KST-12025

Ku Band Satellite Terminal
Installation and Operation Manual

Part Number MN/KST12025.IOM **Revision 1**

Errata A

EFData Documentation Update

Subject: Chapter 4 (Operation)

Date: March 6, 1997
Document: KST-12025 Ku-Band Satellite Terminal Installation and Operation Manual, Rev. 1, dated August 16, 1996
Part Number: MN/KST12025.EA1
Collating Instructions: Attach this page to 4-3 of the manual.

Comments:

The optional front panel display/keypad does not beep.

Change Specifics:

As incorrectly specified in Chapter 4, page 4-3:

> The RFT-1225 responds by beeping whenever a key is pressed:
>
> - A single beep indicates that the key pressed was a valid entry, and that the appropriate action was taken.
> - A double beep indicates the key pressed was an invalid entry.

This information should be deleted.

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Errata B

EFData Documentation Update

Subject: Changes to power input requirements.

Date: April 9, 1997
Document: KST-12025 Ku-Band Satellite Terminal System Installation and Operation Manual, Rev. 1, dated August 19, 1996
Part Number: MN/KST12025.EB1
Collating Instructions: Attach this page to pages 1-1 and 2-21

Comments:

The following changes provide the correct information for AC power input requirements. This information will be incorporated into the next revision.

Change Specifics:

As incorrectly specified Chapter 1, page 1-1:

Prime Power Options	90 to 230 VAC, 47 to 63 Hz, using a 6' cable North American 3-prong plug, or 48 VDC (40 to 50 V)

This information should be changed to:

Prime Power Options	190 to 240 VAC, 47 to 63 Hz, using a 6' cable North American 3-prong plug, or 48 VDC (40 to 50 V)

As incorrectly specified Chapter 2, page 2-21:

The AC power is supplied to the RFT by a 3-pin power connector. Normal input voltage is 90 to 232 VAC, 47 to 63 Hz.

This information should be changed to:

The AC power is supplied to the RFT by a 3-pin power connector. Normal input voltage is 190 to 240 VAC, 47 to 63 Hz.

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KST-12025

Ku-Band Satellite Terminal Installation and Operation Manual

Part Number MN/KST12025.IOM
Revision 1
August 16, 1996

Special Instructions:

This is the second edition of the manual.

Change bars were not utilized. For an overview of changes made to Rev. 0, refer to the preface ("Overview of Changes to Previous Edition").

This revision supersedes part number MN/KST12025 Rev. 0 dated September 13, 1995.

EFData Corporation, 2105 West 5th Place, Tempe, Arizona 85281 USA, (602) 968-0447, FAX: (602) 921-9012.

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Preface

About this Manual

This manual provides installation and operation information for the EFData KST-12025 Ku-band satellite terminal. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the KST-12025.

Conventions and References Used in this Manual

Cautions and Warnings

CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Trademarks

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Related Documents

The following documents are referenced in this manual:

- *EFData Specification SP/4668*
- *EFData RSU-503 Redundancy Switch Unit Installation and Operation Manual*
- *EFData KP-10 External Keypad Installation and Operation Manual*
- *EFData Monitor and Control Software for EFData Satellite Terminals User's Guide*

Overview of Changes to Previous Edition

A summary of changes to Rev. 0 includes:

- Cosmetic (non-technical) changes (e.g., formatting, spelling)
- Updated kits in Chapters 2 and 3
- Updated firmware information in Chapter 4 and Appendix A
- Removed appendix describing M&C system monitor program (it is now a separate manual)

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- Information on returning a product
- Information on upgrading a product
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EFData Corporation
Attention: Customer Support Department
2105 West 5th Place
Tempe, Arizona 85281 USA

(602) 968-0447 (Main EFData Number)
(602) 517-2444 (Customer Support Desk)
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1. Request a Return Material Authorization (RMA) number from the EFData Customer Support Department.

   Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.

2. To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.

3. Ship the product back to EFData. (Shipping charges should be prepaid.)

For more information regarding the warranty policies, refer to the disclaimer page located behind the title page.

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Table of Contents

Figures

Tables

Chapter 1. INTRODUCTION

This chapter describes the KST-12025 Ku-band satellite terminal, referred to in this manual as “the KST-12025” (Figure 1-1).

1.1 Description

The KST-12025 is a 25W Ku-band satellite earth station electronics terminal configured in two assemblies:

- The feed assembly consists of a transmit reject filter and a Low Noise Amplifier (LNA).
- The outdoor enclosure assembly (the RFT-1225) consists of a solid state power amplifier, up and down converters, Monitor and Control (M&C) microprocessor, and power supply.

The KST-12025 meets all requirements for operation on both private and regional domestic Ku-band satellite networks.

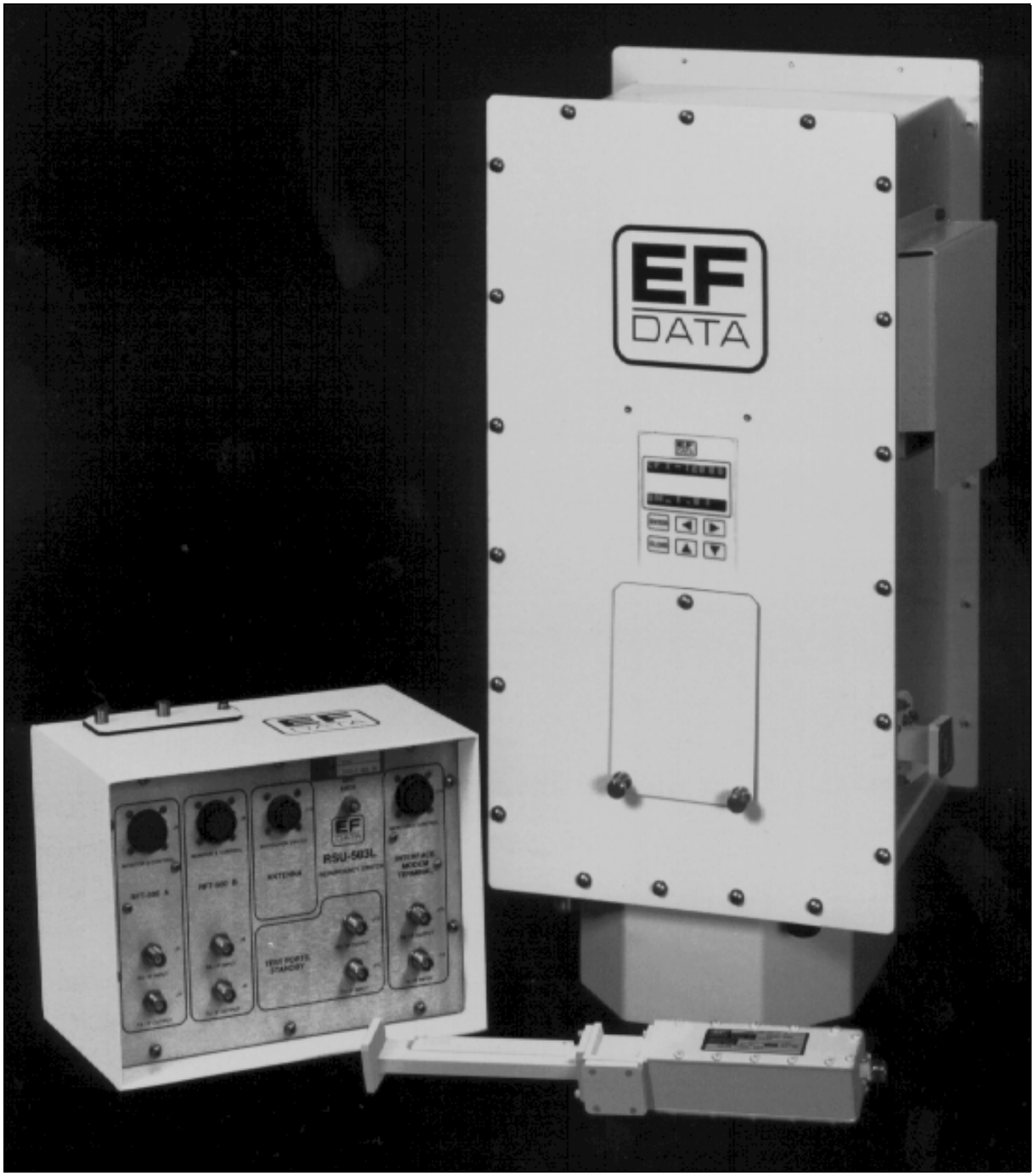

Figure 1-1. KST-12025 Ku-Band Satellite Terminal

Note: The LNAs shown in Figure 1-1 and Figure 1-2 are typical LNAs. Other LNAs are available, and can be ordered from an EFData marketing representative.

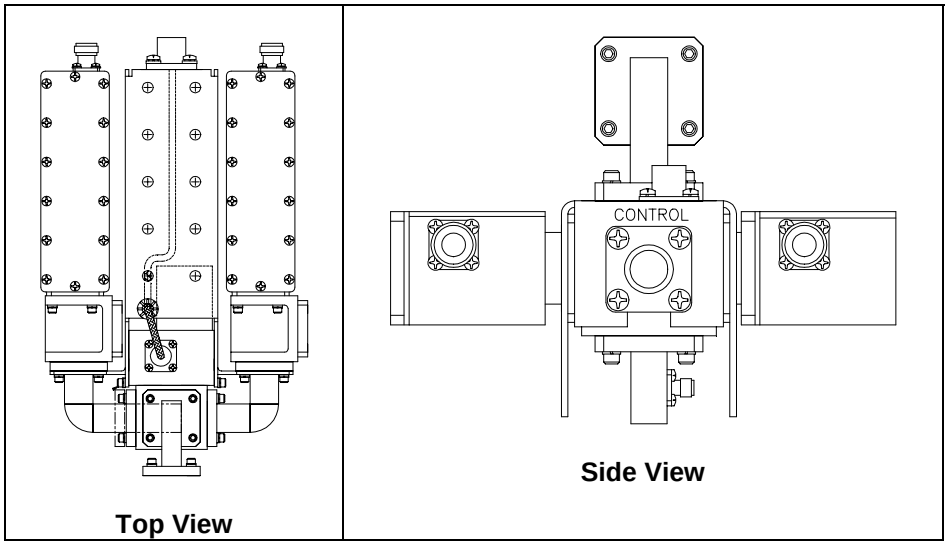

Figure 1-2. Redundant LNA Plate

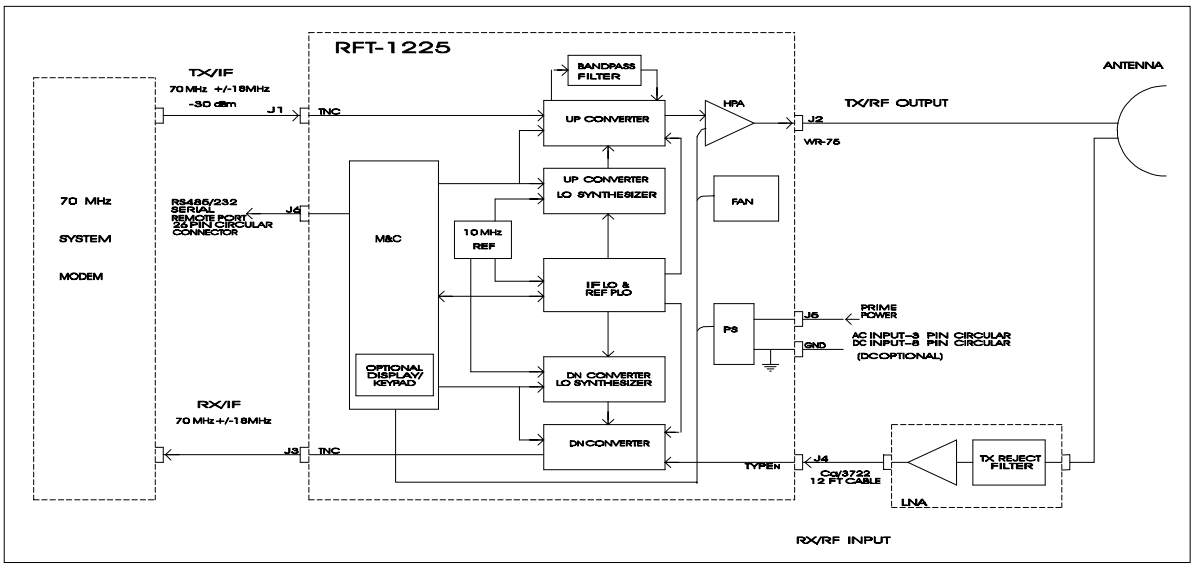

Figure 1-3. KST-12025 Terminal Block Diagram

1.1.1 Applications

When used in conjunction with EFData modems, the KST-12025 terminal is ideal for:

- Single digit carriers
- Multiple carrier operation over a 36 MHz bandwidth

Because the terminal has a 70 MHz IF, it can also be used for other analog and digital applications.

Small-to-medium size earth stations are easily constructed and commissioned with the terminal.

When used with a high-gain antenna, the KST-12025 can also be used as the Radio Frequency (RF) electronics of a central hub in point-to-multipoint applications, as well as serve as the terminal for the end points of the network.

1.1.2 Monitor and Control

An on-board microcomputer monitors and controls all operational parameters and system status of the KST-12025. This powerful M&C system enables the user to locally or remotely control functions such as:

- Output power
- Transmit/receive channel frequencies

The system also reports terminal configuration status, as well as fault status of all KST-12025 components.

The terminal can be initially configured by a keyboard/LCD controller within the enclosure, or by connection of a common ASCII/RS-232 terminal connected to the serial port. A simple command set allows total configuration control and retrieval of status information.

If the indoor unit is a more sophisticated station monitor and control computer, the serial port can be set to RS-485 for bus operation.

For more information on the M&C board, refer to Chapter 5.

1.1.3 LNA Assembly

The LNA assembly consists of a wave guide transmit reject filter and an LNA.

The transmit reject filter provides receive system protection from transmit energy fed back through the antenna feed system.

The LNA standard noise temperature is 120°K, with optional upgrades down to 80°K, depending upon gain over temperature (G/T) requirements.

1.1.4 Outdoor Enclosure

The outdoor unit (the RFT-1225) is a weatherproof enclosure housing the following:

- Solid State Power Amplifier (SSPA)
- Up and down converters
- M&C microprocessor
- Power supply and cables which interface with an antenna subsystem

In the transmit (uplink) direction, the RFT-1225 accepts a 70 MHz IF signal, and transmits it in the 14.0 to 14.5 GHz frequency band.

In the receive (downlink) direction, depending upon the frequency band options, the terminal accepts an RF signal in either the full 10.95 to 12.75 GHz band, or within an individual sub-band (10.95 to 11.7 GHz, 11.7 to 12.2 GHz, 12.25 to 12.75 GHz), and converts the signal to 70 MHz IF output.

Power level is 25W, and is temperature-compensated for maximum stability.

The up and down converters are dual conversion, with individual synthesizers for independent transmit and receive transponder selection.

The microprocessor provides:

- Online loop monitoring
- Dynamic control functions
- Configuration control
- Fault/status monitoring
- Serial computer/terminal interface

1.2 Options

1.2.1 Configurations

The KST-12025 can be ordered with various configurations, including:

- Output power levels
- Input power (AC/DC)
- Step sizes
- Synthesizers
- LNA gain
- Redundant LNA mounting plates
- Custom logos

Contact an EFData marketing representative for more information.

1.2.2 Equipment

The following items are available:

- KP-10 hand-held keypad. The KP-10 provides portable, external access for controlling the RFT. For more information, refer to the *EFData KP-10 External Keypad Installation and Operation Manual*.

- Front panel display/keypad. The optional front panel provides the local user interface, which can be used to configure and monitor the status of the terminal. For more information, refer to Chapter 4.

- High-performance low-noise amplifiers (LNAs).

Contact an EFData marketing representative for more information.

1.3 Specifications

Table 1-1. KST-12025 System Specifications

RF Input Connector	Type N female
RF Output Connector	WR-75G
TX Band	14.0 to 14.5 GHz
RX Band	10.95 to 12.75 GHz 10.95 to 11.7 GHz 11.7 to 12.2 GHz 12.25 to 12.75 GHz
IF Interface	Two 70 MHz ports
IF Out Connector	Type TNC female
IF In Connector	Type TNC female
IF Out Impedance	50Ω
IF Out RTN Loss	> 19 dB at 70 MHz ± 18 MHz
IF In Impedance	50Ω
IF In RTN Loss	> 19 dB at 70 MHz ± 18 MHz
Prime Power Options	90 to 230 VAC, 47 to 63 Hz, using a 6' cable North American 3-prong plug, or 48 VDC (40 to 60V)
Power Consumption: 25W RF Output	 800W AC or DC Input
Physical: Size (RFT-1225) Weight	 26.5" H x 12.7" W x 9.3" D (refer to Figure 1-6) 49 lbs. maximum
Environmental: Temperature Thermal Gradient Humidity Precipitation Salt Fog Sand and Dust Altitude Solar Radiation Safety Emissions ES Discharge	 -40° to +55°C operating -50° to +75°C survival 40°C/hour 10°C/15 min. 0% to 100% relative at -40° to +55°C 95% at 65°C/72 hr. 810/Method 506.2 810/Method 509.2 810/Method 510.1 0 to 15,000 ft oper, 0 to 50,000 ft. surv. 360 BTU/hr./ft2 at 50°C Capable of UL, CSA, VDE, IEC FCC Part 15, J, Class A 10 kV operation, 15 kV survival

Table 1-2. RFT-1225 Specifications

Receiver Specifications	
Frequency Range	10.95 to 12.75 GHz, in 2.5 MHz steps 10.95 to 11.7 GHz, in 2.5 MHz steps 11.7 to 12.2 GHz, in 2.5 MHz steps 12.25 to 12.75 GHz, in 2.5 MHz steps
Frequency Range (Optional)	10.95 to 12.75 GHz, in 1.0 MHz steps 10.95 to 11.7 GHz, in 1.0 MHz steps 11.7 to 12.2 GHz, in 1.0 MHz steps 12.25 to 12.75 GHz, in 1.0 MHz steps
Frequency Sense	No inversion
Receiver gain	Variable 70 to 95 dB with LNA
Frequency Stability	$\pm 1 \times 10^{-8}$ at 23°C
Daily RX Freq Stability	$\pm 1 \times 10^{-8}$ at 23°C
Annual RX Freq Stability	$\pm 1 \times 10^{-7}$ at 23°C
RX Drift/Temp	$\pm 1 \times 10^{-8}$ from -40 to +55°C
Gain Flatness	± 1.0 dB/36 MHz
Bandwidth	70 MHz with 1 dB BW of ± 18 MHz
Noise Figure	120°K (options to 90°K)
Receive Image Rejection	-45 dBc
Linearity	T.O.I. -35 dBc for 2 tones at -86 dBm pin (with LNA)
Group Delay	< 20 ns/36 MHz
Synth Lock Time	< 1 second
RX (2.5 MHz steps) Phase Noise	-60 dBc/Hz at 100 Hz -70 dBc/Hz at 1 kHz -75 dBc/Hz at 10 kHz -80 dBc/Hz at 100 kHz
Optional RX (1.0 MHz steps) Phase Noise	-60 dBc/Hz at 100 Hz -66 dBc/Hz at 1 kHz -75 dBc/Hz at 10 kHz -80 dBc/Hz at 100 kHz
Inband Overdrive	No damage to 0 dBm
Third Order Intercept	+24 dBm minimum
1 dB Output compression	+17 dBm minimum

Transmitter Specifications	
Frequency Range	14.0 to 14.5 GHz, in 2.5 MHz steps
Frequency Range (Optional)	14.0 to 14.5 GHz, in 1.0 MHz steps
Transmitter power at 1 dB compression point: 25W Transmitter Power Option: 25W	Gain at 1 dB compression point with customer attenuator at 13 dB: 74 dB gain Linear Gain with customer attenuator at 13 dB: 75 dB
Transmitter linear gain vs. Customer controlled attentuator setting	0 to 25 dB, factory setting = 13 dB
TX Bandwidth	70 MHz with 1 dB BW of ± 18 MHz
Gain flatness	± 1 dB/36 MHz
Gain variation	± 2 dB max. for flatness, temp., aging
TX Freq Stability	$\pm 1 \times 10^{-8}$ at 23°C
Daily TX Freq Stability	$\pm 1 \times 10^{-8}$ at 23°C
Annual TX Freq Stability	$\pm 1 \times 10^{-7}$ at 23°C
TX Freq Drift/Temp	$\pm 1 \times 10^{-8}$ from -40 to +55°C
TX Synthesizer Lock-up time	< 1 second
TX Phase Noise (2.5 MHz steps)	-60 dBc/Hz at 100 Hz -70 dBc/Hz at 1 kHz -75 dBc/Hz at 10 kHz -80 dBc/Hz at 100 kHz
Optional TX (1.0 MHz steps) Phase Noise	-60 dBc/Hz at 100 Hz -66 dBc/Hz at 1 kHz -75 dBc/Hz at 10 kHz -80 dBc/Hz at 100 kHz

Table 1-3. LNA Specifications

Input VSWR	1.25:1 max.
Output VSWR	1.25:1
Gain Flatness: 10.95 to 12.75 GHz 10.95 to 11.7 GHz 11.7 to 12.2 GHz 12.25 to 12.75 GHz	± 2.0 dB/full band ± 1.5 dB/full band ± 0.50 dB/40 MHz ± 1.5 dB/full band ± 0.25 dB/40 MHz ± 1.5 dB/full band ± 0.25 dB/40 MHz ± 1.5 dB/full band ± 0.25 dB/40 MHz
Gain vs. Temperature	± 1.5 dB Max.
Operating Temperature	-40°C to +60°C
1 dB Gain Comp. Pt. (optional)	+10 dBm +20 dBm optional +8 dBm
Third Order Intercept Point (optional)	+20 dBm +18 dBm
Group Delay: Linear Parabolic Ripple	 0.01 ns/MHz 0.001 ns/MHz^2 0.1 ns/p-p
Power Connector	Power through coax
RF Input W/G	WR-75 cover
Input Power	+12 to +24 VDC at 100 mA nominal
Frequency	10.95 to 12.75 GHz 10.95 to 11.7 GHz 11.7 to 12.2 GHz 12.25 to 12.75 GHz
AM-PM Conversion	0.5°/dB at -5 dBm

