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Installation and Operation Manual

Rack Mount Multi-Channel Telemetry Transmitter

Quasonix, Inc.
6025 Schumacher Park Dr.
West Chester, OH 45069
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1 Introduction

1.1 Description

This document describes the installation and basic operation of the Quasonix Rack Mount Multi-Channel Telemetry Transmitter. The latest addition to the Quasonix transmitter product line provides up to six TIMTER™ transmitters with separate clock, data, and RF ports in a 1U chassis. Operation is via a front panel serial interface or Ethernet-based Remote Terminal Window.

Each transmitter has clock and data input and RF output. The Serial port on the front is shared, switched by the front panel button or via terminal command.

The Rack Mount Multi-Channel Telemetry Transmitter is manufactured by:

Quasonix, Inc.
6025 Schumacher Park Drive
West Chester, OH 45069
CAGE code: 3CJA9

1.2 Nomenclature

The Rack Mount Multi-Channel Telemetry Transmitter is available in a plethora of variations based on the frequency bands, options, etc. The unit contains one to six TIMTER™ transmitters which may be identical or may have different part numbers as determined by the transmitter packages ordered.

The model number identifies the configuration of the unit. Please contact Quasonix for the appropriate part number for your Rack Mount Multi-Channel Telemetry Transmitter.

Quasonix will also assist you in ordering TIMTER™ transmitter options and will provide information regarding upgrades to Rack Mount Multi-Channel Telemetry Transmitter units that you may already own.

All standard TIMTER™ transmitter models are described in the TIMTER™ Transmitter Packages document. Complete transmitter documentation is located in the TIMTER™ T3 Multi-mode Digital Telemetry Transmitter Installation and Operation Manual. Specifications are contained in the TIMTER ™ T3 Multi-mode Digital Telemetry Transmitter Data Sheet. All of these documents are available for download from the company website: www.quasonix.com.

1.3 Package Contents

The contents of the box include the following:

- Rack Mount transmitter unit
- CD with user manual, data sheets, etc.

1.3.1 Cable Requirements

Cables are not included with the Rack-Mount Multi-Channel Telemetry Transmitter. The following cables are required for operation. Refer to Table 3 for rear panel connector specifications and Table 4 for DB-9 pinouts.

- Clock and Data for each channel

- RF Output for each channel
- USB for upgrading the Remote Ethernet Interface software
- Ethernet cable for remote access
- RS-232 on the front panel for serial access to the transmitters
- Five-pin power cable

The Rack-Mount Multi-Channel Telemetry Transmitter requires a power cable with an N-connector. The five pins in the power cable port are labeled as shown in Figure 1. The pinouts are described in Table 1.

Figure 1: Labeled Pins in the Power Cable Port

Table 1: Pinouts for N-Connector Power Cable

Pin	Function
A	+28 VDC
B	+28 VDC
C	Ground
D	Ground
E	Chassis Ground

2 Specifications

The specifications listed in this document refer to the Rack-Mount transmitter chassis. The specifications in Table 2 refer to a unit with three (3) transmitters/channels installed. Physical chassis specifications for units with fewer transmitters, or with up to six (6) transmitters, will be different.

For information specific to individual transmitters installed inside the chassis, please refer to the Multi-Mode Telemetry Transmitters Data Sheet.

Table 2: Rack-Mount Telemetry Transmitter with Three Transmitters/Channels Installed

Characteristic	Specification
Environmental Section	
Operating Temperature	0°C to +70°C
Non-operating Temperature	0°C to + 85°C
Operating Humidity	0 to 95% (non-condensing)
Altitude	Up to 30,000 ft.
Physical Section	
Size	1U rack-mount chassis; 19" wide, 1.75" tall, 14-5/16" rack depth, 15-11/16" overall depth
Weight	13 lbs.
Connectors – per chassis	RF Out: SMA female Clock-In: BNC female Data-In: BNC female Ethernet: RJ-45 RS-232 serial control: DB-9 USB
Power	28 VDC 21 VDC – 34 VDC (Wide Voltage option)

3 Installation Instructions

3.1 Mechanical

The Rack Mount Multi-Channel Telemetry Transmitter's enclosure fits in a standard 19" rack, occupying just 1U of rack space. Mechanical layouts are provided in Figure 2, Figure 3 and Figure 5.

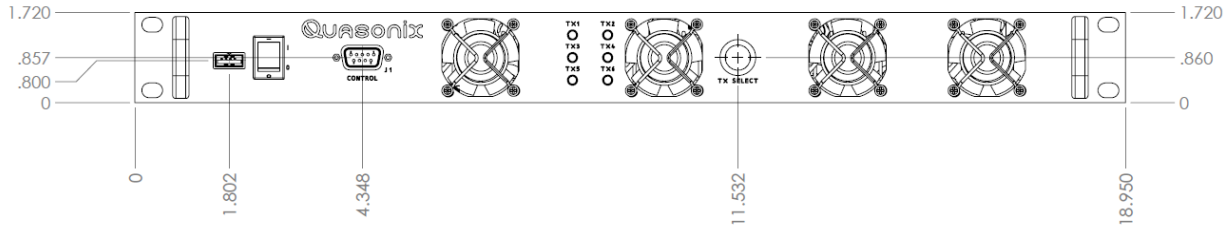

Figure 2: Mechanical Drawing – Front View

Each Channel (transmitter inside the chassis) has its own clock, data, and RF ports on the back of the unit.

