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.

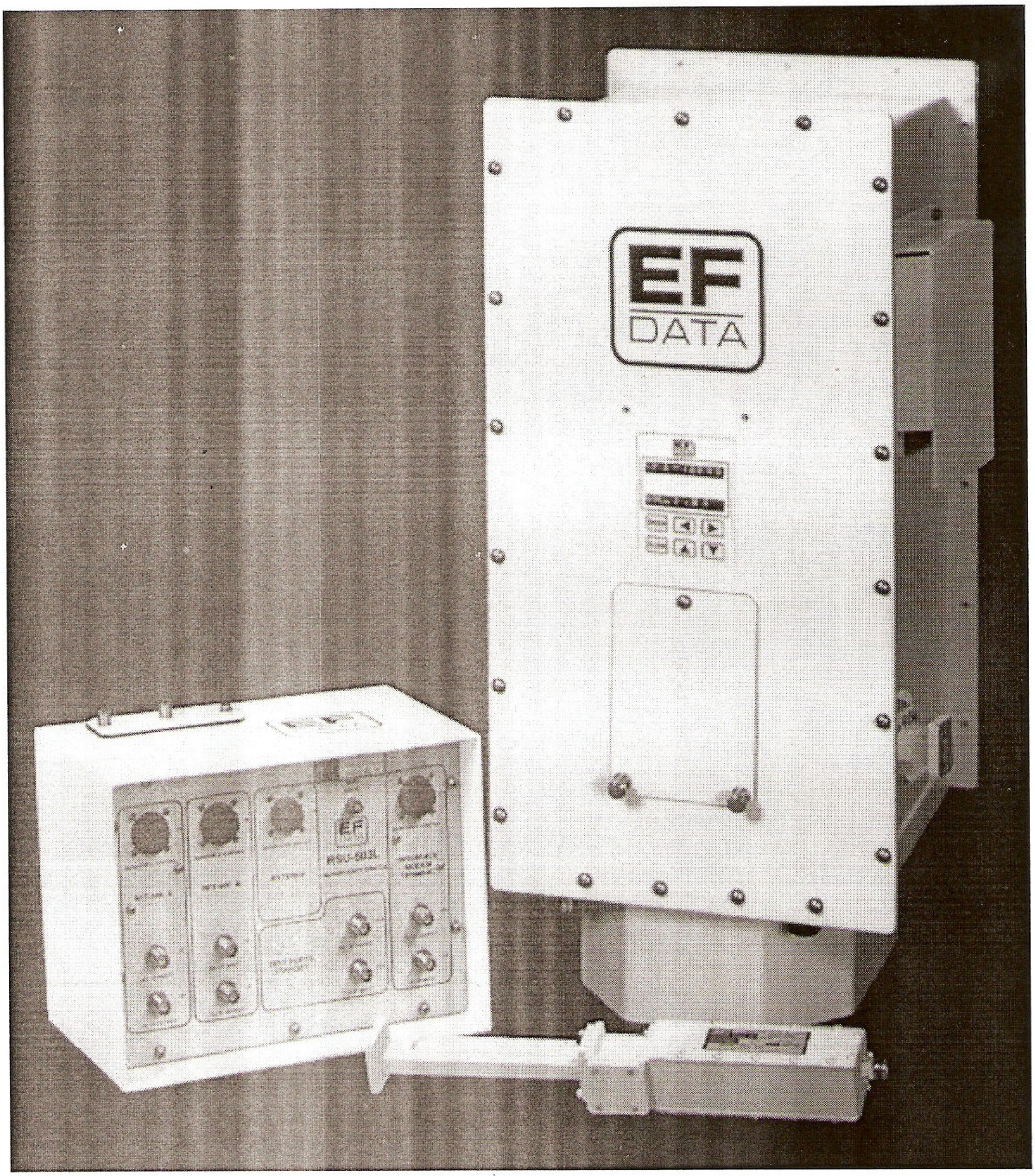

Figure 1-1. KST-12025 Ku-Band Satellite Terminal

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.

