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OPERATION AND MAINTENANCE MANUAL

MULTIBAND BLOCK DOWNCONVERTERS

The model number supplied is:

_____ DNB-2B
_____ DNB-3B
_____ DNB-3B-1

The MITEQ reference number is:_____

Revision B
5/04

MANUAL REVISIONS

5/7/04: REV.A TO REV.B

ADDED SECTION 3.7 AND SUBSECTIONS 3.7.1, 3.7.2, 3.7.3, 3.7.4, APPENDICES AND GLOSSARY - ETHERNET INTERFACE INSTALLATION AND OPERATION
UPDATED SECTION 3.2.1 TO INCLUDE ETHERNET INFORMATION
REVISED TABLE OF CONTENTS TO INCLUDE AFFORMENTION CHANGES

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

SECTION 2

INSTALLATION

SECTION 3

OPERATION

TABLE OF CONTENTS (Cont.)

SECTION 3

OPERATION

TABLE OF CONTENTS (Cont.)

SECTION 3

OPERATION

SECTION 4

PRINCIPLES OF OPERATION

TABLE OF CONTENTS (Cont.)

SECTION 5

MAINTENANCE

LIST OF DIAGRAMS

SECTION 1
INTRODUCTION

1.1 GENERAL DESCRIPTION

1.1.1 PHYSICAL

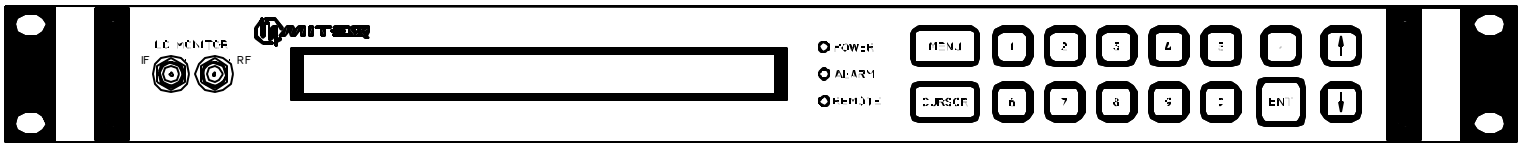


Figure 1-1. Front Panel, Frequency Converter

Figure 1-2. Rear Panel, Frequency Converter

1.1.2 FUNCTIONAL

The MITEQ Multi-band Block Converters are designed for advanced satellite communications systems. Both upconverters and downconverters are available for a wide variety of frequency conversion scenarios. Phase noise, amplitude flatness, group delay and spurious outputs have been optimized to provide the user with a transparent frequency conversion for all video and data applications.

A strong feature set of monitor and control functions supports powerful local and remote control. Among the features are control of frequency, attenuation, and 64 memory locations for each converter where various setups can be stored and recalled easily. Also, a log is continuously updated with time stamped records of activity for each converter. The equipment can operate stand-alone or can be arranged in a redundancy configuration without the need for a dedicated switch control unit.

1.1.3 MODEL NUMBERS

Converter Model Numbers

Multi-band Block Downconverters			
Model Number	Band	Input band	Output band
DNB-3B	Band 1	10.7-11.45 GHz	0.95-1.7 GHz
	Band 2	11.45-12.2 GHz	0.95-1.7 GHz
	Band 3	12.2-12.75 GHz	0.95-1.5 GHz
DNB-3B-1	Band 1	10.95-11.7 GHz	0.95-1.7 GHz
	Band 2	11.7-12.2 GHz	0.95-1.45 GHz
	Band 3	12.2-12.75 GHz	0.95-1.5 GHz
DNB-2B	Band 1	10.7-11.75 GHz	0.95-2.0 GHz
	Band 2	11.7-12.75 GHz	0.95-2.0 GHz

1.2 EQUIPMENT CHARACTERISTICS

1.2.1 PHYSICAL

Weight ..... 18 pounds nominal
Chassis Dimensions ..... 19” x 20” x 1.75” panel height
RF connectors ..... SMA female
RF Monitor connector ..... SMA female
IF Connectors ..... N female
IF Monitor connector ..... SMA female
LO Monitor connectors ..... SMA female
Alarm connector DE-9P
Remote interface connector
RS485, RS422, RS232 ..... DE-9S
IEEE-488 ..... IEEE-488 receptacle
Primary power input connector IEC320

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 (J6)			
RS485 and RS422		**RS232**	
Pin	**Designation**	**Pin**	**Designation**
1	Ground	2	RCV Data
3	Data Out -	3	Tx Data
5	Data In -	5	Ground
7	Data Out +	7	RTS
9	Data In +	8	CTS

1.2.2 FUNCTIONAL

Converter Performance Specifications			
Type	Single conversion		
Frequency step size	See Model Number Table		
Frequency sense	No inversion		
Model Number	Band	Input band	Output band
DNB-3B	Band 1	10.7-11.45 GHz	0.95-1.7 GHz
	Band 2	11.45-12.2 GHz	0.95-1.7 GHz
	Band 3	12.2-12.75 GHz	0.95-1.5 GHz
DNB-3B-1	Band 1	10.95-11.7 GHz	0.95-1.7 GHz
	Band 2	11.7-12.2 GHz	0.95-1.45 GHz
	Band 3	12.2-12.75 GHz	0.95-1.5 GHz
DNB-2B	Band 1	10.7-11.75 GHz	0.95-2.0 GHz
	Band 2	11.7-12.75 GHz	0.95-2.0 GHz
Input characteristics			
Frequency	See Above Table		
Impedance	50 Ohms		
Return loss	20 dB minimum		
Signal monitor	-20 dBc nominal		
LO Leakage	-80 dBm maximum		
Input level (non-damage)	+20 dBm maximum		
Output characteristics			
Frequency	See Above Table		
Impedance	50 Ohms		
Return loss	18 dB minimum		
Signal monitor	N/A		
Power output at 1 dB compression point	+10 dBm minimum		
Transfer characteristics			
Gain	+30 dB minimum		
Noise Figure	15 dB		
Image rejection	80 dB minimum		
Level stability	±0.25 dB/day at constant temperature		
Amplitude response	±0.5 dB/80 MHz		
	±1.0 dB over any band		
Group delay	1 ns over any band typical		
Intermodulation distortion (third order)	With two 0 dBm output signals, 40 dBc minimum		
AM/PM conversion	0.1°/dB maximum up to 0 dBm output		
Spurious outputs			
Signal related	60 dBc up to 0 dBm output		
Signal independent	-75 dBm maximum		
Gain adjustment	30 dB in 0.2 dB steps		
Frequency stability			
Standard	±2 x 10^{-8}, 0 to 50°C ±5 x 10^{-9}/day typical (fixed temperature after 24 hours on time)		
Option 10B	±5 x 10^{-9}, 0 to 50°C 1 x 10^{-9}/day typical (fixed temperature after 24 hours on time)		
Option 10C	±2 x 10^{-9}, 0 to 50°C 1 x 10^{-9}/day typical (fixed temperature after 24 hours on time)		

