

MODEL 1280
FSK MODEM
INSTRUCTION MANUAL

MARCH 1984

TMC21100

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TABLE OF CONTENTS

| SECTION | | PAGE |
|---------|--|------|
| I | INTRODUCTION | |
| | 1.1 Introduction | 1-1 |
| | 1.2 General Description | 1-1 |
| II | INSTALLATION | |
| | 2.1 General | 2-1 |
| | 2.2 Unpacking and Inspection | 2-1 |
| | 2.3 Power Requirements | 2-1 |
| | 2.4 Mounting | 2-3 |
| | 2.5 Signal Connections | 2-3 |
| | 2.6 Strapping Configuration | 2-5 |
| | 2.6.1 Input Impedance | 2-5 |
| | 2.6.2 Auto Mark Hold (AMH) Threshold Switch | 2-6 |
| | 2.6.3 Remote I/O Baud Rate Selection | 2-6 |
| | 2.6.4 Remote I/O Device Address Selection | 2-7 |
| | 2.6.5 Strapping by PC Board | 2-7 |
| | 2.6.5.1 Control Board | 2-7 |
| | 2.6.5.2 Modulator Board | 2-8 |
| | 2.6.5.3 Demodulator Board | 2-10 |
| | 2.7 Installation | 2-10 |
| | 2.8 Initial Checkout Procedure | 2-17 |
| | 2.8.1 Power Supply Checkout | 2-17 |
| | 2.8.2 Front Panel Keypad and Display Checkout | 2-17 |
| | 2.8.3 Remote Control Verification | 2-19 |
| III | OPERATION | |
| | 3.1 General | 3-1 |
| | 3.2 Controls and Display Indicator Elements | 3-1 |
| | 3.3 Remote Control Input | 3-9 |
| | 3.4 Status Output | 3-9 |
| | 3.5 Operating Procedures | 3-13 |
| | 3.5.1 Local Operation | 3-13 |
| | 3.5.1.1 Start-Up | 3-13 |
| | 3.5.1.2 Normal Operation | 3-13 |
| | 3.5.1.3 Standby Operation | 3-13 |
| | 3.5.1.4 Shut-Down | 3-13 |
| | 3.5.2 Remote Operation | 3-14 |
| | 3.5.2.1 Start-Up | 3-14 |

TABLE OF CONTENTS (cont.)

| SECTION | PAGE |
|---|------|
| IV THEORY OF OPERATION | |
| 4.1 General | 4-1 |
| 4.2 Functional Description | 4-1 |
| 4.3 Detailed Functional Description | 4-3 |
| 4.3.1 Demodulator Board | 4-3 |
| 4.3.1.1 Input Circuit | 4-3 |
| 4.3.1.2 Frequency Synthesis | 4-3 |
| 4.3.1.3 Mixer | 4-4 |
| 4.3.1.4 Bandpass Filter | 4-8 |
| 4.3.1.5 Filter, Detector and Gain Compensation | 4-11 |
| 4.3.1.6 Adaptive Slicer | 4-11 |
| 4.3.1.7 Miscellaneous Circuits | 4-12 |
| 4.3.2 Modulator Board | 4-13 |
| 4.3.2.1 Input Level Converter/ Detector | 4-13 |
| 4.3.2.2 Microprocessor Circuit | 4-13 |
| 4.3.2.3 Digital-To-Sine Wave Converter | 4-17 |
| 4.3.2.4 Tone Demultiplexer | 4-19 |
| 4.3.3 Control Board | 4-19 |
| 4.3.4 Front Panel Display Board | 4-23 |
| 4.3.5 Power Supply | 4-26 |
| 4.3.5.1 AC Power Supply | 4-26 |
| 4.3.5.2 Optional DC Power Supply | 4-26 |
| 4.3.6 Mother Board | 4-28 |
| 4.3.7 Optional Loop Power Supply and Keyer | 4-28 |
| V MAINTENANCE | |
| 5.1 General | 5-1 |
| 5.2 Preventive Maintenance | 5-1 |
| 5.3 Required Test Equipment | 5-1 |
| 5.4 System Tests and Adjustments | 5-2 |
| 5.4.1 Power Supply Verification Test | 5-2 |
| 5.4.2 Master Clock Verification | 5-4 |
| 5.4.3 Modulator Verification | 5-4 |
| 5.4.3.1 Mark and Space Frequency Verification | 5-4 |
| 5.4.3.2 Mark & Space Frequency Plus 1/2 Hz (+.5 Hz) Verification | 5-6 |
| 5.4.3.3 Normal/Reverse Output Verification | 5-7 |

TABLE OF CONTENTS (cont.)

| SECTION | | PAGE |
|---------|---|------|
| V | MAINTENANCE (cont.) | |
| | 5.4.3.4 Mute Function Verification | 5-7 |
| | 5.4.3.5 Tone Level Output Verification | 5-7 |
| | 5.4.4 Demodulator Verification | 5-8 |
| | 5.4.4.1 Distortion Verification Test | 5-8 |
| | 5.4.4.2 Data Output Verification | 5-9 |
| | 5.4.4.3 Auto Mark Hold (AMH) Output Verification Test | 5-12 |
| | 5.5 Troubleshooting | 5-13 |
| | 5.5.1 Printed Circuit Board Isolation | 5-13 |
| VI | ASSEMBLY DRAWINGS AND PARTS LISTS | 6-1 |
| VII | SCHEMATIC DIAGRAMS | 7-1 |
| | APPENDIX A - MODEL 1280 MODEM EMERGENCY (MANUAL) OPERATION | A-1 |

ILLUSTRATIONS

FIGURE

- 1-1 Model 1280 FSK Modem
- 1-2 Unit with Front Panel Removed

- 2-1 Rear Panel Connections
- 2-2 Input Impedance Selection Jumper Location
- 2-3 Auto Mark Hold Threshold Selection
- 2-4 Remote I/O Baud Rate Selection
- 2-5 Remote Device Address Selection
- 2-6 Expanded View of Control Board (D5697)
Component Side
- 2-7 Expanded Component View of Modulator
Showing Location of Jumpers
- 2-8 Expanded View of Demodulator Board
Showing Jumper Locations
- 2-9 Typical Modulator Application
- 2-10 Typical Demodulator Application
- 2-11 Remote Control Application
- 2-12 Typical High Level Applications

- 3-1 Model 1280 Front Panel

- 4-1 System Block Diagram
- 4-2 Demodulator Block Diagram
- 4-3 Mixer Logic and Waveforms
- 4-4 Commutating Filter Simplified Waveform Diagram
- 4-5 Modulator Block Diagram
- 4-6 64 Step Sinewave
- 4-7 Control Board Block Diagram
- 4-8 Front Panel Display Block Diagram
- 4-9 AC Power Supply Block Diagram

- 5-1 Test Setup
- 5-2 RS-232 Data Output
- 5-3 MIL-188C Data Output
- 5-4 Undetected Mark Output
- 5-5 Undetected Space Output
- 5-6 Mid-Bit Sample

- 6-1 Assembly, Model 1280
- 6-2 Chassis Assembly
- 6-3 Accessory Kit
- 6-4 Extender PWB Assembly
- 6-5 Front Panel Assembly
- 6-6 Front Panel PWB Assembly
- 6-7 Backplane PWB Assembly
- 6-8 Control PWB Assembly
- 6-9 Demodulator PWB Assembly
- 6-10 Modulator PWB Assembly
- 6-11 AC Power Supply Assembly
- 6-12 Power Supply PWB Assembly

ILLUSTRATIONS (cont.)

FIGURE

| | |
|------|---|
| 6-13 | Power Filter Assembly |
| 6-14 | Power Switch Assembly |
| 6-15 | Transformer |
| 6-16 | Interconnect Cable |
| 6-17 | Test Cable |
| 6-18 | Power Switch Test Cable |
| 6-19 | Optional High Level Assembly |
| 6-20 | Optional Loop Power Supply Sub-Assembly |
| 6-21 | Optional Quad High Level Keyer Sub-Assembly |
| 6-22 | Optional High Level Interface Assembly |
| | |
| 7-1 | Front Panel Board Schematic |
| 7-2 | Backplane Board Schematic |
| 7-3 | Control Board Schematic |
| 7-4 | Demodulator Board Schematic |
| 7-5 | Modulator Board Schematic |
| 7-6 | Power Supply Board Schematic |
| 7-7 | Optional Loop Power Supply Schematic |
| 7-8 | Optional Quad High Level Keyer Schematic |

TABLES

| TABLE | | PAGE |
|-------|---|------|
| 1-1 | Model 1280 Specifications | 1-3 |
| 2-1 | Modem Signal Connections | 2-3 |
| 2-2 | Optional High Level Keyer/Loop Supply Signal Connections | 2-4 |
| 2-3 | Remote Control Verification | 2-20 |
| 3-1 | Model 1280 Controls and Indicators | 3-2 |
| 3-2 | Model 1280 Remote Control Commands | 3-10 |
| 3-3 | Model 1280 Operating Procedures | 3-15 |
| 4-1 | Plasma Display Pin Functions | 4-25 |
| 5-1 | Required Test Equipment | 5-2 |
| 5-2 | Power Supply Voltages | 5-3 |
| 5-3 | Printed Circuit Board (PCB) Isolation | 5-14 |

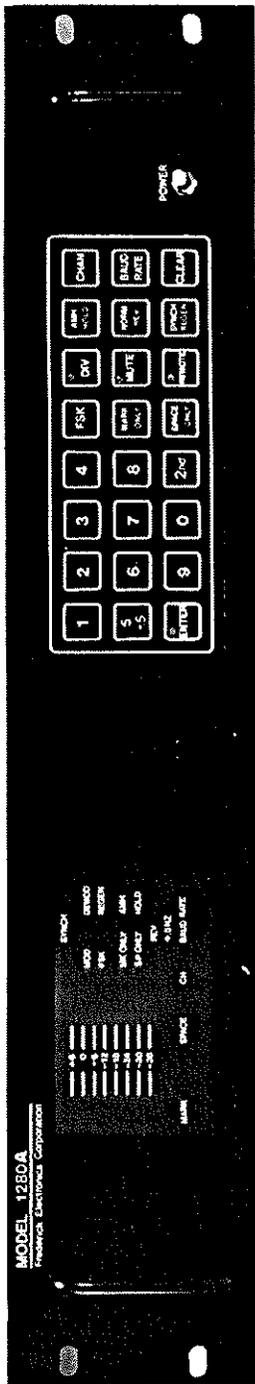


Figure 1-1. Model 1280A FSK Modem

SECTION I

INTRODUCTION

1.1 INTRODUCTION

The Model 1280 FSK Modem (Figure 1-1) is designed for use as a modem, a one or two channel modulator, or a one or two channel demodulator. It will accept input data of EIA-RS-232C, MIL-188C, or high level (20 to 60 milliamps) loop current. It operates in the FSK* mode with shifts of 60 to 200 Hz and in the FEK mode with shifts from 60 to 3000 Hz. Baud rates are selectable to 600.

1.2 GENERAL DESCRIPTION

The unit is microprocessor controlled. Operating parameters are entered by the front panel keypad (or a remote terminal) and displayed on the front panel plasma display.

The Modulator card(s) accepts high level current loop, RS-232, or MIL-188C data in and modulates it at the frequencies selected. The Demodulator card(s) receives the keyed tones and demodulates them as determined by the selected parameters with a resulting data output of RS-232, MIL-188C and optional high level current loop. The Control card serves as an interface between the keypad (or remote terminal) and the demodulator and modulator cards.

The location of the cards are depicted in Figure 1-2. The keypad and plasma display are located on the front panel.

* The modem offers true FSK as defined by FEC's U.S. Patent Number 4,317,209, which allows the change from mark to space to be made as a smooth progression of intermediate frequencies directly related to the selected keying rate. This reduces side band energy normally produced by the nearly instantaneous change from mark to space associated with the more commonly used FEK technique.

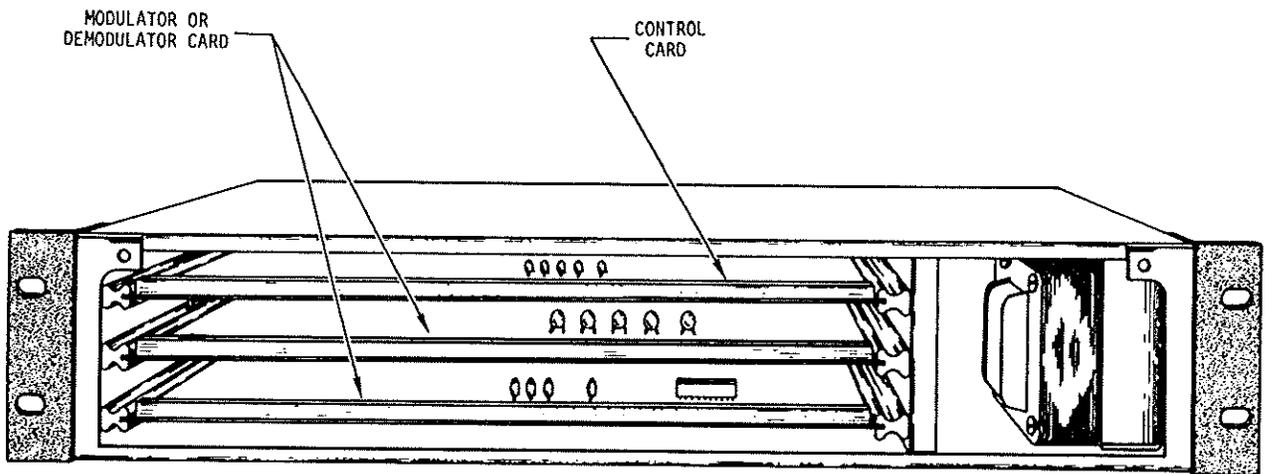


Figure 1-2. Unit With Front Panel Removed

The parameters selectable by the front panel keypad (or remote terminal) are as follows:

- a. Channel (one or two)
- b. Keying Type (FSK, Mark Only, Space Only, FEK)
- c. Diversity
- d. Mark Frequency
- e. Space Frequency
- f. Synchronous/Asynchronous mode
- g. Mute
- h. Baud Rate
- i. Output Polarity (normal or reverse)
- j. Auto Mark Hold/Hold (Standby)

A detailed functional analysis of each board is provided in Section IV, Theory of Operation.

Specifications are listed in Table 1-1.

Table 1-1. Model 1280 Specifications

| ITEM | SPECIFICATION |
|---------------------------|---|
| <u>MODULATOR</u> | |
| Output Impedance | 600 ohms \pm 10% (Balanced and Isolated) |
| Output Level | Internally adjustable from -20 dBm to +6 dBm into 600 ohms. |
| Output Frequency Range | 300-6000 Hz |
| Shift | 60-200 Hz (FSK) 60-3000 Hz (FEK) |
| Mark and Space Tones | Selectable in 0.5 Hz Increments |
| Mute (Low Level Only) | Automatic (strap selectable) Manual (keypad selectable) |
| Input Data | EIA-RS-232C, MIL-188C or Optional High Level Loop |
| Sense | Selectable |
| Waveform Quality | Level of any harmonic will be less than -40 dB referenced to 0 dBm tone output. Maximum level of spurious output -60 dBm tone into 600 ohms |
| <u>DEMODULATOR</u> | |
| Input Impedance | 600 or 10K ohms (Balanced and Isolated) (Strap Selectable) |
| Input Level | +6 to -45 dBm into 600 ohms |
| Input Frequency Range | 300-6000 Hz |
| Mark and Space Frequency | Selectable in 0.5 Hz steps |
| Shift | 60 to 3000 Hz |
| Baud Rate | Selectable 30 to 600 |
| Diversity | Selectable in 2-channel DEMOD configuration |

Table 1-1. Model 1280 Specifications (cont.)

| ITEM | SPECIFICATION |
|---------------------------------------|--|
| <u>DEMODULATOR</u> (cont.) | |
| Data Output | Selectable (keypad or remote) |
| Synchronous Mode Asynchronous Mode | Regenerated RS-232 and MIL-188C Programmable 5, 6, 7, or 8 level RS-232 and MIL-188C |
| Auto Mark Hold | Strap Selectable -18 to -39 dBm into 600 ohms |
| Sense | Selectable (keypad or remote) |
| Indicators | Plasma display of energy in filter (Bar Graphs), frequency of mark/Space tones and baud rate |
| Synchronizer | Tracking Range \pm 5% of Baud Rate |
| <u>REMOTE CONTROL</u> | |
| Device Number | Switch Selectable 01 thru 08. |
| Data In/Out | RS-232C Asynchronous (1 Start bit, 8 Data bits, 2 Stop bits) |
| Status | Received data only |
| Data Rate | Strap Selectable for 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud |
| Frequency | 300 to 6000 Hz (Must be 4-digit entry) |
| Baud Rate | To 600 baud (Must be 4-digit entry) |

Table 1-1. Model 1280 Specifications (cont.)

| ITEM | SPECIFICATION |
|-------------------------------------|--|
| <u>GENERAL</u> | |
| Dimensions | 19 in (48.26 cm) W x 3.5 in (8.89 cm) H x 14 in (35.56 cm) D. 18 in (45.72 cm) D with High Level Option. |
| Weight | Approximately 12 lbs (5.44 Kg). |
| Voltage | 115/230 Vac + 15%, 47 to 440 Hz (switch card selectable) |
| Optional Voltage #1 | 10 to 16 Vdc at 4A maximum |
| Optional Voltage #2 | 20 to 32 Vdc at 2.5A maximum |
| ENVIRONMENTAL | |
| Operating Range | |
| Temperature Humidity Altitude | 0° to 50°C (32° to 122°F) To 95% Non-condensing MSL to 10,000 feet |
| Non-Operating Range | |
| Temperature Humidity Altitude | -40° to +80°C To 95% Non-condensing MSL to 50,000 feet |
| OPTIONAL HIGH LEVEL | |
| Loop Power Supply | ± 65 Vdc at 80 MA max. (non-regulated) |
| Keyer | Polar/Neutral contacts isolated 80 MA max. |

SECTION II
INSTALLATION

2.1 GENERAL

This section contains instructions for unpacking, mounting and making all connections to the Model 1280 modem and its options.

2.2 UNPACKING AND INSPECTION

Open the shipping container. Do not use sharp metallic objects that might damage the contents. Remove the packing and the unit from the container and inspect for damage. If any damage is observed, file a written claim with the shipping agency and forward a copy of the claim to:

PLANTRONICS/Frederick Electronics Corporation
7630 Hayward Road, P.O. Box 502
Frederick, Maryland, 21701-0502

If packing for storage or reshipment is anticipated, replace the packing material in the shipping container and store for future use.

2.3 POWER REQUIREMENTS

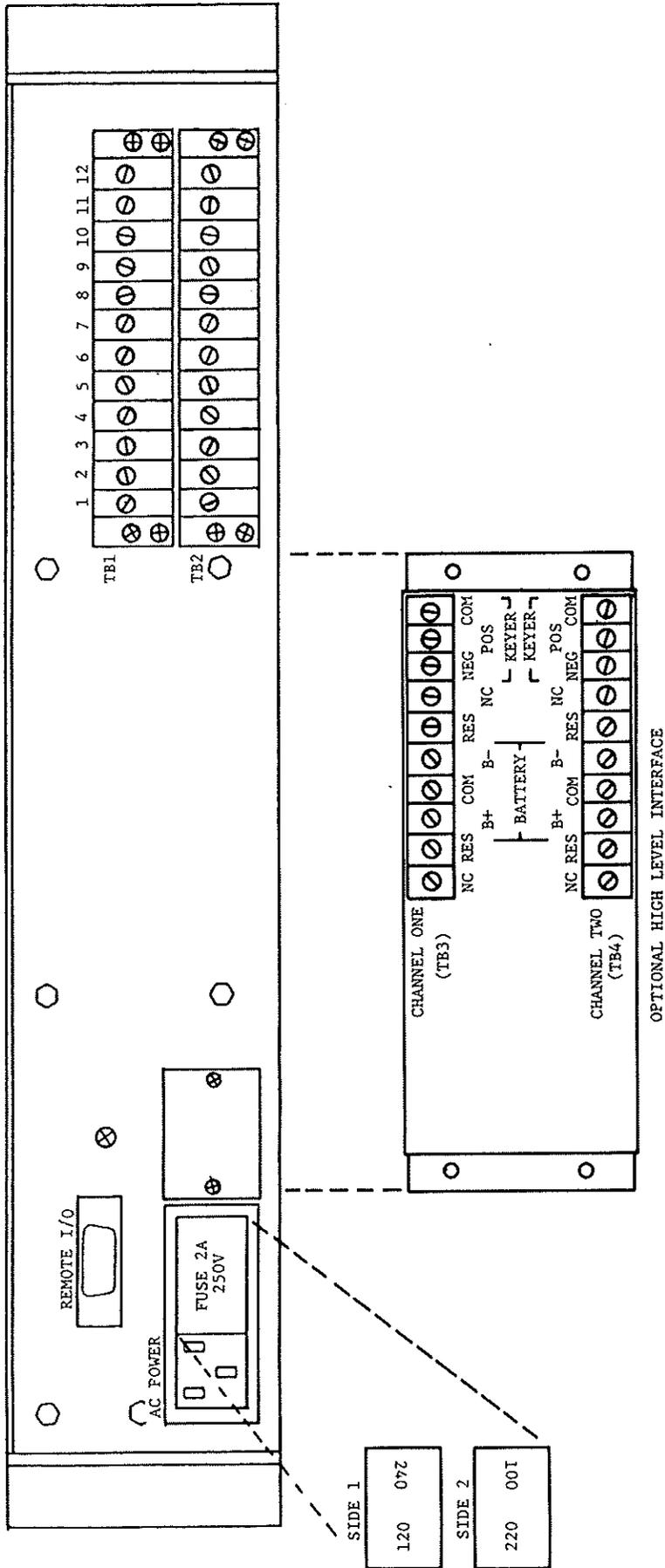
The Modem operates on either 115 or 230 Vac, +15 percent, 47 to 440 Hz or with optional Direct Current (dc) supplies, 10 to 16 Vdc at 4 Amps. maximum or 20 to 32 Vdc at 2.5 Amps. maximum. The unit can be set to operate on 115 volts or 230 volts by the position of the printed circuit (switch) board, located behind the fuse (F1) on the lower right-hand side of the unit. (Refer to Figure 2-1.) Power switch (S1) is located on the front panel. Turn the switch to the ON position to apply power.

* W A R N I N G *

The AC input circuit of this unit contains voltages which may be hazardous to life. Exercise caution while working in the unit when protective cover is removed.

- - - - -
C A U T I O N
- - - - -

Insure the switch board is inserted correctly for the input voltage being used. Refer to Figure 2-1.



 C A U T I O N

FOR 110-120V OPERATION INSERT SWITCH BOARD SIDE 1 UP AS ILLUSTRATED.

FOR 220-240V OPERATION INSERT SWITCH BOARD SIDE 1 UP, ROTATED 180°.

(SIDE 2 OF THE SWITCH BOARD IS NOT USED.)

Figure 2-1. Rear Panel Connections

2.4 MOUNTING

The Modem is designed to mount in a standard 19-inch (48.3 cm) rack. A vertical rack space of 3.5 inches (8.9 cm) is required.

2.5 SIGNAL CONNECTIONS

All signal connections to the Modem are made on the rear panel of the unit and optional High Level Keyer/Supply (Figure 2-1). Connections are listed in Table 2-1 and 2-2.

- - - - -
C A U T I O N
 - - - - -

High level loop current must be externally limited to 80 ma maximum (60 ma typical) and arc suppression to less than 350 volts.

Table 2-1. Modem Signal Connections

Signal connections to TB1/TB2 are determined by the board type (modulator or demodulator) which is installed in each location.

| PIN NUMBER TB1/TB2 | EXPLANATION |
|--------------------|-----------------------------|
| Modulator | |
| 1 | Input/Output Signals |
| 2 | - High Level Input |
| 3 | + High Level Input |
| 4 | N.C. |
| 5 | N.C. |
| 6 | MARK Frequency Output |
| 7 | SPACE Frequency Output |
| 8 | Low Level Input |
| 9 | N.C. |
| 10 | Balanced Output |
| 11 | Balanced Output |
| 12 | Analog Ground |
| 12 | Analog Ground |
| Demodulator | |
| 1 | Input/Output Signals |
| 2 | N.C. |
| 3 | N.C. |
| 4 | Data Mid-Bit Sample |
| 5 | N.C. |
| 6 | Undetected MARK |
| 7 | Undetected SPACE |
| 8 | Data Output RS-232-C |
| 9 | Data Output MIL-188-C |
| 10 | Balanced Audio Input |
| 11 | Balanced Audio Input |
| 12 | Ground |
| 12 | Ground |

Table 2-1. Signal Connections (cont.)

| | EXPLANATION |
|------------|--|
| Remote I/O | Remote Terminal Input/Output Connections |
| 1 | Data Input |
| 2 | Data Output |
| 3 | Status Input (CTS) |
| 4 | Status Output (CTS) |
| 5 | Status Output (RTS) |
| 6 | Status Input (RTS) |
| 7 | Ground |
| 8 | N.C. |
| 9 | N.C. |
| AC POWER | 115 Vac/230 Vac/dc Power Connector |

Table 2-2. Optional High Level Keyer/Loop Supply Signal Connections

Signal connections to TB3/TB4 are identical and provide high level output(s) for corresponding demodulator(s).

| PIN CONNECTION | EXPLANATION |
|----------------|---|
| NC | NC Connection |
| RES | External Current Limiting Resistor |
| B+ > | Internal Loop Positive (+) Battery (B+) |
| COM > BATTERY | Internal Loop Common (BCOMM) |
| B- > | Internal Loop Negative (-) Battery (B-) |
| RES | External Current Limiting Resistor |
| NC | N.C. |
| NEG > | MARK Keyer Output (MK) |
| POS > KEYER | SPACE Keyer Output (SP) |
| COM > | Keyer Loop Common (LP COMM) |

2.6 STRAPPING CONFIGURATION

Several switches and jumpers allow the Modem to be user modified to suit different applications and should be set before power is applied.

