GENERAL DYNAMICS
SATCOM Technologies

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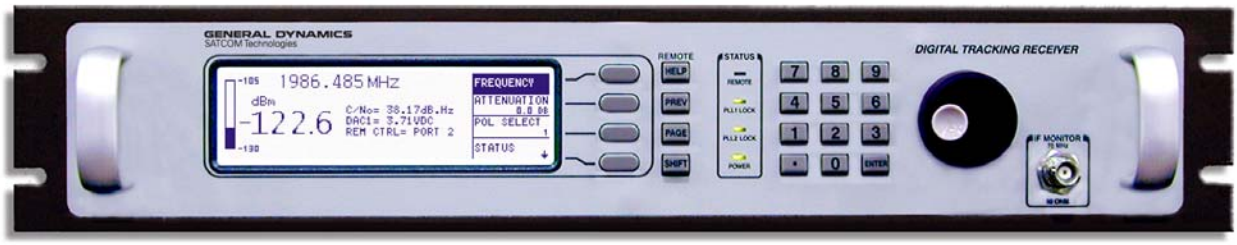
JUNE 2013

OPERATION AND MAINTENANCE MANUAL FOR THE

DIGITAL TRACKING RECEIVER



3750 W. Loop 281
Longview, Texas 75604

Revision History

V- Section 1.1.2	L. Shirey	C. Bolton	6/7/13	13359
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G – ECW & Diversion Stmt	M. Neely	G. Branch	3-22-05	5718
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E – For v1.19.13	M. Neely	G. Branch	7-21-04	5355
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Rev. No/change	Revised By	Approved By	Date	ECO#

NOTICES

WARNING

THE ELECTRICAL CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST OBSERVE SAFETY REGULATIONS AT ALL TIMES.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers of handling potentially hazardous electrical and electronic circuits. This manual is not intended to contain a complete statement of all safety precautions that should be observed by personnel in using this or other electronic equipment.

WARNING

IN CASE OF EMERGENCY BE SURE THAT POWER IS DISCONNECTED.

The manufacturer has attempted to detail in this manual all areas of possible danger to personnel in connection with the use of this equipment. Personnel should use caution when installing, operating, and servicing this equipment. Care should be taken to avoid electrical shock, whether the hazard is caused by design or malfunction.

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, ENCLOSURES, PANELS, OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS OR PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR FATIGUED.

The manufacturer is specifically not liable for any damage or injury arising from improper procedures or failure to follow the instructions contained in this manual or failure to exercise due care and caution in the installation, operation, and service of this equipment or use by improperly trained or inexperienced personnel performing such tasks. During installation and operation of this equipment, local building codes and fire protection standards must be observed.

PROPRIETARY NOTICE

All computer software, technical data, or other information pertaining to the equipment covered by this manual is proprietary to General Dynamics SATCOM Technologies (GDST). Such information is transmitted in this manual or related documents for the benefit of GDST customers and is not to be disclosed to other parties verbally or in writing without prior written approval of GDST. Additionally, this manual may not be reproduced in whole or in part without written consent from GDST.

GENERAL DYNAMICS
SATCOM Technologies

Declaration of Conformity

The **Digital Tracking Receiver (200800/201800/201046/201700)**

was tested to the following specifications and found to be in compliance with the required criteria on the indicated test date.

In accordance with the following directives:

72/23/EEC	**The Low Voltage Directive** and its amending directives.
89/336/EEC	**The Electromagnetic Compatibility Directive** and its amending directives.
1999/5/EC	**R&TTE Directive** and its amending directives.

It has been designed and manufactured to the following specifications:

IEC 61010-1:1990+A1:1992+A2:1995
EN 300339: 1998
EN 55022: 1998, Class B
EN 61000-4-2: 1995
EN 61000-4-3: 1995
EN 61000-4-4: 1995
EN 61000-4-5: 1995
EN 61000-4-6: 1996
EN 61000-4-11: 1994

I hereby declare that the equipment named above, when installed according to manufacturer's instructions, complies with the above directives and standards.

Signed: James B. Hallent Date: April 29, 2004

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PREFACE

About This Manual

This manual is intended for anyone who uses the General Dynamics SATCOM Technologies Digital Tracking Receiver (DTR). First time users as well as experienced operators will find necessary information about features, installation and operation of the DTR.

This manual contains only the information related to the DTR, and does not include information about the antenna structure, the equipment used for positioning the antenna, and other equipment peripheral to the DTR.

This manual is divided into the following sections:

- Section 1.0, Introduction, Identifies standard and optional features of the DTR, and briefly outlines the components of its front and rear panels.
- Section 2.0, Theory, explains the theory of operation of the DTR.
- Section 3.0, Installation, outlines installation, pin-outs, setup and initial power-up of the DTR.
- Section 4.0, Operation, describes the operation of the DTR, including menu structure, navigation and other functional details.
- Section 5.0, Maintenance, provides information necessary for maintaining the DTR.
- Section 6.0, Engineering Drawings, contains the engineering drawings.
- Appendix A, Technical Support, provides the user with contact information for customer support.
- Appendix B, Menu Tree, contains a complete visual representation of the menu hierarchy.
- Appendix C, Remote M&C Protocol, contains commands necessary for remote communication with the DTR.
- Appendix D, Acronyms and Abbreviations, lists the definitions of all acronyms and abbreviations used in this manual.

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1.0 INTRODUCTION

1.1 General Information Regarding the Digital Tracking Receiver

The DTR, developed for satellite tracking, is a fully synthesized tracking receiver. The Digital Signal Processor (DSP) based receiver accepts wideband RF inputs, performs frequency selection, down-converts RF to 70 MHz, and digitally processes the digital samples.

The DTR's user interface is powerful and intuitive giving the operator the ability to custom configure specific applications in a very straight forward manner. The unit's versatile settings allow the unit to interface with a wide range of next-level system components.

1.1.1 Explanation of Safety Symbols

Symbol	Explanation
	Protective Earth/Ground Terminal
	Caution, Risk of Electric Shock
	Caution, Risk of Danger. Consult accompanying documents.

1.1.2 Technical & Environmental Specifications

DTR Dimensions	3.5 in. High (8.9 cm) x 19 in. Wide (48.3 cm) x 22 in. Deep (55.9 cm)
DTR Mass	25 lbs (11.3 kg)
DTR Maximum Power	1 A
DTR Maximum Operating Altitude	6500 ft (2000 m)
Input Power	110-240 VAC, 50-60 Hz,
Operating Temperature & Humidity	0 to 50 C, Up to 90% non-condensing humidity
Non-Operating Temperature & Humidity	-15 to 50 C, Up to 90% non-condensing humidity

1.1.3 DTR Standard Features

The following are the standard features of the DTR:

- Input frequency range of 945 MHz to 2055 MHz for L-band configuration
- Wide input signal dynamic range (70 dB Nominal)
- Sensitivity signal range of –40 dBm to –110 dBm
- Minimum C/No better than 35 dB/Hz
- Synthesized tuning
- Tuning resolution of 1 kHz
- Selectable tracking slope
- Signal linearity (± .5dB over a 10dB nominal tracking range)
- Intelligent signal/side-band recognition
- 240x64-pixel graphics display
- User interface with logically grouped menus
- Optimal mix of “dedicated and soft keys” for efficient menu navigation and data entry
- Spin knob for alternate means of tuning and adjusting parameter values
- Dedicated online Help key
- Remote control capability (RS-232, RS-422, RS-485, contact closures)
- Front panel 70 MHz monitor port (50 Ω BNC female)
- Real time spectral display of tracking signal
- Field upgradeable software
- C/No and power measurement information display
- Compatibility with TRL series L-band Tracking Receivers, including I/O interface and serial communications protocol
- Selectable input attenuator of 0 – 30 dB in 2 dB steps
- Adjustable bandwidth filter options from 16 kHz up to 500 kHz

1.1.4 DTR Optional Features

- Input frequency range covering S, C, X, Ku and Ka-band configurations
- Up to 6 RF inputs
- Dual polarization input
- Multi-band switching
- Single/dual channel monopulse tracking
- Wideband operation
- Complete backward compatibility with TRL series L-band Tracking Receivers, including monopulse interfaces and TBT (Tracking Band Translator) support
- Rack Slides

1.2 Controls and Indicators

The controls and indicators located on the DTR front panel provide the normal operator interface. The DTR front panel is shown in Figure 1-1 with its controls and indicators identified. The function of each is detailed in Section 4, Operation.

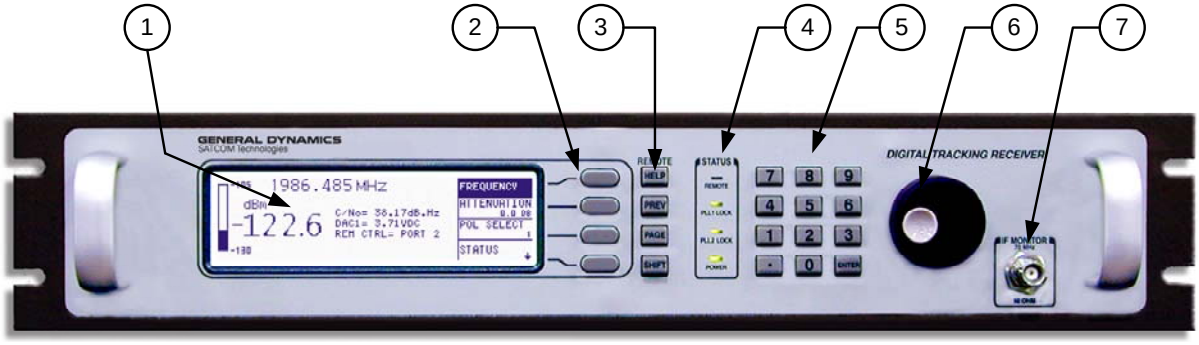

Figure 1-1 DTR Front Panel

TABLE 1-1 CONTROLS AND INDICATORS
1. Receiver Status Display
2. Soft Keys
3. Navigation Keys
4. Status Indicators
5. Numeric Keypad
6. Spin Knob
7. IF Monitor Port

1.3 Inputs and Outputs

The inputs and outputs located on the DTR rear panel provide the external interfaces. The number of inputs varies with user configuration. The DTR rear panel is shown in Figure 1-2. The function of each input and output is listed in Table 1-2.

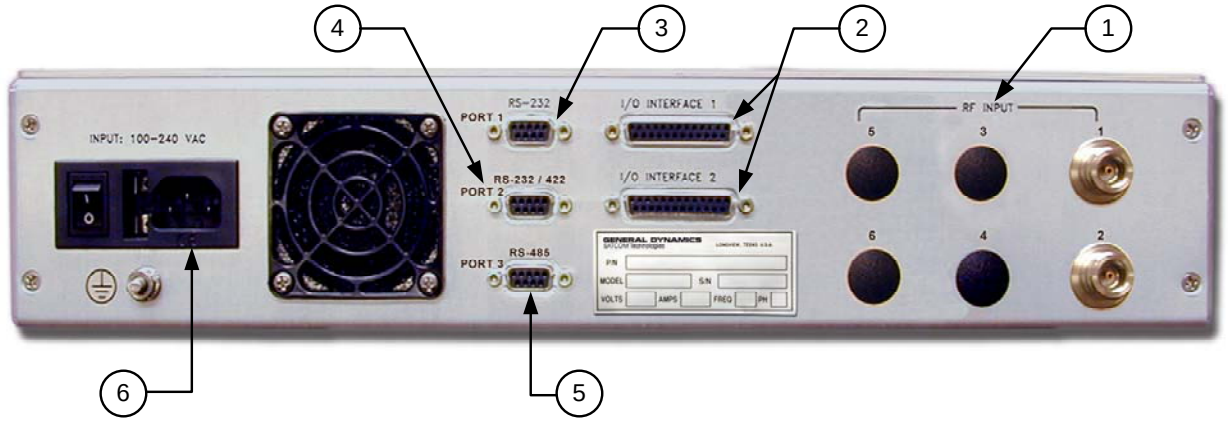

Figure 1-2 DTR Rear Panel

TABLE 1-2 INPUTS AND OUTPUTS

CONNECTOR	FUNCTION
1. RF Input:	Provides up to 6 selectable inputs for RF signals in the following bands:
Type N Connector	• L-band • S-band • C-band • X-band • Ku-band
Type SMA Connector	• Ka-band
2. I/O Interface 1 and 2	Analog Interface and Control ports. Provides analog control and status.
3. RS-232	A standard RS-232 serial port.
4. RS-422	A standard RS-422 serial port. Also configurable as an RS-232 serial port.
5. RS-485	A standard RS-485 serial port.
6. Power Supply	Universal power supply accepting 100 – 240 VAC, 50/60 Hz. A fuse is accessible by pulling out a holder between the switch and the plug. This holder also contains a spare fuse. The fuse used is a 1A, 250V rated 5mm x 20mm slow-blow snap-in fuse. Littelfuse 239001 or equivalent is recommended. The power cord to be used with this unit should be a detachable #18AWG cord meeting at least 1250W/10A. Volex 17251 10 B1 or equivalent is recommended. ⏚ **IMPORTANT:** The safety grounding bolt below the input should be securely connected to the rack ground bar (or adequate earth ground) to eliminate a potential failure hazard.

1.4 Model Numbers

The model number of the DTR can be found on the serial/model number tag found on the side of the unit. For reference, the following tables list possible configurations.

TABLE 1-3 DTR Model Number Designation

Standard Four-Digit Prefix					OPTIONS (Only if Applicable)	
Base No.						
201800-	**1st Digit**	**2nd Digit**	**3rd Digit**	**4th Digit**	**5th Digit**	**6th Digit**
(Standard)	**1st Freq.**	**2nd Freq.**	**3rd Freq.**	**4th Freq.**	**Options**	**Options**
201700- **(Wideband)**	See chart below	See chart below	See chart below	See chart below	Blank – No options 0 – None 1 – Monopulse	Blank – No options 0 – Standard 5 – Special Software

Note: One to four frequency ranges are allowed. The first four digits are entered in ascending order of frequencies. Zeros are entered for ranges not used.

TABLE 1-4 Frequency Range Chart for DTR

Digit	Band	Include Pol Select Switch	Freq. Range	BDC P/N
0	None			
1	L – Band	No	0.945 – 2.055 GHz	None
2		Yes		
3	S – Band	No	2.0 – 2.8 GHz	BRF108
4		Yes		
5	C – Band	No	3.4 – 4.2 GHz	BRF107
6		Yes		
7	X – Band	No	7.25 – 7.75 GHz	BRF110
8		Yes		
A	Ku – Low Band	No	10.7 – 11.75 GHz	BRF111
B		Yes		
C	Ku – High Band	No	11.7 – 12.75 GHz	BRF112
D		Yes		
E	C – High Band	No	3.7 – 4.8 GHz	BRF109
F		Yes		
G	Ka-A	No	17.0 – 18.1 GHz	BRF121
H		Yes		
J	Ka-B	No	18.1 – 19.2 GHz	BRF122
K		Yes		
L	Ka-C	No	19.2 – 20.3 GHz	BRF123
M		Yes		
N	Ka-D	No	20.2 – 21.3 GHz	BRF124
P		Yes		
Q	Ka-E	No	21.2 – 22.3 GHz	BRF125
R		Yes		
S	Ku Extended	No	12.2 – 13.0 GHz	BRF105
T		Yes		
U	X High	No	7.9 – 8.5 GHz	BRF120
V		Yes		

Examples:

201800 1000	L-Band with single pol input
201800 2000	L-Band with dual pol input
201800 AC00 10	Ku-Low, Ku-High with single pol input and monopulse option
201800 6BD0 00	C, Ku-Low, Ku-High with dual pol input

2.0 THEORY

2.1 Standard L-band DTR

The use of advanced DSP techniques coupled with conventional analog radio techniques provides enhanced flexibility and sensitivity to the DTR.

The L-Band DTR, illustrated by the block diagram in Figure 2-1, takes a RF input signal in the L-Band frequency range and down-converts the signal to a 70 MHz Intermediate Frequency (IF) using a super-heterodyne process. The signal is then routed through an anti-aliasing filter prior to being sampled by a high-speed analog to digital converter (A/D). This digital data is then passed through a decimating Finite Impulse Response (FIR) filter, which provides both a sample rate reduction and a band limiting function.

The DSP chip then transforms the data using a Fast Fourier Transform (FFT) and analyzes the band for signal and noise content. The signal power and signal to noise information is estimated and the values are sent to the System Control Processor (SCP).

The SCP sets and manages module functions and communication with the user and other equipment via the front panel controls and data interfaces. The SCP also makes slope adjustments and reports the received signal power level to control equipment via serial communications.

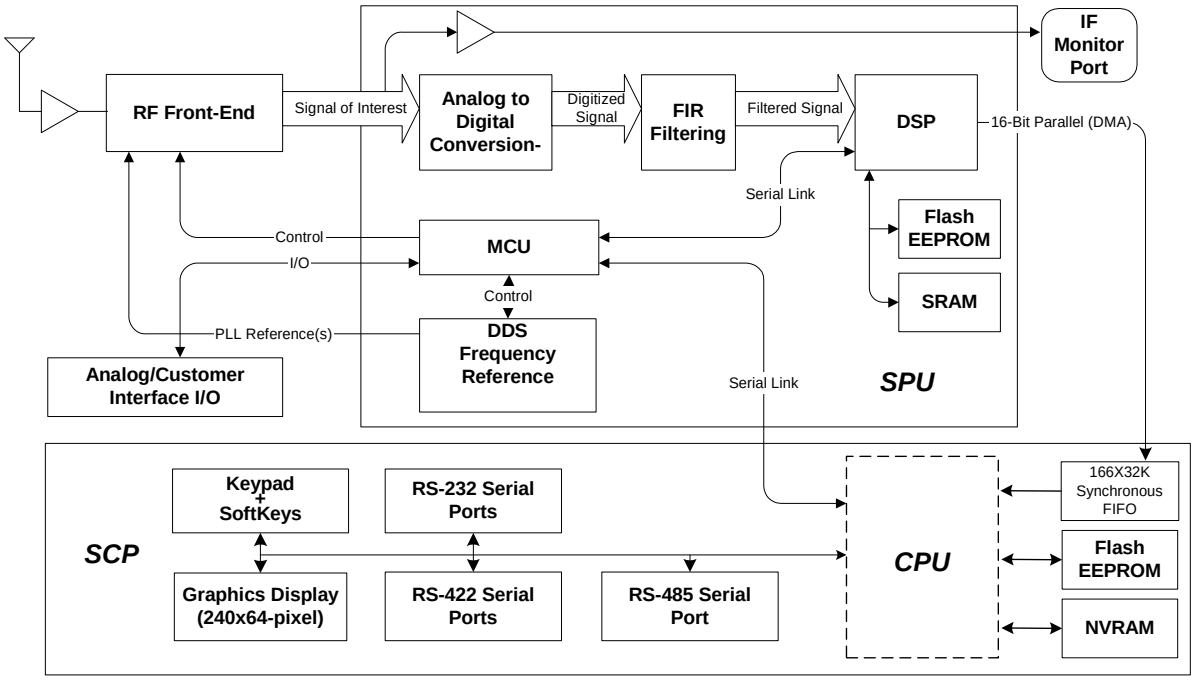

Figure 2-1 DTR Block Diagram

2.2 Optional Configurations

2.2.1 Dual Polarization Input

Versatile unit configurations allow dual-receive signal polarization to be connected to separate RF inputs on the DTR's back panel. Linear polarizations (vertical and horizontal) and circular polarizations (clockwise and counter clockwise) can be connected to the DTR without external combining or switching.

2.2.2 Down Converter Frequencies

RF signals enter the DTR on one of six possible inputs and are routed to the proper Block Down Converter (BDC) for conversion to an L-band signal of 950 MHz to 2050 MHz. Each band accepts an input level of −110 to −40 dBm (decibel referred to 1 milliwatt).

The output of each block downconverter is connected to appropriate switching and routed to the input of the L-band downconverter. To prevent unnecessary heat and noise, the DC power to each BDC is switched so that the BDC is only powered when its particular band is selected.

3.0 INSTALLATION AND INITIAL SETUP

3.1 Introduction

This section provides the information necessary for the installation and initial setup of the DTR.

3.2 Mechanical Installation

Using four #10 screws, mount the DTR in a standard 19-inch Electronic Industries Association (EIA) equipment rack. Rear support and/or rack slides are not usually necessary; however, rack slides may prove helpful during maintenance operations and are available as an option.

There is a stud on the rear panel of the DTR that is marked with the protective earth (ground) symbol. A proper grounding wire from the rack that this piece of equipment is installed into should be attached to this stud, making sure that the end of the grounding wire has good metal-to-metal contact with the rear panel of the DTR. Use the hex nut provided (or similar nut) to secure this grounding wire to the rear panel stud.

Make sure the area directly behind the fan on the rear panel of the DTR is kept clear once the equipment is installed in the rack to allow for proper ventilation of the unit.

The DTR should be connected to a grounded AC power outlet using a detachable power cord.

The main power source supplying power to the rack that the DTR is installed in should be easily accessible for disconnect should an equipment fault occur.

3.3 Input and Output Connections

Refer to Figure 3-1 for a diagram showing the possible Input/Output (I/O) connections to the DTR. Table 3-1 provides brief descriptions of each connection or group of connections.

