

Ref.: XXXXX

OPERATION & MAINTENANCE MANUAL  
FOR  
U-9356 UPCONVERTER

MARCH 2004

CUSTOMER

MAXXXXXU  
114351H  
Rev.B

NOTE

The suffix XXXXX following part numbers in this manual is a unique number assigned at time of order.

This number should be referred to in all correspondence and all referrals to spare parts.

**The reference number is XXXXX**

The AC voltage has been set to 120 VAC.

The U-9356 Upconverter has been supplied with the following option(s):

A. Option 17A: RS422 Remote Bus

## TABLE OF CONTENTS

### SECTION 1

#### INTRODUCTION

| <u>Para.</u> |                                           | <u>Page</u> |
|--------------|-------------------------------------------|-------------|
| 1.1          | GENERAL DESCRIPTION .....                 | 1-1         |
| 1.1.1        | PHYSICAL .....                            | 1-1         |
| 1.1.2        | FUNCTIONAL .....                          | 1-5         |
| 1.2          | EQUIPMENT CHARACTERISTICS .....           | 1-6         |
| 1.2.1        | PHYSICAL .....                            | 1-6         |
| 1.2.2        | FUNCTIONAL .....                          | 1-6         |
| 1.3          | EQUIPMENT REQUIRED .....                  | 1-9         |
| 1.3.1        | EQUIPMENT SUPPLIED .....                  | 1-9         |
| 1.3.2        | EQUIPMENT REQUIRED BUT NOT SUPPLIED ..... | 1-9         |

### SECTION 2

#### INSTALLATION

|     |                                      |     |
|-----|--------------------------------------|-----|
| 2.1 | UNPACKING, STORAGE, RESHIPMENT ..... | 2-1 |
| 2.2 | MOUNTING .....                       | 2-1 |
| 2.3 | TURN-ON PROCEDURE .....              | 2-1 |

### SECTION 3

#### OPERATION

|         |                           |     |
|---------|---------------------------|-----|
| 3.1     | INTRODUCTION .....        | 3-1 |
| 3.2     | CONTROLS .....            | 3-1 |
| 3.2.1   | EXTERNAL CONTROLS .....   | 3-1 |
| 3.2.2   | INTERNAL CONTROLS .....   | 3-2 |
| 3.3     | OPERATING PROCEDURE ..... | 3-4 |
| 3.3.1   | LOCAL OPERATION .....     | 3-4 |
| 3.3.1.1 | Set Frequency .....       | 3-4 |
| 3.3.1.2 | Channel Memory .....      | 3-4 |

## TABLE OF CONTENTS (Cont.)

### SECTION 3

#### OPERATION

| <u>Para.</u>                                    | <u>Page</u> |
|-------------------------------------------------|-------------|
| 3.3.2 REMOTE OPERATION.....                     | 3-6         |
| 3.3.2.1 RS422/RS485 Protocol.....               | 3-6         |
| 3.3.2.2 Data Transfer.....                      | 3-7         |
| 3.3.2.2.1 Header Byte.....                      | 3-7         |
| 3.3.2.2.2 Device Address Byte.....              | 3-7         |
| 3.3.2.2.3 Command/Error Codes.....              | 3-7         |
| 3.3.2.2.4 Parameter Bytes.....                  | 3-8         |
| 3.3.2.2.5 Trailer Byte.....                     | 3-8         |
| 3.3.2.2.6 Checksum Byte.....                    | 3-8         |
| 3.3.2.3 Command Codes.....                      | 3-8         |
| 3.3.2.3.1 Frequency Code = F.....               | 3-8         |
| 3.3.2.3.2 Mute Code = M.....                    | 3-9         |
| 3.3.2.3.3 Status All Code = A.....              | 3-9         |
| 3.3.2.3.4 Status Faults Code = ? (Optional)...  | 3-10        |
| 3.3.2.4 Device Address/Baud Rate Selection..... | 3-11        |
| 3.3.2.5 Programming Examples.....               | 3-11        |
| 3.3.2.6 Remote Interface Connector.....         | 3-12        |
| 3.3.2.7 RS422/485 Bus Termination.....          | 3-13        |
| 3.3.2.8 Contact Closure Control.....            | 3-13        |
| 3.3.2.9 IEEE-488 Control.....                   | 3-13        |
| 3.3.2.9.1 Device Address/Service Request Enable | 3-13        |
| 3.3.2.9.2 Data Input Messages.....              | 3-14        |
| 3.3.2.9.2.1 Frequency Set.....                  | 3-14        |
| 3.3.2.9.2.2 Mute.....                           | 3-14        |
| 3.3.2.9.2.3 Set/Store Frequency in Channel nn   | 3-14        |
| 3.3.2.9.2.4 Recall Frequency from Channel nn    | 3-14        |
| 3.3.2.9.2.5 Data Format.....                    | 3-14        |
| 3.3.2.9.2.6 Frequency Format.....               | 3-15        |
| 3.3.2.9.2.7 Status Faults Format.....           | 3-15        |
| 3.3.2.9.2.8 Status All Format.....              | 3-15        |
| 3.3.2.9.2.9 Channel Format.....                 | 3-16        |
| 3.3.2.9.2.10 Service Request.....               | 3-16        |
| 3.3.3 EMERGENCY OPERATION.....                  | 3-16        |
| 3.3.4 SHUTDOWN PROCEDURE.....                   | 3-16        |

## TABLE OF CONTENTS (Cont.)

### SECTION 4

#### PRINCIPLES OF OPERATION

| <u>Para.</u>                                                   | <u>Page</u> |
|----------------------------------------------------------------|-------------|
| 4.1 INTRODUCTION.....                                          | 4-1         |
| 4.2 FUNCTIONAL DESCRIPTION.....                                | 4-1         |
| 4.3 SUBSYSTEMS AND COMPONENTS FUNCTIONAL DESCRIPTION...        | 4-5         |
| 4.3.1 SIGNAL PATH.....                                         | 4-5         |
| 4.3.1.1 Upconverter Module (A2A1).....                         | 4-5         |
| 4.3.1.2 Filter, Isolator (A2A2, A2A3).....                     | 4-6         |
| 4.3.1.3 Mixer, Second Conversion (A2A4).....                   | 4-6         |
| 4.3.1.4 Output Isolators, Filter<br>(A2A5, A2A6, A2A7).....    | 4-7         |
| 4.3.1.4.1 Option 11, 11A - Output Amplifier...                 | 4-8         |
| 4.3.2 LOCAL OSCILLATOR.....                                    | 4-9         |
| 4.3.2.1 5 MHz Reference (A3A1).....                            | 4-9         |
| 4.3.2.2 1080 MHz Phase Locked Source (A3A2).....               | 4-9         |
| 4.3.2.3 Second Local Oscillator.....                           | 4-12        |
| 4.3.2.3.1 Frequency Synthesizer (A3A4).....                    | 4-12        |
| 4.3.2.3.2 Second Local Oscillator Chain<br>(A3A5 to A3A7)..... | 4-13        |
| 4.3.3 CONVERTER CONTROLLER.....                                | 4-14        |
| 4.3.4 POWER SUPPLY, LOW PASS FILTER.....                       | 4-15        |

## TABLE OF CONTENTS (Cont.)

### SECTION 5

#### MAINTENANCE

| <u>Para.</u>                                                          | <u>Page</u> |
|-----------------------------------------------------------------------|-------------|
| 5.1 INTRODUCTION .....                                                | 5-1         |
| 5.2 PREVENTIVE MAINTENANCE .....                                      | 5-1         |
| 5.2.1 DC VOLTAGE .....                                                | 5-1         |
| 5.2.2 GAIN OF THE CONVERTER .....                                     | 5-1         |
| 5.2.3 FREQUENCY MEASUREMENT .....                                     | 5-3         |
| 5.2.4 LOCAL OSCILLATOR PHASE LOCK TEST POINT<br>(Phase Voltage) ..... | 5-3         |
| 5.3 CORRECTIVE MAINTENANCE .....                                      | 5-4         |
| 5.3.1 POWER SUPPLY MALFUNCTION .....                                  | 5-4         |
| 5.3.2 LOCAL OSCILLATOR .....                                          | 5-4         |
| 5.3.3 CONVERTER, SIGNAL CHAIN .....                                   | 5-4         |

### SECTION 6

#### DIAGRAMS

|                        |     |
|------------------------|-----|
| 6.1 INTRODUCTION ..... | 6-1 |
|------------------------|-----|

## TABLE OF CONTENTS (Cont.)

### TABLES

| <u>Number</u> |                                               | <u>Page</u> |
|---------------|-----------------------------------------------|-------------|
| 1-1           | Equipment Supplied.....                       | 1-9         |
| 1-2           | Test Equipment Required But Not Supplied..... | 1-9         |
| 2-1           | External Connections.....                     | 2-2         |
| 5-1           | Parts List - U-9356 Upconverter.....          | 5-5         |
| 6-1           | List of Diagrams.....                         | 6-1         |

### FIGURES

|     |                                                                             |      |
|-----|-----------------------------------------------------------------------------|------|
| 1-1 | Front View, U-9356 Upconverter.....                                         | 1-2  |
| 1-2 | Rear View, U-9356 Upconverter.....                                          | 1-3  |
| 1-3 | Interior View, U-9356 Upconverter.....                                      | 1-4  |
| 3-1 | Front Panel Layout, 9300 Series Converter.....                              | 3-3  |
| 3-2 | RS422/RS485 Bus Termination Jumpers,<br>9300 Series Converter.....          | 3-17 |
| 4-1 | Block Diagram, U-9356 Upconverter.....                                      | 4-2  |
| 4-2 | Block Diagram, 1080 MHz Phase Lock Source (A3A2)...                         | 4-11 |
| 5-1 | Test Setup for Gain, Gain Ripple and Frequency<br>Response Measurement..... | 5-2  |

### DIAGRAMS

|     |                                                     |      |
|-----|-----------------------------------------------------|------|
| 6-1 | Wiring Diagram.....                                 | 6-2  |
| 6-2 | Schematic Diagram, Converter Controller 9300 Series | 6-12 |
| 6-3 | Assembly Diagram, Converter Controller 9300 Series. | 6-13 |

### APPENDIX

|   |                                     |      |
|---|-------------------------------------|------|
| A | Power Supply Manual (FS05-113)..... | 6-14 |
|---|-------------------------------------|------|

## SECTION 1

### INTRODUCTION

#### 1.1 GENERAL DESCRIPTION

##### 1.1.1 PHYSICAL

The physical configuration of the U-9356 Upconverter is shown in Figures 1-1 through 1-3. The main chassis houses all RF components, control circuitry and power supplies.

The converter chassis is 19" x 22" x 3.5" panel height. Slides are provided for mounting in a standard 19" (EIA) equipment rack.

The following items are found on the front of the converter:

- A. On/Off Power Switch (A1A2)
- B. LO Out-of-Lock LEDs
- C. Memory, Store Key
- D. Memory, Recall Key
- E. Display
- F. Gain Adjustment Potentiometer
- G. Data Entry Keypad
- H. Remote Mode Select Key

The following items are found on the rear of the converter:

- A. IF Input Connector (J1)
- B. RF Output Connector (J2)
- C. Summary Alarm Connector (J3)
- D. Remote Interface Connector (J6)
- E. Redundancy Switch Connector (J7)
- F. Address Select Switch
- G. AC Voltage Input
- H. Fuse, 2.0A for 120VAC, 1.0A for 220VAC
- I. Fan (A1A5)
- J. Ground Lug
- K. LO Frequency/Power Monitors
- L. LO Phase Lock Voltage Test Points
- M. DC Voltage Test Points
- N. IF/RF Signal Monitors (Option 2)

### **1.1.2 FUNCTIONAL**

The MITEQ 9300 Series Converter combines a state of the art communications converter with microprocessor-controlled digital circuitry to provide flexibility and convenience for the station operator.

The converter translates the 70  $\pm$ 20 MHz frequency band to the 14.0-14.5 GHz output frequency band. Phase noise, amplitude flatness, group delay, and spurious outputs have been given optimum consideration to provide the user with a transparent frequency conversion for all video and data applications.

RF frequency may be selected from the front panel in 125 kHz increments. Non-volatile memory allows the operator to store up to thirty channel frequencies.

Remote operation is available via the RS485 (serial) interface. The status of the converter's functions and alarms may also be read through the remote interface (optional). Device address is selectable at the rear panel.

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

AC voltage input is selectable at the rear panel (100, 120, 220, 230/240VAC).

## 1.2 EQUIPMENT CHARACTERISTICS

### 1.2.1 PHYSICAL

- A. Weight: 30 pounds nominal
- B. Overall Dimensions: 19" x 22" x 3.5" panel height
- C. Signal Input Connector (J1): BNC female
- D. Signal Output Connector (J2): SMA female
- E. Summary Alarm Connector (J3): DEM-9P
- F. Remote Interface Connector (J6) -
  - 1. RS485/RS422: DEM-9S
  - 2. RS232: DB-25P
  - 3. Contact Closure: DB-25S
  - 4. GPIB: IEEE-488 receptacle
- G. Redundancy Switch Connector (J7): DEM-9P
- H. IF/RF Signal Monitor Connector(s)  
(Option 2): SMA female

### 1.2.2 FUNCTIONAL

- A. Gain, Frequency Response -
  - 1. Input Frequency: 70  $\pm$ 20 MHz
  - 2. Output Frequency: 14.0-14.5 GHz
  - 3. Gain: 11 dB nominal  
20 dB nominal (Option 11)  
26 dB nominal (Option 11A)
  - 4. Amplitude Response:  $\pm$ 20 MHz at 0.5 dB  
 $\pm$ 18 MHz at 0.4 dB
  - 5. Gain Adjustment: 6 dB nominal (no options)  
30 dB minimum (Option 3C)

- B. Group Delay (ñ18 MHz) -
  - 1. Standard -
    - a. Linear: 0.03 ns/MHz
    - b. Parabolic: 0.01 ns/MHz
    - c. Ripple: 1 ns peak-to-peak
  - 2. Option 5A: 1 ns peak-to-peak total group delay
- C. VSWR -
  - 1. Input: 26 dB return loss/75 ohms  
(50 ohms optional)
  - 2. Output: 20 dB return loss/50 ohms
- D. Third Order Intermodulation: For two inband signals at an output level of -20 dBm, intermodulation products 50 dBc minimum  
Option 11 output level -10 dBm  
Option 11A output level -5 dBm
- E. Spurious -
  - 1. Dependent: -65 dBc
  - 2. Independent: -80 dBm inband (no options)  
-70 dBm inband (Option 11)  
-65 dBm inband (Option 11A)
- F. Frequency Selection: 14.0-14.5 GHz  
in 125 kHz increments
  - 1. Channel Memories: 30 (non-volatile)
- G. Primary Power: Selectable at the rear panel  
(100, 120, 220, 230/240VAC)

H. Rear Panel Test Points -

1. RF LO Phase Voltage: Variable with frequency
2. IF LO Phase Voltage: 10  $\pm$ 2V
3. RF LO Frequency/Power Test Point: -15 dBm minimum,  
12850-13350 MHz
4. IF LO Frequency/Power Test Point: -15 dBm minimum,  
1080 MHz
5. DC Voltage Test Points: +20  $\pm$ 0.5V  
+5.2  $\pm$ 0.1V  
+5.2  $\pm$ 0.1V

I. Summary Alarm Connector (J3) Pin Designations -

1. DC Power Status -
  - a. Normal: 1-2 open, 2-3 closed
  - b. Fault: 1-2 closed, 2-3 open
2. Summary Alarm -
  - a. Normal: 4-5 open, 5-6 closed  
DC Power Normal and  
Local Oscillators In-Lock and  
LO Level Normal (Option 8 Only)
  - b. Alarm: 4-5 closed, 5-6 open  
DC Power Fault or  
Local Oscillator(s) Out-of-Lock or  
LO Level Low (Option 8 Only)

J. Redundancy Switch Connector (J7) Pin Designations -

1. Normal: 1-2 open, 2-3 closed  
DC Power Normal and  
Local Oscillators In-Lock and  
LO Level Normal (Option 8 Only)
2. Alarm: 1-2 closed, 2-3 open  
DC Power Fault or  
Local Oscillator(s) Out-of-Lock or  
LO Level Low (Option 8 Only)

### 1.3 EQUIPMENT REQUIRED

#### 1.3.1 EQUIPMENT SUPPLIED

Table 1-1 lists the equipment supplied with each system.

TABLE 1-1  
EQUIPMENT SUPPLIED

| ITEM | DESCRIPTION                | QUANTITY |
|------|----------------------------|----------|
| 1    | Model U-9356 Upconverter   | 1        |
| 2    | Slides                     | 1 Pair   |
| 3    | AC Voltage Line Cord       | 1        |
| 4    | DEM-9S Connector           | 2        |
| 5    | Remote Interface Connector | 1        |

#### 1.3.2 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Table 1-2 lists the equipment required for periodic maintenance and calibration of the converter.

TABLE 1-2  
TEST EQUIPMENT REQUIRED BUT NOT SUPPLIED

| ITEM | DESCRIPTION                                              | QUANTITY |
|------|----------------------------------------------------------|----------|
| 1    | Wiltron 6648A Sweep Generator<br>(10 MHz - 20 GHz)       | 2        |
| 2    | Wiltron 560A Scalar Network Analyzer                     | 1        |
| 3    | Hewlett Packard 8495B/8494B Step<br>Attenuator (0-81 dB) | 1        |
| 4    | Wiltron 60N50 VSWR Bridge (10-2000 MHz)                  | 1        |
| 5    | Wiltron 64A50 VSWR Bridge (2-8 GHz)                      | 1        |
| 6    | Wiltron 69A50 VSWR Bridge (8-18 GHz)                     | 1        |
| 7    | W and G RM4 Radio Link Measuring Set                     | 1        |
| 8    | Hewlett Packard 8566B Spectrum Analyzer                  | 1        |
| 9    | Hewlett Packard 8970 Noise Figure Meter                  | 1        |
| 10   | EIP 545A Microwave Frequency Counter                     | 1        |
| 11   | Hewlett Packard 436A Power Meter                         | 1        |
| 12   | Hewlett Packard 8405A Vector Voltmeter                   | 1        |
| 13   | Phillips PM3215 Oscilloscope                             | 1        |
| 14   | Compaq Portable Computer                                 | 1        |
| 15   | SEL 488-2000, RS-232 to IEEE 488 Adapter                 | 1        |
| 16   | Fluke 6160B Reference Synthesizer                        | 1        |
| 17   | Beckman 3050 Digital Multi Meter                         | 1        |

## SECTION 2

### INSTALLATION

#### **2.1 UNPACKING, STORAGE, RESHIPMENT**

Carefully open the shipping container and remove the equipment. Weight of the converter is approximately 30 pounds. 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 converter. The carton should be marked to indicate that it contains fragile electronic equipment.

#### **2.2 MOUNTING**

The converter chassis is 19" x 22" x 3.5" panel height. Slides are provided for mounting in a standard 19" (EIA) equipment rack. The converter should be securely mounted.

#### **2.3 TURN ON PROCEDURE**

After mounting, make all external connections per Table 2-1. Refer to Section 1 for the physical configuration of the converter.

Apply power to the converter using the front panel power On/Off switch.

Allow one half hour minimum for oven warm-up in the internal crystal oscillator.

All LO fault lights should be off.

System is now operational.

TABLE 2-1

## EXTERNAL CONNECTIONS

| DESIGNATION          | DESCRIPTION                                         |
|----------------------|-----------------------------------------------------|
| Power Cord           | Attach power cord to AC socket of converter.        |
| IF Input             | Connect IF input to J1 of converter.                |
| RF Output            | Connect RF output to J2 of converter.               |
| Summary Alarm        | Connect the summary alarm to J3 of converter.       |
| Redundancy<br>Switch | Connect redundancy switching to J7 of<br>converter. |
| Remote Control       | Connect the remote interface to J6 of<br>converter. |
| Ground Lug           | Be sure that the converter is well grounded.        |

## SECTION 3

### OPERATION

#### 3.1 INTRODUCTION

The following paragraphs describe the controls, adjustments and procedures for turn-on, operation, emergency operation and shut-down of the converter.