2.6.1 Input Impedance

Jumper W4 on the demodulator board (D5707), as shown in Figure 2-2. The input impedance is 600 ohms with the jumper in and 10 K ohms with the jumper out.

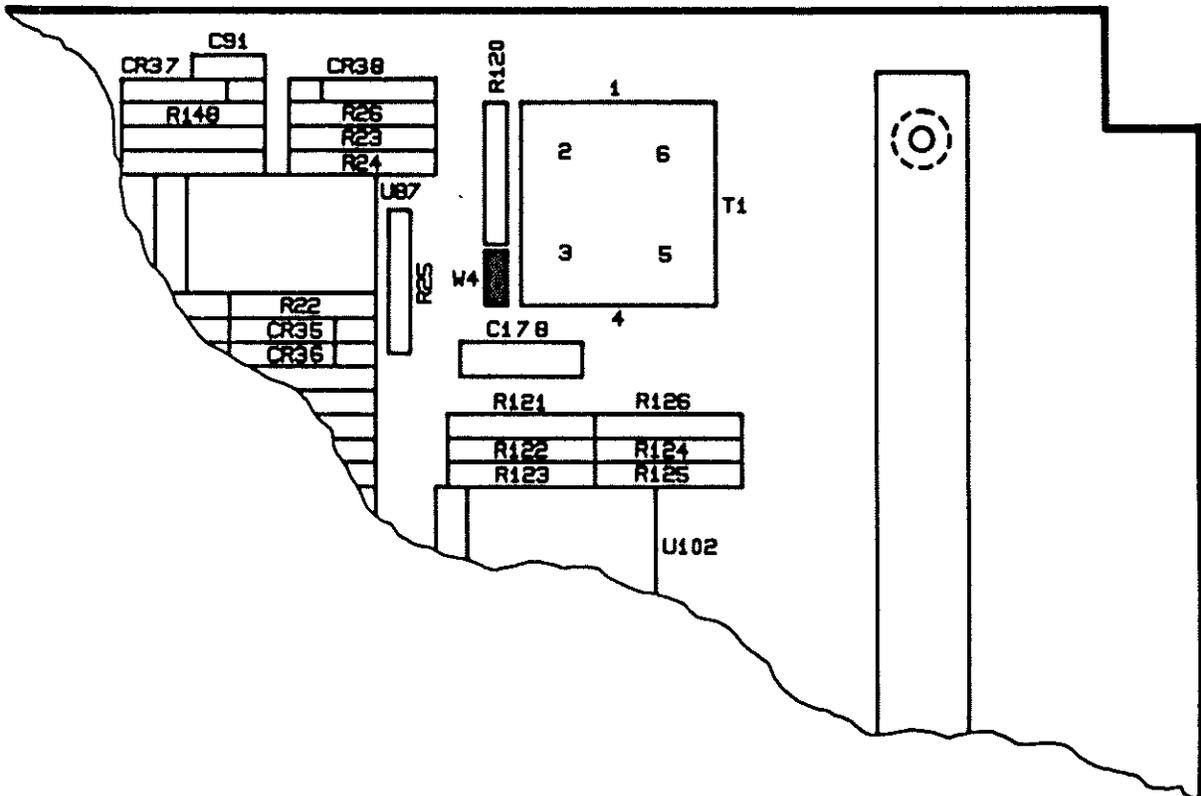


Figure 2-2. Input Impedance Selection
Jumper Location

2.6.2 Auto Mark Hold (AMH) Threshold Switch

The auto mark hold threshold level is selected by switch S7 on the demodulator board. The threshold value is selectable between -18 dBm and -39 dBm in eight 3 dB steps as shown in Figure 2-3, which illustrates a -18 dB setting.

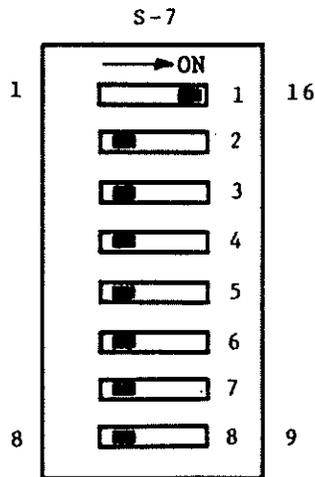


Figure 2-3. Auto Mark Hold Threshold Selection

2.6.3 Remote I/O Baud Rate Selection

The baud rate selection for the remote control device is accomplished by installing a jumper in the header U8 on the control board as shown in Figure 2-4. Labels beside U8 indicate the baud rate achieved by each jumper.

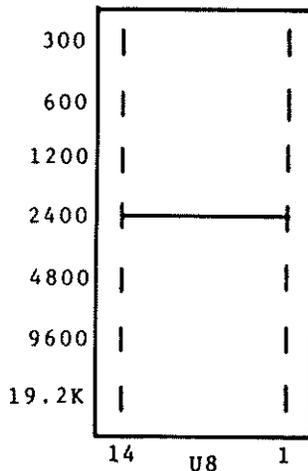
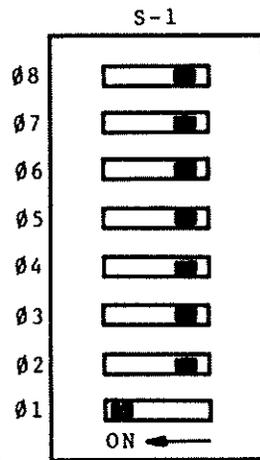


Figure 2-4. Remote I/O Baud Rate Selection

2.6.4 Remote I/O Device Address Selection

The remote control device address is selectable on the control board by switch S1 as shown in Figure 2-5. The address selected by each switch is labeled beside the switch from 01 thru 08.

This switch selects the identification number of the unit when more than one unit is being controlled by the same remote device.



CHANNEL ADDRESS SWITCH

Figure 2-5. Remote Device Address Selection

2.6.5 Strapping By PC Board

2.6.5.1 CONTROL BOARD. The following jumpers must be installed when less than five RS-232 loads are to be driven.

| JUMPER | CONNECTION | SIGNAL |
|--------|------------|---------------------|
| E1-E2 | P1A12 | Remote Data Output |
| E3-E4 | P1B12 | Status Output (RTS) |
| E5-E6 | P1A13 | Status Output (CTS) |

Refer to Figure 2-6 for locations of jumpers.

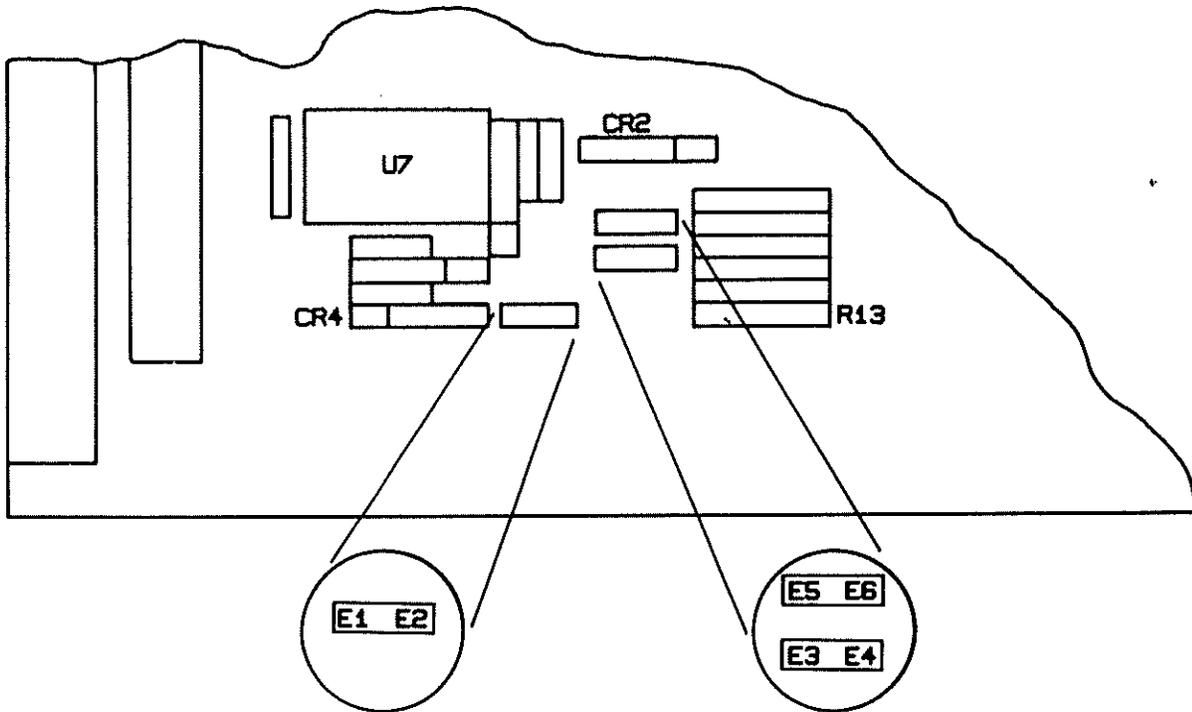


Figure 2-6. Expanded View of Control Board (D5697)
Component Side

2.6.5.2 MODULATOR BOARD (D5725). The following jumpers, as shown in Figure 2-7 will yield the indicated results.

| JUMPER | IN | OUT | RESULTS |
|--------|----|-----|--------------------------------------|
| W1 | X | | Test Probe Ground "Always Installed" |
| W2 | X | | Half-Duplex Operation |
| W2 | | X | Full-Duplex Operation |
| W3 | | X | RS-232-C Input |
| W3 | X | | MIL-188-C Input |
| W4 | X | | Auto Mute |
| W4 | | X | No Auto Mute |
| W5 | X | | Not Used "Always Installed" |
| W6 | X | | Not Used "Always Installed" |
| W7 | X | | 60 ma Input Current Max. |
| W8 | X | | 20 ma. Input Current Max. |
| W9 | X | | Test Probe Ground "Always Installed" |

2.6.5.3 DEMULATOR BOARD (D5707). The following jumpers, as shown in Figure 2-8 will yield the indicated results.

| JUMPER | IN | OUT | RESULTS |
|--------|----|-----|---|
| W1 | X | | Commutating filter feedback "Normally Installed" - Removed for troubleshooting only. |
| W2 | X | | Commutating filter feedback "Normally Installed" - Removed for troubleshooting only. |
| W3 | X | | Test probe ground "Always Installed". |
| W4 | X | | 600 ohm Input Impedance. |
| W4 | | X | 10K ohm Input Impedance. |

2.7 INSTALLATION

Signal Connections for typical operating conditions are illustrated in Figures 2-9 through 2-12.

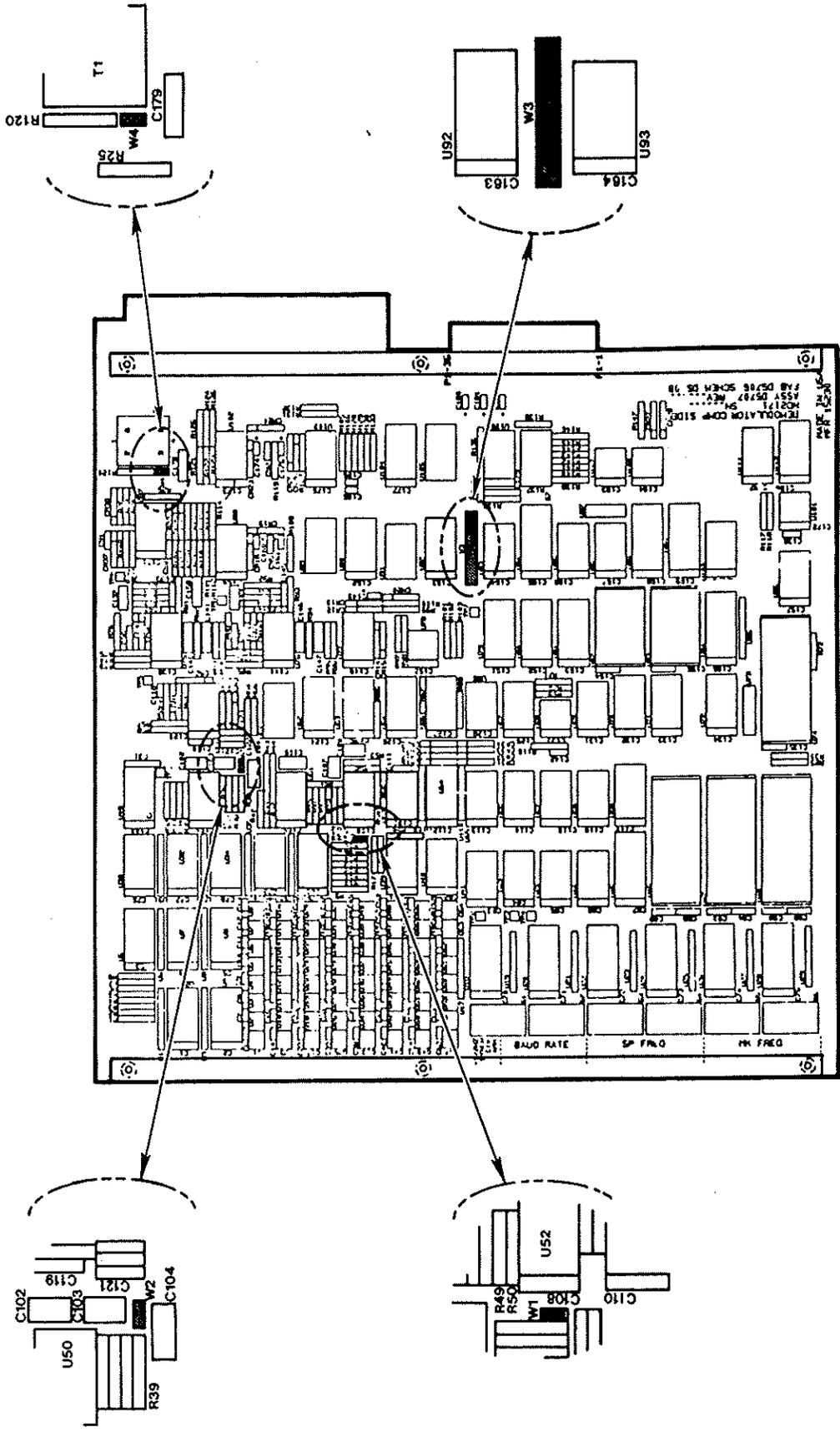


Figure 2-8. Expanded View of Demodulator Board
Showing Jumper Locations

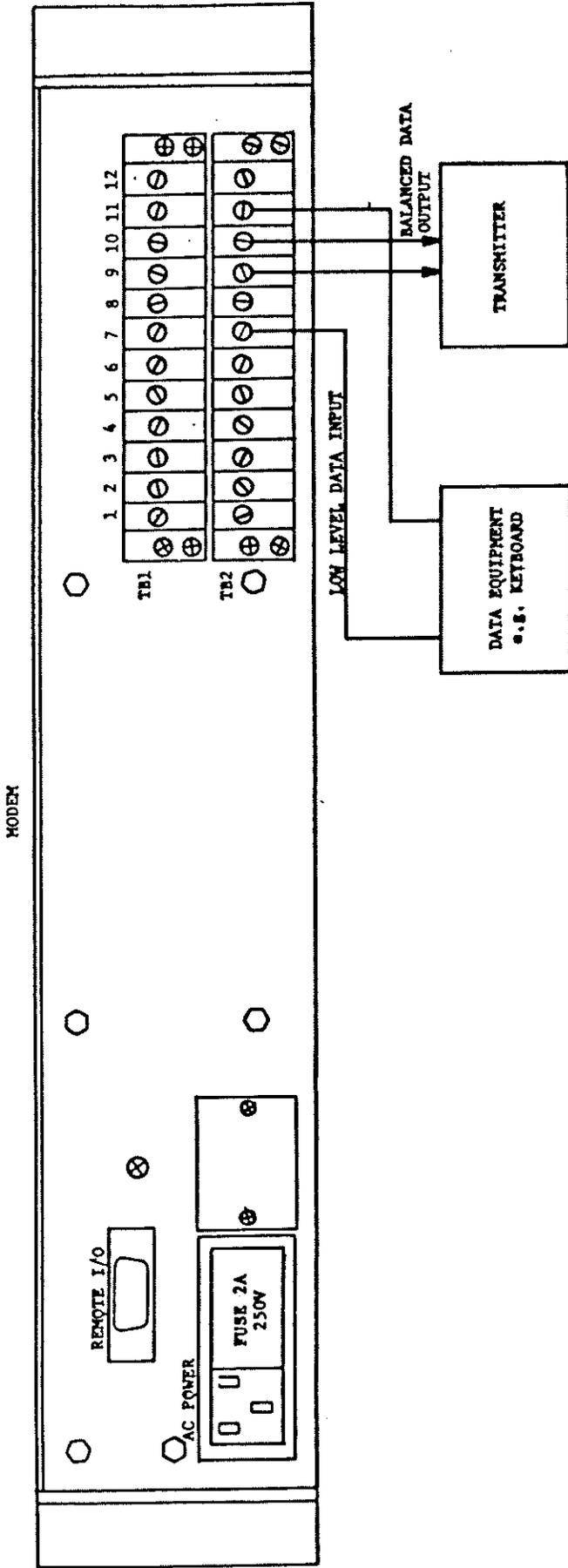


Figure 2-9. Typical Modulator Application

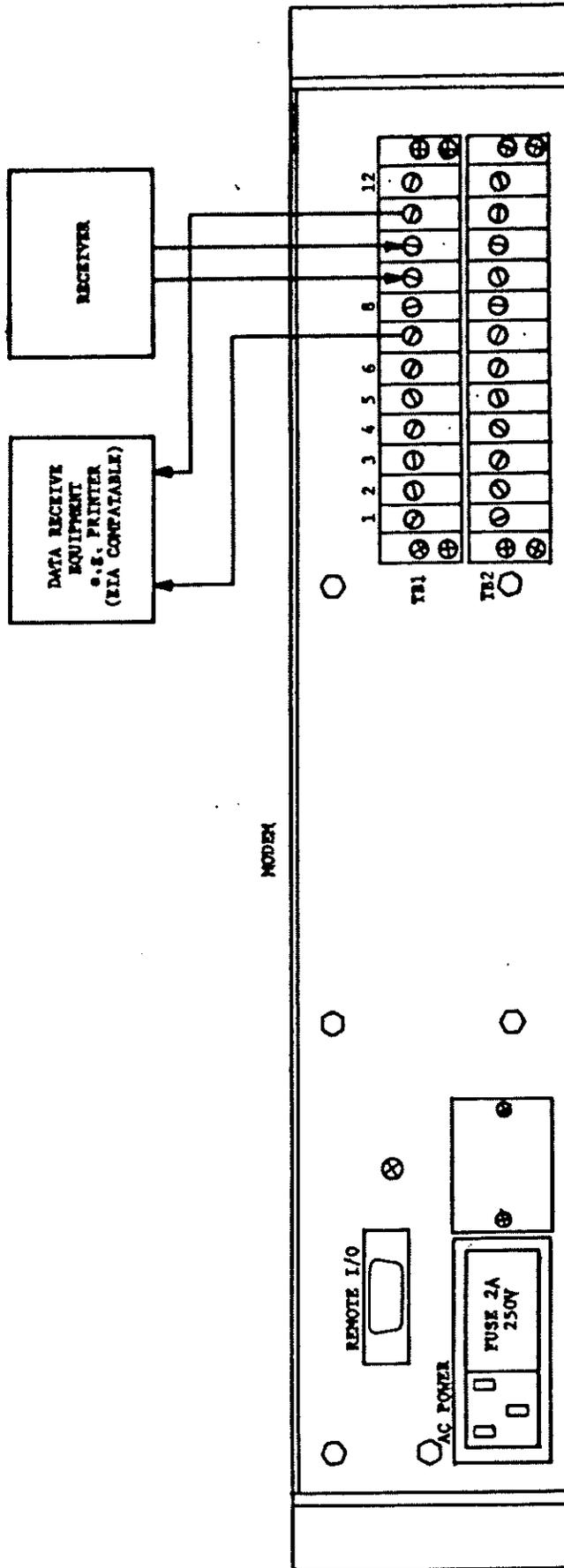


Figure 2-10. Typical Demodulator Application

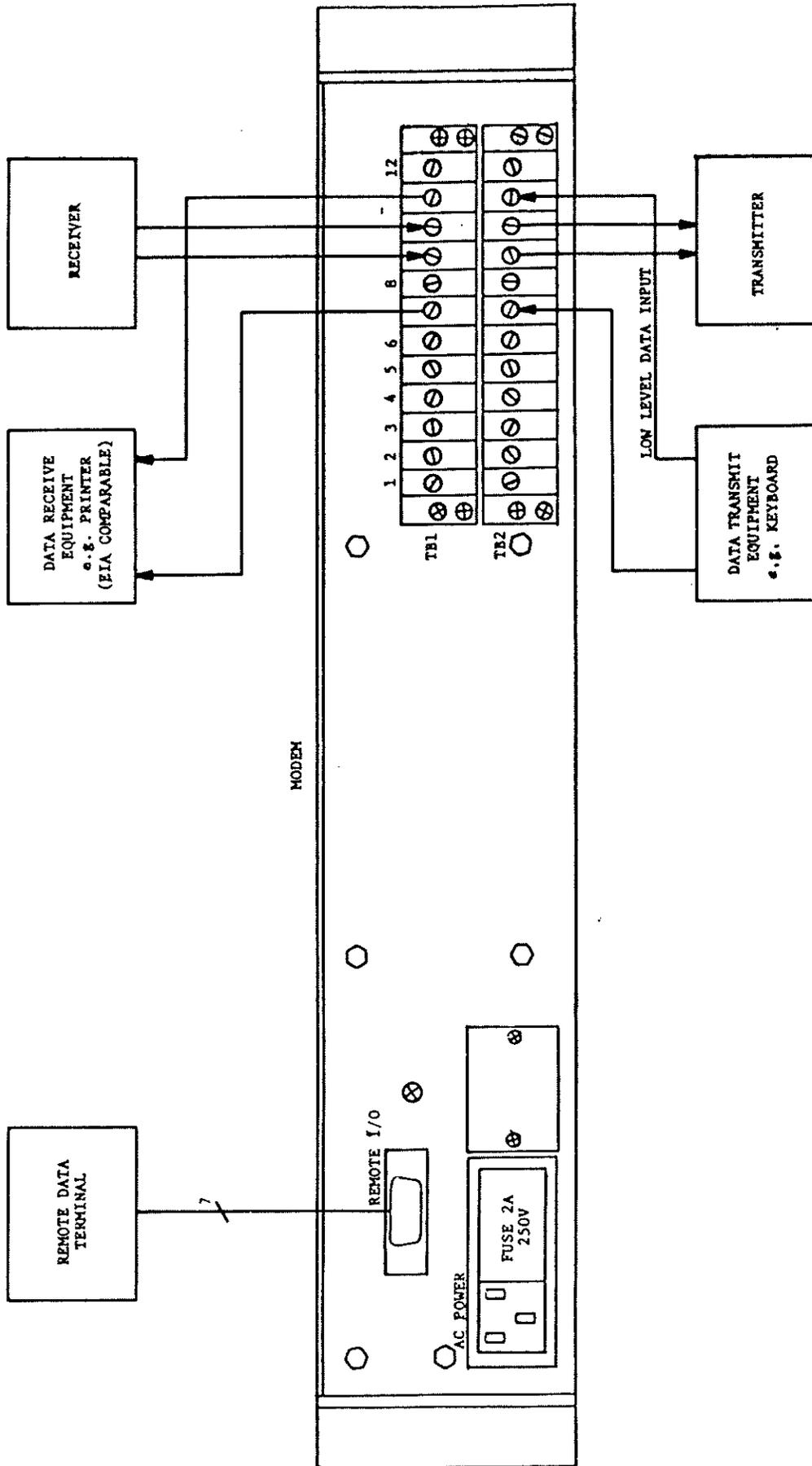
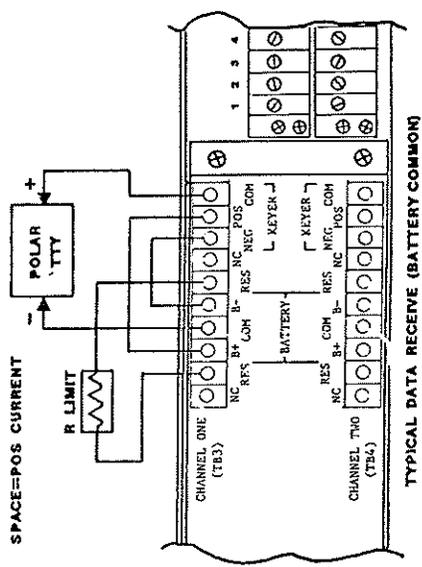


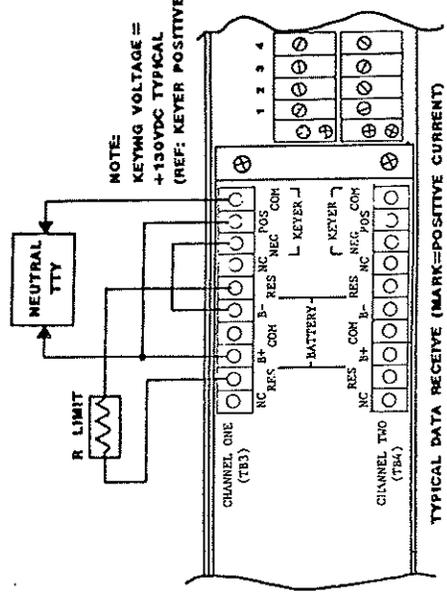
Figure 2-11. Remote Control Application

NOTE:
KEYING VOLTAGE =
±65 VDC TYPICAL
MARK=NEG CURRENT
SPACE=POS CURRENT



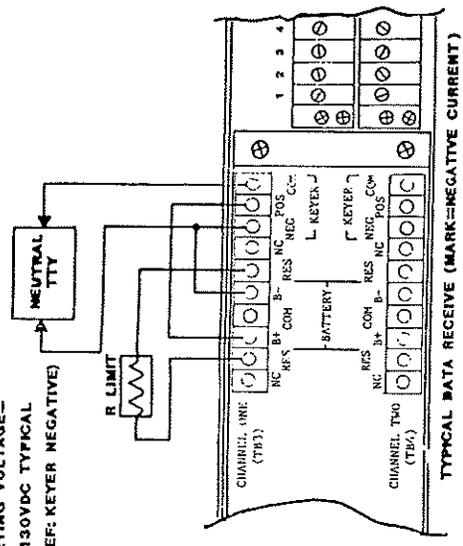
TYPICAL DATA RECEIVE (BATTERY COMMON)

NOTE:
KEYING VOLTAGE =
+130VDC TYPICAL
(REF: KEYS POSITIVE)



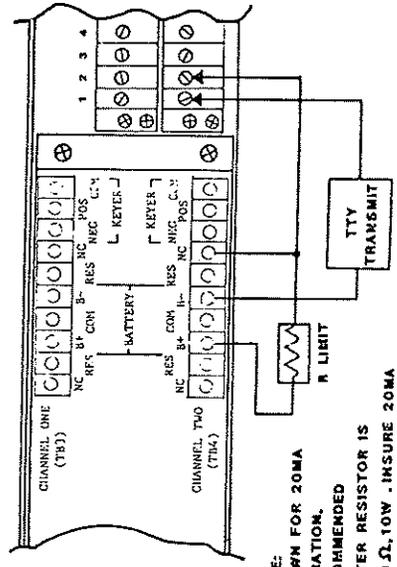
TYPICAL DATA RECEIVE (MARK=POSITIVE CURRENT)

NOTE:
KEYING VOLTAGE =
-130VDC TYPICAL
(REF: KEYS NEGATIVE)



TYPICAL DATA RECEIVE (MARK=NEGATIVE CURRENT)

NOTE:
SHOWN FOR 20MA
OPERATION.
RECOMMENDED
LIMITER RESISTOR IS
6500 Ω, 10W. INSURE 20MA
JUMPER IS INSTALLED



TYPICAL DATA SEND

CAUTION
LOOP CURRENT MUST BE
EXTERNALLY LIMITED TO
100 MA MAX (60 MA TYP)
AND ARC SUPPRESSION TO
LESS THAN 350 VOLTS

Figure 2-12. Typical
High Level
Applications

2.8 INITIAL CHECKOUT PROCEDURE

The initial checkout procedures verify operation of the Modem. They should be performed prior to connecting external signal cables. Should a fault occur during these procedures refer to Section V for troubleshooting procedures.

