



## 9900 SERIES FREQUENCY CONVERTERS



| MODEL NUMBER INCLUDED |               |               |             |
|-----------------------|---------------|---------------|-------------|
| UPCONVERTER           |               | DOWNCONVERTER |             |
|                       | U-9953-6-1K   |               | D-9901-1-1K |
|                       | U-9956-6-1K   |               | D-9908-6-1K |
|                       | U-9953-6-1K-L |               |             |
|                       | U-9956-6-1K-L |               |             |
|                       | U-9956-7-1K   |               |             |
|                       | U-9957-2-1K   |               |             |

| OPTIONS AVAILABLE |   |
|-------------------|---|
|                   | Option 4: 140 MHz IF Frequency  |
|                   | 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 $\pm$ 3 dBm.<br>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 15: 50 Ohm IF Impedance  |
|                   | Option 17C: RS232 Remote Interface  |
|                   | Option NRF: Type 'N' female RF connector (C-band converters only; Monitor remains 'SMA' female)   |

## 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.

12/6/05: INITIAL RELEASE

3/1/06: REV.A TO REV.B

ADDED ESD WARNING TO SECTIONS 2 AND 5; REPAGED SECTION 5 AS PER CHANGE

6/13/06: REV.B TO REV.C

COMPLETE REDESIGN OF DOCUMENTATION APPEARANCE

BLOCK 162811 REV.F TO REV.G

7/12/06: REV.C TO REV.D

ADDED MODEL NUMBER U-9956-6-1K-L TO MANUAL

ADDED L-BAND SPECIFICATIONS TO SECTIONS 1, 2 AND 4

BLOCK 162811 REV.G TO REV.J

3/9/07: REV.D TO REV.E

BLOCK 162811 REV.J TO REV.L

REVISED CRYSTAL OSCILLATOR PHASE NOISE

FROM: 136284-1 -120 -150 -165

136284-2&3 -135 -155 -165

TO: 136284-1 -114 -144 -160

136284-2&3 -129 -158 -165

5/21/07: REV.E TO REV.F

ADDED FIGURE 1-4 - L-BAND REAR PANEL PHOTO

IN SPEC SECTION, REVISED AMPLITUDE RESPONSE

FROM:  $\pm 0.3$  dB maximum

TO:  $\pm 0.3$  dB maximum/40 MHz

$\pm 0.45$  dB maximum/80 MHz (140  $\pm 40$  MHz - Option 4)

IN SPEC SECTION, REVISED:

FROM: Intermodulation distortion (third order) at 0 dBm output

TO: Intermodulation distortion (third order) at two signals each at 0 dBm output

IN SPEC SECTION, REVISED:

FROM: LO leakage at RF

TO: LO leakage at RF port

6/12/08: REV.F TO REV.G

ADDED U-9953-6-1K-L TO MANUAL

BLOCK 162811 REV.L TO REV.M

ADDED BLOCK 165223 REV.E

7/22/08: REV.G TO REV.H

COVER - REMOVED **OPTION 17H** AND ADDED **OPTION NRF**

PG.1 - IN FEATURES, CHANGED **TWO MONITOR AND CONTROL PORTS** TO **THREE MONITOR AND**

**CONTROL PORTS**

PG.1 - ADDED **30 dB LEVEL CONTROL**

PG.2 - ADDED **FIGURES 1-5 & 1-6**

PG.3 - ADDED **OPTION NRF** CONNECTOR TO **PHYSICAL**

PG.4 - ADDED **P1 dB TYPICAL** SPECS TO **POWER OUTPUT (P1dB)**

PG.4 - ADDED  $\pm$  TO **0.25 IN LEVEL STABILITY**

PG.4 - ADDED **0.03 dB/MHz TYPICAL** TO **GAIN SLOPE**

PG.9 - ADDED **ETHERNET INTERFACE** TO MENU KEY LIST

PG.14 - ADDED FIGURE 3-8a

PG.15 - REMOVED (**SERIAL BUSES ONLY**) FROM **BAUD RATE** AND **PARITY** HEADINGS

PG.15 - REMOVED **SERVICE REQUEST (IEEE-488 ONLY)** SECTION AND FIGURE 3-9

MOVED **AUXILIARY CONTROL INTERFACE OPERATION MENU** TO PAGE 15 AND RENUMBERED  
ALL FIGURES THROUGHOUT THE REST OF SECTION 3.

PG.16 - CREATED NEW **ETHERNET CONTROL INTERFACE** SECTION

PG.21 - REMOVED **IEEE-488 MESSAGE PROTOCOL** AND **IEEE-488 MESSAGE FORMAT** SECTIONS

PG.51 - ADDED PAGE WITH BLOCK 180070 REV.B

PG.56 - ADDED P/N 175022 TO **CONTROL BOARD/FIRMWARE KIT**

PG.59&60 - COMPLETELY RE-WROTE **INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT** SECTION

- 11/10/08: REV.H TO REV.J  
CORRECTED COVER SHEET TYPO - U-9956-3-1K-L CHANGED TO U-9953-6-1K-L
- 12/3/08: REV.J TO REV.K  
PG.16 - REMOVED ORIGINAL FIGURE 3-10, CHANGED FIGURE 3-11 TO 3-10 AND RENUMBERED ALL REMAINING SECTION 3 FIGURES.  
PGS.23, 27, 28, 30, 32 - ADDED - = **Does not apply TO IF INDICATOR CODES**
- 2/24/09: REV.K TO REV.L  
PG.3 - REPLACED **J6 PINOUTS** WITH **J6A AND J6B PINOUTS**  
PG.7 - REPLACED **J6 DESCRIPTION** WITH **J6A AND J6B DESCRIPTIONS** IN TABLE 2-1  
PG.7 - COMPLETELY REWROTE **J7 DESCRIPTION** IN TABLE 2-1  
PG.9 - CHANGED **ATT:** TO **ATT: or AT1:** IN **MAIN MENU**  
PG.9 - CHANGED **Tx** FROM (**upconverters only**) TO (**if applicable**)  
PG.9 - ADDED **AT2: Attenuation 2**  
PG.10 - ADDED **AT2** TO FIGURE 3-4  
PG.10 - CHANGED **ATT:** TO **ATT: or AT1**  
PG.10 - ADDED (**if applicable**) TO **Tx/Rx: Mute Status**  
PG.12 - ADDED **AT2: Attenuation 2**  
PG.13 - ADDED **Log Cleared, Power Supply fault/recovery, Attenuation 2 change AND AMP Current fault/recovery TO REPORTABLE EVENTS LIST**  
PG.14 - REMOVED **RTS/CTS PARAMETER** AND REWROTE ALL OTHERS EXCEPT CONTROL IN **REMOTE INTERFACE OPTION MENU**  
PG.14 - REMOVED FIGURE 3-8a  
PG.14 - COMPLETELY REWROTE **BUS SELECTION HEADER** AND REMOVED **RTS/CTS SELECTION**  
PG.20 - COMPLETELY REWROTE **CHECKSUM CALCULATION**  
PG.21 - ADDED THE FOLLOWING COMMAND CODES; **ATT/AT1, ATN/AN1, AT2, AN2, BFR, EAD, FRN, IMP, REV/VER, TMP**  
PG.22 - IN **ALR**, CHANGED **f** FROM **Reserved for future use** TO **Amplifier Current Alarm (Optional)**  
PG.22 - ADDED **ATT OR AT1** COMMAND CODE  
PG.23 - ADDED **ATN OR AN1 AND AT2** COMMAND CODES  
PG.24 - ADDED **AN2 AND BFR** COMMAND CODES  
PG.26 - ADDED (**Aaaa**) TO **COM** COMMAND CODE  
PG.27 - ADDED **EAD** COMMAND CODE  
PG.28 - ADDED **FRN** COMMAND CODE  
PG.29 - ADDED **IMP** COMMAND CODE  
PG.30 - ADDED NEW EVENT INDICATORS FOR **000, 002, 003, 004-013, 127, 128, 129 AND 130-255**  
PG.31 - ADDED (**Aaaa**) TO **MEM** COMMAND CODE  
PG.32 - ADDED (**Aaaa**) TO **MST** COMMAND CODE  
PG.34 - **REV** COMMAND CODE NOW **REV OR VER**  
PG.34 - ADDED (**Aaaa**) TO **SET** COMMAND CODE  
PG.35 - ADDED (**Aaaa**) TO **STA** COMMAND CODE  
PG.36 - ADDED **TMP** COMMAND CODE  
PG.38 - MOVED **AUXILIARY CONTROL INTERFACE OPERATION** FROM END OF SECTION 3 TO THIS PAGE  
REPAGED SECTIONS 3 THRU 5 PER CHANGES TO TEXT
- 4/20/09: REV.L TO REV.M  
PG.21 - ADDED NOTE  
PG.40 - UPDATED **FIGURE 3-16**  
PG.41 - UPDATED **FIGURE 3-17**  
PG.42 - UPDATED **FIGURE 3-18**  
PG.43 - UPDATED **FIGURE 3-19**  
PG.44 - UPDATED **FIGURE 3-20**  
PG.45 - UPDATED **FIGURE 3-21**  
PG.46 - UPDATED **FIGURE 3-22 & 3-23**
- 5/18/09: REV.M TO REV.N  
PG.58 - CHANGED PHASE NOISE FOR **136284-1** FROM **114/144** TO **120/150**
- 11/16/09: REV.N TO REV.P  
PG.23 - ADDED AVAILABILITY NOTE TO **AT2** COMMAND  
PG.24 - ADDED AVAILABILITY NOTE TO **AN2** COMMAND  
PG.26 - ADDED **Optional** TO **Attenuator 2 indicator** IN **COM** COMMAND  
PG.29 - ADDED AVAILABILITY NOTE TO **IMP** COMMAND  
PG.32 - CHANGED **NsaaZz** TO (**NsaaZz**) IN **MST** COMMAND  
PG.32 - ADDED **Optional** TO **Slope indicator** IN **MST** COMMAND  
PG.32 - ADDED **Optional** TO **Impedance indicator** IN **MST** COMMAND  
PG.33 - ADDED AVAILABILITY NOTE TO **MUT** COMMAND  
PG.33 - ADDED AVAILABILITY NOTE TO **REF** COMMAND  
PG.35 - ADDED AVAILABILITY NOTE TO **SLP** COMMAND

- 6/22/10: REV.P TO REV.Q  
PG.6 - ADDED NOTE FOR DISABLING NONVOLATILE MEMORY  
PG.33 - ADDED **MTN** COMMAND  
PG.61 - ADDED FAN REPLACEMENT NOTE
- 1/26/11: REV.Q TO REV.R  
PG.18 - ADDED NOTE FOR ADJUSTING LCD DISPLAY IF TOO DARK OR TOO LIGHT TO INITIALLY READ
- 4/20/11: REV.R TO REV.S  
PG.5 - CHANGED **FUSE** FROM **T1.25A** TO **2A (INTERNAL)**  
PG.8 - REMOVED **Fuse** FROM **EXTERNAL CONTROLS**  
PG.8 - REMOVED **+5 ±0.2V** FROM **INTERNAL CONTROLS**  
PG.8 - REMOVED **FIGURE 3-1. INTERNAL POWER SUPPLY ADJUSTMENT**; RENUMBERED ALL REMAINING FIGURES IN **SECTION THREE**  
PG.16 - ADDED SENTENCE ABOUT **DHCP** IN **IP ADDRESS**  
PG.37 - ADDED **NOTE**  
PG.39 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**  
PG.47 - ADDED **Version 1.0** TO FIRST SENTENCE OF **Access via SNMP**  
PG.48 - CHANGED **192.168.1.1** TO **000.000.000.000 (DHCP)**  
PG.48 - CHANGED **IP** TO **MAC** IN FINAL SENTENCE OF **NOTE**  
PG.52&53 - BLOCK DIAGRAM 162811 REV.M TO REV.N  
PG.55 - BLOCK DIAGRAM 180070 REV.B TO REV.C  
PG.61 - REPLACED **POWER SUPPLY 135782** WITH **189400**  
PG.64 - COMPLETELY REWROTE **13TH BULLET**
- 11/1/11: REV.S TO REV.T  
COVER - ADDED OPTION **10E**  
PG.1 - ADDED **Power Factor Corrected Power Supply**  
PG.5 - IN **Primary power**, CHANGED **35 W** TO **40 W**  
PG.5 - IN **Primary power**, ADDED **Power Factor 0.85 minimum, 0.95 typical**  
PG.5 - REMOVED **Harmonic emissions**  
PG.59 - ADDED **ANALOG REFERENCE PHASE LOCK (OPTION 10E)**
- 9/9/14 REV.T TO REV.U  
COVER - ADDED MODEL NUMBERS **U-9956-7-1K** AND **U-9957-2-1K** AND **OPTION 10F** REFERENCE.  
PGS.1&2 - CHANGED FIGURE 1-2 TO 1-5 WITH NOTE, FIGURE 1-3 TO 1-6 WITH NOTE, FIGURE 1-4 PHOTO REVISIONS, FIGURE 1-5 TO 1-2, AND FIGURE 1-6 TO 1-3.  
PGS.1&2 - ADDED MODEL NOS. **U-9956-7-1K** AND **U-9957-2-1K** TO **FREQUENCY UPCONVERTERS** TABLE.  
PG.4 - CHANGED **FUNCTIONAL INPUT CHARACTERISTICS RETURN LOSS, DOWNCONVERTER** FROM **21 dB minimum** TO **-20 dB minimum** AND **OUTPUT CHARACTERISTICS UPCONVERTER RETURN LOSS** FROM **21 dB minimum** TO **-20 dB minimum**.  
PG.5 - ADDED **NOTE** TO **CONVERTER PERFORMANCE SPECIFICATIONS TABLE** AND REVISED **PHASE NOISE UPCONVERTERS, DOWNCONVERTERS, AND MAXIMUM EXTERNAL REFERENCE** TABLES.  
PGS.52-53 - UPDATED **FIGURE 4-1 BLOCK DIAGRAM** TO **162811 REV.P**.  
PG.56 - ADDED MODEL NOS. **U-9956-7-1K** AND **U-9957-2-1K** TO **FREQUENCY PLANS UPCONVERTER** TABLE AND DELETED **DOWNCONVERTER MODULE MODEL NUMBER** TABLE.  
PG.57 - DELETED **UPCONVERTER MODULE MODEL NUMBER** TABLE.  
PG.60 - ADDED MODEL NOS. **U-9956-7-1K** AND **U-9957-2-1K** TO **LOCAL OSCILLATOR** TABLE AND DELETED **PART NUMBER** COLUMN.

