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Tracking Receiver

Model 550A, GEN2
(2RU and 4RU Versions)

Operation & Maintenance Manual

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Revision and Change Record

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Table of Contents

Revision and Change Record	i
Contact Information	iii
List of Figures	ix
List of Tables	ix
Safety Information.....	xi
Acronyms and Abbreviations	xiii

SECTION 1 - MODEL 550A SERIES TRACKING RECEIVER OVERVIEW 1-1

1.1	Introduction.....	1-1
1.2	2RU and 4RU Versions	1-1
1.3	How This Manual is Organized	1-3
1.4	Conformity to Standards	1-3
1.4.1	CE	1-3
1.4.2	FCC.....	1-4
1.4.3	Environmental Protection (WEEE and REACH)	1-4
1.5	Quick Start Instructions.....	1-4
1.6	Performance Specifications	1-6
1.7	Features of the Model 550A Tracking Receiver	1-7
1.7.1	Parameter Storage	1-7
1.7.2	Beacon Signal Acquisition and Frequency Tracking	1-7
1.7.2.1	Detection Windowing.....	1-8
1.7.2.2	Signal Lock.....	1-8
1.7.2.3	Signal Doppler Shift Correction.....	1-8
1.7.3	Position Tracking.....	1-9
1.7.3.1	StepTrack	1-9
1.7.3.2	Single-Channel Monopulse.....	1-10
1.7.3.2.1	Autophase	1-10
1.7.4	Beacon Spectrum.....	1-11
1.7.5	Signal Polarization.....	1-11
1.7.6	Frequency Band Table	1-11
1.7.7	Local vs. Remote Operation	1-12

SECTION 2 - OPERATING IN LOCAL MODE (2RU ONLY)	2-1
2.1 Common Operations	2-1
2.2 Overview of the User Interface	2-3
2.2.1 Returning to the Previous Screen or to the Main Screen	2-3
2.2.2 Entering Data in Alphanumeric Fields	2-4
2.2.3 Entering Data in Numeric Fields	2-4
2.2.4 Selecting an Item from a Drop-Down List	2-5
2.3 Controlling the Left Panel Display Screen	2-6
2.3.1 Showing the Dashboard	2-6
2.3.1.1 Showing and Configuring a Meter	2-6
2.3.1.2 Showing and Configuring a Chart	2-8
2.3.2 Showing the Spectrum Display	2-10
2.3.2.1 Configuring the Spectrum Display	2-10
2.4 Viewing Fault and Status Information	2-12
2.4.1 Viewing and Acknowledging Fault Messages	2-12
2.4.1.1 Viewing Status Messages	2-13
2.4.1.2 Viewing the External Status Bits	2-14
2.4.1.3 Viewing the Temperature of the Receiver Board	2-14
2.5 Using the 550A Home Screen on the Right Panel	2-15
2.5.1 Testing the Unit with the BITE Generator	2-16
2.5.2 Selecting a POL Option	2-17
2.5.3 Setting the RF Parameters	2-18
2.5.4 Configuring General TRU Settings (including Local vs. Remote Control)	2-20
2.5.5 Displaying the Setup Menu	2-21
2.5.5.1 Setting the Track Mode	2-21
2.5.5.2 Configuring Monopulse Tracking Performance	2-22
2.5.5.2.1 Clearing Persistent Monopulse Track Faults	2-23
2.5.5.3 Setting the External Status Bits as Pulled High or Low	2-24
2.5.5.4 Accessing the Maintenance Functions	2-25
2.5.5.4.1 Adjusting the Display Brightness and Contrast	2-26
2.5.5.4.2 Configuring the Network IP Address	2-27
2.5.5.4.3 Updating the TRU Software	2-28
2.5.5.4.3.1 Reverting to the Previous Software Version	2-29
2.5.5.5 Testing the Unit with the BITE Generator	2-29

2.5.5.6	Configuring the DAC (Digital-to-Analog Conversion) Output	2-30
2.5.5.7	Configuring the Serial Port.....	2-31
2.5.5.8	Configuring the Band Table	2-32
2.5.5.9	Setting the Autophase Parameters and Phasing the System	2-34
2.5.5.9.1	Manually Phasing the System.....	2-36
2.5.5.9.2	Autophasing the System	2-36
2.5.5.10	Displaying Software Version Numbers.....	2-37

SECTION 3 - OPERATING IN REMOTE MODE 3-1

3.1	Remote Interfaces	3-1
3.1.1	Ethernet Port Interface	3-1
3.1.2	Serial Port Interface.....	3-2
3.1.3	External Status Bit Discrete Input Interface	3-2
3.1.4	DAC Analog Output Interface	3-2
3.2	Setting Up a Remote-Client Connection (2RU Only).....	3-3
3.3	Using the Remote M&C Command Line Interface.....	3-4

SECTION 4 - SYSTEM INTEGRATION 4-1

4.1	Mechanical Interface Specifications	4-1
4.1.1	Mechanical Mounting	4-1
4.2	Back Panel Electrical Interface	4-1
4.2.1	Connector Descriptions	4-2
4.3	Controls and Indicators	4-5
4.3.1	Unit Level	4-5
4.3.1.1	Power Switch.....	4-5
4.3.1.2	Dual LCD Displays	4-5
4.3.1.3	USB Port	4-5
4.3.2	Receiver Board	4-6
4.3.2.1	Pushbutton Switches	4-6
4.3.2.1.1	DSP Reset Pushbutton (SW1)	4-6
4.3.2.1.2	DSP Power On Reset Pushbutton (SW2)	4-6
4.3.2.1.3	DSP Configuration Reset Pushbutton (SW3)	4-6
4.3.2.2	LED Indicators.....	4-6
4.3.2.2.1	Power Indicator LEDs	4-6

4.3.2.2.2	Version, Address, and Mode Indicator LED	4-7
4.3.2.2.3	Boot Mode LEDs.....	4-7
4.3.2.3	Jumpers	4-8
4.3.2.3.1	Boot Mode Jumpers.....	4-8
SECTION 5 - MAINTENANCE AND SERVICE GUIDELINES		5-1
5.1	Tools and Test Equipment Required.....	5-1
5.2	Inspection, Cleaning and Lubrication	5-1
5.2.1	General	5-2
5.2.2	Air Filter Cleaning.....	5-2
5.3	Specialized Assembly, Repair, or Replacement Instructions.....	5-2
5.3.1	Replacing the AC Fuse.....	5-2
5.4	Specialized Shipping Precautions.....	5-2
SECTION 6 - TROUBLESHOOTING GUIDE		6-1
6.1	Version Information.....	6-1
6.2	Fault Scenarios.....	6-1
6.2.1	Clearing Track Faults	6-1
6.2.2	Ethernet Communication Failures	6-2
6.2.3	Forgot Receiver Board's IP Address.....	6-2
6.2.4	Serial Communication Failure.....	6-2
6.2.5	Error Signal DAC Output is Saturated	6-3
6.2.6	Beacon Signal Not Detected.....	6-3
6.2.7	Front Panel of 2RU Fails to Light Up	6-4
APPENDIX A - DEFAULT CONFIGURATION PARAMETERS		A-1
APPENDIX B - SET UP AN L-BAND TRU USING EXTERNAL BDCs WITH INTERNAL POL & BAND SWITCHING.....		B-1
B.1	Dual-Band Setup for 550A-T2-22XX-02.....	B-1
B.2	Tri-Band Setup for 550A-T2-222X-02	B-2

APPENDIX C - TRANSITION A LEGACY LONGVIEW DTR RETROFIT C-1

C.1	Transition a Model 930A/940A/950A ACU to a Model 500 Series Receiver	C-2
C.2	Transition a Legacy 7200 ACU to a Model 500 Series Receiver	C-2

APPENDIX D - TRANSLATED SAFETY INFORMATION / QUICK START..... D-1

D.1	Preface	D-1
D.2	Sicherheit Abschnitt [German]	D-2
D.2.1	Sicherheitsinformation	D-2
D.2.2	Kurzanleitung	D-4
D.3	L'Information de la Sécurité [French]	D-6
D.3.1	Information sécuritaire	D-6
D.3.2	Le guide de démarrage rapide.....	D-8

List of Figures

Figure 1-1: Model 550A Front Panel - 2RU Version	1-1
Figure 1-2: Model 550A Front Panel - 4RU Version	1-2
Figure 4-1: Tracking Receiver Back Panel - 2RU	4-1
Figure 4-2: Tracking Receiver Back Panel - 4RU	4-2

List of Tables

Table 1-1: RF Performance Parameters.....	1-6
Table 1-2: Acquisition Mode Parameters.....	1-6
Table 1-3: General Parameters.....	1-7
Table 1-4: Environmental	1-7
Table 1-5: I/O Specifications	1-7
Table 1-6: Signals Developed for Each Tracking Mode	1-9
Table 4-1: Ethernet Connectors	4-2

Table 4-2: J1 Serial Port #1 Connector	4-2
Table 4-3: J2 Tracking Out Connector	4-3
Table 4-4: J3 Alarm Out Connector.....	4-3
Table 4-5: J4 Status Connector.....	4-3
Table 4-6: J6 Scan Out Connector (Single-Input TRUs only)	4-4
Table 4-7: TRU RF Input Connectors.....	4-5
Table 4-8: Receiver Board Power Indicators	4-6
Table 4-9: Alphanumeric LED Indication of State	4-7
Table 4-10: Boot Mode LEDs	4-7
Table 4-11: Boot Modes.....	4-8
Table A-1: Default Configuration Parameters.....	A-1
Table B-1: Dual-Band Setup	B-1
Table B-2: Example of Dual-Band Setup Table	B-2
Table B-3: Tri-Band Setup	B-2
Table B-4: Example of Tri-Band Setup Table	B-3

Safety Information

Safety of personnel is the primary concern during all procedures. Users are responsible for their own safety, the safety of others working on or near the system, and the safe operation of the system. Read and become familiar with the safety information in this section.

Although CPI Satcom & Antenna Technologies Inc. (CPI SAT) has attempted to detail in this document all areas of possible danger to personnel in the use of this equipment, personnel should use caution when installing, operating, and servicing this equipment. Take care to avoid electrical shock, whether the hazard is caused by design or malfunction. CPI SAT is specifically NOT liable for any damage or injury arising from a technician's failure to follow the instructions in this document or to exercise due care and caution while installing, operating, and servicing this equipment. CPI SAT is NOT responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

This document 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 document 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.

Warnings, Cautions, and Notes

Warnings, Cautions, and Notes provide personal safety and equipment protection information in the transport, installation, operation, maintenance, and disassembly of the equipment described in this manual. Failure to comply with the Warnings, Cautions, and Notes may result in personal injury or death, damage to the equipment, or loss of mission effectiveness. Definitions for each are:

WARNING

An operating or maintenance procedure, practice, condition, statement, etc., which, if NOT strictly observed, could result in personal injury or death.

CAUTION

An installation, operating or maintenance procedure, practice, condition, statement, etc., which, if NOT strictly observed, could result in long-term health hazards to personnel, damage to or destruction of equipment, or loss of mission effectiveness.

NOTE

An installation, operating or maintenance procedure, practice, condition or statement, which, if heeded, could enhance efficiency and/or safety of said procedures.

Electrical Hazards

The electrical currents and voltages associated with this equipment, whether supplied by CPI SAT or others, are dangerous. At all times, personnel must observe the Warnings listed below. Failure to comply may result in severe personal injury or death.

WARNING

- *Equipment is intended for installation in a restricted access location. The interior of the Tracking Receiver Unit (TRU) is NOT an operator access area. Only qualified personnel with approved technical training and experience should be permitted access.*
- *Safeguard personnel and property by complying with all local safety procedures as established by the customer site representative, as well as local building codes and fire protection standards.*
- *All persons working on the antenna system must comply with the Occupational Safety and Health Act (OSHA) standards and all other federal, state, and local laws, ordinances, regulations, and codes relating to designated work.*
- *Never perform maintenance or service when alone or fatigued.*

Electrostatic Sensitive Device (ESD) Hazards

CAUTION

Electrostatic sensitive equipment. To prevent equipment damage, use proper grounding techniques.

Explanation of Safety Symbols on Equipment

Symbol	Description
	Protective Earth/Ground Terminal
	Caution, Risk of Electric Shock
	Caution, Risk of Danger

Acronyms and Abbreviations

Term	Definition
°	Degrees (as in degrees of antenna motion)
A	Amperes
AC	Alternating Current
Ack	Acknowledge
ACU	Antenna Control Unit
AM	Amplitude Modulation
AZ	Azimuth Axis
A/D	Analog-to-Digital Converter
BDC	Block Down Converter
BITE	Built-In Test Equipment
bps	Bits per second
CPI	Communications & Power Industries
CPI SAT	CPI Satcom & Antenna Technologies Inc.
CrY	Cross-Y Axis
DAC	Digital-to-Analog Converter
dB	Decibels
dBm	Decibels referenced to 1 milliWatt
DSP	Digital Signal Processor
EEPROM	Electrical Erasable Programmable Read-Only Memory
EL	Elevation Axis
Ext	External
FFT	Fast Fourier Transform
Freq	Frequency
GEO	Geosynchronous Earth Orbit (Satellite)
GHz	gigahertz
GND	Ground
GUI	Graphical User Interface
HORZ	Linear Horizontal Signal Polarization
HW	Hardware
Hz	Hertz (1/second)
IF	Intermediate Frequency
IP	Internet Protocol
I/O	Input / Output
kHz	kiloHertz
lbs	Pounds Weight
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LEO	Low Earth Orbit (Satellite)

Term	Definition
LHCP	Left-Hand Circular Signal Polarization
LNA	Low Noise Amplifier
Max	Maximum
MEO	Medium Earth Orbit (Satellite)
MHz	megahertz
Min	Minimum
N/A	Not Applicable
Osc	Oscillator (as in an Intermediate Frequency Local Oscillator)
POL	Polarization Axis
Rcvr	Receiver
Ref	Reference (as in Reference Level or Reference Designator)
RF	Radio Frequency
RHCP	Right-Hand Circular Signal Polarization
RMS	Root Mean Square
RS-232	An Electronics Industry Association standard single-ended communications protocol
RS-422	An Electronics Industry Association standard differential-signaling communications protocol
RX	Receive
s	Second
SMA	SubMiniature A Connector
SS	Signal Strength
SW	Software
SWx	Switch #x
TE21	Type of Mode Coupler in the Antenna Feed
TRU	Tracking Receiver Unit
TX	Transmit
UPC	Uplink Power Control
USB	Universal Serial Bus
V	Volts
VAC	Volts Alternating Current
VCO	Voltage Controlled Oscillator
VERT	Linear Vertical Signal Polarization
X	X Axis (as on X/Y Antennas)
XEL	Cross-Elevation Axis
XFMR	Transformer
Y	Y Axis (as on X/Y Antennas)

SECTION 1 - MODEL 550A SERIES TRACKING RECEIVER OVERVIEW

1.1 Introduction

This Operation and Maintenance Manual covers the Model 550A Digital Tracking Receiver. The Model 550A is a general purpose single-channel monopulse tracking receiver employing digital signal detection and offering beacon power spectrum displays and internal BDC options.

The key features of the Model 550A Digital Tracking receiver are L-band acquisition and tracking of signals from 890 MHz to 2150 MHz, fast acquisition times in low carrier to noise operating conditions, and a beacon power spectrum to provide spectral visibility.

The Model 550A Digital Receiver uses frequency domain techniques for acquisition and tracking satellite beacon signals when paired with a suitable Antenna Control System.. A Fast Fourier Transform (FFT) algorithm is generated with each update to identify the strength of beacon signals, monopulse tracking errors, and beacon power spectra. The use of FFT techniques leads to a lower noise floor and faster acquisition of signals. The generation of beacon power spectra is a by-product of determining the power of the beacon. Windowing techniques allow operators to fine tune the search bandwidth for beacons.

1.2 2RU and 4RU Versions

The Model 550A is available in both a 2RU and 4RU chassis. Although they differ in size, the two versions are functionally identical. The main difference is in the way they are monitored and controlled. Some sections of this manual apply to both the 2RU and 4RU versions. Other sections, such as “Operating in Local Mode”, apply only to the 2RU.

- The 2RU version supports both Local and Remote modes. In Local mode, the TRU is monitored and controlled through the front panel. In Remote mode, the TRU is monitored and controlled through an external controller unit or XCU such as an 950A ACU.

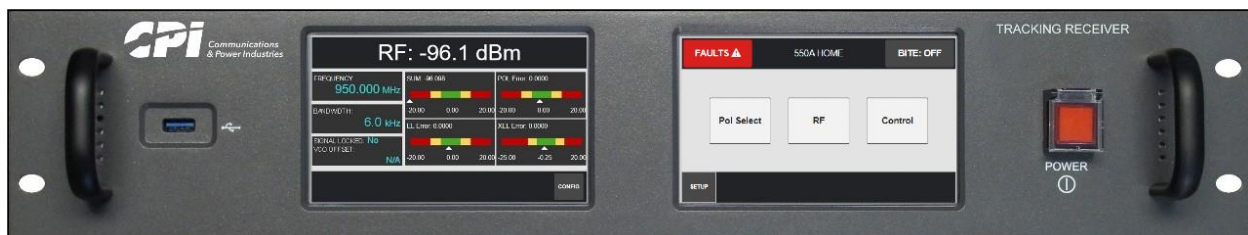


Figure 1-1: Model 550A Front Panel - 2RU Version

- The 4RU version operates exclusively in Remote mode, where the TRU is monitored and controlled through the Antenna Control Unit (ACU) of the Model 950A control system. Therefore, the 4RU front panel contains no touchscreens, controls, or connectors.

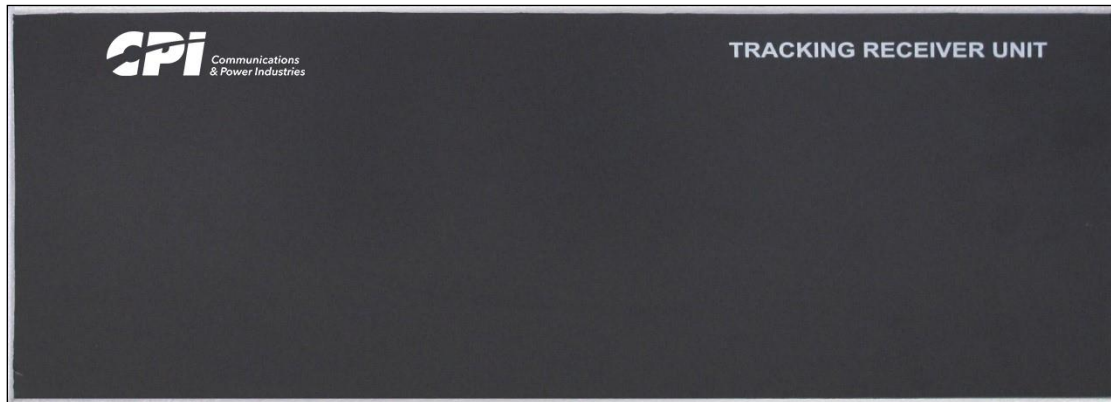


Figure 1-2: Model 550A Front Panel - 4RU Version

Information about using the 4RU TRU through the Model 950A ACU is not included in this Tracking Receiver manual. Instead, refer to the separate manual provided with the Model 950A control system.

In general, on the Model 950A:

To monitor the TRU:

- Press **Monitor > Tracking Receiver**.

To access a spectrum display that is available for the Model 550A Digital TRU:

- Press **Monitor > Spectrum Display**.

To set the parameters that control the TRU:

- Press **Menu > Setup > Tracking Receiver**.

1.3 How This Manual is Organized

This manual is divided into the following sections.