Converter Performance Specifications (Continued)	
Transfer characteristics (Cont.)	
External reference	5 MHz or 10 MHz, +4±3 dBm Unit will automatically switch to internal reference if External Reference level falls below +1 dBm nominal.
Phase noise	See model number table for phase noise table designation
LO Monitors	-5 dBm to –15 dBm
Primary power	90-250VAC
Power Consumption	50 Watts nominal
Fuse	T1.25A
Environmental (Operating)	
Ambient temperature	0 to +50°C
Relative humidity	Up to 95% at 30°C
Atmospheric pressure	Up to 10,000 feet
Environmental (Non-operating)	
Ambient temperature	-50 to +70°C
Relative humidity	Up to 95% at 40°C
Atmospheric pressure	Up to 40,000 feet
Shock and vibration	Normal handling by commercial carriers

TABLE 1

PHASE NOISE CHARACTERISTICS (1.0 Hz BANDWIDTH)

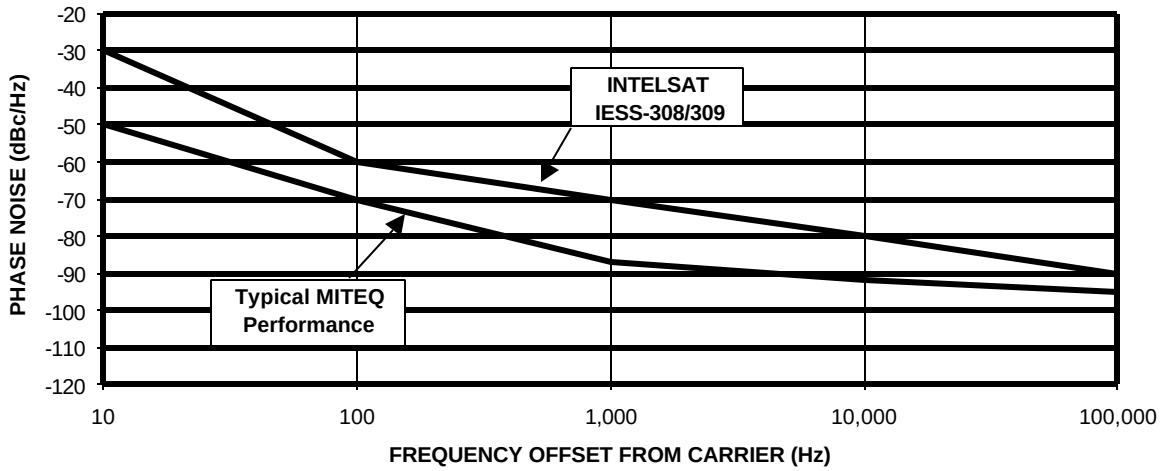


TABLE 2								
Offset (Hz)	10	100	1K	10K	100K	300K	1M	Offset (Hz)
Typical Phase Noise (dBc/Hz)	-50	-70	-87	-92	-95	-95	-115	Maximum Phase Noise (dBc/Hz) (1.0 Hz Bandwidth) Straight line curve defined by the points in the table.

SECTION 2
INSTALLATION

2.1 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.

2.2 MOUNTING

THIS EQUIPMENT IS NOT FOR USE IN A DOMESTIC ENVIRONMENT.

THIS EQUIPMENT IS INTENDED FOR RACK MOUNTING.

OPERATOR INJURY MAY OCCUR IF UNIT IS NOT PROPERLY MOUNTED.

THIS EQUIPMENT MUST BE SECURELY MOUNTED.

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

2.3 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 warmup 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. See Paragraph 1.2.1 for wiring information.
Remote Connector (J6)	The Remote Interface connector is an optional connection. This allows the operator to monitor and control the equipment from a remote location. See Paragraph 1.2.1 for wiring information.
RF Input	Connect the RF Input to J1 of the unit.
IF Output	Connect the IF Output to J2 of the unit.

SECTION 3
OPERATION

3.1 CONTROLS

3.1.1 EXTERNAL CONTROLS

For a description of the front panel keys and select switches see Paragraph 3.2.1.

AC Power

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

Fuse

The fuse is accessible from the top cover of the unit, near the rear panel, in the corner where the AC input is located. The fuse value is T1.25A.

3.1.2 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 ± 0.2V, +5.3 ± 0.2V and +15.3 ± 0.25V. There is no adjustment for the –15.3V output.

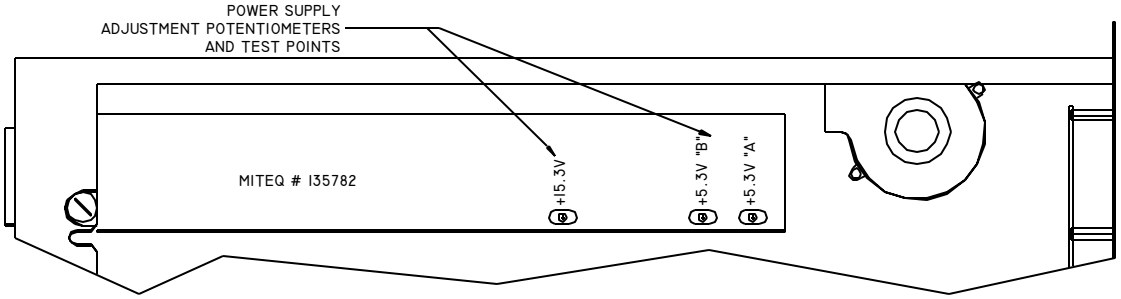


Figure 3-1. Internal Power Supply Adjustment

3.2 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 green “POWER” LED is lit when power is on.

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.