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## 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 control interface is provided for use with NSU redundancy system or as an alternate remote interface
  - 10/100Base-T Ethernet interface
- RF, 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



Figure 1-2. Rear Panel (Three Remotes - S/N 1393369 and after)



Figure 1-3 . Rear Panel - L-Band Monitor (Three Remotes - S/N 1398480 and after)



Figure 1-4. Rear Panel (L-Band Monitor)



Figure 1-5. Rear Panel (S/Ns <1393369, See Fig. 1-2 for Current Rear Panel)



Figure 1-6. Rear Panel (Option 17H) (S/Ns <1393369)

## MODEL NUMBERS

### Converter Model Numbers

| Frequency Downconverters |                |                                    |                      |             |                   |
|--------------------------|----------------|------------------------------------|----------------------|-------------|-------------------|
| MODEL NUMBER             | RF INPUT (GHz) | RF LO (GHz)                        | SECOND IF (MHz)      | IF LO (MHz) | IF OUTPUT (MHz)   |
| D-9901-1-1K              | 3.4-4.2        | 4.71-5.51<br>4.64-5.44 (Opt.4)     | 1310<br>1240 (Opt.4) | 1380        | 70<br>140 (Opt.4) |
| D-9908-6-1K              | 10.7-12.75     | 12.79-14.84<br>12.72-14.77 (Opt.4) | 2090<br>2020 (Opt.4) | 2160        | 70<br>140 (Opt.4) |

| Frequency Upconverters       |                   |             |                      |                                    |                 |
|------------------------------|-------------------|-------------|----------------------|------------------------------------|-----------------|
| MODEL NUMBER                 | IF INPUT (MHz)    | IF LO (MHz) | SECOND IF (MHz)      | RF LO (GHz)                        | RF OUTPUT (GHz) |
| U-9953-6-1K<br>U-9953-6-1K-L | 70<br>140 (Opt.4) | 1080        | 1150<br>1220 (Opt.4) | 4.575-5.575<br>4.505-5.505 (Opt.4) | 5.725-6.725     |
| U-9956-6-1K<br>U-9956-6-1K-L | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 11.52-12.57<br>11.45-12.5 (Opt.4)  | 13.75-14.8      |
| U-9956-7-1K                  | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 10.52-12.27<br>10.45-12.20 (Opt.4) | 12.75-14.5      |
| U-9957-2-1K                  | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 15.07-16.17<br>15.0-16.10 (Opt.4)  | 17.3-18.4       |

## EQUIPMENT CHARACTERISTICS

### PHYSICAL

|                                  |   |
|----------------------------------|---|
| Weight .....                     | 12 pounds nominal   |
| Chassis dimensions.....          | 19" x 1.75" panel height<br>x 20" maximum                         |
| <b>Connectors</b>                |   |
| RF .....                         | SMA female (N female, Option NRF)                                 |
| RF monitor.....                  | SMA female  |
| IF .....                         | BNC female  |
| IF monitor .....                 | BNC female  |
| LO monitors.....                 | SMA female  |
| L-Band monitor.....              | SMA female<br>(U-9953-6-1K-L, 56-6-1K only)                       |
| Alarm .....                      | DE-9P   |
| External reference .....         | BNC female  |
| Remote interface .....           | DE-9S for RS485,<br>RS422 and RS232,<br>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 $\pm$ 20 MHz<br>140 $\pm$ 40 MHz (Option 4)  | Refer to model number table   |
| Impedance  | 75 Ohms/50 Ohms (Option 15)   | 50 Ohms   |
| Return loss  | 26 dB minimum (70 $\pm$ 20 MHz)<br>20 dB minimum (140 $\pm$ 40 MHz)   | 20 dB minimum   |
| Signal monitor   | -20 dBc   |   |
| Input level (non-damage)   | +15 dBm maximum   |   |
| Output characteristics   |   |   |
| Frequency  | Refer to model number table   | 70 $\pm$ 20 MHz<br>140 $\pm$ 40 MHz (Option 4)                      |
| Impedance  | 50 Ohms   | 75 Ohms/50 Ohms (Option 15)   |
| Return loss  | 20 dB minimum   | 26 dB minimum (70 $\pm$ 20 MHz)<br>20 dB minimum (140 $\pm$ 40 MHz) |
| Signal monitor   | -20 dBc   |   |
| Power output (P1 dB)<br>C-band<br>Ku-band  | +16 dBm minimum/17 dBm typical  |   |
|  | +10 dBm minimum/12 dBm typical  | +16 dBm minimum/17 dB typical                                       |
| Transfer characteristics   |   |   |
| Gain   | +31-34 dB at 23°C   | +44-48 dB at 23°C   |
| Noise Figure   | 14 dB maximum   | 11 dB maximum   |
| Noise power density  | -125 dBm/Hz maximum   | N/A   |
| Image rejection  | N/A   | 80 dB minimum   |
| Level stability  | $\pm$ 0.25 dB/day maximum at constant temperature<br>$\pm$ 0.5 dB peak-to-peak typical from 0 to 50°C           |   |
| Amplitude response   | $\pm$ 0.3 dB maximum/40 MHz<br>$\pm$ 0.45 dB maximum/80 MHz (140 $\pm$ 40 MHz - Option 4)                       |   |
| Slope adjust   | $\pm$ 1 dB typical in 0.2 dB steps  |   |
| Group delay (70 $\pm$ 18 MHz)<br>Linear<br>Parabolic<br>Ripple                     | 0.03 ns/MHz maximum<br>0.01 ns/MHz <sup>2</sup> maximum<br>1 ns peak-to-peak                                    |   |
| Group delay (140 $\pm$ 36 MHz)<br>Linear<br>Parabolic<br>Ripple                    | 0.025 ns/MHz maximum<br>0.0035 ns/MHz <sup>2</sup> maximum<br>1 ns peak-to-peak                                 |   |
| Intermodulation distortion<br>(third order) at two signals each<br>at 0 dBm output | 55 dBc min. (+27.5 dBm IP3 pt.) (C-band)<br>45 dBc min. (+22.5 dBm IP3 pt.) (Ku-band)                           | 60 dBc minimum (+30 dBm IP3 pt.)                                    |
| AM/PM conversion   | 0.1°/dB maximum up to 0 dBm output  |   |
| Gain slope   | 0.03 dB/MHz typical<br>0.05 dB/MHz maximum (10 MHz minimum)   |   |
| Frequency Accuracy   | $\pm$ 10 Hz maximum using external reference (C-band)<br>$\pm$ 22 Hz maximum using external reference (Ku-band) |   |
| Spurious outputs<br>Signal related<br>Signal independent                           | 65 dBc up to 0 dBm output<br>-80 dBm maximum  |   |
| LO Leakage at RF port  | -75 dBm maximum   | -80 dBm maximum   |

| Converter Performance Specifications (Continued)  |  |               |
|---|--|---------------|
|   | UPCONVERTER  | DOWNCONVERTER |
| Gain adjustment                                   | 30 dB in 0.2 dB steps  |               |
| Frequency stability                               | $\pm 2 \times 10^{-8}$ , 0 to 50°C<br>$\pm 5 \times 10^{-9}$ /day typical (fixed temperature after 24 hours on time)<br>$\pm 5 \times 10^{-9}$ , 0 to 50°C<br>$1 \times 10^{-9}$ /day typical (fixed temperature after 24 hours on time)<br>$\pm 2 \times 10^{-9}$ , 0 to 50°C<br>$1 \times 10^{-9}$ /day typical (fixed temperature after 24 hours on time) |               |
| Standard  |  |               |
| Option 10B  |  |               |
| Option 10C  |  |               |
| Upconverter mute                                  | 80 dB minimum  | N/A           |
| External reference                                | 5 or 10 MHz, +4 $\pm$ 3 dBm<br>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  |               |
| L-Band Monitor<br>(U-9953-6-1K-L, 56-6-1K-L only) | 1150 MHz (1220 MHz w/Option 4)<br>-2 dBc nominal relative to input signal with 0 dB attenuation  |               |
| Primary power                                     | 90-250 VAC at 40 watts typical<br>Power Factor 0.85 minimum, 0.95 typical  |               |
| Fuse  | 2A (internal)  |               |
| Environmental (Operating)                         | 0 to +50°C<br>Up to 95% at 30°C<br>Up to 10,000 feet   |               |
| Ambient temperature                               |  |               |
| Relative humidity                                 |  |               |
| Atmospheric pressure                              |  |               |
| Environmental (Non-operating)                     | -50 to +70°C<br>Up to 95% at 40°C<br>Up to 40,000 feet   |               |
| Ambient temperature                               |  |               |
| Relative humidity                                 |  |               |
| Atmospheric pressure                              |  |               |
| Shock and vibration                               | Normal handling by commercial carriers   |               |

**Note** All specifications guaranteed at maximum gain unless otherwise noted.

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

| Phase Noise (-dBc/Hz) Maximum/Typical with Internal Reference |             |       |       |        |        |        |         |
|---|-------------|-------|-------|--------|--------|--------|---------|
| MODEL NO.   | Offset (Hz) |       |       |        |        |        |         |
|   | 10          | 100   | 1K    | 10K    | 100K   | 300K   | 1M      |
| UPCONVERTER   |             |       |       |        |        |        |         |
| U-9953-6-1K   | 63/69       | 83/85 | 95/97 | 97/100 | 97/104 | 97/106 | 111/123 |
| U-9956-6-1K   | 55/71       | 70/85 | 78/93 | 91/96  | 95/98  | 95/104 | 111/122 |
| U-9956-7-1K   | 50/70       | 66/84 | 85/93 | 90/95  | 93/96  | 93/102 | 111/122 |
| U-9957-2-1K   | 50/70       | 66/83 | 85/91 | 90/93  | 93/96  | 93/101 | 111/120 |
| DOWNCONVERTER   |             |       |       |        |        |        |         |
| D-9901-1-1K   | 63/69       | 80/83 | 95/97 | 97/99  | 97/103 | 97/106 | 111/123 |
| D-9908-6-1K   | 55/68       | 70/82 | 78/92 | 91/96  | 95/97  | 95/106 | 111/122 |

| Maximum External Reference to Achieve Above Phase Noise with 10 MHz Reference (dBc/Hz) |             |     |     |     |      |      |     |
|--|-------------|-----|-----|-----|------|------|-----|
|  | Offset (Hz) |     |     |     |      |      |     |
|  | 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 |

## SECTION 2: INSTALLATION



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

### UNPACKING, STORAGE, RESHIPMENT

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

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

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

### MOUNTING



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

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

### TURN-ON PROCEDURE

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

**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 3 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 3 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 3 for wiring information. |
| 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   |

## SECTION 3: OPERATION

### CONTROLS

#### EXTERNAL CONTROLS

For a description of the front panel keys and select switches see Page 9.

