { <1 ~ 7 symbols> }

This command sets the user defined address for the interrogation.

:SOURce { SQU | USER }

This command sets the source of the address data for the interrogation.

:DATA

:LONG { <1 ~ 21 symbols> }

This command sets the 83 data bit of the long interrogation formats between the format and address fields. This data is entered in hexadecimal or octal formats.

:SHORt { <1 ~ 7 symbols> }

This command sets the 27 data bit of the long interrogation formats between the format and address fields. This data is entered in hexadecimal or octal formats.

:UF { 0 ~ 31 }

This command sets the 5 bit interrogation format field.

:STATe { OFF | ON }

This command enables or disables the interrogation slot.

5.4.7 TRANsponder Commands (cont)

:TRIGger

:IN?

This command returns the external trigger input configuration. The returned data is:

"STAT=<string1>; DEL=<dec1>"

Keyword	Meaning
STATe	The state of the external trigger input
ON	The rising edge of the pulse initiates an interrogation.
OFF	Inputs to this port are ignored.
DELay	The delay from the rising edge of the external input to the start of the transmission sequence.

:IN { OFF | ON }

This command controls the use of the external input port. When ON the internal PRF generator is disabled and the external source initiates the transmission of an interrogation.

:DELay { 0.008 ~ 20.000 }

This command sets the delay between the input trigger and the start of the transmit sequence of the interrogation.

:OUT?

This command returns the trigger out configuration.

"TARG=<dec1>; LOC=<string1>; POS=<dec2>"

Keyword	Meaning
TARGet	The interrogation which to generate the trigger (The synchronized interrogation).
LOCation	The location of the trigger
INTerrogation	The position is in respect to the timing reference of the interrogation.
REPLy	The position is in respect to the detection of the reply.
POSition	The delay from the timing reference of the interrogation or detection of the reply.

:LOCation { INT | REPL }

This command sets the reference position for the trigger output.

:POSition { 0.000 ~ 8000.000 }

This command sets the position of the trigger out relative to the timing reference

5.4.7 TRANsponder Commands (cont)

:VARiable<[1] | 2 | 3>?

This command returns the configuration of the three variable pulses.

"SIF=<string1>; MODES=<string1>; MODE4=<string1>; MODE5=<string1>; MODE=<string2>; AMPL=<dec1>; POS=<dec2>; WIDT=<dec3>; ERR=<string3>; DATA=<hex1>; ACT=<string4>"

Keyword	Meaning
SIF	SIF mode pulse to modify P<1~4>
MODES	Mode S mode pulse to modify P<1~2> | SPR | P5 | P6
MODE4	Mode 4 mode pulse to modify P<1~5> | D<1~32> | All<1~31>
MODE5	Mode 5 mode pulse to modify P<1~4> | I<1~2> | D<1~11>
MODE	Interrogation mode to modify pulses
NONE	Disable this variable pulse.
MODE1	Modify all Mode 1 interrogations.
MODE2	Modify all Mode 2 interrogations.
MODEA	Modify all Mode A interrogations.
MODEC	Modify all Mode C interrogations.
ACSA	Modify all All Call Short A interrogations.
ACLA	Modify all All Call Long A interrogations.
ACSC	Modify all All Call Short C interrogations.
ACLC	Modify all All Call Long C interrogations.
MSSH	Modify all Mode S Short interrogations.
MSL	Modify all Mode S Long interrogations.
MODE4	Modify all Mode 4 interrogations.
MODE5	Modify all Mode 5 interrogations.
AMPLitude	The relative amplitude of the pulse.
POSition	The relative position of the pulse
WIDTh	The relative width of the pulse
ERRor	Selection
ON	Generate the normal data pattern for the pulse.
OFF	Generate the error data pattern for the pulse.
DATA	The error data for Mode 5 pulses.
ACTion	Controls the pulse build state.
MODify	Modify the pulse as specified.
DELete	Delete the pulse (do not generate the pulse)

:ACTion { MOD | DEL }

This command selects whether to modify or delete the specified pulse.

:AMPLitude { -15.00 ~ 5.00 }

This command sets the relative amplitude of the modified pulse in dB.

:DATA { 0 ~ 65535 }

This command sets the MSK error state data pattern of the transmitted Mode 5 pulse, when enabled. This parameter can be entered in decimal, hex, or octal.

5.4.7 TRANsponder Commands (cont)

:VARiable<[1] | 2 | 3>?

:ERRor { OFF | ON }
This command enables or disables the presence of an error in Mode 5 pulses.

:MODE { NONE | MODE1 | MODE2 | MODEA | MODEC | ACSA | ACLA | ACSC | ACLC | MSSH | MSL | MODE4 | MODE5 }
This command selects the type of interrogations that will include this pulse mode.

:MODE4 { P<1~5> | D<1~32> | All<1~31> }
This command selects which pulse of a Mode 4 interrogation to modify or delete.

:MODE5 { P<1~4> | I<1~2> | D<1~11> }
This command selects which pulse of a Mode 5 interrogation to modify or delete.

:MODES { P<1~2> | SPR | P5 | P6 }
This command selects which pulse of a Mode S interrogation to modify or delete.

:POSition { -1.00 ~ 1.00 }
This command sets the relative position offset from the pulses nominal position in uS.

:SIF { P<1~4> }
This command selects which pulse of a Mode 4 interrogation to modify or delete.
P4 is only valid for an All Call Long interrogation.

:WIDTh { -0.500 ~ 0.500 }
This command sets the relative width offset from the pulses nominal width in uS.

5.4.8 INTerrogator Commands

These commands set up the Interrogator Instrument for testing an Interrogator.

:ECHO?

This command returns the configuration for the echo sub operating mode.

"AMPL=<dec1>; DEL=<dec2>"

Keyword	Meaning
AMPLitude	The amplitude of the echo reply.
DELay	The delay time to the echo reply

:AMPLitude { -15.00 ~ 3.00 }

This command sets the relative amplitude of the echo response in dB.

:DELay { 0 ~ 15.000 }

This command sets the delay between the normal response and the echo response.

:GATE?

This command returns the configuration of the external reply gate.

"GATE=<string>"

Keyword	Meaning
GATE	The state of the external trigger input
ON	The external gate input suppresses replies when active.
OFF	The external gate input is ignored.

:GATE { OFF | ON }

This command sets the units response to the external gate input.

:GENerator

:BDELay?

This command returns the delay of the bottom channel. This setting is only used in Sum / Difference operation.

"DEL=<dec1>"

Keyword	Meaning
DEL	The bottom channel delay.

:BDELay { -1.000 ~ 1.000 }

This command sets the relative delay of the bottom channel in Sum/Difference operation.

5.4.8 INTerrogator Commands (cont)

:GENerator

:CONTrol?

This command returns the generator control parameters.

"CONT=<string>"

Keyword	Meaning
CONTrol	The generator control settings
OFF	The generator is off, no RF power is emitted.
ON	The generator is on, interrogation RF power is emitted.
CW	The generator is generating an CW waveform.

:CONTrol { OFF | ON | CW }

This command controls the output of the generator. The generator can be turned OFF, no RF power will be emitted even if interrogations are being generated. The generator can be turned ON, RF power will be emitted when interrogations are generated. The generator can generate a continuous waveform.

:CW?

This command returns the frequency offset of the generated CW.

"CW=<string1>"

Keywords	Meanings
CW	The frequency offset of the CW from the transmit frequency.
MARK	The CW is generated 4 MHz below the transmit frequency.
NOMinal	The CW is generated at the transmit frequency.
SPACe	The CW is generated 4 MHz above the transmit frequency.

:CW { MARK | NOM | SPAC }

This command sets the frequency offset of the generated CW.

:FREQuency?

This command returns the current transmit frequency.

"FREQ=<dec1>"

Keyword	Meaning
FREQuency	The transmit frequency (in MHz)

:FREQuency { 952.000 ~ 1225.000 }

This command sets the current transmit frequency.

5.4.8 INTerrogator Commands (cont)

:GENerator

:POWer?

This command returns the transmit power levels for the top and bottom channels on the direct and antenna ports.

"DTOP=<dec1>; DBOT=<dec2>; ATOP=<dec3>; ABOT=<dec4>"

Keyword	Meaning
DTOP	Transmit power on the top channel of the direct port.
DBOTtom	Transmit power on the bottom channel of the direct port.
ATOP	Transmit power on the top channel of the antenna port.
ABOTtom	Transmit power on the bottom channel of the antenna port.

:BOTTom

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the bottom channel on the antenna port.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the bottom channel on the direct port.

:TOP

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the top channel on the antenna port.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the top channel on the direct port.

:INTerference?

This command returns the current settings of the interference sub-mode parameters. The returned parameters are:

"AMPL=<dec1>; POS=<dec2>; WIDT=<dec3>; SPAC=<dec4>; STAT=<string1>; DATA=<hex1>; FORM=<string2>"

Keywords	Meaning
AMPLitude	The amplitude of the interference pulses relative to the interrogation.
POSition	The position of the first interference pulse relative to the timing reference of the interrogation.
WIDTh	The width of the interference pulses.
SPACing	The spacing between the first and second interference pulses.
STATe	The state of the second interference pulse.
OFF	The second interference pulse is off.
ON	The second interference pulse is on.
DATA	The MSK Data if the interference pulses are MSK pulses.
FORMat	The modulation format.
CW	The interference pulse modulation is CW.
MSK	The interference pulse modulation is MSK.

5.4.8 INTerrogator Commands (cont)

:INTerference?

:AMPLitude { -15.00 ~ 5.00 }

This command sets the amplitude of the interference pulses. The amplitude is relative to the amplitude of the interrogation.

:DATA { 0 ~ 65535 }

This command sets the MSK modulation data if the pulse format is MSK. This data determines the frequency content of the interference pulse.

:FORMat { CW | MSK }

This command selects the pulse modulation format. Interference pulses can be modulated as CW or MSK pulses.

Keyword	Meaning
CW	The interference pulses will be modulated as CW pulses.
MSK	The interference pulses will be modulated as Minimum Shift Keying pulses.

:POSition { -1.000 ~ 400.000 }

This command sets the position of the first interference pulse relative to the interrogation timing reference.

:SPACing { 1.000 ~ 400.000 }

This command sets the spacing between the first and second interference pulses.

:STATe { OFF | ON }

This command controls the state of the of second interference pulse. The second interference pulse can be turned on and off independently from the first interference pulse.

:WIDTh { 0.250 ~ 32.000 }

This command sets the width of the interference pulses.

:MEASure

:MODE5?

This command returns all the Mode 5 interrogation data sorted by the decoded format of the interrogation. The returned parameters are:

"FORM1=<dec>,<hex>; FORM2=<dec>,<hex>; FORM3=<dec>,<hex>;
FORM4=<dec>,<hex>; FORM5=<dec>,<hex>; FORM6=<dec>,<hex>;
FORM7=<dec>,<hex>; FORM8=<dec>,<hex>; FORM9=<dec>,<hex>;
FORM16=<dec>,<hex>; FORM17=<dec>,<hex>; FORM18=<dec>,<hex>;
FORM19=<dec>,<hex>; FORM20=<dec>,<hex>; FORM21=<dec>,<hex>;
FORM22=<dec>,<hex>; FORM23=<dec>,<hex>"

Keyword	Meaning
FORMat[x]	The decoded format of the received interrogation.
<dec>	A flag that indicates the received data has changed.
<hex>	The decrypted data from the interrogation. (36bits)

5.4.8 INTerrogator Commands (cont)

:MEASure

:MODE5?

:FORMat <0~9, 16~23>?

This command returns the Mode 5 interrogation data for specified decoded interrogation format. The returned parameters are:

"CDAT=<dec1>; DATA=<hex1>"

Keyword	Meaning
ChangeDATa	A flag that indicates the received data has changed.
DATA	The decrypted data from the interrogation. (36bits)

:MODES?

This command returns all the Mode S interrogation data sorted by the decoded format of the interrogation. The returned parameters are:

"UF0=<dec>,<hex1>; UF4=<dec>,<hex1>; UF5=<dec>,<hex1>;
UF11=<dec>,<hex1>; UF16=<dec>,<hex2>; UF20=<dec>,<hex2>;
UF21=<dec>,<hex2>; UF24=<dec>,<hex2>"

Keyword	Meaning
UplinkFormat[x]	The decoded format of the received interrogation.
<dec>	A flag that indicates the received data has changed.
<hex>	The decrypted data (short=56bits, long=112bits) from the received interrogation with parity removed from the AP field.

:UF <0,4,5,11,16,20,21,24>?

This command returns the Mode S interrogation data for specified decoded uplink format. The returned parameters are:

"CDAT=<dec1>; DATA=<hex1>"

Keyword	Meaning
ChangeDATa	A flag that indicates the received data has changed.
DATA	The decrypted data (short=56bits, long=112bits) from the received interrogation with parity removed from the AP field.

:PRF?

This command returns the measured pulse repetition rates, PRFs, for the received interrogations. The returned parameters are:

"SIF=<dec1>; MODES=<dec2>; MODE4=<dec3>; MODE5=<dec4>"

Keyword	Meaning
SIF	The PRF rate for all SIF interrogations (Mode1, Mode2, ModeA, and ModeC
MODES	The PRF rate for Mode S interrogations.
MODE4	The PRF rate for Mode 4 interrogations.
MODE5	The PRF rate for Mode 5 interrogations.

5.4.8 INTerrogator Commands (cont)

:MEASure

:PULSe

:ENVelope?

This command returns the spacing between the decoded Mode 5 symbol reference position and the 90% point of the falling edge of the pulse in uS. The returned data is:

"ENV=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
ENVelope	The Mode 5 envelope measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:FALL?

This command returns the fall time of the pulse in uS. The fall time is the time between the 90% and 10% points on the falling edge of the pulse.
The returned data is:

"FALL=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
FALL	The pulse's fall time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:FREQuency?

This command returns the measured frequency of the pulse in MHz.
The returned data is:

"FREQ=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
FREQuency	The selected pulse's frequency measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:IDENt?

This command identifies the pulse being measured. The returned data is:

"IDEN=<string1>"

Keyword	Meaning
IDENt	The pulse that is currently being measured.

5.4.8 INTerrogator Commands (cont)

:MEASure

:PULSe

:POWer?

This command returns the measured power of the pulse in dBm. For Mode 5 this is the average power of the pulse top. For all other modes this is the peak value of the pulse top. The returned data is:

"POW=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
POWer	The selected pulse's power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:RIPPle?

This command returns the measured ripple of the pulse in dB. The returned data is:

"RIPP=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
RIPPle	The selected pulse's ripple power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

:RISE?

This command returns the rise time of the pulse in nS. The rise time is the time between the 10% and 90% points on the rising edge of the pulse. The returned data is:

"RISE=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
RISE	The pulse's rise time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:SPACing?

This command returns the measured spacing of the pulse from the reference pulse in the reply in uS. The returned data is:

"SPAC=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
SPACing	The selected pulse's pulse spacing measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum)

5.4.8 INTerrogator Commands (cont)

:MEASure

:PULSe

:SSPacing?

This command returns the spacing between the decoded Mode 5 symbol and the decoded preamble symbol in the reference pulse in uS. The returned data is:

"SSP=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
SymbolSPacing	The Mode 5 symbol spacing (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:WIDTh10?

This command returns the width of the pulse at the 10% points in uS. The returned data is:

"WIDT10=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh10	The width of the pulse measured from the 10% point on the rising edge to the 10% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:WIDTh50?

This command returns the width of the pulse at the 50% points in uS. The returned data is:

"WIDT50=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh50	The width of the pulse measured from the 50% point on the rising edge to the 50% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:WIDTh90?

This command returns the width of the pulse at the 90% points in uS. The returned data is:

"WIDT90=<dec1>,<dec2>,<dec3>,<dec4>,<dec5>,<dec6>"

Keyword	Meaning
WIDTh90	The width of the pulse measured from the 90% point on the rising edge to the 90% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

5.4.8 INTerrogator Commands (cont)

:MEASure

:RECeive?

This command returns the interrogation types are currently being received. The returned data is:

"MODE1=<string1>; MODE2=<string2>; MODEA=<string3>; MODEC=<string4>; ACLA=<string5>; ACLC=<string6>; MODES=<string7>; MODE4=<string8>; MODE5=<string9>"

Keyword	Meaning
MODE1	Shows if a Mode 1 interrogation is being received.
MODE2	Shows if a Mode 2 interrogation is being received.
MODEA	Shows if a Mode 3/A interrogation is being received.
MODEC	Shows if a Mode C interrogation is being received.
ACLA	Shows if an All Call Long Mode A interrogation is being received.
ACLC	Shows if an All Call Long Mode C interrogation is being received.
MODES	Shows if a Mode S interrogation is being received.
MODE4	Shows if a Mode 4 interrogation is being received.
MODE5	Shows if a Mode 5 interrogation is being received.
OFF	This type of interrogation is not being received.
ON	This type of interrogation is being received.

:SETup?

This command returns the configured measurement setup parameters. The returned parameters are:

"MODE=<string1>; CHAN=<string2>; SAMP=<dec1>; SIF=<string3>; MODES=<string4>; MODE4=<string5>; MODE5=<string6>"

Keyword	Meaning
MODE	
CHANnel	The measured reply channel in diversity mode.
TOP	Measure interrogation data on the top channel.
BOTTom	Measure interrogation data on the bottom channel. NOTE: Only valid in Sum/Diff mode. Also, the only pulse allowed to measure is the SLS on this channel.
SAMPles	The number of pulse measurements to average.
SIF	The measured SIF reply pulse. (P<1~4>)
MODES	The measured Mode S reply/squitter pulse (P<1~2>, P6B, P6E, SPR, P5).
MODE4	The measured Mode 4 reply pulse (P<1~5>, D<1~32>, AII<1~31>).
MODE5	The measured Mode 5 Level 1 reply pulse (P<1~4>, I<1~2>, D<1~11>).

5.4.8 INTerrogator Commands (cont)

:MEASure

:SETUP?

:CHANnel { TOP | BOTT }

In Sum / Diff mode, the SLS pulse is measureable on both the top and bottom channels. This command allows the user to select the channel to measure the SLS pulse.

:MMReset

This command clears the current measurements, resets the minimum and maximum values, and clears the error flags.

:MODE { MODE1 | MODE2 | MODEA | MODEC | MODES | MODE4 | MODE5 ACLC | ACLA }

This command sets the interrogation mode to be measured.

:MODE4 { P<1~5> | D<1~32> | AII<1~31> }

This command selects the Mode 4 interrogation pulse to be measured.

:MODE5 { P<1~4> | I<1~2> | D<1~11> }

This command selects the Mode 4 interrogation pulse to be measured.

:MODES { P<1~2> | P6B | SPR | P5 | P6E }

This command selects the Mode S interrogation pulse to be measured.

:SAMPles { 1 ~ 200 }

This command sets the size of the sample set used for calculating the pulse parametric measurement results.

:SIF { P<1~4> }

This command selects the SIF interrogation pulse to be measured.

:MODE?

This returns the sub-operating mode of the interrogator instrument. The returned data is:

"MODE=<string1>"

Keyword	Meaning
MODE	Interrogator instrument sub-operating mode.
NORMal	Instrument in normal operating mode.
PulseAMPlitude	Instrument in pulse amplitude control mode.
INTerference	Instrument in interference pulse generation mode.
SumDIFference	Instrument in sum / difference operating mode.
ECHO	Instrument in echo reply generation mode.

5.4.8 INTerrogator Commands (cont)

:MODE { NORM | PAMP | INT | SDIF | ECHO }

This command sets the sub-operating mode of the interrogator instrument.

:SLS?

This command returns the units operation when receiving an interrogation with an SLS pulse present. The returned data is:

"SLS=<string1>"

Keyword	Meaning
SLS	SLS operating mode.
IGNore	The unit responds regardless of the presence of an SLS pulse.
RESPect	The unit responds only if the SLS pulse is not present.

:SLS { IGN | RESP }

This command sets the units operation with respect to a received SLS pulse.

:SQUitter?

This command returns the squitter configuration. The returned data is:

"STAT=<string1>; NOM=<dec1>; RANG=<dec2>"

Keyword	Meaning
STATe	T
OFF	The 12th target is a normal target
ON	The 12th target is designated as a squitter target
NOMinal	The nominal spacing of the squitters.
RANGe	The variation range of the squitter

:SQUitter { OFF | ON }

The command determines if the 12th target is controlled by received interrogations or by the periodic squitter timer.

:NOMinal { 0.400 ~ 10.200 }

This command sets the nominal time between squitters in mS. The actual interval between squitters is the nominal time +/- the range setting.

:RANGe { 0.000 ~ 0.600 }

This command sets the randomized range for the squitter interval in mS.

5.4.8 INTerrogator Commands (cont)

:STATus?

This command returns the number of interrogation received by type and the number of responses generated for that type. The maximum count value is 65535. The returned data is:

"TOT=<dec1>,<dec2>; MODE1=<dec1>,<dec2>; MODE2=<dec1>,<dec2>; MODEA=<dec1>,<dec2>; MODEC=<dec1>,<dec2>; MODES=<dec1>,<dec2>; MODE4=<dec1>,<dec2>; M5L1=<dec1>,<dec2>; M5L2=<dec1>,<dec2>; MODE5=<dec1>; ACLA=<dec1>; ACLC=<dec1>"

Keyword	Meaning
TOTal	The total number of interrogations and replies.
MODE1	The number of Mode 1 interrogations and replies.
MODE2	The number of Mode 2 interrogations and replies.
MODEA	The number of Mode A interrogations and replies.
MODEC	The number of Mode C interrogations and replies.
MODE4	The number of Mode 4 interrogations and replies.
Mode5Level1	The number of Mode 5 Level 1 interrogations and replies.
Mode5Level2	The number of Mode 5 Level 2 interrogations and replies.
MODE5	The total number of Mode 5 interrogations.
AllCallLongA	The number of All Call Long Mode A interrogations.
AllCallLongC	The number of All Call Long Mode C interrogations.
<dec1>	The number of received interrogation of this type.
<dec2>	The number of replies of this type generated.

:ERRor?

This command returns the Interrogator instrument error flags. The returned error flags are:

"ERR=<hex1>"

Error Bit	Meaning
12 to 15 (MSB)	Reserved for future use
11	CVI mismatch
10	EDAC detected an error
9	Unknown Mode 5 report type requested
8	Mode S address mismatch
7	Unit transmission was suppressed
6	Mode 5 symbol spacing measurement failed
5	Fall time measurement failed
4	Rise time measurement failed
3	90% width measurement failed
2	50% width measurement failed
1	10% width measurement failed
0 (LSB)	Unable to find pulse to measure

5.4.8 INTerrogator Commands (cont)

:STATus?

:ERRor?

:MODE5?

This command returns additional error details when Error Bit 13 is set. The returned data is:

"SCVI=<dec1>; ICVI =<dec2>; FMT =<dec3>"

Keyword	Meaning
StaggerCVI	The CVI of the interrogation stagger pattern that was in error.
InterrogationCVI	The decrypted CVI from the interrogation data that was in error.
FMT	The decrypted interrogation format that was in error.

:TABLe?

This command returns the current table's entries configuration. The returned data is:

"TABL=<dec1>; MODE=<string1>; STAT=<string2>; SOUR=<string3>; RDS=<string4>; DIST=<dec2>; TSIF=<dec3>; TMODS=<dec3>; TMOD4=<dec3>; TMOD5=<dec3>; EFF=<dec4>"

Keyword	Meaning
TABLe	The table index.
MODE	The configured reply mode.
NONE	This table entry is not configured.
MODE1	This table entry is configured for a Mode 1 reply
MODE2	This table entry is configured for a Mode 2 reply
MODEA	This table entry is configured for a Mode A reply
MODEC	This table entry is configured for a Mode C reply
AllCallLongA	This table entry is configured for an All-Call Long Mode A reply
AllCallLongC	This table entry is configured for an All-Call Long Mode C reply
ModeS	This table entry is configured for a Mode S reply
MODE4	This table entry is configured for a Mode 4 reply
MODE5	This table entry is configured for a Mode 5 reply
STATe	The state of the table entry
ON	This entry will be used to generate replies.
OFF	This entry will be ignored.
SOURce	The transmit trigger source for the reply
INTernal	The received interrogation triggers the reply.
EXTernal	The external trigger input triggers the reply.
ReplyDelaySource	Indicates which configuration controls the reply delay.
DIST	The distance entry sets the targets reply delay.
TIME	The time entry sets the target reply delay.
DISTance	The reply delay distance setting for all replies.
TimeSIF	The reply delay time setting for SIF replies.
TimeMODeS	The reply delay time setting for Mode S replies.
TimeMODe4	The reply delay time setting for Mode 4 replies.
TimeMODe5	The reply delay time setting for Mode 5 replies.
EFFiciency	The reply efficiency of the reply.

5.4.8 INTerrogator Commands (cont)

:TABLe { 1 ~ 12 }

This command sets which table entry will be modified or queried with the rest of the table commands.

:EFFiciency { 1 ~ 100 }

This command sets the reply efficiency of the target in percent..

:MODE { NONE | MODE1 | MODE2 | MODEA | MODEC | MODES | MODE4 | MODE5 | ACLC | ACLA }

This command sets the type of interrogation the target will reply to.

:MODE4?

This command returns the table entries Mode 4 specific configuration. The returned data is:

"SLOT=<dec1>; SOUR=<string1>"

Keyword	Meaning
SLOT	The slot to reply in for USER mode operation.
SOURce	The Mode 4 reply delay source.
USER	The user slot controls the reply delay.
CHALlenge	The Crypto determines the reply delay from the challenge data.