- Section 1 provides an overview of the Model 550A tracking receiver giving “Quick Start” instructions, performance specifications, and a list of features.
- Section 2 (2RU only) discusses Local mode operation, and the touchscreen menu items in detail.
- Section 3 (2RU only) outlines the Remote mode of operation.
- Section 4 is designed to help system integrators: it contains information on mechanical installation, electrical connections, as well as the unit’s controls and indicators.
- Section 5 is dedicated to maintenance and service support.
- Section 6 describes troubleshooting information.
- Appendix A contains default parameter values.
- Appendix B contains setup information for an L-band TRU using external BDCs with internal POL and band switching.
- Appendix C contains a guide for transitioning systems that currently use a legacy Longview DTR (Digital Tracking Receiver) to a Model 500 Series TRU.
- Appendix D contains safety and quick start information translated into various languages.

1.4 Conformity to Standards

1.4.1 CE

Some system components bear the CE mark based on compliance with the European Electromagnetic Compliance (EMC) Directive, the European Low Voltage Directive (LVD), and the European Restriction of Hazardous Substances (RoHS) Directive.



The safety of system components has been assessed by European standards that mirror their respective UL (Underwriters Laboratories) Standards.

Equipment used in combination with the supplied equipment must also be CE-compliant and display the CE mark. When using the supplied equipment displaying the CE mark in combination with other equipment, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the equipment, verify that conditions meet European standards.

1.4.2 FCC

Some system components bear the following FCC Part 15 Verification label.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.4.3 Environmental Protection (WEEE and REACH)

System components bear the WEEE mark based on compliance with the European Waste Electrical and Electronic Equipment (WEEE) Directive.



Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your local authority or CPI SAT for recycling advice.

These system components maintain compliance with the European Registration, Evaluation, Authorization, and Restriction of Chemical substances (REACH) Directive.

1.5 Quick Start Instructions

To quickly get the unit up and running:

1. Receive and inspect equipment.

CAUTION

Do NOT install or operate any equipment that is damaged or has missing parts. Failure to observe this caution may result in personal injury or equipment damage.

2. Mechanically mount the chassis into the equipment rack.

WARNING

Equipment is intended for installation in a restricted access location.

CAUTION

All equipment must be secured in place before operating. Failure to comply may result in personal injury and/or equipment damage.

3. Read the following warnings and cautions before connecting any cables.

WARNINGS

- *Install unit following local codes.*
- *Wiring should be performed only by qualified personnel.*
- *Disconnect all power before wiring.*
- *The TRU must be connected to an earthed mains socket-outlet. The socket-outlet shall be installed near the equipment and shall be easily accessible.*
- *The inside of the TRU is NOT an operator-access area. Only service personnel with appropriate technical training and experience are permitted access.*
- *The customer is responsible for selecting proper circuit protection, cabling, and lock-out features for power input to the cabinet. These must follow local regulations. The TRU supplies circuit protection from the enclosure to subcomponents.*
- *Lock-out electrical safety for maintenance can be accommodated various ways. The design of the overall installation, safety switches, and power disconnect depends on local codes and should be reviewed by the installer.*
- ***Failure to comply with the above warnings may result in severe personal injury or death and/or equipment damage.***

CAUTIONS

- *Do NOT use a line-to-line voltage as the single-phase source. Voltages must be between 100 – 250 VAC.*
 - ***Failure to comply with the foregoing cautions may result in personal injury or equipment damage.***
4. Plug the chassis into a source of compatible AC power using the connector on the rear panel.
 5. Attach the RF signal cable to the input connector (one of J12 through J19) on the rear panel.
 6. If necessary, plug the RJ-45 connector plug on the cable to the supervisory control computer into J10 (2RU) or J8 (4RU) on the rear panel.
 7. Turn on the power by pressing the Power switch on the right side of the front panel.

During the bootup sequence, the CPI Satcom & Antenna Technologies Inc. splash screen is displayed.

Detailed information about operating the unit is provided in Section 2 of this manual.

1.6 Performance Specifications

Table 1-1: RF Performance Parameters

Parameter	Min	Max	Typical	Units
Input Impedance			50	Ohms
Total Input Power Level (no damage)		+10		dBm
Dynamic Range	-96	+0		dBm
Input Frequency (f_{input})	890	2450		MHz
Signal Strength Linearity Error	± 2 dB			dB
Tuning Resolution			1	kHz
Preselection Bandwidths	1			kHz
	4			kHz
	250			kHz

Table 1-2: Acquisition Mode Parameters

Parameter	Min	Max	Typical	Units
Search Range	$f_{\text{input}} \pm 16$	$f_{\text{input}} \pm 499$		kHz
Sample Rate	1000000			Hz
Acquisition Time @ 4 kHz bandwidth, 150 kHz span	0.300			sec
C/N ₀ Acquisition @ 1 kHz bandwidth	35			dB
C/N ₀ Acquisition @ 4 kHz bandwidth	40			dB
C/N ₀ for Monopulse Tracking, 1 kHz or 4 kHz	37			dB
Detection Type	FFT-Based, No Integration			

Table 1-3: General Parameters

Parameter	Typical	Units
Dimensions (2RU)	3.5" H x 19" W x 20" D	Inches
Weight (2RU, No BDCs)	13.1	Lbs
Dimensions (4RU)	6.97" H x 17" W x 15" D	Inches
Weight (4RU, No BDCs)	25	Lbs
Fuse	5 x 20 mm, 4.0 A, 250 V, Slow Blow Replacement: 0218004.HXP	
AC Input	100-240 VAC~, 50-60 Hz 2.0-1.2 A RMS	

Table 1-4: Environmental

Parameter	Rating
Maximum Operating Altitude	10,000 ft (3,048 m)
Operating Temperature	0° to 50°C
Storage Temperature	-20° to 70°C
Humidity	0 to 95%, Non-condensing

Table 1-5: I/O Specifications

Parameter	Rating
Low Side Drivers for Band Select [0:7] and POL Select A/B	30 V, 1.5 A Max

1.7 Features of the Model 550A Tracking Receiver

1.7.1 Parameter Storage

All parameters used to configure the operation of the tracking receiver are stored in non-volatile storage when an operator makes changes to ensure that the unit comes back to the same operating condition on power up. This feature eliminates the need to re-enter site specific operating data after each power cycle. Note that changes made to parameters take effect immediately but are not stored into non-volatile storage until at least 90 seconds have passed.

1.7.2 Beacon Signal Acquisition and Frequency Tracking

The tracking receiver looks for RF energy within the **Auto Sweepwidth** of the **Frequency**. A signal is “acquired” when the magnitude of energy in the search range exceeds the detection threshold. When this happens, the dashboard on the left panel display shows **Signal Present: Yes**. The tracking receiver locks onto the frequency in the search range with the largest magnitude signal strength.

Refer to Section 2.5.3 for information about configuring the receiver to search for a satellite beacon on a specific frequency.

1.7.2.1 Detection Windowing

The range of frequencies across which a search is made for signal energy is centered at the **Frequency** entered by the operator. The width of the search is equal to twice the value of the **Auto Sweepwidth**. These parameters define a detection window that is overlaid on the spectrum generated by the FFT algorithm. The receiver will only declare **Signal Present: Yes**, when a beacon is detected in the detection window.

Refer to Section 2.5.3 for information about changing the **Auto Sweepwidth**.

1.7.2.2 Signal Lock

The receiver “locks” onto a signal when a beacon is found in the FFT’s detection window. For the Model 550A tracking receiver, the left panel display screen shows **Signal Present: Yes**, when a signal is found.

1.7.2.3 Signal Doppler Shift Correction

After a signal is found in the detection window, the tracking receiver follows the peak signal strength even if the frequency changes. This feature is required to handle the Doppler shift in frequencies caused by overhead passes of Low Earth Orbit (LEO) and Mid Earth Orbit (MEO) satellites.

The Doppler rate is the amount of frequency shift that the receiver can track in one second. The Doppler rate for the receiver depends on the **Auto Sweepwidth** of the receiver. A narrower **Auto Sweepwidth** leads to a smaller Doppler rate. System engineers must calculate the required **Auto Sweepwidth** for each installation based on the frequency uncertainty of the RF downlink as well as the estimated Doppler rate for the beacon signal from the satellite. The **Auto Sweepwidth** must be large enough to render a receiver Doppler rate that is larger than the satellite Doppler rate.

The maximum Doppler shift for the Model 550A tracking receiver is ± 500 kHz. Outside of this frequency range, the receiver will not detect a signal and must be manually retuned to the correct input frequency.

1.7.3 Position Tracking

The tracking receiver has four tracking modes: one for StepTrack and three for monopulse.

In StepTrack mode, the antenna controller typically steers the antenna based on a signal-strength peaking algorithm, and only the raw signal strength is reported. In StepTrack mode, all monopulse error channels are set to zero.

In the monopulse modes, the tracking receiver is attached to a scan plate that modulates a phase-shifted version of the error signal onto the sum signal. For each error channel, the tracking receiver alternatively applies two phase shift values. During the positive shift cycle, a phase shift value that maximizes the summed signal is applied and the signal strength is recorded. During the negative shift cycle, a value that minimizes the summed signal is applied and the signal strength is recorded. The tracking error is calculated from the difference between the maximized and minimized signal strength. The **AZ/EL/POL Monopulse** track mode cycles through six states and develops errors for AZ, EL, and POL. The **AZ/EL Monopulse** track mode cycles through four states and develops errors in AZ and EL. Finally, the **POL Monopulse** track mode cycles through two states and develops an error only in POL. These track modes allow the error channel update rate to be increased if other error channels are not needed or used.

Table 1-6 summarizes the different tracking modes:

Table 1-6: Signals Developed for Each Tracking Mode

Tracking Mode	Signal Strength	AZ Error	EL Error	POL Error	Channel Update Rate
StepTrack	✓				Fastest
AZ/EL/POL Monopulse	✓	✓	✓	✓	Slowest
AZ/EL Monopulse	✓	✓	✓		1.5x AZ/EL/POL
POL Monopulse	✓			✓	3x AZ/EL/POL

These settings are stored in TRU non-volatile memory.

For information about changing the Track mode, refer to Section 2.5.5.1.

1.7.3.1 StepTrack

In StepTrack, the supervisory antenna controller steps the antenna off of track and records signal strength for each step. With a series of steps, a signal strength map is made for the satellite indicating the direction of the strongest signal from the satellite. The position of the antenna is then adjusted to ensure that the antenna always points towards the coordinates of maximum signal strength. StepTrack is only used for Geosynchronous (GEO) satellites.

1.7.3.2 Single-Channel Monopulse

Single-channel monopulse tracking uses measurements of signal strength with alternating phase angles in the digital phase shifter to determine how far off the antenna is from pointing at the satellite. The error signal is amplitude modulated (AM) onto the beacon signal sent to the tracking receiver. The tracking receiver demodulates the sum signal from the error signal, giving tracking error signals in each axis.

Whereas StepTrack is an algorithm that is executed periodically, at a low update rate measured in minutes or hours, single-channel monopulse tracking is a continuous process with updates measured in milliseconds. A single-channel monopulse update is complete with the measurement of signal strength for both the positive and negative phase shifts on each axis in the scan plate. Single-channel monopulse tracking is used for LEO and MEO satellites, which move across the sky.

1.7.3.2.1 Autophase

Before single-channel monopulse tracking is possible, the antenna must be “phased”. Phasing an antenna involves finding the phase shift angles for the digital phase shifter on the antenna’s scan plate that maximize the strength of the tracking error modulation of the signal. These phase shift angles become part of the operating parameters for the antenna. The phase shift angles change with different satellites and different frequency bands.

To simplify the task of finding the correct phase shift angles, the tracking receiver has Autophase capabilities. By following the sequence of operations listed in Section 2.5.5.9, “Setting the Autophase Parameters and Phasing the System”, on page 2-34, an operator can phase the antenna with a few simple commands.

The Model 550A has two autophase algorithms you can choose from:

- Maximum autophase algorithm - Determines the correct phase shifts by looking for a maximum tracking error magnitude.
- Minimum autophase algorithm - Finds the phase shifts that minimize cross-coupling in the feed and then adds 90° to the result, thereby calculating the location of the maximizing phase shift.

The two algorithms give results that are normally within 10° of each other, but the minimum autophase algorithm minimizes the effects of cross-coupling in the antenna feed.

NOTE

The maximum algorithm should be used on antennas that do not employ TE21 mode couplers or systems designed to autophase closer to the beam peak than the half power (-3 dB) beam radius.

1.7.4 Beacon Spectrum

The spectra of the beacon can be displayed on the left front panel of the receiver and/or retrieved by remote host computers. The span of the spectra range is from 15.625 kHz up to 1.0 MHz. The frequency resolution of the data plotted in the spectra ranges from 31.25 Hz to 2 kHz depending on the receiver bandwidth selection. Selecting a narrower bandwidth provides the opportunity of displaying finer resolution spectra, but this extra resolution comes at the expense of extra processing time.

NOTE

Monopulse tracking is only available in 1 kHz and 4 kHz bandwidths. As a consequence, beacon spectra while monopulse tracking are limited to spans between 250 kHz and 1 MHz, and resolutions from 500 Hz to 2 kHz respectively.

Refer to Section 2.3.2, “Showing the Spectrum Display”, on page 2-10 and 2.3.2.1, “Configuring the Spectrum Display”, on page 2-10.

1.7.5 Signal Polarization

The Model 550A Tracking Receiver supports up to two polarizations in each of the six frequency bands. Using the touchscreen controls, operators can select **Pol A** or **Pol B**. These are generic names whose actual polarization type depends on how your system is configured. For example, your system may be configured for both Horizontal and Vertical linear polarization signals, or for both LHCP (left-hand circular polarization) and RHCP (right-hand circular polarization) signals.

Therefore, to select the appropriate POL option, you need to be familiar with the system's configuration. Refer to Section 2.5.2, “Selecting a POL Option”, on page 2-17.

1.7.6 Frequency Band Table

Before the system can be commissioned, its band tables must be configured. The band table defines how the radio frequency (RF) bands are mapped into the receiver's L-band input.

Each band requires a table entry with four fields. The **Start** value is the lowest frequency in the band. The **Stop** value is the largest frequency in the band. The **Local Osc** value is the block down converter's (BDC) local oscillator (LO) frequency. The **Relay** value defines which power switches drive the BDC.

With respect to the Relay bits, if bit 2 contains a 1, low-side band-select bit 2 and high-side power switch 2 are closed when the band is selected. Typically, only one of the bits is 1 in the **Relay** field. If the BDC is internal, the high-side switches are used; if the BDC is external, the low-side band-select switches are used. The “On” bit in the Relay field should be different for each frequency band.

Refer to Section 2.5.5.8, “Configuring the Band Table”, on page 2-32 for general operation. Refer to Appendix B, “Set Up an L-Band TRU Using External BDCs with Internal POL & Band Switching” for setup information.

1.7.7 Local vs. Remote Operation

The 2RU version Model 550A can be operated in either Local or Remote mode. The 4RU version operates in Remote mode only and does not have a touchscreen.

In normal operational circumstances, the TRU is expected to always operate in Remote mode with configuration provided by the ACU only. When switching from Local to Remote mode, the Remote Host ACU synchronizes all parameters between the ACU and the TRU, including tracking frequency, band tables, and polarization switch selections. This synchronization process ensures that the TRU has the operating configuration expected by the ACU and prevent erroneous tracking operation of the antenna. During the Local to Remote synchronization process, there may be a temporary drop in TRU reported RF signal strength since the receiver may be re-tuned or RF paths adjusted.

NOTE

To avoid the potential for RF signal strength drops at the TRU during a handoff, it is recommended:

(a) to make only make TRU modifications while the Remote Host is in Standby mode and make all TRU configuration changes from the Remote Host only.

(b) OR, use the TRU only in Local mode and manually configure the Antenna Control System (not recommended).

- In **Local** mode, parameters can be read and modified through the touchscreen panels. While the unit is in Local mode, remotely connected computers, including the Model 900 Series Antenna Controllers can only read parameters. Section 2 is dedicated to Local mode control of the unit.
- In **Remote** mode, remotely connected computers can read and modify parameters via either the Ethernet port or the serial port. In Remote mode, the front panel touchscreens can only be used to view parameter values. Attempting to modify a parameter through the touchscreens while the unit is in Remote mode results in an error message. Section 3 discusses remote interfaces to the Model 550A receiver.

SECTION 2 - OPERATING IN LOCAL MODE (2RU ONLY)

The Model 550A Tracking Receiver is operated in Local Mode through the front panel displays.



NOTE

- This section applies only to the 2RU version of the tracking receiver, which can be controlled locally from the front panel. The 4RU version does not have a front panel assembly and is controlled remotely from the Antenna Control Unit (ACU) of a Model 950A control system.
- As necessary, refer to Section 2.5.5.4.1, "Adjusting the Display Brightness and Contrast," on page 2-26 for best viewing.

2.1 Common Operations

The following table is a quick reference for performing the most commonly used TRU operations.

To:	Description:
Configure general TRU settings • Change between Local and Remote control • Change the displayed frequency units between GHz and MHz • Turn the audible alarm on and off	From the 550A Home screen on the right panel: Press Control and then press the appropriate Control Set, Frequency Unit, Sound Settings, and Axis Geometry buttons. Refer to Section 2.5.4, "Configuring General TRU Settings (including Local vs. Remote Control)", on page 2-20.
Configure the frequency Band Table	From the 550A Home screen on the right panel: Press Setup > Band Table and then enter the settings for each frequency. Refer to Section 2.5.5.8, "Configuring the Band Table", on page 2-32.

To:	Description:
Set RF parameters • Enter a satellite's beacon frequency • Select the receiver's bandwidth • Adjust the receiver's signal attenuation • Adjust the offset for the reported received signal frequency	From the 550A Home screen on the right panel: Press RF and then use the applicable fields. Refer to Section 2.5.3, "Setting the RF Parameters", on page 2-20.
Monitor the beacon spectrum	From the screen on the left panel: Press Spectrum Display at the bottom of the screen. Refer to: Section 2.3.2, "Showing the Spectrum Display", on page 2-10, Section 2.3.2.1, "Configuring the Spectrum Display", on page 2-10.
Change the signal polarization parameters	From the 550A Home screen on the right panel: Press POL Select and then press the applicable POL button. Refer to Section 2.5.2, "Selecting a POL Option", on page 2-17.
Change a power meter to a chart	From the screen on the left panel: Press Dashboard at the bottom of the screen. Then press Config and set Signal Display to Chart . Refer to Section 2.3.1.2, "Showing and Configuring a Chart", on page 2-8.
Change a chart to a power meter	From the screen on the left panel: Press Dashboard at the bottom of the screen. Then press Config and set Signal Display to Meter . Refer to Section 2.3.1.1, "Showing and Configuring a Meter", on page 2-6.
Configure the Track mode	From the 550A Home screen on the right panel: Press Setup > Track Mode and then press the appropriate mode. Refer to Section 2.5.5.1, "Setting the Track Mode", on page 2-21.
Autophase the antenna	From the 550A Home screen on the right panel: Press Setup > Track Mode and then press the applicable button. Refer to: Section 2.5.5.9, "Setting the Autophase Parameters", on page 2-34, Section 2.5.5.9.1, "Manually Phasing the System", on page 2-36, Section 2.5.5.9.2, "Autophasing the System", on page 2-36.
Clear persistent monopulse track faults	From the 550A Home screen on the right panel: Press Setup > Monopulse and then press the Reset button. Refer to Section 2.5.5.1, "Configuring Monopulse Tracking Performance", on page 2-22.

