MITEQ

9800 SERIES FREQUENCY CONVERTERS

MODEL NUMBER SUPPLIED				
UPCONVERTER				
STANDARD FREQUENCY			**REVERSE FREQUENCY**	
	U-9848-1-1K		U-9848-4-1K		U-9801R-1-1K
	U-9848-5-1K		U-9848-6-1K		U-9802R-2-1K
	U-9853-2-1K		U-9853-6-1K		U-9805R-1K
	U-9854-1K		U-9855-2-1K		U-9808R-6-1K
	U-9856-6-1K		U-9856-7-1K		
	U-9857-2-1K				
DOWNCONVERTER				
STANDARD FREQUENCY			**REVERSE FREQUENCY**	
	D-9800-3-1K		D-9802-2-1K		D-9853R-2-1K
	D-9800-6-1K		D-9805-1K		D-9853R-6-1K
	D-9800-7-1K		D-9808-6-1K		D-9854R-1K
	D-9800-8-1K				D-9855R-2-1K
	D-9801-1-1K				D-9856R-6-1K
					D-9856R-7-1K
					D-9857R-2-1K

OPTIONS 1, 4, 5, 8, 10B, 10C, 10E, 10F, 14, 15, 16C, 17C, 18-4, 18-8, 20, 31A THRU 31D, TNCIF, NRF, TNCRF LISTED ON THE FOLLOWING PAGE.

OPTIONS SUPPLIED
Option 1: 45 dB level control
Option 4: 140 MHz IF Frequency

Option 5: Group delay equalization
    1.0 ns p-p maximum/70 ±18 MHz IF output
    2.0 ns p-p maximum/140 ±36 MHz IF output

Option 8: LO level detect
Option 10B: Higher Frequency Stability Reference (see Section 1 for specifications)
Option 10C: Highest Frequency Stability Reference (see Section 1 for specifications)
Option 10E: Analog Reference Phase Lock - External 5 or 10 MHz at +4 ±3 dBm.   If external reference is below +1 dBm nominal, the converter will automatically lock to the internal reference. Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth. Typical loop suppression of the external reference is as follows: 28 dB at 1 Hz offset; 65 dB at Hz offset and 100 dB at 100 Hz offset
Option 10F: Highest Frequency Stability with Analog Reference Phase Lock
Option 14: Front panel selectable 50/75 ohms IF impedance
Option 15: 50 Ohm IF Impedance
Option 16C: +55-61 dB gain (downconverter only)
Option 17C: RS232 Remote Interface
Option 18-4: Four IF outputs (downconverter only; not compatible with NSUN or Option 14)   Output 1 dB compression point: +10 dBm, Intermodulation distortion at 0 dBm output: 40 dBc minimum (+20 dBm IP3)
Option 18-8: Eight IF outputs (downconverter only; not compatible with NSUN or Option 14)   Output 1 dB compression point: +10 dBm, Intermodulation distortion at 0 dBm output: 40 dBc minimum (+20 dBm IP3)
Option 20: Selectable 70/140 MHz IF frequencies.   One IF connector provided at rear panel (BNC female). Selection of IF frequency is available from the front panel and over the remote bus
Option TNCIF: Type TNC female IF connector and IF monitor
Option NRF: Type N female RF connector (Note: Monitor remains SMA female) RF return loss: 18 dB, 9-15 GHz, not available above 15 GHz
Option TNCRF: Type TNC female RF connector (Note: Monitor remains SMA female) RF return loss: 18 dB, 9-15 GHz, not available above 15 GHz
Option: 45 dB minimum gain
Option 31A: Ultra-low phase noise (See Phase Noise Specifications chart). Option 10E (analog reference phase lock) supplied as standard and an internal reference U-link is provided (an external 10 MHz reference may be applied to the U-link). Higher frequency stability available, for details see Option 10F.
Option 31B: Ultra-low phase noise (See Phase Noise Specifications chart). Option 10F (analog reference phase lock) supplied as standard and an internal reference U-link is provided (an external 10 MHz reference may be applied to the U-link).
Option 31C*: 5 MHz reference only (no internal provided) at +4 ±3 dBm. For ultra-low phase noise reference (no reference suppression) or direct reference multiplication inside 100 kHz. (See below for formula for calculation.)
Option 31D*: 10 MHz reference only (no internal provided) at +4 ±3 dBm. For ultra-low phase noise reference (no reference suppression) or direct reference multiplication inside 100 kHz. (See below for formula for calculation.)
*Formula for calculation of external reference only (Option 31C or 31D): External reference phase noise required to meet the ultra phase noise system characteristics: (U-20log(M) -3) dBc/Hz. Where U is the ultra phase noise characteristic at a specific frequency offset for a specific model and M is the multiplication factor of the reference frequency (5 or 10 MHz) divided into the operational RF frequency (fo) of the model selected: M = Fo (MHz)/10 (MHz) or Fo (MHz)/5 (MHz).

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.

11/7/07: INITIAL RELEASE

5/20/08: REV.A TO REV.B
> PG.1 - IN **FEATURES**, CHANGED T**WO MONITOR AND CONTROL PORTS** TO **THREE MONITOR AND CONTROL PORTS**
> PG.1 - ADDED NEW REAR PANEL PHOTO
> PG.4 - ADDED **+55-61 dB AT 23°C (OPTION 16C)**, **-65 dBm MAXIMUM (OPTION 16C)**, AND **SLOPE ADJUST** ROW
> PG.11 - ADDED **ETHERNET INTERFACE** TO MENU KEY LIST
> PG.16&17 - REMOVED **(SERIAL BUSES ONLY)** FROM **BAUD RATE** AND **PARITY** HEADINGS
> PG.16 - ADDED FIGURE 3-8a
> PG.17 - REMOVED **SERVICE REQUEST (IEEE-488 ONLY)** SECTION AND FIGURE 3-9
> MOVED **AUXILIARY CONTROL INTERFACE OPERATION MENU** TO PAGE 17 AND RENUMBERED ALL FIGURES THROUGHOUT THE REST OF SECTION 3.
> PG.18 - CREATED NEW **ETHERNET CONTROL INTERFACE** SECTION
> PG.22 - REMOVED **IEEE-488 MESSAGE PROTOCOL** AND **IEEE-488 MESSAGE FORMAT** SECTIONS
> PG.50 - BLOCK 175990 REV.A TO REV.B
> PG.52 - BLOCK 165223 REPLACED BY BLOCK 180070
> PG.56 - CONTROL BOARD P/N CHANGED FROM 152929 TO 175022
> PG.59&60 - COMPLETELY RE-WROTE **INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT** SECTION

6/30/08: REV.B TO REV.C
> PG.4 - ADDED **2.92 mm** TO **RF** AND **N/A** to **RF MONITOR** IN **PHYSICAL**
> PG.5 - REVISED **SIGNAL MONITOR** IN **INPUT** AND **OUTPUT CHARACTERISTICS** FOR EXCEPTIONS

11/21/08: REV.C TO REV.D
> COVER - REMOVED MODEL NUMBERS **U-9858-3-1K**, **U-9813R-4-1K**, **D-9813-4-1K** AND **D-9858R-3-1K**
> PG.2 - REMOVED MODEL NUMBERS **D-9813-4-1K** AND **D-9858R-3-1K**
> PG.3 - REMOVED MODEL NUMBERS **U-9858-3-1K** AND **U-9813R-4-1K**
> PG.5 - ADDED **(20 dB min w/Option 4)** TO **UPCONVERTER INPUT** AND **DOWNCONVERTER OUTPUT RETURN LOSS**
> PG.5 - ADDED **50 dBc minimum above 22 GHz (+25 dBm IP3 pt.)** TO **UPCONVERTER INTERMODULATION DISTORTION**
> PG.6 - CHANGED **UPCONVERTER LO LEAKAGE** TO **N/A** AND **DOWNCONVERTER LO LEAKAGE** TO **-80 dBm maximum**
> PG.7 - REMOVED MODEL NUMBERS **U-9858-3-1K, U-9813R-4-1K, D-9813-4-1K** AND **D-9858R-3-1K** FROM **PHASE NOISE TABLES**
> PGS.25, 29, 30, 32, 34 - ADDED **- = Does not apply** TO **IF INDICATOR CODES**
> PGS.50-51 - BLOCK 175990 REV.B TO REV.C
> PG.53 - REMOVED MODEL NUMBERS **D-9813-4-1K** AND **D-9858R-3-1K**
> PG.54 - REMOVED MODEL NUMBERS **U-9858-3-1K** AND **U-9813R-4-1K**

12/8/08: REV.D TO REV.D (FINAL)
> PG.5 - CHANGED **UPCONVERTER NOISE POWER DENSITY** FROM **-125** TO **-124 dBm/Hz maximum** & **-121 dBm/Hz maximum (above 22 GHz)**
> PG.18 - REMOVED ORIGINAL FIGURE 3-10, CHANGED FIGURE 3-11 TO 3-10 AND RENUMBERED ALL REMAINING SECTION 3 FIGURES.

3/9/09: REV.D TO REV.E
> PG.4 - 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 - CHANGED **Tx** FROM **(upconverters only)** TO **(if applicable)**
> PG.11 - ADDED **AT2: Attenuation 2**
> PG.12 - ADDED **AT2** TO FIGURE 3-4
> PG.12 - CHANGED **ATT:** TO **ATT: or AT1**
> PG.12 - ADDED **(if applicable)** TO **Tx/Rx: Mute Status**

3/9/09: REV.D TO REV.E (CONTINUED)
  PG.14 - ADDED **AT2: Attenuation 2**
  PG.15 - ADDED **Log Cleared, Power Supply fault/recovery, Attenuation 2 change** AND **AMP Current fault/recovery** TO **REPORTABLE EVENTS LIST**
  PG.16 - REMOVED **RTS/CTS PARAMETER** AND REWROTE ALL OTHERS EXCEPT CONTROL IN **REMOTE INTERFACE OPTION MENU**
  PG.16 - REMOVED FIGURE 3-8a
  PG.16 - COMPLETELY REWROTE **BUS SELECTION HEADER** AND REMOVED **RTS/CTS SELECTION**
  PG.22 - COMPLETELY REWROTE **CHECKSUM CALCULATION**
  PG.23 - ADDED THE FOLLOWING COMMAND CODES; **ATT/AT1, ATN/AN1, AT2, AN2, BFR, EAD, FRN,**
    PG. 2 - ADDED **IMP, REV/VER, TMP**
  PG.24 - IN **ALR**, CHANGED **f** FROM **Reserved for future use** TO **Amplifier Current Alarm (Optional)**
  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.30 - ADDED **FRN** COMMAND CODE
  PG.31 - ADDED **IMP** COMMAND CODE
  PG.32 - ADDED NEW EVENT INDICATORS FOR **000, 002, 003, 004-013, 127, 128, 129** AND **130-255**
  PG.33 - ADDED **(Aaaa)** TO **MEM** COMMAND CODE
  PG.34 - ADDED **(Aaaa)** TO **MST** COMMAND CODE
  PG.36 - **REV** COMMAND CODE NOW **REV OR VER**
  PG.36 - ADDED **(Aaaa)** TO **SET** COMMAND CODE
  PG.38 - ADDED **(Aaaa)** TO **STA** COMMAND CODE
  PG.39 - ADDED **TMP** COMMAND CODE
  PG.40 - MOVED **AUXILIARY CONTROL INTERFACE OPERATION** FROM END OF SECTION 3 TO THIS PAGE
  REPAGED SECTIONS 3 THRU 5 PER CHANGES TO TEXT

4/23/09: REV.E TO REV.F
  PG.23 - ADDED NOTE
  PG.42 - UPDATED **FIGURE 3-16**
  PG.43 - UPDATED **FIGURE 3-17**
  PG.44 - UPDATED **FIGURE 3-18**
  PG.45 - UPDATED **FIGURE 3-19**
  PG.46 - UPDATED **FIGURE 3-20**
  PG.47 - UPDATED **FIGURE 3-21**
  PG.48 - UPDATED **FIGURE 3-22 & 3-23**

5/28/09: REV.F TO REV.G
  PG.61 - CHANGED PHASE NOISE FOR **136284-1** FROM **114/144** TO **120/150**

11/16/09: REV.G TO REV.H
  PG.25 - ADDED AVAILABILITY NOTE TO **AT2** COMMAND
  PG.26 - ADDED AVAILABILITY NOTE TO **AN2** COMMAND
  PG.28 - ADDED **Optional** TO **Attenuator 2 indicator** IN **COM** COMMAND
  PG.31 - ADDED AVAILABILITY NOTE TO **IMP** COMMAND
  PG.34 - CHANGED **NsaaZz** TO **(NsaaZz)** IN MST COMMAND
  PG.34 - ADDED **Optional** TO **Slope indicator** IN MST COMMAND
  PG.34 - ADDED **Optional** TO **Impedance indicator** IN **MST** COMMAND
  PG.35 - ADDED AVAILABILITY NOTE TO **MUT** COMMAND
  PG.35 - ADDED AVAILABILITY NOTE TO **REF** COMMAND
  PG.37 - ADDED AVAILABILITY NOTE TO **SLP** COMMAND
  PGS.54&55 - BLOCK DIAGRAM 175990 REV.C TO REV.D

6/28/10: REV.H TO REV.J
  PG.8 - ADDED NOTE FOR DISABLING NONVOLATILE MEMORY
  PG.35 - ADDED **MTN** COMMAND
  PG.63 - ADDED FAN REPLACEMENT NOTE

4/19/11: REV.J TO REV.K
  PG.6 - CHANGED **FUSE** FROM **T1.25A** TO **2A (INTERNAL)**
  PG.10 - REMOVED **Fuse** FROM **EXTERNAL CONTROLS**

4/19/11: REV.J TO REV.K (CONTINUED)

        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.39 - ADDED **NOTE**

        PG.41 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**

        PG.49 - ADDED **Version 1.0** TO FIRST SENTENCE OF **Access via SNMP**

        PG.50 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**

        PG.50 - CHANGED **IP** TO **MAC** IN FINAL SENTENCE OF **NOTE**

        PG.56 - BLOCK DIAGRAM 180070 REV.B TO REV.C

        PG.62 - REPLACED **POWER SUPPLY 135782** WITH **189400**

        PG.65 - COMPLETELY REWROTE **13TH BULLET**

10/20/11: REV.K TO REV.L

        COVER - ADDED OPTIONS **10E**, **TNCIF**, **NRF** AND **TNCRF**

        PG.1 - ADDED **Power Factor Corrected Power Supply**

        PG.5 - REMOVED **Slope adjust**

        PG.6 - IN **Primary power**, CHANGED **35 W** TO **60 W**

        PG.6 - IN **Primary power**, ADDED **Power Factor 0.85 minimum, 0.92 typical**

        PG.62 - ADDED **ANALOG REFERENCE PHASE LOCK (OPTION 10E)**

2/5/13: REV.L TO REV.M

        COVER - ADDED MODEL NOS. **D-9800-7-1K**, **D-9800-8-1K**, **U-9848-5-1K**, **U-9848-6-1K**.

