KST-2000L

Satellite Terminal System
Installation and Operation Manual

Part Number MN/KST2000L.IOM Revision 2

KST-2000L

Satellite Terminal System
Installation and Operation Manual

Comtech EF Data is an ISO 9001
Registered Company.

Part Number MN/KST2000L.IOM
Revision 2
February 7, 2002

Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, (480) 333-2200, FAX: (480) 333-2161.

Customer Support

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Information on upgrading or returning a product
- Reporting comments or suggestions concerning manuals

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

(480) 333-2200 (Main Comtech EF Data Number)
(480) 333-4357 (Customer Support Desk)
(480) 333-2161 FAX

or, E-Mail can be sent to the Customer Support Department at:

service@comtechefdata.com

Contact us via the web at www.comtechefdata.com.

1. To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

2. Request a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support Department.

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

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

5. Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

For more information regarding the warranty policies, see Warranty Policy, p. xi.

Table of Contents

Figures

Tables

Overview of Changes to Previous Edition

A summary of the changes made for Rev. 2 includes:

Chapter 2	Updated specification data.
Chapter 4	Updated controls and commands.
Chapter 6	Updated installation procedure.
Chapter 7	Update remote commands.

About this Manual

This manual provides installation and operation information for the Comtech EF Data KST-2000L Satellite Terminal System. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the KST-2000L Satellite Terminal System.

Conventions and References

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.

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing English to Metric conversions.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations (EIA-232, EIA-485, etc.) only.

Trademarks

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

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Customer Support Department.

EMC Compliance

This is a Class A product. In a domestic environment, it may cause radio interference that requires the user to take adequate protection measures.

EN55022 Compliance

This equipment meets the radio disturbance characteristic specifications for information technology equipment as defined in EN55022.

EN50082-1 Compliance

This equipment meets the electromagnetic compatibility/generic immunity standard as defined in EN50082-1.

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference; in which case, users are required to correct the interference at their own expense.

Note: To ensure compliance, properly shielded cables for DATA I/O shall be used. More specifically, these cables shall be shielded from end to end, ensuring a continuous shield.

Safety Compliance

EN 60950

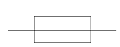
This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.

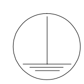
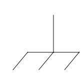
Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (EN60950):

<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing. ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung.

International Symbols:

Symbol	Definition
	Alternating Current.
	**Fuse.**

Symbol	Definition
	**Protective Earth.**
	**Chassis Ground.**

Note: For additional symbols, refer to "Cautions" listed earlier in this preface. Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950.

Warranty Policy

This Comtech EF Data product is warranted against defects in material and workmanship for a period of two years from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective.

For equipment under warranty, the customer is responsible for freight to Comtech EF Data and all related custom, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges **only** for return of the equipment from the factory to the customer. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EF Data.

No other warranty is expressed or implied. Comtech EF Data specifically disclaims the implied warranties of merchantability and fitness for particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order that it will be an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact the Comtech EF Data Customer Support Department.

Chapter 1. INTRODUCTION

This chapter provides a description and the specifications for the KST-2000L satellite terminal system. The terminal system is shown in Figure 1-1.

Figure 1-1. KST-2000L

1.1 Description

The KST-2000L satellite terminal system is a high-performance transceiver designed for single-thread configuration outdoor operation. The unit transmits in Ku-Band and receives in L-Band.

1. The converter unit controls external High Power Amplifiers (HPAs).
2. Automatic Gain Control (AGC) from the converter input to the HPA output assures power output stability over varying conditions.

1.1.1 Areas of Operation:

The areas of operation are divided into three sections:

Converter	Convection cooled up/down converter with an internal power supply and microprocessor-based monitor and control (M&C).
HPA	Offered with 2 or 4 W power output capabilities.
Low Noise Block Down Converter (LNB) Assembly	LNBs with various frequency coverage are available.

1.1.2 Transmit and Receive Band Coverage

14.0 to 14.5 GHz	Transmit range in 1 MHz steps
10.95 to 11.70 GHz **11.70 to 12.20 GHz** **12.25 to 12.75 GHz**	LNB-Select: Receive range in 1 MHz steps

1.1.3 Features

Refer to Table 1-1 for KST-2000L features.

Table 1-1. Features

Parameter	Description
Automatic Gain Control	The KST-2000L incorporates a closed loop control system that maintains the system's conversion gain (as measured from the IF input to the Ku-Band SSPA output) at the user's preset value despite the effects of temperature, aging, and cable loss.
IF Input/Output of 70 /140 MHz	Optional
Selectable Serial Communication	There are several selectable serial communications protocols and bandwidths: • EIA-232, EIA-485, or EIA-422 half-duplex • Baud Rate = 300 to 19200
L-Band RX Power Monitor Output	An isolated output covers the 950 to 1700 MHz downlink bands.
External LED Indicators for Power On and Fault Indications	• A blinking GREEN LED indicates prime power ON. • A steady GREEN LED indicates TX RF Power ON. • A RED LED indicates a summary fault.
Power Factor Corrected Internal Power Supply	All power supply is power factor corrected and meets all CE Mark requirements.
HPA Options	The converter has built-in monitor and control circuitry and functions that operate with the product line Solid-State Power Amplifiers (SSPAs) with 2 or 4 W output power
Industry Standards	• IESS 308 and IESS 309 • FCC radiated emissions requirements • CE Mark The system components are completely weatherproof units designed for the harsh environments of antenna-mounted systems. The system's operating parameters can be monitored and controlled using Windows™ based M&C software with a personal computer or a hand held KP-10, as described in Chapter 3.

1.1.4 KST-2000L System

A block diagram of a single thread configuration, the system is shown in Figure 1-2.

Note: The modem, the remote M&C, OMT, and the antenna are not part of the system and are shown for reference only.

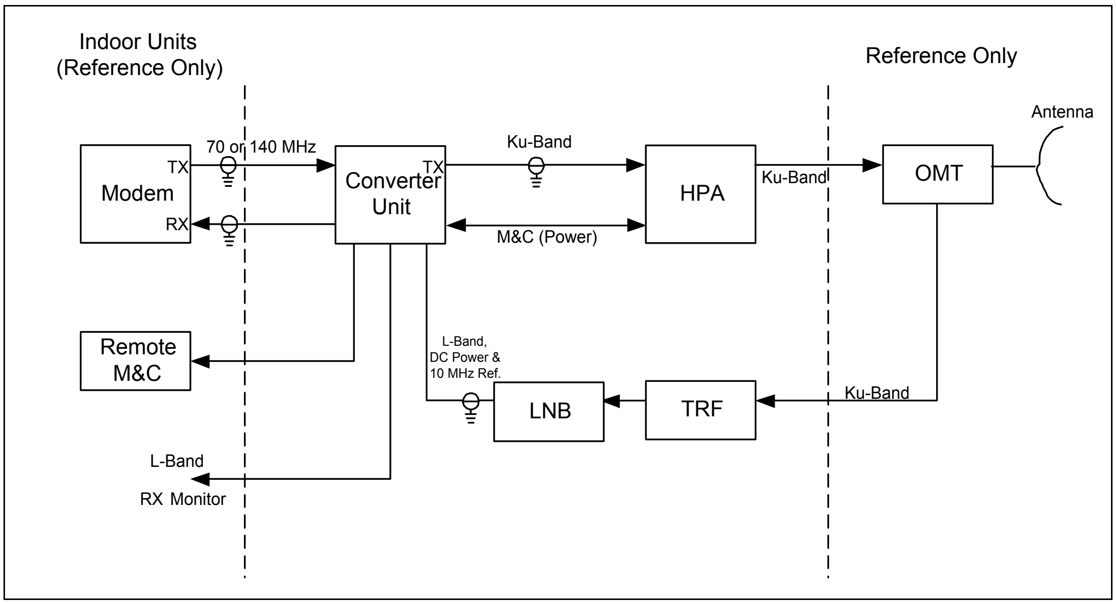


Figure 1-2. KST-2000L System

The M&C remote control, whose operation is described in Chapter 3, is used to set the operating parameters of the system such as transmit and receive frequency, gain, etc.; and to monitor the operation of the system. Connection to the remote M&C is only required during set up and fault finding.

In the TX (uplink) direction, the converter unit receives a 70 MHz ± 20 MHz signal (140 MHz ± 40 MHz signal optional) at –25 to –45 dBm from a modem via a 50 or 75Ω coaxial cable. The converter's input connector for this signal is a type N, female.

The converter unit performs a block conversion (non-inverted sense) first to S-Band, then to Ku-Band. The exact frequency output and power level are set by the user via the remote M&C. The converter output is coupled to an HPA via a coaxial cable with a 50Ω, female, type N connector at the converter output.

The HPA receives the Ku-Band input from the converter and amplifies it to the user-selected level. The converter via the M&C cable supplies prime power for the HPA. The user via the remote M&C sets the output power of the SSPA, and this output is connected to the feed of the antenna via a WR-75 waveguide.

In the RX (downlink) direction, the received Ku-Band signal from the antenna is offset in frequency from the transmitted signal allowing rejection of the transmitted signal by the Transmit Reject Filter (TRF). The exact RX frequency is set by the user via the remote M&C. The RX signal is down-converted to L-Band and is amplified in an LNB whose output is coupled to the converter's input via a coaxial cable with type N connectors. This same cable is used to provide prime power (+15 VDC) and a 10 MHz reference to the LNB.

An output is provided at L-Band (950 to 1700 MHz) to monitor the received signal. This is particularly useful during set up and fault finding.

This page is intentionally left blank.

Chapter 2. Specifications

2.1 Summary of Specifications

Table 2-1. Transmit Specifications

Input Characteristics:		
Frequency Range	50 to 90 MHz, Optional: 100 to 180 MHz	
Power Level	Operational: -25 to –45 dBm Survival: -10 dBm	
Connector	Type N, female	
Impedance	50Ω, unbalanced	
VSWR	1.5:1	
Output Characteristics:		
Frequency Range	14.0 to 14.5 GHz, in 1 MHz steps	
Output Power at Flange:	Typical Pso +25°C	Guaranteed P1 dBm
2 Watt	33 dBm	32 dBm
4 Watt	36 dBm	35 dBm
Connector	WR-75	
VSWR	1.5:1	
Transfer Characteristics:		
Frequency Sense	Non-inverting	
System Gain: (SSG @ 10 dB backoff)	Maximum	Nominal
2 Watt	73 dB	63 dB
4 Watt	76 dB	66 dB
User Attenuator Range	0 to 20 dB, 1 dB steps	
Gain Stability over temperature AGC On, Fixed Frequency AGC Off, Fixed Frequency	 2.0 dB p-p 3.0 dB p-p	
Gain variation with frequency: 70 ± 20 MHz 140 ± 40 MHz	 2.0 dB p-p 3.0 dB p-p	

Table 2-1. Transmit Specifications (Continued)

Spurious Signals: Signal Related Harmonics <250 kHz Non-signal Related	 -50 dBc at 6 dB below P1dB -50 dBc at 6 dB below P1dB -35 dBc at 6 dB below P1dB -20 dBm/4 kHz
Third Order Intermods	-30 dBc (for summed output of 2 signals @ 6 dB for maximum output power rating)
Group Delay	< 10 ns over any 40 MHz
Phase Noise	Exceed IESS 308/309 requirements, Limit 2
Frequency Stability	± 1E-7/Year max ± 1E-8/Temperature

Table 2-2. Receive Specifications

Input Characteristics:	
Frequency Range	10.95 to 11.7 GHz (Option A) 11.7 to 12.2 GHz (Option B) 12.2 to 12.75 GHz (Option C)
LNB Noise Figure	1.1 dB (85°) Max
LNB Gain	60 dB
Power Level	Operational: -125 to –95 dBm Survival: -10 dBm
Connector	WR-75
Impedance	50Ω, unbalanced
VSWR	2.5:1
Output Characteristics:	
Frequency Range	50 to 90 MHz, in 1 MHz steps Optional: 100 to 180 MHz
P1dB	+10 dBm
Connector	Type N, female
Impedance	50Ω, Unbalanced
VSWR	1.5:1
Transfer Characteristics:	
Frequency Sense	Non-inverting
System Gain: (SSG @ -10 dB backoff)	Nominal: 90 dB
User Attenuator Range	0 to 20 dB, 1 dB steps
Gain Stability over temperature Fixed Frequency	 8.0 dB p-p
Gain variation with frequency: ± 20 MHz Entire Band	 2.0 dB p-p 6.0 dB p-p
Spurious Signals: Signal Related < 250 kHz Non-signal Related	 -50 dBc (-5 dBm output) -35 dBc -126 dBm max referred to LNB input
P1dBm	+10 dBm
Third Order Intermods	-30 dBc (for summed output of 2 signals @ 9 dB below P1dB
Group Delay	< 10 ns over any 40 MHz
Phase Noise	Exceed IESS 308/309 requirements, Limit 2
Frequency Stability	± 1E-7/Year max ± 1E-8/Temperature

2.1.1 Solid-State Power Amplifier (SSPA)

2.1.1.1 SSPA Monitor and Control Interface

The M&C function for all SSPAs with output powers of $\leq$ 4W should conform to requirements of Table 2-3.

Table 2-3. SSPA M&C Specifications

SSPA M&C Specification	
Signaling Type	EIA-485 (2-wire, half-duplex)
Baud Rate	83333 bps
Data Structure 11 Data Bits 1 Start Bit 1 Stop Bit 8 Data Bits 9 Data Bits	= 1 when previous 8 bits represents a slave address; = 0 otherwise

Type	Pin	Function
M&C Communication	A	EIA-485 + RX/TX
	B	EIA-485 – RX/TX
DC Power	C	+10.5 VDC
	D	+10.5 VDC
	E	+10.5 VDC
	F	+10.5 VDC
	G	GND
	H	GND
	I	GND
	J	GND
	K	GND

Note: Connector type is PT00E-12-10S.

2.1.2 Interface Requirements

2.1.2.1 M&C Interface

The M&C of the system shall be via the M&C connector located on the Converter Unit. Specifications for the M&C interface are listed in Table 2-4.