#### 3.2 CONTROLS

##### 3.2.1 EXTERNAL CONTROLS (Figures 1-1, 1-2 and 3-1)

- A. On/Off switch (A1A2) applies AC power to the converter
- B. Fuse (A1A1) 2.0A for 100 and 120 VAC,  
1.0A for 220 and 230/240 VAC
- C. AC Power Selection (A1A1)

Voltage input is selected using a card located below the fuse on the AC input connector. The selected voltage input is indicated on the installed card. To change the voltage input, pull the card out and replace it with the desired voltage facing out. The card can be used to set the AC input voltage to 100, 120, 220, or 230/240 VAC.

- D. Gain Control

The front panel potentiometer provides 6 dB minimum of gain control. If Option 3C is ordered the front panel potentiometer will provide a minimum of 30 dB gain control.

- E. Data Entry Section

The keyboard is used for all numeric entry into the converter. A tone will sound for data entry error. There are two keys on the keyboard in addition to the standard numeric keypad and decimal point:

1. "CL" - This key is used to clear the LCD display.
2. "ENT" - This key is used to terminate commands.

#### F. Remote Mode Select Switch

When remote control is installed, the front panel "REMOTE" switch selects either Local (front panel) or Remote mode of operation.

#### G. Channel Memory

The converter has thirty memories for frequency settings numbered 00 to 29.

### **3.2.2 INTERNAL CONTROLS (Figure 1-3)**

#### A. Power Supply Voltage Adjustment

Adjustment of the DC power supplies within the specified tolerances may be made using an insulated tuning tool (refer to Section 4.3.4 and Appendix) after removal of the power supply cover.

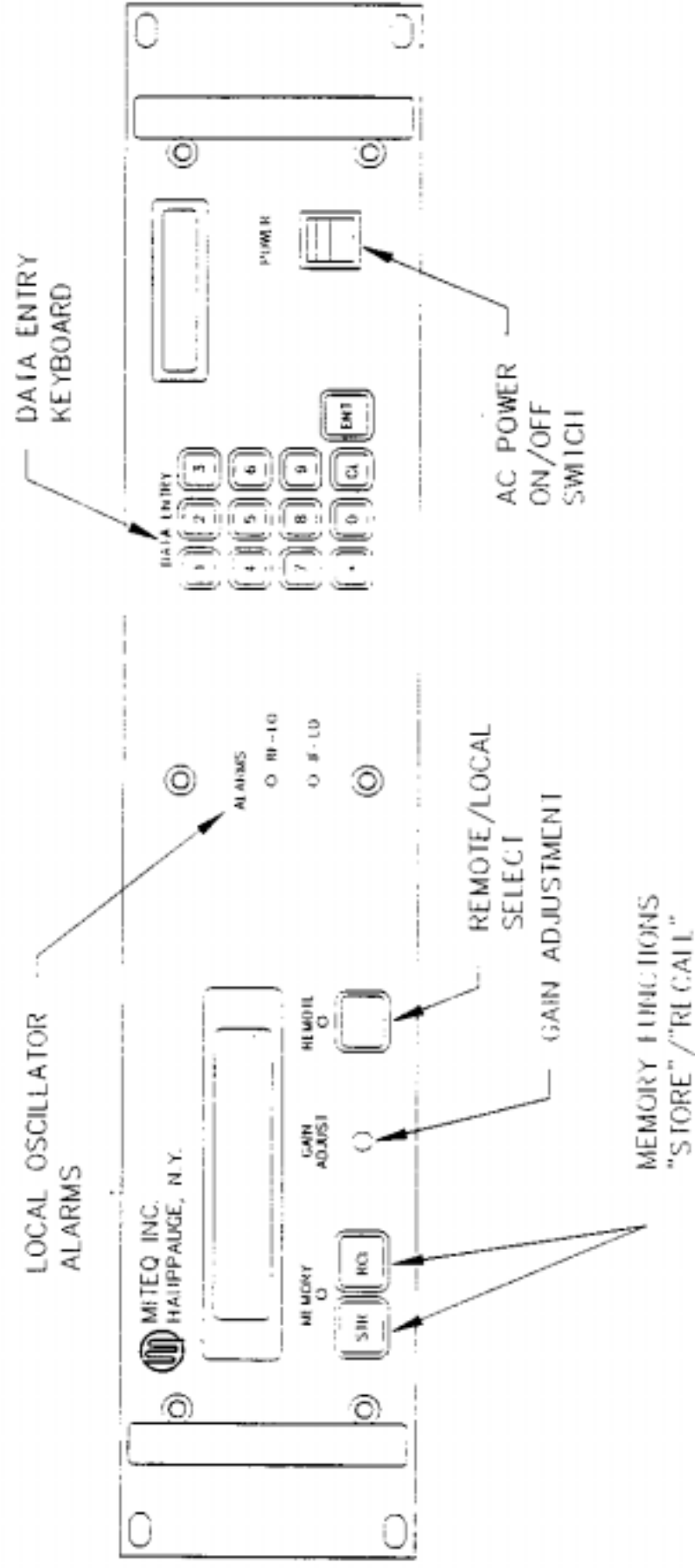


FIG. 1  
FRONT PANEL LAYOUT  
9300 SERIES

### **3.3 OPERATING PROCEDURE**

#### **3.3.1 LOCAL OPERATION (See Figure 3-1)**

When remote control is installed, the front panel "REMOTE" switch selects either Local (front panel) or Remote mode of operation.

Depressing the "REMOTE" panel switch will place the converter in the remote operation mode. An LED on the panel will light to indicate remote mode. Commands are accepted through the rear panel remote interface connector (J6). All front panel function and data entry keys (except "REMOTE") are disabled and if pressed, will cause the error tone to sound.

To return to local operation, depress the "REMOTE" key again. The LED on the panel will not be lit to indicate local mode. All command inputs are from the front panel. The unit will not accept instructions through the remote interface connector (J6) but will report frequency, mode and status.

##### **3.3.1.1 Set Frequency**

To set the frequency of the converter:

- A. Enter the desired frequency (in MHz) using the numbered keys and the decimal point.
- B. Press "ENT".

The key sequence is completed by pressing "ENT". An incomplete sequence will remain on the display for five seconds before it returns to the original frequency display.

##### **3.3.1.2 Channel Memory**

The converter has thirty memories for frequency settings numbered 00 to 29.

To store a frequency in memory:

- A. Enter the desired frequency (in MHz) using the numbered keys and the decimal point.
- B. Press "STR" and enter the memory number using the numbered keys (two digits). The "MEMORY" LED will be on during the key sequence.

#### 3.3.1.2 Channel Memory Cont'd.

To recall a frequency from memory:

- A. Press "RCL".
- B. Enter the memory number using the numbered keys (two digits). The "MEMORY" LED will be on during the key sequence.

The "STR" and "RCL" sequence are used to change and examine the frequency values stored in the 30 channel memory locations. Neither key sequence changes the output frequency of the converter and after five seconds the display will return to its original indication.

To change the converter frequency to the value stored or recalled from memory, it is necessary to press "ENT" before the five second time-out.

### **3.3.2 REMOTE OPERATION**

When remote control is installed, the front panel "REMOTE" switch selects either Local (front panel) or Remote mode of operation (see Section 3.3.1).

#### **3.3.2.1 RS422/485 Protocol**

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.

Data transmission format is a 10 bit sequence consisting of 1 start, 7 data, 1 parity and 1 stop bit. Odd or Even parity is set from the rear panel "ADDRESS" DIP switch. All characters, including the checksum character, are checked for parity. If any character in the message has a parity, framing or overrun error, the entire message is ignored and no response is made by the converter.

All messages addressed to the converter are normally acknowledged with a response message. Before sending the response message a converter configured for RS422A will check for no activity on the communication bus for a period of at least one character time. If the bus is active, the response message will be cancelled. This allows a controller to rapidly update a number of devices on the communication bus without having to wait for a response. When using this method (available only for RS422A) the following restrictions apply:

- Minimum frequency update period is 100 msecs.
- Multiple commands may not be sent without waiting for a response from each command.

The converter continually monitors the communications bus and will accept all commands addressed to it even when in Local mode. When in Local mode, receipt of any commands other than Status All or Status Faults will be ignored and the converter will respond with an error code.

### 3.3.2.2 Data Transfer

The general message format is as follows:

HEADER - DEVICE ADDRESS - COMMAND/ERROR CODE -  
PARAMETERS (if required) - TRAILER - CHECKSUM

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 converter or monitor traffic on the communication bus.

#### 3.3.2.2.1 Header Byte

The Header byte is 7BH, ASCII character "{".

#### 3.3.2.2.2 Device Address Byte

The Device Address may take on the values from 40H to 5FH (32 possible addresses).

#### 3.3.2.2.3 Command/Error Codes

##### COMMAND CODES

| <u>Code</u> | <u>ASCII Character</u> | <u>Function</u> |
|-------------|------------------------|-----------------|
| 46H         | F                      | Frequency Set   |
| 4DH         | M                      | Mute            |
| 41H         | A                      | Status All      |
| 3FH         | ?                      | Status Faults   |

##### ERROR CODES

| <u>Code</u> | <u>ASCII Character</u> | <u>Function</u>                                |
|-------------|------------------------|------------------------------------------------|
| 61H         | a                      | Command not recognized                         |
| 62H         | b                      | Illegal parameter or<br>parameter out of range |
| 63H         | c                      | Unit in Local mode                             |
| 64H         | d                      | Busy                                           |

#### **3.3.2.2.4 Parameter Bytes**

Parameters are numeric characters which are sent MSD first, LSD last. Non-numeric parameters such as ",", ".", or values beyond the range of the converter will be rejected and cause the converter to respond with error code "b".

#### **3.3.2.2.5 Trailer Byte**

The Trailer byte is 7DH, ASCII character "}".

#### **3.3.2.2.6 Checksum Byte**

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.

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

#### **3.3.2.3 Command Codes**

The following paragraphs describe each of the command codes.

##### **3.3.2.3.1 Frequency Code = F**

The Frequency command requires a 7 or 8 digit parameter which sets the frequency of the converter in kHz. Assuming no error conditions, the converter is immediately set to the frequency.

Remote Command Sequence (8 Digit): F14000500  
(7 Digit): F3705000

Converter Response: F

### 3.3.2.3.2 Mute Code = M

The Mute command requires no parameters. The output of the converter is muted until a Frequency command is received.

Remote Command Sequence: M

Converter Response: M

### 3.3.2.3.3 Status All Code = A

The Status All command requires no parameters. The converter responds in both Local and Remote mode with the converter frequency, remote/local status, mute status and component fault status.

Remote Command: A

Converter Response: AFffffffffL1Mm?abcdef

A: Status All indicator

F: Frequency indicator

ffffffff(f): 7 or 8 digit ASCII numeric character indicating frequency. MSD transmitted first, LSD last.

L: Local/Remote indicator

l: "0" or "1" ASCII numeric character  
0 = Local  
1 = Remote

M: Mute indicator

m: "0" or "1" ASCII numeric character  
0 = Mute off  
1 = Mute on

?: Component Fault Status indicator

a-f: "0" or "1" ASCII numeric character  
0 = No fault  
1 = Fault

a through f indicate the status of the six component fault lines.

#### **3.3.2.3.4 Status Faults Code = ? (Optional)**

The Status Faults command requires no parameters. The converter responds in both Local and Remote mode with the component fault status.

Remote Command: ?

Converter Response: ?abcdef

?: Component Fault Status indicator

a-f: "0" or "1" ASCII numeric character

0 = No fault

1 = Fault

a through f indicate the status of the six component fault lines.

- a Synthesizer Alarm
- b LOA Alarm
- c LOB Alarm
- d Power Supply Alarm
- e L01 Level Detect
- f L02 Level Detect

#### 3.3.2.4 Device Address/Baud Rate Selection

The device address is set with a DIP switch on the rear panel. S1, 2, 3, 4 and 5 select the 5 LSBs of the address in binary (switch off = "1", switch on = "0", S1 = LSB.) The two MSBs are permanently set to "10" and not available to the user.

The baud rate and parity are selected with switches S6, 7 and 8 in the following code (switch off = "1", switch on = "0").

| <u>S8</u> | <u>S7</u> | <u>Baud Rate</u> |
|-----------|-----------|------------------|
| 0         | 0         | 1200             |
| 0         | 1         | 2400             |
| 1         | 0         | 4800             |
| 1         | 1         | 9600             |

| <u>S6</u> | <u>Parity</u> |
|-----------|---------------|
| 0         | Even          |
| 1         | Odd           |

#### 3.3.2.5 Programming Examples

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

- A. Set the frequency to 14255.000 MHz

| <u>Controller Command</u> | <u>Converter Response</u>                    |
|---------------------------|----------------------------------------------|
| {AF14255000}0             | {AF}a<br>or possible error code<br><br>{Ac}~ |

- B. Status Faults Command - response indicates the synthesizer alarm is in a fault condition.

| <u>Controller Command</u> | <u>Converter Response</u> |
|---------------------------|---------------------------|
| {A?}Z                     | {A?100000}                |

### 3.3.2.6 Remote Interface Connector

#### RS422/485\* -

|      |            |
|------|------------|
| J6-1 | Ground     |
| -3   | Data Out - |
| -5   | Data In -  |
| -7   | Data Out + |
| -9   | Data In +  |

\* For RS485 two wire party line operation DATA IN + must be externally wired to DATA OUT +, and DATA IN - externally wired to DATA OUT -.

#### RS232 -

|      |          |
|------|----------|
| J6-1 | Ground   |
| -2   | TX Data  |
| -3   | RCV Data |
| -4   | RTS      |
| -5   | CTS      |
| -7   | Ground   |

#### Contact Closure -

|      |     |
|------|-----|
| J6-1 | F14 |
| -2   | F08 |
| -3   | F05 |
| -4   | F02 |
| -5   | F01 |
| -6   | COM |
| -10  | F06 |
| -11  | F10 |
| -12  | F12 |
| -13  | F15 |
| -14  | F16 |
| -15  | F04 |
| -16  | F03 |
| -17  | F09 |
| -23  | F07 |
| -24  | F13 |
| -25  | F11 |

#### IEEE 488 -

IEEE 488 compatible 24 contact connector (receptacle).

### **3.3.2.7 RS422/485 Bus Termination (See Figure 3-2)**

Jumper selectable, 120 ohm termination resistors are connected across the DATA IN +/- and DATA OUT +/- terminals. Installing E1 places the resistor across the DATA OUT terminals and installing E2 places the resistor across the DATA IN terminals.

### **3.3.2.8 Contact Closure Control**

Inputs to the rear panel interface connector (J6) are continuously scanned for momentary closures. When a closure is detected the converter will tune to 1 of 16 pre-selected frequencies stored in memory locations 01 through 16. This operation requires the converter to be in remote operation modes. Momentary connection of F"nn" to COM will cause the converter to tune to the frequency stored in memory location "nn".

### **3.3.2.9 IEEE 488 Control**

The 9300 Series Converter performs the basic Talker and Listener functions as specified in IEEE Standard 488. It is also capable of sending a Service Request to the IEEE 488 controller and will respond with a status word when the Serial Poll Enable message is received.

#### **3.3.2.9.1 Device Address/Service Request Enable**

The device address is set with the ADDRESS DIP switch on the rear panel. S1, 2, 3, 4 and 5 select the address assignment in binary (switch off = "1", on = "0", S1 = LSB). Switch 8 enables the Service Request feature (switch off = disabled, on = enabled). S6, 7 are spares.

The Service Request feature is only available in converters equipped with the Status Alarm Readout option.

### **3.3.2.9.2 Data Input Messages**

The messages to and from the converter are ASCII character strings terminated with CR, LF and EOI.

#### **3.3.2.9.2.1 Frequency Set**

The Frequency Set message sets the converter to the specified frequency in kHz and also unmutes the converter.

```
F14000500      (8 digit)
F3700125       (7 digit)
```

#### **3.3.2.9.2.2 Mute**

The Mute message mutes the RF output of the converter.

```
M
```

#### **3.3.2.9.2.3 Set/Store Frequency in Channel nn**

This message is similar to the Frequency Set message. It sets the converter to the specified frequency in kHz, unmutes the converter and stores the frequency in channel memory "nn".

```
S01F14000125   (8 digit frequency stored in Channel 01)
S25F3712500    (7 digit frequency stored in Channel 25)
```

#### **3.3.2.9.2.4 Recall Frequency from Channel nn**

This message sets the converter to the frequency previously stored in channel memory "nn". It also unmutes the converter.

```
C05 (Recall frequency stored in Channel 05)
```

#### **3.3.2.9.2.5 Data Format**

These messages determine the converter's response when it is addressed to talk by the IEEE 488 Controller. A Data Format message remains in effect until another one is received. DF is the power on default format.

### 3.3.2.9.2.6 Frequency Format

#### Data Format

DF

#### Converter Response

FfffffffffLlMm

F: Frequency indicator

ffffffff(f): 7 or 8 digit converter frequency in kHz

L: Local/Remote indicator

l: 0 = Local, 1 = Remote

M: Mute indicator

m: 0 = mute off, 1 = mute on

### 3.3.2.9.2.7 Status Faults Format

#### Data Format

D?

#### Converter Response

?abcdef

?: Status indicator

a-f: 0 = no fault, 1 = fault

a through f indicate the status of the six component fault lines

a Synthesizer Alarm

b LOA Alarm

c LOB Alarm

d Power Supply Alarm

e L01 Level Detect

f L02 Level Detect

The Status Alarm readout option is required for this format.

### 3.3.2.9.2.8 Status All Format

#### Data Format

DA

#### Converter Response

FfffffffffLlMm?abcdef

The DA format is a combination of the DF and D? formats. The Status Alarm readout option is required.

### 3.3.2.9.2.9 Channel Format

#### Data Format

DCnn

#### Converter Response

CnnFffffffff

The DCnn format returns the frequency stored in channel nn (00-29). It has no effect on the frequency output of the converter.

### 3.3.2.9.2.10 Service Request

The converter will issue a service request (activate the SRQ line) when one of the status alarm lines indicate a failure. The IEEE 488 Controller responds by sending the SPE message (Serial Poll) and addresses the unit to talk. The converter responds with the following message:

| <u>Bit No.</u> |   |   |   |   |    |    |    |
|----------------|---|---|---|---|----|----|----|
| 7              | 6 | 5 | 4 | 3 | 2  | 1  | 0  |
| 0              | 1 | 0 | 0 | 0 | S2 | S1 | S0 |

The S"n" bits indicate in binary code which component fault line caused the service request (a = 0, b = 1, c = 2, etc.).

The IEEE 488 Controller may perform a Serial Poll without a service request being generated by the converter (the request may have been generated from another device on the bus). In this case, the response will be the same message (the data field will be the same as the last status word sent) however, bit 6 will be at "0".

### 3.3.3 EMERGENCY OPERATION

In the event of a failure in converter components, refer to Section 5.3 to determine possible cause/remedies.

### 3.3.4 SHUTDOWN PROCEDURE

The converter is completely shut down when the AC power is removed.

