



HIGH PERFORMANCE BLOCK UPCONVERTERS



MODEL NUMBER SUPPLIED

UPB-1B-6.1-IN	UPB-1B-13
UPB-1B-6.25	UPB-1B-14.125
UPB-1B-6.9	UPB-1B-14.25
UPB-1B-8.15	UPB-1B-17.85
UPB-1B-8.2	UPB-1B-17.7

OPTIONS SUPPLIED

Option 1: High Performance Phase Noise (see Section 1 for specifications)
Option 10B: Higher Frequency Stability (see Section 1 for specifications)
Option 10C: Highest Frequency Stability (see Section 1 for specifications)
Option 17C: RS232 Remote Interface

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DOCUMENTATION REVISIONS

The purpose of this section is to chronicle any and all changes made in this manual, in regards to both technical information concerning this piece of equipment, and the actual format/function of this document.

1/30/06: REV.A TO REV.B

BLOCK 159232 REV.C TO REV.G
ADDED J7 AUXILIARY CONTROL CONNECTOR TO SECTION 1.2.1
ADDED ESD WARNING TO SECTIONS 2 AND 5
ADDED SECTION 3.8, "AUXILIARY CONTROL INTERFACE OPERATION (RS485/RS422)"
IN SECTION 4.3.4, CHANGED P/N FROM 154500 TO 152929
IN SECTION 4.3.5, CHANGED P/N FROM 157824 TO 155495
CHANGED SECTION HEADING 4.3.8 TO 4.3.6
REMOVED PHRASE "SECTION 6.2" FROM SECTION 5.2

6/29/06: REV.B TO REV.C

ADDED AUXILIARY CONTROL INTERFACE WIRING CHART TO SECTION 1.2.1
ADDED AUXILIARY CONTROL DESCRIPTION TO TABLE 2-1.
REMOVED LINE BEFORE "AC POWER" IN SECTION 3.1.1
ADDED "REMOTE INTERFACE, AUXILIARY CONTROL INTERFACE & FREQUENCY REFERENCE" TO MENU KEY IN SECTION 3.2.1
ADDED ETHERNET SUBNET MASK/GATEWAY/PASSWORD DISPLAY LINES IN SECTION 3.2.4
ADDED SECTION 3.2.5 - AUXILIARY CONTROL INTERFACE OPERATION MENU
CHANGED SECTION 3.2.5 - AUXILIARY MENU TO SECTION 3.2.6 - FREQUENCY REFERENCE MENU AND
ADDED ALL REFERENCES TO "FREQUENCY REFERENCE" AND "LOCAL OSCILLATOR SOURCE."
CHANGED UTILITY MENU TO SECTION 3.2.7
CHANGED UNIT TITLE MENU TO SECTION 3.2.8
CHANGED 'C' LANGUAGE PROGRAM IN SECTION 3.4.1
SECTION 3.6.1 - REMOVED "EST" FROM COMMAND CODE CHART
CHANGED "r" PARAMETERS IN SECTION 3.6.17 TO THE FOLLOWING:
r: ASCII numeric character
0 = internal reference, internal LO
1 = external reference, internal LO
2 = internal reference, external LO (if applicable)
3 = external reference, external LO (if applicable)

7/13/07: REV.C TO REV.D

COMPLETELY REDESIGNED MANUAL WITH ADOBE INDESIGN
BLOCK 159232 REV.G TO REV.K

6/16/08: REV.D TO REV.E

PG.1 - IN **FEATURES**, CHANGED **TWO MONITOR AND CONTROL PORTS TO THREE MONITOR AND CONTROL PORTS**
PG.2 - ADDED NEW REAR PANEL PHOTO
PG.3 - ADDED NEW INTERIOR PANEL PHOTO
PG.10 - ADDED **ETHERNET INTERFACE** TO MENU KEY LIST
PG.14 - ADDED FIGURE 3-7a
PG.15 - REMOVED (**SERIAL BUSES ONLY**) FROM **BAUD RATE** AND **PARITY** HEADINGS
PG.15 - REMOVED **SERVICE REQUEST (IEEE-488 ONLY)** SECTION
MOVED **AUXILIARY CONTROL INTERFACE OPERATION MENU** TO PAGE 15 AND RENUMBERED ALL FIGURES THROUGHOUT THE REST OF SECTION 3.
PG.16 - CREATED NEW **ETHERNET CONTROL INTERFACE** SECTION
PG.21 - REMOVED **IEEE-488 MESSAGE PROTOCOL** AND **IEEE-488 MESSAGE FORMAT** SECTIONS
PG.32 - REMOVED **IEEE-488 SERVICE REQUEST** SECTION
PG.43 - ADDED BLOCK 182897
PG.44 - ADDED BLOCK 180070
PG.49 - ADDED CONTROL BOARD P/N 175022
PG.52 - COMPLETELY RE-WROTE **INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT** SECTION

11/6/08: REV.E TO REV.F

CORRECTED J1A CALLOUT IN FIGS. 1-2, 1-3, 1-4 (WAS INPUT, NOW OUTPUT)

4/16/09: REV.F TO REV.G

- PG.5 - REPLACED **J6 PINOUTS** WITH **J6A** AND **J6B PINOUTS**
- PG.9 - REPLACED **J6 DESCRIPTION** WITH **J6A** AND **J6B DESCRIPTIONS** IN TABLE 2-1
- PG.9 - COMPLETELY REWROTE **J7 DESCRIPTION** IN TABLE 2-1
- PG.11 - CHANGED **ATT:** TO **ATT: or AT1:** IN **MAIN MENU**
- PG.11 - ADDED **AT2: Attenuation 2**
- PG.12 - ADDED FIGURE 3-3a
- PG.12 - CHANGED **ATT:** TO **ATT: or AT1**
- PG.12 - ADDED (if applicable) TO **Tx/Rx: Mute Status**
- PG.13 - ADDED **AT2: Attenuation 2**
- PG.15 - ADDED **Log Cleared, Power Supply fault/recovery, Attenuation 2 change, Nonvolatile memory fault, Temperature fault/recovery, Module Communications fault/recovery AND AMP Current fault/recovery** TO **REPORTABLE EVENTS LIST**
- PG.15 - REMOVED **RTS/CTS PARAMETER** AND REWROTE ALL OTHERS EXCEPT CONTROL IN **REMOTE INTERFACE OPTION MENU**
- PG.16 - REMOVED FIGURE 3-7a
- PG.16 - COMPLETELY REWROTE **BUS SELECTION HEADER** AND REMOVED **RTS/CTS SELECTION**
- PG.18 - REMOVED **IP ADDRESS**
- PG.22 - COMPLETELY REWROTE **CHECKSUM CALCULATION**
- PG.23 - ADDED THE FOLLOWING COMMAND CODES; **ATT/AT1, ATN/AN1, AT2, AN2, BFR, EAD, FRN, MST, REV/VER, TMP**
- PG.24 - IN **ALR, e, f, h and i** no longer listed as **Reserved for future use**
- PG.24 - ADDED **ATT OR AT1** COMMAND CODE
- PG.25 - ADDED **ATN OR AN1** AND **AT2** COMMAND CODES
- PG.26 - ADDED **AN2** AND **BFR** COMMAND CODES
- PG.28 - ADDED (**Aaaa**) TO **COM** COMMAND CODE
- PG.29 - ADDED **EAD** COMMAND CODE
- PG.29 - ADDED **FRN** COMMAND CODE
- PG.30&31 - ADDED NEW EVENT INDICATORS FOR **000, 002, 003, 004-013, 127, 128, 129** AND **130-255**
- PG.31 - ADDED (**Aaaa**) TO **MEM** COMMAND CODE
- PG.32 - ADDED **MST** COMMAND CODE
- PG.34 - **REV** COMMAND CODE NOW **REV OR VER**
- PG.34 - ADDED (**Aaaa**) TO **SET** COMMAND CODE
- PG.35 - ADDED (**Aaaa**) TO **STA** COMMAND CODE
- PGS.28, 31, 34, 35 - ADDED - = **Does not apply** TO **IF INDICATOR CODES**
- PG.36 - ADDED **TMP** COMMAND CODE
- PG.37 - MOVED **AUXILIARY CONTROL INTERFACE OPERATION** FROM END OF SECTION 3 TO THIS PAGE
- PG.48 - BLOCK DIAGRAM 182897 REV. A TO REV.B
- REPAGED SECTIONS 3 THRU 5 PER CHANGES TO TEXT

5/19/09: REV.G TO REV.H

- PG.52 - CHANGED PHASE NOISE FOR **136284-1** FROM **114/144** TO **120/150**

2/22/10: REV.H TO REV.J

- COVER - ADDED **UPB-1B-8.2**
- PG.4 - ADDED **UPB-1B-8.2**
- PG.6 - CHANGED **AMPLITUDE RESPONSE** SPEC FROM **±0.25** TO **±0.5**
- PG.50 - ADDED **UPB-1B-8.2**
- PG.51 - CHANGED FOLLOWING **OUTPUT MODULE SPECS: POUT** (ADDED **+16 dB maximum**) AND **DC VOLTAGE** (**+15V** TO **+12V**, ADDED **500 mA maximum**)
- PG.53 - ADDED **UPB-1B-8.2**
- PG.55 - ADDED **FAN REPLACEMENT NOTE**

8/9/11: REV.J TO REV.K

- PG.6 - CHANGED **FUSE** FROM **T1.25A** TO **2A (INTERNAL)**
- PG.10 - REMOVED **Fuse** FROM **EXTERNAL CONTROLS**
- PG.10 - REMOVED **+5 ±0.2V** FROM **INTERNAL CONTROLS**
- PG.10 - REMOVED **FIGURE 3-1. INTERNAL POWER SUPPLY ADJUSTMENT**; RENUMBERED ALL REMAINING FIGURES IN **SECTION THREE**
- PG.18 - ADDED SENTENCE ABOUT **DHCP** IN **IP ADDRESS**
- PG.20 - ADDED **NOTE**
- PG.23 - ADDED **BNN**
- PG.27 - ADDED **BNN**

8/9/11: REV.J TO REV.K (CONTINUED)

- PG.37 - ADDED **NOTE**
- PG.39 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**
- PG.42 - ADDED **Version 1.0** TO FIRST SENTENCE OF **Access via SNMP**
- PG.43 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**
- PG.49 - BLOCK DIAGRAM 182897 REV.B TO REV.C
- PG.50 - BLOCK DIAGRAM 180070 REV.B TO REV.C
- PG.55 - REPLACED **POWER SUPPLY 135782** WITH **189400**
- PG.58 - COMPLETELY REWROTE **13TH BULLET**

7/8/12: REV.K TO REV.L

- COVER - ADDED MODEL NO. **UPB-1B-17.7**.
- PG.vi - ADDED **INDEX** TO TABLE OF CONTENTS.
- PG.vii - CHANGED **Figure 4-1** TITLE FROM **Block Diagram, Block Upconverter** TO **Figure 4-1. Block Diagram, Block Downconverter UPB-1B-XX**.
- PG.vii - CHANGED **Figure 4-2** TITLE FROM **Block Diagram, Block Upconverter (Three Remotes)** TO **Figure 4-2. Block Diagram, Block Downconverter UPB-1B-XX**.
- PG.vii - ADDED **Figure 4-3. Block Diagram, 175022 Controller, 3 Remote Interfaces**.
- PG.4 - ADDED MODEL NO. **UPB-1B-17.7** TO **SINGLE BAND BLOCK UPCONVERTERS** TABLE.
- PGS.47&48 - ADDED TITLE **Figure 4-1. Block Diagram, Block Upconverter UPB-1B-XX**.
- PGS.47&48 - UPDATED BLOCK DIAGRAM **Figure 4-1** 159232 FROM REV.K TO REV.L.
- PG.49 - ADDED TITLE **Figure 4-2. Block Diagram, Block Upconverter UPB-1B-XX**
- PG.49 - UPDATED BLOCK DIAGRAM **Figure 4-2** 182897 FROM REV.C TO REV.E.
- PG.50 - ADDED TITLE **Figure 4-3. Block Diagram, 175022 Controller, 3 Remote Interfaces**.
- PG.50 - UPDATED BLOCK DIAGRAM **Figure 4-3** 180070 FROM REV.B TO REV.C.
- PG.51 - ADDED MODEL NO. **UPB-1B-17.7** TO **SINGLE BAND BLOCK UPCONVERTERS** TABLE.
- PG.51 - ADDED MODEL NO. **UPB-1B-17.7** TO **INPUT MODULE, FIXED ATTENUATOR** TABLE.
- PG.54 - ADDED MODEL NO. **UPB-1B-17.7** TO **PHASE LOCK SOURCE, COUPLER, FIXED ATTENUATOR, FILTER** TABLE.

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SECTION 1: INTRODUCTION

GENERAL DESCRIPTION

The MITEQ Block Upconverter uses a single-conversion technique with a crystal oscillator reference for the local oscillator. Model UPB-1B-6.1-IN is a frequency non-inverting system.

The upconverter translates the IF input frequency band to the RF output frequency band. Phase noise, amplitude flatness, group delay and spurious outputs have been given optimum consideration to provide the user with a transparent frequency conversion for all video and data applications.

Relays are provided for summary alarm output that may be used for monitoring at a remote console and for redundant switching.

FEATURES

- **Three monitor and control ports**
 - Standard RS485/RS422 remote interface which can be substituted with RS232 (Option 17C)
 - RS485/RS422 auxiliary control interface which can be configured to control an external HPA or as an alternate remote interface
 - 10/100Base-T Ethernet interface
- **Automatic 5/10 MHz internal/external reference selection**
- **RS485/RS422 remote control**
- **RF/IF signal monitor port**
- **30 dB gain control**
- **Low phase noise**
- **Low intermodulation distortion**
- **64 programmable memory locations**
- **High frequency stability**
- **Summary alarm**
- **Mute function on alarm or external mute input control**
- **Test points**
- **CE mark**

PHYSICAL

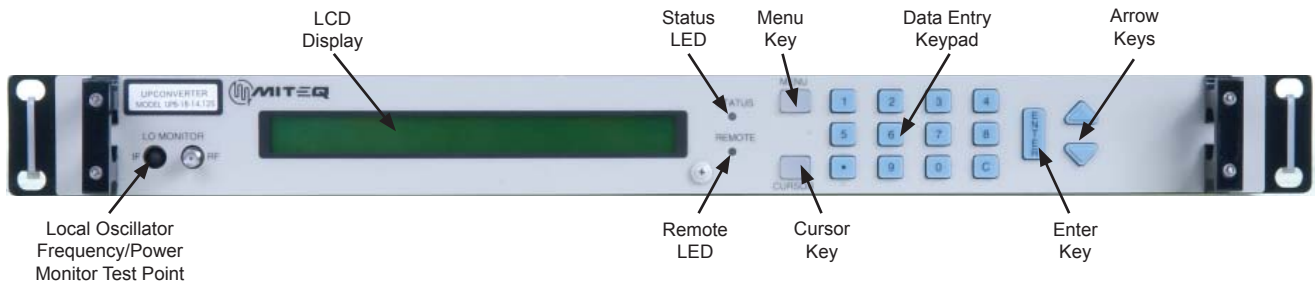


Figure 1-1. Front View, UPB-1B-XX Block Upconverter

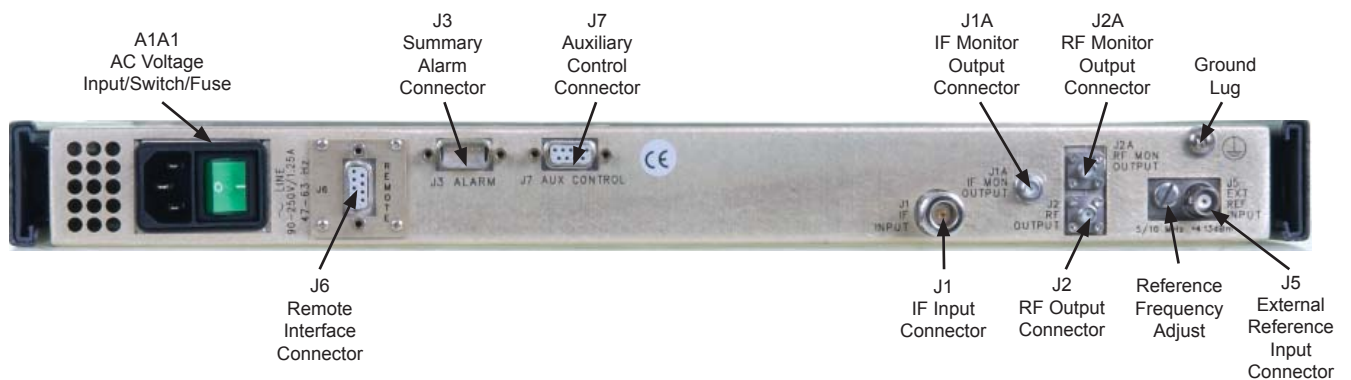


Figure 1-2. Rear View, UPB-1B-XX Block Upconverter

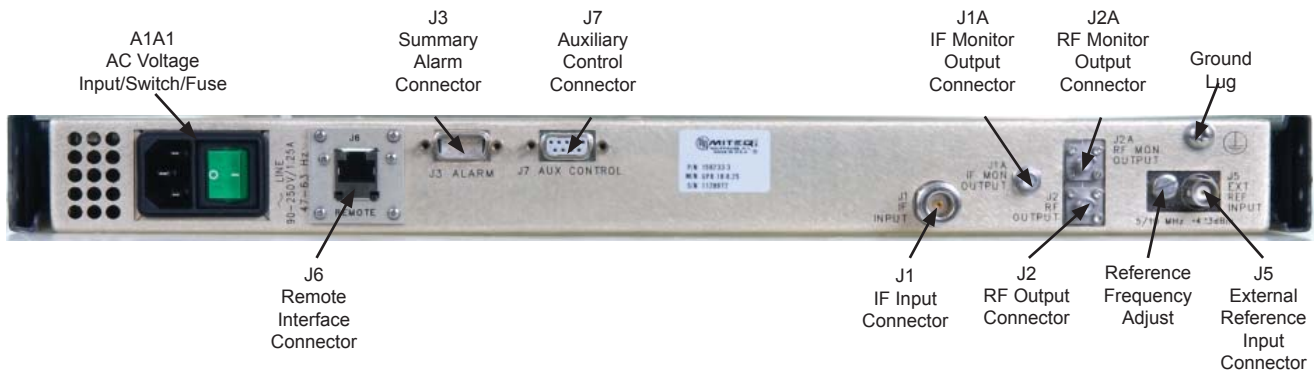


Figure 1-3. Rear View, UPB-1B-XX Block Upconverter (Option 17H)