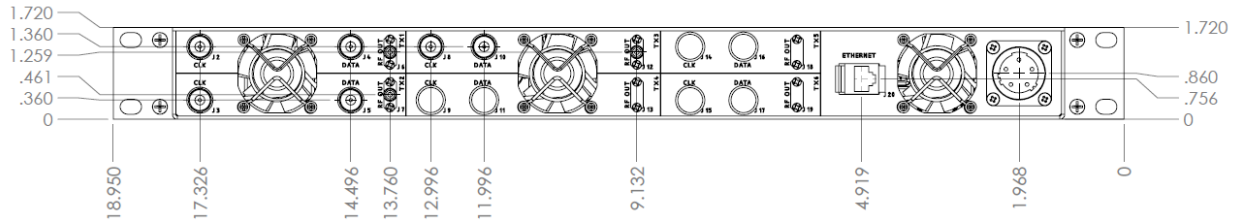

Figure 3: Mechanical Drawing – Rear View

Figure 4: Back Panel Photo

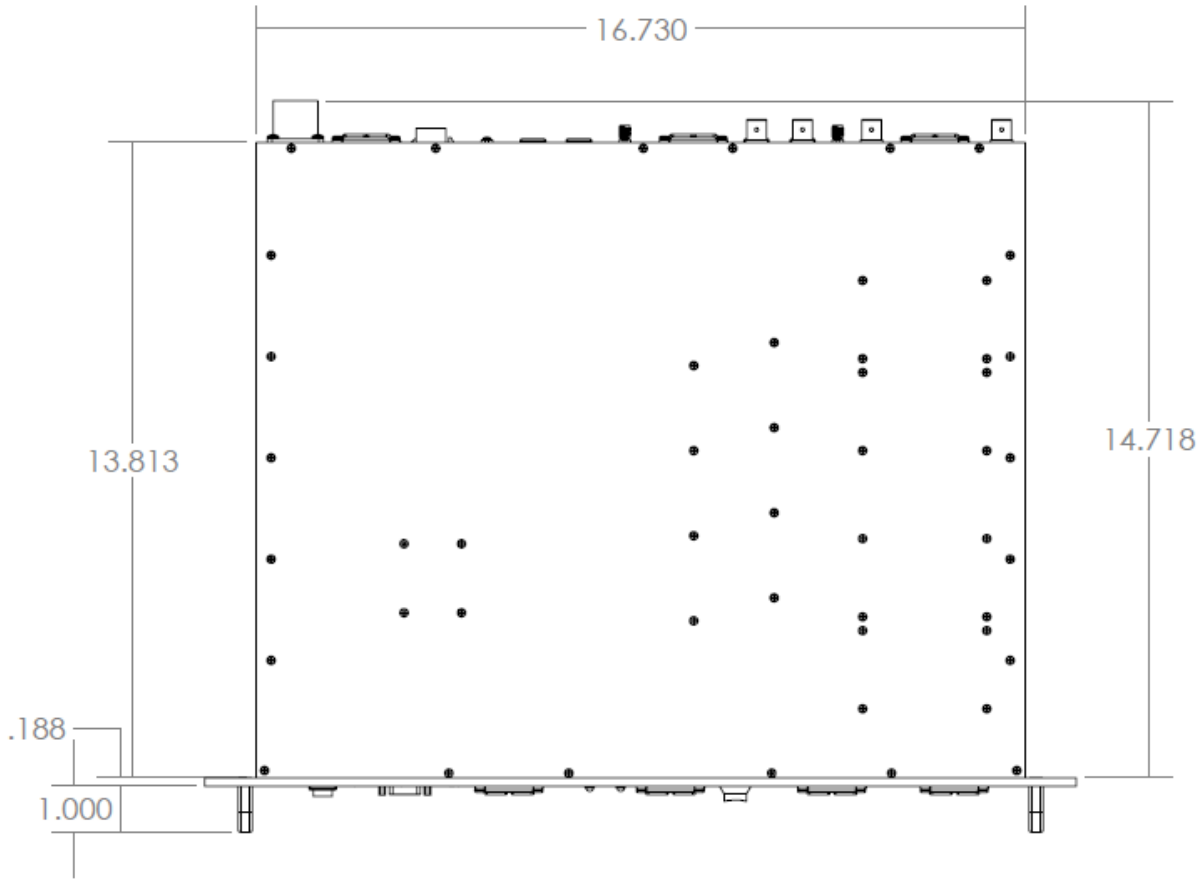

Figure 5: Mechanical Drawing – Top View

3.2 Thermal

The storage temperature of the Rack Mount Multi-Channel Telemetry Transmitter unit is rated for 0°C to +85°C, while the operating temperature is rated for 0°C to +70°C. It is recommended that the unit be kept in a temperature controlled environment to minimize the risk of operating (or storing) outside the ranges specified.

The Rack Mount Multi-Channel Telemetry Transmitter features cooling fans on both sides of its aluminum chassis. These fans must be kept entirely unobstructed in order to allow for maximum airflow through the system. Whenever feasible, it is helpful to leave an open rack space above and below the Rack Mount Multi-Channel Telemetry Transmitter for additional heat dissipation.

Warning: To prevent overheating and damage to the transmitters in the chassis,

Do not block the fans.

3.3 Electrical

The Rack Mount Multi-Channel Telemetry Transmitter is available with one to six transmitters inside. The unit can be operated through its front panel serial interface and standard Terminal software, or via the Ethernet interface and the Remote Terminal software. All pertinent electrical connections are located on the rear panel, with the exception of the USB and DB-9 ports, which are located on the front panel.

Specifications for all Rack Mount Multi-Channel Telemetry Transmitter connectors are listed in Table 3.

Table 3: Rack Mount Multi-Channel Telemetry Transmitter Connector Specifications

Connector	Transmitter	Function	Electrical Characteristics	Connector Type
J1	All	RS-232 Serial Communications	Standard serial port	DB-9
J2	TX1	Clock In	120 ohms termination	BNC
J3	TX2	Clock In	120 ohms termination	BNC
J4	TX1	Data In	120 ohms termination	BNC
J5	TX2	Data In	120 ohms termination	BNC
J6	TX1	RF Output	50 ohms unbalanced	SMA
J7	TX2	RF Output	50 ohms unbalanced	SMA
J8	TX3	Clock In	120 ohms termination	BNC
J9	TX4	Clock In	120 ohms termination	BNC
J10	TX3	Data In	120 ohms termination	BNC
J11	TX4	Data In	120 ohms termination	BNC
J12	TX3	RF Output	50 ohms unbalanced	SMA
J13	TX4	RF Output	50 ohms unbalanced	SMA
J14	TX5	Clock In	120 ohms termination	BNC
J15	TX6	Clock In	120 ohms termination	BNC
J16	TX5	Data In	120 ohms termination	BNC
J17	TX6	Data In	120 ohms termination	BNC
J18	TX5	RF Output	50 ohms unbalanced	SMA
J19	TX6	RF Output	50 ohms unbalanced	SMA
J20	All	Ethernet	Standard Ethernet port	RJ-45

Figure 6: Front Panel DB-9 Serial Port Pins Labeled

Table 4: Rack Mount Multi-Channel Telemetry Transmitter DB-9 Pinouts

Pin	Function
1	Not Used
2	TX Serial Reply
3	TX Serial Input
4	Not Used
5	TX Ground
6	Not Used
7	Not Used
8	Not Used
9	Not Used

Refer to Table 1 for power cord pinouts.

4 Operating Instructions

The Rack Mount Multi-Channel Telemetry Transmitter can be operated through its front panel serial interface or via the Ethernet-based Remote Terminal Window. The serial and Ethernet interfaces are capable of configuring and monitoring from one to six channels (transmitters) within the rack unit.