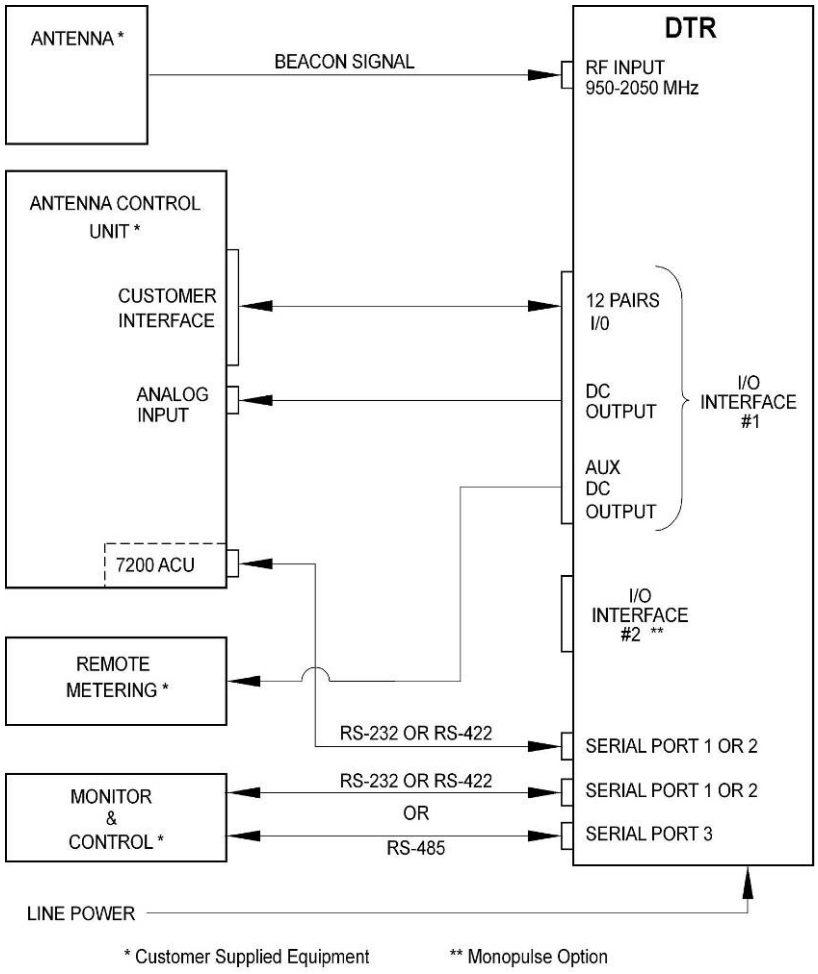

Figure 3-1 L-Band DTR-I/O Connections

NOTE: ACU I/O connections shown for reference only. The DTR may be interfaced with any ACU having contact closures for beacon selection and a tracking voltage input or a serial link utilizing the DTR's M&C command set.

TABLE 3-1 DESCRIPTION OF I/O CONNECTIONS	
CONNECTION	DESCRIPTION
Line POWER ENTRY MODULE	For 120 V operation, a standard 3-prong National Electrical Manufacturers Association (NEMA) plug is provided; for 220/230/240 V operation, the same power cable assembly is provided, but the customer may be required to install a more appropriate plug on site. Note that the ground conductor MUST be utilized with the line power connection.
RF INPUTS	The RF inputs to the DTR are provided through 50 ohm, type N female connectors on the rear panel. The allowable input signal range is -110 decibel referred to 1 milliwatt (dBm) to -40 dBm. The DTR input Voltage Standing-Wave Ratio (VSWR) is 1.25:1, nominal. The standard receiver configuration has INPUT #1 available only. In multiband receivers, lower input numbers correspond with lower frequencies. For example, in a C and Ku receiver, Inputs 1 & 2 would be C-band and Inputs 3 & 4 would be Ku-band.
I/O INTERFACE	The I/O interface provides the classic analog interface for ACU control. There are two sets of analog output signals: OUT(+,-) and AUX(+,-). Four contact lines are provided, as well as a summary fault closure. Additionally, there are several general-purpose inputs and outputs that can be used to change the receiver's operational mode. See Tables 3-2 and 3-3 for pin-outs.
SERIAL INTERFACE #1	This serial port provides a sophisticated digital control and status interface for advanced ACU and M&C systems. Interface #1 is configured for RS-232 only. Full remote control of the receiver is realized with this interface. See Table 3-7 for pin-outs.
SERIAL INTERFACE #2	This serial port provides a sophisticated digital control and status interface for advanced ACU and M&C systems. Interface #2 is fully configurable for RS-232 or RS-422. Full remote control of the receiver is realized with this interface. See Table 3-8 for pin-outs.
SERIAL INTERFACE #3	This serial port provides a sophisticated digital control and status interface for advanced M&C systems. Interface #3 is configured for RS-485 only. Full remote control of the receiver is realized with this interface. See Table 3-9 for pin-outs.

3.3.1 Input/Output Interface Connector Pin-Out

The I/O Interface Connector Pin-Out section describes the signals and configuration of the I/O INTERFACE connectors (25-pin D female subminiature socket).

3.3.1.1 Default Configuration

Table 3-2 and 3-3 describes the pin number, designation and function of the two I/O ports. The tables show the default configuration only.

TABLE 3-2 I/O INTERFACE 1, STANDARD & WIDEBAND CONFIG.		
PIN NUMBER	DESIGNATION	FUNCTION
1,14	+OUT, -OUT (DAC#1)	Analog Output Voltage #1, Common
2	SHLD_OUT	Shield for +/- OUT pair
3,16	+AUX, -AUX (DAC#2)	Analog Output Voltage #2, Common
15	SHLD_AUX	Shield for +/- AUX pair
4,17	SUM_FLT	Summary fault relay contacts.
5,18	GPIO 0, (Beacon 1, Common)	Beacon 1 Input
6,19	GPIO 1, (Beacon 2, Common)	Beacon 2 Input
7,20	GPIO 2, (Beacon 3, Common)	Beacon 3 Input
8,21	GPIO 3, (Beacon 4, Common)	Beacon 4 Input
9,22	GPIO 4 (Command, Return)	POL 3 select control line (Multi Port Option Only)
10,23	GPIO 5 (Command, Return)	POL 4 select control line (Multi Port Option Only)
11,24	GPIO 6, (Command, Return)	POL 1 select control line
12,25	GPIO 7, (Command, Return)	POL 2 select control line
13	SIG_GND (Reserved signal)	DTR signal ground; THIS IS NOT A SAFETY GROUND POINT

TABLE 3-3 I/O INTERFACE 2, STANDARD & WIDEBAND CONFIG.		
PIN NUMBER	DESIGNATION	FUNCTION
1,14	+OUT, -OUT (DAC#1)	Analog Output Voltage #1, Common
2	SHLD_OUT	Shield for +/- OUT pair
3,16	+AUX, -AUX (DAC#2)	Analog Output Voltage #2, Common
15	SHLD_AUX	Shield for +/- AUX pair
4,17	SUM_FLT	Summary fault relay contacts.
5,18	GPIO 8 (Command, Return)	POL 5 Select Control Line (Multi Port Option Only)
6,19	GPIO 9 (Command, Return)	POL 6 Select Control Line (Multi Port Option Only)
7,20	GPIO 10	General purpose I/O
8,21	GPIO 11	General purpose I/O
9,22	GPIO 12	General purpose I/O
10,23	GPIO 13	General purpose I/O
11,24	GPIO 14	General purpose I/O
12,25	GPIO 15	General purpose I/O
13	SIG_GND (Reserved signal)	DTR signal ground; THIS IS NOT A SAFETY GROUND POINT

3.3.1.1.1 Analog Output Voltage Pin-Out

There are two separate analog voltage outputs available; both are capable of producing +/- 10 VDC. Pins 1, 14 and 2 provide the analog output voltage, common, and shield connections respectively for DAC # 1. Pins 3, 16 and 15, respectively, provide an auxiliary analog output for DAC # 2.

3.3.1.1.2 Summary Fault Output

Pins 4 and 17 provide the SUMMARY FAULT relay contact closure in the standard product model. If any faults occur or DTR supply power is lost, the Summary fault contact will open. The ACKNOWLEDGE FAULTS menu has the effect of removing

the highlight from the fault display on the DTR LCD and restoring the Summary Fault contact to the normal (no-fault) state, which is CLOSED. However it may not clear the fault condition. If any new faults occur after the Summary fault relay was forced to close by using ACKNOWLEDGE FAULTS, the Summary Fault relay will open again to indicate a new fault condition.

The following listing of faults that can cause a Summary Fault in the DTR (also listed in Appendix C under the 5.1 Keyword Commands, LIST-FAULTS keyword description):

- Low Input Signal
- Input Saturated
- MCU Link loss
- DSP Link loss
- DSP Data loss
- SPU Overflow
- TBT Link loss
- TBT Summary Fault
- TBT in Local Ctrl
- Out of Band
- Invalid Band Setup
- Band 1 BDC fault
- Band 2 BDC fault
- Band 3 BDC fault
- Band 4 BDC fault
- PLL1 Unlocked
- PLL2 Unlocked
- Temperature alarm
- NVRAM corrupted
- Mute Switch Fault
- SPU Link locked

3.3.1.1.3 Beacon Select Inputs (GPIO 0-3)

The BEACON SELECT inputs (not available on Monopulse units) are formed through pin groups (5,18), (6,19), (7,20) and (8,21)—internal drive common ground, short GPIO + to – to turn off optically coupled isolator. GPIO 0-3 are inputs that switch the DTR to a pre-set BEACON (set of parameters). The main purpose is to provide a discrete, parallel control interface that is compatible with existing 7134 (and 7200) controllers. Selecting one of the 4 BEACON inputs, while the DTR is in REMOTE CONTROL (not Local) and the REMOTE CONTROL PORT parameter is set to I/O Interface #1, will enable the DTR to switch to the pre-set BEACON parameters.

To setup the beacons, the appropriate DTR parameters should be set, and the STORE BEACON command executed. (Refer to Section 3.5.2 for further information about setting up beacons.) This action will store the BEACON parameters into NVRAM, which may then be recalled from the CONFIGS/BEACON-

SETUP/RESTORE-BEACONS menu or from the I/O Interface #1 inputs while the DTR is in REMOTE control.

3.3.1.1.4 General Purpose I/O

GPIO 4, 5, and 8–15 are reserved for future use on the standard product; no connections should be made to these pins. GPIO 4 – 5 and GPIO 8 - 9 are used for POL 3 - 4 and POL 5 - 6 select control lines when used with the Multi Port Option (see Section 3.3.1.1.5).

3.3.1.1.5 External Pol Select Control Lines (GPIO 6-7, 4-5, 8-9)

Pin groups (11,24) and (12,25)–isolated output relays, normally closed--provide two polarization select control lines for a customer furnished switch (external to the DTR). The menu item POL SELECT (POL 1, POL 2) controls the two polarization select control lines on the GPIO 6 and 7 of I/O Interface #1. This was implemented for backward compatibility with a GDST Model TRL Tracking Receiver which provided some I/O lines to facilitate control of an external POL Switch, mounted on the hub with the RF equipment. Notice that these lines are controlled by the Pol Select item on the DTR main menu.

Pin groups (9,22), (10,23) on I/O interface 1 and (5,18), (6,19) on I/O interface 2 – AVAILABLE WITH MULTI PORT OPTION ONLY. Isolated output relays, normally closed--provide four additional polarization select control lines for a customer furnished switch (external to the DTR). The menu item POL SELECT (POL 3, POL 4, POL 5, POL 6) controls the four polarization select control lines on the GPIO 4 and 5 of I/O Interface #1 and GPIO 5 and 6 of I/O interface #2.

3.3.1.1.6 Signal Ground

Pin 13 is reserved for future use on the standard receiver. No connection should be made to this pin.

3.3.1.2 Monopulse Option

Table 3-4 and 3-5 describes the pin number, designation and function of the two I/O ports. The tables show the monopulse option configuration. Connections to the monopulse tracking plate are described below; refer to the preceding section, Default Configuration, for pins that are not described here.

TABLE 3-4 I/O INTERFACE 1, MONOPULSE CONFIG.		
1,14	+OUT, -OUT (DAC#1)	Analog Output Voltage #1, Common
2	SHLD_OUT	Shield for +/- OUT pair
3,16	+AUX, -AUX (DAC#2)	Analog Output Voltage #2, Common
15	SHLD_AUX	Shield for +/- AUX pair
4,17	SUM_FLT	Summary fault relay contacts.
5,18	GPIO 0, (90 DEG, return)	90 degree command control
6,19	GPIO 1, (180 DEG, return)	180 degree command control
7,20	GPIO 2, (Mute, return)	Phase shifter mute control
8,21	GPIO 3, (FR0 Command, Return)	Frequency Band Control (Optional)
9,22	GPIO 4, (FR1 Command, Return)	Frequency Band Control (Optional)
10,23	GPIO 5, (FR2 Command, Return)	Frequency Band Control (Optional)
11,24	GPIO 6, (Command, Return)	POL 1 select control line
12,25	GPIO 7, (Command, Return)	POL 2 select control line
13	SIG_GND (Reserved signal)	DTR signal ground; THIS IS NOT A SAFETY GROUND POINT
1,14	+OUT, -OUT (DAC#1)	Analog Output Voltage #1, Common

TABLE 3-5 I/O INTERFACE 2, MONOPULSE CONFIG.		
PIN NUMBER	DESIGNATION	FUNCTION
1,14	+OUT, -OUT (DAC#1)	Analog Output Voltage #1, Common
2	SHLD_OUT	Shield for +/- OUT pair
3,16	+AUX, -AUX (DAC#2)	Analog Output Voltage #2, Common
15	SHLD_AUX	Shield for +/- AUX pair
4,17	SUM_FLT	Summary fault relay contacts.
5,18	GPIO 8 (Mute status, return)	Mute status (short=on)
6,19	GPIO 9 (Mute status, return)	Mute status (short=off)
7,20	GPIO 10 (1.40625 DEG, return)	1.40625 degree command control
8,21	GPIO 11 (2.8125 DEG, return)	2.8125 degree command control
9,22	GPIO 12 (5.625 DEG, return)	5.625 degree command control
10,23	GPIO 13 (11.25 DEG, return)	11.25 degree command control
11,24	GPIO 14 (22.5 DEG, return)	22.5 degree command control
12,25	GPIO 15 (45 DEG, return)	45 degree command control
13	SIG_GND (Reserved signal)	DTR signal ground; THIS IS NOT A SAFETY GROUND POINT

3.3.1.2.1 Degree Command Control (GPIO 0-1, 10-15)

The phase shifter outputs are formed through I/O Interface #1 pin groups (5,18) and (6,19) as well as I/O Interface #2 (7,20), (8,21), (9,22), (10,23), (11,24), and (12,25)—common ground driver IC.

3.3.1.2.2 Mute Control (GPIO 2)

The mute select control line output is formed through I/O Interface #1 pin group (7,20)--isolated output relay, normally closed. Mute commands the tracking plate to bypasses the monopulse error channel while allowing the sum channel to pass. Mute is normally on; when the DTR is commanded to start monopulse, mute is turned off. It can be set in the MONOPULSE menu.

3.3.1.2.3 Mute Status (GPIO 8-9)

The MUTE STATUS inputs are formed through I/O Interface #2 pin groups (5,18) and (6,19)—internal drive common ground, short GPIO + to – to turn off optically coupled isolator. GPIO 8-9 are inputs that the DTR uses to monitor the operation of the mute switch on the monopulse tracking plate. A fault is set if the switch fails to operate. NOTE: Some monopulse tracking plates may not have this functionality. It can be disabled in the MONOPULSE menu.

3.4 Serial Interface Hardware Configuration

Serial Ports 1 and 2 are factory set to:

TABLE 3-6 DEFAULT SERIAL INTERFACE SETTINGS (PORTS 1&2)	
Setting	Changes Allowed
19200 bps	These parameters can be changed using the following menu: Configs/Comm Parameters/Port 1 or Port 2
Echo enabled	
Newline enabled (CR-LF)	
Shell = M&C	
8 Data bits	These parameters cannot be changed by the user.
No parity	
1 stop bit	

Port 1 can only be an RS-232 port, while Port 2 may be configured as RS-232 or RS-422. Note that these two pin outs coexist on the same 9-pin connector without conflict. Both serial ports are 9-pin D subminiature socket connectors.

Pin-outs for the Serial Interface Ports 1 and 2 are given in Tables 3-7 and 3-8.

TABLE 3-7 SERIAL INTERFACE PORT #1 PIN-OUTS (RS-232)	
PIN	FUNCTION
1	No Connection
2	RX
3	TX
4	No Connection
5	Signal Ground
6	No Connection
7	No Connection
8	No Connection
9	No Connection

TABLE 3-8 SERIAL INTERFACE PORT #2 PIN-OUTS (RS-232/422)		
PIN	FUNCTION	
	RS-232 ONLY	RS-422 ONLY
1	No Connection	TX+
2	RX (from DCE)	No Connection
3	TX (from DTE)	No Connection
4	No Connection	RX+
5	Signal Ground	Signal Ground
6	No Connection	TX-
7	Request to send (RTS) (from DTE)	No Connection
8	Clear to send (CTS) (from DCE)	No Connection
9	No Connection	RX -

Serial Port 3 is factory set to:

TABLE 3-9 DEFAULT SERIAL INTERFACE SETTINGS (PORT 3)	
Setting	Changes Allowed
19200 bps	These parameters can be changed using the following menu: Configs/Comm Parameters/Port 3
Shell = M&C	
Master Address = 0	
Slave Address = 1	
Address Offset = 48	
8 Data bits	These parameters cannot be changed by the user.
No parity	
1 stop bit	

Port 3 is a half-duplex RS-485 port and is a 9-pin D subminiature socket connector. Pin-outs for the Serial Interface Port 3 are given in Table 3-10.

TABLE 3-10 SERIAL INTERFACE PORT #3 PIN-OUTS (RS-485)	
PIN	FUNCTION
1	Data + (Half-Duplex)
2	No Connection
3	No Connection
4	No Connection
5	No Connection
6	Data - (Half-Duplex)
7	Cable Shield
8	No Connection
9	No Connection

3.5 Initial Setup and Power-up

Detailed operating instructions for the DTR are provided in Section 4.0 of this manual. The operator should become familiar with the general operating procedures before continuing.

> ***NOTE: Prior to powering the DTR, observe the incoming beacon signal using a spectrum analyzer to ensure proper level (-110 dBm to -40 dBm) and sufficient Carrier to Noise ratio (C/No) (35 dbHz minimum). Also, make note of the beacon signal frequency. Then connect the RF input(s) to the appropriate N-Type connectors and proceed with the following steps.***

1. Set the DTR rear panel POWER switch to ON.

2. Verify that the 240x64-pixel graphical receiver status display shows a normal operational mode. A default frequency and signal acquisition status should be displayed.

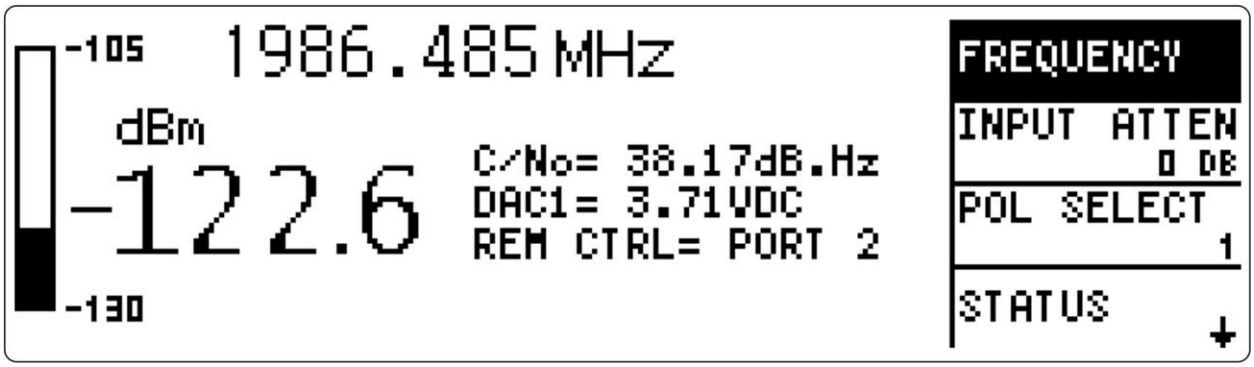

Figure 3-2 Typical Operational Display

3. Set **POL SELECT** item to the desired input (on multiple port configurations).

4. If necessary, select **FREQUENCY** and enter the desired frequency by either rotating the spin knob, or by using the numeric keys to enter the appropriate frequency.

5. Once signal acquisition occurs, verify that no faults are indicated.

6. For troubleshooting assistance, navigate to STATUS\TROUBLE-SHOOT. This menu describes what some of the possible error messages mean and how to fix them.

3.5.1 Analog Voltage Output (DAC) Setup

1. Tune frequency to obtain desired signal at maximum power level.

2. Use DAC SETUP menu to establish VOLTAGE RANGE, MINIMUM REF POWER LEVEL, and SLOPE.

   DAC1 provides an analog DC voltage, proportional to signal level, on pins 1 and 14 (+OUT, -OUT) of I/O Interface #1 on the back panel.

   A. The DC VOLTAGE RANGE of the Digital to Analog Converter (DAC) is set to the default range of (0 to +10V). For Special uses, the voltage range can alternatively be set to (-10 to +10V), or (-5 to +5V).

   B. The SLOPE defaults to 0.3V/dB. SLOPE controls the rate of change of the DC output voltage with respect to a 1 dB change in signal power level.

   C. The MINIMUM REF POWER LEVEL establishes the power level corresponding to the minimum DAC voltage. The default is −90 dBm which emulates GDST "TRL" operation.

3. Check DAC1 output voltage (displayed on the front panel) and adjust MINIMUM REF POWER LEVEL to obtain 8 VDC.

Note: If both DAC1 and DAC2 are enabled, the front panel display will report DAC1 voltage real-time (not at specified DAC1 update rate). If DAC1 is disabled and DAC2 is enabled, front display will report DAC2 voltage real-time; label will change to DAC2=. If DAC1 is enabled and DAC2 is disabled, front display will report DAC1 voltage real-time. If DAC1 is disabled and DAC2 is disabled, front display will not report anything (blank field).

3.5.2 Setting up Beacons for 7134 Remote Control

This brief summary outlines steps necessary to establish beacons which can be accessed via remote control from GDST 7134 ACUs.

1. Set necessary parameters such as FREQUENCY, SLOPE, etc. See Section 4.2.5.4, BEACON SETUP for a complete list of beacon parameters.

2. Execute the STORE BEACON 1-4 menu at CONFIGS\BEACON-SETUP\STORE-BEACONS. These current settings will be stored in the respective beacon (BEACON 1-4).

3. Test by recalling BEACON 1-4.

4. The connection to the 7134 is via the I/O Interface #1. (Refer to Table 3-2)

5. To allow the 7134 ACU to select beacons, set CONFIGS\REMOTE CONTROL to I/O Interface #1.

6. On the front panel, press SHIFT-REMOTE to enter REMOTE mode.

7. Test by selecting BEACON 1-4 at the 7134 ACU.

3.5.3 Controlling DTR with 72XX ACUs via Serial port

The information below briefly describes the connections for controlling a DTR from a GDST 7200-series ACU.

1. Using the connections matrix in Table 3-11 below, decide on a valid RS-232 or RS-422 communications standard connection between the DTR and 7200. An invalid connection is marked by an "X" and cannot be used. Note that DTR Port 2 can be used as either a RS-232 or RS-422 port, and that DTR Port 3 is RS-485 only and cannot be used with a 7200 ACU.