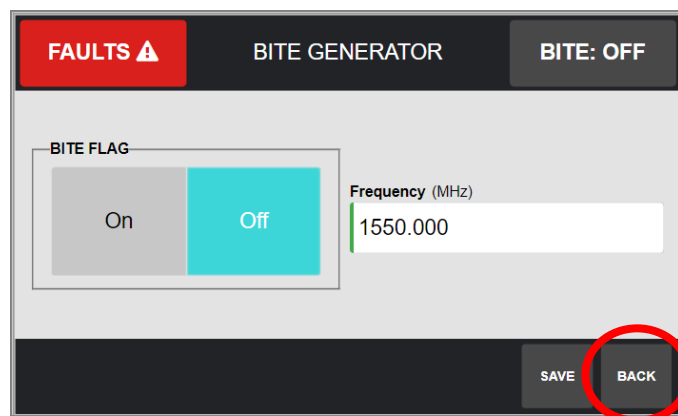
To:	Description:
Test the receiver with the BITE generator	From the 550A Home screen on the right panel: Press BITE Gen . Refer to Section 2.5.5.5, "Testing the Unit with the BITE Generator", on page 2-29.
View external status bits from LNAs and BDCs	From any screen in the right panel: Press the Faults button (or No Faults) in the title bar, and then press Ext Status at the bottom of the screen. Refer to Section 2.4.1.2, "Viewing the External Status Bits", on page 2-14.
Change the IP address	From the 550A Home screen on the right panel: Press Setup > Maintenance and log into the Maintenance menu. Then press Network Config . Refer to: Section 2.5.5.4, "Accessing the Maintenance Functions", on page 2-25, Section 2.5.5.4.2, "Configuring the Network IP Address", on page 2-27.

2.2 Overview of the User Interface

The front panels accept operator inputs through the touchscreen displays. Operating the touchscreens is very intuitive. Most command screens let you press buttons to select an option, enter parameter values with an on-screen keyboard, or select from a list of available values.

2.2.1 Returning to the Previous Screen or to the Main Screen

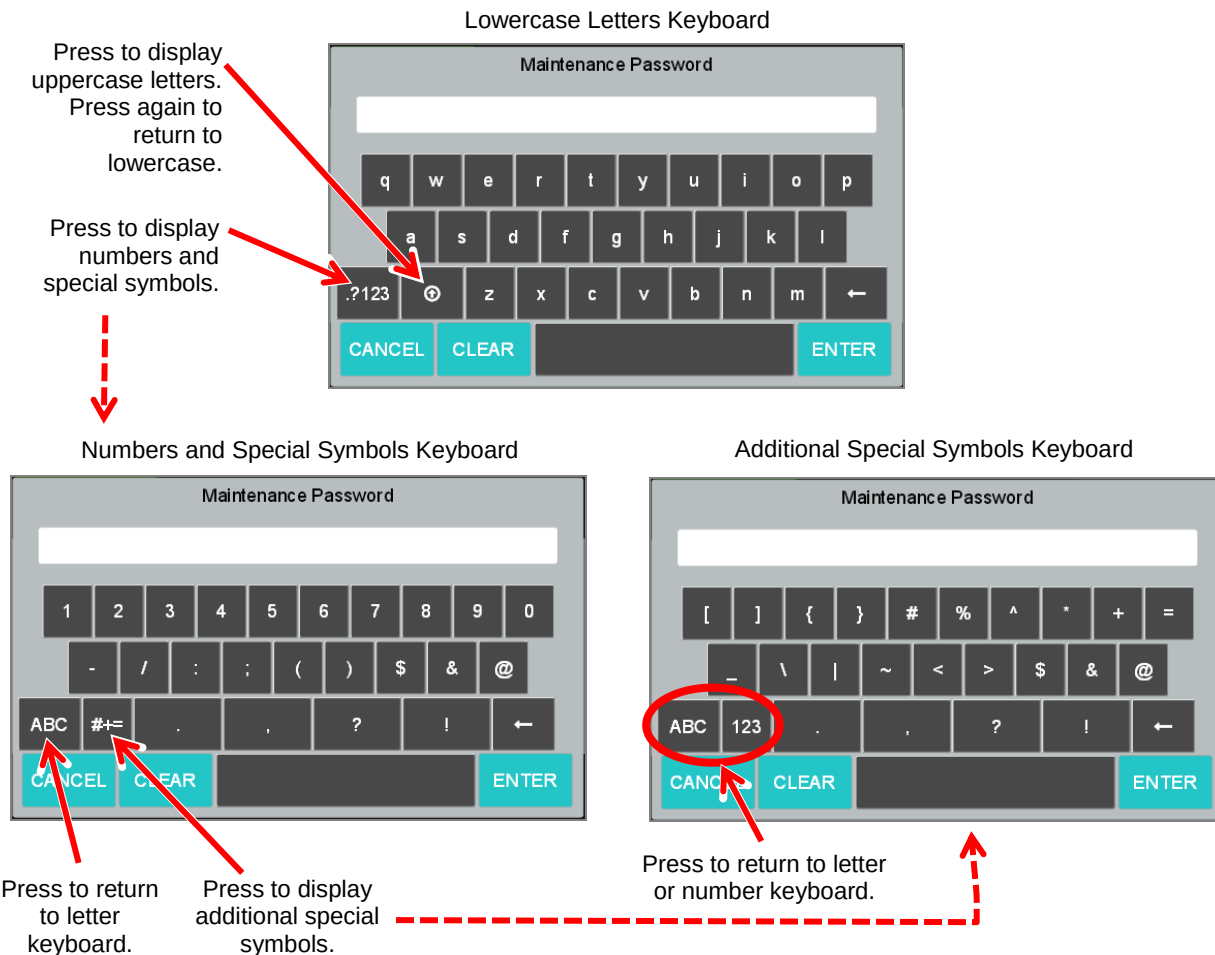
As you navigate to other screens, use the **Back** button to return to the previous screen. For example:



To return to the main screen, continue pressing **Back** as many times as necessary.

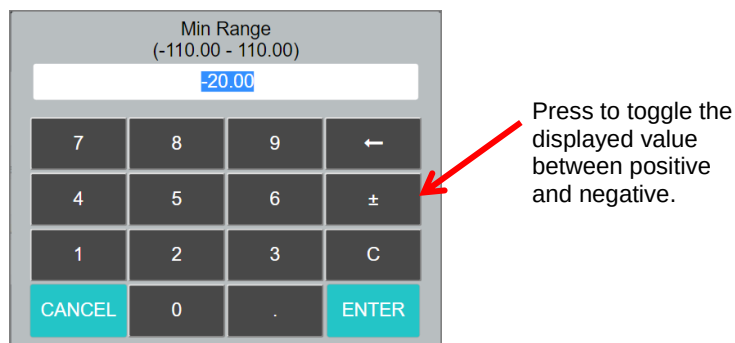
2.2.2 Entering Data in Alphanumeric Fields

When you press a field that uses alphanumeric data, an alphanumeric keyboard opens. You can change the keyboard to enter lowercase or uppercase letters, numbers, and special symbols.



2.2.3 Entering Data in Numeric Fields

When you press a field that allows numbers only, the numeric keyboard opens. The title bar shows the name of the field and its valid range of data.



NOTE

If you enter invalid, out-of-range data, most fields accept the entry but show a red background. For example:

Min Range (dB)
-200.00

When you attempt to save the screen, an Invalid Data error appears. Press the field and enter an appropriate value.

2.2.4 Selecting an Item from a Drop-Down List

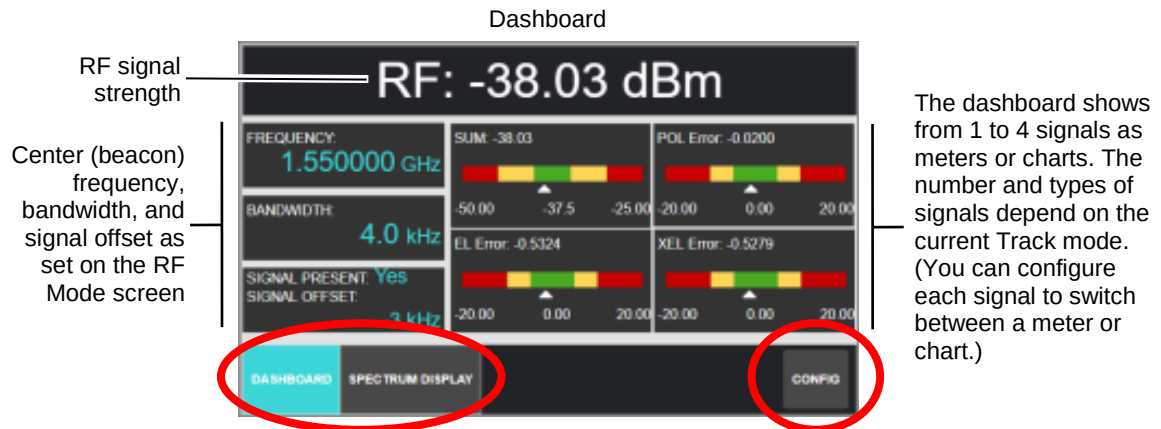
Fields that let you select an item from a list typically have a drop-down arrow ▼ at the end of the field. When you press one of these fields, the available selections appear in a pop-up window. For example, on the **Setup > Serial Port** screen, the Serial Port and Baud Rate fields open a pop-up window.

The screenshot shows the 'SETUP - SERIAL PORT' screen. The 'Baud Rate' field is circled in red. A red arrow points from the dropdown arrow of the 'Baud Rate' field to a pop-up window titled 'Select Baud Rate'. The pop-up window displays a grid of baud rate options: 1200, 2400, 4800, 9600, 19200, and 38400. The '9600' option is highlighted in blue. At the bottom of the pop-up are 'CANCEL' and 'OK' buttons.

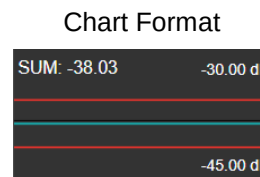
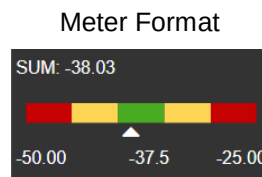
On the pop-up, highlight the item you want to select by pressing it and then press **OK**.

2.3 Controlling the Left Panel Display Screen

By default, the main screen on the left panel shows the dashboard, which shows information about the RF signal. You can change the screen to show a spectrum display. You can also configure the settings for both the dashboard and spectrum display.



Examples of the meter and chart formats are.



2.3.1 Showing the Dashboard

From the main screen on the left panel:

- Press the **Dashboard** button.

2.3.1.1 Showing and Configuring a Meter

When the dashboard is showing:

1. Press the **Config** button.
2. For the Signal, if available, select the signal you want to configure.

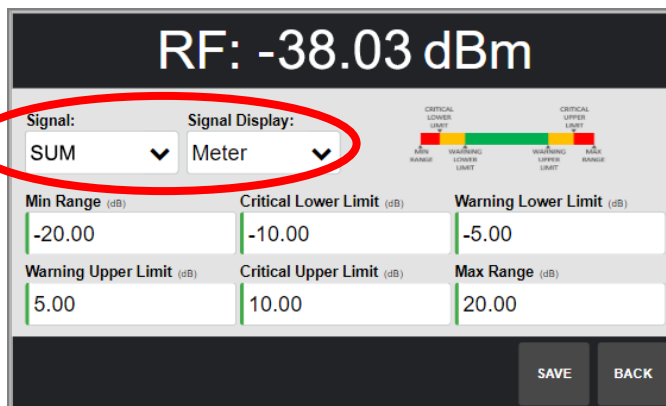
NOTE

*The available signals depend on the current Track mode selected in **Setup > Track Mode**.*

- For the Signal Display, select **Meter**.

This configuration, including the Signal Display format, affects the selected signal only.

Other signals retain their previously defined configuration until you change that signal.



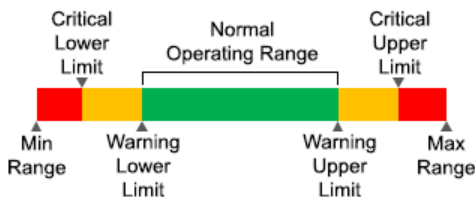
The screenshot shows the RF configuration interface. At the top, it displays 'RF: -38.03 dBm'. Below this, there are two dropdown menus: 'Signal:' set to 'SUM' and 'Signal Display:' set to 'Meter'. A red circle highlights these two dropdowns. To the right of the dropdowns is a color-coded bar representing the signal range, with labels for 'CRITICAL LOWER LIMIT', 'WARNING LOWER LIMIT', 'WARNING UPPER LIMIT', and 'CRITICAL UPPER LIMIT'. Below the dropdowns are six input fields for limits and ranges: 'Min Range (dB)' (-20.00), 'Critical Lower Limit (dB)' (-10.00), 'Warning Lower Limit (dB)' (-5.00), 'Warning Upper Limit (dB)' (5.00), 'Critical Upper Limit (dB)' (10.00), and 'Max Range (dB)' (20.00). At the bottom right are 'SAVE' and 'BACK' buttons.

- Specify the appropriate values:

- Min Range, Max Range** – Set the minimum and maximum values for the meter.
- Warning Lower Limit, Warning Upper Limit** – For the left (lower) and right (upper) side of the meter, these values indicate when the measured signal is leaving the normal operating range and entering the warning range.
- Critical Lower Limit, Critical Upper Limit** - For the left (lower) and right (upper) side of the meter, these values indicate when the measured signal is leaving the warning operating range and entering the critical range. A signal in this range will critically affect the operation of the system.

NOTE

In a meter, colored bars represent various ranges. Be sure to enter values that define each range in ascending numerical order.



- Press **Save**, and then press **OK** in the confirmation window.

2.3.1.2 Showing and Configuring a Chart

When the dashboard is showing:

1. Press the **Config** button.
2. For the Signal, select the signal you want to configure.

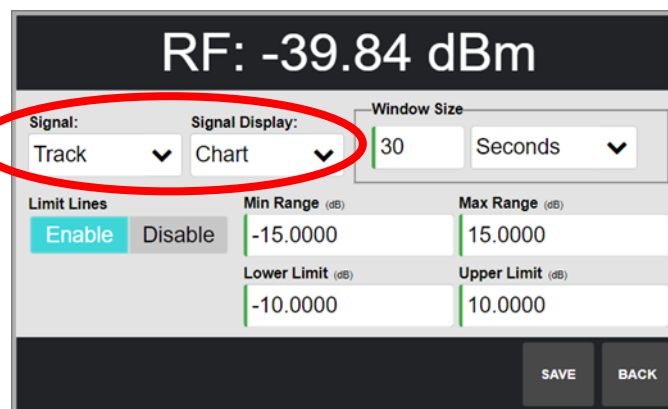
NOTE

*The available signals depend on the current Track mode selected in **Setup > Track Mode**.*

3. For the Signal Display, select **Chart**.

This configuration, including the Signal Display format, affects the selected signal only.

Other signals retain their previously defined configuration until you change that signal.

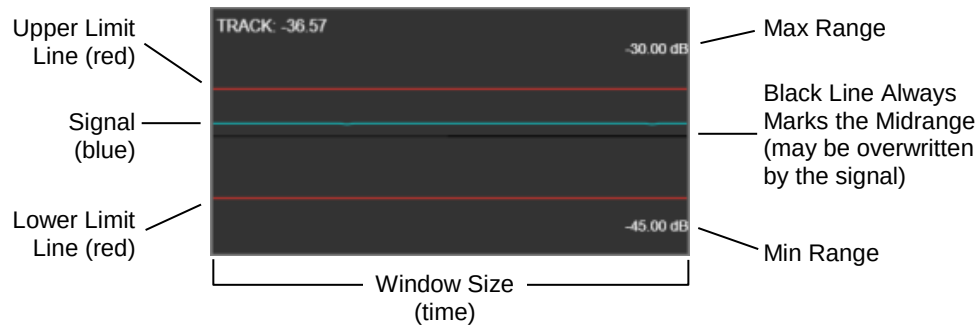


The screenshot shows a configuration window for an RF signal. At the top, it displays 'RF: -39.84 dBm'. Below this, there are two dropdown menus: 'Signal:' set to 'Track' and 'Signal Display:' set to 'Chart'. A red circle highlights these two dropdowns, with a red arrow pointing from the text 'This configuration, including the Signal Display format, affects the selected signal only.' to the circle. To the right of the dropdowns is a 'Window Size' section with a value of '30' and a unit of 'Seconds'. Below these are 'Limit Lines' controls with 'Enable' and 'Disable' buttons, where 'Enable' is selected. Further down are fields for 'Min Range (dB)' (-15.0000), 'Max Range (dB)' (15.0000), 'Lower Limit (dB)' (-10.0000), and 'Upper Limit (dB)' (10.0000). At the bottom right are 'SAVE' and 'BACK' buttons.

4. For each chart you want to configure, specify:
 - **Window Size** - Sets the X-axis (time) range on the chart from a minimum of 30 seconds up to 2 hours (or up to 18 hours, depending on your system). This is a continuous reading from right to left, where the information displayed graphically on the right side of the chart is the newest data set and the information on the left side is the oldest data set.
 - **Limit Lines** - When Enable is selected, red limit lines appear on the chart at the positions entered in the Lower Limit and Upper Limit fields. Limit lines provide a visual queue for determining if the displayed signal is within a specified range.
 - **Min Range, Max Range** – Set the lower and upper Y-axis range values for the chart.
 - **Lower Limit, Upper Limit** – When limit lines are enabled, sets the value (dB or deg, depending on the Signal) for the lower and upper limit lines.

NOTE

Be sure to set the limit line values so they fall within the defined Min/Max range.



5. Press **Save**, and then press **OK** in the confirmation window.

Zooming In on the Signal

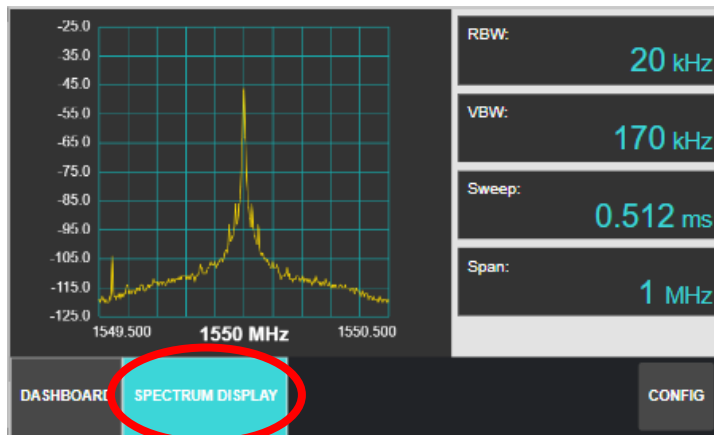
Sometimes the chart may be configured such that the signal is difficult to see. If so, set the **Max Range** and **Min Range** to values somewhat above and below the signal level. Be sure to leave some extra blank space for signal variations.

2.3.2 Showing the Spectrum Display

When acquiring a signal, you can use the spectrum display to determine if the antenna is pointed at the satellite such that the received signal is peaked. The signal is peaked sufficiently within tolerance if a peak waveform appears anywhere in the spectrum window.

From the main screen on the left panel:

- Press the **Spectrum Display** button.



The frequency at the center of the spectrum display is the specified beacon frequency of the satellite.

2.3.2.1 Configuring the Spectrum Display

When the spectrum display is showing:

1. Press the **Config** button.

Depending on your TRU, the Span field may fixed or selectable.

2. Enter the appropriate values for:

- **Auto Scale** – Press the appropriate button to specify whether the vertical Y-axis scale on the spectrum is determined automatically or manually.
 - **On** - The spectrum is scaled automatically according to the dynamic range of the spectrum.
 - **Off** - You need to enter the scaling values manually.
- **Center Frequency (display-only)** – Shows the Frequency value entered on the RF Mode screen.
- **Span** – Sets the total frequency width of the spectrum display, with the beacon frequency at the center. For some receivers, this width is fixed at 1000000 Hz. Other receivers let you select the span width.
- **Ref Level (1st value field, active only if Auto Scale = Off)** – Enter a reference level in dBm that will be shown on the spectrum, either at the Top or Middle as selected. (When Auto Scale = On, this field shows the reference level calculated by the receiver.)
- **Ref Level (2nd position field)** – Select whether the reference level is positioned at the Top or Middle of the spectrum.