#### AC Power

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

#### INTERNAL CONTROLS

##### Power Supply Output Voltage Adjustment

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

#### FRONT PANEL OPERATIONS

A Liquid Crystal Display (LCD) and Light Emitting Diode (LED) indicators have been organized such that important information is available at a glance. The keyboard is divided into functional groups to allow an operator to easily change any parameter from the front panel. See Figure 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. 9900 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)

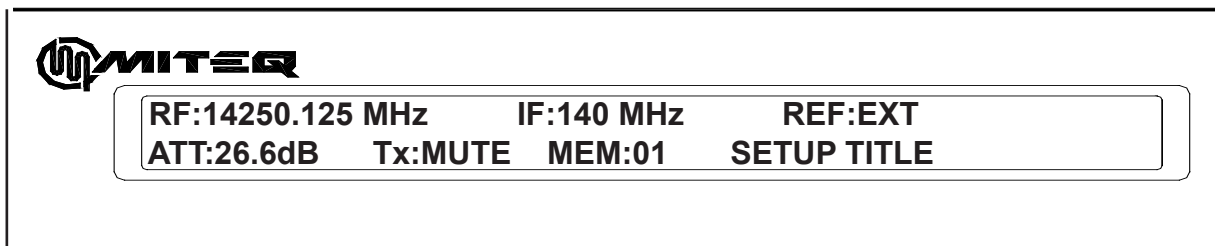
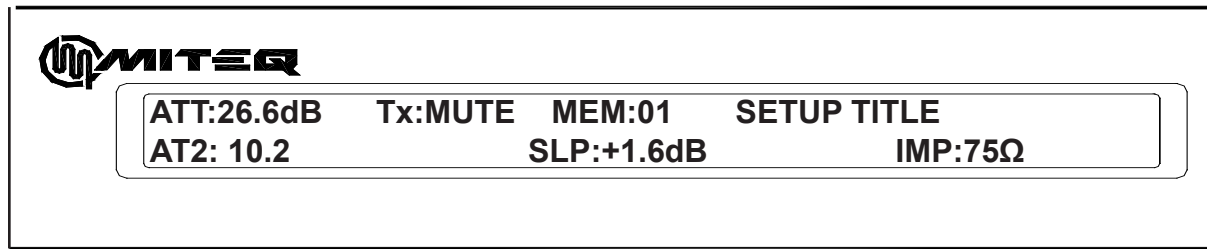


Figure 3-2. Display Lines 1 and 2



**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.

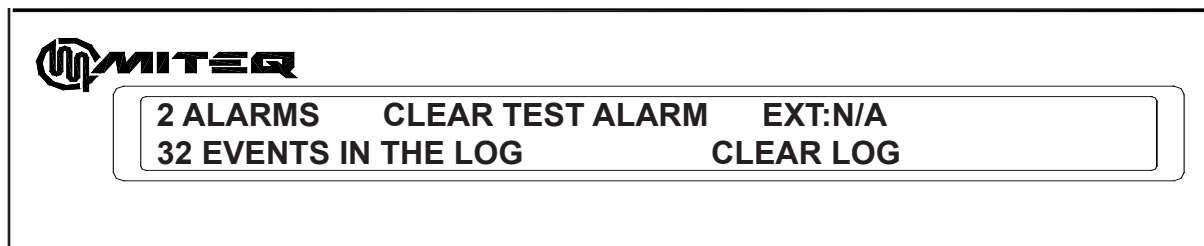
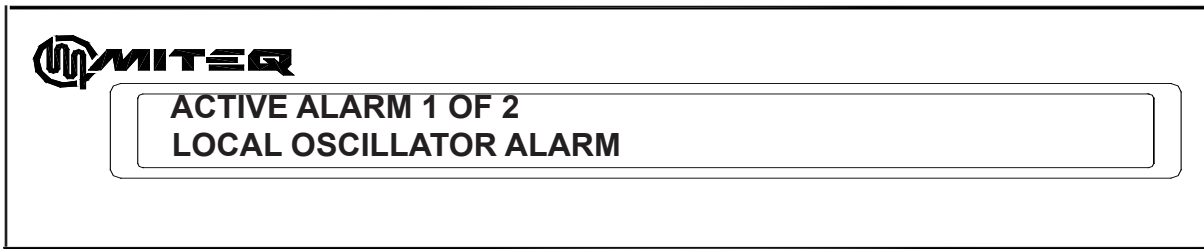


Figure 3-4. Alarm Menu Display

#### 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.



**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

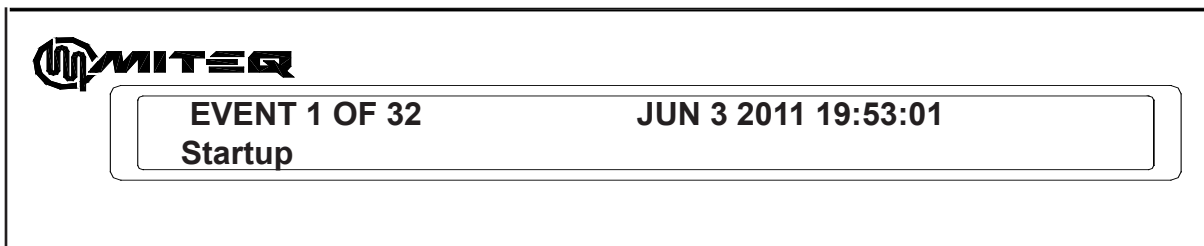
The unit can sense an External Alarm:

- 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.



**Figure 3-6. Event Log Display**

The events that can be reported are:

- |                                   |  |
|-----------------------------------|--|
| • Log Cleared                     | • Test Alarm fault/recovery            |
| • Unit Startup                    | • Unit Title change                    |
| • Power supply fault/recovery     | • External fault/recovery              |
| • LO fault/recovery               | • Nonvolatile memory fault             |
| • LO level fault/recovery         | • Slope change                         |
| • Frequency change (RF)           | • Impedance change                     |
| • Frequency change (IF)           | • Translation frequency offset change  |
| • Attenuation change              | • Temperature fault/recovery           |
| • Attenuation 2 change            | • Module Communications fault/recovery |
| • Unit Mute/Unmute by an operator | • AMP Current fault/recover            |

### Clear Event Log

To clear the Event Log of its contents:

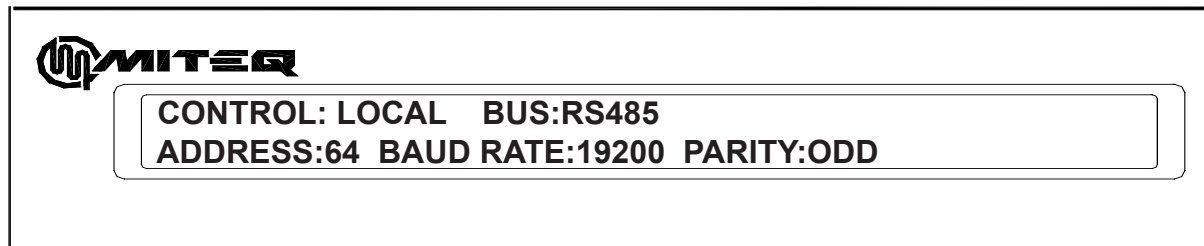
- Press the “CURSOR” key to highlight the Clear Log field on the display.
- Press the “ENTER” key. A message will appear “PRESS ENT TO CLEAR THE EVENT LOG.”
- Press “ENTER” to purge the contents of the event log or Press the “MENU” key to return to the Alarm menu.

## 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:

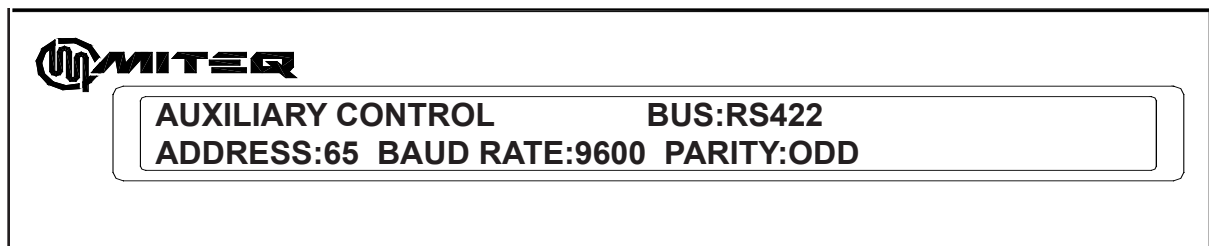
- Press the “CURSOR” key to select the parity field on the display.
- Use the up and down arrow keys to scroll through the available options until the desired setting is displayed. The parity can be set to ODD, EVEN, or NONE.
- Press “ENTER” to set the parity selection.

## 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

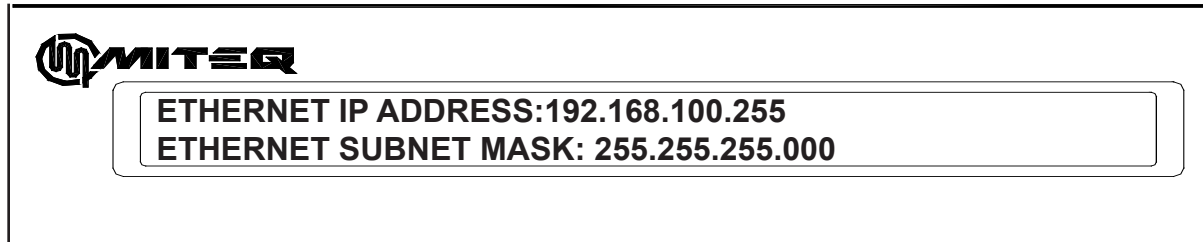
To select the baud rate of the Auxiliary Control Interface:

- 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**

**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.

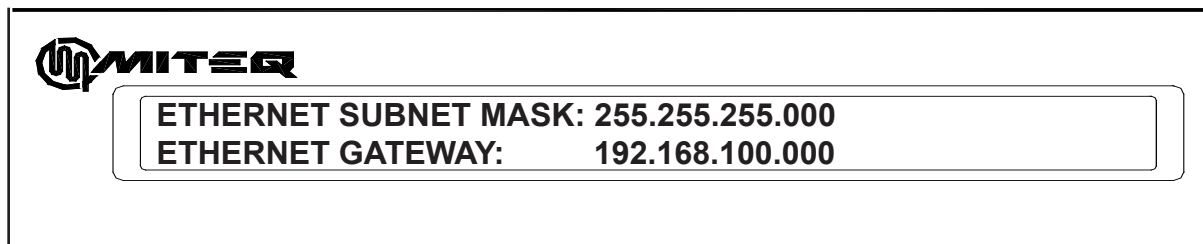
Units are shipped at 000.000.000.000 (DHCP) to allow network assignment of IP Address. To select the remote address:

- 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.



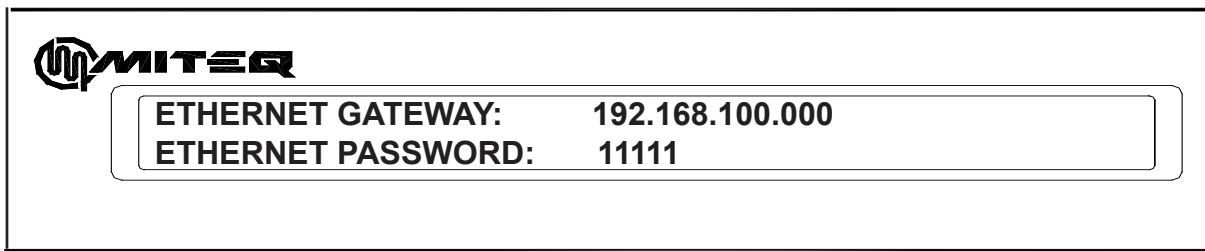
**Figure 3-10. Ethernet Display Lines 2 and 3**

**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.





**Figure 3-11. Ethernet Display Lines 3 and 4**

#### **Ethernet Password**

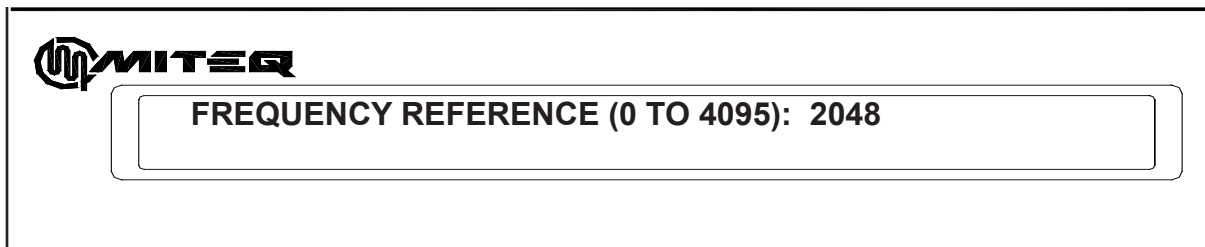
Units equipped with a five digit numeric password. To select the password

- 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.