2.8.1 Power Supply Checkout

Turn the power switch on. Display descriptors should be illuminated.

2.8.2 Front Panel Keypad and Display Checkout

The front panel plasma display must be capable of indicating channel number, baud rate, mark and space frequencies, channel function, keying type, output polarity, auto mark hold, hold, +.5 Hz function, synchronize mode, regenerative mode, and mark only and space only mode when entered from the keypad. Refer to Section III for function of each key and display.

N O T E

The Model 1280 may be used as a modem, a one or two channel modulator, or a one or two channel demodulator depending upon user requirements. The following procedure pertains to the modem with channel one a demodulator, and channel two a modulator.

- a. Press 'CHAN' (channel) and '1' keys on keypad. Observe descriptor beside DEMOD illuminates on display; and digit 1 appears below CH on display.
- b. Press 'FSK' on keypad. Observe FSK descriptor illuminates on display.
- c. Press 'AMH' (Autom Mark Hold) on keypad. Observe AMH descriptor illuminates on display.
- d. Press '2ND' and 'REV' (Reverse) on keypad. Observe REV descriptor illuminates on display.
- e. Press 'BAUD RATE' and '7', '4' keys. Observe the digits 74 appears below BAUD RATE on display.
- f. Press 'SPACE/ONLY' and '1', '3', '1', '7' keys. Observe the digits 1317 appear below SPACE on display.
- g. Press 'MARK/ONLY' and '1', '2', '3', '2' keys. Observe the digits 1232 appear below MARK on display.

- h. Press '2ND' (second function) and '5/+.5' keys.
Observe +.5 descriptor illuminates on display.
- i. Press '2ND' (second function) and 'HOLD' keys.
Observe HOLD descriptor illuminates on display.
- j. Press '2ND' (second function) and 'SYNCH/REGEN' keys.
Observe REGEN descriptor illuminates on display.
- k. Press '2ND' (second function) and 'SPACE/ONLY' keys.
Observe SP ONLY descriptor illuminates on display.
- l. Press '2ND' (second function) and 'MARK/ONLY' keys.
Observe MK ONLY descriptor illuminates and SP ONLY
extinguishes on display.
- m. Press 'SYNCH/REGEN' key on keypad.
Observe Mark, Space and Baud Rate digits disappear and
L= appears below mark on display.

Press '0' and '5' keys. Observe digits 05 appear after
L= on display.
- n. Press 'DIV' key. Observe DIV key LED illuminates.
- o. Press 'ENTER' key. Observe ENTER key LED extinguishes.

N O T E

The ENTER LED comes on
when the parameters are
keyed in.

- p. Press 'CHAN' (channel) and '2' key on keypad.
Observe MOD descriptor illuminates on display; ENTER key
LED illuminates; and digit 2 appears below CH on display.
- q. Press 'MUTE' key on keypad.
Observe MUTE key LED illuminates.
- r. Press 'ENTER' key on keypad.
Observe ENTER key LED extinguishes.

- s. Press 'REMOTE' key on keypad.
Observe REMOTE key LED is illuminated.

N O T E

Whenever the REMOTE LED is illuminated, the Model 1280 is operable from a remote device ONLY. The keypad is disabled.

- t. Verify that keypad is inoperative when REMOTE LED is illuminated by repeating step a.

2.8.3 Remote Control Verification

This procedure verifies the operation of the Model 1280 from a remote terminal. A Remote Terminal (RT) is any device that transmits and receives serial asynchronous digital messages. The digital messages consist of one start bit, eight data bits (ASCII characters), no parity, and two stop bits. When remote operating parameters are entered into the Model 1280 the front panel display changes to reflect the entered operating parameters. A status report occurs when: requested from the RT; an input error is recognized by the Model 1280.

- a. Connect the RT to REMOTE I/O, on the rear panel of the Model 1280. Refer to Table 2-1. for pin connection assignments.

N O T E

RT must be RS-232 compatible.

- b. Set the CHANNEL ADDRESS switch S1 on the control board (D5697) to 01. Refer to Paragraph 2.6.4 for an explanation of the CHANNEL ADDRESS switch settings.
- c. Verify the BAUD RATE selection jumper on the control board (D5697) is compatible for the RT in use. Refer to Paragraph 2.6.3 for an explanation of the BAUD RATE jumper settings.
- d. Perform each input command listed in Table 2-3 from the RT. Observe status and Model 1280 response.

Table 2-3. Remote Control Verification

| INPUT COMMAND | MODEL 1280 RESPONSE |
|---------------|--|
| C1R1 (CR) | REMOTE key LED illuminates. DEMOD descriptor illuminates, digit '1' appears below CH on display. |
| J0 (CR) | FSK descriptor illuminates. |
| J1 (CR) | MK ONLY descriptor illuminates. FSK descriptor extinguishes. |
| J2 (CR) | SP ONLY descriptor illuminates. MK ONLY descriptor extinguishes. |
| A1 (CR) | AMH descriptor illuminates. |
| A0 (CR) | AMH descriptor extinguishes. |
| N1 (CR) | REV descriptor illuminates. |
| N0 (CR) | REV descriptor extinguishes. |
| B74 (CR) | Digits 74 appear below Baud Rate on display. |
| S1317 (CR) | Digits 1317 appear below SPACE on display. |
| M1232 (CR) | Digits 1232 appear below MARK on display. |
| E1 (CR) | +.5 Hz descriptor illuminates on display. |
| E0 (CR) | +.5 Hz descriptor extinguishes. |
| H1 (CR) | HOLD descriptor illuminates on display. |
| H0 (CR) | HOLD descriptor extinguishes. |
| D1 (CR) | DIV key LED illuminates. |
| D0 (CR) | DIV key LED extinguishes. |
| Y1 (CR) | REGEN descriptor illuminates on display. |
| Y0 (CR) | REGEN descriptor extinguishes. |

Table 2-3. Remote Control Verification (cont.)

| INPUT COMMAND | MODEL 1280 RESPONSE |
|---------------|--|
| W5 (CR) | SYNCH descriptor illuminates on display. |
| W0 (CR) | SYNCH descriptor extinguishes. |
| C2 (CR) | MOD descriptor illuminates, digit 2 appears below CH on display. |
| U1 (CR) | MUTE key LED illuminates. |
| U0 (CR) | MUTE key LED extinguishes. |

SECTION III

OPERATION

3.1 GENERAL

This section contains an explanation of the controls and display indicator elements used in the operation of the Model 1280 FSK MODEM. It also describes the location and function of each element, control input and status output in the operation of the Modem from a remote control device, and operating procedures for the Modem.

3.2 CONTROLS AND DISPLAY INDICATOR ELEMENTS

The Model 1280 can be controlled by a front panel keypad. The keypad numeric and function keys are used to set up specific operating parameters used by the Modem. Some keys are dual function keys. For example, numeric "5" key also selects "+.5 Hz." To select the latter function, the "2nd" key has to be pressed before the 5/+5 key is pressed. Specified keys contain LEDs which indicate state of modem.

The front panel indicator element displays the state of the controlled channel(s) via bargraph displays, descriptor lights, and digital read-outs of frequency, baud rate, and channel selected.

Functional descriptions of the display element, keypad, and power switch are given in Table 3-1. Figure 3-1 is a front panel view of the Modem indicating the controls and indicators by item number.

Table 3-1. Model 1280 Controls and Indicators

| ITEM | INDICATOR/CONTROL | DESCRIPTION |
|------|--|---|
| 1 | <u>Display Elements</u> MARK Bar Graph SPACE Bar Graph SYNCH Descriptor MOD Descriptor DEMOD Descriptor MK ONLY Descriptor AMH Descriptor SP ONLY Descriptor HOLD Descriptor REV Descriptor +.5 Hz Descriptor BAUD Rate CH SPACE MARK | Indicates Mark tone input/filter output signal strength in dBm. Indicates Space tone input/filter output signal strength in dBm. Indicates channel in Synchronous mode when illuminated or Asynchronous mode when extinguished. Indicates channel is a Modulator. Indicates channel is a Demodulator. Indicates channel is in Mark Only mode (OOK). Indicates Auto Mark hold selected. Indicates channel is in Space Only Mode (OOK). Indicates channel is in Hold (Standby) condition. Indicates channel in Reverse Sense operation. Indicates channel frequencies selected in 1/2 Hz increments. Indicates selected baud rate. Indicates selected Channel is 1 or 2. Four-digit display indicating Space tone frequency. Four-digit display indicating Mark tone frequency. |

Table 3-1. Model 1280 Controls and Indicators (cont.)

| ITEM | INDICATOR/CONTROL | DESCRIPTION |
|------|--|---|
| 2 | <p><u>Keypad Controls</u></p> <p>CHAN X</p> <p>AMH/HOLD</p> <p>DIV</p> <p>FSK</p> <p>BAUD RATE XXXX</p> <p>NORM/REV</p> <p>MUTE</p> <p>MARK/ONLY</p> | <p>Enables channel selection and control where X is numerical key 1 or 2.</p> <p>AMH - Selects or removes Automark hold function.</p> <p>2nd-HOLD - Selects or removes Hold (STAND-BY) function.</p> <p>Selects or removes diversity of controlled channel with adjacent channel; when selected DIV LED illuminates.</p> <p>Selects or removes FSK Function of frequency shifts 200 Hz and below for modulator.</p> <p style="text-align: center;">N O T E</p> <p>Anytime a shift above 200 Hz is selected the unit defaults to FEK mode.</p> <p>Enables selection of baud rate where XXXX are the four numerical keys.</p> <p>Selects Normal or Reverse output polarity.</p> <p>Selects or removes modulator Mute function; when selected mute descriptor illuminates.</p> <p>MARK XXXX - Enables selection of mark tone frequency for selected channel where XXXX are the four numerical keys specifying frequency in hertz.</p> <p>2nd Mark Only - Places selected channel in the Mark Only mode (OOK).</p> |

Table 3-1. Model 1280 Controls and Indicators (cont.)

| ITEM | INDICATOR/CONTROL | DESCRIPTION |
|------|------------------------------------|---|
| | <u>Key Pad Controls</u> (cont.) | |
| | CLEAR | Clears operating parameters prior to pressing 'ENTER' Key. |
| | SYNCH/REGEN | Selects or removes selected channel in the synchronous regenerated data mode. |
| | REMOTE | Enables or disables modem for remote control function; when selected descriptor illuminates it is enabled. |
| | SPACE/ONLY | Space XXXX - Enable selection of Space tone frequency of selected channel where XXXX are the four numerical keys specifying frequency in hertz. 2nd-Space Only - Places selected channel in the Space Only mode (OOK). |
| | 2ND | Enables selection of 2nd functions for selected channel. |
| | 1 | Selects Numeric 1 |
| | 2 | Selects Numeric 2 |
| | 3 | Selects Numeric 3 |
| | 4 | Selects Numeric 4 |
| | 5/+ .5 | 5 - Selects Numeric 5 2nd +.5 - Selects 1/2 Hertz increment for Mark and/or Space frequencies. |

Table 3-1. Model 1280 Controls and Indicators (cont.)

| ITEM | INDICATOR/CONTROL | DESCRIPTION |
|------|--|---|
| | <p><u>Key Pad Controls</u> (cont.)</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>0</p> <p>ENTER</p> | <p>Selects Numeric 6</p> <p>Selects Numeric 7</p> <p>Selects Numeric 8</p> <p>Selects Numeric 9</p> <p>Selects Numeric 0</p> <p>Enters selected parameters to initiate control of the selected channel. Descriptor illuminate whenever a channel function is selected and extinguishes when parameters are entered.</p> |
| 3 | POWER | ON/OFF switch to provide unit power. |

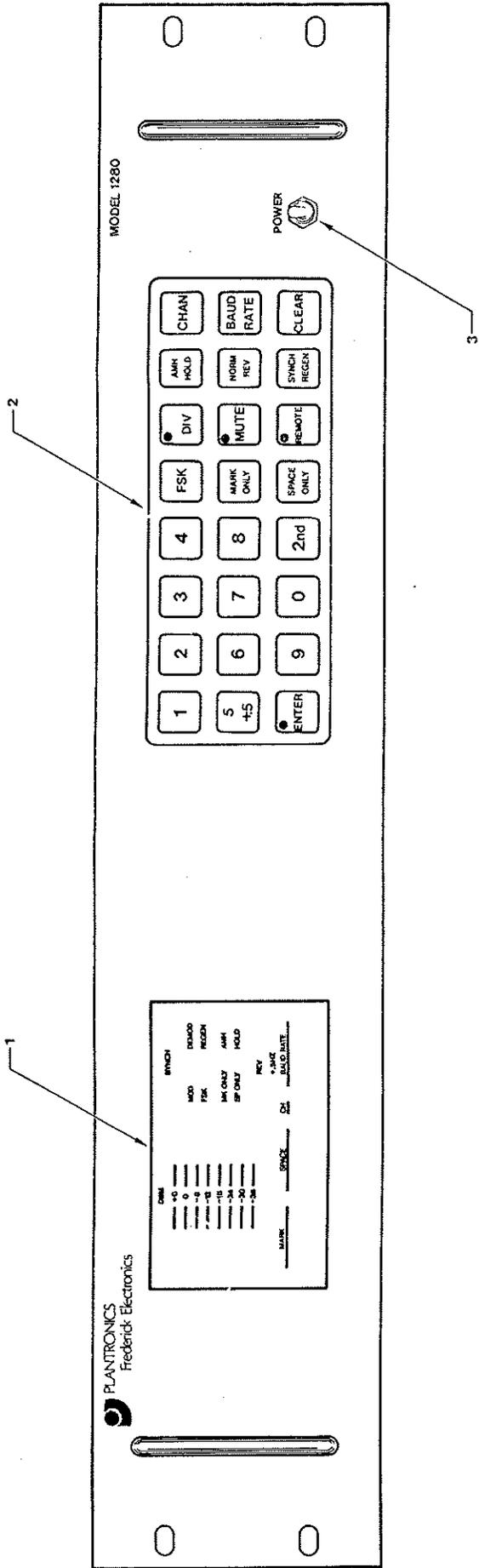


Figure 3-1. Model 1280 Front Panel

3-7/3-8 BLANK

3.3 REMOTE CONTROL INPUT

The Model 1280 can also be controlled through a serial remote control input. This input requires an asynchronous, one start bit, 8 data bits (ASCII characters), and a two stop bit signal. Table 3-2 lists the remote control input commands for the Modem. Each entry command must be followed by a carriage return.

3.4 STATUS OUTPUT

The status response contains only relevant data corresponding to the data requested in the remote condition. A typical command/status would be as follows:

Command: C1G

| | | |
|-----------|-----------------|--------|
| Response: | Channel | = 1 |
| | Mark Frequency | = 1500 |
| | Space Frequency | = 2500 |
| | Baud Rate | = 600 |

Any other parameters that are set.

Table 3-2. Model 1280 Remote Control Commands

| COMMAND/RESPONSE | EXPLANATION |
|-----------------------|---|
| <u>Input Commands</u> | <p>Note: Commands from remote terminal must be received correctly. The unit will not recognize deletions or rub-outs.</p> |
| 'C01' | Selects Channel One |
| 'C02' | Selects Channel Two |
| 'MXXXX' | Selects Mark frequency where XXXX is the desired mark frequency in hertz. |
| 'SXXXX' | Selects Space frequency where XXXX is the desired space frequency in hertz. |
| 'BXXXX' | Selects baud rate where XXXX is the desired baud rate. |
| 'U0' | Disables Mute function. |
| 'U1' | Enables Mute function. |
| 'N0' | Places desired channel into Normal output polarity mode. |
| 'N1' | Places desired channel into Reverse output polarity mode. |
| 'J0' | Places desired channel into Frequency Shift Keying (FSK) mode. |
| 'J1' | Places desired channel into Mark Only (OOK) mode. |
| 'J2' | Places desired channel into Space only (OOK) mode. |
| 'A0' | Disables desired channel Auto Mark Hold (AMH) function. |
| 'A1' | Enables desired channel Auto Mark Hold (AMH) function. |

Table 3-2. Model 1280 Remote Control Commands (cont.)

| COMMAND/RESPONSE | EXPLANATION |
|-------------------------------|--|
| <u>Input Commands</u> (cont.) | |
| 'H0' | Disables desired channel Hold function. (Data output normal) |
| 'H1' | Enables desired channel Hold function. ((Data output in standby (constant state) condition)) |
| 'Y0' | Disables desired channel regenerator. |
| 'Y1' | Enables desired channel regenerator. |
| 'D0' | Disables desired channel diversity function. |
| 'D1' | Enables desired channel diversity function placing it into diversity with adjacent channel. |
| 'R0' | Places unit into Local mode. |
| 'R1' | Places unit into Remote mode. |
| 'W0' | Places desired channel into synchronous mode. |
| 'W5' | Places desired channel into asynchronous 5 level code operation. |
| 'W6' | Places desired channel into asynchronous 6 level code operation. |
| 'W7' | Places desired channel into asynchronous 7 level code operation. |
| 'W8' | Places desired channel into asynchronous 8 level code operation. |
| 'E0' | Disables desired channel 1/2 Hz frequency increment mode. |
| 'E1' | Enables desired channel 1/2 Hz frequency increment mode. |

Table 3-2. Model 1280 Remote Control Commands (cont.),

| COMMAND/RESPONSE | EXPLANATION |
|--|--|
| <p><u>Input Commands (cont.)</u></p> <p>'G'</p> <p>'L'</p> | <p>Request status for desired channel.</p> <p style="text-align: center;"><u>RESPONSE</u></p> <p style="text-align: center;">NOTE</p> <p>Provides the following list of input commands available for remote control use.</p> <p style="text-align: center;"> MK FREQ = MXXXX SP FREQ = SXXXX BD RATE = BXXXX CHAN = CX FSK = J0 MK ONLY = J1 SP ONLY = J2 SYN MODE = W0 ASYN 5L = W5 ASYN 6L = W6 ASYN 7L = W7 ASYN 8L = W8 </p> <p>For the following Commands 0 = OFF 1 = ON</p> <p> MUTE = UX DIV = DX REM = RX REV = NX HOLD = HX REGEN = YX 1/2 HZ = EX AMH = AX </p> <p style="text-align: center;">NOTES</p> <p>1) When you exceed the units parameters for frequency or baud rate, response will be that your request was either too Low or too High and give you the minimum or maximum parameter.</p> <p>2) When you input an invalid function character the unit will respond with the corresponding function "Input Error".</p> |

3.5 OPERATING PROCEDURES

The Model 1280 modem is controlled by two sources, either the front panel keypad or a remote terminal. The following procedures include start-up, standby, normal, and shut-down operation for local and remote function.

3.5.1 Local Operation

The front panel keypad is used to perform the Local operation. The commands may be selected in any sequence and entered by pressing the ENTER key. Each channel is selected by pressing the CHAN key and the Numeric key 1 or 2 for the desired channel. To clear an error in input commands, press the CLEAR key; do not press the ENTER key.

3.5.1.1 START-UP. Before power is supplied, refer to Section II to ensure that internal switch settings, jumpers, and cabling are properly set and connected.

3.5.1.2 NORMAL OPERATION. Turn power on and display elements illuminate. Any elements indicated were programmed prior to power off. Table 3-3 outlines the operation, key to be pressed, and results of operation for programming the Modem under normal operation.

3.5.1.3 STANDBY OPERATION. The following functions can place a channel in standby.

- a. Enter '2ND - AMH/HOLD' to place the selected channel into standby mode. The HOLD (Standby) mode sets the output to a steady mark condition.
- b. Enter 'AMH' to select auto mark hold for the selected channel. AMH sets the output to a steady mark when the input signal level drops below a preset level. Refer to Section II, Paragraph 2.6.2 for information required to select the AMH threshold level.

3.5.1.4 SHUT-DOWN. The Modem does not require any preparatory settings before power is turned off. Operating parameters displayed are stored in memory when power is removed.

3.5.2 Remote Operation

Refer to Section II, Paragraph 2.6.4 and Table 3-2 for setup, input commands and status responses for the Modem.

3.5.2.1 START-UP. When unit is turned on, remote operation can be accessed by either local or remote command. Entering 'REMOTE' from keypad places unit into remote operation. Command 'R1' from a remote terminal places unit into remote operation. In both cases the REMOTE LED will illuminate to indicate unit is in remote control operation. Any keypad entry, with the exception of REMOTE, will be disregarded by the unit when the REMOTE LED is illuminated.

- a. Set 'CHANNEL ADDRESS' switch, S-1, for the proper channel identification setting.
- b. Verify the remote baud rate header (U8) is properly jumpered to match requirements for the remote terminal (refer to Paragraph 2.6.3).

3.5.2.2 STANDBY OPERATION. The same standby operation in Paragraph 3.5.1.3 applies to the remote operation.

Table 3-3. Model 1280 Operating Procedures

| OPERATION | PRESS KEY | RESPONSE |
|---|--|---|
| Select Channel | CHAN X (1 or 2) | ENTER key LED illuminates desired channel number appears below CH on display. |
| Select Desired Channel as a Modulator | MOD | MOD descriptor on display illuminates. |
| Enter FSK Operation | FSK (60 Hz to 200 Hz=FSK 60 Hz to 3000 Hz=FEK) | FSK descriptor on display illuminates for FSK and is extinguished for FEK. |
| | <p style="text-align: center;">NOTE</p> <p>Anytime a shift above 200 Hz is selected, the unit defaults to FEK mode.</p> | |
| Enter Desired Mark Frequency | MARK ONLY XXXX (300 to 6000 Hz) | Mark frequency appears below MARK on display. Each number displayed sequentially from right when keyed. |
| Enter Desired Space Frequency | SPACE ONLY XXXX (300 to 6000 Hz) | Space frequency appears below SPACE on display. Each number displayed sequentially from right when keyed. |
| Enter Desired Baud Rate | Baud Rate XXXX (30 to 600 baud) | Baud rate appears below baud rate on the display. Each number displayed sequentially from right when keyed. |
| Place Selected Channel in Mute Condition | MUTE | Mute key LED illuminates. (Removes output tone levels). |
| Remove Selected Channel from Mute Condition | MUTE | Mute key LED extinguishes. (Output tone levels return to previous set level.) |

Table 3-3. Model 1280 Operating Procedures (cont.)

| OPERATION | PRESS KEY | RESPONSE |
|--|------------------|---|
| Enable Selected Channel Auto Mark Hold | AMH/Hold | AMH descriptor illuminates. (Output goes to constant Mark condition when input level drops below a preset level.) |
| Disable Selected Channel Auto Mark Hold | AMH/Hold | AMH descriptor extinguishes. |
| Enable Selected Channel Diversity Function | DIV | DIV key LED illuminates. (Places selected channel into diversity with adjacent channel.) |
| Disable Selected Channel Diversity Function | DIV | DIV key LED extinguishes. |
| Reverse Selected Channel Output Polarity | 2ND-NORM/REV | REV descriptor illuminates on display. |
| Change Selected Channel Output Polarity to Normal | NORM/REV | REV descriptor extinguishes. |
| Change from Local to Remote Operation | REMOTE | REMOTE key LED illuminates; keypad is disabled; remote control is enabled. |
| Change from Remote to Local Operation | REMOTE | REMOTE key LED extinguished; keypad enabled. |
| Change Operating mode from Asynchronous to Synchronous | SYNCH/REGEN | SYNCH descriptor on display illuminates. |
| Change Operating mode from Synchronous to Asynchronous | SYNCH/REGEN X | SYNCH descriptor on display extinguishes. (X= 5 thru 8; desired code level) |

Table 3-3. Model 1280 Operating Procedures (cont.)

| OPERATION | PRESS KEY | RESPONSE |
|---|-----------------|--|
| Clear Improperly Keyed Input | CLEAR | Clears previous input. Returns elements to original parameters. |
| Enter Operating Parameters Selected | ENTER | ENTER key LED extinguishes; Operating parameters are entered. |
| Place Desired Channel Output to Hold Mode | 2ND-AMH/HOLD | HOLD descriptor on display illuminates. (Output maintains constant Mark condition.) |
| Remove Hold Mode from Desired Channel Output | 2ND-AMH/HOLD | HOLD descriptor on display extinguishes. |
| Place Desired Channel into Regenerative Mode | 2ND SYNCH/REGEN | REGEN descriptor on display illuminates. |
| Return Desired Channel from Regenerative to Normal Operation Mode | 2ND SYNCH/REGEN | REGEN descriptor on display extinguishes. |
| Place Desired Channel into Mark ONLY (OOK) Operation | 2ND-MARK ONLY | MARK ONLY descriptor illuminates. SPACE ONLY descriptor extinguishes. FSK descriptor extinguishes. |
| Place Desired Channel into Space ONLY (OOK) Operation | 2ND-SPACE ONLY | SPACE ONLY descriptor illuminates. MARK ONLY descriptor extinguishes. FSK descriptor extinguishes. |
| Enable MARK and SPACE Tones for 1/2 Hz Increment | 2ND-5/+ .5 | +.5 descriptor illuminates. |
| Remove 1/2 Hz Increment for Mark and Space Tones | 2ND-5/+ .5 | +.5 descriptor extinguishes. |

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

This section describes the theory of operation of the components of the modem including the FSK modulator, the FSK demodulator, the power supplies, the backplane, and the control board and displays.