3.2.1 KEYPAD OPERATION

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
- Auxiliary
- 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

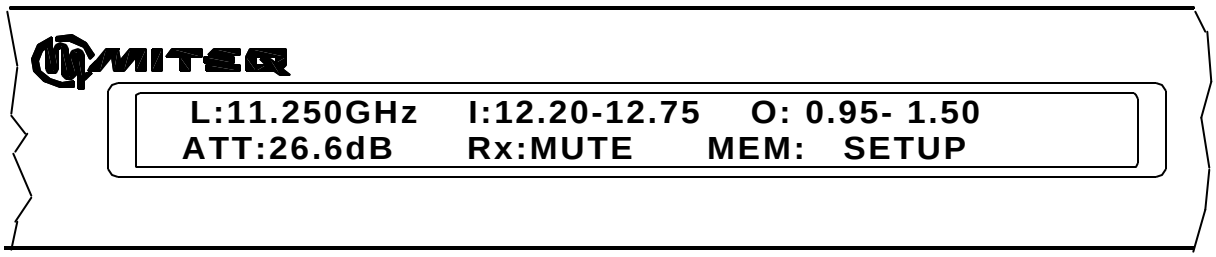
The Data Entry keys allow the operator to enter specific data into an active field. Data is entered by using the numeric keypad and pressing “ENT”, or by using the up and down arrows to scroll until the desired setting is displayed and then pressing the “ENT” key. If using the arrow keys to change attenuation 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.

3.2.2 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: Attenuation
- Tx or Rx: Mute Status (If Applicable)
- MEM: Memory Registers
- Setup Title (12 Characters)



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: 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 (Upconverters) (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:

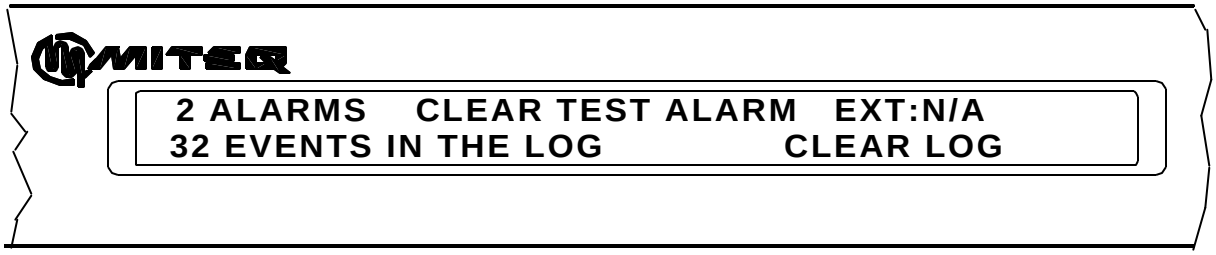
- Press the “CURSOR” key to move the cursor to the Setup Title field. Press an arrow key or press and hold down the “CURSOR” key to select the first letter in the title field.
- Use the up and down arrow keys or the numeric data entry keys to adjust the character in this position.
- Press the “CURSOR” 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.

3.2.3 ALARM MENU

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

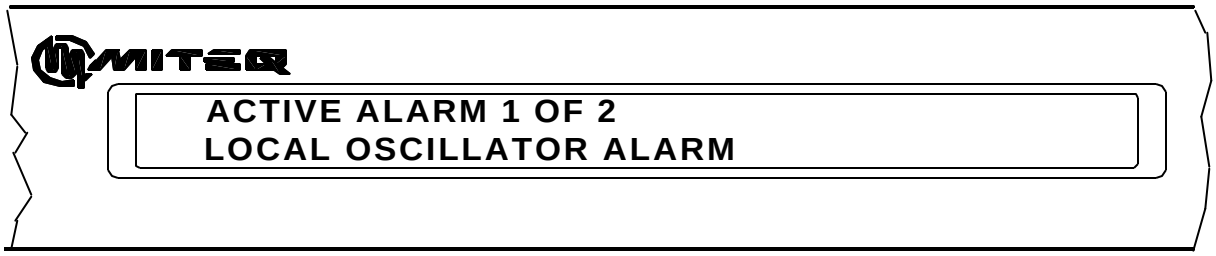
The alarm menu displays the status of the unit’s alarms. A “Test Alarm” can be set and cleared from this menu. This menu also allows the operator to review and clear the event log. The Event Log records the time and dates of significant events including all alarm activity. The “ALARM” LED on the front 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.



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.



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

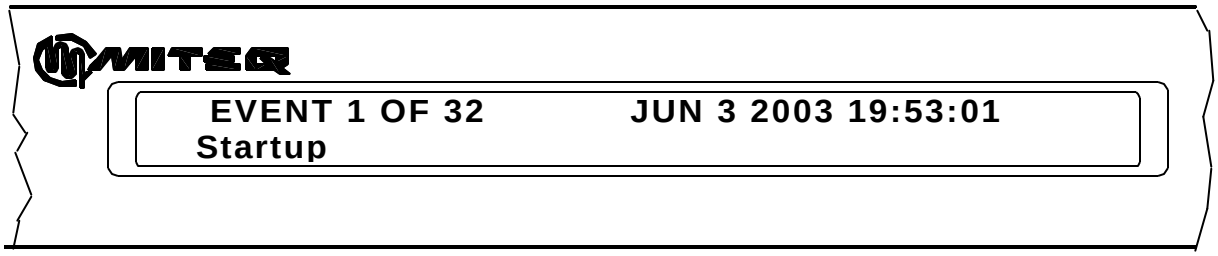
An external alarm can be sensed by the unit:

- 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.



The events that can be reported are:

- Unit Startup
- +15.3V power supply fault/recovery
- -15.3V power supply fault/recovery
- +5.3V ‘A’ power supply fault/recovery
- +5.3V ‘B’ power supply fault/recovery
- LO fault/recovery
- Frequency change
- Attenuation change
- Unit Mute/Unmute by an operator
- Test Alarm fault/recovery
- Unit Title change
- External fault/recovery

Clear Event Log

To clear the Event Log of its contents:

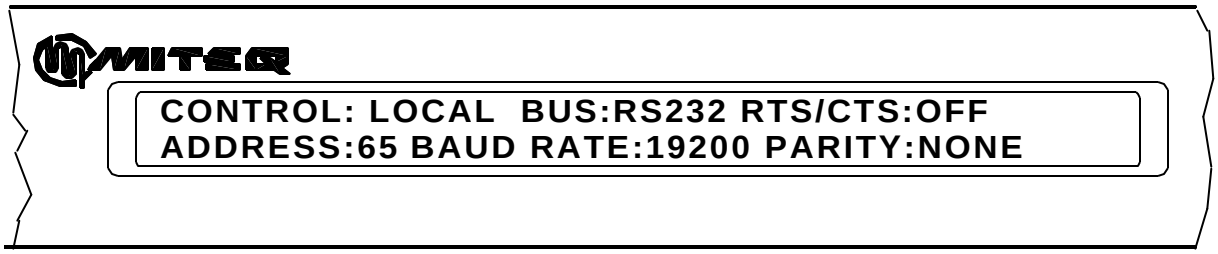
- Press the “CURSOR” key to highlight the Clear Log field on the display.
- Press the “ENT” key. A message will appear “PRESS ENT TO CLEAR THE EVENT LOG.”
- Press “ENT” to purge the contents of the event log or Press the “MENU” key to return to the Alarm menu.