TABLE 3-11 DTR TO 7200 ACU SERIAL CONNECTIONS MATRIX

		7200 ACU						
	PORT	**J14(1)**	**J15(2)**	**J16(3)**	**J17(4)**	**J18(5)**	**J19(6)**	**J20(7)**
DTR	**1**	RS232	RS232	X	X	X	X	X
	2	RS232	RS232	RS422	RS422	RS422	RS422	RS422
	3	X	X	X	X	X	X	X

2. Using Table 3-12 a, b, or c below, make the correct physical connections per the connector and port standard decision made in step 1.

TABLE 3-12a RS-232 CONNECTIONS TO 7200 ACU

DTR PORT 1 OR 2 (DE-9)	ACU PORT J14 OR J15 (DB-25)
2 – RX	2 – TX
3 – TX	3 – RX
5 – GND	7 – GND

TABLE 3-12b RS-422 CONNECTIONS TO 7200 ACU

DTR PORT 2 (DE-9)	ACU PORT J16 OR J17 (DB-25)
1 – TX+	22 – RX+
4 – RX+	19 – TX+
5 – GND	1 – GND
6 – TX-	9 – RX-
9 – RX-	6 – TX-

TABLE 3-12c RS-422 CONNECTIONS TO 7200 ACU

DTR PORT 2 (DE-9)	ACU PORT J18-J20 (DE-9)
1 – TX+	4 – RX+
4 – RX+	1 – TX+
5 – GND	5 – GND
6 – TX-	9 – RX-
9 – RX-	6 – TX-

3. Setup the communications parameters similar to Table 3-13 below.

TABLE 3-13 EXAMPLE OF COMM PARAMETERS	
DTR	**ACU**
Port1 or 2 BPS = 19200 (max. 57600) Echo = Disabled Newline = CR (only) Shell = M&C Shell (8 data, No parity, 1 stop bit are factory set, cannot be changed)	ACU – Port 1-7 BPS = 19200 (max is 38400) Parity = None Data Bits = 8 Stop Bits = 1 Shell = DTR Echo = Disabled Newline = CR (only) Checksums = Disabled Handshake = None

3.5.4 ACU Setup

Proceed with setup of the ACU per the ACU Operation and Maintenance (O&M) Manual.

4.0 OPERATION

This section of the manual explains in detail how to operate the DTR. Table 4-1 describes the function of each control and indicator shown in Figure 4-1.

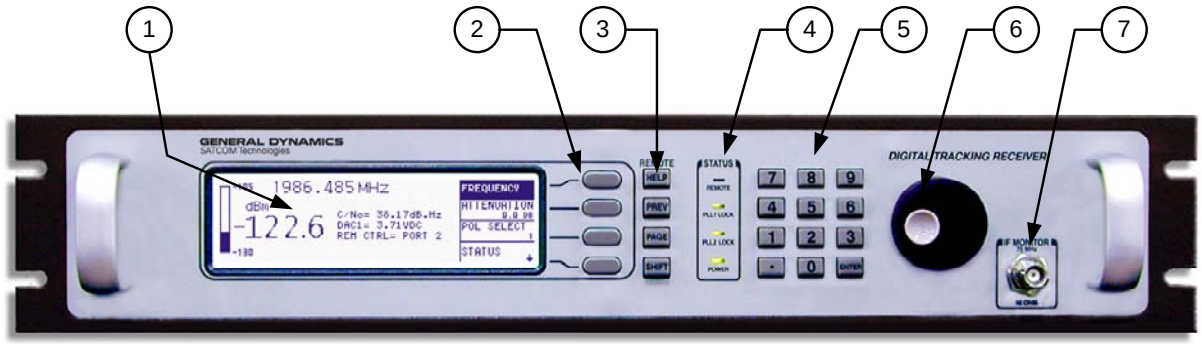

Figure 4-1 DTR Controls and Indicators

TABLE 4-1 CONTROLS AND INDICATORS	
CONTROL OR INDICATOR	FUNCTION
1. Receiver Status Display	The Receiver Status Display is a 240x64-pixel graphical display that indicates the selected frequency, power level, operational mode, and other user-selectable features such as the Spectral Display (detailed in Section 4.2.4).
2. Soft Keys	The Soft-Key interface lends flexibility to the unit and allows the user to select and navigate menus. The function of each key is defined by text displayed on the screen immediately to the left of each key and will change with context.
3. Navigation Keys	The dedicated Navigation Keys allow the user to move quickly between menus.
HELP	The **HELP** key on the front panel is used to assist the user by describing the highlighted menu item. When pressed, a help screen is displayed and assists the user by describing or clarifying the highlighted item. If pressed when a menu item is not highlighted, a summary of the help screen is displayed.
PREV	The **PREV** key is used to back out of menus. Pushing it after a menu item has been selected cancels the input.
PAGE	An ↓ or ↑, appearing at the bottom-right or top-right of the screen, indicates that more menu choices are available. Use **PAGE** to show these additional choices.
SHIFT	The **SHIFT** key is a "Dual Function" key. When used in conjunction with the other navigational keys, it performs alternate functions. SHIFT + PAGE reverses the PAGE function. **SHIFT** + **HELP** toggles **LOCAL**/**REMOTE** Mode.
4. Status Indicators	The Status Indicators indicate 1) LOCAL/REMOTE mode; 2) Failure in critical internal sub-systems (downconverter chain Phase-Locked Loops (PLLs) and loss of phase lock in receiver); 3) Power.
5. Numerical Keypad	A numeric keypad allows the user to enter numeric entries and control parameters.
6. Spin Knob	The Spin Knob is used to provide real-time frequency tuning and to edit other system parameters. It also allows the user to cycle through menus and choices.
7. IF Monitor	The IF Monitor taps the frequency being input into the DSP board. The BNC Connector on the front panel is a buffered 70 MHz Intermediate Frequency (IF) monitor port. The IF monitor port has a 50-Ohm output impedance.

The **Receiver Status Display**, shown below in Figure 4-2, displays the frequency, signal source and levels, faults, etc. along with the **Main Menu** of the DTR. Table 4-2 describes each display feature.

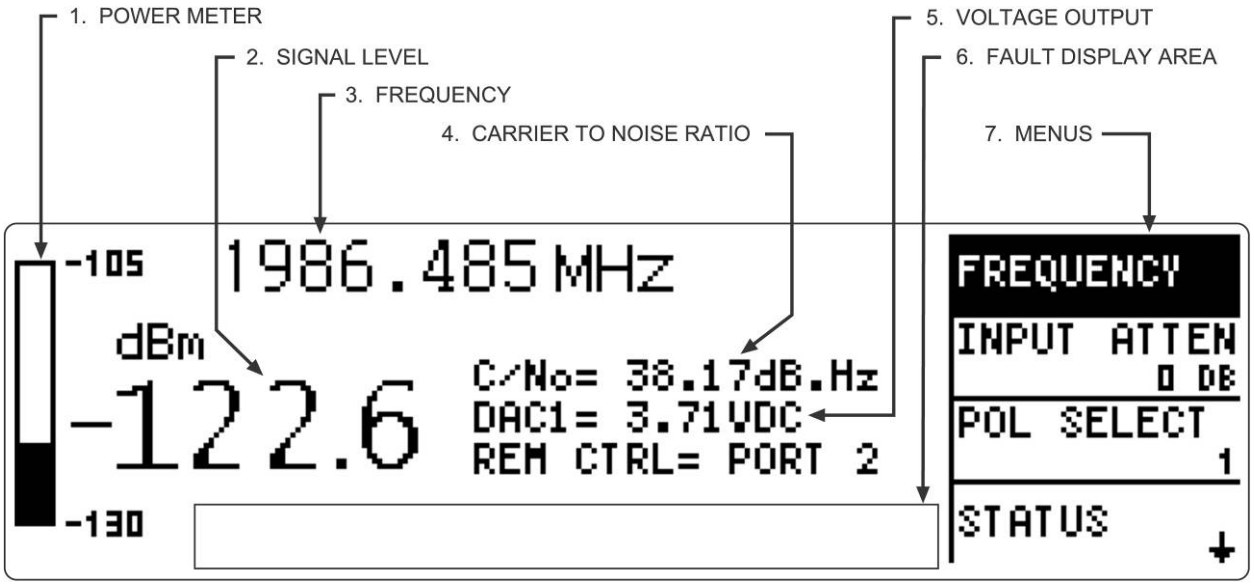

Figure 4-2 Receiver Status Display Screen

TABLE 4-2 RECEIVER STATUS DISPLAY

CONTROL OR INDICATOR	FUNCTION
1. Power Meter	Graphical representation of input signal level in dBm. Range automatically adjusts relative to power level.
2. Signal Level	Input Signal level in dBm
3. Frequency	Frequency of the receiver in MHz
4. Carrier to Noise Ratio	Calculated C/No of tracking signal
5. Voltage Output	Current analog voltage output
6. Fault Display	Displays faults and alarm conditions
7. Menu	Used to support the various system interfaces and control system parameters.

4.1 Understanding the DTR Menu Structure

The **MAIN MENU** on the **Receiver Status Display** contains items which support the various system interfaces and control system parameters. An arrow (↓ or ↑) at the top-right or bottom-right of the menu display indicates that additional menu items are available. These menu items can be accessed by pressing **[PAGE]**. The **Navigation keys [PREV], [PAGE] and [SHIFT]** allow the user to move within menu items (see Table 4-1). Each item of the **MAIN MENU** will be discussed in the following paragraphs. For a complete visual representation of the menu hierarchy, refer to Appendix B, DTR Menu Tree.

4.1.1 Selecting Menu Items

The **Soft Keys** and **Navigation keys** are the primary function keys used in making all menu choices. Menu items, displayed near the right side of the **Display,** are selected by pressing the Soft Key immediately to the right of the menu item (See Figure 4-1).

The DTR's flexible interface also lets the user cycle through menus items with the Spin Knob. Once the desired menu is highlighted, press the **[ENTER]** key.

4.1.2 What Happens When a Menu is Selected…

Selecting a menu does one of three things depending on its context:

4.1.2.1 Selects a Submenu

The most basic outcome of selecting a menu item is a resulting submenu. Each submenu item may contain additional submenus. Generally, no menu will have more than 8 items.

4.1.2.2 Opens an Editor Screen

The **[FREQUENCY]** menu, for example, opens an editor screen where the user inputs a value. There are no additional submenus below an editor screen.

The user can enter data in a number of ways within an editor. The Soft Key functions change to assist the user. In addition, the keypad can be used to directly enter data. Finally, the Spin Knob also may be used. For items that require numeric input, acceptable ranges of values will appear on the screen. If an out-of-range value is entered, the system will reject the value and the value of the parameter will remain as it was before it was edited. The **[ENTER]** key on the keypad should be pressed after the desired value has been input. The **[PREV]** key will "cancel" any input leaving the former value intact.

4.1.2.3 Executes an Action

A menu such as [**ACKNOWLEDGE FAULTS**] does not have submenus and does not open an editor. Instead it performs an action and maintains the current menu screen.

4.2 Main Menu Items

The menus used to support the system interfaces and control system parameters follow. See Appendix B for a complete Menu Tree.

The following are considered to be the **MAIN MENU** items:

- **1 - FREQUENCY**
- **2 - INPUT ATTEN**
- **3 - POL SELECT**
- **4 - STATUS**
- **5 - CONFIGS**
- **6 - ACKNOWLEDGE FAULTS**
- **7 - TESTS**

4.2.1 FREQUENCY

The [**FREQUENCY**] menu allows the user to edit the receiver tuning frequency in 1kHz increments. The valid frequency range depends on the DTR's conversion band setup.

While the receiver is under **LOCAL** control the editing input source should be either the keypad interface or the spin-knob. When the receiver is in **REMOTE** control (controlled by the data link that is configured as the port in control) frequency editing is initiated and executed using ASCII M&C commands via the data link.

4.2.2 INPUT ATTEN

[INPUT ATTEN] controls an internal attenuator inside the RF front end. The attenuator is located after the first amplifier but before the first stage mixer. The default is 0 dB, but the INPUT ATTEN function may be used to compensate for overload signal conditions. When using the attenuator, the front panel signal level reading will automatically compensate so a correct dBm reading is obtained. The range is 0 to 30 dB in 2 dB steps. Use the scroll knob to scroll through the available values, 0, 2, 4, ..., 30. You must press the ENTER button after a selection is made to use the new value.

4.2.3 POL SELECT

[**POL SELECT**] allows the user to select which POL input is the active port for tracking. The numeral "1" or "2" will appear next to the POL SELECT menu in the main menu, indicating which POL input is active. This setting is used to control an RF switch internal to the DTR, and may also be used to control an external switch using I/O Interface #1 on the back panel. GPIO 6 and 7 become active based on the POL SELECT setting. Pins 11, 24 represent the POL 1 state and pins 12, 25 represent the POL 2 state (see Table 3-2). Notice that if multiple POL switches are configured (i.e. in a tri-band system) changing POL will affect all bands (all POL switches are "ganged" together).

4.2.3.1 POL SELECT (Multi Port Option Only)

[POL SELECT] allows the user to select which POL input is the active port for tracking. The numeral "1", "2", "3", "4", "5", or "6" will appear next to the POL SELECT menu in the main menu, indicating which POL input is active.

This setting is used to control an RF switch internal to the DTR, and may also be used to control an external switch using I/O Interface #1 and/or I/O Interface #2 on the back panel. GPIO 4, 5, 6, 7, 8, and 9 become active based on the POL SELECT setting. Pins 11, 24 represent the POL 1 state, pins 12, 25 represent the POL 2 state, pins 9, 22 represent the POL 3 state, pins 10, 23 represent the POL 4 state, pins 5, 18 represent the POL 5 state, and pins 6, 19 represent the POL 6 state (see Table 3-2).

4.2.4 STATUS MENU

The Status menu [**STATUS**] allows the user to view various operational parameters, operating voltages, and settings in a single display window. This information can be useful in diagnosing system problems. The [**STATUS**] menu contains the following submenus.

- **SPECTRAL DISPLAY** – This feature allows the user to view real time amplitude vs. frequency data in a graphical manner similar to a spectrum analyzer. Use the Spin Knob to adjust frequency. Soft keys A/B change step size. Soft keys C/D change vertical scale. Press [**PREV**] to exit.

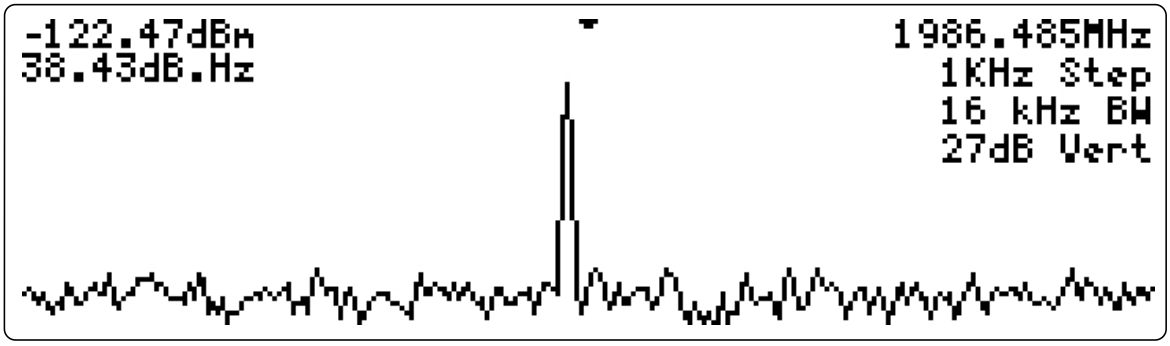

Figure 4-3 Spectral Display

- **SPU SERIAL LINK STATS** – This screen displays SPU RS422 serial link statistics separately for the MCU and DSP. Timeouts are displayed when the CPU did not get a response within 100ms. Errors are logged when an unexpected response did not match internal protocol. The percentage of errors plus timeouts versus the total number of commands is displayed. Linklosses displays the number of failures to establish communication with the MCU or DSP processors. Finally, the total number of commands sent is displayed.

- **I/O STATUS** – Current I/O status information obtained from the I/O card is displayed. This information is intended for diagnostic purposes. Given data format x(y), all x are hex and all y are human-interpretable synonyms of x. x is the internal configuration value useful to GDST technical support (it is subject to change without notice). y is loosely the selected band, but more specifically: (-) if x is undefined (more than one or none), ( ) if x is none; see the specific field description for more details.

  - The **INTF#1** and the **INTF#2** fields provide information regarding the input and output states of the I/O INTERFACE #1 and I/O INTERFACE #2 connectors on the back panel.

  - **FAULTS** is a 4-bit mask where bit 0 is the fault indicator of the first BDC, bit 1 is of the second, etc. A zero bit means the BDC is present and powered off (or malfunctioning). "ok" or "BAD" is display, the latter if the BDC for the current band is malfunctioning or not powered up.

  - The **BDC** fields are internal bit settings that the I/O card uses to set the correct BDC for the selected band.

    - **BDC POWER IN** - y is the number of the BDC whose power is on.

    - **BDC SELECTED** - x bits are active low (e.g. 0x7 = ~0x8,... 0xE = ~1). y is the number of the BDC whose RF output is selected. Note: standard product DTR's do not use SPDT switches with indicators, therefore these always show the status bits set (-).

    - **BDC POWER OUT** - x bits are active high and specify the BDC to turn on and the others to turn off, bit 7 for BDC 1 on, bit 6 for BDC 1 off, 5 for BDC 2 on, etc. y is the number of the BDC whose power was turned on.

    - **BDC SELECT** - x bits are active high, bit 3 set for position 1, 2 for 2, etc. y is the number of the BDC whose RF output was selected.

  - The **SPDTX4** fields are internal bit settings that the I/O card uses to set the correct RF switch settings.

- **SPDTX4 SW IN** - x bit 3 for SW1, 2 for 2, etc. y is the configuration that the SPDT switches (one to four) are in. The first two characters together are both SW1 and SW2, used for RF input selection, which indicate whether the switches are set to their "Lo"w or "Hi"gh band. The next two are SW3 and SW4, respectively, used for POL SELECTION, which indicate whether the switch is in position 1 or 2. Note: standard product DTR's do not use SPDT switches with indicators, therefore these always show the status bits set (-).

  Note: For DTR's containing bands with more than 2 poles, the indicators are either a 1 or 2, depending on which position the SPDT switch is in. For example, (21-2) indicates SW1 = 2, SW2 = 1, SW3 = in determinant, and SW4 = 2.

- **SPDTX4 SW OUT** - x bits are active high and specify the RF switch position to set to 1 or 2, bit 7 set for SW1 position 2, 6 for SW1 position 1, 5 for SW2 position 2, etc. y is the configuration that the SPDT switches (one to four) were set to. The first two characters together are both SW1 and SW2, used for RF input selection, which indicate whether the switches were set to their "Lo"w or "Hi"gh band; they are switched simultaneously leaving the BDC SELECT switch to differentiate between them. The next two are SW3 and SW4, respectively, used for POL SELECTion, which indicate whether the switch was set to position 1 or 2.

  Note: For DTR's containing bands with more than 2 poles, the indicators are either a 1 or 2, depending on which position the SPDT switch is in. For example, (21-2) indicates SW1 = 2, SW2 = 1, SW3 = in determinant, and SW4 = 2.

- The **PLL VOLTAGES** are self-explanatory.

- The **TEMPERATURES** fields (in degrees Fahrenheit) are for the L-Band Front End and Signal Processing Unit.

  *Regarding BDC SELECTED and SPDTX4 SW IN, standard product DTR's do not use SPDT switches with indicators, therefore these always show the status bits set (-).

- **FIFO STATUS** – Displays first-in-first-out (FIFO) data statistics from the DSP/CPU link. The following are counted: Status Frames, Signal Frames, Spectrum Frames, Monopulse Frames, Missing Monopulse Frames, Bad Footers, Unknown Frames and Total Frames. The counts and percents of the given types identify the total number and proportion of frames received since power-up. FPS is frames per second and MS/Frame is milliseconds per frame.

- Status frames contain signal for the front panel and M&C interface.
- Spectrum frames contain data for the SPECTRAL DISPLAY.
- Monopulse frames, either on time or late, contain signal and error vector data for monopulse mode. Monopulse used is the number of frames transmitted out via the M&C monopulse interface. The other ones that are not needed are discarded. "Late monopulse" increments each time monopulse data is requested by or due to be sent to the ACU but a new reading is not yet available. This may increment regularly in a high-performance ACU and a narrow digital filter in the DTR, or when the ACU requests each transmission (RATE = -1). On-time monopulse frames are those that arrive before they are needed.
- Bad footers are when a frame header is intact but the footer (or intervening data) has been corrupted.
- Unknown frames are when frames are out of synchronization or a frame header has been corrupted.

- **MESSAGE LOG** displays the most recent events recorded in the system message buffer. Pressing **[PAGE]** and **[SHIFT]** + **[PAGE]** or spinning the knob scrolls the list; **[PREV]** exits.

- **DISPLAY VERSION** displays the current firmware version and configuration information for the DTR.

- **CPU TASKS** displays current CPU tasks, including task number, name, shell type and activity

- **TROUBLESHOOT** is a diagnostic tool to provide online assistance on the current faults.

4.2.5 CONFIGURATION MENU

The Configuration menu [**CONFIGS**] provides access to system parameters and settings. The [**CONFIGS**] menu provides the following:

- **COMM PARAMETERS**
- **RECEIVER OPERATION**
- **CONVERSION BANDS**
- **BEACON SETUP (Only in Non-Monopulse units)**
- **MONOPULSE (ONLY in Monopulse units)**
- **SYSTEM MEMORY**
- **INTERFACE OPTIONS**

4.2.5.1 COMM PARAMETERS

- **REMOTE CONTROL** - This editor selects which port on the back panel is in control when the DTR is in **REMOTE** mode. For remote M&C communications, select Port1 or 2, which support serial protocols.

- **PORT 1, PORT 2** – These two menus configure the port for M&C communications. Port 1 is RS-232 only, while Port 2 allows RS-232 or RS-422 connections. See Table 3-6 for factory set data parameters for these ports. The following submenus are configurable for M&C communications:

  - **BPS (BAUD)** – The transfer rate of Port 1 can be set from 1200 to 57,600 BPS. The transfer rate of Port 2 can be set from 1200 to 115,200 BPS.

  - **NEWLINE** – When enabled, a carriage return line-feed (CR-LF) is sent at the end of the command line. When disabled, only a carriage return (CR) is sent.

  - **ECHO** returns the received character to the port.

  - **SHELL** determines the communications protocol used on this serial port. DISABLED disables the serial port. M&C SHELL provides Monitor and Control protocol support including status polling and system configuration capability. 72xx M&C Shell provides TRL Monitor and Control protocol support for status polling and system configuration by a 72xx ACU with version 2 firmware. An ACU remote port set to DTR and a DTR set to 72xx M&C SHELL will NOT communicate. MESSAGE PRINTER is a diagnostic tool which may be used to record system events when connected to a terminal program or a serial printer. TBT INTERFACE (Optional) supports serial control of GDST Tracking Band Translator (TBT).