4.2 FUNCTIONAL DESCRIPTION

Figure 4-1 is a general block diagram of the unit with one modulator and one demodulator installed. Other possible configurations are two modulators only (no demodulator) or two demodulators only (no modulator). Thus a unit will always contain one or two PC boards, a power supply, a control board and a control/indicator panel.

The modulator will accept current loop or RS-232/MIL-188C data in and modulate it at the frequencies and baud rates selected by the keypad or remote terminal selection. The output tones are 600 ohm balanced and of adjustable amplitude.

The demodulator receives the FSK tones on a 600/10K ohm balanced line and demodulates them based on the mark and space frequencies and baud rates set up by the front panel keypad. The resulting data is output at selectable levels compatible with MIL-188C, RS-232, or optional high level current loop.

All operating details of this unit can be programmed from the keypad on the front panel. This information and signal energy levels are displayed on the front panel. Remote operation is possible via an RS-232 input.

Selectable power supplies accept 115V/230V AC or optional 12V/24V DC inputs.

An optional high level loop power supply and keyer can be attached to the rear of the chassis and external to it.

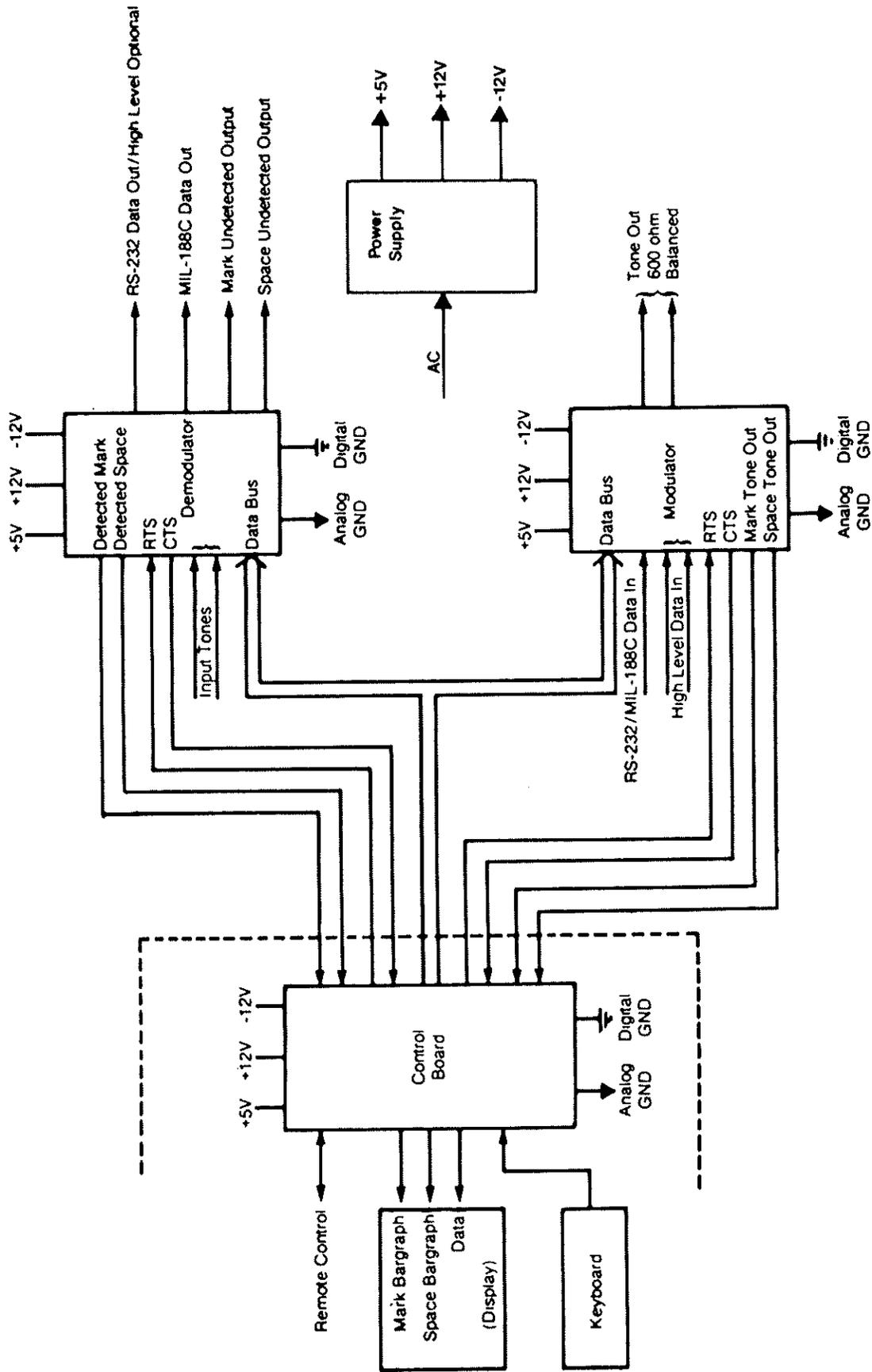


Figure 4-1. System Block Diagram

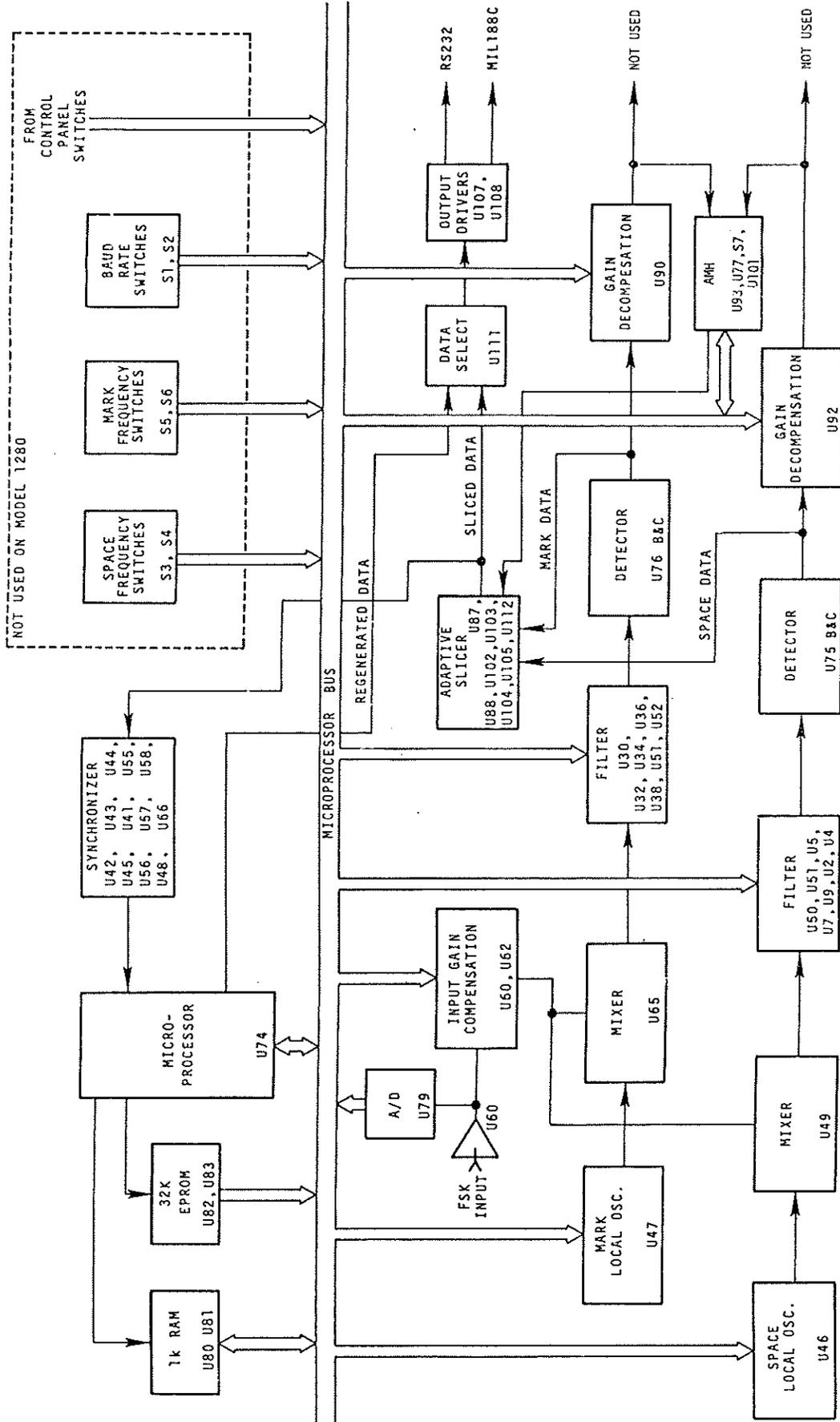


Figure 4-2. Demodulator Block Diagram
4-5/4-6 BLANK

4.3 DETAILED FUNCTIONAL DESCRIPTION

4.3.1 Demodulator Board

A block diagram of this unit is shown in Figure 4-2. The following functional analysis describes the function of the demodulator block and the signals through them. Refer to Figure 4-2 for a block diagram description or the demodulator schematic diagram.

4.3.1.1 INPUT CIRCUIT. The circuit consists of an audio transformer (T1) with an input impedance strap (W4) selectable for 600 ohms or 10K ohms.

The signal is induced across T1 to amplifier U60-A. U60-A has a gain of 1.5. The output of U60-A is inverted and filtered by the 3-pole high-pass filter (C121, C122, C123, R68, and R65). The 3 dB point of the filters is 300 hertz to reduce low frequency noise. The buffer amplifier, U60-B, is noninverting and has unity gain.

The output of U60-B goes to U60-C which functions as a peak detector. The output, a DC level representing the level of the audio input goes to the A/D converter U79, where it is converted to an 8-bit word which the microprocessor uses to generate ACG information.

The output of U60-B also goes to the step attenuator composed of U61 and U62. Here the desired attenuation is introduced based on the AGC developed by the processor and latched by U63. Thus the output of U62 as buffered by U60-D will be a gain compensated audio input signal.

4.3.1.2 FREQUENCY SYNTHESIS. The local oscillator function is accomplished by a frequency synthesis technique involving a binary rate multiplier (BRM) driven by the processor in response to inputs from the control board.

The clock output of the microprocessor (4,194,304 Hz) is supplied to the BRM;s (U46 for the space frequency, U47 for the mark frequency, and U48 for the regeneration mode) and U69 where it is divided by 32 and provided to the filter circuit.

When the desired frequencies, programmable with one/half Hz resolution, are selected via the front panel keypad or a remote control device, the CPU calculates the local oscillator frequency necessary to up-convert the input signals to mark signal plus 16,384 Hz and space signal plus 16,384 Hz. The CPU sends 16 bits of control data (two 8-bit words) over data bus lines D₀ through D₇ to the BRM.

The CPU selects the appropriate chip for the mark or space tone of the input. The selected chip synthesizes the input frequency coming from the counter (U69) into the required local oscillator frequency.

The synthesizer chip select circuit consists of a 1-of-8 line decoder (U59). Address bus lines A0 through A3 from the CPU are decoded by the decoder. The 6 decoded output lines are tied to the BRM's LE inputs, two lines to each chip. When the decoder is strobed by the CPU (at address 78H), the address is decoded and one or the other of the 8 decoded address lines assigned to the selected BRM chip go low. While low the 8 bit data word from the processor is accepted, and latched when the line again goes high. Thus two successive 8-bit words yields the 16 bits of data needed to synthesize the desired frequency.

4.3.1.3 MIXER. The mixer is a chopper circuit consisting of an analog multiplexer (U65 for mark, U49 for space) and differential amplifier (U52-C, or U50-C). The incoming analog signal is mixed with the local oscillator (LO) signal from the synthesizer circuit. The output of the mixer is the sum and the difference of the mark (or space) and LO frequencies, and their harmonics (refer to Figure 4-3). The difference frequency is the intermediate frequency (IF) (16,384 Hz) of the demodulator. This signal is applied to the bandpass filter.

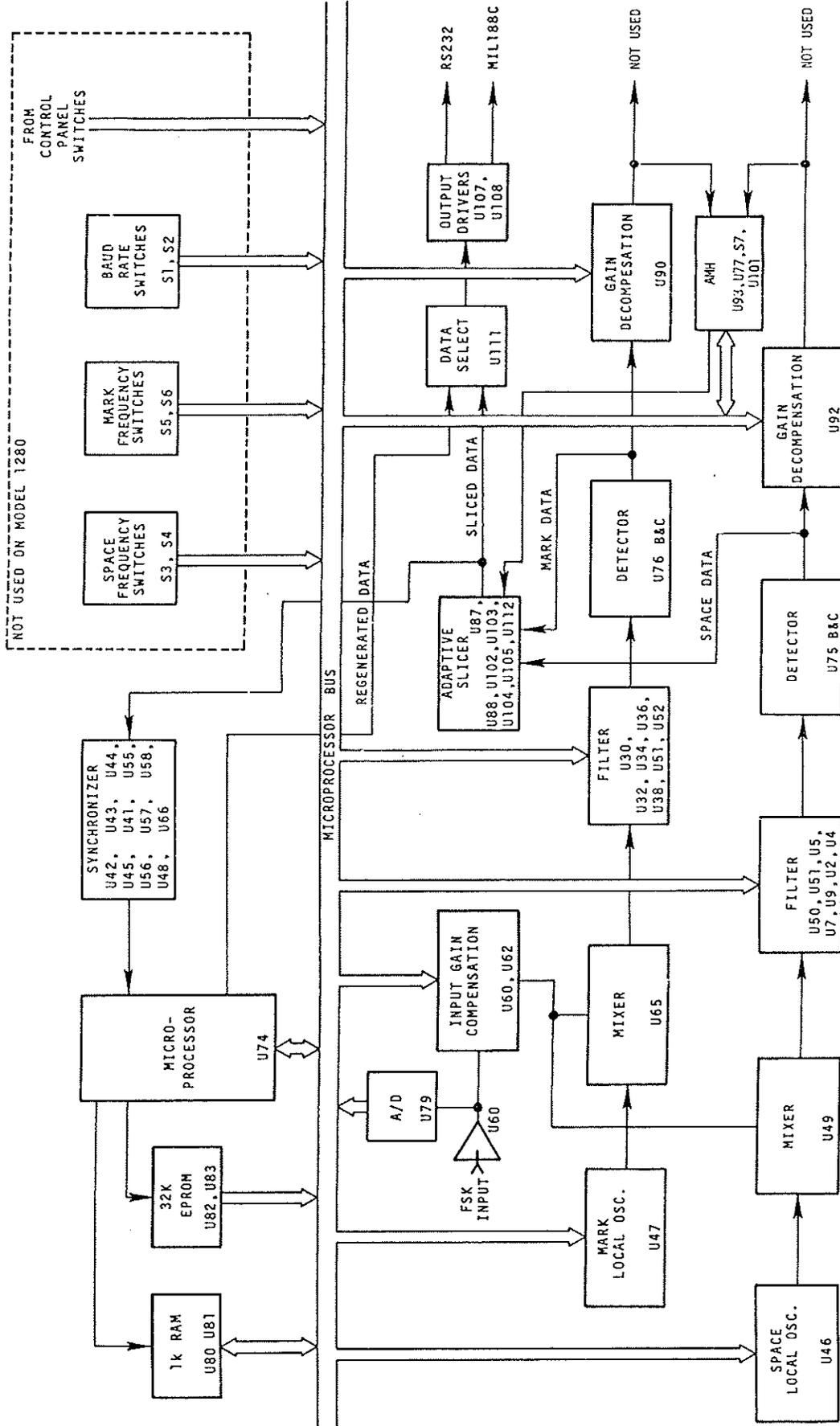


Figure 4-2. Demodulator Block Diagram

4-5/4-6 BLANK

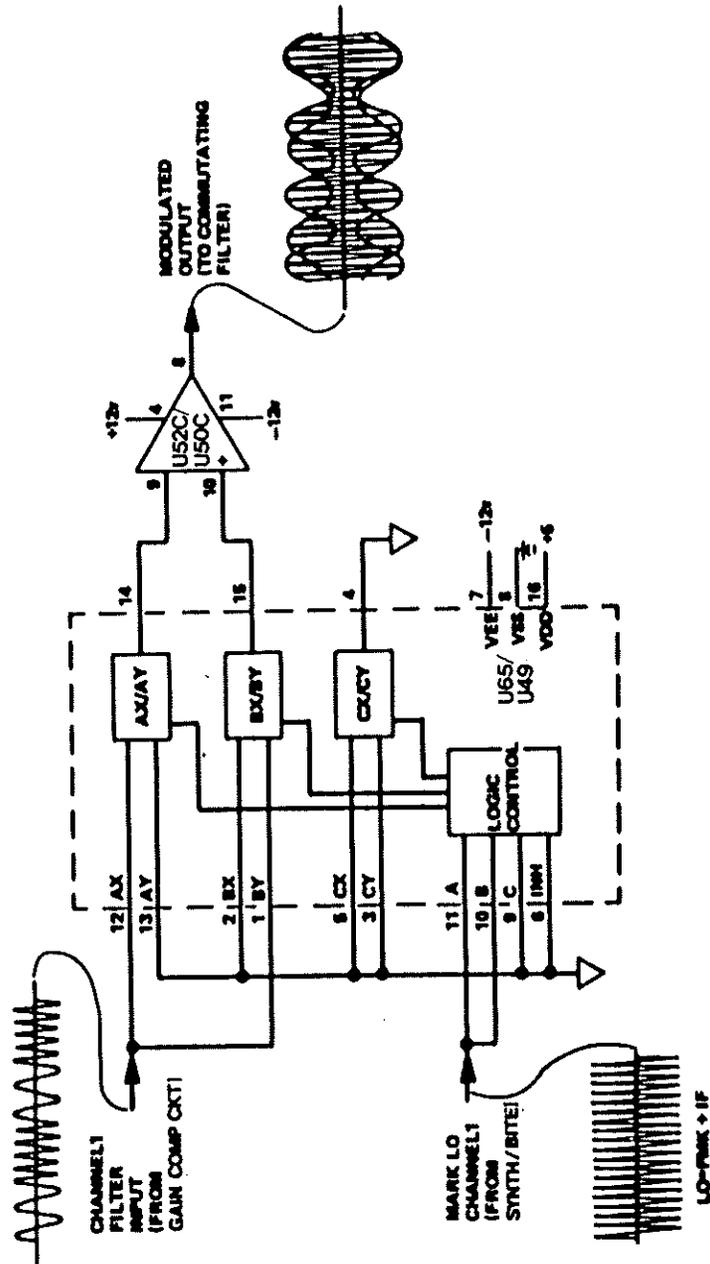


Figure 4-3. Mixer Logic and Waveforms

4.3.1.4 BANDPASS FILTER. The bandpass filter removes unwanted frequencies, allowing only the difference component to pass through.

The filter is a synchronously tuned, programmable bandwidth filter, consisting of four banks. Each bank consists of an eight-stage commutating circuit, a bandwidth selector, and an amplifier. The bandwidth of each bank is programmable to one of eight bandwidth values. The approximate 3 dB bandwidths for the baud rates and their associated filter bandwidths are as follows:

| <u>Baud Rate</u> | <u>Bandwidth</u> |
|------------------|------------------|
| 0-50 baud | 55 Hz |
| 51-75 baud | 75 Hz |
| 76-100 baud | 110 Hz |
| 101-150 baud | 160 Hz |
| 151-200 baud | 220 Hz |
| 201-300 baud | 300 Hz |
| 301-450 baud | 450 Hz |
| 451-600 baud | 690 Hz |

The signal flow for the mark filter is explained, the space is identical except for component designators. The output of the mixer enters the first bank of the filter. It passes through one of the eight bandwidth select resistors (U6) selected by a 1-of-8 line demultiplexer (U7). Selection is based on the control word from a latch (U64) when clocked by the microprocessor. Each of the eight resistors provides a different RC time constant with the fixed capacitors in the eight commutating stages in the bank.

The 131,072 Hz commutation clock, derived from the processor clock by U69, clocks a Johnson synchronous counter (U54). The eight discrete outputs of the counter assigned to the eight commutating stages, turn each transistor ON and OFF at the IF rate (16,384 Hz). The network of diodes, resistors, and amplifiers at the input of each transistor ensures that only one transistor is ON at a time. Refer to Figure 4-4 for waveforms of the commutating filter.

Each capacitor charges only when the associated transistor is ON, at a rate dependent on the RC time constant and the input signal frequency. The capacitors charge build-up is most significant when the local oscillator frequency minus input signal frequency equals the IF frequency. Therefore, the output of the first commutation stage produces a signal that follows only the difference frequency component of the mixer signal and its harmonics. The other components are shunted to ground. Note that the RC time constant is several charging cycles in length.

The output of the first stage passes through an amplifier (U52) to the second bank which is similar to the first bank, with the exception of some component values associated with the amplifiers. The third bank is similar to the second bank with the exception of some component values. The output of the fourth bank, tracked by a voltage follower (U52-D), provides the commutating filter output. The roll-off characteristics of the output improve as the signal passes through the successive banks.

The quality of the filter output is further improved by providing a shaping network, (U51-B and associated resistors) in the negative feedback loop from the output of the third bank to the input of the first bank.

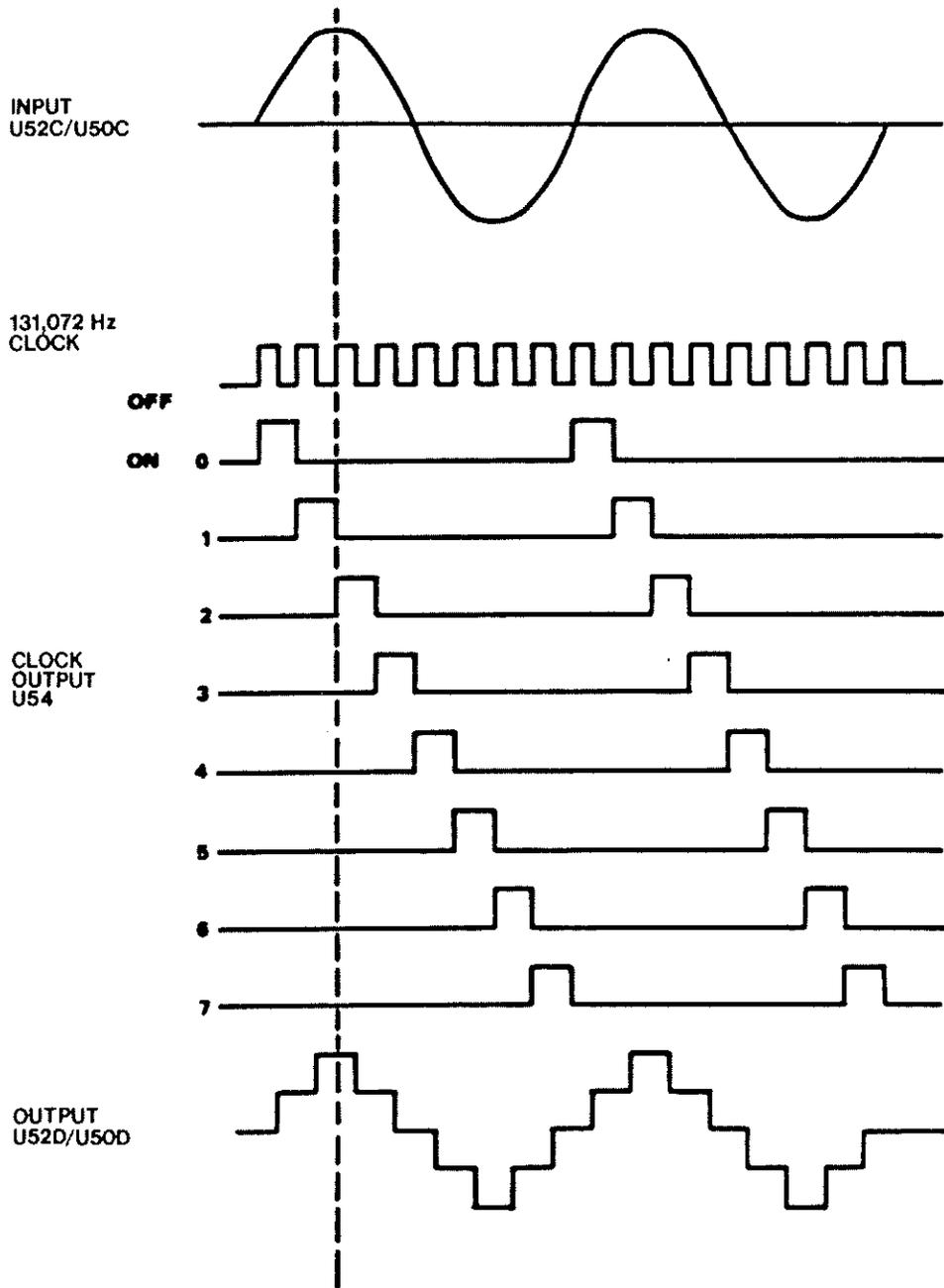


Figure 4-4. Commutating Filter Simplified Waveform Diagram

4.3.1.5 FILTER, DETECTOR AND GAIN COMPENSATION. The output of the commutation filter is a step approximation of the data. The bandpass filter (U76-A for mark, U75-A for space) smooths the waveform.