        COVER - ADDED **Options 10F**, **30A**, **30B**, **30C** AND **30D**.

        PG.1 - ADDED **FIGURE 1-4. REAR PANEL, 9800 SERIES WITH OPTION 31**.

        PG.2 - ADDED TO **Standard Frequency Downconverters** TABLE: MODEL NOS. **D-9800-7-1K** AND
             D-9800-8-1K.

        PG.3 - ADDED TO **Standard Frequency Upconverters** TABLE: MODEL NOS. **U-9848-5-1K** AND
             D-9848-6-1K.

        PG.4 - ADDED **Reference Input/Output (Option 31)** TO **Connectors**

        PG.6 - ADDED TO **Converter Performance Specifications** TABLE: **Options 10E** and **10F.**

        PG.7 - ADDED **Phase Noise Specifications** TABLE.

            DELETED External Reference Phase Noise TABLE.

            DELETED Standard Frequency Maximum Phase Noise TABLE.

            DELETED Reverse Frequency Maximum Phase Noise TABLE.

        PG.9 - ADDED TO **TABLE 2-1. EXTERNAL CONNECTIONS**: **Options 31A, 31B, 31C, 31D**.

        PGS. 56 TO 69 - RENUMBERED PAGES FROM **56 THRU 69** TO **58 THRU 71**.

        PG.56 - ADDED FIGURE **4-2. BLOCK DIAGRAM, 9800 SERIES NARROW BAND CONVERTERS FOR
             TT&C APPLICATION**.

        PG.58 - CHANGED FIGURE NUMBER FROM **FIGURE 4-2** TO **FIGURE 4-3**.

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FIGURES & TABLES

SECTION 1: INTRODUCTION

GENERAL DESCRIPTION

The MITEQ converters are designed for advanced satellite communication systems and are available for a wide variety of frequency plans. Phase noise, amplitude flatness 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 the powerful local and remote control. Among these features are control of frequency, attenuation and sixty-four memory locations for each converter where various setups can be stored and recalled.

A continuously updated log of time-stamped records of activity is also provided.

FEATURES
- **Expansion support for the NSU 1:N Switchover Series**
- **Amplitude slope adjust**
- **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**
- **IF and LO monitor ports**
- **Automatic switching to external 5/10 MHz reference and electronic adjust of internal reference frequency**
- **Low intermodulation distortion**
- **Better than IESS-308/309 compliant phase noise**
- **64 programmable memory locations**
- **30 dB level control**
- **External alarm input via contact closure**
- **Date and time-stamped event log**
- **CE mark**
- **Power factor corrected power supply**

PHYSICAL

Figure 1-1. Front Panel, 9800 Series Converter

Figure 1-2. Rear Panel, 9800 Series Converter

Figure 1-3. Rear Panel, 9800 Series Converter (Option NRF)

Figure 1-4. Rear Panel, 9800 Series with Option 31

MODEL NUMBERS

Converter Model Numbers

Standard Frequency Downconverters					
Model Number	RF Input (GHz)	RF LO (GHz)	Second IF (MHz)	IF LO (MHz)	IF Output (MHz)
D-9800-3-1K	0.95-1.75	4.68-5.55	3800 3730 (Opt.4)	3870	70 140 (Opt.4)
D-9800-6-1K	2.0-2.4	3.33-3.8	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9800-7-1K	2.02-2.12	3.35-3.52	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9800-8-1K	2.2-2.3	3.53-3.7	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9801-1-1K	3.4-4.2	4.62-5.49	1290 1220 (Opt.4)	1360	70 140 (Opt.4)
D-9802-2-1K	4.5-4.8	5.51-5.88	1080 1010 (Opt.4)	1150	70 140 (Opt.4)
D-9805-1K	7.25-7.75	8.47-9.04	1290 1220 (Opt.4)	1360	70 140 (Opt.4)
D-9808-6-1K	10.7-12.75	12.72-14.84	2090 2020 (Opt.4)	2160	70 140 (Opt.4)

Reverse Frequency Downconverters					
Model Number	RF Input (GHz)	RF LO (GHz)	Second IF (MHz)	IF LO (MHz)	IF Output (MHz)
D-9853R-6-1K	5.725-6.725	4.505-5.575	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9853R-2-1K	6.7-7.1	5.48-5.95	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9854R-1K	7.9-8.4	6.68-7.25	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9855R-2-1K	12.75-13.25	10.45-11.02	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9856R-7-1K	12.75-14.5	10.45-12.27	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9856R-6-1K	13.75-14.8	11.45-12.57	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9857R-2-1K	17.3-18.4	15.0-16.17	2230 2300 (Opt.4)	2160	70 140 (Opt.4)

Standard Frequency Upconverters					
Model Number	IF Input (MHz)	IF LO (MHz)	Second IF (MHz)	RF LO (GHz)	RF Output (GHz)
U-9848-1-1K	70 140 (Opt.4)	3870	3800 3730 (Opt.4)	4.68-5.55	0.95-1.75
U-9848-4-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.33-3.8	2.0-2.4
U-9848-5-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.353-3.52	2.02-2.12
U-9848-6-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.53-3.78	2.2-2.3
U-9853-6-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	4.505-5.575	5.725-6.725
U-9853-2-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	5.48-5.95	6.7-7.1
U-9854-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	6.68-7.25	7.9-8.4
U-9855-2-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	10.45-11.02	12.75-13.25
U-9856-7-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	10.45-12.27	12.75-14.5
U-9856-6-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	11.45-12.57	13.75-14.8
U-9857-2-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	15.0-16.17	17.3-18.4

Reverse Frequency Upconverters					
Model Number	IF Input (MHz)	IF LO (MHz)	Second IF (MHz)	RF LO (GHz)	RF Output (GHz)
U-9801R-1-1K	70 140 (Opt.4)	1360	1290 1220 (Opt.4)	4.62-5.49	3.4-4.2
U-9802R-2-1K	70 140 (Opt.4)	1150	1080 1010 (Opt.4)	5.51-5.88	4.5-4.8
U-9805R-1K	70 140 (Opt.4)	1360	1290 1220 (Opt.4)	8.47-9.04	7.25-7.75
U-9808R-6-1K	70 140 (Opt.4)	2160	2090 2020 (Opt.4)	12.72-14.84	10.7-12.75

EQUIPMENT CHARACTERISTICS

PHYSICAL

Weight .... 15 pounds nominal
Chassis dimensions............................... 19" x 1.75" panel height
x 20" maximum
Connectors
RF... SMA female (2.92 mm above 26 GHz)
RF Monitor... SMA female (n/a above 17.7 GHz)
IF .... BNC female
IF monitor .... BNC female
LO monitors .... SMA female
Reference input/output (option 31)...... 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

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		
	Upconverter	Downconverter
Type	Dual conversion	
Frequency step size	1 kHz	
Frequency sense	No inversion	
Input characteristics		
Frequency	70 ±20 MHz 140 ±40 MHz (Option 4)	Refer to model number table
Impedance	75 Ohms 50 Ohms (Option 15)	50 Ohms
Return loss	26 dB minimum (20 dB min w/Option 4)	20 dB minimum
LO leakage	N/A	80 dBm maximum
Signal monitor	-20 dBc nominal	-20 dBc nominal (n/a above 17.7 GHz)
Input level (non-damage)	+15 dBm maximum	
Output characteristics		
Frequency	Refer to model number table	70 ±20 MHz 140 ±40 MHz (Option 4)
Impedance	50 Ohms	75 Ohms 50 Ohms (Option 15)
Return loss	20 dB minimum. 17 dB above 27 GHz	26 dB minimum (20 dB min w/Option 4)
Signal monitor	-20 dBc nominal (n/a above 17.7 GHz)	-20 dBc nominal
Power output (P1dB)	+15 dBm minimum	+20 dBm minimum
Transfer characteristics		
Gain	+30-35 dB at 23°C	+43-50 dB at 23°C +55-61 dB at 23°C (Option 16C)
Noise Figure	15 dB maximum, 18 dB above 22 GHz	12 dB maximum, 15 dB above 22 GHz
Noise power density	-124 dBm/Hz maximum -121 dBm/Hz maximum (above 22 GHz)	N/A
Image rejection	80 dB minimum	
Level stability	±0.25 dB/day maximum at constant temperature ±0.5 dB peak-to-peak typical from 0 to 50°C	

Amplitude response
        70 ±20 MHz
        140 ±40 MHz
	±0.25 dB/±20 MHz; ±0.2 dB/±18 MHz
	±0.75 dB maximum/±36 MHz	

Group delay (70 ±18 MHz)
        Linear
        Parabolic
        Ripple
	0.03 ns/MHz maximum
	0.01 ns/MHz^2 maximum
	1 ns peak-to-peak	

Group delay (140 ±36 MHz)
        Linear
        Parabolic
        Ripple
	0.025 ns/MHz maximum
	0.0035 ns/MHz^2 maximum
	1 ns peak-to-peak	

Intermodulation distortion (third order) at two signals each at 0 dBm output	54 dBc minimum (+27 dBm IP3 pt.) 50 dBc minimum above 22 GHz (+25 dBm IP3 pt.)	60 dBc minimum (+30 dBm IP3 pt.)
AM/PM conversion	0.03°/dB maximum up to 0 dBm output	

Gain slope
        70 ±20 MHz
        140 ±40 MHz
	0.03 dB/MHz maximum (10 MHz maximum)
	0.05 dB/MHz maximum (10 MHz maximum)	

Converter Performance Specifications (Continued)		
	Upconverter	Downconverter
Spurious outputs Signal related	65 dBc up to 0 dBm output, 60 dBc above 22 GHz	
Signal independent	-70 dBm maximum	-75 dBm maximum -65 dBm maximum (Option 16C)
LO Leakage at RF port	N/A	-80 dBm maximum
Gain adjustment	30 dB in 0.2 dB steps	

Frequency stability
   Standard
 	
   Option 10B
 	
   Option 10C
 	
   Option 10E
 	
   Option 10F
	$\pm 2 \times 10^{-8}$, 0 to 50°C
	$\pm 5 \times 10^{-9}$/day typical (fixed temperature after 24 hours on time)
	$\pm 5 \times 10^{-9}$, 0 to 50°C
	1×10^{-9}/day typical (fixed temperature after 24 hours on time)
	$\pm 2 \times 10^{-9}$, 0 to 50°C
	1×10^{-9}/day typical (fixed temperature after 24 hours on time)
	$\pm 5 \times 10^{-9}$, 0 to 50°C
	1×10^{-9}/day typical (fixed temperature after 24 hours on time) See Note below.
	$\pm 2 \times 10^{-9}$, 0 to 50°C
	1×10^{-9}/day typical (fixed temperature after 24 hours on time) See Note below.	