  - **RESET PORT** resets the given port. The communication interface is reinitialized and the shell (if any) that was running on it is restarted.

- **PORT 3** – This menu configures the RS-485 Port 3 for M&C communications. See Table 3-9 for factory set data parameters for this port. The following submenus are configurable for M&C communications:

  - **BPS (BAUD)** – The transfer rate of Port 3 can be set from 1200 to 115,200 BPS.

  - **SHELL** determines the communications protocol used on this serial port. DISABLED disables the serial port. M&C SHELL provides Monitor and Control protocol support including status polling and system configuration capability.

  - **MASTER ADDRESS** is the address of the master (controlling) device on the multi-drop RS-485 bus. There are a maximum of 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

- **SLAVE ADDRESS** is the address of this unit (a slave, controlled) on the multi-drop RS-485 bus. There are a maximum of 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

- **ADDRESS OFFSET** is the offset added to the multi-drop bus address of a device to determine the ASCII value needed to be used on the bus.

  Example: ADDRESS-OFFSET is 48 (ASCII for '0')
  MASTER-ADDRESS is 0
  SLAVE-ADDRESS is 1

  In the above example, the ASCII value on the RS-485 multi-drop bus would be 48 (ASCII for '0') for the master, and 49 (ASCII for '1') for the slave.

- **RESET PORT** resets the given port. The communication interface is reinitialized and the shell (if any) that was running on it is restarted.

4.2.5.2 RECEIVER OPERATION

The **RECEIVER OPERATION** configures how the Signal Processing Unit (SPU) processes input signals.

- **FILTERS** controls the bandwidth of the band-pass filter, centered around the receiver tuning frequency. A signal is detectable if it is visible on the spectral display (MAIN\STATUS\SPECTRAL DISPLAY). A spectrum analyzer attached to the IF Monitor port may be used to view the filter band. Filters 1 MHz and narrower are centered at 70 MHz. Filters wider than 1 MHz are centered at 72 MHz, except 16 MHz. For the 16 MHz filter, the tuning frequency is translated to 71 MHz; filter coverage is 9 MHz below to 7 MHz above. The 16 MHz filter has a 1.5 MHz notch 7 MHz below the tuning frequency. To use this filter, the NCO OFFSET should be zero (MAIN\CONFIGS\SYSTEM MEMORY\FACTORY CALIBRATION\NCO OFFSET). In standard configurations choose from: 16 kHz, 32 kHz, 62.5 kHz, 125 kHz, 250 kHz or 500 kHz. In addition, wide-band units provide these additional filters: 1 MHz, 2 MHz, 4 MHz, 8 MHz, 12 MHz, and 16 MHz.

  500 kHz is the default bandwidth filter. This allows the ability to track most CW beacon carriers. Selecting a smaller bandwidth filter will improve the carrier-to-noise ratio (C/No). However, the bandwidth filter selected must be greater than the Doppler Effect in order to track the carrier continuously.

- **ANALOG OUTPUTS** - The ANALOG OUTPUTS menu controls the Digital to Analog Converter (DAC) and contains the following items:

- **DAC1 and DAC2 SETUPS** – DAC1 provides an analog DC voltage proportional to signal level on pins 1 and 14 (+OUT, -OUT) of I/O Interface #1 on the back panel. DAC2 provides an analog DC voltage proportional to signal level on pins 3 and 16 (+AUX, -AUX) of I/O Interface #1 on the back panel. See Section 3.5.1 for DAC setup information. Both DAC1 and DAC2 SETUPS have the following submenus:

  - **VOLTAGE RANGE** selects the DC voltage range of the DAC. This value is used to represent the signal level as a tracking voltage

  - **MINIMUM REFERENCE POWER LEVEL** sets the minimum input power level reference which corresponds to minimum DAC voltage output.

  - **SLOPE** controls the rate of change of the DC output with respect to a 1 dB change in signal power level. Select a value from -1.000 to 1.000 V/dB.

  - **OUTPUT** enables or disables the respective DAC output, DAC1 or DAC2.

- **UPDATE RATE**, in milliseconds, is used by the DSP to send the current signal level to both DAC1 and DAC2 outputs. Notice that the VOLTAGE RANGE, MINIMUM REFERENCE POWER LEVEL, and SLOPE may be independently set up. However, the UPDATE RATE applies to both DAC outputs.

- **A**TTENUATION controls the lower end of the Digital to Analog Converter (DAC) voltage output, in conjunction with the parameters in the DAC1 and DAC2 setups. The range is from 0 to 50 dB. Rotating the spin knob clockwise, for example, increases the apparent attenuation, resulting in a lower voltage level output; actual input power is not affected. NOTE: This parameter will affect both DAC1 and DAC2. Also, this parameter is not intended to compensate for signal overload conditions. If signal overload occurs, use parameter INPUT ATTEN from the MAIN MENU.

- **FFT SAMPLE AVERAGING** determines how new FFT data is combined with previous data. Increasing AVERAGING smoothes the spectral curve and increases the stability of the display. Decreasing AVERAGING improves the DTR response time.

- Detection (WIDEBAND OPTION ONLY)
  Receivers with the ***Wideband*** option have four detection modes:

  1. FFT Signal – (Default) Detects and sums together all signals, within the selected bandwidth, that are above the estimated noise floor. This mode is useful when detecting narrow band signals, narrow with respect to the bandwidth selected.

2. FFT Noise - Displays noise density within the selected bandwidth. This mode is useful when tracking a broadband signal (Video or digital). However due to FFT processing time the response is slightly slower than that of the ***RMS Density*** mode process time.

3. RMS Power – Displays total RMS power measured in the selected bandwidth. This mode suspends the FFT operation thus decreasing signal processing time. Changing the selected bandwidth changes the displayed power measurement. The displayed power level will increase with broader bandwidth selections.

4. RMS Density - Displays power level per Hz of bandwidth thus normalizing the signal measurement. This mode is preferable for tracking a wideband signal. Displayed power level will be more constant at different bandwidth selections and slightly faster than ***FFT Noise*** mode.

4.2.5.3 CONVERSION BANDS*

*Factory default has all conversion bands set to L-Band if no internal BDC is present in the unit. If an internal BDC is present, factory default contains information specific to the internal BDC.

The conversion bands can be configured for an external down-conversion device. This enables the actual beacon frequency to be entered as the tracking frequency rather than the down-converted L-Band frequency being entered as the tracking frequency.

For example, if an L-Band DTR is being used to track a 12.0GHz beacon and the LO of the external device is 10.5GHz, the L-Band frequency at the DTR RF input would be 1.5GHz. The tracking frequency could be set to 1.5GHz in order to track this beacon. However, the conversion band could be setup with the external down-converter's parameters. This would enable the DTR to be set to a tracking frequency of 12.0GHz to match the actual frequency of the beacon.

The **[CONVERSION BANDS]** menu describes the downconverter setup and has various submenus, depending on the number of bands in any particular model. Each **BAND** menu (1-4) has the following submenus:

- **BDC GAIN** is the gain in dB of the down-conversion devicefor this band. The factory default setting should not be adjusted, as it reflects the BDC attenuator pair internal to the unit. If utilizing an external down-conversion device, this should be set to 0.
- **OSCILLATOR FREQUENCY** is the local oscillator frequency of the down-conversion device for this band. Factory default is the LO frequency of the internal BDC and should not be adjusted. If utilizing an external down-conversion device, this should be set within 1kHz of the external device's LO frequency.

- **LOW FREQUENCY** is the low-end frequency of the down-conversion device that supports this band. Factory default is the low-end frequency of the internal BDC. If utilizing an external down-conversion device, it should be that device's low-end frequency.
- **HIGH FREQUENCY** is the high-end frequency of the down-conversion device that supports this band. Factory default is the high-end frequency of the internal BDC. If utilizing an external down-conversion device, it should be that device's high-end frequency.
- **LBAND-DEFAULTS** sets BAND 1 parameters to L-Band defaults.

WARNING: Changing these values for units with internal BDC may cause the DTR to stop working. Only change these values when an internal BDC is present in the unit when directed to do so by GDST customer support personnel.

4.2.5.4 BEACON SETUP*

* Only available in Non-Monopulse units.

A subset of DTR system parameters may be stored as BEACONS to provide parallel control via I/O Interface #1. This provides support of legacy GDST interfaces, such as the 7134 ACU. See Section 3.5.2 for more information on setting up beacons with a 7134 ACU.

- **STORE BEACONS** – Executing each item in this menu will store current values of the following parameters as a BEACON state:

  - FREQUENCY
  - POL-SELECT
  - ATTENUATION
  - FILTER
  - INPUT ATTEN
  - SLOPE
  - VOLTAGE RANGE
  - MINIMUM POWER REFERENCE LEVEL

  Only DAC1 SLOPE, VOLTAGE RANGE, and MINIMUM POWER REFERENCE LEVEL are stored. Those parameters for DAC2 are not stored.

- **RESTORE BEACONS** – Executing each item in this menu will restore values previously stored as a BEACON state.

4.2.5.5 MONOPULSE*

* Only available in Monopulse units.

This MONOPULSE menu provides the ability to configure some aspects of monopulse mode and view others. Monopulse mode uses one of the serial ports to communicate with the GDST 7200 series ACU via the M&C SHELL. Control and status of the monopulse RF signal processing assembly is provided via lines located on the general purpose I/O interfaces.

- **MUTE** controls the combination of signal and error channels in the monopulse hardware. Disable to include the error channel for monopulse

operation. Enable to exclude the error channel for normal operation. **NOTE**: This can also be set by M&C commands in TRL-Emulation.

- **MUTE-FAULT** enables or disables the mute switch fault. This feature should be disabled for monopulse plates which do not support mute switch feedback. Disabling the fault on systems that support mute switch failure detection is not recommended for normal operation. Feedback is provided via mute status lines on I/O interface 2.

- **RATE** is the minimum number of milliseconds between the monopulse data transmissions of START. If the value is -1, new data is sent only after receiving a carriage return. **NOTE**: Also used by M&C in TRL-Emulation

- **MODE** sets the type of monopulse output of START, either two error vectors with sum for normal operation or four phase levels for diagnostics. Remote control is required to start normal operation; loss of control stops automatically. All output is in hexadecimal:

  0:VECTORS reply:
  "[+|-]ddddd [+|-]eeeee -fffff" where d and e units are |dBm/10000| and f units are |dBm/1000| (range 0 to -262.143 dBm)

  1:LEVELS reply:
  "+dddddd +eeeeee +ffffff +gggggg" where units are |dBm/1000|

  NOTE: Also set by M&C in TRL-Emulation

- **START** monopulse operation; to stop, use EXIT followed by a carriage return. It stops automatically if and when a fault is set. After stopping, in either case, the mute switch is enabled. **NOTE**: Only usable via the M&C

4.2.5.6 SYSTEM MEMORY

The SYSTEM MEMORY menu contains functions related to the storage of system parameters in nonvolatile RAM (NVRAM).

- **FACTORY CALIBRATION** contains system parameters that are calibrated in factory and are NOT normally changed by the user. CHANGING THE PARAMETERS IN THIS MENU MAY DEGRADE THE PERFORMANCE OF THE DTR.

  - **SAMPLING FREQUENCY** compensates for the oscillator's slight deviation from nominal 64 MHz. Entering the actual oscillator frequency to within 1Hz maximizes the receiver's performance. This calibration is done in the factory for each DTR before shipment; it should NOT be changed in most cases.

    If it must be reconfigured, connect a cable from the 70 MHz IF monitor (on the front of the DTR) to a spectrum analyzer. Set up the spectrum analyzer as follows:

    1) Set Auto Couple to ALL.
    2) Set Frequency to 64 MHz.
    3) Set Span to 5 KHz.
    4) Peak-search the signal.
    5) Center the frequency.
    6) Span down to 500 Hz.
    7) Record and enter the measured value.

  - **NCO OFFSET** adjusts the frequency of the Numerically Controlled Oscillator (NCO) on the SPU.

  - **POWER LEVEL CALIBRATION** adjusts the calibration value used to calculate the signal power measurement reported by the DTR (shown on the front display in dBm). This parameter should NOT be modified under normal circumstances.

  - **MANUAL IF OVERRIDE** allows the user to manually select the Intermediate Frequency (IF) used by the L-band front end. The DTR normally selects the optimal IF; this menu provides flexibility for special cases.

    - **FREQUENCY #1-4 OVERRIDE** allows user selection of up to four IF1s used by the L-band front end for current frequency. IF1 specifies an approximate center for the digital filter within a 25 MHz analog filter centered at 836.5 MHz. “Automatic” is the default setting, but settings from 824.8 to 847.2 MHz are available.

  - **HARDWARE OPTIONS** allows factory setup of special hardware configurations. These options are typically set in the factory and should not be changed under normal circumstances.

    - **POL INPUTS** allows user selection of STANDARD or MULTI PORT.

- **SET DATE AND TIME**

  The port used to set the date or time (local or remote) must be the one in control.

  - **SET DATE** allows the current date to be set. In the M&C shell, the format is MMDDYYYY and al fields must be set.

  - **SET TIME** allows the current time to be set. In the M&C shell, the format is HHMMSS and all fields must be set. The time is in 24-hour format.

- **RESTORE ROM DEFAULTS – WARNING: This will erase user and factory calibration settings!**

  Selecting YES and pressing ENTER restores all DTR parameters to factory ROM defaults. The DTR will reset.

- **FORCE CLEAR FAULTS** forces the system to clear all faults. Faults which are set periodically will appear again. Also see ACKNOWLEDGE FAULTS below.

4.2.5.6 INTERFACE OPTIONS

- **LCD CONTRAST** adjusts the contrast of the LCD display. Choose a value between 0 (for least contrast) and 30 (for most contrast). The default value is 6.

- **LOW LEVEL SIGNAL** – This value, in dB, sets the trigger threshold for the LOW INPUT SIGNAL fault. Regardless of this value, the LOW INPUT SIGNAL fault will still occur if input signal is undetectable. The default value is -120 dBm.

- **LOW SIGNAL ALARM** – LOW SIGNAL ALARM enables the LOW INPUT SIGNAL alarm, allowing the fault to be reported. This is not useful for most applications and is disabled by default.

- **HIGH TEMP LIMIT** – This value, in degrees Fahrenheit, is used to trigger the TEMPERATURE ALARM fault. The default value is 120° F.

4.2.6 ACKNOWLEDGE FAULTS

Choosing **[ACKNOWLEDGE FAULTS]** clears current alarm conditions. The fault messages remain displayed on the screen, but no longer cause an alarm and the summary fault contact closure is no longer asserted by the faults. Also see FORCE CLEAR FAULTS.

4.2.7 TESTS

The [**TESTS**] menu provides system integrity tests and is intended primarily for factory testing.

Use of some tests may obscure real-time data, and others may temporarily affect the performance of the receiver.

- **LCD DISPLAY** tests every pixel of the LCD by drawing lines in two alternating patterns. The first pattern displays automatically; the second pattern will display after a key-press. Press any key to exit test.

- **LEDS TEST** blinks the top three LED's four times (the power LED will remain lighted). The test should last no more than 5 seconds.

- **FIFO TEST** displays a test pattern received from the SPU, in hexadecimal values. The pattern should be:

R/C	A	B	C	D	E	F	G	H
1	0000	0001	1111	0002	2222	0004	3333	0008
2	4444	0010	5555	0020	6666	0040	7777	0080
3	8888	0100	9999	0200	AAAA	0400	8888	0800
4	CCCC	1000	DDDD	2000	EEEE	4000	FFFF	8000

FIFO TEST: PASSED

  In case of failure, a small "x" will precede the values that do not match. Press PREV to exit.

- **DISPLAY TIME DOMAIN** – This function displays the sampled waveform of the received signal in time domain. NOTE: this is for diagnostic purposes only; signal strength is not calculated while the time domain is displayed, thus preventing tracking functionality.

5.0 MAINTENANCE

5.1 Inspection and Preventive Maintenance

Scheduled maintenance should include the following:

- Check the inside of the unit for excessive dust accumulation every 6 to 12 months. If excessive dust is found, disconnect the power cord from the DTR and remove the dust using a clean, dry (non-oiled) high-pressure air source.

- Check and clean the fan filter, accessible from back of unit, whenever dirty to avoid overheating which may degrade system performance. Before removing the filter, turn the power switch on the DTR to the off position and remove the cover to the DTR. To remove the filter, remove the 4 flat head screws on the rear panel side of the plastic housing of the exhaust fan and filter, making sure to keep track of the washers and nuts on the inside of the unit as the screws are removed. The plastic cover and filter can then be removed and cleaned with a high-pressured hose. If the filter needs to be replaced, replace it with General Dynamics part #BFN011. Replace the filter and secure the fan housing by re-installing the 4 screws, washers, and nuts.

- Replace batteries for non-volatile memory as required. The long life battery ensures that user parameters are stored when the unit is powered off. The battery is a long-life lithium battery, but it is important to monthly monitor the strength of this battery. If the battery sufficiently discharges, all NVRAM parameters will be lost including the following:

    - Frequency
    - Time/Date

Checking the Battery

To check if the battery charge is low, remove the top cover and locate the CPU board. This is the large board closest to the front panel on the right side when viewing from the front of the unit. The battery is located in the socket on the right-side of the board. Using a voltmeter, place the positive probe on the top of the battery and the negative probe on the side of the battery. A good battery will measure around +3 VDC.

Replacing the Battery

It is possible to replace the battery without losing any parameters.

NOTE: The battery must be removed while the power is applied to the unit or the NVRAM parameters and/or real time clock information may be lost. If removed with the unit in the powered-off state, then NVRAM parameters may be lost.

Before removing the original battery, acquire the GDST part #BBA003 (Panasonic CR2354). This 3V Lithium coin-type battery can be carefully pried out with a small screwdriver and the new battery can be replaced in reverse fashion.

IMPORTANT: The "+" side of the battery faces up.

5.2 System Spares

Due to the complex nature of the DTR, there are VERY FEW user serviceable parts inside. Repairs must be made by qualified service technicians under the direction of General Dynamics SATCOM Technologies Technical Support ONLY. Failure to follow this recommendation will void your warranty.

The following spare parts can be ordered from General Dynamics SATCOM Technologies.

TABLE 5-1 SPARE PARTS

P/N	DESCRIPTION	QTY PER SYS
CFU079	Fuse 1 Amp fuse	1
CSS091	Filter power entry module 85-265 VAC	1
BBA003	Battery coin 23mm DIA X 5.4mm	1
BFN010	Cooling Fan	1
CPS039	Power Supply	1

Additional parts such as printed circuit boards are NOT user-replaceable since they must be factory calibrated and matched with other components. In addition they must have the proper, compatible software version installed prior to installation in the unit.

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6.0 ENGINEERING DRAWINGS

This section of the manual contains the following engineering drawing:

201807 Digital Tracking Receiver, Stock Level Drawing

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APPENDIX A - TECHNICAL SUPPORT

If you have any questions or problems that are not addressed by the manual, there are several ways to contact our technical support team.

Prior to contacting General Dynamics SATCOM Technologies, please navigate to STATUS\DISPLAY VERSION and have the DTR's Model, Serial, and corresponding software versions readily available. If the unit will not function, please consult the Model/Serial tag on the side of the unit for the proper unit identification information.

1. Phone us at +1 (903) 295-1480.

2. Email us at ***LV_CustomerService@gdsatcom.com***

3. Obtain form CG-4121 - Technical Inquiry Form (below) and fax us your questions at (903) 295-1479.

4. Contact us on our web site at ***www.gdsatcom.com***

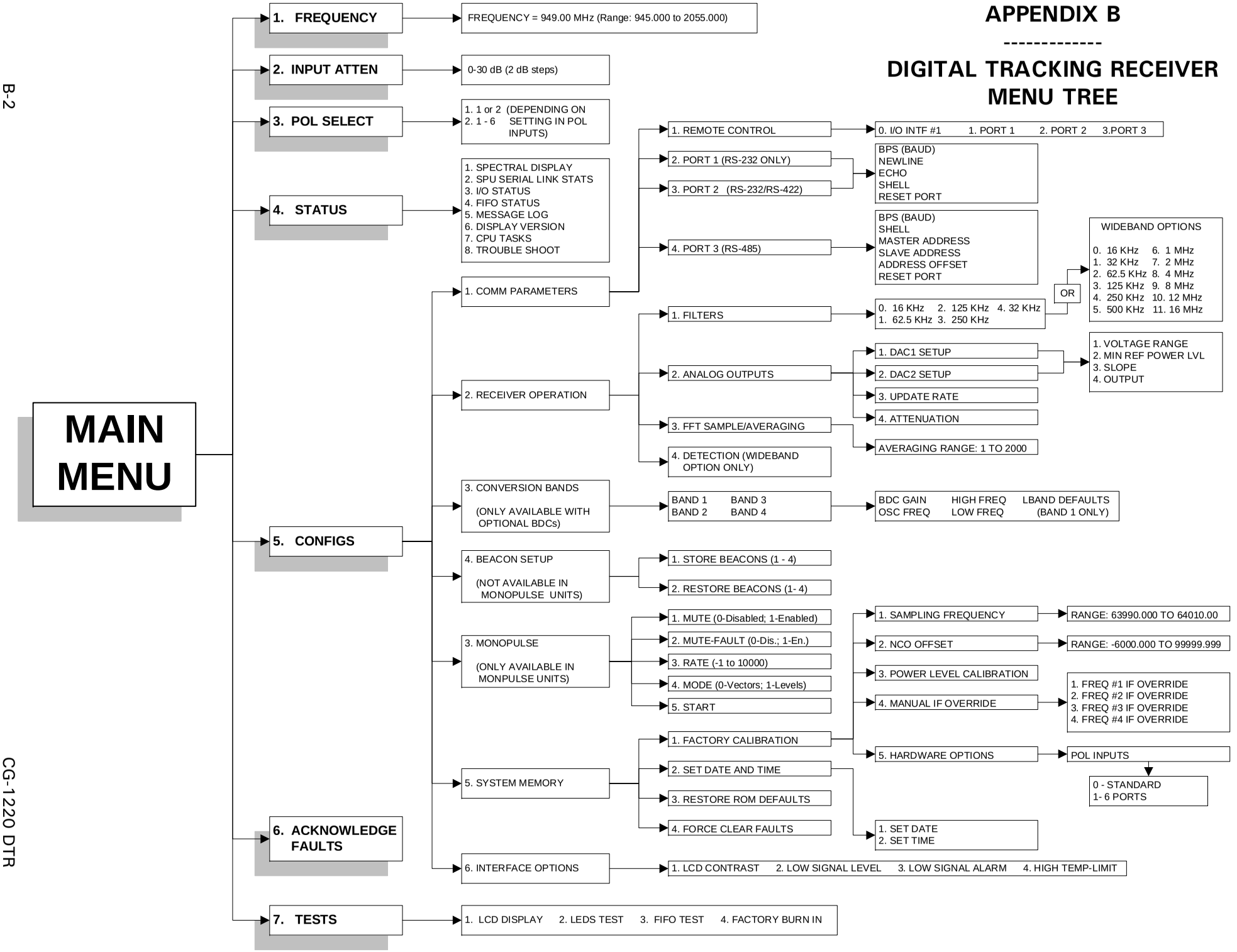
GENERAL DYNAMICS SATCOM Technologies **Technical Inquiry**		**FAX (903) 295-1479**	
CUSTOMER NAME:		**SITE:**	
CONTACT:		**PHONE:**	**EXT:**
FAX:		**EMAIL:**	
EQUIPMENT: ***(INCLUDE MODEL, NAME, AND SERIAL NUMBER OF ALL PERTINENT EQUIPMENT)***			**S/N:**
1. Model:			_____
2. Model:			_____
3. Model:			_____
4. Model:			_____
OTHER EQUIPMENT			
TECHNICAL QUESTION/PROBLEM:			
RESPONSE FROM GENERAL DYNAMICS:			
GDST TROUBLESHOOTER	**DATE**	**TIME**	**REF. NO.**

APPENDIX B – MENU TREE

This Appendix contains the menu tree for the DTR.