4.1 Front-Panel Control

The Rack Mount Multi-Channel Telemetry Transmitter's comprehensive front panel interface includes a USB-A port (used for programming upgrades), a standard toggle power switch, a DB-9 serial port, (6) green LEDs for indicating the active Channel (transmitter), and a transmitter selection button. The front panel also includes four cooling fans.

Figure 7: Rack Mount Multi-Channel Telemetry Transmitter Front Panel

Figure 8: Left Side of Front Panel Labeled

Figure 9: Right Side of Front Panel Labeled

4.2 Power-on Operation

Upon power up, the transmitters load any stored parameters present in their nonvolatile memory. If parameters have not been stored previously, the transmitters initialize default parameters and then store them in the first preset slot, 0. There are a total of 16 available software-based presets (0 through 15) for saving multiple parameters at once for future use.

Transmitter
Channel
LEDs

PF / PM OPTION NOTE: Stored parameters are loaded based on the state of the startup configuration (SC) setting. The SC setting allows the user to choose the priority between the parameters stored in nonvolatile memory and the frequency and/or mode settings designated by pins on the external parallel control connector. For other variations, contact Quasonix.

4.2.1 Dual Power via Hardware Control

When the dual power option (DP) is specified, all transmitters use the hardware pin to switch between the low power setting and the high power setting.

When the pin is left floating or pulled high (logical 1), the transmitters enter the high power mode. When the pin is grounded (logical 0), the transmitters enter the low power mode.

4.2.2 Simultaneous Operation by Different Users

Unlike a rack-mount receiver where operational priority must be established when two user interfaces are available, the transmitter rack can actually work with the front panel serial connection and Ethernet simultaneously.

Any actions taken from the remote Ethernet are visible from the Serial connection. The reverse is also true.

For example, if User A is plugged into the rack with the serial cable and User B remotes in using the Ethernet software, User A can see everything User B types. Likewise, User B can see everything User A types.

A maximum of one Serial connection and one Ethernet connection is permitted simultaneously.

4.3 Serial Control Protocol

When in Serial Control (Terminal) mode, the Rack Mount Multi-Channel Telemetry Transmitter is controlled via a simple three-wire serial interface (transmit, receive, and ground). The serial port configuration is as follows:

- 57600 baud rate (changeable depending on the configuration option)
- 8 bits
- No parity
- 1 stop bit
- No flow control

For setup and configuration via a standard Windows-based PC, you may use HyperTerminal. For a more flexible, full-featured control interface, we recommend Terminal, available for download from the Quasonix website: http://www.quasonix.com/uploads/terminal_v1-9b.zip.

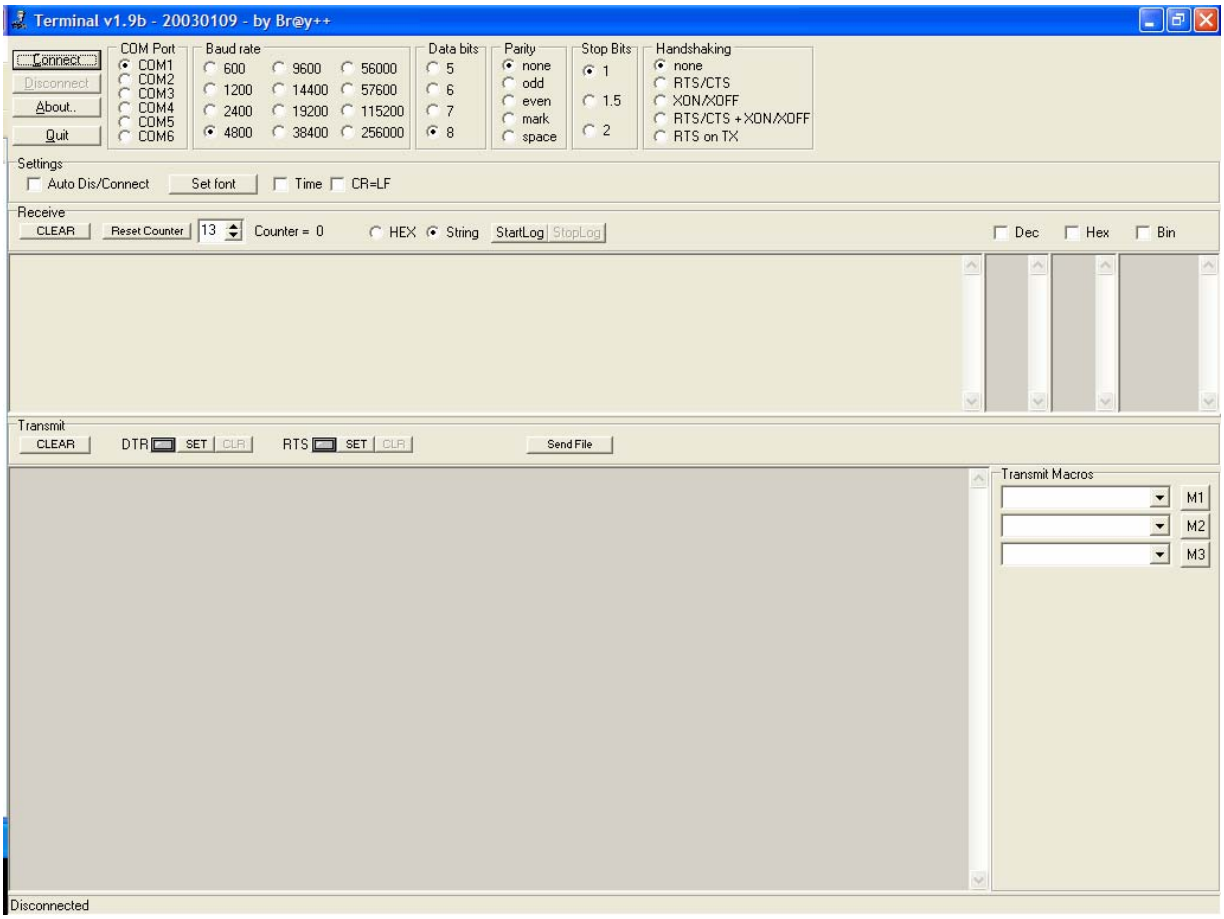

Figure 10: Standard Terminal Application

If the terminal program is active when power is applied to the transmitter, the following welcome message displays, as shown in Figure 23. At this point, you can verify that your serial connection is active in both directions by issuing any standard command, such as “FR” to learn the frequency.

```
Quasonix Multi-Mode Digital Transmitter
Customer Part # = QSX-xxx-xx-xx…
Customer Name = Quasonix Customer
Contract # = 999999-9
TX Serial # = 99999999
Hardware Rev: B
PA Rev: No PA
IRIG 106-09
6025 Schumacher Park Drive
West Chester, OH 45069
(513) 942-1287
www.Quasonix.com
CAGE CODE: 3CJA9
FPGA version: 0x07110004
Firmware version: V2.116 5/22/2009
```