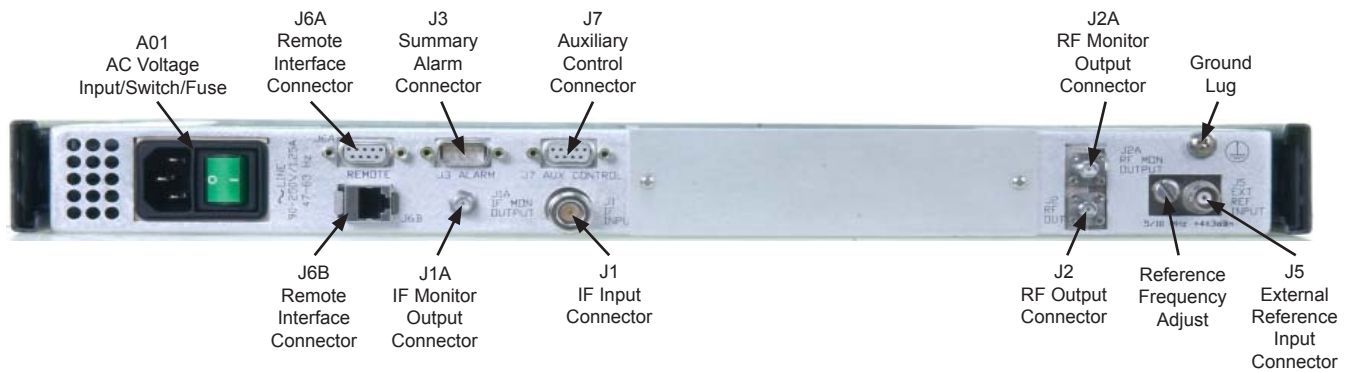


Figure 1-4. Rear View, UPB-1B-XX Block Upconverter (S/N 1389303 and later)

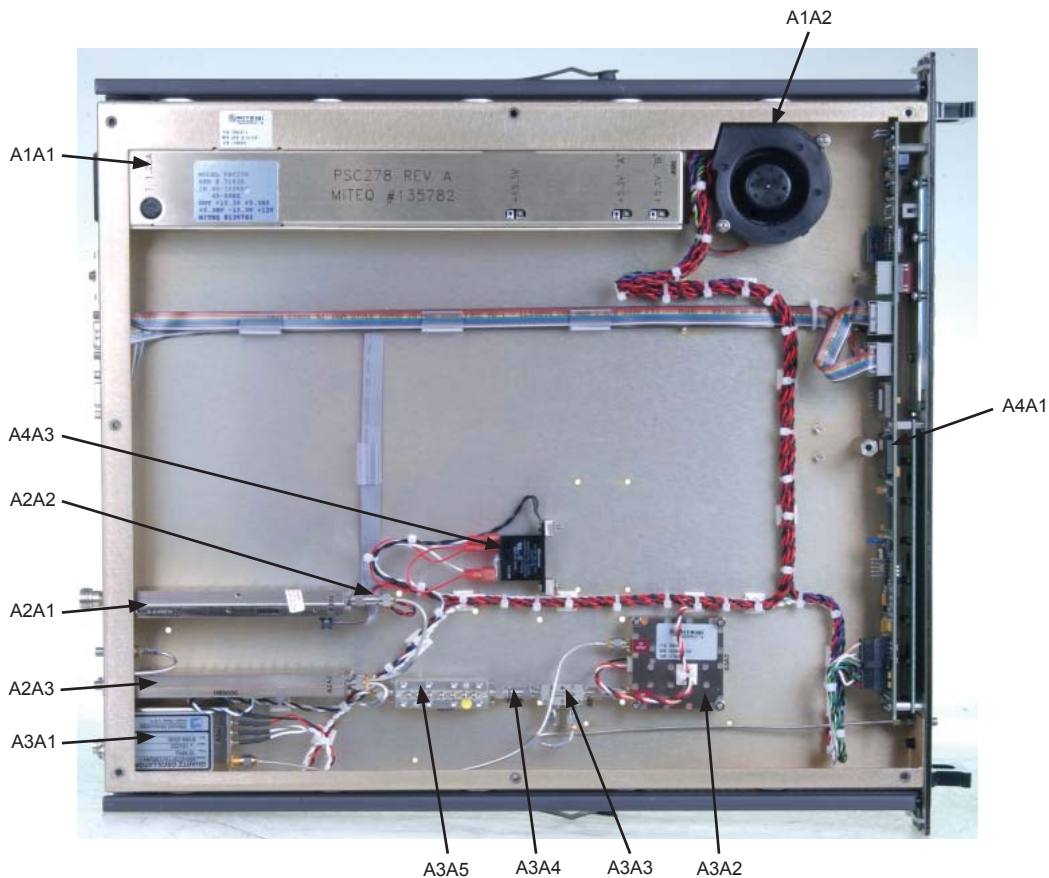


Figure 1-5. Interior View, UPB-1B-XX Block Upconverter

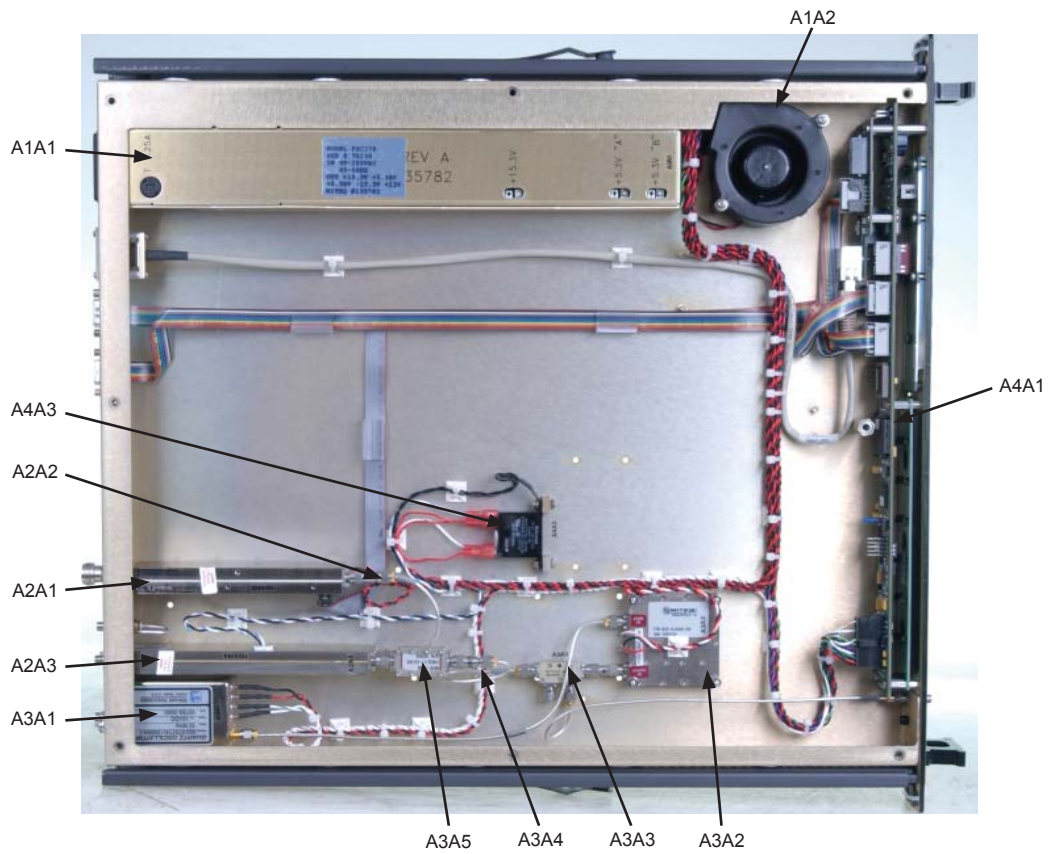


Figure 1-6. Interior View, UPB-1B-XX Block Upconverter (Option 17H)

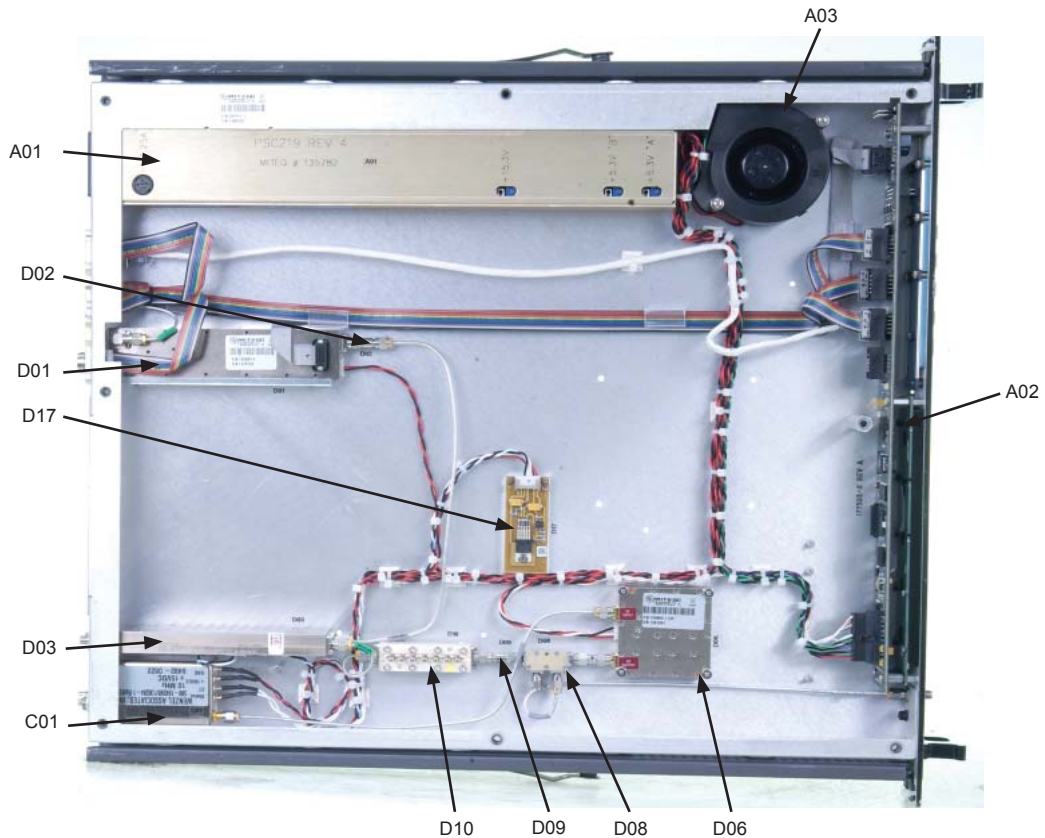


Figure 1-7. Interior View, UPB-1B-XX Block Upconverter (S/N 1389303 and later)

MODEL NUMBERS

Converter Model Numbers

Single Band Block Upconverters			
Model Number	Input band (GHz)	LO frequency (GHz)	Output band (GHz)
UPB-1B-6.1-IN	0.95-1.525	7.375	5.85-6.425
UPB-1B-6.25	0.95-1.75	4.9	5.85-6.65
UPB-1B-6.9	0.95-1.35	5.75	6.7-7.1
UPB-1B-8.15	0.95-1.45	6.95	7.9-8.4
UPB-1B-8.2	0.95-1.45	7.0	7.95-8.45
UPB-1B-13	0.95-1.45	11.8	12.75-13.25
UPB-1B-14.125	0.95-1.7	12.8	13.75-14.5
UPB-1B-14.25	0.95-1.45	13.05	14.0-14.5
UPB-1B-17.85	0.95-2.05	16.35	17.3-18.4
UPB-1B-17.7	0.95-1.75	16.35	17.3-18.1

EQUIPMENT CHARACTERISTICS

PHYSICAL

Weight	18 pounds nominal
Chassis dimensions.....	19" x 1.75" panel height x 20" maximum
Connectors	
RF	SMA female
RF monitor.....	SMA female
IF	N female
IF monitor	SMA female
LO monitors.....	SMA female
Alarm	DE-9P
External reference	BNC female
Remote interface	DE-9S for RS485, RS422 and RS232, RJ-45 female for Ethernet
Primary power input.....	IEC-320
Auxiliary control interface.....	DE-9S
Ground Lug.....	10-32 screw w/washers

Connector Wiring Information

Alarm Connector (J3)			
Function	Pins	Normal	Fault
Summary Alarm	4,5	Open	Closed
Summary Alarm	5,6	Closed	Open
Redundancy Alarm	1,2	Open	Closed
Redundancy Alarm	2,3	Closed	Open
External Alarm Input	7,8	User defined	

Remote Interface Connector (J6A)			
RS485 and RS422		RS232	
Pin	Designation	Pin	Designation
1	Ground	2	Rx Data
3	Data Out -	3	Tx Data
5	Data In -	5	Ground
7	Data Out +	7	RTS
9	Data In +	8	CTS

Ethernet Interface Connector (J6B)		
RJ-45 Pin	Color	Signal
1	white/orange	Tx+
2	orange	Tx-
3	white/green	Rx+
4	blue	unused
5	white/blue	unused
6	green	Rx-
7	white/brown	unused
8	brown	unused

Auxiliary Control Interface (J7)	
RS485 and RS422	
Pin	Designation
1	Ground
3	Data Out -
5	Data In -
7	Data Out +
9	Data In +

FUNCTIONAL

Converter Performance Specifications	
Type	Single conversion
Frequency step size	See Model Number Table
Frequency sense	No inversion except for UPB-1B-6.1-IN
Input characteristics	
Frequency Impedance Return loss Signal monitor Input level (non-damage)	See Model Number Table 50 Ohms 18 dB minimum -20 dBc nominal +20 dBm maximum
Output characteristics	
Frequency Impedance Return loss Signal monitor Power output at 1 dB compression point	See Model Number Table 50 Ohms 20 dB minimum -20 dBc nominal +13 dBm minimum
Transfer characteristics	
Gain Gain slope Noise figure Image rejection Level stability Amplitude response Group delay Intermodulation distortion (third order) AM/PM conversion Spurious outputs Signal related Signal independent Gain adjustment Upconverter mute Frequency stability Standard Option 10B Option 10C External reference Phase noise LO Monitors Primary power Power Consumption	+33 dB \pm 3 dB @ 23°C 0.03 dB/MHz 15 dB maximum at minimum attenuation 80 dB minimum \pm 0.25 dB/day at constant temperature \pm 0.5 dB/40 MHz \pm 1.0 dB over any band 1 ns over any band typical With two 0 dBm output signals, 50 dBc minimum 0.1°/dB maximum up to 0 dBm output -65 dBc up to 0 dBm output -75 dBm maximum 30 dB in 0.2 dB steps 80 dB minimum on summary alarm, external mute input or remote command \pm 2 x 10 ⁻⁸ , 0 to 50°C \pm 5 x 10 ⁻⁹ /day typical (fixed temperature after 24 hours on time) \pm 5 x 10 ⁻⁹ , 0 to 50°C 1 x 10 ⁻⁹ /day typical (fixed temperature after 24 hours on time) \pm 2 x 10 ⁻⁹ , 0 to 50°C 1 x 10 ⁻⁹ /day typical (fixed temperature after 24 hours on time) 5 MHz or 10 MHz, +4 \pm 3 dBm Unit will automatically switch to internal reference if External Reference level falls below +1 dBm nominal. See Table 2 for Standard Phase Noise See Table 3 for Option 1 Phase Noise -5 dBm to -15 dBm 90-250VAC 50 Watts nominal
Fuse	2A (internal)
Environmental (Operating)	
Ambient temperature Relative humidity Atmospheric pressure	0 to +50°C Up to 95% at 30°C Up to 10,000 feet

Converter Performance Specifications (Continued)	
Environmental (Non-operating)	
Ambient temperature Relative humidity Atmospheric pressure Shock and vibration	-50 to +70°C Up to 95% at 40°C Up to 40,000 feet Normal handling by commercial carriers

TABLE 2						
	Offset (Hz)					
LO Frequency	10	100	1K	10K	100K	1M
Below 9 GHz, Level (dBc/Hz)	-51	-73	-83	-93	-103	-103
Above 9 GHz, Level (dBc/Hz)	-45	-67	-77	-87	-97	-97

TABLE 3 (Option 1)						
	Offset (Hz) (maximum/typical)					
LO Frequency	10	100	1K	10K	100K	1M
Below 6.7 GHz, Level (dBc/Hz)	-54/-56	-78/-82	-112/-114	-119/-121	-119/-127	-136/-145
6.7 to 8 GHz, Level (dBc/Hz)	-53/-55	-76/-80	-110/-112	-117/-119	-117/-125	-134/-143
8 to 12 GHz, Level (dBc/Hz)	-48/-50	-73/-77	-108/-110	-115/-117	-115/-123	-132/-141
12 to 13.4 GHz, Level (dBc/Hz)	-48/-50	-72/-76	-106/-108	-111/-113	-113/-121	-130/-139
13.4 to 16 GHz, Level (dBc/Hz)	-47/-49	-70/-74	-104/-106	-111/-113	-111/-119	-128/-137
16 to 24 GHz, Level (dBc/Hz)	-42/-44	-68/-71	-102/-104	-109/-111	-109/-117	-126/-135

SECTION 2: INSTALLATION



**PROPER GROUNDING PRECAUTIONS
ARE REQUIRED AT ALL TIMES TO
PREVENT DAMAGE FROM ESD WHILE
HANDLING THIS UNIT**

UNPACKING, STORAGE, RESHIPMENT

Carefully open the shipping container and remove the equipment. Inspect the equipment thoroughly and report any damage.