NOTE

The spectrum's Y-axis is built around the reference level. If Ref Level = -32.5 Middle, the middle tick mark is set to -32.5 dBm and the tick marks above and below the middle are scaled according to the Auto Scale setting.

- **Scale (active only if Auto Scale = Off)** – Incremental signal strength (dBm) for each tick on the Y-axis. For example, if Ref Level = -30 Top and Scale = 10, the ticks down from the top of the graph are -30, -20, etc. (When Auto Scale = On, this field shows the scale calculated by the receiver.)

3. Press **Save**, and then press **OK** in the confirmation window.

Zooming In on a Spectrum Graph

Sometimes the spectrum may appear in the spectrum display window but is not positioned or scaled for best viewing.

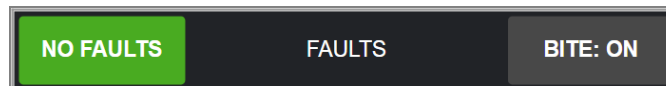
To zoom in:

- Set the **Ref Level** at the top such that the value is just above the highest point on the graph.
- Adjust the **Scale** value as necessary. In most cases, if you lower the Ref Level, you should decrease the Scale (such as changing it from 10 to 5) to spread the graph more evenly from top to bottom across the display.

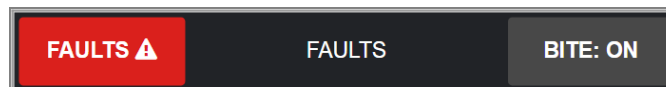
2.4 Viewing Fault and Status Information

2.4.1 Viewing and Acknowledging Fault Messages

If there are no existing system faults, the green **No Faults** indicator appears in the title bar of the 550A Home screen on the right panel. The indicator is always visible at the top of any screen on the right panel.



However, if one or more faults are active, the red **Faults** button appears in the title bar. When a new fault occurs, the TRU sounds an audible alarm (if the alarm is turned on).

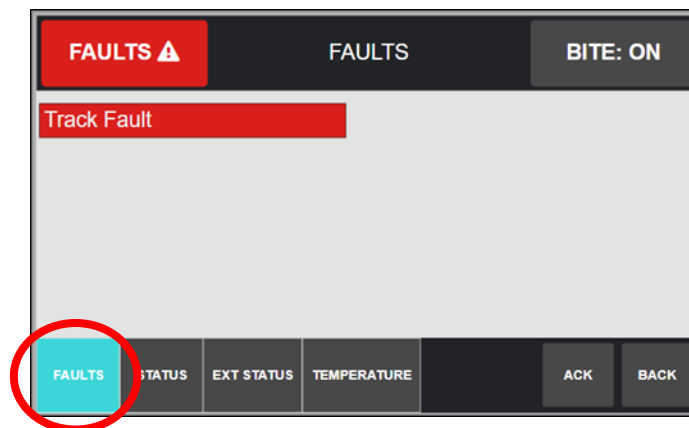


To view a list of active faults:

1. Press the **Faults** button.

By default, the Faults screen appears. You can switch between fault messages, status messages, external status bits, and the temperature of the receiver board by pressing the buttons along the bottom of the screen.

The Faults screen shows the current faults. Any unacknowledged faults are highlighted with a red background.



2. To acknowledge all unacknowledged faults, press **ACK**. This also stops the audible alarm.

NOTE

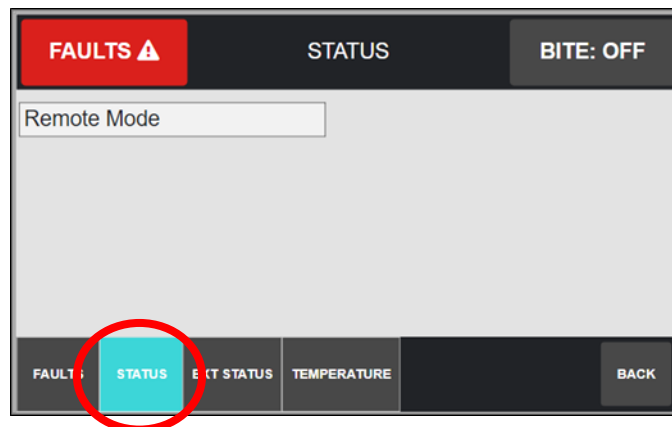
Acknowledging a fault indicates that you know the fault exists; it does not actually clear the fault. The underlying problem needs to be corrected. Then the system can clear the fault automatically and remove the fault from the list.

2.4.1.1 Viewing Status Messages

From any screen in the right panel:

1. Press the **Faults** button (or **No Faults**) in the title bar, and then press **Status** in the lower-left corner of the screen.

The Status screen shows all current status messages.

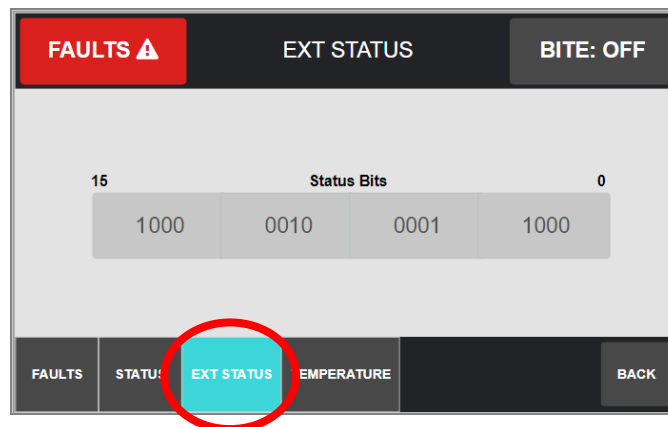


2.4.1.2 Viewing the External Status Bits

As described in Section 2.5.5.3, “Setting the External Status Bits as Pulled High or Low”, on page 2-24, up to 16 status bits from external devices such as LNAs and BDCs can be connected to the receiver. You can use the following screen to view the value of each external status bit.

From any screen in the right panel:

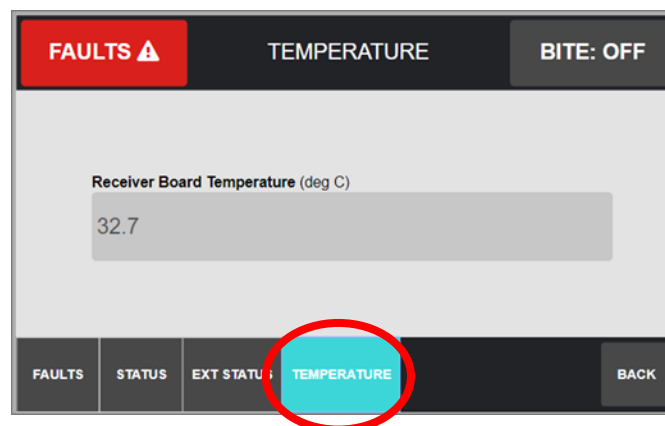
- Press the **Faults** button (or **No Faults**) in the title bar, and then press **Ext Status** at the bottom of the screen.



Bits that show a **1** indicate a fault in the corresponding external device.

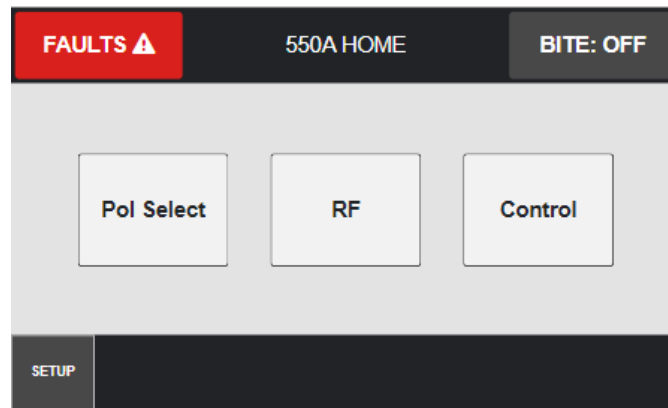
2.4.1.3 Viewing the Temperature of the Receiver Board

1. Press the **Faults** button.
2. Press **Temperature** at the bottom of the screen.



2.5 Using the 550A Home Screen on the Right Panel

The right display panel lets you access all of the Model 550A's operational parameters.



Several common operational parameters can be set directly from a button on the top-level 550A Home screen. Other parameters are set on various sub-screens accessible through the **Setup** button in the lower-left corner of the 550A Home screen.

NOTE

From any of the lower-level screens, you can always return to the 550A Home by pressing the Back button until the screen reappears.

The following outline shows the menu structure under the top level 550A Home screen.

- 550A Home
 - |----- POL Select
 - |----- RF
 - |----- Control
 - |----- Setup (button in lower-left corner)
 - |----- Track Mode
 - |----- Monopulse
 - |----- Ext Status
 - |----- Maintenance
 - |----- Display Settings
 - |----- Network Config
 - |----- Software Update
 - |----- BITE Gen
 - |----- DAC Output
 - |----- Serial Port
 - |----- Band Table
 - |----- Autophase
 - |----- Software Versions

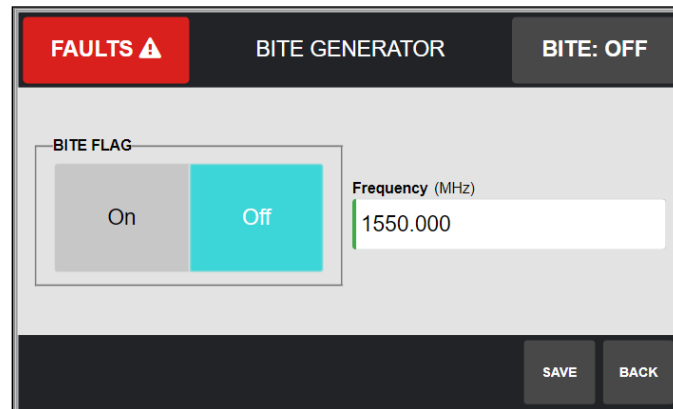
2.5.1 Testing the Unit with the BITE Generator

By using the Built-In Test generator, you can test the RF front-end at a specified frequency without connecting an RF source input to the rear panel.

From the 550A Home screen on the right panel:

1. PRESS the Setup button (lower left) – brings up Setup/Functions below

Press **BITE Gen.**



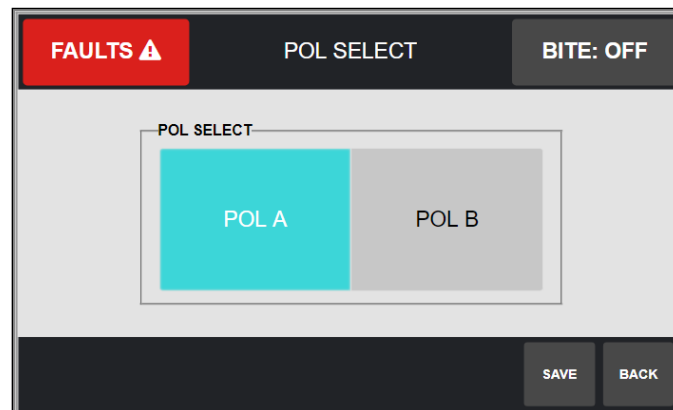
2. Specify the appropriate settings.
 - **BITE Flag** – Turns the BITE generator on and off. During normal operations, leave the BITE generator turned off.
 - **Frequency** – Enter a BITE generator frequency between 950 and 2150 MHz. (The frequency is in either MHz or GHz depending on the Frequency Unit setting on the Control screen.) The current settable resolution is 1 MHz.
3. Press **Save**, and then press **OK** in the confirmation window.
4. To display the BITE signal spectrum, refer to Section 2.3.2 on page 2-10.

2.5.2 Selecting a POL Option

For receivers that use polarization, the POL Select screen lets you select between two polarization types referred to as POL A and POL B. The exact polarization type for each setting (such as LCHP or RHCP for Circular polarization, or Horizontal or Vertical for Linear polarization) depends on the polarization connections for your TRU. The connector assignments for the RF inputs are shown in a table on the TRU cover.

From the 550A Home screen on the right panel:

1. Press **POL Select**.



2. Select the appropriate setting.
 - **Pol A** – Uses the “A” polarization.
 - **Pol B** – Uses the “B” polarization.
3. Press **Save**, and then press **OK** in the confirmation window.

2.5.3 Setting the RF Parameters

The RF Mode screen sets the various RF parameters used by the receiver during acquisition and tracking of the satellite's beacon frequency.

From the 550A Home screen on the right panel:

1. Press **RF**.

The screenshot shows the 'RF MODE (DIGITAL)' screen. At the top, there are three buttons: 'FAULTS' with a warning icon, 'RF MODE (DIGITAL)', and 'BITE: OFF'. Below these are four input fields: 'Frequency (MHz)' with the value '1550.000', 'Bandwidth (kHz)' with a dropdown menu showing '4.0 kHz', 'Signal Offset (dB)' with the value '0.0', and 'Auto Sweepwidth (kHz)' with the value '± 120'. At the bottom right, there are two buttons: 'SAVE' and 'BACK'.

2. Specify the appropriate settings.

- **Frequency** – The satellite's beacon frequency, in MHz or GHz depending on the Frequency Unit setting on the Control screen.
- **Bandwidth** – Select the bandwidth selections for narrow band signal acquisition. Monopulse tracking is supported for the wider bandwidth selections while the noise floor drops with the choice of narrower bandwidths.
 - **1.0 (kHz)** - Select this option if a lower noise floor is required in a monopulse tracking application.
 - **4.0 (kHz)** - The default bandwidth selection for the tracking receiver.
 - **250.0 (kHz)** - The widest of the narrow band receiver bandwidths for which monopulse tracking is supported. Select this option if the system needs to use monopulse tracking on a broadband carrier signal rather than a beacon.
- **Signal Offset** – Used to report signal power offset relative to another point in the system. *Unlike the Attenuation value, changing Signal Offset does affect the reported signal strength.*
- **Auto Sweepwidth** – Enter a value to indicate how far the receiver will search for the beacon signal to either side of the specified Frequency value. For example, if Auto Sweepwidth = ± 110 , the receiver will search within a 220 kHz range centered around the Frequency value.

3. Press **Save**, and then press **OK** in the confirmation window.

More About Bandwidths

When choosing a bandwidth, the tradeoff between update rate and receiver sensitivity must be made. While a narrow bandwidth provides the best sensitivity in terms of dB-Hz, it comes at the cost of update rate. For all bandwidths, the beacon's frequency "location" is identified and tracked within a 1.0 MHz band FFT. However, the signal power is computed based on the bandwidth around the beacon's location. For the 250 kHz choice, the receiver does not search for the beacon. The signal strength is calculated over a 250 kHz bandwidth about the tune frequency. This option is typically chosen when the antenna is tracking on a broadband data carrier rather than a beacon frequency.

NOTE

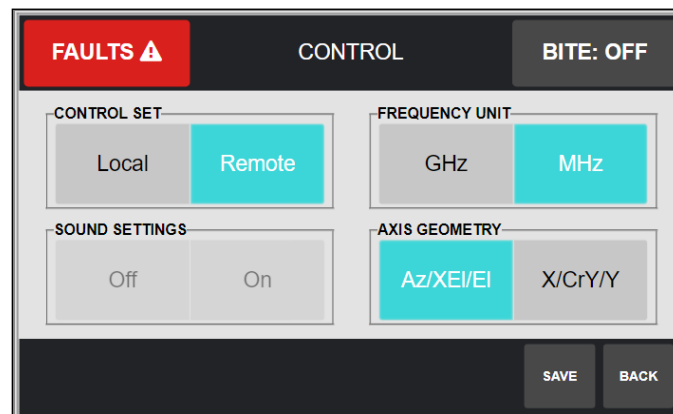
For monopulse tracking, only the 4.0 kHz bandwidth is recommended. The 1.0 kHz bandwidth update rate is generally inadequate for most monopulse applications.

2.5.4 Configuring General TRU Settings (including Local vs. Remote Control)

The Control screen lets you access general control functions related to the Model 550A itself, rather than the satellite beacon.

From the 550A Home screen on the right panel:

1. Press **Control**.



2. Specify the appropriate settings.
 - a. To switch between Local and Remote control, use the **Control Set** buttons.
 - **Local** – Operators at the TRU can use its front panel to change the operating parameters.
 - **Remote** – Parameters can only be changed by a host system.
 - b. To display frequencies in **GHz** or **MHz**, press the corresponding **Frequency Unit** button.
 - c. To turn the audible alarm **Off** or **On**, press the corresponding **Sound Settings** button.

NOTE

The alarm is normally activated when a fault occurs and continues until the fault is acknowledged. If the alarm is turned off, faults continue to be listed on the Fault screen as they occur.

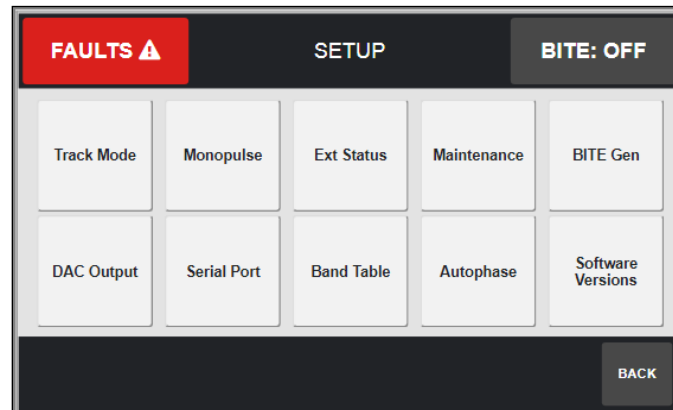
- d. To specify whether the TRU uses nomenclature consistent for an antenna that uses an Elevation-over-Azimuth axis geometry (most common) or an X/Y axis geometry, press the corresponding **Axis Geometry** button.
 - **Az/XE/El** – Appropriate field names use Elevation-over-Azimuth nomenclature.
 - **X/CrY/Y** – Appropriate field names use X/Y axis nomenclature.
3. Press **Save**, and then press **OK** in the confirmation window.

2.5.5 Displaying the Setup Menu

The Setup menu is used to configure the operating parameters for the tracking receiver.

From the 550A Home screen on the right panel:

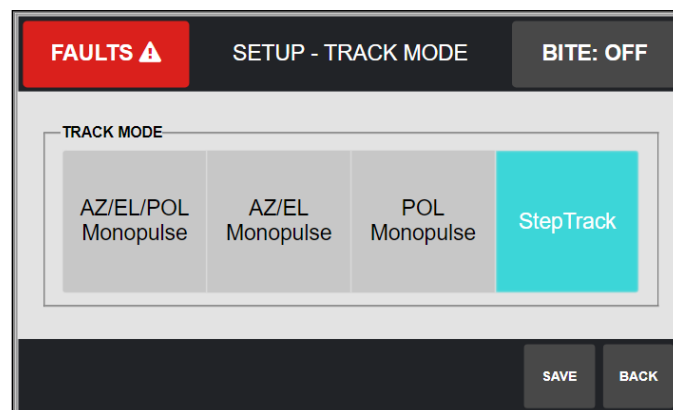
- Press **Setup** in the lower-left corner of the Home screen to display the Setup menu.



2.5.5.1 Setting the Track Mode

From the 550A Home screen on the right panel:

1. Press **Setup > Track Mode**.



NOTE

StepTrack is available on all systems. Monopulse modes are available only on antennas fitted with an appropriate scan plate.

2. Press the appropriate Track mode button.

- **AZ/EL/POL Monopulse** – For systems with scan plates designed for single-channel monopulse tracking in all three system axes.
- **AZ/EL Monopulse** – For systems with scan plates designed for single-channel monopulse tracking in the AZ and EL axes.
- **POL Monopulse** – For systems with scan plates designed for single-channel monopulse tracking in only the Polarization axis.
- **StepTrack** – For systems that do not have scan plates designed for single-channel monopulse tracking. StepTrack can also be used on single-channel monopulse tracking systems as a backup track mode.