The resulting sinewave is presented to the detector (U76-B and C for mark, U75-B and C for space) which is essentially a full wave rectifier. The envelope of the resulting waveform is recovered by the low pass filter (U76-D or U75-D).

The output of the low pass filter also goes to the gain decompensation circuit (U90, U92, U78, U106) where the true signal levels are restored. This is accomplished by adjusting the gain of an amplifier (U106-B for mark, U106-A for space) by routing its feedback through one of the resistors in U89 or U91. The selection of the resistor is made by the multiplexers U90 or U92 based on the same processor data that inserted the gain compensation via U62. The decompensated signal goes to the Auto Mark Hold (AMH) comparator U77-D and U77-C for comparison against the AMH threshold selected by S7 and also goes to U35 of the control board for generation of bargraph levels.

The AMH command comes from the processor via the data bus. When this command has been entered from the keypad (see Paragraph 4.3.3) D6 goes true at address 60H and the output of U93 is latched high. U68-B, the resistor selected by S7 and R138 yield a threshold level for the signals to be passed by U77-C and D. The components on the output of these amplifiers effect a 5 second time constant on a change of state of the output of U101-B. This output is the signal to the processor, via U96 and D0 that the threshold has been exceeded. Thus brief signal interruptions or "hits" will not cause the activation of AMH.

4.3.1.6 ADAPTIVE SLICER. The mark and space signals out of U103-A and B go to the "adaptive slicer" circuits. The purpose of these circuits is to select the data (mark or space) having the most energy for use as the data output, to sharpen the transitions, and to correct the timing (jitter).

Following the path of the mark signal (space is identical), it is connected to the "positive" input of U88-A. This amplifier and its associated components CR18 and C160 functions as a peak detector, whose output follows the peak value of the incoming wave. In a similar manner U88-B's output follows the valley part of the incoming wave.

The output of the peak and valley detectors are summed at the junction of R112 and R111, thus the output of U88-C is the average D.C. value of the incoming waveform. This is used as a bias on the positive input of U88-D and the input wave is the negative input. Thus the output of U88-D is a reproduction of the input to the detectors except that the DC offset has been nulled out.

The circuits associated with U87 compose two identical pulse generators whose ultimate purpose is to assure proper operation of the slicer circuit when the constant mark condition occurs. It accomplishes this in the following manner: Using mark as an example the peak voltage from U88-A, V_p is applied to 87-B where it is inverted and multiplied by 2 yielding negative $2 V_p$. U87-A compares this voltage with the mark input; when signalling is in progress a pulse is output for each mark and when no signalling is present the output is low. This output is the "A" control input to the analog switch U105.

The output of the "A" section of U105 is the input to U88-B described earlier. It is switched between the the mark input and the negative $2 V_p$ level such that when signalling is in progress U88-B sees the mark input and when constant mark is present it sees negative $2 V_p$. This switching is necessary to prevent the gradual charging of C161 during the constant mark condition and the resultant rise of the summing point of R111 and R112 to near zero volts so that U88-C becomes sensitive to noise.

The mark and space signal output (U88-D, U102-D) are switched by U104 so that the output of U103-C represents a signal derived of: (0) mark and space data, (1) mark data only, (2) space data only, or, (3) mark and space data reversed. U103-C is a zero-crossing detector whose output is TTL compatible data.

4.3.1.7 MISCELLANEOUS CIRCUITS. The following sections describe circuits not covered in the previous paragraphs.

4.3.1.7.1 Output Selector/Blanker/Driver. The output of the demodulator board will be one of three possibilities: (1) none (blanked), (2) raw data from the detector U103-C, or (3) regenerated data from the serial output of the microprocessor, U74. The selection is accomplished by U111 as commanded by the microprocessor via the latch U112.

The selected signal is connected to the RS-232 line drivers U107 and U108. CR27 and CR28 limit the voltage excursions on one line to +6 volts.

4.3.1.7.2 Data Regeneration. The microprocessor, based on the baud rate selection made from the keypad and the data input from the slicer circuit can regenerate the data at precisely the required baud rate. This is accomplished by the use of a synchronizer circuit.

The synchronizer counter U44 runs when mark and space data are present from the slicer. The counting rate is determined by the BRM (U48) whose output is divided by 8 in U41 and gated to U44 by U57-A when data is present. The purpose of this is to give the processor a way to find the edges of the incoming data waveform. It accomplishes this by noting the count present on U44 (which is input to the data bus by U45) when a data transition occurs (the processor receives the data via its serial input port, pin 5). Knowing the count present at each transition the CPU knows the status of the input data relative to the programmed baud rate.

The outputs of the counter U55 are used to develop the sampling rate (8 samples per bit) and the mid-bit pulse which interrupt the processor as RST5.5 and RST6.5 respectively. This allows the processor to sample the bits of the incoming data stream eight times.

4.3.2 Modulator Board

The modulator board is described in the following paragraphs. Figure 4-5 is a block diagram of the modulator board. The functions of each block and their interrelationships are as follows. Refer to the modulator schematic diagram for a more detailed explanation.

4.3.2.1 INPUT LEVEL CONVERTER/DETECTOR. The Input Level Converter accepts input data, high or low level, detects the presence of mark and space data, conditions its amplitude and edges, and converts it to TTL logic levels for use by the microprocessor. When data is present at level converters (U49, U39), signals at TP6 exceed the thresholds of the level detectors U50A and U50B which effectively cancel any changes due to opposing polarities. Capacitor C47 inhibits any minor variations that might occur. When no data is present, TP6 is at a potential less than the threshold causing a positive at the detector outputs. This potential (with jumper W4 installed) is applied to the processor as a RST 5.5 interrupt. The processor, with auto mute selected, inhibits the output tones.

4.3.2.2 MICROPROCESSOR CIRCUIT. The microprocessor function is composed of the CPU (U24), which is an 8085 A-2, address latch, (U31), 16K PROMS (U44 and U45), 1K RAMS (U29 and U30), and Read/Write demultiplexers (U22 and U20).

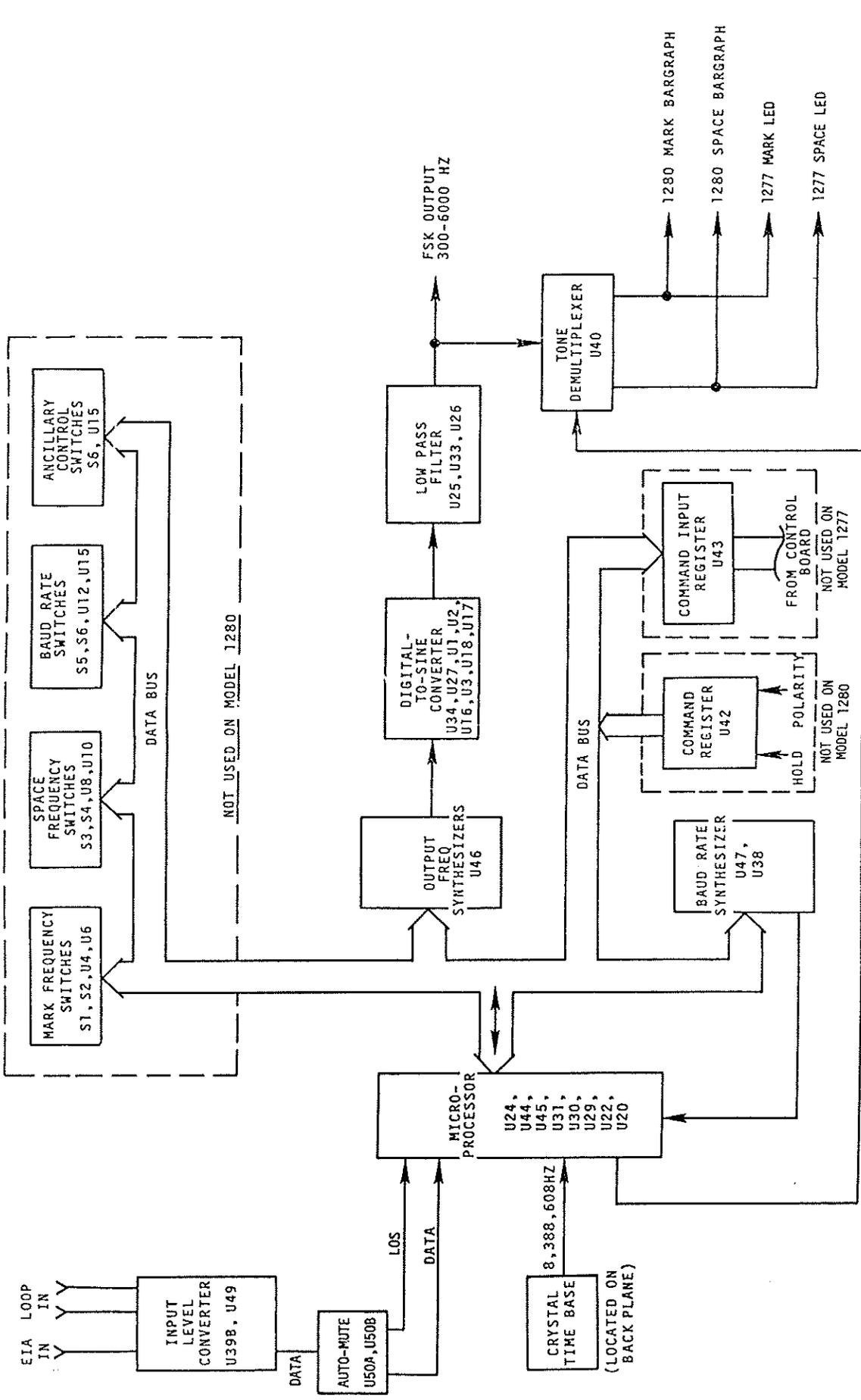


Figure 4-5. Modulator Block Diagram

The processor clock is generated on the backplane and is 8,388,608 Hz. It is used by the processors on the modulator and demodulator boards. Power up reset is also generated on the backplane and used by all processors.

The LO signals are used by the processor to inhibit the processor outputs used to generate the audio outputs. If there is no data into the modulator, there will be no FSK output.

The microprocessor converts the incoming digital data to the two FSK/FEK frequencies using a binary rate multiplier and a digital-to-sine wave converter. The microprocessor receives the desired baud rate, and mark and space frequencies from the control board via the eight data lines (DB0-7) as latched by U43. When the control board wishes to send data it interrupts the processor at RST6.5 via U51-A. Receipt of the data is acknowledged via U51-B.

As the incoming data is received and processed by the processor it yields a 16-bit word which is used by the binary rate multiplier U46 (Frequency Synthesizer) to produce a pulse train. The rate of these pulses is 32768 times the desired FSK frequency.

4.3.2.3 DIGITAL-TO-SINE WAVE CONVERTER. In the Digital-to-Sine converter the pulses from the frequency synthesizers (BRM) are divided by 8 in U34 to produce a shift register clock and also divided by 512 in U34 and U27 to produce a pulse which will be shifted through the register to yield a 64-step representation of a sine wave.

The result of this 64-step shift is shown in Figure 4-6. Each resistor, beginning with Section 1 of U3 applies +12V to a resistor in U17 or U16. These resistors are the top half of a voltage divider completed by R11. This voltage is the input to the amplifier U26-D. The resulting stepped sine wave is smoothed by the low pass filter composed of U26 A through C and U33. The resulting pure sine wave is applied to the output transformer T1 via the adjustable-gain amplifier U25A, B, and D.

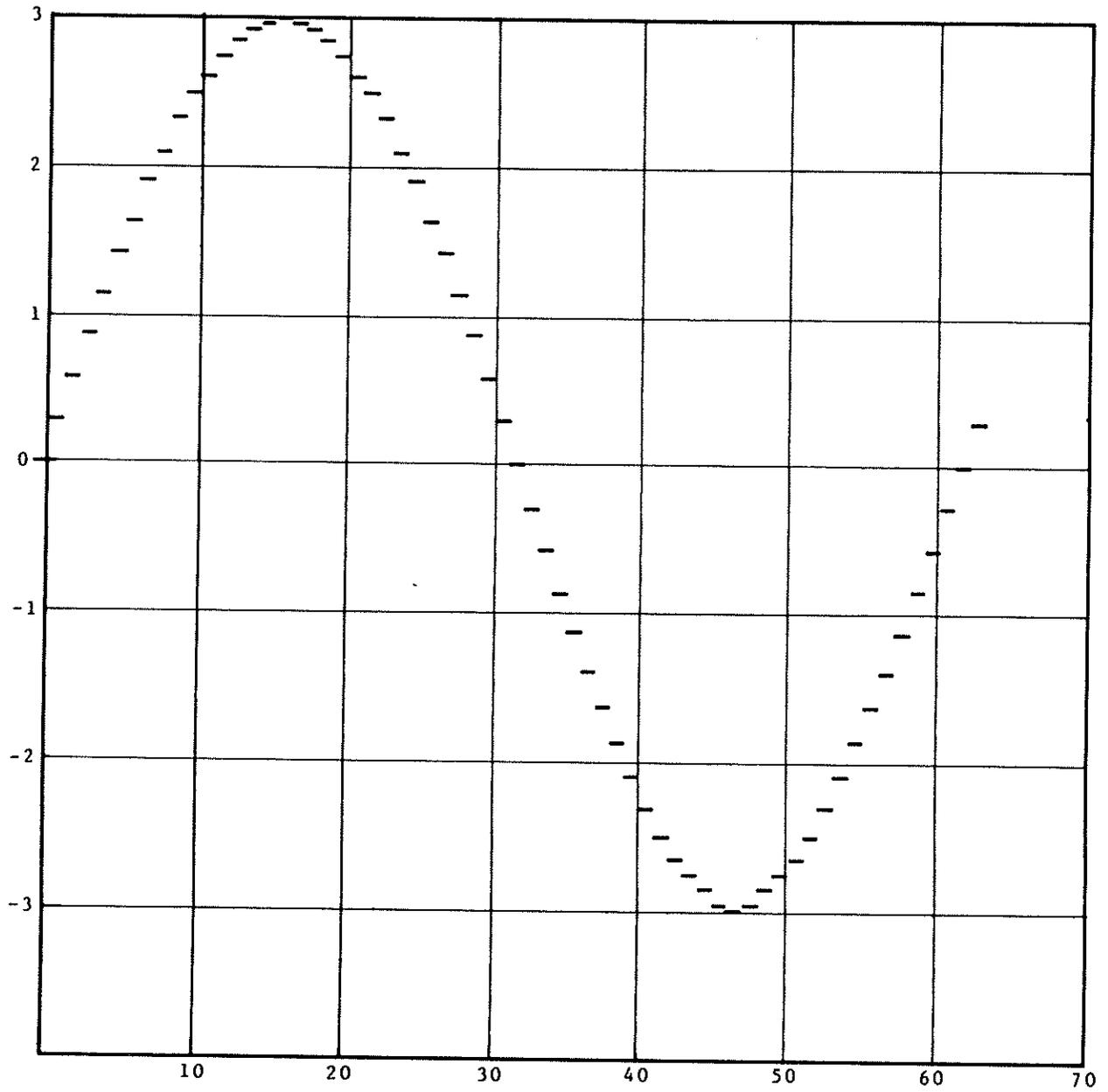


Figure 4-6. 64 Step Sinewave

4.3.2.4 TONE DEMULTIPLEXER. A sample of the output sine wave is presented to the demultiplexer U40 which routes it to the mark or space indicators as directed by the serial output line of the processor.

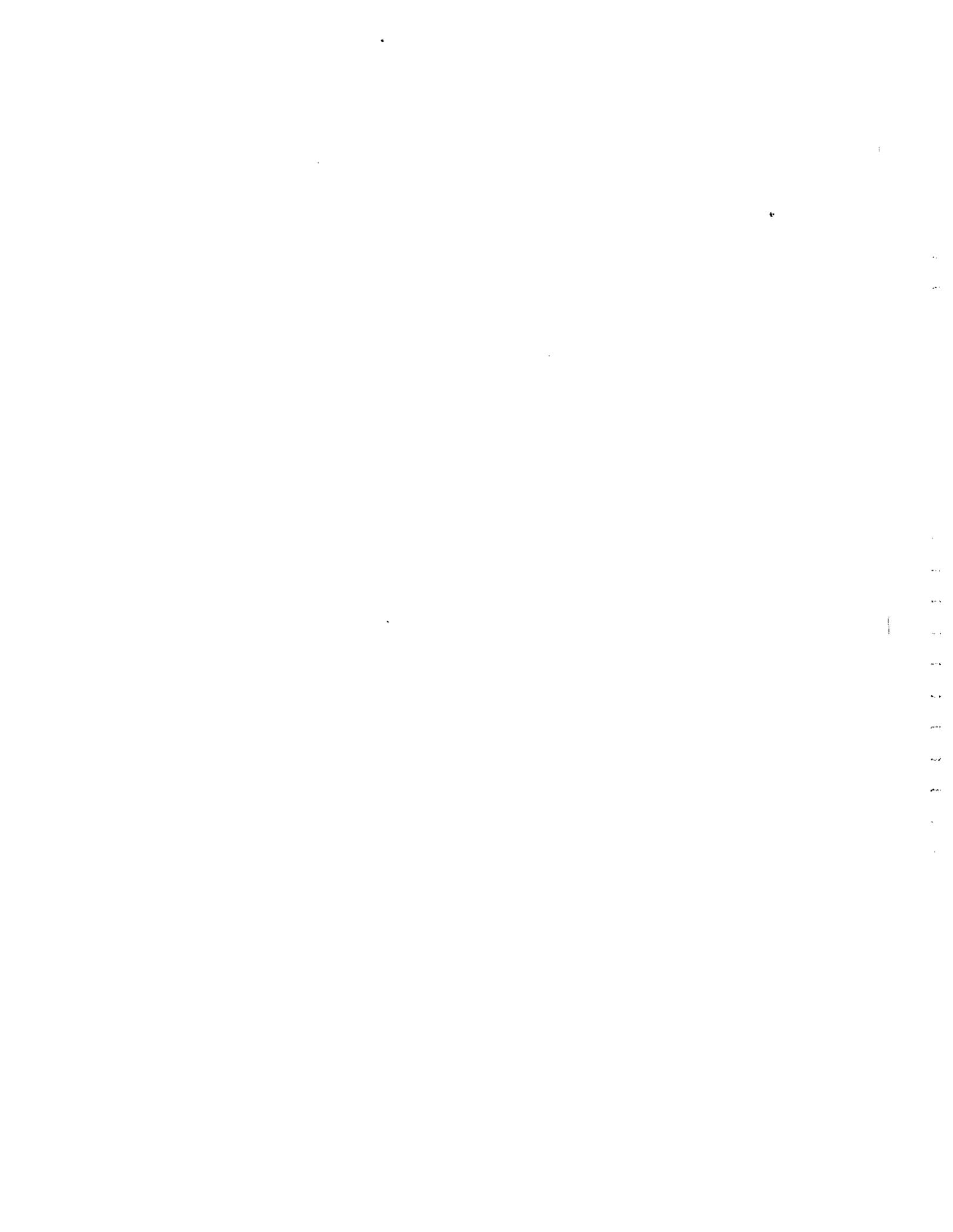
When this unit is operated in the FSK mode (function not used in FEK mode) the frequency change between mark and space is not stepped abruptly but rather occurs gradually over a period of time determined by the baud rate. This function is accomplished by the Binary Rate Multiplexer U47. The data inputs to U47 are set according to the selected baud rate. The resulting output pulses interrupt the processor at regular intervals servicing a software routine which increments or decrements the data word provided to U46. The frequency shift between mark and space is actually accomplished in a series of small steps.

4.3.3 Control Board

The operation of the control board is described in the following paragraphs. Refer to Figure 4-7 and the control board schematic diagram. The control board functions under the control of an 8085 microprocessor who's data/address bus ties together the various functions. The processor program is stored in 64K of EPROM (U32, 33). The 256 bytes of non-volatile static RAM (U30, 31) for processor scratch pad and retention of such operating parameters as have been set in from the control panel (local or remote), even when power is not present. This latter characteristic occurs when the STORE command goes true as the processor senses power fail.

The control interface with the modulator and demodulator boards is accomplished via U34 and U42. Eight lines of control data are output from U34. The control "data ready" is output by U42. The modulator and demodulator boards identify themselves to this control board by setting the appropriate voltage levels at P1-27, 29, 31 and 32. These are interfaced to the processor via U38.

The front panel contains a keypad of 24 keys, four of which are illuminated, and a status display. The keypad is interfaced via the keyboard interface circuits U5 and U6 and the buffer U19. It connects to J2 on the control board. The keypad interrupts the processor via circuits including U4 and U12. The illuminated keys are driven from the data bus via U13 and U12. Information to be displayed is stored in the RAM (U23) by the processor via U22 and U14. The display is refreshed at a 2.150 ms rate by the counter (U9 and U10) whose outputs address the RAM via the two input multiplexers (U22 and U14). They also address the segments of the display digits via J1-1 thru J1-5.



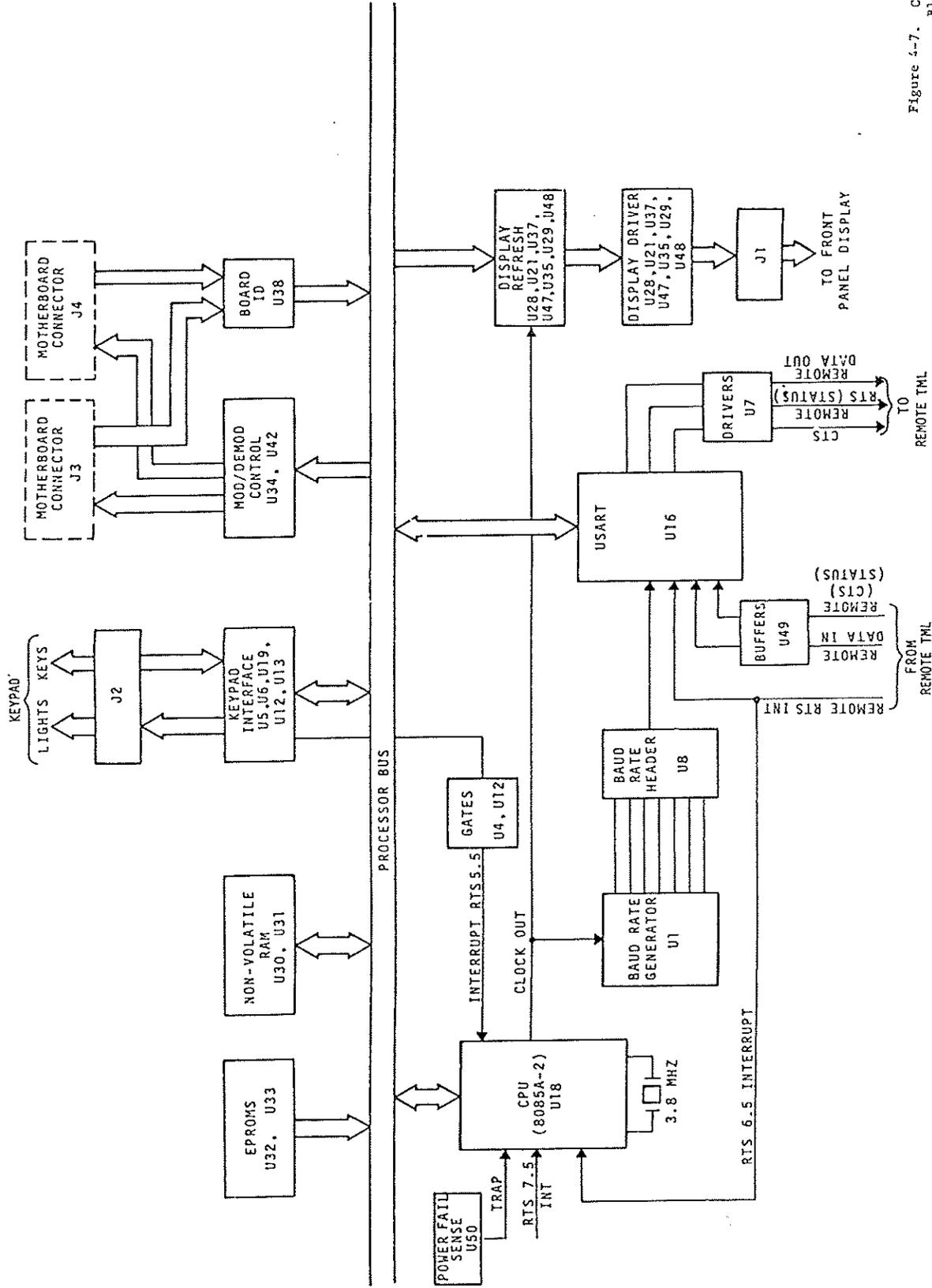


Figure 4-7. Control Board Block Diagram

The processor accesses the RAM only when a change is to be made to the displayed data. This is accomplished via address 68H which switches the multiplexer to the processor address and gates bit 0 of the data bus to the RAM I/O bit 0 via gate U15.