**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.

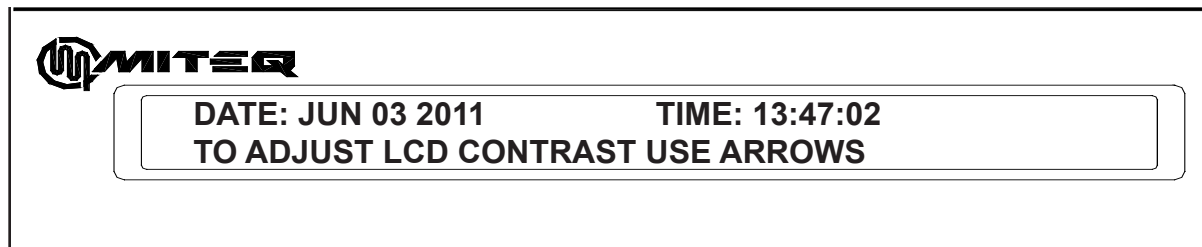


Figure 3-13. Utility Menu Display

### 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.



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

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

## UNIT TITLE MENU

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

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

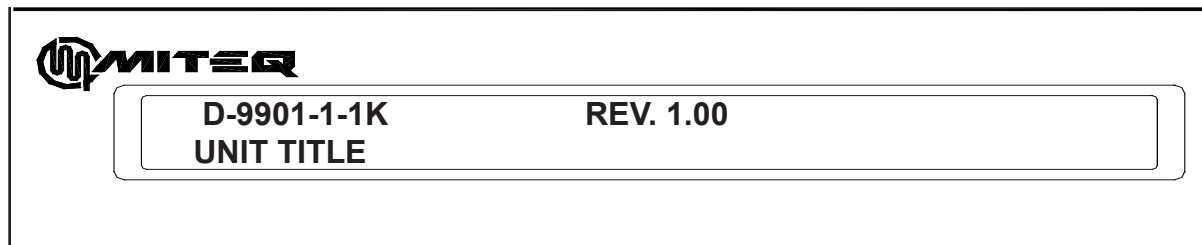


Figure 3-14. Unit Title Menu Display

### 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.

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

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

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

## COMMAND CODE SUMMARY

The following paragraphs describe each of the command codes.

| COMMAND CODES          |  |
|------------------------|--|
| ASCII CHARACTER STRING | FUNCTION   |
| ALR                    | System Fault Status                                    |
| ATT/AT1                | Unit Attenuation                                       |
| ATN/AN1                | Unit Attenuation change without storing in event log   |
| AT2                    | Unit Attenuation 2                                     |
| AN2                    | Unit Attenuation 2 change without storing in event log |
| BFR                    | Band Frequencies                                       |
| 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: | \$ALRabcdeghi |
| Unit Response:           | \$ALR         |

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?ALR  |
| Unit Response:           | ?ALRabcdeghi  |
|                          | <p>?ALR: Component Fault Status indicator<br/>a-i: "0" or "1" ASCII numeric character<br/>0 = No fault<br/>1 = Fault</p> <p>a-i indicates the status of the component faults described below.</p> <ul style="list-style-type: none"> <li>a Test Alarm</li> <li>b Logged Alarm</li> <li>c LO Alarm</li> <li>d Power Supply Alarm</li> <li>e LO Level Alarm (Optional)</li> <li>f Amplifier Current Alarm (Optional)</li> <li>g External Alarm</li> <li>h Temperature Alarm</li> <li>i Module Communications Alarm</li> </ul> |

## 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  |
|                          | <p>ATT: Attenuation indicator<br/>ttt: Three-digit parameter indicating attenuation in tenths of a dB.<br/>INC: Used in place of "ttt" to increment the attenuator 0.2 dB<br/>DEC: Used in place of "ttt" to decrement the attenuator 0.2 dB</p> |

## 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<br>ttt: Three-digit parameter indicating attenuation in tenths of a dB.<br>INC: Used in place of "ttt" to increment the attenuator 0.2 dB<br>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<br>ttt: Three-digit parameter indicating attenuation in tenths of a dB.<br>INC: Used in place of "ttt" to increment the attenuator 0.2 dB<br>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<br>ttt: Three-digit parameter indicating attenuation in tenths of a dB.<br>INC: Used in place of “ttt” to increment the attenuator 0.2 dB<br>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:           | ?BFRbIIIIIIII-hhhhhhhhhhhOIIIIIIII-hhhhhhhhhhh  |
|                          | BFR: Band frequency indicator<br>b: Single-digit ASCII numeric character representing Band number<br>I: Input frequency range indicator<br>O: Output frequency range indicator<br>IIIIIIII: Twelve-digit ASCII numeric characters, indicating low frequency range in Hz<br>hhhhhhhhhh: 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: | \$CLKYyyyMmmDddHhhNnnSss |
| Unit Response:           | \$CLK                    |

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?CLK  |
| Unit Response:           | ?CLKYyyyMmmDddHhhNnnSss   |
|                          | Y: Year indicator<br>yyy: Year, Four-digit ASCII numeric characters.<br><br>M: Month indicator<br>mm: Month, Two-digit ASCII numeric characters<br><br>D: Day indicator<br>dd: Day, Two-digit ASCII numeric characters<br><br>H: Hour indicator<br>hh: Hour, Two-digit ASCII numeric characters<br><br>N: Minute indicator<br>nn: Minute, Two-digit ASCII numeric characters<br><br>S: Second indicator<br>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: | \$COMFffffffffTtt(Aaaa)(li) |
| Unit Response:           | \$COM                       |

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?COM  |
| Unit Response:           | ?COMFffffffffTtt(Aaaa)li  |
|                          | <p>F: Frequency indicator.<br/>F: Twelve-digit ASCII numeric characters, indicating the tuned frequency in Hz.</p> <p>T: Attenuation indicator.<br/>ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Attenuation 2 indicator<br/>aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>l: IF indicator. (optional on SET command)<br/>i: "0" or "1" ASCII numeric character (optional on SET command)<br/>0 = 70 MHz<br/>1 = 140 MHz.<br/>- = Does not apply</p> |

## EXTERNAL ALARM CONFIGURATION = EAC

The SET command requires one parameter.

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

The QUERY command requires no parameters.

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

## ETHERNET PARAMETERS = EAD

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

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

The QUERY command requires no parameters.

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



*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: | \$FRQfffffffff |
| 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:           | ?FRQfffffffff   |
|                          | FRQ: Frequency indicator<br>fffffffff: 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<br>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<br>i: "0" or "1" ASCII numeric character<br>0 = 70 MHz<br>1 = 140 MHz |

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?IFS  |
| Unit Response:           | ?IFSi   |
|                          | IFS: IF indicator<br>i: "0" or "1" ASCII numeric character<br>0 = 70 MHz<br>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<br>i: "0" or "1" ASCII numeric character<br>0 = 50 $\Omega$<br>1 = 75 $\Omega$ |

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?IMP  |
| Unit Response:           | ?IMPi   |
|                          | IMP: Impedance indicator<br>i: "0" or "1" ASCII numeric character<br>0 = 50 $\Omega$<br>1 = 75 $\Omega$ |

## 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.<br><br>C: Calendar/Clock indicator.<br><br>yyyy: Year, Four-digit ASCII numeric characters, MSD transmitted first, LSD last.<br><br>mm: Month, Two-digit ASCII numeric characters<br><br>dd: Day, Two-digit ASCII numeric characters<br><br>hh: Hour, Two-digit ASCII numeric characters<br><br>nn: Minute, Two-digit ASCII numeric characters<br><br>ss: Second, Two-digit ASCII numeric characters<br><br>E: Alarm indicator.<br>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: | \$MEMnnFffffffffTtt(Aaaa)liUuuuuuuuuuuSsaa |
| 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:           | ?MEMnnFffffffffTtt(Aaaa)liUuuuuuuuuuuSsaa  |
|                          | <p>nn: Two-digit ASCII numeric characters, indicating the memory register accessed.</p> <p>F: Frequency indicator.<br/>           fffffffff: Twelve-digit ASCII numeric characters.<br/>           Indicating the tuned frequency in Hz.</p> <p>T: Attenuation indicator.<br/>           ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator<br/>           aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>I: IF indicator.<br/>           i: "0" or "1" ASCII numeric character<br/>               0 = 70 MHz<br/>               1 = 140 MHz.<br/>               - = Does not apply</p> <p>U: User-defined Setup Title Indicator<br/>           Uuuuuuuuuuu: Twelve-character user-defined setup title</p> <p>S: Slope indicator<br/>           s: Sign + or -<br/>           aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.</p> |

## MORE SYSTEM STATUS = MST

There is no SET command.

The QUERY command requires no parameters.

| Command                  | Parameters   |
|--------------------------|--|
| Remote Command Sequence: | ?MST   |
| Unit Response:           | ?MSTFffffffffTttt(Aaaa)LlIiMmRrPpUuuuuuuuuuuu(NsaaZz)?abcdefghi  |
|                          | <p>F: Frequency indicator.<br/>           ffffffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in Hz.</p> <p>T: Attenuation indicator<br/>           ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator<br/>           aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>L: Local / Remote mode indicator<br/>           l: "0" or "1" ASCII numeric character<br/>               0 = Local control<br/>               1 = Remote control</p> <p>I: IF indicator<br/>           i: "0" or "1" ASCII numeric character<br/>               0 = 70 MHz<br/>               1 = 140 MHz<br/>               - = Does not apply</p> <p>M: Mute status indicator<br/>           m: "0" or "1" ASCII numeric character<br/>               0 = Not mute<br/>               1 = Mute</p> <p>R: Frequency Reference Source indicator<br/>           r: "0" or "1" ASCII numeric character<br/>               0 = Internal<br/>               1 = External</p> <p>P: Polarization indicator<br/>           p: "0"</p> <p>U: User-defined Setup Title Indicator<br/>           Uuuuuuuuuuu: Twelve-character user-defined setup title</p> <p>N: Optional Slope indicator<br/>           s: Sign + or -<br/>           aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.</p> <p>Z: Optional Impedance indicator<br/>           z: "0" or "1" ASCII numeric character<br/>               0 = 50 <math>\Omega</math><br/>               1 = 75 <math>\Omega</math>.</p> <p>?: Component Fault Status indicator<br/>           a-i: "0" or "1" ASCII numeric character<br/>               0 = No fault<br/>               1 = Fault</p> <p>a-i indicates the status of the component faults described in the ALR command.</p> |



**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<br>m: "0" or "1" ASCII numeric character<br>0 = Not mute<br>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<br>m: "0" or "1" ASCII numeric character<br>0 = Not mute<br>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.

| <b>Command</b>           | <b>Parameters</b>            |
|--------------------------|------------------------------|
| Remote Command Sequence: | \$NAMnnnnnnnnnnnnnnnnnnnnnnn |
| Unit Response:           | \$NAM                        |

The QUERY command requires no parameters.

| Command                  | Parameters   |
|--------------------------|--|
| Remote Command Sequence: | ?NAM   |
| Unit Response:           | ?NAMnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn                           |
|                          | Nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn: 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: | \$SETnnFffffffTtt(Aaaa)liUuuuuuuuuuuSsaa |
| 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:           | ?SETnnFffffffTtt(Aaaa)liUuuuuuuuuuuSsaa  |
|                          | <p>nn: Two-digit ASCII numeric characters, indicating the memory register accessed.</p> <p>F: Frequency indicator<br/>ffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in kHz.</p> <p>T: Attenuation indicator<br/>ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator<br/>aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>I: IF indicator<br/>i: "0" or "1" ASCII numeric character<br/>0 = 70 MHz<br/>1 = 140 MHz<br/>- = Does not apply</p> <p>U: User-defined Setup Title Indicator<br/>Uuuuuuuuuuu: Twelve-character user-defined setup title</p> <p>S: Slope indicator.<br/>s: Sign + or -<br/>aa: Two-digit ASCII numeric characters, indicating the slope in tenths of a dB.</p> |

## 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   |
|                          | <p>S: Slope indicator.<br/>s: Sign + or -<br/>aa: Two-digit parameter indicating the slope in 0.2 dB steps.</p> |

## UNIT STATUS = STA

There is no SET command.

The QUERY command requires no parameters.

| Command                  | Parameters  |
|--------------------------|---|
| Remote Command Sequence: | ?STA  |
| Unit Response:           | ?STAFffffffffTtt(Aaaa)LliMmRrPp?abcdefghi   |
|                          | <p>F: Frequency indicator.<br/>           fffffffff: Twelve-digit ASCII numeric characters, indicating the tuned frequency in Hz.</p> <p>T: Attenuation indicator<br/>           ttt: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>A: Optional Second Attenuation indicator<br/>           aaa: Three-digit ASCII numeric characters, indicating the attenuation in tenths of a dB.</p> <p>L: Local / Remote mode indicator<br/>           l: "0" or "1" ASCII numeric character<br/>               0 = Local control<br/>               1 = Remote control</p> <p>I: IF indicator<br/>           i: "0" or "1" ASCII numeric character<br/>               0 = 70 MHz<br/>               1 = 140 MHz<br/>               - = Does not apply</p> <p>M: Mute status indicator<br/>           m: "0" or "1" ASCII numeric character<br/>               0 = Not mute<br/>               1 = Mute</p> <p>R: Frequency Reference Source indicator<br/>           r: "0" or "1" ASCII numeric character<br/>               0 = Internal<br/>               1 = External</p> <p>P: Polarization indicator<br/>           p: "0"</p> <p>?: Component Fault Status indicator<br/>           a-i: "0" or "1" ASCII numeric character<br/>               0 = No fault<br/>               1 = Fault</p> <p>a-i indicates the status of the component faults described in the ALR command.</p> |

## INTERNAL TEMPERATURE READING = TMP

There is no SET command.