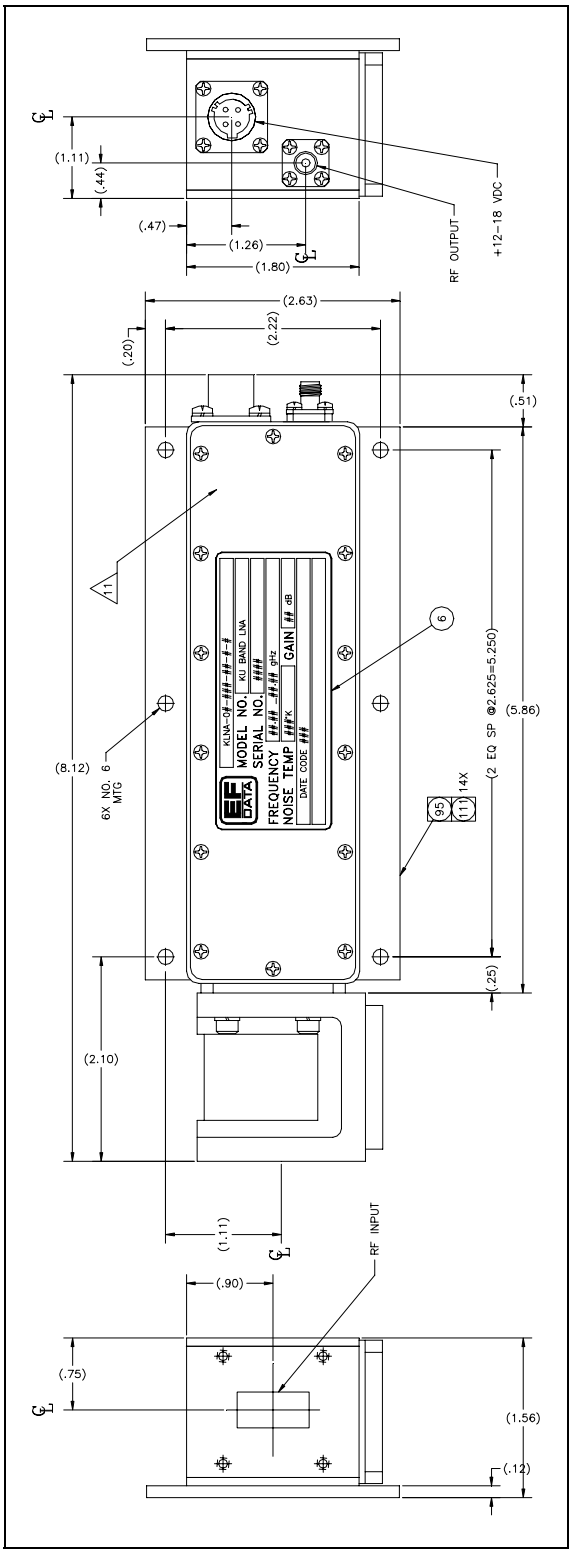

Figure 1-4. LNA Dimensions

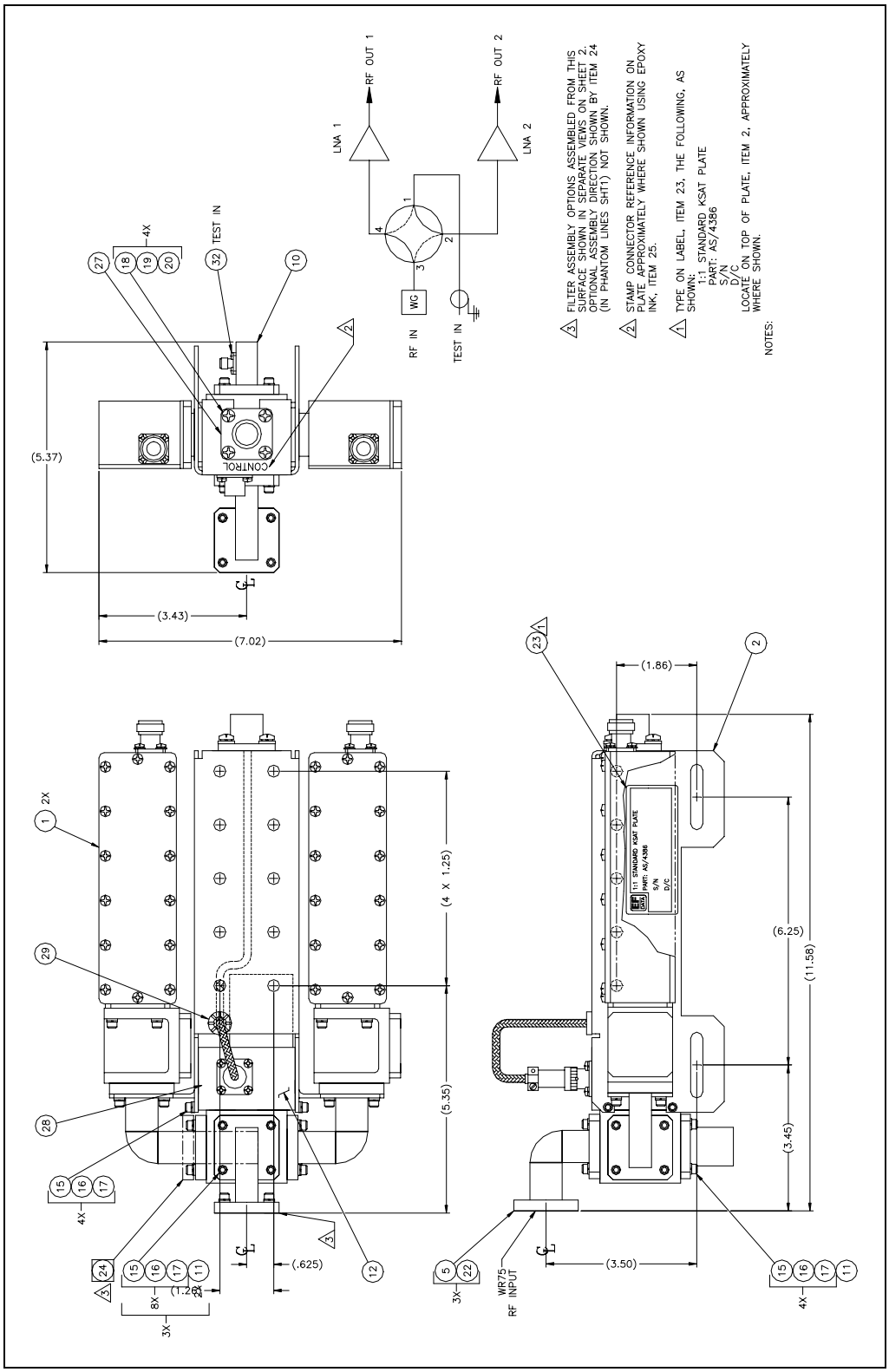

Figure 1-5. Dimensions for 1:1 Redundant LNA Plate

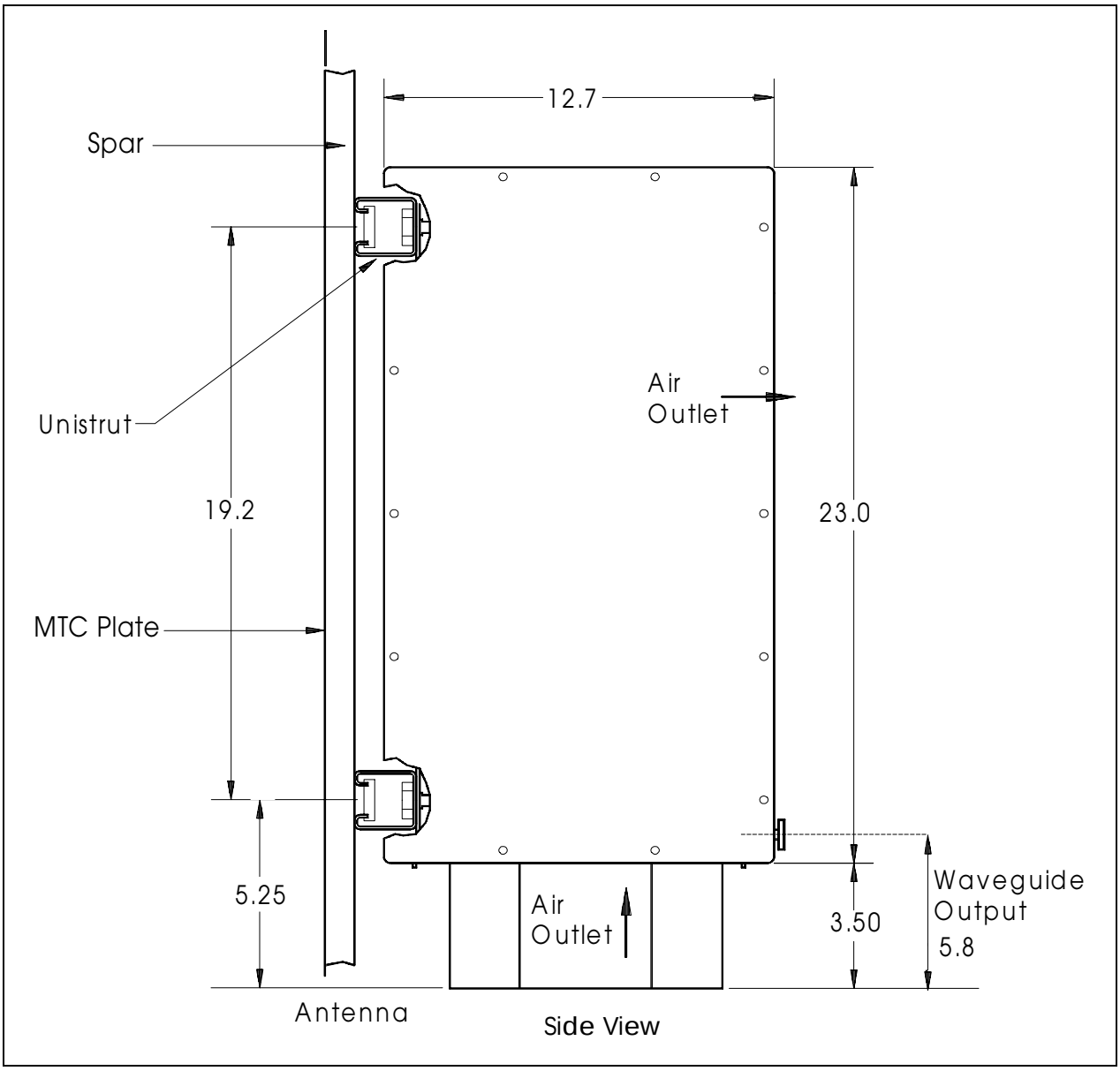

Figure 1-6. RFT-1225 Dimensions

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Chapter 2. SINGLE THREAD SYSTEM INSTALLATION

This chapter provides installation information for single thread systems, including:

- Unpacking and inspecting the parts
- Installing the RFT
- Installing the LNA and flexible waveguide
- External connections

For redundant systems, refer to Chapter 3.

2.1 Unpacking

The KST-12025 terminal system is packaged in preformed, reusable foam inside a cardboard carton.

Before unpacking the carton components, ensure that there is plenty of room around the carton for workspace. A large table is recommended.

To remove the parts:

1. Cut the tape at the top of the carton where it is indicated OPEN THIS END.
2. Lift out the cardboard/foam spacer covering the unit.
3. Remove each part from the carton. Refer to Section 2.2.1 for a parts breakdown.

Because the RFT is heavy, assistance may be necessary to remove the unit from the box.

Note: Save the packing material for reshipment.

2.2 Inspecting the Equipment

1. Carefully check the equipment for damage incurred during shipment.

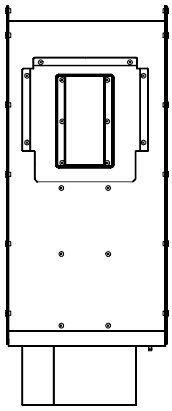
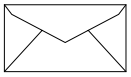
2. Carefully check the equipment against the packing list shipped with the equipment to ensure that the shipment is complete. Refer to the following paragraphs.

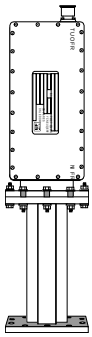
2.2.1 Included Parts

A typical single thread KST-12025 configuration contains the following components.

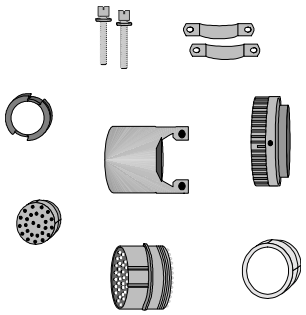
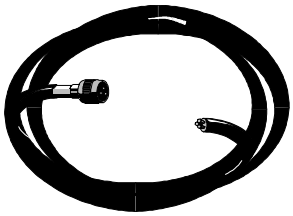
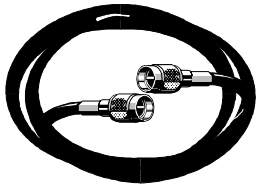
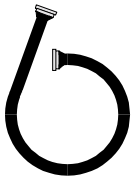
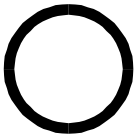
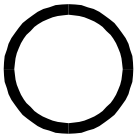
Notes:

1. Parts are not drawn to scale.
2. Because each system can be custom ordered, it is beyond the scope of this manual to provide the unlimited configuration possibilities.
3. This chapter does not describe the installation procedures for amplifiers, high performance LNAs, phase-locked LNBs, LNBs, and phase-locked block converters.

Qty.	Description
1	RFT outdoor unit. 
1	Envelope containing the test data sheet. 

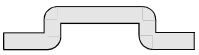
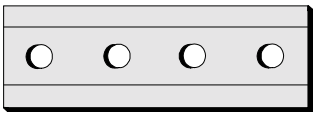
Qty.	Description
1	Feed assembly.  **Note:** Pictured is a typical LNA. Other LNAs are available, and can be ordered from an EFData marketing representative.
1	*KST-12025 Ku-Band Satellite Terminal Installation and Operation Manual*. 

1	*Monitor and Control Software for EFData Satellite Terminals User's Guide.* 

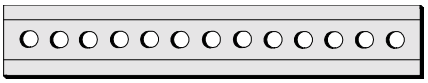
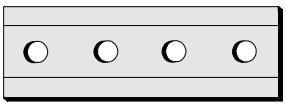
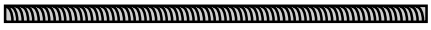
1	**Kit KT/3954-x (where x = 1 for AC power, and 2 for DC power), which includes:**			
Qty.	**Description**		**Qty.**	**Description**
1	Connector kit.  *EFData Part # CN/STPG26M01.* *Used to connect customer's cable to the RFT 26-pin J6 (REMOTE). For remote control and status monitoring (by using M&C system monitor software).*		1	**Note:** Either the AC or DC cable is provided, depending upon the product ordering code. Assembly, 15' AC prime power cable. *EFData Part # PL/2754.* Assembly, 15' DC prime power cable. *EFData Part # PL/4157.* 
1	17' Heliax cable.  *EFData Part # CA/3722.* *Used for LNA to down converter.*		1	Flexible Waveguide.  *EFData Part # RF/WGFLXWR75-5.* *Used to connect LNA to antenna.*
1	O-Ring, -024, buna, black.  *EFData Part # 32P1037.*		2	O-Ring, black neoprene.  *EFData Part # 32P1039.*
10	6-32 x 7/8" socket head cap screw.  *EFData Part # HW/6-32X7/8SHCS.*		20	#6 flat washer.  *EFData Part # HW/6-FLT.*
10	6-32 nut.  *EFData Part # HW/6-32HEXNUT.*		10	#6 split lockwasher.  *EFData Part # HW/6-SPLIT.*

Note: If an RFT for a spar mount is ordered, EFData will provide a spar mount kit (KT/4061). Otherwise, the universal installation kit (KT/3576) will be provided.

1	**Kit KT/4061, which includes:**

Qty.	Description
2	Spar support bracket.  *EFData Part # FP/3175.* *Used for spar mount only.*
8	1/4-20 x 5/8” bolt.  *EFData Part # HW/1/4-20X5/8BT.* *Used to attach 8” or 14” unistruts to RFT.*
8	1/4” flat washer.  *EFData Part # HW/1/4-FLT.* *Used to attach 8” unistruts to RFT.*
8	1/4” split lockwasher.  *EFData Part # HW/1/4-SPLIT.* *Used to attach 8” unistruts to RFT.*
2	Unistrut — 8” long.  *EFData Part # FP/3481.* *Attaches directly to RFT.*

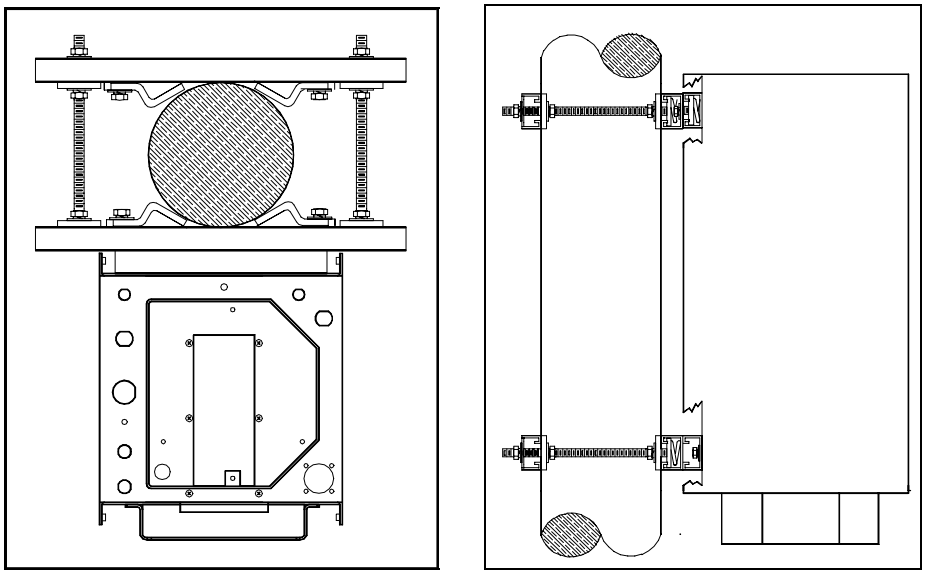
Qty.	Description
4	5/16-18 x 1” bolt.  *EFData Part # HW/5/16-18X1BLT.* *Used to attach spar support bracket to 8” unistrut.*
4	5/16” split lockwasher.  *EFData Part # HW/5/16-SPLIT.* *Used to attach spar support bracket to 8” unistrut.*
4	5/16” flat washer.  *EFData Part # HW/5/16-FLT.* *Used to attach spar support bracket to 8” unistrut.*
4	5/16-18 spring nut.  *EFData Part # HW/5/16-18SPNUT.* *Used to attach spar support bracket to 8” unistrut.*

1	**Kit KT/3576, which includes:**			
Qty.	**Description**		**Qty.**	**Description**
2	Spar support bracket.  *EFData Part # FP/3175.* *Used for spar mount only.*		12	5/16-18 x 1” bolt.  *EFData Part # HW/5/16-18X1BLT.*
4	Unistrut — 14” long.  *EFData Part # FP/3595.* *Used for round and square pole mount only.*		24	5/16” split lockwasher.  *EFData Part # HW/5/16-SPLIT.*
2	Unistrut — 8” long.  *EFData Part # FP/3481.* *Attaches directly to RFT.*		24	5/16” flat washer.  *EFData Part # HW/5/16-FLT.*
8	1/4-20 x 5/8” bolt.  *EFData Part # HW/1/4-20X5/8BT.* *Used to attach 8” unistruts to RFT.*		12	5/16-18 hex nut.  *EFData Part # HW/5/16-18HEXNT.*
8	1/4” flat washer.  *EFData Part # HW/1/4-FLT.* *Used to attach 8” unistruts to RFT.*		16	5/16-18 spring nut.  *EFData Part # HW/5/16-18SPNUT.*
8	1/4” split lockwasher.  *EFData Part # HW/1/4-SPLIT.* *Used to attach 8” unistruts to RFT.*		8	Flat fitting plate, 5/16”.  *EFData Part # HW/FIT-PLT-5/16.*
8	Pipe block.  *EFData Part # HW/BLK-PIPE2-8.* *Used for round pole mount only.*		4	Threaded rod, 5/16-18 x 14”.  *EFData Part # HW/RD5/16-18X14.* *Used for round and square pole mount only.*

2.3 RFT Installation

At the customer's discretion, the RFT can be installed anywhere on or near the antenna. The supplied hardware allows the installer a wide range of installation alternatives, including:

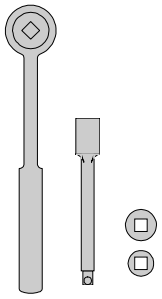
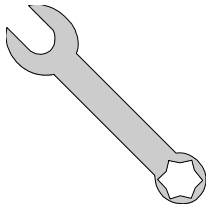
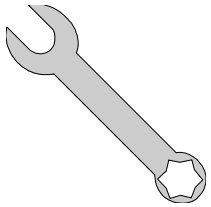
- Vertical pole (e.g., mast) (either square or round). This is the most typical installation.



- Within the hub of a large antenna.
- Spar (i.e., square bar) on the antenna structure.

EFData recommends that the RFT be mounted vertically, with the air inlet facing the ground.

2.3.1 Tools Required

Qty.	Description
1 1 1 1	3/8” drive ratchet. 3” x 3/8” drive extension. 7/16” x 3/8” drive socket. *(Metric equivalent: 12mm, 6 pt.)* 1/2” x 3/8” drive socket. *(Metric equivalent: 13mm, 6 pt.)* 
1	1/2” combination wrench. *(Metric equivalent: 13mm combination wrench with a 6 pt. box end.)* 
1	7/64” hex key (allen wrench). *(No metric equivalent.)* 
1	5/16” combination wrench. *(Metric equivalent: 8mm combination wrench with a 6 pt. box end.)* 

2.3.2 Vertical Pole Installation

2.3.2.1 Round Pole

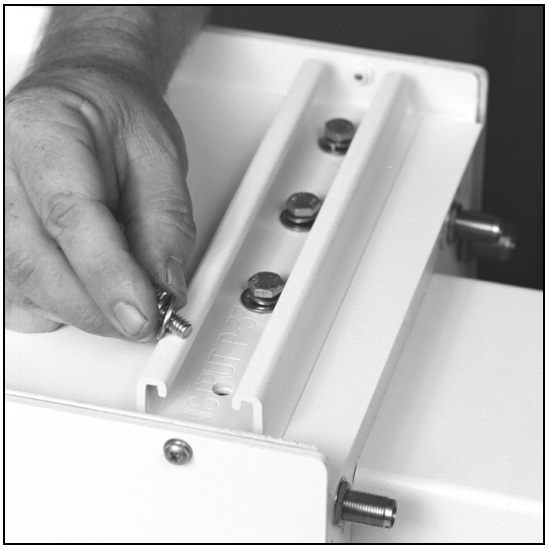
Note: The following process is for a typical installation. Custom systems may be ordered, and are beyond the scope of this manual.

To install the RFT to a round vertical pole:

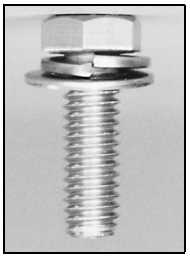
1. Set the unit on its side, with the mounting holes facing up.

2. Install the 8” unistruts as follows:

   a. Position an 8” unistrut (with the open side facing up) over one set of the mounting holes on the RFT.

   b. Using four 1/4-20 bolts, 1/4” split lockwashers, and 1/4” flat washers, attach an 8” unistrut to the RFT.

   Tighten the bolts firmly.

   c. Repeat Steps 2.a. and 2.b. for the second 8” unistrut.

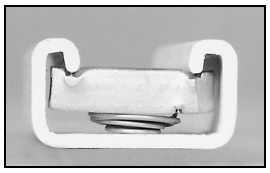
3. Install the 14” unistruts as follows:

   a. Position a spring nut between the inner and outer bolts on both sides of each 8” unistrut.

   b. Install each spring nut as follows:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

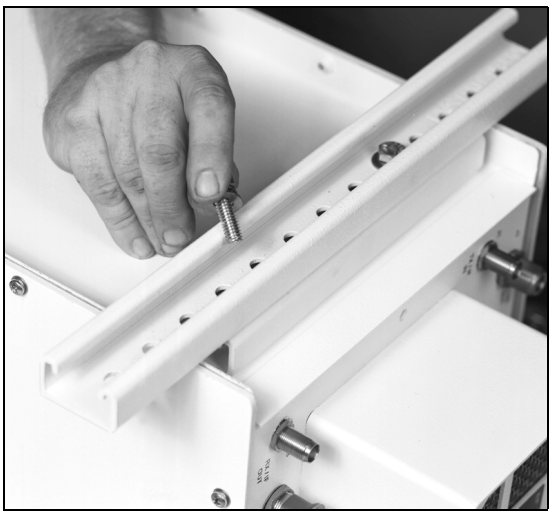
      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).