:SOURce { USER | CHAL }

This command selects the Mode 4 reply delay source setting for the target.

:SLOT { 1 ~ 16 }

This command sets the USER mode replay delay slot for the target.

5.4.8 INTerrogator Commands (cont)

:TABLe

:MODE5?

This command returns the table entries Mode 5 specific configuration. The returned data is:

"TYPE=<string1>; FORM=<dec1>; SPR=<string2>; LEV2=<string3>; L1RD=<hex1>; L1ED=<hex2>; L2RD=<hex3>; L2ED=<hex4>"

Keyword	Meaning
TYPE	The control of the reply build information source.
UserRAW	The user raw data is used for transmission. The user specifies the Mode 5 Level 1 RRD value as the first 2 symbols of the data.
CryptoRAW	The user raw data is used for transmission. The crypto selects the Mode 5 Level 1 RRD value and overwrites the RRD field(s) of the transmission.
ENCrypted	The encrypted data is used for transmission. (NOTE: Not recommended for use)
FORM	The Mode 5 interrogation format to reply to.
SPR	The use of the spreading function.
ON	The spreading function is used.
OFF	The spreading function is not used.
LEV2	This control the response to a Mode 5 format 16 or greater interrogation.
ON	If the target is configured for a format 16 or above, a series of Mode 5 Level 2 reports is generated.
OFF	If the target is configured for a format 16 or above, a single Mode 5 Level 1 reply is generated.
L1RawData	This is the 9 data symbol reply transmission. In user mode, the first 2 symbols are interpreted as the random reply delay, RRD, of the reply. In crypto mode the RRD symbols are overwritten with the RRD value selected by the crypto.
L1EncryptedData	This is the 9 data symbol reply. The symbols are assumed to already have been encrypted. NOTE: Not recommended for use.
L2RawData	This is the 77 bits of tactical data for the report transmission.
L2EncryptedData	This is the 33 data symbol reply. The symbols are assumed to already have been encrypted. NOTE: Not recommended for use.

:DATA

:LEVel1

:ENCRypted { <1 ~ 9 symbols> }

This command sets the 9 data symbol reply. The symbols are assumed to already have been encrypted. This parameter can be entered in hex, or octal (not recommended for use).

5.4.8 INTerrogator Commands (cont)

:TABLe

:MODE5?

:DATA

:LEVel1

:RAW { <1 ~ 9 symbols> }

This is the 9 data symbol reply transmission. In user mode, the first 2 symbols are interpreted as the random reply delay, RRD, of the reply. In crypto mode the RRD symbols are overwritten with the RRD value selected by the crypto. This parameter can be entered in hex, or octal.

:LEVel2

:ENCRypted { <1 ~ 33 symbols> }

This command allows the user to set the encrypted 33 data symbols for the report transmission. The bits are right justified in the field. This parameter can be entered in hex, or octal (not recommended for use).

:RAW { <1 ~ 20 symbols> }

This command allows the user to set the 77 bits of tactical data for the report transmission. The bits are right justified in the field. This parameter can be entered in hex, or octal.

:TYPE { URAW | CRAW | ENCR }

This command sets the data source for the Mode 5 replies. ENCRypted mode is not recommended for use.

:FORMat { 0 ~ 31 }

This command sets the interrogation format that elicits the target's reply.

:LEVel2 { OFF | ON }

This command enables or disables Mode 5 level 2 reports to format 16 and above interrogations.

:SPRead { OFF | ON }

This command enables or disables the use of the Mode 5 spreading function for the replies/reports.

:MODES?

This command returns the table entries Mode 5 specific configuration. The returned data is:

"DF=<dec1>; UF=<dec2>; ADDR=<hex1>; SDAT=<hex2>; LDAT=<hex3>"

Keyword	Meaning
DownlinkFormat	The format field for the transmitted reply. DF0~DF11 selects the short data field. DF12~DF24 selects the long data field.
UplinkFormat	The format field of the expected interrogation.
ADDRess	The 24 bit Mode S address.
ShortDATA	The 27 bits of data in a short reply.
LongDATA	The 83 bits of data in a long reply.

5.4.8 INTerrogator Commands (cont)

:TABLe

:MODES?

:ADDRess { <1 ~ 6 symbols> }
This command sets the 24 bits of Mode S address for the target. This parameter can be entered in hex, or octal.

:DATA

:LONG { <1 ~ 21 symbols> }
This command sets the 83 bits of Mode S long format data for the target. The bits are right justified in the field. This parameter can be entered in hex, or octal.

:SHORt { <1 ~ 7 symbols> }
This command sets the 27 bits of Mode S long format data for the target. The bits are right justified in the field. This parameter can be entered in hex, or octal.

:DF { 0 ~ 31 }
This command sets the downlink format field data for the target.

:UF { 0 ~ 31 }
This command sets the uplink format that elicits the target's reply.

:RDELay

:DISTance { 0.00 ~ 400.00 }
This command sets the reply delay as a function of target distance. The distance is entered in NMI.

:SOURce { DIST | TIME }
This command selects the reply delay data source.

:TIME

:MODE4 { -1.000 ~ 7798.000 }
This command sets the reply delay time for a Mode 4 target in uS.

:MODE5 { -1.000 ~ 7520.000 }
This command sets the reply delay time for a Mode 5 target in uS.

:MODES { -1.000 ~ 7872.000 }
This command sets the reply delay time for a Mode S target in uS.

:SIF { -1.000 ~ 7996.000 }
This command sets the reply delay time for a SIF target in uS.

5.4.8 INTerrogator Commands (cont)

:TABLe

:SIF

:SIF?

This command returns the table entries SIF specific configuration. The returned data is:

"CODE=<hco1>; MCC=<hco2>; MCA=<dec1>; MCS=<string1>; FORM=<string2>; XPUL=<string3>"

Keyword	Meaning
CODE	The reply code for SIF replies.
ModeCCode	The altitude code for Mode C replies.
ModeCAltitude	The Mode C altitude.
ModeCSource	The Mode C reply data source.
CODE	Transmit the reply code for Mode C replies.
ALTitude	Transmit the altitude code for Mode C replies.
FORMat	For Mode 1, 2, and A, selects the reply formatting.
NORMal	Transmit the normal SIF reply.
IDENtification	Add the identification pulse or pulses to the reply.
EMERgency	Add the emergency pulses to the reply
XPULse	The state of the X-pulse.
ON	The X-pulse is transmitted.
OFF	The X-pulse is not transmitted.

:CODE { 0000 ~ 7777 }

This command sets the SIF reply code for the target.

:FORMat { NORM | IDEN | EMER }

This command sets the response type for the target.

:MODEC

:ALTitude { -1000 ~ 126700 }

This command sets the Mode C altitude in Ft.

:SOURce { CODE | ALT }

This command selects the SIF data source as the code or the altitude

:XPULse { OFF | ON }

This command sets the state of the X-pulse.

:SOURce { INT | EXT }

This command sets the trigger source for the target. In internal mode, a received interrogation initiates the reply sequence. In external mode the rising edge of the trigger input initiates the reply sequence.

:STATe { OFF | ON }

This command enables or disables the target.

5.4.8 INTerrogator Commands (cont)

:TRIGger

:OUT?

This command returns the output trigger configuration. The returned data is:

"TARG=<dec1>; LOC=<string1>; POS=<dec2>"

Keyword	Meaning
TARGet	The reply target that initiates the trigger.
LOCation	The reference location of the trigger.
INTerrogation	The reference location is the detection of the interrogation.
REPLy	The reference location is the reply reference.
POSition	The trigger delay from the reference.

:LOCation { INT | REPL }

This command sets the output trigger's reference location.

:POSition { 0.000 ~ 8000.000 }

This command sets the delay from the trigger source to the trigger output.

:TARGet { 1 ~ 12 }

This command sets the reply target that initiates the trigger output.

5.4.8 INTerrogator Commands (cont)

:VARiable<[1] | 2 | 3>?

"SIF=<string1>; MODES=<string1>; MODE4=<string1>; M5L1=<string1>; M5L2=<string1>; MODE=<string2>; AMPL=<dec1>; WIDT=<dec3>; ERR=<string3>; POS=<dec2>; PMOD5=<dec2>; DATA=<hex1>; ACT=<string4>"

Keyword	Meaning
SIF	SIF mode pulse to modify P<1~4>
MODES	Mode S mode pulse to modify P<1~2> | SPR | P5 | P6
MODE4	Mode 4 mode pulse to modify P<1~5> | D<1~32> | All<1~31>
MODE5L1	Mode 5 mode pulse to modify P<1~4> | I<1~2> | D<1~11>
MODE5L2	Mode 5 mode pulse to modify P<1~4> | I<1~2> | D<1~11>
MODE	Interrogation type to modify pulses
NONE	Disable this variable pulse.
MODE1	Modify replies to Mode 1 interrogations.
MODE2	Modify replies to Mode 2 interrogations.
MODEA	Modify replies to Mode A interrogations.
MODEC	Modify replies to Mode C interrogations.
ACLA	Modify replies to All Call Long A interrogations.
ACLC	Modify replies to All Call Long C interrogations.
MSSH	Modify replies to Mode S Short interrogations.
MSL	Modify replies to Mode S Long interrogations.
MODE4	Modify replies to Mode 4 interrogations.
MODE5	Modify replies to Mode 5 interrogations.
AMPLitude	The relative amplitude of the pulse.
WIDTh	The relative width of the pulse
ERRor	Selection
ON	Generate the normal data pattern for the pulse.
OFF	Generate the error data pattern for the pulse.
POSition	The relative position of the pulse except Mode 5
PositionMODe5	The relative position of the pulse for Mode 5
DATA	The error data for Mode 5 pulses.
ACTion	Controls the pulse build state.
MODify	Modify the pulse as specified.
DELete	Delete the pulse (do not generate the pulse)

:ACTion { MOD | DEL }

This command selects whether to modify or delete the specified pulse.

:AMPLitude { -15.00 ~ 5.00 }

This command sets the relative amplitude of the modified pulse in dB.

:DATA { 0 ~ 65535 }

This command sets the MSK error state data pattern of the transmitted Mode 5 pulse, when enabled. This parameter can be entered in decimal, hex, or octal.

:ERRor { OFF | ON }

This command enables or disables the presence of an error in Mode 5 pulses.
16-bit unsigned integer in decimal, hex, or octal

5.4.8 INTerrogator Commands (cont)

:VARiable<[1] | 2 | 3>?

:M5L1 { P<1~2> | D<1~9> }
This command selects which pulse of a Mode 5 Level 1 reply to modify or delete.

:M5L2 { P<1~4> | D<1~33> }
This command selects which pulse of a Mode 5 Level 2 report to modify or delete.

:MODE { NONE | MODE1 | MODE2 | MODEA | MODEC | MODES | MODE4 | M5L1 | M5L2 | ACLC | ACLA }
This command selects the type of reply that will include this pulse mode.

:MODE4 { R<1~3> }
This command selects which pulse of a Mode 4 reply to modify or delete.

:MODES { P<1~4> | D<1~112> }
This command selects which pulse of a Mode S reply to modify or delete.

:POSition { -1.00 ~ 1.00 }
This command sets the relative position offset from the pulses nominal position in uS. This command is for all modes except Mode 5 replies or reports.

:MODE5 { -0.25 ~ 0.25 }
This command sets the relative position offset from the pulses nominal position in uS. This command is for Mode 5 replies and reports.

:SIF { A1 | A2 | A4 | B1 | B2 | B4 | C1 | C2 | C4 | D1 | D2 | D4 | F1 | F2 | X | 1A1 | 1A2 | 1A4 | 1B1 | 1B2 | 1B4 | 1C1 | 1C2 | 1C4 | 1D1 | 1D2 | 1D4 | 1F1 | 1F2 | 1X | 2F1 | 2F2 | 3F1 | 3F2 }
This command selects which pulse of a SIF reply to modify or delete.

:WIDTh { -0.500 ~ 0.500 }
This command sets the relative width offset from the pulses nominal width in uS.

5.4.9 TACan Commands

These commands set up the TACAN Instrument for testing a TACAN unit.

:ARB?

This command returns the status of the ARB (Auxiliary Reference Burst) configuration, including information about pulse count, pulse position, state/status (on, or off), and operating mode (normal or missing pulses). ARB settings are only relevant for G/A modes of operation, and are ignored in other TACAN modes.

"COUN=<dec1>; POS=<dec2>; ARB=<string1>; STAT=<string2>"

Keyword	Meaning
COUNt	The number of ARB pulses (or pulse pairs).
POSition	The position of the ARB pulses (or pulse pairs) from nominal.
ARB	The operating mode of the ARB pulses (normal or missing-pulse).
STATe	The enabled state of ARB pulses (not mode dependent).

:ARB { NORM | MISS }

This command configures the ARB for normal mode or missing pulse mode. In normal mode, all pulses occur in expected positions. In missing mode, the first pulse (or pulse pair, depending on channel mode) of the ARB is missing.

:COUNt { -2 ~ 2 }

This command sets the number of transmitted ARB pulses (or pulse pairs as given by operating mode). Nominal is zero, but can be incremented or decremented by 1 or 2.

:POSition { -3.900 ~ 3.900 }

This command sets the position of the ARB pulses (or pulse pairs) from nominal, in microseconds.

:STATe { OFF | ON }

This command sets the enabled state of the ARB pulses, subject to the current mode. Hence, ARB pulses can be enabled in A/A mode, for instance, but yet ARB pulses will not be generated (superseded by mode).

:DIVersity?

This command returns the status of Diversity mode (on, or off).

"DIV=<string1>"

:DIVersity { OFF | ON }

This command sets the status of Diversity mode (on, or off).

5.4.9 TACan Commands (cont)

:ECHO?

This command returns the status of the echo configuration for TACAN, which includes information about the amplitude and enabled status of the echo pulses.

"CONT=<string1>; AMPL=<dec1>"

Keyword	Meaning
AMPLitude	The relative amplitude of the echo pulses.
CONTrol	The enabled status of echo pulses (on, or off).

:AMPLitude { -12.00 ~ 3.00 }

This command sets the amplitude of the echo pulses, in dB.

:CONTrol { OFF | ON }

This command sets the enabled status of echo pulses (or, or off).

:EFFiciency?

This command returns the percent reply efficiency for TACAN replies

"EFF=<dec1>"

:EFFiciency { 0 ~ 100 }

This command sets the percent reply efficiency for TACAN replies.

:EQUalizer?

This command returns the enabled status of equalizer pulses in TACAN (on, or off).

"EQU=<string1>"

:EQUalizer { OFF | ON }

This command sets the enabled status of equalizer functionality (on, or off)

:GENerator

:CHANnelX { 1 ~ 126 }

This command sets the channel for Channel-X operation in TACAN mode. This channel setting affects the current transmit and receive frequencies, according to normal TACAN channeling, whenever the unit is operating in Channel-X mode only.

:OFFSet { -1.000 ~ 1.000 }

This command sets an available offset for Channel-X mode operation. Frequency offset +/- 1 MHz from the Channel-X channel as set.

:CHANnelY { 1 ~ 126 }

This command sets the channel for Channel-Y operation in TACAN mode. This channel setting affects the current transmit and receive frequencies, according to normal TACAN channeling, whenever the unit is operating in Channel-Y mode only.

:OFFSet { -1.000 ~ 1.000 }

This command sets an available offset for Channel-Y mode operation. Frequency offset +/- 1 MHz from the Channel-Y channel as set.

5.4.9 TACan Commands (cont)

:GENerator

:CONFig?

This command returns the current transmit/receive configuration for TACAN generation.

"TFR=<dec1>; RFR=<dec2>; CHAN=<dec3>"

Keyword	Meaning
Transmit FRequency	Transmit frequency (currently configured)
Receive FRequency	Receive frequency (currently configured)
CHANnel	Current channel number based on configuration of nearest transmit frequency (if off-channel).

:CONTrol?

This command returns the generator control parameters.

"CONT=<string>"

Keyword	Meaning
CONTrol	The generator control settings
OFF	The generator is off, no RF power is emitted.
ON	The generator is on, interrogation RF power is emitted.
CW	The generator is generating a CW waveform.

:CONTrol { OFF | ON | CW }

This command controls the output of the generator. The generator can be turned OFF; no RF power will be emitted even if interrogations are being generated. The generator can be turned ON; RF power will be emitted when interrogations are generated. The generator can generate a continuous waveform.

:FREQuency { 960.000 ~ 1220.000 }

This command sets the current transmit frequency (in MHz). This frequency setting affects the current transmit and receive frequencies, according to normal TACAN channeling, whenever the unit is operating in a specified frequency mode only. This is managed by matching the selected transmit frequency to the nearest channel, and the receive frequency is set accordingly. No offset is required for this command, as the command resolution supports the offset inherently.

5.4.9 TACan Commands (cont)

:GENerator

:MODE?

This command returns information about the TACAN generation modes.

"MODE=<string1>; FREQ=<dec1>; CHANX=<dec2>; CHANY=<dec3>; OFFSX=<dec4>; OFFSY=<dec5>"

Keywords	Meanings
MODE	TACAN frequency selection operating mode
CHANnel X	Transmit/Receive frequencies based on selected Channel, in the Channel X configuration.
CHANnel Y	Transmit/Receive frequencies based on selected Channel, in the Channel Y configuration.
FREQuency X	Transmit/Receive frequencies based on selected Frequency, in the Channel X configuration
FREQuency Y	Transmit/Receive frequencies based on selected Frequency, in the Channel Y configuration
FREQuency	Actual transmit frequency
CHANnel X	Selected X Channel
CHANnel Y	Selected Y Channel
OFFSet X	Selected transmit frequency offset if in Channel X Mode
OFFSet Y	Selected transmit frequency offset if in Channel Y Mode

:MODE { CHANX | CHANY | FREQX | FREQY }

This command sets the TACAN frequency selection operating mode as detailed above.

:POWer?

This command returns the transmit power levels for the top and bottom channels on the direct and antenna ports. All are 16-bit signed decimal numbers in hundredths of dB resolution

"DTOP=<dec1>; DBOT=<dec2>; ATOP=<dec3>; ABOT=<dec4>"

Keyword	Meaning
Direct TOP	Transmit power on the top channel of the direct port.
Direct BOTtom	Transmit power on the bottom channel of the direct port.
Antenna TOP	Transmit power on the top channel of the antenna port.
Antenna BOTtom	Transmit power on the bottom channel of the antenna port.

:BOTTom

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the bottom channel on the antenna port.

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the bottom channel on the direct port.

:TOP

:ANTenna { -110.00 ~ 30.00 }

This command sets the transmit power of the top channel on the antenna port.

5.4.9 TACan Commands (cont)

:GENerator

:POWer?

:TOP

:DIRect { -110.00 ~ 0.00 }

This command sets the transmit power of the top channel on the direct port.

:IDENT?

This command returns the identification pulse configuration parameters

"CHAR=<dec1>; CODE=<string1>; DASH=<dec2>; DOT=<dec3>; MODE=<string2>; RATE=<dec4>; SPAC=<dec5>"

Keywords	Meanings
MODE	The ident mode of operation
OFF	Ident pulses are turned off.
TONE	Ident pulses operate in a continuous tone mode at 1350 Hz.
CODE	Ident pulses are enabled and disabled in time to correspond to the selected Morse code timing configuration.
CODE	The 8 character (maximum) ASCII code transmitted for ident mode. Transmitted as Morse code.
DOT	The configured Morse code dot time, or the length of time pulses are transmitted for a corresponding Morse code “Dot”. Nominally 125 ms.
DASH	The configured Morse code dash time, or the length of time pulses are transmitted for a corresponding Morse code “Dash”. Normally configured as three times longer than the dot time.
CHARacter	The configured Morse code character time, or the length of time pulses are *not* transmitted inside a given character. Normally configured as identical to dot time.
SPACe	The configured Morse code space time, or the length of time pulses are *not* transmitted between subsequent character dot/dash groups. Normally configured as identical to dash time.
RATE	The time between subsequent transmissions of the CODE character group. This can be configured as less than the actual code group total transmission time, which can cause errors in ident transmission.

:CHARacter { 150.000 ~ 750.000 }

This command sets the character time (the length of time pulses are *not* transmitted inside a given character), in ms. Normally, it is configured as identical to dot time (space between dots and dashes in one character).

:CODE { <1 ~ 8 CHARACTERS> }

This command sets the ident code, or the 8 character (maximum) ASCII code transmitted for ident mode (which is transmitted as Morse code).

:DASH { 150.000 ~ 750.000 }

This command sets the dash time (the length of time pulses are transmitted for a corresponding Morse code “Dash”), in mS. It is normally configured as three times longer than the dot time.

5.4.9 TACan Commands (cont)

:IDENT?

:DOT { 50.000 ~ 250.000 }

This command sets the dot time (the length of time pulses are transmitted for a corresponding Morse code “Dot”), in ms. Nominally, it is 125 mS.

:MODE { OFF | TONE | CODE }

This command sets the ident generation mode.

:RATE { 10.000 ~ 65.000 }

This command sets the ident code repetition rate (the time between subsequent transmissions of the CODE character group), in seconds. This can be configured as less than the actual code group total transmission time (depending on selected code), which can cause errors in Morse code decode.

:SPACe { 50.000 ~ 250.000 }

This command sets the space time (or the length of time pulses are *not* transmitted between subsequent character dot/dash groups in the given code) in ms. Normally it is configured as identical to dash time.

:INTerrogation?

This command returns the current interrogation parameters (for use in Air-to-Air Modes).

"TYPE=<string1>; RATE=<dec1>"

Keyword	Meaning
RATE	The interrogation rate.
TYPE	The type or mode of interrogation.
OFF	Interrogations are not enabled.
FIX	Interrogations are enabled, and fixed in spacing as given by the rate.

:RATE { 0 ~ 3999 }

This command sets the given interrogation rate (interrogations/second).

:TYPE { OFF | FIX }

This command sets the mode of interrogations as defined above.

5.4.9 TACan Commands (cont)

:MEASure

:DELay?

This command returns the measured reply delay. It is only non-zero if the system is operating in Air-to-Air mode, and if valid replies are present.

"DEL=<dec1>"

:PREPly?

This command returns the measured percent reply. It is only non-zero if the system is operating in Air-to-Air mode, and if valid replies are present.

"TOP=<dec1>; BOTT=<dec2>"

Keyword	Meaning
TOP	Percent Reply for the top channel.
BOTT	Percent Reply for the bottom channel.

:PRF?

This command returns the measured pulse repetition frequency (PRF), for the received interrogations and squitters.

"INT=<dec1>, <dec2>, <dec3>; SQU=<dec1>, <dec2>, <dec3>"

Keyword	Meaning
INT	PRF Measurements for interrogations. Included is the current measured PRF, the minimum PRF measured over the sample period, and the maximum PRF measured over the sample period.
SQU	PRF Measurements for squitters. Included is the current measured PRF, the minimum PRF measured over the sample period, and the maximum PRF measured over the sample period.

:PULSe

:FALL?

This command returns the fall time of the pulse in uS. The fall time is the time between the 90% and 10% points on the falling edge of the pulse.

"FALL=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
FALL	The pulse's fall time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum).

5.4.9 TACan Commands (cont)

:MEASure

:PULSe

:FREQuency?

This command returns the measured frequency of the pulse in MHz. The returned data is:

"FREQ=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
FREQuency	The selected pulse's frequency measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum).

:IDENt?

This command identifies the pulse being measured. The returned data is:

"IDEN=<string1>"

Keyword	Meaning
IDENt	The pulse that is currently being measured.

:POWer?

This command returns the measured power of the pulse in dBm.

"POW=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
POWer	The selected pulse's power measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum)

:RISE?

This command returns the rise time of the pulse in uS. The rise time is the time between the 10% and 90% points on the rising edge of the pulse.

"RISE=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
RISE	The pulse's rise time (current, maximum, minimum, standard deviation of current, standard deviation of maximum, standard deviation of minimum).

:SPACing?

This command returns the measured spacing of the pulse from the reference pulse in the reply in uS.

"SPAC=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
SPACing	The selected pulse's pulse spacing measurement (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum)

5.4.9 TACan Commands (cont)

:MEASure

:PULSe

:WIDTh10?

This command returns the width of the pulse at the 10% points in uS.

"WIDT10=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
WIDTh10	The width of the pulse measured from the 10% point on the rising edge to the 10% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum).

:WIDTh50?

This command returns the width of the pulse at the 50% points in uS.

"WIDT50=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
WIDTh50	The width of the pulse measured from the 50% point on the rising edge to the 50% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum).

:WIDTh90?

This command returns the width of the pulse at the 90% points in uS.

"WIDT90=<dec1>, <dec2>, <dec3>, <dec4>, <dec5>, <dec6>"

Keyword	Meaning
WIDTh90	The width of the pulse measured from the 90% point on the rising edge to the 90% point on the falling edge (current, maximum, minimum, standard deviation of current, standard deviation of maximum, and standard deviation of minimum).

:RANGe?

This command returns the measured percent reply. It is only non-zero if the system is operating in Air-to-Air mode, and if valid replies are present.

"RANG=<dec1>"

5.4.9 TACan Commands (cont)

:MEASure

:PULSe

:SETup?

This command returns the current measurement configuration.

"MODE=<string1>; CHAN=<string2>; SAMP=<dec1>; PULS=<string3>"

Keyword	Meaning
AA:MODE	Returns the measurement mode.
INTerrogation	Measurement mode is set to measure interrogation pulses.
REPLy	Measurement mode is set to measure reply pulses.
SQUitter	Measurement mode is set to measure squitter pulses.
CHANnel	Current channel selected for measurement.
TOP	Top channel selected.
BOTTom	Bottom channel selected.
SAMPles	The number of pulses sampled to derive measurement parameters.
PULSe	Determines which pulse of the selected mode will be measured, if more than one pulse is available (otherwise, defaults to the single available pulse).
P1	The first (or only) pulse.
P2	The second (if available) pulse.