Upconverter mute	60 dB minimum	N/A
External reference	5 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 phase noise table designation	
LO Monitors	-5 dBm to -15 dBm	
Slope adjust	±3 dB typical in 0.2 dB steps	
Primary power	90-250VAC at 60 watts typical Power Factor 0.85 minimum, 0.92 typical	
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	

Environmental (Non-operating)
   Ambient temperature
   Relative humidity
   Atmospheric pressure
	-50 to +70°C
	Up to 95% at 40°C
	Up to 40,000 feet	

Shock and vibration	Normal handling by commercial carriers	

Note *Analog reference Phase Lock: External 5 or 10 MHz at +4 ±3 dBm. If external reference is below +1 dBm nominal, the converter will automatically lock to the internal reference. Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth. Typical loop suppression of the external reference is as follows: 28 dB at 1 Hz offset; 65 dB at 10 Hz offset and 100 dB at 100 Hz offset.*

Phase Noise guaranteed provided external reference has the following phase noise -

Phase Noise Specifications														
Model Number	Standard							Option 31 - Ultra-Low Phase Noise						
	Offset (Hz)*							Offset (Hz)*						
	10	100	1K	10K	100K	300K	1M	10	100	1K	10K	100K	300K	1M
U-9848-1-1K	-57	-77	-92	-97	-99	-99	-117	-60	-80	-96	-100	-101	-101	-122
U-9848-4-1K U-9848-5-1K U-9848-6-1K	-60	-78	-88	-96	-96	-96	-117	-65	-86	-100	-102	-105	-107	-125
U-9853-2-1K U-9853-6-1K	-57	-77	-90	-97	-99	-99	-117	-65	-85	-96	-99	-100	-100	-120
U-9854-1K	-57	-77	-90	-97	-99	-99	-117	-62	-82	-96	-98	-100	-100	-120
U-9855-2-1K	-51	-69	-87	-91	-93	-93	-111	-60	-79	-91	-93	-95	-95	-118
U-9856-6-1K	-50	-66	-87	-91	-93	-94	-111	-59	-75	-91	-93	-95	-95	-118
U-9856-7-1K U-9857-2-1K	-50	-66	-85	-90	-93	-93	-111	-59	-75	-90	-92	-95	-95	-118
D-9800-3-1K	-57	-77	-92	-97	-99	-99	-117	-60	-80	-96	-100	-101	-101	-122
D-9800-6-1K D-9800-7-1K D-9800-8-1K	-60	-78	-88	-96	-96	-96	-117	-65	-86	-100	-102	-105	-107	-125
D-9801-1-1K D-9802-2-1K	-57	-77	-93	-97	-99	-99	-117	-65	-85	-96	-99	-100	-100	-120
D-9805-1K	-57	-77	-92	-97	-99	-99	-117	-60	-80	-96	-100	-101	-101	-122
D-9808-6-1K	-51	-69	-87	-91	-93	-93	-111	-60	-79	-91	-93	-95	-95	-118
Reverse Frequency Converters														
U-9801R-1-1K U-9802R-2-1K	-57	-77	-93	-97	-99	-99	-117	-65	-85	-96	-99	-100	-100	-120
U-9805R-1K	-57	-77	-92	-97	-99	-99	-117	-60	-80	-96	-100	-101	-101	-122
U-9808R-6-1K	-51	-69	-87	-91	-93	-93	-111	-60	-79	-91	-93	-95	-95	-118
D-9858R-6-1K D-9853R-2-1K	-57	-77	-90	-97	-99	-99	-117	-65	-85	-96	-99	-100	-100	-120
D-9854R-1K	-57	-77	-90	-97	-99	-99	-117	-62	-82	-96	-98	-100	-100	-120
D-9855R-2-1K	-51	-69	-87	-91	-93	-93	-111	-60	-79	-91	-93	-95	-95	-118
D-9856R-6-1K	-50	-66	-87	-91	-93	-93	-111	-59	-75	-91	-93	-95	-95	-118
D-9856R-7-1K	-50	-66	-85	-90	-93	-93	-111	-59	-75	-90	-92	-95	-95	-118
D-9857R-2-1K	-50	-65	-85	-90	-93	-93	-111	-59	-75	-90	-92	-95	-95	-118

*Maximum Phase Noise (dBc/Hz) (1 Hz bandwidth) Straight line curve defined by the points in the table.

Phase Noise guaranteed provided external reference has the following phase noise -

Maximum External Reference To Achieve Above Phase Noise with 10 MHz Reference							
	10	100	1K	10K	100K	300K	1M
Systems without Option 31, 10E or 10F	-120	-150	-160	-160	-160	-160	-160
Systems with Option 10E or 10F	-95	-130	-140	-140	-140	-140	-140

Note *For 5 MHz reference decrease phase noise by 6 dB.*

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

⚠ CAUTION **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.

Note *This system includes a feature that allows the user to disable nonvolatile memory writes (to save current settings and update event logs) when the unit settings are changed by way of remote commands.*

- *The feature disables nonvolatile memory writes in response to remote commands that change frequency, attenuation, attenuation 2, IF frequency, slope, impedance and mute.*
- *The Remote Nonvolatile Memory Writes are disabled from the unit's front panel as follows:*
    1. *Power On the unit while holding the UP arrow key*
    2. *When the display reads the following, release the UP arrow key:*
            Factory Configuration Mode
              Release Key
    3. *Press the CURSOR key until the cursor points to the entry:*
            REMOTE NONVOL WRITE
    4. *Using the UP or DOWN arrow key, change the display from ENABLED to DISABLED*
    5. *Press the ENT key to save the displayed setting*
    6. *Power the unit Off then back On*
- *When this feature has been activated, "-NOV" will be displayed on the alarms/event log menu indicating that the Remote Nonvolatile Memory Writes have been disabled.*
- *When the Remote Nonvolatile Memory Writes are disabled, recycling the system's power does NOT re-enable the Remote Nonvolatile Memory Writes.*

- *Once the Remote Nonvolatile Memory Writes are disabled, they remain disabled until "-NOV" is cleared from the front panel as follows:*
  1. *Power On the unit while holding the UP arrow key*
  2. *When the display reads the following, release the UP arrow key:*
     Factory Configuration Mode
       Release Key
  3. *Press the CURSOR key until the cursor points to the entry:*
     REMOTE NONVOL WRITE
  4. *Using the UP or DOWN arrow key, change the display from DISABLED to ENABLED*
  5. *Press the ENT key to save the displayed setting*
  6. *Power the unit Off then back On*
- *Regardless of whether the Remote Nonvolatile Memory Writes are enabled or disabled, changed made locally from the front panel WILL be stored in nonvolatile memory.*

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 Page 4 for wiring information.
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 4 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 4 for wiring information.
External Reference Connector (J5)	Connect the External Reference to J5 of the unit.
Downconverters -	
RF Input	Connect the RF Input to J1 of the unit.
RF Monitor	Connect the RF Monitor to J1A of the unit.
IF Output	Connect the IF Output to J2 of the unit.
IF Monitor	Connect the IF Monitor to J2A of the unit.
Upconverters -	
IF Input	Connect the IF Input to J1 of the unit.
IF Monitor	Connect the IF Monitor to J1A of the unit.
RF Output	Connect the RF Output to J2 of the unit.
RF Monitor	Connect the RF Monitor to J2A of the unit
(Option 31A, 31B) Reference U Link	Connect the reference U link between the reference output (J16) and reference input (J17) of the unit.
(Option 31C) External 5 MHz Reference Only	Connect the external 5 MHz reference to J17 of the unit (no internal reference provided).
(Option 31D) External 10 MHz Reference Only	Connect the external 10 MHz reference to J17 of the unit (no internal reference provided).

SECTION 3: OPERATION

CONTROLS

EXTERNAL CONTROLS

For a description of the front panel keys and select switches see Page 11.

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 insolated tuning tool. Voltage tolerances are +5.3 ±0.2V and +15.3 ±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 3-2 for the physical layout of the front panel.

The red "STATUS" LED indicates an active alarm. The "STATUS" 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. 9800 Series 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
- Auxiliary
- Ethernet Interface
- 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 "ENTER", or by using the up and down arrows to scroll until the desired setting is displayed and then pressing the "ENTER" key. If using the arrow keys to change attenuation settings, the "ENTER" 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 "ENTER" 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:

- RF: RF Frequency
- IF: IF Frequency
- REF: Frequency Reference Source Status
- ATT: or AT1: Attenuation
- Tx: Transmit or Mute Status (if applicable)
- MEM: Memory Registers
- Setup Title (12 Characters)
- AT2: Attenuation 2
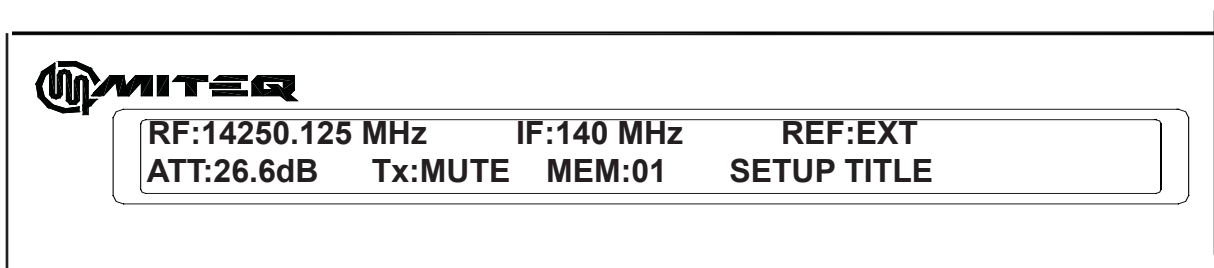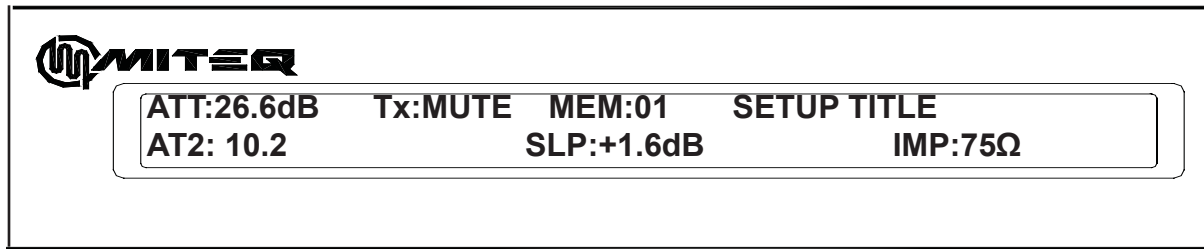- Slope: Slope
- Imp: Impedance (50/75 Ohm)

Figure 3-2. Display Lines 1 and 2

```
MITEQ
ATT:26.6dB      Tx:MUTE    MEM:01        SETUP TITLE
AT2: 10.2                   SLP:+1.6dB                  IMP:75Ω
```

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

RF: RF Frequency
To change the RF Frequency that the unit is tuned to:
- Press the "CURSOR" key to select the RF Frequency field on the display.
- Use the numeric data entry keys to enter the desired frequency in MHz.
- Press "ENTER" to tune the unit to the desired frequency.

IF: IF Frequency
To change the IF Frequency of the unit (only possible with Option 20: Selectable 70/140 MHz IF frequencies):
- Press the "CURSOR" key to select the IF Frequency field on the display.
- Use the arrow keys to toggle between 70 MHz and 140 MHz.
- Press "ENTER" to apply the selection.

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.

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 "ENTER" to set the displayed attenuation.

Tx/Rx: Mute Status (if applicable)
The operator can mute the output of any 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 a 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 "ENTER" to apply the selection.

MEM: Memory Registers

The user can store and recall a combination of RF 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 "ENTER" 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 "ENTER" to select the memory register field and the cursor will advance to the RF Frequency field.
- Enter the RF Frequency to be stored in the memory location.
- Press the "ENTER" key and the cursor will advance to the IF frequency field. This will not retune the unit. See note below.
- Use arrow keys to toggle between 70 MHz and 140 MHz.
- Press the "ENTER" 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 "ENTER" key and the cursor will advance to the Slope field. This will not retune the unit. See note below.
- Use arrow keys to toggle between 50Ω and 75Ω.
- Enter the Slope to be stored.
- Use arrow keys to toggle between '+' and '-'.
- Press the "ENTER" 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 "ENTER" to store the entire combination of settings and the cursor will advance to the "MEM" field. See note below.
- Press "ENTER" again to set the unit to the displayed settings.
- If "ENTER" 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 "ENTER" 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 "ENTER" 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 "ENTER" to select the recall function and the cursor will advance to the memory register field.
- Use the numeric data entry keys followed by "ENTER" or the arrow keys to recall and view the contents of a memory register (00 through 63)
- Press "ENTER" to set the unit to the retrieved settings.
- If "ENTER" 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 "ENTER" 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.

SLP: Slope
Some models are equipped with Amplitude Slope adjustment. To change the Amplitude Slope of one of these units:

- Press the "CURSOR" key to select the Slope field on the display.
- Use the numeric data entry keys to enter the slope or up and down keys to increment or decrement the slope. (Note: if the arrows keys are used to adjust the slope the slope value will change with the up or down key press.)
- If the numeric entry keys were used, the arrow keys can be used to change the sign between '+' and '-'.
- If the numeric entry keys were used, press "ENTER" to set the displayed slope.

IMP: IF Impedance
Standard units have an IF Impedance of 75Ω. Those units equipped with Option 15 have an IF Impedance of 50Ω. Units equipped with Option 14 allow the operator to toggle the between 75Ω and 50Ω. To change the IF Impedance on units equipped with Option 14:

- Press the "CURSOR" key to select the IF Impedance field on the display.
- Use the arrow keys to toggle between 75Ω and 50Ω.
- Press "ENTER" to apply the selection.