3.2.4 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/RS422 only)
- RTS/CTS: RTS/CTS handshaking (RS232 only)
- Address: Remote Address
- Baud Rate (Serial Buses only)
- Parity (Serial Buses only)



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/RS422 Only)

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.

RTS/CTS: RTS/CTS Handshaking (RS232 Only)

For RS232 operation RTS/CTS handshaking can be enabled or disabled by the operator. To select the state of the RTS/CTS handshaking for RS232 operation:

- Press the "CURSOR" key to select the RTS/CTS field on the display.
- Use the up or down arrow key to toggle between "ON" and "OFF" until the desired setting is displayed.
- Press "ENT" to set the selection.

Address: Remote Address

Units equipped with a serial interface can occupy a remote address from 64 to 95 decimal. Units equipped with an IEEE-488 option can maintain an address from 0 to 30 decimal. To select the remote address:

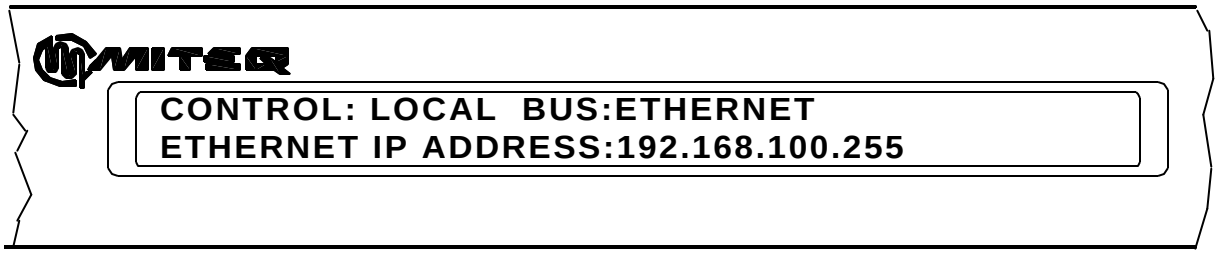
- Press the "CURSOR" key to select the address field on the display.

- 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 (Serial Buses Only)
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 (Serial Buses Only)
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.

Service Request (IEEE-488 Only)
To toggle the Service Request Feature between Enabled and Disabled:
- Press the “CURSOR” key to select the Service Request field on the display.
- Use the up or down arrow key to toggle the setting to “ENABLED” or “DISABLED”.
- Press “ENT” to set the service request feature.



IP Address
Units equipped with a Ethernet interface can occupy a IP address from 000.000.000.000 to 255.255. 255.255. 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.
- Press “ENT” to save the address.

Ethernet Subnet Mask
Units equipped with a Ethernet interface can occupy a subnet mask from 000.000.000.000 to 255.255. 255.255. To select the subnet mask:
- 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 “ENT” to save the subnet mask.

Ethernet Gateway
Units equipped with a 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 “ENT” to save the gateway.

Ethernet Password

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

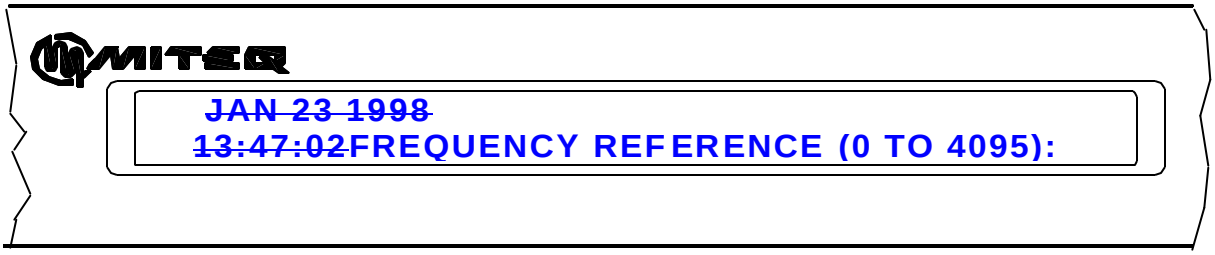
- Press the “CURSOR” key to select the password field on the display.
- Use the numeric data entry keys to enter the desired gateway.
- Press “ENT” to save the gateway.

3.2.5 AUXILIARY 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



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.

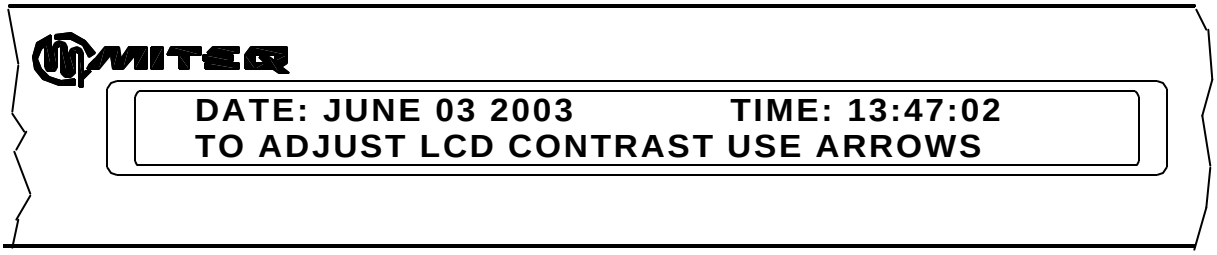
REF: Frequency Reference Source

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.

3.2.6 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.



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.