:AA

:MODE { INT | REPL | SQU }

This command sets the type of signal to be measured (as noted above).

:CHANnel { TOP | BOTT }

This command sets the channel to be examined for measurement data.

:MMReset

This command resets the minimum and maximum averages and information for all applicable measurements.

:PULSe { P1 | P2 }

This command sets the pulse to be examined for measurements. It is always set to P1, unless two pulses are available for measurement (based on measurement mode).

:SAMPles { 1 ~ 200 }

This command sets the number of samples to take per measurement (decimal).

5.4.9 TACan Commands (cont)

:MODE?

This command returns the current TACAN operating mode.

"MODE=<string1>"

Keyword	Meaning
GA	Ground to Air
IGA	Inverse Ground to Air
BGA	Beacon Ground to Air
AA	Air to Air
IAA	Inverse Air to Air
BAA	Beacon Air to Air

:MODE { GA | IGA | BGA | AA | IAA | BAA }

This command sets the current TACAN operating mode.

:MODulation?

This command returns the current TACAN modulation control settings.

"15HZ=<dec1>; 135HZ=<dec2>; OFFS=<dec3>; PSH=<dec4>"

Keyword	Meaning
15HZ	Percent Modulation of the 15Hz control.
135HZ	Percent Modulation of the 135Hz control.
OFFSet	Percent Modulation audio offset (deviation from 15/135Hz), in percent.
Phase SHift	Amount of phase shift between the 15Hz and 135Hz modulation controls. Normally, the zero crossing of the 15Hz control matches the zero crossing of every ninth 135Hz control signal.

:135HZ { 0 ~ 39 }

This command sets the 135Hz Percent Modulation.

:15HZ { 0 ~ 39 }

This command sets the 15Hz Percent Modulation.

:OFFSet { -3.90 ~ 3.90 }

This command sets the audio frequency offset percentage for both the 15 Hz and 135 Hz controls (deviation from 15/135 Hz nominal).

:PSHift { -39 ~ 39 }

This command sets the phase shift between the 15 Hz and 135 Hz modulation control. Normally, the zero-crossings are co-incident (when possible).

5.4.9 TACan Commands (cont)

:MRB?

This command returns the status of the MRB (Main Reference Burst) configuration, including information about pulse count, pulse position, and state/status (on, or off). ARB settings are only relevant for G/A modes of operation, and are ignored in other TACAN modes.

"COUN=<dec1>; POS=<dec2>; STAT=<string1>"

Keyword	Meaning
COUNt	The number of MRB pulses (or pulse pairs).
POSition	The position of the MRB pulses (or pulse pairs) from nominal.
STATe	The enabled state of MRB pulses (not mode dependent).

:COUNt { -2 ~ 2 }

This command sets the number of transmitted MRB pulses (or pulse pairs as given by operating mode). Nominal is zero, but can be incremented or decremented by 1 or 2.

:POSition { -3.900 ~ 3.900 }

This command sets the position of the ARB pulses (or pulse pairs) from nominal, in microseconds.

:STATe { OFF | ON }

This command sets the enabled state of the MRB pulses, subject to the current mode. Hence, MRB pulses can be enabled in A/A mode, for instance, but yet MRB pulses will not be generated (superseded by mode).

:PULSe

:INTerrogator?

This command returns the variable pulse characteristics for interrogator pulses.

"AMPL1=<dec1>; AMPL2=<dec2>; WIDT=<dec3>; SPAC=<dec4>"

Keyword	Meaning
AMPLitude 1	The amplitude of P1, from nominal.
AMPLitude 2	The amplitude of P2 (if available, depending on mode), from nominal
WIDTh	The pulse width of each pulse (single or pulse pairs)
SPACing	The spacing between pulses (only valid for pulse pairs).

:AMPLitude[1] { -15.00 ~ 5.00 }

This command sets the amplitude of P1, in an interrogation, from nominal.

:AMPLitude2 { -15.00 ~ 5.00 }

This command sets the amplitude of P2, in an interrogation (if available, depending on mode), from nominal.

:SPACing { -12.000 ~ 12.000 }

This command sets the pulse spacing between pulse pairs, in an interrogation (if in valid mode for transmitting pulse-pair interrogations).

:WIDTh { 0.000 ~ 5.500 }

This command sets the width of each pulse in the interrogation (single or pulse pairs).

5.4.9 TACan Commands (cont)

:PULSe

:REPLy?

This command returns the variable pulse characteristics for reply pulses.

"AMPL1=<dec1>; AMPL2=<dec2>; WIDT=<dec3>; SPAC=<dec4>"

Keyword	Meaning
AMPLitude 1	The amplitude of P1, from nominal.
AMPLitude 2	The amplitude of P2 (if available, depending on mode), from nominal
WIDTh	The pulse width of each pulse (single or pulse pairs)
SPACing	The spacing between pulses (only valid for pulse pairs).

:AMPLitude[1] { -15.00 ~ 5.00 }

This command sets the amplitude of P1, in a reply, from nominal.

:AMPLitude2 { -15.00 ~ 5.00 }

This command sets the amplitude of P2, in a reply, (if available, depending on mode), from nominal.

:SPACing { -12.000 ~ 12.000 }

This command sets the pulse spacing between pulse pairs, in an reply (if in valid mode for transmitting pulse-pair replies).

:WIDTh { 0.000 ~ 5.500 }

This command sets the width of each pulse in the reply (single or pulse pairs).

:SIMulation?

This command returns the current state of the simulation variables for TACAN range and bearing simulation for one target.

"BEAR=<dec1>; BRATE=<dec2>; VEL=<dec3>; ACC=<dec4>; DIR=<string1>; RANG=<dec5>"

Keyword	Meaning
BEARing	The current bearing (from 0 to 360 degrees) of the generated target. Affected only by bearing rate.
Bearing RATE	The current bearing rate (or rate of bearing change) for the generated target. Positive values imply clockwise rotation.
VELocity	The current velocity for the generated target. Affected by acceleration.
ACCeleration	The current acceleration (rate of change) of the generated target.
DIRection	The current direction (inbound or outbound) of the generated target. When passing a range limit, the direction of motion will switch (if moving inbound, changes to outbound, and vice versa).
RANGe	The range of the current target from the origin (0 nmi to 400 nmi at every bearing). Affected by velocity (and hence, acceleration) only.

5.4.9 TACan Commands (cont)

:SIMulation

:ACCeleration?

This command returns the current simulation acceleration in ft/s/s.

"ACC=<dec1>"

:ACCeleration { -400 ~ 400 }

This command sets the current simulation acceleration. If non-zero, target motion will be simulated. 16-bit signed integer entered in decimal, hexadecimal, or octal.

:BEARing?

This command returns only the bearing parameters.

"BEAR=<dec1>; RATE=<dec2>"

Keyword	Meaning
BEARing	The current bearing (from 0 to 360 degrees) of the generated target. Affected only by bearing rate.
bearing RATE	The current bearing rate (or rate of bearing change) for the generated target. Positive values imply clockwise rotation.

:BEARing { 0.00 ~ 359.90 }

This command sets the bearing (0 to 360 degrees) for a generated simulated target.

:RATE { -39.00 ~ 39.00 }

This command sets the bearing rate of change for a generated simulated target in degrees/second. A non-zero value implies target bearing change will be simulated.

:RANGe?

This command returns the current range for a normal (stationary) or simulated target.

:RANGe { -1.00 ~ 400.00 }

This command returns the current range for a normal (stationary) or simulated target. If simulated, any range under 0 nmi is invalid.

:VELocity?

This command returns only the velocity parameters.

"VEL=<dec1>; DIR=<string1>"

Keyword	Meaning
VELocity	The current velocity for the generated target. Affected by acceleration.
DIRection	The current direction (inbound or outbound) of the generated target. If passing a range limit, the direction of motion will switch (if moving inbound, changes to outbound, and vice versa).

5.4.9 TACan Commands (cont)

:SIMulation

:VELocity { 0 ~ 9999 }

This command sets the current velocity for a simulated target. A non-zero value implies that target range will be simulated (constant velocity).

:DIRection { IN | OUT }

This command sets the current direction of the target as being either inbound (moving toward the origin, or a range of 0 nmi) or outbound (moving away from the origin, to a limit of 400 nmi).

:SQUitter?

This command returns the current squitter rate in Hz (approximate).

"SQU=<dec1>"

:SQUitter { 0 ~ 8000 }

This command sets the current squitter rate in Hz. This rate is approximate, and is compliant with ARINC 568 at a rate of 2700 Hz.

:STATus?

This command is identical to TACan:SIMulation? See above for more details.

"BEAR=<dec1>; BRATE=<dec2>; VEL=<dec3>; ACC=<dec4>; DIR=<string1>; RANG=<dec5>"

:ERRor?

This command returns measurement error fields that express measurement failures as per the following table.

"ERR=<hex1>"

Keyword	Meaning
ERRor	16 bit Error Field (bit 15 = MSB)
Bit15-7	Reserved for future use.
Bit6	Symbol spacing measurement failed.
Bit5	Fall time measurement failed.
Bit4	Rise time measurement failed.
Bit3	90% width measurement failed.
Bit2	50% width measurement failed.
Bit1	10% width measurement failed.
Bit0	Unable to find pulse to measure.

:TRIGger

:IN?

This command returns the enabled status of the external trigger system.

"STAT=<string1>"

:IN { OFF | ON }

This command sets the enabled status of the external trigger system (on, or off). The external trigger can be used to force a triggered reply or interrogation, depending on mode of operation.

5.4.9 TACan Commands (cont)

:TRIGger

:OUT?

This command returns the trigger position offset as well as the current trigger out mode for each TACAN operating mode.

"POS=<dec1>; GA=<string1>; IGA=<string1>; BGA=<string1>; AA=<string1>; IAA=<string1>; BAA=<string1>"

Keyword	Meaning
POSition	The trigger out position offset from nominal (nominal position depends on trigger selection).
GA	Trigger out selection for Ground to Air mode. Only valid options are: UUTI, REPL, IDEN, ECHO, TSQU, MRB, ARB, 15HZ, 135HZ.
INTerrogation	Trigger out is coincident with interrogation.
REPLy	Trigger out is coincident with the rise of the first pulse of the pattern.
ECHO	Trigger out is coincident with the rise of the first pulse of the pattern.
IDENt	Trigger out is coincident with the rise of the first pulse of the pattern.
Transmit SQUitter	Trigger out is coincident with the rise of the first pulse of the pattern.
Receive SQUitter	Trigger out is coincident with Received Squitter.
MRB	Trigger out is coincident with the rise of the first pulse of each MRB.
ARB	Trigger out is coincident with the rise of the first pulse of each ARB.
UUT Interrogation	Coincident with P2+8us (+/- 1us)
UUT Reply	Trigger out is coincident with the UUT Reply.
15HZ zero crossing	Coincident with positive going zero crossing of 15Hz modulation wave (+/- 250ns)
135HZ zero crossing	Coincident with positive going zero crossing of 135Hz modulation wave (+/- 250ns)
North REFerence	Coincident with negative going zero crossing of 15Hz modulation wave (+/- 250ns)
IGA	Trigger out selection for Inverse Ground to Air mode. Only valid options are: UUTI, REPL, IDEN, ECHO, TSQU, 15HZ, NREF.
BGA	Trigger out selection for Beacon Ground to Air mode. Only valid options are: UUTI, REPL, IDEN, ECHO, TSQU.
AA	Trigger out selection for Air to Air mode. Only valid options are: INT, UUTI, REPL, IDEN, ECHO, TSQU, RSQU, MRB, 15HZ.
IAA	Trigger out selection for Inverse Air to Air mode. Only valid options are: INT, UUTI, REPL, UUTR, IDEN, ECHO, TSQU, RSQU, 15HZ, NREF.
BAA	Trigger out selection for Inverse Air to Air mode. Only valid options are: INT, UUTI, UUTR, IDEN, ECHO, TSQU.

5.4.9 TACan Commands (cont)

:TRIGger

:OUT?

:LOCation

:AA { INT | UUTI | REPL | UUTR | ECHO | IDEN | TSQU | RSQU | MRB | 15HZ }

This command sets the Air to Air mode trigger out mode (from above list). See above mode operation. This trigger out setting is only valid if TACAN operating mode is set to Air to Air.

:BAA { INT | UUTI | REPL | UUTR | ECHO | IDEN | TSQU }

This command sets the Beacon Air to Air mode trigger out mode (from above list). See above for definitions of the various trigger out modes. Only the modes listed here are valid for Beacon A/A mode operation. This trigger out setting is only valid if TACAN operating mode is set to Beacon Air to Air.

:BGA { UUTI | REPL | ECHO | IDEN | TSQU }

This command sets the Beacon Ground to Air mode trigger out mode (from above list). See above for definitions of the various trigger out modes. Only the modes here listed are valid for Beacon G/A mode operation. This trigger out setting is only valid if TACAN operating mode is set to Beacon Ground to Air.

:GA { UUTI | REPL | ECHO | IDEN | TSQU | MRB | ARB | 15HZ | 135HZ }

This command sets the Ground to Air mode trigger out mode (from above list). See above for definitions of the various trigger out modes. Only the modes here listed are valid for G/A mode operation. This trigger out setting is only valid if TACAN operating mode is set to Ground to Air.

:IAA { INT | UUTI | REPL | UUTR | ECHO | IDEN | TSQU | RSQU | 15HZ | NREF }

This command sets the Inverse Air to Air mode trigger out mode (from above list). See above for definitions of the various trigger out modes. Only the modes listed here are valid for Inverse A/A mode operation. This trigger out setting is only valid if TACAN operating mode is set to Inverse Air to Air.

:IGA { UUTI | REPL | ECHO | IDEN | TSQU | 15HZ | NREF }

This command sets the Inverse Ground to Air mode trigger out mode (from above list). See above for definitions of the various trigger out modes. Only the modes here listed are valid for Inverse G/A mode operation. This trigger out setting is only valid if TACAN operating mode is set to Inverse Ground to Air.

:POSition { 0.000 ~ 8000.000 }

This command sets the position offset for the currently active output trigger (dependent on both trigger mode and active operating mode). The position is offset from the nominal position for the selected trigger.

5.4.9 TACan Commands (cont)

:TRIGger

:SELF?

This command returns the enabled status of the self interrogation functionality of the unit (unit will interrogate itself at a fixed interval, and otherwise respond normally).

"SELF=<string1>"

:SELF { OFF | ON }

This command sets the enabled status for self interrogate mode (on, or off).

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SECTION 3 - SPECIFICATIONS

NOTE: Specifications are subject to change without notice.

NOTE: Warm up minimum 15 minutes. To achieve full specified accuracies a warm up time of 45 minutes is required.

SIGNAL GENERATOR

Frequency Range:	955.00 MHz to 1223.00 MHz, 10 KHz resolution increments
Frequency/Time Reference:	2.5 ppm composed of 1 ppm/year aging and 1 ppm accuracy over temp
Output Characteristics:	
Direct Port:	0.0 dBm to -110 dBm (into 50 Ω) in 0.1 dB increments
Accuracy @ 25° ± 5 ° C:	Specified at 1030 and 1090 MHz
0.0 dBm to -80.0 dBm:	±0.5 dB
<-80.0 dBm to -100 dBm:	±[0.5 dB + 0.05 dB per dB below -80 dBm]
<-100.0 dBm:	±[1.5 dB + 0.35 dB per dB below -100 dBm]
	(For a power setting of -85 dBm, the accuracy will be ±[0.5 + 0.05*5], or ±0.75 dB, and for a power setting of -95 dBm, the accuracy will be ±[0.5 + 0.05*15], or ±1.25 dB)
Accuracy over full temp:	Specified at 1030 and 1090 MHz
0.0 dBm to -80.0 dBm:	±1.0 dB
<-80.0 dBm to -100 dBm:	±[1.0 dB + 0.10 dB per dB below -80 dBm]
<-100.0 dBm:	±[3.0 dB + 0.70 dB per dB below -100 dBm]
Impedance:	50 Ω, VSWR < 1.2:1
Antenna Port:	+30 dBm to -60 dBm (into 50 Ω) in 0.1 dB increments
Accuracy @ 25° ± 5 ° C:	Specified at 1030 and 1090 MHz
Power ≥-30.0 dBm:	±1.0 dB
Power <-30.0 dBm:	±[1.0 dB + 0.033 dB per dB below -30 dBm]

SIGNAL GENERATOR (cont)

Output Characteristics (cont):

Antenna Port (cont):	
Accuracy over full temp:	Specified at 1030 and 1090 MHz
Power ≥-30.0 dBm	±2.0 dB
Power <-30.0 dBm	±[2.0 dB + 0.066 dB per dB below -30 dBm]
Impedance:	50 Ω, VSWR< 2.5:1
ON/OFF Ratio @ 0dBm:	80 dB minimum
Pulse Top Ripple:	< 1 dB
Pulse-to-Pulse Ampl. Var. :	< 0.25 dB
Warm-up Time	Minimum 15 minutes. To achieve full specified accuracies a warm-up of 45 minutes is required.

Spectral Purity:

Residual FM:	250 Hz Peak to Peak maximum
Phase Noise:	< 80 dBc/Hz measured at 100 KHz from the carrier
Spurious:	< 60 dBc from 350 to 1800 MHz (Exception of 45 dBc or greater at LO frequency of 28MHz below selected carrier and also of 35 dBc or greater at 8 MHz above carrier when generating a nominal SIF-CW)
Harmonics:	
Direct:	< 50 dBc
Antenna:	< 40 dBc

UUT MEASUREMENT

Transmitter Frequency - Top/Sum and Bottom/Difference Channels:

Range:	1020 MHz to 1155 MHz
Accuracy:	±50 KHz (DME/TACAN Mode)
	±50 KHz (Transponder Mode)
	±50 KHz (Interrogator Mode)
Resolution:	1 KHz

Transmitter Peak Power:

Direct Port:	
Amplitude Range:	+66 dBm (4.0 kW) to +30 dBm (1W) pk
Accuracy:	0.5 dB (from 50 Ω source)
	(Accuracy specified @ 1030 and 1090 MHz, @ 25° C. Over full temperature range, accuracy limits are doubled)
Maximum Average Power:	25W
Antenna Port:	
Amplitude Range:	+30 dBm to -40 dBm pk
Accuracy:	±1.0 dB (from 50 Ω source)

TRANSPONDER

Interrogation Modes	SIF, ACS, ACL
	Mode S
	Mode 4 internal/external Crypto support (see Crypto section for more information)
	Mode 5 internal/external Crypto support (see Crypto section for more information)
	Mode 5 level 1 formats 0-9, (10-14 undefined and 15 is reserved)
	Mode 5 level 2 formats 16-23 (24-31 undefined)
Interrogation Types:	
Continuous Interrogation Rate - Top and Bottom Channels	
Range (SIF):	1 Hz to 10,000 Hz
Range (Mode S):	1 Hz to 2500 Hz
Range (Mode 4):	1 Hz to 3500 Hz (internal)
	2500 Hz (external)
Range (Mode 5):	1 Hz to 1200 Hz
Resolution:	1 Hz
Accuracy:	±0.1% of setting
Interrogation Pattern Generator:	Up to 12 unique interrogations (only the first two are used in interlaced and double mode). Interlace and Double have selectable PRF of 1 to 400.
Double Interrogation Characteristics (Interrogation Recovery Tests):	1st and 2nd Interrogations may be SIF, ACS, ACL, Mode S, Mode 4, or Mode 5. Applicable for table 1 and 2 entries only.
Range:	0 µs to 400 µs referenced from timing reference of first interrogation
Resolution:	1 ns
Accuracy:	±10 ns
Interlace Interrogations:	
Interlace Ratio:	(1st Interrogation to 2nd Interrogation ratio)
Range:	1 to 63
Resolution:	1

TRANSPONDER (cont)

Burst Interrogations:

Trigger:	User, Squitter
Number of Bursts:	Selectable (1 to 1000) or Infinite
Interrogations/Burst:	1 to 2500
Burst Spacing:	End of previous burst to start of new burst.
Range:	0.1 s to 20 s
Resolution:	0.1 s
Accuracy:	±30 ms
Interrogation Spacing:	Controlled by PRF, 1-400 Hz
Squitter Delay Count:	1 to 20
	(Burst occurs < 10 ms following Mode S squitter detection)
Mode S Formats:	HEX raw data entry
	UF0 –UF31
Mode S Discrete Address:	HEX entry, or via Mode S squitter
Time Diversity:	Top channel timing reference to bottom channel timing reference.
	Amplitude Variation maximum of ±20 dB between outputs required for specified accuracy.
Deviation (VAR):	±1 µs
Resolution:	1 ns
Accuracy:	±10 ns

Interrogation Pulse Characteristics:

SIF Mode Nominal:	
Spacing P1-P3:	
Mode 1:	3.00 µs ±10 ns
Mode 2:	5.00 µs ±10 ns
Mode 3/A:	8.00 µs ±10 ns
Mode C:	21.00 µs ±10 ns
Width:	800 ns ±10 ns, P1, P2 and P3
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)

TRANSPONDER (cont)

Interrogation Pulse Characteristics (cont):

Intermode - P4 Nominal:	
P3-P4 Spacing:	2 µs s ±0.01 µs
Width (Short):	0.80 µs ±0.01 µs
Width (Long):	1.60 µs ±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
Mode S - P6 Nominal:	
Spacing:	P2 rising edge to sync phase reversal 2.75 µs ±0.01 µs
Width (Short):	16.25 µs ±0.25 µs (56 phase reversals)
Width (Long):	30.25 µs ±0.25 µs (112 phase reversals)
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
Mode S - Sync Phase Reversal Nominal:	
Position:	2.75 µs ±10ns following P2 rising edge
Phase Reversal Time:	<80 ns (10° to 170°)
Mode 4 Nominal:	
Pulse Spacing:	Relative to P1 (When using an external crypto, pulse width and spacing are controlled by the crypto.)
Preamble group:	
P2:	2.0 µs ±0.01 µs
P3:	4.0 µs ±0.01 µs
P4:	6.0 µs ±0.01 µs
Information Group:	D1 – D32
Position:	Pulses are distributed throughout the 9 to 72 µs range at 1, 2 or 3 µs increments. Spacing is dependent on Mode 4 data.
Width:	0.5 µs ±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)

TRANSPONDER (cont)

Interrogation Pulse Characteristics (cont):

Mode 5 Nominal:	
Symbol Spacing:	Relative to P4 Timing Reference
Preamble:	
P1:	-40.375 µs - Stagger (0-2.875 us) ±0.005 µs
P2:	-23.0 µs - Stagger (0-2.875 us) ±0.005 µs
P3:	-13.0 µs - Stagger (0-1.375 us) ±0.005 µs
Data:	
D(N):	22.8125 µs +5.75*(N-1) µs ±0.005 µs
Width 90%:	≥1.0625 µs
Width 10%:	≤ 1.375 µs
Rise Time:	62.5 ns to 87.5 ns (10% to 90%)
Fall Time:	87.5 ns to 162.5 ns (90% to 10%)
Variable Modes:	
Amplitude:	Nominal -15 dB to +5 dB (fixed in Mode S-SPR)
Resolution:	0.01 dB
Accuracy:	±0.25 dB
Width:	Nominal ±0.5 µs (Fixed in Mode S-SPR)
Resolution:	1 ns
Accuracy:	±10 ns
Position:	
SIF Mode Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns
Intermode - P4 Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns
Mode S - P6 Variable:	Nominal ±0.5 µs
Resolution:	1 ns
Accuracy:	±10 ns
Mode S - SPR Variable:	Nominal ±0.4 µs
Resolution:	1 ns
Accuracy:	±10 ns

TRANSPONDER (cont)

Interrogation Pulse Characteristics (cont):

Variable Modes (cont):	
Mode 4 Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns
Mode 5 Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns

Side Lobe Suppression (SLS) Independent Channel Top and Bottom:

Carrier Phase:	Arbitrary phase angle based on pulse timing
Amplitude P2/P5/I1/I2:	-15 to +5dB, relative to nominal power. (Mode 5 I1 and I2 symbol amplitudes may be varied independently. P5 is in reference to Mode S only.)
Resolution:	0.01 dB
Accuracy:	±0.25 dB
P2 Pulse - SIF, ACS or ACL SLS:	
SLS Mode:	
Spacing Nominal:	2.00 µs ±0.01 µs from rising edge of P1
Spacing Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns
Width Nominal:	0.8 µs s ±0.01 µs
Width Variable:	Nominal ±0.5 µs
Resolution:	1 ns
Accuracy:	±10 ns
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
SLS Channel:	TOP / BOTTOM
Diversity Mode:	
Spacing Nominal:	2.0 µs ±0.01 µs from rising edge of P1
Width Nominal:	800 ns ±10 ns
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
SLS Channel:	NONE / TOP / BOTTOM

TRANSPONDER (cont)

Side Lobe Suppression (SLS) Independent Channel Top and Bottom (cont):