      (3) Release pressure on the spring nut.

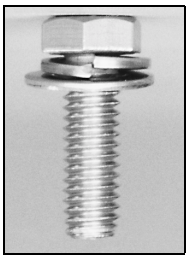
      (4) Repeat Steps 3.b.(1) through 3.b.(3) for each spring nut.

c. Position a 14” unistrut (open side facing up) over one of the 8” unistruts.



Ensure the 14” unistrut is centered over the RFT.

d. Using two 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, attach the 14” unistrut to the 8” unistrut.



Note: The bolts should be installed in the fifth hole from each end, as illustrated.

Tighten the bolts firmly.

e. Attach the second 14” unistrut to the second 8” unistrut by repeating Steps 3.a. through 3.d.

4. Install the pipe blocks as follows:

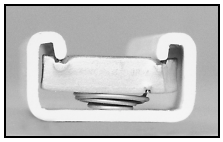
   a. Install two spring nuts in each of four 14” unistruts (the two just mounted on the RFT, and two additional).

      Be sure to position the spring nuts in the unistruts wide enough apart so that when the pipe blocks are installed, they will clear the pole when the unit is lifted into place for installation.

   b. Install each spring nut as follows:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

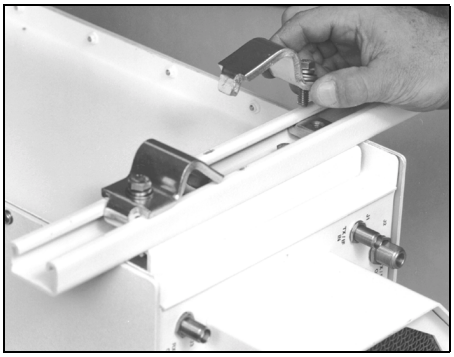
      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).



      (3) Release pressure on the spring nut.

      (4) Repeat Steps 4.b.(1) through 4.b.(3) for each spring nut.

   c. Using four 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, loosely secure the pipe blocks to the spring nuts.

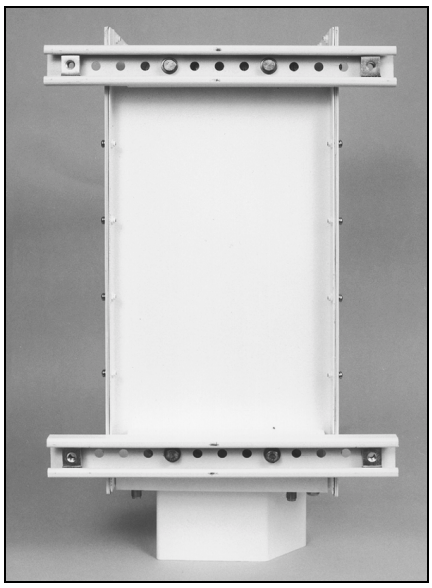


      Ensure the pipe blocks are installed with the long angle facing inward, toward the pipe, as illustrated.

      DO NOT tighten the pipe block bolts until after mounting the RFT on the vertical pole. (See Step 6.e.)

5. Install the threaded rods as follows:

   a. Install two spring nuts in both 14” unistruts mounted on the RFT.

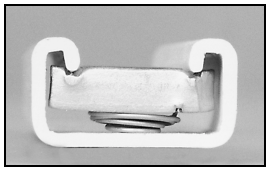
   

   Note: Ensure the spring nuts are positioned over the outer holes in the 14” unistruts, as illustrated.

   b. To install each spring nut:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).

      (3) Release pressure on the spring nut.

      (4) Repeat Steps 5.b.(1) through 5.b.(3) for each spring nut.

   c. Thread a 5/16-20 nut approximately 1-1/2” onto each threaded rod. (This will ensure that the threaded rods will extend beyond the spring nuts when installed.)

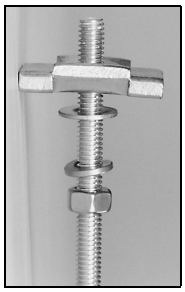
   d. Place a 5/16” split lockwasher, 5/16” flat washer, and flat fitting plate over each threaded rod.

e. One threaded rod at a time, hold the washers and plate in place on the rod, and screw the rod into a spring nut, as illustrated.

Notes:

1. Be sure to position the flanges of the flat fitting plates in the grooves of the unistruts.
2. Before tightening the nuts on the threaded rods, ensure that the end of each rod is screwed in until it is flush with the backside of the unistruts. This ensures the rods are threaded completely through the spring nuts.



Tighten each nut firmly.

f. Thread a 5/16-18 nut about 2” onto the end of each threaded rod.

g. Slip a 5/16” split lockwasher, 5/16” flat washer, and flat fitting plate (in that order) onto each threaded rod.

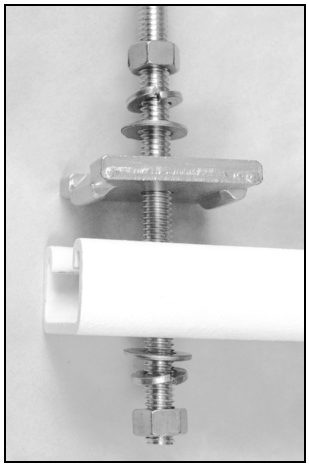
6. Mount the RFT as follows:

   a. Lift the RFT into position on the vertical pole.

   b. Slip a 14” unistrut over each of pair of threaded rods (upper and lower).

      Note: Install the 14” unistruts with the open face toward the pole as illustrated below.

c. Install a 5/16” flat washer, 5/16” split lockwasher, and 5/16-18 nut on each threaded rod.



d. Position the RFT as desired, and tighten the 5/16-18 nuts installed in Step 6.c.

e. Slide the pipe blocks inward until they contact the vertical pole, then firmly tighten the 5/16-18 bolts.

2.3.2.2 Square Pole

For square vertical pole installation, follow the steps in Section 2.3.2.1, with the following exceptions:

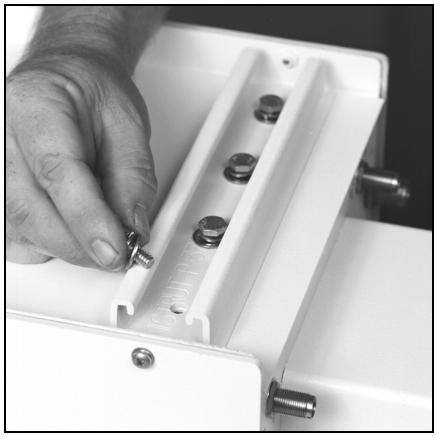
- Do not perform Step 4.
- Do not perform Step 6.e.

2.3.3 Spar Installation

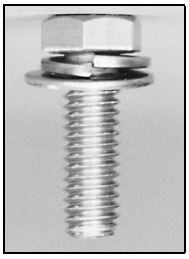
Note: The following process is for a typical installation. Custom systems may be ordered, and are beyond the scope of this manual.

To install the RFT to a spar:

1. Set the unit on its side, with the mounting holes facing up.
2. Install the 8” unistruts as follows:
   a. Position an 8” unistrut (with the open side facing up) over one set of the mounting holes on the RFT.



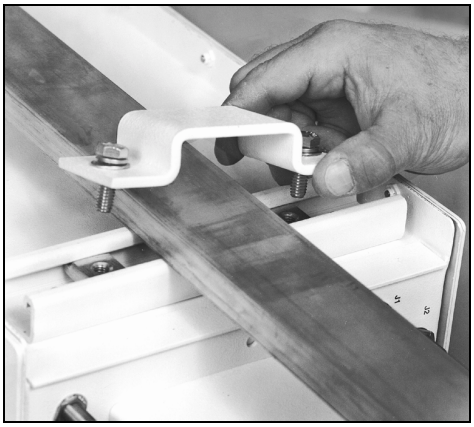
   b. Using four 1/4-20 bolts, 1/4” split lockwashers, and 1/4” flat washers, attach an 8” unistrut to the RFT.



      Tighten the bolts firmly.

   c. Repeat Steps 2.a. and 2.b. for the second 8” unistrut.

3. Mount the RFT as follows:

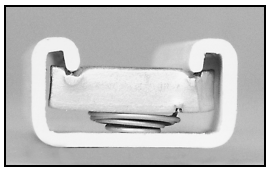


   a. Position a spring nut between the inner and outer bolts on both sides of each 8” unistrut, as illustrated.

   b. Install each spring nut as follows:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).

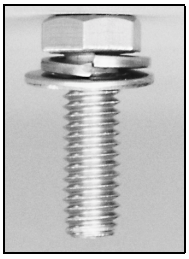


      (3) Release pressure on the spring nut.

      (4) Repeat Steps 3.b.(1) through 3.b.(3) for each spring nut.

   c. Lift the RFT into position.

   d. Using four 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, bolt the two spar support brackets in place.



      Tighten the bolts firmly.

2.4 LNA and Flexible Waveguide Installation

Refer to Section 2.2.1 for included parts.

To install a single LNA to an antenna:

1. Remove the protective cover from the antenna mount location (if installed).
2. Remove the plastic cover from the antenna end (RF IN) of the LNA.
3. Remove the plastic cover from the RF OUT end of the LNA.

After removing the protective cover(s), ensure that no foreign material or moisture enters the antenna waveguide or LNA.

4. Install the appropriate O-ring on the antenna end of the LNA:
   a. If both components have O-ring grooves, use EFData Part # 32P1039.
   b. If only one component has an O-ring groove, use EFData Part # 32P1037.
5. Using four 6-32 x 7/8” socket head cap screws, eight #6 flat washers, four #6 split lockwashers, and four 6-32 nuts, attach the LNA to the antenna. Tighten the cap screws firmly.

To install the flexible waveguide:

1. Install the appropriate O-ring between the flexible waveguide and the antenna.
2. Using four 6-32 x 7/8” socket head cap screws, four #6 split lockwashers, eight #6 flat washers, and four 6-32 nuts, attach the flexible waveguide to the antenna. Tighten the cap screws firmly.
3. Install the appropriate O-ring between the flexible waveguide and the waveguide flange on the RFT.
4. Using four 6-32 x 7/8” socket head cap screws, four #6 split lockwashers, eight #6 flat washers, and four 6-32 nuts, attach the flexible waveguide to the waveguide flange on the RFT. Tighten the cap screws firmly.

2.5 External Connections

Connections between the RFT and other equipment are made through six connectors. These connectors are listed in Table 2-1, and their locations are shown in Figure 2-1.

The use of each connector is described in the following paragraphs.

Table 2-1. Rear Panel Connectors

Name	Ref. Design.	Connector Type	Function
TX/IF IN	J1	TNC	TX IF INPUT (70 MHz)
TX/RF OUT	J2	WR-75 G	14.0 to 14.5 GHz OUT
RX/IF OUT	J3	TNC	RX IF OUT (70 MHz)
RX/RF IN	J4	Type N	10.95 to 12.75 GHz Input
PRIME PWR	J5	Standard	Prime Power Input
REMOTE	J6	26-pin CIR	Remote Interface
GND	None	#10-32 Stud	Chassis Ground

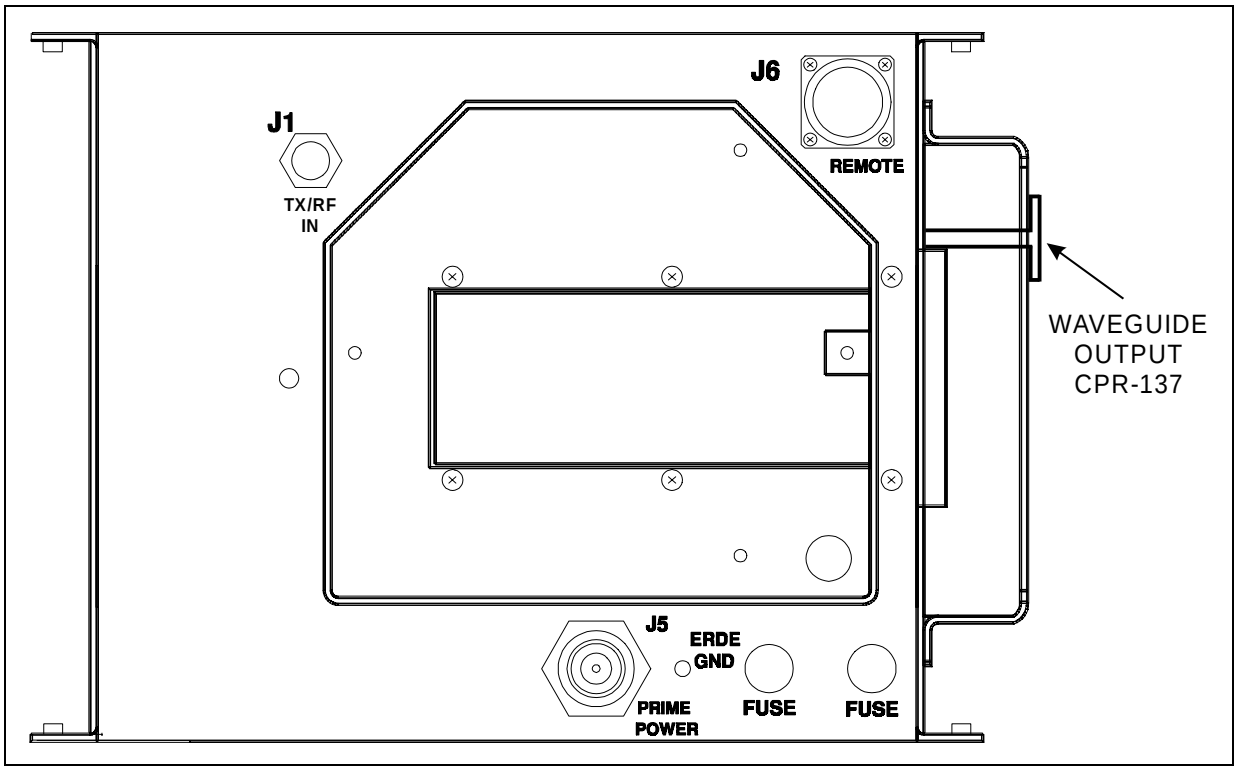


Figure 2-1. RFT External Connections

2.5.1 TX/IF Input (J1)

The TX/IF input is a TNC type connector that comes from the indoor unit. The input impedance is 50Ω, and the frequency is 70 MHz ± 18 MHz. The typical power level is from -43 to -19 dBm, depending on the customer's configuration and application.

2.5.2 TX/RF Output (J2)

The TX/RF output is a WR-75 G interface with an output impedance of 50Ω. The output frequency range is 14.0 to 14.5 GHz. The output power level is 25W.

2.5.3 RX/IF Output (J3)

The RX/IF output is a TNC type connector that sends the received signal to the indoor unit. The output impedance is 50Ω, and the frequency is 70 MHz ± 18 MHz.

The 1 dB output compression point is +17 dBm.

The level of the signal at the RX/IF output is a factor of input signal level and total system gain.

The system gain is adjustable by the user over a 25 dB range.

The typical system gain includes a 50 dB LNA, making the total typical system gain 70 to 95 dB.

Note: A 60 dB LNA is only used when there are extremely long cables from the LNA to the down converter.

2.5.4 RX/RF Input (J4)

The RX/RF input is a type N connector that comes from the LNA. The input impedance is 50Ω. The connector also has the LNA DC power on the center conductor.

The input frequency range depends upon receive band options, either:

- Full 10.95 to 12.75 GHz band
- Individual sub-band:
  - 10.95 to 11.7 GHz
  - 11.7 to 12.2 GHz
  - 12.25 to 12.75 GHz

2.5.5 Prime Power (J5)

The AC power is supplied to the RFT by a 3-pin power connector. Normal input voltage is 90 to 232 VAC, 47 to 63 Hz. The AC pinout is as follows:

Pin #	Name	Function	Wire Color
A	HI	Line	Brown
B	LO	Neutral	Blue
C	GND	Ground	Green/yellow

Maximum power consumption is 800W for the RFT-1225.

A circular 4-pin power connector is used for the DC (48 VDC) option. The pinout is as follows:

Pin #	Name
A	+ INPUT
B	GROUND
C	- INPUT
D	NC

2.5.6 Serial Remote Control (J6)

The remote connector on the RFT is used to interface the M&C functions to a remote location. This interface can be either EIA-232-C or EIA-485.

When using an EIA-485 interface, the transmit and receive signals are able to accommodate either type of remote equipment pinouts. As long as the polarities of the remote equipment TX and RX signals are correct, this remote interface will be completely compatible.

Refer to Table 2-2 for a list of pinouts for the J6 connector.

For standard EIA-232-C or EIA-485 applications, an adapter cable must be used to connect the 26-pin connector (J6) to a standard 9-pin D.

Refer to Figure 2-1 for an illustration of the adapter cable with its pinouts.

Table 2-2. RFT-1225 Remote Control Connector, J6

Pin	Name		Description
	EIA-232-C	EIA-485	
A	GND	-RX/TX	RX/TX Data
B		-RX/TX	RX/TX Data
C		+RX/TX	RX/TX Data
D	CTS	+RX/TX	Clear to Send *(see Note 1 below)*
E	RD/RX		Receive Data
F	RTS		Ready to Send *(see Note 1 below)*
G	TD/TX		Transmit Data
H	DSR		Data Set Ready
J		GND	Ground
K	LNA Power		Output, 10V for powering LNA *(see Note 2 below)*
L	EXT_PWR		Output voltage, 11V, to power EIAU-503L and KP-10
M	EXT TWT FLT		Input, logic 0 or 5V, 5V = FLT, 0V = normal *(see Note 3 below)*
N	EXT IN_2		Input, logic 0 or 5V, spare *(see Note 3 below)*
P	SPARE		N/C
R	GRD		Ground
S	SPARE		N/C
T	ALOG TST		Analog test voltage output
U	UL_NC		Uplink fault relay, connects to uplink COM with fault
V	UL_COM		Uplink fault relay, COMMON
W	UL_NO		Uplink fault relay, opens with fault
X	DL_NC		Downlink fault relay, connects to downlink COM with fault
Y	DL_COM		Downlink fault relay, COMMON
Z	DL_NO		Downlink fault relay, opens with fault
a	LNA PWR RTN		Return for LNA Power *(see Note 2 below)*
b	SPARE		
c	SPARE		

Notes:

1. In EIA-232-C mode, CTS is tied to RTS (and vice versa).
2. LNA can be powered from these pinouts instead of up through the RF cable.
3. 5V is a floating level.

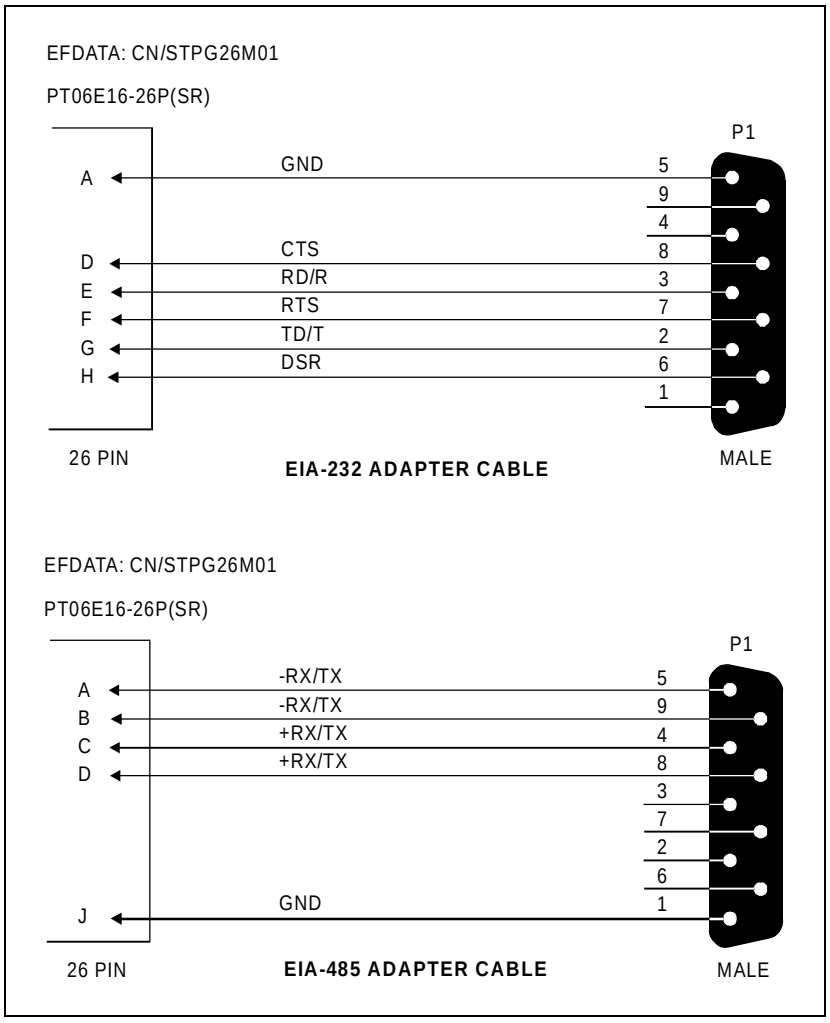


Figure 2-2. Serial Adapter Cables

2.5.7 GND

A #10-32 stud is available on the rear for the purpose of connecting a common chassis ground between all of the equipment.

Chapter 3. REDUNDANT SYSTEM INSTALLATION

This chapter provides installation information for redundant systems, including:

- Unpacking and inspecting the parts
- Installing the RFTs
- Installing the 1:1 redundant plate
- Installing the waveguide switch
- External connections

For RSU-503L installation information, refer to the *EFData RSU-503 Redundancy Switch Unit Installation and Operation Manual.*

For single thread systems, refer to Chapter 2.

If the RFTs are to be mounted individually, refer to Chapter 2 for installation information.

3.1 Unpacking

The KST-12025 redundant system is shipped in two cartons (one RFT each) and one crate.

To remove the parts:

1. Cut the tape at the top of each carton where it is indicated OPEN THIS END.
2. Lift out the cardboard/foam spacer covering the units.
3. Remove the parts from the cartons. Refer to Section 3.2.1 for a parts breakdown.

Because the RFTs are heavy, assistance may be necessary to remove the units from the boxes.

4. Remove the screws from the lid of the wooden crate, and remove the lid.
5. Unbolt the redundant LNA plate and remove it from the crate.
6. Remove the remainder of the parts from the crate. Refer to Section 3.2.1 for a parts breakdown.

Note: Save the packing material for reshipment.

3.2 Inspecting the Equipment

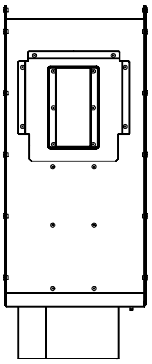
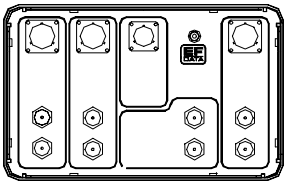
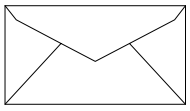
1. Carefully check the equipment for damage incurred during shipment.
2. Carefully check the equipment against the packing list shipped with the equipment to ensure that the shipment is complete. Refer to the following paragraphs.