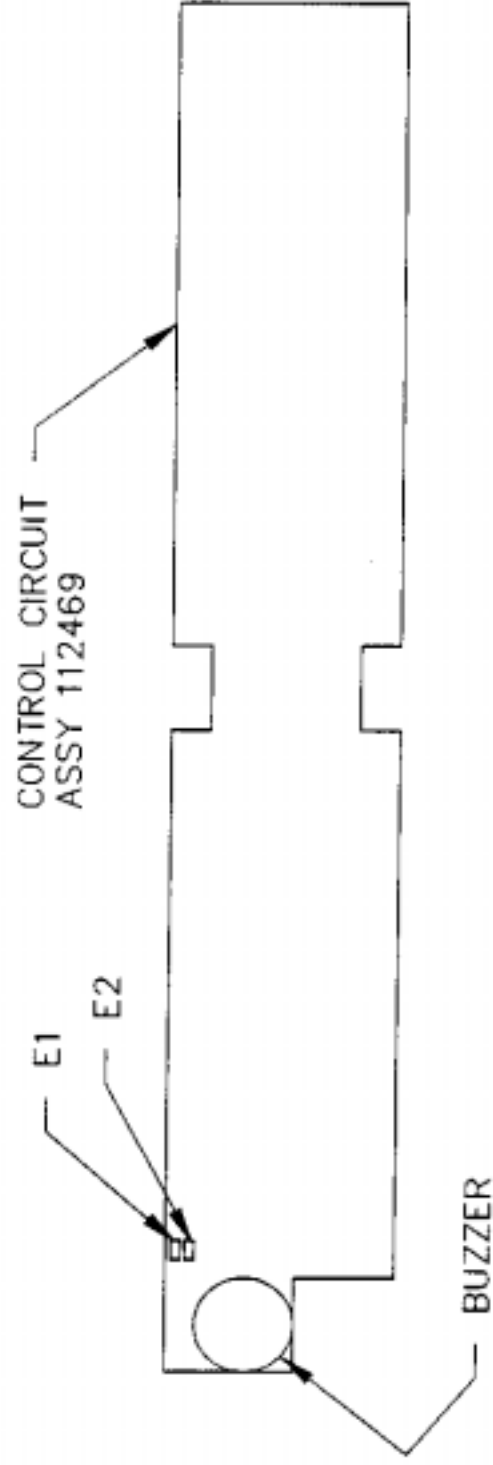


FIG. 2  
RS422/485 BUS TERMINATION JUMPERS  
9300 SERIES

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4.1 INTRODUCTION

The following paragraphs provide information on the principles of operation of the MITEQ Model U-9356 Upconverter. Overall functional operation of the system is discussed in Paragraph 4.2 and detailed principles of operation for the individual subassemblies are presented in Paragraph 4.3.

#### 4.2 FUNCTIONAL DESCRIPTION

The converter translates a 40 MHz frequency band at 70 MHz to the 14.0-14.5 GHz output frequency band. A double conversion system is used (see Figure 4-1).

The input signal is fed to a well-matched upconverter module. If Option 2B is ordered, a coupled output port is included in the module to provide an IF test point at the rear panel of the converter. If the converter is ordered with Option 5, the signal passes through a group delay equalizer which is included in the module. The input signal is fed through a PIN diode attenuator, providing gain control for the system, amplified and fed to a mixer which converts the input signal to the second IF frequency. The signal is then amplified again and output from the module.

The output of the converter module is fed to a filter which rejects out-of-band signals resulting from the first conversion, including rejection of local oscillator signal. The signal is then fed to the second mixer which translates the signal frequency to the output frequency band.

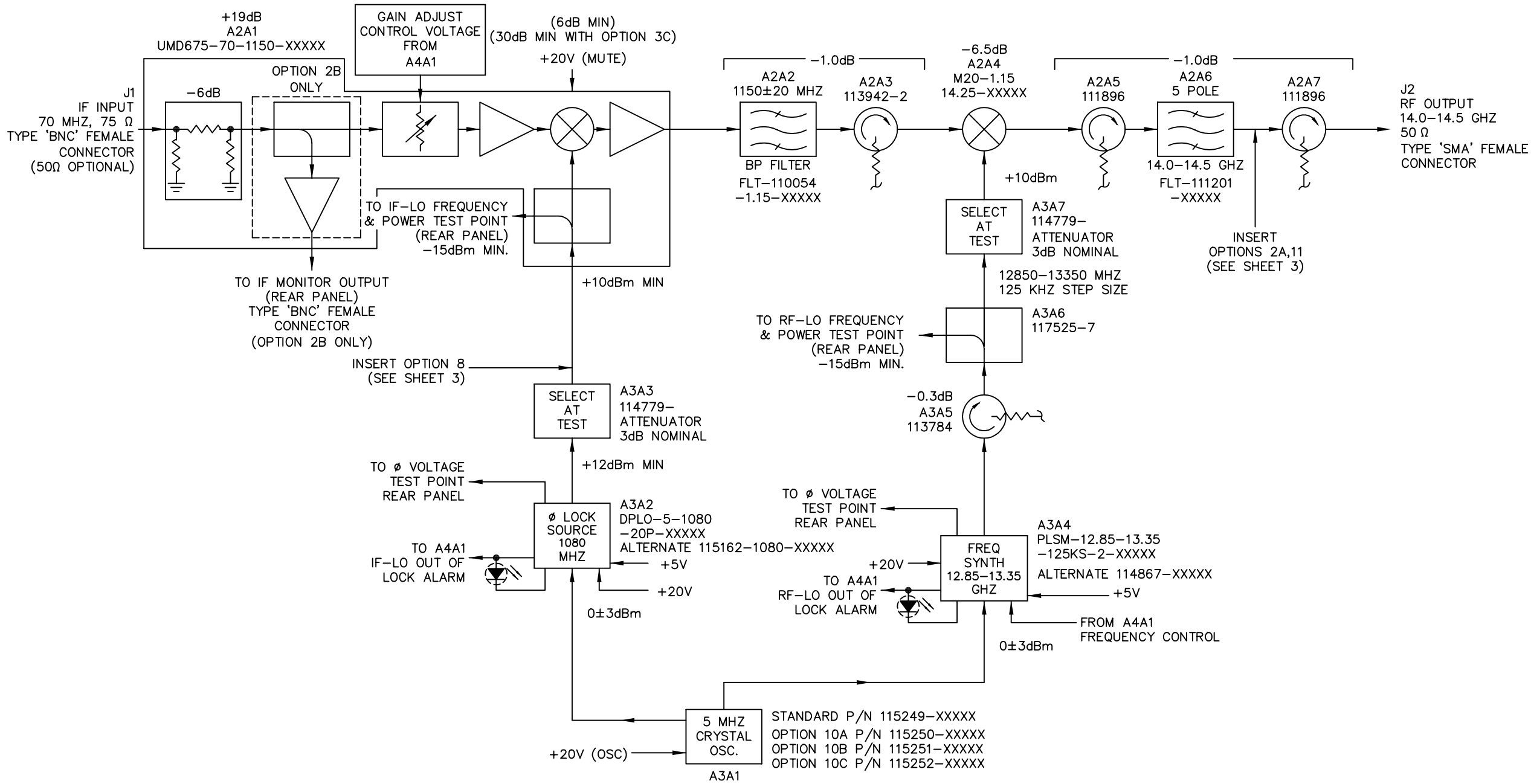
The output of the second mixer is filtered for rejection of out-of-band signals. An optional output amplifier (Option 11) may be used to increase the output level of the converter.

The reference source for the local oscillator chains is a dual output high stability oven-controlled crystal oscillator at 5 MHz.

The first local oscillator is a phase locked source which is locked to the 5 MHz reference.

The second local oscillator is a synthesized frequency source which is locked to the 5 MHz reference.

| REVISIONS |     |                       |       |          |
|-----------|-----|-----------------------|-------|----------|
| ZONE      | LTR | DESCRIPTION           | DATE  | APPROVAL |
|           | G   | REVISED AND REDRAWN   | 5/91  |          |
|           | H   | A3A6 P/N WAS C3267-20 | 10/92 |          |



BEFORE 2/21/89 MODEL U-9356 WAS BLOCK DIAGRAM 113955

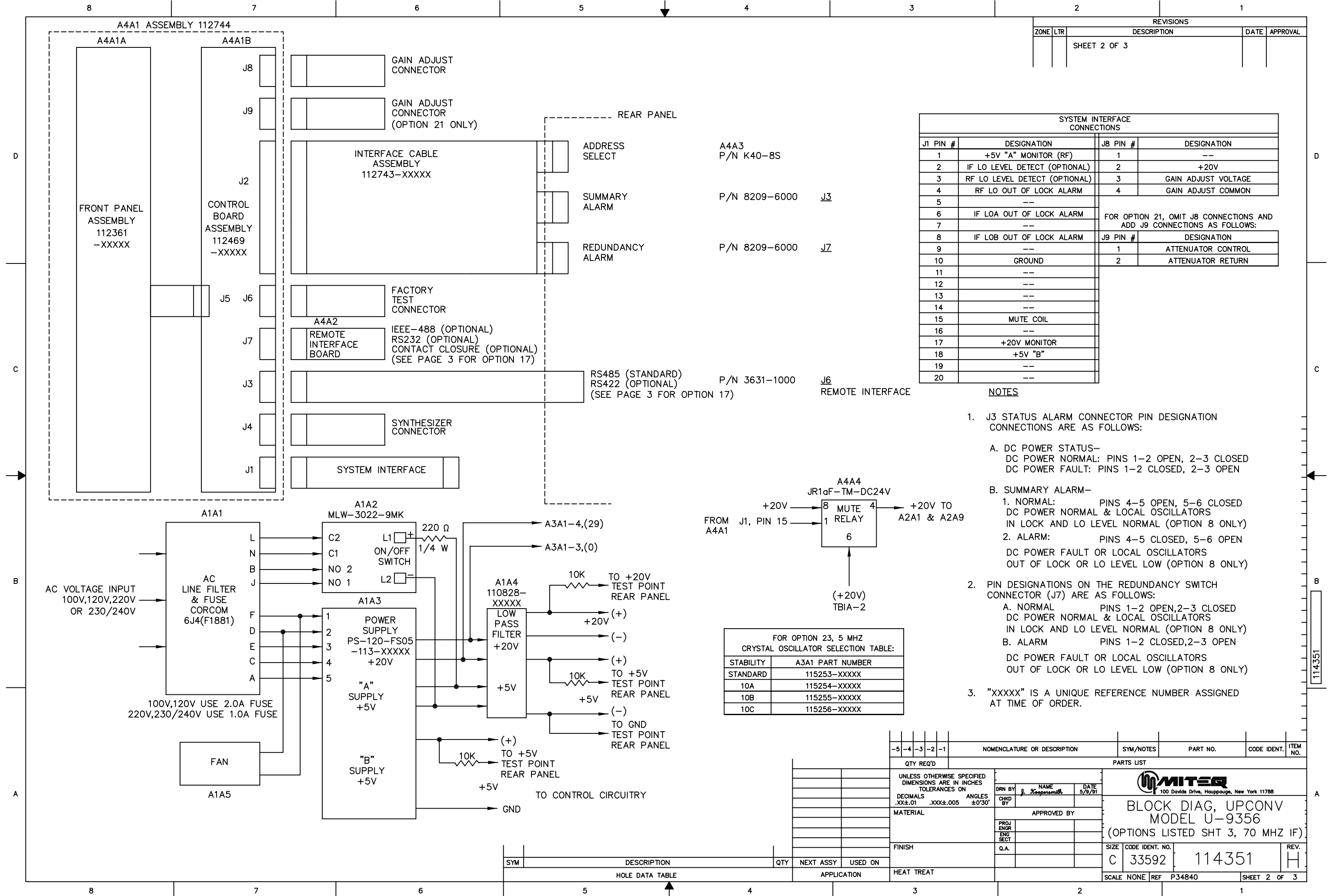
| -5                                                                | -4 | -3 | -2 | -1 | NOMENCLATURE OR DESCRIPTION |           | SYM/NOTES  | PART NO.       | CODE IDENT. | ITEM NO. |
|-------------------------------------------------------------------|----|----|----|----|-----------------------------|-----------|------------|----------------|-------------|----------|
|                                                                   |    |    |    |    | QTY REQ'D                   |           | PARTS LIST |                |             |          |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON |    |    |    |    | DECIMALS                    | ANGLES    | DRN BY     | NAME           | DATE        |          |
|                                                                   |    |    |    |    | .XX±.01                     | .XXX±.005 | CHKD BY    | J. Koopersmith | 5/9/91      |          |
| MATERIAL                                                          |    |    |    |    | APPROVED BY                 |           |            |                |             |          |
| FINISH                                                            |    |    |    |    | Q.A.                        |           |            |                |             |          |
| HEAT TREAT                                                        |    |    |    |    | SCALE NONE REF P34840       |           |            |                |             |          |
| SYMBOL                                                            |    |    |    |    | DESCRIPTION                 |           |            |                |             |          |
| QTY                                                               |    |    |    |    | HOLE DATA TABLE             |           |            |                |             |          |
| NEXT ASSY                                                         |    |    |    |    | USED ON                     |           |            |                |             |          |
| APPLICATION                                                       |    |    |    |    | HEAT TREAT                  |           |            |                |             |          |
| C                                                                 |    |    |    |    | 33592                       |           |            |                |             |          |
| H                                                                 |    |    |    |    | 114351                      |           |            |                |             |          |
| SHEET 1 OF 3                                                      |    |    |    |    | REV. H                      |           |            |                |             |          |



100 Davids Drive, Hauppauge, New York 11788

BLOCK DIAG, UPCONV  
MODEL U-9356  
(OPTIONS LISTED SHT 3, 70 MHZ IF)

| SIZE | CODE IDENT. NO. | REV. |
|------|-----------------|------|
| C    | 33592           | H    |





## 4.3 SUBSYSTEMS AND COMPONENTS FUNCTIONAL DESCRIPTION

### 4.3.1 SIGNAL PATH

#### 4.3.1.1 Upconverter Module (A2A1)

Part Number: UMD675-70-1150-XXXXX

Description: Upconverter Module

Function: Provide a well matched system input, frequency translation, gain and gain control.

Design: Integrated assembly

Specifications -

A. Frequency -

1. Input: 50-90 MHz
2. Output: 1150  $\pm$ 20 MHz
3. LO: 1080 MHz at +10 dBm

B. Gain: 19 dB nominal

C. Input VSWR: 26 dB/75 ohms  
(50 ohms with Option 15)

D. Output VSWR: 23 dB/50 ohms

E. Power Output  
(1 dB Compression): +6 dBm

F. DC Voltage: +20 volts

G. Gain Control: 6 dB minimum  
(30 dB with Option 3C)

H. IF Monitor Output  
(Option 2B): -20 dBc nominal

I. Local Oscillator  
Monitor Output: -20 dBc nominal

J. Connectors -

1. Input: BNC female
2. LO/Output: SMA female
3. DC: Solder filter

#### 4.3.1.2 Filter, Isolator (A2A2, A2A3)

##### A2A2 -

Description: Filter  
Part Number: FLT-110054-1.15-XXXXX  
Function: IF passband, out-of-band rejection  
Design: Fourteen pole rod combline bandpass

##### Specifications -

- A. Frequency: 1150  $\pm$ 20 MHz
- B. Insertion Loss: 1.0 dB
- C. Input/Output VSWR: 25 dB
- D. Parabolic Group Delay: 4 nsec  $\pm$ 20 MHz
- E. Rejection: 75 dB  $\pm$ 70 MHz
- F. Connectors -
  - 1. Input/Output: SMA male

##### A2A3 -

Description: Isolator  
Part Number: 113942-2

##### Specifications -

- A. Frequency: 1150  $\pm$ 50 MHz
- B. Insertion Loss: 0.5 dB
- C. Input/Output VSWR: 1.1:1
- D. Isolation: 23 dB minimum
- E. Connectors: SMA female

#### 4.3.1.3 Mixer, Second Conversion (A2A4)

Part Number: M20-1.15-14.25-XXXXX

Function: Frequency translation

Design: Double balanced

Specifications -

- A. Input Frequency: 1150  $\pm$ 20 MHz
- B. Output Frequency: 14.0-14.5 GHz
- C. LO Frequency: 12850-13350 MHz
- D. Conversion Loss: 6.5 dB nominal
- E. LO Power: +10 dBm
- F. Isolation -
  - 1. LO/Output: 20 dB
  - 2. LO/Input: 20 dB
- G. Power Output  
(1 dB Compression): -5 dBm minimum
- H. Connectors -
  - 1. Input: SMA male
  - 2. Output: SMA male
  - 3. LO: SMA female

#### 4.3.1.4 Output Isolators, Filter (A2A5, A2A6, A2A7)

##### A2A5, A2A7 -

Description: Isolator  
Part Number: 111896

##### Specifications -

- A. Frequency: 13.9-14.6 GHz
- B. Insertion Loss: 0.25 dB
- C. Input/Output VSWR: 1.15:1
- D. Isolation: 23 dB minimum
- E. Connectors: SMA female input

##### A2A6 -

Description: Filter  
Part Number: FLT-111201-XXXXX  
Function: Rejection of out-of-band signals  
Design: Five section waveguide (WR62)

##### Specifications -

- A. Frequency: 14.0-14.5 GHz
- B. Insertion Loss: 0.4 dB
- C. Flatness: 0.2 dB peak-to-peak
- D. Rejection: 50 dBc/±1 GHz
- E. Connectors -
  - 1. Input: Right angle SMA male
  - 2. Output: Right angle SMA male

#### 4.3.1.4.1 Option 11, 11A - Output Amplifier

Description: Amplifier

Part Number: AMF-14145-10-XXXXX

Function: Increase system gain and output level

Design: Two-stage GaAs FET

Specifications -

A. Frequency: 14.0-14.5 GHz

B. Gain: 10 dB nominal

C. Input/Output VSWR: 2:1

D. Power Output  
(1 dB Compression): +10 dBm

E. DC Voltage: +20 volts

F. Connectors -

1. Input: SMA male

2. Output: SMA male

3. DC: Solder filter

#### Option 11A -

Description: Amplifier

Part Number: AFD3-060018-14.25-XXXXX

Function: Increase system output level

Design: Three-stage GaAs FET

Specifications -

A. Frequency: 14.0-14.5 GHz

B. Gain: 15 dB nominal

C. Input/Output VSWR: 2:1

D. Power Output  
(1 dB Compression): +13 dBm

E. DC Voltage: 20 volts

F. Connectors -

1. Input: SMA male

2. Output: SMA male

3. DC: Solder filter

An additional isolator may be inserted between the output filter and the Option 11 output amplifier.

#### **4.3.2 LOCAL OSCILLATOR**

##### **4.3.2.1 5 MHz Reference (A3A1)**

Part Number: 115249-XXXXX

The dual output 5 MHz crystal oscillator is a highly stable precision crystal oscillator enclosed in a proportionally-controlled oven housing.

The specifications of the crystal oscillator are:

- A. Frequency: 5.000000 MHz
- B. Power Output: 0±3 dBm
- C. DC Power -
  - 1. Warm-Up: +20V/150 mA
  - 2. Normal: +20V/70 mA stabilized at 25°C
- D. Oven Stabilization Time: 20 minutes (25°C)
- E. Connectors -
  - 1. RF: SMA female
  - 2. DC: Solder filter

Refer to the index for description and data sheets for higher stability reference sources when installed (Option 10).

##### **4.3.2.2 1080 MHz Phase Lock Source (A3A2)**

Part Number: DPL0-5-1080-20P-XXXXX

Alternate Part Number: 115162-1080-XXXXX

The phase lock source consists of:

- 1. Fundamental VTO (1080 MHz)
- 2. Frequency divider (÷216)
- 3. Phase detector
- 4. Phase lock alarm circuit

A functional block diagram is shown in Figure 4-2.

A sample of the VTO is directed through the frequency divider and then to the phase detector. The input reference frequency is also fed to the phase detector.