3. Press **Save**, and then press **OK** in the confirmation window.

2.5.5.2 Configuring Monopulse Tracking Performance

From the 550A Home screen on the right panel:

1. Press **Setup > Monopulse**.

2. Specify the appropriate settings.

- **Monopulse Scan** – Select which monopulse scan option to use.
 - **Constant** - Uses a rate monotonic update of the modulation phases in the scan plate of the antenna. That is, the duration of positive and negative phase shifts sent to the scan plate are constant; they never change.
 - **Random** - Uses pseudo-random updates of the modulation phases in the scan plate of the antenna. That is, the duration of positive and negative phase shifts sent to the scan plate change from one scan cycle to the next.
 - **Off** - Turns off the monopulse modulation of the scan plate. The receiver does not calculate monopulse error signals.
- **Track Fault: Reset button** – Refer to Section 2.5.5.2.1, “Clearing Persistent Monopulse Track Faults”, on page 2-23.

- **XEL Scale (CrY Scale)** - Used to set the tracking slope for the antenna in the cross-Elevation axis (secant corrected AZ axis). Set the value according to:

$$XEL\ Scale = \frac{0.5\ Volts}{\frac{1}{2} \times (XEL\ 3dB\ Beamwidth)}$$

- **EL Scale (Y Scale)** - Used to set the tracking slope for the antenna in the Elevation axis. Set the value according to:

$$EL\ Scale = \frac{0.5\ Volts}{\frac{1}{2} \times (EL\ 3dB\ Beamwidth)}$$

- **POL Scale** - Used to set the tracking slope for the antenna in the Polarization axis. Set the value according to:

$$POL\ Scale = \frac{0.5\ Volts}{\frac{1}{2} \times (POL\ Rotation\ for\ 3dB\ Beamwidth)}$$

3. Press **Save**, and then press **OK** in the confirmation window.

2.5.5.2.1 Clearing Persistent Monopulse Track Faults

Track faults may occur when the receiver is commanded to a beacon frequency outside the currently active frequency band. When the frequency band changes, the receiver assumes that the LNA and BDC configuration also changes, leading to a need for updated phase shifts in the scan plate's phase shifter. Track faults also occur when the external status bits change, which happens when baseband switch settings are changed or if there is a failure in one of the RF boxes.

To clear a persistent track fault:

- Press **Setup > Monopulse**, and then press the **Reset** button.

This clears the current track fault and records the current external/BDC status. If the BDC or LNA configuration changes again, another track fault will be issued.

NOTE

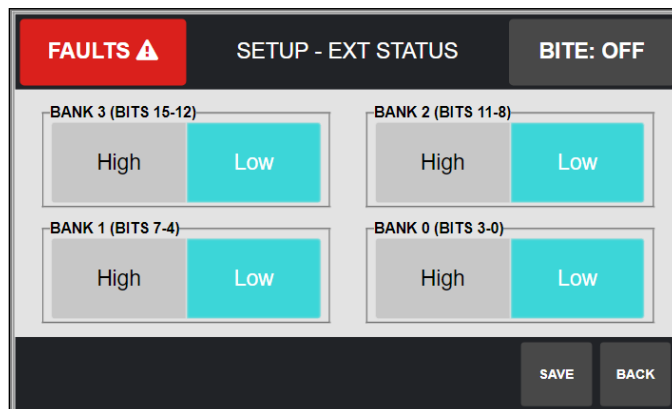
*You do not need to press **Reset** when the loss of tracking is simply due to signal fade. The receiver will automatically clear the track fault when the signal comes back up.*

2.5.5.3 Setting the External Status Bits as Pulled High or Low

Status lines from external devices can be connected to the receiver's 16 status bit inputs. These status bits are divided into four separate banks, each with four bits. The Ext Status screen lets you configure each bank as pulled Low or High. To view the resulting values of all individual status bits as 0s or 1s, refer to Section 2.4.1.2 on page 2-14.

From the 550A Home screen on the right panel:

1. Press **Setup > Ext Status**.



2. For Bank 3 through Bank 0, configure the external status lines for the associated bits as **Low** or **High**.

NOTE

The window shows which bits are associated with each bank. For example, Bank 3 uses bits 12 through 15.

- **Low** – Causes the external status lines for the associated bits to be pulled down by default. Use this setting if LNAs and BDCs connected to these bits use pull-ups to signal faults.
- **High** – Causes the external status lines for the associated bits to be pulled up by default. Use this setting if LNAs and BDCs connected to these bits use pull-downs to signal faults.

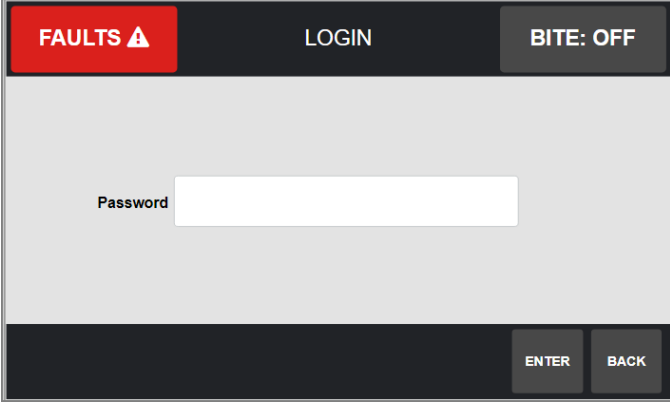
3. Press **Save**, and then press **OK** in the confirmation window.

2.5.5.4 Accessing the Maintenance Functions

The Maintenance functions are used to change the display's brightness and contrast, set up network IP addresses, and update the TRU software. Because these functions are intended to be performed by qualified personnel, the Maintenance menu is password-protected. Performing these functions incorrectly can seriously affect the TRU's performance.

From the 550A Home screen on the right panel:

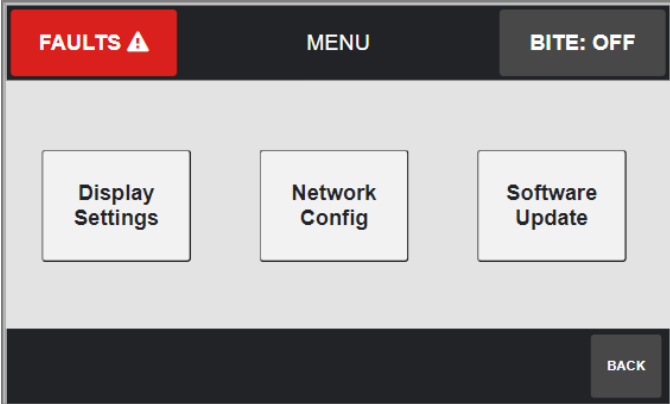
1. Press **Setup > Maintenance**.



The screenshot shows a login interface. At the top, there is a header bar with three sections: a red button labeled 'FAULTS' with a warning triangle icon, a 'LOGIN' label, and a 'BITE: OFF' status indicator. Below the header is a large light gray area containing a 'Password' label and a white text input field. At the bottom right of this area are two buttons: 'ENTER' and 'BACK'.

2. Enter your password. (The default is **1397**.)

The Maintenance menu opens.



The screenshot shows the Maintenance Menu. The header bar is identical to the previous screen, with 'FAULTS', 'MENU' (instead of LOGIN), and 'BITE: OFF'. The main area is light gray and contains three white rectangular buttons arranged horizontally: 'Display Settings', 'Network Config', and 'Software Update'. At the bottom right, there is a 'BACK' button.

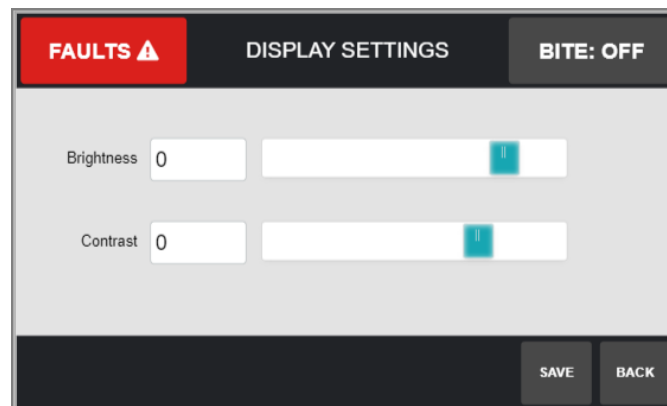
2.5.5.4.1 Adjusting the Display Brightness and Contrast

As necessary, you may need to adjust your ACU screen's brightness and/or contrast for best viewing.

NOTE

This procedure affects the 550A ACU screen only and does not affect a remote-client computer. If you use a remote client to change the contrast and/or brightness, you will not see any change on your computer screen. However, your changes will affect the 550A ACU and may severely affect a local operator's view. Therefore, it is recommended that you do not make any adjustments using a remote client.

1. Open the password-protected Maintenance menu as described on page 2-25.
2. Press **Display Settings**.



3. To change the brightness and contrast, either:
 - Press and move the sliders for each setting. The Brightness and Contrast field values update accordingly.
 - Press the Brightness and Contrast fields and enter a value directly.

Typical values depend on the internal display board used in your ACU. However, you might start with either Brightness = 0 and Contrast = 0, or Brightness = -75 and Contrast = -45. For the combination that works best for your display, you may then need to adjust the settings around those values.
4. Press **Save**, and then press **OK** in the confirmation window.

2.5.5.4.2 Configuring the Network IP Address

The TRU ships with a default IP addresses in the 10.165.50.xxx subnet. Both the front-panel display card and the tracking receiver card have IP addresses. If the TRU is installed in an antenna control LAN that uses a different subnet, you need to change the IP address of the cards.

1. Open the password-protected Maintenance menu as described on page 2-25.
2. Press **Network Config**.

The screenshot shows the 'NETWORK CONFIG' menu. At the top, there are three tabs: 'FAULTS' (with a warning icon), 'NETWORK CONFIG' (selected), and 'BITE: OFF'. Below the tabs, there are two sections: 'DISPLAY CARD' and 'RECEIVER CARD'. Each section has a 'MAC Address' field and an 'IP Address' field. The 'DISPLAY CARD' MAC Address is '00:19:0F:2D:89:F7' and its IP Address is '10.165.50.152'. The 'RECEIVER CARD' MAC Address is '00:0B:4E:03:12:34' and its IP Address is '10.165.50.200'. At the bottom right, there are 'SAVE' and 'BACK' buttons.

- **MAC Address (display-only)** – Shows the MAC address of the corresponding card.
 - **IP Address** – Shows the IP address of the corresponding card.
3. If you need to change the IP address for one or both cards:
 - a. Enter the new address.
 - b. Press **Save**, and then press **OK** in the confirmation window.

NOTE

New IP addresses do not take effect until after the next power cycle on the TRU chassis.

WARNING

*The front panel and receiver board IP addresses must be on the same **255.255.255.0** subnet. If they are not, the Ethernet link between the front panel and the receiver will not operate, and the screens will go down. If this happens and the receiver's IP address is not known, remove the lid and power cycle the unit. The current IP address will be echoed one character at a time on the LED display.*

2.5.5.4.3 Updating the TRU Software

Use the Software Update screen to perform a software upgrade for the front panel's display card or the receiver card. When you perform an upgrade, the TRU saves a copy of the current software before it starts the upgrade. This lets you revert to the previous version if needed.

NOTE

- When upgrades are available, CPI SAT will provide the necessary upgrade files.
- On the 4RU, software can be upgraded via the ACU of the Model 950A control system. Refer to the separate Model 950A O&M Manual.

CAUTION

Ensure the power is stable (for example, with UPS power) throughout the upgrade. Do not manually power cycle the TRU until prompted to do so. A power interruption during an upgrade may corrupt the software and require assistance from CPI SAT.

1. Open the password-protected Maintenance menu as described on page 2-25.
2. If the upgrade files were not provided on a USB drive, load the files to the root folder of a USB drive.
3. Connect the USB drive to the USB port on the TRU.
4. Press **Software Update**.

By default, the screen shows upgrade/revert information for the display card.

5. Along the bottom of the screen, press the appropriate button to select the card (display or receiver) whose software you want to upgrade.

The Upgrade area shows the version number of the upgrade software on the USB.

Note: To see the current version, use **Setup > Software Versions**.

The Revert area shows the previous version number saved in storage.

6. Press **Upgrade**, and then press **OK** in the confirmation window. (The confirmation window reminds you that the TRU must be rebooted after the upgrade.)

The TRU performs the upgrade using the files on the USB drive. The Status box displays messages during the upgrade to show any problems that may occur.

NOTE

During software updates, different versions of the TRU may either (a) prompt the user to manually power cycle or (b) automatically power cycle. Follow on-screen messages to complete the upgrade process. Do NOT attempt to manually power cycle unless directed.

During the upgrade, the TRU screens may go blank or flash. The TRU may also reboot itself several times and display informational messages. These are normal events. Unless directed by an on-screen message, do not attempt to power cycle the TRU or remove the USB drive during these times. The upgrade may take up to 10 minutes to complete.

7. When prompted after the upgrade, reboot the TRU.

2.5.5.4.3.1 Reverting to the Previous Software Version

If the upgrade does not operate properly, you can revert to the previous version.

NOTE

- *Each time you perform a display or receiver upgrade, the current version is saved as a backup. The backup always overwrites the previously saved backup. Therefore, only the most recent previous version is available for a revert.*
- *Certain upgrades, such as major upgrades, may remove the revert option in situations where a revert might cause an issue.*

1. Open the password-protected Maintenance menu as described on page 2-25.
2. Press **Software Update**.
3. Along the bottom of the screen, press the appropriate button to select the card whose software you want to revert.
4. Press **Revert**, and then press **OK** in the confirmation window. (The confirmation window reminds you that the TRU must be rebooted after the revert.)

The TRU performs the revert using the previously saved backup version. The Status box displays messages during the revert process to show any problems that may occur.

5. When prompted after the upgrade, reboot the TRU.

2.5.5.5 Testing the Unit with the BITE Generator

The Built-In Test generator lets you test the RF front-end at a specified frequency without connecting an RF source input to the rear panel. You can open the BITE Generator screen by pressing **Setup > Bite Gen** or you can also open it directly from the 550A Home screen.

For information about the screen, refer to Section 2.5.1, "Testing the Unit with the BITE Generator", on page 2-16.

2.5.5.6 Configuring the DAC (Digital-to-Analog Conversion) Output

For systems that require analog TRU signals such as external UPC applications or for test devices such as a stripchart recorder, you can set up DAC outputs. To scale the output voltage and the beacon signal strength appropriately, you need to specify the analog ranges. The DAC voltage is output on connector J2 pin 1 on the receiver's back panel.

For applications requiring external monitoring of signal strength, two methods are provided:

1. **DAC Output (Preferred):** Analog output proportional to signal strength. Provides redundancy to Ethernet or Serial network outages or antenna control system failures since the DAC output is a direct sample of the signal without associated communications overhead.
2. **M&C Status:** Status command allows signal strength to be polled over an Ethernet or Serial network. Signal may be lost in cases of Ethernet or Serial network outages or antenna control system failures.

From the 550A Home screen on the right panel:

1. Press **Setup > DAC Output**.

2. For the Output Voltage Range:
 - **Range** – Select one of the preset voltages ranges: 0 to 10 V, -5 to 5 V, or -10 to 10 V.
 - **Output Min, Output Max (display-only)** – Show the selected range.
3. For the Nominal Signal Strength Range:
 - **Range** – Select either -105 to -5 dBm or Custom.
 - **Signal Min, Signal Max (display-only if Range = -105 to -5)** – Show the selected range.
 - **Signal Min, Signal Max (active if Range = Custom)** – Enter the lower (Min) and upper (Max) dBm values for the custom range.

4. Enter the filter values.
 - **Sum Filter** – Bandwidth for the first-order filter applied to the analog voltage representation of the beacon signal strength.
 - **Error Filter** – Bandwidth for the first-order filter applied to the analog voltage representations of the tracking error signals.
5. Press **Save**, and then press **OK** in the confirmation window.

For Help Setting the DAC Output Parameters

To display a window that shows Help information:

- Press the **Help** button at the bottom of the DAC Output screen.

2.5.5.7 Configuring the Serial Port

For host systems that use a serial connection to the TRU, you must configure the receiver's serial port to be compatible with the host.

From the 550A Home screen on the right panel:

1. Press **Setup > Serial Port**.

The screenshot shows the 'SETUP - SERIAL PORT' configuration window. The top bar includes a red 'FAULTS' button with a warning icon, the title 'SETUP - SERIAL PORT', and a 'BITE: OFF' indicator. The main area contains four configuration sections: 'Serial Port' with a dropdown menu set to 'RS232'; 'Parity' with three radio buttons where 'Odd' is selected; 'Baud Rate' with a dropdown menu set to '9600'; and 'Stop Bit' with two radio buttons where '2' is selected. At the bottom right, there are 'SAVE' and 'BACK' buttons.

2. Select the appropriate settings to configure the serial port.
 - **Serial Port** – Select the protocol as **RS232** or **RS422**.
 - **Baud Rate** – Select the baud rate as **1200**, **2400**, **4800**, **9600**, **19200**, or **38400**.
 - **Parity** – Set the parity as **None**, **Odd**, or **Even**.
 - **Stop Bit** – Set the number of stop bits as **1** or **2**.
3. Press **Save**, and then press **OK** in the confirmation window.

NOTE

Any changes do not take effect until after the next power cycle on the tracking receiver chassis.

2.5.5.8 Configuring the Band Table

Use the Band Table to configure the receiver for operation with multiple frequency bands. The center frequency is compared to the frequency band table to identify the correct frequency translation to the native frequency band (L-band) of the tracking receiver. For example, given a Band Table Entry with Start frequency 17.7 GHz, Stop 18.9 GHz, and LO 16.75 GHz and a user entered Center frequency of 17.895 GHz, the internally translated frequency is $17.895 - 16.75 = 1.145$ GHz. The receiver then internally tunes to the L-band frequency of 1.145 GHz.

From the 550A Home screen on the right panel:

1. Press **Setup > Band Table**.

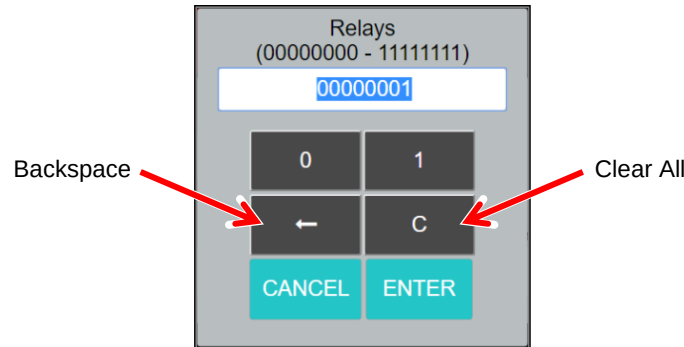
2. Select the appropriate settings to configure each frequency band.

- **Table Entry** – Select which frequency band (1 – 15) you want to configure.

NOTE

*You can also press ▲ and ▼ under **Quick change table** to cycle through the frequency bands.*

- **Relays** – Shows the Relay bits that drive band-select low-side switches and high-side BDC switches when the beacon frequency falls in the band. The Relay entries should be distinct for each frequency band. These bits are set according to the discrete logic used to control the RF transfer (baseball) switches in the downlink. To set the Relays value:
 - a. Press the field to open the Relays window.



b. Press **0** or **1** as necessary to set all the bits.

c. Press **Enter**.