Table 2-4. M&C Interface Specification

M&C Interface Specifications	
Serial Data Signal Interface (User selectable) EIA-232 EIA-485 (2-wire, half duplex) EIA-485 (4-wire, half duplex)	
Serial Data Baud Rates (User selectable)	300, 600, 1200, 2400, 4800, 9600, 19200 kbps
Discrete Alarm Outputs Uplink Summary Alarm Downlink Summary Alarm System Summary Alarm	 Form 'C' Relay Contacts Form 'C' Relay Contacts Form 'C' Relay Contacts

The converter unit and the SSPA are capable of being monitored and controlled via the data connector whose connections are listed in Table 1-6 using Comtech EF Data supplied software on an IBM compatible PC running DOS version ≤ 5.0 with at least 192K of available RAM and running with a 386SX processor or greater.

Table 2-5. M&C Functions/Parameters

	Signal	Description
A	-TX/-RX or –TX only (see Notes)	-EIA-485 TX/RX or -EIA-422 TX
B	-TX/-RX or –RX only (see Notes)	-EIA-485 TX/RX or -EIA-422 TX
C	+TX/+RX or +TX only (see Notes)	+EIA-485 TX/RX or +EIA-422 TX
D	+TX/+RX or +RX only (see Notes)	+EIA-485 TX/RX or +EIA-422 TX
E	RXD	EIA-232 RX Data
F	RTS	EIA-232 Ready-to-Send (tied to CTS)
G	TXD	EIA-232 TX Data
H	DSR	EIA-232 Data Set Ready
J	GND	Ground
K	LNA Power	+15 VDC to LNA
L	LNA Power Return	+15 VDC Return from LNA
M	RESET	Reset (momentary low resets system)
N	GND	Ground
P	CTS	EIA-232 Clear-to-Send (tied to RTS)
R	GND	Ground
S	+12V (KP10 Power)	KP10 Power Supply Output
T	2/4 WIRE (SEE note)	EIA-485/EIA-232 Operation Selection
U	UL_FLT_NC	Uplink Fault Relay, Closed = Fault
V	UL_FLT_COM	Uplink Fault Relay, Common
W	UL_FLT_NO	Uplink Fault Relay, Open = Fault
X	DL_FLT_NC	Downlink Fault Relay, Closed = Fault
Y	DL_FLT_COM	Downlink Fault Relay, Common
Z	DL_FLT_NO	Downlink Fault Relay, Open = Fault
a	SUM_FLT_NO	Summary Fault Relay, Open = Fault
b	SUM_FLT_NC	Summary Fault Relay, Closed = Fault
c	SUM_FLT_COM	Summary Fault Relay, Common

Notes:

1. These signals can be configured as EIA-485, 2-wire, half-duplex or EIA-422, 4-wire, half-duplex.
2. In 2-wire mode, pins A and B are tied together as are pins C and D.
3. To select 2-wire operation, pin T is left open.
4. Tie pin T to ground for EIA-422 (4-wire) operation.

2.1.3 Internal Data Interface

The individual RF uplink and downlink subassemblies, along with the separate SSPA, contains a separate microprocessor that will individually monitor and control each subassembly and communicate via a high-speed serial data bus with the central M&C subassembly. The communications provides control parameters, status monitoring, and fault reporting. Specification for the internal data bus are listed in Table 2-6.

Table 2-6. Internal Data Interface Specifications

Internal Data Interface Specification	
Signaling Type	Balanced Multipoint EIA-485, 2-wire
Baud Rate	83333 bps
Data Structure: 11 Data Bits: 1 Start Bit 1 Stop Bit 8 Data Bits or 9 Data Bits	 = 1 when previous 8 bits represents a slave address; = 0 otherwise

2.2 Size and Weight Specifications

Table 2-7. Size and Weight Specifications

Unit	Size	Weight
Converter	21.75L x 8.25W x 8.0H inches (54.48L x 20.95W x 20.3H cm)	30 lbs (13.6 kg)
2W SSPA	12.95L x 6.0W x 3.9H inches (32.89L x 15.24W x 9.9H cm)	7 lbs (3.17 kg)
4W SSPA	12.95L x 6.0W x 3.9H inches (32.89L x 15.24W x 9.9H cm)	7 lbs (3.17 kg)

2.3 Environment Specifications

Table 2-8. Converter Unit and SSPA Environmental Requirements

Parameter	Requirements
Temperature	Operation: -40 to 55°C (-40 to 131°F) Survival: -50 to 75°C (-58 to 167°F)
Thermal Gradient	40°C/hour 10°C/15 minute
Humidity	0 to 100% relative at -40 to 55°C (-40 to 131°F) 95% at 65°C/72 hours
Precipitation	MIL-STD-810, Method 506.2 Proc I, 5.2 inches/hour
Salt Fog	MIL-STD-810, Method 506.2
Sand and Dust	MIL-STD-810, Method 509.2
Altitude	MIL-STD-810, Method 510.1 Operational: 0 to 15,000 ft Survival: 0 to 50,000ft
Solar Radiation	360 BTU/ft^2/hr at 50°C (122°F)
ES Discharge	Operational: 10 KV Survival: 15 KV
Shock	Operation: 10 g for 10 mS (half-sine) on three axis Survival: 40 g for 10 mS (half-sine) on three axis
Vibration	Survival – 5minute resonant dwell at four major resonances at 1 g peak. Survival – 2.41g$_{rms}$ of random vibration as listed below, 10 minutes/axis Frequency / Slope / PSD 5 to 100 Hz / 0 / 0.20 g^2/Hz 100 to 137 Hz / -6 dB/oct / - 137 to 350 Hz / 0 / 0.0107 g^2/Hz 350 to 500 Hz / -6 dB/oct / - 500 Hz / 0 / 0.0052 g^2/Hz Operational – 0.91 g$_{rms}$ of random vibration as listed, 10 minutes/axis Frequency / Slope / PSD 5 to 350 Hz / 0 / 0.0015 g^2/Hz 350 to 500 Hz / -6 dB/oct / - 500 Hz / 0 / 0.00074 g^2/Hz

2.4 CE Certification

Table 2-9. CE Certification

Specification	Description/Test
EN55022	Conducted and Radiated Emissions
EN50082-1	Immunity • Fast Transmit Burst • Static Discharge • Radiated Immunity
EN60958	Safety

2.5 Terminal Assemblies

Table 2-10. Part Numbers for Various Equipment

Part Number	Description	Comments
System/FW Configuration:		
FW/8439-1	TX/RX Duplex	System/FW Configuration
Primary Input Power:		
CA/84914-0223	90-264 VAC	
TX Output Power:		
KT/2819(2)	2 Watt CEFD SSPA	13.75 – 14.50 GHz
KT/2819 (2)	4 Watt CEFD SSPA	13.75 – 14.50 GHz
RX KLNB:		
RF/LNB-10.9-11.7 RF/LNB-11.7 to 12.2 RF/LNB-12.2-12.7	10-95 to 11.70 GHz 11.70 to 12.20 GHz 12.25 to 12.75 GHz	None (TX only) or No KLNB KT/2819 for selected RX KLNB
RX Transmit Reject Filter:		
RF/TRF-KU-WR75R2 RF/TRF-KU-WR75G	Right-Angle, TRF Straight, TRF	None (TX only) or No KLNB
IF Frequency		
KT/8766-2	70 MHz, IF	
KT/8766-2	140 MHz, IF	
TX Interlink Cables		
CA/3722-2	5-Foot Cables	
CA/3722-8	10-Foot Cables	
CA/3722-9	15-Foot Cables	
CA/3722-7	20-Foot Cables	
RX Interlink Cables		
CA/3722-2	5-Foot Cables	
CA/3722-8	10-Foot Cables	
CA/3722-9	15-Foot Cables	
CA/3722-7	20-Foot Cables	

Table 2-10. Part Numbers for Various Equipment (Contd)

Part Number	Description	Comments
Antenna Mounting Hardware:		
KT/8324-1	Spar (1 x 2 in) Mount	Base Unit Only
KT/8326-1	Spar (2.5 x 2.5 in) Mount	Base Unit Only)
KT/7805-1	Spar (1 x 2in) Mount	Prodelin Offset 5.25 in. Interface SSPA/LNA Feed Mount
KT/7945-1	Spar (1 x 2in) Mount	Prodelin Offset 3.74 in. Interface SSPA/LNA Feed Mount
KT/7595	Spar (2.5 x 2.5) Mount	Channel Master 5.29 in. Interface SSPA/LNA Feed Mount
KT/8324-1/KT/8094-1	Spar (1 x 2) Mount for Amplifier	Mast Pipe Mount for Base Unit
KT/8326-1/KT/8094-1	Spar (2.5 x 2.5) Mount for Amplifier	Mast Pipe Mount for Base Unit
TX Flexible Waveguide:		
KT/5860	5-Foot Flex Waveguide	
KT-5860-1	3-Foot Flex Waveguide	
KT/5860-2	2-Foot Flex Waveguide	
RX Flexible Waveguide:		
KT/5860	5-Foot Flex Waveguide	
KT-5860-1	3-Foot Flex Waveguide	
KT/5860-2	2-Foot Flex Waveguide	
Handheld Keypad Controller:		
KT/8078	KP10: RS-232	
KT/8078-1	KP10: RS-485	
KT/8078-2	KP10: RS-422	

Notes:

1. Several items of equipment are customer-select.
2. All inquiries shall be directed to Comtech EF Data Customer Support department.

This page is intentionally left blank.

Chapter 3. Connector Pinouts

This chapter provides system equipment and external connections information. Refer to Chapter 6 for installation procedures specific to particular mounting applications.

3.1 System Equipment Information

3.1.1 System Components

The standard components delivered with a single thread system include:

QTY	Description
1	Base converter unit
1	HPA
1	LNB
1	12ft (3.66m) Prime power cable for the converter unit
As Required	5ft (1.52m) Interlink cabling
As Required	Mounting hardware for a spar mounted offset antenna. *(see Note)*

Note: Antenna type shall be indicated when ordering the KST-2000L.

3.1.2 Description of Options

Table 3-1 lists the various equipment options, and Table 3-2 lists the available spare parts.

Table 3-1. Description of Options

LNB OPTIONS (discrete narrow bands at 1.1db max NF only):
10.95 to 11.70 GHz Europe
11.70 to 12.20 GHz North American
12.25 to 12.75 GHz Aussat

MOUNTING HARDWARE OPTIONS:
Standard Prodelin spar offset antenna
Standard Channel Master spar offset antenna
Non-standard single thread converter pole-mount Kit
No mounting hardware beyond the “pick off points” on the completed assembly
For mounting requirements outside those previously indicated, please consult the factory for availability.

CABLING OPTIONS:
No RF or control cabling. Includes only the prime power cable(s) and applicable MS connectors
For cabling requirements outside those previously indicated, please consult the factory for availability.

3.1.3 Spare Parts

Table 3-2. Spare Parts

Description	P/N
2 Watt SSPA (white)	PL/8308-1
4 Watt SSPA (white)	PL/8235-1
M&C PCB assembly	PL/8314-1
10.95 to 11.7 GHz Europe and also Intelsat (11.2 to 11.7 GHz) KLNB (white)	RF/LNB-KU-60-751
11.7 to 12.2 GHz North American KLNB (white)	RF/LNB-KU-60-752
12.25 to 12.75 GHz Aussat KLNB (white)	RF/LNB-KU-60-753
10ft RF heliax “N” cable	CA/3722-8
12ft RF heliax “N” cable	CA/3722
15ft RF heliax “N” cable	CA/3722-9
Base A/C converter power supply	PS/AC150W02P01
Transmit reject filter (right angle)	RF/TRF-KU-WR75R1
Transmit reject filter (straight)	RF/TRF-KU-WR75G

3.2 Electrical Connections

3.2.1 Converter Unit

The external connections on the converter unit are shown in Figure 2-1 and listed in Table 3-3. The connectors are described in the following paragraphs.

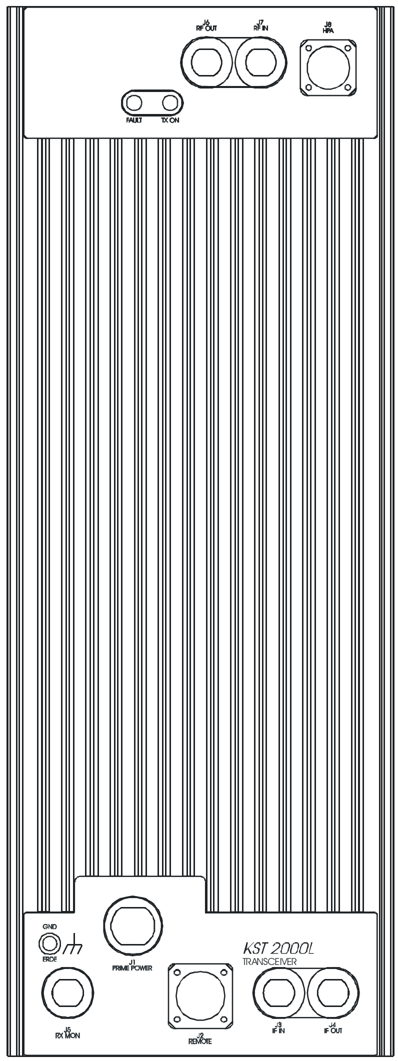


Figure 3-1. I/O View of KST-2000L Converter Unit

Table 3-3. Converter Unit External Connections

Ref. Des.	Name	Connector Type	Function
J1	PRIME POWER	3 pin circular Male	Prime AC Power Input
J2	REMOTE	26 pin circular, Female	Remote M&C Interface
J3	IF IN	Type N, Female	TX IF Input 70 MHz (Optional: 140 MHz)
J4	IF OUT	Type N, Female	RX IF Output 70 MHz (Optional: 140 MHz)
J5	RX MON	Type N, Female	Ku-Band Receive Monitor (950 to 700MHz)
J6	RF OUT	Type N, Female	14.00 to 14.50 GHz TX out to HPA
J7	RF IN	Type N, Female	950 to 1700 MHz from LNB
J8	HPA	10 pin circular, Stet	HPA M&C Interface

3.2.1.1 Prime Power Connector (J1)

Prime power is supplied to the converter unit through a 3–pin circular male connector (J1). Prime power input requirements are 85 to 264 VAC, 47 to 63 Hz, 100 watts. The J1 connections are listed in Table 3-4 for pin assignments.

Note: Pin C is adjacent to the connector notch.

Table 3-4. Prime Power Input (J1) Pin Assignments

Pin	Function
A	Line
B	Neutral
C	Ground

3.2.1.2 Remote Connector (J2)

The Remote Connector (J2) is a 26-pin, circular, female connector. It is used to allow remote control and monitoring of KST-2000L operating parameters. Interface is via EIA-232, EIA-485, or EIA-422 half-duplex. Refer to Table 3-5 for pin assignments.