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.
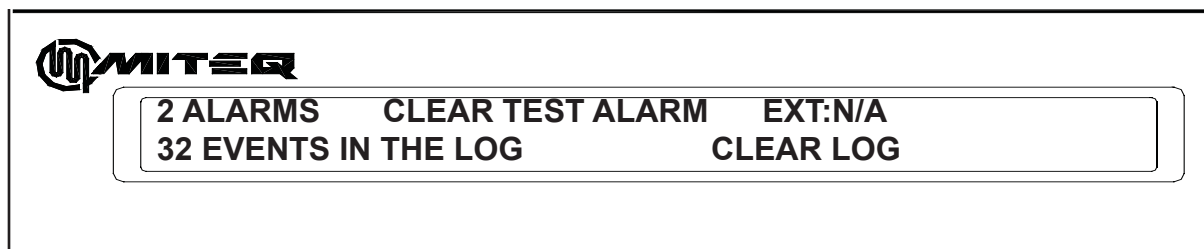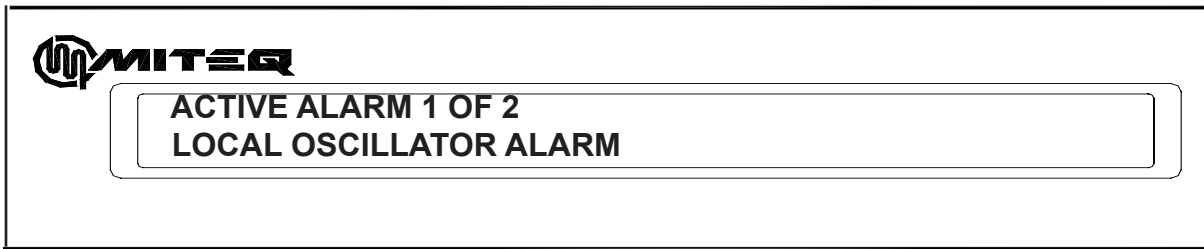

Figure 3-4. Alarm Menu Display

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.

MITEQ

```
┌─────────────────────────────────────────────┐
│  ACTIVE ALARM 1 OF 2                          │
│  LOCAL OSCILLATOR ALARM                       │
└─────────────────────────────────────────────┘
```

Figure 3-5. 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 "ENTER" key to toggle the state of the Test Alarm.
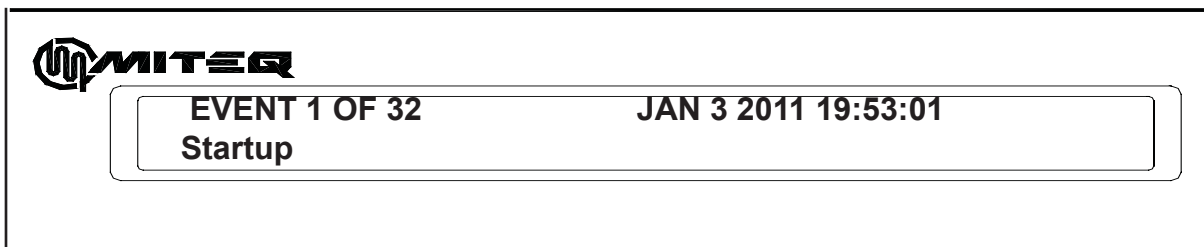
External Alarm
The unit can sense an External Alarm:

- 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 "ENTER" 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.

MITEQ

```
┌─────────────────────────────────────────────┐
│   EVENT 1 OF 32              JAN 3 2011 19:53:01 │
│   Startup                                     │
└─────────────────────────────────────────────┘
```

Figure 3-6. 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 (RF)
- Frequency change (IF)
- Attenuation change
- Attenuation 2 change
- Unit Mute/Unmute by an operator

- Test Alarm fault/recovery
- Unit Title change
- External fault/recovery
- Nonvolatile memory fault
- Slope change
- Impedance change
- Translation frequency offset change
- Temperature fault/recovery
- Module Communications fault/recovery
- AMP Current fault/recover

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 "ENTER" key. A message will appear "PRESS ENT TO CLEAR THE EVENT LOG."
- Press "ENTER" to purge the contents of the event log or Press the "MENU" key to return to the Alarm menu.

REMOTE INTERFACE 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
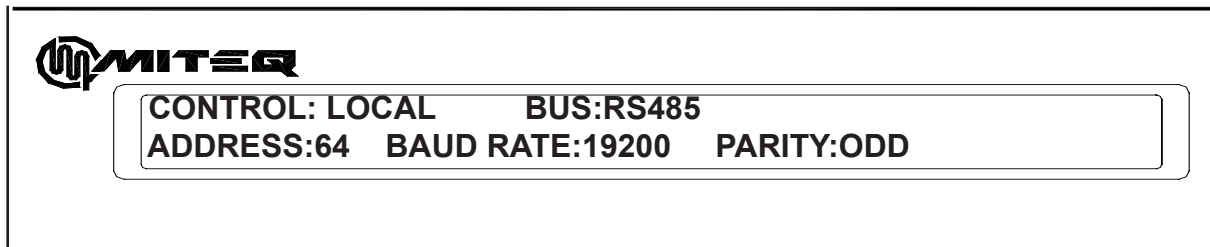
Figure 3-7. RS485 Display Lines 1 and 2

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 "ENTER" 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 "ENTER" 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 "ENTER" 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 "ENTER" to save the selection.

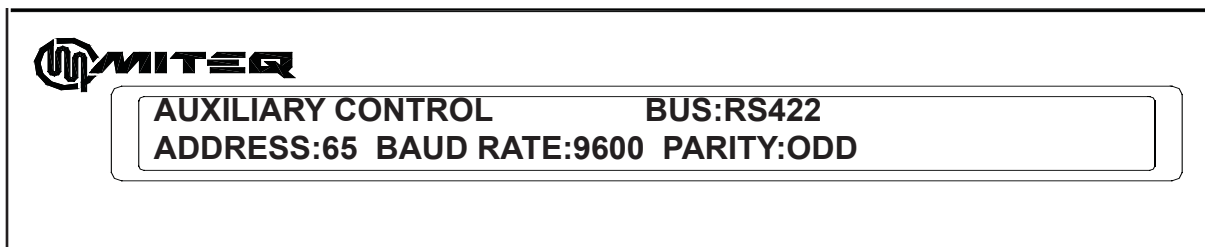**Parity**
To select the Parity for remote communications:
- Press the "CURSOR" key to select the parity field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The parity can be set to ODD, EVEN, or NONE.
- Press "ENTER" 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 3-8. 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 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.
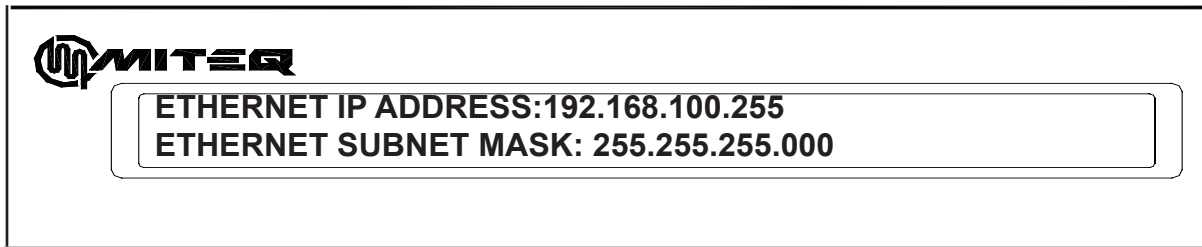- Press "ENTER" to set the parity selection.

ETHERNET CONTROL INTERFACE

```
ETHERNET IP ADDRESS:192.168.100.255
ETHERNET SUBNET MASK: 255.255.255.000
```

Figure 3-9. Ethernet Display Lines 1 and 2

IP Address
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 address.
- Press "ENTER" 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.
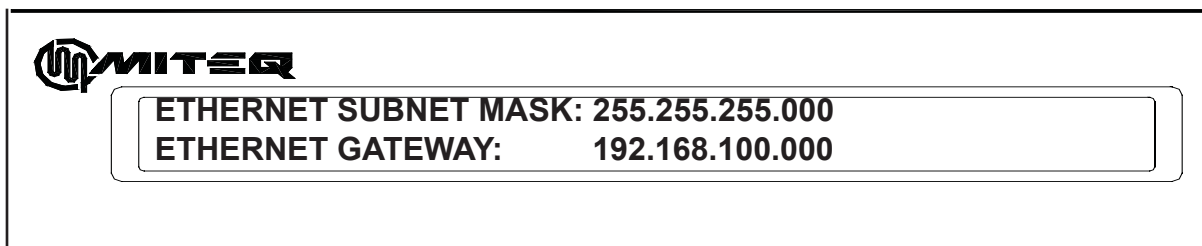- Press "ENTER" to save the subnet mask.

```
ETHERNET SUBNET MASK: 255.255.255.000
ETHERNET GATEWAY:        192.168.100.000
```

Figure 3-10. 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.

```
ETHERNET GATEWAY:        192.168.100.000
ETHERNET PASSWORD:       11111
```
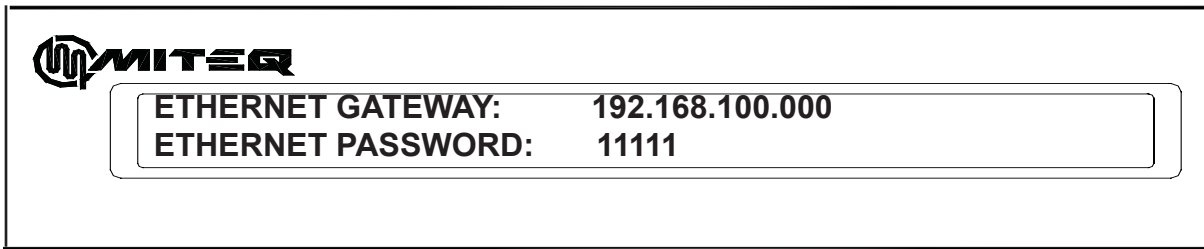
Figure 3-11. Ethernet Display Lines 3 and 4

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.

INTERNAL FREQUENCY REFERENCE FINE TUNING MENU

If not already displayed, use the MENU key to access the Internal Frequency Reference Fine Tuning Menu.

This menu provides access to the fine frequency adjustment of the internal frequency reference of the frequency converter. This is a relative adjustment that can be set from 0 to 4095.

```
FREQUENCY REFERENCE (0 TO 4095):  2048
```
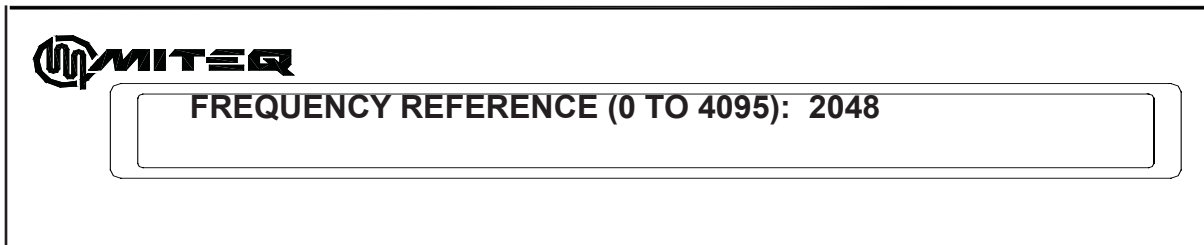
Figure 3-12. Internal Frequency Reference Fine Tuning Menu Display

In order to adjust the Internal 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 "ENTER" to set the displayed Reference Frequency setting.

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.


```
MITEQ
    DATE: JAN 03 2011            TIME: 13:47:02
    TO ADJUST LCD CONTRAST USE ARROWS
```
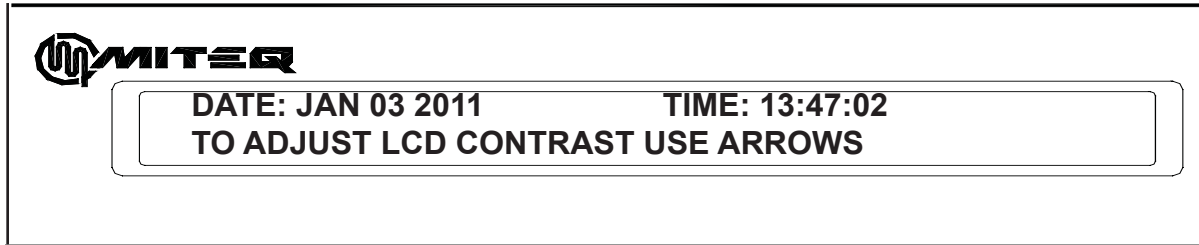
Figure 3-13. Utility Menu Display

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 "ENTER" 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.