The bar graph display is developed as follows: Samples of FSK mark and space amplitudes are received from the Modulator or Demodulator board at P1-36, 34 or P1-35, 36. One of the four is selected by U35 as directed by the processor via U26 and by the state of the refresh counter via U29 and U48. The selected sample is presented to the comparators U21, U28, U37 and U47. The comparators are supplied with reference voltages via U41 and the resistor strings R14 thru R22 and R25 thru R32. Each comparator has a reference voltage which corresponds to the signal level represented by the bar segment to which it is connected. For a given sample those comparators whose reference voltage is lower than the sample will be in conduction, illuminating the bars to which they are connected.

Remote control is accomplished via an RS-232 link. A USART (U16) is provided for this purpose. Data and control out to the remote station is via the interface driver U7. The output driver can be increased by removing jumpers E1-E2, E3-E4, and E5-E6. Received data and control are interfaced by U49. U1 is a baud rate generator whose output rate to the USART is selected by jumpers on a header installed in socket U8.

4.3.4 Front Panel Display Board

The purpose of this board is to interface the signals from the control board to the high voltage plasma display (refer to Figure 4-8). U1 and U2 interface to the anodes of the digits and the bars. U3, U4, and U5 interface to the cathodes of the individual bar segments and digit segments. For a detailed description of each pin of the plasma display see Table 4-1. The digit that will be driven (illuminated) during a given refresh cycle is controlled by U10, a 4:16 decoder driven by the outputs of the refresh counter (U9 and U10) on the control board. INHIBIT is active during the counter transitions and during the RAM (U23) update on the control board so that meaningless counter outputs do not produce a display. In similar fashion the shift register U9 which cycles through the segments of the digit is reset after the seventh segment, thus blanking the time between digits.

T1 is a 12 volt to + 90 volt converter which produces the drive voltages for the plasma display.

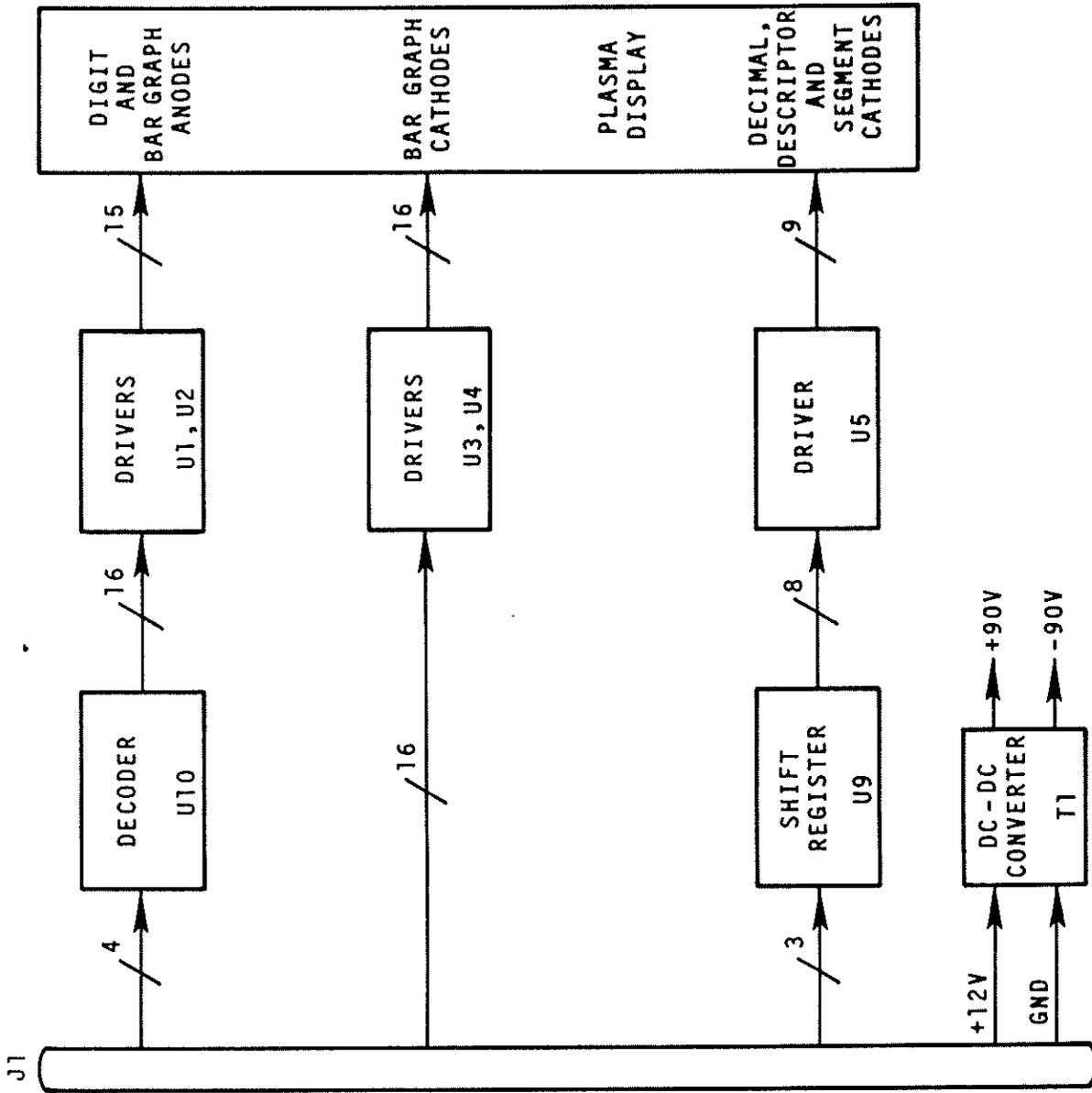


Figure 4-8. Front Panel Display Block Diagram

Table 4-1. Plasma Display Pin Functions

| <u>PIN #</u> | <u>DESCRIPTION</u> |
|--------------|----------------------------------|
| 1 | SEGMENT E CATHODE |
| 2 | DIGIT 1 ANODE |
| 3 | SEGMENT F CATHODE |
| 4 | DIGIT 2 AND DESCRIPTOR 11 ANODE |
| 5 | BAR 1 CATHODE |
| 6 | BAR 2 CATHODE |
| 7 | BAR 3 CATHODE |
| 8 | BAR 4 CATHODE |
| 9 | BAR 5 CATHODE |
| 10 | BAR GRAPH 1 ANODE |
| 11 | BAR 6 CATHODE |
| 12 | BAR 7 CATHODE |
| 13 | BAR 8 CATHODE |
| 14 | BAR 9 CATHODE |
| 15 | BAR 10 CATHODE |
| 16 | BAR 11 CATHODE |
| 17 | BAR GRAPH 2 ANODE |
| 18 | BAR 12 CATHODE |
| 19 | DIGIT 3 AND DESCRIPTOR 1 ANODE |
| 20 | BAR 13 CATHODE |
| 21 | KEEP ALIVE ANODE |
| 22 | NO CONNECTION |
| 23 | KEEP ALIVE CATHODE |
| 24 | BAR 16 CATHODE |
| 25 | DIGIT 4 AND DESCRIPTOR 2 ANODE |
| 26 | BAR 15 CATHODE |
| 27 | DIGIT 5 AND DESCRIPTOR 3 ANODE |
| 28 | BAR 14 CATHODE |
| 29 | DIGIT 6 AND DESCRIPTOR 4 ANODE |
| 30 | DESCRIPTOR CATHODES |
| 31 | DIGIT 7 AND DESCRIPTOR 5 ANODE |
| 32 | SEGMENT A CATHODE |
| 33 | DIGIT 8 AND DESCRIPTOR 6 ANODE |
| 34 | SEGMENT B CATHODE |
| 35 | DIGIT 9 AND DESCRIPTOR 10 ANODE |
| 36 | SEGMENT G CATHODE |
| 37 | DIGIT 10 AND DESCRIPTOR 9 ANODE |
| 38 | SEGMENT C CATHODE |
| 39 | DIGIT 12 AND DESCRIPTOR 8 ANODE |
| 40 | SEGMENT D CATHODE |
| 41 | DIGIT 13 AND DESCRIPTOR 7 ANODE |
| 42 | DECIMAL POINT CATHODE |
| 43 | DIGIT 11 AND DECIMAL POINT ANODE |
| 44 | NO CONNECTION |

4.3.5 Power Supply

4.3.5.1 AC POWER SUPPLY. The AC power supply (Figure 4-9) consists of a Line filter-fuse-switch board assembly, (mounted on the rear of the chassis), an input transformer (mounted on the right front of the chassis), rectifiers, regulators, and a switching regulator.

The ac input is passed through the fused switch board to the transformer whose primary windings are tapped for 115 or 230V by the position of the switch board. The secondary has a center tap which is grounded. Full wave rectifiers CR2 and CR3 are connected to yield a negative voltage at their common point. This voltage is filtered and regulated to -12V by VR1. Fullwave rectifies CR6 and CR7 yield a positive voltage which is regulated to +12V by VR2 and to +5V by a switching regulator composed of U1, L1, L2, Q1 and their associated components.

The switching regulator functions as follows. U1 is a pulse-width modulation circuit including a voltage reference and an oscillator. The outputs E1 and E2 of U1 drive the FET switch Q1 which turns on to charge L1 until 5V appears at its output, as sensed by the voltage divider R1, R2 and in turn by an error amplifier in U1. When Q1 switches off the current stored in L1 continues to flow to the load. The switching action continues so the voltage at the output of L1 is held within the tolerance of the 5 volt output.

4.3.5.2 OPTIONAL DC POWER SUPPLY. Optional dc power supplies can be provided that will operate from 10-16 Vdc or 20-32 Vdc sources.

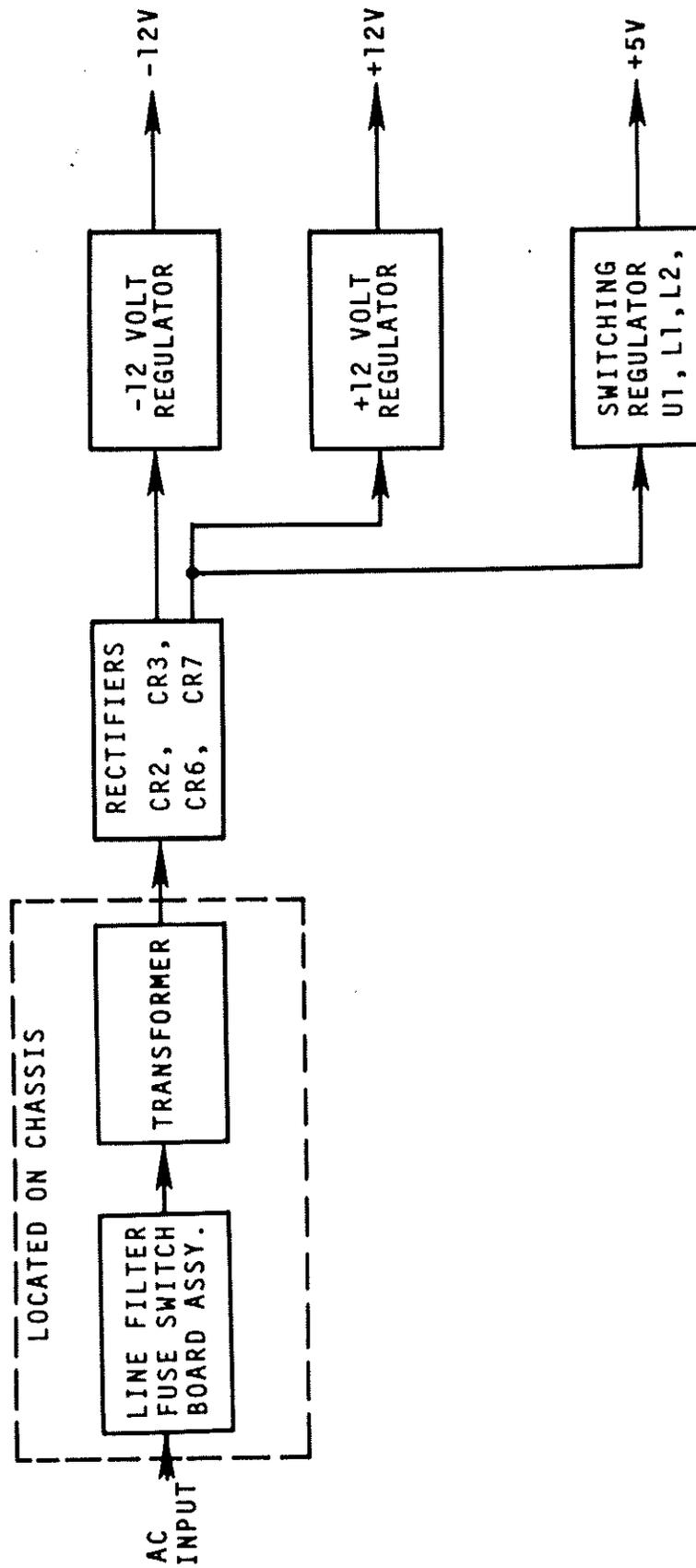


Figure 4-9. AC Power Supply Block Diagram

4.3.6 Mother Board

This board interconnects the control board (J2) and the other two (modulator or demodulator) boards (J3 and J4). It also contains the power up reset circuit and the master clock (refer to the backplane schematic diagram).

The power up reset circuit, U2-A, holds all the microprocessors on the various installed boards in the reset condition until the power supply has reached normal operating voltage levels. This is supplied to J2, J3 and J4. The master clock is generated by the crystal Y1 whose frequency is 8.388608 MHZ. It is provided to all boards via the driver U1-C.

J1 is the power supply connector, J5 is the optional high level loop connector, and J8 is the remote RS-232 connector.

4.3.7 Optional Loop Power Supply And Keyer

This unit consists of two PC boards; an AC input power supply which produces + 65 Vdc output and a 2 channel keyer which can be connected for neutral or polar keying. (Refer to Figures 7-7 and 7-8.)

The loop supply consists of a transformer (T1), and full wave rectifier (CR1 thru CR4) which yield positive and negative 60 Vdc. Capacitors C1 and C2 filter these voltages which are then connected to terminals 2, 3 and 4 of the high level keyer circuit.

A circuit description of the Channel 1 keyer is provided. Channel 2 operation is identical. The EIA output of the demodulator is connected to terminals E1 and E2. The positive (mark) portion of the output will cause opto-isolator U1 to conduct. The negative (space portion) will cause U3 to conduct. The conduction action of U1 turns on switching transistors Q1 and Q2 providing a mark loop current output at TB1-8. The conduction of U3 will turn on switching transistors Q5 and Q6 providing a space loop current output at TB1-9.

- - - - -
C A U T I O N
- - - - -

Keyer current must not
exceed 80 milliamps.

SECTION V

MAINTENANCE

5.1 GENERAL

The Model 1280 FSK MODEM is a solid-state device using microprocessors. The unit is designed to operate over long periods of time with little or no routine maintenance. Occasional inspection and cleaning are the only preventive maintenance procedures needed for the unit. If trouble should occur, the information provided in this section will be helpful to a qualified maintenance technician. The technician should be well acquainted with digital and analog intergrated circuitry and have a thorough understanding of microprocessors, RAMs, USARTS, multiplexers, and the theory of operation of the Model 1280 FSK MODEM before attempting any troubleshooting. A discussion of the theory of operation can be found in Section IV with assembly drawings and schematic diagrams in Section VI and VII.

5.2 PREVENTIVE MAINTENANCE

Since the modem is a solid-state, low power device, preventive maintenance is not recommended, except for periodic external visual inspections for indications of mechanical or electrical defects. Internal components inspection and cleaning are not recommended except during corrective maintenance.

5.3 REQUIRED TEST EQUIPMENT

The test equipment or its equivalent required to test and troubleshoot the modem is listed in Table 5-1.

No special tools other than those normally contained in an electronic technician's toolbox are required. The modem is supplied with its own board extender for ease of troubleshooting.

Table 5-1. Required Test Equipment

| EQUIPMENT | MANUFACTURER |
|-------------------------------|----------------------|
| Standard Technicians Tool Kit | |
| Board Extender | |
| Multimeter | Simpson 260 |
| Oscilloscope | Tektronics 465 |
| AC Voltmeter | HP-400FL |
| Attenuator | HP-350D |
| Pattern Generator | Data Products PG303 |
| Distortion analyzer | Data Products PMS303 |
| Data Terminal | HP-2645A |
| Frequency Counter | HP-5307A |

5.4 SYSTEM TESTS AND ADJUSTMENTS

The following tests provides complete system checkout. Should any test fail, refer to Paragraph 5.5 for troubleshooting procedures.

Refer to the appropriate table (Table 2-1 or 2-2) for rear panel connector pin assignments.

5.4.1 Power Supply Verification Test

This procedure verifies the voltage sources of the modem.

- a. Requirements - Measure the output voltages supplied to motherboard J2 with respect to digital ground (J3-18). Measure the output voltages of the DC to DC converter on the front panel.

Table 5-2. Power Supply Voltages

| TEST POINT | VOLTAGES | TOLERANCE | REMARKS |
|---------------------------|-------------|---------------|---------------------------|
| Demodulator Board U106 | -5.0 Vdc | <u>+0.50V</u> | Pin 14 |
| Mother Board J3 | +5.0 Vdc | <u>+0.50V</u> | Pin 14 |
| Mother Board J3 | +12.0 Vdc | <u>+1.2V</u> | Pin 16 |
| Mother Board J3 | -12.0 Vdc | <u>+1.2V</u> | Pin 17 |
| Mother Board J3 | Digital Gnd | - | Pin 18 |
| Front Panel Board CR1 | +90.0 Vdc | <u>+10.0V</u> | Anode to grd (J1-34) |
| Front Panel Board CR2 | -90.0 Vdc | <u>+10.0V</u> | Cathode to grd (J1-34) |

b. Procedure - Perform the following procedure to verify the voltage sources.

- (1) Remove front panel (do not disconnect cables) and connect power cord.
- (2) Locate anode of CR1, cathode of CR2, and ground (J1-34).
- (3) Turn power on and measure the voltages at test points listed in Table 5-2 for front panel board.
- (4) Turn power off and remove control board, demodulator/modulator boards.
- (5) Measure voltages on motherboard connector J3 as listed in Table 5-2 with respect to digital ground.
- (6) Shut off power.
- (7) Insert extender board in demodulator position and insert demodulator board into extender.
- (8) Measure voltage on U106-14 with respect to digital ground (board pin 13).
- (9) Replace top cover, modulator and control board.

5.4.2 Master Clock Verification

This procedure verifies the master clock frequency.

- a. Requirements - Measure the frequency of the master system clock using a high impedance input frequency counter.
- b. Procedure - Perform the following steps to verify and adjust master system clock frequency.
 - (1) With demodulator board extended locate pin 4 of IC U-99.
 - (2) Connect frequency counter between U-99 pin 4 and digital ground J3-18.
 - (3) Counter should read 8.388608 MHz ± 400 Hz
NOTE: If frequency is incorrect locate and adjust C4 on the motherboard (Figure 6-7) to obtain correct frequency.
 - (4) Turn power off and remove demodulator board from extender board.
 - (5) Remove extender board and replace with demodulator board.
 - (6) Replace front panel assembly.

5.4.3 Modulator Verification

5.4.3.1 MARK AND SPACE FREQUENCY VERIFICATION. This procedure verifies the programmed mark and space frequencies are correct.

- a. Requirements - Measure the frequency of the mark and space tone outputs.
- b. Procedure - Perform the following steps to verify the frequency of the mark and space tones.
 - (1) Set-up the test equipment as indicated in Figure 5-1.
 - (a) Set message generator controls to the following.

| | |
|----------------|----------------------------|
| Pattern Output | - 5 level, 2-unit stop bit |
| Function | - MK (MARK) |
| Baud Rate | - 50 |

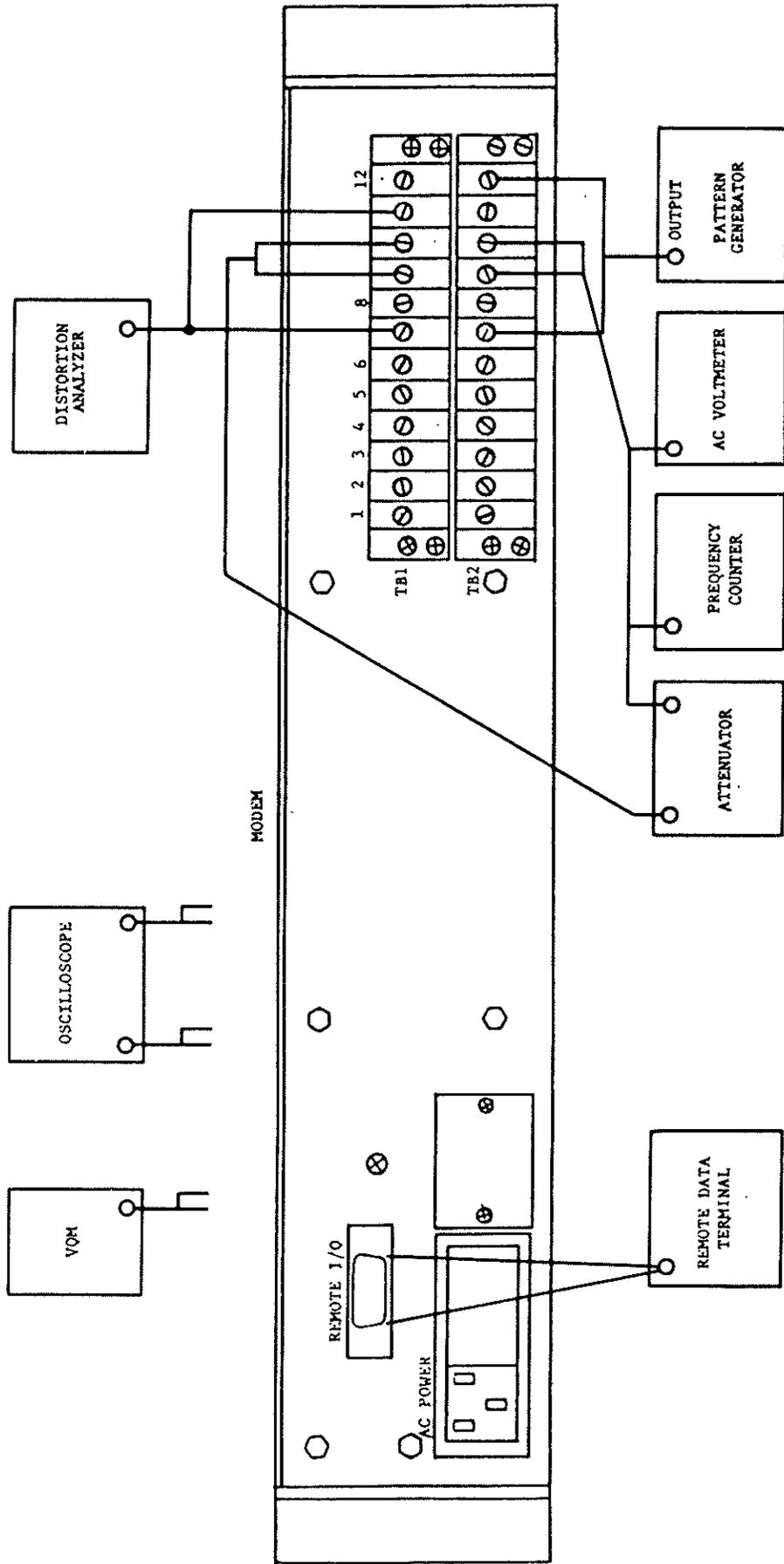


Figure 5-1. Test Setup

- (2) Set-up unit parameters, either by keypad or remote terminal, as follows:

CHANNEL ONE - DEMOD

Mark Frequency - 1575 Hz
Space Frequency - 2425 Hz
Baud Rate - 50
Output Polarity - Normal

CHANNEL TWO - MOD

Mark Frequency - 1575 Hz
Space Frequency - 2425 Hz
Baud Rate - 50
Output Polarity - Normal

- (3) Verify the following:
- a. Mark frequency reading on frequency counter of 1575 Hz.
 - b. Channel 2 (modulator) mark bargraph illuminated.
- (4) Set unit to display Channel 1 (Demodulator) and verify mark bargraph illuminated.
- (5) Set message generator to SP (SPACE) and verify:
- a. Space frequency reading on frequency counter of 2425 Hz.
 - b. Channel 1 (Demodulator) space bargraph illuminated.
- (6) Set unit to display Channel 2 (Modulator) and verify space bargraph illuminated.

5.4.3.2 MARK AND SPACE FREQUENCY PLUS 1/2 HZ
(+.5 HZ) VERIFICATION

- a. Program Channel 2 for +.5 Hz function. Refer to Section III, Tables 3-2 or 3-3 for appropriate procedure.
- b. Verify Space frequency reading of 2425.5 Hz on frequency counter.
- c. Set message generator to MK (MARK).
- d. Verify Mark frequency reading of 1575.5 Hz on frequency counter.

5.4.3.3 NORMAL/REVERSE OUTPUT VERIFICATION

- a. Program Channel 2 for 'REV' function.
Refer to Section III, Tables 3-2 or 3-3 for appropriate procedure.
- b. Verify frequency counter now reads 2425.5 Hz.
- c. Program Channel 2 for 'NORM' function.
Refer to Section III, Tables 3-2 or 3-3 for appropriate procedure.
- d. Verify frequency counter now reads 1575.5 Hz.

5.4.3.4 MUTE FUNCTION VERIFICATION

- a. Program Channel 2 for 'MUTE' function.
Refer to Section III, Tables 3-2 or 3-3 for appropriate procedure.
- b. Verify output frequency disappears.
- c. Verify Mark bargraph extinguishes.
- d. Remove 'MUTE' function from Channel 2.
Refer to Section III, Tables 3-2 or 3-3 for appropriate procedure.
- e. Verify output frequency of 1575.5 Hz reappears.
- f. Verify Mark bargraph illuminates.

5.4.3.5 TONE LEVEL OUTPUT VERIFICATION

- a. Verify 0 dBm level indication on VTVM.
NOTE: If level is incorrect perform the following steps.
 1. Remove front panel assembly from unit.
 2. Locate R1 on modulator board.
 3. Adjust R1 for required level output.