P5 Pulse - Mode S SLS:	
SLS Mode:	
Spacing Nominal:	400 ns, ±10 ns prior to SPR
Spacing Variable:	Nominal ±1 ns
Resolution:	1 ns
Accuracy:	±10 ns
Width Nominal:	800 ns ±10 ns
Width Variable:	Nominal ±0.5 µs
Resolution:	1 ns
Accuracy:	±10 ns
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
SLS Channel:	TOP / BOTTOM
Diversity Mode:	
SLS Channel:	TOP / BOTTOM (SPR disable)
P5 Pulse - Mode 4 SLS:	
SLS Mode:	
Spacing Nominal:	8.0 µs, ±0.01 µs relative to rising edge of P1
Spacing Variable:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns
Width Nominal:	0.5 µs ±0.01 µs
Width Variable:	Nominal ±0.5 µs
Resolution:	1 ns
Accuracy:	±10 ns
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
SLS Channel:	TOP / BOTTOM
Diversity Mode:	
Spacing Nominal:	8.0 µs, ±0.01 µs relative to rising edge of P1
Width Nominal:	0.5 µs ±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)

TRANSPONDER (cont)

Side Lobe Suppression (SLS) Independent Channel Top and Bottom (cont):

P5 Pulse - Mode 4 SLS (cont):

Diversity Mode (cont):

SLS Channel:	NONE / TOP / BOTTOM

Mode 5 ISLS Symbols:

SLS Mode:

Spacing I1 Nominal:	10.5 µs Relative to P4 trailing edge
Accuracy:	±5 ns
Spacing I2 Nominal:	16.375 µs Relative to P4 trailing edge
Accuracy:	±10 ns
I1 and I2 Variable:	±62.5 ns or 125 ns Relative to nominal positions
Resolution:	62.5 ns
Accuracy:	±5 ns
Width:	
90%:	≥ 1.0625 µs
10%:	≤1.375 µs
Width (VAR):	±2 chips
Resolution:	1 ns
Accuracy:	±10 ns
SLS Channel:	TOP / BOTTOM

Diversity Mode:

Spacing I1 Nominal:	10.5 µs Relative to P4 trailing edge
Accuracy:	±5 ns
Spacing I2 Nominal:	16.375 µs Relative to P4 trailing edge
Accuracy:	±10 ns
Width:	
90%:	≥ 1.0625 µs
10%:	≤1.375 µs
SLS Pulse Selection:	I1, I2 , BOTH, NONE
SLS Channel:	NONE / TOP / BOTTOM

TRANSPONDER (cont)

Interference Pulse Characteristics:

Pulse Format:	CW or MSK (16 bits of MSK data)
Width:	0.25 µs to 32.00 µs
Resolution:	25 ns
Accuracy:	±10 ns
Level:	-15 dB to +5 dB, relative to reference pulse of synced interrogation
Resolution:	0.01 dB
Accuracy:	±0.2 dB
Primary Pulse:	
Position Range:	-44 µs to +400 µs, referenced to reference pulse of synced interrogation
Resolution:	1 ns
Accuracy:	±10 ns
Secondary Pulse:	
Spacing Range:	1 µs to +400 µs, referenced to reference pulse of synced interrogation
Resolution:	1 ns
Accuracy:	±10 ns

TRANSPONDER UUT MEASUREMENTS

Reply Decode:

SIF Mode 1:	
Normal:	0000 to 7777 (Octal)
Ident:	ID (2 Reply Groups)
Emergency:	EM (1 Reply Group + 3 sets framing pulses)
X Pulse:	X
SIF Mode 2:	
Normal:	0000 to 7777 (Octal)
Ident:	ID (1 Reply Group + SPI)
Emergency:	EM (1 Reply Group + 3 sets framingpulses)
X Pulse:	X
SIF Mode 3/A:	
Normal:	0000 to 7777 (Octal)
Ident:	ID (1 Reply Group + SPI)
Emergency:	EM (1 Reply Group + 3 sets framing pulses)
X Pulse:	X
SIF Mode C:	
Altitude:	-1000 ft to 126,700 ft (100 ft increments)
Code:	0000 to 7777 (Octal)
Mode S Squitter:	
Address/Data:	Hex
DF11:	
Period:	0.01 s to 4.0 s
DF17:	
Period Range:	
Airborne Position:	0.01 s to 2.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
Surface Position:	0.01 s to 15.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
A/C Identification:	0.01 s to 25.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)

TRANSPONDER UUT MEASUREMENTS (cont)

Reply Decode (cont):

DF17:	
Period Range:	
Airborne Position:	0.01 s to 2.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
Surface Position:	0.01 s to 15.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
A/C Identification:	0.01 s to 25.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
Airborne Velocity:	0.01 s to 2.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)
Event Driven:	0.01 s to 25.0 s
Resolution:	0.001 s
Accuracy:	±(0.001 s +0.001% of reading)

Reply Delay -
Top and Bottom Channel: Reply Delay Range is in reference to 0 nmi:

SIF Reply Delay:	P3 to F1
Range:	2.00 µs to 4.00 µs
Resolution:	1 ns
Accuracy:	±20 ns
Mode S Reply Delay:	SPR to P1
Range:	125.00 µs to 133.00 µs
Resolution:	1 ns
Accuracy:	±20 ns
Mode S Reply Delay:	P4 to P1
Range:	125.00 µs to 131.00 µs
Resolution:	1 ns
Accuracy:	±20 ns
ACS/ACL Reply Delay:	ATCRBS Reply P3 to F1
Range:	2.00 µs to 4.00 µs
Resolution:	1 ns
Accuracy:	±20 ns

TRANSPONDER UUT MEASUREMENTS (cont)

Reply Delay -
Top and Bottom Channel (cont):

Mode 4 Reply Delay:	
Internal Crypto:	P4 to R1 (Static when internal crypto simulation selected)
Range:	197.00 µs to 267.00 µs
Resolution:	1 ns
Accuracy:	±20 ns
External Crypto:	P4 to TDV (External Crypto Only)
Range:	197.00 µs to 267.00 µs
Resolution:	1 ns
Accuracy:	±20 ns
Mode 5 Reply Delay:	P4 to P2
Range:	464.00 µs to 2538.00 µs
Resolution:	1 ns
Accuracy:	±20 ns

Reply Jitter -
Top and Bottom Channel:

Reply Jitter All Modes:	Any SIF, Mode 4, Mode S reply pulse group, or Mode 5 reply symbol (except Mode 4 TDV)
Resolution:	1 ns
Accuracy:	±20 ns
Mode 4 TDV:	External Crypto Only (TDV jitter is dependent upon Crypto uncertainty.)
Resolution:	1 ns
Accuracy:	±20 ns

Reply Pulse Width -
Top and Bottom Channel:

SIF Reply Pulse Width:	F1/F2 or any code pulse, SPI
Tolerance:	±150 ns
Resolution:	1 ns
Accuracy:	±10 ns
Mode 4 Reply Pulse Width:	Mode 4 R1, 2, 3
Tolerance:	±200 ns
Resolution:	1 ns
Accuracy:	±10 ns

TRANSPONDER UUT MEASUREMENTS (cont)

**Reply Pulse Width -
Top and Bottom Channe (cont):**

Mode S Reply Pulse Width:	Mode S P1, 2 or Any Mode S Reply Bit 1 to 56, 112 selectable
Tolerance:	±200 ns
Resolution:	1 ns
Accuracy:	±10 ns

**Reply Pulse Top Ripple -
Top and Bottom Channel:**

Non Mode 5 Ripple	SIF F1/F2 or any code pulse, SPI, Mode 4 R1, 2, 3, and any Mode S Reply Bit 1 to 56 selectable
Resolution:	0.25dB
Accuracy:	±0.5 dB typical
Mode 5 Ripple:	
Resolution:	0.25dB
Accuracy:	±0.5 dB typical

**Reply Pulse Spacing -
Top and Bottom Channel:**

SIF Reply Pulse Spacing:	F1 to any pulse
Tolerance:	±300 ns
Resolution:	1 ns
Accuracy:	±10 ns
Mode S Reply Pulse Spacing:	P1 to any bit
Tolerance:	±190 ns
Resolution:	1 ns
Accuracy:	±10 ns
Mode 4 Reply Pulse Spacing:	R1 to any pulse
Tolerance:	±190 ns
Resolution:	1 ns
Accuracy:	±10 ns

TRANSPONDER UUT MEASUREMENTS (cont)

Mode 5 Level 1 ID and Data Replies:

Symbol Spacing:	P1, P2, D(N) Relative to symbol timing references, stagger removed
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns
Pulse Spacing:	P1, P2, D(N) falling edge to falling edge, stagger removed
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns
Pulse Width 10% and 90%:	P1, P2, D(N)
Tolerance:	±125 ns
Resolution:	1 ns
Accuracy:	±20 ns
Pulse Rise/Fall Time 10% to 90%:	P1, P2, D(N)
Resolution:	±1 ns
Accuracy:	±20 ns

Mode 5 Level 2 Report:

Symbol Spacing:	P1, P2, P3, P4, D(N) relative to symbol timing references (stagger removed)
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns
Pulse Spacing:	P1, P2, P3, P4, D(N) falling edge to falling edge (stagger removed)
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns
Pulse Width 10% and 90%:	P1, P2, P3, P4, D(N)
Tolerance:	±125 ns
Resolution:	1 ns
Accuracy:	±20 ns
Pulse Rise/Fall Time 10% to 90%:	P1, P2, P3, P4, D(N)
Resolution:	±1 ns
Accuracy;	±20 ns

TRANSPONDER UUT MEASUREMENTS (cont)

Mode 5 MSK Reply Mark/Space Frequency Measurement: Special waveforms are required to measure Mark/Space. The special waveform consists of a reply/report with a data pulse train of all Mark or Space frequency chips. See the COMMON UUT MEASUREMENT CHARACTERISTICS section for frequency accuracy and resolution.

Percent Reply:

Top and Bottom Channel:

Percent Reply:	SIF, Mode S, Mode 4, Mode 5
Range:	0% to 100%
Resolution:	0.0125%
Sample Size:	1-8000
Accuracy:	±0.0125% Maximum

INTERROGATOR MODE CHARACTERISTICS

Selectable Modes:	SIF, Mode S, ACS, ACL, Mode 4
	Mode 5 level 1 formats 0-9 (10-14 undefined and 15 is reserved)
	Mode 5 level 2 formats 16-23 (24-31 undefined)
Replies:	
SIF Mode 1:	
Normal :	1 Reply Group
Ident:	2 Reply Groups
Emergency:	1 Reply Group + 3 sets framing pulses
Code:	0000 to 7777
X:	X pulse ON/OFF
SIF Mode 2:	
Normal:	1 Reply Group
Ident:	1 Reply Group + SPI
Emergency:	1 Reply Group + 3 sets framing pulses
Code:	0000 to 7777
X:	X pulse ON/OFF
SIF Mode 3/A:	
Normal:	1 Reply Group
Ident:	1 Reply Group + SPI
Emergency:	1 Reply Group + 3 sets framing pulses
Code:	0000 to 7777
X:	X pulse ON/OFF
SIF Mode C:	
Normal:	1 Reply Group
Altitude:	-1000 ft to +126,700 ft (100 ft resolution)
X:	X pulse ON/OFF
Mode S Squitter:	
Address:	Hex
DF11:	
Rate:	0.4 s to 26.2s
Distribution:	0 s to 12.9 s, Cannot exceed maximum rate
DF17/18/19:	
Addres:	Hex
Rate:	0.4 s to 26.2 s
Distribution:	0 s to 12.9 s, Cannot exceed maximum rate

INTERROGATOR MODE CHARACTERISTICS (cont)

Replies (cont):

Mode S Formats:	
DF0-DF31:	Raw HEX data only
Mode 4:	
External Reply Slot:	Reply Triplet provided by KIT-1C
Internal Reply Slot:	Selectable
Fixed:	1-16
Challenge Directed:	See CRYPTO CHARACTERISTICS information section
Mode 5:	
Level 1:	Selectable Formats 0-9, Expandable 10-15. Raw data and format entry. No field entry.
Random Reply Delay:	Selectable (0-255 or Crypto Generated)
Level 2:	Selectable Formats 16-23, Expandable 24-31. Raw data and Report type entry. No field entry.
Sum/Difference:	Top channel timing reference to bottom channel timing reference
Deviation (VAR):	±1 µs
Resolution:	±0.001 µs
Accuracy:	±0.010 µs

Echo Characteristics:

Timing (Either Channel):	0 µs to 1 µs
Resolution:	±0.010 µs
Accuracy:	±0.010µs

Reply Pulse Characteristics:

SIF Mode Nominal:	
Spacing:	Relative to Rising Edge of F1
C1:	1.45 µs±0.01 µs
A1:	2.90 µs±0.01 µs
C2:	4.35 µs±0.01 µs
A2:	5.80 µs±0.01 µs
C4:	7.25 µs±0.01 µs
A4:	8.70 µs±0.01 µs
X	10.15 µs±0.01 µs
B1:	11.60 µs±0.01 µs
D1:	13.05 µs±0.01 µs
B2:	14.50 µs±0.01 µs

INTERROGATOR MODE CHARACTERISTICS (cont)

Reply Pulse Characteristics (cont):

SIF Mode Nominal (cont):

Spacing (cont):

D2:	15.95 µs±0.01 µs
B4:	17.40 µs±0.01 µs
D4:	18.85 µs±0.01 µs
F2:	20.30 µs±0.01 µs
1F1:	24.65 µs±0.01 µs
1F2:	44.95 µs±0.01 µs
2F1:	49.30 µs±0.01 µs
2F2:	69.60 µs±0.01 µs
3F1:	73.95 µs±0.01 µs
3F2:	94.25 µs±0.01 µs
Width:	0.45 µs±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)

Mode S Nominal:

Spacing:	Relative to Rising Edge of P1
P2:	1.00 µs ±0.01 µs
P3:	3.50 µs ±0.01 µs
P4:	4.50 µs ±0.01 µs
First data pulse:	8.00 µs ±0.01 µs
	(bit in logic “1” position, add 0.5 µs for logic “0” position)
Last data pulse (Short):	63.0 µs ±0.02 µs
	(bit in logic “1” position, add 0.5 µs for logic “0” position)
Last data pulse (Long):	119.0 µs ±0.02 µs
	(bit in logic “1” position, add 0.5 µs for logic “0” position)
Width:	0.50 µs ±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)

INTERROGATOR MODE CHARACTERISTICS (cont)

Reply Pulse Characteristics (cont):

Mode 4 Nominal:	
Spacing:	Relative to Rising Edge of R1
R2:	1.75 µs ±0.01 µs
R3:	3.50 µs ±0.01 µs
Width:	0.45 µs ±0.01 µs
Rise Time:	80 ns ±20 ns (10% to 90%)
Fall Time:	125 ns ±50 ns (90% to 10%)
Mode 5 Level 1 Nominal:	
Spacing:	Relative to P2 timing reference
P1:	-3.00 µs - Stagger (0-1.875 µs) ±0.005 µs
D9:	10.0625 µs ±0.005 µs
Preamble pulses:	
Width 90%:	≥1.0625 µs
Width 10%:	≤1.375 µs
Data pulse train	
Width 90%:	≥9.0625 µs
Width 10%:	≤9.375 µs
Rise Time:	62.5 ns to 87.5 ns (10% to 90%)
Fall Time:	87.5 ns to 162.5 ns (90% to 10%)
Mode 5 Level 2 Nominal:	
Spacing:	Relative to P4 timing reference
P1:	-26.625 µs - Stagger (0-2.875 µs) ±0.005 µs
P2:	-17.25 µs - Stagger (0-2.875 µs) ±0.005 µs
P3:	-5.00 µs - Stagger (0-1.375 µs) ±0.005 µs
D33:	34.0625 µs ±0.005 µs
Preamble pulses:	
Width 90%:	≥1.0625 µs
Width 10%:	≤1.375 µs
Data pulse train:	
Width 90%:	≥33.0625 µs
Width 10%:	≤33.375 µs
Rise Time:	62.5 ns to 87.5 ns (10% to 90%)
Fall Time:	87.5 ns to 162.5 ns (90% to 10%)

INTERROGATOR MODE CHARACTERISTICS (cont)

Reply Pulse Characteristics (cont):

Variable Modes:

SIF, Mode S, Mode 4:

Amplitude:	Nominal -15 dB to +5 dB
Resolution:	0.01 dB
Accuracy:	±0.25 dB
Width:	Nominal ±0.25 µs
Resolution:	1 ns
Accuracy:	±10 ns
Position:	Nominal ±1.0 µs
Resolution:	1 ns
Accuracy:	±10 ns

Mode 5:

Amplitude:	Nominal -15 dB to +5 dB
Resolution:	0.01 dB
Accuracy:	±0.25 dB
Width:	Nominal ±0.0625 µs
Resolution:	1 ns
Accuracy:	±10 ns
Position:	Nominal ±0.25 µs
Resolution:	1 ns
Accuracy:	±10 ns

Interference Pulse Characteristics:

Pulse Format:	CW or MSK (16 bits of MSK data)
Width:	0.25 µs to 32.00 µs
Resolution:	25 ns
Accuracy:	±10 ns
Level:	-1215 dB to +5 dB, relative to reference pulse of the reply
Resolution:	0.01 dB
Accuracy:	±0.2 dB

SIF, Mode S, Mode 4:

Primary Pulse:

Position Range:	-1 µs to +400 µs, referenced to reference pulse of the reply
Resolution:	1 ns
Accuracy:	±10 ns

INTERROGATOR MODE CHARACTERISTICS (cont)

Interference Pulse Characteristics (cont):

SIF, Mode S, Mode 4 (cont):

Secondary Pulse:

Spacing Range:	1 µs to +400 µs, referenced to the primary pulse
Resolution:	1 ns
Accuracy:	±10 ns

Mode 5:

Primary Pulse:

Position Range:	-5 µs to +400 µs, referenced to reference pulse of the reply
Resolution:	1 ns
Accuracy:	±10 ns

Secondary Pulse:

Spacing Range:	1 µs to +400 µs, referenced to the primary pulse
Resolution:	1 ns
Accuracy:	±10 ns

Reply Delay -
Top and Bottom Channels:

SIF:	P3 to F1
Range Nominal:	3.25 µs ±0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	±0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns

INTERROGATOR MODE CHARACTERISTICS (cont)

Reply Delay -
Top and Bottom Channels (cont):

ACS/ACL:

ATCRBS Reply P3 to F1:

Nominal:	3.25 µs ±0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	±0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns

Mode S Reply P4 to P1:

Nominal:	128.00 µs ±0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	±0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns

Mode S Reply SPR to P1:

Nominal:	128.00 µs ±0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	±0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns

INTERROGATOR MODE CHARACTERISTICS (cont)

Reply Delay -
Top and Bottom Channels (cont):

ACS/ACL (cont):

Mode 4:	P4 to R1 (Internal Mode 4 crypto simulation)
Format A:	202.00 µs ±0.10 µs (0 nmi)
Format B:	262.00 µs ±0.10 µs (0 nmi)
Nominal:	202.00 µs ±0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	±0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns
Mode 5:	P4 to P2 falling edge (Random Reply Delay of 0)
Nominal:	480.00 µs 0.10 µs (0 nmi)
Range Distance:	0 nmi to 400 nmi
Resolution:	0.01 nmi
Accuracy:	± 0.01 nmi
Range Time:	-1.0 µs to (8000 - Nominal Delay) µs
Resolution:	±1 ns
Accuracy:	±50 ns

Reply Delay Offset -
Bottom Channel Relative to Top Channel:

Nominal:	0.00 µs ±0.01 µs
Variable:	-1.00 µs to 1.00 µs
Resolution:	1 ns
Accuracy:	±10 ns

INTERROGATOR UUT MEASUREMENTS

Interrogation Rate:

SIF Range:	0 Hz to 10,000 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz
Mode S Range:	0 Hz to 3500 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz
Mode 4 Range:	0 Hz to 3500 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz
Mode 5 Range:	0 Hz to 1200 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz

Interrogation Pulse Top Ripple

Top and Bottom Channel:	SIF P1, 2, 3, Mode 4 P1-P37 Mode 5 Symbols
Mode S Preamble and P6:	
Accuracy:	±0.25 dB

Non-Mode 5 Interrogation Characteristics - Top and Bottom Channel:

Pulse Spacing:	
SIF:	
P1 to P3:	
Tolerance:	±600 ns
Resolution:	1 ns
Accuracy:	±10 ns
P1 to P2 (ISLS):	
Tolerance:	±460 ns
Resolution:	1 ns
Accuracy:	±10 ns
ACS, ACL:	
P1 to P4:	
Tolerance:	±600 ns
Resolution:	1 ns
Accuracy:	±10 ns

INTERROGATOR UUT MEASUREMENTS (cont)

Top and Bottom Channel (cont):

Pulse Spacing (cont):

Mode S Preamble:

P1 to P2:

Tolerance:	±185 ns
Resolution:	1 ns
Accuracy:	±10 ns

P1 to P5 (ISLS):	Simultaneous Top and Bottom Port operation only (non-overlapping signal)
Tolerance:	±185 ns
Resolution:	1 ns
Accuracy:	±10 ns

P1 to P6:

Tolerance:	±190 ns
Resolution:	1 ns
Accuracy:	±10 ns

Mode 4 Preamble:

P1 to P2:

Tolerance:	±380 ns
Resolution:	1 ns
Accuracy:	±10 ns

P1 to P3:

Tolerance:	±380 ns
Resolution:	1 ns
Accuracy:	±10 ns

P1 to P4:

Tolerance:	±380 ns
Resolution:	1 ns
Accuracy:	±10 ns

P1 to P5 (ISLS):

Tolerance:	±380 ns
Resolution:	1 ns
Accuracy:	±10 ns

INTERROGATOR UUT MEASUREMENTS (cont)

Pulse Width:

SIF:

P1, P2, P3:

Tolerance:	±165 ns
Resolution:	1 ns
Accuracy:	±10 ns

ACS, ACL:

P4:

Tolerance:	±165 ns
Resolution:	1 ns
Accuracy:	±10 ns

Mode S:

P1, P2, P3, P4, P5 (ISLS):

Tolerance:	±165 ns
Resolution:	1ns
Accuracy:	±10 ns

P6:

Tolerance:	±300 ns
Resolution:	1 ns
Accuracy:	±10 ns

Mode 4:

P1, P2, P3, P4, P5 (ISLS), All Data and All Pulses:

Tolerance:	±200 ns
Resolution:	1 ns
Accuracy:	±10 ns

Mode 5 Interrogation Characteristics -

Top and Bottom Channel:

Symbol Spacing:	P1, P2, P3, P4, I1, I2, D(N), Relative to P4 timing reference
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns

INTERROGATOR UUT MEASUREMENTS (cont)

Mode 5 Interrogation Characteristics - Top and Bottom Channel (cont):

Pulse Spacing:	P1, P2, P3, P4, I1, I2, D(N), Relative to P4 falling edge
Tolerance:	±62.5 ns
Resolution:	1 ns
Accuracy:	±10 ns
Pulse Width 10% and 90%:	P1, P2, P3, P4, I1, I2, D(N)
Tolerance:	±125 ns
Resolution:	1 ns
Accuracy:	±20 ns
Pulse Rise/Fall Time 10% to 90%:	P1, P2, P3, P4, I1, I2, D(N)
Resolution:	±1 ns
Accuracy:	±20 ns
Mode S Formats:	UF0
	UF4
	UF5
	UF11
	UF16
	UF17
	UF18
	UF19
	UF20
	UF21
	UF24
Mode S Data:	
Decode:	HEX Raw data only

DME/TACAN MODE CHARACTERISTICS

Range Simulation:

Range:	-1.00 nmi to 400.00 nmi
Resolution:	0.01 nmi
Accuracy:	±0.02 nmi ±0.0003% of simulated range

Velocity Simulation:

Range:	0 kts to 9,999 kts
Resolution:	1 kt
Accuracy:	±0.001%

Acceleration Simulation:

Range:	0 to 400 ft/sec/sec
Resolution:	1 ft/sec/sec
Accuracy:	±0.05% of setting

Squitter:

Range:	Selectable from 10 Hz to 8000 Hz
Resolution:	1 Hz (Ave squitter)
Accuracy:	10 Hz or 2%, whichever is greater
Distribution:	At 2700 Hz the distribution is in compliance with the requirements presented in ARINC Characteristics 568

Ident:

Position:	740 µs ±50 µs after ARB
Code Rep. Rate:	Variable, 10 s to 60 s
Code Rate Resolution:	0.1 s
Code Rate Accuracy:	0.1 s
Pulse Pair Rate:	1350 Hz ±0.02%
Equalizing Pulse Pair:	100 µs ±0.1 µs after IDENT
ASCII Code:	
Alphanumeric Char:	1 to 8 [A-Z]
Dot Time:	0.05 s to 0.25 s
Dash Time:	0.15 s to 0.75 s
Space Time:	0.05 s to 0.25 s
Character Space:	0.15 s to 0.75 s
Resolution:	0.01 s
Accuracy:	0.001 s

DME/TACAN MODE CHARACTERISTICS (cont)

Echo Pulse Pair Characteristics:

Position:	30 nmi ±0.2 nmi after the interrogation is received.
Amplitude:	-12 dB to +3 dB, referenced to the desired reply
Resolution:	0.1 dB
Accuracy:	±0.25 dB

Reply Efficiency:

Range:	0% to 100%
Resolution:	1%
Accuracy:	±0.5%
Distribution:	Fixed

Pulse Characteristics:

Spacing:	
Replies (DME/TACAN):	P1 to P2, 50% pk
X Channel:	12 µs ±0.1 µs,
Resolution:	1 ns
Accuracy:	±50 ns
Y Channel:	30 µs ±0.1 µs
Resolution:	1 ns
Accuracy:	±50 ns
A/A Interrogations (TACAN):	P1 to P2, 50% pk
X Channel:	12 µs ±0.1 µs
Resolution:	1 ns
Accuracy:	±50 ns
Y Channel:	24 µs ±0.1 µs
Resolution:	1 ns
Accuracy:	± 50 ns
P2 Deviation:	±12 µs (When Applicable without Pulse Overlap)
Resolution:	1 ms
Accuracy:	±50 ns
Rise Time:	2.0 µs ±0.25 µs (10% to 90%)
Fall Time:	2.5 µs ±0.25 µs (90% to 10%)