Figure 11: TIMTER™ Welcome Message

All user commands consist of one or two alphabetic characters, followed by 0, 1, or 2 arguments. If the command is issued with arguments, there must be a space after the alphabetic characters. The commands are not case sensitive. Most parameters set by these commands are stored in the unit's nonvolatile flash memory (CS and DS are the exception). On power-up, ALL settings are restored from preset 0, which is the default power on configuration. If the parallel interface is active, then any applicable configuration settings are read from the parallel port and updated accordingly after the initial power on sequence is completed. Refer to the Startup Configuration command (SC) for exceptions. A carriage return is required to initiate each command except for the single key commands described at the beginning of the table.

All commands generate a response of one or more lines. The length of the response depends on the verbosity level (set by the VL command). The last response line is always the currently selected mode (PCMFM, SOQPSK, CPM, or PSK), followed by the character "+" or ">", depending on the version of the firmware. This prompt signifies that the Rack Mount Multi-Channel Telemetry Transmitter is ready to accept new characters.

Refer to the TIMTER™ T3 Multi-mode Digital Telemetry Transmitter Installation and Operation Manual for commands and detailed transmitter documentation.

4.4 Remote Control Ethernet Interface

The Rack Mount Multi-Channel Telemetry Transmitter's remote control interface, a customized Remote Terminal Window, is an Ethernet-based graphical user interface that enables configuration and monitoring of one, or multiple, transmitter units on the user's network. The Remote Control Ethernet Interface provides the user with remote access to the transmitter channels, thus eliminating the need for direct access to the front panel.

The Quasonix Remote Terminal Window software is built upon Microsoft's ubiquitous .NET Framework, which is a software-based coding foundation that facilitates consistent application performance across various hardware platforms, as well as enhanced security. .NET is compatible with Windows XP, Windows Vista, and Windows 7.

To install the Quasonix Remote Terminal Window software from the accompanying CD:

1. Go to the “Remote RDMS Client Install” folder at the root level of the CD.
2. Double-click on the “Setup.exe” file and the installation will begin.

Depending on the operating system, the user may receive an application install security warning that says the publisher cannot be verified. Click on the ‘Install’ screen button to continue. Toward the end of installation, the Windows firewall may ask the user if they wish to block the application. The user should click on ‘Unblock’ to enable the Remote Control Ethernet Interface.

Following installation, the program can be found under the following Windows path:

Start > All Programs > Quasonix Tools > Remote Ethernet Terminal

Windows Vista and Windows 7 include .NET by default; however certain Vista users may still be prompted during the installation process to install the latest version of .NET, which is included on the CD under the folder “Quasonix Client Dot Net Support”.

For issues that occur during installation, call Quasonix Technical Support at 513-942-1287.

4.4.1 Network Requirements

The following parameters are required for the Rack Mount Multi-Channel Telemetry Transmitter to operate properly within a network:

- Multicast must be enabled on the network level
- Network or local firewalls must provide for a means to open up ports for the Remote Control Ethernet Interface to communicate with the transmitter through the network, otherwise the software will not work properly

NOTE: Certain real-time antivirus and firewall programs, such as Symantec’s Endpoint Protection, are known to block the ports used by the Remote Control Ethernet Interface application without alerting the user. Others, such as Microsoft’s Windows Built-in Firewall, alert the user of the action and allow for the decision to be overridden. If communications between the Remote Control Ethernet Interface and the rack unit are being disrupted by the user’s antivirus and firewall program, Quasonix recommends temporarily disabling it.

If an inexpensive broadband router is used instead of a switch or hub to connect the computer and the rack unit, check each unit’s Ethernet cable connections to be sure that they are not connected to the WAN port on the broadband router.

After the Remote Control Ethernet Interface has successfully established a connection, refer to your firewall documentation for allowing multicast and or Remote Control Ethernet Interface program access. The following IP and port addresses may be useful for troubleshooting firewall issues:

RRC Multicast IP addresses and Ports:

```
MULTICAST IP Address 224.168.200.1
MULTICAST IP Address 224.168.200.2
       MULTICAST PORT 65000
```

One additional unique UDP port is opened for connection to each rack. This port is based on the last octlet of the transmitter rack IP address + 20000. For example if the transmitter rack’s IP address is 192.168.0.100 the last octlet is 100+20000 resulting in a unique UDP port of 20100.

NOTE: These ports are based on the transmitter's unique IP address; therefore a static IP address may be advisable if your DHCP server or device changes the IP address of the transmitter rack (resulting in a new UDP port).

4.4.2 Quasonix Remote Control Window

The Rack Mount Multi-Channel Telemetry Transmitter may be controlled remotely via an Ethernet connection and the Quasonix Remote Terminal software, or locally, using a standard serial cable connected to the front panel while accessing a serial terminal program.

When the Quasonix Remote Control Window software is executed, the window opens with an instruction to enter the IP address for the transmitter rack unit. The Remote Control Window is shown in Figure 12.