The QUERY command requires no parameters.

| Command                  | Parameters   |
|--------------------------|--|
| Remote Command Sequence: | ?TMP   |
| Unit Response:           | ?TMPsttt   |
|                          | s: "+" or "-" indicating sign<br>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<br>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.<br>s: "+" or "-" indicating sign.<br>vv.vv: Four-digit ASCII numeric characters, indicating the measured voltage in Volts.<br>a: +15.3 Volt Supply Rail<br>b: +5.3 'A' Volt Supply Rail<br>c: +5.3 'B' Volt Supply Rail<br>d: -15.3 Volt Supply Rail |



**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 can be 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 48 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 48 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<br>(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 16).

#### 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 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 -

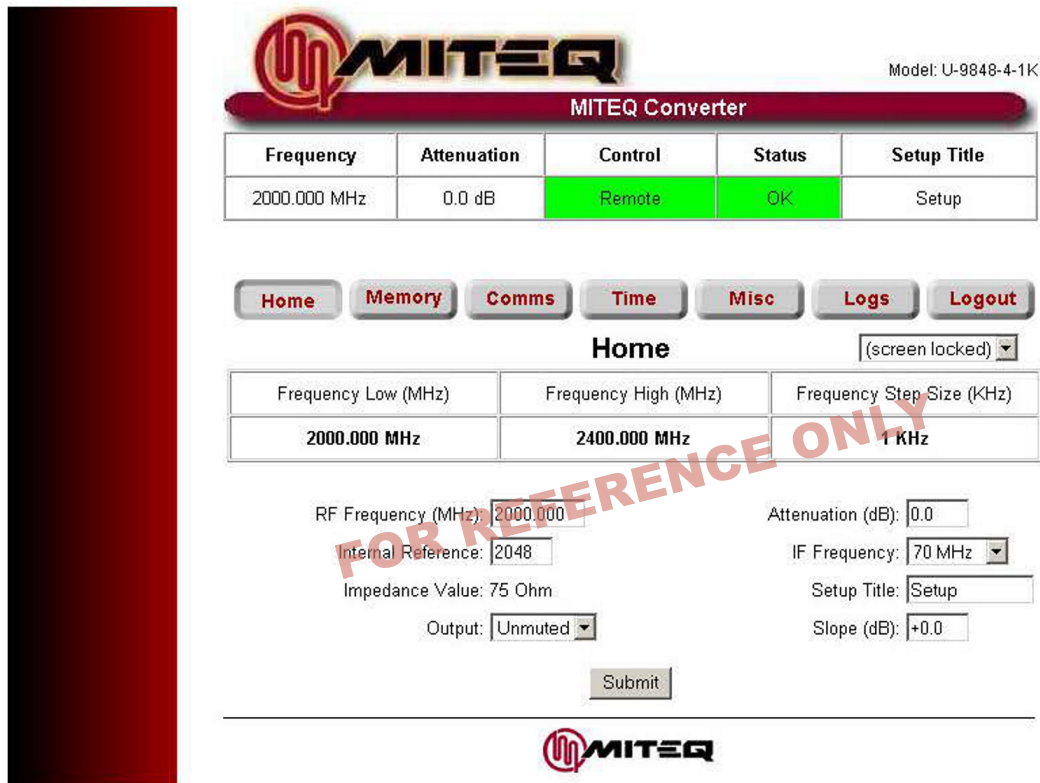
**http://<assigned IP address>**

A sign-on page requesting the password should be displayed. (See page 49 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**





Model: U-9848-4-1K

**MITEQ Converter**

| Frequency    | Attenuation | Control | Status | Setup Title |
|--------------|-------------|---------|--------|-------------|
| 2000.000 MHz | 0.0 dB      | Remote  | OK     | Setup       |

[Home](#)
[Memory](#)
[Comms](#)
[Time](#)
[Misc](#)
[Logs](#)
[Logout](#)

**Home** (screen locked)

| Frequency Low (MHz) | Frequency High (MHz) | Frequency Step Size (KHz) |
|---------------------|----------------------|---------------------------|
| 2000.000 MHz        | 2400.000 MHz         | 1 KHz                     |

RF Frequency (MHz): 2000.000  
 Internal Reference: 2048  
 Impedance Value: 75 Ohm  
 Output: Unmuted

Attenuation (dB): 0.0  
 IF Frequency: 70 MHz  
 Setup Title: Setup  
 Slope (dB): +0.0

Submit

**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.


Model: U-9848-4-1K

MITEQ Converter

| Frequency    | Attenuation | Control | Status | Setup Title |
|--------------|-------------|---------|--------|-------------|
| 2000.000 MHz | 0.0 dB      | Remote  | OK     | Setup       |

Home
Memory
Comms
Time
Misc
Logs
Logout

### Memory

(screen locked)

| Frequency Low (MHz) | Frequency High (MHz) | Frequency Step Size (KHz) |
|---------------------|----------------------|---------------------------|
| 2000.000 MHz        | 2400.000 MHz         | 1 KHz                     |

Memory #:   
 Frequency (MHz):   
 IF Frequency (MHz):

Memory Name:   
 Attenuation (dB):   
 Slope (dB):

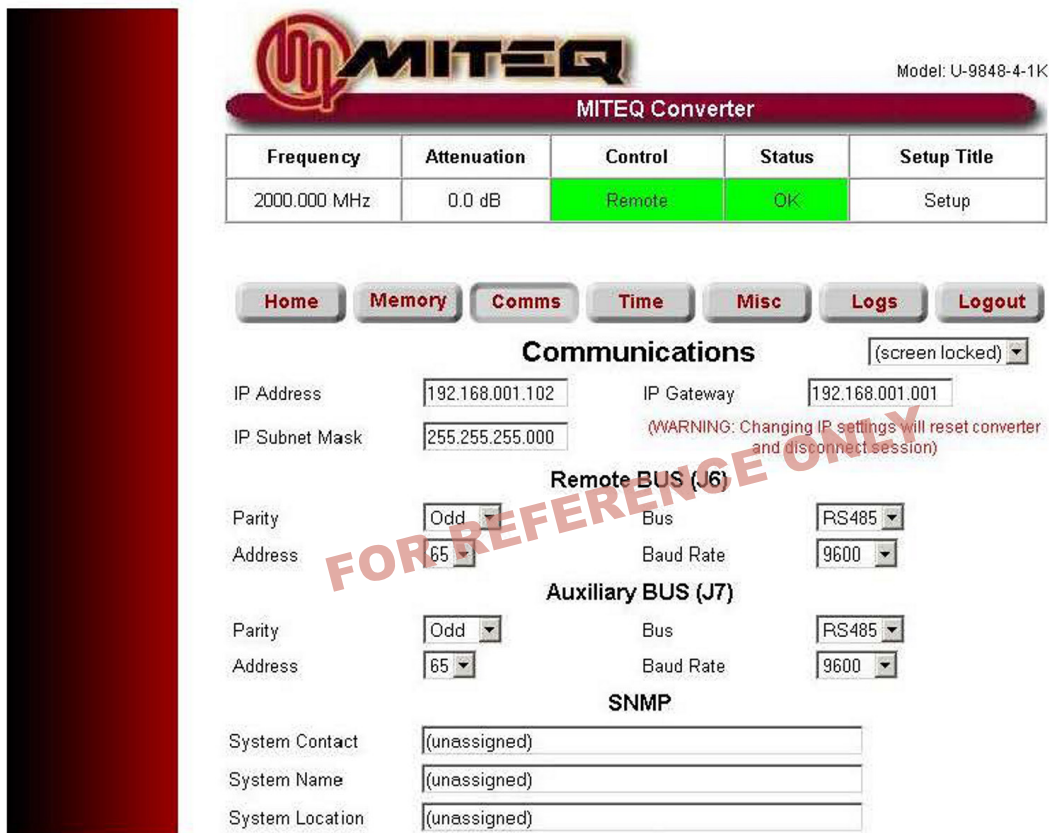
View Memory
Save Memory
Set From Memory
Save And Set

| Memory # | Memory Name | Frequency (MHz) | Attenuation (dB) | IF Frequency (MHz) | Slope (dB) |
|----------|-------------|-----------------|------------------|--------------------|------------|
| 00       | Setup 00    | 2000.000        | 30.0             | 70                 | +0.0       |
| 01       | Setup 01    | 2000.000        | 30.0             | 70                 | +0.0       |

**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 |   |
|----------------------|---|
| FUNCTION NAME        | DESCRIPTION   |
| 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.           |



Model: U-9848-4-1K

**MITEQ Converter**

| Frequency    | Attenuation | Control | Status | Setup Title |
|--------------|-------------|---------|--------|-------------|
| 2000.000 MHz | 0.0 dB      | Remote  | OK     | Setup       |

Home Memory Comms Time Misc Logs Logout

**Communications** (screen locked)

IP Address: 192.168.001.102 IP Gateway: 192.168.001.001  
IP Subnet Mask: 255.255.255.000  
(WARNING: Changing IP settings will reset converter and disconnect session)

**Remote BUS (J6)**

Parity: Odd Bus: RS485  
Address: 65 Baud Rate: 9600

**Auxiliary BUS (J7)**

Parity: Odd Bus: RS485  
Address: 65 Baud Rate: 9600

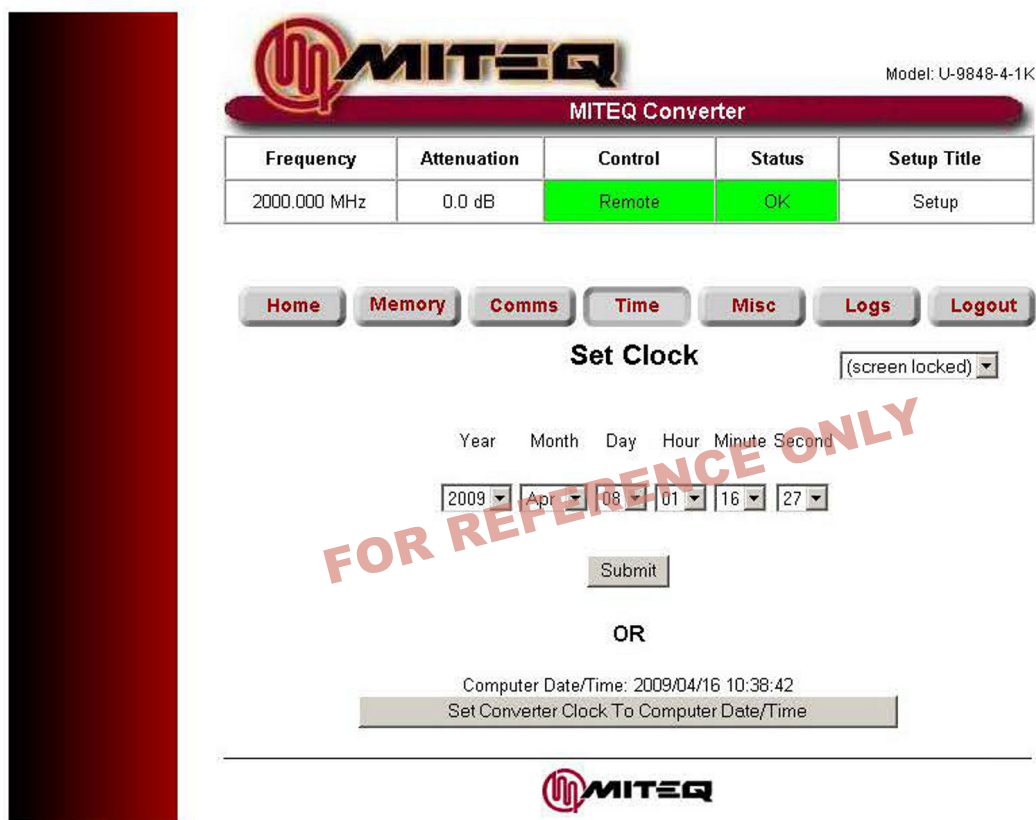
**SNMP**

System Contact: (unassigned)  
System Name: (unassigned)  
System Location: (unassigned)