Note: This cable must be assembled by the user. Figure 3-2 shows the connections for an EIA-232 adapter for use with a PC COM port.

Table 3-5. Remote M&C Connector (J2) Pin Assignments

Pin	Signal	Description
A	-TX/-RX or –TX only (see Note)	– EIA-485 TX/RX or – EIA-422 TX
B	-TX/-RX or –RX only (see Note)	–EIA-485 TX/RX or – EIA-422 RX
C	+TX/+RX or +TX only (see Note)	+ EIA-485 TX/RX or + EIA-422 TX
D	+TX/+RX or +RX only (see Note)	+ EIA-485 TX/RX or + EIA-422 RX
E	RXD	EIA-232 receive data
F	RTS	EIA-232 ready to send (tied to CTS)
G	TXD	EIA-232 transmit data
H	DSR	EIA-232 data set ready
J	GND	Ground
K	LNB Power	+15 VDC to LNB
L	LNB Power Return	+15 VDC Return from LNB
M	RESET	Reset (momentary low resets system)
N	GND	Ground
P	CTS	EIA-232 clear to send (tied to RTS)
R	GND	Ground
S	+12V (KP10 Power)	KP10 power supply output
T	2/4 wire (see note)	EIA-485/EIA-422 operation selection
U	UL_FLT_NC	Uplink fault relay, closed = fault
V	UL_FLT_COM	Uplink fault relay common
W	UL_FLT_NO	Uplink fault relay, open = fault
X	DL_FLT_NC	Downlink fault relay, closed = fault
Y	DL_FLT_COM	Downlink fault relay common
Z	DL_FLT_NO	Downlink fault relay, open = fault
a	SUM_FLT_NO	Summary fault relay, open = fault
b	SUM_FLT_NC	Summary fault relay, closed = fault
c	SUM_FLT_COM	Summary fault relay, common

Note: These signals can be configured as EIA-485, 2-wire, half-duplex or EIA-422, 4-wire, half-duplex. In 2-wire mode, pins A and B are tied together as are pins C and D. To select 2 wire operation, pin T is left open. Tie pin T to ground for EIA-422 (4-wire) operation.

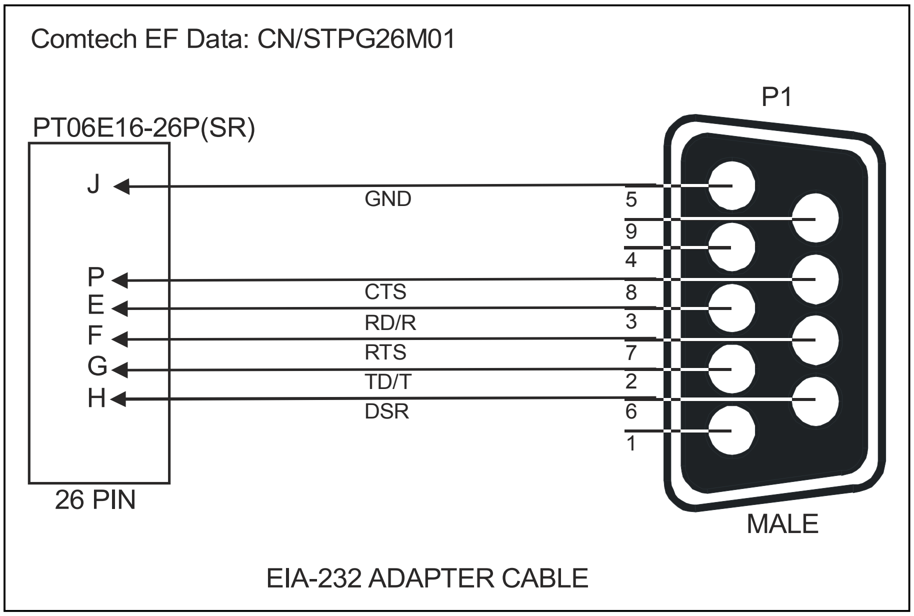


Figure 3-2. Serial (EIA-232) Adapter Cable Wiring Diagram

3.2.1.3 IF IN Connector (J3)

The IF IN connector (J3) is a Type N, female connector used to connect the IF at 70 MHz (140 MHz optional) at –25 to – 45 dBm from the modem to the converter unit. Either 50Ω or 75Ω cables may be used to connect to J3.

3.2.1.4 IF OUT Connector (J4)

The IF OUT connector (J4) is a Type N, female connector used to connect the IF at 70 MHz (140 MHz optional) from the converter unit to the modem. Either 50Ω or 75Ω cables may be used to connect to J4.

3.2.1.5 RX MON Connector (J5)

The RX Mon (J5) connector provides the received (downlink) signal at L-Band (950 to 1700 MHz) for monitoring. This signal has a gain of 20 dB relative to the carrier. J5 is a Type N, female connector. Nominal output impedance is 50Ω.

3.2.1.6 RF OUT Connector (J6)

The RF OUT connector (J6) is a type N, female, 50Ω connector used to connect the converter unit's output at Ku-Band (uplink) to an HPA. Power output at 1 dB compression is +15 dBm minimum.

3.2.1.7 RF IN Connector (J7)

The RF IN connector (J7) is a type N, female, 50Ω connector used to connect the LNB's output at L-Band (downlink) to the converter unit.

3.2.1.8 HPA Connector (J8)

The HPA connector (J8) is a 10 pin circular, female (ITT #KPT02E-12-105) connector used for HPA M&C and power functions. Refer to Table 3-6 for pin assignments for 2 and 4 watt SSPAs.

Table 3-6. HPA Connector (J8) Pin Assignments (2 and 4W SSPAs)

Pin	Signal	Description
A	IPA	Communications line A
B	IPB	Communications line B
C	+10V	+10V Power Supply Output
D	+10V	+10V Power Supply Output
E	+10V	+10V Power Supply Output
F	+10V	+10V Power Supply Output
G	+10V_RTN	+10V Power Supply Return
H	+10V_RTN	+10V Power Supply Return
J	+10V_RTN	+10V Power Supply Return
K	+10V_RTN	+10V Power Supply Return

3.2.1.9 2 and 4 Watt SSPA RF Connections

The 2 and 4 Watt SSPAs have a Type N, female (50Ω) connector (J1) at one end for the Ku-Band input and a WR-75 waveguide isolator (J2) at the other end for the Ku-Band output.

3.2.1.10 LNB Connections

Note: The power supply for the LNB can be supplied by the KST-2000L.

The RF input of the LNB is a WR-75 waveguide flange. The RF OUT/REF/PWR IN connector of the LNB is a type N, 50Ω connector. It supplies the block-converted output of 950 to 1700 MHz. It accepts +15 V at 400 mA, and a 10 MHz reference signal supplied by the converter unit.

Chapter 4. OPERATION

This chapter describes the procedures for initial testing of a KST-2000L system, and describes each major system function.

4.1 Initial Setup

This section details the procedures necessary to laboratory test a KST-2000L system for the first time. Refer to Figure 4-1 for system setup.

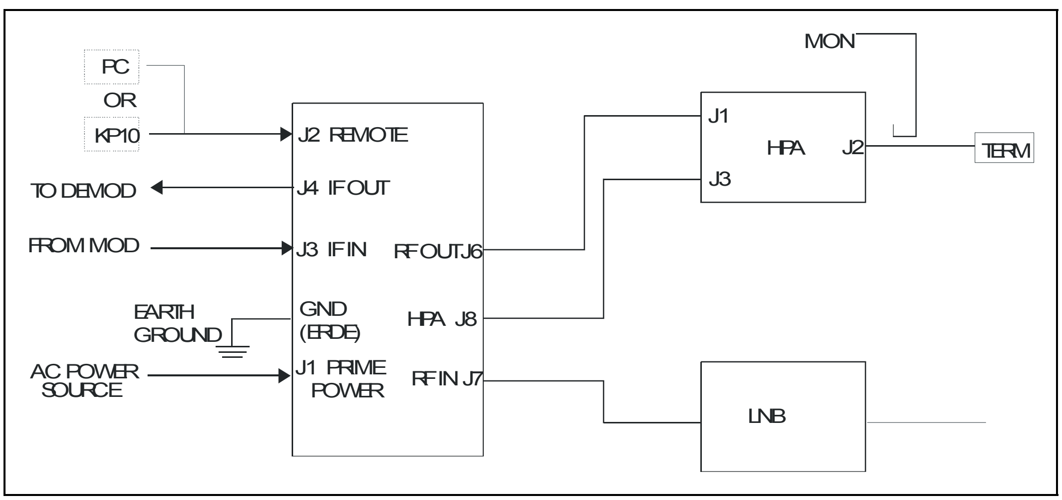


Figure 4-1. System Block Diagram

Note: Ensure that the termination selected for the HPA output is sized to handle the HPA output power.

1. Apply power to the KST-2000L. After a few seconds ensure that the green TX ON LED is flashing, and the fault LED is extinguished. Refer to Section 4 if this is not the case.

2. Using a KP-10 or PC equipped with a terminal or Windows™ based M&C program, ensure that you can communicate to the system M&C, via J2, remote connector. (Refer to M&C software manual, part number MN/M&CWIN.IOM)

Default Communication Parameters	Address	1
	Baud Rate	9600
	Parity	even
	Stop bits	2
	Data length	7 bits

If the communication parameters for the system are not known, the Windows™ based M&C system has a facility that will search all combinations of address, baud rate, and parity until communication is established with the system.

Using the KP-10 or terminal program, send a miscellaneous command such as EQUIPMENT TYPE (see appendix B.8) and confirm a response is displayed. The Windows™ based status screen will turn from red to gray when communication with the KST-2000L is established.

4.1.1 Uplink Setup

1. Apply a 70 MHz (140 MHz) signal at a known level between –25 and –45 dBm to the IF IN (J3) connector of the KST-2000L.

   Note: This assumes that the AGC function is selected as ON. The AGC will not function below a – 45 dBm input level. If the AGC function is selected as OFF, lower input levels can be used limited only by noise. See section 3.12 for more information on the AGC function.

2. Set the up converter to the desired RF transmit frequency using the appropriate commands from the KP10 terminal, or Windows™ M&C. See the up converter frequency select command (Appendix B.3). If an error message is received, see Appendix B.2.3 to determine the cause.

3. Before proceeding, ensure that the HPA is properly terminated. If a directional coupler and termination is used or an attenuator is used, note the value.

4. Enable external faults, execute the appropriate HPA Power commands. See section B.4 HPA commands.

5. Turn the RF output of the up converter ON. See appendix B.3 system configuration commands. There should be no up converter faults at this time.

6. Using an appropriate frequency measuring device, ensure that the output of the HPA (measured through the coupler or attenuator) is at the correct frequency.

   Note: The internal, high-stability oscillators frequency can be fine tuned using the reference frequency adjust command. See Appendix B.3. Allow at least 30 minutes warm-up before adjusting the oscillator.

7. Using an appropriate RF power measuring device, set the up converter attenuation until the power measured at the output of the coupler or attenuator is at the correct value. See Appendix B.3.

8. Turn the RF output of the up converter off. See Appendix B.3.

4.1.2 Downlink Setup

1. Apply a signal in the appropriate receive frequency range according to the following table at a known level (approximately –95 dBm) to the LNB input.

   10.95 to 11.70 GHz
   11.70 to 12.20 GHz
   12.25 to 12.75 GHz

   a. If the LNB is using power supplied by the KST-2000L, enable the LNB power – see section B.5.
   b. After a 10-minute warm-up, perform an LNB calibration, and enable LNB faults if desired. See Appendix B.5.

2. Set the down converter to the desired RX operating frequency. See Appendix B.3. There should not be any existing receive system faults. See Appendix B.9.

3. Using an appropriate power measuring device attached to the IF OUT connector (J4), set the down converter attenuator until the desired downlink gain is attained. See section B.3.

   Note: At this point there should be no existing faults.

4. Execute a Clear Stored Faults command to clear the fault log (see Appendix B.9), wait a few moments, and execute a System Fault Status command to verify.

5. Remove the AC power from the unit, remove the 70 MHz (140 MHz) test source, remove the RX signal source, and remove the coupler/attenuator from the HPA.

6. The system is ready for final installation to the antenna feed. Perform the rest of the system alignment to applicable international, national, or local regulations.

4.2 Monitor and Control (M&C)

The Monitor and Control (M&C) monitors the KST-2000L and provides configuration updates to the up converter, down converter, and HPA when necessary. Refer to Figure 4-2.

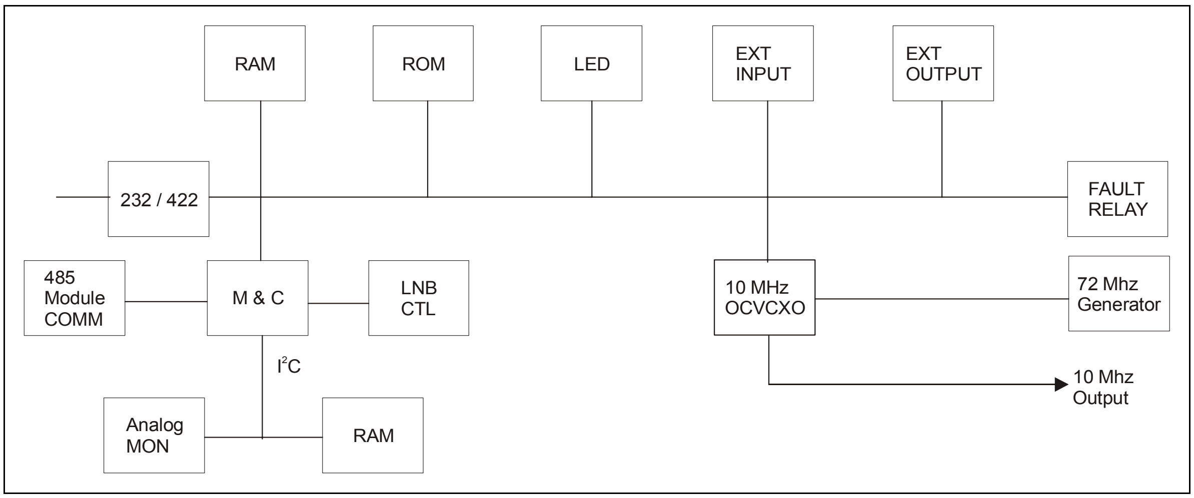


Figure 4-2. Monitor and Control (M&C) Block Diagram

The KST-2000L configuration parameters are maintained on battery locked RAM, which provides recovery after power down.