If the equipment is to be stored, it should be wrapped in plastic and kept in a clean, dry place.

If the equipment is to be reshipped for any reason, wrap in heavy plastic and ship in a heavy (275 lb. test) double wall carton. At least three inches of a solid packing material should be used on all sides of the unit. The carton should be marked to indicate that it contains fragile electronic equipment.

MOUNTING



This equipment is NOT for use in a domestic environment. It is intended for rack mounting. This equipment MUST be securely mounted; Operator injury may occur if this is not done.

Slides are provided for mounting in a standard 19" equipment rack.

TURN-ON PROCEDURE

- After mounting, make all external connections per Table 2-1.
- Apply power to the equipment using the power On/Off switch.
- Allow 20 minutes for warm-up of the internal crystal oscillator reference. The unit should be left in the power-on state for 24 hours in order to reach the specified performance for frequency stability.
- System is now operational.

Table 2-1. External Connections	
DESIGNATION	DESCRIPTION
Ground Lug	Connect the Ground Lug on the rear panel of the equipment to the Protective Earth connection of the building.
Power Cord	Attach the power cord to the rear panel AC power inlet. Connect the other end to the power source. Refer to national wiring standards for the correct connection to the power source.
Alarm Connector (J3)	This connector is a form-c contact closure indicating the summary alarm status of the equipment.
Remote Connector (J6A)	The Remote Interface connector allows the operator to monitor and control the equipment from a remote location using a serial interface. See Page 5 for wiring information.
Ethernet Connector (J6B)	The Ethernet Interface connector allows the operator to monitor and control the equipment from a remote location using a 10baseT interface
Auxiliary Connector (J7)	The Auxiliary Interface connector allows the operator to monitor and control the equipment from a remote location using a serial interface. This connector also allows connection to a NSU redundant switch. See Page 5 for wiring information.
IF Input	Connect the IF Input to J1 of the unit.
RF Output	Connect the RF Output to J2 of the unit.

SECTION 3: OPERATION

CONTROLS

EXTERNAL CONTROLS

AC Power

Use the rear panel power on/off switch to control AC power to the unit.

INTERNAL CONTROLS

Power Supply Output Voltage Adjustment

Power supply voltages are adjusted from potentiometers located on the power supply. Adjustment should be made using an insulated tuning tool. Voltage tolerances are $+5.3 \pm 0.2V$ and $+15.3 \pm 0.25V$. There is no adjustment for the $-15.3V$ output.

FRONT PANEL OPERATIONS

A Liquid Crystal Display (LCD) and Light Emitting Diode (LED) indicators have been organized such that important information is available at a glance. The keyboard is divided into functional groups to allow an operator to easily change any parameter from the front panel. See Figure 1-1 for the physical layout of the front panel.

The red “ALARM” LED indicates an active alarm. The alarm LED lights amber when no alarms are active but alarms have been recorded in the log. This LED does not light when no alarms are active and the log has been cleared.

The green “REMOTE” LED is lit when the unit is under remote control and is off while the unit is under local control.

KEYPAD OPERATION



Figure 3-1. Block Converter Front Panel

The keypad includes two keys that are for menu navigation, a “MENU” key and a “CURSOR” key. A full set of numeric Data Entry keys, including up and down arrows, simplify operator entries. A beeper will sound to acknowledge each key press. An error tone will sound for illegal entries.

While in Remote mode, local data entry is prohibited. However, all system parameters can be examined.

After one minute of idle time the display will default to the Main.

Menu Key

The "MENU" key allows the operator to switch the context of the LCD between various menus with ease. This key provides instant access to all pertinent data in both Local and Remote modes. Sequential menu key actions will show the menus in the following order:

- Main
- Alarm
- Remote Interface
- Auxiliary Control Interface
- Ethernet Interface
- Frequency Reference
- Utility (Time, Date, and contrast control)
- Unit Title

Cursor Key

The "CURSOR" key cycles through each of the data fields in a given menu. This accommodates the simple activation of a field within a menu for data entry.

Data Entry Keys

The Data Entry keys allow the operator to enter specific data into an active field. Data is entered by using the numeric keypad and pressing "ENT", or by using the up and down arrows to scroll until the desired setting is displayed and then pressing the "ENT" key. If using the arrow keys to change attenuation settings, the "ENT" key need not be pressed. Invalid entries will be ignored and cause an error tone to sound. Any data entry not terminated by pressing the "ENT" key will expire after ten seconds, an error tone will sound, and the display will be restored to its prior setting.

MAIN MENU

If not already displayed, use the MENU key to access the Main Menu.

The main menu is the default menu at power-up. This menu provides access to the following parameters of the frequency converter:

- L: LO or Translation Frequency
- I: Input Frequency Band (Factory set and displayed for informational purposes only)
- O: Output Frequency Band (Factory set and displayed for informational purposes only)
- ATT: or AT1: Attenuation
- Tx or Rx: Mute Status (If Applicable)
- MEM: Memory Registers
- Setup Title (12 Characters)
- AT2: Attenuation 2

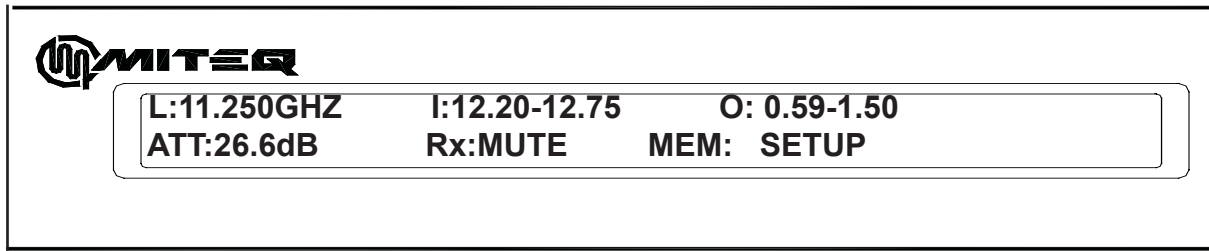


Figure 3-2. Main Menu Display

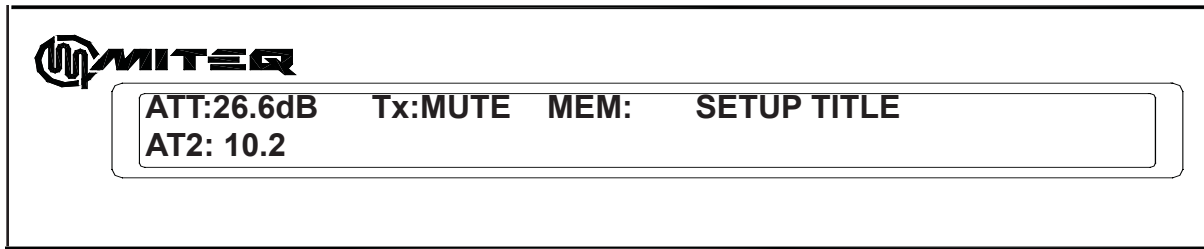


Figure 3-2a. Display Lines 2 and 3 (Where applicable)

L: LO Frequency (Translation Frequency)

To change the LO Frequency:

- Press the “CURSOR” key to select the LO Frequency field on the display.
- Use the numeric data entry keys to enter the desired LO Frequency, or the up and down arrow keys to scan through the valid LO Frequencies.
- Press “ENT” to tune the unit to the desired frequency.

I: Input Frequency Band

The Input Frequency Band that the unit operates at is set at the factory and is displayed for informational purposes only. This parameter is not user selectable.

O: Output Frequency Band

The Output Frequency Band that the unit operates at is set at the factory and is displayed for informational purposes only. This parameter is not user selectable.

ATT: or AT1: Attenuation

To change the attenuation setting of the unit:

- Press the “CURSOR” key to select the attenuation field on the display.
- Use the numeric data entry keys to enter the desired attenuation or the up and down arrow keys to increment or decrement the attenuation.
- If the numeric data entry keys were used, press “ENT” to set the displayed attenuation.

Tx/Rx: Mute Status (If Applicable)

The operator can mute the output of the converter as long as the unit is not in an alarm state. If the unit is in an alarm state, there is no operator override of the Mute. To mute the output of the converter:

- Press the “CURSOR” key to select the “Tx or Rx” field.
- Use the arrow keys to toggle between ON and MUTE until the desired setting is displayed.
- Press “ENT” to apply the selection.

MEM: Memory Registers

The user can store and recall a combination of LO Frequency, Attenuation and Setup Title in each of the sixty-four memory locations, 00 through 63. Memory contents can be stored or reviewed without setting the unit to the parameters indicated in the memory locations.

To store the settings in memory of the unit:

- Press the “CURSOR” key to select the “MEM” field.
- Press either arrow key until “STR” appears in the “MEM” field.

- Press “ENT” to select the store function and the cursor will advance to the memory register field.
- Use the numeric data entry keys or the up and down arrow keys to select the memory register (00 through 63) to be updated. The contents of the memory location will be displayed along with the memory register number. Press “ENT” to select the memory register field and the cursor will advance to the LO Frequency field.
- Enter the LO Frequency to be stored in the memory location.
- Press the “ENT” key and the cursor will advance to the Attenuation field. This will not retune the unit. See note below.
- Enter the Attenuation to be stored.
- Press the “ENT” key and the cursor will advance to the Setup Title field. This will not retune the unit. See note below.
- Use the numeric data entry keys or the arrow keys to enter each character of the Setup Title to be stored. Use the “CURSOR” key to advance to the next character of the title.
- Press “ENT” to store the entire combination of settings and the cursor will advance to the “MEM” field. See note below.
- Press “ENT” again to set the unit to the displayed settings.
- If “ENT” is not pressed after ten seconds, or “MENU” is pressed the “MEM” field will become selected again and the display will be updated to reflect the actual settings.

Note *If “ENT” is not pressed after 10 seconds the display will timeout and the actual setting stored in the memory register will be displayed. If after 30 seconds “ENT” has not been pressed the store function will be terminated.*

To recall the settings from a memory register:

- Press the “CURSOR” key to select the “MEM” field.
- Press either arrow key until “RCL” appears in the “MEM” field.
- Press “ENT” to select the recall function and the cursor will advance to the memory register field.
- Use the numeric data entry keys followed by “ENT” or the arrow keys to recall and view the contents of a memory register (00 through 63) .
- Press “ENT” to set the unit to the retrieved settings.
- If “ENT” is not pressed after ten seconds, or “MENU” is pressed the “MEM” field will become selected again and the display will be updated to reflect the actual settings.

Setup Title

Setup Title length may be up to twelve characters. The range of allowable characters are ASCII printable from 32 decimal (SP) to 122 decimal (z). Use the numeric keypad to enter a numeric digit directly.

To enter a title:

- Press the “CURSOR” key to move the cursor to the Setup Title field. Press an arrow key or press and hold down the “CURSOR” key to select the first letter in the title field.
- Use the up and down arrow keys or the numeric data entry keys to adjust the character in this position.
- Press the “CURSOR” key to advance to the next character position.
- After all of the desired characters are displayed press the “ENT” key. This will save the title and truncate any character that may occupy remaining digits.

AT2: Attenuation 2

Some models are equipped with two attenuator adjustments. To change the second attenuation setting of one of these units:

- Press the “CURSOR” key to select the attenuation 2 field on the display.
- Use the numeric data entry keys to enter the desired attenuation or the up and down arrow keys to increment or decrement the attenuation.
- If the numeric data entry keys were used, press “ENTER” to set the displayed attenuation.

ALARM MENU

If not already displayed, use the MENU key to access the Alarm Menu.

The alarm menu displays the status of the unit's alarms. A "Test Alarm" can be set and cleared from this menu. This menu also allows the operator to review and clear the event log. The Event Log records the time and dates of significant events including all alarm activity. The "ALARM" LED on the front panel will light red when there is an Active Alarm. If there are no Active Alarms, but alarm activity has been stored in the event log, the front panel "ALARM" LED will light amber.

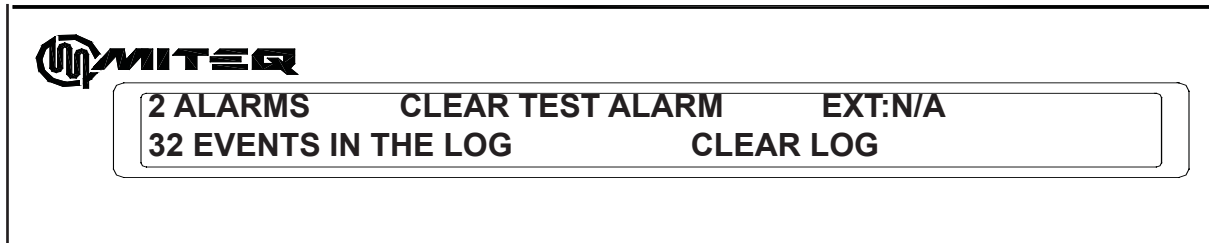


Figure 3-3. Alarm Menu Display

Active Alarms

The number of active alarms is reported in the alarm menu. To view the alarms:

- Press the "CURSOR" key to highlight the Alarms field on the display.
- Use the arrow keys to scroll through all of the active alarms.
- Press the "MENU" key to return to the Alarm Menu.

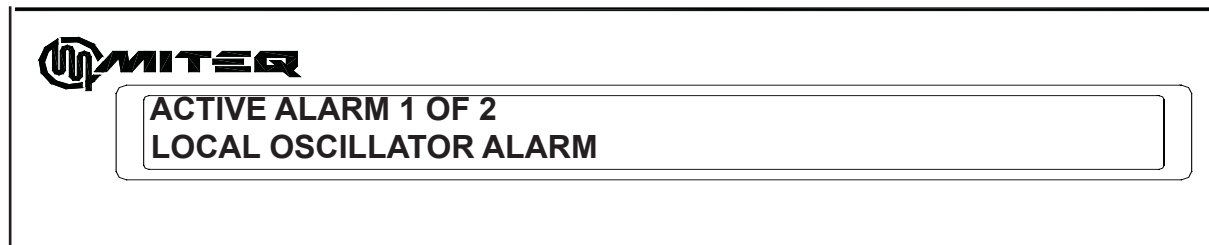


Figure 3-4. Active Alarms Display

Test alarm

The test alarm will cause the status contacts to indicate a fault condition simulating a genuine alarm. To toggle the state of the Test Alarm:

- Press the "CURSOR" key to highlight the Test Alarm field on the display.
- If the Test Alarm is inactive the field will read "SET TEST ALARM". If the Test Alarm is active the field will read "CLEAR TEST ALARM"
- Press the "ENT" key to toggle the state of the Test Alarm.

External Alarm

An external alarm can be sensed by the unit:

- Press the "CURSOR" key to highlight the External Alarm field on the display.
- Use the arrow keys to scroll through three possible settings for the External Alarm Input.
 - N/A - External Alarm Input is ignored
 - NO - Normally Open, a closure will indicate a fault
 - NC - Normally Closed, an open will indicate a fault
- Press the "ENT" key to save the external alarm setting.