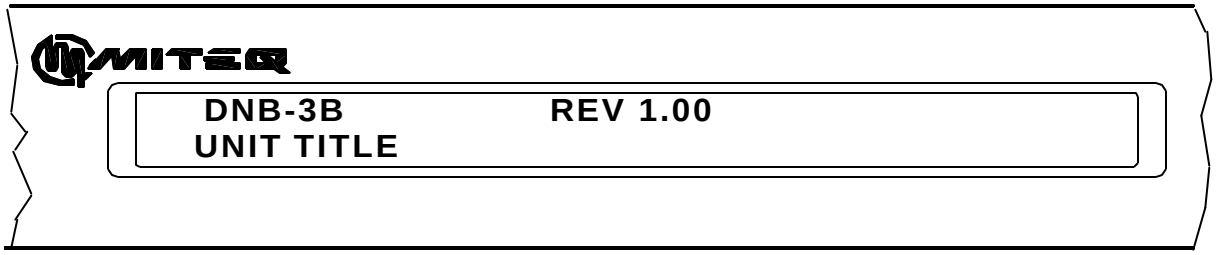
LCD Contrast
In order to adjust the LCD contrast:

- 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.

3.2.7 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.



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.

3.3 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.

3.4 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.

3.4.1 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.

Checksum = MOD [(character value - 32), 95] + 32

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

```
char check_sum(char*,char);

char check_sum(array,mes_len)
/* 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 array[32],mes_len;
{
char i,sum;
        sum = 0;
        for ( i = 0; i < mes_len; i++ ) {
                sum = sum + ( array[i] - 32 );
                if ( sum >= 95 ) sum = sum - 95;
        }
        return(sum + 32);
}
```

3.5 IEEE-488 MESSAGE PROTOCOL

The equipment performs the basic Talker and Listener functions as specified in the IEEE-488 standard. It is also capable of sending a Service Request to the active IEEE-488 controller and will respond with a status word when the Serial Poll Enable message is received.

The messages to and from the unit are ASCII character strings terminated with CR, LF and EOI. The response time from command to acknowledge is 100 ms. maximum.

3.5.1 IEEE-488 MESSAGE FORMAT

The IEEE-488 message format is as follows:

COMMAND CODE - PARAMETERS

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.

SET commands do not affect the unit's response when it is addressed to talk by the IEEE-488 controller.

QUERY commands determine the unit's response when it is addressed to talk by the IEEE-488 controller. The context of the unit's response remains in effect until another QUERY command is received. The response to the Alarm Status Query command (?ALR) is in effect at power up as the default format.

Parameters are all ASCII printable characters in the range of 20H to 7EH. Numeric parameters are sent MSD first, LSD last. Values that do not adhere to the command format, or are beyond the allowable range, will be ignored.

3.6 COMMAND CODE SUMMARY

The following paragraphs describe each of the command codes.

3.6.1 COMMAND CODES

ASCII Character String	Function
ALR	System Fault Status
ATT	Unit Attenuation
BND	Frequency Band Information
CLK	Internal Calendar / Clock
COM	Unit Combination Command
EAC	External Alarm Configuration
EST	Extended System Status
FRQ	LO Frequency
LOG	Alarm Activity Log
MEM	Memory Recall / Store
MUT	Mute
NAM	Unit title
REF	Frequency Reference Adjust
REV	Firmware Title and Revision
SET	Memory Recall / Store and Set
STA	System Status
USR	User Title
VLT	System Voltages

Note: The Mutliband 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 Mutliband Block Converters units.

3.6.2 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

3.6.3 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.

Remote Command Sequence: $ALRabcdefghi
Unit Response: $ALR

The QUERY command requires no parameters.

Remote Command Sequence: ?ALR
Unit Response: ?ALRabcdefghi

?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	Reserved for future use
f	Reserved for future use
g	External Alarm
h	Reserved for future use
i	Reserved for future use

3.6.4 UNIT ATTENUATION = ATT

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.

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

The QUERY command requires no 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

3.6.5 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.

Remote Command Sequence: $BNDb
Unit Response: $BND

The QUERY command requires no parameters.

Remote Command Sequence: ?BND
Unit Response: ?BNDbLfffffIffff-ffffOffff-ffff

BND: Band indicator
b: single-digit ASCII numeric character representing Band number
L: LO frequency indicator
fffff: Five-digit ASCII numeric characters indicating frequency in MHz
I: Input frequency indicator
ffff-ffff: Input Frequency Range
O: Output Frequency indicator
ffff-ffff: Output Frequency Range

3.6.6 INTERNAL CALENDAR / CLOCK = CLK

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

Remote Command Sequence: $CLKYyyyyMmmDddHhhNnnSss
Unit Response: $CLK

The QUERY command requires no parameters.

Remote Command Sequence: ?CLK
Unit Response: ?CLKYyyyyMmmDddHhhNnnSss

Y: Year indicator
yyyy: Year, 4-digit ASCII numeric characters

M: Month indicator
mm: Month, 2-digit ASCII numeric characters

D: Day indicator
dd: Day, 2-digit ASCII numeric characters

H: Hour indicator
hh: Hour, 2-digit ASCII numeric characters

N: Minute indicator
nn: Minute, 2-digit ASCII numeric characters

S: Second indicator
ss: Second, 2-digit ASCII numeric characters

3.6.7 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.

Remote Command Sequence: $COMFfffffffffffTttt or $COMBbTttt
Unit Response: $COM

The QUERY command requires no parameters.

Remote Command Sequence: ?COM
Unit Response: ?COMFfffffffffffTtttIi

F: LO Frequency indicator.
Fffffffffff: Twelve digit ASCII numeric characters indicating the LO frequency in Hz.

B: Band indicator
b: single-digit ASCII numeric character representing Band number

T: Attenuation indicator.
ttt: Three digit ASCII numeric characters indicating the attenuation in tenths of a dB.

I: IF indicator
i: "0" No IF selection available

3.6.8 EXTERNAL ALARM CONFIGURATION = EAC

The SET command requires one parameter.

Remote Command Sequence: $EACn
Unit Response: $EAC

The QUERY command requires no parameters.

Remote Command Sequence: ?EAC
Unit Response: ?EACn

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.

3.6.9 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.

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.

Remote Command Sequence: ?FRQ
Unit Response: ?FRQfffffffffff

FRQ: Frequency indicator
fffffffffff: Twelve-digit ASCII numeric characters indicating frequency in Hz.

3.6.10 ALARM LOG = LOG

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

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.