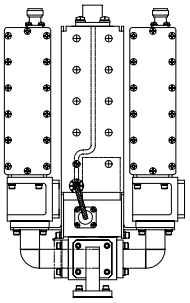
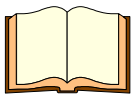
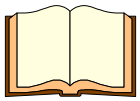
3.2.1 Included Parts

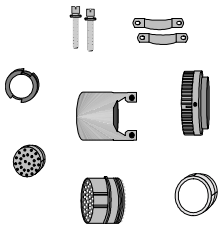
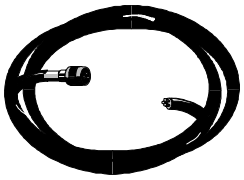
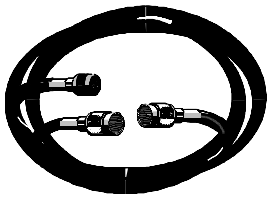
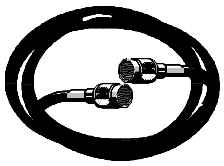
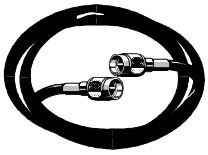
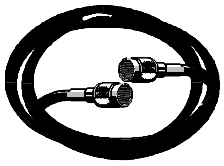
A typical redundant KST-12025 configuration contains the following components.

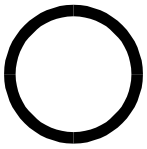
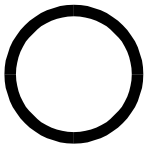
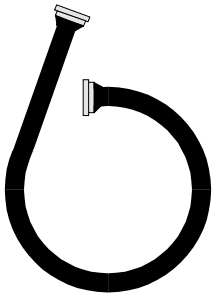
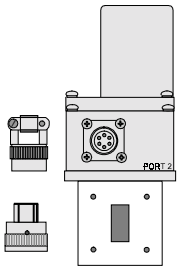
Notes:

1. Parts are not drawn to scale.
2. Because each system can be custom ordered, it is beyond the scope of this manual to provide the unlimited configuration possibilities.
3. This chapter does not describe the installation procedures for amplifiers, high performance LNAs, phase-locked LNBs, LNBs, and phase-locked block converters.

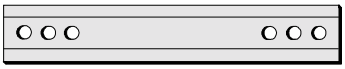
Qty.	Description
2	RFT outdoor unit. 
1	RSU-503L. 
1	Envelope containing the test data sheet. 

Qty.	Description
1	Redundant LNA plate.  **Note:** Pictured is a typical LNA. Other LNAs are available, and can be ordered from an EFData marketing representative.
1	*KST-12025 Ku-Band Satellite Terminal Installation and Operation Manual.* 
1	*RSU-503 Redundancy Switch Unit Installation and Operation Manual.* 
1	*Monitor and Control Software for EFData Satellite Terminals User's Guide.* 

1	**Kit KT/3950-x (where x = 1 for AC power, and 2 for DC power), which includes:**			
Qty.	**Description**		**Qty.**	**Description**
1	Connector kit.  *EFData Part # CN/STPG26M01.* *Used to connect customer's cable to the RFT 26-pin J6 (REMOTE). For remote control and status monitoring (by using M&C system monitor software).*		2	**Note:** Either the AC or DC cable is provided, depending upon the product ordering code. Assembly, 15' AC prime power cable. *EFData Part # PL/2754.* Assembly, 15' DC prime power cable. *EFData Part # PL/4157.* 
1	12' Cable assembly.  *EFData Part # CA/3951.* *"Y" to waveguide switches.*		2	4' Cable assembly.  *EFData Part # PL/3003.* *Used for communications from RFTs A and B to RSU.*
4	4' Cable assembly.  *EFData Part # CA/3005-1.* *TNC to TNC, 50Ω.*		2	12' Cable.  *EFData Part # CA/3722.* *LNA to down converter.*
1	Weldment.  *EFData Part # FP/4427.* *Used to attach switch to antenna feed.*		1	Termination.  *EFData Part # RF/TERM-11923-2.* *Used on port 3 of the switch.*

	Kit KT/3950-x (Continued):			
Qty.	**Description**		**Qty.**	**Description**
4	O-Ring, -024, BUNA, black.  *EFData Part # 32P1037.*		4	O-Ring, black neoprene.  *EFData Part # 32P1039.*
2	Flexible waveguide.  *EFData Part # RF/WGFLXWR75-5.* *Used to attach RFTs to switch.*		1	Switch.  *EFData Part # SW/WGS+28V-75SB.* *Used to switch between RFT outputs.*
10	6-32 x 1/2” socket head cap screw.  *EFData Part # HW/6-32X1/2SHCS.*		50	#6 flat washer.  *EFData Part # HW/6-FLT.*
20	6-32 x 7/8” socket head cap screw.  *EFData Part # HW/6-32X7/8SHCS.*		20	6-32 hex nut.  *EFData Part # HW/6-32HEXNUT.*
30	#6 split lockwasher.  *EFData Part # HW/6-SPLIT.*			

2	**Kit KT/3577, which includes:**

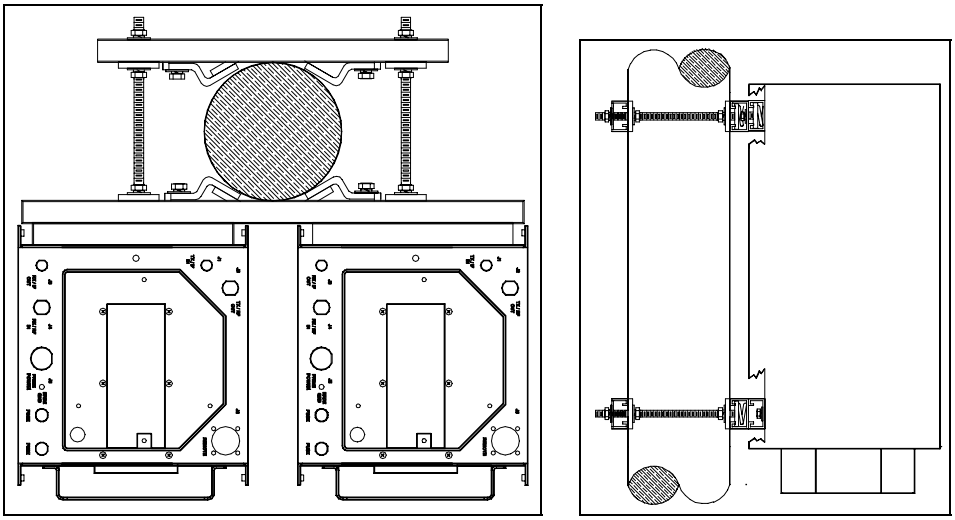
Qty.	Description
3	Spar support bracket.  *EFData Part # FP/3175.* *Used for spar mount only.*
10	Unistrut — 14” long.  *EFData Part # FP/3595.* *Used for round and square pole mount only.*
18	5/16-18 hex nut.  *EFData Part # HW/5/16-18HEXNT.*
30	5/16-18 spring nut.  *EFData Part # HW/5/16-18SPNUT.*
28	5/16-18 x 1” bolt.  *EFData Part # HW/5/16-18X1BLT.*
2	Unistrut, modified, 20” long.  *EFData Part #FP/3482.* *Used for round and square pole mount only.*
19	1/4-20 x 5/8” bolt.  *EFData Part # HW/1/4-20X5/8BT.* *Used to attach short unistruts to RFTs.*
19	1/4” split lockwasher.  *EFData Part # HW/1/4-SPLIT.* *Used to attach short unistruts to RFT.*

Qty.	Description
42	5/16” flat washer.  *EFData Part # HW/5/16-FLT.*
42	5/16” split lockwasher.  *EFData Part # HW/5/16-SPLIT.*
12	Pipe block.  *EFData Part # HW/BLK-PIPE2-8.* *Used for round pole mount only.*
12	Flat fitting plate, 5/16”.  *EFData Part # HW/FIT-PLT-5/16.*
6	Threaded rod, 5/16-18 x 14”.  *EFData Part # HW/RD5/16-18X14.* *Used for round and square pole mount only.*
4	Unitstrut — 8” long.  *EFData Part # FP/3481.* *Attaches directly to RFTs.*
19	1/4” flat washer.  *EFData Part # HW/1/4-FLT.* *Used to attach short unistruts to RFT.*

3.3 RFT Installation

At the customer's discretion, the RFTs can be installed anywhere on or near the antenna. The supplied hardware allows the installer a wide range of installation alternatives, including:

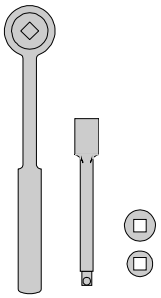
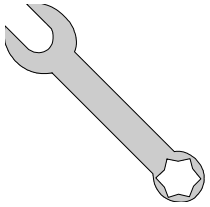
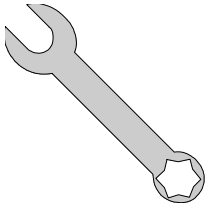
- Vertical pole (e.g., mast) (either square or round). This is the most typical installation.



- Within the hub of a large antenna.
- Spar (i.e., rectangular bar) on the antenna structure.

EFData recommends that the RFTs be mounted vertically, with the air inlets facing the ground.

3.3.1 Tools Required

Qty.	Description
1 1 1 1	3/8” drive ratchet. 3” x 3/8” drive extension. 7/16” x 3/8” drive socket. *(Metric equivalent: 12mm, 6 pt.)* 1/2” x 3/8” drive socket. *(Metric equivalent: 13mm, 6 pt.)* 
1	1/2” combination wrench. *(Metric equivalent: 13mm combination wrench with a 6 pt. box end.)* 
1	7/64” hex key (allen wrench). *(No metric equivalent.)* 
1	5/16” combination wrench. *(Metric equivalent: 8mm combination wrench with a 6 pt. box end.)* 

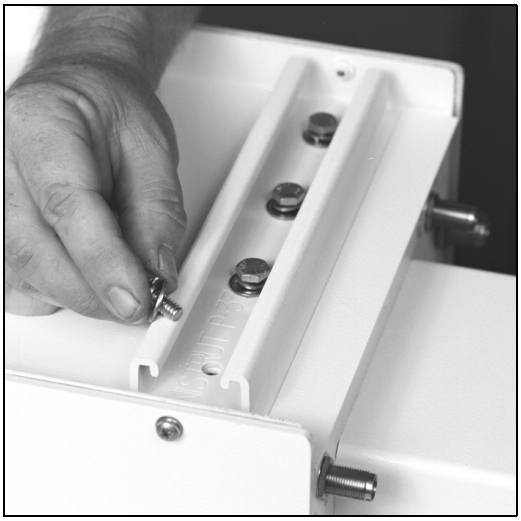
3.3.2 Vertical Pole Installation

3.3.2.1 Round Pole

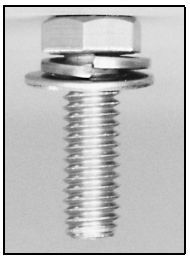
The following process is for a typical installation. Custom systems may be ordered, and are beyond the scope of this manual.

To install the RFTs to a round vertical pole:

1. Set the units on their sides, with the mounting holes facing up.
2. Install the 8” unistruts as follows:
   a. Position an 8” unistrut (with the open side facing up) over one set of the mounting holes on the RFT.



   b. Using four 1/4-20 bolts, 1/4” split lockwashers, and 1/4” flat washers, attach an 8” unistrut to the RFT.



      Tighten the bolts firmly.

   c. Repeat Steps 2.a. and 2.b. for each of the remaining 8” unistruts (for a total of four).

3. Install the 20” unistruts as follows:

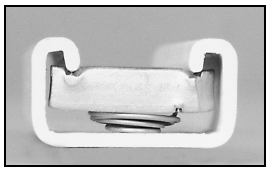
   Note: The placement of the pipe blocks may interfere with the inner or center unistrut attaching bolts. Be sure to determine the pipe block placement locations before bolting the 20” unistruts in place. It may be necessary to eliminate the center or inner 20” unistrut mounting spring nuts and bolts.

   a. Insert a spring nut between the unistrut mounting bolts on both RFTs, as illustrated.

   b. To install each spring nut:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

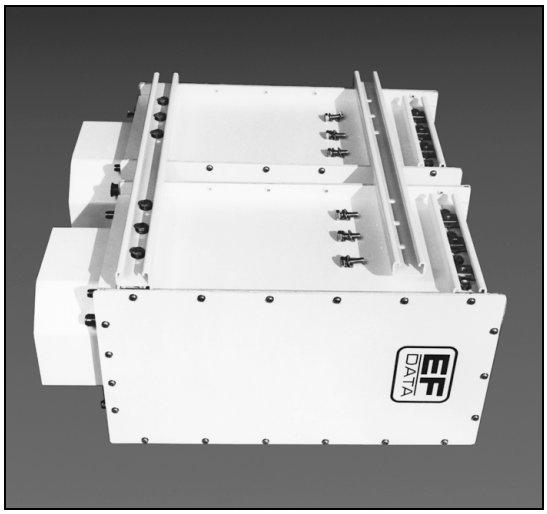
      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).



      (3) Release pressure on the spring nut.

      (4) Repeat Steps 3.b.(1) through 3.b.(3) for each spring nut.

c. With the RFTs side by side, position a 20” unistrut (open side facing up) in place over one pair of 8” unistruts.



Ensure the long unistrut is centered over the RFT.

d. Using two or three 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, attach the 20” unistrut to the 8” unistruts.

Tighten the bolts firmly.

e. Attach the second 20” unistrut to the second set of 8” unistruts by repeating Steps 3.a. through 3.d.

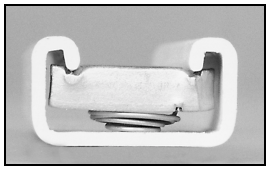
4. Install the pipe blocks as follows:

a. Install two spring nuts in each of the two 20” long unistruts and two 14” long unistruts (centered in the unistruts, and wide enough apart so the pipe blocks will clear the pole when the unit is installed).

b. Install each spring nut as follows:

(1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

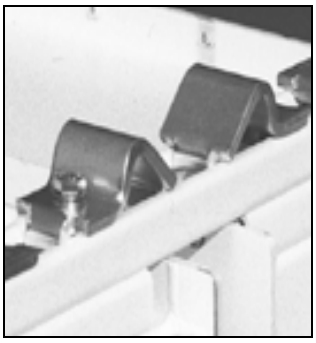
(2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).



(3) Release pressure on the spring nut.

(4) Repeat Steps 4.b.(1) through 4.b.(3) for each spring nut.

c. Using eight 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, loosely secure the pipe blocks to the spring nuts.

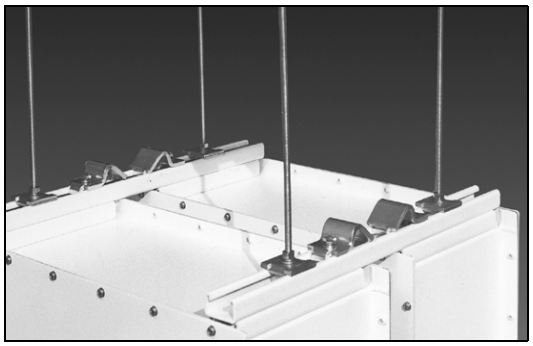


Ensure the pipe blocks are installed with the long angle face inward, toward the pipe, as illustrated.

DO NOT tighten the pipe block bolts until after mounting the RFTs on the vertical pole. (See Step 6.e.)

5. Install the threaded rods as follows:

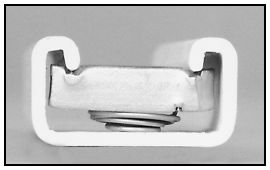
a. Install two spring nuts in both 20” unistruts mounted on the RFT.



b. Install each spring nut as follows:

(1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

(2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).



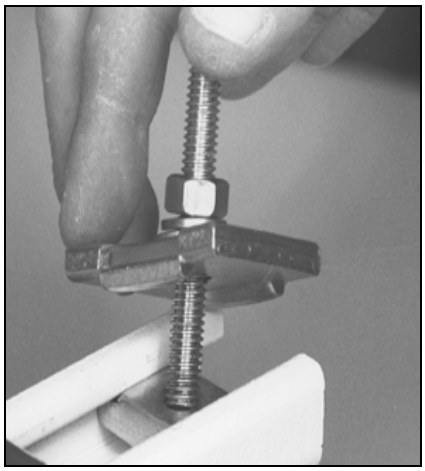
(3) Release pressure on the spring nut.

(4) Repeat Steps 5.b.(1) through 5.b.(3) for each spring nut.

c. Thread a 5/16-20 nut approximately 1-1/2” onto each threaded rod. (This will ensure that the threaded rods will extend beyond the spring nuts when installed.)

d. Place a 5/16” split lockwasher, 5/16” flat washer, and flat fitting plate over each threaded rod.

e. One threaded rod at a time, hold the washers and plate in place on the threaded rod and screw it into a spring nut, as illustrated.



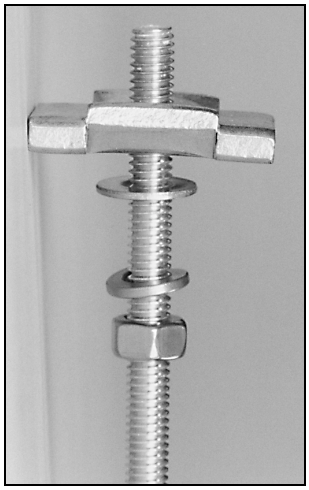
Notes:

1. Be sure to position the flanges of the flat fitting plates in the grooves of the unistruts.
2. Before tightening the nuts on the threaded rods, ensure that the end of each rod is screwed in until it contacts the unistrut. This ensures the rods are threaded completely through the spring nuts.

Tighten each nut firmly.

f. Thread a 5/16-18 nut about 2” onto the end of each threaded rod.

g. Slip a 5/16” split lockwasher, 5/16” flat washer, and flat fitting plate (in that order) onto each threaded rod.



6. Mount the RFTs as follows:

   a. Lift the RFT into position on the vertical pole.

   b. Slip a 14” unistrut over each of pair of threaded rods (upper and lower).

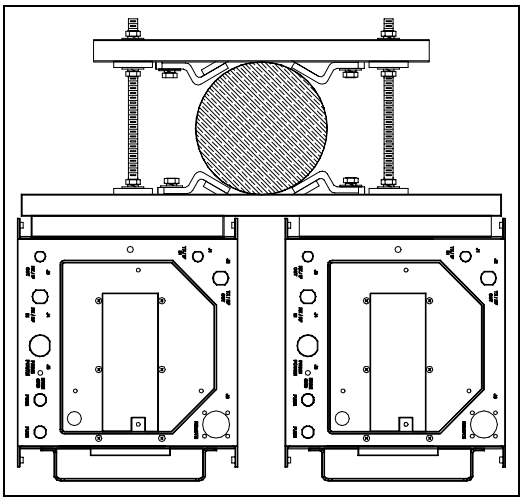
      Note: Install the 14” unistruts with the open face toward the pole, as illustrated.

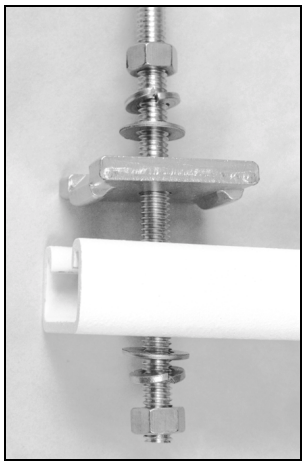
   c. Install a 5/16” flat washer, 5/16” split lockwasher, and 5/16-18 nut on each threaded rod.

   d. Position the RFT, as desired, and tighten the 5/16-18 nuts installed in Step 6.c.

   e. Slide the pipe blocks in until they contact the vertical pole.

      Then, firmly tighten the 5/16-18 bolts.





3.3.2.2 Square Pole

For square vertical pole installation, follow the steps in Section 3.3.2.1, with the following exceptions:

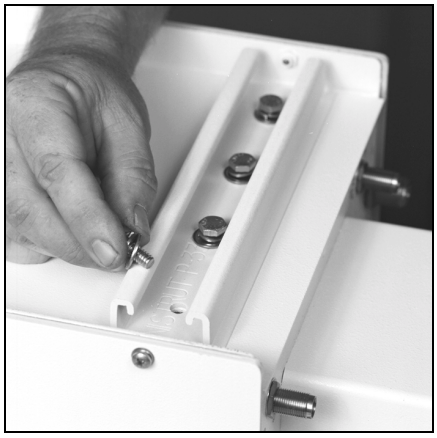
- Do not perform Step 4.
- Do not perform Step 6.e.

3.3.3 Spar Installation

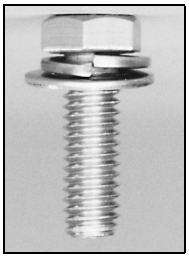
Note: The following process is for a typical installation. Custom kits may be ordered and are beyond the scope of this manual.

To install the RFTs to a spar:

1. Set the units on their side, with the mounting holes facing up.
2. Install the 8” unistruts as follows:
   a. Position an 8” unistrut (with the open side facing up) over one set of the mounting holes on the RFT.



   b. Using four 1/4-20 bolts, 1/4” split lockwashers, and 1/4” flat washers, attach an 8” unistrut to the RFT.

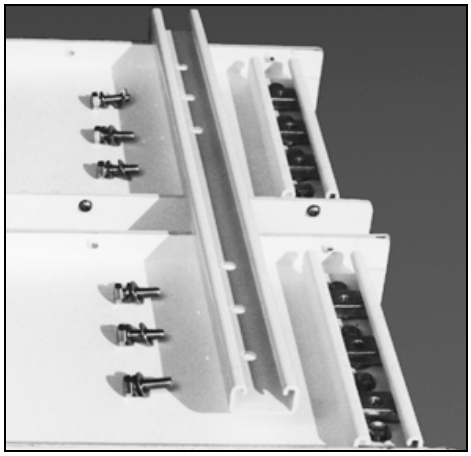


      Tighten the bolts firmly.

   c. Repeat Steps 2.a. and 2.b. for the remaining 8” unistruts (for a total of four).

3. Install the 20” unistruts as follows:

   a. Position a spring nut between the 1/4-20 bolts in each 8” unistrut, as illustrated below:



   b. Install each spring nut as follows:

      (1) Place the spring nut in the unistrut channel, spring side down, with its wide side parallel with the unistrut channel.

      (2) Press down on the spring nut to compress the spring, and rotate the nut 90° (i.e., perpendicular to the unistrut).

      (3) Release pressure on the spring nut.

      (4) Repeat Steps 3.b.(1) through 3.b.(3) for each spring nut.

   c. With the RFTs side by side, position a 20” unistrut in place over one pair of 8” unistruts (open side up).

   d. Using four 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, bolt the 20” unistrut to the 8” unistruts.

   e. Tighten the bolts firmly.

   f. Repeat Steps 3.c. through 3.e. for the second 20” unistrut.

4. Mount the RFT as follows:

   a. Lift the RFT into position.

   b. Using four 5/16-18 bolts, 5/16” split lockwashers, and 5/16” flat washers, bolt the two spar support brackets in place.

   Tighten the bolts firmly.

3.3.4 1:1 Redundant Plate Installation

The 1:1 redundant plate is shown in Figure 3-1. Refer to Section 3.2.1 for included parts.