The M&C functions include extensive fault and status reporting. All KST-2000L functions are accessible through the remote communications interface.

The M&C is composed of the following sections:

- Microcontroller and UART
- ROM
- Fault relays
- LNB power control
- Inter-module communication interface
- D to A and A to D converters
- RAM
- 10 MHz/72MHz Oscillators

The microcontroller is an Intel 80C32 operating at 16 MHz. The micro-controller contains 256 bytes of internal RAM. The external ROM is 29F020 (256 kbytes). The battery backed RAM is 8 kbytes in size.

The non-volatile RAM allows the KST-2000L to retain configuration information without prime power for 1 year.

The UART supports serial asynchronous communication (remote port) with a maximum data rate of 19,200 bit/s. The communications type can be EIA-232, EIA-485 (2-wire), or EIA-422 (4-wire) half duplex.

The DAC supplies a voltage that fine tunes the reference oscillator operating frequency. The ADC monitors the internal power supply voltages, as well as external temperature and analog inputs from SSPAs.

The three fault relay outputs are failsafe. They will indicate a fault in the event of a power outage. The three relays are uplink fault, downlink fault, and summary fault.

The M&C has a switching regulator that can generate +15VDC at 400 mA to power an external LNB. This voltage can be enabled or disabled via the remote interface. The M&C monitors the LNB current and generates a fault if the LNB current draw increases or decreases excessively.

The M&C communicates status and control information to the up converter, down converter and SSPAs via a high speed RS-485 interface.

The 10 MHz OCVCXO is a high stability, low phase noise, crystal oscillator. It has a tuning voltage input which can be used to fine tune the oscillator frequency. The M&C generates a bias voltage which can be changed remotely to set the oscillator frequency.

The 72 MHz VCXO is phase locked to the 10 MHz reference. The 72 MHz output of the VCXO is amplified and distributed throughout the KST-2000L to provide a reference frequency for the up converter and portions of the down converter.

4.3 Up Converter Description

The up converter accepts a 70 MHz (140 MHz) IF input signal and translates it to an output frequency in the range of 13.750 to 14.500 GHz. The up converter consists of two modules: the IF to S-Band module and the S to Ku-Band module.

The IF to S-Band module translates the 70 MHz (140 MHz) IF input to an output frequency in the range of 2,330 to 3,080 MHz. Refer to Figure 4-3 for a block diagram of the IF to S-Band module.

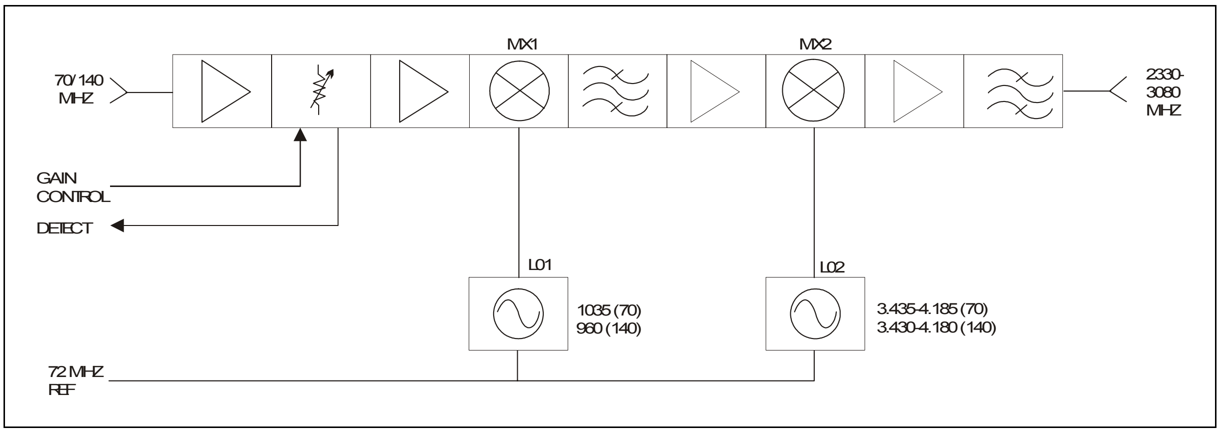


Figure 4-3. IF to S-Band Converter Module Block Diagram

The 70 MHz (140 MHz) IF input is first amplified, and then applied to an electronically variable attenuator. This attenuator is controlled via the local M&C to provide calibrated 1dB attenuation steps over a 20 dB attenuation range. The signal is then amplified and heterodyned with a fixed frequency LO1. The desired sideband of this process is selected via bandpass filtering and applied to the second up conversion stage MX2. LO2 is a low noise synthesized source, whose output covers 750 MHz in 1 MHz steps. The output of the second up conversion stage is a signal in the 2,330 to 3,080 MHz frequency range. This signal is applied to the input of the S to Ku-Band module.

This module is slightly different for the 70 MHz and 140 MHz IF input options. As shown in Figure 4-3, the LOs are tuned to different frequencies and filtering is different.

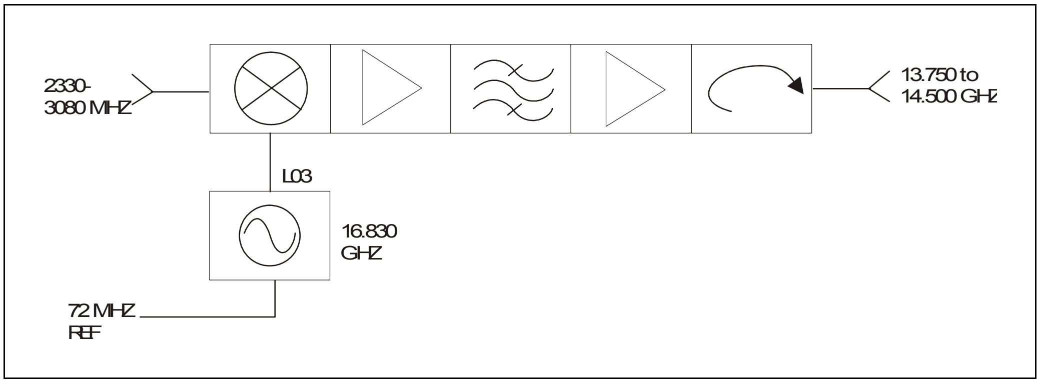


Figure 4-4. S to Ku-Band Up Converter Module

The S to Ku-Band up converter module (Figure 4-4) performs block up conversion of the 2,330 to 3,080 MHz signal input to an output in the range of 13.750 to 14.500 GHz. This is done by mixing the IF input with a fixed frequency Dielectric Resonator Oscillator (DRO), operating at 16.830 GHz. The correct sideband of this process is amplified and filtered before being applied to the isolated output of the module.

4.4 L-Band to IF Down Converter Description

The L-Band to IF down converter (Figure 4-5) accepts an RF input in the frequency range of 950 to 1,700 MHz and translates it to an output of 70 (140) MHz. The RF input to this module is supplied from an externally mounted LNB.

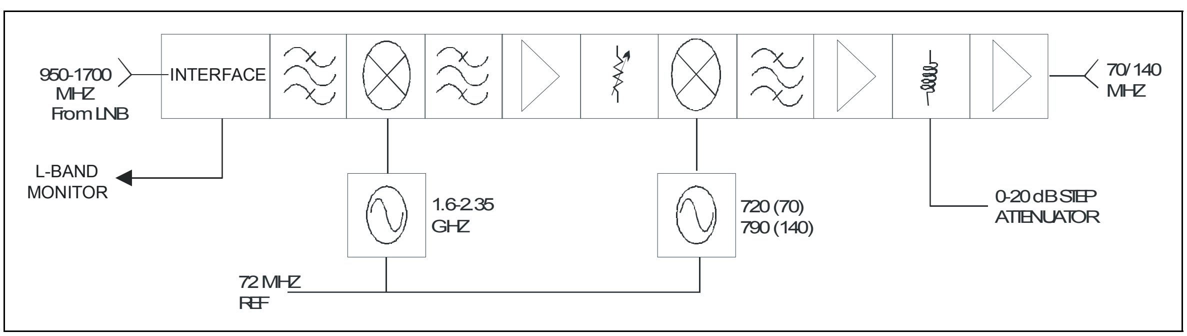


Figure 4-5. Ku-Band to IF Down Converter Block Diagram

The 950 to 1,700 MHz input is first pre-selected and then heterodyned with a local oscillator in the range of 1.6 to 2.35 GHz to generate the first IF signal of 650 MHz. The 650 MHz signal is then mixed with 790 or 720 MHz to generate the 70 or 140 MHz output. The IF output frequency of the second down conversion stage is then amplified and applied to a 0 to 20 dB step attenuator with 1 dB steps. The overall Ku-Band down converter tunes in a frequency step-size of 1 MHz across the 950 to 1700 MHz band.

This module is slightly different for the 70 and 140 MHz options.

4.5 Automatic Gain Control (AGC)

The KST-2000L incorporates a closed-loop Automatic Gain Control (AGC) function that maintains the system gain, as measured from the TX IF input to the Ku-Band output of the SSPA, at the user's preset value despite the effects of aging, operating temperature, or cabling loss. This is not a Automatic Level Control (ALC) function, but a true AGC that maintains the gain of the system constant independent of input and output absolute levels. This is important to multicarrier operation, when individual carriers turn On/Off and the level of the remaining carriers must remain unaffected. The transceiver can be set to operate in either the AGC, non-AGC, or MANUAL gain mode.

4.5.1 Operation

The AGC function is implemented by using two calibrated RF detectors.

- The first detector monitors the TX input (70 or 140 MHz; amplitude range of –25 to –45 dBm). The DC voltage from the detector is converted to a digital word in an A/D converter and read by the main processor.

- The second detector monitors the output signal of the SSPA. This detector is calibrated for five frequencies over the output frequency range. Additionally, the second detector calibration covers output power from the saturation point of the amplifier down to 30 dB (approximately) below saturation.

The calibration data is stored in a non-volatile memory within each SSPA making all SSPAs interchangeable without loss of system gain accuracy. The estimate of output power corresponds to the detector voltage linearly interpolated between nearby frequency and power steps stored in memory. The main processor reads the estimated output power from the SSPA and computes an error function as follows:

Gain Error = SSPA Output Power – Input Power – Gain_Max + UCA

Where Gain_Max is the maximum specified gain of the entire transceiver (converter unit plus SSPA) and UCA is the value of the up converter attenuator and is set by:

<add/UCA_xx.x (Appendix B)

The main processor processes this data and generates an analog voltage that adjusts the up converter attenuator to drive the error function to zero.

When the uplink AGC is enabled (***<add/UAGC_ON***) the display value of UCA will include a decimal point. Attenuation is adjustable over a range of 0 to 20 dB in 1 dB steps. When the uplink AGC is disabled (***<add/UAGC_OFF***) the displayed value of UCA does not include the decimal point.

4.5.2 Fault and Error Response

Table 4-1 shows how the AGC system reacts to power outages, system faults and operation outside the specified limits.

Table 4-1. AGC Fault and Error Response

Problem	Response/Notes
If the transceiver prime power fails	The UCA value is effect prior to the failure is restored on power up.
If the input signal (70 or 140 MHz) is removed or is set to ≤ –45dBm.	1. The internal Up Converter attenuator is set to its maximum value (minimum gap). 2. The value of UCA is not affected. 3. The output power will slowly increase for several seconds until the gain error reaches zero, when the input signal is reapplied.
If the user enters a value of UCA that is low for a set input level.	1. The SSPA will be driven into saturation and the value of UCA will automatically increase (Gain decreased) in steps of 1 dB until the SSPA output power is below saturation. 2. The new (increased) value of UCA is displayed at the user's interface. Even if the input power is reduced, the new value of UCA will remain fixed.
If the input power is increased, such that the SSPA is driven into saturation.	1. The value of UCA is increased (Gain decreased) in steps of 1 dB until the SSPA is below saturation. 2. The new value of UCA is displayed at the user's interface. Even if the input power is reduced, the new value of UCA will remain fixed.
Loop fault occurs when the Gain Error is non-zero for >5 out 255 iterations of the processor control loop.	1. A top level AGS_Fault is reported. 2. Excessive cable loss between the converter unit and the SSPA can cause this condition. 3. If the AGC is enabled and the RF is commanded Off (<add/RF_OFF), this fault is registered.
INSUFFICIENT INPUT POWER fault is generated when the IF input power transitions from normal power to low power (< – 45 dBm).	Under this condition, a top level AGS_fault is reported and the internal up converter attenuator is set to its maximum value (minimum RF output). The value of UCA is not affected. When the input signal increases above –45 dBm, the output power will slowly increase for several seconds until the gain error reaches zero.
EXCESSIVE INPUT POWER fault is generated when the IF input power transitions from normal power to high power (> –25 dBm).	Under this condition, a top level AGS_Fault is reported. If the combination of the input power and the up converter attenuator is such that the SSPA is driven into saturation, the value of the UCA will automatically increase in steps of 1 dB until the SSPA output power is below saturation. The new value of UCA is displayed at the user's interface. Even if the input power is reduced, the new values of UCA will remain fixed.

The LOOP, INSUFFICIENT INPUT POWER, and EXCESSIVE INPUT POWER faults can be displayed by issuing the AGC current faults command (***<add/AGS_)*** . The allowed ranges of IF input power and UCA settings are limited by the SSPA saturation and detector range to the shaded area defined in Figure 4-6.