Remote Command Sequence: ?LOGnn
Unit Response: ?LOGnnCyyyymmddhhnnssEeee

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
001	Unit startup
002	+15.3V power supply fault
003	+15.3V power supply fault recovery
004	-15.3V power supply fault
005	-15.3V power supply fault recovery
006	+5.3V 'A' power supply fault

007	+5.3V ‘A’ power supply fault recovery
008	+5.3V ‘B’ power supply fault
009	+5.3V ‘B’ power supply fault recovery
010-013	Reserved for future use
014	LO fault
015	LO fault recovery
016-025	Reserved for future use
026	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
033	Unit Title change
034-043	Reserved for future use
044	External Fault
045	External Fault Recovery
046-255	Reserved for future use

3.6.11 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.

Remote Command Sequence: $MEMnnFfffffffffffTtttIiUuuuuuuuuuuu
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.

Remote Command Sequence: ?MEMnn
Unit Response: ?MEMnnFfffffffffffTtttIiUuuuuuuuuuuu

nn: Two digit ASCII numeric characters indicating the memory register accessed.

F: Frequency indicator
fffffffffff: 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.

I: IF indicator
i: "0" No IF selection available

U: User-defined Setup Title Indicator
Uuuuuuuuuuuu: Twelve character user-defined setup title

3.6.12 UNIT MUTE COMMAND = MUT

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

Remote Command Sequence: $MUTm
Unit Response: $MUT

The QUERY command requires no parameters.

Remote Command Sequence: ?MUT
Unit Response: ?MUTm

MUT: Mute indicator.
m: "0" or "1" ASCII numeric character
0 = not mute
1 = mute

3.6.13 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.

Remote Command Sequence: $NAMnnnnnnnnnnnnnnnnnn
Unit Response: $NAM

The QUERY command requires no parameters.

Remote Command Sequence: ?NAM
Unit Response: ?NAMnnnnnnnnnnnnnnnnnn

Nnnnnnnnnnnnnnnnnnn: Twenty-character unit name.

3.6.14 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.

Remote Command Sequence: $REFdddd
Unit Response: $REF

The QUERY command requires no parameters.

Remote Command Sequence: ?REF
Unit Response: ?REFdddd

dddd: Reference frequency tune voltage DAC setting (0000 to 4095)

3.6.15 FIRMWARE TITLE AND REVISION = REV

There is no SET command.

The QUERY command requires no 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

3.6.16 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.

Remote Command Sequence: $SETnnFfffffffffffTtttIiUuuuuuuuuuuu
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.

Remote Command Sequence: ?SETnn
Unit Response: ?SETnnFfffffffffffTtttIiUuuuuuuuuuuu

nn: Two digit ASCII numeric characters indicating the memory register accessed.

F: Frequency indicator
fffffffffff: 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.

I: IF indicator
i: "0" No IF selection available

U: User-defined Setup Title Indicator
Uuuuuuuuuuu: Twelve character user-defined setup title

3.6.17 UNIT STATUS = STA

There is no SET command.

The QUERY command requires no parameters.

Remote Command Sequence: ?STA
Unit Response: ?STAFfffffffffffTtttLlIiMmRrPp?abcdefghi

F: Frequency indicator
fffffffffffff: 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.

L: Local / Remote mode indicator
l: "0" or "1" ASCII numeric character
0 = Local control
1 = Remote control

I: IF indicator
i: "0" No IF selection available

M: Mute status indicator
m: "0" or "1" ASCII numeric character
0 = not mute
1 = mute.

R: Frequency Reference Source indicator
r: "0" or "1" ASCII numeric character
0 = internal
1 = external.

P: Polarization indicator
p: "0" No Polarization selection available

?: 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 in the ALR command.

3.6.18 USER TITLE = USR

The SET command stores a user-defined setup title.

Remote Command Sequence: $USRuuuuuuuuuuuu
Unit Response: $USR

The QUERY command requires no parameters.

Remote Command Sequence: ?USR
Unit Response: ?USRuuuuuuuuuuuu

USR: User-defined Setup Title Indicator
Uuuuuuuuuuuu: Twelve character user-defined setup title

3.6.19 SYSTEM VOLTAGES = VLT

There is no SET command.

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

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

3.6.20 EXAMPLES

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

A. Set the Attenuation to 15.2 dB.

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

B. Return the number of entries stored in the Alarm log. The converter returns that there are 3 entries in the alarm log.

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

3.6.21 IEEE-488 SERVICE REQUEST

The unit will issue a Service Request (activate the SRQ line) if the SRQ is enabled and one of the status alarms indicate a failure. The IEEE-488 controller then performs a serial poll addressing the unit to talk. The following bits are reported back to the controller:

Bit No.							
7	6	5	4	3	2	1	0
0	1	0	0	0	S2	S1	S0

The S"n" bits indicate in binary code which component fault line caused the service request (a = 1, b = 2, c = 4, etc.). In the case of multiple faults, the lowest fault value will be reported.

The IEEE-488 controller may perform a serial poll without a service request being generated by the unit (a request may have been generated by another device on the bus). In this case, the message will have the same format with the exception that bit 6 will be a "0."

3.7 ETHERNET INTERFACE INSTALLATION AND OPERATION

3.7.1 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

3.7.2 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 Appendix A 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 Appendix A for information on connecting directly to a PC without a Local Area Network) Three parameters will be required:

IP Address (factory setting 192.168.1.1)
Subnet Mask (factory setting 255.255.255.0)
Gateway (factory setting 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

Address: $EADaaaaaaaaaaa
Subnet mask: $ESBsssssssssss
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 0 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 Appendix A 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.

3.7.3 ACCESSING THE SYSTEM

Access via the Web Interface

All system setting may be 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 Appendix B 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.

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:

Function Name	Description
(all pages)	
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	
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	
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	
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
Time Page	
Set Clock	View or set the system real-time clock

Miscellaneous Page	
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	
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	
(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). 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. This file is read by the chosen SNMP management tool to provide an “understanding” of the interface. 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.

3.7.4 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:

IP Address 192.168.1.2
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:

Direct Cable Wiring

1	wh/or	1
2	or	2
3	wh/gn	3
4	bl	4
5	wh/bl	5
6	gn	6
7	wh/br	7
8	br	8

Crossover Cable Wiring

1	wh/or	3
2	or	6
3	wh/gn	1
4	bl	4
5	wh/bl	5
6	gn	2
7	wh/br	7
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:

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:

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

4.1 INTRODUCTION

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

4.2 FUNCTIONAL DESCRIPTION

The Multi-band block converters use a single-conversion frequency translation scheme. The converters employ local oscillators that are phase locked to a 10 MHz reference source. All converters can be operated from an external 5 MHz or 10 MHz reference source. The reference oscillator will automatically detect the presence of an external reference and switch to external reference source as long as the power level of the external source is above +1 dBm nominal. The output from the internal reference oscillator is always 10 MHz. If a 5 MHz external reference signal is applied, the internal reference source will frequency double the incoming signal to achieve the 10 MHz output signal.