Event Log

To view the event log:

- Press the “CURSOR” key to highlight the Event Log field on the display.
- Use the arrow keys to scroll through all of the events stored in the Event Log. Events are displayed in chronological order with the highest numbered event as the most recent.
- Press the “MENU” key to return to the Alarm Menu.

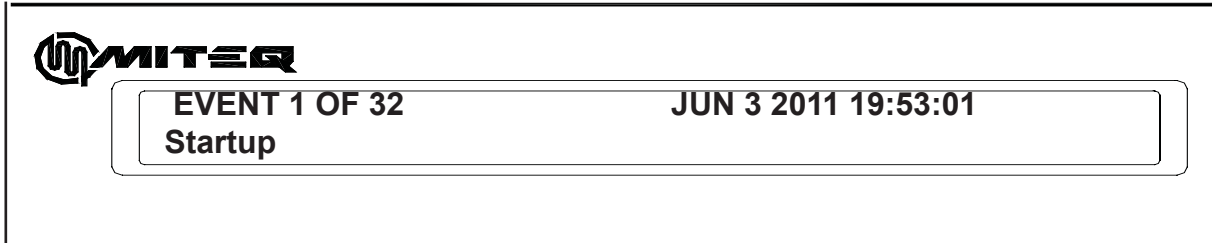


Figure 3-5. Event Log Display

The events that can be reported are:

- Log Cleared
- Unit Startup
- Power supply fault/recovery
- LO fault/recovery
- LO level fault/recovery
- Frequency change
- Attenuation change
- Attenuation 2 change
- Unit Mute/Unmute by an operator
- Test Alarm fault/recovery
- Unit Title change
- External fault/recovery
- Nonvolatile memory fault
- Temperature fault/recovery
- Module Communications fault/recovery
- AMP Current fault/recovery

Clear Event Log

To clear the Event Log of its contents:

- Press the “CURSOR” key to highlight the Clear Log field on the display.
- Press the “ENT” key. A message will appear “PRESS ENT TO CLEAR THE EVENT LOG.”
- Press “ENT” to purge the contents of the event log or Press the “MENU” key to return to the Alarm menu.

REMOTE OPERATION MENU

If not already displayed, use the MENU key to access the Remote Operation Menu.

The remote operation menu allows the operator to configure the remote control parameters and to switch the unit between remote and local control. The following parameters are accessible from the remote operations menu:

- Control: Remote or local control
- Bus: Bus selection RS485 2-wire/RS422 4-wire selectable or fixed RS232
- Address: Remote Control Interface Address
- Baud Rate: Remote Control Interface Baud Rate
- Parity: Remote Control Interface Parity

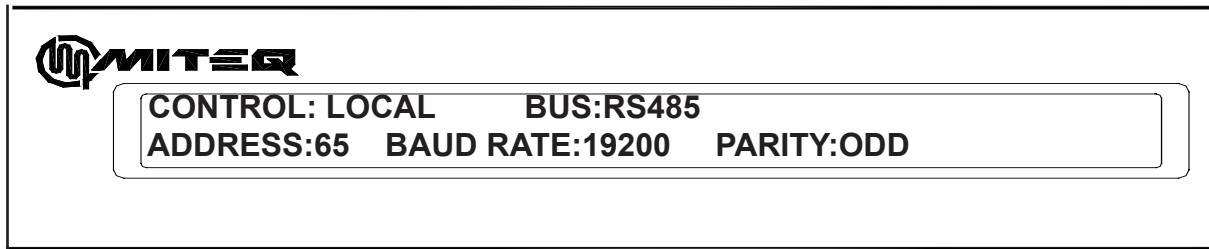


Figure 3-6. RS485 Display Lines 1 and 2

Control: Remote or Local Control

The “REMOTE” LED is lit when the converter is under remote control. The LED is extinguished when the converter is under local control. To toggle between local and remote control:

- Press the “CURSOR” key to select the control field on the display.
- Use the up and down arrow keys to toggle the display between remote and local.
- Press “ENT” to set the control mode.

Bus Selection RS485 2-wire/RS422 4-wire selectable or fixed RS232

In standard units the user can select one of two serial buses RS485 or RS422. On units equipped with optional remote interfaces the remote bus is fixed.

To select the remote bus:

- Press the “CURSOR” key to select the bus field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed.
- Press “ENT” to set the serial bus.

Address: Remote Address

Units equipped with a serial interface can occupy a remote address from 64 to 95 decimal. To select the remote address:

- Press the “CURSOR” key to select the address field on the display.
- Use the numeric data entry keys to enter the desired address or the up and down arrow keys to increment or decrement the displayed address respectively.
- Press “ENT” to save the address.

Baud Rate

To select the baud rate of the serial port:

- Press the “CURSOR” key to select the baud rate field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The baud rates available are 1200, 2400, 4800, 9600, and 19200.
- Press “ENT” to save the selection.

Parity

To select the parity for remote communications:

- Press the “CURSOR” key to select the parity field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The parity can be set to ODD, EVEN, or NONE.
- Press “ENT” to set the parity selection.

AUXILIARY CONTROL INTERFACE OPERATION MENU

If not already displayed, use the menu key to access the Auxiliary Control Interface Operation Menu.

This menu allows the operator to configure the Auxiliary Control Interface parameters. The following parameters are accessible from the remote operations menu:

- Bus: Bus selection (RS485 2-wire/RS422 4-wire)
- Auxiliary Control Interface Address
- Auxiliary Control Interface Baud Rate
- Auxiliary Control Interface Parity

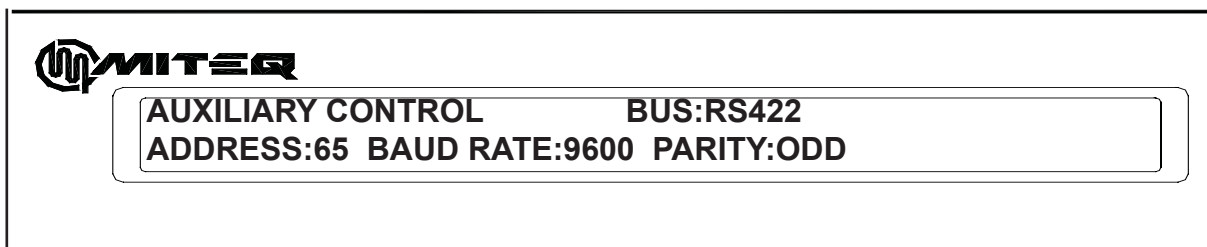


Figure 3-7. Auxiliary Control Interface Operation Menu Display

Auxiliary Control Interface Bus Selection (RS485/RS422 Only)

The user can select one of two serial buses - RS485 for 2-wire operation or RS422 for 4-wire operation.

- Press the “CURSOR” key to select the bus field on the display.
- Use the up and down arrow keys to toggle between the available options until the desired setting is displayed.
- Press “ENTER” to set the Auxiliary Control Interface Bus Selection.

Auxiliary Control Interface Address

The Auxiliary Control Interface can occupy an address from 64 to 95 decimal. To select the remote address:

- Press the “CURSOR” key to select the address field on the display.
- Use the numeric data entry keys to enter the desired address or the up and down arrow keys to increment or decrement the displayed address respectively.
- Press “ENTER” to save the address.

Auxiliary Control Interface Baud Rate

To select the baud rate of the Auxiliary Control Interface:

- Press the “CURSOR” key to select the baud rate field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The baud rates available are 1200, 2400, 4800, 9600 and 19200.
- Press “ENTER” to save the selection.

Auxiliary Control Interface Parity

To select the parity for Auxiliary Control Interface communications:

- Press the “CURSOR” key to select the parity rate field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The parity can be set to ODD, EVEN or NONE.
- Press “ENTER” to set the parity selection.

ETHERNET CONTROL INTERFACE MENU

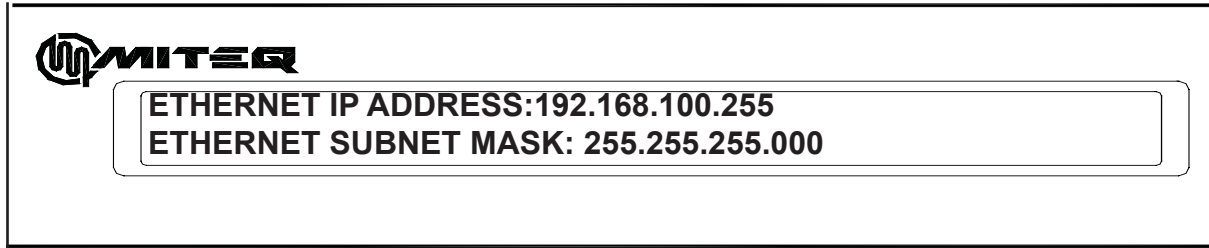


Figure 3-8. Ethernet Display Lines 1 and 2

Ethernet Subnet Mask

Units are equipped with an Ethernet interface and can occupy a IP Address from 000.000.000.000 to 255.255.255.255. Units are shipped at 000.000.000.000 (DHCP) to allow network assignment of IP Address. To select the remote address:

- Press the "CURSOR" key to select the address field on the display.
- Use the numeric data entry keys to enter the desired subnet mask.
- Press "ENTER" to save the subnet mask.

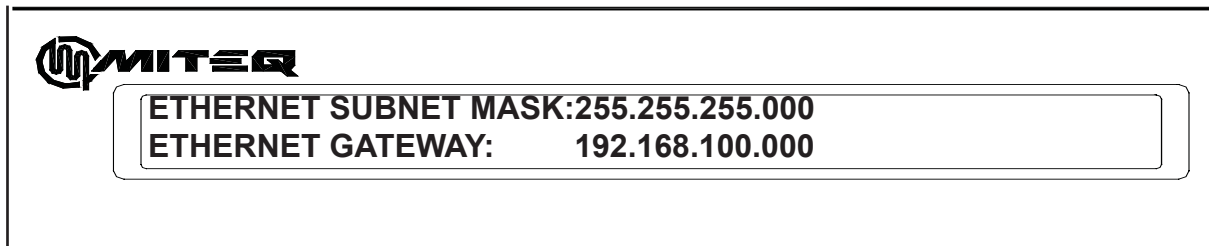


Figure 3-9. Ethernet Display Lines 2 and 3

Ethernet Gateway

Units equipped with an Ethernet gateway can occupy a subnet mask from 000.000.000.000 to 255.255. 255.255. To select the gateway:

- Press the "CURSOR" key to select the Ethernet Gateway field on the display.
- Use the numeric data entry keys to enter the desired gateway.
- Press "ENTER" to save the gateway.

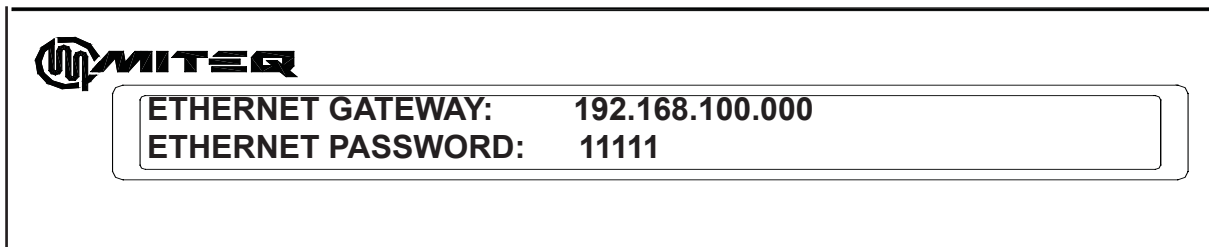


Figure 3-10. Ethernet Display Lines 3 and 4

Ethernet Password

Units equipped with a five digit numeric password. To select the password:

- Press the "CURSOR" key to select the password field on the display.
- Use the numeric data entry keys to enter the desired password.
- Press "ENTER" to save the password.

FREQUENCY REFERENCE MENU

If not already displayed, use the MENU key to access the Auxiliary Menu.

The auxiliary menu provides access to the following parameters of the frequency converter:

- FREQUENCY REFERENCE (0 to 4095): Internal Reference Frequency adjust.
- REF: Frequency Reference Source Status
- LO: Local Oscillator Source Status (if applicable)

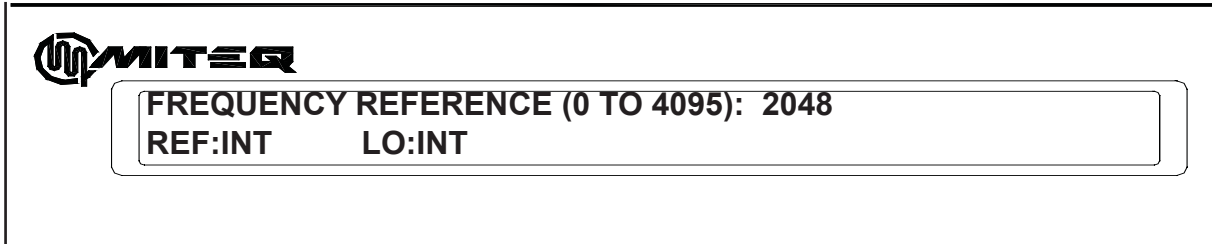


Figure 3-11. Frequency Reference Menu Display

Frequency Reference

In order to adjust the Frequency Reference:

- Press the “CURSOR” key to select the Frequency Reference field.
- The Reference Frequency adjustment employs a 12-bit digital-to-analog converter and can be adjusted from 0 to 4095. Use the numeric data entry keys to enter the desired setting or the up and down arrow keys to increase or decrease the Reference Frequency.
- Press “ENT” to set the displayed Reference Frequency setting.

REF: Frequency Reference Source

In the absence of an external frequency reference the unit automatically switches to an internal reference oscillator. The source of the frequency reference is displayed as “EXT” or “INT” for external or internal respectively. This parameter is not user selectable.

LO: Local Oscillator Source (if applicable)

As an option, there is a toggle switch on the rear panel of the unit that selects the source of one of the local oscillators. This indicator will display the source of the local oscillator as “EXT” or “INT” for external or internal respectively.

UTILITY MENU

If not already displayed, use the MENU key to access the Utility Menu.

The utility menu allows the operator to enter the date and time as well as adjust the contrast of the LCD.



Figure 3-12. Utility Menu Display

Date and Time

In order to adjust the date and time:

- Press the “CURSOR” key to select each of the fields: month, day, year, hour, minute, second.
- If the selected field is correct then press the “CURSOR” key to advance to the next field.
- If the selected field needs adjustment use the arrow keys or the numeric data entry keys to adjust the new display.
- Continue to press the “CURSOR” key adjusting the necessary fields until all of the fields are correct.
- Press “ENT” to set the date and time.

LCD Contrast

In order to adjust the LCD contrast:

- Without pressing the “CURSOR” key use the up arrow key to darken the display. Use the down arrow key to lighten the display. The setting is automatically saved. There is no need to press “ENT.” An error tone will sound if the end of the adjustment range is reached.

Note *If the LCD display is too light or too dark to read use the following sequence to quickly access contrast:*

1. Press the “ENTER” button.
2. Press the “.” button.
3. Use the up arrow to darken the display or the down arrow to lighten the display.

UNIT TITLE MENU

If not already displayed, use the MENU key to access the Unit Title Menu.

This menu displays the model number of the unit, the revision of the firmware, the redundancy switch type and allows the operator to assign a title to the unit. This menu is temporarily displayed during power up of the equipment.

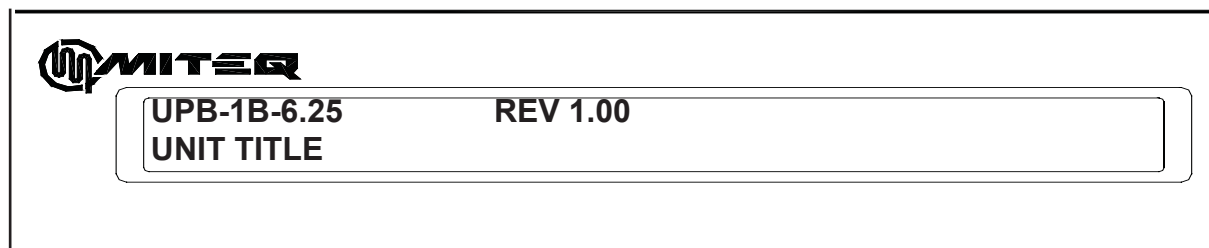


Figure 3-13. Unit Title Menu Display

Unit title

Unit Title length may be up to twenty characters. The range of allowable characters are ASCII printable from 32 decimal (SP) to 122 decimal (z). To enter a title:

- Press the “CURSOR” key to highlight the first letter in the title field.
- Use the up and down arrow keys to adjust the character in this position. Use the numeric keypad to enter a numeric digit directly.

- Press the “CURSOR” key to advance to the next character position.
- After all of the desired characters are displayed press the “ENT” key. This will save the title and truncate any character that may occupy remaining digits.

REMOTE OPERATIONS

The equipment is supplied with an RS485/RS422 bus interface or, as an option, with RS232, IEEE-488 or Ethernet TCP/IP. The command structures for the serial buses are identical.

SERIAL REMOTE PROTOCOL (RS485 / RS422 / RS232)

The command structures for the serial buses; RS485, RS422 and RS232 are identical. All transmissions are multi-byte sequences beginning with a header byte and ending with a trailer byte and checksum byte. The transmitted bytes are all ASCII printable characters in the range of 20H to 7EH.