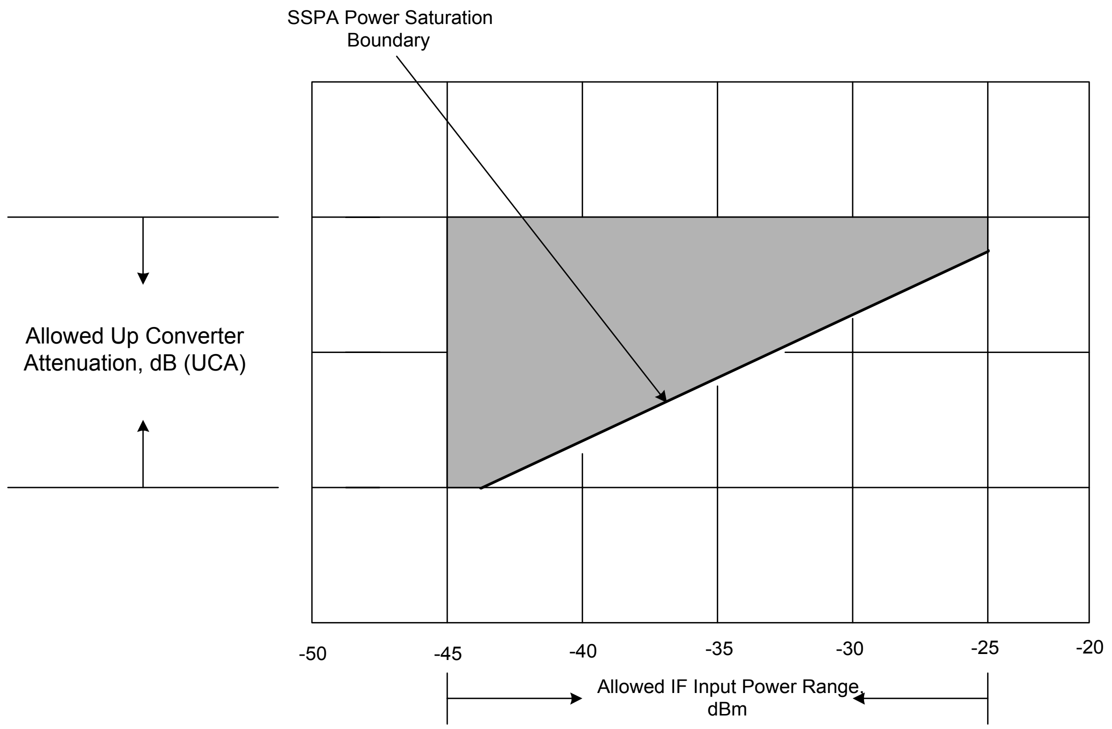


Figure 4-6. AGC Operating Region

4.5.3 Manual Gain Operation

With AGC disabled, the closed loop control of the uplink path is disabled. The SSPA saturation, INSUFFICIENT INPUT POWER, EXCESSIVE INPUT POWER, and LOOP faults are not monitored or reported as faults. The status of the AGS_fault is displayed as OK. In this mode, the system gain is not accurately defined as in the AGC mode, because the accuracy of the up converter's programmable attenuator and the static gains of the up-link amplifiers determine the gain.

When this mode is selected, UCA will display as an integer (with no decimal point), and the allowed range of the UCA is 0 to 55 dB in 1 dB steps. The accuracy of the attenuator is not guaranteed and degrades at high values.

Chapter 5. FAULT INDICATION AND ISOLATION

This section describes fault indication and isolation methods for the KST-2000L system. Routine maintenance for the system consists only of assuring air flow for cooling of the units. A system fault is indicated in three ways:

- An external LED
- Form C relay contacts
- The remote M&C control

5.1 Fault Indication

The KST-2000L converter unit has two external LED indicators as shown in Figure 2-1. The TX ON indicator is green when illuminated, and the FAULT indicator is red.

When prime power is applied to the KST-2000L and the HPA is transmitting power, the TX ON indicator is a steady green. The indicator flashes when prime power is applied but the HPA is not transmitting. The FAULT indicator is a steady red when any fault is detected by the internal M&C processor.

The REMOTE connector (J2) has pins assigned (see Chapter 2, for pin assignments) for the contacts on two form C relays, one for the uplink and one for the downlink. Normally open contacts close and normally closed contacts open when there is a fault in any part of the uplink or downlink. Fault isolation requires the use of the remote M&C as described in section 4.2.

5.2 Fault Isolation

System faults are reported on the fault log screen in the Windows™ based remote M&C software. (Alternatively, they may be viewed in the terminal mode as shown in Chapter 7). Chapter 7 lists the KST-2000L faults and their indication in the LEDs and relays. In some cases, items listed in Chapter 7 give no LED or relay indication when they occur because they are not equipment faults but are useful for troubleshooting problems.

5.3 Stored Faults

Each of the major modules within the KST-2000L (up converter, down converter, HPA, LNB, and Reference), together with the AGC function and the Common Equipment, report their individual fault status to the main M&C. Each time there is a change in the fault status, that status is stored in a non-volatile memory on the main M&C. Note that each event corresponds to a change in status. Therefore, when a fault occurs, that constitutes one status change, and when that fault clears, another event occurs. The M&C can store up to ten fault status conditions.

After ten fault status changes are logged, no further logging can take place until the Clear Stored Faults (<add/CLSF) command is issued. Refer to Appendix B, Table B-7 for the fault commands to access the fault status of each function. When the fault status is queried, such as <add/HS_, the response returned will indicate how many stored faults are actually stored. To retrieve the individual fault status, issue the appropriate stored fault command with the corresponding stored fault number, such as <add/HSF_2. That particular fault condition will be returned. Note that the stored fault numbers (locations) are 0 through 9 inclusive.

It is good maintenance practice to query the stored faults and record them in a logbook or other permanent record and then issue the clear stored fault command, <add/CLSF_. There is no time stamp associated with these stored faults. Noting them in a logbook is the only way to establish an approximate time reference,.

Table 5-1. KST-2000L Fault Tree

	RF OUTPUT OFF	TX RF LED OFF	TX RF LED SOLID	TX RF LED FLASHING	SUMMARY FAULT LED	SUMMARY FAULT RELAY (1)	UL FAULT RELAY (2)	DL FAULT RELAY (3)
COMMON EQUIPMENT FAULTS								
M&C MODULE					X	X		
-7 VOLT POWER SUPPLY					X	X		
+7 VOLT POWER SUPPLY					X	X		
+12 VOLT POWER SUPPLY					X	X		
+17 VOLT POWER SUPPLY					X	X		
AGC FAULTS								
EXCESSIVE INPUT POWER								
INSUFFICIENT INPUT POWER								
AGC LOOP CONVERGE								
LNB FAULTS								
LNB MODULE FAULT					X1	X1		X1
REFERENCE FAULTS								
72MHz LOCK DETECT					X	X		
OSCILLATOR WARM/COLD				X				
UC FAULTS								
UC MODULE	X	X			X	X	X	
S-BAND SYNTHESIZER LOCK DETECT	X	X			X	X	X	
KU BAND SYNTHESIZER LOCK DETECT	X	X			X	X	X	
LATCHED S BAND SYNTH. LOCK DETECT								
LATCHED KU BAND SYNTH. LOCK DETECT								
INTER-PROCESSOR COMMUNICATIONS	X	X			X	X	X	
DC FAULTS								
DC MODULE					X	X		X
KU-BAND SYNTHESIZER LOCK DETECT					X	X		X
LATCHED KU-BAND SYNTH. LOCK DETECT								
INTER-PROCESSOR COMMUNICATIONS					X	X		X

Table 5-2. KST-2000L Fault Tree (Continued)

	RF OUTPUT OFF	TX RF LED OFF	TX RF LED SOLID	TX RF LED FLASHING	SUMMARY FAULT LED	SUMMARY FAULT RELAY	UL FAULT RELAY	DL FAULT RELAY
HPA FAULTS (Adaptive Broadband)								
HPA MODULE	X1	X1			X1	X1	X1	
BIAS VOLTAGE #1 - #9	X1	X1			X1	X1	X1	
-5 VOLT POWER SUPPLY	X1	X1			X1	X1	X1	
+9.75 VOLT POWER SUPPLY	X1	X1			X1	X1	X1	
INTER-PROCESSOR COMMUNICATIONS	X1	X1			X1	X1	X1	

Legend		
Note	**Fault/Alarm Relay**	**Test Points Connector/Pins**
1	SUMMARY FAULT	J2: a (NO), c (COM), b(NC)
2	UL FAULT	J2: W (NO), V (COM), U (NC)
3	DL FAULT	J2: Z (NO), Y (COM), X (NC)
X1	FAULTS IF NOT MASKED OFF	N/A

Chapter 6. EQUIPMENT MOUNTING

This chapter describes the mounting instructions for the KST-2000L unit.

Installation procedures and hardware kits have been verified on the following antennas:

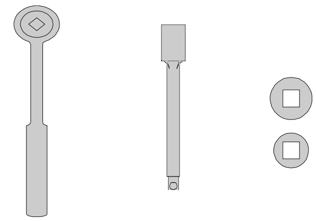
- PRODELIN 1.8, 2.4, and 3.8M
- Channel Master offset antenna

Figure 6-1 is an example of a single thread system installed on the antenna spar arm assembly.

Figure 6-1. KST-2000L System Installed on Spar Arm

6.1 Tools Required

Qty.	Description
1	3/8” drive ratchet.
1	Adjustable wrench.
1	7/16” x 3/8” drive socket, or 7/16" drive wrench. (Metric equivalent: 12mm, 6 pt.)
1	1/2” x 3/8” drive socket, or 1/2" box wrench. (Metric equivalent: 13mm, 6 pt.)
1	5/16" box wrench, or nut driver
1	7/64" Allen wrench



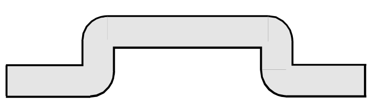
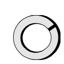
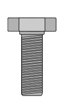
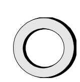
6.2 Converter Unit Installation

The following information describes the steps performed and optional hardware required for installing the converter unit on an antenna spar arm or a pole.

6.2.1 Spar Arm Mount

6.2.1.1 Optional Spar Arm Installation Kits for Converter, SSPA, and LNB

Antenna Type Mounting Kit	Kit Part Number
KST-2000A/B Converter Only	KT/8324-1

Kit KT/8324-1 include:			
Qty.	**Description**	**Qty.**	**Description**
2	Spar support bracket. (Spar Mount Only)  *Comtech EF Data Part #s:FP/3175*	4	1/4” split washer.  *Comtech EF Data Part #:HW/1/4-SPLIT.*
4	1/4-20 x 1” bolt.  *Comtech EF Data Part #:HW/ 1/4-20x1-BLT*	4	1/4” flat washer.  *Comtech EF Data Part #:HW/1/4-FLT.*

6.2.1.2 Converter Spar Arm Mounting Instructions

1. Position the Converter unit against the spar arm of the satellite dish and bolt the two spar support brackets to the Converter unit brackets as shown in Figure 6-2 Utilize four each 1/4x-20x1” bolts, 1/4 split, and 1/4” flat washers.

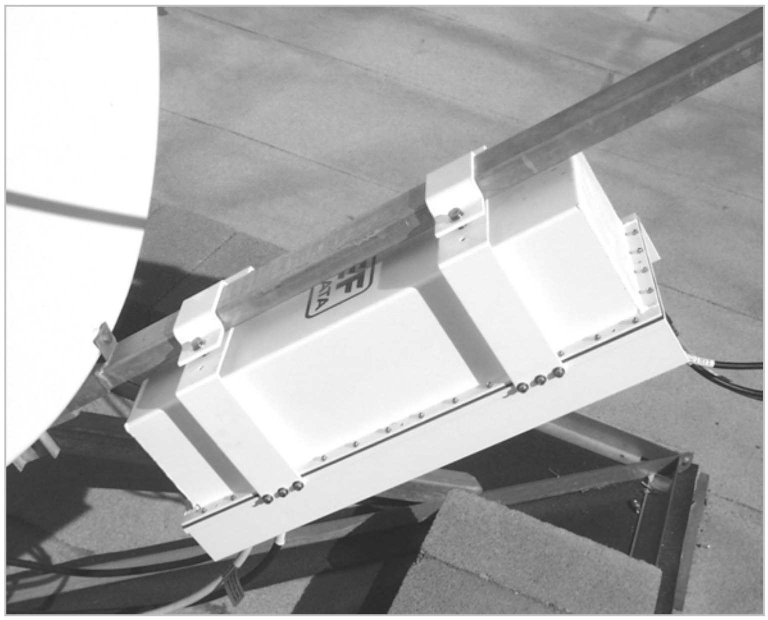
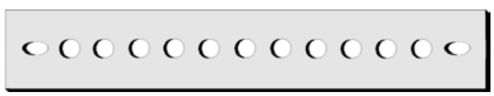
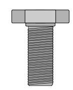
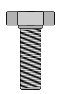
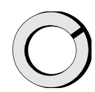
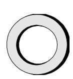
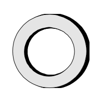
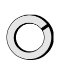
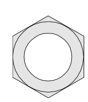
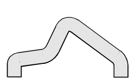
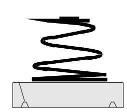
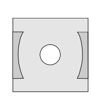


Figure 6-2. Typical Converter Unit Installation on Spar

6.2.2 Pole Mount

6.2.2.1 Optional Pole Mount Installation Kit for Converter

	Kit KT/8094 includes:		
Qty.	**Description**	**Qty.**	**Description**
4	Unistrut — 14” long.  *Comtech EF Data Part # FP/3595.*	8	5/16-18 x 1” bolt.  *Comtech EF Data Part # HW/5/16-18X1BLT.*
6	1/4-20 x 5/8” bolt.  *Comtech EF Data Part # 03P1131.* *Used to attach Unistruts to RFT.*	20	5/16” split washer.  *Comtech EF Data Part # HW/5/16-SPLIT.*
6	1/4” flat washer.  *Comtech EF Data Part # HW/1/4-FLT.* *Used to attach Unistruts to RFT.*	20	5/16” flat washer.  *Comtech EF Data Part # HW/5/16-FLT.*
6	1/4” split washer.  *Comtech EF Data Part # HW/1/4-SPLIT.* *Used to attach Unistruts to RFT.*	12	5/16-18 hex nut.  *Comtech EF Data* *Part # HW/5/16-18HEXNT.*
8	Pipe block.  *Comtech EF Data* *Part # HW/BLK-PIPE2-8.* *Used for round pole mount only.*	12	5/16-18 spring nut.  *Comtech EF Data* *Part # HW/5/16-18SPNUT.*
4	Threaded rod, 5/16-18 x 14”.  *Comtech EF Data* *Part # HW/RD5/16-18X14.*	8	Flat fitting plate, 5/16”.  *Comtech EF Data* *Part # HW/FIT-PLT-5/16.*

6.2.2.2 Converter Round Pole Mounting Instructions

1. Position the converter with fins down and mounting brackets facing upward (refer to Figure 6-3). Position (2) 14” Unistrut channels centered on the converter mounting brackets. Fasten with 1/4” hardware (4 to 6 each of bolts, split and flat washers).

   Note: Vary the number and location of the hardware as needed to avoid interfering with the spring nuts used for the pipe blocks.