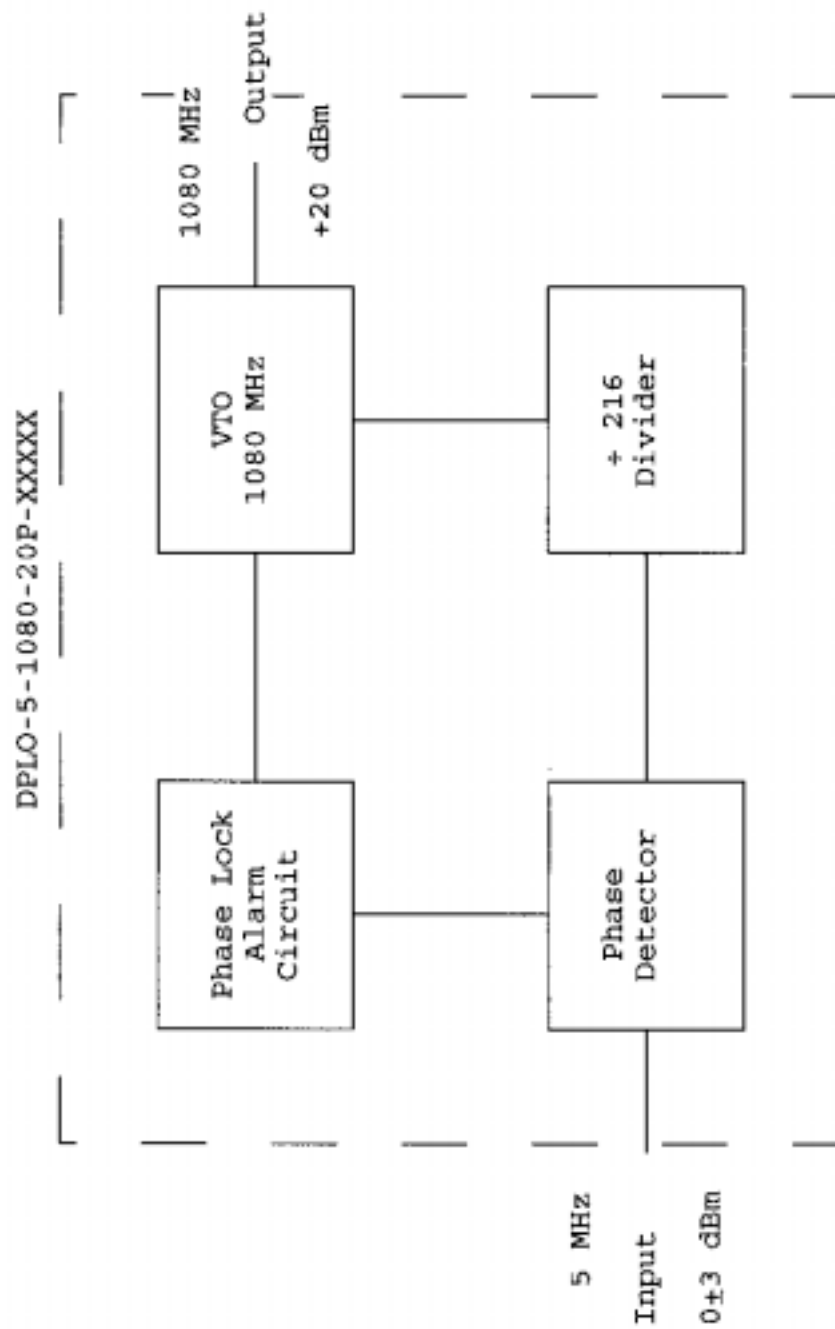


Figure 4-2. Block Diagram, 1080 MHz Phase Lock Source (A3A2)

When the input reference frequency and divided VTO frequency differ only in phase, the phase detector output is a DC voltage proportional to the phase difference between these two signals. A frequency difference between the two signals results in a sweep voltage which is applied to the voltage-tuned capacitor of the VTO. As the VTO is being swept through its frequency range, comparison of frequency is made in the phase detector. When the divided VTO frequency is at the same frequency as the input reference, the sweep is disabled and the VTO is locked to the input reference.

The specifications for the phase lock source are:

- A. Frequency Output: 1080 MHz
- B. Frequency Input: 5 MHz
- C. Power Output: +12 dBm nominal
- D. Power Input:  $0 \pm 3$  dBm
- E. DC Power -
  - 1. DPL0-5-1080-20P  
-XXXXX: +20V at 300 mA, +5V at 500 mA
  - 2. 116162-1080-XXXXX: +20V at 400 mA
- F. Connectors -
  - 1. RF: SMA female
  - 2. DC: Solder filter

A fixed attenuator follows the phase lock source and is used to provide level adjustment.

#### 4.3.2.3 Second Local Oscillator

##### 4.3.2.3.1 Frequency Synthesizer (A3A4)

The microwave frequency synthesizer incorporates multiple loop, digital phase locking techniques to produce an RF output frequency in steps of 125 kHz. Phase lock loop bandwidths are adjusted for best overall phase noise performance.

Due to the complexity of the microwave synthesizer, it is recommended that all service be referred to the factory.

The specifications for the synthesized source are:

- A. Frequency Output: 12850-13350 MHz
- B. Frequency Input: 5 MHz
- C. Power Output: +13 dBm minimum
- D. Power Input:  $0 \pm 3$  dBm
- E. DC Power: +20V at 1.0A, +5V at 1.5A
- F. Phase Lock TP: DC voltage variable with frequency
- G. Connectors -
  - 1. RF: SMA female
  - 2. DC: "D" connector

| <u>Function</u> | <u>Pin</u> |
|-----------------|------------|
| +20V            | 1, 6       |
| +5V             | 4, 8       |
| Ground          | 5, 9       |
| Phase Voltage   | 2          |
| Alarm           | 3          |

- 3. Control: Ribbon cable

#### 4.3.2.3.2 Second Local Oscillator Chain (A3A5 to A3A7)

##### A3A5 -

Description: Isolator

Part Number: 113784

Specifications -

- A. Frequency: 12.6-14.0 GHz
- B. Insertion Loss: 0.3 dB
- C. Input/Output VSWR: 1.2:1
- D. Isolation: 22 dB minimum
- E. Connectors: SMA female

##### A3A6 -

Description: Coupler

Part Number: 117525-7

Specifications -

- A. Frequency: 7.5-16.0 GHz
- B. Insertion Loss: 1 dB
- C. Coupled Output: 20 dBc nominal
- D. Connectors -
  - 1. Input: SMA male
  - 2. Output: SMA female
  - 3. Coupled Output: SMA female

##### A3A7 -

Description: Fixed Attenuator

Part Number: 114779

Function: Gain adjustment

Specifications -

- A. Insertion Loss: 3 dB nominal
- B. Connectors -
  - 1. Input: SMA male
  - 2. Output: SMA female

### 4.3.3 CONVERTER CONTROLLER

The Converter Controller board contains the microcomputer and analog circuitry necessary to control the LCD display, accept data from the front panel keys, control the frequency synthesizer, monitor status signals from the critical converter components, control the muting and alarm relays and provide a remote bus interface (e.g. RS485).

The microcomputer is designed with a microprocessor which contains on-chip RAM, a serial port and an I/O port. Program memory is stored in an EPROM. Additional RAM is located on a peripheral IC along with extra I/O ports and a timer. The I/O ports read the rear panel DIP switch for address and baud rate selection (remote bus option only), control the "MEMORY" and "REMOTE" front panel LEDs, control the muting and alarm relays and monitor the analog status alarm circuitry. The on-chip timer is used as a gated oscillator to sound the buzzer.

The I/O port on the microprocessor controls the LCD controller chips, stores and recalls data from the EEPROMs (non volatile memory) and sends serial data to the frequency synthesizer via the interface ICs. When the remote bus option is used, the microprocessor on-chip serial I/O port is used with the interface ICs to provide an RS422/485 interface.

Front panel keys are monitored by the keyboard encoder. The keys are scanned at a periodic rate and an interrupt is generated whenever a key is pressed. Key debouncing and multiple key lockout are also provided in the chip.

The power monitor IC performs three functions. It generates a power-on reset pulse whenever power is turned on. As a power monitor, it continuously monitors the +5V power supply and generates a reset signal if the supply drops below 4.5V. It also contains a watch dog timer which must be periodically reset by the microprocessor. Failure to do so indicates a circuit failure and causes a reset pulse to be generated.

The analog section monitors signal levels from the critical converter components and outputs to the microcomputer whenever a fault level has been reached. Fault levels for the power supplies are fixed while others such as the LO level detect are adjusted with trim pots. A separate relay, DC alarm, is controlled from the output of the power supply monitor circuitry. The two front panel alarm LEDs, "RF-LO" and "IF-LO", are controlled from the analog circuitry.

#### 4.3.4 POWER SUPPLY, LOW PASS FILTER

The complete manual for the power supply is given in Appendix A.

MITEQ Part Number - PS120-FS05-113-XXXXX  
Power One Part Number - FS05-113

The power supply is divided into three sections:

- A. +5.2 volts for the Converter Controller only  
Voltage Setting Tolerance:  $\pm 0.10$  volts
- B. +5.2 volts for the converter's RF components  
Voltage Setting Tolerance:  $\pm 0.10$  volts
- C. +20 volts for the converter's RF components  
Voltage Setting Tolerance:  $\pm 0.25$  volts

Overvoltage protection is included for all sections of the power supply.

A low pass filter (A1A4) follows the RF component sections of the power supply to aid in the rejection of power supply noise. A balanced configuration is used with a series inductor and shunt electrolytic capacitor. Voltage is set and monitored after the low pass filter and is supplied to all system components with the exception of the crystal reference oscillator heater circuit. The heater circuit derives DC power before the low pass filter.

## SECTION 5

### MAINTENANCE

#### 5.1 INTRODUCTION

This section includes information and instructions for periodic monitoring of converter performance, information for troubleshooting, alignment and adjustment of the converter in case of converter malfunction.

#### 5.2 PREVENTIVE MAINTENANCE

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

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

##### 5.2.1 DC VOLTAGE

Connect the digital voltmeter to the DC test points on the rear panel. If voltage is beyond tolerance (see Section 4.3.4), reset power supply (refer to Appendix and Figure 1-3), using the tuning adjustment on the power supply.

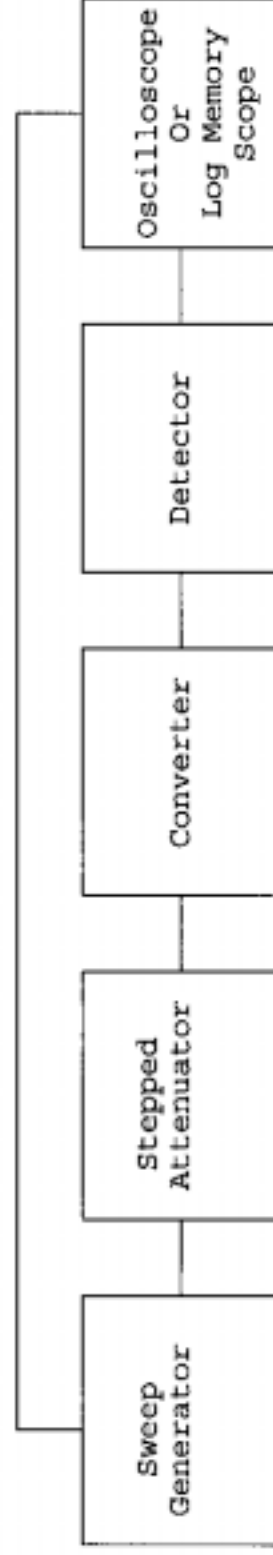


Figure 5-1. Test Setup for Gain, Gain Ripple and Frequency Response Measurement

### 5.2.2 GAIN OF THE CONVERTER

The following procedure is to be followed for gain measurements. Connect the test equipment as shown in Figure 5-1. Set the sweeper to cover the required input frequency range. Set the attenuator on the log memory scope to 000 and memorize the input reference. Connect the converter into the test setup. Record the gain and frequency response of the converter.

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

### 5.2.3 FREQUENCY MEASUREMENT

Frequency accuracy of the converter is determined by the reference source used. Frequency may be monitored at the rear panel L0 test points.

### 5.2.4 LOCAL OSCILLATOR PHASE LOCK TEST POINT (Phase Voltage)

The phase lock test point (phase voltage) of the phase lock source indicates proper locking conditions and frequency for the basic voltage-tuned oscillator. The following voltages will be observed at 25°C ambient:

- |         |                                                              |
|---------|--------------------------------------------------------------|
| A. L01: | 10 ±2 volts "in lock"<br>1 volt or 18 volts<br>"out-of-lock" |
| B. L02: | Variable with frequency                                      |

Due to the nature of multiple loop frequency synthesizers, the test point may not always indicate an out-of-lock state. The front panel LED represents a summary of the individual phase lock loop alarms.

Data on test point voltage should be recorded in a log and compared to the original data in order that changes in data as a function of time can be observed.

### **5.3 CORRECTIVE MAINTENANCE**

If the converter malfunctions during normal use or if the tests in Section 5.2 reveal excessive discrepancies in converter gain or local oscillator frequency or test point voltage, 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. In addition, power supply failures can be corrected on the station level.

#### **5.3.1 POWER SUPPLY MALFUNCTION**

If the fault is detected in the power supply, remove the power supply protective cover. Check AC voltage input to the power supply. With the help of the power supply schematics in Appendix A, isolate the malfunctioning component.

#### **5.3.2 LOCAL OSCILLATOR**

To isolate the malfunctioning component in the local oscillator chain, Section 4.3.2 should first be carefully studied for theory of operation. The following voltage check should be performed before proceeding.

Check DC voltages to phase lock oscillators. A scope (AC coupled) should be applied to voltage line to measure power supply ripple (refer to Appendix for specifications). If incorrect voltage or excessive ripple is observed, refer to Paragraph 5.3.1 for a power supply check.

Power level of the input reference should be checked. Required input reference power level for phase lock sources is  $0 \pm 3$  dBm. If the reference source is significantly off frequency, the phase lock source may not be able to lock to it. Frequency of the reference should be 5.000000 MHz.

Assuming an "in-lock" condition at the correct output frequency, check output power. If unit is out of specification or above procedures fail to rectify the problem, it is recommended that unit be returned for factory repair.

### **5.3.3 CONVERTER, SIGNAL CHAIN**

The components in the signal chain can be checked against the individual specifications listed in Section 4.3.

TABLE 5-1

## PARTS LIST - U-9356 UPCONVERTER

| ITEM<br>NUMBER | SYMBOL<br>NUMBER | MANUFACTURER | PART NUMBER                        | DESCRIPTION                |
|----------------|------------------|--------------|------------------------------------|----------------------------|
| 1              | A1A1             | Corcom       | 6J4 (F1881)                        | AC Line Filter             |
| 2              | A1A2             | Kaiheiki     | MLW-3022-9MK                       | On/Off Switch              |
| 3              | A1A3             | MITEQ        | PS120-PS05-113-XXXXX               | Power Supply               |
| 4              | A1A4             | MITEQ        | 110828-XXXXX                       | Low Pass Filter            |
| 5              | A1A5             | Rotron       | SU2A5                              | Fan                        |
| 6              | A2A1             | MITEQ        | UMD675-70-1150-XXXXX               | Upconverter Module         |
| 7              | A2A2             | MITEQ        | FLT-110054-1.15-XXXXX              | Bandpass Filter            |
| 8              | A2A3             | MITEQ        | 113942-2                           | Isolator                   |
| 9              | A2A4             | MITEQ        | M20-1.15-14.25-XXXXX               | Balanced Mixer             |
| 10             | A2A5, A7         | MITEQ        | 111896                             | Isolator                   |
| 11             | A2A6             | MITEQ        | FLT-111201-XXXXX                   | Bandpass Filter            |
| 12             | A3A1             | MITEQ        | 115249-XXXXX                       | Crystal Oscillator         |
| 13             | A3A2*            | MITEQ        | DPLO-5-1080-20P-XXXXX              | Phase Lock Source          |
| 14             | *Alternate       | MITEQ        | 115162-1080-XXXXX                  | Phase Lock Source          |
| 15             | A3A3, A7         | MITEQ        | 114779-                            | Attenuator, SAT            |
| 16             | A3A4**           | MITEQ        | PLSM-12.85-13.35-<br>125KS-2-XXXXX | Frequency Synthesizer      |
| 17             | **Alternate      | MITEQ        | 114867-XXXXX                       | Frequency Synthesizer      |
| 18             | A3A5             | MITEQ        | 113784                             | Isolator                   |
| 19             | A3A6             | MITEQ        | 117525-7                           | Directional Coupler        |
| 20             | A4A1             | MITEQ        | 112744                             | A4A1 Assembly              |
| 21             | A4A1-A           | MITEQ        | 112361-XXXXX                       | Front Panel Assembly       |
| 22             | A4A1-B           | MITEQ        | 112469-XXXXX                       | Control Board Assembly     |
| 23             | A4A3             | TLC          | K40-8S                             | Address Select             |
| 24             | A4A4             | Aromat       | JR1aF-TM-DC24V                     | Mute Relay                 |
| 25             | J3               | 3M           | 8209-6000                          | Summary Alarm Connector    |
| 26             | J6               | 3M           | 3631-1000                          | Remote Interface Connector |
| 27             | J7               | 3M           | 8209-6000                          | Redundancy Alarm Connector |

XXXXX represents a unique number assigned at time of order.

114351H

TABLE 5-1

## PARTS LIST - U-9356 UPCONVERTER

| ITEM<br>NUMBER | SYMBOL<br>NUMBER | MANUFACTURER   | PART NUMBER                      | DESCRIPTION                           |
|----------------|------------------|----------------|----------------------------------|---------------------------------------|
| 28             |                  | MITEQ          | 112825                           | Chassis, 17" x 20" x 3.06"            |
| 29             |                  | MITEQ          | 112361                           | Front Panel                           |
| 30             |                  | MITEQ          | 114522                           | RF Tray                               |
| 31             |                  | MITEQ          | 111404-2                         | Crystal Mounting, A3A1                |
| 32             |                  | MITEQ          | 110875                           | Power Supply Cover                    |
| 33             |                  | MITEQ          | 110332                           | Fan Mounting                          |
| 34             |                  | MITEQ          | 8220-A-0440                      | 4-40 x 1/4" Hex Spacers 1" Long       |
| 35             |                  | MITEQ          | 106497-23                        | Isolator Mounting Bracket, A2A5, A2A7 |
| 36             |                  | MITEQ          | 114556-1                         | Isolator Mounting Bracket, A3A5       |
| 37             | A2A10            | Mac Technology | OPTION 2A                        | Directional Coupler                   |
| 38             | A2A11            | MITEQ          | C3267-20<br>111896               | Ferrite Isolator                      |
| 39             | A2A1             | MITEQ          | OPTION 2B                        | Upconverter Module                    |
|                |                  |                | UMD6C75-70-1150-XXXXX            |                                       |
| 40             | A2A1             | MITEQ          | OPTION 3C                        | Upconverter Module                    |
|                |                  |                | UMD3075-70-1150-XXXXX            |                                       |
| 41             | A2A1             | MITEQ          | OPTION 5A                        | Upconverter Module                    |
|                |                  |                | UMD675-70-1150-5A-XXXXX          |                                       |
| 42             | A3A6             | MITEQ          | OPTION 8                         | Coupler Detector                      |
| 43             | A3A8             | MITEQ          | CD-129134-XXXXX<br>CD-1080-XXXXX | Coupler Detector                      |
| 44             | A3A1             | MITEQ          | OPTION 10A                       | Crystal Oscillator                    |
|                |                  |                | 115250-XXXXX                     |                                       |
| 45             | A3A1             | MITEQ          | OPTION 10B                       | Crystal Oscillator                    |
|                |                  |                | 115251-XXXXX                     |                                       |