DME/TACAN MODE CHARACTERISTICS (cont)

Pulse Characteristics (cont):

Width Range:	3.5 µs to 9.0 µs (50% to 50%) variable, 3.5 µs Nominal
Resolution:	±0.001 µs
Accuracy:	±0.1 µs
Spectrum:	at least 42 dB down at f 0 ± 800 kHz

R-NAV Characteristics:

X Channel Spacing:	50 µs at 0 nmi
Accuracy:	±500 ns
Y Channel Spacing:	56 µs at 0 nmi
Accuracy:	±500 ns
Width (All Channels):	7 µs
Accuracy:	±1 µs

NREF Characteristics:

Position:	Coincident with negative going zero crossing of 15 Hz sine wave (with accuracy ±250 ns typical).
Width:	70 µs ±10µs

TACAN CHARACTERISTICS

Bearing:

Range:	0° to 359.9°
Resolution:	0.1°
Accuracy:	±0.05°

Bearing Rate:

Range:	0°/s to ±39°/s
Resolution:	1°/s
Accuracy:	±0.1°/s

TACAN Modulation:

Range:	0% to 39% (15 Hz and 135 Hz separately adjustable)
Resolution:	1%
Accuracy:	±1%
Distortion:	<5.0% of either tone, <2% typical

15/135 Hz Phase Shift:

Range:	0° to ±39°
Resolution:	1°
Accuracy:	±0.2°, (±0.05° typical)

TACAN 15/135 Hz Frequency Values:

Range:	±3.9%
Resolution:	0.1%
Accuracy:	±0.01%

Main Reference Burst:

Control:	Selectable ON/OFF on REFERENCE DEV MRB
Length:	
G/A:	
X Channel:	12 pulse pairs nominal
Y Channel:	13 single pulses nominal
A/A (All Channels):	10 single pulses nominal
Count Range:	Adjustable for -1, -2, +1 or +2 pairs/pulses
Pulse/Pair Group Spacing:	30.0 µs Nominal
Variable Spacing Range:	±3.9 µs
Resolution:	100 ns
Accuracy:	±100 ns

TACAN CHARACTERISTICS (cont)

Auxiliary Reference Burst:

Length (G/A):	
X Channel:	6 pulse pairs
Y Channel:	13 single pulses
Count Range:	Adjustable for -1, -2, +1 or +2 pairs/pulses
Pair Group Spacing (G/A):	
X Channel:	24.0 µs (12.0 µs pulse pair spacing – P1 to P2)
Y Channel:	15.0 µs
Variable Spacing Range:	±3.9 µs
Position:	The first ARB following MRB may be disabled.
Resolution:	100 ns
Accuracy:	±100 ns

A/A Interrogations:

Average Rate:	0 Hz to 3999 Hz
Resolution:	1 Hz
Accuracy:	±0.1% ±1 count
Period:	Selectable fixed or none

DME/TACAN UUT MEASUREMENTS

Pulse Spacing:

P1 to P2 Spacing (@50% amplitude):	±0.5 µs from Nominal
Resolution:	1 ns
Accuracy:	±50 ns

Pulse Width:

P1/P2 Acceptable Reply Pulse Width:	2.50 µs to 4.50 µs
Resolution:	1 ns
Accuracy:	±50 ns

Continuous Fixed Interrogation Rate - Top and Bottom Channels:

Interrogation Rate Range:	1 Hz to 10,000 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz

Continuous Squitter Rate - Top and Bottom Channels:

Squitter Rate Range:	1 Hz to 10,000 Hz
Resolution:	1 Hz
Accuracy:	±1 Hz

CRYPTO INTERFACES

Mode 4 Supported Cryptographic Devices:	KIT-1(A/C). KIR-1(A/C) KIV-77 Internal Crypto simulation (AC/DC power for the crypto is not supplied by the IFF-45TS)
Mode 5 Supported Cryptographic Devices:	KIV-77 Internal Crypto simulation
Internal Mode 4 Crypto Simulation:	Per “Technical Description of Mode 4/5 Cryptographic Computer Emulator Equations” prepared by: United States Navy Mode 5 Program Office. January 2008
Internal Mode 5 Crypto Simulation:	Per “Technical Description of Mode 4/5 Cryptographic Computer Emulator Equations” prepared by: United States Navy Mode 5 Program Office. January 2008
External Mode 4 Crypto Interface KIR-1(A/C) and KIT-1(A/C):	Per AIMS 97-900
External Mode 4/5 Crypto Interface KIV-77:	Per AIMS 04-900A

CONNECTORS

Front Panel Connectors:

Direct Top/Sum:	
Connector Type:	N
Direct Bot/Diff:	
Connector Type:	N
Antenna Top/Sum:	
Connector Type:	TNC
Antenna Bot/Diff:	
Connector Type:	TNC
Programmable Out 1 and 2 (Prog Out 1 and 2):	
Connector Type:	BNC
Amplitude:	DAC Output ±2.5V (50 Ω Output Impedance)
Sum Channel Functions:	(All Modes)
SUM_RX_DATA:	Receive Raw Data
SUM_RX_BOXCAR_8x16:	Filtered Receive Data (8x16 Boxcar)
SUM_RX_BOXCAR_10x11:	Filtered Receive Data (10x11 Boxcar)
SUM_TX_DATA:	Transmit Raw Data
SUM_TX_BOXCAR_8x16:	Filtered Transmit Data (8x16 Boxcar)
SUM_TX_BOXCAR_10x11:	Filtered Transmit Data (10x11 Boxcar)
SUM_M5_TRHESHOLD_VIDEO:	Threshold Values for Mode 5 Decode Detection
SUM_M5_PREAMBLE_VIDEO:	Mode 5 Preamble Detection Video
SUM_M5_MSK_VIDEO:	Mode 5 MSK Data Detection Video
Diff Channel Functions:	(All Modes)
DIF_RX_DATA:	Receive Raw Data
DIF_RX_BOXCAR_8x16:	Filtered Receive Data (8x16 Boxcar)
DIF_RX_BOXCAR_10x11:	Filtered Receive Data (10x11 Boxcar)
DIF_TX_DATA:	Transmit Raw Data
DIF_TX_BOXCAR_8x16:	Filtered Transmit Data (8x16 Boxcar)
DIF_TX_BOXCAR_10x11:	Filtered Transmit Data (10x11 Boxcar)
DIF_M5_TRHESHOLD_VIDEO:	Threshold Values for Mode 5 Decode Detection
DIF_M5_PREAMBLE_VIDEO:	Mode 5 Preamble Detection Video
DIF_M5_MSK_VIDEO:	Mode 5 MSK Data Detection Video
Walsh Code Video Functions:	(Transponder/Interrogator Modes)
M5_WALSH_(X)_VIDEO:	Walsh Code (X) Associated Video (Selectable, 0-15)

CONNECTORS (cont)

Trigger In:

Connector Type:	BNC
Polarity:	Positive
Level:	LVTTL
Function:	
Transponder Mode:	PRF Trigger
Delay:	To Interrogation Reference Point (Fixed + Selectable)
Selectable:	0-20 µs (Not selectable in TACAN Mode)
Fixed:	Enabled Mode and Crypto Setting Dependent
Without Mode 5:	(Interrogations enabled)
Normal:	46.22 µs 0.1 µs
Ext. Mode 4:	214.7 µs ±0.1 µs
With Mode 5:	(Interrogations enabled)
Double/Interlace:	
Normal:	755.43 µs ±0.1 µs
Ext. Mode 4:	755.93 µs ±0.1 µs
Diversity:	
Normal:	635.43 µs ±0.1 µs
Ext. Mode 4:	635.93 µs ±0.1 µs
All Remaining:	
Normal:	495.41 µs ±0.1 µs
Ext. Mode 4:	495.91 µs ±0.1 µs
Interrogator Mode:	Reply Trigger
Delay:	Fixed + Selectable + Target Range
Selectable:	0-20 µs (Not selectable in TACAN Mode)
Fixed:	
SIF Modes:	1.55 µs ±0.1 µs
Mode S:	1.55 µs ±0.1 µs
Mode 4:	1.55 µs ±0.1 µs
Mode 5:	4.75 µs ±0.1 µs

CONNECTORS (cont)

Trigger In (cont):

TACAN Mode:	Reply Trigger
Delay:	Fixed + Target Range
Fixed:	Time to P1
G/A Mode:	40 µs ±0.2 µs
A/A Mode:	52 µs ±0.2 µs

Trigger Out:

Connector Type:	BNC
Polarity:	Positive
Amplitude:	LVTTL, Active High
Width:	1 µs ±0.01 µs
Transponder Mode:	
Position:	
Sync'd Interrogation:	Coincident with Timing Reference ±0.1 µs
Delay:	
SIF Modes:	P3 Rising Edge (50% Point)
Mode S:	SPR (90 Degree Point)
Mode 4:	P4 Rising Edge (50% Point)
Mode 5:	P4 Symbol Data
Sync'd Reply Detection:	Coincident with Reply Detect
Delay:	
SIF Modes:	23.2 µs ±0.1 µs after F1
Mode S:	7.5 µs ±0.1 µs after P1
Mode 4:	6.5 µs ±0.1 µs after R1
Mode 5 – Level 1:	1.8 µs ±0.1 µs after P2
Mode 5 – Level 2:	1.8 µs ±0.1 µs after P4
Interrogator Mode:	
Position:	
Transmit Selected Target:	Coincident with Start of Transmission ± 0.1 µs
Target:	Selectable 1-12
Delay:	At 0 nmi
SIF Modes:	F1 Rising Edge (50% Point)
Mode S:	P1 Rising Edge (50% Point)
Mode 4:	R1 Rising Edge (50% Point)
Mode 5 – Level 1:	P2 Symbol Data
Mode 5 – Level 2:	P4 Symbol Data

CONNECTORS (cont)

Trigger In (cont):

Interrogator Mode (cont):

Position (cont):

Measured Detection:	Coincident with Detection of Measured Interrogation
Delay:	
SIF Modes:	2.6 µs ±0.1 µs after P3
Mode S:	0.312 µs ±0.1 µs after SPR
Mode 4:	3.9 µs ±0.1 µs after P4
Mode 5:	17.4 µs ±0.1 µs after P4 (Falling Edge)
TACAN Mode:	Selectable

Position:

15 Hz Modulation:	±250 ns of positive going zero crossing of 15 Hz sine wave
135 Hz Modulation:	±250 ns of positive going zero crossing of 135 Hz sine wave
MRB Sync:	Coincident with first pulse of Main Reference Burst
ARB Sync:	Coincident with first pulse of each Auxiliary Reference Burst
UUT A/A Interrogation:	8.0 µs ±1.0 µs following P2 (Rising Edge)
Reply:	Coincident with rise of first pulse of pattern
Squitter, Echo, Ident:	Coincident with rise of first pulse of pattern
NREF:	Coincident with negative going zero crossing of 15 Hz sine wave

Rear Panel Connectors:

Ext 10MHz In:

Connector Type:	BNC
Function:	External 10 MHz Reference Clock
Nominal Level:	10 dBm

Suppression In:

Connector Type:	BNC
Function:	Suppresses Transmission
Level:	Active High, 10 V to 80 V

CONNECTORS (cont)

Rear Panel Connectors (cont):

Suppression Out:	
Connector Type:	BNC-Triax-2lug
Pulse Characteristics:	(Measured with a 2K Ω load)
Pulse Width:	0.25 to 300 µs
Resolution:	1 ns
Accuracy:	±0.5 µs
Amplitude:	12 to 80V
Resolution:	0.1V
Accuracy:	±2V
Nominal Position:	
Transponder:	
SIF:	0.25 µs prior to P3
Mode S:	0.15 µs prior to SPR
Mode 4:	0.25 µs prior to P4
Mode 5:	0.30 µs prior to P4
TACAN:	Unavailable
Interrogator:	Unavailable
Position Deviation:	-40.00 µs to 2500.00 µs relative to timing reference
Resolution:	100 ns
Accuracy:	±200 ns

External Input:

Connector Type:	25 Pin D-SUB, Female
Level :	LVTTL
Functions:	
Pin 12:	Suppression Input (Active Low)

External Output:

Connector Type:	25 Pin D-SUB, Female
Level:	LVTTL
Functions:	(All Modes)
Pin 2:	TACAN R-NAV Signal (Same as TACAN R-NAV, above)
Pin 11:	Sum Channel 50% Video
Pin 12:	Difference Channel 50% Video
Pin 14:	TACAN NREF (Same as TACAN NREF, above)

CONNECTORS (cont)

Communications Connections:

GPIB/IEEE-488:

Connector Type:	Standard IEEE-448.1

Ethernet:

Connector Type:	RJ-45

Serial:

Connector Type:	9 Pin D-SUB, Female

GENERAL

Input Power:	100 to 240 VAC, 50 to 60 Hz (CE)
Environmental	
Temperature:	-10 °C to +55 °C (functional)
Relative Humidity:	< 80% for temperatures up to 31 °C decreasing linearly to 50% at 40 °C non-condensing
Altitude:	< 4000 meters (13,124 ft)
Pollution:	degree 2
Dimensions:	
Width:	17.75”
Depth	21”
Height	4”
Weight	24 lbs. (10 kg.)

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SECTION 4 - SHIPPING

1. SHIPPING TEST SETS

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

Authorization

Do not return any products to factory without first receiving authorization from Aeroflex Customer Service Department.

Contact Aeroflex:

Customer Service Dept.

Telephone: (800) 835-2350
FAX: (316) 524-5330

E-Mail: americas.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 not available, 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.)

Freight Insurance

Aeroflex recommends that customers obtain freight insurance with the freight carrier when shipping Test Set. Aeroflex is not responsible for cost of repairs for damages that occur during shipment on warranty or non-warranty items. Contact Aeroflex Customer Service for Test Set shipping instructions.

NOTE: Test Set must be properly packaged or freight company may not honor insurance claim.

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 top packing mold rests solidly on Test Set.
- 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.

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SECTION 5 - STORAGE

1. STORING TEST SETS

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

- Disconnect Test Set from any electrical power source.
- Disconnect the wire harness connecting the battery to the Test Set and remove the battery. Refer to the Battery/Voltage Instructions.
- 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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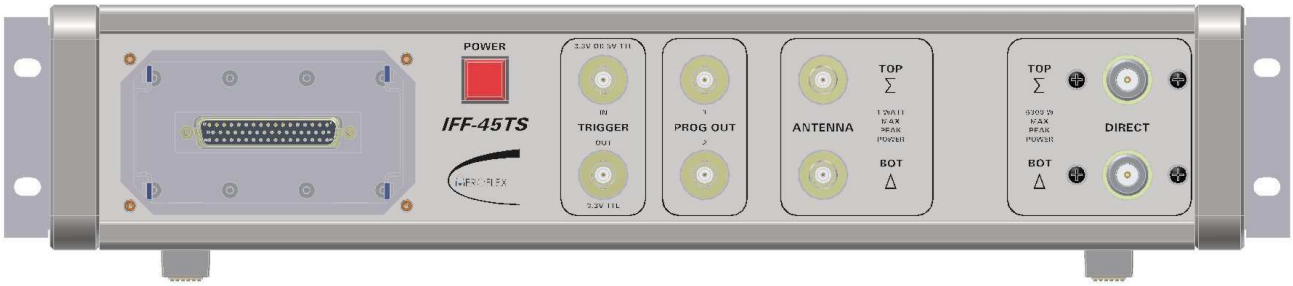
APPENDIX A - CONNECTOR PIN-OUT TABLES

I/O CONNECTORS – FRONT PANEL

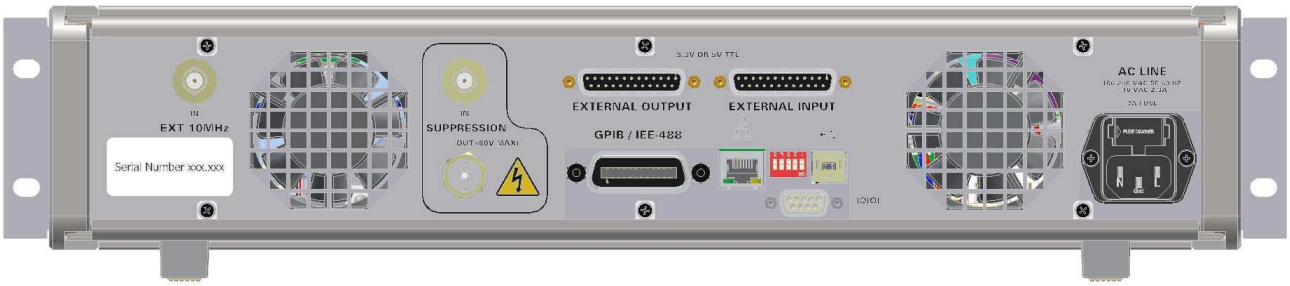


IFF-45TS Front Panel
Figure 1

CONNECTOR	TYPE	SIGNAL TYPE	INPUT/OUTPUT
TRIGGER IN	BNC	LVTTL, 50 Ohm	INPUT
TRIGGER OUT	BNC	LVTTL, 50 Ohm	OUTPUT
PROG OUT 1	BNC	±2.5V DAC	OUTPUT
PROG OUT 2	BNC	±2.5V DAC	OUTPUT
ANTENNA TOP	TNC	RF, 1W MAX Peak	INPUT/OUTPUT
ANTENNA BOTTOM	TNC	RF, 1W MAX Peak	INPUT/OUTPUT
DIRECT TOP	N	RF, 4.0 kW MAX Peak, 25W MAX Average power	INPUT/OUTPUT
DIRECT BOTTOM	N	RF, 4.0 kW MAX Peak, 25W MAX Average power	INPUT/OUTPUT

I/O Connectors - Front Panel
Table 1

I/O CONNECTORS – REAR PANEL

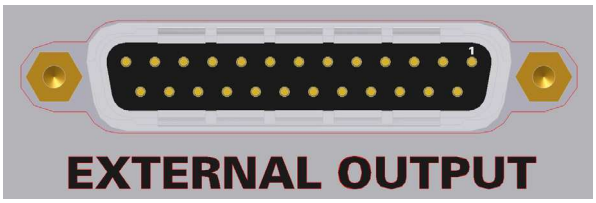


IFF-45TS Rear Panel
Figure 2

CONNECTOR	TYPE	SIGNAL TYPE	INPUT/OUTPUT
EXT 10 MHz IN	BNC	External Time Reference, +10 dBm Nominal	INPUT
SUPPRESSION IN	BNC	0-80V	INPUT
SUPPRESSION OUT	BNC_Triax-2Lug	12-80V	OUTPUT
EXTERNAL OUTPUT	25 Pin D-SUB Female	LVTTL	OUTPUT
EXTERNAL INPUT	25 Pin D-SUB Female	LVTTL	INPUT
GPIB/IEEE-488	Standard IEEE-488.1	See Pin-Out	INPUT/OUTPUT
RS-232	9 Pin D-SUB Female	See Pin-Out	INPUT/OUTPUT
USB	USB Type B	Not supported at this time	INPUT/OUTPUT
ETHERNET	RJ-45	See Pin-Out	INPUT/OUTPUT
AC IN	IEC-320-C14	AC POWER	INPUT

I/O Connectors - Rear Panel
Table 2

EXTERNAL INPUT CONNECTOR PIN-OUTS

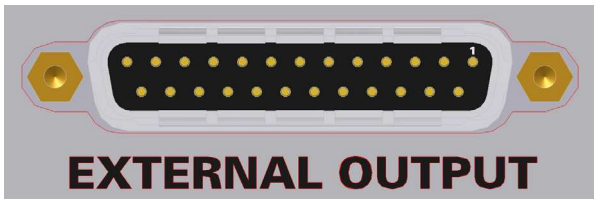


EXTERNAL OUTPUT Connector
Figure 3

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	GND	GND	GND
2	TACAN RNAV	LVTTL	OUTPUT
3	Undefined	LVTTL	OUTPUT
4	GND	GND	GND
5	Undefined	LVTTL	OUTPUT
6	Undefined	LVTTL	OUTPUT
7	GND	GND	GND
8	Undefined	LVTTL	OUTPUT
9	Undefined	LVTTL	OUTPUT
10	GND	GND	GND
11	TACAN SUM Channel 50% Video	LVTTL	OUTPUT

Pin-Out Table for EXTERNAL OUTPUT Connector
Table 3

EXTERNAL INPUT CONNECTOR PIN-OUTS (cont)

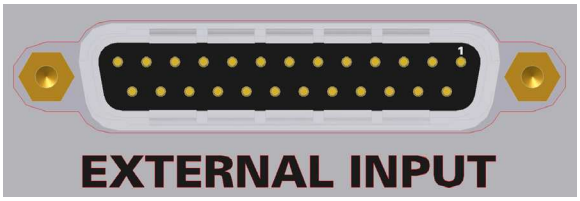


EXTERNAL OUTPUT Connector
Figure 3

12	TACAN DIFF Channel 50% Video	LVTTL	OUTPUT
13	GND	GND	GND
14	TACAN NREF	LVTTL	OUTPUT
15	GND	GND	GND
16	Undefined	LVTTL	OUTPUT
17	Undefined	LVTTL	OUTPUT
18	GND	GND	GND
19	Undefined	LVTTL	OUTPUT
20	Undefined	LVTTL	OUTPUT
21	GND	GND	GND
22	Undefined	LVTTL	OUTPUT
23	Undefined	LVTTL	OUTPUT
24	GND	GND	GND
25	N/C	N/C	N/C

Pin-Out Table for EXTERNAL OUTPUT Connector
Table 3 (cont)

EXTERNAL INPUT CONNECTOR PIN-OUTS

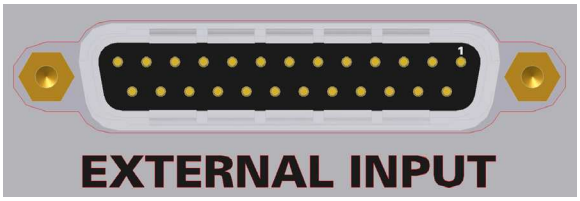


EXTERNAL INPUT Connector
Figure 4

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	GND	GND	GND
2	Undefined	LVTTL	INPUT
3	Undefined	LVTTL	INPUT
4	GND	GND	GND
5	Undefined	LVTTL	INPUT
6	Undefined	LVTTL	INPUT
7	GND	GND	GND
8	Undefined	LVTTL	INPUT
9	Undefined	LVTTL	INPUT
10	GND	GND	GND
11	Undefined	LVTTL	INPUT

Pin-Out Table for EXTERNAL INPUT Connector
Table 4

EXTERNAL INPUT CONNECTOR PIN-OUTS (cont)

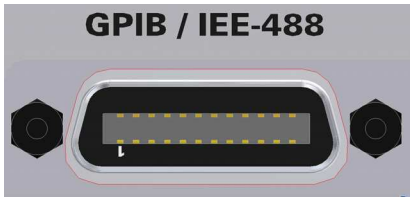


EXTERNAL INPUT Connector
Figure 4

12	Suppression Input Active Low	LVTTL	INPUT
13	GND	GND	GND
14	Undefined	LVTTL	INPUT
15	GND	GND	GND
16	Undefined	LVTTL	INPUT
17	Undefined	LVTTL	INPUT
18	GND	GND	GND
19	Undefined	LVTTL	INPUT
20	Undefined	LVTTL	INPUT
21	GND	GND	GND
22	Undefined	LVTTL	INPUT
23	Undefined	LVTTL	INPUT
24	GND	GND	GND
25	N/C	N/C	N/C

Pin-Out Table for EXTERNAL INPUT Connector
Table 4 (cont)

GPIB/IEEE-488 CONNECTOR PIN-OUTS

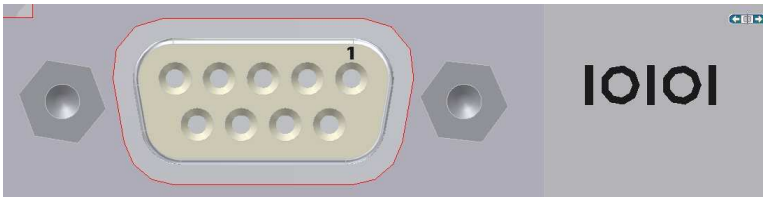


GPIB/IEEE-488 Connector
Figure 5

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	DIO1	TTL	INPUT/OUTPUT
2	DIO2	TTL	INPUT/OUTPUT
3	DIO3	TTL	INPUT/OUTPUT
4	DIO4	TTL	INPUT/OUTPUT
5	EOI	TTL	INPUT/OUTPUT
6	DAV	TTL	INPUT/OUTPUT
7	NRFD	TTL	INPUT/OUTPUT
8	NDAC	TTL	INPUT/OUTPUT
9	IFC	TTL	INPUT/OUTPUT
10	SQR	TTL	INPUT/OUTPUT
11	ATN	TTL	INPUT/OUTPUT
12	SHIELD	GND	GND
13	DIO5	TTL	INPUT/OUTPUT
14	DIO6	TTL	INPUT/OUTPUT
15	DIO7	TTL	INPUT/OUTPUT
16	DIO8	TTL	INPUT/OUTPUT
17	REN	TTL	INPUT/OUTPUT
18	GND(TW Pair)	GND	GND
19	GND(TW Pair)	GND	GND
20	GND(TW Pair)	GND	GND
21	GND(TW Pair)	GND	GND
22	GND(TW Pair)	GND	GND
23	GND(TW Pair)	GND	GND
24	Signal GND	GND	GND