Serial data format is a 10-bit sequence consisting of 1 Start, 7 Data, 1 Parity, and 1 Stop bit. All characters, including the checksum character, are checked for parity. If any character in a command message contains an error (parity, framing or overrun) or the checksum is incorrect, the command is ignored and no response is made. The remote parameters: Address, Baud Rate, and Parity are programmable from the front panel. The response time from command to acknowledge is 100 ms. maximum.

All messages addressed to the equipment are acknowledged with a response message. The unit continually monitors the communication bus and will accept commands, addressed to it, even in Local mode. When in Local mode, receipt of any SET commands (commands beginning with “\$”) will be ignored and the unit will respond with an error code.

The response time from command to acknowledge is 100 ms. maximum. Since all bytes are ASCII printable characters, a compatible terminal may be used to control the equipment or monitor traffic on the communication bus.

SERIAL MESSAGE FORMAT

The serial message format is as follows:

HEADER - ADDRESS - COMMAND/ERROR CODE - PARAMETERS - TRAILER - CHECKSUM

The Header byte is 7BH, ASCII character “{”.

The address may take on the values from 64 to 95 decimal (40H to 5FH).

Commands are three ASCII characters preceded by an ASCII “?” or “\$.” Commands preceded by “?” are QUERY commands and those preceded by “\$” are SET commands. Query commands are used to examine system parameters while SET commands are intended to modify system parameters.

Parameters are all ASCII printable characters in the range of 20H to 7EH. Numeric parameters are sent MSD first, LSD last. Values which do not adhere to the command format, or are beyond the allowable range, will be rejected and cause the unit to respond with an error code.

The Trailer byte is 7DH, ASCII character “}”.

The checksum byte is the sum modulo 95 of all message characters beginning with the header byte up to and including the trailer byte. The value 32 is subtracted from each character value before taking the modulo 95 sum. The value 32 is added to the final sum to obtain the checksum value. All values are in decimal.

$$\text{Checksum} = \text{MOD} [(\text{character value} - 32), 95] + 32$$

Below is a program, written in the 'C' programming language that illustrates the checksum calculation.

```
/******  
  return the checksum character for the message in array  
  subtract 32 from each character before taking modulo 95 sum  
  add 32 to the final sum  
  mes_len = message length  
*****/  
char check_sum(char *array, unsigned char mes_len)  
{  
  int i,sum;  
  
  for (i = 0, sum = 0; i < mes_len; i++) {  
    sum += *array++ - 32;  
    sum %= 95;  
  }  
  return(sum + 32);  
}
```

COMMAND CODE SUMMARY

The following paragraphs describe each of the command codes.

COMMAND CODES	
ASCII Character String	Function
ALR	System Fault Status
ATT/AT1	Unit Attenuation
ATN/AN1	Unit Attenuation change without storing in event log
AT2	Unit Attenuation 2
AN2	Unit Attenuation 2 change without storing in event log
BFR	Band Frequencies
BND	Frequency Band Information
BNN	Frequency Band without storing in event log
CLK	Internal Calendar / Clock
COM	Unit Combination Command
EAC	External Alarm Configuration
EAD	Ethernet Parameters
FRQ	RF Frequency
FRN	RF Frequency change without storing in event log
LOG	Alarm Activity Log
MEM	Memory Recall / Store
MST	More System Status
MUT	Mute
NAM	Unit title
REF	Frequency Reference Adjust
REV/VER	Firmware Title and Revision
SET	Memory Recall / Store and Set
STA	System Status
TMP	Internal Temperature
USR	User Title
VLT	System Voltages

Note The Multiband Block Converters units are fully backward compatible with the command set for both the 9400 and 9600 series MITEQ frequency converters and translators. Please refer to MITEQ technical notes 25T027 and 25T039 for clarification of these protocols. However, these protocols do not take full advantage of the extended feature set of the Multiband Block Converters units.

ERROR CODES (SERIAL PROTOCOL ONLY)	
ASCII Character	Function
a	Command not recognized
b	Illegal parameter or parameter out of range
c	Unit in Local mode
d	Busy

SYSTEM FAULT STATUS = ALR

The SET command requires nine parameters. All but the first parameter are ignored. The first parameter is used to set or clear a user generated test alarm.

Command	Parameters
Remote Command Sequence:	\$ALRabcdeghi
Unit Response:	\$ALR

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?ALR
Unit Response:	?ALRabcdeghi
	?ALR: Component Fault Status indicator a-i: "0" or "1" ASCII numeric character 0 = No fault 1 = Fault a-i indicates the status of the component faults described below. a Test Alarm b Logged Alarm c LO Alarm d Power Supply Alarm e LO Level Alarm (Optional) f Amplifier Current Alarm (Optional) g External Alarm h Temperature Alarm i Module Communications Alarm

UNIT ATTENUATION = ATT or AT1

The SET command requires a three-digit parameter representing the attenuation in dB. The three-character string "INC" or "DEC" can be used in place of the attenuation parameter to increment or decrement the attenuator by 0.2 dB.

Command	Parameters
Remote Command Sequence:	\$ATTttt, \$ATTINC or \$ATTDEC
Unit Response:	\$ATT

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?ATT
Unit Response:	?ATTttt
	ATT: Attenuation indicator ttt: Three-digit parameter indicating attenuation in tenths of a dB. INC: Used in place of "ttt" to increment the attenuator 0.2 dB DEC: Used in place of "ttt" to decrement the attenuator 0.2 dB

UNIT ATTENUATION WITHOUT LOG = ATN OR AN1

The SET command requires a three-digit parameter representing the attenuation in dB. The three-character string “INC” or “DEC” can be used in place of the attenuation parameter to increment or decrement the attenuator by 0.2 dB. This event is not logged in the unit event log.

Command	Parameters
Remote Command Sequence:	\$ATNttt, \$ATNINC or \$ATNDEC
Unit Response:	\$ATN

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?ATN
Unit Response:	?ATNttt
	ATN: Attenuation indicator ttt: Three-digit parameter indicating attenuation in tenths of a dB. INC: Used in place of “ttt” to increment the attenuator 0.2 dB DEC: Used in place of “ttt” to decrement the attenuator 0.2 dB

UNIT ATTENUATION 2 = AT2

The SET command requires a three-digit parameter representing the attenuation in dB. The three-character string “INC” or “DEC” can be used in place of the attenuation parameter to increment or decrement the attenuator by 0.2 dB. This event is logged in the unit event log.

Command	Parameters
Remote Command Sequence:	\$AT2ttt, \$AT2INC or \$AT2DEC
Unit Response:	\$AT2

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?AT2
Unit Response:	?AT2ttt
	AT2: Attenuator indicator ttt: Three-digit parameter indicating attenuation in tenths of a dB. INC: Used in place of “ttt” to increment the attenuator 0.2 dB DEC: Used in place of “ttt” to decrement the attenuator 0.2 dB

UNIT ATTENUATION 2 WITHOUT LOG ENTRY = AN2

The SET command requires a three-digit parameter representing the attenuation in dB. The three-character string “INC” or “DEC” can be used in place of the attenuation parameter to increment or decrement the attenuator by 0.2 dB. This event is not logged in the unit event log.

Command	Parameters
Remote Command Sequence:	\$AN2ttt, \$AN2INC or \$AN2DEC
Unit Response:	\$AN2

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?AN2
Unit Response:	?AN2ttt
	AN2: Attenuator indicator ttt: Three-digit parameter indicating attenuation in tenths of a dB. INC: Used in place of “ttt” to increment the attenuator 0.2 dB DEC: Used in place of “ttt” to decrement the attenuator 0.2 dB

BAND FREQUENCIES = BFR

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?BFR(b)
Unit Response:	?BFRbIIIIIIIIII-hhhhhhhhhhhOIIIIIIIIII-hhhhhhhhhhh
	BFR: Band frequency indicator b: Single-digit ASCII numeric character representing Band number I: Input frequency range indicator O: Output frequency range indicator IIIIIIIIIII: Twelve-digit ASCII numeric characters, indicating low frequency range in Hz hhhhhhhhhhh: Twelve-digit ASCII numeric characters, indicating high frequency range in Hz

FREQUENCY BAND INFORMATION = BND

The SET command requires one parameter which is one digit in length representing the desired frequency band. If no alarms exist, this command also unmutes the output.

Command	Parameters
Remote Command Sequence:	\$BNDb
Unit Response:	\$BND

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?BND
Unit Response:	?BNDbLfffflffff-ffffOfff-ffff
	BND: Band indicator b: Single-digit ASCII numeric character representing Band number L: LO frequency indicator ffff: Five-digit ASCII numeric characters indicating frequency in MHz l: Input frequency indicator ffff-ffff: Input Frequency Range O: Output Frequency indicator ffff-ffff: Output Frequency Range

FREQUENCY BAND WITHOUT LOG = BNN

The SET command requires one parameter which is one digit in length representing the desired frequency band. If no alarms exist, this command also unmutes the output. This event is not logged in unit event log.

Command	Parameters
Remote Command Sequence:	\$BNNb
Unit Response:	\$BNN

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?BNN
Unit Response:	?BNNbLfffflffff-ffffOfff-ffff
	BNN: Band indicator b: Single-digit ASCII numeric character representing Band number L: LO frequency indicator ffff: Five-digit ASCII numeric characters indicating frequency in MHz l: Input frequency indicator ffff-ffff: Input Frequency Range O: Output Frequency indicator ffff-ffff: Output Frequency Range

INTERNAL CALENDAR / CLOCK = CLK

The SET command requires a twenty-character parameter that sets the date and time of the internal calendar / clock.

Command	Parameters
Remote Command Sequence:	\$CLKYyyyMmmDddHhhNnnSss
Unit Response:	\$CLK

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?CLK
Unit Response:	?CLKYyyyMmmDddHhhNnnSss
	Y: Year indicator yyyy: Year, Four-digit ASCII numeric characters M: Month indicator mm: Month, Two-digit ASCII numeric characters D: Day indicator dd: Day, Two-digit ASCII numeric characters H: Hour indicator hh: Hour, Two-digit ASCII numeric characters N: Minute indicator nn: Minute, Two-digit ASCII numeric characters S: Second indicator ss: Second, Two-digit ASCII numeric characters

UNIT COMBINATION COMMAND = COM

The SET command requires two parameters; a frequency parameter and an attenuation parameter. The frequency parameter can be either the LO frequency or the band number. The mute status is not affected.

Command	Parameters
Remote Command Sequence:	\$COMFffffffffTtt(Aaaa) or \$COMBbTtt(Aaaa)
Unit Response:	\$COM

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?COM
Unit Response:	?COMFffffffffTtt(Aaaa)li
	<p>F: LO Frequency indicator. Fffffffff: Twelve-digit ASCII numeric characters indicating the LO frequency in Hz.</p> <p>B: Band indicator b: Single-digit ASCII numeric character representing Band number</p> <p>T: Attenuation indicator. tt: Three-digit ASCII numeric characters indicating the attenuation in tenths of a dB.</p> <p>A: Attenuation 2 indicator aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>I: IF indicator i: "0" No IF selection available - = Does not apply</p>

EXTERNAL ALARM CONFIGURATION = EAC

The SET command requires one parameter.

Command	Parameters
Remote Command Sequence:	\$EACn
Unit Response:	\$EAC

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?EAC
Unit Response:	?EACn
	<p>EAC: External Alarm Configuration indicator. n: ASCII numeric character 0 = Ignore External Alarm 1 = Normally Open, A closure will cause a fault indication. 2 = Normally Closed, An open will cause a fault indication.</p>

ETHERNET PARAMETERS = EAD

The SET command requires three twelve-digit parameters indicating the Ethernet IP address, Ethernet Gateway Address and Ethernet Subnet Mask. Each value should be entered as four groups of three digits.

Command	Parameters
Remote Command Sequence:	\$EADliiiiiiiiiiGgggggggggggSsssssssssss
Unit Response:	\$EAD

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?EAD
Unit Response:	?EADliiiiiiiiiiGgggggggggggSsssssssssss

Note *The unit will automatically reset after receipt of the SET command to invoke the settings.*

LO FREQUENCY = FRQ

The SET command requires one parameter which is twelve digits in length representing the LO frequency in Hz. Leading zeros must be used with frequencies below 10 GHz. If no alarms exist, this command also unmutes the output.

Command	Parameters
Remote Command Sequence:	\$FRQfffffffffff
Unit Response:	\$FRQ

The QUERY command requires no parameters. The reply will consist of twelve digits indicating LO frequency in Hz. Leading zeros will be used for frequencies less than 10 GHz.

Command	Parameters
Remote Command Sequence:	?FRQ
Unit Response:	?FRQfffffffffff
	FRQ: Frequency indicator fffffffffff: Twelve-digit ASCII numeric characters indicating frequency in Hz.

LO FREQUENCY WITHOUT LOG = FRN

The SET command requires one parameter which is twelve digits in length representing the transmit (upconverter) or receive (downconverter) frequency in Hz. Leading zeros must be used with frequencies below 10 GHz. This event is not logged in unit event log.

Command	Parameters
Remote Command Sequence:	\$FRNfffffffffff
Unit Response:	\$FRN

The QUERY command requires no parameters. The reply will consist of twelve digits indicating transmit (upconverter) or receive (downconverter) frequency in Hz. Leading zeros will be used for frequencies less than 10 GHz.

Command	Parameters
Remote Command Sequence:	?FRN
Unit Response:	?FRNfffffffffff
	FRN: Frequency indicator fffffffffff: Twelve-digit ASCII numeric characters, indicating frequency in Hz.

ALARM LOG = LOG

The only SET command clears the unit log of its contents.

Command	Parameters
Remote Command Sequence:	\$LOG00
Unit Response:	\$LOG

The QUERY command requires a two-digit parameter indicating the log entry to be examined. If entry 00 is queried, the unit returns the number of log entries currently in the log, otherwise the unit responds with the date, time and a code indicating the event which has occurred.

Command	Parameters
Remote Command Sequence:	?LOGnn
Unit Response:	?LOGnnCyyyymmddhhnssEeee
	nn: Two-digit ASCII numeric characters, MSD transmitted first, LSD last. Indicating the log entry queried. C: Calendar / Clock indicator. yyyy: Year, Four-digit ASCII numeric characters mm: Month, Two-digit ASCII numeric characters dd: Day, Two-digit ASCII numeric characters hh: Hour, Two-digit ASCII numeric characters nn: Minute, Two-digit ASCII numeric characters ss: Second, Two-digit ASCII numeric characters E: Alarm indicator. eee: Event Code 001 to 255 represents the following:

Event Indicator	Event
000	Log cleared
001	Unit startup
002	Power supply fault
003	Power supply fault recovery
004-013	Reserved for future use
014	LO fault
015	LO fault recovery
016	LO level fault
017	LO level fault recovery
018-025	Reserved for future use
026	RF Frequency change
027	Attenuation Change
028	Reserved for future use
029	Unit Mute by operator
030	Unit Unmute by operator
031	User activated test fault
032	User deactivated test fault

Event Indicator	Event
033	Unit Title change
034-043	Reserved for future use
044	External Fault
045	External Fault Recovery
046-118	Reserved for future use
119	System Nonvolatile Memory Fault
120	Slope Change
121	Impedance Change
122	Translation Frequency Change
123	Temperature Fault
124	Temperature Fault recovery
125	Module Communications Fault
126	Module Communications Fault Recovery
127	Attenuation 2 Change
128	AMP Current Fault
129	AMP Current Fault Recovery
130-255	Reserved for future use

UNIT MEMORY REGISTER STORE / RECALL = MEM

The SET command stores frequency, attenuation, IF and a user-defined setup title into a selected memory register. All five parameters are required. This command does not affect unit operation.

Command	Parameters
Remote Command Sequence:	\$MEMnnFffffffTtt(Aaa)liUuuuuuuuuuu
Unit Response:	\$MEM

The QUERY command requires one parameter indicating the memory register to recall and returns the contents of that register. This command does not affect unit operation.

Command	Parameters
Remote Command Sequence:	?MEMnn
Unit Response:	?MEMnnFffffffTtt(Aaa)liUuuuuuuuuuu
	nn: Two-digit ASCII numeric characters indicating the memory register accessed. F: Frequency indicator fffffff: Twelve-digit ASCII numeric characters indicating the frequency in Hz. T: Attenuation indicator ttt: Three digit ASCII numeric characters indicating the attenuation in tenths of a dB. A: Optional Second Attenuation indicator aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB. l: IF indicator i: - = Does not apply U: User-defined Setup Title Indicator Uuuuuuuuuuu: Twelve character user-defined setup title

MORE SYSTEM STATUS = MST

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?MST
Unit Response:	?MSTFffffffffTtt(Aaaa)LliMmRrPpUuuuuuuuuuuNsaaZz?abcdefghi
	<p>F: Frequency indicator. ffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in Hz.</p> <p>T: Attenuation indicator ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>L: Local / Remote mode indicator l: "0" or "1" ASCII numeric character 0 = Local control 1 = Remote control</p> <p>I: IF indicator i: - = Does not apply</p> <p>M: Mute status indicator m: "0" or "1" ASCII numeric character 0 = Not mute 1 = Mute</p> <p>R: Frequency Reference Source indicator r: "0" or "1" ASCII numeric character 0 = Internal 1 = External</p> <p>P: Polarization indicator (not used) p: "0"</p> <p>U: User-defined Setup Title Indicator Uuuuuuuuuuu: Twelve-character user-defined setup title</p> <p>N: Slope indicator (not used) s: +00</p> <p>Z: Impedance indicator z: "0" or "1" ASCII numeric character 0 = 50 Ω</p> <p>? : Component Fault Status indicator a-i: "0" or "1" ASCII numeric character 0 = No fault 1 = Fault</p> <p>a-i indicates the status of the component faults described in the ALR command.</p>

UNIT MUTE COMMAND = MUT

The SET command requires a one-digit parameter indicating mute or unmute.