TABLE 5-1

## PARTS LIST - U-9356 UPCONVERTER

| ITEM<br>NUMBER | SYMBOL<br>NUMBER | MANUFACTURER  | PART NUMBER                       | DESCRIPTION                         |
|----------------|------------------|---------------|-----------------------------------|-------------------------------------|
| 46             | A3A1             | MITEQ         | OPTION 10C<br>115252-XXXXX        | Crystal Oscillator                  |
| 47             | A2A8             | MITEQ         | OPTION 11<br>111896               | Isolator                            |
| 48             | A2A9             | MITEQ         | AMF-14145-10-XXXXX                | Amplifier                           |
| 49             | A2A8             | MITEQ         | OPTION 11A<br>111896              | Isolator                            |
| 50             | A2A9             | MITEQ         | AFD3-060018-14.25-XXXX            | Amplifier                           |
| 51             | A2A1             | MITEQ         | OPTION 15<br>UMD650-70-1150-XXXXX | Upconverter Module                  |
| 52             | A4A2             | MITEQ         | OPTION 17C<br>113643-XXXXX        | Remote Control RS232                |
| 53             | A4A2             | MITEQ         | OPTION 17D<br>113564-XXXXX        | Remote Control With Contact Closure |
| 54             | A4A2             | MITEQ         | OPTION 17F<br>113632-XXXXX        | Remote Control IEEE 488             |
| 55             | A4A1A            | MITEQ         | OPTION 21<br>115764-XXXXX         | Power Divider                       |
| 56             | A4A1B            | MITEQ         | 115779-XXXXX                      |                                     |
| 57             | A3A1             | Mini-circuits | OPTION 23A<br>ZMSC2-1B            |                                     |

TABLE 5-1

## PARTS LIST - U-9356 UPCONVERTER

| ITEM<br>NUMBER | SYMBOL<br>NUMBER | MANUFACTURER  | PART NUMBER     | DESCRIPTION                |
|----------------|------------------|---------------|-----------------|----------------------------|
| 58             | A3A1             | MITEQ         | OPTION 23B      | Crystal Oscillator         |
| 59             | A3A9             | Mini-circuits | 115253-XXXXX    | Power Divider              |
| 60             | A3A1             | MITEQ         | ZMSC2-1B        | Crystal Oscillator         |
| 61             | A3A1             | MITEQ         | with OPTION 10A | Crystal Oscillator         |
| 62             | A3A1             | MITEQ         | 115254-XXXXX    | Crystal Oscillator         |
|                |                  |               | with OPTION 10B | Crystal Oscillator         |
|                |                  |               | 115255-XXXXX    | Crystal Oscillator         |
|                |                  |               | with OPTION 10C | Crystal Oscillator         |
|                |                  |               | 115256-XXXXX    | Crystal Oscillator         |
| 63             | A3A1             | MITEQ         | OPTION 23C      | Crystal Oscillator         |
| 64             | A3A9             | Mini-circuits | 115253-XXXXX    | Power Divider              |
| 65             | A3A10            | MITEQ         | ZMSC2-1B        | SPDT Switch                |
| 66             | A4A5             | Alco          | 118140          | Int/Ext Reference Select   |
|                |                  |               | MTL-206N        |                            |
| 67             | A3A1             | MITEQ         | with OPTION 10A | Crystal Oscillator         |
| 68             | A3A1             | MITEQ         | 115254-XXXXX    | Crystal Oscillator         |
|                |                  |               | with OPTION 10B | Crystal Oscillator         |
|                |                  |               | 115255-XXXXX    | Crystal Oscillator         |
|                |                  |               | with OPTION 10C | Crystal Oscillator         |
| 69             | A3A1             | MITEQ         | 115256-XXXXX    | Crystal Oscillator         |
| 70             | A3A1             | MITEQ         | OPTION 23D      | Crystal Oscillator         |
| 71             | A3A9             | Mini-circuits | 115253-XXXXX    | Power Divider              |
| 72             | A3A11            | MITEQ         | ZMSC2-1B        | Automatic Reference Switch |
|                |                  |               | ARS-28621-XXXXX |                            |
| 73             | A3A1             | MITEQ         | with OPTION 10A | Crystal Oscillator         |
|                |                  |               | 115254-XXXXX    | Crystal Oscillator         |
| 74             | A3A1             | MITEQ         | with OPTION 10B | Crystal Oscillator         |
|                |                  |               | 115255-XXXXX    | Crystal Oscillator         |
| 75             | A3A1             | MITEQ         | with OPTION 10C | Crystal Oscillator         |
|                |                  |               | 115256-XXXXX    | Crystal Oscillator         |

## SECTION 6

### DIAGRAMS

#### 6.1 INTRODUCTION

This section contains the overall wiring diagram and schematics for the U-9356 Upconverter.

TABLE 6-1

LIST OF DIAGRAMS

| FIG. NO. | DESCRIPTION                                                          | PAGE |
|----------|----------------------------------------------------------------------|------|
| 6-1      | Wiring Diagram                                                       | 6-2  |
| 6-2      | Schematic Diagram, 9300 Series Converter<br>Controller (A4A1B)       | 6-12 |
| 6-3      | Assembly Diagram, 9300 Series Converter<br>Controller Series (A4A1B) | 6-14 |



**WIRE RUN SHEET**  
**9300 SERIES UPCONVERTER**

MODEL: U-9356

BLOCK DIAGRAM: 114351G

| FROM: AC LINE FILTER A1A1 |       |           |
|---------------------------|-------|-----------|
| DESIGNATION               | COLOR | TO        |
| L                         | 80    | A1A2-C2   |
| N                         | 89    | A1A2-C1   |
| B                         | 80    | A1A2-NO 2 |
| J                         | 89    | A1A2-NO 1 |
| F                         | 80    | A1A3-1    |
| D                         | 89    | A1A3-2    |
| E                         | 80    | A1A3-3    |
| C                         | 89    | A1A3-4    |
| A                         | 80    | A1A3-5    |

| FROM: POWER ON/OFF SWITCH A1A2 |       |                     |
|--------------------------------|-------|---------------------|
| DESIGNATION                    | COLOR | TO                  |
| C-1                            | 89    | A1A1-N              |
| C-2                            | 80    | A1A1-L              |
| NO-1                           | 89    | A1A1-J              |
| NO-2                           | 80    | A1A1-B              |
| L-1                            | 45    | A1A4 TB1-A (SW LED) |
| L-2                            | 0     | A1A4 TB1-B (5V GND) |

| FROM: POWER SUPPLY A1A3 |          |                                                        |
|-------------------------|----------|--------------------------------------------------------|
| DESIGNATION             | COLOR    | TO                                                     |
| 1                       | 80, 0    | A1A1-F, A1A5                                           |
| 2                       | 89, 0    | A1A1-D, A1A5                                           |
| 3                       | 80       | A1A1-E                                                 |
| 4                       | 89       | A1A1-C                                                 |
| 5                       | 80       | A1A1-A                                                 |
| +5V"A"                  | 5        | A4A1B-J1-1, A1A4<br>(5V Post) X2                       |
| 5V"A" RTN               | 05       | A1A4 (5V GND Post) X2                                  |
| +5V"B"                  | 59, 95   | A4A1B J1-18, +5V"B"T.P.                                |
| 5V"B" RTN               | 05       | A4A1B J1-10                                            |
| +20V                    | 29<br>20 | A1A4 (20V) X2, A4A1B J1-17<br>A3A1 Term. 4/A4A4 Term 8 |
| 20V RTN                 | 0, 0     | A1A4 (20V GND Post) X2,<br>A3A1, Term-3/A4A4 GND Lug   |

| FROM: LOW PASS FILTER AND TERMINAL STRIP A1A4 |        |                         |
|-----------------------------------------------|--------|-------------------------|
| DESIGNATION                                   | COLOR  | TO                      |
| +20V INPUT                                    | 29 x 2 | A1A3 +20V TERMINAL POST |
| 20V GROUND                                    | 0 x 2  | A1A3 20V RTN TERM. POST |
| +5V "A" INPUT                                 | 5 x 2  | A1A3 +5V TERMINAL POST  |
| 5V "A" GROUND                                 | 05 x 2 | A1A3 5V RTN TERM. POST  |
| TB1-A +20V T.P.                               | 92     | +20V TEST POINT         |
| TB1-A +20V SECTION                            | 29     | A3A2 (+20V)             |
| TB1-A +20V SECTION                            | 29     | A3A4 Conn. PIN #1       |
| TB1-A +20V SECTION                            | 29     | A3A4 Conn. PIN #6       |
| TB1-A +20V SECTION                            | 29     | A4A4 Terminal #6        |
| TB1-A +20V SECTION                            |        |                         |
| TB1-A +20V SECTION                            |        |                         |
| TB1-A +5V T.P.                                | 95     | +5V "A" TEST POINT      |
| TB1-A SW. LED                                 | 45     | A1A2-L1                 |
| TB1-A +5V SECTION                             | 5      | A3A2 (+5V)              |
| TB1-A +5V SECTION                             | 5      | A3A4 Conn. PIN #4       |
| TB1-A +5V SECTION                             | 5      | A3A4 Conn. PIN #8       |
| TB1-B 20V GND SECT                            | 0      | A3A2 (GND)              |
| TB1-B 20V GND SECT                            | 0      | A3A4 Conn. PIN #9       |
| TB1-B 20V GND SECT                            | 0      | A4A4 (GND LUG)          |
| TB1-B 20V GND SECT                            |        |                         |
| TB1-B 20V GND SECT                            |        |                         |
| TB1-B 20V GND SECT                            |        |                         |
| TB1-B 20V GND SECT                            |        |                         |
| TB1-B 5V GND SECT                             | 05     | A3A2 (GND)              |
| TB1-B 5V GND SECT                             | 05     | A3A4 Conn. PIN #5       |

118464A

| FROM: LOW PASS FILTER AND TERMINAL STRIP A1A4 (CONTD.) |       |    |
|--------------------------------------------------------|-------|----|
| DESIGNATION                                            | COLOR | TO |
| TB1-B 5V GND SECT                                      |       |    |
| TB1-B 5V GND SECT                                      |       |    |
| TB1-B 5V GND SECT                                      |       |    |

| FROM: FAN A1A5 |       |        |
|----------------|-------|--------|
| DESIGNATION    | COLOR | TO     |
| E1             | 0     | A1A3-1 |
| E2             | 0     | A1A3-2 |

| FROM: DC TEST POINTS |       |                                       |
|----------------------|-------|---------------------------------------|
| DESIGNATION          | COLOR | TO                                    |
| +20 VOLTS            | 92    | A1A4 (+20V SECT) T.P.                 |
| +5 VOLTS "A"         | 95    | A1A4 (+5V SECT) T.P.                  |
| +5 VOLTS "B"         | 95    | A1A3 (+5V B)                          |
| 20V & 5V"A" GND      | 0     | A1A4 (20V GND & 5V GND)<br>(SECTIONS) |
| RF LO $\phi$ VOLTAGE | 19    | A3A4 Conn. PIN #2                     |
| IF LO $\phi$ VOLTAGE | 69    | A3A2 ( $\phi$ LOCK T.P.)              |

| RF TRAY CONNECTOR  |     |       |             |                |
|--------------------|-----|-------|-------------|----------------|
| DESIGNATION        | PIN | COLOR | FROM        | TO             |
| +20V OR MUTE (MOD) | 1   | 96    | A2A1 (+20V) | A4A4 Term. #4  |
| +20V OR MUTE       | 2   |       |             |                |
| RED                | 3   | 2     | A2A1 (+20V) | A4A1B-J8-PIN 2 |
| WHITE (GC)         | 4   | 9     | A2A1 (G.C.) | A4A1B-J8-PIN 3 |
| BLACK (GC)         | 5   | 0     | A2A1 GND    | A4A1B-J8-PIN 4 |
| 20V GND            | 6   |       | A2A1 (GND)  | A4A4 GND Lug   |
| 20V GND            | 7   |       |             |                |
| SHEILDED GROUND    | 9   |       | A2A1 (GND)  | Chassis GND    |

| MUTE RELAY A4A4 |       |                                          |
|-----------------|-------|------------------------------------------|
| DESIGNATION     | COLOR | TO                                       |
| 1               | 9     | A4A1B J1-15                              |
| 4               | 96    | A2A1 - (+20V)                            |
| 6               | 29    | A1A4 (+20V SECTION)                      |
| 8               | 20    | A1A3 (+20V POST)                         |
| GND LUG         | 0     | A2A1 GND, A1A4 (20V GND)<br>A1A3 20V GND |

| FROM: IF MODULE A2A1 |       |                                   |
|----------------------|-------|-----------------------------------|
| DESIGNATION          | COLOR | TO                                |
| +20 VOLTS            | 96    | A4A4 TERM. #4                     |
| +20 VOLTS            | 2     | A4A1B-J8 PIN #2                   |
| GROUND               | 0     | A4A4 (GND Lug)                    |
| GAIN CONTROL         | 9     | A4A1B-J8 PIN #3                   |
| GROUND               | 0     | A4A1B J8 PIN #4 &<br>Cable Shield |

| FROM: AMPLIFIER A A |       |    |
|---------------------|-------|----|
| DESIGNATION         | COLOR | TO |
| +20 VOLTS           |       |    |
| GROUND              |       |    |

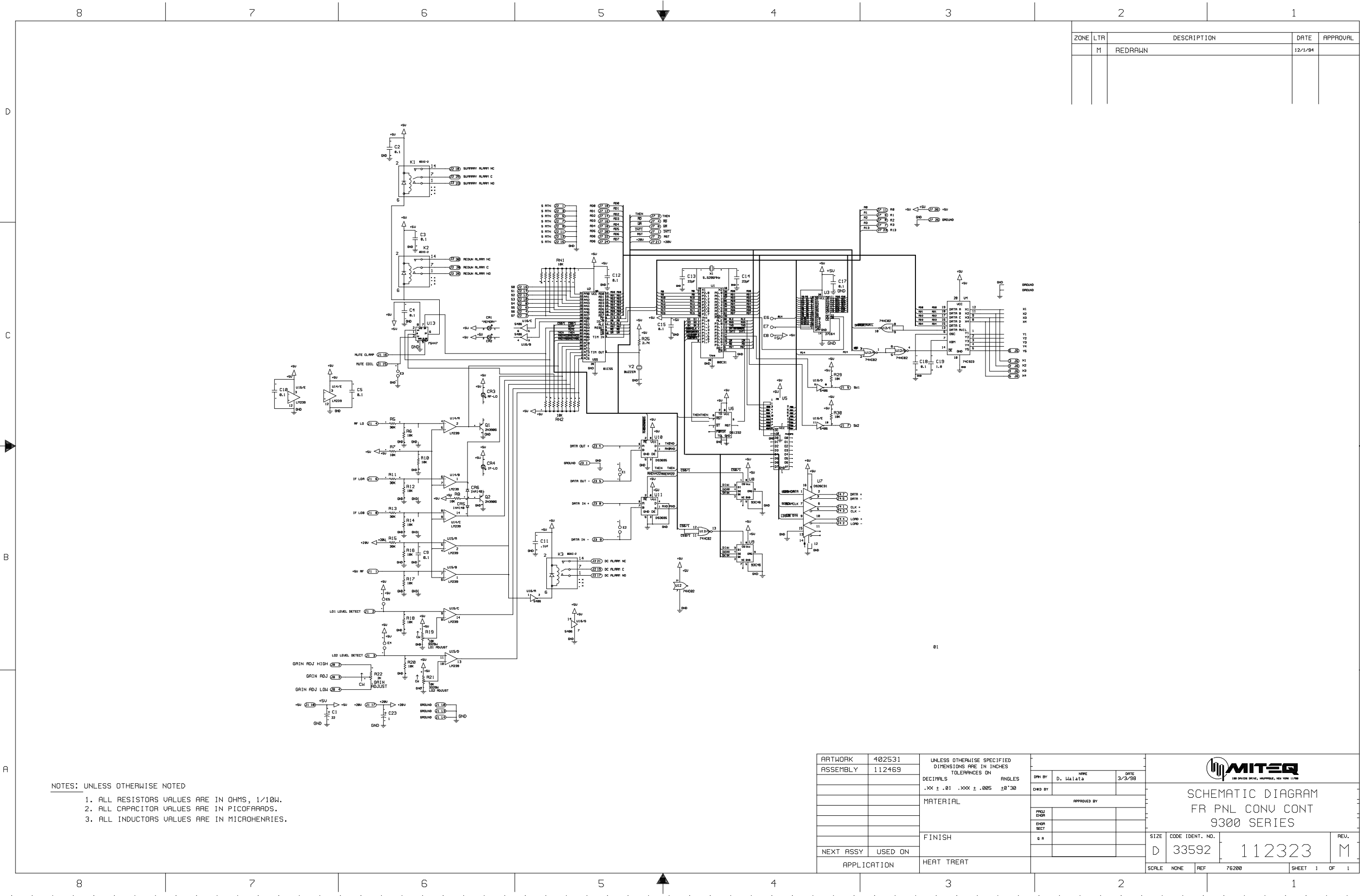
| FROM: CRYSTAL OSCILLATOR A3A1 |       |                  |
|-------------------------------|-------|------------------|
| DESIGNATION                   | COLOR | TO               |
| +20 VOLTS (OSC)               | 20    | A1A3 (+20V POST) |
| +20 VOLTS (HTR)               |       |                  |
| GROUND                        | 0     | A1A3 (20V GND)   |

| FROM: PHASE LOCK SOURCE A3A2 |       |                     |
|------------------------------|-------|---------------------|
| DESIGNATION                  | COLOR | TO                  |
| +20 VOLTS                    | 29    | A1A4 (+20V SECT)    |
| GROUND                       | 0     | A1A4 (20V GND)      |
| $\phi$ LOCK TEST POINT       | 69    | I.F. $\phi$ VOLT    |
| EXTERNAL LED-A               | 93    | A4A1B J1-PIN 6      |
| EXTERNAL LED-K               | 0     | A1A4 (20V GND SECT) |
| +5 VOLTS                     | 5     | A1A4 (+5V SECT)     |

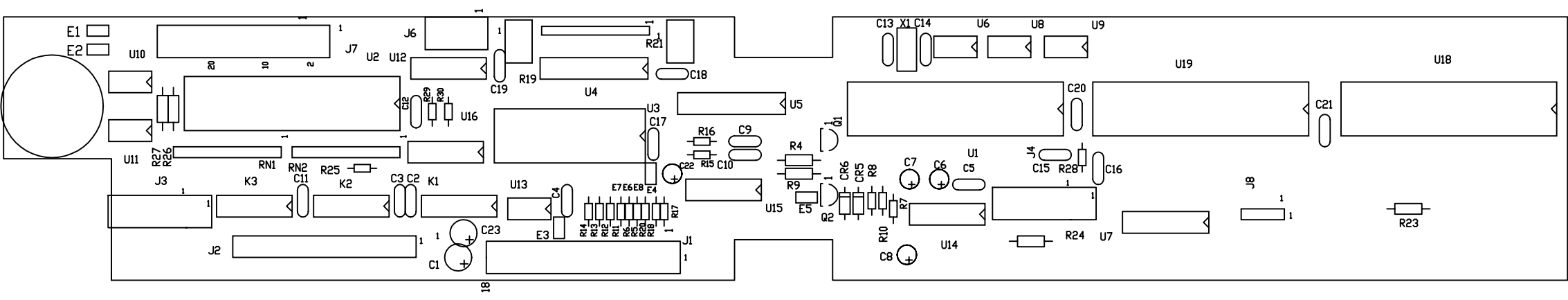
| FROM: FREQUENCY SYNTHESIZER A3A4 |     |       |                  |
|----------------------------------|-----|-------|------------------|
| DESIGNATION                      | PIN | COLOR | TO               |
| +20 VOLTS                        | 1   | 29    | A1A4 (+20V SECT) |
| TEST POINT                       | 2   | 19    | R.F. $\phi$ VOLT |
| ALARM LED                        | 3   | 91    | A4A1B J1-PIN 4   |
| +5 VOLTS                         | 4   | 5     | A1A4 (+5V SECT)  |
| 5 VOLT GROUND                    | 5   | 05    | A1A4 (5V GND)    |
| +20 VOLTS                        | 6   | 29    | A1A4 (+20V SECT) |
| N/C                              | 7   |       |                  |
| +5 VOLTS                         | 8   | 5     | A1A4 (+5V SECT)  |
| 20 VOLT GROUND                   | 9   | 0     | A1A4 (20V GND)   |

| GAIN ADJUST POTENTIOMETER |       |                |             |
|---------------------------|-------|----------------|-------------|
| DESIGNATION               | COLOR | FROM           | TO          |
| C.W.                      | 2     | A4A1B J8 PIN 2 | A2A1 (+20V) |
| C.T.                      | 9     | A4A1B J8 PIN 3 | A2A1 (G.C)  |
| C.C.W                     | 0     | A4A1B J8 PIN 4 | A2A1 (GND)  |

| FROM: 9300 SERIES CONTROL BOARD A4A1B |        |       |                       |
|---------------------------------------|--------|-------|-----------------------|
| DESIGNATION                           | J1 PIN | COLOR | TO                    |
| +5V"A" MON. (RF)                      | 1      | 5     | A1A3 (+5V POST)       |
| IF LO LEVEL DET.                      | 2      |       |                       |
| RF LO LEVEL DET.                      | 3      |       |                       |
| RF LO ALARM                           | 4      | 91    | A3A4 Conn. PIN #3     |
| IF LOA ALARM                          | 6      | 93    | A3A2 (ANODE EXT. LED) |
| TTL SWITCH CONT.                      | 7      |       |                       |
| IF LOB ALARM                          | 8      |       |                       |
| GROUND                                | 10     | 05    | A1A3 (5V"B" GND)      |
| MUTE COIL                             | 15     | 9     | A4A4 TERM #1          |
| +20V MONITOR                          | 17     | 29    | A1A3 (+20V POST)      |
| +5V "B"                               | 18     | 59    | A1A3 (+5V"B" POST)    |
| DESIGNATION                           | J8 PIN | COLOR | TO                    |
| +20 VOLTS                             | 2      | 2     | A2A1 (+20V)           |
| GAIN ADJ. VOLTAGE                     | 3      | 9     | A2A1 G.C.             |
| GAIN ADJ. COMMON                      | 4      | 0     | A2A1 GND              |
| DESIGNATION                           | J9 PIN | COLOR | TO                    |
| ATTEN. CONTROL                        | 1      |       |                       |
| ATTEN. RETURN                         | 2      |       |                       |