- **Start** – Enter the starting frequency for the selected frequency band. The units are either MHz or GHz as shown. The **Start** frequency must be greater than 0 and lower than the **Stop** frequency.
- **Stop** – Enter the ending frequency for the selected frequency band. The units are either MHz or GHz as shown. The **Stop** frequency must be greater than the **Start** frequency and less than or equal to 50 GHz.
- **Local Osc** – Enter the frequency of the local oscillator for the frequency band. The difference between the local oscillator frequency and the **Start** and **Stop** frequencies should result in an equivalent L-band range of 890 MHz to 2150 MHz.

NOTE

*The **Local Osc** frequency may be either a low-side LO with a frequency less than or equal to the **Start** frequency or a high-side LO with a frequency greater than or equal to the **Stop** frequency.*

3. After you finish making changes, press **Save** and then press **OK** in the confirmation window.

The receiver checks the currently entered beacon frequency to see if it is still valid. If changes to the frequency band table have rendered the beacon frequency invalid, the receiver resets the beacon frequency to the **Start** frequency of the most recently entered band.

2.5.5.9 Setting the Autophase Parameters and Phasing the System

For monopulse tracking modes, the Autophase parameters are used to phase the scan plate and monitor the phase shift angles that the ACU sends to the TRU. This section describes the parameters on the Autophase screen and also gives the procedures for using the screen to phase the system automatically or manually.

From the 550A Home screen on the right panel:

1. Press **Setup > Autophase**.

2. Specify the appropriate settings.

- **Algorithm** – Select whether to calculate the phase angles by using the Minimum or Maximum algorithm.
 - **Min (Minimum)** - To use this algorithm, the antenna must be moved off of peak beacon strength in one axis while phasing is performed in the orthogonal axis. This algorithm cycles the phase shifter and measures the monopulse tracking errors, looking for zero crossings. The zero crossings correspond to zero cross-coupling of tracking error from the axis being phased which is the desired effect for movement in an orthogonal axis.

If an operator is using the TRU screens to phase the antenna with the **Min** algorithm, it is necessary to manually use the ACU to move the antenna off of beam peak in the orthogonal axis prior to phasing.
 - **Max (Maximum)** - To use this algorithm, the antenna must be moved off of peak beacon strength in the same axis as the phasing is performed. This algorithm cycles the phase shifter and measures the monopulse tracking errors, looking for the positive and negative extrema in the error signal. The peak and valley in the error sine wave correspond to maximum error signal strength and the corresponding phase shifts are used to determine the in-axis phase shift.

If an operator is using the TRU screens to phase the antenna with the **Max** algorithm, it is necessary to manually use the ACU to move the antenna off of beam peak in the axis being phased prior to phasing.

- **Mode** – Selects whether the axes will be autophased or phased manually.
 - **Auto** - Enables the autophasing algorithms and the **Phase XEL** and **Phase EL** buttons. Pressing this button does not start the phasing process; it merely configures the TRU for autophasing.
 - **Manual** - Configures the TRU for manual phasing of the antenna. To manually phase the antenna, select this option and enter phase shifts into the XEL Phase, EL Phase, and POL Phase fields.
- **Autophase State Machine Status (display-only)** – Shows the current status or state of the autophase state machine.
 - **OK** - The system has been phased and is operating with valid phase shifts or that one axis has been successfully phased during an autophase procedure.
 - **Phasing** - The autophase algorithm is actively phasing either the XEL or EL axis.
 - **Phasing Error** - An error occurred during an autophase procedure. Phasing errors occur if the zero crossings found by the minimum autophase algorithm are not separated by $180^{\circ} \pm 15^{\circ}$. A phasing error is also declared if a Track Fault occurs while the system is phasing.
- **Phase (active only when Mode = Auto)** – Used to autophase each axis.
 - **XEL (CrY if configured for X/Y antenna)** - Press to initiate autophasing of this axis. After pressing this button, wait until the **EL** or **Save** button becomes highlighted before performing any other operation.
 - **EL (Y if configured for X/Y antenna)** - Press to initiate autophasing of this axis. After pressing this button, wait until the **XEL** or **Save** button becomes highlighted before performing any other operation.
- **XEL Phase, EL Phase, POL Phase** – These fields have different functions depending on whether the Mode is set to **Auto** or **Manual**.
 - In **Auto** mode, these fields display the currently active phase shift values. When the system is actively phasing the system, the value shown in this field is not valid and remains invalid until **Save** (or **Undo**) button is selected.
 - In **Manual** mode, use these fields to enter a phase shift value for each axis.

NOTE ABOUT POL PHASING

To optimize the POL Phase shift, increase the POL Phase until the signal strength begins to reduce. Then choose the phase shift value that gives the largest negative value for the displayed POL axis monopulse error.

3. The **Save** and **Undo** buttons become active when both the XEL and EL axes have been successfully phased in an autophase procedure. Press the appropriate button.
 - **Save** – Accepts the phase shifts that have been found and stores them in the TRU's non-volatile memory.
 - **Undo** – Rejects the phase shifts that have been found and reverts the TRU back to the phase shifts it was operating with previously.

Displaying the Help Window

To view basic instructions for using the maximum algorithm in an autophase procedure:

- Press the **Help** button.

2.5.5.9.1 Manually Phasing the System

On the Autophase screen:

1. For the Mode, press **Manual**.

NOTE

For the following steps, check the XEL Error, EL Error, and POL Error displays on the left panel screen's dashboard.

2. In the XEL Phase field, enter a phase shift value and adjust it as necessary to maximize the XEL error channel and minimize the EL error cross-channel.
3. Similarly, adjust the appropriate phase shift values in the EL Phase and POL Phase fields.
4. Press **Save**, and then press **OK** in the confirmation window.

When you save a new number in manual mode, the receiver starts using the new phase shift value immediately to develop the error on the respective channel. *This value is also stored in non-volatile memory so it is retained the next time the unit is power cycled.*

2.5.5.9.2 Autophasing the System

NOTE

It is imperative that the antenna be pointed off beam by the antenna control system in the appropriate axis before autophasing that axis.

On the Autophase screen:

1. For the Mode, press **Auto**.
2. For the Algorithm, press either **Min** or **Max** to select the desired algorithm.
3. For the Phase, press **XEL** to begin autophasing the XEL axis.

NOTE

*To abort the autophase procedure, press **Undo** at the bottom of the screen to return to the values used before you began autophasing.*

When the XEL autophase is complete, the calculated phase angle is shown in the XEL Phase field and the **EL** button becomes active.

4. Press **EL** to begin autophasing the EL axis.

When the EL autophase is complete, a “Phasing Completed” message appears on the screen and the calculated phase angle is shown in the EL Phase field.

At this stage, the calculated XEL and EL phase values are being used, but they have *not been stored* in non-volatile memory.

5. If the values are acceptable, press **Save** at the bottom of the screen to store the values. Otherwise, press **Undo** to return to the values used before you pressed **XEL** or **EL**.

2.5.5.10 Displaying Software Version Numbers

You can display the software version numbers for the front panel display card and the receiver card.

From 550A Home screen on the right panel:

- Press **Setup > Software Versions**.

The screenshot shows a software interface with a dark header bar containing three buttons: 'FAULTS' with a warning icon, 'SOFTWARE VERSIONS' (which is highlighted), and 'BITE: OFF'. Below the header, there are two main sections. The first section is titled 'DISPLAY CARD' and contains three fields: 'Software' with the value '1.0.182', 'Date' with '2018/10/18', and 'Time' with '05:46:54'. The second section is titled 'RECEIVER CARD' and contains four fields: 'Software' with 'D3.1.710', 'Date' with '2018/09/07', 'Time' with '14:50:30', 'Hardware' with '6', and 'FPGA' with '16'. At the bottom right of the screen is a 'BACK' button.

NOTE

The Receiver Card area includes the hardware revision number for the tracking receiver board and the revision number for the FPGA on the tracking receiver board.

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SECTION 3 - OPERATING IN REMOTE MODE

NOTE

*On the 2RU version, options for the Remote mode can be set on the front panel. The 4RU version does not have controls on the front panel and always operates in Remote mode. **Refer to the separate Model 950A O&M Manual for details about setting options for the 4RU.***

3.1 Remote Interfaces

The Model 550A tracking receiver has several remote interfaces. The Ethernet port and a configurable RS-232/RS-422 serial port are digital interfaces that accept M&C commands from a host system. The External Status Bit interface is used to monitor the status bits on external RF equipment such as LNAs and BDCs. If an antenna control system is unable to command the Model 550A via the Ethernet or serial port interfaces, it can still receive signal strength and tracking information via the DAC generated analog outputs.

The tracking receiver accepts a suite of commands through either the Ethernet or serial port. Commands are processed inside the receiver on a first come, first served basis and no distinction is made concerning the port on which the command is received. For detailed information on how to interface host systems to the tracking receiver, contact CPI Satcom & Antenna Technologies Inc.

3.1.1 Ethernet Port Interface

The Ethernet port interface is the primary means for a host system to communicate with the Model 550A tracking receiver. The host system can load parameters and request parameter values. Because the Model 550A does not provide any broadcast capabilities, the host system must poll the Model 550A to update its copy of receiver parameters.

To simplify the integration of the tracking receiver into a host network, the receiver board's Ethernet IP address is flexible. On the 2RU, use the **Setup > Maintenance > Network Config** screen to view or modify the current IP address. If the IP address is changed, the new value is stored immediately in EEPROM, but it does not take effect until unit power is cycled. This prevents a sudden interruption in the Ethernet communications.

WARNING

*The front panel and receiver board IP addresses must be on the same **255.255.255.0** subnet. If they are not, the Ethernet link between the front panel and the receiver will not operate, and the screens will go down. If this happens and the receiver's IP address is not known, remove the lid and power cycle the unit. The current IP address will be echoed one character at a time on the LED display.*

3.1.2 Serial Port Interface

One configurable RS-232/RS-422 serial port is available for remote control and monitoring. On the 2RU, use the **Setup > Serial Port** screen to configure the port so it is compatible with the host system. In this screen, the port can be set up to support either the RS-232 or the RS-422 standard. Additionally, a baud rate of 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19.2 kbps, or 38.4 kbps may be chosen. The serial port has 8 data bits, 1 stop bit, and odd parity. If the protocol or baud rate is changed, they will be stored in the EEPROM within 90 seconds, but changes do not take effect until power is cycled. This policy prevents a sudden interruption in remote communication.

3.1.3 External Status Bit Discrete Input Interface

The tracking receiver provides 16 status bit inputs, which are designed to indicate the current antenna system configuration. These inputs may be driven by SPST relays, which may be closed to either ground or power. To give the antenna system designer flexibility, the 16 bits are divided into banks of 4. Bits 0-3 belong to bank 0; bits 4-7 belong to bank 1; bits 8-11 belong to bank 2; and bits 12-15 belong to bank 3. Every bank may be pulled up or down independently. On the 2RU, use **Setup > Ext Status** to establish these settings. *These settings are stored in non-volatile memory and will be retained until they are changed.* To verify the settings, press the **Faults** (or **No Faults**) button in the title bar of the right panel display and then press **Ext Status** at the bottom of the screen.

3.1.4 DAC Analog Output Interface

The DAC outputs provide analogs of the signal strength and monopulse error channels. On the 2RU, use **Setup > DAC Output** to set the output scaling and bandwidth. For information about using the screen, refer to Section 2.5.5.6, "Configuring the DAC (Digital-to-Analog Conversion) Output", on page 2-30.

3.2 Setting Up a Remote-Client Connection (2RU Only)

The remote GUI client can be accessed with a web browser via the J10 (2RU) PDU port on the TRU. The client computer can access the system through an existing network (if provided by the customer) or a direct connection to the PDU port.

NOTE

The blank display version of the 2RU TRU (-03 version) is not capable of establishing a remote-client connection given the absence of the front panel display hardware.

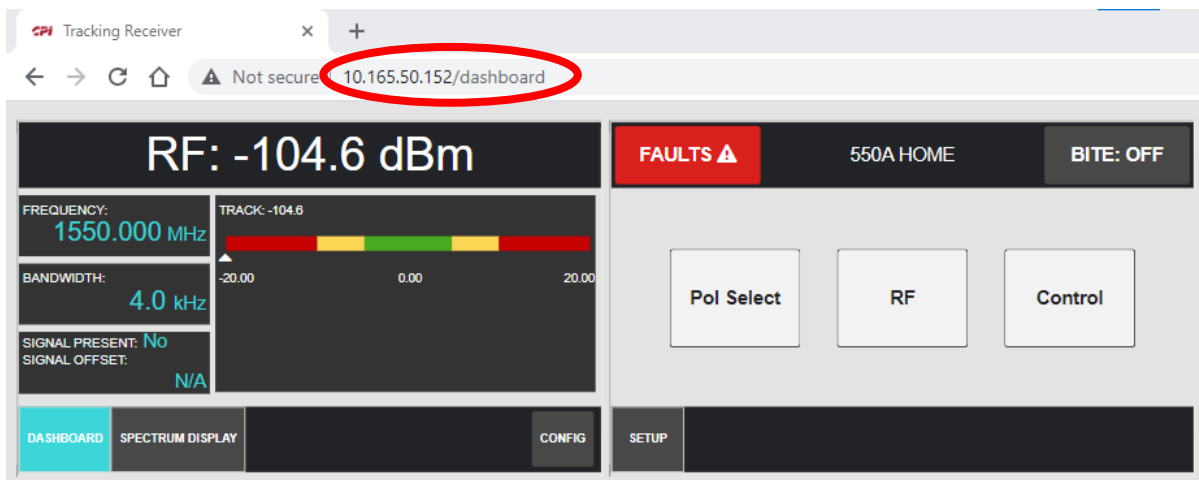
To view or change the IP address of the PDU port:

- Open the **Setup > Maintenance > Network Config** window.
Refer to Section 2.5.5.4.2, “Configuring the Network IP Address” on page 2-27.

Open a web browser for the remote client and access the URL:

- `http:// ip_address/dashboard`
where the default `ip_address` is **10.165.50.152**

The remote client displays the same graphical interface as the TRU, although minor discrepancies may appear due to browser differences.



Although the TRU GUI and remote client behave the same, keep in mind the following important points when using the remote client.

- The remote client was tested on Google Chrome v65. Full functionality is not guaranteed with other browsers or browser versions.
- The TRU software version fields are not applicable on the remote client.
- Do not use the remote client to upgrade, undo, or revert software.

- The remote client has the same privileges as the TRU. All commands from remote clients are treated as though entered directly at the TRU. Take care if multiple remote clients or if a remote client and the TRU are operated simultaneously. The system processes commands in the order received and does not attempt to resolve any conflicting commands.
- All monitor functions are available.
- If you need to change any settings, the TRU must be in Local mode.

3.3 Using the Remote M&C Command Line Interface

The TRU offers a software command line interface for M&C using either an Ethernet or serial connection. Refer to drawing 08-588-1108, M&C Software Interface Specification, for setup details and available commands.

NOTE

*This interface is optional and is not required for general operation.
If the TRU is paired with a compatible antenna control system, the
TRU's M&C interface is not necessary.*

SECTION 4 - SYSTEM INTEGRATION

4.1 Mechanical Interface Specifications

The Model 550A comes in a 2RU chassis with two touchscreen displays or a 4RU chassis with no displays or controls on the front panel, along with a suite of rear panel connectors including Ethernet and serial interfaces.

- On the 2RU, operational and configuration parameters (discussed in Section 2) can be changed either via the touchscreens or the remote interfaces. Operational controls are typically used on a day-to-day basis, whereas configuration controls tend to be set up once during the commissioning of a system. Unit status can be read from the front panel or the remote interfaces.
- On the 4RU, parameters are set via the Antenna Control Unit (ACU), as discussed in the separate Model 950A O&M Manual.

4.1.1 Mechanical Mounting

The chassis is designed to be mounted in a standard 19-inch rack using General Devices C-300-S-122 slides.

4.2 Back Panel Electrical Interface

Figure 4-1 and Figure 4-2 show the standard back panel electrical interface on the 2RU and 4RU units. The complement of connectors may change from this standard to address antenna-specific options such as additional RF connectors to support optional block down converters (BDCs) inside the tracking receiver chassis.

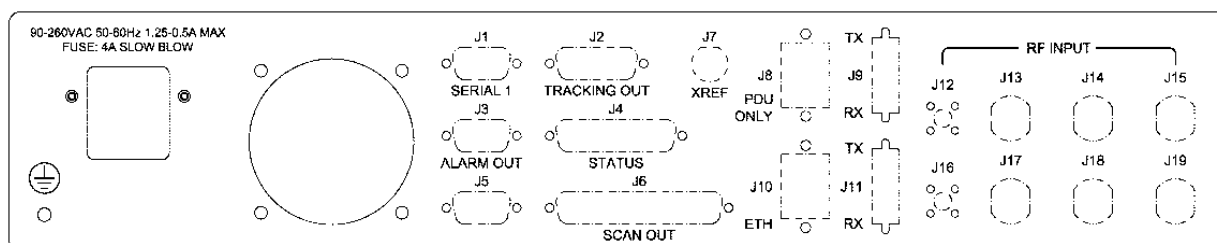


Figure 4-1: Tracking Receiver Back Panel - 2RU

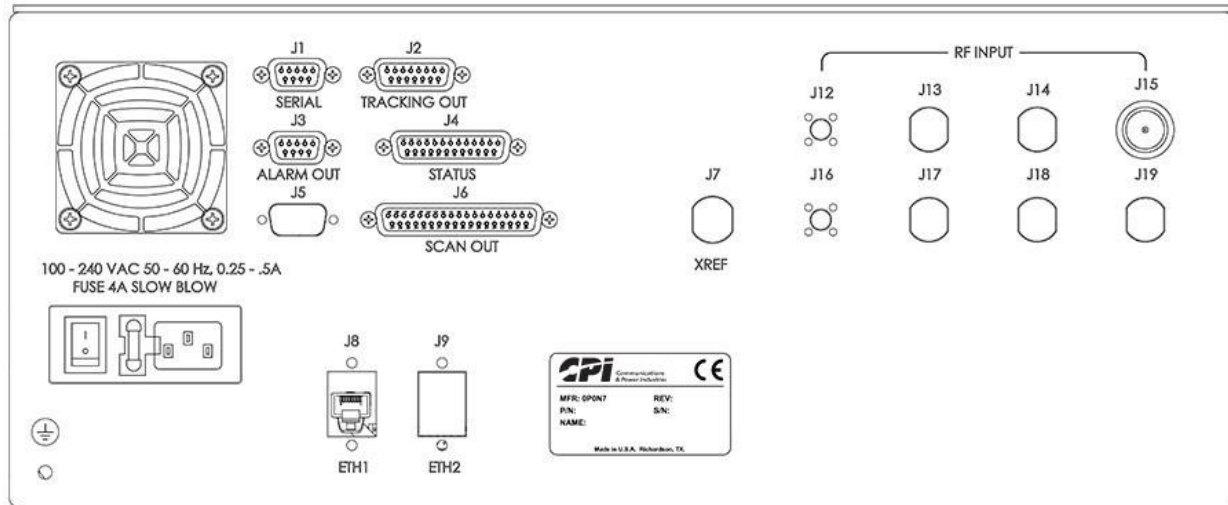


Figure 4-2: Tracking Receiver Back Panel - 4RU

4.2.1 Connector Descriptions

Both the 2RU and 4RU versions of the TRU provide Ethernet connectors, but they differ as shown in Table 4-1.

Table 4-1: Ethernet Connectors

Connector	2RU	4RU
Fiber Ethernet	J9, J11	N/A
Primary Ethernet	J10	J8

The following tables list the signals present on each pin of the standard back panel connectors.