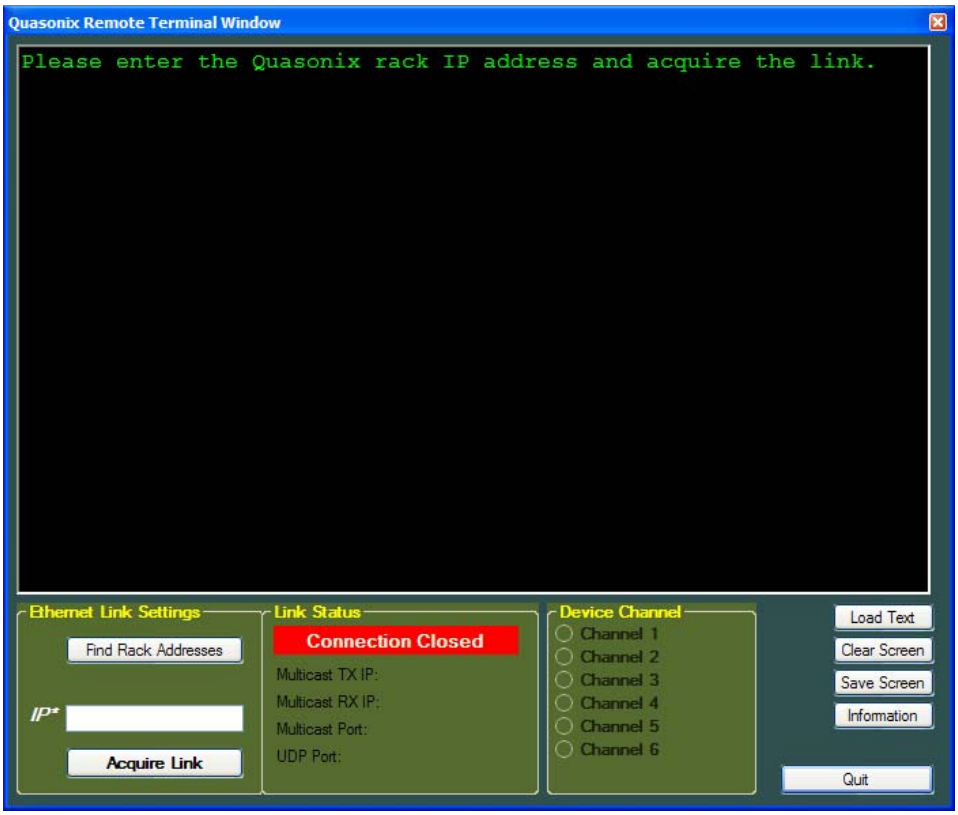

Figure 12: Quasonix Remote Terminal Window for Ethernet Access

4.4.2.1 Screen Buttons

The buttons clustered in the lower right corner of the Remote Terminal Window are described below.

- **Load Text** – Used to load a previously created text file into the Remote Terminal Window

  This function may be used to easily set identical parameters on multiple transmitters. For example, a text file named MyTXsetup.txt may contain the following transmitter serial commands:

```
CS 1
DS 1
FR 2300.0
MO 1
```

1. Select a Device Channel (Channel 1 equals Transmitter 1).
2. Click on the Load Text button.
3. Select the file MyTXsetup.txt.
4. The contents of the file displays in the Remote Terminal Window.

The selected Channel (Transmitter) should now be set to CS 1 (internal clock source), DS 1 (internal data source), frequency 2300.0, and MO 1 (SOQPSK). To verify the settings, type the QA command in the display window. Rather than typing the same individual options into the Remote Terminal Window to set up all of the desired Channels (Transmitters), select a different Device Channel and click on the Load Text button, repeating the same procedure.

- **Clear Screen** – Used to erase everything in the display window
- **Save Screen** – Saves everything previously typed or displayed into a log file; type a file name and select a location on the Save As window
- **Information** – Displays the Remote Terminal Window software version number
- **Quit** – Disconnects the Ethernet link and closes the Remote Terminal Window

4.4.2.2 Ethernet Link Settings

The Ethernet Link Settings box, located below the display window, contains two buttons, Find Rack Addresses and Acquire Link, and the IP* field. The operator may type the IP address directly into the IP* field in the Ethernet Link Settings box and then click on the Acquire Link button to make the Ethernet connection.

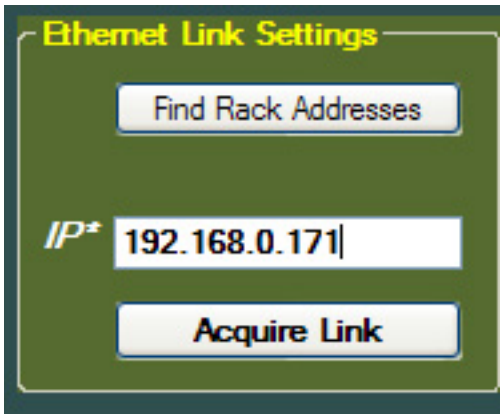

Figure 13: Quasonix Remote Terminal Window, Ethernet Link Settings Box, IP Address Typed

- **Find Rack Addresses button** – Used to search for all Quasonix racks (transmitters or receivers) on the network then displays a list of the rack IPs and aliases
- **IP* field** – Type an IP address into this field to establish an Ethernet connection
- **Acquire Link/Disconnect button** – Acquire Link looks for the IP address typed into the IP field and attempts to make a connection. When a connection is made, the button name changes to Disconnect. Click on the Disconnect button to break the Ethernet link to the transmitter unit.

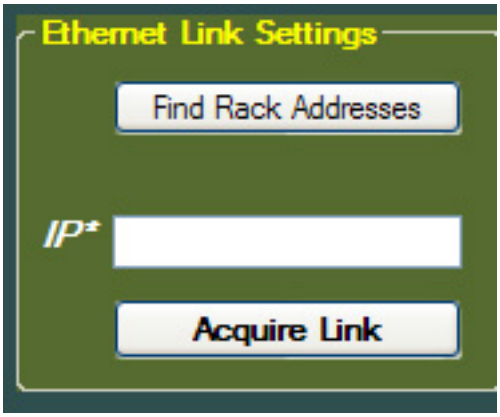

Figure 14: Quasonix Remote Terminal Window, Ethernet Link Settings Box

If the operator is unsure of the IP address, click on the Find Rack Addresses button, shown in Figure 14, to display a list of all Quasonix racks (transmitters and/or receivers) found in the network. An example of a "racks found" list is shown in Figure 15. Select the desired IP address from the list and type it into the IP* field as described above (Figure 13).