**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 |   |
|----------------------------|---|
| FUNCTION NAME              | DESCRIPTION   |
| IP Address                 | View or set the system IP address (changing this value will reset the system).                            |
| IP Subnet Mask             | View or set the system IP Subnet Mask (changing this value will reset the system).                        |
| IP Gateway                 | View or set the system IP Gateway (changing this value will reset the system).                            |
| System Contact             | View or set the SNMP System Contact parameter.  |
| System Name                | View or set the SNMP System Name parameter.   |
| System Location            | View or set the SNMP System Location parameter.   |
| Read Community             | View or set the SNMP Read Community parameter (enter a long arbitrary string to make SNMP inaccessible).  |
| Write Community            | View or set the SNMP 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   |



Model: U-9848-4-1K

**MITEQ Converter**

| Frequency    | Attenuation | Control | Status | Setup Title |
|--------------|-------------|---------|--------|-------------|
| 2000.000 MHz | 0.0 dB      | Remote  | OK     | Setup       |

[Home](#)
[Memory](#)
[Comms](#)
[Time](#)
[Misc](#)
[Logs](#)
[Logout](#)

**Set Clock** (screen locked)

Year Month Day Hour Minute Second  
 2009 Apr 08 01 16 27

OR

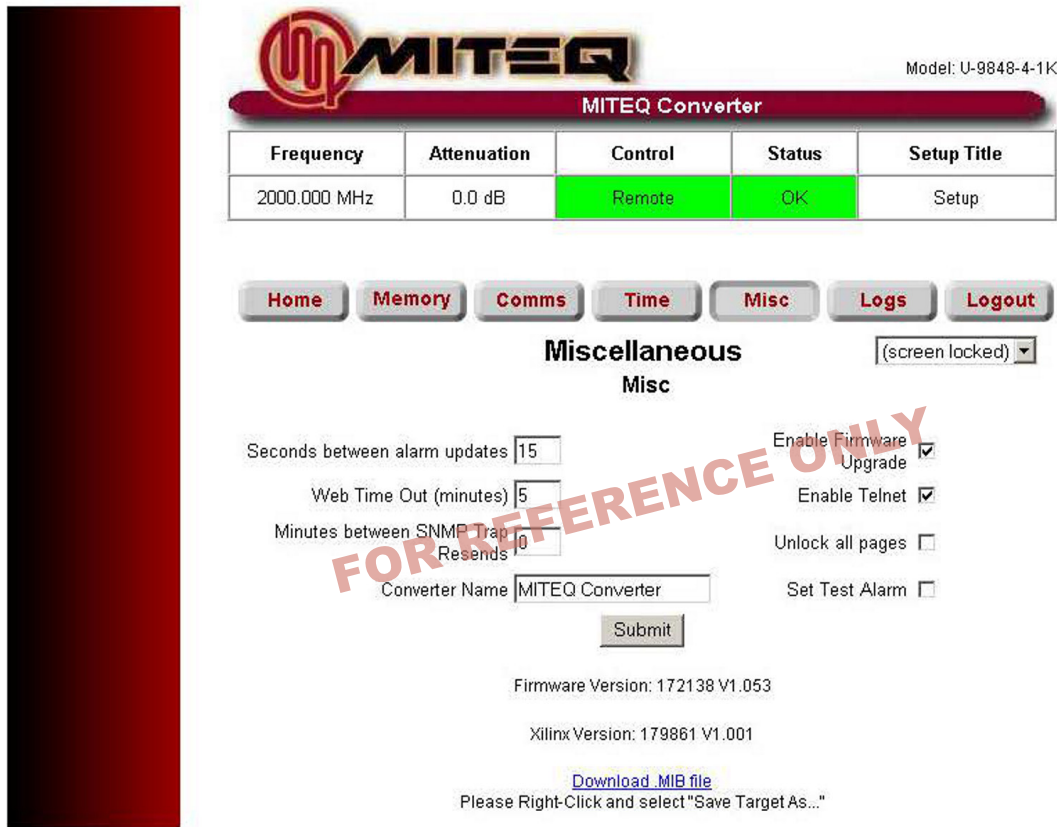
Computer Date/Time: 2009/04/16 10:38:42  
 Set Converter Clock To Computer Date/Time



**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     |   |
|---------------|---|
| FUNCTION NAME | DESCRIPTION                             |
| Set Clock     | View or set the system real-time clock. |



Model: U-9848-4-1K

| Frequency    | Attenuation | Control | Status | Setup Title |
|--------------|-------------|---------|--------|-------------|
| 2000.000 MHz | 0.0 dB      | Remote  | OK     | Setup       |

Home Memory Comms Time Misc Logs Logout

**Miscellaneous** (screen locked)

Misc

Seconds between alarm updates  Enable Firmware Upgrade ☒

Web Time Out (minutes)  Enable Telnet ☒

Minutes between SNMP Trap Resends  Unlock all pages ☐

Converter Name  Set Test Alarm ☐

Firmware Version: 172138 V1.053

Xilinx Version: 179861 V1.001

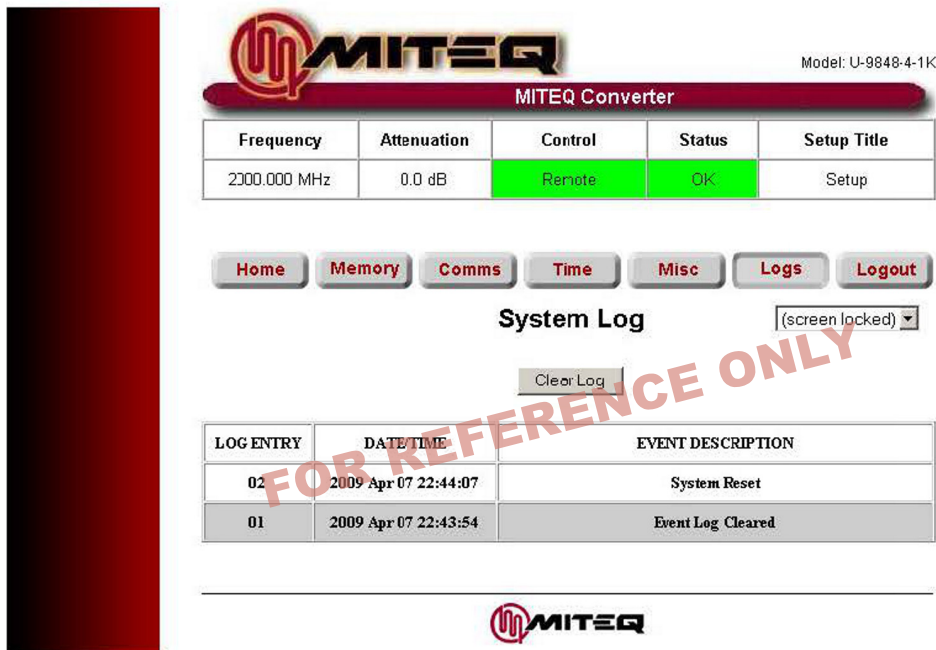
[Download MIB file](#)

Please Right-Click and select "Save Target As..."

**Figure 3-20. Miscellaneous Page Display**

The following table describes the fields on the Miscellaneous Page.

| Miscellaneous Page Fields                    |  |
|--|--|
| FUNCTION NAME                                | DESCRIPTION  |
| Second Between Alarm Updates                 | View or set how frequently the alarm indications will be refreshed on the Logs page.   |
| Web Timeout                                  | View or set the time before a web user is logged off due to inactivity.  |
| Minutes Between SNMP traps                   | View or set the frequency with which SNMP traps are resent. A value of 0 will cause traps to be sent only when an alarm initially occurs.  |
| Converter Name                               | View or set the assigned converter name.   |
| Enable Firmware Upgrade                      | Permit or prevent remote upgrade of the converter Ethernet firmware.   |
| Enable Telnet                                | Permit or prevent Telnet access.   |
| Enable Test Alarm                            | Force a false alarm for test purposes.   |
| Old Password<br>New Password<br>New Password | Update the system password (1-5 digits). All three values must be entered. If the old password does not match the existing password, or the two new password entries are different, the update will not occur. |



**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         |   |
|------------------|---|
| FUNCTION NAME    | DESCRIPTION                                       |
| 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.

## 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<br>(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/blue   | 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 9900 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

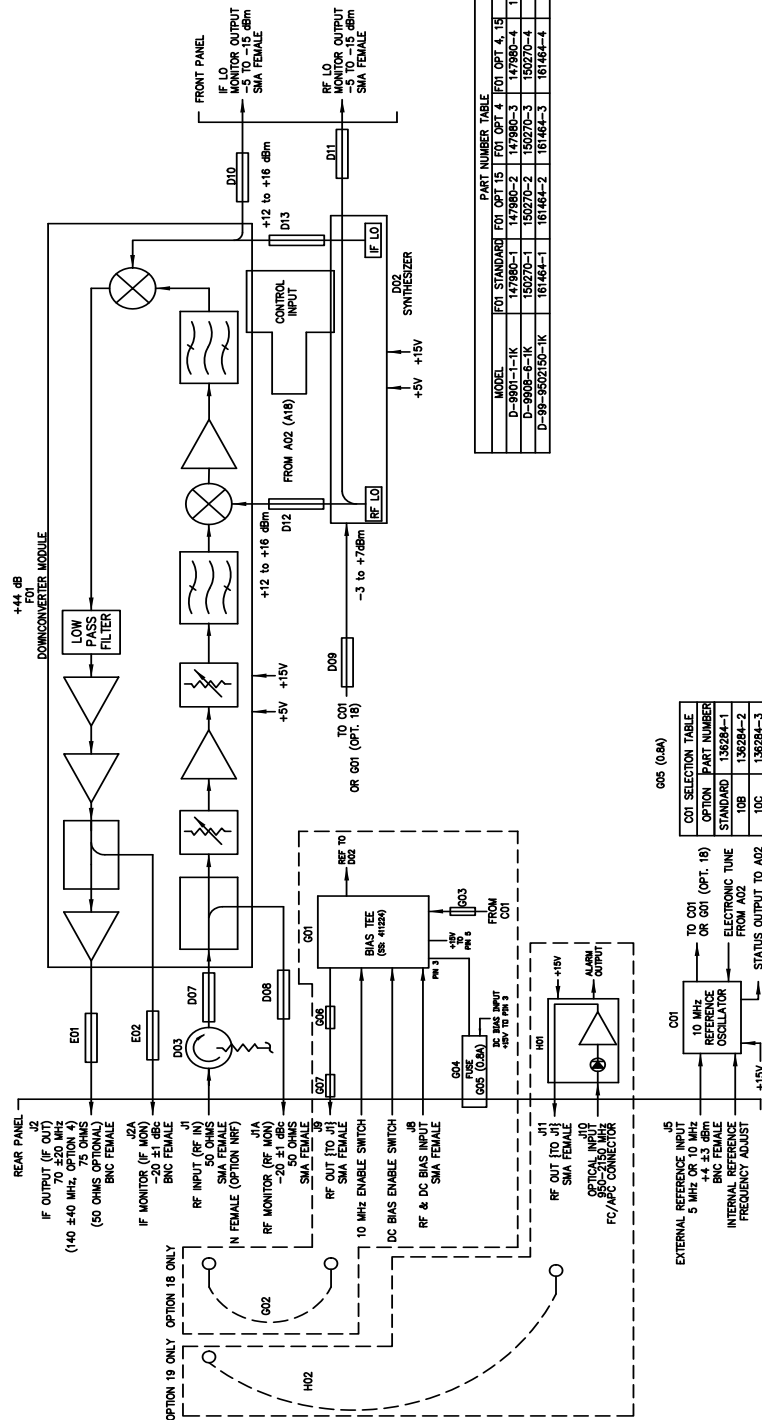
The input signal is fed to an isolator, which provides a good input match. The signal is then fed to the downconverter module. In the module an input filter rejects out-of-band signals including the image frequency. A coupler is used at the input to provide an RF signal monitor at the rear panel of the 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 amplified and filtered. The filter rejects out-of-band signals resulting from the first conversion. The signal is fed to a second mixer which converts the input signal to the output IF frequency. The signal passes through a low pass filter which rejects the local oscillator signal, to a PIN diode attenuator which provides gain control for the system, is amplified, and output from the system. A coupled output port is included in the module to provide an IF signal monitor at the rear panel of the converter.

### UPCONVERTER FUNCTIONAL DESCRIPTION

The input signal is fed to the upconverter 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 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 and amplified. A coupler is used at the output to provide an RF signal monitor at the rear panel of the converter.