5.4.4 Demodulator Verification

5.4.4.1 DISTORTION VERIFICATION TEST. This procedure verifies the eight discrete filter bandwidths that are selected by the appropriate programmed baud rate. The procedure also verifies that distortion does not exceed acceptable limits for eight baud rates within the non-overlapping bandwidths.

- a. Requirements - For baud rates of 50, 75, 100, 150, 200, 300, 450 and 600 baud. The total peak distortion of the output does not exceed the following:

25 percent for a +6 dBm input level
15 percent for a 0 dBm input level
25 percent for a -45 dBm input level

- b. Procedure - Perform the following procedure to verify the peak distortion for the baud rates listed previously.

- (1) Set-up the test equipment as indicated in Figure 5-1.
- (2) Set-up the message generator as follows:
Pattern Output - 5 level, 2-unit stop bit length
Function - 1:1
Baud Rate - 50
- (3) Set distortion analyzer to measure the levels indicated and connect distortion analyzer to RS-232 output (TB1-7 and TB1-1).
- (4) Program both channels of the Model 1280 modem with the following parameters.
Mark Frequency - 1575 Hz
Space Frequency - 2425 Hz
Baud Rate - 50
Polarity - Normal
Mode - FEK
- (5) Verify that distortion level meets or exceeds the requirements as indicated in Paragraph a.
- (6) Repeat Steps b(2) through b(5) for the following baud rates: 75, 100, 150, 200, 300, 450, and 600.

5.4.4.2 DATA OUTPUT VERIFICATION. This procedure verifies the data output level and presence of RS-232, Military Standard 188C, undetected mark, undetected space and mid bit sample.

- a. Requirement - Verify the level and presence of output data.
- b. Procedure - Perform the following procedures to verify the level and presence of output data.

(1) Set-up test equipment as indicated in Figure 5-1.

(2) Set-up message generator as follows.

Pattern Output - 5 level, 2-unit stop bit length
Function - 1:1
Baud Rate - 50

(3) Program both channel of the Model 1280 Modem with the following parameters.

Mark Frequency - 1575 Hz
Space Frequency - 2425 Hz
Baud Rate - 50
Polarity - Normal
Mode - FEK

5.4.4.2.1 RS-232 Data Output Verification

- a. Connect oscilloscope between TB1-7 and TB1-11.
- b. Verify data is present at levels indicated in Figure 5-2.

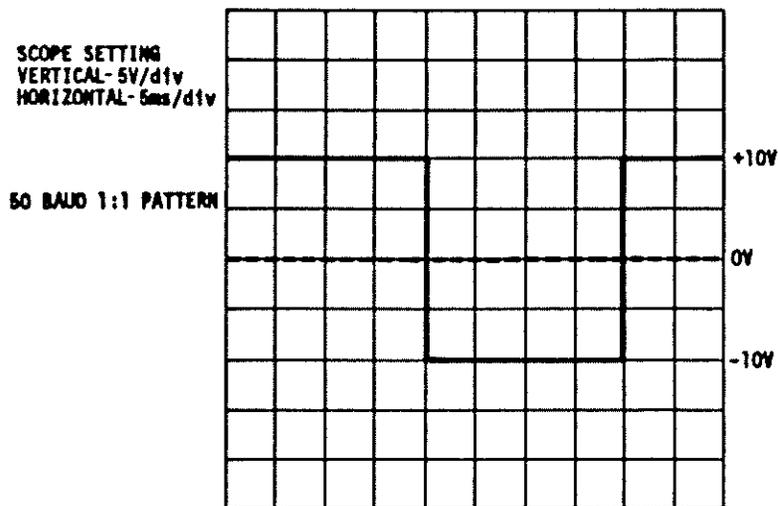


Figure 5-2. RS-232 Data Output

5.4.4.2.2 Military Standard 188C Data Output Verification

- a. Connect oscilloscope between TB1-8 and TB1-11.
- b. Verify data is present at levels indicated in Figure 5-3.

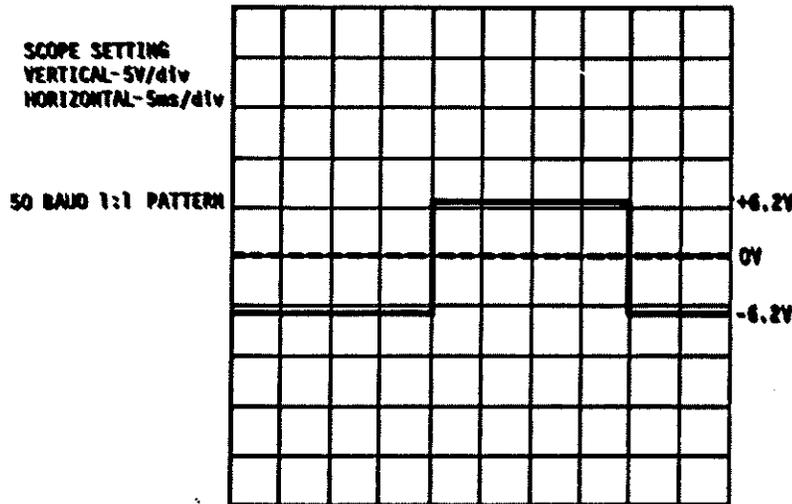


Figure 5-3. MIL-188C Data Output

5.4.4.2.3 Undetected Mark Output Verification

- a. Connect oscilloscope between TB1-5 and TB1-11.
- b. Verify output is present at levels indicated in Figure 5-4.

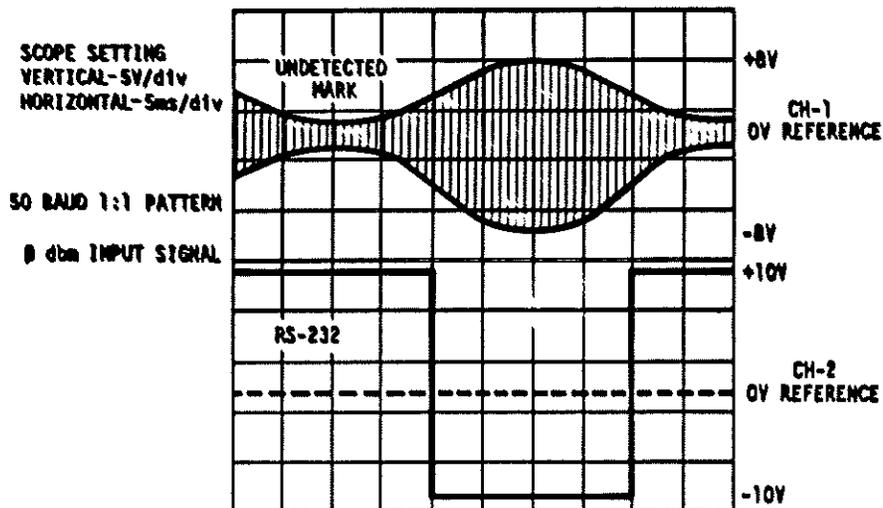


Figure 5-4. Undetected Mark Output

5.4.4.2.4 Undetected Space Output Verification

- a. Connect oscilloscope between TB1-6 and TB1-11.
- b. Verify output is present at levels indicated in Figure 5-5.

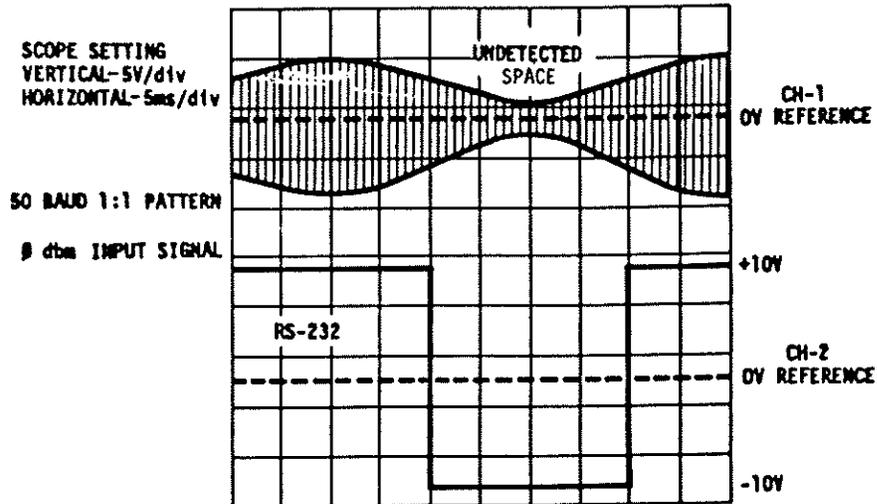


Figure 5-5. Undetected Space Output

5.4.4.2.5 Mid-Bit Sample

- a. Using a two channel oscilloscope set for alternate function.
 - (1) Place Channel 1 probe between TB1-7 and TB1-11.
 - (2) Place Channel 2 probe between TB1-3 and TB1-12.
- b. Verify output present and levels appears as shown in Figure 5-6.

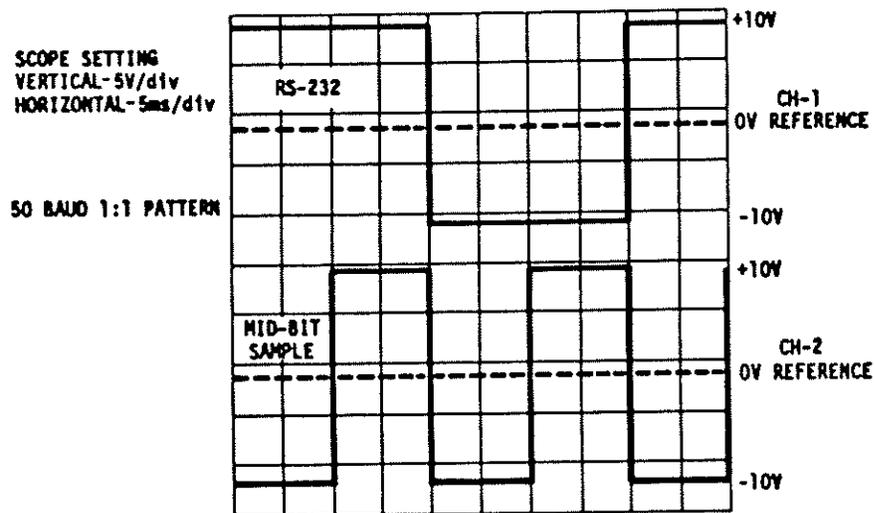


Figure 5-6. Mid-Bit Sample

5.4.4.3 AUTO MARK HOLD (AMH) OUTPUT VERIFICATION TEST. This procedure verifies the AMH function of the modem. The AMH threshold levels are switch selectable on the demodulator board.

- a. Requirements - The keyed DC output defaults to a mark hold state +3 dBm about the AMH threshold 5 seconds after losing the input signal. The keyed DC output resumes normal data output immediately after the input signal exceeds the selected AMH threshold by 3 dBm.
- b. Procedure - Perform the following procedure to verify the timing and on/off levels of AMH.

(1) Set-up test equipment as indicated in Figure 5-1.

(2) Program both channel of the Model 1280 Modem with the following parameters. Refer to Section III, Table 3-2 and 3-3 for appropriate procedures.

| | |
|-----------------|-----------|
| Mark Frequency | - 1575 Hz |
| Space Frequency | - 2425 Hz |
| Baud Rate | - 50 |
| Polarity | - Normal |
| Mode | - FSK |
| Auto Mark Hold | - On |

(3) Set-up Message Generator as follows:

| | |
|----------------|-----------------------------------|
| Pattern Output | - 5 level, 2-unit stop bit length |
| Function | - Message |
| Baud Rate | - 50 |

(4) Turn power off to Model 1280.

(a) Remove front panel assembly.

(b) Remove demodulator board and insert extender board.

(c) Insert demodulator board into extender board.

(5) Connect oscilloscope between TB1-7 (keyed DC output) and TB1-11 (ground).

(6) Turn power ON. Verify keyed DC output present.

(7) Locate S7 on demodulator board. Note original settings and clear switch positions. Reset position 8 (-39 dBm level) on S7 to ON.

(8) Adjust attenuator for -42 dBm (AMH ON). Verify the keyed DC output changes to a mark condition after approximately 5 seconds.

- (9) Adjust attenuator for -36 dBm (AMH OFF). Verify the key DC output returns to a normal data output.
- (10) Select each position one at a time on S7 as listed in the following.

| S7 Position | Selected Threshold | Tolerance | |
|----------------|-----------------------|-----------|---------|
| | | MAX | MIN |
| 8 | -39 dBm | -42 dBm | -36 dBm |
| 7 | -36 dBm | -39 dBm | -33 dBm |
| 6 | -33 dBm | -36 dBm | -30 dBm |
| 5 | -30 dBm | -33 dBm | -27 dBm |
| 4 | -27 dBm | -30 dBm | -24 dBm |
| 3 | -24 dBm | -27 dBm | -21 dBm |
| 2 | -21 dBm | -24 dBm | -18 dBm |
| 1 | -18 dBm | -21 dBm | -15 dBm |

- (11) Repeat Steps (7) through (10) for each level.
- (12) Disable AMH and return switch position to original setting noted in Step (7) upon completion of this procedure.

5.5 TROUBLESHOOTING

In troubleshooting the Modem, as in all electronic equipment, the technician relies on the fact that a signal progresses in a predetermined fashion from input to output of the unit, while being processed or acted upon in some manner.

The troubleshooting procedures outlined in this section, along with the block and schematic diagrams and the functional descriptions contained in this manual will enable a qualified technician to isolate a trouble.

5.5.1 Printed Circuit Board Isolation

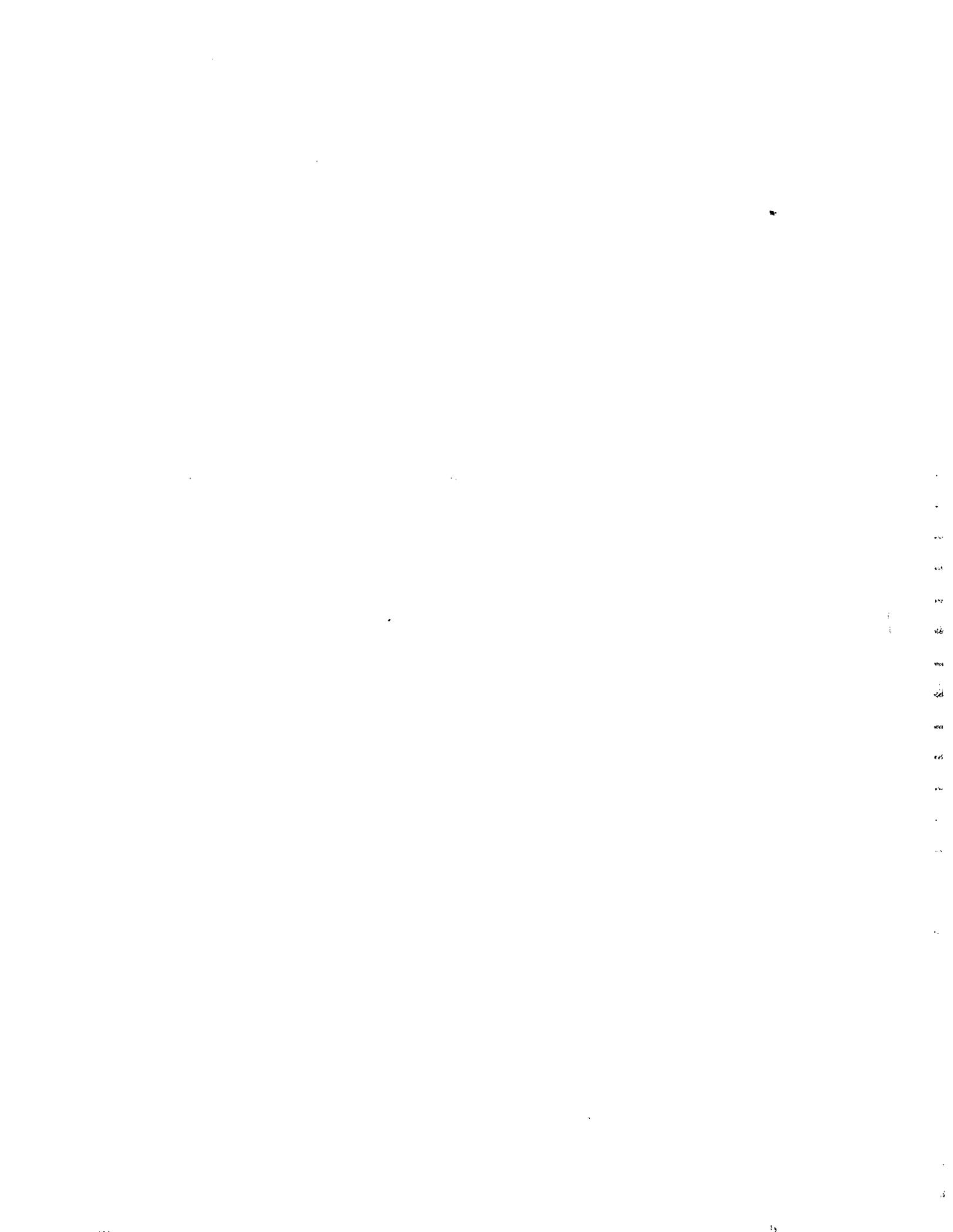
Possible symptoms and suspected PCBs required to correct problems that may occur are listed in Table 5-3. The conditions listed assume fault to be in one channel only, however the fault could occur in both channels.

Table 5-3. Printed Circuit Board (PCB) Isolation

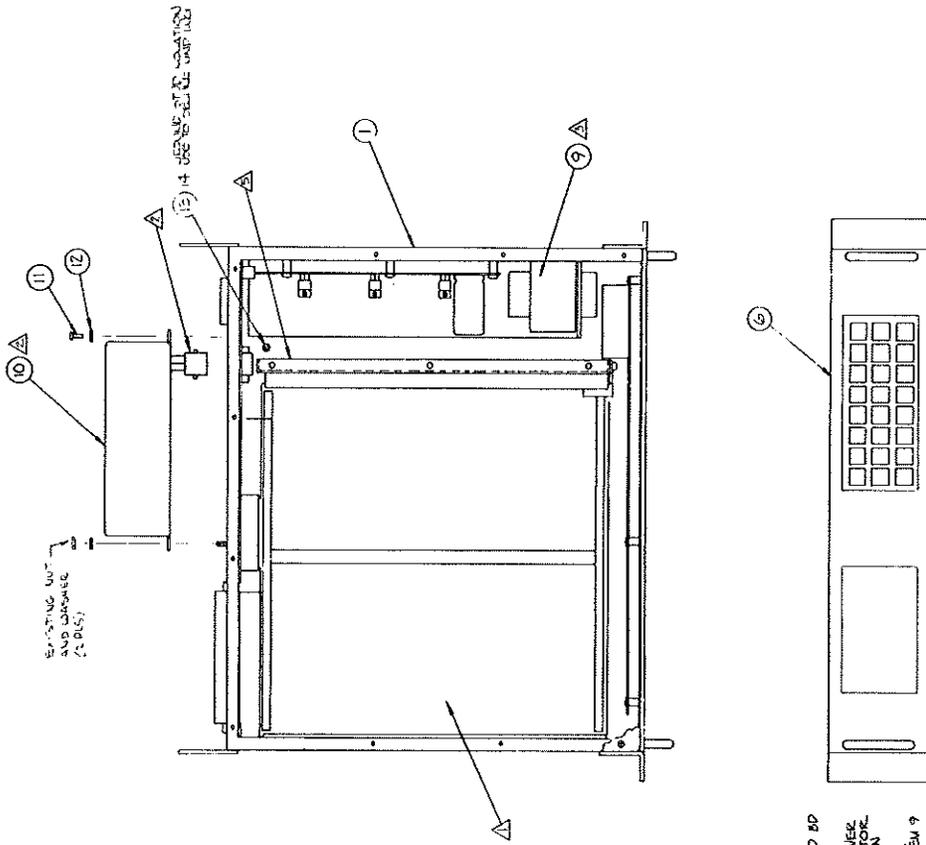
| SYMPTOM | SUSPECTED PCB/CONNECTIONS |
|--|--|
| <p><u>Front Panel Display Malfunctions</u></p> <p>No Lights and No Keypad Function</p> <p>Channels Inoperative</p> <p>No Bargraphs</p> <p>No Power Loss Memory</p> <p>Front Panel Numeric and Descriptor Malfunction</p> | <p>1) Power Supply 2) Front Panel 3) Plasma Display 4) Control</p> <p>1) Power Supply 2) Backplane 3) Control 4) Modulator 5) Demodulator</p> <p>1) Front Panel 2) Plasma Display 3) Demodulator Input Signal 4) Modulator Input Signal</p> <p>1) Control</p> <p>1) Front Panel 2) Plasma Display 3) Keypad 4) Control</p> |

Table 5-3. Printed Circuit Board (PCB) Isolation (cont.)

| SYMPTOM | SUSPECTED PCB/CONNECTIONS |
|-------------------------------------|--|
| <u>Reports From Other Units</u> | |
| No Remote Control | 1) Control 2) Signal Connections |
| No Analog Output | 1) Modulator 2) Signal Connections 3) Backplane (Master Clock) 4) Control Board |
| No Keyed DC | 1) Demodulator 2) Signal Connections 3) Backplane (Master Clock) 4) Control |
| Distorted or Garbled Output | 1) Demodulator 2) Control 3) Backplane |
| Normal/Reverse Response Inoperative | 1) Control 2) Demodulator 3) Modulator 4) Keypad |
| Mute Response Inoperative | 1) Control 2) Modulator 3) Keypad |
| AMH Response Inoperative | 1) Control 2) Demodulator 3) Keypad |
| SYNCH/REGEN Response Inoperative | 1) Control 2) Demodulator 3) Keypad |



SECTION VI
ASSEMBLY DRAWINGS
AND
PARTS LISTS



INTERCONNECTIONS

| FROM | REF DES | TO | REF DES |
|-------------------------|---------|------------------------|---------|
| POWER FILTER | P2 | POWER SWITCH | S1 |
| POWER FILTER | P3 | POWER SUPPLY | J1 |
| POWER FILTER | J2 | POWER SUPPLY | PS |
| HIGH LEVEL INTERFERENCE | J1 | POWER SUPPLY CONNECTOR | P1 |
| CONTROL BD | J1 | DISPLAY BD | J1 |
| CONTROL BD | J2 | KEY BD | J1 |
| POWER FILTER | M1 | REAR PANEL | — |

OPTIONAL

- NOTES:
- △ TOP SLOT IS EXTENDER BD, ITEM 5
 - △ TOP SLOT IS CONTROL BD, ITEM 6
 - △ FOR SLOT 3 AND BOTTOM, SELECT ONEZ DEMOD BD ITEM 5 OR 1 ONEZ MOD BD, ITEM 2 OR 1 OF EACH
 - △ IF HIGH LEVEL OPTION IS SELECTED, REMOVE COVER FROM CONTROL BOARD AND ATTACH HIGH LEVEL AGST (ITEM 7) AS SHOWN
 - △ IF DC VERSION IS SELECTED, REMOVE AC POWER SUPPLY (SHOWN) AND REPLACE WITH DC SUPPLY ITEM 9
 - △ ITEM 6
 - △ ROUTE WIRES THROUGH CABLE CLAMPS

Figure 6-1. Assembly, Model 1280

| ITEM CARD NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------------|--------------|----------|---|--------------|------------------------------|------|---------------|----------------------|
| | | | | | | | | |
| 1 | D5679 | | 1 | | ASSY CHASSIS | FEC | | |
| 2 | D5707 | | 0 | | ASSY MODULATOR BD. | FEC | N02174 | |
| 3 | D5725 | | 0 | | ASSY DEMODULATOR BD | FEC | N02171 | |
| 4 | D5698 | | 1 | | ASSY CONTROL BD | FEC | N02169 | |
| 5 | D5864 | | 1 | | ASSY EXTENDER BD | FEC | N02211 | |
| 6 | D5703 | | 1 | | ASSY FRONT PANEL | FEC | | |
| 7 | AK1280 | | 1 | | ACCESSORY KIT | FEC | | |
| 8 | C4079 | | 2 | | INTERCONNECT CABLE | FEC | | |
| 9 | D5841 | | 0 | | ASSY DC POWER SUPPLY | FEC | | |
| 10 | D5865 | | 0 | | ASSY HIGH LEVEL INTERFACE | FEC | | |
| 11 | 404361 | | 0 | | SCREW #6-32x1/4 PH | T&C | | |
| 12 | 404893 | | 0 | | WASHER, INT TOOTH #6 | T&C | | |
| | | | | | | | | |
| | | | | | | | | |