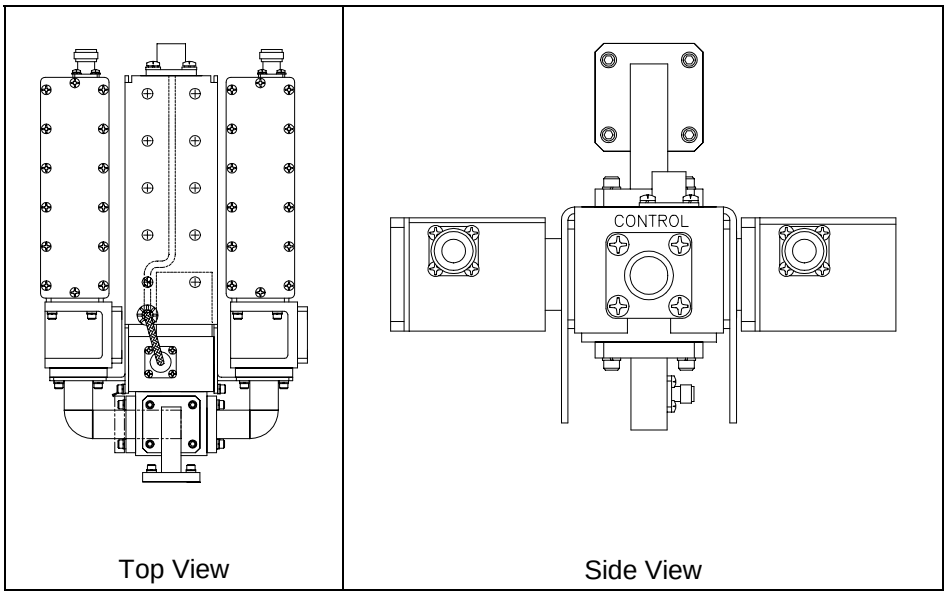


Figure 3-1. 1:1 Redundant LNA Plate

To install the 1:1 redundant plate:

1. Mount the 1:1 redundant plate to the antenna.

   Note: The type of mounting is determined by the brand of antenna on which the equipment will be installed.

2. Remove the plastic cover from the RF IN connector of the redundant plate.

   CAUTION

   After removing the protective cover, ensure that no foreign material or moisture enters the 1:1 redundant plate's waveguide.

3. Install the appropriate O-ring on the RF IN connector of the redundant plate:

   a. If both components have O-ring grooves, use EFData Part # 32P1039.
   b. If only one component has an O-ring groove, use EFData Part # 32P1037.

4. Using four 6-32 x 7/8” socket head cap screws, eight #6 flat washers, four #6 split lockwashers, and four 6-32 nuts, attach the LNA to the antenna waveguide. Tighten the cap screws firmly.

3.3.5 Waveguide Switch Installation

The following process is for a typical installation. Custom systems may be ordered, and are beyond the scope of this manual.

An installed waveguide switch is shown in Figure 3-2. Refer to Section 3.2.1 for included parts.

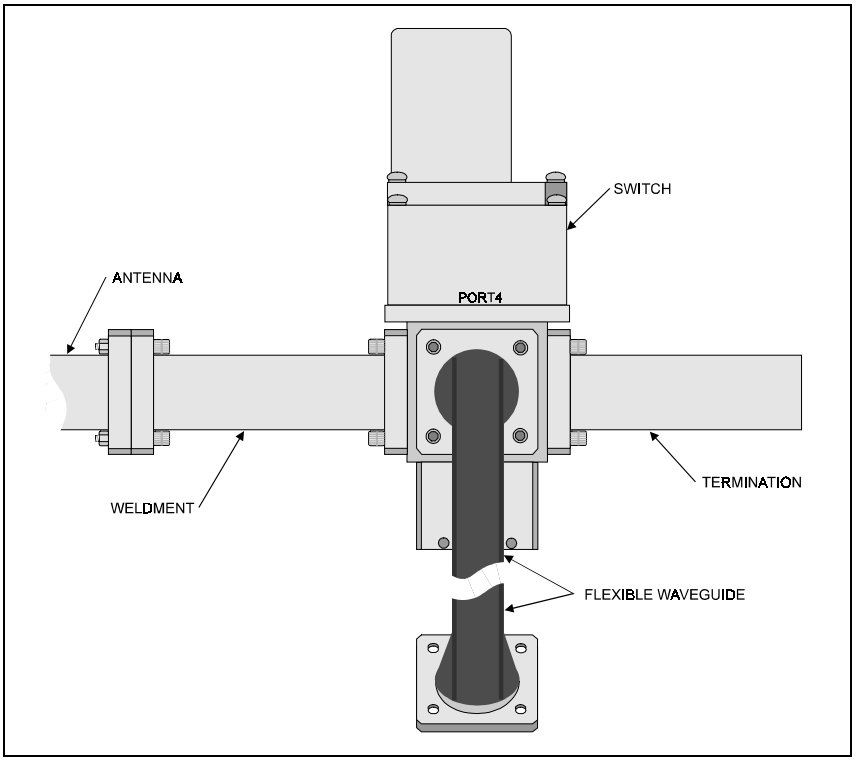


Figure 3-2. Installed Waveguide Switch

To install the waveguide switch:

1. Install the appropriate O-ring between the weldment and port 1 of the waveguide switch.

   a. If both components have O-ring grooves, use EFData Part # 32P1039.
   b. If only one component has an O-ring groove, use EFData Part # 32P1037.

2. Using four 6-32 x 1/2” socket head cap screws, #6 split lockwashers, and #6 flat washers, attach the weldment to port 1 of the waveguide switch. Tighten the cap screws firmly.

3. Install the appropriate O-ring between the antenna and the weldment.

4. Using four 6-32 x 7/8” socket head cap screws, eight #6 flat washers, four #6 split lockwashers, and four 6-32 nuts, attach the weldment to the antenna. Tighten the cap screws firmly.

5. Install the appropriate O-ring between port 3 of the waveguide switch and the termination.

6. Using four 6-32 x 1/2” socket head cap screws, #6 split lockwashers, and #6 flat washers, attach the termination to port 3 of the waveguide switch. Tighten the cap screws firmly.

7. Install the appropriate O-ring between port 2 of the waveguide switch and a section of the flexible waveguide.

8. Using four 6-32 x 1/2” socket head cap screws, #6 split lockwashers, and #6 flat washers, attach the flexible waveguide to port 2 of the waveguide switch. Tighten the cap screws firmly.

9. Install the appropriate O-ring between port 4 of the waveguide switch and the second flexible waveguide.

10. Using four 6-32 x 1/2” socket head cap screws, #6 split lockwashers, and #6 flat washers, attach the flexible waveguide to port 4 of the waveguide switch. Tighten the cap screws firmly.

11. Install the appropriate O-ring between the flexible waveguide attached to port 2 of the waveguide switch and the waveguide flange on the RFT “A.”

12. Using four 6-32 x 7/8” socket head cap screws, four #6 split lockwashers, eight #6 flat washers, and four 6-32 nuts, attach the flexible waveguide (attached to port 2 of the waveguide switch) to the waveguide flange on the RFT “A.” Tighten the cap screws firmly.

13. Install the appropriate O-ring between the flexible waveguide attached to port 4 of the waveguide switch and the waveguide flange on the RFT "B."

14. Using four 6-32 x 7/8" socket head cap screws, four #6 split lockwashers, eight #6 flat washers, and four 6-32 nuts, attach the flexible waveguide (attached to port 4 of the waveguide switch) to the waveguide flange on the RFT "B." Tighten the cap screws firmly.

3.4 RSU-503L Installation

Refer to the *EFData RSU-503 Redundancy Switch Unit Installation and Operation Manual.*

3.5 External Connections

Refer to Section 2.5 for external connections information.

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Chapter 4. OPERATION

This chapter provides the following information:

- System operation
- Remote control
- Front panel display/keypad operation

4.1 System Operation

There are three methods of operating the RFT-1225:

- Connect a PC running DOS to the EIA-232-C/485 remote control port, and run the M&C system monitor software. This software is DOS-based and provides an interface to the remote commands.

  For information on the remote commands, refer to Appendix A.

  For more information on the M&C system monitor program, refer to the *EFData Monitor and Control Software for EFData Satellite Terminals User's Guide*.

- Connect the optional KP-10 hand-held keypad. For more information, refer to the *EFData KP-10 External Keypad Installation and Operation Manual*.

- Use the optional front panel display/keypad (refer to Section 4.3).

4.2 Remote Control

Refer to Appendix A.

4.3 Front Panel Display/Keypad

The optional front panel display (Figure 4-1) provides the local user interface, which is necessary to configure and monitor status of the satellite terminal.

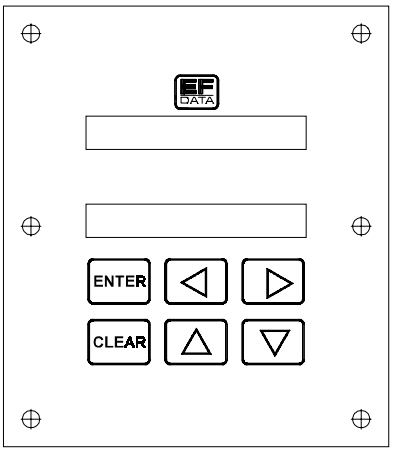

Figure 4-1. RFT-1225 Terminal Keypad

The front panel diplay features a 16-character, 2-line LCD display, and a 6-key keypad which provides for sophisticated functions, yet is easy to use. All functions are accessible at the front panel by entering one of three predefined “SELECT” categories or levels:

- Configuration (CONFIG)
- Monitor
- Faults

4.3.1 Front Panel Controls

The terminal is locally operated by using the front panel keypad. The keypad consists of six keys. Each key has its own logical function or functions.

Key	Description
[ENTER]	This key is used to select a displayed function or to execute a change to the terminal's configuration.
[CLEAR]	This key is used for backing out of a selection or to cancel a configuration change which has not been executed using [ENTER]. Pressing [CLEAR] generally returns the display to the previous selection.
[←] and [→]	These keys are used to move to the next selection, or to move the cursor for certain functions.
[↑] and [↓]	These keys are used primarily to change configuration data (numbers), but are also used at times to move from one section to another.

The RFT-1225 responds by beeping whenever a key is pressed:

- A single beep indicates that the key pressed was a valid entry, and that the appropriate action was taken.
- A double beep indicates the key pressed was an invalid entry.

The terminal front panel control uses a tree-structured menu system (Table 4-1 through Table 4-4) to access and execute all functions. The base level of this structure is the sign-on message, which is displayed at the front panel upon terminal power-up.

- Line 1 of the sign-on message displays the terminal model number.
- Line 2 displays the version number of the firmware implemented in the terminal.

The main level of the menu system is the SELECT menu, which may be accessed from the base level by pressing any of the arrow keys. From the SELECT menu, any one of three functional categories may be selected:

- Configuration functions
- Monitor functions
- Fault functions

Press [←] or [→] to move from one selection to another.

When the desired function is displayed on line 2, that level can be entered by pressing [ENTER]. Once the functional level has been entered, move to the desired function by pressing [←] or [→].

Table 4-1. Main Menu

Screen	Unit Type	Comments
RFT-1225 SW_x.xx	RFT-1225 Firmware FW/3786-xx, Version x.xx	This is an information screen only. • -1 version (2.5 MHz step size): ◆ Firmware number: FW/3786-1A ◆ Software version: 1.01 • -2 version (1.0 MHz step size): ◆ Firmware number: FW/3786-2A ◆ Software version: 2.01
Screen	**Submenus/Options**	**Comments**
SELECT CONFIG	SELECT RF OUTPT U/C FREQ D/C FREQ U/C ATTN D/C ATTN PROGRAM BAUD ADDRESS PARITY LNA PWR LNA FLT CALIB. REF ADJ XFLT ENABLE RSW MODE LOCKMODE	Go to Table 4-2.
SELECT MONITOR	U/C TEMP D/C TEMP HPA TEMP USV UVV DCV DVV TIV	Go to Table 4-3
SELECT FAULTS	RESTART UPLINK DOWNLINK 5V PWR 12V PWR HPA LNA U/C LOCK USV TUN UVV TUN D/C LOCK DCV TUN DVV TUN IF LOCK IF TUN	Go to Table 4-4

Note: Explanations of the menu windows are located in Section 4.3.2.

Table 4-2. Configuration Menu

Screen	Submenus/Options	Comments
SELECT	1, 2, 3, or NONE	
RF OUTPUT	ON WRM OFF	
U/C FREQ	14.0 to 14.5 GHz	In 2.5 MHz steps (1.0 MHz steps for the -2 version).
D/C FREQ	11.7 to 12.2 GHz	In 2.5 MHz steps (1.0 MHz steps for the -2 version).
U/C ATTN	0 to 25 dB	
D/C ATTN	0 to 31 dB	
PROGRAM	1, 2, or 3	Program or clear.
BAUD	300 to 9600 bit/s	
ADDRESS	0 to 255	
PARITY	EVEN ODD	
LNA PWR	ON OFF	On coax cable. Not on coax cable.
LNA FLT ENABLE	ON OFF	Monitor LNA. Ignore LNA.
CALIB.		Press [ENTER] to calibrate.
REF ADJ	0 to 255	Adjust 10.000 MHz.
XFLT ENABLE	ON OFF	Monitor external fault. Ignore external fault.
RSW MODE	INDEP DEP	Independent. Dependent.
LOCKMODE	LOCK ENABLE	

Table 4-3. Monitor Menu

Screen	Submenus/Options	Comments
U/C TEMP	-40 to +50°C	Temperature of U/C.
D/C TEMP	-40 to +50°C	Temperature of D/C.
HPA TEMP	-40 to +50°C	Temperature of HPA.
USV	2 to 10V	U/C Tuning voltage.
UVV	0 to 10V	U/C SYN Tuning voltage.
DCV	0 to 20V	D/C Tuning voltage.
DVV	2 to 10V	D/C SYN Tuning voltage.
TIV	2 to 10V	IFLO Tuning voltage.

Table 4-4. Faults Menu

Screen	Submenus/Options
RESTART	OK FAULTED
UPLINK	OK FAULTED
DOWNLINK	OK FAULTED
5V PWR	OK FAULTED
12V PWR	OK FAULTED
HPA	OK FAULTED
LNA	OK FAULTED
U/C LOCK	OK FAULTED
USV TUN	OK FAULTED
UVV TUN	OK FAULTED
D/C LOCK	OK FAULTED
DCV TUN	OK FAULTED
DVV TUN	OK FAULTED
IF LOCK	OK FAULTED
IF TUN	OK FAULTED

4.3.2 Menu Explanations

The following paragraphs explain the various menus/options outlined in Table 4-1 through Table 4-4.

4.3.2.1 Configuration

Terminal configuration may be viewed or changed by entering the CONFIG level from the SELECT menu on the front panel (Table 4-2).

Enter the selected configuration menu by pressing [ENTER]. Press [←] or [→] to view the selected configuration parameters. To change a configuration parameter, press [ENTER] to begin the change process, at which point the arrow keys can be used to make the changes.

After the changes are made and the display represents the correct parameters, execute the change by pressing [ENTER]. When [ENTER] is pressed, the necessary programming is initiated by the RFT-1225.

To undo a parameter change prior to executing it, simply press [CLEAR].

The following notes describe each configuration function in detail.

Function	Description
SELECT	Selects any one of the three "preset" configurations. The user must first program (store) configuration parameters in the PROGRAM menu. On entry, the current Select parameter will appear in the menu. Press [↑] or [↓] to select 1, 2, 3, or None. Press [ENTER] to execute the change. If no parameters have been selected in the PROGRAM menu, default configurations will be loaded.
RF OUTPUT	Programs the RF output to ON, WRM, or OFF. On entry, the current status of the output is displayed. Use the Arrow keys to select ON, WRM, or OFF. Press [ENTER] to execute the change.
U/C FREQ	Programs the up converter frequency in 2.5 MHz steps. On entry, the current up converter frequency is displayed with the flashing cursor on the first character. Press [←] or [→] to move the flashing cursor. Press [↑] or [↓] to increment or decrement the digit at the flashing cursor. Press [ENTER] to execute the change. Note: The frequency is programmable within the specified range in 2.5 MHz steps. When the transmitter frequency is changed, the transmitter is automatically turned off to prevent the possible swamping of other channels. To turn the transmitter ON, use the RF_OUTPT function.

DC FREQ	Programs the down converter frequency in 2.5 MHz steps. On entry, the current down converter frequency is displayed with the flashing cursor on the first character. Press [←] or [→] to move the flashing cursor. Press [↑] or [↓] to increment or decrement the digit at the flashing cursor. Press [ENTER] to execute the change.
U/C ATTN	Programs the up converter output power attenuation from 0 to 25 dB, in 0.5 dB steps. On entry, the current up converter attenuation is displayed with the flashing cursor on the first character. Press [↑] or [↓] to increase or decrease the output power attenuation in 0.5 dBm steps. Press [ENTER] to execute the change.
D/C ATTN	Programs the down converter input power attenuation from 0 to 31 dB, in 0.5 dB steps. On entry, the current down converter attenuation is displayed with the flashing cursor on the first character. Press [↑] or [↓] to increase or decrease the output power attenuation in 0.5 dBm steps. Press [ENTER] to execute the change.
PROGRAM	Programs or clears the current frequency and attenuator settings as one of three "preset" selections. On entry, 1*, 2*, or 3* will appear in the window. Press [←] or [→] to move the cursor from left to right. When the flashing cursor is on any of the "*"s, press [↑] or [↓] to turn the "*" ON or OFF. When the "*" is ON, press [ENTER] to clear stored parameters in the preset location to the left of the "*". When the "*" is OFF, press [ENTER] to store the current frequency and attenuation parameters in the preset location at the cursor. To recall any of the present selections, use the SELECT menu, and select 1, 2, or 3. Press [ENTER].
BAUD	Programs the baud rate of the terminal. On entry, the currently selected baud rate of the terminal will be displayed with the flashing cursor on the first digit on the second line of the display. To change the baud rate, press [↑] or [↓] to select a baud rate from 300 to 9600 bit/s. Press [ENTER] to execute the changes.
ADDRESS	Programs the terminal remote address. On entry, the currently selected address of the terminal is displayed with the flashing cursor on the first character. Press [↑] or [↓] to select the desired address of the terminal from 1 to 255. Press [ENTER] to execute the change.
PARITY	Programs the parity bit to Even (the default), Odd, or None (for 8-bit). On entry, the currently selected parity is displayed. Use the Arrow keys to select Even or Odd. Press [ENTER] to execute the change.
LNA PWR	"ON" means LNA power will be available on the center conductor of the coax cable. "OFF" means DC power will be removed from the coax cable.
LNA FLT	"ON" means the system will declare an LNA fault when applicable. "OFF" means all LNA faults will be ignored by the system.
CALIB.	Enables the user to calibrate the LNA. If [ENTER] is pressed, the M&C will perform an analog-to-digital conversion of the LNA current, and store the value in the Electrically-Erasable Programmable Read-Only Memory (EEPROM). During the normal operation, the M&C will monitor the recent LNA current, and compare it to the stored value. If the LNA deviates by ± 30%, a fault will be declared.
REF ADJ	Allows adjustment of the 10.000 MHz reference frequency to account for long term drift. DAC setting varies from 0 to 256.

XFLT ENABLE	Enables or disables the external fault input. For use with external Traveling Wave Tubes (TWTs). On entry, the currently selected parameter will appear. Use the arrow keys to select ON or OFF. Press [ENTER] to execute the change. When ON is selected, all of the uplink external faults will appear in the front panel monitoring menus and fault menus. When OFF is selected, all of the uplink external faults will be masked in the front panel monitoring menus and fault menus.
RSW MODE	Used in redundant systems only. “INDEP” means uplink and downlink switch independently. “DEP” means a fault in either UL or DL, and both will switch over.
LOCK MODE	If the system is placed in the Lock mode, none of the above parameters can be changed. This is to prevent accidental changes of the operation conditions by unauthorized personnel. The mode must be changed to Enable in order to change the existing configuration.

4.3.2.2 Monitor

The Monitor level is accessible from the SELECT menu (Table 4-3). When the Monitor level is entered, press [←] or [→] to select the desired function.

Each monitor function is displayed in real time as long as it is selected.

Function	Description	
U/C Temp	Up converter temperature monitor.	Range: -40 to +90°C.
D/C Temp	Down converter temperature monitor.	Range: -40 to +90°C.
HPA Temp	HPA temperature monitor.	Range: -40 to +90°C.
USV	Tuning voltage monitor for U/C synthesizer Vt-S.	Range: 3V to 10.5V.
UVV	Tuning voltage monitor for U/C synthesizer Vt-V.	Range: 0.5V to 10V.
DCV	Tuning voltage monitor for D/C synthesizer Vt-S.	Range: 2.0V to 17V.
DVV	Tuning voltage monitor for D/C synthesizer Vt-V.	Range: 0.2V to 20V.
TIV	Tuning voltage monitor for the IF LO.	Range: 1.25V to 10V.

4.3.2.3 Faults

The FAULTS level is accessible from the SELECT menu (Table 4-4). Faults are similar to monitor functions, as they display the current fault status of the group being displayed.

Press [←] or [→] to move between the faults.

The current faults status is displayed as “OK” or “FLT” for each parameter monitored. “OK” indicates that no fault exists, while “FLT” indicates that a faults exists.

Press [CLEAR] to exit this level of operation and return to the previous level.

The following list outlines the faults monitored in the FAULTS menu. Refer to Chapter 6 for troubleshooting procedures for each displayed fault.

Fault	Description
RESTART	M&C microprocessor experienced a restart due to power failure or watchdog timer time-out.
UPLINK	U/L fault caused by synth, U/C, IFLO, or HPA.
DOWNLINK	D/L fault caused by synth, D/C, IFLO, or LNA.
5V PWR	+5V power supply fault. This is a status only fault and will not turn the transmitter off.
12V PWR	+12V power supply fault. This is a status only fault and will not turn the transmitter off.
HPA	High Power Amplifier fault. Typically indicates that the amplifier is not present or is not operating. This fault will turn the RF transmitter off.
LNA	Low noise amplifier fault. Typically indicates that the LNA is not present, has failed, or exceeded the high or low fault window trip point. This fault will not turn the transmitter off.
U/C LOCK	Up converter lock fault. Indicates the up converter is not locked up. This fault will turn the transmitter off.
USV TUN	Up converter synthesizer tuning voltage. Vt-s.
UVV TUN	Up converter synthesizer tuning voltage. Vt-v.
D/C LOCK	Down converter lock fault. Indicates the down converter is not locked up. This fault will NOT turn the transmitter off.
DCV TUN	Down converter synthesizer tuning voltage. Vt-s.
DVV TUN	Down converter synthesizer tuning voltage. Vt-v.
IF LOCK	IF synthesizer lock fault. This fault will turn the transmitter off.
IF TUN	IF tuning fault.

Chapter 5. THEORY OF OPERATION

This chapter provides the basic theory of operation for the following components:

- Monitor and Control (M&C)
- High stability oscillator
- IFLO
- Synthesizer
- Up and down converters

5.1 Monitor and Control

The RFT-1225 uses a sophisticated microcontroller module to perform the M&C functions of the terminal. This board (refer to Figure 5-1) is located inside of the RFT-1225, on top of the other assemblies.

The M&C monitors the RFT-1225 and provides configuration updates to other modules within the terminal when necessary.

Terminal configuration parameters are maintained in EEPROM, which provides for total recovery after a power-down situation.

Fault monitoring and status gathering are also provided.

All RFT-1225 functions are accessible through the local front panel keypad/display or a remote communications interface.

Note: For more information on the M&C board, refer to Section 1.1.2.