Pin-Out Table for GPIB/IEEE-488 Connector
Table 5

RS-232 CONNECTOR PIN-OUS

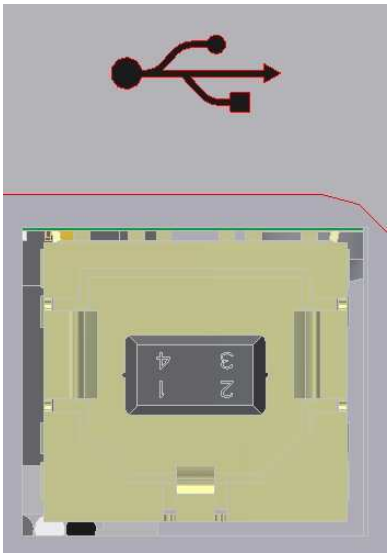


RS-232 Connector
Figure 6

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	NC	NC	NC
2	RX Data	±5V to ±30V Data	INPUT
3	TX Data	±5V Data	OUTPUT
4	NC	NC	NC
5	GND	GND	GND
6	NC	NC	NC
7	RTS	±5V Control	OUTPUT
8	CTS	±5V to ±30V Control	INPUT
9	NC	NC	NC

Pin-Out Table for RS-232 Connector
Table 6

USB CONNECTOR PIN-OUTS

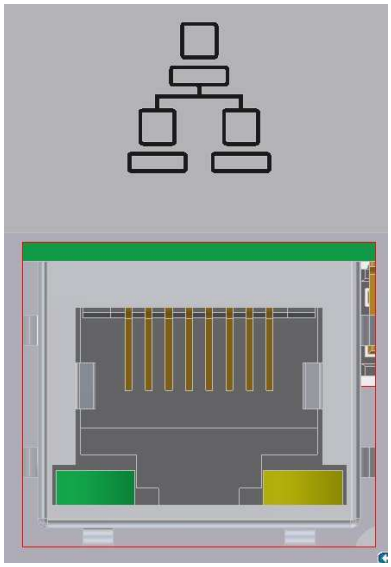


USB Connector
Figure 7

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	VBUS	4.0 to 5.25VDC	INPUT
2	D-	Data	INPUT/OUTPUT
3	D+	Data	INPUT/OUTPUT
4	GND	GND	INPUT
5	GND	GND	INPUT
6	GND	GND	INPUT

Pin-Out Table for USB Connector
Table 7

ETHERNET CONNECTOR PIN-OUTS



ETHERNET Connector
Figure 8

PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	TX+	Data	OUTPUT
2	TX-	Data	OUTPUT
3	RX+	Data	INPUT
4	RC Terminated	Not used	N/A
5	RC Terminated	Not used	N/A
6	RX-	Data	INPUT
7	RC Terminated	Not used	N/A
8	RC Terminated	Not used	N/A

Pin-Out Table for ETHERNET Connector
Table 8

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 - ABBREVIATIONS

A

A	Amperes
AA	Address Announced
AC	Altitude Code
AC	Alternating Current
ac	Alternating Current
ACAS	Airborne Collision Avoidance System
ACL	All Call Long
ACS	All Call Short
ACS	Altitude Code Subfield
ACS	Comm-A Capability Subfield
ADDR	Address
Addr	Address
ADLP	Airborne Data Link Processor
ADJ	Adjust
ADS	A-Definition Subfield
AIMS	ATCRBS IFF Mark XII(A) System
AIS	Comm-A Capability Subfield
AM	Amplitude Modulation
ANG	Analog
ANP	Actual Navigation Performance
ANT	Antenna
Ant	Antenna
ANT A	Antenna A
AntA	Antenna A
ANT B	Antenna B
AntB	Antenna B
AP	Address Parity
APER	Antenna A Percent Reply
AQ	Acquisition Special
ARB	Auxiliary Reference Burst
Arf	RF through Antenna A
ARF LVL	Antenna A RF Level
ASCII	American National Standard Code for Information Interchange
ATC	Air Traffic Control
ATC	ATCRBS (screen/function abbreviation)
ATCRBS	Air Traffic Control Radar Beacon System
ATE	Automatic Test Equipment
ATS	Altitude Type Subfield
AUX	Auxiliary

B

BD	Comm-B Data
BCS	Comm-B Capability Subfield
BDS	B-Definition Subfield
BN	Burst Number
BPER	Antenna B Percent Reply
bps	Bits per Second
Brf	RF through Antenna B
BRF LVL	Antenna B RF Level

C

C	Celsius or Centigrade
CA	Transponder Capability
CAL	Calibration or Calibrated
CC	Crosslink Capability
ccw	Counterclockwise
CFS	Continuation Subfield
CH	Channel
CHAN	Channel
CL	Code Label
CL/ESC	Clear/Escape
CLOS	Closeout
cm	Centimeter (10^{-2} Meters)
C MENU	Control Menu
COMSEC	Communication Security
Cont	Continued
CR	Carriage Return
CTRL	Control
CTS	Clear to Send/(One-way hardware)
CTS/RTS	Two-way hardware
CVC	Cancel Vertical Resolution Advisory Complement
CVI	Crypto Validity Interval
CW	Continuous Wave
cw	Clockwise

D

DABS	Discrete Address Beacon System
DAC	Digital to Analog Converter
DCD	Data Carrier Detect
dB	Decibel
DBL	Double
dBm	Decibels above one milliwatt
DELM	Downlink Extended Length Message
DEV	Deviation
DF	Downlink Format
DHCP	Dynamic Host Configuration Protocol
DI	Designator Identification
DI	Double Interrogation
Dly	Delay
DME	Distance Measuring Equipment
DMM	Digital Multimeter
DNS	Domain Name System
DO	Document
DPSK	Differential Phase Shift Keying
DR	Downlink Request
DSP	Digital Signal Processor
DSR	Data Set Ready
DTR	Data Terminal Ready
Dv	Deviation

E

ECL	Extended Command Language
ECS	Extended Capability Subfield
EDAC	Error Detection and Correction
ELM	Extended Length Message
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EnaTrgWd	Enable Trigger Width
EOL	End of Line
ER	Emergency Reply
ERRM	Error Message
ESC	Escape
ESD	Electrostatic Discharge
EX MOD	External Modulation
EXP	Expected
EX SYN	External Synchronization
EXT	External
Ext	External

F

FIR	Finite Impulse Response (Filter)
FP	Front Panel Processor
FPGA	Field Programmable Array
FPM	Feet Per Minute
FREQ	Frequency
FS	Flight Status
FUNC	Function
FUNC#	Function Number
F/W	Firmware
Ft	Foot/Feet

G

GEN	Generator
GHz	Gigahertz (10^9 Hertz)
GND	Ground
GNSS	Global Navigation System Satellite
GPIB	General Purpose Interface Bus
GPS	Global Positioning System
GRP	Group
GTC	Gain Time Control
GUI	Graphical User Interface

H

h	Hexadecimal
HEX	Hexadecimal
Hndshk	Handshake
HRC	Horizontal Resolution Advisory Complement
hrs	Hours
Hz	Hertz

I

IC	Interrogator Code
ID	Identification (4096 Code)
IDS	Identifier Designators Subfield
IEEE	Institute of Electrical and Electronics Engineers
IFF	Identification Friend or Foe
II	Interrogator Identification
IIS	Interrogator Identification Subfield
IN	Input
INT	Internal
Int	Internal
INTF	Interface
INTRF	Interference
INTERR	Interrogation
INTERRF	Interference
INTLCE	Interlace
I/O	Input/Output
IP	Identification Pulse, Special
I/P	Identification of Position
ISLS	Interrogator Side-Lobe Suppression
ITAR	International Traffic in Arms Regulations

J

Jtr	Jitter

K

KE	Control, ELM
kg	Kilogram (10^3 Grams)
kHz	Kilohertz (10^3 Hertz)
Kts	Knots (Velocity)

L

LCA	Logic Cell Array
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Line Feed
LOS	Lockout Subfield
LSS	Lockout Surveillance Subfield
LVL	Level

M

M4	Mode 4
MA	Message, COMM-A
MAN	Manual
MAX	Maximum
MB	Message, COMM-B
MBS	Multisite COMM-B Subfield
MC	Message, COMM-C
MD	Message, COMM-D
ME	Message, Extended Squitter
MES	Multisite ELM Subfield
MHz	Megahertz (10^6 Hertz)
MIN	Minimum
µs	Microsecond (10^{-6} Seconds)
MLD	Multi-Level Diversity
MOD	Modulation
MP	Main Processor
MRB	Main Reference Burst
MS	Mode S
ms	Millisecond (10^{-3} Seconds)
MTE	Multiple Threat Encounter
MTL	Minimum Threshold Level
MU	Message, COMM-U
MV	Message, COMM-V

N

NA	Not Applicable
NATO	North Atlantic Treaty Organization
NC	C-Segment Number
ND	D-Segment Number
Neg	Negative
NORM	Normal
NR	NATO Restricted
NRT	North Reference Trigger
ns	Nanosecond (10^{-9} Seconds)

O

o	Octal
OCT	Octal
OPT	Option
OUT	Output
Ω	Ohm

P

PC	Personal Computer
PC	Printed Circuit
PC	Protocol
PLCS	Places
PN	Part Number
PP	Pulse Processor
PPM	Pulse Position Modulation
ppm	Parts per Million
P PULSE	Prepulse
PR	Probability of Reply
PRF	Pulse Repetition Frequency
PRTSCR	Print Screen
PWR	Power

R

RAM	Random Access Memory
RAC	Resolution Advisory Complement
RAT	Resolution Advisory Termination
RC	Reply Control
RCI	Remote Control Interface
RCS	Rate Control Subfield
RCV	Receive
RESV	Reservation
RF	Radio Frequency
RI	Reply Information Air-to-Air
RL	Reply Length
RMS	Root Mean Square
Rnd	Random
ROM	Read Only Memory
RPDLY	Reply Delay
RPLY	Reply
RR	Reply Request
RRS	Reply Request Subfield
RSS	Reservation Status Subfield
R/T	Receiver / Transmitter
RTCA	Requirements and Technical Concepts for Aviation organization
RTS	Request to Sent
RXD	Receive Data

S

SAS	Surface Antenna Subfield
SCOPE	Oscilloscope
SCPI	Standard Commands for Programmable Instruments organization
SD	Special Designator
Sec	Second
SEQ	Sequence
SEQ AD	Sequence Address
SI	Surveillance Identifier
SIF	Selective Identification Format
SIS	Surveillance Identifier Subfield
SLM	Standard Length Message
SLS	Side-Lobe Suppression
SMENU	Sequence Menu
SPER	Antenna A Mode S Percent Reply
SPI	Special Identifier Pulse (Special Position Identification)
spi	Special Identifier Pulse
SPR	Synchronous Phase Reversal
SQTR	Squitter
Sqtr	Squitter
Src	Source
SRQ	Service Request
SRS	Segment Request Subfield
SSR	Secondary Surveillance Radar
SSS	Surveillance Status Subfield
STANAG	Standardization Agreement
STATMTL	MTL Status
SYNC	Synchronous
sync	Synchronous

T

TACAN	Tactical Air Navigation
TCAS	Traffic Alert and Collision Avoidance System
TCS	Type Control Subfield
TCXO	Temperature Compensated Crystal Oscillator
TD	Reply Sync
TDV	Time-Decoded Video
TID	Threat Identity Data
TMAC	Test Macro Language
T MENU	Test Menu
TMS	Tactical Message Subfield
TO	Interrogation Sync
T/R	Transmitter / Receiver
TRANSEC	Transmission Security
TRIG	Trigger
Trig	Trigger
TRS	Transmission Rate Subfield
TTI	Threat Type Indicator
TTL	Transistor-Transistor Logic
TX	Transmit
TXD	Transmit Data
TYP	Typical

U

UDS	U-Definition Subfield
UELM	Uplink Extended Length Message
UF	Uplink Format
UM	Utility Message
U MENU	User Menu
UUT	Unit Under Test

V

V	Volt
VAC	Volts, Alternating Current
VAR	Variation
VCO	Voltage Controlled Oscillator
Vdc	Volts, Direct Current
VDS	V-Definition Subfield
VERS	Version
Vid	Video
Vih	High Level Input Voltage
Vil	Low Level Input Voltage
Voh	High Level Output Voltage
Vol	Low Level Output Voltage
V_{P-P}	Volts, Peak to Peak
VRAM	Video Random Access Memory
VRC	Vertical Resolution Advisory Complement
Vrms	Volts Root Mean Square
VS	Vertical Status
VSWR	Voltage Standing Wave Ratio