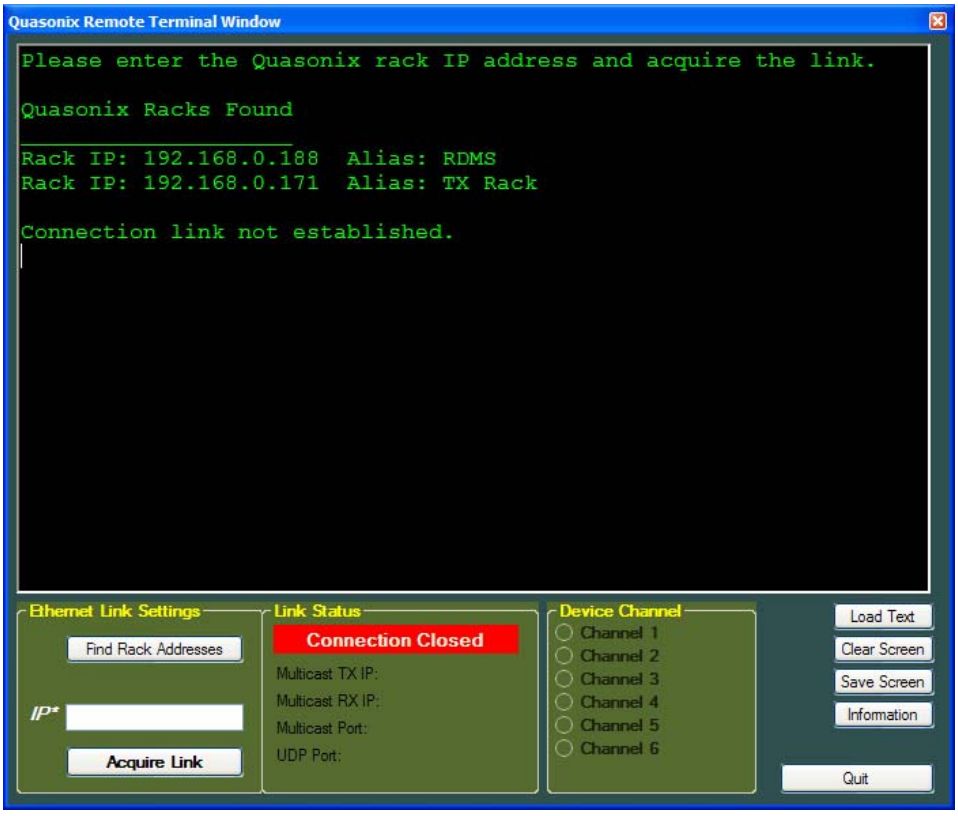

Figure 15: Quasonix Remote Terminal Window, Rack Addresses Found

After the Ethernet link is acquired, the following activities occur, as shown in Figure 16:

- The Acquire Link button changes to Disconnect.
- The display indicates “Channel 1 selected.” Channel 1 is the default.
- The Connection Closed status changes to Connection Open and the color changes from red to green.
- Channel 1 is selected in the Device Channel box.

For more information about these boxes and fields, please continue to the next section.

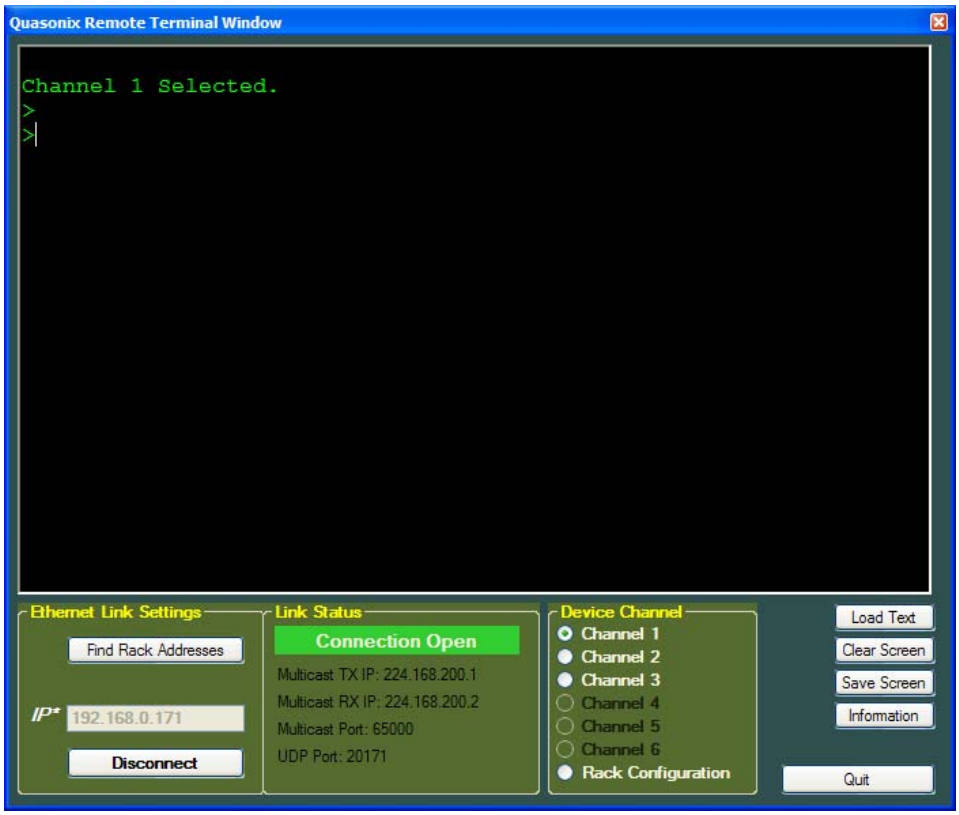

Figure 16: Quasonix Remote Terminal Window, Ethernet Connection Established

4.4.2.3 Link Status

The Link Status box, shown in Figure 17, provides specific information about the Ethernet connection.

- **Connection Status** – Connection status is indicated by one of two conditions: Either the connection is closed (no connection) and the status box displays in red, or the connection is open and the status box displays in green.
- **Multicast Transmit IP address** – Displays the IP address for multicast packets being sent
- **Multicast Receive IP address** – Displays the IP address for multicast packets being received
- **Multicast Port** – Displays the port number for both sending and receiving multicast packets
- **UDP Port** – Displays the UDP port number for sending and receiving raw ASCII data from the selected transmitter (channel)

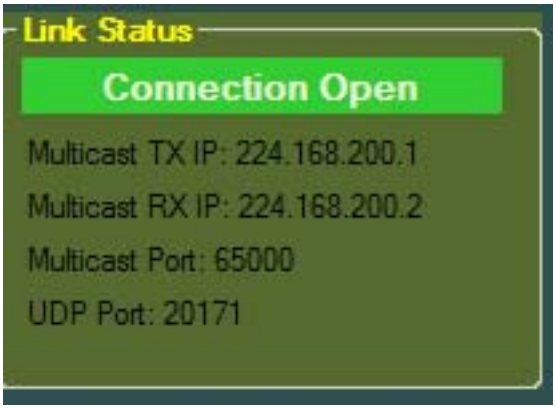

Figure 17: Quasonix Remote Terminal Window, Link Status Box

4.4.2.4 Device Channel

Device Channels represent each of the physical TIMTER™ transmitters available inside the Rack Mount Multi-Channel Telemetry Transmitter unit. Channel numbers that display in white text are available. Channel numbers that display in dark text are not available or are not present in the unit. A unit may be purchased with one to six transmitters installed. All Channels display in dark text when the Remote Terminal Window is initialized prior to an Ethernet connection being established. When a Channel (transmitter) is connected and selected, the indicator next to the Channel number is highlighted. This corresponds to the green LEDs on the front panel of the unit.