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 and allows the operator to assign a title to the unit. This menu is temporarily displayed during power up of the equipment.


```
MITEQ
    D-9800-3                REV. 1.00
    UNIT TITLE
```
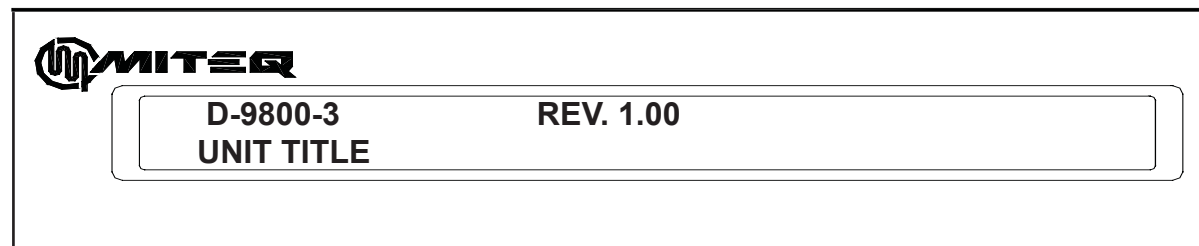
Figure 3-14. Unit Title Menu Display

Unit Title
Unit Title length may be up to 20 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 "ENTER" 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. 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.

> Checksum = MOD [(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
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
IFS	IF Frequency
IMP	Impedance
LOG	Alarm Activity Log
MEM	Memory Recall/Store
MST	More System Status
MUT	Mute
MTN	Mute without storing in event log
NAM	Unit Title
REF	Frequency Reference Adjust
REV/VER	Firmware Title and Revision
SLP	Slope
SET	Memory Recall/Store and Set
STA	System Status
TMP	Internal Temperature
USR	User Title
VLT	System Voltages

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

Note *The 9800/9900 series units are fully backward compatible with the command set for both the 9400 and 9600 series MITEQ frequency converters. Please refer to MITEQ technical notes 25T009 (9600) and 25T010 (9400) for clarification of these protocols. However, these protocols do not take full advantage of the extended feature set of the 9800/9900 series units.*

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:	$ALRabcdefghi
Unit Response:	$ALR

The QUERY command requires no parameters.

Command	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 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 (N/A IN ALL MODELS)

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 (N/A IN ALL MODELS)

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:	?BFRbllllllllllll-hhhhhhhhhhhhOllllllllllll-hhhhhhhhhhhh
	BFR: Band frequency indicator b: Single-digit ASCII numeric character representing Band number l: Input frequency range indicator O: Output frequency range indicator llllllllllll: Twelve-digit ASCII numeric characters, indicating low frequency range in Hz hhhhhhhhhhhh: Twelve-digit ASCII numeric characters, indicating high frequency range in Hz

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:	$CLKYyyyyMmmDddHhhNnnSss
Unit Response:	$CLK

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?CLK
Unit Response:	?CLKYyyyyMmmDddHhhNnnSss
	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 three parameters; a frequency parameter, an attenuation parameter and an optional IF selection parameter.

Command	Parameters
Remote Command Sequence:	$COMFffffffffffffTttt(Aaaa)(Ii)
Unit Response:	$COM

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?COM
Unit Response:	?COMFffffffffffffTttt(Aaaa)Ii

	F: Frequency indicator.
	Fffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in Hz.
	
	T: Attenuation indicator.
	ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.
	
	A: Optional Attenuation 2 indicator
	aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.
	
	I: IF indicator. (optional on SET command)
	i: "0" or "1" ASCII numeric character (optional on SET command)
	      0 = 70 MHz
	      1 = 140 MHz.
	      - = Does not apply

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

	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.

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:	$EADIiiiiiiiiiiiiGgggggggggggggSssssssssssss
Unit Response:	$EAD

The QUERY command requires no parameters.

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

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

UNIT FREQUENCY = FRQ

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. If no alarms exist, this command also unmutes the output.

Command	Parameters
Remote Command Sequence:	$FRQffffffffffff
Unit Response:	$FRQ

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:	?FRQ
Unit Response:	?FRQffffffffffff
	FRQ: Frequency indicator ffffffffffff: Twelve-digit ASCII numeric characters, indicating frequency in Hz.

UNIT 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 even is not logged in the unit event log.

Command	Parameters
Remote Command Sequence:	$FRNffffffffffff
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:	?FRNffffffffffff
	FRN: Frequency indicator ffffffffffff: Twelve-digit ASCII numeric characters, indicating frequency in Hz.

UNIT IF SELECTION = IFS

The SET command requires one parameter.

Command	Parameters
Remote Command Sequence:	$IFSi
Unit Response:	$IFS
	IFS: IF indicator i: "0" or "1" ASCII numeric character 0 = 70 MHz 1 = 140 MHz

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?IFS
Unit Response:	?IFSi
	IFS: IF indicator i: "0" or "1" ASCII numeric character 0 = 70 MHz 1 = 140 MHz

IMPEDANCE = IMP (N/A IN ALL MODELS)

The SET command requires one parameter.

Command	Parameters
Remote Command Sequence:	$IMPi
Unit Response:	$IMP

	IMP: Impedance indicator
	i: "0" or "1" ASCII numeric character
	          0 = 50 Ω
	          1 = 75 Ω

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?IMP
Unit Response:	?IMPi

	IMP: Impedance indicator
	i: "0" or "1" ASCII numeric character
	          0 = 50 Ω
	          1 = 75 Ω

EVENT 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 000 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:	?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, MSD transmitted first, LSD last. 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	IF Frequency change
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
046-118	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, Slope and a user-defined setup title into a selected memory register. All six parameters are required. This command does not affect unit operation.

Command	Parameters
Remote Command Sequence:	$MEMnnFffffffffffffTttt(Aaaa)IiUuuuuuuuuuuuSsaa
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:	?MEMnnFffffffffffffTttt(Aaaa)IiUuuuuuuuuuuuSsaa

	nn: Two-digit ASCII numeric characters, indicating the memory register accessed.
	
	F: Frequency indicator.
	ffffffffffff: Twelve-digit ASCII numeric characters.
	          Indicating the tuned 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: "0" or "1" ASCII numeric character
	        0 = 70 MHz
	        1 = 140 MHz.
	        - = Does not apply
	
	U: User-defined Setup Title Indicator
	Uuuuuuuuuuuu: Twelve-character user-defined setup title
	
	S: Slope indicator
	s: Sign + or -
	aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.

MORE SYSTEM STATUS = MST

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?MST
Unit Response:	?MSTFffffffffffffTttt(Aaaa)LlIiMmRrPpUsuuuuuuuuuuuu(NsaaZz)?abcdefghi

	F: Frequency indicator.
	ffffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned 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: Local / Remote mode indicator
	l: "0" or "1" ASCII numeric character
	       0 = Local control
	       1 = Remote control
	
	I: IF indicator
	i: "0" or "1" ASCII numeric character
	       0 = 70 MHz
	       1 = 140 MHz
	       - = Does not apply
	
	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"
	
	U: User-defined Setup Title Indicator
	Uuuuuuuuuuuu: Twelve-character user-defined setup title
	
	N: Optional Slope indicator
	s: Sign + or -
	aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.
	
	Z: Optional Impedance indicator
	z: "0" or "1" ASCII numeric character
	       0 = 50 Ω
	       1 = 75 Ω.
	
	?: 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.

UNIT MUTE COMMAND = MUT (N/A IN ALL MODELS)

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 MUTE COMMAND WITHOUT LOG = MTN (N/A IN ALL MODELS)

The SET command requires a one-digit parameter indicating mute or unmute. This event is not logged in unit event log.

Command	Parameters
Remote Command Sequence:	$MTNm
Unit Response:	$MTN

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?MTN
Unit Response:	?MTNm
	MTN: 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
	Nnnnnnnnnnnnnnnnnnnn: Twenty-character unit name.

REFERENCE FREQUENCY ADJUSTMENT = REF (N/A IN ALL MODELS)

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

Command	Parameters
Remote Command Sequence:	$SETnnFfffffffffffffTttt(Aaaa)IiUuuuuuuuuuuuuSsaa
Unit Response:	$SET

The QUERY command requires one parameter 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:	?SETnnFfffffffffffffTttt(Aaaa)IiUuuuuuuuuuuuuSsaa

.	nn: Two-digit ASCII numeric characters, indicating the memory register accessed.
	
	F: Frequency indicator
	ffffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in kHz.
	
	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: "0" or "1" ASCII numeric character
	       0 = 70 MHz
	       1 = 140 MHz
	       - = Does not apply
	
	U: User-defined Setup Title Indicator
	Uuuuuuuuuuuu: Twelve-character user-defined setup title
	
	S: Slope indicator.
	s: Sign + or -
	aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.

UNIT SLOPE = SLP (N/A IN ALL MODELS)

The SET command requires a two-digit parameter representing the slope in dB.

Command	Parameters
Remote Command Sequence:	$SLPsaa
Unit Response:	$SLP

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?SLP
Unit Response:	?SLPsaa
.	S: Slope indicator. s: Sign + or - aa: Two-digit parameter indicating the slope in 0.2 dB steps.

UNIT STATUS = STA (SERIAL PROTOCOL ONLY)

There is no SET command.

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?STA
Unit Response:	?STAFffffffffffffTttt(Aaaa)LlIiMmRrPp?abcdefghi

	F: Frequency indicator.
	ffffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned 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: Local / Remote mode indicator
	l: "0" or "1" ASCII numeric character
	        0 = Local control
	        1 = Remote control
	
	I: IF indicator
	i: "0" or "1" ASCII numeric character
	        0 = 70 MHz
	        1 = 140 MHz
	        - = Does not apply
	
	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"
	
	?: 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.

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:	$USRuuuuuuuuuuuu
Unit Response:	$USR

The QUERY command requires no parameters.

Command	Parameters
Remote Command Sequence:	?USR
Unit Response:	?USRuuuuuuuuuuuu
	USR: User-defined Setup Title Indicator Uuuuuuuuuuuu: 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 Converter 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 OPERATION

FUNCTIONAL DESCRIPTION

The MITEQ 9800/9900 Series 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 Ethernet 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

ETHERNET SETUP

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 page 50 for details).

Setup

Setup of the Ethernet Interface should be attempted only after the Converter is fully installed and functioning. 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 page 50 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	192.168.1.0

Note *Factory setting IP address is assigned at time of final testing of the converter. The default IP is recorded on the Final Test Data Sheet for the unit. Unique MAC addresses are provided and recorded on the basis of serial number at MITEQ.*

The Ethernet IP address can be configured via the local interface (see page 18).

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 indicate whether a connection was established.

ACCESSING THE SYSTEM

Access via the Web Interface

All system settings 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). If the frequency, attenuation, status, unit name or title text displayed on the webpage looks too large, click view on the browser menu bar and select text size smaller from the dialog box.

Web access may function properly, or with somewhat degraded performance, using other browsers of the same vintage. Browsers of earlier vintage are not recommended.
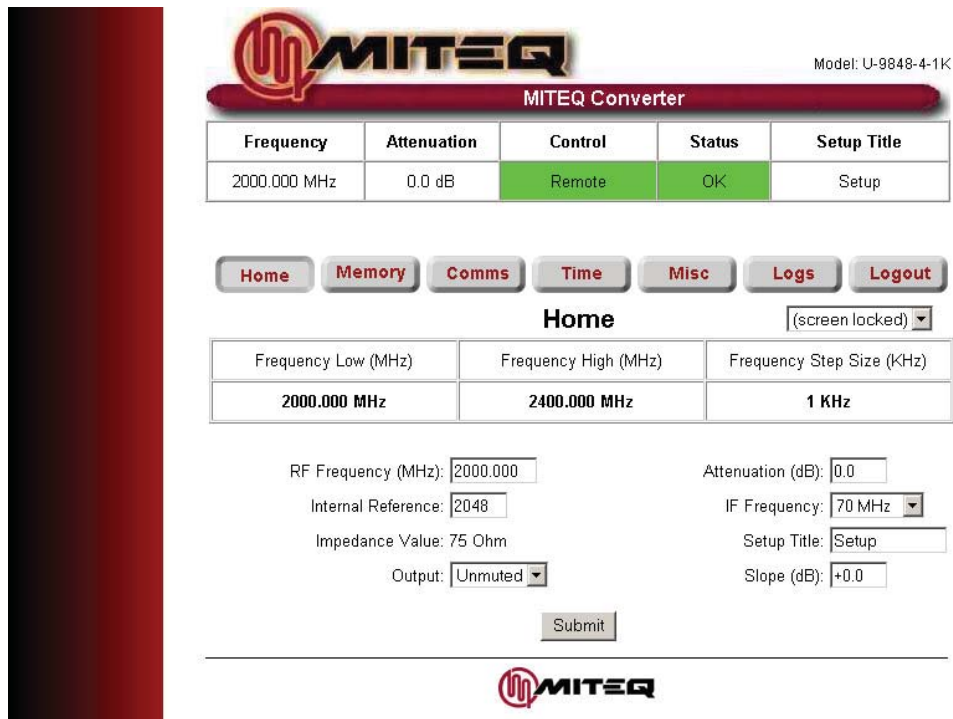
To connect to the Converter, launch the web browser on any PC connected to the same LAN, and enter the address -

http://<assigned IP address>

A sign-on page requesting the password should be displayed. (See page 51 for information on configuring for access to the Converter by name instead of IP address). The default password is "11111".

Figure 3-15. Web Interface Sign-on Page

Figure 3-16. MITEQ Home Page Display

Once logged in the home page will appear. At the top of each page the MITEQ logo along with the model number of the unit is displayed.