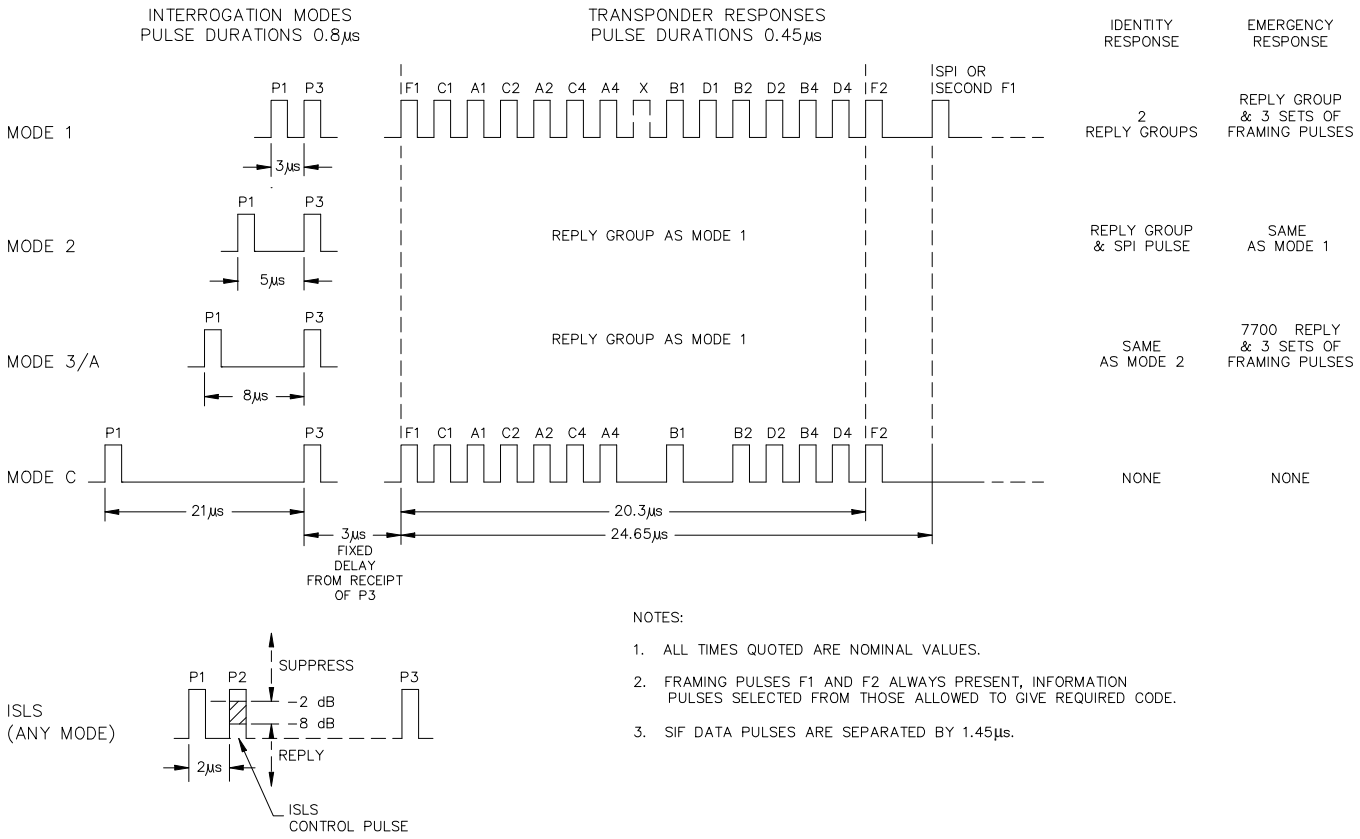
W

W	Watt
w/	With
Wd	Width
w/o	Without

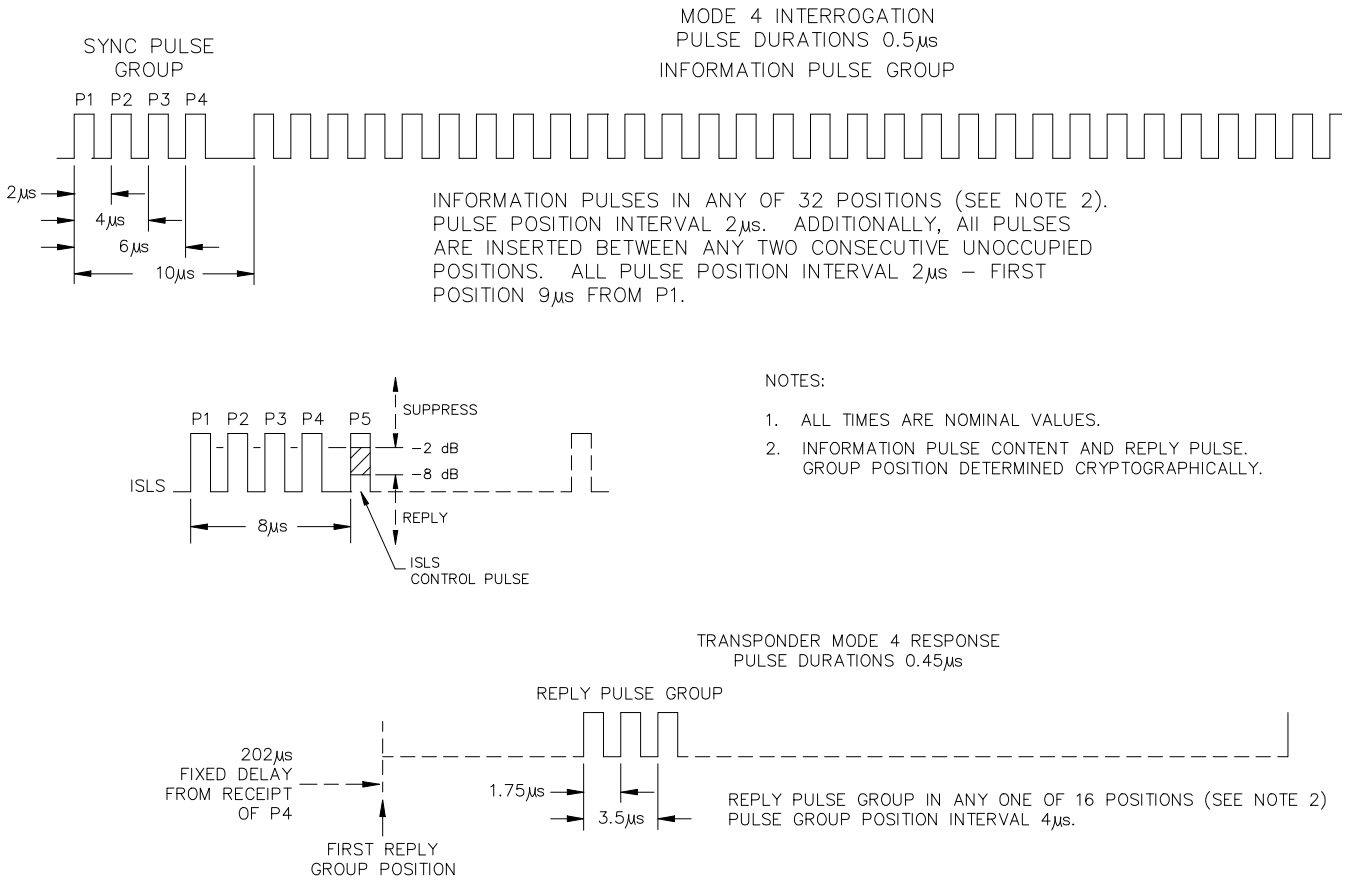
X

XMT	Transmit
XMTR	Transmitter
XON/XOFF	Software Handshake
XPDR	Transponder

APPENDIX D – TRANSPONDER/INTERROGATOR TIMING DIAGRAMS

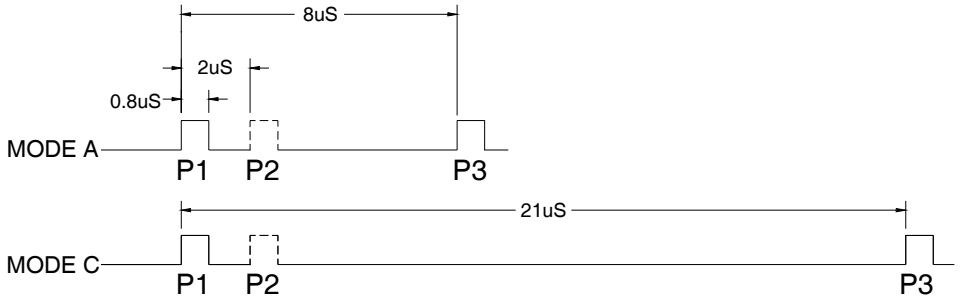


IFF MK10A / MK12 SIF Interrogation / Reply Formats
Figure 1

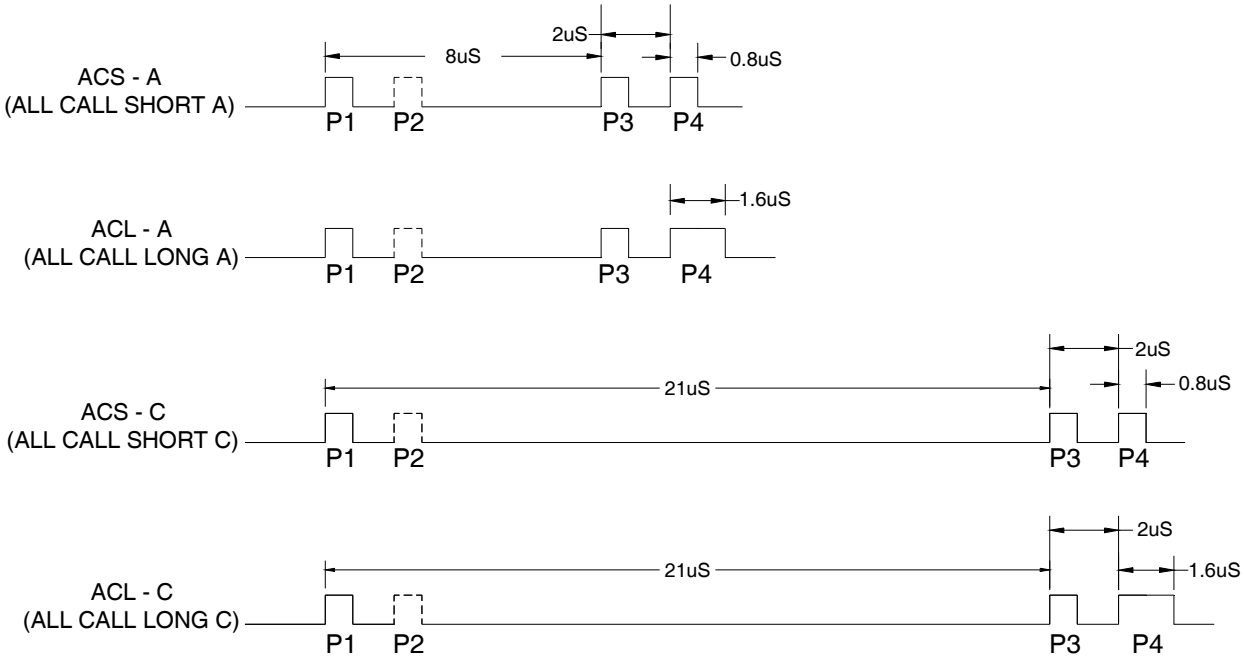


IFF MK12 Mode 4 Interrogation / Reply Formats
Figure 2

ATCRBS

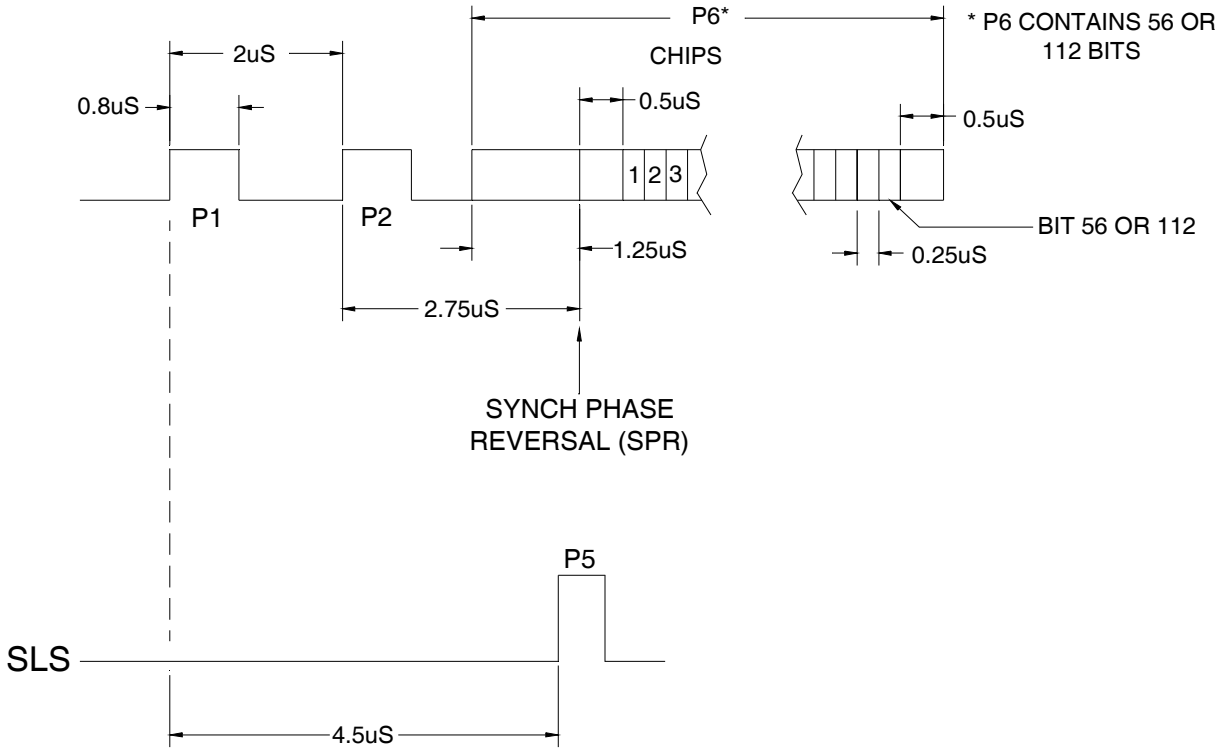


INTER MODE

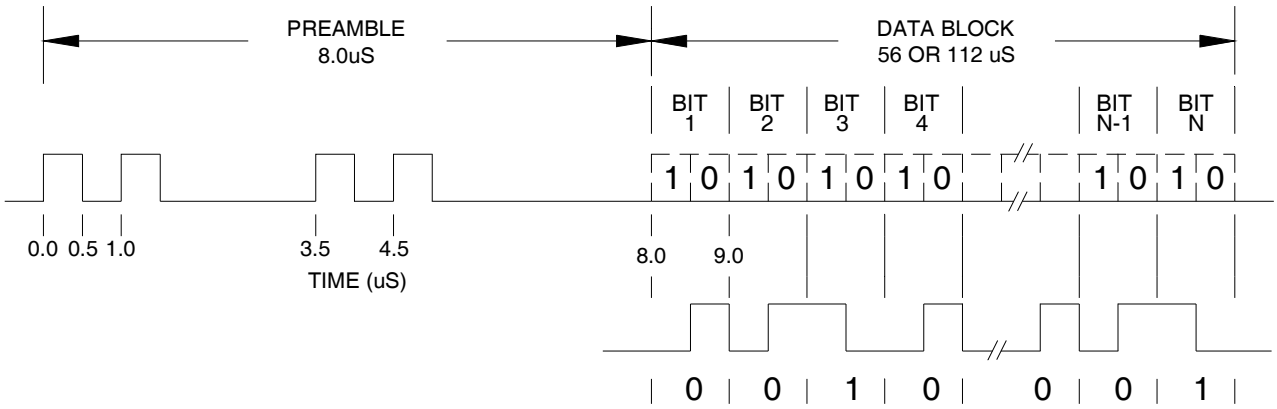


Pulse Patterns for Mode S PAM Interrogations
Figure 3

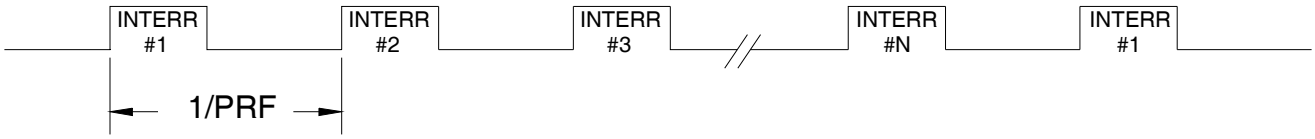
MODE S INTERROGATION
DISCRETE ADDRESSING (DPSK)



Pulse Pattern for Mode S DPSK Interrogations
Figure 4

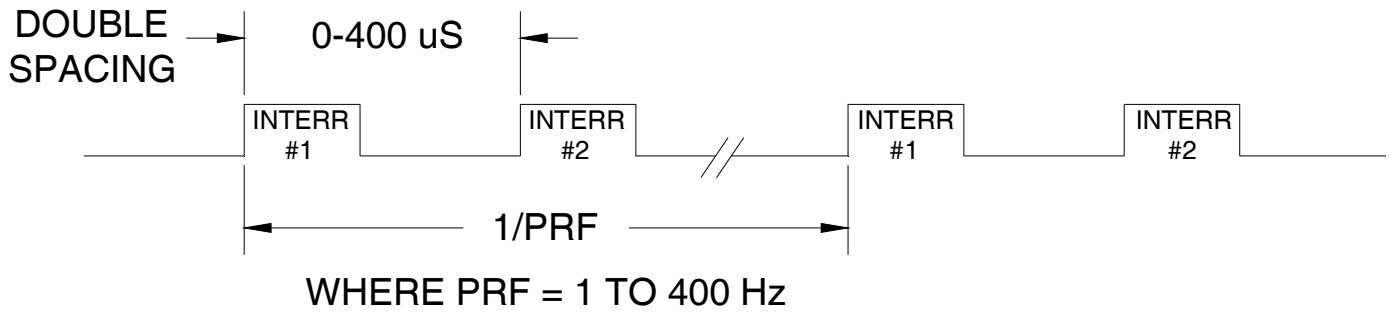


Mode S Reply Pattern
Figure 5

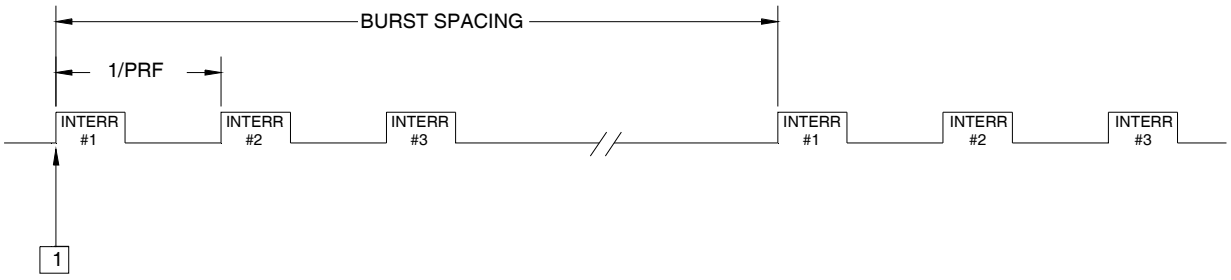


WHERE N = 1 TO 30 and
PRF = 1 TO 400 Hz

Normal Test Mode Timing
Figure 6



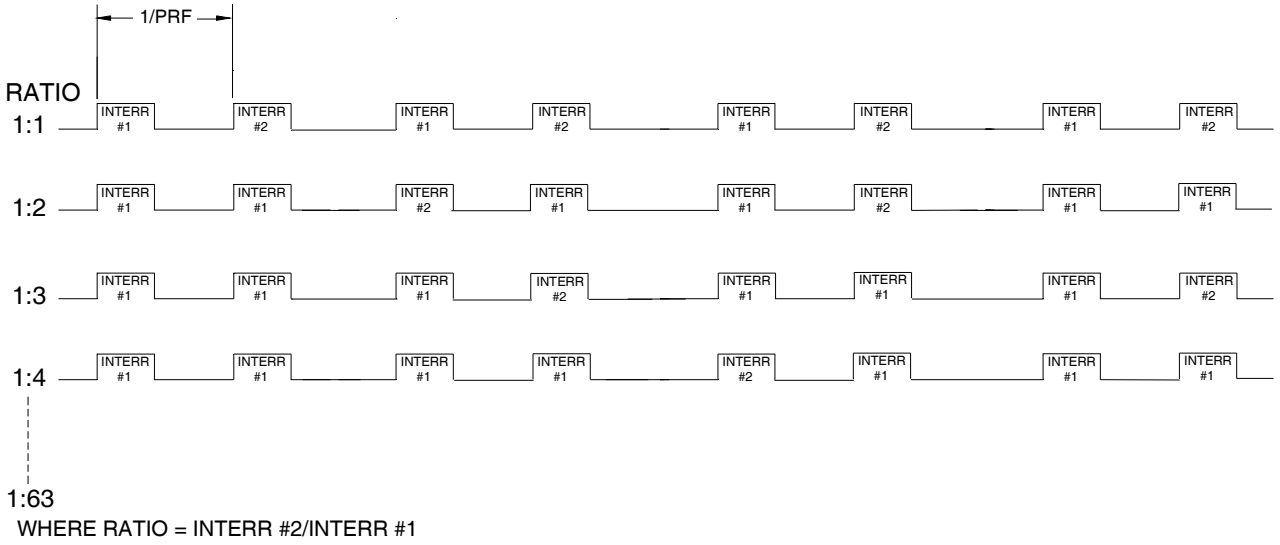
Double Test Mode Interrogation Timing
Figure 7



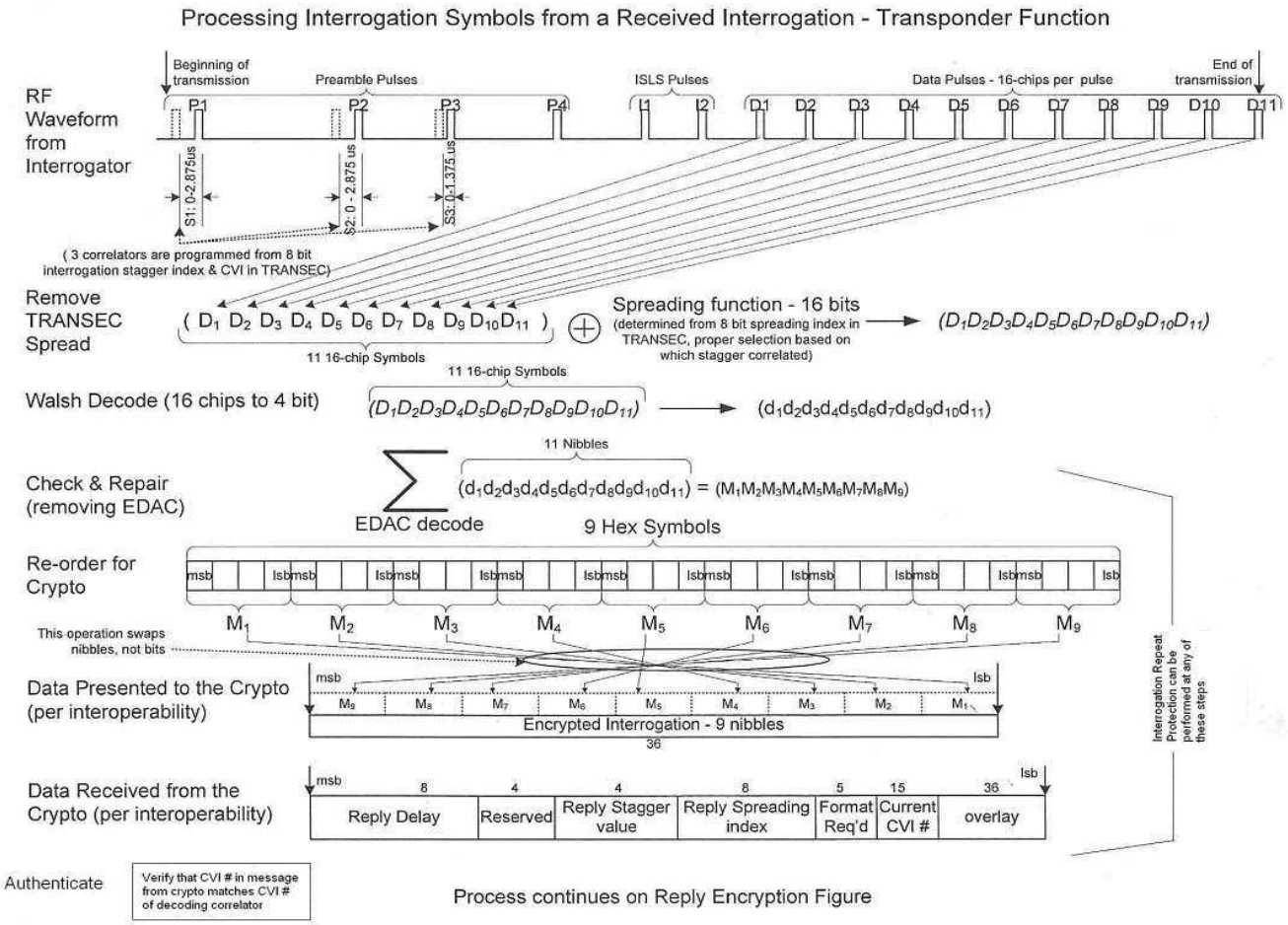
Where: Interrogation Count = 1 to 2000
PRF = 1 to 2500
Burst Spacing = 0.1 to 20 sec

1 First interrogation output of each burst is the first enabled interrogation in the Table summary menu.

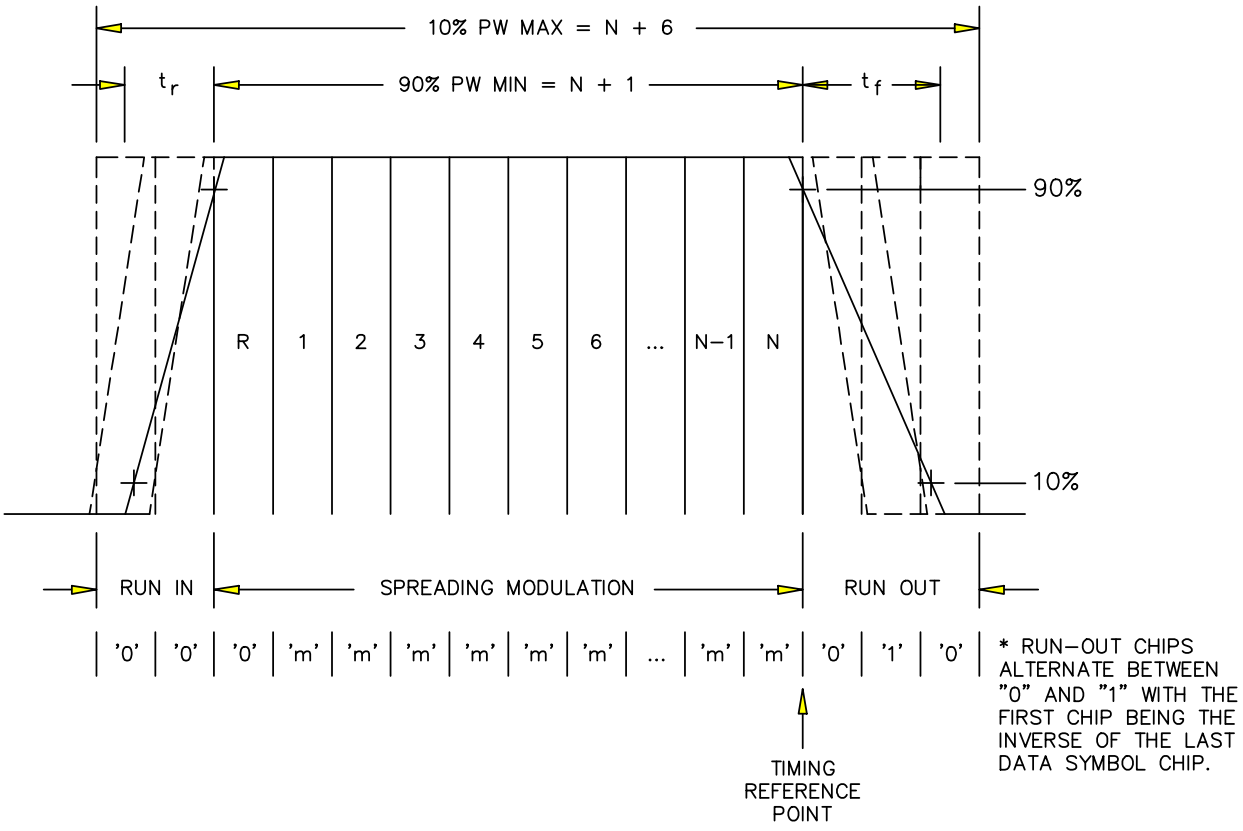
Burst Mode Timing
Figure 8



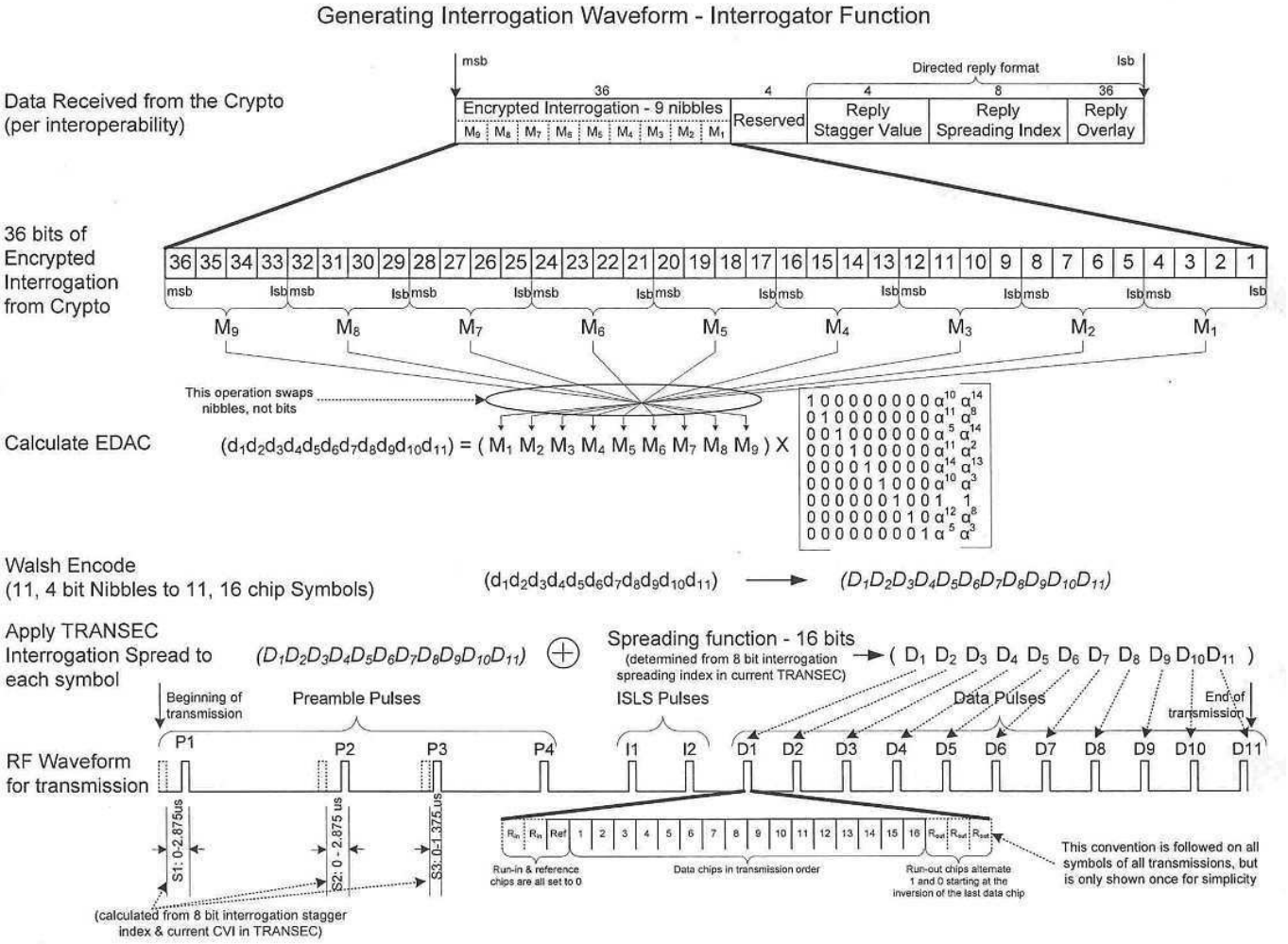
Interlaced Mode Timing
Figure 9



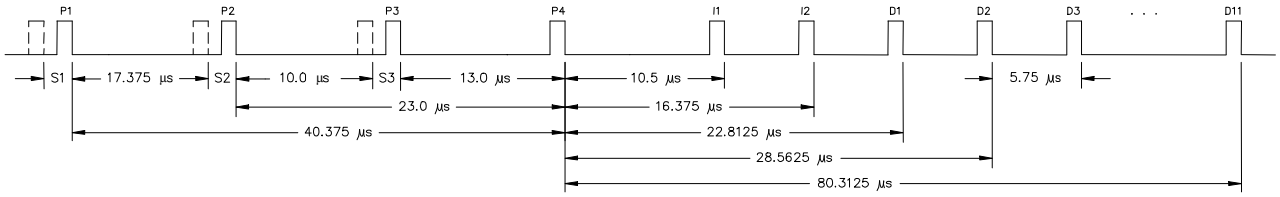
Processing Mode 5 Interrogation Symbols
Figure 10



Mode 5 Symbol
Figure 11



Generating Mode 5 Interrogation Waveform
Figure 12

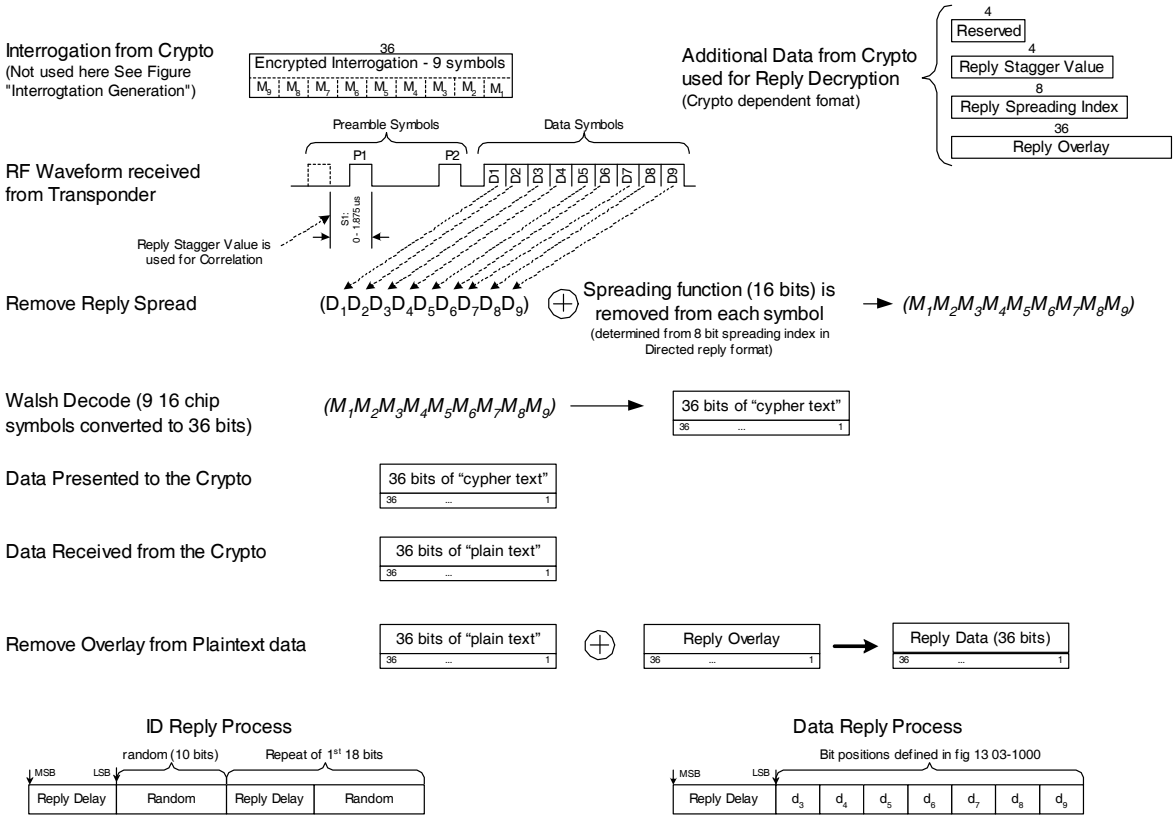


LENGTH OF WAVEFORM: 121.75 TO 124.625µs

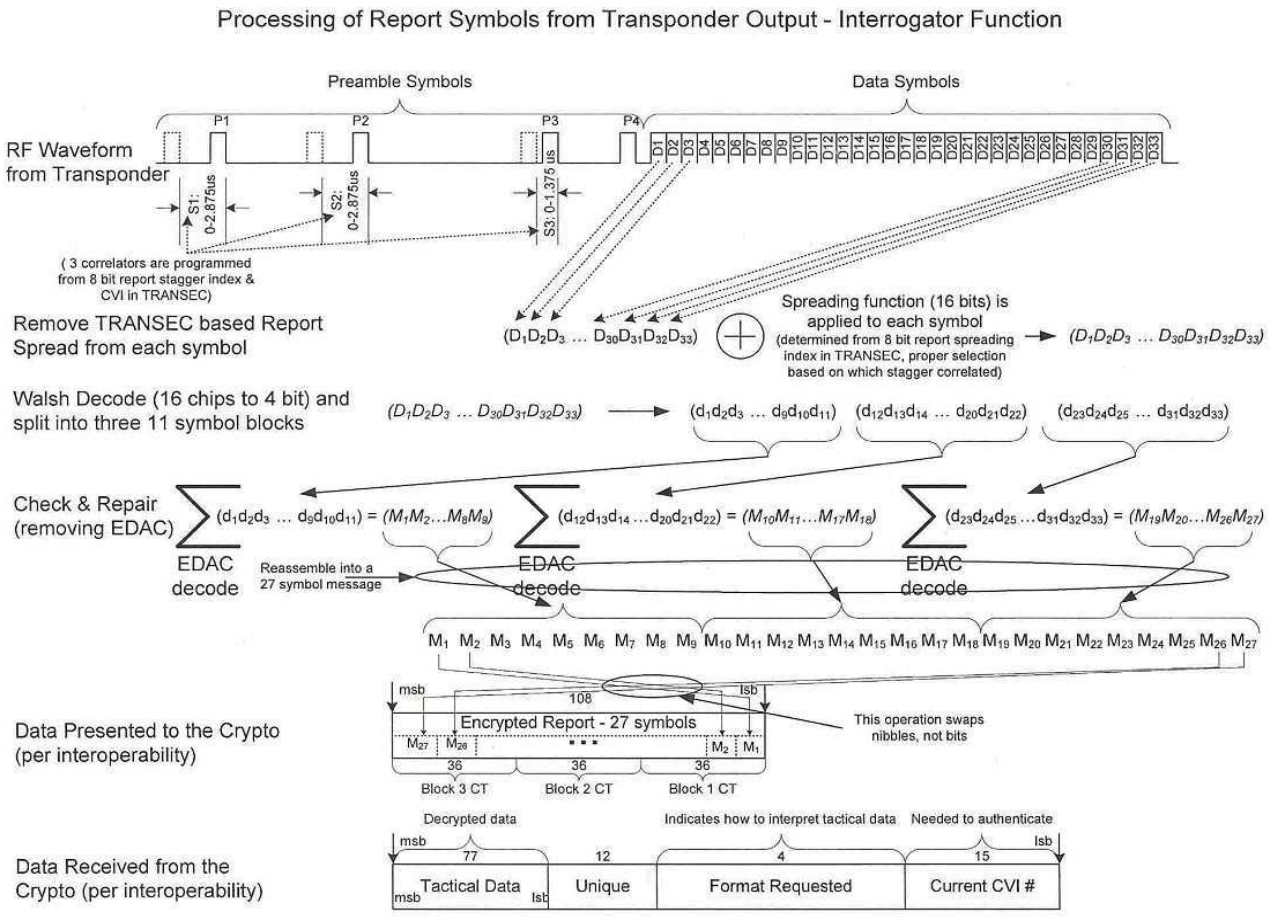
P1–P4: SYNC SYMBOLS
I1, I2: ISLS SYMBOLS
D1–D11: DATA SYMBOLS
S1 STAGGER: 0 TO 2.875µs
S2 STAGGER: 0 TO 2.875µs
S3 STAGGER: 0 TO 1.375µs