Command	Parameters
Remote Command Sequence:	\$MUTm
Unit Response:	\$MUT

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?MUT
Unit Response:	?MUTm
	MUT: Mute indicator. m: "0" or "1" ASCII numeric character 0 = not mute 1 = mute

UNIT NAME = NAM

The SET command requires an ASCII string from one to twenty digits in length indicating the name of the unit. Allowable characters are in the range of 20H to 7AH.

Command	Parameters
Remote Command Sequence:	\$NAMnnnnnnnnnnnnnnnnnnnn
Unit Response:	\$NAM

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?NAM
Unit Response:	?NAMnnnnnnnnnnnnnnnnnnnn
	Nnnnnnnnnnnnnnnnnnnnn: Twenty-character unit name.

REFERENCE FREQUENCY ADJUSTMENT = REF

The SET command requires a four-digit parameter indicating the digital-to-analog converter setting of the reference frequency tune voltage from 0 to 4095.

Command	Parameters
Remote Command Sequence:	\$REFdddd
Unit Response:	\$REF

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?REF
Unit Response:	?REFdddd
	dddd: Reference frequency tune voltage DAC setting (0000 to 4095)

FIRMWARE TITLE AND REVISION = REV or VER

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?REV
Unit Response:	?REV firmware title and revision

The length of this reply will vary depending on the title of the applicable firmware

UNIT MEMORY REGISTER STORE/RECALL AND SET = SET

The SET command stores frequency, attenuation, IF and a user-defined setup title into a selected memory register. Thus five parameters are required; memory register, frequency, attenuation, IF selection, and the user-defined title. The unit is set to the parameters included in the command.

Command	Parameters
Remote Command Sequence:	\$SETnnFffffffffTtt(Aaaa)liUuuuuuuuuuuuu
Unit Response:	\$SET

The QUERY command requires one parameters indicating the memory register to recall and returns the contents of that register. The unit is set to the parameters included in the reply.

Command	Parameters
Remote Command Sequence:	?SETnn
Unit Response:	?SETnnFffffffffTtt(Aaaa)liUuuuuuuuuuuuu
	nn: Two-digit ASCII numeric characters indicating the memory register accessed. F: Frequency indicator fffffffff: Twelve-digit ASCII numeric characters indicating the frequency in Hz. T: Attenuation indicator ttt: Three-digit ASCII numeric characters indicating the attenuation in tenths of a dB. A: Optional Second Attenuation indicator aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB. I: IF indicator i: - = Does not apply U: User-defined Setup Title Indicator Uuuuuuuuuuu: Twelve-character user-defined setup title

UNIT STATUS = STA

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?STA
Unit Response:	?STAFffffffffTtt(Aaaa)LlIiMmRrPp?abcdefghi
	<p>F: Frequency indicator ffffffffff: Twelve-digit ASCII numeric characters indicating the frequency in Hz.</p> <p>T: Attenuation indicator tt: Three-digit ASCII numeric characters indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>L: Local / Remote mode indicator l: "0" or "1" ASCII numeric character 0 = Local control 1 = Remote control</p> <p>I: IF indicator i: - = Does not apply</p> <p>M: Mute status indicator m: "0" or "1" ASCII numeric character 0 = not mute 1 = mute.</p> <p>R: Frequency Reference Source indicator r: ASCII numeric character 0 = internal reference, internal LO 1 = external reference, internal LO 2 = internal reference, external LO (if applicable) 3 = external reference, external LO (if applicable)</p> <p>P: Polarization indicator (not used) p: "0"</p> <p>? : Component Fault Status indicator a-i: "0" or "1" ASCII numeric character 0 = No fault 1 = Fault</p> <p>a-i indicates the status of the component faults described in the ALR command.</p>

INTERNAL TEMPERATURE READING = TMP

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?TMP
Unit Response:	?TMPsttt
	s: "+" or "-" indicating sign ttt: Temperature in degrees Celsius, three-digit ASCII numeric characters

USER TITLE = USR

The SET command stores a user-defined setup title.

Command	Parameters
Remote Command Sequence:	\$USRxxxxxxxxxxxx
Unit Response:	\$USR

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?USR
Unit Response:	?USRxxxxxxxxxxxx
	USR: User-defined Setup Title Indicator Uxxxxxxxxxxxx: Twelve-character user-defined setup title

SYSTEM VOLTAGES = VLT

There is no SET command.

The QUERY command requires a one-digit parameter indicating the voltage to be reported.

Command	Parameters
Remote Command Sequence:	?VLTp
Unit Response:	?VLTpsvv.vv
	p: "a" through "d" indicating the particular voltage to be reported. s: "+" or "-" indicating sign. vv.vv: Four-digit ASCII numeric characters indicating the measured voltage in Volts. a: +15.3 Volt Supply Rail b: +5.3 'A' Volt Supply Rail c: +5.3 'B' Volt Supply Rail d: -15.3 Volt Supply Rail

Note Voltages *b* and *c* are identical. Monitoring of Voltage *c* is supplied for legacy reasons.

EXAMPLES

The following are typical commands and responses showing the ASCII printable characters. The address is 41H (ASCII code 'A') for these examples.

Set the Attenuation to 15.2 dB.

Command	Parameters
Remote Command Sequence:	{A\$ATT152}B
Unit Response:	{A\$ATT}i

Return the number of entries stored in the Alarm log. The converter returns that there are three entries in the alarm log.

Command	Parameters
Remote Command Sequence:	{A?LOG00}>
Unit Response:	{A?LOG03}A

AUXILIARY CONTROL INTERFACE OPERATION (RS485/RS422)

An additional RS485/RS422 serial port has been provided to support ancillary system functions. This port can be used to connect to the MITEQ NSU Series 1:N Redundancy Switchover Systems leaving the remote port available for direct connection to a conventional monitor and control (M&C) system. The command structures for the Auxiliary Control Interface are identical to those described in the RS485/RS422 Remote Operation section of this document.

ETHERNET INTERFACE INSTALLATION AND OPERATION

FUNCTIONAL DESCRIPTION

The MITEQ Multiband Block Converter is equipped with an Ethernet Interface feature permitting control and monitoring via a 10 or 100 Mbps Ethernet connection. Available interface protocols are HTTP (web access), SNMP (Simple Network Management Protocol), and Telnet. In addition, a capability to remotely upgrade the system firmware is provided.

The use of standard protocols makes it possible to provide (password-protected) access to the Converter from any location in the world where an Internet connection is available

INSTALLATION

Connection

The Converter must be connected to the facility Local Area Network (LAN) network via an industry-standard 10baseT RJ45 cable. The cable should be a “direct” cable, not a “crossover” cable. The Converter may also be connected directly to a PC without a LAN. (See pg.43 for details)

Setup

Setup of the Ethernet Interface should be attempted only after the Converter is fully installed and functioning, in accordance with the Converter Operation and Maintenance (O&M) Manual. Once operating, the Ethernet Interface may be configured.

Configuring Internet Protocol (IP) Operating Parameters

An Internet Protocol (IP) address and associated parameters must be configured in the unit so the controlling device can address it. Normally, the individual or organization managing the facility’s LAN assigns this address. (See pg. 43 for information on connecting directly to a PC without a Local Area Network) Three parameters will be required:

Parameters	Factory Setting
IP Address	000.000.000.000 (DHCP)
Subnet Mask	255.255.255.0
Gateway	0.0.0.0

The Ethernet address may be configured either via the serial interface or via a web browser.

Configuring via Serial Interface

The commands listed below may be used to enter the IP parameters. Commands must be transmitted with the standard MITEQ protocol, as described in the O&M manual.

Each value should be entered as four groups of three digits

Parameters	Values
Address	\$EADaaaaaaaaaaaa
Subnet mask	\$ESBssssssssssss
Gateway	\$EGWgggggggggggg

The values may be verified using the corresponding query commands (?EAD, ?ESB, ?EGW)

Configuring via Ethernet

If the unit is reachable with the factory IP setting, the setting may be changed via the web interface. See below for more details.

In a situation where it is impossible to configure the system via the Serial Interface and the default IP parameters are incompatible with the facility LAN; the system may be temporarily attached directly to a PC as described in pg. 43 so the IP parameters may be set.

Verifying Proper Connection and Configuration

The connection and configuration may be verified from a PC attached to the LAN using the network “ping” command. From a command prompt, enter:

“ping <assigned IP address>”

The response will either indicate whether a connection was established.

ACCESSING THE SYSTEM

Access via the Web Interface

All system setting may be queried or modified via the Web Interface. The web page designs have been optimized for the use with the Microsoft Internet Explorer (MSIE) Version 5.0 web browser, or higher. Use of Cookies must be enabled (see the TOOLS|INTERNET OPTIONS|PRIVACY setting).

Web access may function properly, or with somewhat degraded performance, using other browsers of the same vintage. Browsers of earlier vintage are not recommended.

To connect to the Converter, launch the web browser on any PC connected to the same LAN, and enter the address:

http://<assigned IP address>

A sign-on page requesting the password should be displayed. (See pg. 44 for information on configuring for access to the Converter by name instead of IP address). The default password is “11111”.

The operator may navigate between the seven available pages by clicking on the button images about 1/3 of the way down from the top of the screen.

Note *To set an operating parameter, make the appropriate changes, change the (screen locked) pull-down to UNLOCKED, and press the Submit or other applicable button.*

The following table lists the functions available on each page:

Table 3-1. Web Page Functions	
(all pages)	
Function Name	Description
Band	Show the currently selected band
Input Frequency	Show the currently selected input frequency range
Output Frequency	Show the currently selected output frequency range
LO Frequency	Show the current LO frequency
Attn	Show the current attenuation setting
Home Page	
Function Name	Description
Band Table	Show the available bands
Band Select	Set the desired band
Attenuation Set	Enter the desired attenuation value
Mute Select	Mute or unmute the Converter
Memory Page	
Function Name	Description
Memory Number	Select or view the memory location number
Setup Name	Select or view the memory setup name
Band Number	Select or view the memory band number
Attenuation	Select or view the memory attenuation setting
View Memory	Recall the specified memory number and show its values without changing the Converter settings.
Set from Memory	Recall the specified memory number and load its values to the Converter.
Save Memory	Save the specified settings at the specified memory number without changing the Converter settings.
Save and Set	Save the specified settings at the specified number and load its values to the Converter.
Communications Page	
Function Name	Description
IP Address	View or set the system IP address (changing this value will reset the system)
IP Subnet Mask	View or set the system IP Subnet Mask (changing this value will reset the system)
IP Gateway	View or set the system IP Gateway (changing this value will reset the system)
System Contact	View or set the SNMP System Contact parameter
System Name	View or set the SNMP System Name parameter
System Location	View or set the SNMP System Location parameter
Read Community	View or set the SNMP Read Community parameter (enter a long arbitrary string to make SNMP inaccessible)
Write Community	View or set the SNMP System Contact parameter parameter (enter a long arbitrary string to make SNMP inaccessible)
Trap Destination	View or set the SNMP Trap destination address
Send a test trap	Check this box and press Submit to send a single SNMP test trap

Table 3-1. Web Page Functions (Continued)	
Time Page	
Function Name	Description
Set Clock	View or set the system real-time clock
Miscellaneous Page	
Function Name	Description
Second Between Alarm Updates	View or set how frequently the alarm indications will be refreshed on the Logs page
Web Timeout	View or set the time before a web user is logged off due to inactivity.
Minutes between SNMP traps	View or set the frequency with which SNMP traps are resent. A value of 0 will cause traps to be sent only when an alarm initially occurs.
Converter Name	View or set the assigned converter name
Enable Firmware Upgrade	Permit or prevent remote upgrade of the converter firmware.
Enable Telnet	Permit or prevent Telnet access
Enable Test Alarm	Force a false alarm for test purposes
Old Password New Password New Password	Update the system password (1-5 digits). All three values must be entered. If the old password does not match the existing password, or the two new password entries are different, the update will not occur.
Logs Page	
Function Name	Description
Alarm Indicators	View any pending system alarms
Log Listing	View a listing of all system log entries
Clear Logs	Clear the system log
Logout Page	
Function Name	Description
(N/A)	The user is logged off the system

Access via SNMP

The Multiband Block Converter may be accessed and monitored via the Simple Network Management Protocol (SNMP) Version 1.0. SNMP is designed for control of network elements from a central management point.

The SNMP Management Information Base (MIB) file for the system, available from MITEQ defines the specifics of the interface. The SNMP management tool chosen to provide an “understanding” of the interface reads this file. The MIB file is in a format that can be ready with any text editor. Do **NOT** modify this file.

SNMP operating parameters may be set on the COMMS web page. If SNMP operation is not desired, this feature may be rendered inaccessible by inserting a long arbitrary string in the Read Community and Write Community fields.

Access via Telnet

The Converter may be accessed via Telnet. There is no special protocol on the Telnet channel; the Converter will expect the same commands, and offer the same replies, as via the serial port.

Telnet access must first be enabled on the COMMS web page. If not being used, it is recommended that it be left disabled for security reasons.

When a Telnet connection is established, the Converter will request the password, which should be sent in the standard MITEQ wrapper (‘{’<address byte (ignored)>’<password>’<checksum byte>’). The connection will be refused if a user is already logged in via the web interface.

Once the connection is established, standard serial commands may be sent and responses will be received. Logout is automatic when the Telnet connection is broken.

FIRMWARE UPGRADE

Should it become necessary to upgrade the Converter firmware, a file will be provided by MITEQ for this purpose. Firmware upgrade is accomplished via File Transfer Protocol (FTP). Numerous FTP client programs are available, or MSIE may be used for this purpose. If MISE is being used, be sure to enable the FTP feature on the TOOLS\INTERNET OPTIONS\ADVANCED page.

Firmware Upgrade must be enabled on the MISC web page before beginning. Once it is set, connect to the Converter via FTP. If using MSIE, enter the command:

“ftp://<assigned IP address>”

The user will be prompted for a user ID and password. The user ID is always “MITEQ”, and the password will be the assigned system password.

No files will be visible in the FTP server directory. Upload the file provided (if using MSIE, by dragging and dropping into the IE window), and wait for the upload to complete. The file will NOT be visible in the FTP file name list or window after loading. The firmware upgrade will begin when the FTP connection is broken, and may take as long as 15 seconds, during which it will be impossible to connect to the Converter.

After the upgrade, it will be necessary to log in again. The new firmware version will be visible on the login page.

Connecting without a Network

For testing, familiarization, or configuration, the Converter may be connected to a PC without a LAN. This may be done two ways:

- Connect via an Ethernet hub, using standard cables
- Connect directly using a single, reversing cable

In this configuration, the PC must be configured with a Static IP address. The procedure for this varies between OS types and versions. Consult the operating manual or help files available with the computer to be used to determine the proper procedure.

The computer must be configured with the same Subnet Mask, but a different IP address, to connect properly. For connecting with the converter as shipped from the factory, the following settings are recommended:

Parameters	Factory Setting
IP Address	000.000.000.000 (DHCP)
Subnet Mask	255.255.255.0
Gateway	0.0.0.0

Both standard and reversing cables are widely available. The following chart is provided for assembling cables if desired, or for identifying a specific cable type:

Table 3-2. Ethernet Cable Wiring

Direct Cable Wiring			Crossover Cable Wiring		
End 1	Color	End 2	End 1	Color	End 2
1	wh/or	1	1	wh/or	3
2	or	2	2	or	6
3	wh/gn	3	3	wh/gn	1
4	bl	4	4	bl	4
5	wh/bl	5	5	wh/bl	5
6	gn	6	6	gn	2
7	wh/br	7	7	wh/br	7
8	br	8	8	br	8

Reaching the Converter by NAME instead of IP address

If the Converter is connected to a LAN equipped with a Domain Name Server, the network manager may be able to configure the server to associate a particular text name with an IP address. If this is not the case and addressing by name is desired, machines equipped with Microsoft Windows may be configured for this capability.