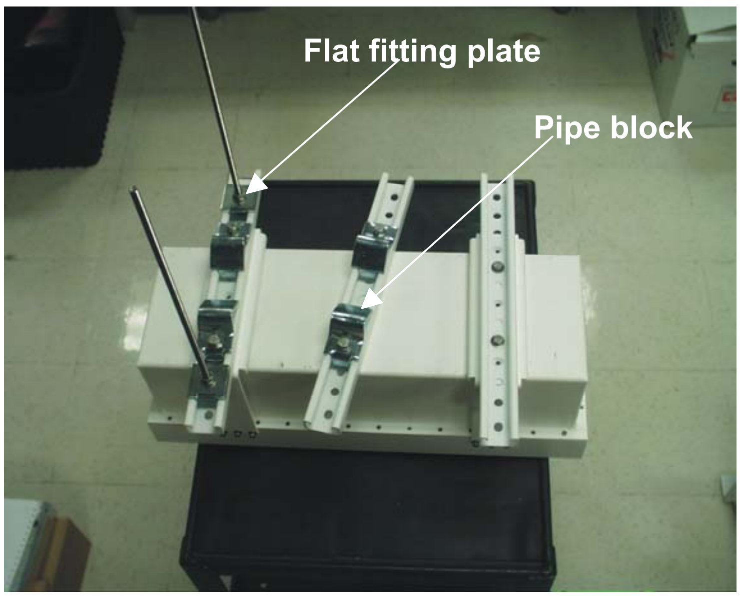


Figure 6-3. KST-2000L Converter with Mounting Brackets

2. Position two spring nuts into the channel of one of the remaining Unistrut channels. With the mounting holes facing the ends of the channel, fasten two pipe blocks loosely to the spring nuts with the hardware (2 each 5/16” bolts, split and flat washers).

3. Place the channel with pipe blocks against the mounting pole, slide the pipe blocks until they contact the mounting pole. Ensure the pipe blocks are centered to the Unistrut and tighten the hardware. Use this channel as a guide and mount the pipe blocks on the remaining three channels in a similar manner.

4. Position two spring nuts in each of the Unistrut channels mounted to the converter. Position these nuts between the pipe blocks and the ends of the Unistrut.

   Above the spring nuts, position the flat fitting plates with the locating notches engaged in the openings of the channels.

5. Thread a 5/16” nut, split and flat washer onto each of the threaded rods, leaving 1” of rod remaining. Thread that end of the rod through the flat fitting plates and fully into the spring nuts (do not bottom out).

   Using one of the mating channels, ensure that the threaded rods from the channels mounted to the converters are aligned with holes in the mating channels. Center these rods with the channels as well as possible and tighten the hardware.

6. Thread a 5/16” nut, split, flat washer and flat fitting plate on the remaining ends of the threaded rods. This hardware is to secure the mating Unistrut channels from the opposite side of the pole to the threaded rod. Adjust accordingly.

7. Position the converter assembly with the pipe blocks against the pole (refer to Figure 6-4), slide the mating Unistrut channels onto the threaded rods from the opposite side (pipe blocks against pole and channels against flat fitting plates). Adjust and fasten with the 5/16” hardware (4 each flat, split washers and nuts).

Figure 6-4. Rear View of Converter Installed on Round Pole

Figure 6-5. Front View of Converter Installed on Round Pole

6.2.2.3 Converter Square Pole Mounting Instructions

For square pole mount, please follow the instructions in Section 6.2.2.2, but do not use the pipe blocks.

6.3 SSPA Installation

6.3.1 Feed Mount Offset Antenna

The information in this section applies to installation on typical offset antenna of sizes 1.8, 2.4, or 3.8M; with interfaces of 3.74" or 5.25". Refer to Figure 6-1 for an illustration.

6.3.1.1 Optional Feed Mount Offset Antenna Installation Kit for SSPA

Refer to Section 6.2.1.1.

6.3.1.2 SSPA Feed Mount Offset Antenna Installation Instructions

1. Remove the protective cover from the antenna (OMT) and SSPA (if installed).

CAUTION

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

2. Install the appropriate gasket on the SSPA isolator.
   a) If only one of the mounting surfaces has a groove, use the thin gasket
   b) If both mounting surfaces have grooves, then use the thick gasket.

3. Position the SSPA on the antenna OMT and fasten using the hardware from KT/2820 (4 each socket head screws, split washers, (8) flat washers, and nuts).

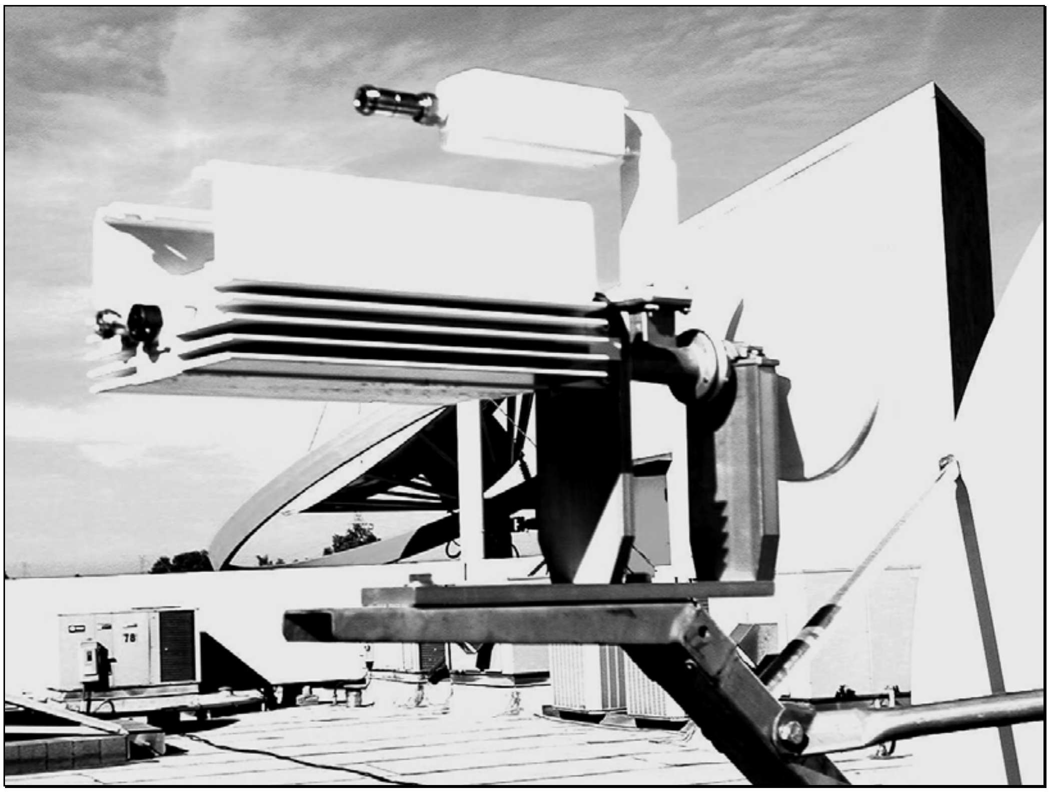
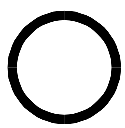
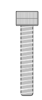
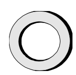
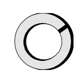
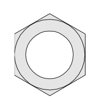


Figure 6-6. Installing the SSPA

6.4 LNB Installation

6.4.1 Feed Mount Offset Antenna

6.4.1.1 Optional Feed Mount Offset Antenna Installation Kit for LNB

Kit KT/2820			
Qty.	**Description**	**Qty.**	**Description**
4	O-ring.  *Comtech EF Data Part # 32P1037.*	8	6-32 x 7/8” socket head cap screw.  *Comtech EF Data Part # HW/6-32x7/8 SHCS.*
16	#6 flat washer.  *Comtech EF Data Part # HW/6-FLT.*	8	#6 split washer.  *Comtech EF Data Part # HW/6-SPLIT.*
		8	#6 Hex nut  *Comtech EF Data Part # HW/6-32HEXNUT*

6.4.1.2 LNB Feed Mount Offset Antenna Installation Instructions

To install a single LNB to an antenna:

1. Remove the protective cover from the antenna OMT and LNB.

   CAUTION

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

2. Install the appropriate gasket on the antenna end of the LNB.
   a) If only one of the mounting surfaces has a groove, use the thin gasket.
   b) If both mounting surfaces have grooves, use the thick gasket.

3. Position the LNB (with gasket) in place on the antenna OMT and fasten using the #4M hardware from KT/2820 (4 each socket head screws, (8) flat washers, split washers and nuts).

6.5 Cable Installation

Care should be exercised in cable installation. Install the cables using the most direct route and secure with clamps and ties. Avoid all sharp bends.

Cable connectors used in outdoor applications must be sealed to avoid leakage, particularly N-type connectors. Moisture can seep into junctions at the plug end of the connector, between the fixed and movable parts, and where the cable connects to the connector. Signal attenuation and possible loss of signal can occur in the presence of moisture. All cable junctions must be sealed with a self-amalgamating tape, such as 3M, Type 23 Scotch Self-Amalgamating tape, or equivalent, including military style (MS) connectors.

This page is intentionally left blank.

Chapter 7. TERMINAL MODE COMMANDS

This chapter defines the protocol and command structure for remote control and status monitoring of the KST-2000L in the terminal mode of the Windows™ based M&C remote control software and on the KP-10 keypad.

7.1 General

Remote control and status information are transferred via a EIA-485, EIA-422 or EIA-232C serial communications link. Commands and data are transferred on the remote control communications link as 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 KST-2000L never transmits data on the link unless it is commanded to do so.

7.2 Message Structure

The ASCII character format used requires 11 bits/character: 1 start bit and 7 information bits plus 1 parity bit (odd/even), or 8 information bits with no parity bit (none) and 2 stop bits. Messages on the remote link fall into the categories of commands and responses. Commands are messages which are transmitted to the KST-2000L, while responses are messages returned by the KST-2000L in response to a command.

The general message structure is as follows:

- Start Character
- Device Address 'add'
- Command/Response
- End of Message Character 'cr'

7.2.1 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

7.2.2 Device Address

The device address is the address of the KST-2000L 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 0 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.

KST-2000Ls which are connected to a common remote communications link must be assigned their own unique address. Addresses are software selectable and must be in the range of 1 to 255.

Notes:

1. 'add' is used to indicate a valid 1 to 3 character device address in the range between 0 and 255.
2. Global address '*' is reserved for EXTERNAL KEYPAD commands.

7.2.3 Command/Response

The command/response portion of the message contains a variable length character sequence, which conveys command and response data. If a KST-2000L receives a message addressed to it, which does not match the established protocol or can not be implemented, a negative acknowledgement message is sent in response. This message is:

```
>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 or user is directing redundancy commands to the offline unit)

```
>add/?ER5_NOT SUPPORTED BY
HARDWARE'cr''lf']
```

(the command is a legal command but it is not supported by the current hardware configuration)