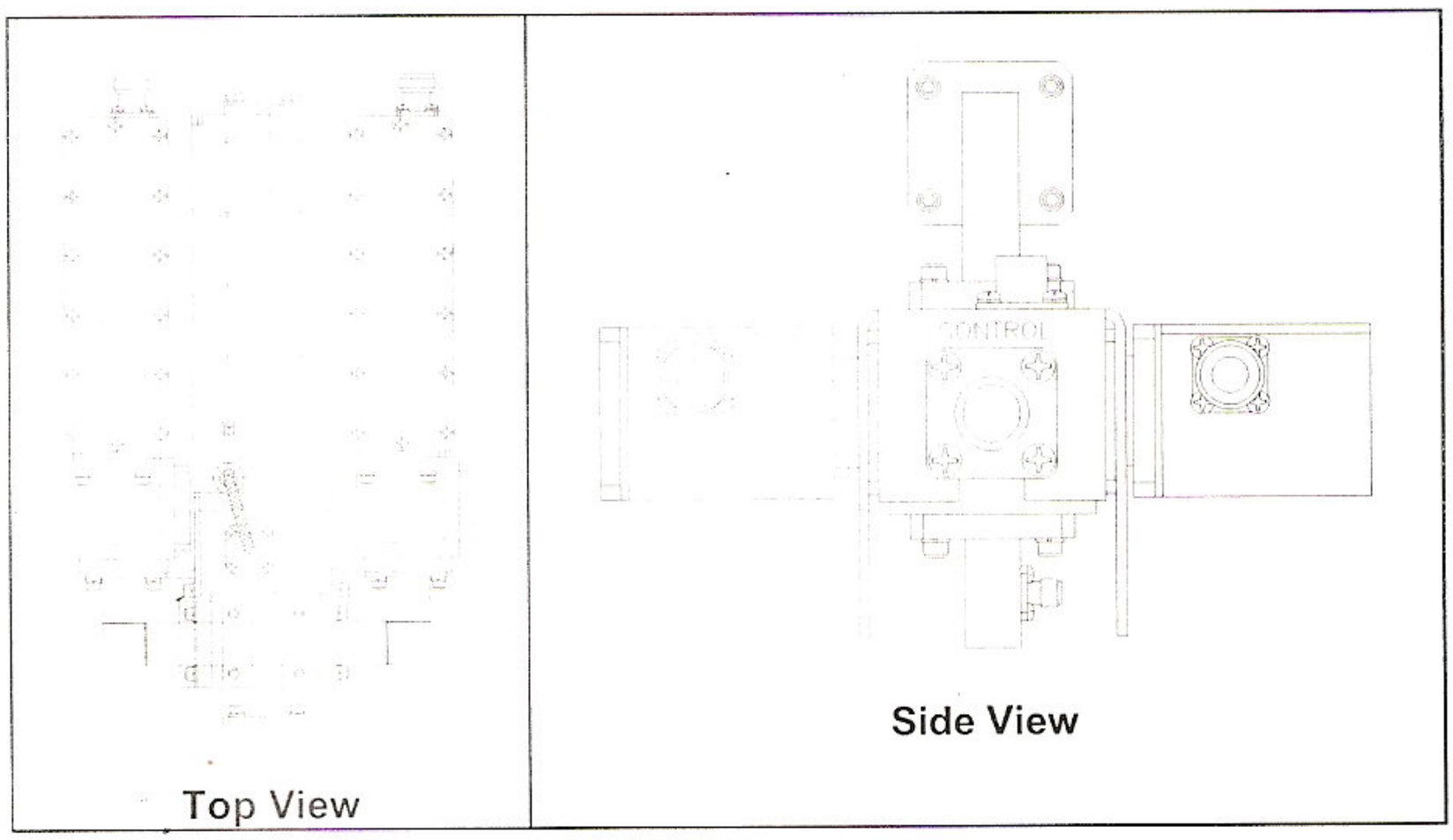

Figure 1-2. Redundant LNA Plate

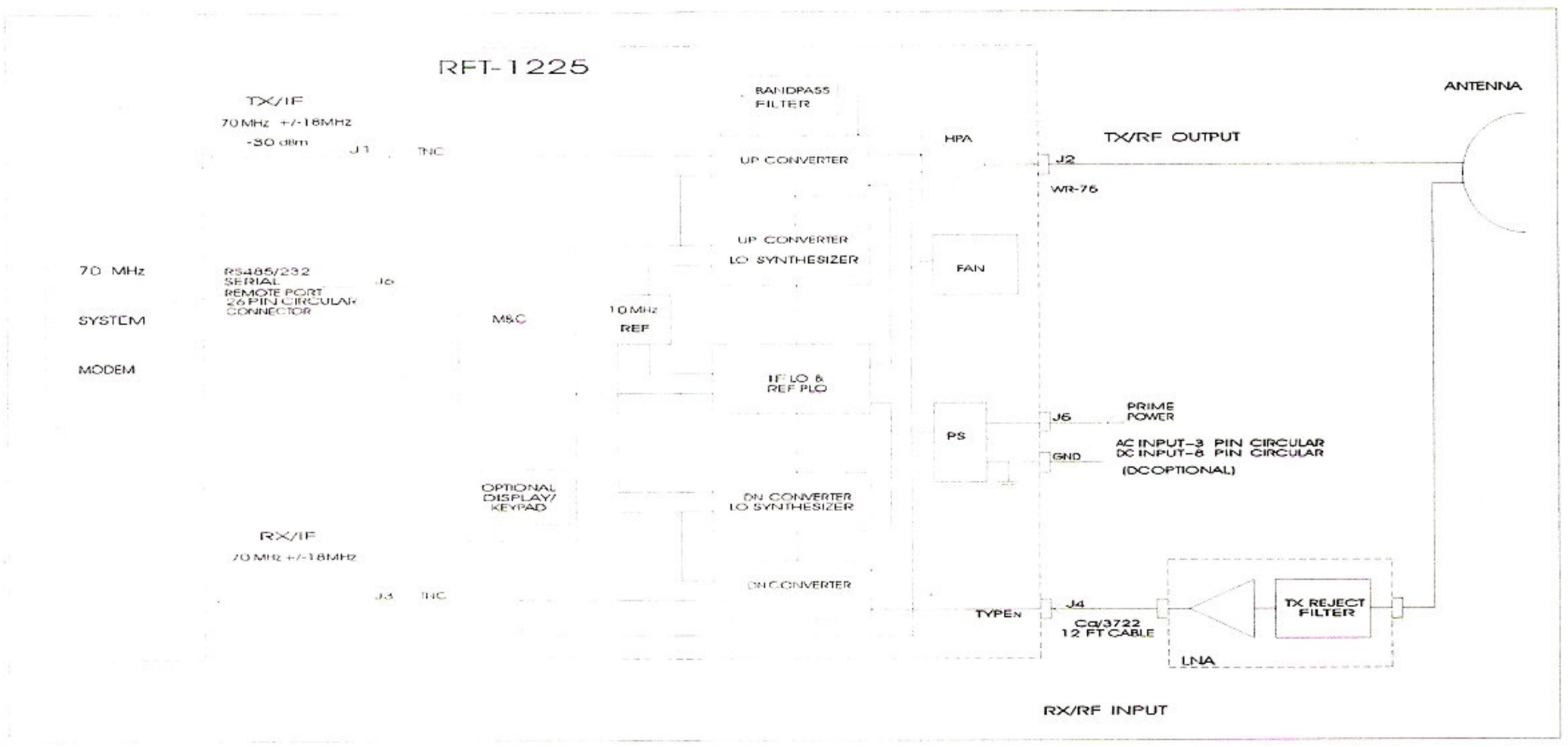

Figure 1-3. KST-12025 Terminal Block Diagram

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