The RF frequency, Attenuation, Alarm Status, Unit title and the active setup title will appear on all of the remaining pages.

The operator may navigate between the available pages by clicking on the buttons toward 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.

From the home page the RF frequency and attenuation can be changed. If the unit is an upconverter the unit can be mute.

Figure 3-17. Memory Page Display

The Memory Page will allow an operator to access any of the memory settings of the unit. From this page the operator can view the contents of the memory registers, change the contents of the memory registers and set the converter to the settings saved in the memory register. The screen must be unlocked to perform any of these actions. The table below describes the controls available on the Memory Page.

Memory Page Controls	
Memory Number	Select or view the memory location number.
Setup Name	Select or view the memory setup name.
Frequency	Select or view the memory RF Frequency.
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.

Figure 3-18. Communications Page Display

The Communications provides access to the communication settings of the unit. Changing the IP settings will disrupt the session and the operator will be required to reconnect to the unit at the new settings. These can be set from the front panel. SNMP parameters can also be defined from this page. The table below describes the fields on the Communications page.

Communications Page Fields	
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 Write Community 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

Figure 3-19. Time Page Display

The unit is equipped with a real time clock, which can be adjusted from the time page. Simply use the pull-downs to adjust the display for the desired settings pull down the unlock tab and submit the changes.

Time Page	
Set Clock	View or set the system real-time clock.
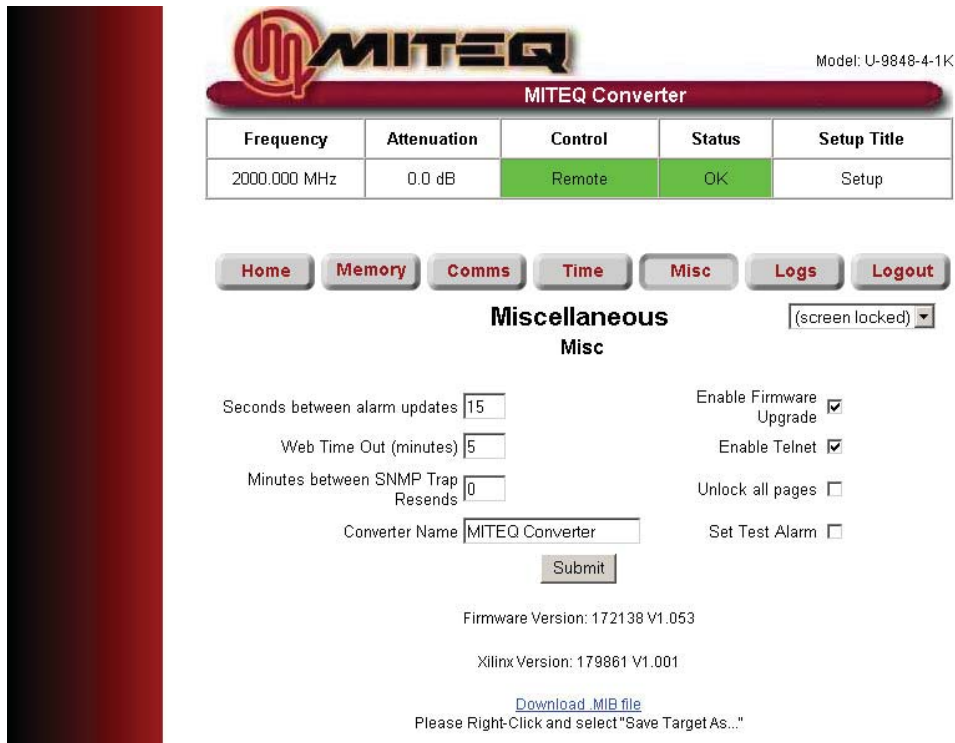
Figure 3-20. Miscellaneous Page Display

The following table describes the fields on the Miscellaneous Page.

| Miscellaneous Page Fields	
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 Ethernet firmware.
Enable Telnet	Permit or prevent Telnet access.
Enable Test Alarm	Force a false alarm for test purposes.
Old Password New Password Confirm 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.
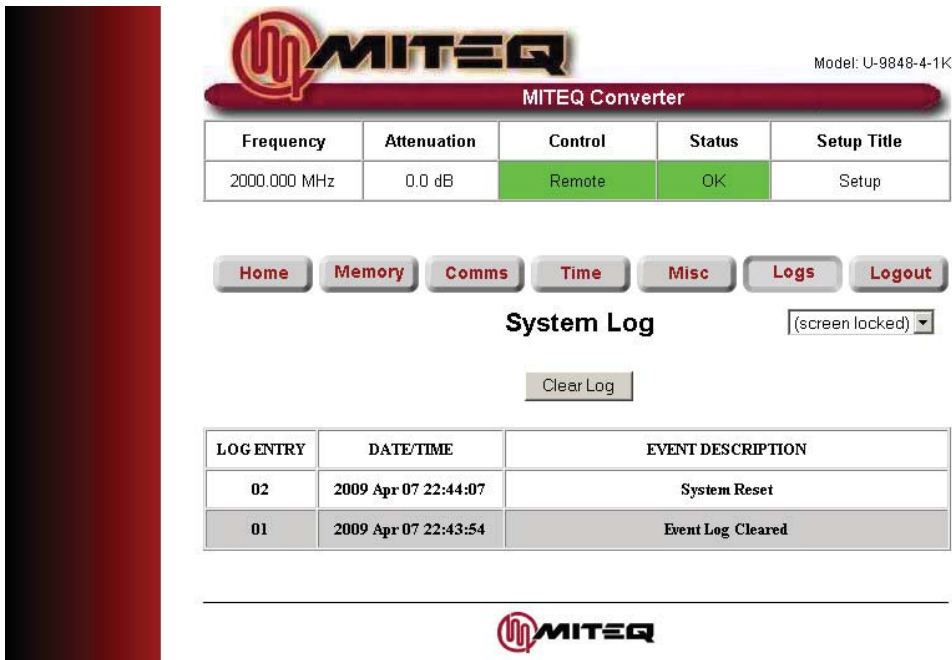
Figure 3-21. System Log Page Display

The log page allows the user to review the events stored in the event log. The page captures a "snapshot" of the event log. Unlocking the screen and pressing the Clear Log button can also clear the event log.

Log Page	
Alarm Indicators	View any the state of the discrete system alarms.
Log Listing	View a listing of all system log entries.
Clear Logs	Clear the event log.

Figure 3-22. End of Session Display

Pressing the Logout button will end the session and the following page will appear on the browser.

Access via SNMP

The 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 MIB file is read by the SNMP management tool and will 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.

ETHERNET FIRMWARE UPGRADE

Should it become necessary to upgrade the Ethernet firmware onboard the Converter, 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 viewable from the local interface.

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.

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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	192.168.1.0

Note *Factory setting IP address is assigned at time of final testing of the converter. The default IP is recorded on the Final Test Data Sheet for the unit. Unique MAC addresses are provided and recorded on the basis of serial number at MITEQ.*

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			
End 1	Color	End 2	Signal
1	white/orange	1	Tx+
2	orange	2	Tx-
3	white/green	3	Rx+
4	blue	4	unused
5	white/blue	5	unused
6	green	6	Rx-
7	white/brown	7	unused
8	brown	8	unused

Crossover Cable Wiring		
End 1	Color	End 2
1	white/orange	3
2	orange	6
3	white/green	1
4	blue	4
5	white/green	5
6	green	2
7	white/brown	7
8	brown	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	miteq9800_1
192.168.1.2	miteq9800_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.

Ethernet 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 sub-network.
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 converters.

FUNCTIONAL DESCRIPTION

The 9800 series converters use a dual-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 IF local oscillator is a fixed frequency phase locked source and the RF local oscillator is a synthesized frequency-agile phase locked source.

DOWNCONVERTER FUNCTIONAL DESCRIPTION

The input signal is fed to the downconverter input module. In the module an input filter 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 second IF frequency by use of the RF local oscillator signal. The output of the first mixer is fed to the downconverter output module. In the downconverter module, a low noise amplifier is followed by a PIN diode attenuator, which provides gain control for the system. The signal is then filtered and fed to the second mixer, which converts the input signal to the output IF frequency. The signal is then amplified and output from the system. A coupled output port is included in the module to provide an IF signal monitor at the rear of the converter.

UPCONVERTER FUNCTIONAL DESCRIPTION

The input signal is fed to the upconverter input module. In the upconverter module a fixed attenuator is used to provide a good match at the input. A coupled output port is included in the module to provide an IF signal monitor at the rear panel of the converter. The signal is fed to a PIN diode attenuator, which provides gain control for the system. A low noise amplifier is followed by a mixer which converts the input signal to the second IF frequency using the IF local oscillator signal. The signal is then filtered and amplified. The filter rejects out-of-band signals resulting from the first conversion. The signal is then fed to the upconverter output module. In the upconverter module the signal is fed to a second mixer, which converts the input signal to the output frequency band, by use of a synthesized local oscillator signal. The signal is then filtered, amplified and then output from the system. A coupled output port is included in the module to provide an RF signal monitor at the rear panel of the converter.
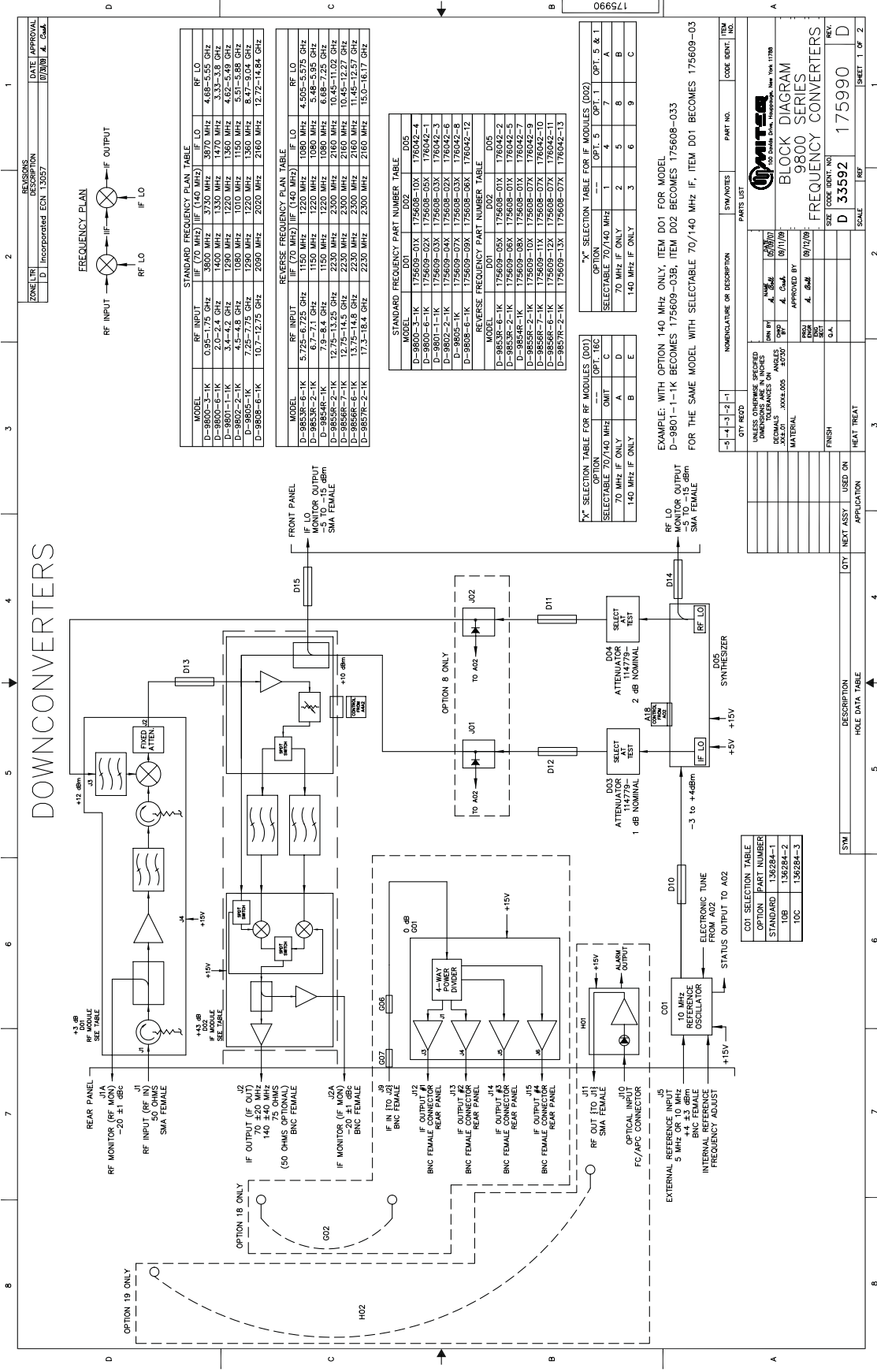
Figure 4-1. Block Diagram, 9800 Series Frequency Converters
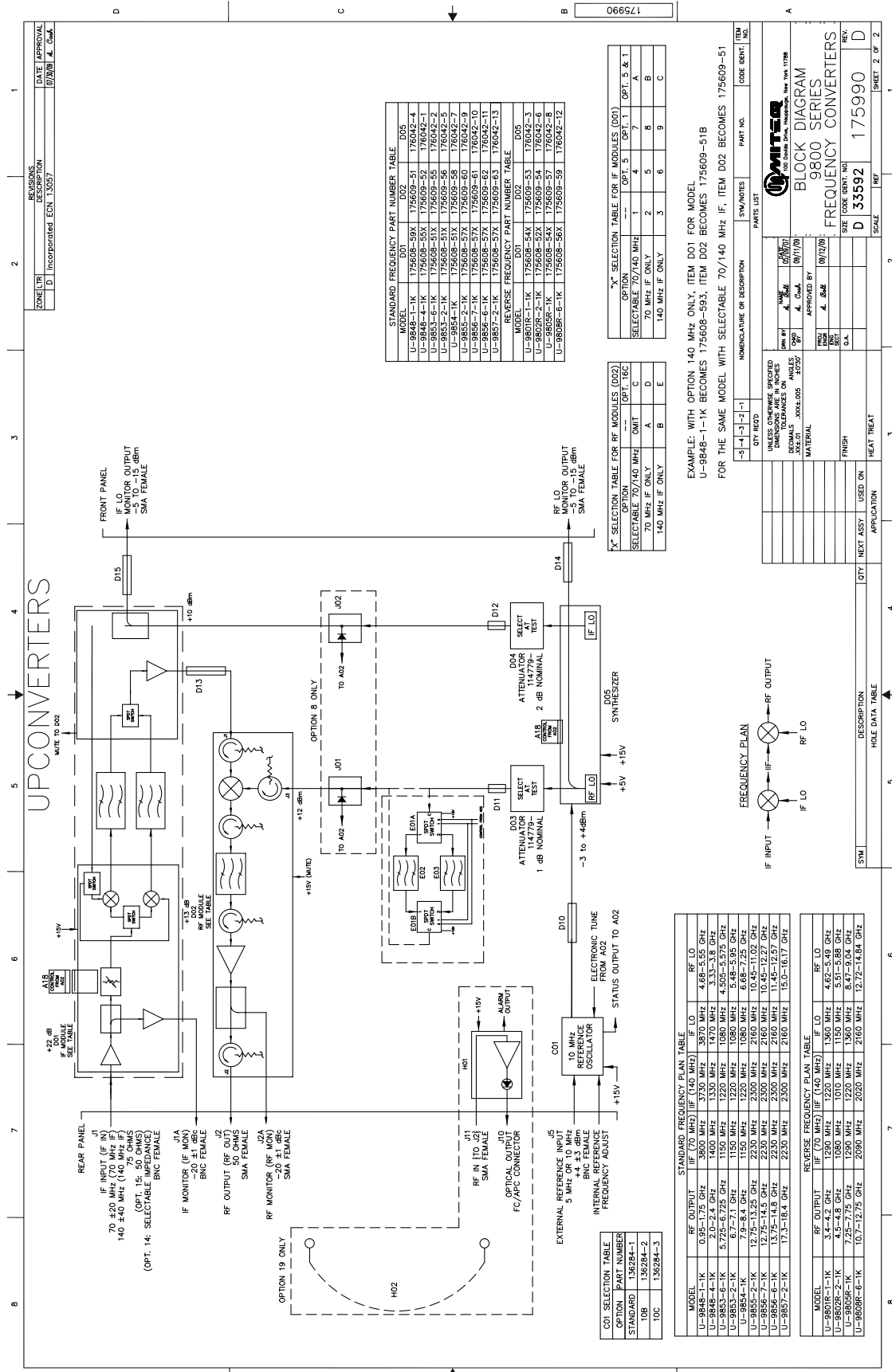**(Sheet 1 of 2)**