APPENDIX B

DIGITAL TRACKING RECEIVER MENU TREE



APPENDIX C – REMOTE M&C PROTOCOL

This Appendix contains the remote M&C protocol for the DTR (CG-6073).

GENERAL DYNAMICS
SATCOM Technologies

CG-6073
REV R
JUN 2012

REMOTE M&C PROTOCOL FOR THE DIGITAL TRACKING RECEIVER

3750 W. Loop 281
Longview, Texas 75604

Revision History

Rev. No/change	Revised By	Approved By	Date	ECO#
R – CPU Firmware V2.3 filters	B. Tanner	D. Bulgrien	6/6/12	11559
P – Updates	B. Tanner	D. Harrison	8/3/10	9910
N – Updates	M. Neely	G. Branch	4/25/06	6629
M – Updates	M. Neely	G. Branch	2/06/06	6456
L – Updates	M. Neely	G. Branch	3/24/05	5718
K – Updates	M. Neely	G. Branch	10/18/04	5469
J - Updates	M. Neely	G. Branch	7/21/04	5355
H – Updates	M. Neely	G. Branch	10/10/03	4518
G – Updates	M. Neely	C. Bonner	10/18/02	4306
F – Updates	M. Neely	D. Bulgrien	6/14/01	2624

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APPENDIX C
DTR REMOTE MONITOR AND CONTROL

1.0 INTRODUCTION

This appendix contains the Digital Tracking Receiver (DTR) Remote Monitor and Control (M&C) protocol applicable to version 2.3 and higher of the DTR CPU firmware. The M&C interface is provided to assist in the setup of remote communications with the DTR.

The remote port communication parameters (bps, echo, newline) may be configured at the front panel of the DTR visual interface for the desired port. If you are unsure about your system configuration or cannot find the necessary information in this manual, please consult your General Dynamics SATCOM Technologies (GDST) representative.

1.1 Syntax Diagrams

This section discusses syntax diagrams used in this document.

1. | Choices or optional data are shown inside brackets and separated by the pipe "|" sign.

2. { } Text surrounded by curly brackets indicates a choice. The following command example indicates that you can enter either a or b:

   command {a | b}

3. [ ] Square brackets indicate optional data. The following command example indicates that argument_2 is optional:

   command argument1 [argument2]

4. < > Angle brackets indicate a single replaceable token. The following command example indicates that you must specify one name and one value separated by a colon with no intervening spaces:

   command <identifier name>:<identifier value>

5. ... Horizontal ellipses show repetition of the preceding item(s). The following command example indicates you can optionally specify more than one number: command number [...]

6. .. Indicates a range of argument values.

2.0 OVERVIEW

The M&C shell (command line interface) is analogous to a typical computer operating system shell in MS-DOS or UNIX. The menus can be thought of as a hierarchical "directory." The contents of a menu are its menu items. A menu item is executed by first changing to its parent menu (or Path) and then issuing the command.

There are, generally speaking, four types of menu items:

1. Commands - executed to perform a function, navigate menu hierarchy, list unit status, etc. Example: keyword “LS” lists items in the current menu.

2. Editable items (parameters) - either display or edit a parameter value such as frequency.

3. Submenus - executed to change from the current menu to the desired submenu.

4. Read Only - Calculated or predefined status information.

3.0 GENERAL PROTOCOL

The general format for transactions being sent to and from the DTR M&C interface is described below.

Format for sending a command is:

command [arguments]<CR>

Format for information returned is:

[data)] [(newline)(data)] ... [[(newline)]
(error message)]prompt

1. **command** - May be a Keyword, or menu item name or number. Items are numbered 0 to n-1, where n is the number of items in the menu. Note that some menu items may not be available depending on system configuration.

2. [arguments] - 0 or more space-separated fields which are actually arguments to the command. These are command-specific.

3. <CR> - ASCII carriage return (ASCII 13 decimal). Note that the DTR M&C expects only a carriage return; line feeds are not permitted.

4. (newline) - User-definable: either CR (ASCII 13 decimal) or CRLF: (ASCII 13 and ADCII10 decimal). If a command returns data as part of its action, then each line of data is preceded by a (newline), except for the first line.

6. (error message) - Error message from the preceding command. Depending on error status and user-definable options, there may or may not be an error message. Most error messages are preceded with a (newline) as defined previously. Error messages are described in Section 3.2.

Argument fields sent to the M&C shell must always be separated by at least one space (ASCII 32 decimal).

The command and all (if any) arguments are individual fields. Note that more than one command may be issued on the same command line, as long as the maximum input length of 80 characters is not exceeded; however, output from those commands may be on the same line.

3.1 Range Details

Sending a D argument to any editable item returns format information.

D Prints the format and/or limits required for editing.

I*lo hi* **Integer** reply: Range **lo** to **hi**, inclusive.

Example:

```
> / POL-SELECT D
 I1 2
```

R*lo hi* **Real** reply: Range **lo** to **hi**, inclusive.

Example:

```
> / FREQUENCY D
 R945.000 12750.000
```

L*max*... Selection **List** Reply: Range 0 to ***max***, inclusive.

Example:

```
> / CONFIGS COMM-PARAM REM-CONTROL D
 L4
0 "No remote"
1 "PORT 1"
2 "PORT 2"
3 "PORT 3"
```

3.2 Error Messages

Error messages always follow the carriage return of the previously submitted command line. They are usually preceded with a user-defined newline, as described in the General Protocol. Processing of a line of input which contains multiple commands ceases when an error in one of the commands occurs; subsequent commands are ignored. An example session containing various error messages follows:

M&C terminal shell
> HI<cr>
Error: HI is unknown

> FREQUENCY =<cr> value is missing
> FREQUENCY = 0 0.000<cr> <-- value is too low. Range: 945.000 to 12750.000
> FREQUENCY = 950<cr>
Not in control - can't change parameter
>

3.3 Status Requests

Status requests are obtained by polling the DTR for information. All status requests send by default only the information that has changed since the last request. Each request has an option to force transmission of all status information.

The recommended operating procedure for the remote computer is to get a full status update when the M&C software is launched, then periodically get status updates.

Status commands return their data as a string which may be parsed into one or more fields. A field contains data which is logically grouped together. A field may have sub-fields. An example of this is found in the S command in the "Monitor and Control Commands" Section. This keyword requests receiver status; the response is formatted with character separators for each field and fixed field widths as follows:

```
BbbCcEeeFffffffffVvvvvAaaaIi
```

Where B = beacon, C = control, E = errors, D = frequency, V = voltage, A = attenuation, and I = RF input.

Sample:

```
>S
B00C0E00F01014000V0108A000I1
```

While the total length of a status update depends on the number of fields that have changed, the length of any data field (that is, a field without sub-fields) is always fixed.

4.0 DTR MENU TREE WITH M&C COMMANDS

The DTR listing shows all of the menu items, user editable parameters and executable commands. The listing also shows the M&C command that is equal to the menu item. Only the **MAIN MENU** items are shown in **bold** letters while all of the **OPTIONAL** items or menus that contain optional features and choices are ***italicized***. All menu items with submenus or parameters below them are followed by three trailing periods…

DTR MAIN MENU SYSTEM

MAIN MENU	TYPE	PARENT MENU
FREQUENCY	**Data Editor**	**MAIN MENU**
INPUT-ATTEN	**Data Editor**	**MAIN MENU**
POL-SELECT	**Data Editor**	**MAIN MENU**
STATUS…	**Sub Menu**	**MAIN MENU**
SPECTRAL-DISPLAY	Executable	**STATUS**
SPU-DIAG (“SPU SERIAL LINK STATS”)	Executable	**STATUS**
I/O-STATUS	Executable	**STATUS**
FIFO-STATUS	Executable	**STATUS**
LOG (“MESSAGE LOG”)	Executable	**STATUS**
VERSION (“DISPLAY VERSION”)	Executable	**STATUS**
TASKS or TASKS-DIAG (“CPU TASKS”)	Executable	**STATUS**
TROUBLESHOOT	Executable	**STATUS**
CONFIGS…	**Sub Menu**	**MAIN MENU**
COMM-PARAM (“COMM PARAMETERS”)…	Sub-Menu	CONFIGS
REM-CONTROL (“REMOTE CONTROL”)	Data Editor	COMM-PARAM
PORT-1…	Sub Menu	COMM-PARAM
BPS (“BPS (BAUD)”)	Data Editor	PORT-1
NEWLINE	Data Editor	PORT-1
ECHO	Data Editor	PORT-1
SHELL	Data Editor	PORT-1
RESET-PORT	Executable	PORT-1
PORT-2…	Sub Menu	COMM-PARAM
BPS (“BPS (BAUD)”)	Data Editor	PORT-2
NEWLINE	Data Editor	PORT-2
ECHO	Data Editor	PORT-2
SHELL	Data Editor	PORT-2
RESET-PORT	Executable	PORT-2
PORT-3…	Sub Menu	COMM-PARAM
BPS (“BPS (BAUD)”)	Data Editor	PORT-3
SHELL	Data Editor	PORT-3
MASTER-ADDRESS	Data Editor	PORT-3
SLAVE-ADDRESS	Data Editor	PORT-3
ADDRESS-OFFSET	Data Editor	PORT-3
RESET-PORT	Executable	PORT-3
OPERATION (“RECEIVER OPERATION”)…	Sub Menu	CONFIGS
FILTER	Data Editor	OPERATION
ANALOG-OUTPUTS…	Sub Menu	OPERATION
DAC1 (“DAC1 SETUP”)	Sub Menu	ANALOG-OUTPUTS
DAC1-RANGE (“VOLT RANGE”)	Data Editor	DAC1
DAC1-REF (“MIN REF PWR LVL”)	Data Editor	DAC1
DAC1-SLOPE (“SLOPE”)	Data Editor	DAC1
DAC1-OUTPUT (“OUTPUT”)	Data Editor	DAC1
DAC2 (“DAC2 SETUP”)	Sub Menu	ANALOG-OUTPUTS
DAC2-RANGE (“VOLT RANGE”)	Data Editor	DAC2
DAC2-REF (“MIN REF PWR LVL”)	Data Editor	DAC2
DAC2-SLOPE (“SLOPE”)	Data Editor	DAC2
DAC2-OUTPUT (“OUTPUT”)	Data Editor	DAC2
UPDATE (“UPDATE RATE”)	Data Editor	ANALOG-OUTPUTS
ATTENUATION	Data Editor	ANALOG-OUTPUTS
AVERAGING (“FFT SAMPLE AVERAGING”)	Data Editor	OPERATION
DETECTION (only in Wideband units)	Data Editor	OPERATION

Continued on the next page

MAIN MENU	TYPE	PARENT MENU
CONFIGS…(CONTINUED)	**Sub Menu**	**MAIN MENU**
BANDS ("CONVERSION BANDS")…	**Sub Menu**	**CONFIGS**
(ONLY in units with BDC)		
BAND-1…	**Sub Menu**	**BANDS**
BDC-GAIN	Data Editor	BAND-1
OSC-FREQ	Data Editor	BAND-1
LOW-FREQ	Data Editor	BAND-1
HIGH-FREQ	Data Editor	BAND-1
LBAND-DEFAULTS	Executable	BAND-1
BAND-2, 3, 4…	**Sub Menu**	**BANDS**
BDC-GAIN	Data Editor	BAND-2
OSC-FREQ	Data Editor	BAND-2
LOW-FREQ	Data Editor	BAND-2
HIGH-FREQ	Data Editor	BAND-2
BEACONS ("BEACON SETUP")…	**Sub-Menu**	**CONFIGS**
(ONLY in Non-Monopulse units)		
STORE-BEACONS…	**Sub-Menu**	**BEACONS**
STORE-BEACON1	Executable	STORE-BEACONS
STORE-BEACON2	Executable	STORE-BEACONS
STORE-BEACON3	Executable	STORE-BEACONS
STORE-BEACON4	Executable	STORE-BEACONS
RESTORE-BEACONS…	**Sub-Menu**	**BEACONS**
RESTORE-BEACON1	Executable	RESTORE-BEACONS
RESTORE-BEACON2	Executable	RESTORE-BEACONS
RESTORE-BEACON3	Executable	RESTORE-BEACONS
RESTORE-BEACON4	Executable	RESTORE-BEACONS
MONOPULSE ("MONOPULSE")…	**Sub-Menu**	**CONFIGS**
(ONLY in Monopulse units)		
MUTE	Data Editor	MONOPULSE
MUTE-FAULT	Data Editor	MONOPULSE
RATE	Data Editor	MONOPULSE
MODE	Data Editor	MONOPULSE
START	Executable	MONOPULSE
MEMORY ("SYSTEM MEMORY")…	Sub Menu	CONFIGS
CALIBRATION ("FACTORY CALIBRATION")	Sub Menu	SYSTEM MEMORY
SAMPLING ("SAMPLING FREQUENCY")	Data Editor	CALIBRATION
NCO ("NCO OFFSET")	Data Editor	CALIBRATION
CALIBRATION ("POWER LEVEL CALIB")	Data Editor	CALIBRATION
IF-OVERRIDE ("MANUAL IF OVERRIDE")…	Sub Menu	CALIBRATION
F1-OVERRIDE ("FREQ #1 IF OVERRIDE")	Data Editor	IF-OVERRIDE
F2-OVERRIDE ("FREQ #2 IF OVERRIDE")	Data Editor	IF-OVERRIDE
F3-OVERRIDE ("FREQ #3 IF OVERRIDE")	Data Editor	IF-OVERRIDE
F4-OVERRIDE ("FREQ #4 IF OVERRIDE")	Data Editor	IF-OVERRIDE
OPTIONS ("HARDWARE OPTIONS")	Sub Menu	SYSTEM MEMORY
POL-INPUTS	Data Editor	OPTIONS
DATE&TIME ("SET DATE AND TIME")…	Sub Menu	MEMORY
SET-DATE	Data Editor	DATE&TIME
SET-TIME	Data Editor	DATE&TIME
RESTORE-TO-ROM-DEFAULTS	Data Editor	MEMORY
CLEAR-FAULTS ("FORCE CLEAR FAULTS")	Executable	MEMORY
UI-OPTIONS ("INTERFACE OPTIONS")…	Sub-Menu	CONFIGS
CONTRAST ("LCD CONTRAST")	Data Editor	UI-OPTIONS
LOW-SIGNAL-LEVEL	Data Editor	UI-OPTIONS
LOW-SIGNAL-ALARM	Data Editor	UI-OPTIONS
TEMP-LIMIT ("HIGH TEMP LIMIT")	Data Editor	UI-OPTIONS
ACKNOWLEDGE-FAULTS	**Executable**	**MAIN MENU**

Continued on the next page

MAIN MENU	TYPE	PARENT MENU
TESTS...	**Sub Menu**	**MAIN MENU**
LCD-TEST ("LCD DISPLAY")	Executable	TESTS
LEDS-TEST	Executable	TESTS
FIFO-TEST	Executable	TESTS
TIME-DOMAIN ("DISPLAY TIME DOMAIN")	Executable	TESTS
FACTORY-BURN-IN	Executable	TESTS

5.0 MONITOR AND CONTROL COMMANDS

ACKNOWLEDGE-FAULTS

Path: / ACKNOWLEDGE-FAULTS

Type: Executable

Syntax: ACKNOWLEDGE-FAULTS

Notes: ACKNOWLEDGE FAULTS clears current alarm conditions. The fault message remains displayed on the screen, but no longer causes an alarm and the summary fault contact closure is no longer asserted by this fault.

ADDRESS OFFSET (v 1.19.06 or later)

Path: / CONFIGS COMM-PARAM PORT-3 ADDRESS-OFFSET

Type: Data Editor

Syntax: ADDRESS-OFFSET [= n] | [D]

Range: Integer:0 .. 224

Notes: ADDRESS-OFFSET is the offset added to the multi-drop bus address of a device to determine the ASCII value needed to be used on the bus.

Example:
ADDRESS-OFFSET is 48 (ASCII for '0')
MASTER-ADDRESS is 0
SLAVE-ADDRESS is 1
In the above example the ASCII value on the RS-485 multi-drop bus would be 48 (ASCII for '0') for the master, and 49 (ASCII for '1') for the slave.

ANALOG OUTPUTS

Path: / CONFIGS OPERATION ANALOG-OUTPUTS

Type: Sub Menu

Syntax: ANALOG-OUTPUTS

Notes: The ANALOG OUTPUTS menu controls the Digital to Analog Converter (DAC) DC Voltage output Range, Minimum Reference Power Level, Slope, Update Rate, and Attenuation to generate the tracking voltage.

ATTENUATION

Path: / CONFIGS OPERATION ANALOG-OUTPUTS ATTENUATION

Type: Data Editor

Syntax: ATTENUATION [= n] | [D]

Range: Real: 0.0 .. 50.0

Notes: ATTENUATION controls the lower end of the DAC voltage output, in conjunction with the parameters in the ANALOG OUTPUTS configuration menu.

V1.19.13 or earlier this parameter was in the MAIN MENU with path / ATTENUATION. It was replaced by INPUT ATTEN and moved to sub-menu ANALOG OUTPUTS in v1.19.15.

BAND 1 *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-1

Type: Sub Menu

Syntax: BAND-1

Notes: The conversion parameters of the Block Downconverter to support this BAND must be defined here to provide conversion to L-Band frequency.

BAND 2 *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-2

Type: Sub Menu

Syntax: BAND-2

Notes: The conversion parameters of the Block Downconverter to support this BAND must be defined here to provide conversion to L-Band frequency.

BAND 3 *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-3

Type: Sub Menu

Syntax: BAND-3

Notes: The conversion parameters of the Block Downconverter to support this BAND must be defined here to provide conversion to L-Band frequency.

BAND 4 *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-4**

Type: **Sub Menu**

Syntax: **BAND-4**

Notes: **The conversion parameters of the Block Downconverter to support this BAND must be defined here to provide conversion to L-Band frequency.**

BDC GAIN *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-1 BDC-GAIN**

Type: **Data Editor**

Syntax: **BDC-GAIN [= n] | [D]**

Range: **Real: 0.0 .. 31.0**

Notes: **The GAIN in dB, of the BDC and attenuator pair that supports this band. The typical range for this parameter is 2-4 dB when using BDCs and 10 dB pads as provided by GDST. NOTE: This parameter is set in the factory and should not be changed under normal circumstances.**

BDC GAIN *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-2 BDC-GAIN**

Type: **Data Editor**

Syntax: **BDC-GAIN [= n] | [D]**

Range: **Real: 0.0 .. 31.0**

Notes: **The GAIN in dB, of the BDC and attenuator pair that supports this band. The typical range for this parameter is 2-4 dB when using BDCs and 10 dB pads as provided by GDST. NOTE: This parameter is set in the factory and should not be changed under normal circumstances.**

BDC GAIN *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-3 BDC-GAIN**

Type: **Data Editor**

Syntax: **BDC-GAIN [= n] | [D]**

Range: **Real: 0.0 .. 31.0**

Notes: **The GAIN in dB, of the BDC and attenuator pair that supports this band. The typical range for this parameter is 2-4 dB when using BDCs and 10 dB pads as provided by GDST. NOTE: This parameter is set in the factory and should not be changed under normal circumstances.**

BDC GAIN *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-4 BDC-GAIN**

Type: **Data Editor**

Syntax: **BDC-GAIN [= n] | [D]**

Range: **Real: 0.0 .. 31.0**

Notes: **The GAIN in dB, of the BDC and attenuator pair that supports this band. The typical range for this parameter is 2-4 dB when using BDCs and 10 dB pads as provided by GDST. NOTE: This parameter is set in the factory and should not be changed under normal circumstances.**

BEACON SETUP

Path: **/ CONFIGS BEACONS**

Type: **Sub Menu**

Syntax: **BEACONS**

Notes: **A subset of DTR system parameters may be stored as BEACONS to provide parallel control via I/O INTERFACE #1. This provides support of legacy GDST interfaces such as the 7134ACU.**

BPS

Path: / CONFIGS COMM-PARAM PORT-1 BPS

Type: Data Editor

Syntax: BPS [= n] | [D]

Range:

Integer:	0 .. 6
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600

Notes: BPS refers to the bits per second (BAUD) transmitted/received by the port.

BPS

Path: / CONFIGS COMM-PARAM PORT-2 BPS or
/ CONFIGS COMM-PARAM PORT-3 BPS

Type: Data Editor

Syntax: BPS [= n] | [D]

Range:

Integer:	0 .. 7
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600
7	115200

Notes: BPS refers to the bits per second (BAUD) transmitted/received by the port.

COMM PARAMETERS

Path: / CONFIGS COMM-PARAM

Type: Sub Menu

Syntax: COMM-PARAM

Notes: COMM PARAMETERS allow serial port configuration. BPS and SHELL may be set, as well as NEWLINE and ECHO, which only apply to ports set to M&C shell. Any change to communications parameters will cause the Port to RESET and the SHELL will restart.

CONFIGS

Path: / CONFIGS

Type: Sub Menu

Syntax: CONFIGS

Notes: The CONFIGS menu provides access to all configuration parameters; from serial port communications parameters to receiver operation parameters and user interface options.