## DOWNCONVERTERS

NOT ITAR CONTROLLED - ITAR PARTS ARE PROHIBITED

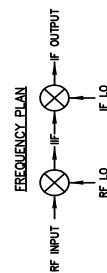


| MODEL          | PART NUMBER TABLE |            |           |               |          |          |
|----------------|-------------------|------------|-----------|---------------|----------|----------|
|                | F01 STANDARD      | F01 OPT 15 | F01 OPT 4 | F01 OPT 4, 15 | D02      | D03      |
| D-8900-1-K     | 147980-1          | 147980-3   | 147980-3  | 147980-4      | 157305-2 | 123343-2 |
| D-9808-6-K     | 150270-1          | 150270-2   | 150270-3  | 150270-4      | 157311   | 111895   |
| N-99-0507150-W | 151464-1          | 151464-2   | 151464-3  | 151464-4      | 131422   | N/AET    |

| C01 SELECTION TABLE |             |
|---------------------|-------------|
| OPTION              | PART NUMBER |
| STANDARD            | 136284-1    |
| 10B                 | 136284-2    |
| 10C                 | 136284-3    |

| 70 MHz IF OUTPUT FREQUENCY PLAN TABLE |                |          |                 |          |
|---------------------------------------|----------------|----------|-----------------|----------|
| MODEL                                 | RF INPUT       | IF       | RF LO           | IF LO    |
| D-9901-1-1K                           | 3.4-4.2 GHz    | 1310 MHz | 4.71-5.51 GHz   | 1380 MHz |
| D-9908-6-1K                           | 10.7-12.75 GHz | 2090 MHz | 12.79-14.84 GHz | 2160 MHz |

| MODEL           | RF INPUT       | IF       | RF LO           | IF LO    |
|-----------------|----------------|----------|-----------------|----------|
| D-9901-1-1K     | 3.4-4.2 GHz    | 1240 MHz | 4.64-5.44 GHz   | 1380 MHz |
| D-9908-6-1K     | 10.7-12.75 GHz | 2020 MHz | 12.72-14.77 GHz | 2160 MHz |
| D-99-9502150-1K | 0.95-2.15 GHz  | 780 MHz  | 1.73-2.93 GHz   | 970 MHz  |



|  |    |                            |    |    |  |  |  |  |  |  |  |           |  |          |  |                 |  |  |  |  |
|--|----|----------------------------|----|----|--|--|--|--|--|--|--|-----------|--|----------|--|-----------------|--|--|--|--|
| QTY REQD   |    | HOMECAPTURE OR DESCRIPTION |    |    |  |  |  |  |  |  |  | SYN/NOTES |  | PART NO. |  | CODE IDENT. NO. |  |  |  |  |
| -5   | -4 | -3                         | -2 | -1 |  |  |  |  |  |  |  |           |  |          |  |                 |  |  |  |  |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES<br>TOLERANCES ARE:<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS DECIMALS<br>FRACTIONS 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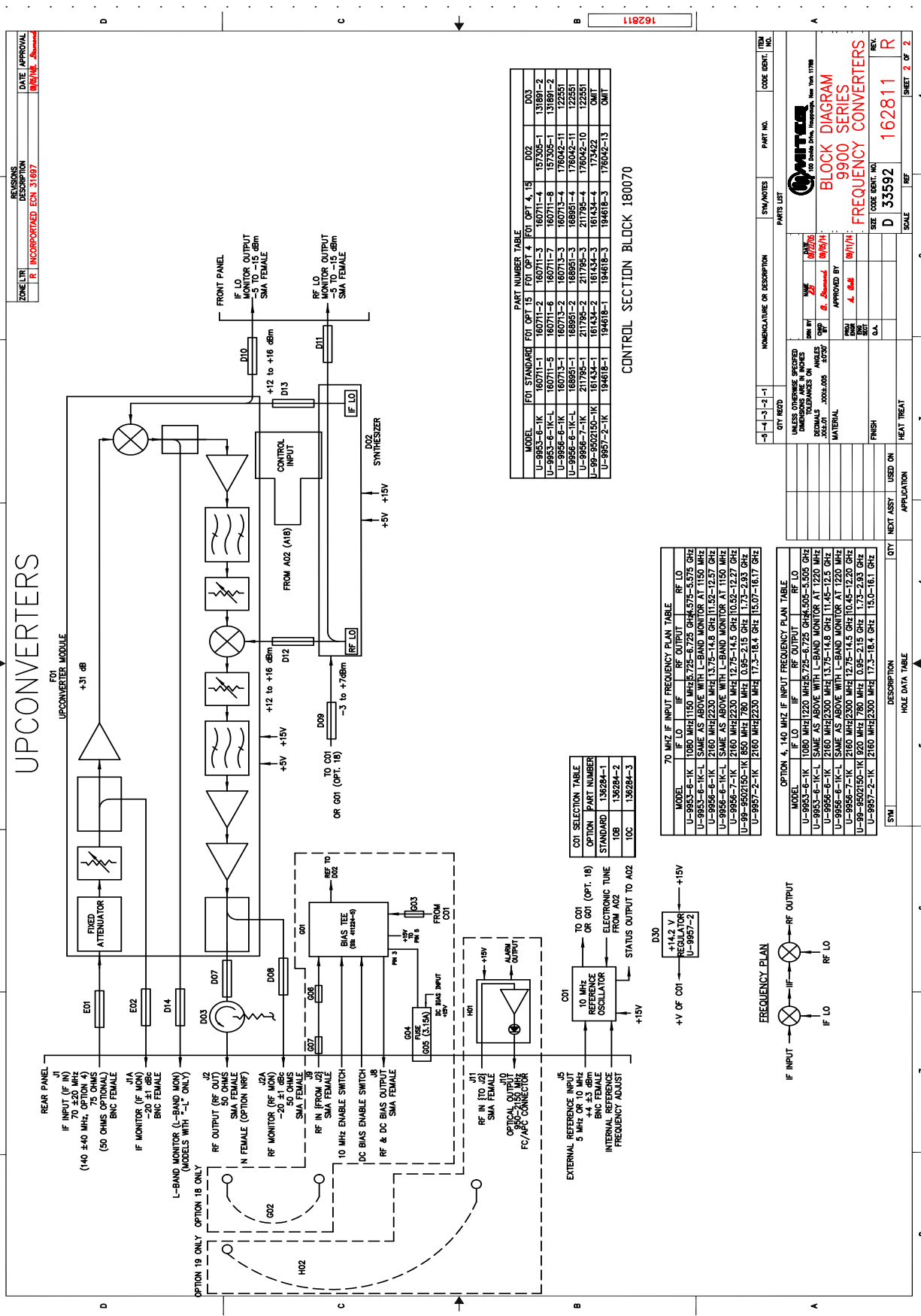
[illegible]

| Y PLAN TABLE |          | QTY |
|--------------|----------|-----|
| RF LO        | IF LO    |     |
| 1-5.51 GHz   | 1380 MHz |     |
| 9-14.84 GHz  | 2160 MHz |     |
| 3-2.93 GHz   | 850 MHz  |     |

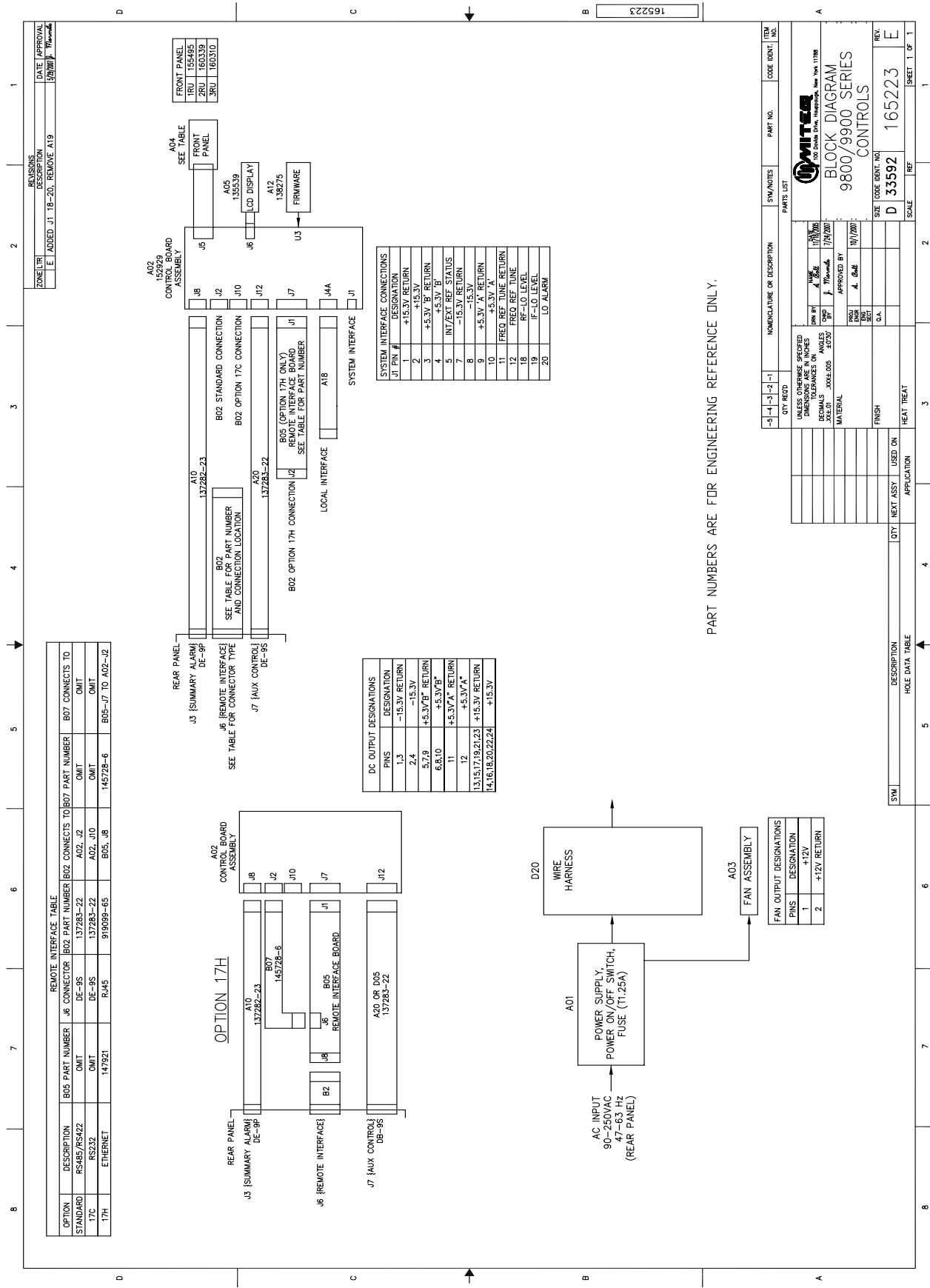
| 140 MHz IF OUTPUT |          | FREQUENCY |          | DESCRIPTION     |
|-------------------|----------|-----------|----------|-----------------|
| RF INPUT          | IF       |           |          |                 |
| 3.4-4.2 GHz       | 1240 MHz | 4.6 GHz   | 4.7 GHz  | HOLE DATA TABLE |
| 3.4-4.2 GHz       | 1310 MHz | 4.7 GHz   | 4.8 GHz  |                 |
| 3.4-4.2 GHz       | 1390 MHz | 4.8 GHz   | 4.9 GHz  |                 |
| 3.4-4.2 GHz       | 1470 MHz | 4.9 GHz   | 5.0 GHz  |                 |
| 0.7-12.75 GHz     | 2090 MHz | 12.7 GHz  | 12.8 GHz |                 |
| 0.7-12.75 GHz     | 2160 MHz | 12.8 GHz  | 12.9 GHz |                 |
| 0.7-12.75 GHz     | 2240 MHz | 12.9 GHz  | 13.0 GHz |                 |
| 0.7-12.75 GHz     | 2320 MHz | 13.0 GHz  | 13.1 GHz |                 |
| 0.95-2.15 GHz     | 780 MHz  | 1.7 GHz   | 1.7 GHz  |                 |
| 0.95-2.15 GHz     | 780 MHz  | 1.7 GHz   | 1.7 GHz  |                 |
| 0.95-2.15 GHz     | 780 MHz  | 1.7 GHz   | 1.7 GHz  |                 |
| 0.95-2.15 GHz     | 780 MHz  | 1.7 GHz   | 1.7 GHz  |                 |

| OPTION 4, 14    |    |
|-----------------|----|
| MODEL           |    |
| D-9901-1-1K     | 11 |
| D-9908-6-1K     | 11 |
| D-99-9502150-1K | 11 |