- J MOVE RY3 AND J4 .05 ON X  
ADDED CONNECTION U6 PIN6 -U10 PIN3  
INCREASED ALL PAD SIZE
- K REV:ARTWORK U18-20 W/GND.  
CLEAR +5V FROM INT LYR, REVISED SILKSCREEN  
ON WIRING SIDE, INCR MTG PAD.
- L ADDED J7 PIN 3
- M SHT 3: REVISED HOLE COUNT NEAR POT



SCHEMATIC 112323  
ARTWORK 402531

B. LaCiana

4-10-90

ASSY/DRILLING  
FRONT PANEL  
CONTROLLER

112469

**ORIGINAL****POWER SUPPLY DATA SHEET**DWG # 5666111/R

DEC 04 1986

WORK ORDER \_\_\_\_\_ MODEL FS05-113 QUANTITY \_\_\_\_\_ DATE \_\_\_\_\_CUSTOMER MITEQ TESTED BY: \_\_\_\_\_ Q.C. \_\_\_\_\_

| PARAMETER                             | TEST RESULTS             | ACCEPTANCE LIMITS                                  | TEST RESULTS             | ACCEPTANCE LIMITS                            | TEST RESULTS             | ACCEPTANCE LIMITS                            | TEST RESULTS | ACCEPTANCE LIMITS |
|---------------------------------------|--------------------------|----------------------------------------------------|--------------------------|----------------------------------------------|--------------------------|----------------------------------------------|--------------|-------------------|
| LINE REG.<br>110 - 132 VAC            |                          | $\leq 20\text{mV}$                                 |                          | $\leq 5\text{mV}$                            |                          | $\leq 5\text{mV}$                            |              |                   |
| 0-100% LOAD REG.<br>AT 110VAC         |                          | $\leq 20\text{mV}$                                 |                          | $\leq 5\text{mV}$                            |                          | $\leq 5\text{mV}$                            |              |                   |
| CURRENT LIMIT<br>AT 132VAC            |                          | .4 TO<br>4.6 AMPS                                  |                          | .4 TO<br>4.6 AMPS                            |                          | 2 TO<br>2.5 AMPS                             |              |                   |
| SHORT CIRCUIT<br>CURRENT<br>AT 132VAC |                          | 0.5 TO<br>1.3 AMPS                                 |                          | 0.5 TO<br>1.3 AMPS                           |                          | 0.25 TO<br>0.75 AMP                          |              |                   |
| RIPPLE<br>CONTENT P/P                 |                          | $\leq 5\text{mV}$                                  |                          | $\leq 5\text{mV}$                            |                          | $\leq 5\text{mV}$                            |              |                   |
| OVP<br>TRIP POINT                     |                          | 22.5 TO<br>25.5 VDC                                |                          | 5.7 TO<br>6.7 VDC                            |                          | 5.7 TO<br>6.7 VDC                            |              |                   |
| DROP OUT<br>VAC                       |                          | $\leq 108\text{VAC}$<br>$+20.03 \pm .03\text{VDC}$ |                          | $\leq 108\text{VAC}$                         |                          | $\leq 108\text{VAC}$                         |              |                   |
| OUTPUT<br>AT 115VAC<br>FULL LOAD      | _____ V<br>@<br>3.3 AMPS | $+20 \pm .05\text{VDC}$<br>@<br>3.3 AMPS           | _____ V<br>@<br>3.3 AMPS | $+5.025 \pm .025\text{VDC}$<br>@<br>3.3 AMPS | _____ V<br>@<br>1.5 AMPS | $+5.025 \pm .025\text{VDC}$<br>@<br>1.5 AMPS |              |                   |

NOTE:

1.) TEST PER PSTS-01.

## REVISIONS

| ECO | LTR | DESCRIPTION      | DATE    | APPROVED |
|-----|-----|------------------|---------|----------|
| —   | N/R | RELEASED TO PROD | 12-7-86 |          |

## APPROVALS

## DATE

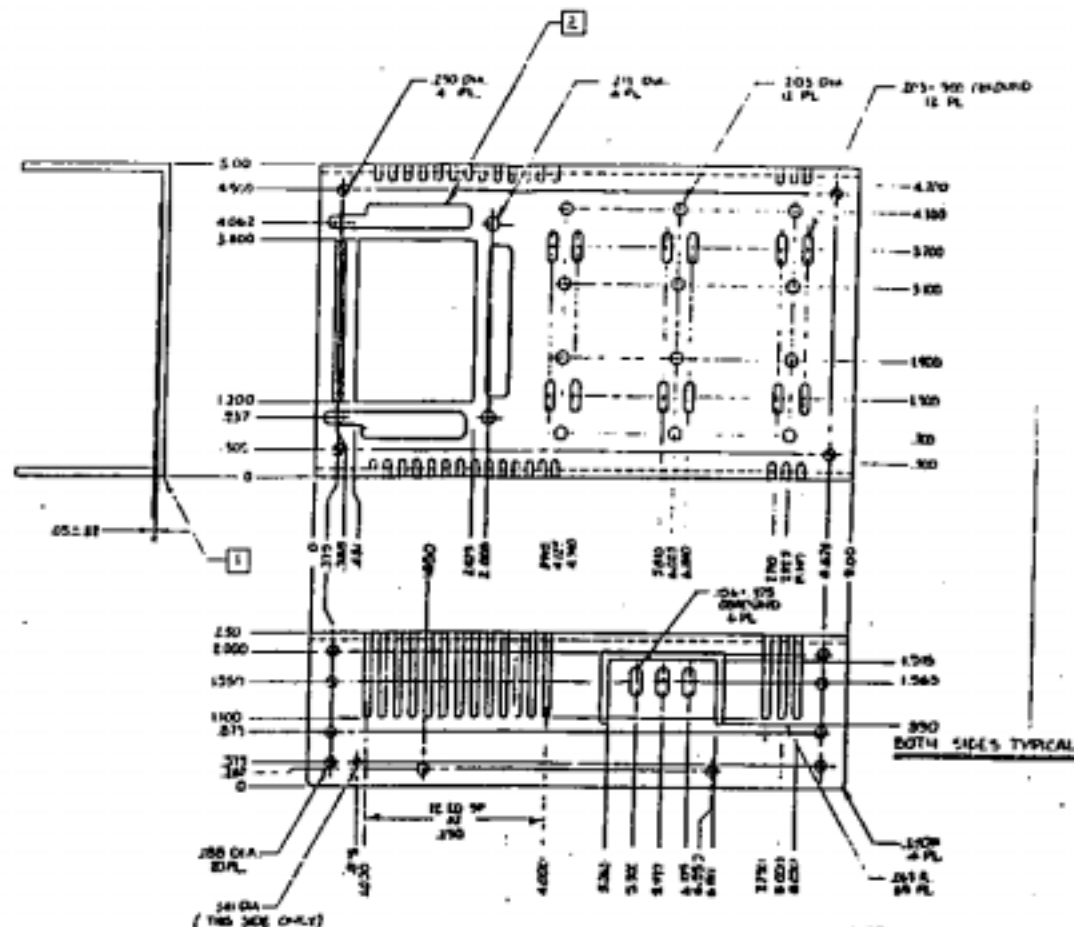
|                                 |         |
|---------------------------------|---------|
| DRAWN: <u>ADAM K. GILCHRIST</u> | 6-8-86  |
| CHECKED: <u>[Signature]</u>     | 12-3-86 |
| APPVD: <u>[Signature]</u>       | 12-3-86 |

 **Power-One**  
D.C. POWER SUPPLIES

SHEET 1 OF 1

**ORIGINAL**

LC 11 1985



BOTH SIDES TYPICAL

2. LSA RIDGE DUE TO FORM (LOCATE FROM XFMR MTDG HOLES)

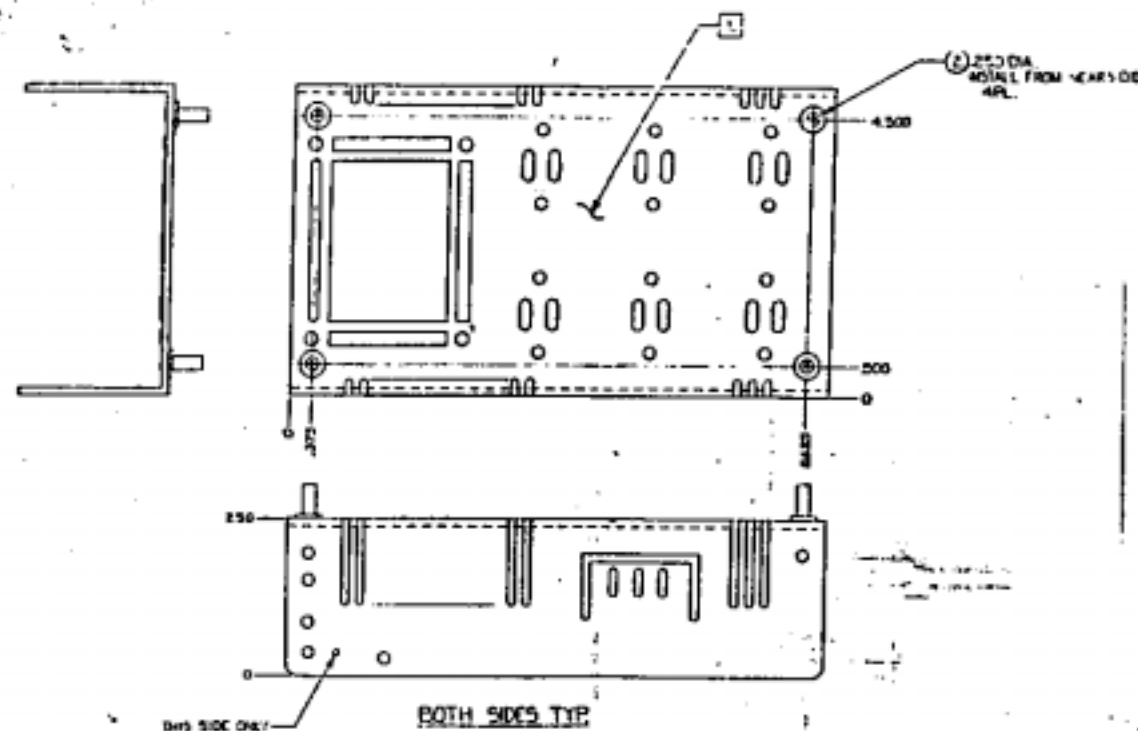
1. ALL BEAMS TO BE 90° ± 1°, LSA SHARP RADIUS WHEN FORMING

[illegible]

|     |           |    |      |      |
|-----|-----------|----|------|------|
| REV | DATE      | BY | CHKD | APPD |
| 1   | 1100-1014 |    |      |      |
| 2   | 1100-1014 |    |      |      |
| 3   | 1100-1014 |    |      |      |
| 4   | 1100-1014 |    |      |      |

**ORIGINAL**

NOV 04 1985



|     |           |           |                    |           |
|-----|-----------|-----------|--------------------|-----------|
| 4   | 2         | X3507     | STANDOFF, 832 x V2 | 504-21724 |
| 1   | 1         | 1100-1014 | CHASSIS, FROG      | 411-55610 |
| REV | DATE      | BY        | CHKD               | APPD      |
| 1   | 1100-1014 |           |                    |           |
| 2   | 1100-1014 |           |                    |           |
| 3   | 1100-1014 |           |                    |           |
| 4   | 1100-1014 |           |                    |           |
| 5   | 1100-1014 |           |                    |           |
| 6   | 1100-1014 |           |                    |           |
| 7   | 1100-1014 |           |                    |           |
| 8   | 1100-1014 |           |                    |           |
| 9   | 1100-1014 |           |                    |           |
| 10  | 1100-1014 |           |                    |           |
| 11  | 1100-1014 |           |                    |           |
| 12  | 1100-1014 |           |                    |           |
| 13  | 1100-1014 |           |                    |           |
| 14  | 1100-1014 |           |                    |           |
| 15  | 1100-1014 |           |                    |           |
| 16  | 1100-1014 |           |                    |           |
| 17  | 1100-1014 |           |                    |           |
| 18  | 1100-1014 |           |                    |           |
| 19  | 1100-1014 |           |                    |           |
| 20  | 1100-1014 |           |                    |           |
| 21  | 1100-1014 |           |                    |           |
| 22  | 1100-1014 |           |                    |           |
| 23  | 1100-1014 |           |                    |           |
| 24  | 1100-1014 |           |                    |           |
| 25  | 1100-1014 |           |                    |           |
| 26  | 1100-1014 |           |                    |           |
| 27  | 1100-1014 |           |                    |           |
| 28  | 1100-1014 |           |                    |           |
| 29  | 1100-1014 |           |                    |           |
| 30  | 1100-1014 |           |                    |           |
| 31  | 1100-1014 |           |                    |           |
| 32  | 1100-1014 |           |                    |           |
| 33  | 1100-1014 |           |                    |           |
| 34  | 1100-1014 |           |                    |           |
| 35  | 1100-1014 |           |                    |           |
| 36  | 1100-1014 |           |                    |           |
| 37  | 1100-1014 |           |                    |           |
| 38  | 1100-1014 |           |                    |           |
| 39  | 1100-1014 |           |                    |           |
| 40  | 1100-1014 |           |                    |           |
| 41  | 1100-1014 |           |                    |           |
| 42  | 1100-1014 |           |                    |           |
| 43  | 1100-1014 |           |                    |           |
| 44  | 1100-1014 |           |                    |           |
| 45  | 1100-1014 |           |                    |           |
| 46  | 1100-1014 |           |                    |           |
| 47  | 1100-1014 |           |                    |           |
| 48  | 1100-1014 |           |                    |           |
| 49  | 1100-1014 |           |                    |           |
| 50  | 1100-1014 |           |                    |           |
| 51  | 1100-1014 |           |                    |           |
| 52  | 1100-1014 |           |                    |           |
| 53  | 1100-1014 |           |                    |           |
| 54  | 1100-1014 |           |                    |           |
| 55  | 1100-1014 |           |                    |           |
| 56  | 1100-1014 |           |                    |           |
| 57  | 1100-1014 |           |                    |           |
| 58  | 1100-1014 |           |                    |           |
| 59  | 1100-1014 |           |                    |           |
| 60  | 1100-1014 |           |                    |           |
| 61  | 1100-1014 |           |                    |           |
| 62  | 1100-1014 |           |                    |           |
| 63  | 1100-1014 |           |                    |           |
| 64  | 1100-1014 |           |                    |           |
| 65  | 1100-1014 |           |                    |           |
| 66  | 1100-1014 |           |                    |           |
| 67  | 1100-1014 |           |                    |           |
| 68  | 1100-1014 |           |                    |           |
| 69  | 1100-1014 |           |                    |           |
| 70  | 1100-1014 |           |                    |           |
| 71  | 1100-1014 |           |                    |           |
| 72  | 1100-1014 |           |                    |           |
| 73  | 1100-1014 |           |                    |           |
| 74  | 1100-1014 |           |                    |           |
| 75  | 1100-1014 |           |                    |           |
| 76  | 1100-1014 |           |                    |           |
| 77  | 1100-1014 |           |                    |           |
| 78  | 1100-1014 |           |                    |           |
| 79  | 1100-1014 |           |                    |           |
| 80  | 1100-1014 |           |                    |           |
| 81  | 1100-1014 |           |                    |           |
| 82  | 1100-1014 |           |                    |           |
| 83  | 1100-1014 |           |                    |           |
| 84  | 1100-1014 |           |                    |           |
| 85  | 1100-1014 |           |                    |           |
| 86  | 1100-1014 |           |                    |           |
| 87  | 1100-1014 |           |                    |           |
| 88  | 1100-1014 |           |                    |           |
| 89  | 1100-1014 |           |                    |           |
| 90  | 1100-1014 |           |                    |           |
| 91  | 1100-1014 |           |                    |           |
| 92  | 1100-1014 |           |                    |           |
| 93  | 1100-1014 |           |                    |           |
| 94  | 1100-1014 |           |                    |           |
| 95  | 1100-1014 |           |                    |           |
| 96  | 1100-1014 |           |                    |           |
| 97  | 1100-1014 |           |                    |           |
| 98  | 1100-1014 |           |                    |           |
| 99  | 1100-1014 |           |                    |           |
| 100 | 1100-1014 |           |                    |           |

2. SUBTRACTOR FOR THE SUBTRACTOR AND SUBTRACTOR

(1) SHAKESCREEN BEARING ATTACH WERE USED

1.000-1014-1014

3

7

6

5

6

3

2

1

# ORIGINAL

DEC 04 1986

TO BE SILKSCREENED IN BLACK INK

|                                 |     |                                      |         |
|---------------------------------|-----|--------------------------------------|---------|
| CONTRACT NO.                    |     | <b>power-one</b> A.C. POWER SUPPLIES |         |
| APPROVALS                       |     | DATE                                 |         |
| DESIGNED BY: <i>[Signature]</i> |     | 6-19-86                              |         |
| CHECKED BY: <i>[Signature]</i>  |     | 11-3-86                              |         |
| ISSUED BY: <i>[Signature]</i>   |     | 11-3-86                              |         |
| CHASSIS SILKSCREEN              |     | MODEL NO. FS05-113                   |         |
| SIZE NO. OF PCS. 1              |     | DWG. NO. A56662                      |         |
| REV. N/R                        |     | REV. N/R                             |         |
| SCALE 1:1                       |     | SHEET 1 of 1                         |         |
| REVISIONS                       |     |                                      |         |
| ECO                             | LTR | DESCRIPTION                          | DATE    |
| ---                             | N/R | RELEASED TO PRODUCTION               | 3/11/87 |
| APPROVED                        |     | DATE                                 |         |
| [Signature]                     |     | 3/11/87                              |         |