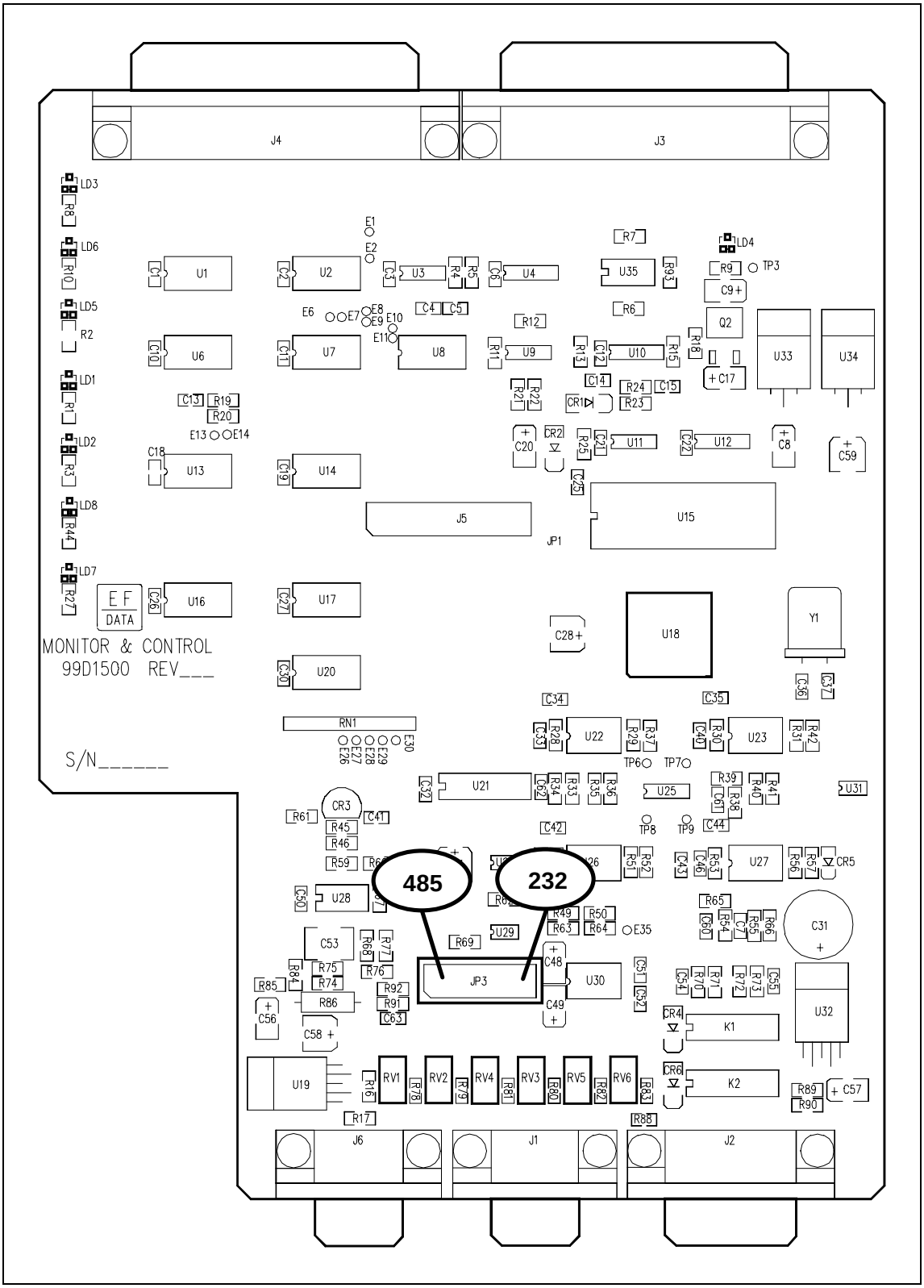

Figure 5-1. M&C Card

5.1.1 EEPROM Memory

EEPROM memory on the M&C module allows it to retain configuration information for at least one year without power. Should the terminal be powered down, the following sequence is carried out by the M&C microcontroller:

1. When power is applied to the M&C, the microcontroller checks the EEPROM Random Access Memory (RAM) to see if valid data has been retained. If valid data has been retained, the terminal is reconfigured to the configuration maintained in EEPROM.

2. If EEPROM memory fails the valid data test, a default configuration from Read Only Memory (ROM) is loaded into the system.

5.1.2 Remote Interface

The functions of the RFT-1225 can be remotely controlled and monitored via an EIA-485 or EIA-232-C communications link.

The EIA-485 interface makes it possible to operate 255 terminals on a common communications link.

The EIA-232-C interface is used to communicate with a single terminal.

The M&C module must be hardware configured to one of the two interfaces.

Refer to Figure 5-2 for jumper placement at JP3:

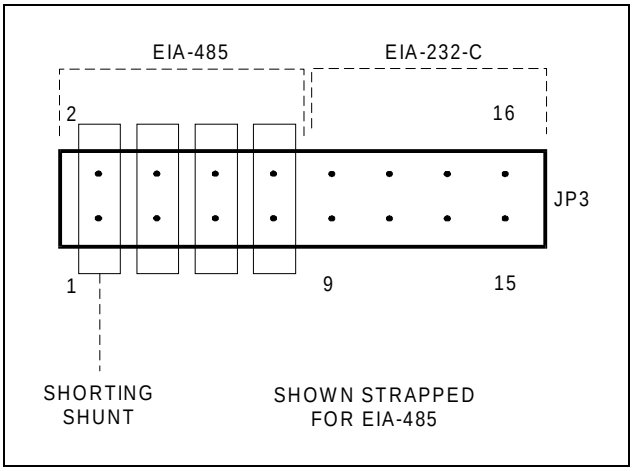

Figure 5-2. M&C Jumper Placement at JP3

5.1.2.1 Remote Interface Specification

Refer to Appendix A.

5.1.3 Terminal Default Conditions

On initial power-up, the unit will default to the following parameters.

Parameter	Default
Baud Rate	[9600]
Parity	[Even]
Device Address	[1]
U/C Gain	[10.0]
D/C Gain	[0.0]
RF Output	[OFF]
U/C Frequency	[Low end of range]
D/C Frequency	[Low end of range]

5.1.4 Theory of Operation

Refer to Figure 5-3 for a functional block diagram of the M&C.

The M&C PCB performs the following operations:

- Receives the desired frequency from either the remote EIA-232-C/485 or local keypad, and after converting it to a synthesizer setting, stores it to the applicable synthesizer output latch.
- Reads the thermistors located in the up converter, down converter, and high-power amplifier, and converts them to temperatures for display.
- Reads the characterization EEPROMs in the up converter, down converter, and high-power amplifier, and calculates an Automatic Gain Control (AGC) voltage based on frequency and temperature to linearize the respective module.
- Turns the fan on or off, depending on the temperature.
- Receives fault inputs from all modules, and presents them to the remote EIA-232-C/485 and the optional local keypad display.
- Performs an initial current sense on the LNA, and stores the reading in EEPROM. Subsequent current sense readings are taken and compared to the initial reading to determine a fault.

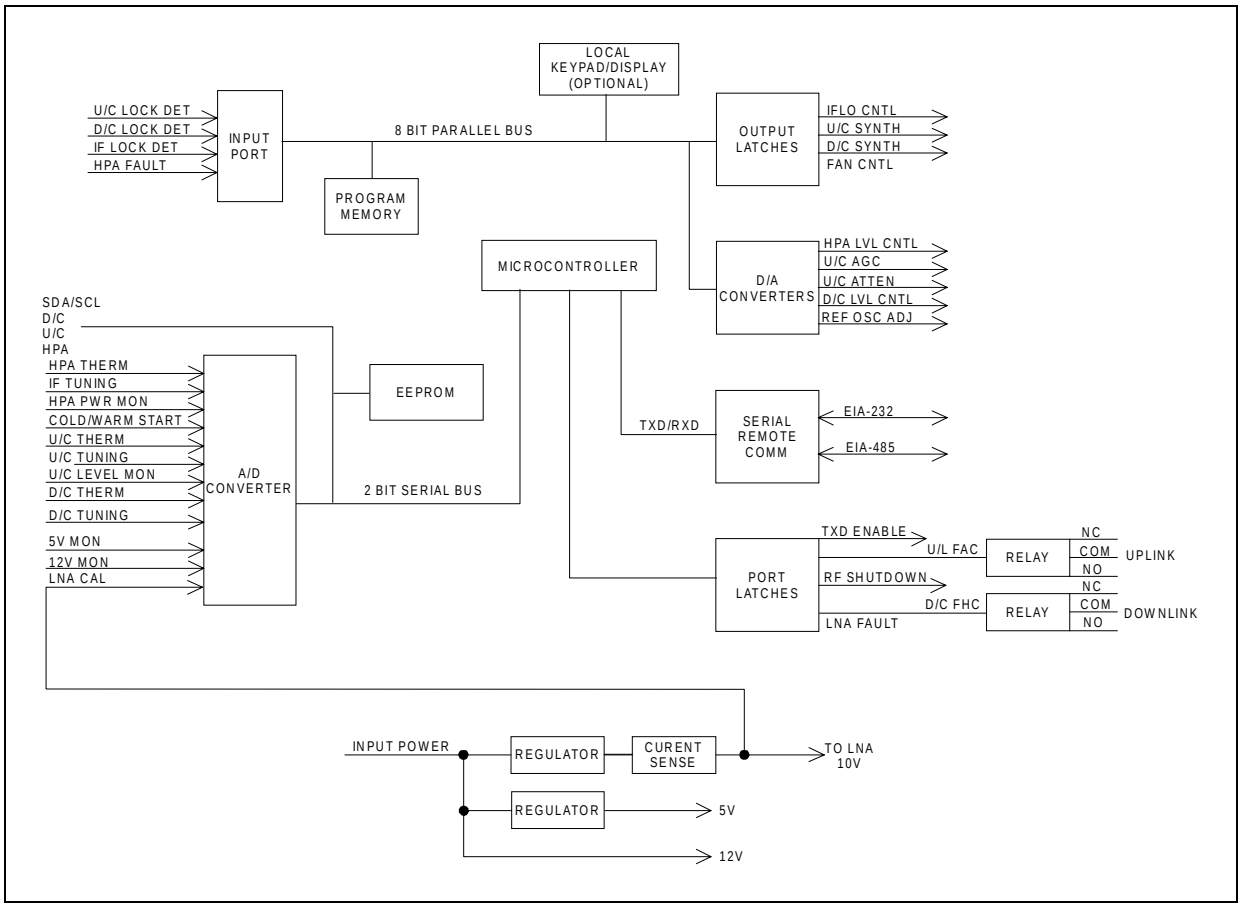

Figure 5-3. M&C Functional Block Diagram

5.1.5 M&C Board Connector Pinouts

5.1.5.1 EIA-232-C/485 Remote Control (J1)

The remote interface is provided on a 9-pin female D connector. Screw locks are provided for mechanical security of the mating connector. The remote connector is a Data Circuit Terminating Equipment (DCE) interface.

Pin #	EIA-232-C	EIA-485	Description
1	GND	GND	Ground
2	TD/TX		Transmit Data
3	RD/RX		Receive Data
4		+RX/TX	Plus Transmit or Receive
5	GND	-RX/TX	Negative Transmit or Receive
6	DSR		Data Set Ready
7	RTS		Ready to Send
8	CTS	+RX/TX	Clear to Send (EIA-485 — Plus Transmit or Receive)
9		-RX/TX	Negative Transmit or Receive Data

Notes:

1. Clear to Send (CTS) is tied to Ready to Send (RTS) in EIA-232-C mode.
2. Pinout for Data Terminal Equipment (DTE) interface is provided for EIA-232-C.

5.1.5.2 Remote Relay Control, J2 DB15-Female

Pin #	Name	Description
1	EXT 10V	Output voltage, 10V at 1000 mA
9	LNA PWR	Output, 11V
2	DL FLT NO	Downlink FLT, Opens on FLT
10	DL COM	DL
3	DL FLT NC	DL
11	UL FLT NO	Uplink FLT, Opens on FLT
4	UL COM	UL FLT Common
12	UL FLT NC	UL FLT Closes on FLT
5	SPARE	
13	SPARE	
6	ALOG TST	Analog voltage output, TBD
14	LNA PWR RTM	Ground, Return for LNA Power
7	EXT INPUT2	Input, logic 0 or 5V
15	EXT TWT FLT	Input, logic 0 or 5V, TWT Fault
8	GRD	Ground

5.1.5.3 HPA, PS, U/C and D/C, J3 DB37-Male

Pin #	Name	Description
1	12.5V PWR	Input power to M&C, 12.5V, 220 mA
20	12.5V PWR	Input power to M&C, 12.5V, 220 mA
2	DC LNA PWR	Output power to DC, 10V, 100 mA
21	GND	M&C ground
3	GND	M&C ground
22	SPARE	
4	FREQ CNTRL	Output, voltage 0 to 10V
23	FAN CNTRL	Output, NPN OC Transistor with resistor to 5V
5	SPARE	
24	SPARE	
6	SPARE	
25	HPA FLT COM	Output, ground connection to relay common
7	HPA FLT NO	Input from high-power amplifier, contact to COM during normal operation
26	SPARE	
8	SPARE	
27	HPA THERM	Input, 5K thermistor to ground located in high-power amplifier
9	HPA LEVEL CON	Output, 0 to 4 VDC for AGC control of high-power amplifier output
28	HPA SHUTDOWN	Output, NPN OC transistor to GND, low produces shut-off
10	HPA PWR MON	Input from high-power amplifier, 0 to 4V
29	SPARE	
11	SPARE	
30	SPARE	
12	DC LEVEL CON	Output, analog voltage 0 to 4V, AGC control of D/C output
31	DC LEVEL MON	Input, 0 to 4V
13	DC THERM	Input, 5K thermistor to ground located in D/C
32	SPARE	
14	HPA SDA	Bi-directional serial data
33	DC SDA	Bi-directional serial data
15	UC SDA	Bi-directional serial data
34	HPA SCL	Output, serial clock
16	DC SCL	Output, serial clock
35	UC SCL	Output, serial clock
17	SPARE	
36	UC LEVEL MON	Input, 0 to 4V
18	UC THERM	Input, 5K thermistor to ground located in U/C
37	UC ATT (FLC)	Output, analog voltage 0 to 4V, attenuator control
19	UC AGC (CLC)	Output, analog voltage 0 to 4V, AGC control

5.1.5.4 Synthesizers (DC/UC/LO), J4 DB37-Female

Pin #	Name	Description
1	UC LO EN	Output CMOS level, Enable Strobe
20	UC LO A1	Ouput CMOS level
2	UC LO DATA	Output CMOS level, DATA
21	UC LO CLOCK	Output CMOS level, CLOCK
3	UC LO GO	Output CMOS level
22	UC LO CNTL V1	Output CMOS level
4	UC LO CNTL V2	Ouput CMOS level
23	UC LO CNTL V3	Output CMOS level
5	UC LO GDCO	Output CMOS level
24	UC LO GDC1	Output CMOS level
6	UC LO GDC2	Output CMOS level
25	UC LO GDC3	Output CMOS level
7	UC LO N4	Output CMOS level
26	UC LO N5	Output CMOS level
8	DC LO LCK DET	Input, 0V = locked, 5V = unlocked
27	DC LO Vt-S	Input, 0 to 11V, nominal reading = 6V
9	DC LO Vt-V	Input, 0 to 11V, nominal reading = 6V
28	UC LO Vt-V	Input, 0 to 11V, nominal reading = 6V
10	IF LCK DET	Input, 0V = locked, 5V = unlocked
29	IF T_MON	Input, 0 to 11V, nominal reading = 6V
11	SPARE	
30	DC LO EN	Output CMOS level, Enable Strobe
12	DC LO A1	Output CMOS level
31	DC LO DATA	Output CMOS level, Data
13	DC LO CLOCK	Output CMOS level, Clock
32	DC LO GO	Output CMOS level
14	DC LO CNTL V1	Output CMOS level
33	DC LO CNTL V2	Output CMOS level
15	DC LO CNTL V3	Output CMOS level
34	DC LO GDC1	Output CMOS level
16	DC LO GDC2	Output CMOS level
35	DC LO GDC3	Output CMOS level
17	DC LO GDC4	Output CMOS level
36	DC LO N4	Output CMOS level
18	DC LO N5	Output CMOS level
37	UC LO LCK DET	Input, 0V = locked, 5V = unlocked
19	UC LO Vt-S	Input, 0 to 11V, nominal reading= 6V

5.1.5.5 Keypad Display, 24-Pin (12 x 2) Ribbon Connector (J5)

The front panel display/keypad is an optional feature which allows the user to configure and monitor status of the terminal locally.

All functions are also accessible from the remote port.

When this option has been installed, the 24-pin ribbon connector will be routed from J5 of the M&C PCB to the keypad/display assembly.

The connection pinouts are as follows:

Pin #	Name	Description
1	/A0	Address data line 0 inverted
3	/A2	Address data line 1 inverted
5	A2	Address data line 2
7	A3	Address data line 3
9	A4	Address data line 4
11	A5	Address data line 5
13	/D0000	Address D000 inverted
15	/BFR READ	Buffered read inverted
17	/BFR WRITE	Buffered write inverted
19	SPARE	
21	/KB INTRPT	Reserved for KB interrupt
23	GND	Ground
2	+5V	+5V
4	SPARE	
6	BFRD AD0	Buffered address data line 0
8	BFRD AD1	Buffered address data line 1
10	BFRD AD2	Buffered address data line 2
12	BFRD AD3	Buffered address data line 3
14	BFRD AD4	Buffered address data line 4
16	BFRD AD5	Buffered address data line 5
18	BFRD AD6	Buffered address data line 6
20	BFRD AD7	Buffered address data line 7
22	SPARE	
24	SPARE	

5.1.6 Test Points and LEDs

Refer to Section 6.1.

5.2 High Stability Oscillator

The high stability oscillator provides a low-phase noise, frequency stable, 10 MHz source for the up converter, down converter, and IFLO synthesizers.

The oven, which is provided for additional stability, operates directly from the 12V power source. The electronic control circuitry is buffered by an active filter.

The sinewave output is converted to a CMOS square wave before cabling to the synthesizers.

Refer to Figure 5-4 for a block diagram of the high stability oscillator.

5.2.1 Specifications

Frequency	10 MHz
Frequency Stability	± 1 x 10^{-8}, -40 to +70°C
Output Level	CMOS voltages (+5V)
Output Waveform	Square Wave
Input Voltage	12.5V
Input Current	550 mA at turn-on, 300 mA after warm-up at +25°C
Warm-up	2.5 minutes to within 1 x 10^{-7} of final frequency at +25°C
Phase Noise (Maximum); 1Hz Measurement bandwidth measured at 10 MHz 10 Hz 100 Hz 1 kHz 10 kHz	 -120 dBc -150 dBc -160 dBc -165 dBc
Vibrational sensitivity	1 x 10^{-9}/g
Aging	5 x 10^{-10}/day, 1 x 10^{-7}/year
Frequency Deviation (mechanical)	To compensate for 10 years of aging
Frequency Deviation (electrical)	± 2 x 10^{-6} minimum, 0 to 10 VDC

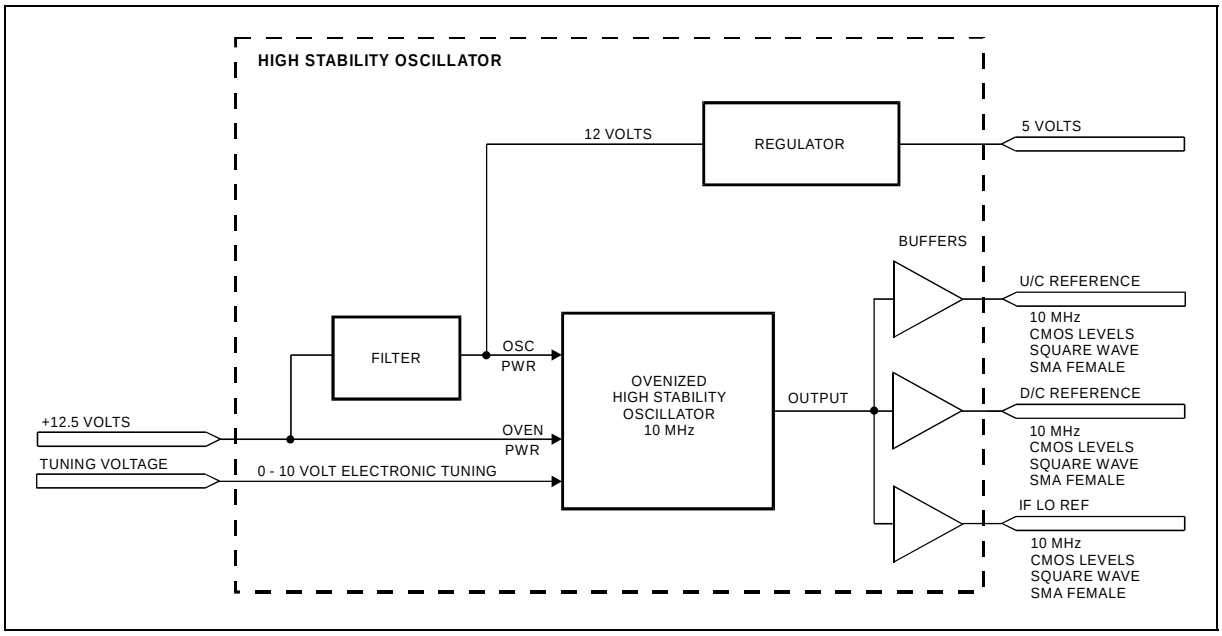

Figure 5-4. High Stability Oscillator Block Diagram

5.3 IF Local Oscillator

The IFLO contains a Voltage Controlled Oscillator (VCO), loop filter, and a divide down chain.

The loop tracking voltage is sent to the M&C board, where it is monitored along with the lock detect fault.

Refer to Figure 5-5 for a block diagram of the IFLO.

5.3.1 Specifications

Input	10 MHz square wave, CMOS levels
Output	1150 MHz (2 each), 2300 MHz (2 each)
Connectors	SMA
Output Impedance	50Ω
Output level	+7 dBm (-4 dBm, U/C Synth Reference)

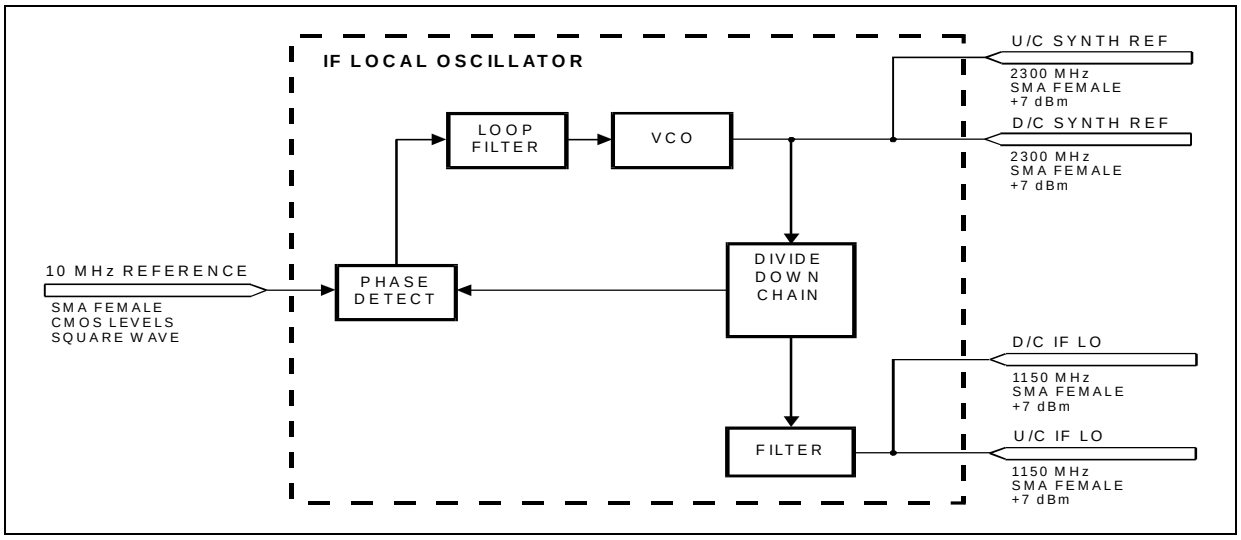

Figure 5-5. IF LO Block Diagram

5.4 Synthesizer

The RFT-1225 requires two synthesizers:

- One for the down converter to convert the RF input to a 70 MHz IF output.
- One for the up converter to convert the 70 MHz input to the RF output.