CONVERSION BANDS *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS

Type: Sub Menu

Syntax: BANDS

Notes: CONVERSION BANDS describes the down converter setup. The frequency range of the DTR may be extended according to the Block Downconverters installed.

CPU TASKS

Path: / STATUS TASKS-DIAGS

Type: Executable

Syntax: TASKS-DIAGS

Notes: Displays diagnostics on the CPU tasks, including task number, name, shell type and activity.

DAC1 OUTPUT

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC1 DAC1-OUTPUT

Type: Sub Menu

Syntax: DAC1-OUTPUT

Range:

Integer:	0 .. 1
0	Disabled
1	Enabled.

Notes: Enables or disables this DAC output.

DAC2 OUTPUT

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC2 DAC2-OUTPUT

Type: Sub Menu

Syntax: DAC2-OUTPUT

Range: Integer: 0 .. 1
0 Disabled
1 Enabled.

Notes: Enables or Disables this DAC output.

DAC1 SETUP

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC1

Type: Sub Menu

Syntax: DAC1

Notes: Allows setup of DAC1 which provides an analog DC voltage proportional to signal level on pins 1 and 14 (+OUT, -OUT) of I/O Interface #1 on the back panel.

DAC2 SETUP

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC2

Type: Sub Menu

Syntax: DAC2

Notes: Allows setup of DAC2 which provides an analog DC voltage proportional to signal level on pins 3 and 16 (+AUX, -AUX) of I/O Interface #1 on the back panel.

DETECTION TYPE *(Only in Wideband Units)*

Path: / CONFIGS OPERATION DETECTION

Type: Data Editor

Syntax: DETECTION [= n] | [D]

Range: Integer: 0 .. 3

0	FFT SIGNAL	2	RMS POWER
1	FFT NOISE	3	RMS DENSITY

Notes: DETECTION selects how the DTR will report signal power. FFT SIGNAL is the default, used to track broad spectrum signals, using FFTs. FFT NOISE is a special mode used to track broad spectrum signals, using FFTs. RMS POWER will report a direct RMS power estimate, without using FFTs. RMS DENSITY will report direct RMS power density estimate, without using FFTs.

DIAGS (v1.13 or earlier)

Notes: This menu's name changed to STATUS after v1.13.

DISPLAY TIME DOMAIN

Path: / TESTS TIME-DOMAIN

Type: Executable

Syntax: TIME-DOMAIN

Notes: Provides a display of the sampled waveform, in time domain, of the received signal.

DISPLAY VERSION

Path: / STATUS VERSION

Type: Executable

Syntax: VERSION

Notes: DISPLAY VERSION displays firmware versions and configuration information (P/N, S/N, Release date, and configuration in hexadecimal).

ECHO

Path: / CONFIGS COMM-PARAM PORT-1 ECHO

Type: Data Editor

Syntax: ECHO [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: ECHO, when enabled, returns the received character to the port.

ECHO

Path: / CONFIGS COMM-PARAM PORT-2 ECHO

Type: Data Editor

Syntax: ECHO [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: ECHO, when enabled, returns the received character to the terminal.

FACTORY BURN-IN

Path: / TESTS FACTORY-BURN-IN

Type: Executable

Syntax: FACTORY-BURN-IN

Notes: Factory burn-in is used to sweep through frequency ranges of all the configured bands. If the unit contains BDCs, then only the bands associated with those BDCs are used. If there are no BDCs, then only the L-Band frequency range is used. While burning in, the alarm "Factory burn-in" is set to indicate that the unit is not in normal operation. While in burn-in, the menu portion of the display is used to show the progress of the burn-in process. For a given band, the entire frequency range is swept in 30 minutes, with a frequency step occurring every 10 seconds. The frequency the unit is set to is upon on entering burn-in is restored when burn-in is exited. Press PREV or the top soft menu key to exit burn-in.

FACTORY CALIBRATION

Path: **/ CONFIGS MEMORY CALIBRATION**

Type: **Sub Menu**

Syntax: **CALIBRATION**

Notes: **Contains system parameters that are calibrated in factory and are NOT normally changed by the user. CHANGING THE PARAMETERS IN THIS MENU MAY DEGRADE THE PERFORMANCE OF THE DTR.**

FFT SAMPLE AVERAGING

Path: **/ CONFIGS OPERATION AVERAGING**

Type: **Data Editor**

Syntax: **AVERAGING** [= n] | [D]

Range: **Real: 1 .. 2000**

Notes: **FFT SAMPLING AVERAGING determines how new FFT data is combined with previous data. Increasing AVERAGING smoothes the spectral curve and increases the stability of the display. Decreasing AVERAGING improves response time.**

FIFO-STATUS (v1.16.51 or later)

Path: **/ STATUS FIFO-STATUS**

Type: **Executable**

Syntax: **FIFO-STATUS**

Notes: **Displays counts of the following: Status Frames, Signal Frames, Spectrum Frames, Monopulse Frames, Missing Monopulse Frames, Unknown Frames, Total Frames. The Missing Monopulse Frames count is caused by requesting monopulse at a rate higher than the number of monopulse data frames being generated.**

FIFO-TEST

Path: **/ TESTS FIFO-TEST**

Type: **Executable**

Syntax: **FIFO-TEST**

Notes: **This diagnostic displays a test pattern received from the SPU, in hexadecimal values. The pattern should be like below. In case of failure, a small "x" will precede those values that do no match.**

R/C	A	B	C	D	E
1	0000	0001	1111	0002	2222
2	4444	0010	5555	0020	6666
3	8888	0100	9999	0200	AAAA
4	CCCC	1000	DDDD	2000	EEEE

FIFO TEST: PASSED

FILTER

Path: **/ CONFIGS OPERATION FILTER**

Type: **Data Editor**

Syntax: **FILTER [= n] | [D]**

Range: **Integer: 0 .. 5 (0 .. 11 in *Wideband units*)**

Standard		Wideband		IF MONITOR center
0	16 kHz	0	16 kHz	70 MHz
1	62.5 kHz	1	32 kHz	70 MHz
2	125 kHz	2	62.5 kHz	70 MHz
3	250 kHz	3	125 kHz	70 MHz
4	32 kHz	4	250 kHz	70 MHz
5	500 kHz	5	500 kHz	70 MHz
		6	1 MHz	70 MHz
		7	2 MHz	72 MHz
		8	4 MHz	72 MHz
		9	8 MHz	72 MHz
		10	12 MHz	72 MHz
		11	16 MHz	71 MHz (see notes)

Notes: **FILTER controls the bandwidth of the bandpass filter, centered around the receiver tuning frequency. 500 kHz is the default, for tracking most signals; selecting a narrower filter may optimize the carrier-to-noise ratio (C/NO?). A signal is detectable if it is visible on the SPECTRAL DISPLAY. A spectrum analyzer attached to the IF MONITOR port may be used to view the filter band. The 16 MHz filter coverage is 9 MHz below to 7 MHz above with a 1.5 MHz notch 7 MHz below the tuning frequency; NCO OFFSET should be zero when this filter is used.**

500 kHz is the default bandwidth filter. This allows the ability to track most CW beacon carriers. Selecting a smaller bandwidth filter will improve the carrier-to-noise ratio (C/No). However, the bandwidth filter selected must be greater than the Doppler Effect in order to track the carrier continuously.

FORCE CLEAR FAULTS

Path: / CONFIGS MEMORY CLEAR-FAULTS

Type: Executable

Syntax: CLEAR-FAULTS

Notes: FORCE CLEAR FAULTS forces the system to clear all faults, Faults that are set periodically will appear again.

FREQ #1 IF OVERRIDE

Path: / CONFIGS MEMORY CALIBRATION IF-OVERRIDE F1-OVERRIDE

Type: Data Editor

Syntax: F1OVERRIDE [= n] | [D]

Range Integer: 0 .. 15

0 – Automatic	4 – 829.6	8 – 836.0	12 – 842.4
1 – 824.8	5 – 831.2	9 – 837.6	13 – 844.0
2 – 826.4	6 – 832.8	10 – 839.2	14 – 845.6
3 – 828.0	7 – 834.4	11 – 840.8	15 – 847.2

Notes: Allows user selection of IF1 used by the L-Band front end for the current frequency. IF1 specifies an approximate center for the digital filter within a 25MHz analog filter centered at 836.5.

FREQ #2 IF OVERRIDE

Path: / CONFIGS MEMORY CALIBRATION IF-OVERRIDE F2-OVERRIDE

Type: Data Editor

Syntax: F2OVERRIDE [= n] | [D]

Range: Integer: 0 .. 15

0 – Automatic	4 – 829.6	8 – 836.0	12 – 842.4
1 – 824.8	5 – 831.2	9 – 837.6	13 – 844.0
2 – 826.4	6 – 832.8	10 – 839.2	14 – 845.6
3 – 828.0	7 – 834.4	11 – 840.8	15 – 847.2

Notes: Allows user selection of IF1 used by the L-Band front end for the current frequency. IF1 specifies an approximate center for the digital filter within a 25MHz analog filter centered at 836.5.

FREQ #3 IF OVERRIDE

Path: / CONFIGS MEMORY CALIBRATION IF-OVERRIDE F3-OVERRIDE

Type: Data Editor

Syntax: F3OVERRIDE [= n] | [D]

Range: Integer: 0 .. 15

0 – Automatic	4 – 829.6	8 – 836.0	12 – 842.4
1 – 824.8	5 – 831.2	9 – 837.6	13 – 844.0
2 – 826.4	6 – 832.8	10 – 839.2	14 – 845.6
3 – 828.0	7 – 834.4	11 – 840.8	15 – 847.2

Notes: Allows user selection of IF1 used by the L-Band front end for the current frequency. IF1 specifies an approximate center for the digital filter within a 25MHz analog filter centered at 836.5.

FREQ #4 IF OVERRIDE

Path: / CONFIGS MEMORY CALIBRATION IF-OVERRIDE F4-OVERRIDE

Type: Data Editor

Syntax: F4OVERRIDE [= n] | [D]

Range: Integer: 0 .. 15

0 – Automatic	4 – 829.6	8 – 836.0	12 – 842.4
1 – 824.8	5 – 831.2	9 – 837.6	13 – 844.0
2 – 826.4	6 – 832.8	10 – 839.2	14 – 845.6
3 – 828.0	7 – 834.4	11 – 840.8	15 – 847.2

Notes: Allows user selection of IF1 used by the L-Band front end for the current frequency. IF1 specifies an approximate center for the digital filter within a 25MHz analog filter centered at 836.5.

FREQUENCY

Path: / FREQUENCY

Type: Data Editor

Syntax: FREQUENCY [= n] | [D]

Range: Real: 945.000 .. 12750.000 (v2.0.7 or later)
Real: 949.000 .. 12750.000 (v2.0.4 or earlier)

Notes: This is the FREQUENCY editor. The valid frequency range depends on the DTR's downconverter configuration.

HARDWARE OPTIONS (v1.19.08 or later)

Path: **/ CONFIGS MEMORY CALIBRATION OPTIONS**

Type: **Sub Menu**

Syntax: **OPTIONS**

Notes: **Contains settings for special hardware configurations. These settings are typically made in the factory and should not be changed under normal circumstances. CHANGING THE PARAMETERS IN THIS MENU MAY DEGRADE THE PERFORMANCE OF THE DTR.**

HIGH FREQ *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-1 HIGH-FREQ**

Type: **Data Editor**

Syntax: **HIGH-FREQ [= n] | [D]**

Range: **Real: 945.000 .. 13000.000 (v2.0.7 or later)**
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: **HIGH end FREQUENCY of the BDC that supports this band. Typical configurations:**
S-band = 2800MHz
C-band = 4200MHz
X-band = 7750MHz
Ku-lo-band = 11700MHz
Ku-hi-band = 12750MHz
Ka-A = 18100, Ka-B = 19200, Ka-C = 20200, Ka-D = 21200, Ka-E = 22300

HIGH FREQ *(OPTIONAL-Depending on RF Range)*

Path: **/ CONFIGS BANDS BAND-2 HIGH-FREQ**

Type: **Data Editor**

Syntax: **HIGH-FREQ [= n] | [D]**

Range: **Real: 945.000 .. 13000.000 (v2.0.7 or later)**
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: **HIGH end FREQUENCY of the BDC that supports this band. Typical configurations:**
S-band = 2800MHz
C-band = 4200MHz
X-band = 7750MHz
Ku-lo-band = 11700MHz
Ku-hi-band = 12750MHz
Ka-A = 18100, Ka-B = 19200, Ka-C = 20200, Ka-D = 21200, Ka-E = 22300

HIGH FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-3 HIGH-FREQ

Type: Data Editor

Syntax: HIGH-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: HIGH end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2800MHz
C-band = 4200MHz
X-band = 7750MHz
Ku-lo-band = 11700MHz
Ku-hi-band = 12750MHz
Ka-A = 18100, Ka-B = 19200, Ka-C = 20200, Ka-D = 21200, Ka-E = 22300

HIGH FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-4 HIGH-FREQ

Type: Data Editor

Syntax: HIGH-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: HIGH end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2800MHz
C-band = 4200MHz
X-band = 7750MHz
Ku-lo-band = 11700MHz
Ku-hi-band = 12750MHz
Ka-A = 18100, Ka-B = 19200, Ka-C = 20200, Ka-D = 21200, Ka-E = 22300

HIGH TEMP LIMIT (v1.16.51 or later)

Path: / CONFIGS UI-OPTIONS TEMP-LIMIT

Type: Data Editor

Syntax: TEMP-LIMIT [= n]

Range: 0 .. 140

Notes: This value, in degrees Fahrenheit, is used to trigger the TEMPERATURE ALARM fault. The default value is 120 degrees F.

INPUT ATTEN (v1.19.15 or later)

Path: / INPUT-ATTEN

Type: Data Editor

Syntax: INPUT-ATTEN [= n] | [D]

Range: Integer: 0 .. 15

0 – 0 dB	2 – 4 dB	4 – 8 dB	6 – 12 dB	8 – 16 dB	10 – 20 dB	12 – 24 dB	14 – 28 dB
1 – 2 dB	3 – 6 dB	5 – 10 dB	7 – 14 dB	9 – 18 dB	11 – 22 dB	13 – 26 dB	15 – 30 dB

Notes: INPUT ATTEN controls the attenuator in the RF front-end. The specified attenuation is applied inside the RF front-end, after the first amplifier but before the first stage mixer.
Also see: CONFIGS, RECEIVER OPERATION, ANALOG OUTPUTS, ATTENUATION.

INTERFACE OPTIONS

Path: / CONFIGS UI-OPTIONS

Type: Sub-Menu

Syntax: UI-OPTIONS

Notes: Allows control of options related to the DTR user interface.

I/O STATUS

Path: / STATUS I/O-STATUS

Type: Executable

Syntax: I/O-STATUS

Notes: Displays current I/O status info obtained from the I/O card. The I/O STATUS M&C request returns the same information as the front panel I/O STATUS screen. Below is an example from a terminal program. The content (especially for the internal configuration values) and format is subject to change without notice:

```
>I/O-STATUS
 INTF #1 IN= ~~ OUT= 00    INTF #2 IN= FF OUT= 00

  BDC POWER IN= 2(3) BDC SELECTED=D(3)  FAULTS=C ok
 BDC POWER OUT=59(3)   BDC SELECT=2(3)
 SPDTX4 SW IN=FF(----)  SPDTX4 SW OUT=AA (Hi22)

 PLL VOLTAGES (VOLTS):   PLL1=11.30  PLL2=1.70
 TEMPERATURES (DEG F):   LBFE=76.4  SPU=91.5
>
```

IS LBAND? (v1.16.51 through v1.19.06)

Notes: This parameter became LBAND-DEFAULTS in v1.19.07.

LBAND-DEFAULTS (v1.19.07 or later)

Path: / CONFIGS BANDS BAND-1 LBAND-DEFAULTS

Type: Executable

Syntax: LBAND-DEFAULTS

Notes: Sets BAND-1 parameters to L-Band defaults. From v1.16.51 to v1.19.06, this parameter was called IS-LBAND?.

LCD DISPLAY

Path: / CONFIGS TESTS LCD-TEST

Type: Data Editor

Syntax: LCD-TEST

Notes: LCD DISPLAY tests every pixel of the LCD by drawing lines in two alternating patterns. The first pattern displays automatically; the second pattern will display after a key-press. Press any key to exit test.

LCD CONTRAST

Path: / CONFIGS UI-OPTIONS CONTRAST

Type: Data Editor

Syntax: CONTRAST [= n]

Range: Real: 0 .. 30

Notes: Use LCD Contrast to adjust the contrast of the LCD display. Choose a value between 0 (for least contrast) and 30 (for maximum contrast). Six is default value.

LEDS TEST

Path: / CONFIGS TESTS LEDS-TEST

Type: Executable

Syntax: LEDS-TEST

Notes: LEDS TEST blinks the top three status LED's four times. The Power LED does not blink.

LOW FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-1 LOW-FREQ

Type: Data Editor

Syntax: LOW-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: LOW end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2000MHz
C-band = 3400MHz
X-band = 7250MHz
Ku-lo-band = 10700MHz
Ku-hi-band = 11700MHz
Ka-A = 17000, Ka-B = 18100, Ka-C = 19200, Ka-D = 20200, Ka-E = 21200

LOW FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-2 LOW-FREQ

Type: Data Editor

Syntax: LOW-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: LOW end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2000MHz
C-band = 3400MHz
X-band = 7250MHz
Ku-lo-band = 10700MHz
Ku-hi-band = 11700MHz
Ka-A = 17000, Ka-B = 18100, Ka-C = 19200, Ka-D = 20200, Ka-E = 21200

LOW FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-3 LOW-FREQ

Type: Data Editor

Syntax: LOW-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: LOW end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2000MHz
C-band = 3400MHz
X-band = 7250MHz
Ku-lo-band = 10700MHz
Ku-hi-band = 11700MHz
Ka-A = 17000, Ka-B = 18100, Ka-C = 19200, Ka-D = 20200, Ka-E = 21200

LOW FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-4 LOW-FREQ

Type: Data Editor

Syntax: LOW-FREQ [= n] | [D]

Range: Real: 945.000 .. 13000.000 (v2.0.7 or later)
Real: 949.000 .. 13000.000 (v2.0.4 or earlier)

Notes: LOW end FREQUENCY of the BDC that supports this band. Typical configurations:
S-band = 2000MHz
C-band = 3400MHz
X-band = 7250MHz
Ku-lo-band = 10700MHz
Ku-hi-band = 11700MHz
Ka-A = 17000, Ka-B = 18100, Ka-C = 19200, Ka-D = 20200, Ka-E = 21200

LOW SIGNAL LEVEL

Path: / CONFIGS UI-OPTIONS LOW-SIGNAL-LEVEL

Type: Data Editor

Syntax: LOW-SIGNAL-LEVEL [= n] | [D]

Range: Real: -199.00 .. -1.00

Notes: This value, in dB, is used to trigger the low input signal fault.

LOW SIGNAL ALARM

Path: / CONFIGS UI-OPTIONS LOW-SIGNAL-ALARM

Type: Data Editor

Syntax: LOW-SIGNAL-ALARM [= n]

Range: 0 (“disabled”)...1 (“enabled”)

Notes: Enables the Low Input Signal alarm, allowing the fault to be reported. This is not useful for most applications and is disabled by default.

MANUAL IF OVERRIDE

Path: / CONFIGS MEMORY CALIBRATION IF-OVERRIDE

Type: Sub Menu

Syntax: IF-OVERRIDE

Notes: The IF OVERRIDE menu allows the user to manually select the IF used by the L-Band front end. The DTR normally selects the optimal IF; this menu provides flexibility for special cases.

MASTER ADDRESS (v 1.19.06 or later)

Path: / CONFIGS COMM-PARAM PORT-3 MASTER-ADDRESS

Type: Data Editor

Syntax: MASTER-ADDRESS [= n] | [D]

Range: Integer:0 .. 31

Notes: MASTER-ADDRESS is the address of the master (controlling) device on the multi-drop RS-485 bus. There are a maximum on 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

MESSAGE LOG

Path: / STATUS LOG

Type: Executable

Syntax: LOG

Notes: The MESSAGE LOG displays the most recent events recorded in system's message log. The latest message is at bottom of the screen and pressing SHIFT-PAGE scrolls the list to display previous messages.

MINIMUM REF LVL

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC1 DAC1-REF

Type: Data Editor

Syntax: REFERENCE [= n] | [D]

Range: Real: -150.0 .. 20.0

Notes: The MINIMUM REF POWER LVL is the minimum input power level reference which corresponds to minimum DAC voltage output.

MINIMUM REF LVL

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC2 DAC2-REF

Type: Data Editor

Syntax: REFERENCE [= n] | [D]

Range: Real: -150.0 .. 20.0

Notes: The MINIMUM REF POWER LVL is the minimum input power level reference which corresponds to minimum DAC voltage output.

MUTE

Path: / CONFIGS MONOPULSE

Type: Data Editor

Syntax: MUTE [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: MUTE controls the combination of signal and error channels in the monopulse hardware. Disable to include the error channel for monopulse operation. Enable to exclude the error channel for normal operation. NOTE: This can also be set by M&C commands in TRL-Emulation.

MUTE FAULT

Path: / CONFIGS MONOPULSE

Type: Data Editor

Syntax: MUTE-FAULT [= n] | [D]
Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: MUTE-FAULT enables or disables the mute switch fault. This feature should be disabled for monopulse plates which do not support mute switch feedback. Disabling the fault on systems that support mute switch failure detection is not recommended for normal operation. Feedback is provided via mute status lines on I/O interface 2.

MODE

Path: / CONFIGS MONOPULSE

Type: Data Editor

Syntax: MODE [= n] | [D]

Range: Integer: 0 .. 1
0 Vectors
1 Levels

Notes: MODE sets the type of monopulse output of START, either two error vectors with sum for normal operation or four phase levels for diagnostics. All output is in hexadecimal:

0:VECTORS reply:
"[+|-]ddddd [+|-]eeeee -fffff" where d and e units are |dBm/10000| and f units are |dBm/1000| (range 0 to -262.143 dBm)

1:LEVELS reply:
"+dddddd +eeeeee +ffffff +gggggg" where units are |dBm/1000|

NOTE: Also set by M&C in TRL-Emulation

NCO OFFSET

Path: / CONFIGS MEMORY CALIBRATION NCO

Type: Data Editor

Syntax: NCO [= n] | [D]

Range: Real: -6000.000 .. 99999.999

Notes: Adjusts the frequency of the Numerically Controlled Oscillator (NCO) on the SPU.