**power-one** A.C. POWER SUPPLIES FS05-113

OUTPUT: +20VDC AT 3.3AMPS W/OVP  
 A + 5VDC AT 3.3AMPS W/OVP  
 B + 5VDC AT 1.5AMPS W/OVP

Q3

| AC INPUT                 |              | 47-63Hz     |     |         |  |
|--------------------------|--------------|-------------|-----|---------|--|
| FOR USE AT               | 100          | 120         | 220 | 230/240 |  |
| JUMPER                   | 1A3/1A3      | 2A3         | 2A3 | 2A3     |  |
| APPLY AC                 | 1A3/1A4      | 1A3         | 1A4 | 1A4     |  |
| MAX CURRENT/ FUSE RATING | 2 AMPS/ 250V | 1 AMP/ 250V |     |         |  |

Q2



EXTERNAL FUSE REQUIRED  
EXT

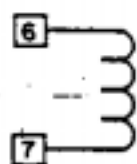
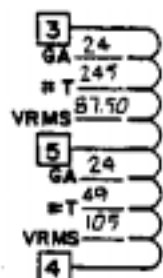
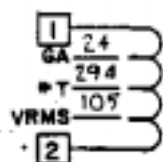


MADE IN USA

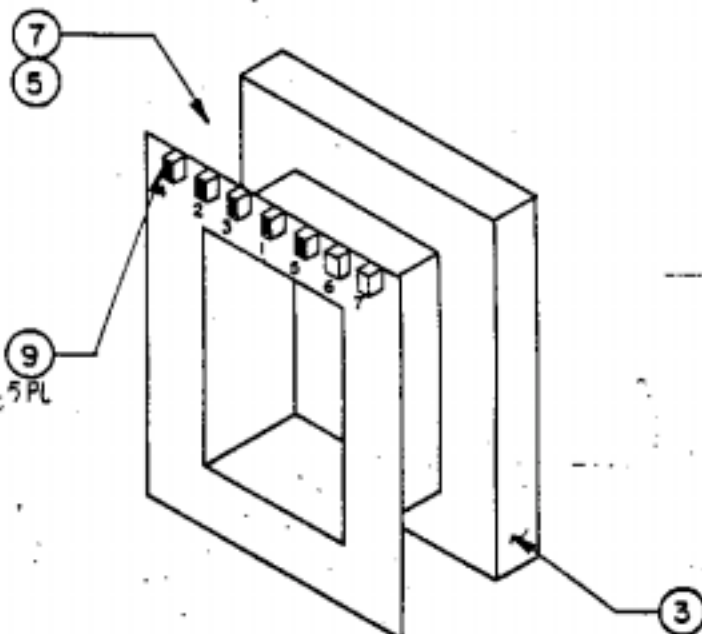
ORIGINAL

MAY 01 1986

| WINDING NUMBER    | 1        | 2         | 3 | 4 | REVISIONS |                  |         |       |
|-------------------|----------|-----------|---|---|-----------|------------------|---------|-------|
| WIRE-GAUGE, TYPE  | 24 NLZ   | 24 NLZ    |   |   | LTR       | DESCRIPTIONS     | DATE    | APPD. |
| PART NUMBER       | 260-0141 | 260-10141 |   |   | A         | RELEASE TO PROD. | 3/14/82 | AT    |
| TOTAL TURNS       | 294      | 294       |   |   | B         | INC. ECO 866B    | 4/11/83 | AT    |
| TAP               | -        | 49        |   |   |           |                  |         |       |
| LEAD NUMBERS      | 1-2      | 3-5-4     |   |   |           |                  |         |       |
| INT. BOBBIN WIDTH | .651     | .651      |   |   |           |                  |         |       |



SCHEMATIC



|    |            |                       |           |
|----|------------|-----------------------|-----------|
| 10 |            |                       |           |
| 9  | 5 EA.      | TERMINALS             | 250-50417 |
| 8  |            |                       |           |
| 7  | .75 FT.    | TAPE                  | 240-20967 |
| 6  |            |                       |           |
| 5  | .5809 LBS. | WIRE # 24 NLZ         | 260-10141 |
| 4  |            |                       |           |
| 3  | 1 EA.      | BOBBIN, EI 125 x 1.60 | 200-50477 |
| 2  |            |                       |           |
| 1  |            |                       |           |

| ITEM | QUANTITY | DESCRIPTION | STD. PART NO. |
|------|----------|-------------|---------------|
|------|----------|-------------|---------------|

INPUT: 100/120/220/240 VAC  $\pm 10\%$   $\pm 13\%$   
47-63 HZ

**POWER-ONE**  
A.C. POWER SUPPLIES

(805) 484-2806  
740 CALLE PLANO  
CAMARILLO, CA. 93010

TITLE

TRANSFORMER  
PRIMARY - SUB ASSEMBLY

NOTES:

|         | APPROVALS                    | DATE    | SIZE | IDENT. NO. | DWG. NO. | REV. |
|---------|------------------------------|---------|------|------------|----------|------|
| CP323   | DRAWN <i>Don Vanden</i>      | 5/15/81 |      |            |          |      |
| HN24/28 | CHECKED <i>7/12/81</i>       | 8/26/81 |      |            |          |      |
| HN12/15 | ENG. APPD. <i>Don Vanden</i> | 9/21/81 |      |            |          |      |
| HN7     | APPROVED                     |         | B    | 54407      | 50633    | B    |

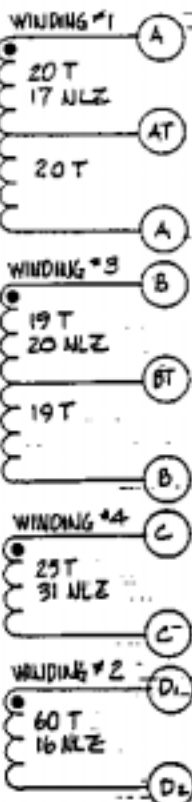
USED ON

MFG. APPD. *7/12/81* 1-17-P SCALE

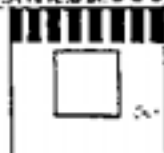
SHEET 1 OF 1

FILL FACTOR : 87 %

| R  | ECO | DESCRIPTION            | DATE   | APPR |
|----|-----|------------------------|--------|------|
| NR |     | RELEASED TO PRODUCTION | 7-7-77 | JHM  |
|    |     |                        |        |      |
|    |     |                        |        |      |
|    |     |                        |        |      |
|    |     |                        |        |      |



DATA B B C C D2



6. Q.R. NOT SHOWN ON THE LABEL. LEADS TO BE TERMINATED AS SHOWN.

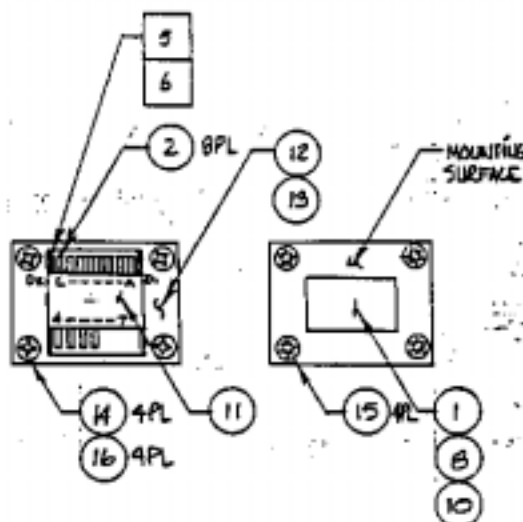
5. D1, D2 TO BE CURLED SELF-LEADS.

- 4. VARNISH PER P501001.
- 3. MARK PER P501002.
- 2. TAPE PER P501004.
- 1. MANUFACTURE PER POWER-ONE WORKMANSHIP STD. 53857.

NOTES:

|    |            |                       |            |
|----|------------|-----------------------|------------|
| 17 | .0798 LBS  | WIRE, 20 NLZ          | 260 - 1013 |
| 16 | 4          | WASHER                | 391 - 1020 |
| 15 | 4          | NUT, PRESS            | 340 - 1029 |
| 14 | 4          | SCREW, 8-32 X 2/8"    | 353 - 2129 |
| 13 | .076 LBS.  | LAMINATION KEEPER     | 280 - 1017 |
| 12 | 4.00 LBS.  | LAMINATION, M19, 24GA | 231 - 1016 |
| 11 | 1          | LABEL PLATE           | 274 - 506  |
| 10 | 1          | HOUSING               | 200 - 504  |
| 9  | 1          | SECONDARY COIL        | 092 - 766  |
| 8  | 1          | PRIMARY COIL          | 091 - 506  |
|    |            | ASSEMBLY, XFMR        | 082 - 766  |
| 7  | .0043 LBS. | WIRE, 31 NLZ          | 260 - 1014 |
| 6  | .1676 LBS  | WIRE, 17 NLZ          | 260 - 1013 |
| 5  | .3176 LBS. | WIRE, 16 NLZ          | 260 - 1013 |
| 4  | —          | TAPE .043" LEAD-OUT   | 240 - 207  |
| 3  | —          | TAPE .095"            | 240 - 207  |
| 2  | 8          | TERMINAL SECONDARY    | 250 - 504  |
| 1  | 1          | BOBBIN, EI 125 X 1.6  | 200 - 504  |
|    |            | SECONDARY COIL        | 092 - 766  |

APPLY 105 VAC AT TERMINALS 1;2



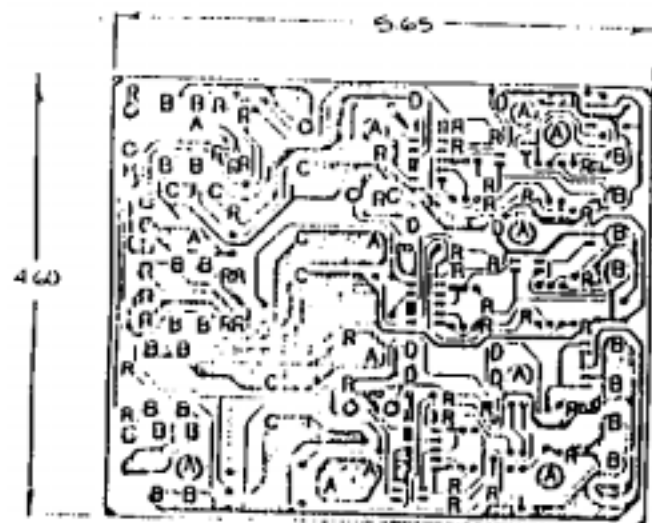
DEC 04 1986

| HY POT  |          | VOLTAGE RATIO TEST-PRIMARY TERMS |       |       |       | ITEM       | QTY    | DESCRIPTION        | P/N          |
|---------|----------|----------------------------------|-------|-------|-------|------------|--------|--------------------|--------------|
| TERMS   | VOLTS    | TERM                             | VOLT  | TERM  | VOLT  | APPROVALS  | DATE   |                    |              |
| PRI-PRI | 500 VAC  | 3-5                              | 87.50 | C-C   | 8.92  | Ray Redman | 8-1-80 | USED ON: ES05-113  |              |
| PRI-SEC | 3750 VAC | 3-4                              | 105   | D1-D2 | 21.42 |            | 7-2-77 | TITLE: TRANSFORMER |              |
| PRI-GND | 3750 VAC | A-AT                             | 7.14  |       |       |            | 7-2-77 | OWB NO. 56663      | RI N         |
| SEC-GND | 1500 VAC | A-A                              | 14.28 |       |       |            | 7-2-77 | SCALE: —           | SHEET 1 OF 1 |
|         |          | E-BT                             | 6.78  |       |       |            |        |                    |              |
|         |          | 3-8                              | 13.57 |       |       |            |        |                    |              |

# CONFIDENTIAL

DEC 04 1986

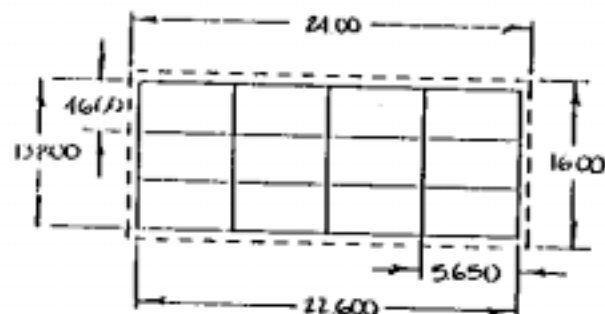
| REVISIONS |     |                       |      |          |
|-----------|-----|-----------------------|------|----------|
| ECO       | REV | DESCRIPTION           | DATE | APPROVED |
| 1         | 1   | RELEASE TO PRODUCTION |      |          |



| HOLE LEGEND |      |
|-------------|------|
| IDENT.      | QTY. |
| A           | 13   |
| B           | 24   |
| C           | 11   |
| D           | 8    |
| E           | 5    |
| H           | 1/0  |
| R           | 45   |
| J           | ---  |
| K           | ---  |
| L           | ---  |
| M           | ---  |

2

FOR HOLE DIA.  
REFER TO DWG. 16328



|                                    |      |                         |                                 |                                                              |
|------------------------------------|------|-------------------------|---------------------------------|--------------------------------------------------------------|
| 0033                               | 1    |                         | 063 BLK EXPT GASK, 1/10 OZ TR 1 | 509-21674                                                    |
| QTY REQ                            | ITEM | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION     | PURCHASING OFFICE (S)                                        |
| PARTS LIST                         |      |                         |                                 |                                                              |
| TOLERANCE .01 - .010<br>XXX - .010 |      | APPROVALS               | DATE                            | <b>POWER-ONE</b><br>CANAMKLO, CALIF. 93018<br>(805) 491-8808 |
| DRAWN                              |      | DATE                    |                                 |                                                              |
| CHECKED                            |      | DATE                    |                                 |                                                              |
| ENG APP'D                          |      | DATE                    |                                 |                                                              |
| MATERIAL                           |      | APPROVED                |                                 | TITLE<br><b>PWB. DRILL 1</b>                                 |
| SEE ITEM 1                         |      | DATE                    |                                 |                                                              |
| FINISH                             |      | DATE                    |                                 |                                                              |
| NEXT ASST                          |      | USED ON                 |                                 | SET CODE IDENT NO. DRAWING NO.<br><b>C 54407 56664</b>       |

3 MANUFACTURE PER M-I SPECIFICATION (P50100).

[2] ALL IN-MARKED HOLES TO BE "H" HOLES.

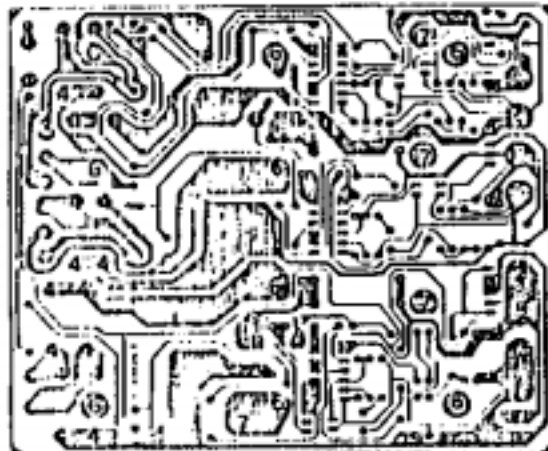
1 FOR PWB HARDWARE, SEE APPROPRIATE PWB. M-I.

NOTES: UNLESS OTHERWISE SPECIFIED

# ORIGINAL

DEC 04 1986

| REVISIONS |     | DESCRIPTION              | DATE | APPROVED |
|-----------|-----|--------------------------|------|----------|
| ECO       | 118 | RELEASE TO 17/1/18/15/11 |      |          |

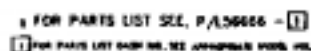


| IDENT | QTY | POWER-ONE P/N | DESCRIPTION                                | INSTALLATION |
|-------|-----|---------------|--------------------------------------------|--------------|
| 1     | 8   | 502-10227     | EYELET Ø810D x .155L                       | FARSIDE      |
| 2     | 8   | 503-10998     | TERM DUAL TUR MACH                         | FARSIDE      |
| 3     | —   | 503-13596     | TERM SGL TUR ROLLED<br>Ø80 O.D x .204 LONG | FARSIDE      |
| 4     | 16  | 503-10224     | TERM DUAL TURRET<br>Ø80 O.D x .320 LONG    | FARSIDE      |
| 5     | —   | 503-10222     | TERMINAL NO FASTON                         | FARSIDE      |
| 6     | 9   | 504-10223     | STANDOFF, THRU 3/16 L                      | NEAR SIDE    |
| 7     | 4   | 504-10223     | STANDOFF, THRU 3/16 L                      | FARSIDE      |
| 8     | —   | 504-20119     | SPACER, 6 CLEAR x .188                     | FARSIDE      |
| 9     | —   | 502-20602     | CAP EYELETS                                | NEAR SIDE    |
| 10    | —   | 312-10226     | FUSE CLIP                                  | FARSIDE      |
| 11    | 6   | 901-21242     | CAGE JACK                                  | NEAR SIDE    |
| 12    | —   | 504-21317     | STANDOFF, CAP                              | FARSIDE      |
| 13    | —   | 901-21322     | CAGE JACK (DIODE, SCR)                     | NEAR SIDE    |
| 14    |     |               |                                            |              |
| 15    |     |               |                                            |              |

|                                     |      |                       |                         |                                                                                                                                                                                                                             |  |                                                     |  |
|-------------------------------------|------|-----------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------|--|
| 1                                   |      | 1                     |                         | FIBER MILL                                                                                                                                                                                                                  |  | 506 56664                                           |  |
| QTY                                 | REQD | ITEM                  | PART OR IDENTIFYING NO. | DRAWING OR PART NUMBER                                                                                                                                                                                                      |  | PART NUMBER                                         |  |
| PARTS LIST                          |      |                       |                         |                                                                                                                                                                                                                             |  |                                                     |  |
| TOLERANCE .XX + .000<br>.XXX + .010 |      |                       |                         | APPROVALS                                                                                                                                                                                                                   |  | DATE                                                |  |
| MATERIAL                            |      |                       |                         | DRAWN                                                                                                                                                                                                                       |  | 11/12/86                                            |  |
|                                     |      |                       |                         | CHECKED                                                                                                                                                                                                                     |  | 12/3/86                                             |  |
|                                     |      |                       |                         | ENG APP'D                                                                                                                                                                                                                   |  |                                                     |  |
|                                     |      |                       |                         | APPROVED                                                                                                                                                                                                                    |  |                                                     |  |
| FINISH                              |      |                       |                         | THIS DRAWING AND SPECIFICATIONS, HEREIN, ARE THE PROPERTY OF POWER-ONE INC. and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission. |  | POWER-ONE<br>CAMPBELL, CALIF 93011<br>(805)484-3400 |  |
| NEXT ASST                           |      | USED ON               |                         | SIZE                                                                                                                                                                                                                        |  | C 54407                                             |  |
| APPLICATION                         |      | P/N NOT SCALE DRAWING |                         | DRAWING NO.                                                                                                                                                                                                                 |  | 56665                                               |  |

NOTES: UNLESS OTHERWISE SPECIFIED

DEC 04 1986



Received 15 June 2004; accepted 15 July 2004

| LAST REFERENCE<br>IN QUOTATION USED |    |    |   |
|-------------------------------------|----|----|---|
| CM                                  | CR | Q  | R |
| 200                                 | 1  | 12 | 1 |
| 1                                   |    |    |   |