The purpose of the synthesizer module is to convert the 10 MHz reference signal to a variable frequency to perform the conversion.

5.4.1 Specifications

RF Inputs:	10 MHz CMOS square wave, 2300 MHz reference (from IFLO)
Connector Type	SMA
Impedance	50Ω
Input level	+7 dBm
RF Outputs:	U/C Frequencies 12780 to 13280 MHz D/C Frequencies 9730 to 11530 (RCV 10.95 to 12.75 GHz) 9730 to 10480 MHz (RCV 10.95 to 11.7 GHz) 10480 to 10980 MHz (RCV 11.7 to 12.2 GHz) 11030 to 11530 MHz (RCV 12.25 to 12.75 GHz)
Connector Type	SMA
Impedance	50Ω
Level	+7 dBm

5.4.2 Theory of Operation

The synthesizer module multiplies the 10 MHz reference clock to a variable clock by use of:

- VCOs
- Loop filters
- Phase detectors
- Variable divide-down chains

The divide-down chain is controlled by the M&C board through the use of CMOS signals.

The VCO tuning voltages are sent to the M&C for monitoring, as well as a summary lock detect fault.

Refer to Figure 5-6 for a diagram of the down converter LO synthesizer. Refer to Figure 5-7 for a diagram of the up converter LO synthesizer.

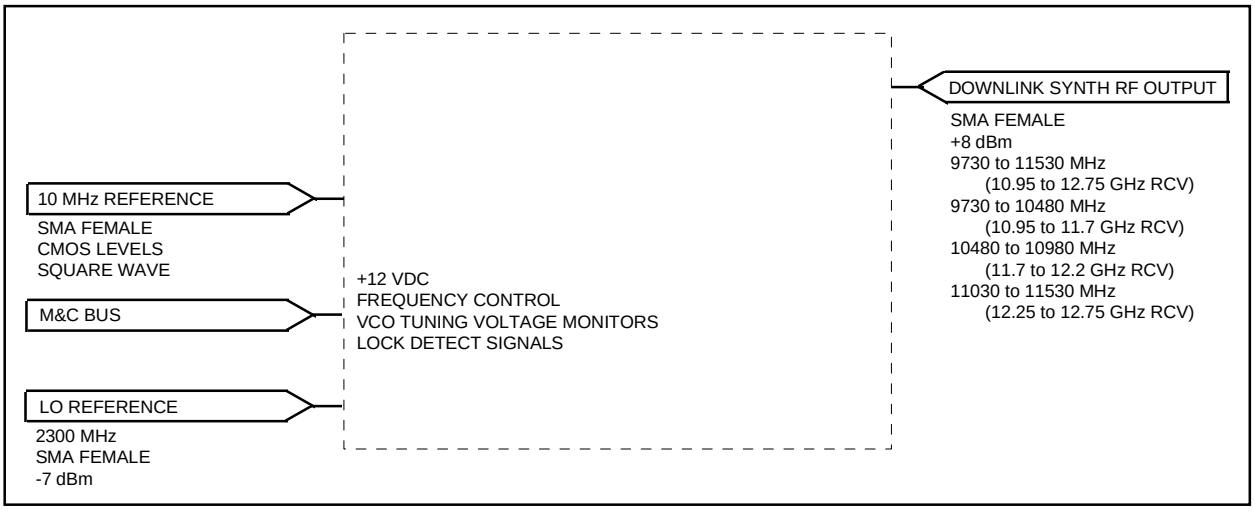

Figure 5-6. Down Converter Synthesizer Diagram

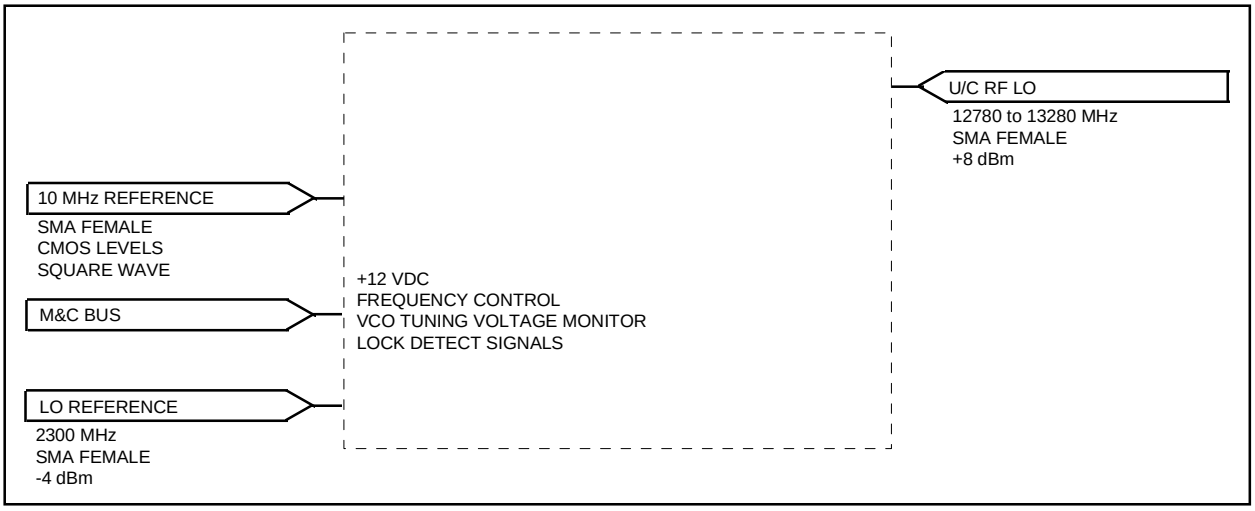

Figure 5-7. Up Converter Synthesizer Diagram

5.5 Down Converter

The function of the down converter is to convert the Ku-band signal from the LNA to a 70 MHz IF signal for use in the modem.

Refer to Figure 5-8 for a functional block diagram of the down converter.

5.5.1 Specifications

Input Frequency	10.95 to 12.75 GHz 10.95 to 11.7 GHz 11.7 to 12.2 GHz 12.25 to 12.75 GHz
Input Connector	SMA female
Input Impedance	50Ω
Input VSWR	1.25:1
Output Frequency	70 MHz (± 18 MHz)
Output Connector	SMA Female
Output VSWR	1.25:1
1 dB Compression	+17 dBm

1st IF Synthesizer Input	
Frequency	9.73 to 11.53 GHz (RCV 10.95 to 12.75 GHz) 9.73 to 10.48 GHz (RCV 10.95 to 11.7 GHz) 10.48 to 10.98 GHz (RCV 11.7 to 12.2 GHz) 11.03 to 11.53 GHz (RCV 12.25 to 12.75 GHz)
Level	+8 dBm
Connector	SMA Female
Return Loss	10 dB
Impedance	50Ω

2nd IF Local Oscillator Input	
Frequency	1150 MHz 875 MHz
Level	+8 dBm
Connector	SMA Female
Return Loss	14 dB
Impedance	50Ω

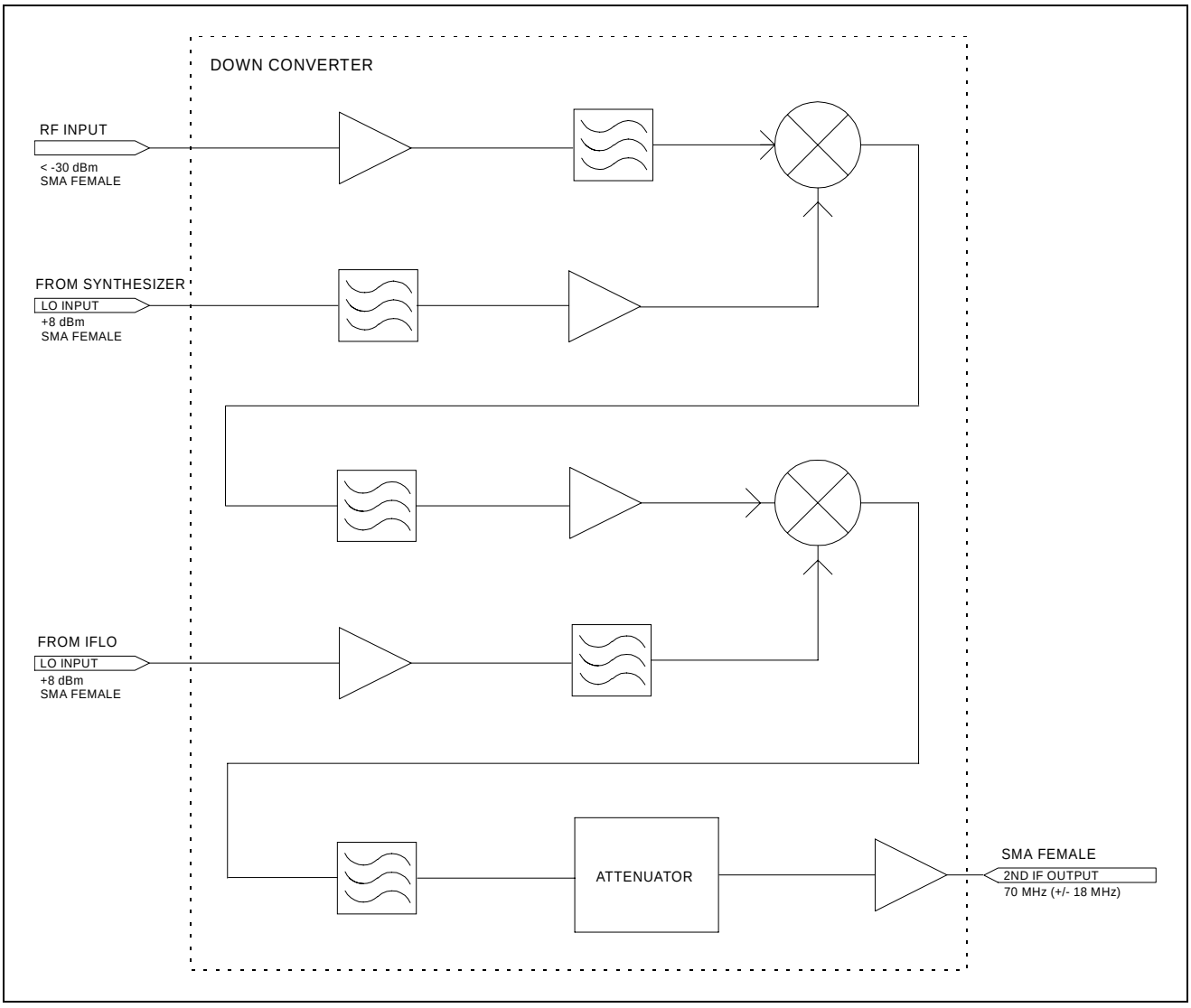

Figure 5-8. Down Converter Block Diagram

5.5.2 Theory of Operation

The RFT-1225 employs the down converter to convert a band of signals within the 10.95 to 12.75 GHz frequency range to a baseband 70 MHz output IF signal.

The frequency conversion utilizes a dual-conversion process:

- The first conversion mixes the input RF signal with the synthesizer input to down convert to the first IF 1220 MHz.
- The second conversion mixes the first IF signal with the IFLO input to down convert to the baseband IF of 70 MHz (± 18 MHz).

The synthesizer input is generated externally by the down converter synthesizer. The IFLO is also generated externally by the IFLO assembly.

The input power level of both the synthesizer and IFLO will be at a nominal +8 to +10 dBm coming into the down converter.

The M&C board interpolates the factory preset compensation data that is stored in an EEPROM inside the down converter. This data allows the M&C board to command and compensate the down converter's output power, ensuring proper output power levels over the entire frequency and temperature range.

The M&C board also supplies the DC power for the LNA, which is subsequently injected into the RF input connector.

5.6 Up Converter

The function of the up converter is to convert the 70 MHz IF signal used in the indoor unit modem to a Ku-band signal to be sent to the high-power amplifier.

Refer to Figure 5-9 for a functional block diagram of the up converter.

5.6.1 Specifications

Input Frequency	70 MHz (± 18 MHz)
Input Connector	SMA Female
Input Impedance	50Ω
Input VSWR	1.25:1
Output Frequency	14.0 to 14.5 GHz
Output Connector	SMA Female
Output VSWR	1.5:1
1 dB Compression	+10 dBm

1st RF Local Oscillator Input	
Frequency	1150 MHz
Level	+8 dBm
Connector	SMA Female
Return Loss	14 dB
Impedance	50Ω

2nd RF Synthesizer Input	
Frequency	12.75 to 13.28 GHz
Level	+8 dBm
Connector	SMA Female
Return Loss	10 dB
Impedance	50Ω

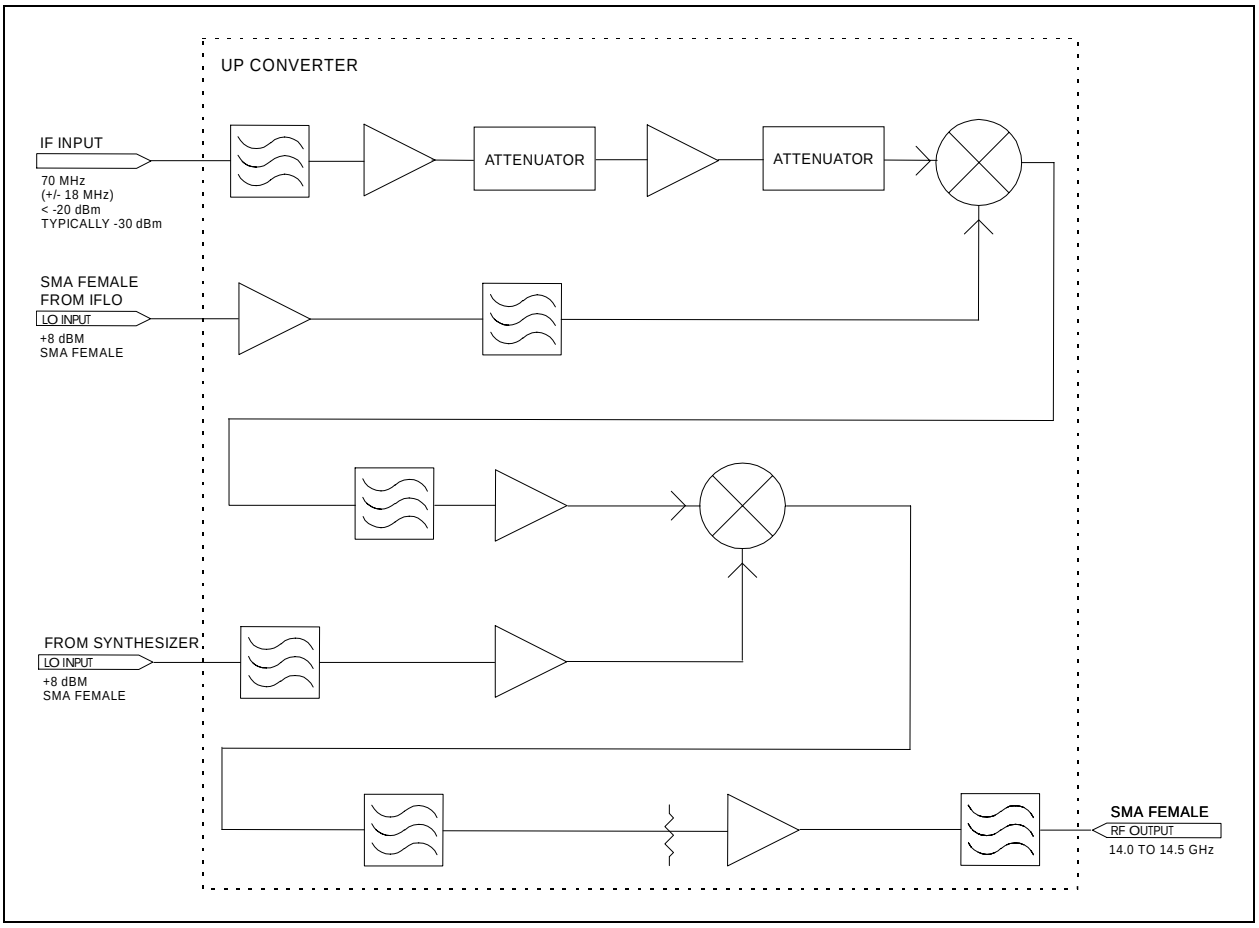

Figure 5-9. Up Converter Block Diagram

5.6.2 Theory of Operation

The RFT-1225 employs the up converter to convert a baseband 70 MHz input IF signal to a Ku-band RF output signal at 14.0 to 14.5 GHz (refer to Figure 5-9).

- The first frequency conversion mixes the input IF signal 70 MHz (± 18 MHz) with the IFLO input at 1150 MHz, to up convert to the second IF of 1220 MHz.

- The second conversion mixes the second IF signal with the synthesizer input of 12.75 to 13.28 GHz, to up convert to the final RF output band of 14.0 to 14.5 GHz.

The synthesizer input is generated externally by the up converter synthesizer. The IFLO is also generated externally by the IFLO assembly.

The input power level of both the synthesizer and IFLO will be at a nominal +8 to +10 dBm coming into the up converter.

The M&C board interpolates the factory preset compensation data that is stored in an EEPROM inside the up converter. This data allows the M&C board to command and compensate the up converter's output power, ensuring proper output power levels over the entire frequency and temperature range.

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6 Chapter 6. MAINTENANCE

This chapter provides information on how to use the test points and LEDs on the M&C board for troubleshooting. In addition, this chapter provides guidelines for troubleshooting faults.

6.1 Test Points and LEDs

Test points and LEDs are included on the M&C board for quick troubleshooting references. LEDs are a visual reference. Test points are used when more troubleshooting is required.

Refer to Table 6-1 for a list of LEDs and their functions. Refer to Table 6-2 for a list of test points on the M&C board.

Table 6-1. M&C LEDs

Name	Color	Description
HPA FLT	Red	Illuminates when the high-power amplifier is faulted. This fault will cause the transmitter to turn off.
LD IF	Red	Illuminates when the IF local oscillator is out of lock. This fault will cause the transmitter to turn off.
LD UC	Red	Illuminates when the up converter local oscillator is out of lock. This fault will cause the transmitter to turn off.
LD DC	Red	Illuminates when the down converter local oscillator is out of lock. This fault will cause the transmitter to turn off.
LNA FLT	Red	Illuminates when the LNA is faulted.
RF ON	Yellow	Illuminates when the high-power amplifier is turned on.
12.5V	Green	Illuminates when 12.5V is applied to board.
5V	Green	Illuminates when 5V is applied to board.

Table 6-2. Test Points

Test Point	Description
TP3	12.5V input power voltage.
TP6	Down converter AGC voltage (0 to 4V).
TP7	Up converter attenuator voltage (0 to 4V).
TP8	High-power amplifier AGC voltage (0 to 4V).
TP9	Up converter AGC voltage (0 to 4V).

6.2 Fault Isolation

Once the terminal has been set up for operation, troubleshooting faults can be accomplished by monitoring the terminal faults either remotely or via the optional front panel/keypad and display.

System faults are reported in the Faults menu.

The following list should be used in isolating a problem and deciding the appropriate action to be taken. Refer to Figure 6-1 and Figure 6-2 for the locations of the various modules mentioned in this list.

Fault	Possible Problem and Action
+5 VOLT	+5V power supply fault. Indicates the +5V power supply on the M&C board is at a high or a low voltage condition. Allowable level variation is ± 5% Check for a short on the +5V line or faulty connection at P3 on the M&C.
+12 VOLT	+12V supply fault. Indicates the +12V supply is at a high or low voltage condition. Check for a short on the +12V line or faulty connections between any of the internal modules.
HPA	High-power amplifier fault. Check for a loose connector at P12, then replace the high-power amplifier. The high-power amplifier is not intended to be opened in the field. Once the problem has been isolated, the transmitter must be turned back on.
LNA	Low Noise Amplifier fault. Check the RF cable to the LNA, then replace the LNA.
U/C LOCK U/C LO V_t-S TUN U/C LO V_t-V TUN	Up Converter Lock fault. Check for loose connections at P7, P8, and P4. Also check all RF coaxial connectors on the U/C synthesizer and U/C board before replacing modules. Once the problem has been isolated, the transmitter must be turned back on.
D/C LOCK D/C LO V_t -V TUN	Down converter tuning fault. Check for loose connections at P10, P11, and P4. Also check all RF coaxial connectors on the D/C synthesizer and D/C before replacing the modules. Once the problem has been corrected, the transmitter must be turned back on.
IF LOCK	IF Lock fault. Check for loose connections at P9 and P4. Also, check all RF coaxial connectors on the IFLO module. If all connections are good, replace the IFLO module. Once the problem has been isolated, the transmitter must be turned back on.
IF TUN	IF Tuning fault. Check for loose connections at P9 and P4. Also check all RF coaxial connectors on the IFLO module. If all connections are good, replace the IF local oscillator module. Once the problem has been isolated, the transmitter must be turned back on.