- Channel 1 – Opens a connection to Channel 1 (Transmitter 1 inside the unit)
- Channel 2 – Opens a connection to Channel 2 (Transmitter 2 inside the unit)
- Channel 3 – Opens a connection to Channel 3 (Transmitter 3 inside the unit)
- Channel 4 – Opens a connection to Channel 4 (Transmitter 4 inside the unit)
- Channel 5 – Opens a connection to Channel 5 (Transmitter 5 inside the unit)
- Channel 6 – Opens a connection to Channel 6 (Transmitter 6 inside the unit)
- Rack Configuration – Displays network information associated with this unit including single board computer version number (for Quasonix reference), DHCP status, IP Address, IP Subnet, and IP Gateway. An example is shown in Figure 19. The display also provides a list of configuration commands, as described in Table 5.

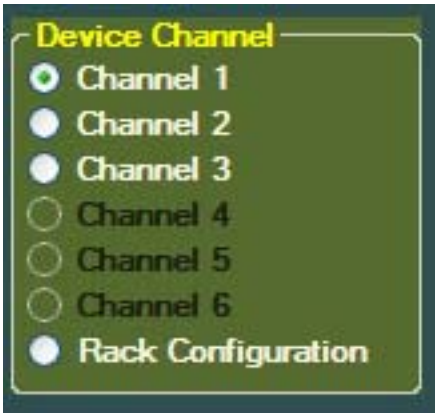

Figure 18: Quasonix Remote Terminal Window, Device Channel Box

4.4.2.4.1 Rack Configuration

When Rack Configuration is selected, a list of the current Ethernet configuration parameters and a list of configuration commands display in the Remote Terminal Window, as shown in Figure 19.

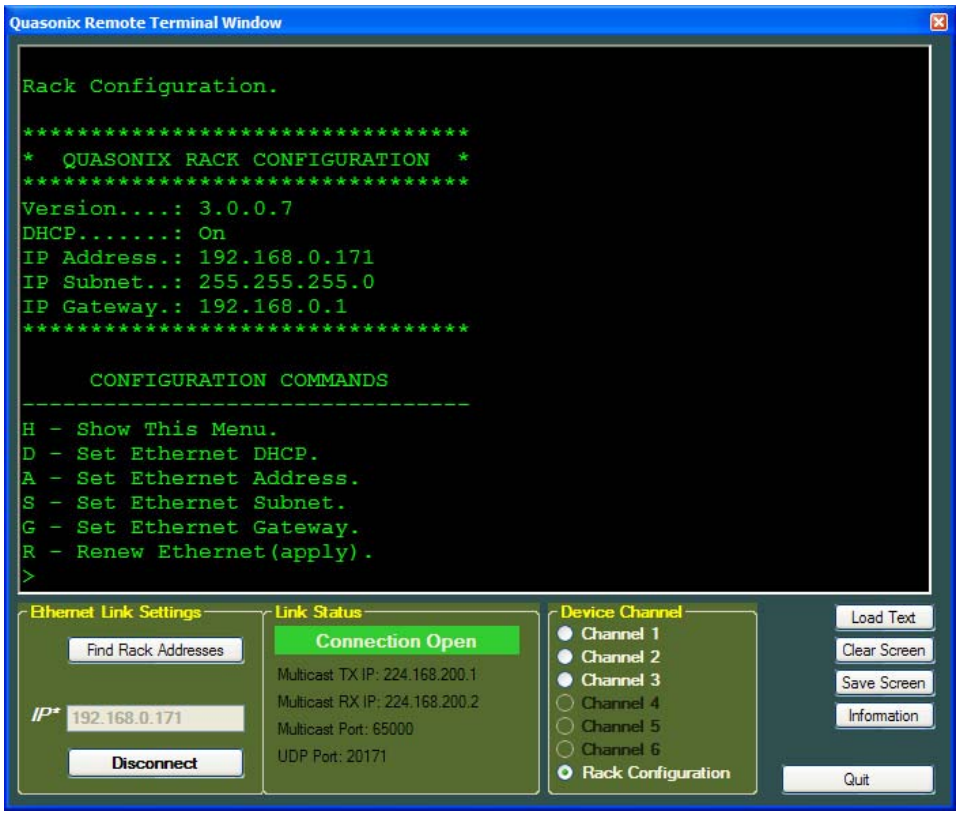

Figure 19: Quasonix Remote Terminal Window, Rack Configuration

There are six selections in the Ethernet Configuration Commands list. They are described in Table 5.

Table 5: Quasonix Remote Terminal Window Ethernet Configuration Commands

Configuration Command	Description	Values
H	Help for the Setup commands	H redisplays the list
D	Configure the Ethernet DHCP	0 = Off; 1 = On
A	Configure the Ethernet IP Address	Up to 12 characters for a new IP address
S	Configure the Ethernet Subnet	Up to 12 characters for a new Subnet
G	Configure the Ethernet Gateway	Up to 12 characters for a new Gateway
R	Renew Ethernet	R applies all new settings

Caution: Renewing the Ethernet settings ("R" command) while connected and using the Remote Control Ethernet Interface will cause the connection to be lost.

Check with your network administrator before changing the IP address as the change will affect everyone using that address.

After applying the Ethernet settings, click on the Disconnect screen button, then type the new IP address of the rack unit. Click on the Connect screen button.

4.4.2.5 Commanding Channels (Transmitters)

When an Ethernet connection is established and a Channel (transmitter) selected, the operator may issue the usual transmitter commands. Keep in mind that each Channel represents a different transmitter within the rack unit. For example, in Figure 20 Channel 1 is selected and the transmitter H (Help) command was issued. The list of available transmitter commands displays.

Figure 20: Quasonix Remote Terminal Window, Channel 1, Transmitter Command List

In the next example, shown in Figure 21, the CS (clock source) status command was issued. Channel 1 (transmitter 1) returned a status of 0 followed by the PCMFM mode indicator. This display is identical to the one generated by serial commands to a standard Terminal window.