NEWLINE

Path: / CONFIGS COMM-PARAM PORT-1 NEWLINE

Type: Data Editor

Syntax: NEWLINE [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: NEWLINE, when enabled, sends a carriage-return line-feed at the end of the command line. When disabled, only carriage return is sent.

NEWLINE

Path: / CONFIGS COMM-PARAM PORT-2 NEWLINE

Type: Data Editor

Syntax: NEWLINE [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 Enabled

Notes: NEWLINE, when enabled, sends a carriage-return line-feed at the end of the command line. When disabled, only carriage-return is sent.

OSC FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-1 OSC-FREQ

Type: Data Editor

Syntax: OSC-FREQ [= n] | [D]

Range: Real: 100.000 .. 15000.000

Notes: LOCAL OSCILLATOR of the BDC that supports this band. Typical configurations:
S-band = 3750MHz
C-band = 5150MHz
X-band = 6300MHz
Ku-lo-band = 9750MHz
Ku-hi-band = 10750MHz
Ka-A = 16500, Ka-B = 17150, Ka-C = 18250, Ka-D = 19250, Ka-E = 20250

OSC FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-2 OSC-FREQ

Type: Data Editor

Syntax: OSC-FREQ [= n] | [D]

Range: Real: 100.000 .. 15000.000

Notes: LOCAL OSCILLATOR of the BDC that supports this band. Typical configurations:
S-band = 3750MHz
C-band = 5150MHz
X-band = 6300MHz
Ku-lo-band = 9750MHz
Ku-hi-band = 10750MHz
Ka-A = 16500, Ka-B = 17150, Ka-C = 18250, Ka-D = 19250, Ka-E = 20250

OSC FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-3 OSC-FREQ

Type: Data Editor

Syntax: OSC-FREQ [= n] | [D]

Range: Real: 100.000 .. 15000.000

Notes: LOCAL OSCILLATOR of the BDC that supports this band. Typical configurations:
S-band = 3750MHz
C-band = 5150MHz
X-band = 6300MHz
Ku-lo-band = 9750MHz
Ku-hi-band = 10750MHz
Ka-A = 16500, Ka-B = 17150, Ka-C = 18250, Ka-D = 19250, Ka-E = 20250

OSC FREQ *(OPTIONAL-Depending on RF Range)*

Path: / CONFIGS BANDS BAND-4 OSC-FREQ

Type: Data Editor

Syntax: OSC-FREQ [= n] | [D]

Range: Real: 100.000 .. 15000.000

Notes: LOCAL OSCILLATOR of the BDC that supports this band. Typical configurations:
S-band = 3750MHz
C-band = 5150MHz
X-band = 6300MHz
Ku-lo-band = 9750MHz
Ku-hi-band = 10750MHz
Ka-A = 16500, Ka-B = 17150, Ka-C = 18250, Ka-D = 19250, Ka-E = 20250

POL INPUTS (v1.19.08 or later)

Path: /CONFIGS MEMORY CALIBRATION OPTIONS POL-INPUTS

Type: Data Editor

Syntax: POL-INPUTS [= n] | [D]

Range:

Integer:	0 .. 1
0	Standard
1	4 Ports

Notes: 4 Ports is an optional hardware configuration that provides four discreet inputs for a single band. Selecting the 4 inputs option will provide for POL inputs 1..4 in the POL SELECT menu. Default is STANDARD. Select 4 Ports ONLY if the correct hardware is installed.

POL SELECT

Path: / POL SELECT

Type: Data Editor

Syntax: POL-SELECT [= n] | [D]

Range: Integer: 1 .. 2
1 Pol 1
2 Pol 2

Notes: POL SELECT selects which POL input will be used for tracking. This setting is used to control an RF switch internal to the DTR, and may also be used to control an external switch using I/O Interface #1 on the back panel. GPIO 6 and 7 become active based on the POL SELECT setting. Pins 11,24 represent the POL1 state and pins 11,25 represent the POL2 state. These pin groups are connected to dry relay contacts (1Amp max current).

POL SELECT *(FOUR PORTS OPTION ONLY)* (v1.19.08 or later)

Path: / POL-SELECT

Type: Data Editor

Syntax: POL-SELECT [= n] | [D]

Range: Integer: 1 .. 4
1 Pol 1
2 Pol 2
3 Pol 3
4 Pol 4

Notes: POL-SELECT selects which POL input will be used for tracking. This setting is used to control an RF switch internal to the DTR, and may also be used to control an external switch using I/O Interface #1 on the back panel. GPIO 4, 5, 6 and 7 become active based on the POL SELECT setting. Pins 11,24 represent the POL1 state , pins 12,25 represent the POL2 state, pins 9,22 represent the POL3 state, and pins 10,12 represent the POL4 state. These pin groups are connected to dry relay contacts (1Amp max current).

PORT 1

Path: / CONFIGS COMM-PARAM PORT-1

Type: Sub Menu

Syntax: PORT-1

Notes: PORT 1 is an RS-232 (only) port used for remote M&C communications. The data parameters are set in factory to: 8 data bits, 1 stop bit, no parity. Port 1 is available on the back panel as a 9-pin D subminiature socket connector with the following electrical pinout: pin 2 = RX (from DCE); pin 3 = TX (from DTE); pin 5 = Signal Ground. The other pins are not connected.

PORT 2

Path: / CONFIGS COMM-PARAM PORT-2

Type: Sub Menu

Syntax: PORT-2

Notes: PORT 2 is used for M&C operation and allows RS-232 and RS-422 connections. . The data parameters are set in factory to: 8 Data bits, 1 Stop bit, No Parity. PORT 2 is available on the back panel as a 9 pin D subminiature socket connector. The RS-232 electrical pinout is: pin 2 = RX (from DCE); pin 3 = TX (from DTE); pin 5 = Signal Ground; pin 7 = RTS (from DTE); pin 8 = CTS (from DCE); The RS-422 electrical pinout is: pin 1 = TX+; pin 4 = RX+; pin 6 = TX-; pin 9 = RX-. Notice that these two pinouts coexist on the same 9 pin connector without conflict.

PORT 3 (v 1.19.06 or later)

Path: / CONFIGS COMM-PARAM PORT-3

Type: Sub Menu

Syntax: PORT-3

Notes: PORT 3 is used for M&C communications on a multi-drop half-duplex 485 bus. This menu controls the BPS, SHELL, and bus addressing parameters of this PORT. Notice that the data parameters are set in factory to: 8 Data bits, 1 Stop bit, No Parity. PORT 3 is available on the back panel as a 9 pin D subminiature socket connector.
The RS-485 electrical pinout is:

Pin 7 = Cable Shield
Pin 1 = Data+ (RxD/TxD +)
Pin 6 = Data- (RxD/TxD -)

POWER LEVEL CALIBRATION

Path: / CONFIGS MEMORY CALIBRATION CALIBRATION

Type: Data Editor

Syntax: CALIBRATION [= n] | [D]

Range: Real: -99.99 .. 99.99

Notes: POWER LEVEL CALIBRATION adjusts the calibration value used to calculate the signal power measurement reported by the DTR (shown on the front display in dBm). This parameter should NOT be modified under normal circumstances.

RATE

Path: / CONFIGS MONOPULSE

Type: Data Editor

Syntax: RATE [= n] | [D]

Range: Integer: -1 .. 10000

Notes: RATE is the minimum number of milliseconds between the monopulse data transmissions of START. If the value is -1, new data is sent only after receiving a carriage return. NOTE: Also used by M&C in TRL-Emulation

RECEIVER OPERATION

Path: / CONFIGS OPERATION

Type: Sub Menu

Syntax: OPERATION

Notes: RECEIVER OPERATION configures how the Signal Processing Unit (SPU) will process the signal.

REMOTE CONTROL

Path: / CONFIGS COM-PARAM REM-CONTROL

Type: Data Editor

Syntax: REM-CONTROL [= n] | [D]

Range: Integer: 0 .. 3

0	I/O INTF #1
1	PORT 1
2	PORT 2
3	PORT 3

Notes: REMOTE CONTROL selects which port on back panel is in control when the DTR is in REMOTE mode. For remote M&C communications select PORT 1, 2, or 3 which support serial protocols. To control the DTR via discrete digital I/O select I/O INTF #1, which will allow a remote device (such as 7134ACU) to select a BEACON using a cable connected to I/O INTERFACE #1 on the back panel and the STORE/RESTORE BEACONS menus. The pinout of I/O INTERFACE # 1 includes: Pins 5,18, GPIO 0, = Beacon 1 Input; Pins 6,19, GPIO 1, = Beacon 2 Input; Pins 7,20, GPIO 2, = Beacon 3 Input; Pins 8,21, GPIO 3, = Beacon 4 Input.

RESET PORT

Path: **/ CONFIGS COMM-PARAM PORT-1 RESET-PORT**

Type: **Executable**

Syntax: **RESET-PORT**

Notes: **RESET-PORT resets the given port. The electrical interface is initialized and the shell (if any) that was running on it is restarted.**

RESET PORT

Path: **/ CONFIGS COMM-PARAM PORT-2 RESET-PORT**

Type: **Executable**

Syntax: **RESET-PORT**

Notes: **RESET-PORT resets the given port. The electrical interface is initialized and the shell (if any) that was running on it is restarted.**

RESET PORT

Path: **/ CONFIGS COMM-PARAM PORT-3 RESET-PORT**

Type: **Executable**

Syntax: **RESET-PORT**

Notes: **RESET-PORT resets the given port. The electrical interface is initialized and the shell (if any) that was running on it is restarted.**

RESTORE BEACONS

Path: **/ CONFIGS BEACONS RESTORE-BEACONS**

Type: **Sub Menu**

Syntax: **RESTORE-BEACONS**

Notes: **Executing each item in this menu will RESTORE values previously stored as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

RESTORE BEACON1

Path: **/ CONFIGS BEACONS RESTORE-BEACONS RESTORE-BEACON1**

Type: **Executable**

Syntax: **RESTORE-BEACON1**

Notes: **Executing each item in this menu will RESTORE values previously stored as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

RESTORE BEACON2

Path: **/ CONFIGS BEACONS RESTORE-BEACONS RESTORE-BEACON2**

Type: **Executable**

Syntax: **RESTORE-BEACON2**

Notes: **Executing each item in this menu will RESTORE values previously stored as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

RESTORE BEACON3

Path: **/ CONFIGS BEACONS RESTORE-BEACONS RESTORE-BEACON3**

Type: **Executable**

Syntax: **RESTORE-BEACON3**

Notes: **Executing each item in this menu will RESTORE values previously stored as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

RESTORE BEACON4

Path: **/ CONFIGS BEACONS RESTORE-BEACONS RESTORE-BEACON4**

Type: **Executable**

Syntax: **RESTORE-BEACON4**

Notes: **Executing each item in this menu will RESTORE values previously stored as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

RESTORE ROM DEFAULTS

Path: / CONFIGS MEMORY RESTORE-TO-ROM-DEFAULTS

Type: Data Editor

Syntax: RESTORE-TO-ROM-DEFAULTS [= n] | [D]

Range: Integer: 0 .. 1
0 No
1 Yes

Notes: Selecting YES and pressing ENTER restores all DTR parameters to factory ROM defaults. If this is done, the front panel (not the whole DTR) will reset.

SAMPLING FREQUENCY

Path: / CONFIGS MEMORY CALIBRATION SAMPLING

Type: Data Editor

Syntax: SAMPLING [= n] | [D]

Range: Real: 63990.000 .. 64010.000

Notes: SAMPLING FREQUENCY compensates for the oscillator's slight deviation from 64MHz. Entering the actual oscillator frequency to within 1Hz maximizes the receiver's performance.

SET DATE AND TIME

Path: / CONFIGS MEMORY DATE&TIME

Type: Sub Menu

Syntax: DATE&TIME

Notes: The SET DATE and TIME menu contains editors for setting the date and time. The port used to set the date or time with (local or remote) must be the one in control.

SET DATE

Path: / CONFIGS MEMORY DATE&TIME SET-DATE

Type: Data Editor

Syntax: SET-DATE [= n] | [D]

Range: Integer: 1011980 .. 12312079 (Must be a valid date)

Notes: Changing this changes the current date. Under the menu tree shell the format is MMDDYYYY and all fields must be set.

SET TIME

Path: / CONFIGS MEMORY DATE&TIME SET-TIME

Type: Data Editor

Syntax: SET-TIME [= n] | [D]

Range: Integer: 000000 to 235959 (Must be a valid time)

Notes: Changing this changes the current time (in 24 hour format). Under the menu tree shell the format is HHMMSS and all fields must be set.

SHELL

Path: / CONFIGS COMM-PARAM PORT-1 SHELL or
/ CONFIGS COMM-PARAM PORT-2 SHELL

Type: Data Editor

Syntax: SHELL [= n] | [D]

Range: Integer: 0 .. 4
0 Disabled
1 M&C Shell
2 Message Printer
3 Data Reader
4 72xx M&C Shell

Notes: SHELL determines the communications protocol used on this serial port. M&C Shell provides monitor and control protocol support including status polling and system configuration capability. 72xx M&C Shell provides TRL Monitor and Control protocol support for status polling and system configuration by a 72xx ACU with version 2 firmware. An ACU remote port set to DTR and a DTR set to 72xx M&C SHELL will NOT communicate. Message Printer is a diagnostic tool which may be used to record system events, when connected to a terminal program or a serial printer.

SHELL (v 1.19.06 or later)

Path: / CONFIGS COMM-PARAM PORT-3 SHELL

Type: Data Editor

Syntax: SHELL [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 M&C Shell

Notes: SHELL determines the communications protocol used on this serial port. M&C Shell provides monitor and control protocol support including status polling and system configuration capability. The PORT-3 shell was added in v1.19.06.

SLAVE ADDRESS (v 1.19.06 or later)

Path: / CONFIGS COMM-PARAM PORT-3 SLAVE-ADDRESS

Type: Data Editor

Syntax: SLAVE-ADDRESS [= n] | [D]

Range: Integer:0 .. 31

Notes: SLAVE-ADDRESS is the address of this unit (a slave, controlled) on the multi-drop RS-485 bus. There are a maximum on 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

SLOPE

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC1 DAC1-SLOPE

Type: Data Editor

Syntax: DAC1-SLOPE [= n] | [D]

Range: Real: -1.000 .. 1.000 (volts/dB)

Notes: SLOPE controls the rate of change of the DC output voltage with respect to a 1 dB change in signal power level.

SLOPE

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC2 DAC2-SLOPE

Type: Data Editor

Syntax: DAC2-SLOPE [= n] | [D]

Range: Real: -1.000 .. 1.000 (volts/dB)

Notes: SLOPE controls the rate of change of the DC output voltage with respect to a 1 dB change in signal power level.

SPECTRAL DISPLAY (v2.0.7 or later)

Path: **/ STATUS SPECTRAL-DISPLAY**

Type: **Executable**

Syntax: **SPECTRAL-DISPLAY**

Notes: **SPECTRAL DISPLAY plots the signal's frequency components in a graphical manner similar to a spectrum analyzer. Use the Spin Knob to adjust frequency. Soft keys A/B change step size. Soft keys C/D change vertical scale. Press PREV to exit. The M&C command outputs spectral data using the following format:**
HEADER: freq, Sig, C/No, BW, Scale(CR)
BODY: 256 encoded data points(CR)
FOOTER: Elapsed Time in ms.(CR)
Each data point is 1 to 64, encoded as a single character (ascii 49 to 112)

Reference:

Dec	Chr	Data	Dec	Chr	Data	Dec	Chr	Data	Dec	Chr	Data
49	1	1	65	A	17	81	Q	33	97	a	49
50	2	2	66	B	18	82	R	34	98	b	50
51	3	3	67	C	19	83	S	35	99	c	51
52	4	4	68	D	20	84	T	36	100	d	52
53	5	5	69	E	21	85	U	37	101	e	53
54	6	6	70	F	22	86	V	38	102	f	54
55	7	7	71	G	23	87	W	39	103	g	55
56	8	8	72	H	24	88	X	40	104	h	56
57	9	9	73	I	25	89	Y	41	105	i	57
58	:	10	74	J	26	90	Z	42	106	j	58
59	;	11	75	K	27	91	[	43	107	k	59
60	<	12	76	L	28	92	\	44	108	l	60
61	=	13	77	M	29	93	]	45	109	m	61
62	>	14	78	N	30	94	^	46	110	n	62
63	?	15	79	O	31	95	_	47	111	o	63
64	@	16	80	P	32	96	`	48	112	p	64

Sample Output:

1014000,3631,4527,125,17
>7?D@<<:;;:48A===?A???DIGFILJJHIEHDCJI@DBCFEC;>CA:<8:>>539;9>?;515:=:;?:=866>837857;<728;<468889:=6;=?8931698=A@A=;;=A@<ACEZekgYOL=CFCBBBNQUKJ>9@<B>9;<A@9;<;==?@A:;=@;:>56<9367897?;9?:312:849;=935;:<9:999??85>;16=?=;=<;<:79B@:?:468:<D<7989:886;@;9:@=9<>><C
38

Frame Rate: **@ 19,200 -> 6 fps**
@ 57,600 -> 15 fps
@ 119,200 -> 30 fps

SPU SERIAL LINK STATS

Path: **/ STATUS SPU-DIAG**

Type: **Executable**

Syntax: **SPU-DIAG**

Notes: **Displays the SPU RS422 serial link statistics separated by destination (MCU and DSP): Timeouts – the CPU did not get a response within 100mSec. Errors – unexpected responses that do not match the internal protocol. % of Total – indicates the percentage of errors plus timeouts versus the total number of commands. Linklosses – counts the number of failures to establish communication with the MCU or DSP processors. Total – sum total of commands sent.**

START

Path: **/ CONFIGS MONOPULSE**

Type: **Executable**

Syntax: **START**

Notes: **START monopulse operation; to stop, use EXIT followed by a carriage return. It stops automatically if and when a fault is set. After stopping, in either case, the mute switch is enabled. NOTE: Only usable via the M&C**

STATUS (v1.16.51 or later)

Path: **/ STATUS**

Type: **Sub Menu**

Syntax: **STATUS**

Notes: **The STATUS menu contains useful diagnostic tools. The SPECTRAL DISPLAY option is accessed from this menu, as are other tools, such as a I/O status and the message log. This parameter was called DIAGS prior to v1.16.51.**

STORE BEACONS

Path: **/ CONFIGS BEACONS STORE-BEACONS**

Type: **Sub Menu**

Syntax: **STORE-BEACONS**

Notes: **Executing each item in this menu will STORE CURRENT values of the following parameters as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

STORE BEACON1

Path: **/ CONFIGS BEACONS STORE-BEACONS STORE-BEACON1**

Type: **Executable**

Syntax: **STORE-BEACON1**

Notes: **Executing each item in this menu will STORE CURRENT values of the following parameters as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

STORE BEACON2

Path: **/ CONFIGS BEACONS STORE-BEACONS STORE-BEACON2**

Type: **Executable**

Syntax: **STORE-BEACON2**

Notes: **Executing each item in this menu will STORE CURRENT values of the following parameters as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

STORE BEACON3

Path: **/ CONFIGS BEACONS STORE-BEACONS STORE-BEACON3**

Type: **Executable**

Syntax: **STORE-BEACON3**

Notes: **Executing each item in this menu will STORE CURRENT values of the following parameters as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

STORE BEACON4

Path: **/ CONFIGS BEACONS STORE-BEACONS STORE-BEACON4**

Type: **Executable**

Syntax: **STORE-BEACON4**

Notes: **Executing each item in this menu will STORE CURRENT values of the following parameters as a BEACON state: FREQUENCY, INPUT ATTEN, POL SELECT, FILTER, SLOPE, VOLT RANGE, MIN REF LVL, and ATTENUATION.**

SYSTEM MEMORY

Path: / CONFIGS MEMORY

Type: Sub Menu

Syntax: MEMORY

Notes: The MEMORY menu contains commands relating to the storage of system parameters that are stored in nonvolatile RAM (NVRAM).

TESTS

Path: / TESTS

Type: Sub Menu

Syntax: TESTS

Notes: The TESTS menu provides system integrity tests. These tests are primarily intended for GDST factory testing. USE OF SOME TESTS MAY OBSCURE REAL TIME DATE, AND OTHERS MAY TEMPORARILY AFFECT THE PERFORMANCE OF THIS RECEIVER.

TROUBLESHOOT

Path: / STATUS TROUBLESHOOT

Type: Executable

Syntax: TROUBLESHOOT

Notes: This is a diagnostic tool to provide online help information on the current faults.

VOLTAGE RANGE

Path: / CONFIGS OPERATION ANALOG-OUTPUTS DAC1 DAC1-RANGE

Type: Data Editor

Syntax: DAC1-RANGE [= n] | [D]

Range:

Integer:	0 .. 2
0	0 to +10
1	-10 to +10
2	-5 to +5

Notes: The DC VOLTAGE RANGE of the Digital to Analog Converter. Used to represent the signal level as a tracking voltage.

VOLTAGE RANGE

Path: **/ CONFIGS OPERATION ANALOG-OUTPUTS DAC2 DAC2-RANGE**

Type: **Data Editor**

Syntax: **DAC2-RANGE [= n] | [D]**

Range:

Integer:	**0 .. 2**
0	**0 to +10**
1	**-10 to +10**
2	**-5 to +5**

Notes: **The DC VOLTAGE RANGE of the Digital to Analog Converter. Used to represent the signal level as a tracking voltage.**

5.1 Keyword Commands

A keyword is a command that is always accessible on the command line, regardless of the current menu or system configuration. Unlike generic menu items, which are subject to change with firmware revisions, the keywords form the basis of the command-line interface, and thus will remain available for future revisions.

Keywords, like all other items entered on the command line, must be separated from other fields with at least one space. Most keywords do not accept arguments.

/

Path: **Keyword**

Type: **Executable**

Syntax: /

Notes: **This keyword returns to the top of the menu tree.**

\

Path: **Keyword**

Type: **Executable**

Syntax: \

Notes: **This keyword is a comment character. Rest of line is ignored.**

..

Path: **Keyword**

Type: **Executable**

Syntax: ..

Notes: **This keyword moves up to the parent menu of the current menu in the menu tree.**

?

Path: Keyword

Type: Executable

Syntax: ?

Notes: Aliases: "HELP", "help", and "?". The command interpreter is case sensitive. Most items are in caps. If a keyword or item number follows, then its help is displayed. Type KEYS in followed by carriage-return for a list of keywords. LS lists non-keyword menu items.

C#

Path: Keyword

Type: Executable

Syntax: C#

Notes: Native and TRL EMULATION MODE keyword. This keyword requests receiver port in use; response is port #.