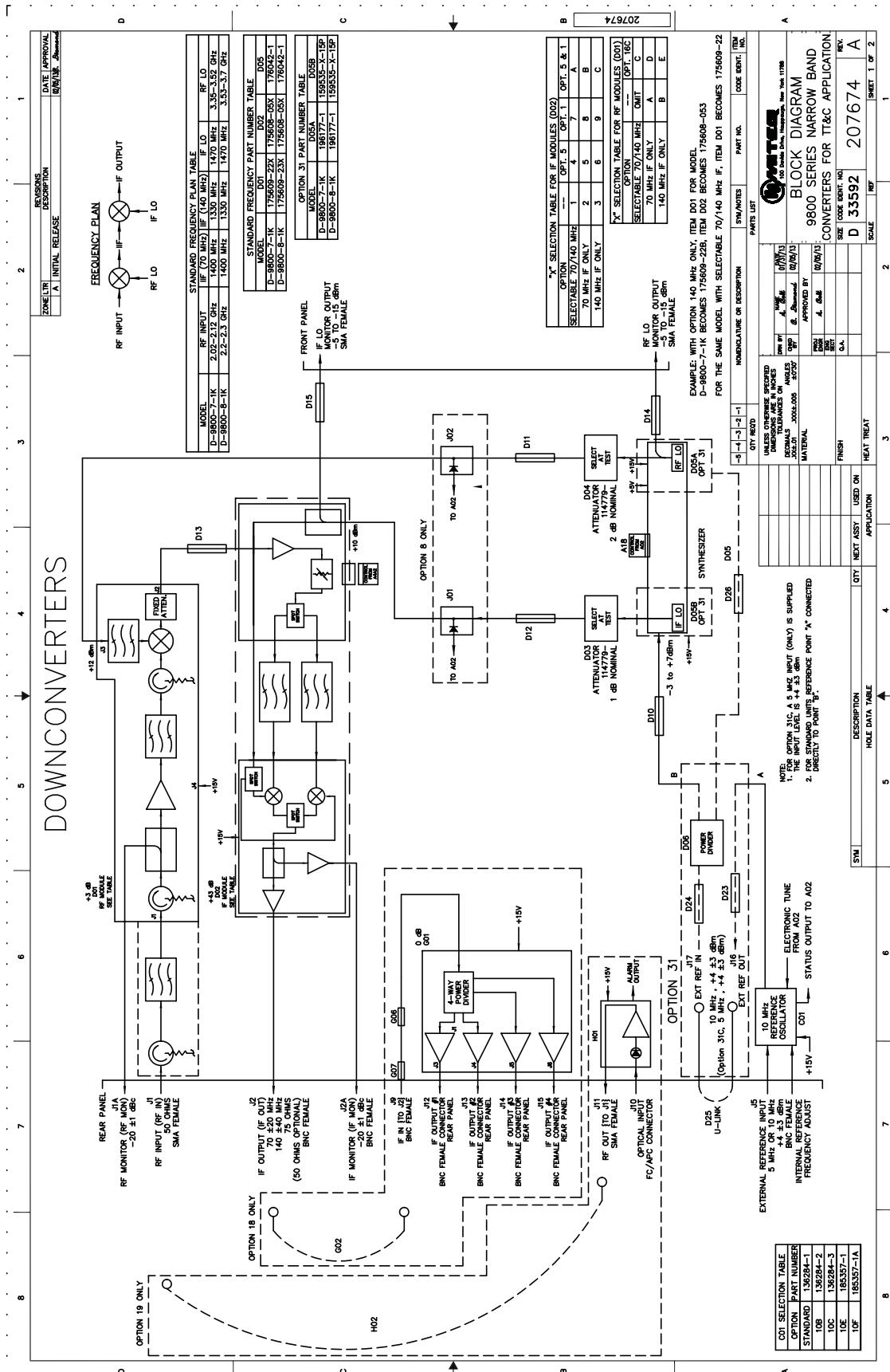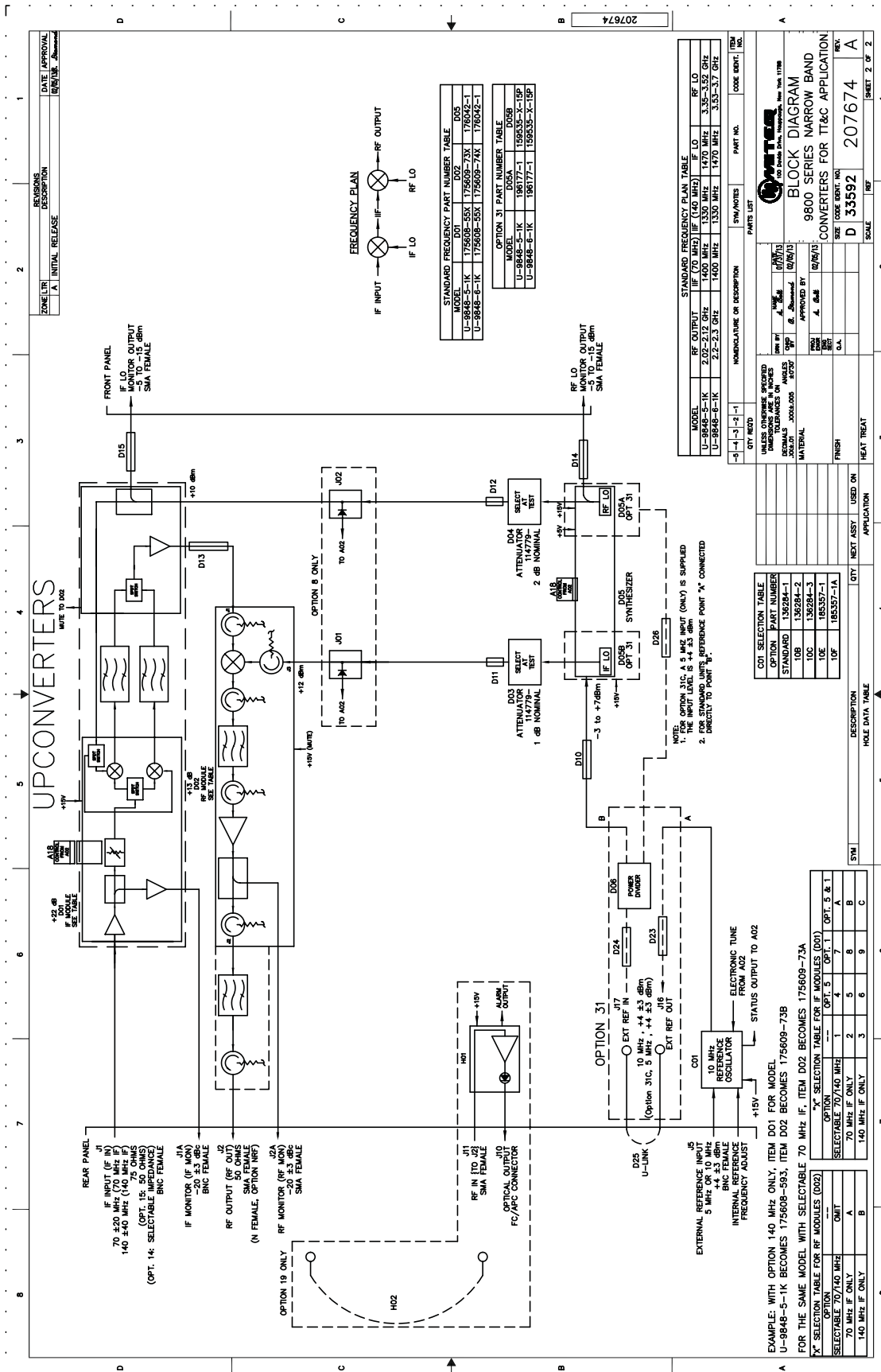**Figure 4-1. Block Diagram, 9800 Series Frequency Converters
(Sheet 2 of 2)**