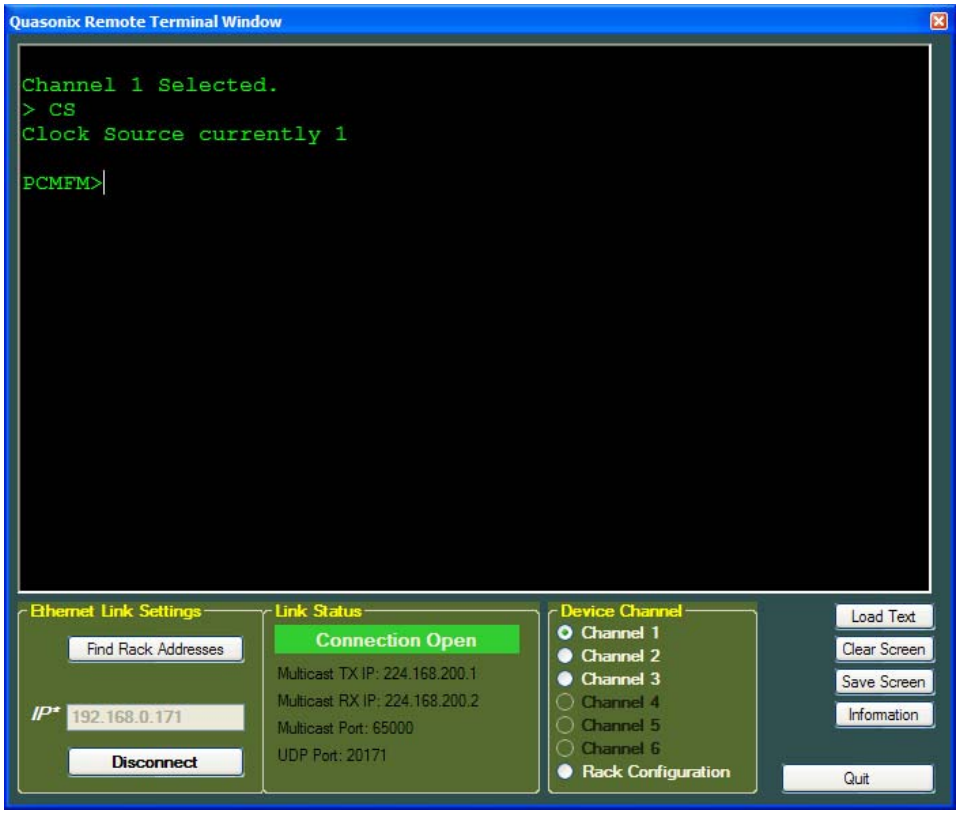

Figure 21: Quasonix Remote Terminal Window, Channel 1, CS Command Issued

Complete documentation for the TIMTER™ transmitter, including user commands, may be found in the TIMTER™ T3 Multi-mode Digital Telemetry Transmitter Installation and Operation Manual.

5 Maintenance Instructions

The Rack Mount Multi-Channel Telemetry Transmitter requires no regular maintenance, and there are no user-serviceable parts inside. Please consult the factory for any maintenance, upgrade, or repair requirements.

6 Product Warranty

The Rack Mount Multi-Channel Telemetry Transmitter carries a standard parts and labor warranty of one (1) year from the date of delivery.

7 Technical Support and RMA Requests

In the event of a product issue, customers should contact Quasonix via phone (1-513-942-1287) or e-mail (support@quasonix.com) to seek technical support. If Quasonix determines that the product issue must be addressed at the factory, a returned materials authorization (RMA) number will be provided for return shipment.

Authorized return shipments must be addressed in the following manner:

Quasonix, Inc.
ATTN: Repair, RMA #
6025 Schumacher Park Drive
West Chester, OH 45069

To ensure that your shipment is processed most efficiently, please include the following information with your product return:

- Ship To – Company name, address, zip code, and internal mail-drop, if applicable
- Attention/Contact person – Name, Title, Department, Phone number, email address
- Purchase Order Number – If applicable
- RMA Number – provided by the Quasonix representative

Please note that Quasonix reserves the right to refuse shipments that arrive without RMA numbers.

8 Appendix A – Acronym List

Acronym	Description
A	Amperes (amps)
AC	Automatic Carrier Wave option
AM	Amplitude Modulation
AQPSK	Variant of Quadrature Phase Shift Keying
ARTM	Advanced Range Telemetry
AUQPSK	Variant of Quadrature Phase Shift Keying
BER	Bit Error Rate
BNC	Bayonet Neill-Concelman Connector (RF Connector)
BPSK	Binary Phase Shift Keying
CF	Clock Free option
CG	Clock Generator option
CPM	Continuous Phase Modulation
DB	Data Bias Level option
DB-9	D-subminiature 9 pin Serial Connector
DD	Debounce Delay
DE	Differential Encoding
DDS	Direct Digital Synthesizer
DP	Data Polarity option
DP	Dual Power
DS	Data Source option
EC	Error Correction
FEC	Forward Error Correction
FPGA	Field Programmable Gate Array
FS	Frequency Step
HR	High Bit Rate
ID	Internal Data
kbps	Kilobits per second

Acronym	Description
KHz	Kilohertz
LC	List Configurations option
LR	Low Bit Rate
LS	Lower S-band
MA	Modulations Allowed option
mbps	Megabits per second
MHCPM	multi-h Continuous Phase Modulation
MHz	Megahertz
MO	Modulation
mwatt	Megawatt
N	(connector type) Threaded RF connector
OQPSK	Offset Quadrature Phase Shift Keying
PCMFM	Pulse Code Modulation/Frequency Modulation
PF	Parallel Port Frequency
PL	Power Level
PM	Parallel Port Mode
PM	Phase Modulation
PSK	Phase Shift Keying
PW	Parameter Write option
QPSK	Quadrature Phase Shift Keying
QT	Query Temperature option
RC	Recall Configuration option
RF	Radio Frequency
RG	Reverse Gender option
RJ-45	Ethernet Connection Jack
RN	Randomizer option
RS-232	Recommended Standard 232 (Serial Communications)
SC	Startup Configuration option
SN	Serial Number
SOQPSK	Shaped Offset Quadrature Phase Shift Keying

Acronym	Description
SOQPSK-TG	Shaped Offset Quadrature Phase Shift Keying –Telemetry Group
SV or PS	Preset Save option
TIMTER	Tier I Missile Test Transmitter
TRL	Tracking Loop
TTL	Transistor Transistor Logic
UDP	User Datagram Protocol
UQPSK	Unbalanced Quadrature Phase Shift Keying
US	Upper S-band
USB	Universal Serial Bus
UUT	Unit Under Test
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
VP	Variable Power option
VR	Variable Reference Level
VSWR	Voltage Standing Wave Ratio
W	Watt
WAN	Wide Area Network
WV	Wide Input Voltage Range option