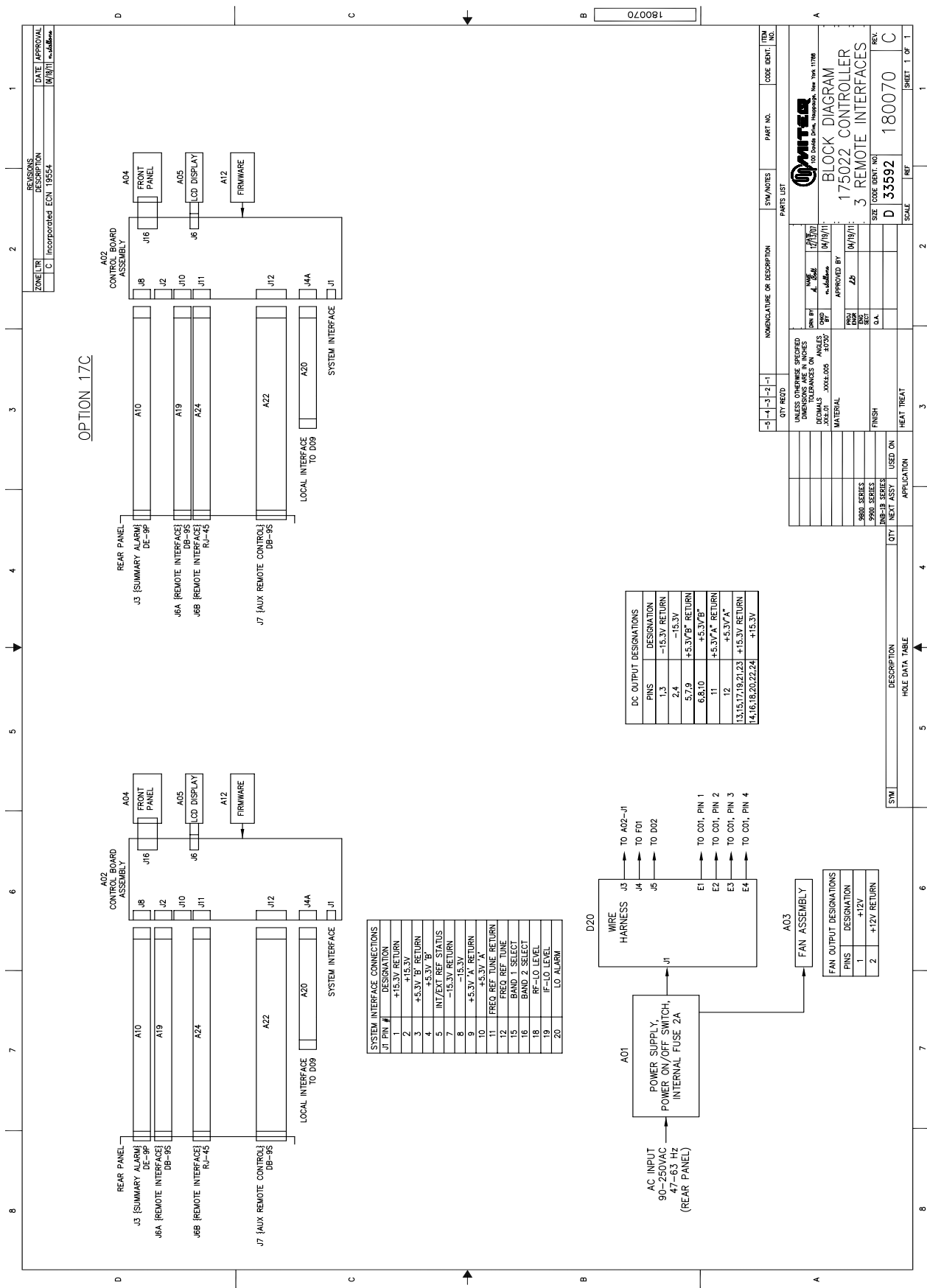
**Figure 4-1. Block Diagram, 9900 Series Converters**  
(Sheet 1 of 2)



**Figure 4-1. Block Diagram, 9900 Series Converters**  
(Sheet 2 of 2)



### Figure 4-2. Block Diagram, 9800/9900 Series Controls



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

## FREQUENCY PLANS

| Downconverter Frequency Plans* |                |                                    |                      |             |                   |
|--------------------------------|----------------|------------------------------------|----------------------|-------------|-------------------|
| MODEL NUMBER                   | RF Input (GHz) | RF LO (GHz)                        | Second IF (MHz)      | IF LO (MHz) | IF Output (MHz)   |
| D-9901-1-1K                    | 3.4-4.2        | 4.71-5.51<br>4.64-5.44 (Opt.4)     | 1310<br>1240 (Opt.4) | 1380        | 70<br>140 (Opt.4) |
| D-9908-6-1K                    | 10.7-12.75     | 12.79-14.84<br>12.72-14.77 (Opt.4) | 2090<br>2020 (Opt.4) | 2160        | 70<br>140 (Opt.4) |

| Upconverter Frequency Plans** |                   |             |                      |                                    |                 |
|-------------------------------|-------------------|-------------|----------------------|------------------------------------|-----------------|
| MODEL NUMBER                  | IF Input (MHz)    | IF LO (MHz) | Second IF (MHz)      | RF LO (GHz)                        | RF Output (GHz) |
| U-9953-6-1K                   | 70<br>140 (Opt.4) | 1080        | 1150<br>1220 (Opt.4) | 4.575-5.575<br>4.505-5.505 (Opt.4) | 5.725-6.725     |
| U-9956-6-1K                   | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 11.52-12.57<br>11.45-12.5 (Opt.4)  | 13.75-14.8      |
| U-9956-7-1K                   | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 10.52-12.27<br>10.45-12.20 (Opt.4) | 12.75-14.5      |
| U-9957-2-1K                   | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 15.07-16.17<br>15.0-16.10 (Opt.4)  | 17.3-18.4       |

| L-Band Upconverter Frequency Plan** |                   |             |                      |                                    |                 |                      |
|-------------------------------------|-------------------|-------------|----------------------|------------------------------------|-----------------|----------------------|
| MODEL NUMBER                        | IF Input (MHz)    | IF LO (MHz) | Second IF (MHz)      | RF LO (GHz)                        | RF Output (GHz) | L-Band Monitor (MHz) |
| U-9953-6-1K-L                       | 70<br>140 (Opt.4) | 1080        | 1150<br>1220 (Opt.4) | 4.575-5.575<br>4.505-5.505 (Opt.4) | 5.725-6.725     | 1150<br>1220 (Opt.4) |
| U-9956-6-1K-L                       | 70<br>140 (Opt.4) | 2160        | 2230<br>2300 (Opt.4) | 11.52-12.57<br>11.45-12.5 (Opt.4)  | 13.75-14.8      | 1150<br>1220 (Opt.4) |



## MAJOR SUBASSEMBLIES FUNCTIONAL DESCRIPTION

### DOWNCONVERTER MODULE

| SPECIFICATIONS   |   |
|--|---|
| *See frequency plans for input, output and LO frequencies. |   |
| Gain   | 44-48 dB minimum                          |
| Input Return Loss  | 20 dB/50 ohms minimum                     |
| Output Return Loss<br>(75 Ohms, 50 Ohms with Option 15)    | 26 dB minimum<br>20 dB minimum (Option 4) |
| Power Output (1 dB Compression)                            | +17 dBm minimum                           |
| Image Rejection  | 80 dB minimum                             |
| Input Signal Monitor                                       | -20 dBc nominal                           |
| Output Signal Monitor                                      | -20 dBc nominal                           |
| DC Voltage   | +5 volts, +15 volts                       |
| Noise Figure   | 11 dB maximum                             |
| LO Input Power Level                                       | +14 dBm nominal                           |

### UPCONVERTER MODULE

| SPECIFICATIONS  |   |
|---|---|
| **See frequency plans for input, output, LO and L-Band frequencies. |   |
| Gain  | 31-34 dB minimum                                      |
| Output Return Loss  | 20 dB/50 ohms minimum                                 |
| Input Return Loss<br>(75 Ohms, 50 Ohms with Option 15)              | 26 dB minimum<br>20 dB minimum (Option 4)             |
| Power Output (1 dB Compression)                                     | +16 dBm minimum (C-Band)<br>+10 dBm minimum (Ku-Band) |
| Image Rejection   | 80 dB minimum   |
| Input Signal Monitor  | -20 dBc nominal                                       |
| Output Signal Monitor   | -20 dBc nominal                                       |
| DC Voltage  | +5 volts, +15 volts                                   |
| Noise Figure  | 14 dB maximum   |
| LO Input Power Level  | +14 dBm nominal                                       |

## CRYSTAL OSCILLATOR

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

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

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

| SPECIFICATIONS  |  |
|---|--|
| Input characteristics<br>Frequency<br>Impedance<br>Level                  | 5 MHz or 10 MHz<br>50 ohms<br>+4 $\pm 3$ dBm   |
| Output characteristics<br>Frequency<br>Impedance<br>Level                 | 10 MHz<br>50 ohms<br>+4 $\pm 3$ dBm  |
| Status indicator<br>Internal oscillator "ON"<br>Internal oscillator "OFF" | TTL Low (0V)<br>TTL High (5V)  |
| Mechanical Tuning<br>136284 -<br>163284-2 & -3                            | $\pm 2 \times 10^{-6}$ min. 20 turn control<br>$\pm 1 \times 10^{-6}$ min. 20 turn control |
| Electrical Tuning   | $\pm 1 \times 10^{-7}$ $\pm 5$ V 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    | $\pm 5 \times 10^{-9}$               | $1 \times 10^{-9}$                 | -130           | -155            | -166           |

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

## LOCAL OSCILLATOR

| Model Number | IF LO Frequency (MHz) | RF LO Frequency (GHz)              |
|--------------|-----------------------|------------------------------------|
| U-9953-6-1K  | 1080                  | 4.575-5.575<br>4.505-5.505 (Opt.4) |
| U-9956-6-1K  | 2160                  | 11.52-12.57<br>11.45-12.5 (Opt.4)  |
| U-9956-7-1K  | 2160                  | 10.52-12.27<br>10.45-12.20 (Opt.4) |
| U-9957-2-1K  | 2160                  | 15.07-16.17<br>15.00-16.10 (Opt.4) |
| D-9901-1-1K  | 1380                  | 4.71-5.51<br>4.64-5.44 (Opt.4)     |
| D-9908-6-1K  | 2160                  | 12.79-14.84<br>12.72-14.77 (Opt.4) |

| Model Number  | IF LO Frequency (MHz) | RF LO Frequency (GHz)              | L-Band Frequency (MHz) |
|---------------|-----------------------|------------------------------------|------------------------|
| U-9953-6-1K-L | 1080                  | 4.575-5.575<br>4.505-5.505 (Opt.4) | 1150<br>1220 (Opt.4)   |
| U-9956-6-1K-L | 2160                  | 11.52-12.57<br>11.45-12.5 (Opt.4)  | 1150<br>1220 (Opt.4)   |

| SPECIFICATIONS            |              |
|---------------------------|--------------|
| Output power              | +14 dBm      |
| Input reference frequency | 10 MHz       |
| Input reference power     | -3 to +7 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<br>+15.3V<br>+5.3V<br>-15.3V   | +15.3 $\pm$ 0.25V<br>+5.3 $\pm$ 0.2V<br>-15.3V $\pm$ 0.25V                |
| DC Output Pins<br>Pins 1, 3<br>Pins 2, 4<br>Pins 5, 7, 9, 11<br>Pins 6, 8, 10, 12<br>Pins 13, 15, 17, 19, 21, 23<br>Pins 14, 16, 18, 20, 22, 24 | -15.3V Return<br>-15.3V<br>5.3V Return<br>5.3V<br>+15.3V Return<br>+15.3V |
| Fan Output Pins<br>Pin 1<br>Pin 2   | +12V<br>+12V Return   |
| Power factor (For Reference Only)   | > 0.95 typical  |
| Power supply efficiency (For Reference Only)  | 70-75% nominal  |

## CONTROL BOARD/FIRMWARE KIT

| SPECIFICATIONS |                                  |
|----------------|----------------------------------|
| Part Number    | 152929<br>175022 (Three Remotes) |

## 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 61), 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.61) 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             | <p>This is the second IF frequency of the unit.</p> <p><b>Note: the second IF frequency is either positive or negative based on the equation -</b></p> <p><i>Internal IF frequency (MHz) = Internal local oscillator frequency – RF frequency.</i></p> <p><b>For example:</b> The 70 MHz IF frequency version of Model number D-9741-1 would be “+1310.000000” (4710 - 3400 = 1310).<br/> The 70 MHz IF frequency version of Model number U-9793-6 would be “-1150.000000” (4575 - 5725 = -1150).</p> |
| Frequency Display Format | <p>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.</p> <p><b>For example:</b> 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.</p>  |
| 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 is field is for future use   |
| Mute Option              | Enable for upconverters, disable for downconverters   |
| IF Option                | Changes the displayed IF frequency of the unit, not the operation   |

To access these settings perform the following steps:

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



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

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

To change the remote bus option:

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

## INSTALLING A NEW CONTROL BOARD/FIRMWARE KIT

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



**DURING NORMAL OPERATION THESE SETTINGS SHOULD NEVER BE ACCESSED.**

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

To access these settings and configure the unit:

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



***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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