**Figure 4-2. Block Diagram, 9800 Series Narrow Band Converters for TT&C Application
(Sheet 1 of 2)**

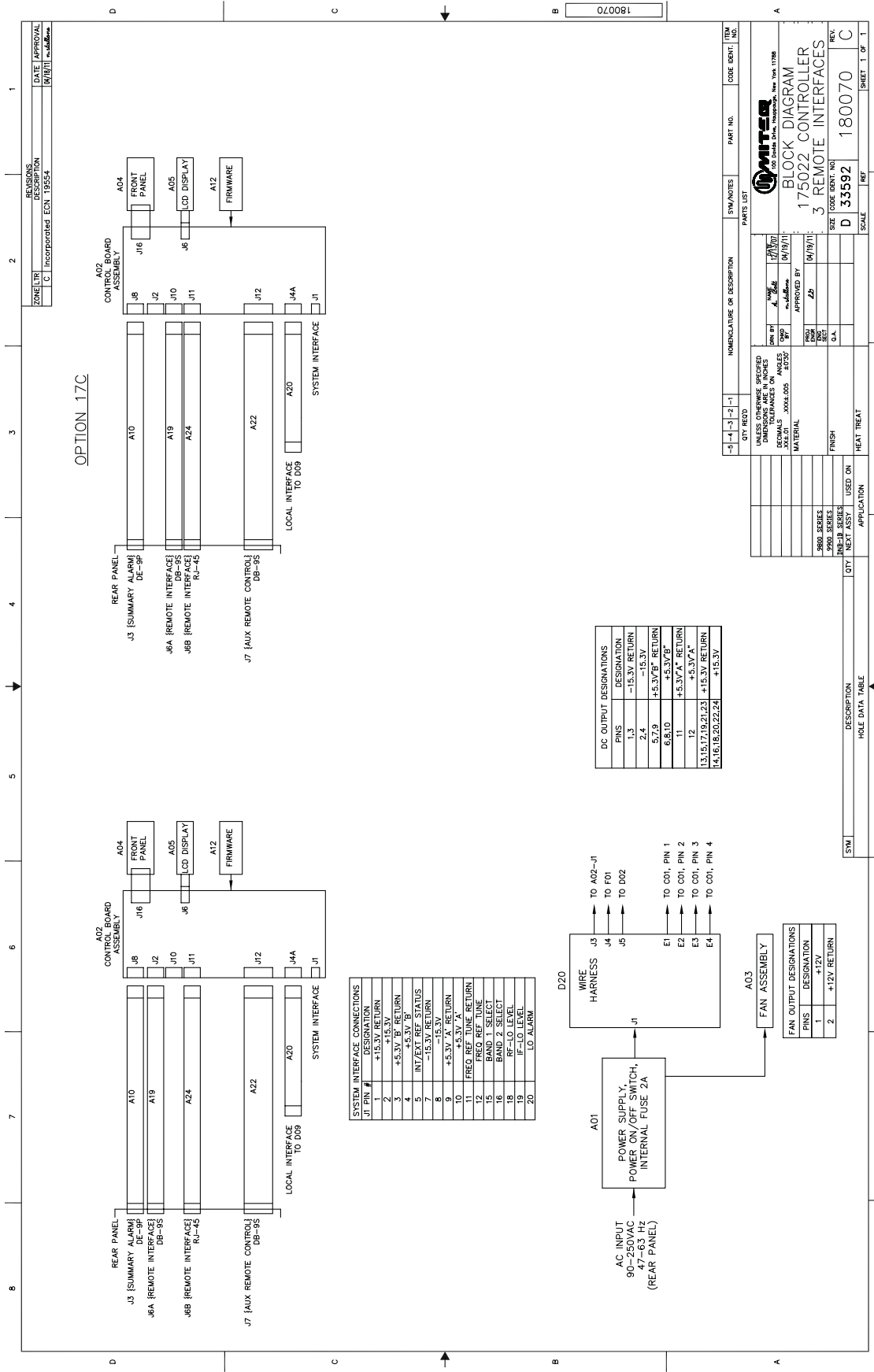**Figure 4-2. Block Diagram, 9800 Series Narrow Band Converters for TT&C Application (Sheet 2 of 2)**

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

FREQUENCY PLANS

Standard Frequency Downconverters					
Model Number	RF Input (GHz)	RF LO (GHz)	Second IF (MHz)	IF LO (MHz)	IF Output (MHz)
D-9800-3-1K	0.95-1.75	4.68-5.55	3800 3730 (Opt.4)	3870	70 140 (Opt.4)
D-9800-6-1K	2.0-2.4	3.33-3.8	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9800-7-1K	2.02-2.12	3.35-3.52	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9800-8-1K	2.2-2.3	3.53-3.7	1400 1330 (Opt.4)	1470	70 140 (Opt.4)
D-9801-1-1K	3.4-4.2	4.62-5.49	1290 1220 (Opt.4)	1360	70 140 (Opt.4)
D-9802-2-1K	4.5-4.8	5.51-5.88	1080 1010 (Opt.4)	1150	70 140 (Opt.4)
D-9805-1K	7.25-7.75	8.47-9.04	1290 1220 (Opt.4)	1360	70 140 (Opt.4)
D-9808-6-1K	10.7-12.75	12.72-14.84	2090 2020 (Opt.4)	2160	70 140 (Opt.4)

Reverse Frequency Downconverters					
Model Number	RF Input (GHz)	RF LO (GHz)	Second IF (MHz)	IF LO (MHz)	IF Output (MHz)
D-9853R-6-1K	5.725-6.725	4.505-5.575	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9853R-2-1K	6.7-7.1	5.48-5.95	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9854R-1K	7.9-8.4	6.68-7.25	1150 1220 (Opt.4)	1080	70 140 (Opt.4)
D-9855R-2-1K	12.75-13.25	10.45-11.02	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9856R-7-1K	12.75-14.5	10.45-12.27	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9856R-6-1K	13.75-14.8	11.45-12.57	2230 2300 (Opt.4)	2160	70 140 (Opt.4)
D-9857R-2-1K	17.3-18.4	15.0-16.17	2230 2300 (Opt.4)	2160	70 140 (Opt.4)

Standard Frequency Upconverters					
Model Number	IF Input (MHz)	IF LO (MHz)	Second IF (MHz)	RF LO (GHz)	RF Output (GHz)
U-9848-1-1K	70 140 (Opt.4)	3870	3800 3730 (Opt.4)	4.68-5.55	0.95-1.75
U-9848-4-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.33-3.8	2.0-2.4
U-9848-5-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.35-3.52	2.02-2.12
U-9848-6-1K	70 140 (Opt.4)	1470	1400 1330 (Opt.4)	3.53-3.7	2.2-2.3
U-9853-6-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	4.505-5.575	5.725-6.725
U-9853-2-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	5.48-5.95	6.7-7.1
U-9854-1K	70 140 (Opt.4)	1080	1150 1220 (Opt.4)	6.68-7.25	7.9-8.4
U-9855-2-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	10.45-11.02	12.75-13.25
U-9856-7-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	10.45-12.27	12.75-14.5
U-9856-6-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	11.45-12.57	13.75-14.8
U-9857-2-1K	70 140 (Opt.4)	2160	2230 2300 (Opt.4)	15.0-16.17	17.3-18.4

Reverse Frequency Upconverters					
Model Number	IF Input (MHz)	IF LO (MHz)	Second IF (MHz)	RF LO (GHz)	RF Output (GHz)
U-9801R-1-1K	70 140 (Opt.4)	1360	1290 1220 (Opt.4)	4.62-5.49	3.4-4.2
U-9802R-2-1K	70 140 (Opt.4)	1150	1080 1010 (Opt.4)	5.51-5.88	4.5-4.8
U-9805R-1K	70 140 (Opt.4)	1360	1290 1220 (Opt.4)	8.47-9.04	7.25-7.75
U-9808R-6-1K	70 140 (Opt.4)	2160	2090 2020 (Opt.4)	12.72-14.84	10.7-12.75

MAJOR SUBASSEMBLIES FUNCTIONAL DESCRIPTION

DOWNCONVERTER INPUT MODULE

SPECIFICATIONS	
*See frequency plans for input, output and LO frequencies.	
Gain	3 ±1 dB @ 25ºC
Input return loss	20 dB/50 ohms minimum
Output return loss	14 dB/50 ohms minimum
Power output (1 dB compression)	-5 dBm minimum
Image rejection	80 dB minimum
Input signal monitor	-20 dBc ±3 dB nominal
DC voltage	+15 volts
Noise figure	9 dB maximum
LO input power level	+12 dBm minimum

DOWNCONVERTER OUTPUT MODULE

SPECIFICATIONS	
*See frequency plans for input, output and LO frequencies.	
Gain	43 dB nominal
Gain adjustment	30 dB minimum
Input return loss	14 dB/50 ohms minimum

Output return loss
   70 MHz ±20 MHz
   140 MHz ±40 MHz
	26 dB/75 ohms minimum
	20 dB/50 ohms minimum

Power output (1 dB compression)	+20 dBm minimum
Image rejection	80 dB minimum
Output signal monitor	-20 dBc ±2 dB nominal
DC voltage	+15 volts
Noise figure	9.5 dB maximum
LO input power level	+10 dBm minimum

UPCONVERTER INPUT MODULE

SPECIFICATIONS	
*See frequency plans for input, output and LO frequencies.	
Gain	22 dB nominal
Gain adjustment	30 dB minimum

Input return loss
    70 MHz ±20 MHz
    140 MHz ±40 MHz
	26 dB/75 ohms minimum
	20 dB/50 ohms minimum

Output return loss	14 dB/50 ohms minimum
Power output (1 dB compression)	+8 dBm minimum
Image rejection	80 dB minimum
Input signal monitor	-20 dBc ±2 dB nominal
DC voltage	+15 volts
Noise figure	14 dB maximum
LO input power level	+10 dBm minimum

UPCONVERTER OUTPUT MODULE

SPECIFICATIONS	
*See frequency plans for input, output and LO frequencies.	
Gain	13 ±1 dB @ 25ºC
Input return loss	14 dB/50 ohms minimum
Output return loss	20 dB/50 ohms minimum
Power output (1 dB compression)	+18 dBm minimum
Image rejection	80 dB minimum
Input signal monitor	-20 dBc ±3 dB nominal
DC voltage	+15 volts
Noise figure	18 dB maximum
LO input power level	+12 dBm minimum

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 +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	$\pm2 \times 10^{-8}$	$\pm5 \times 10^{-9}$	-120	-150	-160
10B	136284-2	$\pm5 \times 10^{-9}$	1×10^{-9}	-129	-158	-165
10C	136284-3	$\pm2 \times 10^{-9}$	1×10^{-9}	-129	-158	-165

SPECIFICATIONS	

Input characteristics -
     Frequency
     Impedance
     Level
	5 MHz or 10 MHz
	 50 ohms
	 +4 ±3 dBm

Output characteristics -
     Frequency
     Impedance
     Level
	10 MHz
	 50 ohms
	 +4 ±3 dBm

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

Mechanical Tuning -
     136284-1
     136284-2 & -3
	$\pm2 \times 10^{-6}$ min. 20 turn control
	 $\pm1 \times 10^{-6}$ min. 20 turn control

Electrical Tuning:	$\pm1 \times 10^{-7}$ ±5V input

ANALOG REFERENCE PHASE LOCK (OPTION 10E)

The oscillator shall be capable of receiving an external input of 5 MHz or 10 MHz. The oscillator will detect the external input frequency and phase lock to the external input. If the external input signal frequency is 5 MHz, the reference oscillator will double the external signal and phase lock to it. If the external signal frequency is 10 MHz, the reference oscillator will directly phase lock to the external signal.

The oscillator shall operate as an analog phase lock oscillator. The oscillator shall operate as an internal ovenized 10 MHz oscillator if the external input signal is below a threshold level of -1 to +0.5 dBm. When the oscillator is not lock to external signal, fine frequency electronic tuning shall be available to adjust the oscillator output frequency. The internal oscillator fine tune voltage shall not control the oscillator tune range when the external input signal is present.

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)
10E	185357-1	±5 x 10^{-9}	1 x 10^{-9}	-130	-155	-166
10F	185357-1A	±2 x 10^{-9}	1 x 10^{-9}	-130	-155	-166

SPECIFICATIONS	
Input characteristics - Frequency Impedance Level	5 MHz or 10 MHz 50 ohms +4 ±3 dBm
Output characteristics - Frequency Impedance Level	10 MHz 50 ohms +4 ±3 dBm
Status indicator - Internal oscillator "ON" Internal oscillator "OFF"	TTL Low (0V) TTL High (5V)
Mechanical Tuning	±1 x 10^{-6} min. 20 turn control
Electrical Tuning:	±1.5 x 10^{-6} ±5 VDC input

Note *Analog reference Phase Lock: External 5 or 10 MHz at +4 ±3 dBm. If external reference is below +1 dBm nominal, the converter will automatically lock to the internal reference. Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth. Typical loop suppression of the external reference is as follows: 28 dB at 1 Hz offset; 65 dB at 10 Hz offset and 100 dB at 100 Hz offset.*

SYNTHESIZER

SPECIFICATIONS	
Output frequency	See frequency plans
Output power	+12-16 dBm
Input reference frequency	10 MHz
Input reference power	-3 to +4 dBm
Input/Output impedance	50 ohms
DC voltage	+5V, +15V

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 ±0.25V
	+5.3 ±0.2V
	-15.3V ±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	175022

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 Page 63), reset power supply (refer to Figure 3-1), 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 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.63) 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. THE SETTINGS ARE AS FOLLOWS:**

SETTING	DESCRIPTION
Low Frequency Limit	Low limit of the RF frequency band (See Section 1)
High Frequency Limit	High limit of the RF frequency band (See Section 1)
Frequency Step Size	0.125000 MHz or 0.001000 MHz (See Section 1)
IF Frequency	This is the second IF frequency of the unit. **Note: the second IF frequency is either positive or negative based on the equation -** *Internal IF frequency (MHz) = Internal local oscillator frequency – RF frequency.* **For example:** The 70 MHz IF frequency version of Model number D-9741-1 would be "+1310.000000" (4710 - 3400 = 1310). The 70 MHz IF frequency version of Model number U-9793-6 would be "-1150.000000" (4575 - 5725 = -1150).
Frequency Display Format	4.3 or 5.3. This indicates the number of digits that will be displayed to the left and to the right of the decimal point. 5.3 means five digits to the left of the decimal point and three digits to the right. **For example:** if the RF frequency of the unit is 14500.000 the display format is 5.3. If the frequency of the unit is 3400.000 MHz, the display format is 4.3.
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	Upconverter or downconverter
Model Code	This 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

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. 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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