```
>add/?ER9_HARDWARE NOT OPERABLE'cr''lf']
```

(This error is issued when hardware prevented the system from carrying out the users remote command request.)

7.2.4 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

7.3 System Configuration Commands

The commands and responses for setting the basic system parameters of uplink and downlink frequency and attenuation, for making an adjustment on the internal reference, and for disabling the RF output. Commands are included for setting and selecting programmed frequency and attenuation values, for locking out changes in settings, and for reading the status of settings.

Up Converter Frequency Select	Command Response Status Response	<add/UCF_nnnnn.n'cr' >add/UCF_nnnnn.n'cr''lf'] <add/UCF'cr' >add/UCF_nnnnn.n'cr''lf']	Where nnnnn.n = 14000.0 to 14500.0 (in MHz, variable in 1 MHz steps)
Down Converter Frequency 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 nnnnn.n = 10950.0 to 12750.0 (in MHz, variable in 1 MHz steps)
Up Converter Attenuation	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 20.0 (in dB, variable in 1.0 dB steps) Note: No decimal point when AGC is Off.
Down Converter Attenuation	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 (in dB, variable in 1.0 dB steps)
Reference Frequency Adjust	Command Response Status Response	<add/RFJ_nnn'cr' >add/RFJ_nnn'cr''lf'] <add/RFJ_'cr >add/RFJ_nnn'cr''lf']	Where nnn = 0 to 255 (full range is ~5000 Hz, nominal frequency is ~10 MHz)
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, OFF, default = OFF The OFF command will keep the RF output turned off under all conditions. The WRM command is a conditional ON command telling the RF output to come on after the unit is warmed up and meets the stability requirements. The ON command is an override instructing the output to be on and ignores the warm start.
Program Preset Configuration	Command Response Status Response	<add/PGM_n'cr' >add/PGM_n'cr''lf'] <add/PGM_'cr' >add/PGM_n'cr' 1 – xxxx'cr' 2 – xxxx'cr' 3 – xxxx'cr'lf']	Where n = 1,2 or 3 (Stores the current frequency and attenuation settings in 1 of 3 locations) Where xxxx = Programmed or None
Select Preset Configuration	Command Response Status Response	<add/SEL_n'cr' >add/SEL_n'cr''lf'] <add/SEL_'cr' >add/SEL_'cr' 1'cr' xxxxxx'cr' 2'cr' xxxxxx'cr' 3'cr' xxxxxx'cr''lf']	Where n = 1,2 or 3 Where xxxxxx = up/down converter frequencies and attenuations

Preset Configuration Clear	Command Response Status Response	<add/CPGM_n'cr' >add/CPGM_n'cr''lf'] <add/CPGM_'cr' >add/CPGM_'cr' 1 – xxx'cr' 2 – xxx'cr' 3 – xxx'cr'lf']	Where n = 1, 2 or 3 Where xxx = 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 DS (disable), default = DS Lock mode prevents the present settings from being changed.
System Configuration Status	Status 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']	Returns block of data on addressed unit. nnnnn.n = frequency nnnnn.n = frequency xxx = ON, WRM, OFF nn.n = attenuation nn.n = attenuation n = 1, 2, 3, or NONE
AGC	Command Response Status Response	<add/UAGC_xxx'cr' >add/UAGC_xxx'cr''lf'] <add/UAGC_'cr' >add/UAGC_xxx'cr''lf']	Where xxx = ON, OFF

7.4 HPA Commands

Commands and responses for controlling and determining the status of HPAs.

HPA Power Enable	Command Response Status Response	<add/HPE_xxx'cr' >add/HPE_xxx'cr''lf'] <add/HPE_'cr' >add/HPE_xxx'cr''lf']	Where xxx = ON/OFF, default is OFF (For ADAP SSPAs only)
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/OFF, default is ON Determines if the system takes action on HPA fault notification

7.5 LNB Commands

Commands and responses to control and to determine the status of an LNB.

LNB 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/OFF, default is OFF
LNB Calibration	Command Response	<add/CLNAB_'cr' >add/CLNAB_''cr''lf']	Calibration to allow system to determine nominal LNB power consumption, performed at initial installation only
LNB 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/OFF, default is ON Determines if the system takes action on LNA fault notification
Select Receive Band	Command Response Status Response	<add/SRB_n'cr' >add/SRB_n'cr''lf'] <add/SRB_'cr' >add/SRB_n'cr''lf']	Where n = A for 10.95 to 11.70 GHz B for 11.70 to 12.20 GHz C for 12.25 to 12.75 GHz

7.6 System Communications Commands

Commands and responses for setting up communications with the system.

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 = present address and xxx = new address, 1 to 255 (default = 1)
Baud Rate Select	Command Response Status Response	<add/BR_xxx'cr' >add/BR_xxx'cr''lf'] <add/BR_'cr' >add/BR_xxx'cr''lf']	Where xxx = 300, 600, 1200, 2400, 4800, 9600 or 19200 (default = 9600)
Parity Select	Command Response Status Response	<add/PS_xxx'cr' >add/PS_xxx'cr''lf'] <add/PS_'cr' >add/PS_xxx'cr''lf']	Where xxx = OD (odd), EV (even) or NO (none – 8 bit), default = EV

7.7 Miscellaneous Commands

Miscellaneous commands and responses for resetting the internal M&C processor and for determining system configuration information.

M&C Soft Reset	Command	<add/SRM_'cr'	Restarts system while retaining current variables
M&C Hard Reset	Command	<add/HRM_'cr'	Restarts system and resets variables to factory-default values
M&C Firmware Information	Command Response	<add/MCFI_'cr' >add/MCFI_'cr' VER_xxx.yyy.zzz'cr' FW/nnnnn-ddr'cr' Mm/dd/yy'cr''lf']	Where xxx.yyy.zzz = version number, nnnnn = firmware number, dd = dash number, r = revision (- or A to Z)
Upconverter Firmware Information	Command Response	<add/UFI_'cr' >add/UFI_'cr''lf'] VER_xxx.yyy.zzz'cr' FW/nnnnn-ddr'cr' Mm/dd/yy'cr''lf']	Where xxx.yyy.zzz = version number, nnnnn = firmware number, dd = dash number, r = revision (- or A to Z)
Downconverter Firmware Information	Command Response	<add/DFI_'cr' >add/DFI_'cr''lf'] VER_xxx.yyy.zzz'cr' FW/nnnnn-ddr'cr' Mm/dd/yy'cr''lf']	Where xxx.yyy.zzz = version number, nnnnn = firmware number, dd = dash number, r = revision (- or A to Z)
HPA Firmware Information	Command Response	<add/HFI_'cr' >add/HFI_'cr''lf'] VER_xxx.yyy.zzz'cr' FW/nnnnn-ddr'cr' Mm/dd/yy'cr''lf']	Where xxx.yyy.zzz = version number, nnnnn = firmware number, dd = dash number, r = revision (- or A to Z)
Query Serial Numbers	Command Response	<add/SNUM_'cr' >add/SNUM_'cr' UC_xxxxxxxxx'cr' HPA_xxxxxxxxx'cr' DC_xxxxxxxxx'cr' M&C_xxxxxxxxx'cr''lf']	Where xxxxxxxxx – Serial Number (0 to 999999999)
Query Assembly Numbers	Command Response	<add/ANUM_'cr' >add/ANUM_'cr' UC_nnnn-dr'cr' HPA_nnnn-dr'cr' DC_nnnn-dr'cr' M&C_nnnn-dr'cr''lf']	Where nnnn = Assembly Number (0 to 9999), d = dash number (0 to 9), r = revision (- or A to Z)
System Maintenance Status	Command Response	<add/MS_'cr' >add/MS_'cr' UCT_nn'cr' HPT_nn'cr' DCT_nn'cr' MCT_nn'cr' PRF_YY'cr' FTD_xxx'cr' HV_xxx'cr''lf']	Where nn = temperature in degrees C, YY =HPA RF power value, xxx with FTD = OK, DLY or N/A for TWTA heaters, xxx with HV = ON, OFF or N/A for TWTA high voltage
Equipment Type	Command Response	<add/ET_'cr' >add/ET_ttttttt_xxx.yyy.zzz'cr''lf']	Where ttttttt = equipment type, xxx.yyy.zzz = firmware version
Terminal Emulation	Command Response Status Response	<add/EMUL_xxxxxxxxxxxx'cr' >add/EMUL_xxxxxxxxxxxx'cr''lf'' <add/EMUL_'cr' >add/EMUL_xxxxxxxxxxxx'cr''lf']	Where xxxxxxxxxxxx = RFT1200_2.06, RFT1225_2.02/DISABLED which emulates the serial remote command interface for the specified version of the listed RFT product.