Mode 5 Process Gain Waveform
Figure 13

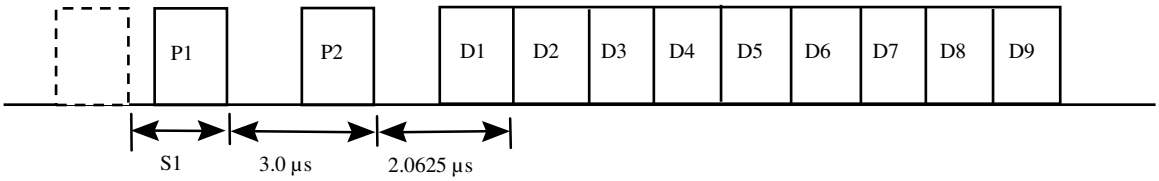
Processing Reply Symbols from a Received Reply - Interrogator Function



Processing Mode 5 ID and Data Reply Symbols
Figure 14



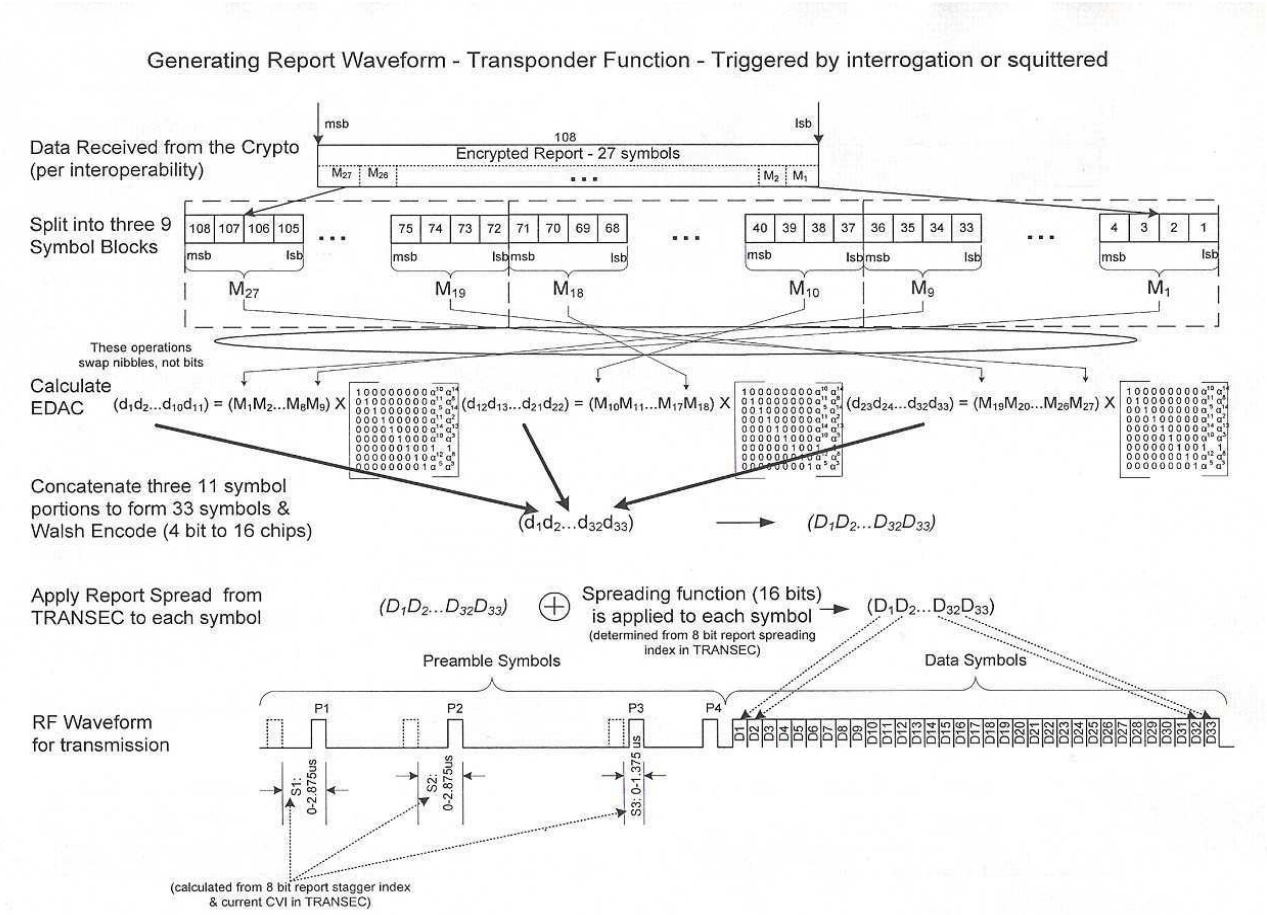
Processing Mode 5 Report Symbols
Figure 15



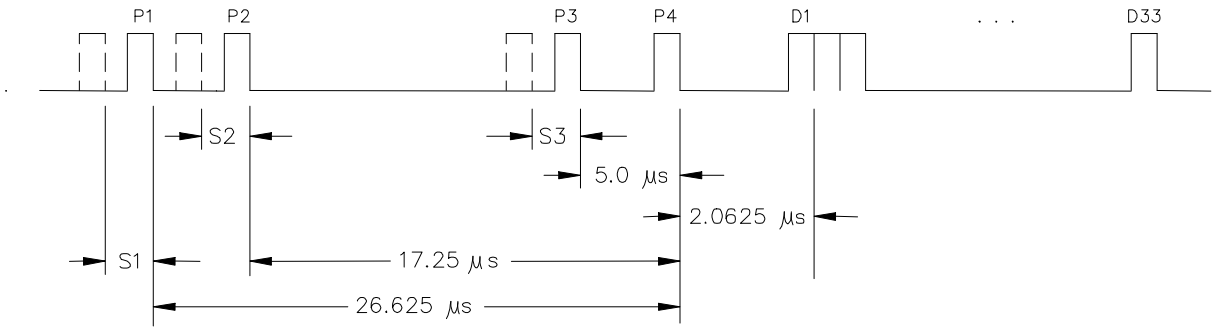
Length of waveform: 14.125 to 16.0 µs

P1,P2: Sync Symbols (17 chips)
D1-D9: Data (Nine Contiguous Symbols, 16 chips each, plus one reference chip)
S1: Preamble Stagger: 0 to 1.875 µs in 0.125 µs steps

Mode 5 Level 1 Reply Waveform
Figure 16



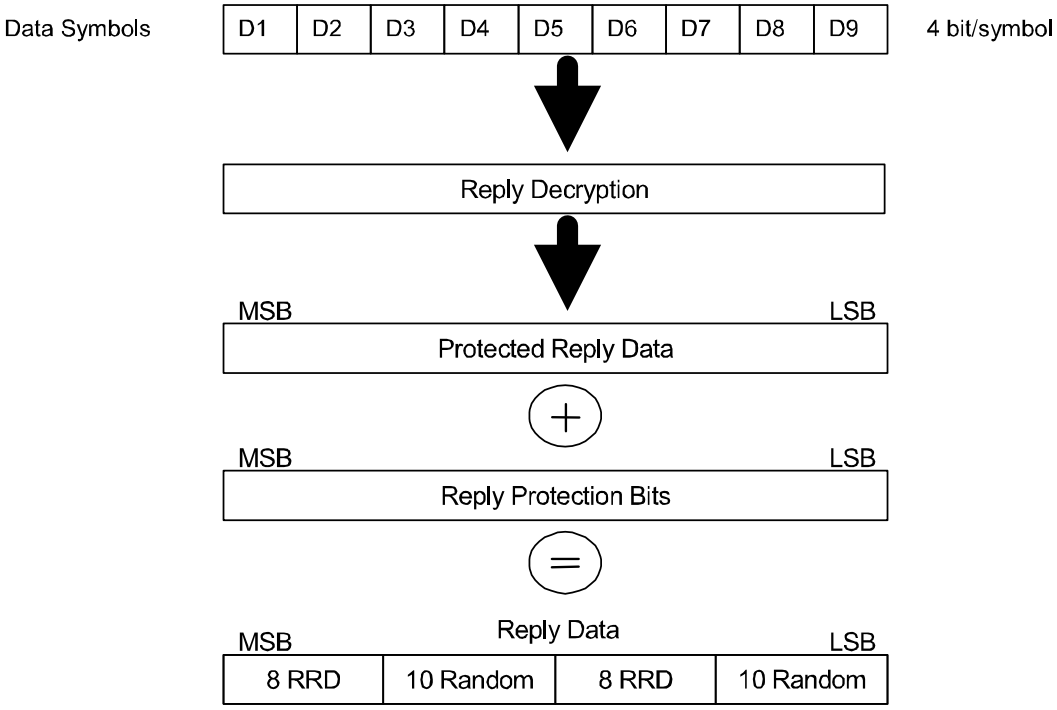
Generating Mode 5 Report Waveform
Figure 17



LENGTH OF WAVEFORM (90% AMPLITUDE POINT): 61.75 TO 64.625 µs

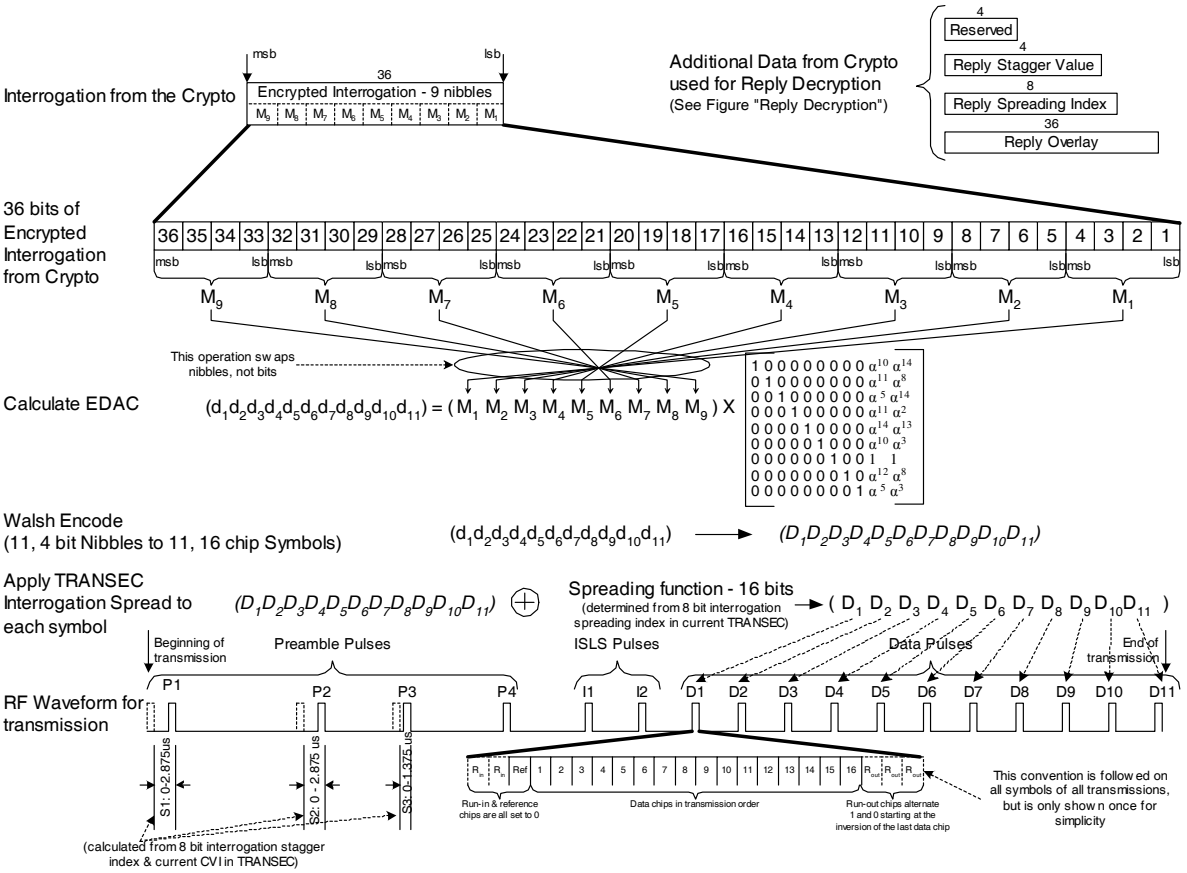
NOMINAL VALUES
P1–P4: SYNC SYMBOLS
D1–D33: DATA
S1: PREAMBLE STAGGER 0 TO 2.875 µs
S2: PREAMBLE STAGGER 0 TO 2.875 µs
S3: PREAMBLE STAGGER 0 TO 1.375 µs

Mode 5 Level 2 Report Waveform
Figure 18

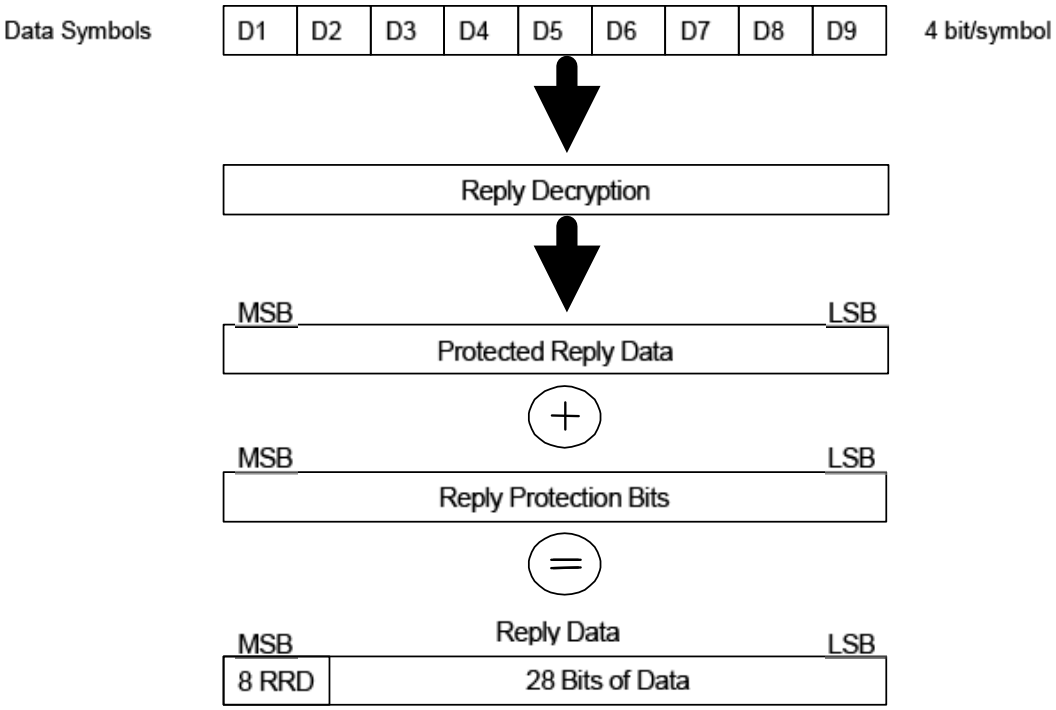


Generation of Mode 5 ID Reply Symbols
Figure 19

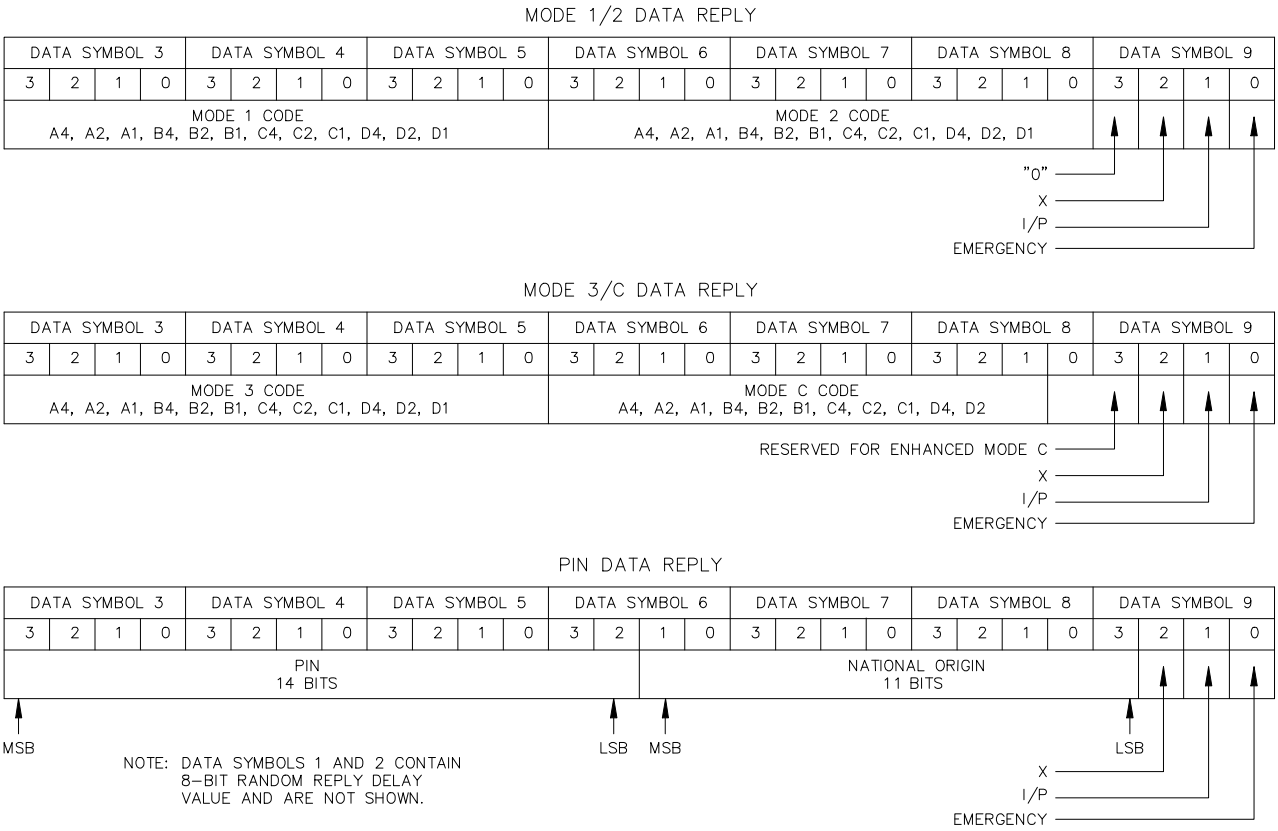
Generating Interrogation Waveform - Interrogator Function



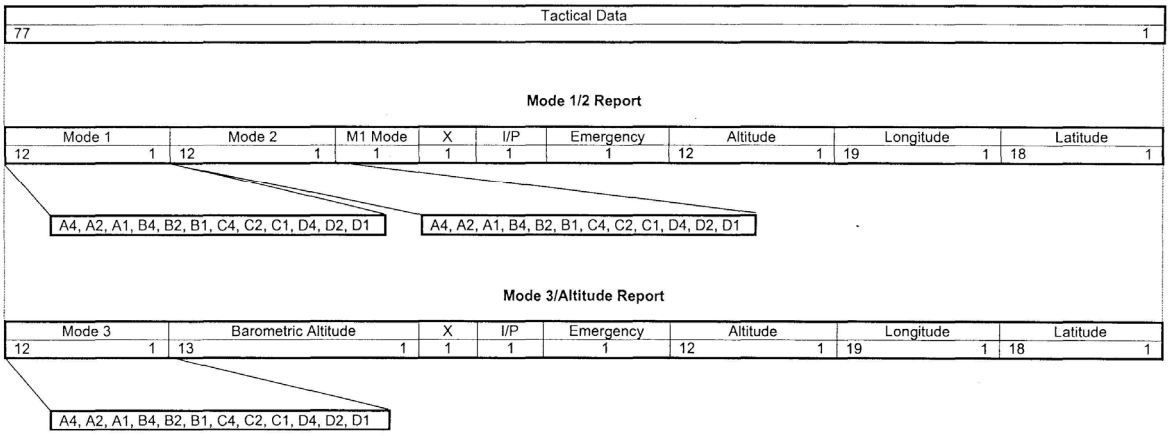
Generation of Mode 5 ID Reply Waveform
Figure 20



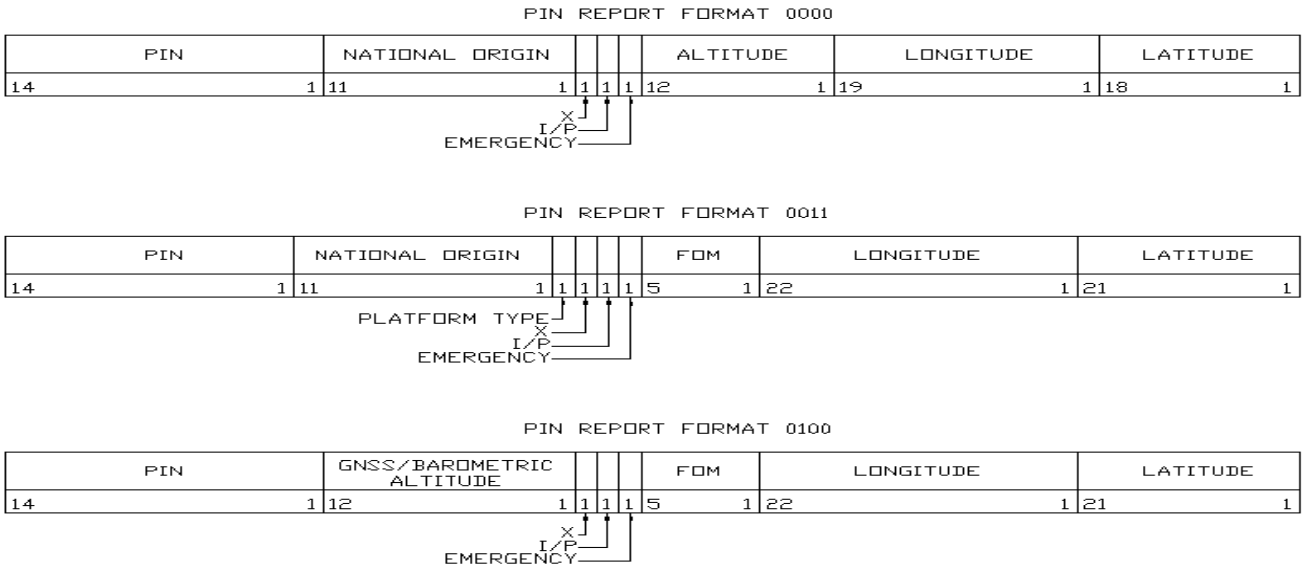
Generation of Mode 5 Data Reply Symbols|
Figure 21



Mode 5 Level 1 Reply Data
Figure 22



Mode 5 Level 2 Data Report
Figure 23



Mode 5 Level 2 PIN Report Bit Allocation
Figure 24

INDEX

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