Table 4-2: J1 Serial Port #1 Connector

Type	9 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
1	NC	6	NC
2	RS232 TX RS422 TX-	7	RS422 TX+
3	RS232 RX RS422 RX-	8	RS422 RX+
4	NC	9	NC
5	GND		

Table 4-3: J2 Tracking Out Connector

Type	15 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
1	Sum Out #1 (-10V to +10V)	9	GND
2	XEL Error #1 (-2.5V to +2.5V)	10	GND
3	EL Error #1 (-2.5V to +2.5V)	11	GND
4	POL Error #1 (-2.5V to +2.5V)	12	GND
5	NC	13	GND
6	NC	14	GND
7	NC	15	GND
8	NC		

Table 4-4: J3 Alarm Out Connector

Type	9 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
1	Sum Fault Common	6	Track Fault NO
2	Sum Fault NC	7	+12V
3	Sum Fault NO	8	GND
4	Track Fault Common	9	GND
5	Track Fault NC		

Table 4-5: J4 Status Connector

Type	25 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
1	Status 8	14	Status 9
2	Status 10	15	Status 11
3	Status 12	16	Status 13
4	Status 14	17	Status 15
5	NC	18	NC
6	Status 0	19	Status 1
7	Status 2	20	Status 3
8	Status 4	21	Status 5
9	Status 6	22	Status 7
10	+12V	23	NC
11	+12V	24	GND

Type	25 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
12	GND	25	GND
13	NC		

Table 4-6: J6 Scan Out Connector (Single-Input TRUs only)

Type	37 Pin D-Sub Receptacle		
Pin	Description	Pin	Description
1	Digital Phase Shift 0	20	Band Select 0 (Low Side Driver)
2	Digital Phase Shift 1	21	Band Select 1 (Low Side Driver)
3	Digital Phase Shift 2	22	Band Select 2 (Low Side Driver)
4	Digital Phase Shift 3	23	Band Select 3 (Low Side Driver)
5	Digital Phase Shift 4	24	Band Select 4 (Low Side Driver)
6	Digital Phase Shift 5	25	Band Select 5 (Low Side Driver)
7	Digital Phase Shift 6	26	Band Select 6 (Low Side Driver)
8	Digital Phase Shift 7	27	Band Select 7 (Low Side Driver)
9	Axis Select 0	28	POL Select A (Low Side Driver)
10	Axis Select 1	29	POL Select B (Low Side Driver)
11	Axis Select 2	30	NC
12	Axis Select 3	31	GND
13	GND	32	GND
14	GND	33	NC
15	NC	34	NC
16	GND	35	NC
17	NC	36	NC
18	GND	37	+12V
19	GND		

Table 4-7: TRU RF Input Connectors

Connector	Description*
J15	Band 1, POL A
J14 (if configured)	Band 2, POL A
J13 (if configured)	Band 3, POL A
J19 (if configured)	Band 1, POL B single-band, dual-band, tri-band or Band 4, POL A quad-band
J18 (if configured)	Band 2, POL B
J17 (if configured)	Band 3, POL B
J12 (if configured)	Band 1, POL A single-band or Band 2, POL A dual-band
J16 (if configured)	Band 1, POL B single-band or Band 2, POL B dual-band

* These are the normal configurations. Consult the top-level documentation for the exact configuration for your application. This is especially true for non-L-Band input, dual-POL configurations with:

- Tri-band 3-BDC
- Dual-band 4-BDC
- Tri-band 4-BDC

4.3 Controls and Indicators

4.3.1 Unit Level

4.3.1.1 Power Switch

The Power switch is located on the right side of the front panel. A replaceable fuse is located inside a fuse drawer on the back panel. For information about replacing the fuse, refer to Section 5.3.1.

4.3.1.2 Dual LCD Displays

The dual LCD displays on the front of the unit both have touchscreen capability. They are 5.0" TFT panels with 800 x 480 pixels, LED back lighting, and 4-wire resistive touch sensors. They are intended as the principle means of configuring and operating the unit.

4.3.1.3 USB Port

The USB 3.0 port on the left side of the front panel lets you connect a USB drive that contains a software upgrade. Refer to Section 2.5.5.4.3, "Updating the TRU Software", on page 2-28.

4.3.2 Receiver Board

4.3.2.1 Pushbutton Switches

4.3.2.1.1 DSP Reset Pushbutton (SW1)

Pressing the DSP Reset button performs a “Warm Reset” of the DSP chip. The emulation logic used by factory engineers stays alive during this “Warm Reset”.

4.3.2.1.2 DSP Power On Reset Pushbutton (SW2)

Pressing the DSP POR Reset button initiates a global chip reset. This is essentially a cold reboot of the DSP chip. The effect on the DSP chip of pressing this button is the same as if the main power switch on the back of the chassis were turned OFF and then ON.

4.3.2.1.3 DSP Configuration Reset Pushbutton (SW3)

The DSP CONFIG RESET button is used to revert the DSP’s configuration parameters back to factory defaults. To reset the configuration parameters, hold this button down prior to powering up the unit. Keep holding the DSP CONFIG RESET button down until after the LED on the receiver board finishes displaying the DSP software version and IP address. When the board finishes displaying the IP address, the factory default parameters have been loaded into the DSP and the board is up and running.

CAUTION

Resetting the DSP configuration parameters will overwrite all site specific information, such as frequency band information, with factory defaults.

4.3.2.2 LED Indicators

4.3.2.2.1 Power Indicator LEDs

The LEDs listed in Table 4-8 indicate that each voltage is present from the power supply.

Table 4-8: Receiver Board Power Indicators

Ref.	Description
D5	+12V
D6	-12V
D7	+5V
D8	+3.3V
D9	+1.8V
D10	+1.0V
D11	+1.2V

4.3.2.2.2 Version, Address, and Mode Indicator LED

The receiver board has a 16-segment LED that serves several purposes.

At startup, the LED echoes the unit's software version and IP address one character at a time. This provides a means of checking both the software load and the IP address of the unit just in case communication with the front panel board is ever lost.

During normal operation, the decimal point on the LED will blink. This represents the receiver board's "heartbeat". The beat rate depends on the pre-selection bandwidth. Narrow bandwidths result in slower beat rates than wider bandwidths.

The character displayed by the LED indicates the tracking receiver mode (or state). The following table can be used to determine the mode of the receiver.

Table 4-9: Alphanumeric LED Indication of State

Character	State
I	Initialization
A	Acquisition (such as waiting for a signal)
T	Steptrack
M	Monopulse tracking
P	Autophasing

4.3.2.2.3 Boot Mode LEDs

These boot mode LEDs indicate the boot mode which is currently active, based on the boot jumper location.

Table 4-10: Boot Mode LEDs

Ref.	Label	Description
D16	JTAG Boot	JTAG mode for engineering development.
D17	NOR Flash Boot	Mode for bootloading code from NOR FLASH. <i>This is the normal mode of operation.</i>
D18	Serial Boot	Mode for bootloading code from serial port.

4.3.2.3 Jumpers

4.3.2.3.1 Boot Mode Jumpers

The boot mode jumpers select the active boot mode for the DSP chip on the receiver board. The normal setting is to have no jumper which forces the DSP to boot from the software image stored in NOR FLASH on the receiver board. The additional modes are provided for factory troubleshooting and upgrades.

Table 4-11: Boot Modes

Jumper Location	Description
None	Boots from NOR FLASH
Middle+Right Pins	Boots from serial port
Middle+Left Pins	JTAG mode for engineering development.

SECTION 5 - MAINTENANCE AND SERVICE GUIDELINES

5.1 Tools and Test Equipment Required

- Horsehair Brush
- Screwdrivers - Slot and #2 Phillips Head
- 7/16 Open End Wrench
- 5/16 Open End Wrench
- Vacuum
- Multimeter
- Oscilloscope

5.2 Inspection, Cleaning and Lubrication

WARNINGS

- *Disconnect all power before wiring. The socket-outlet shall be installed near the equipment and shall be easily accessible.*
- *The inside of the TRU is NOT an operator-access area. Only service personnel with appropriate technical training and experience are permitted access.*
- *Lock-out electrical safety for maintenance can be accommodated various ways. The design of the overall installation, safety switches, and power disconnect depends on local codes and should be reviewed by the installer.*
- ***Failure to comply with the above warnings may result in severe personal injury or death and/or equipment damage.***

CAUTION

- *Electrostatic sensitive equipment. To prevent equipment damage, use proper grounding techniques.*

5.2.1 General

Once a year, brush and vacuum the interior of the unit to remove dust and lint. Shut down the unit prior to removing the cover.

5.2.2 Air Filter Cleaning

The required frequency of cleaning is dependent upon the operating environment of the unit and should be determined accordingly.

The mesh screen may be cleaned from the back panel using the vacuum and horsehair brush. Optionally, the screen guard may be removed carefully with a slot head screwdriver prior to cleaning. This allows access to a greater surface area of the screen. Replace screen guard when finished.

5.3 Specialized Assembly, Repair, or Replacement Instructions

5.3.1 Replacing the AC Fuse

The AC power fuse is located inside a fuse drawer directly below the AC power connector on the back panel. Before replacing the fuse, be sure to disconnect the power cord from the back panel.

Pull out the fuse drawer and replace the blown fuse. The drawer has an extra compartment to hold a spare fuse. If you use the spare, replace it with a new spare at the earliest possible time. Use a 5 x 20 mm slow-blow fuse rated at 250 VAC and 4 A.

5.4 Specialized Shipping Precautions

The Tracking Receiver and circuit board assemblies are sensitive to electrostatic discharge (ESD) and must be packaged in protective metal film bags and padded with electrostatic resistant bubble wrap. Provide sufficient padding within the shipping crate to prevent any breakage.

SECTION 6 - TROUBLESHOOTING GUIDE

6.1 Version Information

On the 2RU version, to find out the software, hardware, and FPGA versions on both the front panel and receiver cards, press **Setup > Software Versions** from the 550A Home screen. This shows the software version numbers for the front panel display card and the tracking receiver card. It also shows the hardware revision number for the tracking receiver board and the revision number for the FPGA on the tracking receiver board.

On the 4RU version, use the Antenna Control Unit (ACU) of the Model 950A control system to view the TRU's software version. Refer to the separate Model 950A O&M Manual for details.

6.2 Fault Scenarios

6.2.1 Clearing Track Faults

Symptom or Problem:

A track fault appears on the Faults screen.

Cause:

Track faults can be caused by a number of issues. On the right panel, press **Faults** (or **No Faults**) in the title bar to open the Faults screen. Check to see if the cause of the fault is listed with the Track Fault message.

Examples:

- a. Track Fault due to change in external status bits.
- b. Track Fault due to change in RF path. (e.g. baseball switch status)
- c. Track Fault due to temperature outside operating range.
- d. Track Fault due to unlocked RF synthesizer.
- e. Track Fault due to low signal in 250 kHz bandwidth.
- f. Track Fault due to saturating signal.
- g. Track Fault due to monopulse scan off.
- h. Track Fault due to improper bandwidth selection for monopulse.

Solution:

Go to the Faults screen and press the **ACK** button to acknowledge any existing faults. Then, from the 550A Home screen on the right panel, press **Setup > Monopulse**. On the Monopulse screen, press the **Reset** button. In addition to clearing the existing track fault, this resets the baseline status bit pattern.

6.2.2 Ethernet Communication Failures

Symptom or Problem:

There is a link failure between the front panel or host computer and the receiver board.

Cause:

Link failures can be caused by: a loose cable, a broken conductor in the cable, or an incorrect IP address.

Solution:

Try re-seating the Ethernet cable connecting the front panel to the receiver board and the host computer to the Model 550A tracking receiver.

If this does not correct the problem, check the IP addresses of the front panel and receiver boards. They must be on the same subnet, meaning the first three octet values of the IP address must be identical.

If the IP addresses are on the same subnet, replace the cable with a known good cable.

6.2.3 Forgot Receiver Board's IP Address

Symptom or Problem:

The IP address of the tracking receiver board has been lost or is unknown.

Cause:

The antenna control LAN is using a site specific IP address scheme.

Solution:

Open the lid and cycle the power to the chassis. The receiver board's current IP address will be echoed one character at a time on the 16-segment LED. If the displayed IP address is not correct, refer to Section 2.5.5.4.2, "Configuring the Network IP Address", on page 2-27.

6.2.4 Serial Communication Failure

Symptom or Problem:

There is a serial communication link failure between the host and the receiver board.

Cause:

The serial communication protocol and baud rate settings are incorrect or the cable is broken.

Solution:

Check the serial port settings on the **Setup > Serial Port** screen. Confirm that the receiver protocol and baud rate match the settings on the host computer. Also, confirm that the serial port on the host side is setup for 8 data bits, 1 stop bit, and odd parity.

If the serial port settings are correct, check the cable for continuity. If any open circuits are found, discard the cable and replace it with a known good cable.

6.2.5 Error Signal DAC Output is Saturated**Symptom or Problem:**

One or more of the error channels is saturated at -2.5 V or +2.5 V.

Cause:

The phase scaling for the error channel is incorrect or the attenuator on the scan plate has not been correctly set.

Solution:

Confirm that the attenuator in the scan plate is set to give 0.5 Volts when the antenna is moved to -3 dB off of the beam peak.

Confirm the angular displacement required on the antenna to produce a 3 dB drop in signal strength and then recalculate the phase scale according to the equations shown in Section 2.5.5.2, "Configuring Monopulse Tracking Performance", on page 2-22.

6.2.6 Beacon Signal Not Detected**Symptom or Problem:**

The beacon signal is not detected.

Cause:

Beacon signals are not acquired for several reasons ranging from the tracking receiver being set to an incorrect beacon frequency to there being too much noise in the direction of a satellite with a weak beacon.

Solution:

Test the operation of the receiver with the BITE generator. To see the BITE signal spectrum, press **RF** on the 550A Home screen. Enter a tune frequency equal to the BITE frequency. Then press **BITE Gen** on the 550A Home screen and turn on the BITE generator. If the receiver does not acquire the test signal, it may be necessary to define another band entry between 950 and 2150 MHz, with an LO of 0 MHz and relay settings of 00000000B.

If the Model 550A acquires the BITE generator signal, this demonstrates that the receiver hardware is operating. At this point, disconnect the RF cable from the rear panel of the tracking receiver and use a spectrum analyzer to search for the input beacon manually. If no beacon is found, the problem in the system is upstream of the Model 550A.

If the beacon is found on the spectrum analyzer, note the frequency of maximum energy at the input connector to the Model 550A. Enter that frequency on the RF screen. Also make sure the frequency is part of one of the six frequency bands entered on the **Setup > Band Table** screen.

NOTE

If the BDC is external to the Model 550A, the signal seen at the input on the back of the Model 550A will have been down converted to L-band. If the Model 550A acquires the down-converted L-band signal but does not acquire the beacon signal when its RF frequency is entered, it is likely that the band table entries, including the local oscillator frequency, are not correct.

6.2.7 Front Panel of 2RU Fails to Light Up

Symptom or Problem:

The front panel does not light up when the power switch is turned on.

Cause:

The front panel will fail to light up either because of a hardware failure or a lack of power.

Solution:

Confirm that the power cable is attached to the rear panel of the chassis.

If the power cable is attached to the rear panel of the chassis, qualified personnel can unscrew the lid on the unit. Lift the lid off of the unit and apply power once more.

- If no LEDs are lit on either the front panel board or the tracking receiver board, it is likely that the power supply has failed. Contact CPI Satcom & Antenna Technologies Inc. customer support.
- If the tracking receiver board's LEDs are lit but the front panel LEDs are not lit, check the power connector going into the front panel board. Make sure the connector is properly seated. If the connector is properly seated, there is likely a hardware failure on the front panel board. Contact CPI Satcom & Antenna Technologies Inc. customer support.

APPENDIX A - DEFAULT CONFIGURATION PARAMETERS

The following table contains the parameter settings that come with a new TRU unit. If the non-volatile parameter storage becomes corrupted, the TRU receiver reverts to these settings.

Table A-1: Default Configuration Parameters

Parameter	Value	Units
Tuning		
Band Table #1: Start Frequency	0.95	GHz
Band Table #1: Stop Frequency	2.15	GHz
Band Table #1: LO Frequency	0	GHz
Band Table #1: Band Select	0000 0000B	-
Tune Frequency	1.55	GHz
Preselection Bandwidth	4	kHz
Signal Attenuation	0	dB
Signal Offset	0	dB
Monopulse		
Track Mode	Steptrack	-
Monopulse Scan	Constant	-
Scale XEL	1.0	V/°
Scale EL	1.0	V/°
Scale POL	1.0	V/°
Autophase Algorithm	Maximum	-
Phase Shift XEL	119.5	°
Phase Shift EL	119.5	°
Phase Shift POL	119.5	°
Status		
External Status Banks 0-3	Pulldown	-
Serial		
Serial Protocol	RS-232	-
Serial Baud Rate	9600	bps
BITE		
BITE	Off	-
BITE Frequency	1.55	GHz

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APPENDIX B - SET UP AN L-BAND TRU USING EXTERNAL BDCS WITH INTERNAL POL & BAND SWITCHING

This appendix contains setup information for using external BDCs with internal TRU POL and band switching. The signals into the TRU are L-band. Depending on the type of L-band signal, two standard TRUs are available with the following part numbers:

- 550A-T2-22XX-02 for dual-band
- 550A-T2-222X-02 for tri-band

Two POLs are used for these configurations. This appendix denotes them by A and B, but you can further label them HORIZ/VERT or RHCP/LHCP as necessary in the POL setup. However, you must keep track of the POL labelling below in the connections to the TRU.

B.1 Dual-Band Setup for 550A-T2-22XX-02

Obtain the two sets of start, stop, and local oscillator frequencies for your BDCs. Fill in the table below for each POL. The band information is the same for each POL.

Table B-1: Dual-Band Setup

Band	POL	Start	Stop	LO	Relay Setting	TRU Connector
1	A				00000000	J15
2	A				00000001	J14
1	B				00000000	J19
2	B				00000001	J18

NOTE

The maximum start-stop difference is 1.2 GHz.

Table B-2: Example of Dual-Band Setup Table

Band	POL	Start	Stop	LO	Relay Setting	TRU Connector
1	A	10.70	11.70	9.75	00000000	J15
2	A	11.70	12.75	10.60	00000001	J14
1	B	10.70	11.70	9.75	00000000	J19
2	B	11.70	12.75	10.60	00000001	J18

Set up the band table using the green highlighted boxes above for your BDC frequencies (refer to Section 2.5.5.8 on page 2-32) and connect to the TRU connectors for each POL and band as indicated.

B.2 Tri-Band Setup for 550A-T2-222X-02

Obtain the three sets of start, stop, and local oscillator frequencies for the BDCs. Fill in the table below for each POL. The band information is the same for each POL.

Table B-3: Tri-Band Setup

Band	POL	Start	Stop	LO	Relay Setting	TRU Connector
1	A				00000000	J15
2	A				00000001	J14
3	A				00000010	J13
1	B				00000000	J19
2	B				00000001	J18
3	B				00000010	J17

NOTE

The maximum start-stop difference is 1.2 GHz.