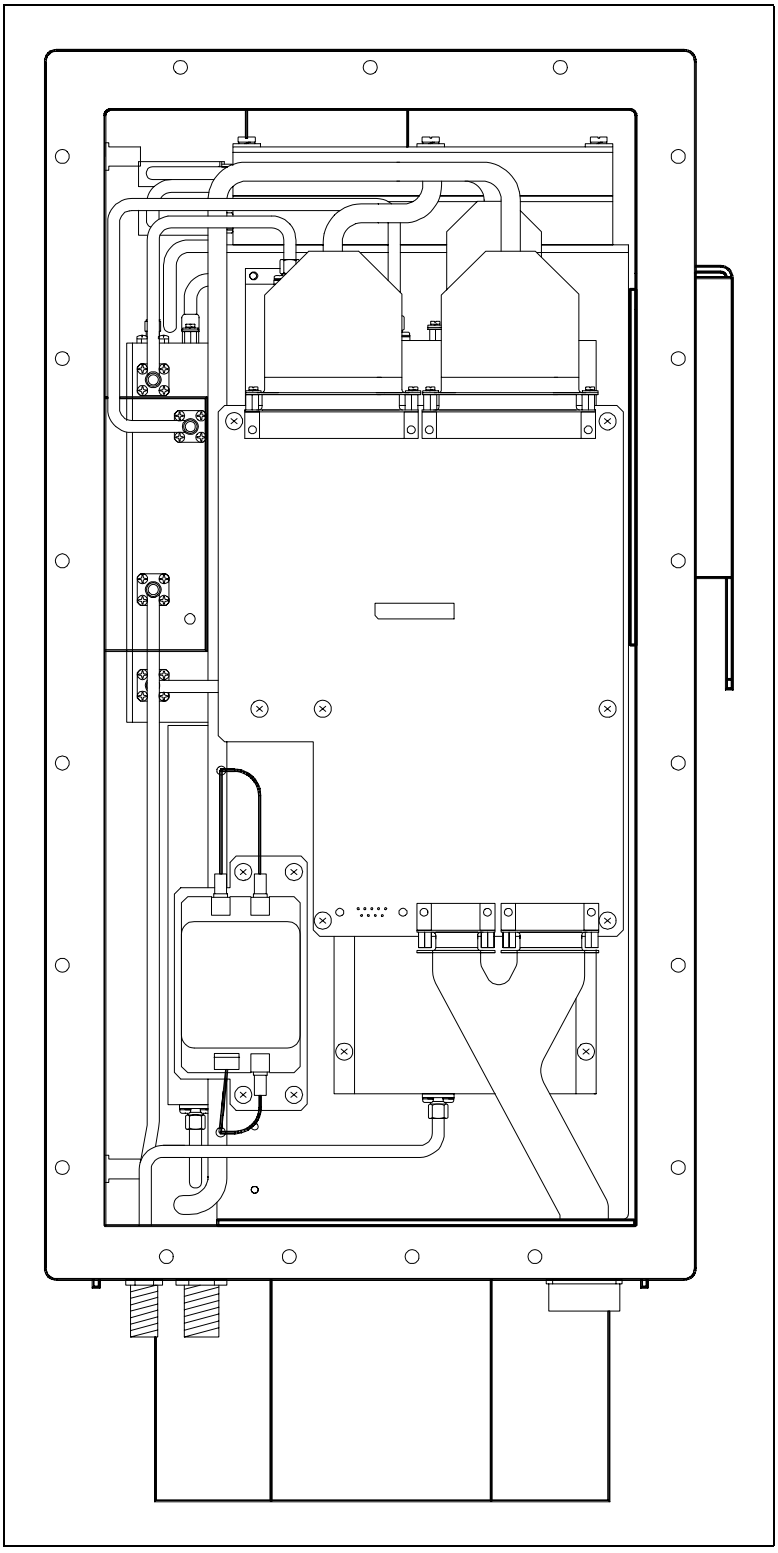

Figure 6-1. RFT-1225 Inside Front View

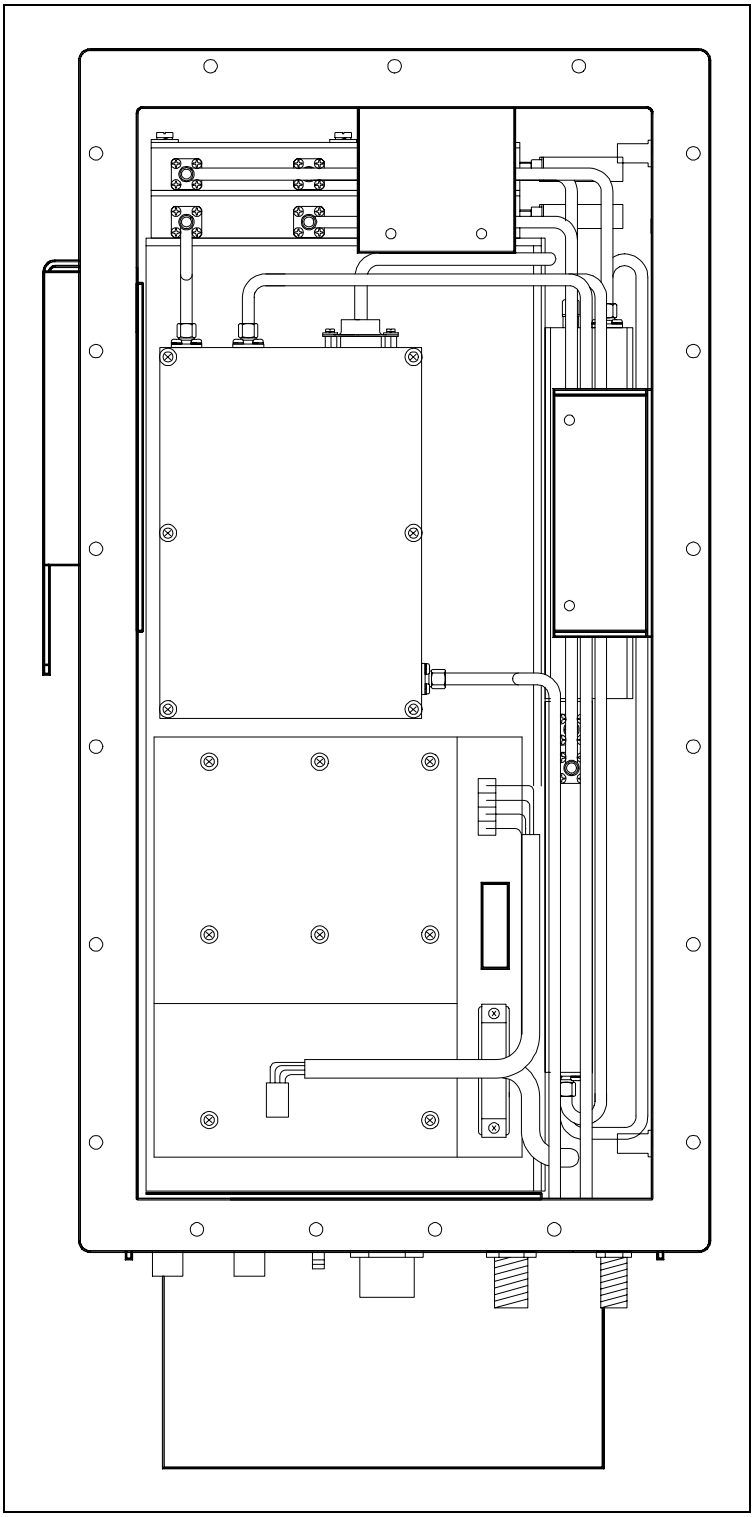

Figure 6-2. RFT-1225 Inside Rear View

Appendix A. REMOTE CONTROL OPERATION

This appendix describes the remote control operation of the RFT-1225.

- For the -1 version (2.5 MHz step size):
  - Firmware number: FW/3786-1A
  - Software version: 1.01
- For the -2 version (1.0 MHz step size):
  - Firmware number: FW/3786-2A
  - Software version: 2.01

A.1 General

Remote controls and status information are transferred via an EIA-485 (optional EIA-232-C) serial communications link.

Commands and data are transferred on the remote control communications link as US ASCII-encoded character strings.

The remote communications link is operated in a half-duplex mode.

Communications on the remote link are initiated by a remote controller or terminal. The RFT-1225 never transmits data on the link unless it is commanded to do so.

A.2 Message Structure

The ASCII character format used requires 11 bits/character:

- 1 Start bits
- 7 Information bits
- 1 Parity bit (odd, even)
- 2 Stop bits

Messages on the remote link fall into the categories of commands and responses. Commands are messages which are transmitted to the RFT-1225, while responses are messages returned by the RFT-1225 in response to a command.

The general message structure is as follows:

- Start Character
- Device Address
- Command/Response
- End of Message Character

A.2.1 Start Character

A single character precedes all messages transmitted on the remote link. This character flags the start of a message. This character is:

- "<" for commands
- ">" for responses

A.2.2 Device Address

The device address is the address of the controller which is designated to receive a transmitted command, or which is responding to a command.

Valid device addresses are 1 to 3 characters long, and in the range of 1 to 255. Address 0 is reserved as a global address which simultaneously addresses all devices on a given communications link. Devices do not acknowledge global commands.

Each RFT-1225 which is connected to a common remote communications link must be assigned its own unique address. Addresses are software selectable at the modem, and must be in the range of 1 to 255.

A.2.3 Command/Response

The command/response portion of the message contains a variable length character sequence which conveys command and response data.

If the RFT-1225 receives a message addressed to it which does not match the established protocol or cannot be implemented, a negative acknowledgment message is sent in response. This message is:

- >add/?ER1_PARITY ERROR'cr''lf']
  (Error message for EV, OD, or No parity errors.)

- >add/?ER2_INVALID PARAMETER'cr''lf']
  (Error message for a recognized command which cannot be implemented or has parameters which are out of range.)

- >add/?ER3_UNRECOGNIZABLE COMMAND'cr''lf']
  (Error message for unrecognizable command or bad command syntax.)

- >add/?ER4_CONVERTER IN LOCK MODE'cr''lf']
  (Controller in Lock mode. Must go to Enable mode first.)

- >add/?ER5_NOT SUPPORTED BY HARDWARE'cr''lf']
  (Command is a valid command. However, it is not supported by the current hardware configuration.)

Notes:

1. "add" is used to indicate a valid 1 to 3 character device address in the range between 1 and 255.
2. Global address "*" is reserved for external keypad commands (i.e., for the KP-10).

A.2.4 End Character

Each message is ended with a single character which signals the end of the message:

- "cr" Carriage return character for commands
- "]" End bracket for responses

Note: For the external keypad (i.e., the KP-10), the end of message character is:

- "cr]" Carriage return and end bracket for commands
- "]" End bracket for responses

A.3 Configuration Commands/Responses

Up Converter Freq Select	Command: Response: Status: Response:	<add/UCF_nnnnn.n'cr' >add/UCF_nnnnn.n'cr' RF_OFF'cr"lf'] <add/UCF'cr' >add/UCF_nnnnn.n'cr"lf']	Where: In version -1, nnnnn.n = 14000.0 to 14500.0 MHz, in 2.5 MHz steps. In version -2, nnnnn.n = 14000.0 to 14500.0 MHz, in 1.0 MHz steps.
Down Converter Freq Select	Command: Response: Status: Response:	<add/DCF_nnnnn.n'cr' >add/DCF_nnnnn.n'cr"lf'] <add/DCF'cr' >add/DCF_nnnnn.n'cr"lf']	Where:. In version -1, nnnnn.n = 10950.0 to 12750.0 MHz, in 2.5 MHz steps. In version -2, nnnnn.n = 10950.0 to 12750.0 MHz, in 1.0 MHz steps.
RF Output	Command: Response: Status: Response:	<add/RF_xxx'cr' >add/RF_xxx'cr"lf'] <add/RF_'cr' >add/RF_xxx'cr"lf']	Where: xxx = ON, WRM, or OFF. The OFF command will keep the RF output turned OFF under all conditions. The WRM command is a conditional ON command, instructing the RF output to come ON after the unit is warmed up and meets stability requirements. The ON command is an override, instructing the output to be ON and to ignore the warm start.
Up Converter Attenuator	Command: Response: Status: Response:	<add/UCA_nn.n'cr' >add/UCA_nn.n'cr"lf'] <add/UCA_'cr' >add/UCA_nn.n'cr"lf']	Where: nn.n = 0.0 to 25.0 dB, in 0.5 dB steps.
Down Converter Attenuator	Command: Response: Status: Response:	<add/DCA_nn.n'cr' >add/DCA_nn.n'cr"lf'] <add/DCA_'cr' >add/DCA_nn.n'cr"lf']	Where: nn.n = 0.0 to 20.0 dB, in 0.5 dB steps.

Select Preset Config	Command: Response: Status: Response:	<add/SEL_n'cr' >add/SEL_n'cr"lf'] <add/SEL_'cr' >add/SEL_'cr' 1 UCF_nnnnn.n'cr' DCF_nnnnn.n'cr' UCA_nn.n'cr' DCA_nn.n'cr' 2 UCF_nnnnn.n'cr' DCF_nnnnn.n'cr' UCA_nn.n'cr' DCA_nn.n'cr' 3 UCF_nnnnn.n'cr' DCF_nnnnn.n'cr' UCA_nn.n'cr' DCA_nn.n'cr"lf']	Where: n = 1, 2, or 3. Allows the user to select any one of three 'PreSet' configurations. The user must first program (store) a configuration using the 'PGM_n' command defined below. This command used without the 'PreSet' number (n) will provide the current programming of each of the three 'PreSets'. nnnnn.n = 14000.0 to 14500.0 MHz nnnnn.n = 10950.0 to 12750.0 MHz nn.n = 0 to 25.0 dB (UC Fine Adj) nn.n = 0 to 20.0 dB (DC Fine Adj) nnnnn.n = 14000.0 to 14500.0 MHz nnnnn.n = 10950.0 to 12750.0 MHz nn.n = 0 to 25.0 dB (UC Fine Adj) nn.n = 0 to 20.0 dB (DC Fine Adj) nnnnn.n = 14000.0 to 14500.0 MHz nnnnn.n = 10950.0 to 12750.0 MHz nn.n = 0 to 25.0 dB (UC Fine Adj) nn.n = 0 to 20.0 dB (DC Fine Adj)
Program Preset Config	Command: Response: Status: Response:	<add/PGM_n'cr' >add/PGM_n'cr"lf'] <add/PGM_'cr' >add/PGM_'cr' 1 xxxxxxxxxx'cr' 2 xxxxxxxxxx'cr' 3 xxxxxxxxxx'cr"lf']	Where: n = 1, 2, or 3. Allows the user to store (program) the current frequency and attenuator setting as one of three 'PreSet' selections. (xxxxxxxxxx = 'Programmed' or 'None'.)
Clear Program Preset Config	Command: Response: Status: Response:	<add/CPGM_n'cr' >add/CPGM_n'cr"lf'] <add/CPGM_'cr' >add/CPGM_'cr' 1 xxxxxxxxxx'cr' 2 xxxxxxxxxx'cr' 3 xxxxxxxxxx'cr"lf']	Where: n = 1, 2, or 3. Allows the user to clear (unprogram) the current frequency and attenuator setting for one of three 'PreSet' selections. (xxxxxxxxxx = 'Programmed' or 'None'.)
Lock Mode	Command: Response: Status: Response:	<add/LM_xx'cr' >add/LM_xx'cr"lf'] <add/LM_'cr' >add/LM_xx'cr"lf']	Where: xx = LK (lock) or EN (enable, the default). Lock mode prevents the current settings from being changed.

RS-232 Address Select	Command: Response: Status: Response:	<add/AS_xxx'cr' >add/AS_xxx'cr"lf'] <add/AS_'cr' >add/AS_xxx'cr"lf']	Where: add = current address. xxx = new address, 1 to 255. Default address = 1.
RS-232 Baud Rate Select	Command: Response: Status: Response:	<add/BR_xxxx'cr' >add/BR_xxxx'cr"lf'] <add/BR_'cr' >add/BR_xxxx'cr"lf']	Where: xxxx = 300 to 9600, in standard settings of 300, 600, 1200, 2400, 4800, and 9600 (default).
RS-232 Parity Select	Command: Response: Status: Response:	<add/PS_xx'cr' >add/PS_xx'cr"lf'] <add/PS_'cr' >add/PS_xx'cr"lf']	Where: xx = OD (odd) or EV (even, the default).
Reference Freq Adjust	Command: Response: Status: Response:	<add/RFJ_nnn'cr' >add/RFJ_nnn'cr"lf'] <add/RFJ_'cr' >add/RFJ_nnn'cr"lf']	Where: nnn = DAC setting 0 to 255. Where: nnn = Current DAC setting.
LNA Calibration	Command: Response:	<add/CLNA_'cr' >add/CLNA_'cr"lf']	Performs a current windowing calibration on the LNA. Note: This is only done once during the initial installation.
LNA Fault Enable	Command: Response: Status: Response:	<add/LFE_xxx'cr' >add/LFE_xxx'cr"lf'] <add/LFE_'cr' >add/LFE_xxx'cr"lf']	Where: xxx = ON or OFF. Default = ON, enable monitor. Allows user to disable LNA fault.
External Fault Enable	Command: Response: Status: Response:	<add/XFE_xxx'cr' >add/XFE_xxx'cr"lf'] <add/XFE_'cr' >add/XFE_xxx'cr"lf']	Where: xxx = ON or OFF. Default = ON, enable monitor. This command is used to enable an external fault signal from a customer-supplied external HPA. The external source interfaces with the RFT-1225 at connector J6, pin M. This signal must be a ground for an 'Okay' condition and 'Open' for a faulted condition. This input is 'OR'ed with the internal HPA signal to produce an uplink fault, thus allowing the use of both internal and external HPAs.
LNA Power Enable	Command: Response: Status: Response:	<add/LPE_xxx'cr' >add/LPE_xxx'cr"lf'] <add/LPE_'cr' >add/LPE_xxx'cr"lf']	Where: xxx = ON (default) or OFF. This command is used to route the LNA DC power to the coax cable or to remote it. 'ON' means DC power will be available on the center conductor of the coax cable to the LNA. 'OFF' means DC power will be removed. Under both conditions, LNA DC power will always be available on connector J6, pin K. Note: This command is only available with M&C boards Rev. C and newer.
Redundant Switch Mode	Command: Response: Status: Response:	<add/RSW_xxxxx'cr' >add/RSW_xxxxx'cr"lf'] <add/RSW_'cr' >add/RSW_xxxxx'cr"lf']	Where: xxxxx = INDEP (default) or DEP. Note: For use in redundant system only with RSU-503L switch. (INDEP TX and RX switch independently on fault to backup terminal. DEP switches both TX and RX on fault to backup terminal.)

A.4 Status Commands/Responses

Config Status	Command: Response:	<add/OS_'cr' >add/OS_'cr' UCF_nnnnn.n'cr' DCF_nnnnn.n'cr' RF_xxx'cr' UCA_nn.n'cr' DCA_nn.n'cr' SEL_n'cr"lf']	The converter configuration status command causes a block of data to be returned by the addressed RFT-1225. The block of data reflects the current configuration status. (nnnnn.n = 14000.0 to 14500.0 MHz.) (nnnnn.n = 10950.0 to 12750.0 MHz.) (xxx = ON, WRM, or OFF.) (nn.n = 0 to 25.0 dBm UC Fine Adj.) (nn.n = 0 to 25.0 dBm DC Fine Adj-31.0 scale.) (n = 1, 2, 3, or None.)
Fault Status	Command: Response:	<add/FS_'cr' >add/FS_'cr' RST_xxx'cr' UL_xxx'cr' DL_xxx'cr' PS5_xxx'cr' P12_xxx'cr' HPA_xxx'cr' LNA_xxx'cr' ULD_xxx'cr' USV_xxx'cr' UVV_xxx'cr' DLD_xxx'cr' (See Note) DCV_xxx'cr' (See Note) DVV_xxx'cr' (See Note) ILD_xxx'cr' ITM_xxx'cr"lf']	This command returns a block of data reflecting the current and logged faults. Logged faults will be reset when receiving this command, while current faults can be read on the second request. xxx = OK or FLT Unit experienced a restart xxx = OK or FLT Uplink fault xxx = OK or FLT Downlink fault xxx = OK or FLT +5V power supply xxx = OK or FLT +12V power supply xxx = OK or FLT Power Amp fault xxx = OK or FLT LNA fault xxx = OK or FLT UC LO Lock Detect xxx = OK or FLT UC LO Vt-S Tuning voltage xxx = OK or FLT UC LO Vt-V Tuning voltage xxx = OK or FLT DC Lock Detect xxx = OK or FLT DC LO Vt-C tuning voltage xxx = OK or FLT DC LO Vt-V tuning voltage xxx = OK or FLT IF LO Lock Detect xxx = OK or FLT IF LO Tuning voltage Note: In a single synthesizer configuration, these items will display 'DLD_N/A', 'DCV_N/A', and 'DVV_N/A', respectively.
Summary Fault	Command: Response:	<add/SF_'cr' >add/SF_xxx'cr"lf']	Where: xxx = OK or FLT. Returns status of current faults only.
Maint Status	Command: Response:	<add/MS_'cr' >add/MS_'cr' UCT_nn'cr' DCT_nn'cr' HPT_nn'cr' USV_nn.n'cr' UVV_nn.n'cr' DCV_nn.n'cr' (See Note) DVV_nn.n'cr' (See Note) TIV_nn.n'cr' VDD_nn.n'cr'lf']	This command returns a block of data from the RFT-1225 reflecting the status of certain internal parameters for the purpose of troubleshooting. nn = UC temperature in degrees C nn = DC temperature in degrees C nn = Power Amp temp in degrees C nn.n = UC LO Vt-S Tuning voltage nn.n = UC LO Vt-V Tuning voltage nn.n = DC LO Vt-C Tuning voltage nn.n = DC LO Vt-V Tuning voltage nn.n = Tuning voltage of IF LO nn.n = Tuning voltage of HPA drain Note: In a single synthesizer configuration, these items will display 'DCV_N/A' and 'DVV_N/A', respectively.

Equip Type Status	Command: Response:	<add/ET_'cr' >add/ET_ xx'cr"lf']	Where: In version -1, xx = RFT-1225 SW_1.01. In version -2, xx = RFT-1225 SW_2.01. This command returns the equipment type polled and software version.

Glossary

The following is a list of acronyms and abbreviations that may be found in this manual.

Acronym/ Abbreviation	Definition
Ω	Ohms
32	Internal 32 VDC Power
5V	Internal 5 VDC Power
A	Ampere
AC	Alternating Current
ASA	Address Select Unit A
ASB	Address Select Unit B
ASCII	American Standard Code for Information Interchange
BER	Bit Error Rate
bit/s	bits per second
C	Celsius
CAL	Calibrate
CLNA	Calibrated LNA
CLR	CLEAR
COMP	Compensation
CR	Carriage Return
D/C	Down Converter
dB	Decibels
dBc	Decibels referred to carrier
dBm	Decibels referred to 1.0 milliwatt
DC	Direct Current
DCA	Down Converter Attenuation
DCF	Down Converter Frequency
DCT	Down Converter Temperature
DL	Down Link Fault
DLA	Down Link Fault — Unit A
DLB	Down Link Fault — Unit B
DLD	Down Converter Lock Detect Fault
DLM	Down Link Mode (Auto or Manual)

DLS	Down Link Switch (A or B)
DTM	Down Converter Tuning Voltage Fault
EIRP	Equivalent Isotropically Radiated Power
EN	Enable
ERR	Error
ESC	Escape
EXE	Executable
FLT	Fault
G/T	Gain Over Temperature
GHz	Gigahertz (10^9 Hertz)
GND	Ground
HPA	High Power Amplifier
HPT	HPA Temperature
HPV	HPA Internal 12 VDC Power
Hz	Hertz (cycle per second)
IF	Intermediate Frequency
IF TUN	Intermediate Frequency Tuning
ILD	IF LO Lock Detect Fault
INI	Initialize
ITM	IF LO Tuning Voltage Fault
k	kilo (10^3)
KΩ	kilo-ohms
kbit/s	Kilobits per second (10^3 bits per second)
kHz	Kilohertz (10^3 Hertz)
LCD	Liquid Crystal Display
LFE	LNA Fault Enable
LK	Lock
LNA	Low Noise Amplifier
LO	Local Oscillator
m	milli (10^{-3})
M&C	Monitor and Control
mA	Milliamp
Max	Maximum
Mbit/s	Megabits per second
MHz	Megahertz (10^6 Hertz)
Min	Minimum or Minute
ns	Nanosecond (10^{-9} second)
P-P	Peak-to-Peak
P05	Internal 5 VDC Power Fault
P32	Internal 32 VDC Power Fault
PC	Printed Circuit
PLO	Phase Locked Oscillator
PROG	Program
PS	Power Supply
PSIG	Pressure per Square Inch Guage
RAM	Random Access Memory
REF	Reference
RF	Radio Frequency
RF	Radio Frequency
RFJ	Reference Frequency Adjust (10 MHz)
RFRF	RF Output
RFT	Radio Frequency Terminal
RH	Relative Humidity
RMA	Return Material Authorization
RST	Restart Fault
RSU	Redundancy Switch Unit

RX	Receive (Receiver)
SEL	Select
SSPA	Solid State Power Amplifier
TDV	Down Converter Tuning Voltage
TIV	IF LO Tuning Voltage
TRF	Transmit Reject Filter
TUV	Up Converter Tuning Voltage
TWT	Traveling Wave Tube
TX	Transmit (Transmitter)
U/C	Up Converter
U/C TUN	Up Converter Tuning
UCA	UP Converter Attenuation
UCF	Up Converter Frequency
UCT	Up Converter Temperature
UL	Up Link Fault
ULA	Up Link Fault — Unit A
ULB	Up Link Fault — Unit B
ULD	Up Converter Lock Detect Fault
ULM	Up Link Mode (Auto or Manual)
ULS	Up Link Switch (A or B)
UTM	Up Converter Tuning Voltage Fault
V	Volts
VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VSAT	Very Small Aperture Terminal
VSWR	Voltage Standing Wave Ration
W	Watt
WRM	Warm
XFE	External Fault Enable
XVA	External Input Power from Unit A
XVB	External Input Power from Unit B

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METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
C = (F - 32) * 0.555
F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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