The RF local oscillator is a synthesized frequency-agile phase locked source.

4.2.1 DOWNCONVERTER FUNCTIONAL DESCRIPTION

The input signal is fed to an isolator and input filter which rejects out-of-band signals including the image frequency. A coupler is used at the input to provide an RF signal monitor at the rear panel of the converter. The signal is then converted in the first mixer to the IF frequency by use of the RF local oscillator signal.

The output of the first mixer is fed to the output module. In the module a low noise amplifier is followed by a PIN diode attenuator which provides gain control for the system, is amplified, and output from the system.

4.2.2 BLOCK DIAGRAMS

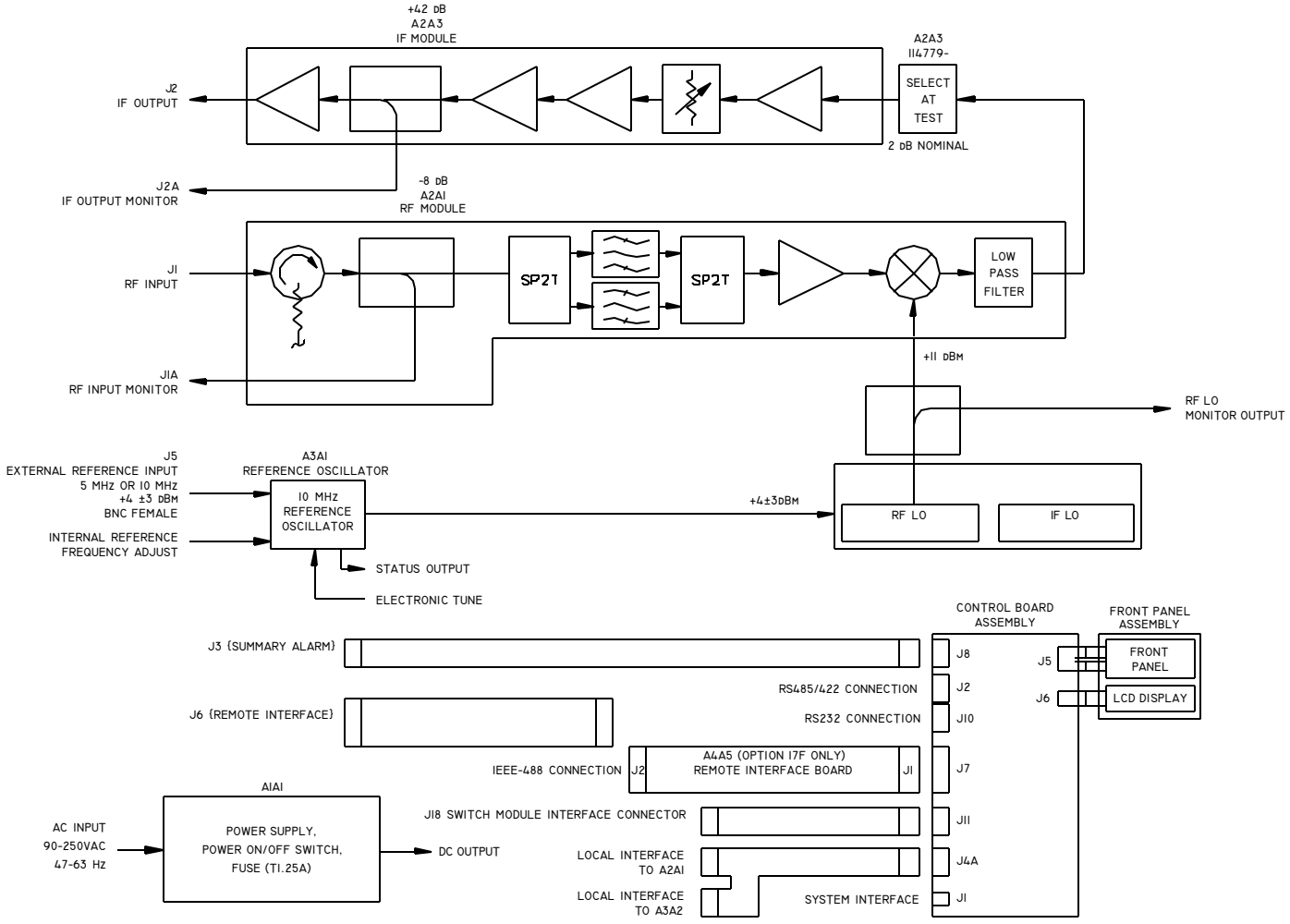


Figure 4-1. Downconverter Functional Block Diagram

4.2.3 FREQUENCY PLANS

Downconverter Frequency Plans				
MITEQ Model Number	Band	Input band	LO frequency	Output band
DNB-3B	Band 1	10.7-11.45 GHz	9.75 GHz	0.95-1.7 GHz
	Band 2	11.45-12.2 GHz	10.5 GHz	0.95-1.7 GHz
	Band 3	12.2-12.75 GHz	11.25 GHz	0.95-1.5 GHz
DNB-3B-1	Band 1	10.95-11.7 GHz	10.0 GHz	0.95-1.7 GHz
	Band 2	11.7-12.2 GHz	10.75 GHz	0.95-1.45 GHz
	Band 3	12.2-12.75 GHz	11.25 GHz	0.95-1.5 GHz
DNB-2B	Band 1	10.7-11.75 GHz	9.75 GHz	0.95-2.0 GHz
	Band 2	11.7-12.75 GHz	10.75 GHz	0.95-2.0 GHz

4.3 MAJOR SUBASSEMBLIES FUNCTIONAL DESCRIPTION

4.3.1 DOWNCONVERTER RF MODULE (A2A1)

Model Number	Part Number
DNB-3B	148862-1
DNB-3B-1	148862-2
DNB-2B	148862-4

See frequency plans for input, output and LO frequencies.