DATE

Path: Keyword

Type: Executable

Syntax: DATE

Notes: This keyword displays the current date.

DOWNLOAD-PARAMS

Path: Keyword

Type: Executable

Syntax: DOWNLOAD-PARAMS

Notes: This keyword sends all the system parameters to the M&C terminal. Designed to allow text file captures of all system parameters.

EXIT

Path: **Keyword**

Type: **Executable**

Syntax: **EXIT**

Notes: **This keyword exits and restarts the current menu tree shell or a sub-shell such as TRL EMULATION MODE. On Monopulse units, it exits Monopulse mode.**

See: **Keyword X1, Executable START**

F

Path: Keyword

Type: Executable

Syntax: F [0] | [n]

Range: Hexmask - 0..FF

Notes: The F request displays a hex bitmap for each fault table specified in the mask. The mask is supplied in hex. Use a mask of 0 to display all fault bitmaps. This is a detailed fault report that returns 8 ASCII encoded hex digits. Each digit represents four bits in the fault table. The fault table is the same as the faults listed by the LIST-FAULTS command.

BIT	FAULT	BIT	FAULT
1	LOW-INPUT-SIGNAL	12	BDC1-FAULT
2	INPUT-SIGNAL-SATURATED	13	BDC2-FAULT
3	MCU-LINKLOSS	14	BDC3-FAULT
4	DSP-LINKLOSS	15	BDC4-FAULT
5	DSP-DATALOSS	16	PLL1-UNLOCKED
6	SPU-RESPONSE-OVERFLOW	17	PLL2-UNLOCKED
7	TBT-LINKLOSS	18	FACTORY-BURN-IN
8	TBT-FAULT	19	NVRAM-CORRUPTED
9	TBT-IN-LOCAL	20	FAULTY-MUTE-SWITCH
10	OUT-OF-BAND	21	SPU-LINK-LOCKED
11	INVALID-BAND-SETUP		

The string reads right to left. Bit 1 is on the far right. For example

```
> F 0
0000101D
>
```

Expanding the string 0000101D showing each bit

0000 0000 0000 0000 0001 0000 0001 1101

Reading right to left, bits 1,3 4,5, and 13 are set, which correspond to the following faults:

1 LOW-INPUT-SIGNAL
3 MCU-LINKLOSS
4 DSP-LINKLOSS
5 DSP-DATALOSS
13 BDC2-FAULT

FINDEX

Path: Keyword

Type: Executable

Syntax: FINDEX

Notes: This keyword displays version of images in FLASH

FLASH

Path: Keyword

Type: Executable

Syntax: FLASH n

Range: Integer: 0 .. 3

Notes: This keyword uploads a software update using XMODEM (CRC) and programs it into the given bank of flash memory. Where n = flash bank to program, must be 0 thru 3)

FREQUENCY?

Path: Keyword

Type: Executable

Syntax: FREQUENCY?

Notes: This keyword displays current frequency in megahertz.

G

Path: Keyword

Type: Executable

Syntax: G [!]

Notes: This is a global system update. The optional ! after the G forces transmission of all status information. The default is to only transmit information that has changed since the last G command. The port does not need to be in control.

Typical response: Fhhhhhhhh

F Fault status (summarized). See notes on the 'F' keyword. The hex mask indicates which fault tables have faults that just changed. On a "G !", all fault tables are indicated to have changes in faults. This hex mask can be used as the argument for the "F" keyword.

help

Path: Keyword

Type: Executable

Syntax: help

Notes: Aliases: "HELP" and "?". The command interpreter is case-sensitive. Most items are in caps. If a keyword or item number follows, then its help is displayed. Type KEYS in followed by carriage-return for a list of keywords. LS lists non-keyword menu items.

HELP

Path: Keyword

Type: Executable

Syntax: HELP

Note: The command interpreter is case-sensitive. Most items are in caps.

Aliases: "help" and "?". Help by itself displays this text. If a keyword or item number follows, then its help is displayed. Type is KEYS followed by carriage-return for a list of keywords. LS lists non-keyword menu items.

KEYS

Path: Keyword

Type: Executable

Syntax: KEYS

Notes: This keyword lists the available keywords along with the help screen for each keyword.

KEYS-HELPS

Path: Keyword

Type: Executable

Syntax: KEYS-HELPS

Notes: This keyword lists the available keywords along with the help screen for each keyword.

LIST-FAULTS

Path: Keyword

Type: Executable

Syntax: LIST-FAULTS

Notes: Lists all fault names along with their LCD text names, and their current status. This report is in verbose ASCII format, for readability. For periodic status polling, us the F keyword (HEX bitmapped fault report).

For example:

Fault Name	Text Name	Current Status
LOW-INPUT-SIGNAL	Low Input Signal Set	Not Acknowledged
INPUT-SIGNAL-SATURATED	Input Saturated	Cleared
MCU-LINKLOSS	MCU Link loss	Set Not Acknowledged
DSP-LINKLOSS	DSP Link loss	Set Not Acknowledged
DSP-DATALOSS	DSP Data loss	Set Not Acknowledged
SPU-RESPONSE-OVERFLOW	SPU Overflow	Cleared
TBT-LINKLOSS	TBT Link loss	Cleared
TBT-FAULT	TBT Summary Fault	Cleared
TBT-IN-LOCAL	TBT in Local Ctrl	Cleared
OUT-OF-BAND	Out of Band	Cleared
INVALID-BAND-SETUP	Invalid Band Setup	Cleared
BDC1-FAULT	Band 1 BDC fault	Cleared
BDC2-FAULT	Band 2 BDC fault	Set Not Acknowledged
BDC3-FAULT	Band 3 BDC fault	Cleared
BDC4-FAULT	Band 4 BDC fault	Cleared
PLL1-UNLOCKED	PLL1 Unlocked	Cleared
PLL2-UNLOCKED	PLL2 Unlocked	Cleared
FACTORY-BURN-IN	Factory Burn In	Cleared
NVRAM-CORRUPTED	NVRAM corrupted	Cleared
FAULTY-MUTE-SWITCH	Mute Switch Fault	Cleared
SPU-LINK-LOCKED	SPU Link locked	Cleared

LS

Path: Keyword

Type: Executable

Syntax: LS

Notes: Keywords are not listed. Use KEYS to see the keyword list.

LS (Lists) lists all items in the current menu in the form "n" type "title" [= value]. Where n = item's menu index [0, (# of items in menu) –1]. Type = 'X' (executable), 'M' (menu), 'E' (editable). If 'E', then value is also printed with '=' between item title and value. Note: keywords are not listed. Use KEYS to see the keyword list.

MC

Path: **Keyword**

Type: **Executable**

Syntax: **MC**

Notes: **MC (Messages Clear) clears the message log.**

MD

Path: **Keyword**

Type: **Executable**

Syntax: **MD**

Notes: **MD (Messages Display) dumps the message log to the terminal.**

MDR

Path: **Keyword**

Type: **Executable**

Syntax: **MDR**

Notes: **MDR (Messages Display-Reversed) dumps the message log to the terminal. MDR, in contrast with MD (Messages Display), dumps the message lines in reverse, with the newest line first, and the oldest line last.**

MTREE

Path: **Keyword**

Type: **Executable**

Syntax: **MTREE**

Notes: **MTREE (Menu Tree) lists the entire Menu Tree.**

MTREE-HELPS

Path: Keyword

Type: Executable

Syntax: MTREE-HELPS

Notes: This keyword lists the entire Menu Tree along with the help screens and menu tree shell name for each item.

N

Path: Keyword

Type: Executable

Syntax: N

Notes: Native and TRL EMULATION MODE keyword. This keyword requests status update, since last N or S. Only fields that have changed are reported.

Example:
> N
V0127

POWER

Path: Keyword

Type: Executable

Syntax: POWER

Notes: This keyword displays current power level in dBm.

Example:
> POWER
-86.27

See: Command POWER LEVEL CALIBRATION, Keyword S

RESTORE-ROM-DEFAULTS

Path: Keyword

Type: Executable

Syntax: RESTORE-ROM-DEFAULTS

Notes: This keyword resets the DTR parameters to ROM defaults.

S

Path: Keyword

Type: Executable

Syntax: S

Notes: Native and TRL EMULATION MODE keyword. This keyword requests receiver status; the response is formatted with character separators for each field and fixed field widths as follows:

BbbCcEeeFffffffffVvvvvAaaali

Sample: >S
B00C0E00F01014000V0108A000I1

B = beacon: indicates which beacon is selected, supports beacons 1-4
C = control: indicates which port is control (0, 1 or 2)
E = errors: hex 80 indicates Summary Fault, hex 00 indicates no faults
F = frequency: standard DTR frequencies are 945000 - 2055000 KHz
V = voltage: voltage level in thousands of volts, 0 to 9.999
A = attenuation: current attenuation setting, 0 - 50.0 dB
I = RF input: 1 or 2 representing current POL select setting.

SPU-FREQUENCY?

Path: Keyword

Type: Executable

Syntax: SPU-FREQUENCY?

Notes: This keyword displays SPU frequency in megahertz.

TIME

Path: Keyword

Type: Executable

Syntax: TIME

Notes: This keyword displays the current time.

VERSION

Path: Keyword

Type: Executable

Syntax: VERSION

Notes: This keyword displays the version and configuration information of the DTR.

WHO

Path: **Keyword**

Type: **Executable**

Syntax: **WHO**

Notes: **This keywords displays which port is being used by the current terminal, and which port is the one that has control of the DTR.**

X1

Path: **Keyword**

Type: **Executable**

Syntax: **X1**

Notes: **TRL EMULATION MODE keyword. This keyword is used by the GDST ACU to resync the TRL shell. On the DTR it is used to enter TRL EMULATION MODE. When executed, the current shell goes into TRL EMULATION MODE. To get out of TRL EMULATION MODE, use the EXIT keyword.**

6.0 RS-485 PROTOCOL FOR DTR MULTI-DROP BUS

For M&C systems that need to communicate over RS-485, there are additional requirements and restrictions in the DTR M&C protocol. The M&C is the only shell offered on the RS-485 bus. The command line format is different since multiple devices can be present on the multi-drop RS-485 bus. Since the bus is half duplex and is shared, the set of M&C menu items and keywords is restricted to those items that do not require interactive (full duplex) features, and do not hold the bus for longer than is necessary or desirable. Multiple DTR units can be monitored and controlled on the same bus, as well as equipment whose protocol can co-exist with the RS-485 protocol format described here.

Message Format

Format of multi-drop serial bus shell messages is:

```
<stx> <direction> <addr> <text> <etx>
```

<stx>	is the ASCII start of text ($02) character
<direction>	is $5 on commands sent to the DTR. <direction> is $4 on replies sent from the DTR.
<addr>	is the address of the device to whom this message is sent
<text>	is the body of the command or response (may be null if there is no response)
<etx>	is the ASCII end of text ($03) character

Note: <stx> is Ctrl-B
<etx> is Ctrl-C
<$4> is Ctrl-D
<$5> is Ctrl-E

Examples:

To send a "/ 0" to unit with address of 1.

```
<stx><$5>1/ 0<etx>
```

Response would be something like:

```
<stx><$4>0 2000.000<etx>
```

To send a "WHO" to unit with address of 1.

```
<stx><$5>1WHO<etx>
```

Response would be:

```
<stx><$4>0<cr>3 (3 in control)<etx>
```

To change frequency of unit 1 (already at /):

```
<stx><$5><$D>10 = 1999.8<etx>
```

Response would be:

```
<stx><$4>0<etx>
```

To send a "/ 0" to unit with address of 4.

```
<stx><$5>4/ 0<etx>
```

Response would be something like:

```
<stx><$4>0 2000.000<etx>
```

Note: The first '0' in the response is the master address.

Restrictions

Normally multiple commands in the MT M&C shell can be queued up on one line. In the RS-485 shell, commands can be queued, but not after any command that has a response. Only one command with a response can be on a line, and it must be the last command on the line.

Menu items disabled for the RS-485 shell

/ STATUS LOG
/ STATUS TASKS-DIAG
/ STATUS TROUBLESHOOT
/ TESTS FIFO-TEST

Keywords disabled for the RS-485 shell

LIST-FAULTS
FLASH
HELP
?
help
MTREE
MTREE-HELPS
KEYS
KEYS-HELPS
EXIT
MD
MDR
MC
LS
FINDEX
RESTORE-ROM-DEFAULTS
DOWNLOAD-PARAMS
SPU-FREQUENCY?
X1
S
N
C#
?Y
?V
?W

Added Menu Items

/ CONFIGS COMM-PARAM PORT-3
/ CONFIGS COMM-PARAM PORT-3 BPS
/ CONFIGS COMM-PARAM PORT-3 SHELL
/ CONFIGS COMM-PARAM PORT-3 MASTER-ADDRESS
/ CONFIGS COMM-PARAM PORT-3 SLAVE-ADDRESS
/ CONFIGS COMM-PARAM PORT-3 ADDRESS-OFFSET
/ CONFIGS COMM-PARAM PORT-3 RESET-PORT
/ CONFIGS COMM-PARAM REM-CONTROL **(modified) Port-3 added**

Added Menu Items: (v1.19.06 or later)

SHELL

Path: / CONFIGS COMM-PARAM PORT-3 SHELL

Type: Data Editor

Syntax: SHELL [= n] | [D]

Range: Integer: 0 .. 1
0 Disabled
1 M&C Shell

Notes: SHELL determines the communications protocol used on this serial port. M&C Shell: provides monitor and control protocol support including status polling and system configuration capability.

PORT 3

Path: / CONFIGS COMM-PARAM PORT-3

Type: Sub Menu

Syntax: PORT-3

Notes: PORT 3 is used for M&C communications on a multi-drop half-duplex 485 bus. This menu controls the BPS, SHELL, and bus addressing parameters of this PORT. Notice that the data parameters are set in factory to: 8 Data bits, 1 Stop bit, No Parity. PORT 3 is available on the back panel as a 9 pin D subminiature socket connector.

The RS-485 electrical pinout is:

Pin 7 = Cable Shield
Pin 1 = RxD/TxD +
Pin 6 = RxD/TxD –

MASTER ADDRESS

Path: / CONFIGS COMM-PARAM PORT-3 MASTER-ADDRESS

Type: Data Editor

Syntax: MASTER-ADDRESS [= n] | [D]

Range: Integer: 0 .. 31

Notes: MASTER-ADDRESS is the address of the master (controlling) device on the multi-drop RS-485 bus. There are a maximum of 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

SLAVE ADDRESS

Path: / CONFIGS COMM-PARAM PORT-3 SLAVE-ADDRESS

Type: Data Editor

Syntax: SLAVE-ADDRESS [= n] | [D]

Range: Integer: 0 .. 31

Notes: SLAVE ADDRESS is the address of this unit (a slave, controlled) on the multi-drop RS-485 bus. There are a maximum of 32 addresses, ranging from 0 to 31. On the bus, the actual ASCII value used for addressing is the address assigned here plus the value of the parameter ADDRESS OFFSET.

ADDRESS OFFSET

Path: / CONFIGS COMM-PARAM PORT-3 ADDRESS-OFFSET

Type: Data Editor

Syntax: ADDRESS-OFFSET [= n] | [D]

Range: Integer: 0 .. 224

Notes: ADDRESS-OFFSET is the offset added to the multi-drop bus address of a device to determine the ASCII value needed to be used on the bus.

Example:

ADDRESS-OFFSET is 48 (ASCII for '0')
MASTER-ADDRESS is ‘0’
SLAVE-ADDRESS is ‘1’

In the above example the ASCII value on the RS-485 multi-drop bus would be 48 (ASCII for '0') for the master, and 49 (ASCII for '1') for the slave.

7.0 TRL EMULATION MODE

The TRL EMULATION MODE allows legacy equipment to communicate with the DTR as if it were a GDST TRL tracking receiver. It is obsolete and should not be used for new applications.

TRL prompts are 'c>', where c is the status of last command, as follows:

- \- No error; processed OK.
- ? Unrecognized command.
- R Not in remote control; can't execute command.
- V Value out of range or not allowed with current configuration.
- M Missing fields/parameters.
- X Extra characters at end of command (not including whitespace.)

TRL commands supported are as follows:

? Get help on TRL commands.

Usage: ?c

c is the character of the command to get help on.

A Set attenuation. See / CONFIGS OPERATION ANALOG-OUTPUTS ATTENUATION

Usage: Annn

n TRL range was 0 to 500 tenths of a dB, with implied dB decimal point to the left of the least significant digit. Since the dynamic range of the DTR is much larger than the TRL range, this parameter controls the minimum reference level of the DTR input, which in conjunction with the slope and DAC output voltage range are used to generate the corresponding tracking signal level.

C# See DTR keyword C#

F Set tuning frequency in kHz. See / FREQUENCY

Usage: Fnnnnnn[n...]

n Range is 945000 to 12750000

I Set RF input source. See / POL-SELECT

Usage: In

n is 1 or 2, representing the state of an RF path selection switch typically used to select Polarization (Vertical or Horizontal, Left-hand or Right-hand for circular feed systems).

L Start Monopulse diagnostic mode (Monopulse units only). The port does not have to be in control but all faults must be cleared. The mode exits if a fault is set. Use Xn to stop.

Usage: Ln
n is 0 or 1 and determines whether the monopulse mute switch is turned off or on, respectively.

```
Output:+dddddd +eeeeee +ffffff +gggggg
      dddddd=quadrant #1 level in hex.
      eeeeee=quadrant #2 level in hex.
      ffffff=quadrant #3 level in hex.
      gggggg=quadrant #4 level in hex.
```

M Start Monopulse mode (Monopulse units only). The port must be in control and all faults must be cleared. The mode exits if control is lost or a fault is set. Use Xn to stop.

Usage: Mn x x x x
n is 0 or 1 and determines whether the monopulse mute switch is turned off or on, respectively, and the x's are ignored but must be present.

```
Output:+ddddd +eeeee +fffff
      ddddd=error vector 1 in hex.
      eeeee=error vector 2 in hex.
      fffff=sum of phase vectors in hex.
```

N See DTR keyword N

S See DTR keyword S

V Gets or sets the FFT sample averaging parameter. This is not a native TRL command, but was added to allow the 7200 ACU TRL shell to set FFT averaging. See / CONFIGS OPERATION AVERAGING

Usage: V[n]
n is the averaging value; if not specified, the current value is returned in four digits on the next line.

W Gets or sets the digital filter index parameter. This is not a native TRL command, but was added to allow the 7200 ACU TRL shell to set the bandpass filter. See / CONFIGS OPERATION FILTER

Usage: W[n]
n is the filter index; if not specified, the current value is returned in four digits on the next line.

X Exits Monopulse mode (Monopulse units only)
Usage: Xn
n is 0 or 1 and determines whether the monopulse mute switch is turned off or on, respectively.

Y Gets or sets the Monopulse data transfer rate. (Monopulse units only)

Usage: Y?|[-]n[n...] m

"Y?" queries the millisecond interval of the monopulse data transmission.

"Yn m" sets the interval, where n is -1 or the transfer interval in 1228 counts per 4ms and m is ignored but must be present. The valid range for n is -1 to 3070000 (value is forced into this range).

n / 1228 * 4 ms is the minimum interval between sets of monopulse data

n < 1228 = 0 ms, n = 1228 = 4 ms, and n >= 3070000 = 10 seconds

n = -1 specifies an infinite interval; new data is sent only after receiving a carriage return.

Example: Y1229 n/a

n: 1229 / 1228 * 4 = 4 ms interval

m: "n/a" is ignored

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APPENDIX D – ACRONYMS & ABBREVIATIONS

The following is a list of acronyms and abbreviations that are used by General Dynamics SATCOM Technologies and may appear in this manual.

A/D.....Analog to Digital
A.....Amperes
AC.....Alternating Current
ACU.....Antenna Control Unit
A/D.....Analog-to-Digital
ASCII.....American Standard Code for Information Interchange
ASSY.....Assembly
AUX.....Auxiliary

BDC.....Block Down Converter
BIT.....Binary digit
bps.....Bits Per Second (Baud)
BW.....Bandwidth

C.....Celsius
C/No.....Carrier Relative to Noise
CCW.....Counterclockwise
cm.....centimeters
COM.....Common
CPU.....Central Processing Unit
CR.....Carriage return
CRLF.....Carriage return/line feed
CTS.....Clear to Send
CW.....Clockwise

DAC.....Digital to Analog Converter
dB.....Decibel
dBHz.....Decibel Hertz
dBm.....Decibel referred to 1 milliwatt
DC.....Direct Current
DCE.....Data Communications Equipment
DOS.....Disk Operating System
DSP.....Digital Signal Processor
DTE.....Data Terminating Equipment
DTR.....Digital Tracking Receiver

EEPROM.....Electrically Erasable Programmable Read Only Memory
EIA.....Electronic Industries Association
EPROM.....Erasable Programmable Read-Only Memory

FFT.....Fast Fourier Transform
FIFO.....First In First Out
FIR.....Finite Impulse Response
FLT.....Fault
ft.....Feet

GHz .....Gigahertz
GND.....ground
GPIO .....General Purpose Input Output

HHMMSS.....Hours Minutes Seconds (e.g. 120030)
Hz .....Hertz

I/O .....Input/Output
IC .....Integrated Circuit
IEC .....International Electrotechnical Commission
IF.....Intermediate Frequency
in.....Inches

kg.....Kilograms

lbs .....Pounds
LCD .....Liquid Crystal Display
LED.....Light-Emitting Diode
LNA .....Low Noise Amplifier
LSB.....Least Significant Bit

m .....Meters
M&C .....Monitor and Control
MCU .....Microcontroller Unit
MHz.....Megahertz
MMDDYYYY .....Month Day Year (e.g. 01012010)
ms .....Millisecond

N/A.....Not applicable
NEMA .....National Electrical Manufactures Association
NVRAM.....Nonvolatile Read-Only Memory

O&M.....Operations and Maintenance

PC .....Printed circuit
PCB .....Printed-Circuit Board
PLL .....Phase-Locked Loop
PROM .....Programmable Read-Only Memory

RAM .....Random Access Memory
RC .....Resistance-capacitance
REV .....Revision
RF .....Radio Frequency
RFI.....Radio Frequency Interference
RMS.....Root mean square
ROM .....Read-Only Memory
RTS .....Request to Send
RX .....Receive

SCP .....System Control Processor
SHLD .....Shield
SPST.....Single-Pole Single-Throw
SPU .....Signal Processing Unit
STD .....Standard
SUM_FLT.....Summary Fault

TBT .....Tracking Band Translator

TX .....Transmit

V .....Volts
VAC.....Volts AC
VDC.....Volts DC
VSWR .....Voltage Standing-Wave Ratio

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