7.8 Fault Commands

The internal M&C stores up to 10 faults of each type listed. These are the stored faults listed in the table. When 10 faults are stored, succeeding faults are not stored unless the stored faults are cleared. Equipment faults are constantly monitored by the M&C, and faults that occur may be viewed by the Current fault commands.

System Fault Status	Command Response	<add/FS_'cr' >add/FS_'cr' US_xxx'cr' HS_xxx'cr' DS_xxx'cr' RS_xxx'cr' AGS_'cr' LS_xxx'cr' CES_xxx'cr''lf']	Where xxx = OK or FLT, US = upconverter, HS = HPA, DS = downconverter, RS = reference, AGS = AGC, LS = LNA, CES = common equipment
Up Converter Latched Fault Reset	Command Response Status Response	<add/ULR_RESET'cr' >add/ULR_RESET'cr''lf'] <add/ULR_'cr' >add/ULR_'cr' LSSYN_xxx'cr' LKSYN_xxx'cr''lf']	Resets/clears any detected upconverter faults Where xxx = OK or FLT for the S-band synthesizer lock detect (LSSYN) or the Ku-band syntehsizer lock detect (LKSYN)
Down Converter Latched Fault Reset	Command Response Status Response	<add/DLR_RESET'cr' >add/DLR_RESET'cr''lf'] <add/DLR_'cr' >add/DLR_'cr' LLSYN_xxx'cr' LKSYN_xxx'cr''lf']	Resets/clears any detected downconverter faults Where xxx = OK or FLT for the Ku-Band synthesizer lock detect (LLSYN) or the Ku-band syntehsizer lock detect (LKSYN)
Up Converter Current Faults	Command Response	<add/US_'cr' >add/US_'cr' RF_yyy'cr' UC_xxx'cr' SSYN_xxx'cr' KSYN_xxx'cr' LSSYN_xxx'cr' LKSYN_xxx'cr' PROG_xxx'cr' SFLT_#'cr''lf']	Where yyy = ON or OFF, xxx = OK or FLT, # = number of stored faults (1 to 10), RF = RF output, UC = upconverter, SSYN = S-band synthesizer lock detect, KSYN = Ku-band synthesizer lock detect, LSSYN = latched S-band synthesizer lock detect, LKSYN = latched Ku-band synthesizer lock detect, inter processor communications
Down Converter Current Faults	Command Response	<add/DS_'cr' >add/DS_'cr' DC_xxx'cr' LSYN_xxx'cr' KSYN_xxx'cr' LLSYN_xxx'cr' LKSYN_xxx'cr' PROG_xxx'cr' SFLT_#'cr''lf']	Where xxx = OK or FLT, #= number of stored faults (1 to 10), DC = downconverter, LSYN = Ku-Band synthesizer lock detect, KSYN = Ku-band synthesizer lock detect, LLSYN = latched Ku-Band synthesizer lock detect, LKSYN = latched Ku-band synthesizer lock detect, inter processor communications

Reference Current Faults	Command Response	<add/RS_'cr' >add/RS_'cr' REF_yyy'cr' 72MHZ_xxx'cr' OSC_zzz'cr' SFLT_#'cr''lf']	Where yyy = INT, xxx = OK or FLT, zzz = WARM or COLD, # = number of stored faults, 72MHZ = 72 MHz lock detect, LOCK and PHASE_N and RANGE refer to an external reference
ADAP 2 and 4 Watt SSPAs Current Faults	Command Response	<add/HS_'cr' >add/HS_'cr' RF_yyy'cr' HPA_xxx'cr' BV1_xxx'cr' +9.75V_xxx'cr' -5V_xxx'cr' PROG_xxx'cr' SFLT_#'cr''lf']	Where yyy = ON or OFF, xxx = OK or FLT, BV1 = bias voltage #1, PROG = inter processor communications, # = number of stored faults (1 to 10)
LNB Current Faults	Command Response	<add/LS_'cr' >add/LS_'cr' LNA_xxx'cr' SFLT_#'cr''lf']	Where xxx = OK or FLT, # = number of stored faults (1 to 10)
AGC Current Faults	Command Response	<add/AGS_'cr' >add/AGS_'cr' EIP_xxx'cr' IIP_xxx'cr' LOOP_xxx'cr' SFLT_#'cr''lf']	Where xxx = OK or FLT, # = number of stored faults (1 to 10), EIP = excessive input power, IIP = insufficient input power, LOOP = loop converge
Common Equipment Current Faults	Command Response	<add/CES_'cr' >add/CES_'cr' M&C_xxx'cr' -7V_xxx'cr' +7V_xxx'cr' +12V_xxx'cr' +17V_xxx'cr' SFLT_#'cr''lf']	Where xxx = OK or FLT, # = number of stored faults (1 to 10)
Clear Stored Faults	Command Response	<add/CLSF_'cr' >add/CLSF_'cr''lf']	Clears all stored faults in all locations
Up Converter Stored Faults	Command Response	<add/USF_#'cr' >add/USF_#'cr' RF_yyy'cr' UC_xxx'cr' SSYN_xxx'cr' KSYN_xxx'cr' LSSYN_xxx'cr' LKSYN_xxx'cr' PROG_xxx'cr''lf']	Where # = stored fault location (0 to 9), yyy = ON or OFF, xxx = OK or FLT, (1 to 10), RF = RF output, UC = upconverter, SSYN = S-band synthesizer lock detect, KSYN = Ku-band synthesizer lock detect, LSSYN = latched S-band synthesizer lock detect, LKSYN = latched Ku-band synthesizer lock detect, inter processor communications
Down Converter Stored Faults	Command Response	<add/DSF_#'cr' >add/DSF_#'cr' DC_xxx'cr' LSYN_xxx'cr' KSYN_xxx'cr' LLSYN_xxx'cr' LKSYN_xxx'cr' PROG_xxx'cr''lf']	Where xxx = OK or FLT, #= stored fault loaction (0 to 9), DC = downconverter, LSYN = Ku-Band synthesizer lock detect, KSYN = Ku-band synthesizer lock detect, LLSYN = latched Ku-Band synthesizer lock detect, LKSYN = latched Ku-band synthesizer lock detect, inter processor communications
Reference Stored Faults	Command Response	<add/RSF_#'cr' >add/RSF_#'cr' REF_yyy'cr' 72MHZ_xxx'cr' OSC_zzz'cr''lf']	Where yyy = INT, xxx = OK or FLT, zzz = WARM or COLD, # = stored fault location, 72MHZ = 72 MHz lock detect, LOCK and PHASE_N and RANGE refer to an external reference

ADAP 2 and 4 Watt SSPA Stored Faults	Command Response	<add/HSF_#'cr' >add/HSF_#'cr' RF_yyy'cr' HPA_xxx'cr' BV1_xxx'cr' +9.75V_xxx'cr' -5V_xxx'cr' PROG_xxx'cr''lf']	Where yyy = ON or OFF, xxx = OK or FLT, BV1 = bias voltage #1, PROG = inter processor communications, # = stored fault location (0 to 9)
LNB Stored Faults	Command Response	<add/LSF_#'cr' >add/LSF_#'cr' LNA_xxx'cr''lf]'	Where xxx = OK or FLT, # = stored fault location (0 to 9)
AGC Stored Faults	Command Response	<add/ASF_#'cr' >add/ASF_#'cr' EIP_xxx'cr' IIP_xxx'cr' LOOP_xxx'cr''lf']	Where xxx = OK or FLT, # = stored fault location (0 to 9), EIP = excessive input power, IIP = insufficient input power, LOOP = loop converge
Common Equipment Stored Faults	Command Response	<add/CSF_#'cr' >add/CSF_#'cr' M&C_xxx'cr' -7V_xxx'cr' +7V_xxx'cr' +12V_xxx'cr' +17V_xxx'cr' SFLT_#'cr ''lf']	Where xxx = OK or FLT, # = stored fault location (0 to 9), TXS = transmit redundancy switch, RXS = receive redundancy switch, IF = IF redundancy switch, RFLC = redundancy fault line cable

7.9 Burst Control Mode

Burst Control Mode	Command Response Status Response:	<add/BCM_xxx'cr' >add/BCM_xxx'cr''lf'] <add/BCM_'cr' >add/BCM_xxx'cr''lf']	where: xxx = (ON/OFF), default is OFF. This command enters a special burst signal operation mode, when Uplink AGC is disabled. The detected loss of an IF input carrier will cause the uplink to turn its RF OFF. When the IF carrier is re-applied, the RF will be turned ON

.

Appendix A. EQUIPMENT OUTLINE DRAWINGS

This section contains the equipment outlines for the following components:

- 2 and 4 Watt SSPA
- KST-2000L Converter
- Ku-Band LNB

A.1 2 and 4 Watt SSPA Equipment Outline

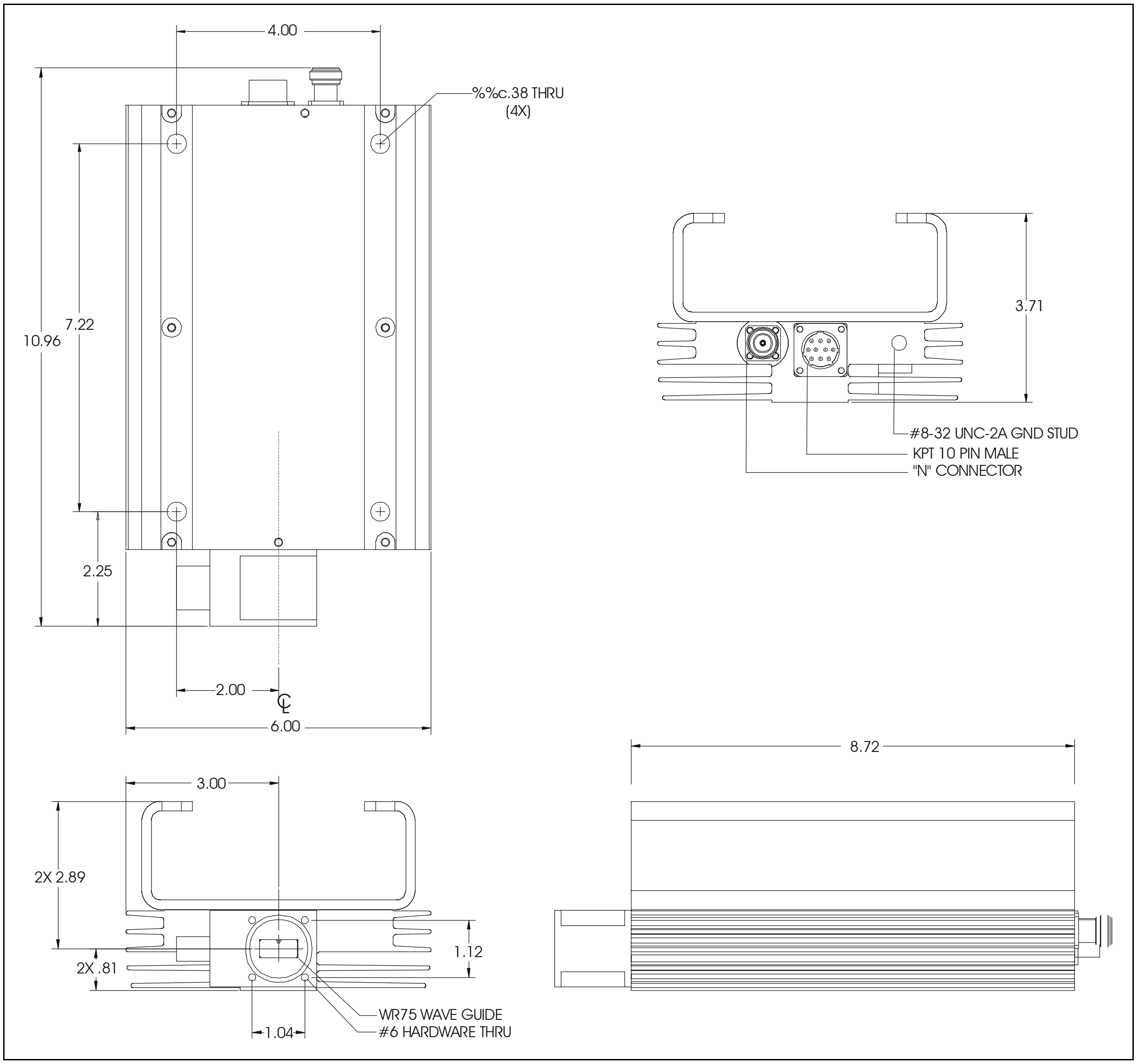


Figure A-1. 2 Watt SSPA Equipment Outline

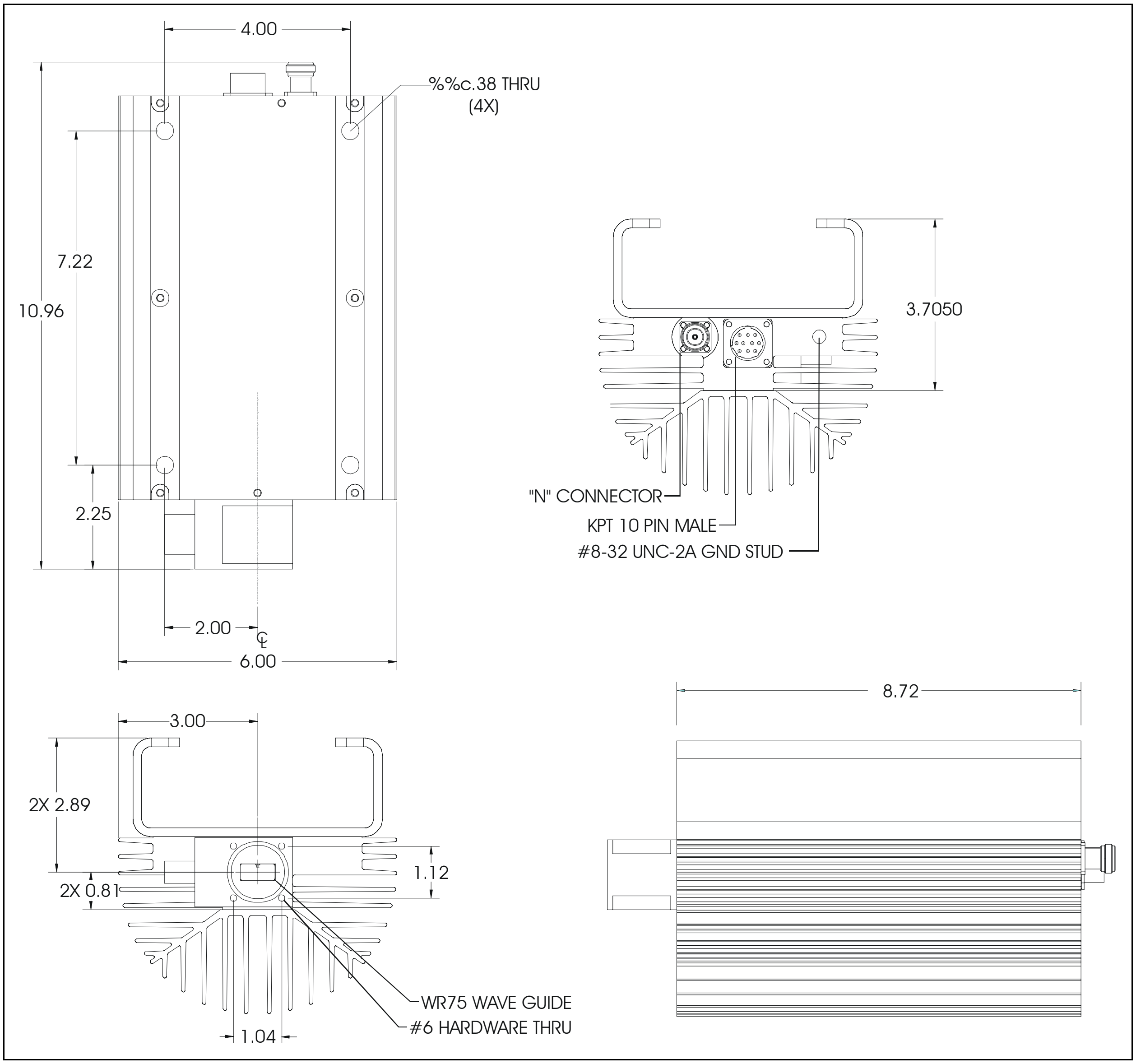


Figure A-2. 4 Watt SSPA Equipment Outline

A.2 KST-2000L Converter Equipment Outline

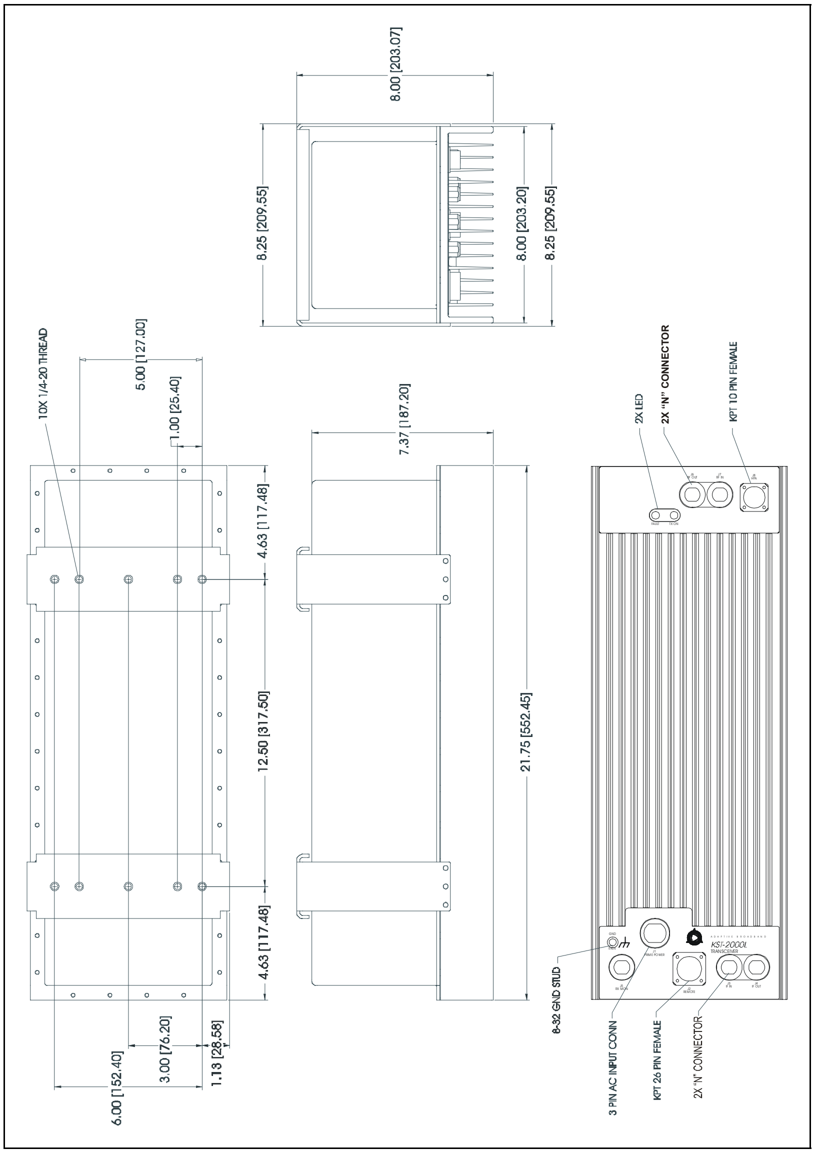


Figure A-3. KST-2000L Converter Equipment Outline

A.3 Ku-Band LNB Equipment Outline

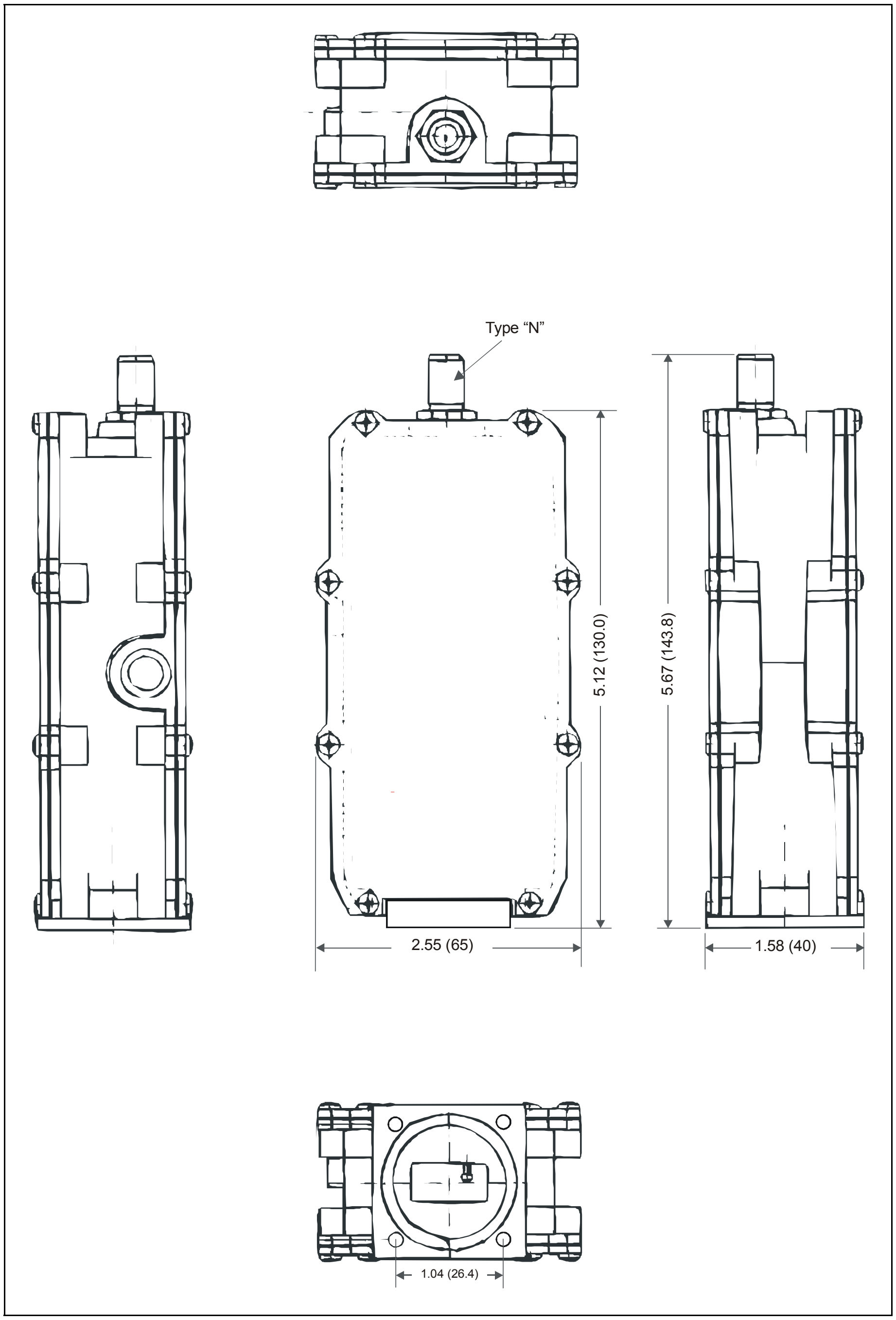


Figure A-4. Ku-Band LNB Equipment Outline

This page is intentionally left blank.

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	—

2114 WEST 7TH STREET TEMPE ARIZONA 85281 USA
480 • 333 • 2200 PHONE
480 • 333 • 2161 FAX