Conversion Loss:	8 dB nominal
Input Return Loss:	20 dB/50 ohms minimum
Output Return Loss:	14 dB/50 ohms nominal
Power Output (1 dB Compression):	-8 dBm nominal
Image Rejection	80 dB minimum
LO Leakage at the Input	-80 dBm maximum
Input Signal Monitor:	-20 dBc nominal
DC Voltage:	+15 volts
Noise Figure:	9 dB nominal
LO Input Power Level	+10 dBm nominal

4.3.2 OUTPUT MODULE (A2A3)

Model Number	Part Number
DNB-3B	148868-1
DNB-3B-1	148868-1
DNB-2B	148868-2

Gain:	42 dB nominal
Noise Figure:	6 dB nominal
Input Return Loss:	10 dB nominal/50 Ohms
Output Return Loss:	20 dB minimum
Pout 1 dB:	+10 dBm minimum
Flatness:	0.5 dB/80 MHz
Level Control:	30 dB
DC Voltage:	+15 volts, +5 volts

4.3.3 CRYSTAL OSCILLATOR (A3A1)

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 +50°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	-165
10B	136284-2	$\pm 5 \times 10^{-9}$	1×10^{-9}	-135	-155	-165
10C	136284-3	$\pm 2 \times 10^{-9}$	1×10^{-9}	-135	-155	-165

Input characteristics -

Frequency:	5 MHz or 10 MHz
Impedance:	50 ohms
Level:	+4 ±3 dBm

Output characteristics -

Frequency:	10 MHz
Impedance:	50 ohms
Level:	+4 ±3 dBm

Status indicator -

Internal oscillator "ON"	TTL Low (0V)
Internal oscillator "OFF"	TTL High (5V)

Mechanical Tuning –

136284-1:	±2 x 10-6 min. 20 turn control
136284-2, 136284-3:	±1 x 10-6 min. 20 turn control
Electrical Tuning:	±1 x 10-7 ±5V input

4.3.4 LOCAL OSCILLATOR (A3A2)

Model Number	Part Number	RF LO Frequency (GHz)
DNB-3B	143022-1	9.75, 10.5, 11.25 GHz
DNB-3B-1	143022-5	10.0, 10.75, 11.25 GHz
DNB-2B	143022-4	9.75, 10.75 GHz

Output power:	+13 dBm
Input reference frequency:	10 MHz
Input reference power:	+4 ±3 dBm
Input/Output impedance:	50 ohms
DC voltage:	+5V, +15V

4.3.5 POWER SUPPLY (A1A1)

The Power Supply has an integrated AC line input and illuminated rocker type power on/off switch. The fuse is top mounted flush with the top surface of the converter. Accessible voltage adjustment potentiometers are provided for the +15.3V, +5.3V "A" and +5.3V "B" outputs by removing the converter cover. Over-voltage protection is included for all sections of the power supply.

Part Number:	135782
AC input:	90 VAC to 265 VAC, 45 Hz to 66 Hz
Input connector type:	IEC 320 socket
Fuse value:	1.25A
Fuse type:	Time-lag
Fuse size:	5 x 20 mm
DC Output Voltage Tolerances-	
+15V:	+15.3 ±0.25V
+5V:	+5.3 ±0.2V
-15V	-15.3V ±0.25V
DC Output Pins -	
Pins 1, 3:	-15.3V Return
Pins 2, 4:	-15.3V
Pins 5, 7, 9:	+5.3V "B" Return
Pins 6, 8, 10:	+5.3V "B"
Pin 11:	+5.3V "A" Return
Pin 12:	+5.3V "A"
Pins 13, 15, 17, 19, 21, 23:	+15.3V Return
Pins 14, 16, 18, 20, 22, 24:	+15.3V
Fan Output Pins -	
Pin 1:	+12V
Pin 2:	+12V Return
Power factor (For Reference Only):	0.8 nominal
Power supply efficiency (For Reference Only):	80% nominal

4.3.6 CONTROL BOARD/FIRMWARE KIT (A4A1)

Part Number:	138276

4.3.7 FAN (A1A2)

Part Number:	137892
DC Voltage:	+12V

SECTION 5
MAINTENANCE

5.1 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.

5.1.1 DC VOLTAGE

A set of power supply test points is available on the power supply. If voltage is beyond tolerance (see Section 5.3.7), reset power supply (refer to Figure 4-1), using the tuning adjustment on the power supply.

5.1.2 GAIN OF THE CONVERTER

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

5.1.3 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.

5.2 CORRECTIVE MAINTENANCE

If the unit malfunctions during normal use or if the tests in Section 6.2 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.

5.3 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:

Low Frequency Limit - Low limit of the LO frequency (See Section 1.1.3)
High Frequency Limit - High limit of the LO frequency (See Section 1.1.3)
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.

NOTE: 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.

5.3.1 INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT (A4A1)

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**. However, if it becomes necessary to replace a failed Control Board/Firmware Kit (A4A1) then these settings must be entered to configure the replacement unit. These settings can be automatically set by changing the converter's model number.

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 soon appear.

  Use arrow keys to select model number or "ENT" key for manual entry.

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 Downconverter models.
- Press "ENT".
- Use the arrow keys to select Block Downconverters.
- Press "ENT".
- Use the arrow keys to select the proper model numbers
- The High and Low LO frequency limits will soon appear on the display.
- You may now use the "MENU" key to verify the settings or enter different values.
- Enter the Low LO Frequency Limit in MHz (See Section 1.1.3) using the data entry keys and press "ENT".
- Enter the High LO Frequency Limit in MHz (See Section 1.1.3) using the data entry keys and press "ENT".
- Enter the Frequency Step Size using the data entry keys, 0.125000 MHz or 0.001000 MHz (See Section 1.1.3), and press "ENT".
- Enter the IF Frequency in MHz using the data entry keys and press "ENT". This is the second IF frequency of the unit. (See Above and Section 5.2.4). Use the arrow keys to select "+" and "-".
- Enter the Frequency Display Format using the data entry keys, 2.3 , and press "ENT".
- Enter the Attenuation Max using the data entry keys, 30.0 dB for all units, and press "ENT".
- Enter the Attenuation Step Size using the data entry keys, 0.2 dB for all units, and press "ENT".
- Select the Remote Bus using the arrow keys and press "ENT".
- Enter the Model Number -
  - 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.

- Select the Model Type using the arrow keys, *Upconverter* or *downconverter,* and press "ENT"
- Model Code (This field is for future use and should be set to "0"): press "ENT"
- Select the Mute Option using the arrow keys, *ENABLE* for upconverters, *DISABLE* for downconverters, and press "ENT"
- Select the IF Option using the arrow keys, *70 MHz* or *140 MHz*, and press "ENT".
- INT/EXT Reference Option
- Use the arrow key to select the proper option and 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.