Locate the “hosts” file on the PC to be configured. Some common locations for the host’s file are:

Operating System	Host File Location
Windows XP:	C:\WINDOWS\SYSTEM32\DRIVERS\ETC
Windows 2K:	C:\WINNT\SYSTEM32\DRIVERS\ETC
Win 98\ME:	C:\WINDOWS

The hosts file is a plain-text file of the form:

<ip address> <associated name>

Add the desired address/name pair(s) to the list. Generally, it is a good idea to back up any system file before modification. An example host file is provided here:

IP Address	Associated Name
216.239.39.99	google.com
127.0.0.1	localhost
192.168.1.1	miteqMultBB_1
192.168.1.2	miteqMultBB_2

In some cases, it may be necessary to reboot the PC before changes to the host file take effect.

Other Operating Systems may use a different mechanism. Consult the appropriate documentation to change host settings.

Glossary	
10-baseT	Controlled-impedance cable used for Ethernet wiring
Crossover cable	An Ethernet cable wired with the signal pairs reversed, to permit connection of two computer devices.
Direct cable	An Ethernet cable wired with the signal pairs directly connected, to permit connection between a computer and hub or router
FTP	File Transfer Protocol, a protocol for moving files between computers via a TCP/IP connection
Gateway	An IP setting parameter that indicates how a device may connect to other devices that are not a member of the immediate subnetwork
HTTP	Hypertext Transport Protocol. The standard protocol for moving web pages between servers (e.g. the Converter) and clients (e.g. the web browser)
Hub	A component used to connect several Ethernet-equipped devices together.
IP Address	Internet Protocol address. A unique address used to identify and connect to a device.
LAN	Local Area Network. A means (usually, but not always Ethernet) for connecting multiple computing devices together for high-speed communications.
IP	Internet Protocol. Specifies an organization of data packets sent between computers for network communications.
MSIE	Microsoft Internet Explorer, the web browser integrated with most versions of Microsoft Windows. The Converter interface design was optimized for operation with MSIE 5.0 or higher
RJ45	The standard telephone-style connector used for terminating twisted-pair Ethernet cables.
SNMP	Simple Network Management Protocol, a system of communication between managed network elements (e.g. the Converter), and a network control program, e.g. HP Openview.
Subnet Mask	A numeric mask defining the size of a subnetwork. Bits cleared in the mask define IP addresses that may communicate on the subnetwork.
TCP	Transmission Control Protocol. Specifies a mechanism for establishing a virtual connection between network elements, usually via IP
Telnet	A simple mechanism for communicating between two devices via TCP. A connection is opened between the devices, and bytes may then pass freely between them, as with a serial connection.

SECTION 4: PRINCIPLES OF OPERATION

INTRODUCTION

The following paragraphs provide information on the principles of operation of the converter.

FUNCTIONAL DESCRIPTION

The block upconverter translates the IF Input frequency band to the RF output frequency band. A single conversion system is used (see Figure 4-1). Model UPB-1B-6.1-IN is a frequency inverting system. All other models are frequency non-inverting systems.

The input signal is fed to an input module. The module contains a fixed attenuator followed by a low-noise amplifier and a pinlow-pass filter. The attenuator provides a good match at the input and the low-pass filter provides rejection of input harmonics. The output of the module is followed by a fixed attenuator, which provides level adjustment and a good match to the output module.

In the output module the signal is fed to a mixer which converts the input signal to the output RF frequency. The signal passes through a filter, which rejects the local oscillator signal, is amplified, and output, from the system. A coupled output port is included in the module to provide a RF test point at the rear panel of the converter. If the converter is ordered with Option 1, the signal passes through a PIN diode attenuator, which provides gain control for the system.

The reference oscillator shall be capable of receiving an external input of 5 MHz or 10 MHz. The oscillator will detect the external input frequency. If the external input signal frequency is 10 MHz, the external signal will be directed to the output. If the external signal frequency is 5 MHz, the external signal will be frequency doubled, resulting in a 10 MHz signal, which will be directed to the output.

The oscillator shall operate as an automatic reference selection switch in a SPDT configuration. The oscillator shall switch to the internal 10 MHz oscillator if the external input signal is below a threshold level of +0.5 dBm to +1 dBm. The internal oscillator shall be turned off if the unit's output is switched to the external input signal.

The local oscillator is a phase locked source, which is locked to the 10 MHz reference.

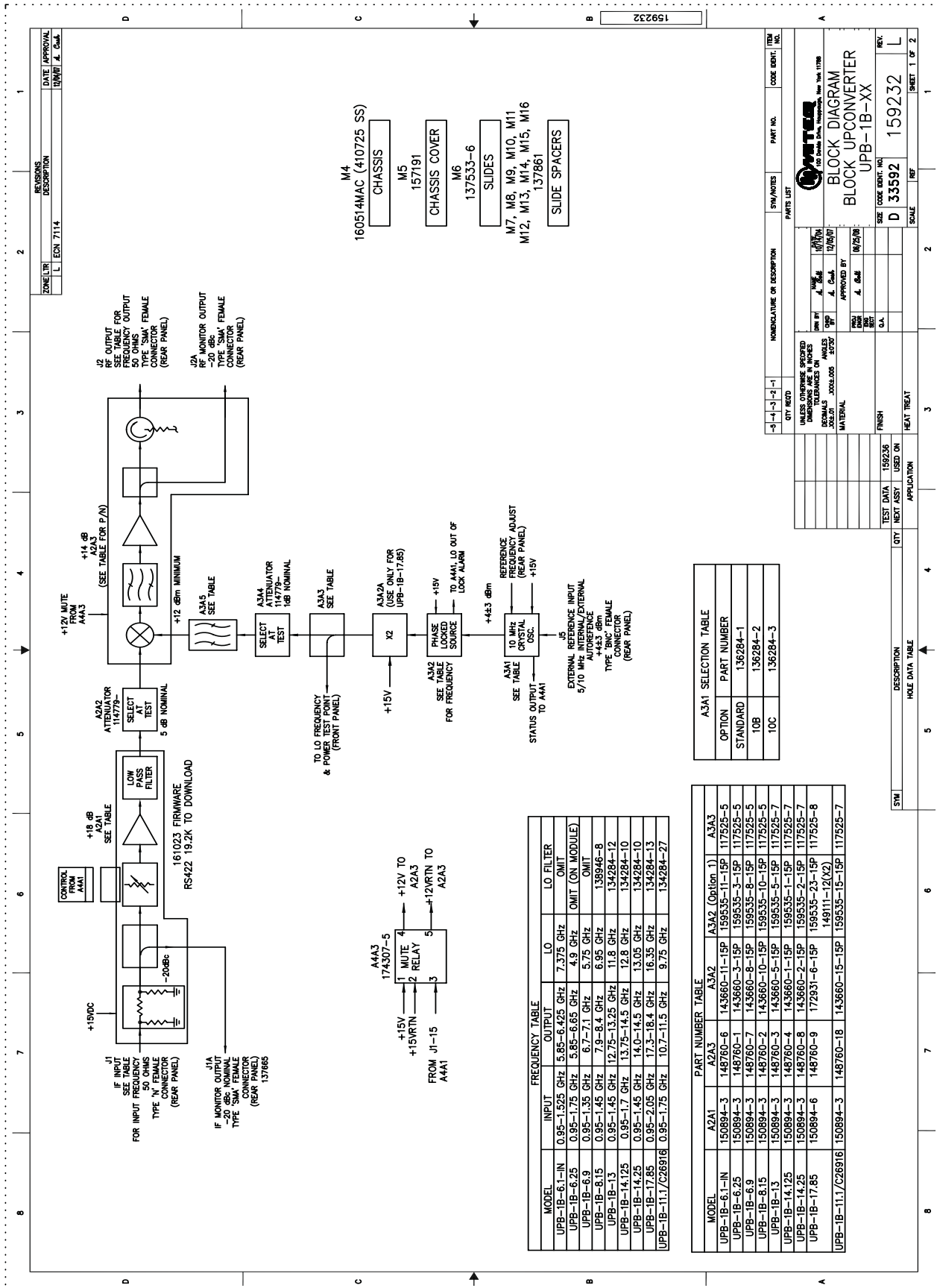


Figure 4-1. Block Diagram, Block Upconverter UPB-1B-XX
(Sheet 1 of 2)

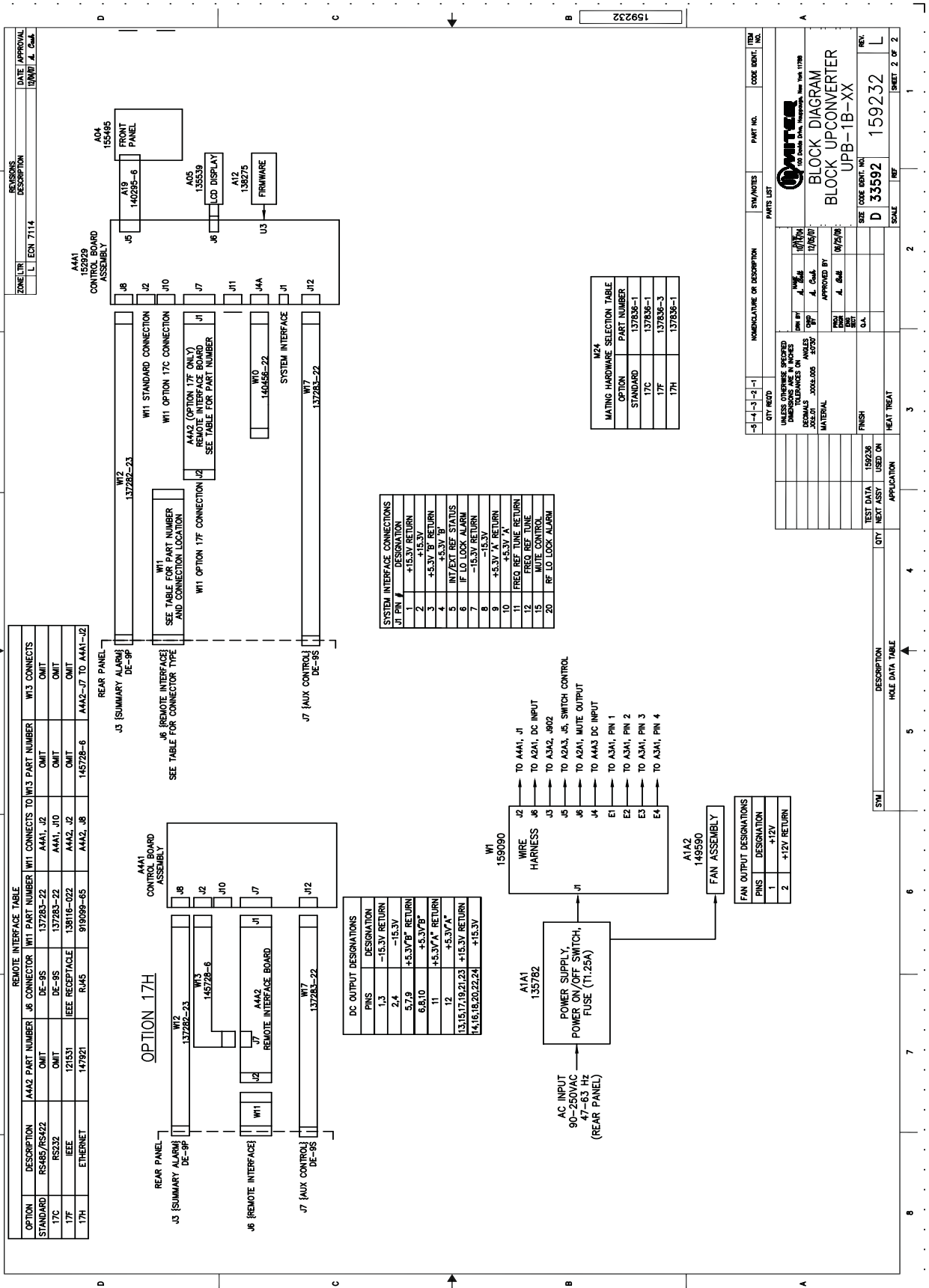


Figure 4-1. Block Diagram, Block Upconverter UPB-1B-XX
(Sheet 2 of 2)