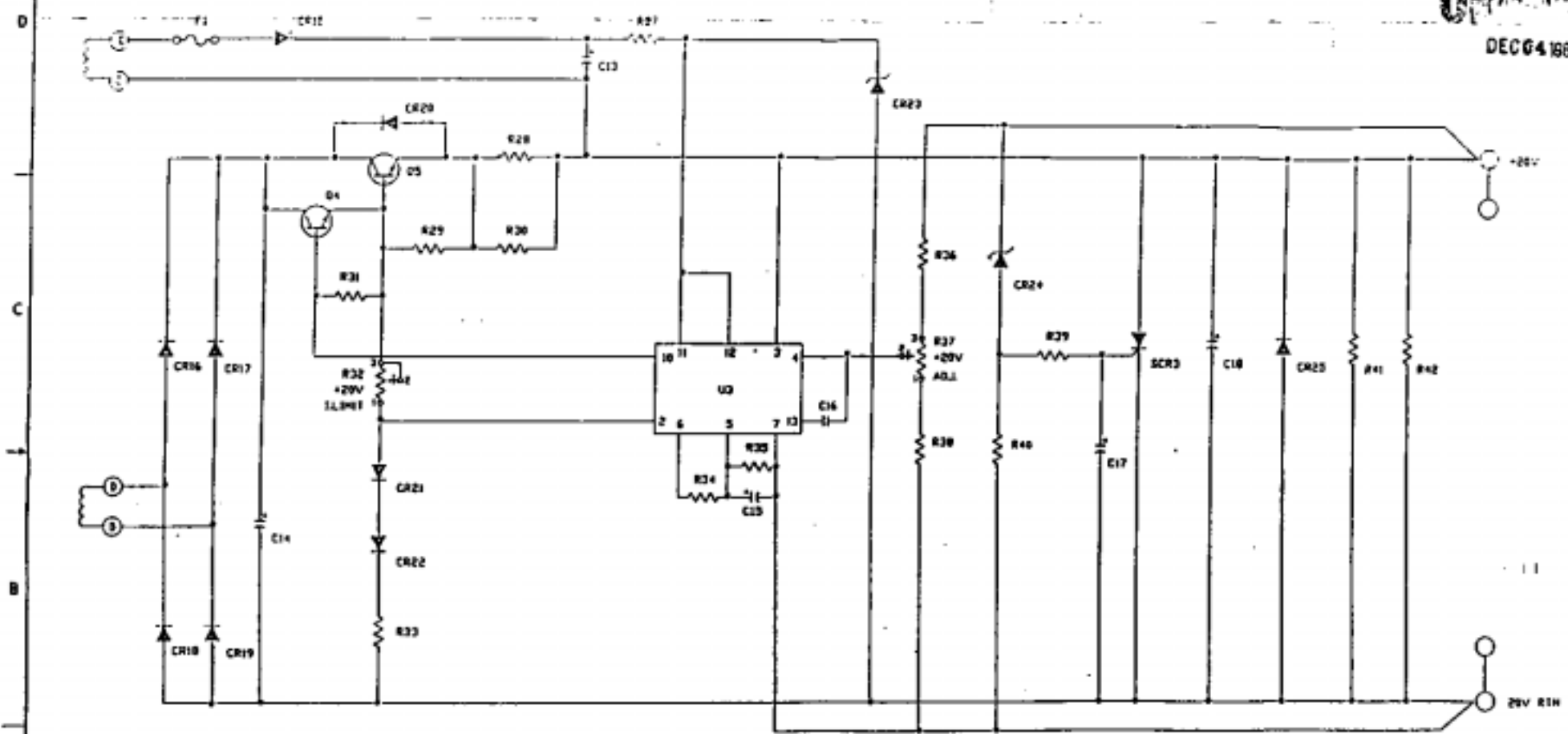
THE QUOTATION WAS USED

|              |      |       |        |
|--------------|------|-------|--------|
| NAME         | LAST | FIRST | MIDDLE |
| SSN          |      |       |        |
| DATE         |      |       |        |
| TIME         |      |       |        |
| ROOM         |      |       |        |
| TEST         |      |       |        |
| SCORE        |      |       |        |
| REMARKS      |      |       |        |
| TEST #       |      |       |        |
| TEST DATE    |      |       |        |
| TEST TIME    |      |       |        |
| TEST ROOM    |      |       |        |
| TEST SCORE   |      |       |        |
| TEST REMARKS |      |       |        |
| TEST #       |      |       |        |
| TEST DATE    |      |       |        |
| TEST TIME    |      |       |        |
| TEST ROOM    |      |       |        |
| TEST SCORE   |      |       |        |
| TEST REMARKS |      |       |        |

[illegible]

ORIGINAL

DEC 04 1986



POWER-ONE POWER SUPPLY

|                  |  |                    |  |                      |  |
|------------------|--|--------------------|--|----------------------|--|
| DATE: 12/04/86   |  | DRAWN BY: J. J. J. |  | CHECKED BY: J. J. J. |  |
| PROJECT: 54407   |  | SHEET: 2 OF 2      |  | POWER-ONE            |  |
| TITLE: SCHEMATIC |  | PARTS LIST         |  | REVISIONS            |  |
| REV: 1           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 2           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 3           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 4           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 5           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 6           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 7           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 8           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 9           |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |
| REV: 10          |  | DATE: 12/04/86     |  | BY: J. J. J.         |  |

**power-one**  
D.C. POWER SUPPLIES

**SHEET** | **OF 4**

REV.  
A

USED ON: FS05-113

## APPROVALS

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DRAWN: Geo-T. Gromley 8-11-86 ENG. APPD. Math. M. Jones 12-3-86

|                             |         |           |
|-----------------------------|---------|-----------|
| CHECKED: <i>[Signature]</i> | 17-3-81 | APPROVED: |
|-----------------------------|---------|-----------|

**NOTE:**

1. FOR SCHEMATIC, SEE DWG.#56666.

# ORIGINAL

MAR 12 1987

## REVISIONS

[illegible]

## PARTS LIST

 **power-one**  
D.C. POWER SUPPLIES

DWG. NO. PL. 56666-101

SHEET 2 OF 4

REV.  
SEE  
SHT. 1

| ITEM NO. | NOTE | QTY REQD | POWER ONE STD PART NO. | DESCRIPTION.                          | VENDOR NO. | REF. DES.        |
|----------|------|----------|------------------------|---------------------------------------|------------|------------------|
| 1        |      | 1        | 505-56665              | PRINTED WIRING BOARD                  | BD*56664   | A1               |
| 2        |      |          |                        |                                       |            |                  |
| 3        |      | 3        | 154-20020              | POTENTIOMETER, 2K                     |            | R9,22,37         |
| 4        |      | 3        | 154-20937              | POTENTIOMETER, 500 $\Omega$           |            | R2,15,32         |
| 5        |      |          |                        |                                       |            |                  |
| 6        |      | 1        | 158-10077              | RESISTOR, .12 $\Omega$ , 2W, 5%, M.O. |            | R4               |
| 7        |      | 3        | 158-10081              | .39 $\Omega$ , 2W, M.O.               |            | R17,28,30        |
| 8        |      | 3        | 150-20307              | 6.8 $\Omega$ , 1/4W, C.F.             |            | R12,25,39        |
| 9        |      | 4        | -20327                 | 47 $\Omega$                           |            | R5,11,18,24      |
| 10       |      | 3        | -20343                 | 220 $\Omega$                          |            | R13,26,34        |
| 11       |      | 2        | -20356                 | 750 $\Omega$                          |            | R8,21            |
| 12       |      | 4        | -20364                 | 1.6K                                  |            | R1,3,14,16       |
| 13       |      | 4        | -20368                 | 24K                                   |            | R29,31,38,40     |
| 14       |      | 6        | -20372                 | 3.6K                                  |            | R6,7,10,19,20,23 |
| 15       |      | 4        | 150-20375              | RESISTOR 4.7K, 1/4W, 5%, C.F.         |            | R33,36,41,42     |
| 16       |      |          |                        |                                       |            |                  |
| 17       |      | 0        | —                      | RESISTOR —                            |            | R35              |
| 18       |      | 1        | 151-10370              | RESISTOR, 1.6K, 1/2W, 5%, C.F.        |            | R27              |

MAR 12 1987

## PARTS LIST



DWG. NO. PL. 56666-101

SHEET 3 OF 4

REV.  
SEE  
SHT. 1

| ITEM NO. | NOTE | QTY REQD | POWER ONE STD PART NO. | DESCRIPTION.            | VENDOR NO. | REF. DES.                         |
|----------|------|----------|------------------------|-------------------------|------------|-----------------------------------|
| 19       |      | 3        | 130-10287              | I.C. VOLTAGE REGULATOR  | μA723      | U1,2,3                            |
| 20       |      |          |                        |                         |            |                                   |
| 21       |      | REF.     | 171-10262              | TRANSISTOR, NPN, TO-3   | 2N3055     | Q2,3,5                            |
| 22       |      | 1        | 172-10247              | TRANSISTOR, NPN, TO-92  | 2N2219     | Q1                                |
| 23       |      | 1        | 172-20771              | TRANSISTOR, NPN, TO-220 | TIP29A     | Q4                                |
| 24       |      |          |                        |                         |            |                                   |
| 25       |      | 3        | 160-10258              | SCR, 3A, 30V            | S0303LS3   | SCR 1,2,3                         |
| 26       |      |          |                        |                         |            |                                   |
| 27       |      | 1        | 120-20954              | FUSE, PICO, 1A, 125V    |            | F1                                |
| 28       |      |          |                        |                         |            |                                   |
| 29       |      | 11       | 111-10251              | DIODE, 1A, 200V         | IN4003     | CR 1,2,5,7,8,9,12,<br>14,15,20,25 |
| 30       |      | 2        | 4-10252                | 4 3A, 100V              | IN5401     | CR 10,11                          |
| 31       |      | 6        | 4-10256                | 6A, 50V                 | MR750      | CR 3,4,16,17,18,19                |
| 32       |      | 2        | 111-20058              | 0.2A, 100V              | IN4448     | CR 21,22                          |
| 33       |      | 2        | 112-10006              | ZENER, 5.6V             | IN752A     | CR 6,13                           |
| 34       |      | 1        | 112-10285              | DIODE ZENER, 24V        | IN970B     | CR 24                             |
| 35       |      | 0        | —                      | DIODE ZENER MAR 12 1987 | —          | CR 23                             |
| 36       |      |          |                        |                         |            |                                   |

## PARTS LIST

**power-one**  
D.C. POWER SUPPLIES

DWG. NO. PL.56666-101

SHEET 4 OF 4

REV.  
SEE  
SHT. 1

| ITEM NO. | NOTE | QTY REQD | POWER ONE STD PART NO. | DESCRIPTION.                    | VENDOR NO.  | REF. DES.         |
|----------|------|----------|------------------------|---------------------------------|-------------|-------------------|
| 37       |      | 6        | 101-10114              | CAPACITOR, ELECT., 10uf/25V     |             | C3,5,9,11,15,17   |
| 38       |      | 1        | -20932                 | 4700uf/16V                      |             | C8                |
| 39       |      | 1        | -20933                 | 10,000uf/16V                    |             | C2                |
| 40       |      | 1        | -21731                 | 7400uf/63V                      |             | C14               |
| 41       |      | 6        | 101-21987              | ELECT, 220uf/35V                |             | C1,6,7,12,13,18   |
| 42       |      | 2        | 104-10093              | FILM, .001uf/100V               |             | C4,10             |
| 43       |      | 1        | 105-10089              | CAPACITOR, CERAMIC, 470pf/1K    |             | C16               |
| 44       |      |          |                        |                                 |             |                   |
| 45       |      | 3        | 321-10679              | I.C. SOCKET, 14 PIN             |             | FOR: U1,2,3,1     |
| 46       |      | 4        | 352-10218              | SCREW 6-32X 5/16"               |             | FOR Q4, SCRI, 2,3 |
| 47       |      |          |                        |                                 |             |                   |
| 48       |      | 1        | 261-20002              | JUMPER, .250", 22 AWG, TEFL     |             | W1                |
| 49       |      | 1        | 261-20555              | JUMPER, 1.00", 22 AWG, TEFL     |             | W2                |
| 50       |      | 1        | 916-55490              | WIRE UL1429 16GA, WHITE, 3 1/2" | MAR 12 1966 | D(1)              |
| 51       |      | 1        | 916-21033              | WIRE UL1429 16GA, WHITE, 5 1/2" |             | D(2)              |
| 52       |      | 3        | 916-54958              | WIRE UL1429 16GA, WHITE, 3 1/2" |             | A, AT, A          |
| 53       |      | 3        | 914-21284              | WIRE UL1429 20GA, WHITE, 3 1/2" |             | B, BT, B          |
| 54       |      | 2        | 914-21065              | WIRE UL1429 20GA, BLACK, 5 1/2" |             | C, C              |

DATE IN \_\_\_\_\_

QTY. \_\_\_\_\_

DUE DATE \_\_\_\_\_

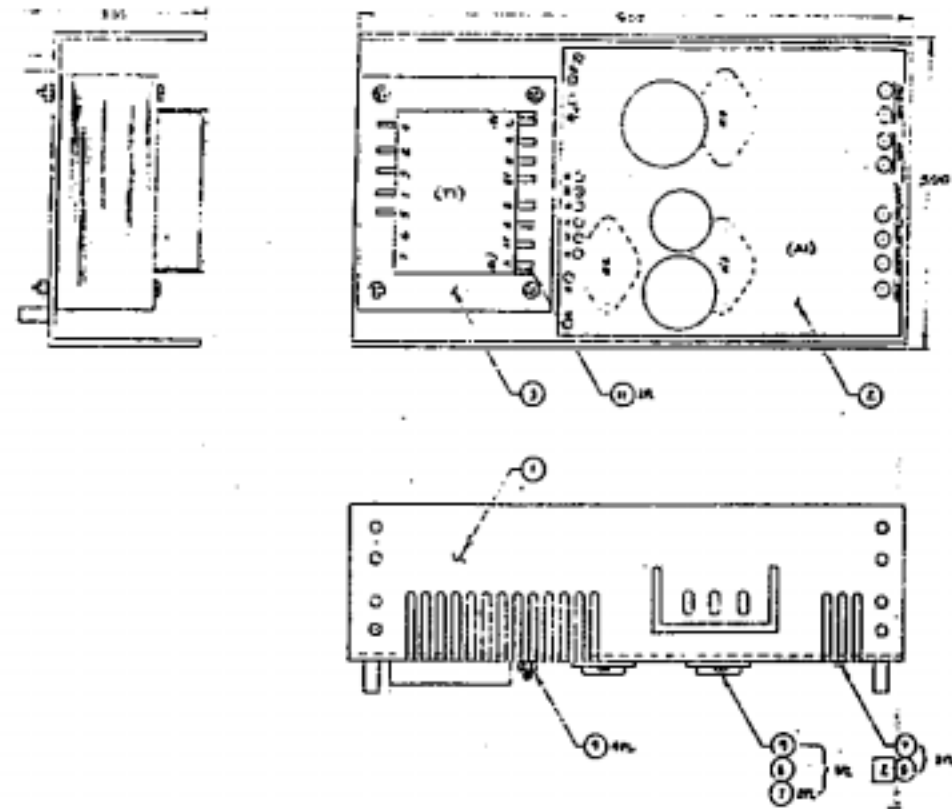
[illegible]

THIS DRAWING IS THE PROPERTY OF THE U.S. GOVERNMENT AND IS TO BE USED FOR THE PURPOSES SPECIFIED THEREIN. IT IS TO BE RETURNED TO THE U.S. GOVERNMENT WHEN NO LONGER REQUIRED.

REVISIONS  
REV. 1  
REV. 2  
REV. 3  
REV. 4  
REV. 5  
REV. 6  
REV. 7  
REV. 8  
REV. 9  
REV. 10

**ORIGINAL**

DEC 04 1966



NOTES: 1. WELDED PARTS AND TUBS.  
2. P.C. TRAYS NOT INDICATED, SEE APPROPRIATE MODEL M.B.L.  
NOTES: UNLESS OTHERWISE SPECIFIED

FOR PARTS LIST, SEE P/L 56660-1

|                       |  |                      |  |             |  |
|-----------------------|--|----------------------|--|-------------|--|
| PART NAME             |  | PART NO.             |  | REV. NO.    |  |
| POWER SUPPLY ASSEMBLY |  | 56660-1              |  | 1           |  |
| MANUFACTURED BY       |  | POWER-ONE            |  | DRAWING NO. |  |
| DATE                  |  | 12-1-66              |  | REV. NO.    |  |
| BY                    |  | J. J. J.             |  | REV. NO.    |  |
| CHECKED BY            |  | J. J. J.             |  | REV. NO.    |  |
| APPROVED BY           |  | J. J. J.             |  | REV. NO.    |  |
| APPLICATION           |  | DO NOT SCALE DRAWING |  | REV. NO.    |  |
| PART NAME             |  | PART NO.             |  | REV. NO.    |  |
| POWER SUPPLY ASSEMBLY |  | 56660-1              |  | 1           |  |
| MANUFACTURED BY       |  | POWER-ONE            |  | DRAWING NO. |  |
| DATE                  |  | 12-1-66              |  | REV. NO.    |  |
| BY                    |  | J. J. J.             |  | REV. NO.    |  |
| CHECKED BY            |  | J. J. J.             |  | REV. NO.    |  |
| APPROVED BY           |  | J. J. J.             |  | REV. NO.    |  |
| APPLICATION           |  | DO NOT SCALE DRAWING |  | REV. NO.    |  |

## PARTS LIST



DWG NO. PL. 56660-101

SHEET 1 OF 2

REV.  
N/R

TITLE: ASSEMBLY, POWER SUPPLY

USED ON: FS05-113

## APPROVALS

DATE \_\_\_\_\_

DATE \_\_\_\_\_

DRAWN: Roy Rodriguez

11-18-86

ENG. APPD.

17-3-86

CHECKED: *[Signature]*

12-386

**APPROVED:**

NOTE: 1, FOR ASSEMBLY, SEE DWG. #56660.

## WIRING TABLE

| FROM                | TO                |
|---------------------|-------------------|
| A1-A                | T1-A              |
| A1-AT               | T1-AT             |
| A1-B                | T1-B              |
| A1-BT               | T1-BT             |
| A1-C                | T1-C              |
| A1-D <sub>(1)</sub> | T1-D <sub>1</sub> |
| A1-D <sub>(2)</sub> | T1-D <sub>2</sub> |

ORIGINAL

DEC 04 1986

## REVISIONS

| ECO | LET | DESCRIPTION            | DATE   | APPD |
|-----|-----|------------------------|--------|------|
| —   | N/R | RELEASED TO PRODUCTION | 7-9-80 | AUMC |
|     |     |                        |        |      |
|     |     |                        |        |      |
|     |     |                        |        |      |

## PARTS LIST



DWG. NO. PL. 56660-101

SHEET 2 OF 2

 REV.  
SEE  
SHT. 1

| ITEM NO. | NOTE | QTY REQD | POWER ONE STD PART NO. | DESCRIPTION.                            | VENDOR NO.  | REF. DES.    |
|----------|------|----------|------------------------|-----------------------------------------|-------------|--------------|
| 1        |      | 1        | 412 - 56662            | CHASSIS W/SILKSCREEN                    | 59670/55938 |              |
| 2        |      | 1        | 081 - 56666-101        | P.W.B. ASSEMBLY                         | BD# 56664   | A1           |
| 3        |      | 1        | 082 - 56663            | TRANSFORMER                             |             | T1           |
| 4        |      | 3        | 171 - 10262            | TRANSISTOR, NPN, TO-3                   | 2N3055      | Q2,3,5       |
| 5        |      | 3        | 320 - 10288            | INSULATOR, MICA, TO-3                   |             |              |
| 6        |      | 3        | 320 - 10290            | INSULATOR, MCNABB, TO-3                 |             |              |
| 7        |      | 9        | 350 - 10206            | SCREW, B.H., 6-32 X 7/16"               |             |              |
| 8        |      | 3        | 391 - 20185            | SHOULDER WASHER                         |             |              |
| 9        |      | 4        | 340 - 10603            | NUT, KEP, # 8                           |             |              |
| 10       |      |          |                        |                                         |             |              |
| 11       |      | 125FT    | 360 - 22203            | SLEEVING, 3/8" DIA, CUT 3/4" LONG, 2 PL |             | FOR : D1, D2 |
| 12       |      |          |                        |                                         |             |              |
| 13       |      |          |                        |                                         |             |              |
| 14       |      |          |                        |                                         |             |              |
| 15       |      |          |                        |                                         |             |              |
| 16       |      |          |                        |                                         |             |              |
| 17       |      |          |                        |                                         |             |              |
| 18       |      |          |                        |                                         |             |              |

ORIGINAL

DEC 9 1960