Table B-4: Example of Tri-Band Setup Table

Band	POL	Start	Stop	LO	Relay Setting	TRU Connector
1	A	17.7	18.9	16.75	00000000	J15
2	A	18.9	20.1	17.95	00000001	J14
3	A	20.1	21.3	19.15	00000010	J13
1	B	17.7	18.9	16.75	00000000	J19
2	B	18.9	20.1	17.95	00000001	J18
3	B	20.1	21.3	19.15	00000010	J17

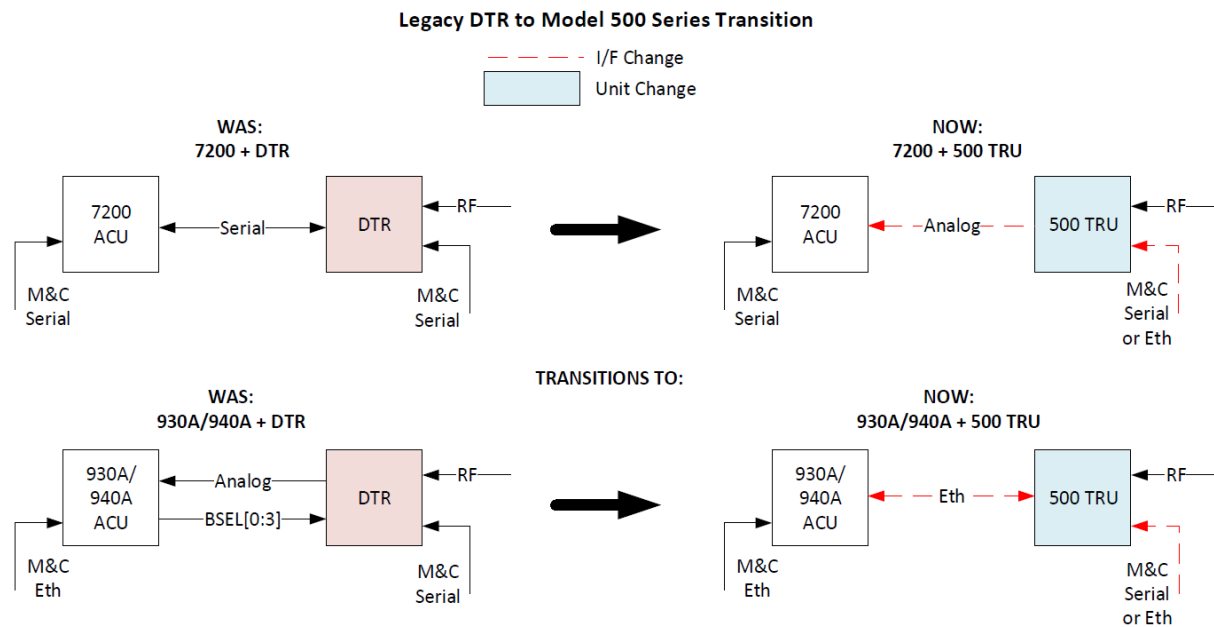
Set up the band table using the green highlighted boxes above for your BDC frequencies (refer to Section 2.5.5.8 on page 2-32) and connect to the TRU connectors for each POL and band as indicated.

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APPENDIX C - TRANSITION A LEGACY LONGVIEW DTR RETROFIT

The Model 500 Series TRUs are functional replacements for the legacy Longview Digital Tracking Receiver (DTR). This appendix discusses how to transition an existing installation using a legacy Longview DTR to a Model 500 Series TRU.

The following diagram gives a general survey of ACU and receiver interface connections.



Both the Model 520A and Model 550A receivers are offered in a 2RU form factor with comparable performance, but some primary differences include:

- User Interface
- Back Panel Connectors/Locations
- M&C Software Commands
- Beacon/Band Select I/O
- Serial Port Quantity
- Pairing Methods to the Legacy 7200 ACU

C.1 Transition a Model 930A/940A/950A ACU to a Model 500 Series Receiver

These systems can communicate configuration and tracking information over an Ethernet data link. Simply connect the ACU and TRU together, configure the ACU for the 500 Series TRU, and proceed with system integration.

To check the TRU's status and configuration, use the ACU's front panel or M&C interface.

NOTE

The Model 940A ACU is a compatible replacement to the legacy 7200 ACU.

C.2 Transition a Legacy 7200 ACU to a Model 500 Series Receiver

When the DTR is paired with a legacy 7200 ACU, the systems generally communicate configuration and tracking information over a serial data link. The Model 500 Series does not support this serial connection with the legacy 7200 ACU. Instead, the Model 500 Series provides an Analog Tracking Output (J2) that can interface with the legacy 7200 ACU's Analog Tracking Input (J21) using a shielded twisted-pair cable and the connection list below.

Set the Model 520A/550A's Analog Output range to 0-10 V, -105 to -5 dB. Set the legacy 7200's RF slope to 0.1 V/dB.

NOTE

Advanced users can configure each product to achieve higher resolution. Consult the ACU's O&M manual for details. For the Model 550A, refer to Section 2.5.5.6, "Configuring the DAC (Digital-to-Analog Conversion) Output," on page 2-30.

7200	Model 500 Series
J21-2 (AD1+)	J2-1 (Sum Out 1)
J21-7 (AD1-)	J2-9 (GND)
P2-Backshell (Shield)	J2-Backshell (Shield)

If an M&C connection is required, the Model 500 Series provides either an Ethernet or a single configurable RS-232/RS-422 serial interface. The TRU's M&C software commands are not backward compatible with the legacy Longview DTR. For more information, refer to Section 4.2.1, "Connector Descriptions," on page 4-2.

The legacy 7200 ACU's Beacon Select output (TB1) functionality is not supported by the Model 520A/550A. You must make band selection changes manually at the TRU screen or through the M&C interface.

APPENDIX D - TRANSLATED SAFETY INFORMATION / QUICK START

D.1 Preface

This document contains multiple language translations for the safety statements included in CPI SAT product documentation. These languages include English, German, and French.

It is the responsibility of the importer to provide any required language translation at the time of import.

Language translation is provided on an as-is basis and is not guaranteed. Please reference English language translation or contact CPI SAT for more information.

Per European requirements, the following warnings apply to pluggable equipment:

In English:

WARNING: Equipment must be connected to an earthed mains socket-outlet

In Germany:

WARNUNG: Ausrüstung muss an eine geerdete Netz-Steckdose angeschlossen werden

In France:

AVERTISSEMENT: Équipement doit être raccordé à une prise de terre

In Finland:

VAROITUS: Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan

In Norway:

ADVARSEL: Apparatet må tilkoples jordet stikkontakt

In Sweden:

VARNING: Apparaten skall anslutas till jordat uttag

D.2 Sicherheit Abschnitt [German]

Sprache Übersetzung ist auf einer Ist-Basis zur Verfügung gestellt und ist nicht garantiert. Bitte referenzieren Sie die englische Übersetzung oder kontaktieren CPI SAT für weitere Informationen.

D.2.1 Sicherheitsinformation

Sicherheit des Personals ist die wichtigste Angelegenheit in allen Verfahren. Benutzer sind für ihre eigene Sicherheit, die Sicherheit anderer Mitarbeiter, dass an oder in der Nähe des Systems arbeiten, und den sicheren Bedienung des Systems verantwortlich. Lesen die Sicherheitshinweise und sich damit vertraut machen.

Obwohl CPI Satcom & Antenna Technologies Inc. (CPI SAT) hat zum Detail in diesem Dokument alle Bereiche der möglichen Gefahr für das Personal bei der Verwendung dieses Geräts versucht, sollte Personal Vorsicht bei der Installation, dem Betrieb und der Wartung dieses Gerätes nutzen. Achten Sie darauf, um einen elektrischen Schlag zu vermeiden, ob das Risiko durch Konstruktion oder eine Fehlfunktion verursacht werden. CPI SAT ist ausdrücklich nicht haftbar für Schäden oder Verletzungen, die aus einer Techniker Nichtbeachtung der Anweisungen in diesem Dokument folgen oder Sorgfalt und Vorsicht walten lassen bei der Installation, der Bedienung und der Wartung dieses Gerätes. CPI SAT ist nicht für Verletzungen oder Schäden verantwortlich, die durch unsachgemäße Verfahren oder durch die Verwendung von nicht ordnungsgemäß geschult oder unerfahrenem Personal der Wahrnehmung dieser Aufgaben resultierenden Steuern.

Dieses Dokument ist als allgemeine Richtlinie für geschultes und qualifiziertes Personal, die sich der Gefahren der Handhabung potentiell gefährlichen elektrischen und elektronischen Schaltungen sind vorgesehen. Dieses Dokument ist nicht beabsichtigt, eine vollständige Erklärung aller Sicherheitsmaßnahmen, die von Personal im Umgang mit diesem oder anderen elektronischen Geräten zu beachten sind, enthalten.

Warnungen, Vorsicht und Notiz

Warnungen, Vorsichtsmaßnahmen und Hinweise geben die persönliche Sicherheit und Geräteschutz Informationen für Transport, Installation, Bedienung, Wartung und Demontage des in diesem Handbuch beschriebene Geräts. Die Nichtbeachtung der Warnungen, Vorsichtsmaßnahmen, und Hinweise einzuhalten kann zu Verletzungen oder Tod, Schäden an den Geräten, oder Verlust der Mission Wirksamkeit führen. Definitionen für jeweils:

WARNUNG

Ein Bedienungs- oder Wartungsverfahren, Praxis, Zustand, Rechnung etc., die, wenn sie nicht strikt eingehalten, es zu Verletzungen oder Tod führen kann.

VORSICHT

Ein Installations-, Bedienungs- oder Wartungsverfahren, Praxis, Zustand, Rechnung etc., die, wenn sie nicht strikt eingehalten, in langfristigen gesundheitlichen Gefahren für Personen führen könnten, Beschädigung oder Zerstörung von Geräten, oder Verlust der Einsatzeffizienz.

NOTIZ

Ein Installations-, Bedienungs- oder Wartungsverfahren, Praxis, Bedingung oder Erklärung, die, wenn sie befolgt, könnte die Effizienz und / oder die Sicherheit der Prozeduren verbessern.

Elektrische Gefahren

Die elektrischen Ströme und Spannungen mit diesem Gerät verbunden sind, sei es durch CPI SAT oder anderen zugeführt werden, sind gefährlich. Zu allen Zeiten, muss das Personal die unten aufgeführten Warnhinweise zu beachten. Nichtbeachtung kann zu schweren Verletzungen oder zum Tod führen.

WARNUNG

- *Geräte sind zum Einbau in einem eingeschränkt zugänglichen Ort ausgelegt. Das Innere des Tracking Receiver Unit (TRU) ist NICHT ein Betreiber Zugangsbereich. Nur qualifiziertes Personal mit zugelassenen technischen Ausbildung und Erfahrung sollten Zugriff gestattet werden.*
- *Schützen Personal und Eigentum durch die Einhaltung aller lokalen Sicherheitsverfahren, wie durch den Kunden vor Ort Vertreter sowie die örtlichen Bauvorschriften und Brandschutznormen etabliert.*
- *Alle Personen, die auf der Antennenanlage arbeiten, muss mit den Occupational Safety and Health Act (OSHA) Standards und allen anderen Bundes-, Länder- und lokalen Gesetze, Verordnungen, Vorschriften und Codes in Bezug auf sehenen Arbeitsplatz entsprechen.*
- *Führen Sie niemals Wartungs- oder Service wenn sie allein oder müde.*

Mögliche Gefahren

VORSICHT

Elektrostatisch empfindlichen Geräten. Um Schäden zu vermeiden, verwenden Sie eine ordnungsgemäße Erdung Techniken.

Erklärung der Sicherheitssymbole on Geräts

Sinnbild	Bezeichnung
	Schutzerde / Erdungsklemme
	Vorsicht, Stromschlaggefahr
	Achtung, Gefahr

D.2.2 Kurzanleitung

Um schnell das Gerät zum Laufen:

1. Empfang und Überprüfung Ausrüstung.

VORSICHT

Nicht installieren oder bedienen Ausrüstung, die beschädigt ist oder Teile fehlen. Die Nichtbeachtung dieses Warnhinweises kann zu Verletzungen oder Sachschäden führen.

2. Mechanisch Montage des Chassis in das Gestell.

WARNUNG

Geräte sind zum Einbau in einem eingeschränkt Zugangsbereich ausgelegt.

VORSICHT

Alle Geräte müssen an Ort und Stelle vor dem Bedienung gesichert werden. Nichtbeachtung kann zu Verletzungen und / oder Sachschäden führen.

3. Lesen Sie die folgenden Warnhinweise und Vorsichtsmaßnahmen, bevor Sie die Kabel anschließen.

WARNUNG

- *Installieren Einheit nach örtlichen Vorschriften.*
- *Die Verkabelung sollte nur von Fachpersonal durchgeführt werden.*

- *Trennen Sie der Strom vor der Verdrahtung.*
- *Der TRU ACU muss an eine geerdete Netzsteckdose angeschlossen werden. Die Steckdose soll in der Nähe des Geräts befinden und leicht zugänglich sein.*
- *Das Innere des TRU ist NICHT Bediener zugänglichen Bereichen. Nur Service-Personal, das die fachlichen Ausbildung und Erfahrung haben, sind erlaubt Zugang.*
- *Der Kunde ist für die Auswahl der richtigen Stromkreisschutz, Verkabelung und Aussperrung Funktionen für Stromeingang zu dem Schrank verantwortlich. Diese müssen örtlichen Vorschriften zu folgen. Die TRU Lieferungen Schlussschutz aus dem Gehäuse, um Unterkomponenten.*
- *Aussperrung elektrischen Sicherheit für die Wartung kann auf verschiedene Weise untergebracht werden. Die PDU hat einen Not-Aus (E-Stop) an dem Schrank. Notaus-Schalter sind an jedem Motor Standort empfohlen. Das Design der gesamte Aufbau, Sicherheitsschalter und Stromtrennschalter ist abhängig von örtlichen Vorschriften und sollte vom Installateur überprüft werden.*
- ***Die Nichtbeachtung der obigen Warnungen Beachtung kann zu schweren Verletzungen oder Tod und / oder Sachschäden führen.***

VORSICHT

- *Verwenden Sie keine Leitung-zu-Leitung-Spannung als die einphasigen Quelle. Spannungen müssen zwischen 100 und 250 VAC sein.*
- ***Die Nichteinhaltung der vorgenannten Vorsichtsmaßnahmen kann zu Verletzungen oder Sachschäden führen.***

D.3 L'Information de la Sécurité [French]

La traduction en français n'est pas une traduction précise. Veuillez faire référence à la traduction en anglais ou contactez CPI SAT pour plus de renseignements.

D.3.1 Information sécuritaire

La sécurité du personnel est la préoccupation principale pendant toutes les procédures. Les utilisateurs sont responsables de leur propre sécurité, la sécurité des autres personnes travaillant sur le système ou à proximité, et la sécurité de fonctionnement du système. Il faut lire et se familiariser avec les consignes de sécurité dans cette section.

Bien que CPI Satcom & Antenna Technologies Inc. (CPI SAT) ait tenté de détailler dans ce document tous les domaines des dangers possibles pour le personnel à l'utilisation de cet équipement, le personnel doit faire prudence lors de l'installation, l'exploitation et l'entretien de cet équipement. Prenez soin d'éviter tout choc électrique, que le danger soit causé par sa conception ou son dysfonctionnement. CPI SAT, en spécifique, n'est pas responsable des dommages ni des blessures causés par l'incapacité d'un technicien de suivre les instructions de ce document ou de diligence et de prudence lors de l'installation, l'exploitation et l'entretien de cet équipement. CPI SAT n'est pas responsable des blessures ni des dommages résultant de procédures irrégulières ou de l'utilisation exécutées par le personnel mal formés ou inexpérimentés avec ces tâches.

Ce document est conçu comme un guide général pour le personnel formé et qualifié qui sont conscients des dangers de la manipulation de circuits électriques et électroniques potentiellement dangereux. Ce document ne vise pas à contenir une déclaration complète de toutes les mesures de sécurité qui doivent être respectées par le personnel à utiliser ce ou tout autre l'équipement électronique.

Avertissements, Attentions, et les Notes

Les avertissements, les attentions, et les notes fournissent des renseignements pour la sécurité du personnel et la protection des équipements dans le transport, l'installation, l'exploitation, l'entretien, et le démontage de l'équipement décrit dans ce manuel. Défaut de se conformer avec les avertissements, et les notes peuvent entraîner des blessures ou la mort, des dommages à l'équipement, ou la perte d'efficacité de la mission. Les définitions pour chaque catégorie:

AVERTISSEMENT

Une procédure d'exploitation ou d'entretien, pratique, condition, déclaration, etc., qui, si n'est pas strictement observée, peut entraîner des blessures ou la mort.

ATTENTION

Une procédure d'installation, d'exploitation ou d'entretien, pratique, condition, déclaration, etc., qui, si n'est pas strictement observée, peut entraîner des risques pour la santé à long terme au personnel, des dommages ou la destruction de l'équipement ou de la perte d'efficacité de la mission.

NOTE

Une installation, la procédure d'exploitation ou d'entretien, pratique, condition ou déclaration, qui pourrait améliorer l'efficacité et / ou la sécurité desdites procédures si on la suivait.

Risques électriques

Les courants et les tensions associées à cet équipement électrique, que ce soit fourni par CPI SAT ou autres, sont dangereux. En tout temps, le personnel doit observer les avertissements énumérés ci-dessous. Le non-respect peut entraîner des blessures sévères ou la mort.

AVERTISSEMENT

- *L'équipement est destiné à être installé dans un endroit à accès restreint. Les intérieurs de le Tracking Receiver Unit (TRU) ne sont pas des zones d'accès de l'opérateur. Seul un personnel qualifié ayant une formation technique approuvée et l'expérience devraient être autorisé à l'accéder.*
- *Protéger le personnel et les biens en respectant toutes les procédures de sécurité locales établies par le représentant du site du client, ainsi que les codes de construction locaux et les normes de protection contre les incendies.*
- *Toutes les personnes travaillant sur le système d'antenne doivent se conformer au Occupational Safety and Health Act (OSHA) et toutes les autres organisations fédérales, d'État et les lois, les ordonnances, les règlements et codes locaux relatifs au travail désigné.*
- *Ne jamais effectuer l'entretien ou le service quand on est seul ou fatigué.*

Electrostatic Sensitive Device (ESD) Dangers

ATTENTION

Équipements sensibles aux décharges électrostatiques. Pour éviter d'endommager l'équipement, utiliser des techniques de mise à la terre.

Explication de Symboles de sécurité sur l'équipement

Symbol	Description
	Terre de protection / RDC Terminal
	Attention, risque de choc électrique
	Attention, risque de danger

D.3.2 Le guide de démarrage rapide

Pour allumer rapidement l'unité:

1. Recevoir et inspecter l'équipement.

ATTENTION

Ne pas installer ou faites fonctionner du matériel qui est endommagé ou des pièces manquantes. Le non-respect de cette précaution peut entraîner des blessures ou des dommages matériels.

2. Montage mécaniquement le châssis dans la bâti.

AVERTISSEMENT

L'équipement est destiné à être installé dans un endroit à accès restreint.

ATTENTION

Tout le matériel doit être maintenu en place avant de faire fonctionner. Le non-respect de cette précaution peut entraîner des blessures ou des dommages matériels.

2. Lisez les avertissements et les précautions suivantes avant de brancher les câbles.

AVERTISSEMENT

- *Installez l'unité suivant les codes locaux.*
- *Le câblage doit être effectuée uniquement par du personnel qualifié.*
- *Coupez l'alimentation avant le câblage.*
- *Le TRU doit être connecté à un réseau mis à la terre prise de courant. La prise de courant doit être installée près de l'équipement et doit être facilement accessible.*
- *L'intérieur de la TRU n'est pas de zone accessible aux opérateurs. Seulement le personnel de service avec une formation technique appropriée et l'expérience sont autorisés à accéder.*
- *Le client est responsable de la sélection une protection de circuit, le câblage et blocage des commandes pour introduire d'alimentation à l'armoire. Ceux-ci doivent suivre les réglementations locales. Le TRU fournitures de système de protection des circuits de l'armoire de sous-composants.*
- *Lock-out sécurité électrique pour l'entretien peut être logé de diverses manières. La conception de l'installation globale, interrupteurs de sécurité, et la puissance de déconnexion dépend de codes locaux et devrait être examiné par l'installateur.*
- *Défaut de se conformer aux avertissements ci-dessus peut entraîner des blessures graves ou la mort et / ou des dommages matériels*

ATTENTION

- *Ne pas utiliser une tension ligne-à-ligne comme source monophasée. Tensions doivent être comprises entre 100 à 250 VAC.*
- *Défaut de se conformer aux mises en garde qui précèdent peut entraîner des blessures ou des dommages matériels.*

— End of document —