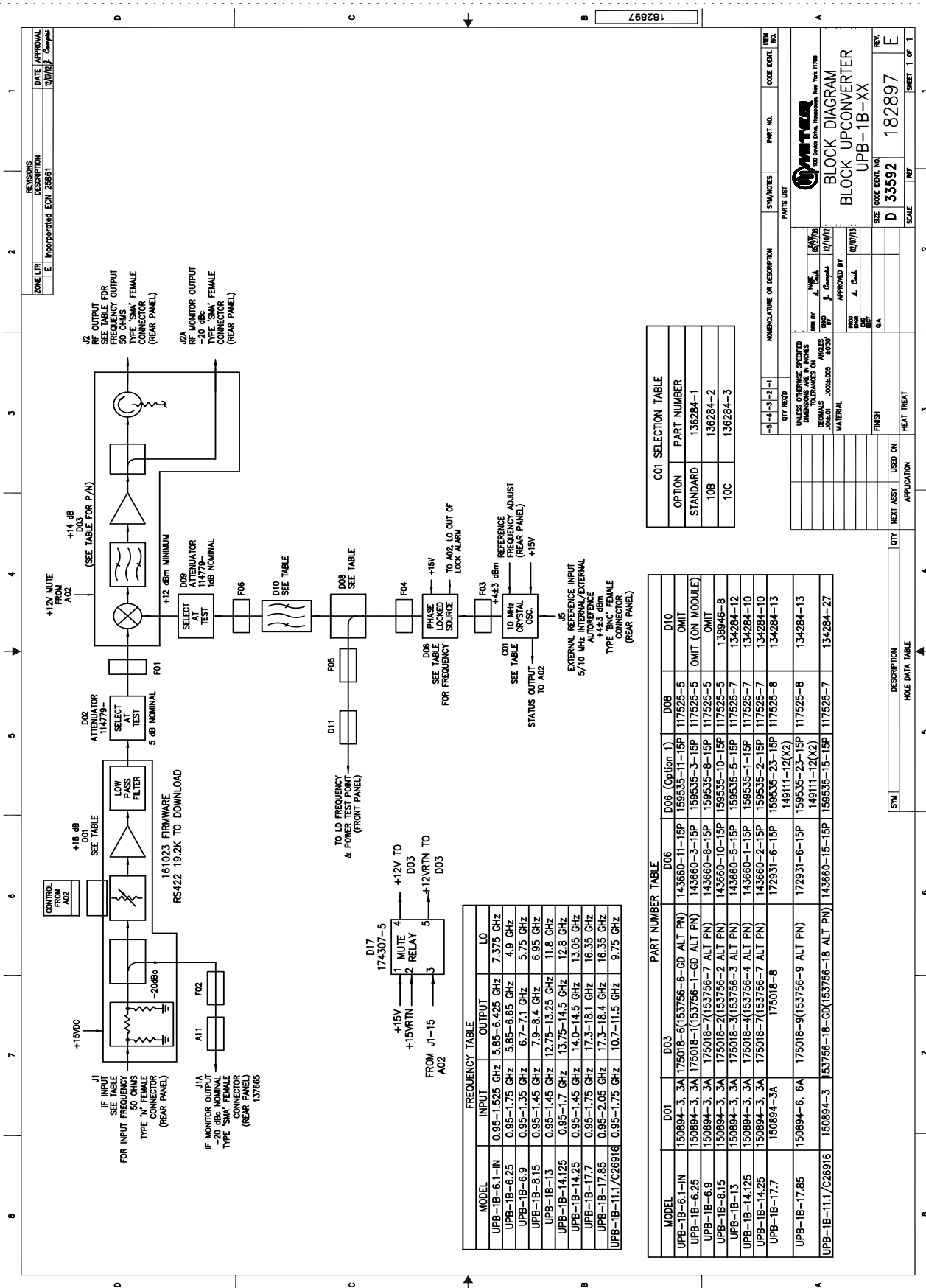


Figure 4-2. Block Diagram, Block Upconverter UPB-1B-XX

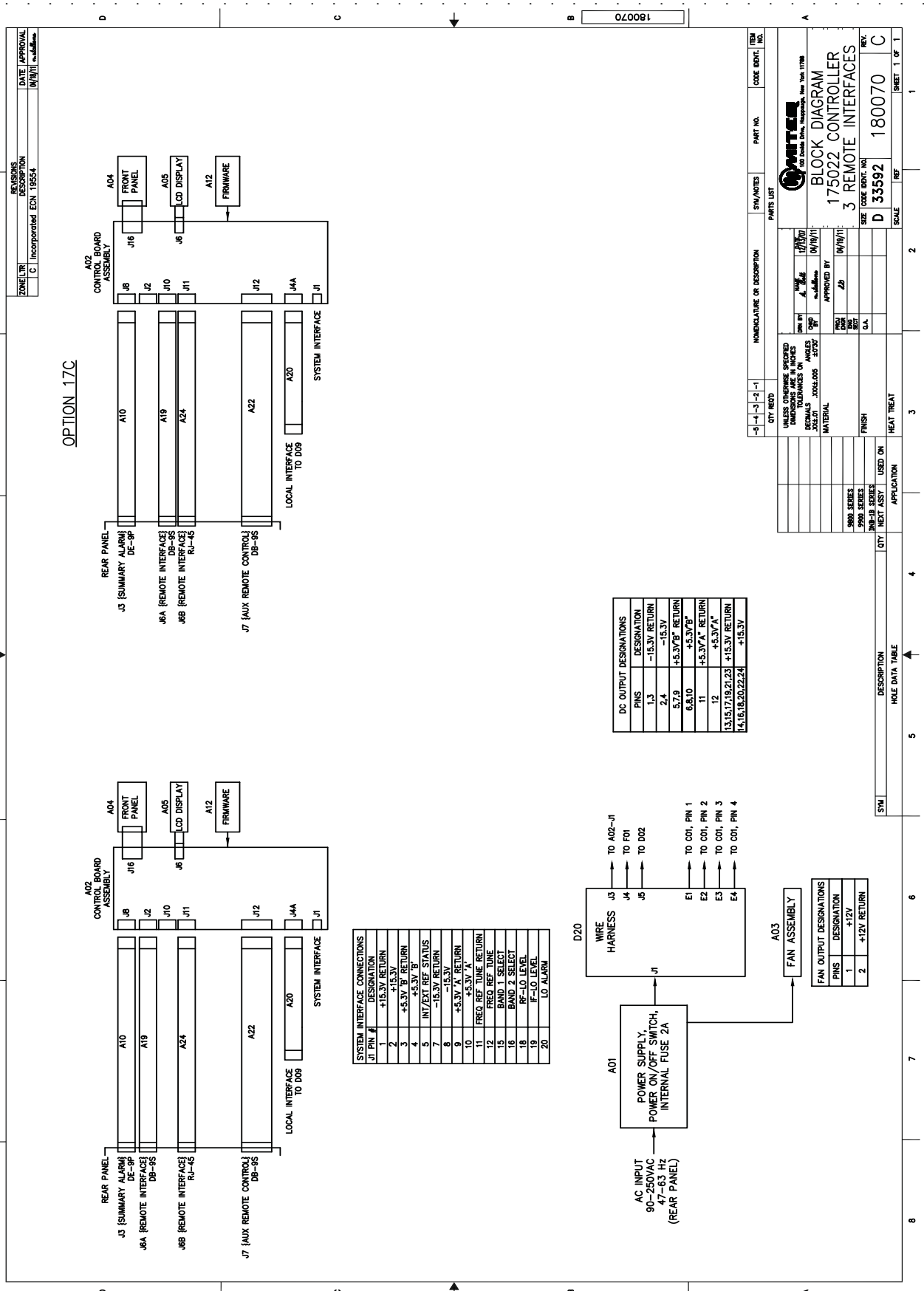


Figure 4-3. Block Diagram, 175022 Controller, 3 Remote Interfaces

FREQUENCY PLANS

Single Band Block Upconverters			
Model Number	Input band (GHz)	LO frequency (GHz)	Output band (GHz)
UPB-1B-6.1-IN	0.95-1.525	7.375	5.85-6.425
UPB-1B-6.25	0.95-1.75	4.9	5.85-6.65
UPB-1B-6.9	0.95-1.35	5.75	6.7-7.1
UPB-1B-8.15	0.95-1.45	6.95	7.9-8.4
UPB-1B-8.2	0.95-1.45	7.0	7.95-8.45
UPB-1B-13	0.95-1.45	11.8	12.75-13.25
UPB-1B-14.125	0.95-1.7	12.8	13.75-14.5
UPB-1B-14.25	0.95-1.45	13.05	14.0-14.5
UPB-1B-17.85	0.95-2.05	16.35	17.3-18.4
UPB-1B-17.7	0.95-1.75	16.35	17.3-18.1
UPB-1B-17.7	0.95-1.75	16.35	17.3-18.1

SUBSYSTEMS AND COMPONENTS FUNCTIONAL DESCRIPTION

SIGNAL PATH

Input Module, Fixed Attenuator

Model Number	Frequency (GHz)
UPB-1B-6.1-IN	0.95-1.525
UPB-1B-6.25	0.95-1.75
UPB-1B-6.9	0.95-1.35
UPB-1B-8.15	0.95-1.45
UPB-1B-8.2	0.95-1.45
UPB-1B-13	0.95-1.45
UPB-1B-14.125	0.95-1.7
UPB-1B-14.25	0.95-1.45
UPB-1B-17.85	0.95-2.05
UPB-1B-17.85	0.95-1.75
UPB-1B-17.7	0.95-1.75

Specifications	
Gain	+22-25 dB
Gain flatness	0.5 dB/band
Input return loss	20 dB/50 ohms
Output return loss	14 dB/50 ohms
Level control	30 dB minimum
Power output (1 dB compression)	+10 dBm minimum
DC voltage	+15 volts
DC current	200 mA typical
Noise Figure	14 dB maximum

A fixed attenuator (A2A2/D02) follows the input module. The attenuator provided level adjustment and a good match to the output module.

Output Module

Specifications	
See Frequency Plans for input, output and LO frequencies	
Gain	15 dB nominal
Group delay	0.5 nsec p-p/76 MHz in band maximum 0.7 nsec p-p in band maximum
Monitor port level	-20 dBc below RF output port, nominal
Pout 1 dB	+13 dBm minimum, +16 dBm maximum
Third order intercept	+25 dBm minimum
Noise figure	18 dB maximum
LO leakage	-70 dBm
Image rejection	80 dB minimum
Return loss	
RF output port	20 dB minimum
Coupled output port	10 dB minimum
IF input port	10 dB minimum
DC Voltage	+12 volts

LOCAL OSCILLATOR

Crystal Oscillator

The oscillator is capable of receiving an external input of 5 MHz or 10 MHz. The oscillator detects the external input frequency. If the external input signal frequency is 10 MHz, the external signal will be directed to the output. If the external signal frequency is 5 MHz, the external signal will be frequency doubled, resulting in a 10 MHz signal, which will be directed to the output.

The oscillator operates as an automatic reference selection switch in a SPDT configuration. The oscillator switches to the internal 10 MHz oscillator if the external input signal is below a threshold level of +1 dBm nominal. The internal oscillator is turned off if the unit's output is switched to the external input signal.

Option	Part Number	Temperature Stability (0°C to +65°C)	Aging/day (After 24 hours on time)	Phase Noise		
				10 Hz (dBc/Hz)	100 Hz (dBc/Hz)	1 kHz (dBc/Hz)
Standard	136284-1	$\pm 2 \times 10^{-8}$	$\pm 5 \times 10^{-9}$	-120	-150	-160
10B	136284-2	$\pm 5 \times 10^{-9}$	1×10^{-9}	-129	-158	-165
10C	136284-3	$\pm 2 \times 10^{-9}$	1×10^{-9}	-129	-158	-165

SPECIFICATIONS	
Input characteristics: Frequency Impedance Level	5 MHz or 10 MHz 50 ohms +4 \pm 3 dBm
Output characteristics: Frequency Impedance Level	10 MHz 50 ohms +4 \pm 3 dBm
Status indicator: Internal oscillator "ON" Internal oscillator "OFF"	TTL Low (0V) TTL High (5V)
Mechanical Tuning: 136284 - 163284-2 & -3	$\pm 2 \times 10^{-6}$ min. 20 turn control $\pm 1 \times 10^{-6}$ min. 20 turn control
Electrical Tuning:	$\pm 1 \times 10^{-7}$ \pm 5V input

Phase Lock Source, Coupler, Fixed Attenuator, Filter

Model Number	LO Frequency (GHz)
UPB-1B-6.1-IN	7.375
UPB-1B-6.25	4.9
UPB-1B-6.9	5.75
UPB-1B-8.15	6.95
UPB-1B-8.2	7.0
UPB-1B-13	11.8
UPB-1B-14.125	12.8
UPB-1B-14.25	13.05
UPB-1B-17.85	16.35
UPB-1B-17.7	16.35

Specifications	
Output power	+13 dBm
Input reference frequency	10 MHz
Input reference power	-10 to +7 dBm
Output impedance	50 ohms
Output spurious	-90 dBc minimum from 900-2000 MHz, above and below output -70 dBc up to 16 GHz
DC voltage	+15V
Alarm output	TTL, low in lock, high out of lock

A coupler (A3A3/D08), fixed attenuator (A3A4/D09) and LO filter (A3A5/D10) follow the phase lock source. The coupler provides a front panel frequency/power monitor test point, the attenuator provides level adjustment and the filter rejects the local oscillator signal.

POWER SUPPLY

The Power Supply converts a single phase AC input voltage to four DC outputs, three to drive a load and the last to drive a fan. The unit shall include an accessible voltage adjustment potentiometer for the output voltage. The fuse will be internal to the power supply.

The Power Supply has an integrated AC line input and illuminated rocker type power on/off switch which will be mounted on the rear edge of the supply and will constitute a section of the rear panel of the chassis to which the supply is mounted.

The Power Supply has an internal fuse for safety reasons and is not field replaceable.

SPECIFICATIONS	
Part Number	189400
AC input	90 VAC to 265 VAC, 45 Hz to 66 Hz
Input connector type	IEC 320 socket
DC Output Voltage Tolerances: +15.3V +5.3V -15.3V	+15.3 \pm 0.25V +5.3 \pm 0.2V -15.3V \pm 0.25V
DC Output Pins: Pins 1, 3 Pins 2, 4 Pins 5, 7, 9, 11 Pins 6, 8, 10, 12 Pins 13, 15, 17, 19, 21, 23 Pins 14, 16, 18, 20, 22, 24	-15.3V Return -15.3V 5.3V Return 5.3V +15.3V Return +15.3V
Fan Output Pins: Pin 1 Pin 2	+12V +12V Return
Power factor (For Reference Only)	> 0.95 typical
Power supply efficiency (For Reference Only):	70-75% nominal

CONTROL BOARD/FIRMWARE KIT

Specifications	
Part Number	152929 175022 (s/n 1389303 & later)

FAN

Specifications	
Part Number	149590
DC Voltage	+12V

SECTION 5: MAINTENANCE



**PROPER GROUNDING PRECAUTIONS
ARE REQUIRED AT ALL TIMES TO
PREVENT DAMAGE FROM ESD WHILE
HANDLING THIS UNIT**

PREVENTIVE MAINTENANCE

The equipment is a completely solid state design. Normal periodic inspection for cleanliness and mechanical integrity should be made in accordance with standard procedures.

To prevent long and costly downtime of the unit periodic monitoring of the overall performance parameters that are most indicative of individual component performance is necessary. A log should be maintained that provides a permanent record of operation and compares it to factory provided data. By doing so, any long term degradation, erratic or abnormal performance can be detected. The overall performance parameters that are most indicative of system component performance are gain and local oscillator frequencies.

Any excessive change in gain indicates a malfunction in the local oscillator and/or signal channel and/or in the power supply. Any excessive frequency change indicates malfunction in phase locking to the reference oscillator.

DC VOLTAGE

A set of power supply test points is available on the power supply. If voltage is beyond tolerance (see pg. 55), reset power supply (refer to Figure 4-1), using the tuning adjustment on the power supply.

GAIN OF THE CONVERTER

The gain of the converter should be periodically monitored to reveal deviations which would indicate possible malfunction.

FREQUENCY MEASUREMENT

Frequency accuracy of the converter is determined by the reference source used. Frequency may be monitored at the front panel LO test points.

CORRECTIVE MAINTENANCE

If the unit malfunctions during normal use or if the tests reveal excessive discrepancies in gain or local oscillator frequency, isolation and correction of the malfunction becomes necessary.

While it is difficult to fully anticipate and describe all possible failure modes in a complicated electronic system, this manual contains sufficient information in the form of theory of operation and diagrams to enable an experienced technician to isolate and remove the malfunctioning module.



**IT IS STRONGLY SUGGESTED THAT ANY MALFUNCTIONING COMPONENT BE
RETURNED TO MITEQ FOR REPAIR.**

**IT IS ALSO RECOMMENDED THAT THE FAN (ASSEMBLY P/N ON PG.55) BE REPLACED ON
A YEARLY BASIS FOR REGULAR MAINTENANCE.**

CHANGING THE REMOTE INTERFACE FROM RS485/422 TO RS232 OR FROM RS232 TO RS485/422

On board each unit there is a menu of factory settings which are stored in non-volatile memory.



DURING NORMAL OPERATION THESE SETTINGS SHOULD NEVER BE ACCESSED. IT IS EXTREMELY IMPORTANT THAT YOU RECORD THE CONTENTS OF THE FACTORY CONFIGURATION MODE SETTINGS. THESE SETTINGS ARE AS FOLLOWS:

Setting	Description
Low Frequency Limit	Low limit of the LO frequency (See Section 1)
High Frequency Limit	High limit of the LO frequency (See Section 1)
Frequency Step Size	0.125000 MHz or 0.001000 MHz (N/A for this unit)
IF Frequency	0.000000 MHz
Frequency Display Format	2.3. This indicates the number of digits that will be displayed to the left and to the right of the decimal point. 2.3 means two digits to the left of the decimal point and three digits to the right. For example: if the LO frequency of the unit is 10.750000 the display format is 2.3.
External Reference Configuration	Auto-reference
Attenuation Max	30.0 dB for all units.
Attenuation Step Size	0.2 dB for all units.
Remote Bus	The remote interface configuration for the unit.
Model	The Model number of the unit.
Model Type	Multi-band Block Downconverter
Model Code	This is field is for future use
Mute Option	Enable for upconverters, disable for downconverters
IF Option	Changes the displayed IF frequency of the unit, not the operation
System Control	Converter only

To access these settings perform the following steps:

- Take the unit offline and power "Off" the unit using the rear panel power On/Off switch.
- Power "On" the unit while holding the front panel CURSOR key until the words "Factory Configuration Mode" appear on the front panel display temporarily.
- Release the CURSOR key. The following display will soon appear
Use arrow keys to select model number or "ENT" key for manual entry.



If the display is blank or unreadable, the LCD contrast may need to be adjusted. Follow the LCD contrast adjustment procedure.

- Press the "ENT" key and the Low and High Frequency Limits will soon appear on the display.
- Use the "MENU" key to scroll through the settings and record all of the current parameter settings.

To change the remote bus option:

- Press the "MENU" key until the remote bus and the model appear on the display.
- Use the arrow keys to scroll through the available remote options on the display until the desired remote option is displayed.
- Press "ENT" to store the new remote option.
- The cable that attaches to the remote interface connector (J6) on the rear panel must be attached to the appropriate connector on the control board (A4A1). For RS485/422 operation connect to J2 of the control board. For RS232 operation, connect to J10 of the control board.

INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT

On board each unit there is a menu of factory settings that are stored in non-volatile memory.



DURING NORMAL OPERATION THESE SETTINGS SHOULD NEVER BE ACCESSED.

However, if it becomes necessary to replace a failed Control Board/Firmware Kit then these settings must be entered to configure the replacement unit. Changing the converter's model number can automatically set these settings

To access these settings and configure the unit:

- Power "On" the unit while holding the front panel CURSOR key until the words "Factory Configuration Mode" appear on the front panel display temporarily.
- Release the CURSOR key. The following display will so appear.
Use the up arrow key to select model number.



Note *If the display is blank or unreadable, the LCD contrast may need to be adjusted. Follow the LCD contrast adjustment procedure.*

- Use the arrow keys to select Upconverter or Downconverter models for synthesized converters or Block Upconverter or Block Downconverter for Block converters.
- Press "ENT".
- Use the arrow keys to select Single Band Upconverters or Downconverters. If unit has multiple bands, then select Multiband Upconverter or Downconverter.
- Press "ENT".
- Use the arrow keys to select the proper model numbers. If model is not found on the list, please check converter type for multiple band or block converter. Consult factory if there are any questions about settings.
- Press "ENT" when the correct model number is found.
- Next the Model Number field will come up with the current model number.
- Press "ENT".
- Next enter Serial Number of the converter. The serial number of the converter is located on the MITEQ label that is attached to the chassis near the power supply and is visible through the cover. This field is for reference only.
- Press "ENT" when serial number is complete.
- Next the ID field of the converter will be displayed. This field is for reference only. Please leave blank.
- Press "ENT".
- Select the Remote Bus using the arrow keys and press "ENT". Select the dual remote option (i.e., Ethernet and RS485 or Ethernet and RS232).
- Next the Mute field of the converter will be displayed. This field is for reference only. The Mute option has already been defaulted by model number.
- Press "ENT".
- Next the IF field of the converter will be displayed. Please select the IF: 70 MHz, 140 MHz or option 20 70/140 MHz.
- Press "ENT".
- Next the IF Impedance field of the converter will be displayed. Please select the IF Impedance: 75 Ohms, 50 Ohms (Option 4) or 50/75 Ohms selectable.
- Press "ENT".
- Next the Int/Ext reference field will be displayed. This field is for reference only. The option has already been defaulted by model number. Leave default setting.
- Press "ENT".
- Next the LO Level Detect (Option 8). Unless unit has Option 8, leave default setting.
- Press "ENT".
- Next the External LO level. The option has already defaulted by model number. Unless unit has this special option, leave default setting.
- Press "ENT".
- Next the Converter Control. Leave default setting. Converter only.
- Press "ENT".
- Next the Legacy Mode. Leave default setting (9400 Series).
- Press "ENT".
- Cycle the unit power or use the CURSOR key to select "RETURN TO NORMAL MODE" and press "ENT" to return to normal operation.

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