Figure 6-1. Parts List

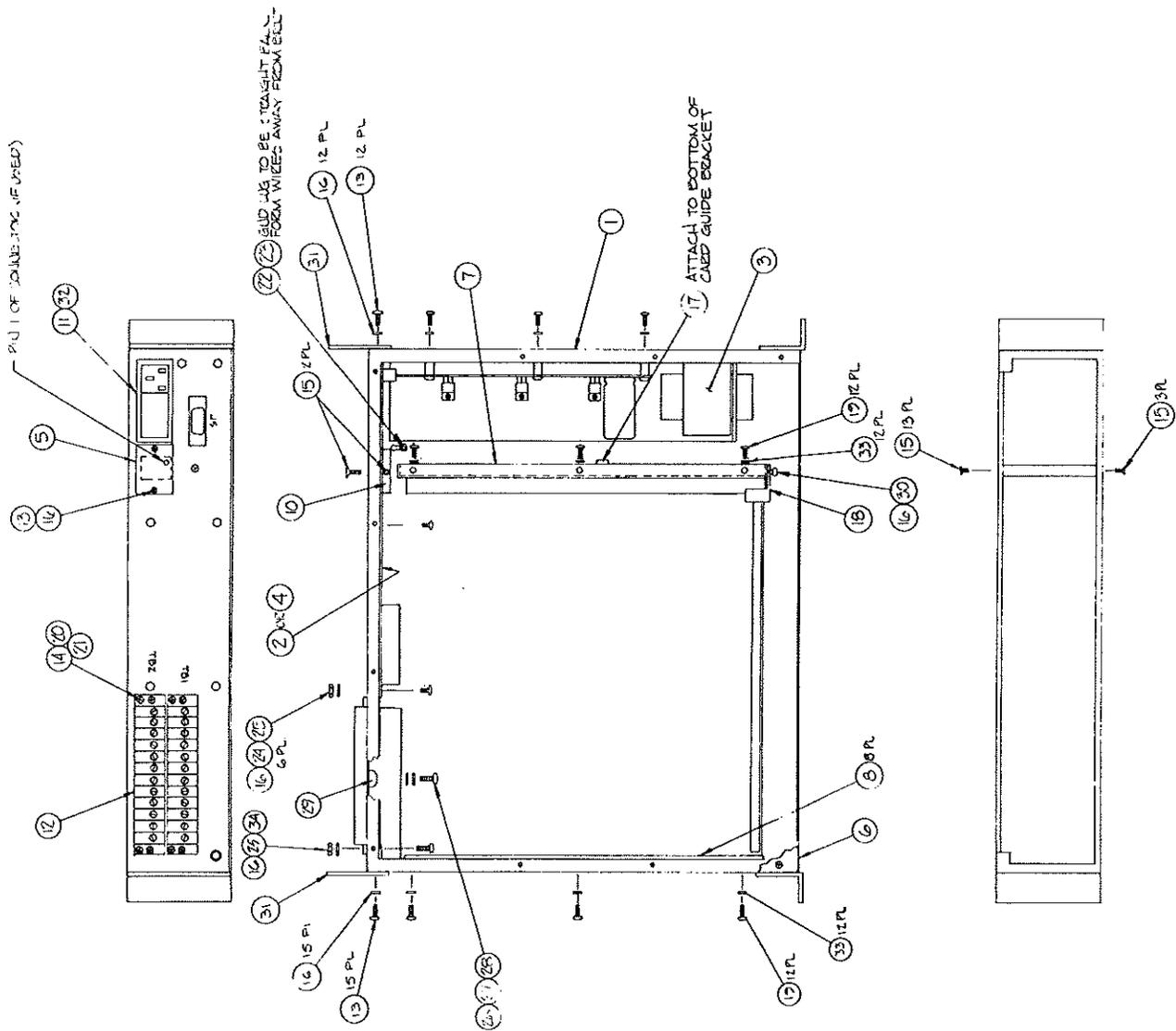


Figure 6-2. Chassis Assembly

| ITEM CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------------------|-------------|--------------|----------|----|-------------|-----------------------|------|---------------|----------------------|
| | | | | | | | | | |
| | 1 | D5711 | 1 | 1 | | CHASSIS | FEC | | |
| | 2 | D9010 | | 1 | | ASSY BACKPLANE | FEC | N02249 | |
| | 3 | D5810 | | 1 | | ASSY. AC POWER SUPPLY | FEC | | |
| | 4 | D9090 | | 1 | - | ASSY BACKPLANE | FEC | N02267 | |
| | 5 | B2689 | | 1 | | COVER PLATE | FEC | | |
| | 6 | D5713 | | 1 | | TOP COVER | FEC | | |
| | 7 | C4053 | | 1 | | PC GUIDE BRACKET | FEC | | |
| | 8 | B2691 | | 8 | | CARD GUIDE | FEC | | |
| | 9 | | | | | | | | |
| | 10 | B2697 | | 1 | | CONNECTOR BRACKET | FEC | | |
| | 11 | C4053 | | 1 | | ASSY. FILTER | FEC | | |
| | 12 | 100863 | | 2 | | TERMINAL BLOCK | AMP | 350883-1 | |
| | 13 | 404361 | | 15 | 15 | SCREW 6-32x1/4 PH | T&C | MS51957-26 | |
| | 14 | 404373 | | 8 | 8 | SCREW 6-32x3/8 PH | T&C | MS51957-28 | |

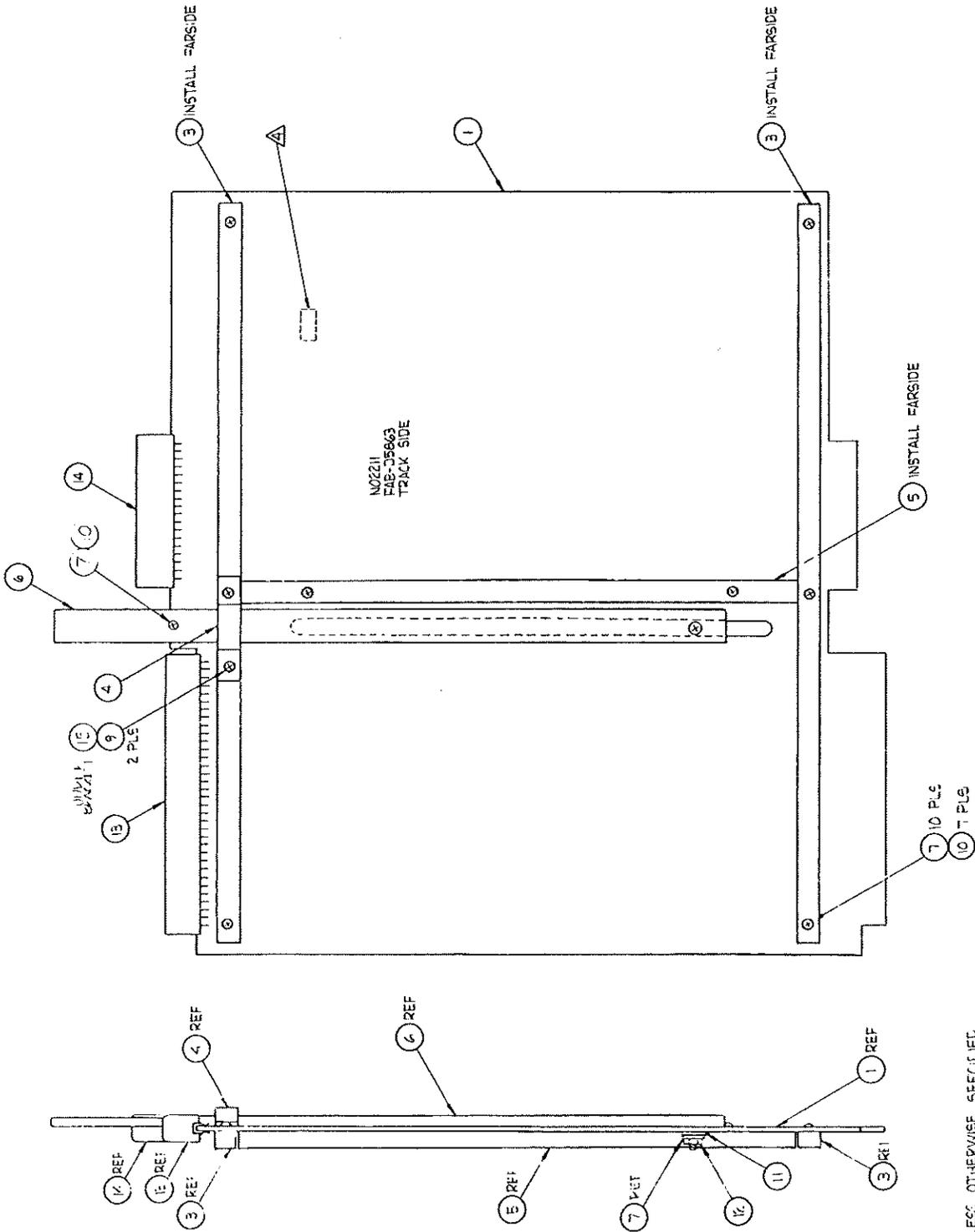
Figure 6-2. Parts List, Sheet 1

| CARD ITEM CODE NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------|--------------|----------|----|--------------|------------------------|------|---------------|----------------------|
| | | - | + | | | | | |
| 15 | 404354 | 18 | 18 | | SCREW 6-32X3/16 | T&C | MS51959-25 | |
| 16 | 404893 | 25 | 25 | | WASHER INT TOOTH #6 | T&C | MS35333-71 | |
| 17 | 184557 | 1 | 1 | | CABLE CLAMP | GC | 34-404-C | |
| 18 | B2696 | 1 | 1 | | PC LOCK BRACKET | FEC | | |
| 19 | 404194 | 24 | 24 | | SCREW 4-40 x .250 | T&C | MS51957-13 | |
| 20 | 404895 | 8 | 8 | | WASHER, SPLITLOCK #6 | T&C | MS35338-136 | |
| 21 | 404896 | 8 | 8 | | WASHER, FLAT #6 | T&C | MS15795-805 | |
| 22 | 404917 | 1 | 1 | | WASHER, SPLITLOCK, #10 | T&C | MS35338-138 | |
| 23 | 404914 | 1 | 1 | | WASHER, FLAT #10 | T&C | MS15795-809 | |
| 24 | 404405 | 6 | 6 | | SCREW 6-32 x .75 | T&C | MS51959-32 | |
| 25 | 403035 | 7 | 7 | | NUT 6-32x.18 | T&C | NAS671-C6 | |
| 26 | 404210 | 1 | 1 | | SCREW 4-40 x .38 | T&C | AN515C-4-R6 | |
| 27 | 404877 | 1 | 1 | | WASHER #4 FLAT | T&C | AN960-C4 | |
| 28 | 404880 | 1 | 1 | | WASHER #4 SPLITLOCK | T&C | MS35338-135 | |

Figure 6-2. Parts List, Sheet 2

| CARD NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-------------|-------------|--------------|----------|-----|-------------|--------------------------|---------------------|---------------|-------------------------------------|
| | | | | | | | | | |
| | 1 | N02211 | | 1 | | P.W.B | FEC | | |
| | 2 | D5863 | | REF | | FABRICATION DWG | FEC | | |
| | 3 | C4104-1 | | 2 | | STIFFNER | FEC | | FOR ITEM 1 |
| | 4 | B2702 | | 1 | | SUPPORT BAR BRACKET | FEC | | FOR ITEM 1 |
| | 5 | C4104-2 | | 1 | | STIFFNER | FEC | | FOR ITEM 1 |
| | 6 | B2699 | | 1 | | SLIDE SUPPORT | FEC | | |
| | 7 | 404878 | | 11 | | WASHER, INT TOOTH, NO4 | T&C | NO. 4 WASHER | TO MOUNT ITEMS 3,4 & 5 TO ITEM 1 |
| | 8 | 801190 | | 4 | | TORQUE SEAL | ORGANIC PRODUCTS | F900, GREY | |
| | 9 | 404203 | | 2 | | SCREW, SST, NO. 4, 5/16" | T&C | PH4-40x5/16 | TO MOUNT ITEM 4 TO ITEM 1 |
| | 10 | 404194 | | 8 | | SCREW, SST, NO. 4, 1/4" | T&C | MS51957-13 | TO MOUNT ITEMS 3 & 5 TO ITEM 1 |
| | 11 | 404892 | | 1 | | WASHER, FLAT #6 CRES | T&C | AN960-C6 | |
| | 12 | 403030 | | 1 | | NUT, HEX 4-40x1/4AF CS | T&C | MS35649-244 | |
| | 13 | 241200 | | 1 | | CONNECTOR, DUAL, 34 POS | AMP | 1-530265-2 | |
| | 14 | 241199 | | 1 | | CONNECTOR, DUAL 18 POS | AMP | 530290-5 | * |

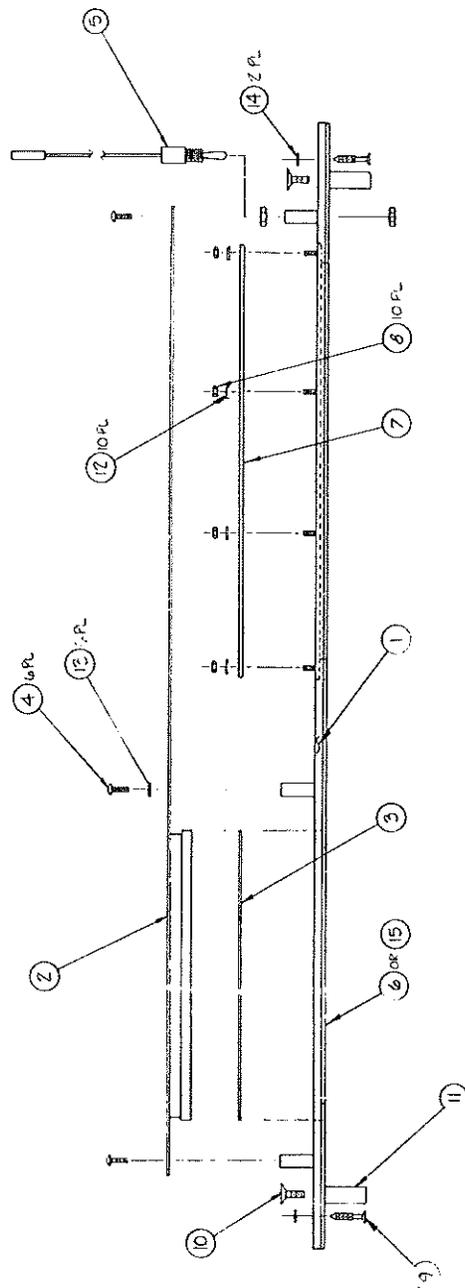
Figure 6-4. Parts List, Sheet 1



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
P.C. BOARD-NOZZLE
FABRICATION: DWG-D5863
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY
AND DO NOT NECESSARILY APPEAR ON PARTS.
3. SOLDER USING SN60 OR SN63 PER QQ-S-571.
- △ MARKS CLIPPLET REVISION LEVEL IN 1/2 HIGH CHARACTERS
USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.

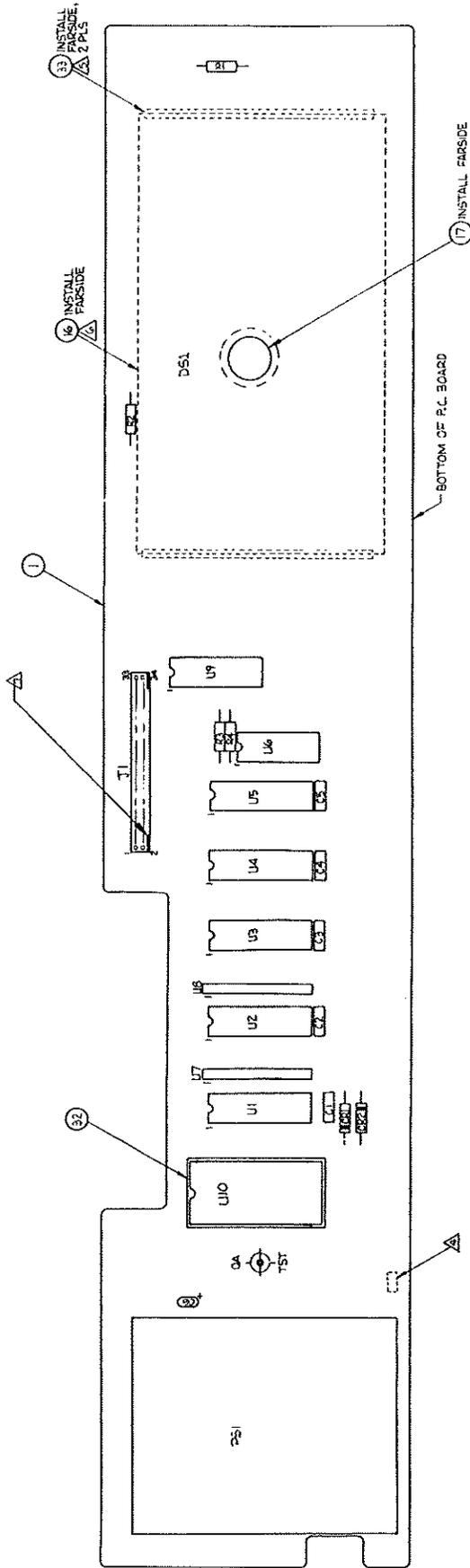
Figure 6-4. Extender PWB Assembly L-864C



| QTY | ITEM | PART NO | DESCRIPTION | MFR | REF D/W |
|-----|------|---------|---------------------------|-------------|------------|
| 1 | 15 | DOTS | OVERLAY | FEC | 1000-12 |
| 2 | 14 | 408477 | E TYPE RETAINING RING | RELIANCE | 1000-12 |
| 10 | 13 | 408480 | WASHER SPLIT LOCK #4 | LC | MSS330-175 |
| 10 | 12 | 408484 | WASHER SPLIT LOCK #2 | LC | MSS330-175 |
| 2 | 11 | 409153 | HANDLE | JANOMA | 1000-12 |
| 4 | 10 | 409153 | SCREEN # 2 5/8 X 2 1/4 | JANOMA | 1000-12 |
| 2 | 9 | 408471 | CAPTIVE SCREW # 4 | JANOMA | 1000-12 |
| 10 | 8 | 409170 | UNIT HEX 2-5/16 X 1/4 | JANOMA | 1000-12 |
| 1 | 7 | 57499 | KEYBOARD | FEC | MSS330-175 |
| 1 | 6 | 408480 | OVERLAY FRONT PANEL | RELIANCE | 1000-12 |
| 1 | 5 | 408484 | ASSY POWER SWITCH | FEC | 1000-12 |
| 1 | 4 | 408477 | SCREEN # 4 1/2 X 7 1/2 PH | JANOMA | 1000-12 |
| 1 | 3 | 408480 | PLEXIGLASS WINDOW | FEC | MSS330-175 |
| 1 | 2 | 408477 | ASSY FRONT PANEL 80 | FEC | 1000-12 |
| 1 | 1 | 408477 | FRONT PANEL | FEC | 1000-12 |
| *1 | QUAN | ITEM | PART NO | DESCRIPTION | MFR |

Figure 6-5. Front Panel Assembly

D5703B



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
P.C. BOARD-NP2170
FABRICATION DWG-D5700
SCHEMATIC DWG-D5702
 2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY
AND DO NOT NECESSARILY APPEAR ON PARTS.
 3. SOLDER USING SN60 OR SN63 PER QQ-6871.
- ▲ MARK CURRENT REVISION LEVEL IN .12 HIGH CHARACTERS
USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.
- ▲ INSTALL STRIP SOCKET WITH NARROW SIDE TOWARDS LARGE HOLE.
- ▲ USE .015" (.413mm) DELTA WITH DIGITAL READ OUT TOWARDS
THE BOTTOM OF THE P.C. BOARD.

▲ INSTALL FLAS SHOWN WITH KEYING
TAB SIDE TOWARD I.C.S.

Figure 6-6. Front Panel PWB Assembly

D5701A

| ITEM CARD NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------------|--------------|----------|--|--------------|---------------------------|-------|----------------|----------------------|
| | | | | | | | | |
| 1 | N02170A | 1 | | | P.W.B. | FEC | | |
| 2 | D5700 | REF | | | FABRICATION DWG. | FEC | | |
| 3 | D5702 | REF | | | SCHEMATIC | FEC | | |
| 4 | | | | | | | | |
| 5 | 021880 | 5 | | | CAPACITOR, .1uf, 50VDC | KEMET | C630C104M5X5CA | C1-C5 |
| 6 | 028581 | 1 | | | CAPACITOR, 22uf, 15V | KEMET | T368B226K015AS | C6 |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | 040770 | 2 | | | DIODE | MOT | 1N4740A | CR1, CR2 |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | 626020 | 2 | | | RESISTOR, 453K, 1/8W, 1% | DALE | CCF554533F | R1, R2 |
| 13 | 625673 | 1 | | | RESISTOR, 40.2K, 1/8W, 1% | DALE | CCF554022F | R3 |
| 14 | 625597 | 1 | | | RESISTOR, 26.7K, 1/8W, 1% | DALE | CCF552672F | R4 |

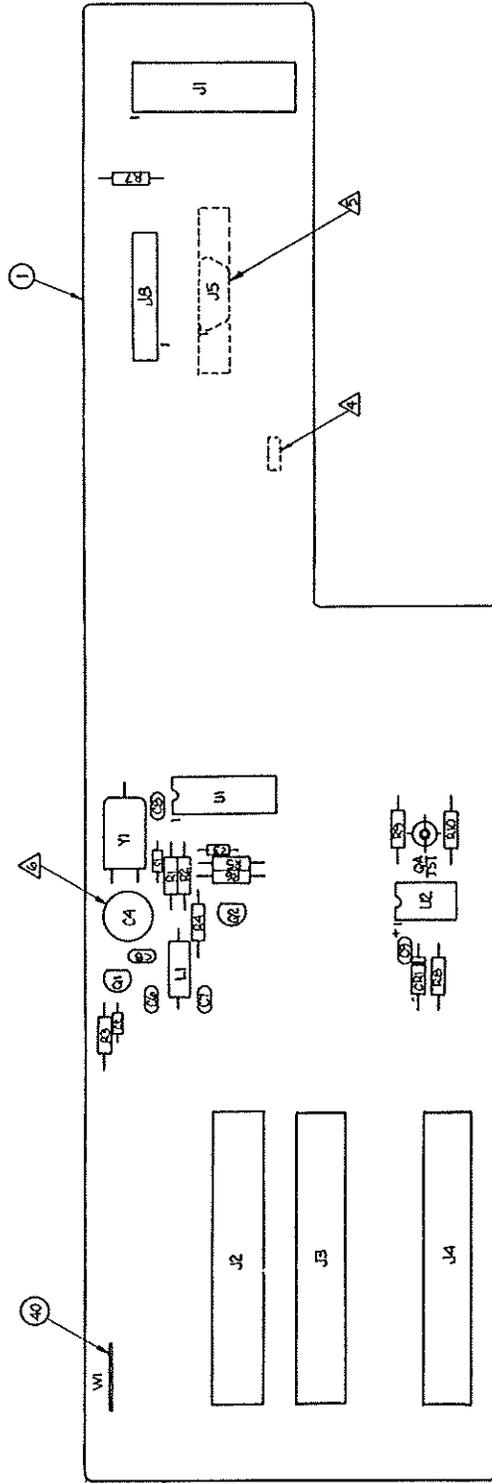
Figure 6-6. Parts List, Sheet 1 PLD5701A

| CARD NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHC CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|----------|--------------|----------|---|----------|------------------------------------|----------------|------------------|----------------------|
| | | | | | | | | | |
| | 15 | | | | | | | | |
| | 16 | 085066 | | 1 | | DALE PLASMA DISPLAY | SC263 | DS1 | |
| | 17 | 400010 | | 1 | | BANICO NON-THREADED CAP INC. | SERIES-W3 | USE WITH ITEM 16 | |
| | 18 | 241936 | | 1 | | CONNECTOR, 34 POS AMP | 1-87586-3 | J1 | |
| | 19 | | | | | | | | |
| | 20 | 580480 | | 1 | | DC-DC CONVERTER TI | 200ZDCP88101 | PS1 | |
| | 21 | | | | | | | | |
| | 22 | | | | | | | | |
| | 23 | 061887 | | 2 | | I.C., DISPLAY DRIVER SPRAGUE | UDN6184A | U1, U2 | |
| | 24 | 061890 | | 2 | | I.C., DISPLAY DRIVER SPRAGUE | UDN7186A | U3, U4 | |
| | 25 | 061889 | | 1 | | I.C., DISPLAY DRIVER SPRAGUE | UDN7180A | U5 | |
| | 26 | 062933 | | 1 | | R/NET, DIP, 14 PIN, 82K DALE | MMP1403-8236 | U6 | |
| | 27 | 062714 | | 2 | | R/NET, SIP, 10 PIN, 100K DALE | MSP10A-01-104C | U7, U8 | |
| | 28 | 0611907 | | 1 | | I.C., SHIFT REGISTER RCA | CD4015BE | U9 | |

Figure 6-6. Parts List, Sheet 2 PLD5701A

| ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-------------|--------------|----------|--|--------------|----------------------|-------|---------------|----------------------|
| | | | | | | | | |
| 29 | 061891 | 1 | | | I.C., 4-16, MUX | RCA | CD4514BE | U10 |
| 30 | | | | | | | | |
| 31 | | | | | | | | |
| 32 | 248468 | 1 | | | SOCKET, 24 PIN | AUGAT | 244-AG-29D | USE WITH ITEM 29 |
| 33 | 241435 | 2 | | | STRIP SOCKET, 22 PIN | AMP | 1-583773-0 | USE WITH ITEM 16 |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | | | | | | | | |
| 39 | | | | | | | | |
| 40 | | | | | | | | |
| 41 | | | | | | | | |
| 42 | | | | | | | | |

Figure 6-6. Parts List, Sheet 3



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
P.C. BOARD-NP2172
FABRICATION DWG-D5716
SCHEMATIC DWG-D5718
 2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY
AND DO NOT NECESSARILY APPEAR ON PARTS.
 3. SOLDER USING SN60 OR SN63 PER QQ-5-571.
- ▲ MARK CURRENT REVISION LEVEL IN J2 HIGH CHARACTERS
 USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.
 ▲ INSTALL FAR SIDE.
 ▲ INSTALL AFTER PC BOARD HAS BEEN INSTALLED.

Figure 6-7. Backplane PWB Assembly D5717C

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|-----|----------|-----------------------------|---------|--------------------|----------------------|
| | | | | | | | | | |
| | 1 | N02172B | | 1 | | P.W.B. | FEC | | |
| | 2 | D5716 | | REF | | FABRICATION DNG | FEC | | |
| | 3 | D5718 | | REF | | SCHEMATIC DNG | FEC | | |
| | 4 | | | | | | | | |
| | 5 | | | | | | | | |
| | 6 | 021880 | | 3 | | CAPACITOR, .1uf, 50VDC | KEMET | C630C104M5X5CA | C1, C2, C3 |
| | 7 | 029650 | | 1 | | CAPACITOR, TRIM CAP, 5-50pf | NIPCO | 2810-C5-R-55Q-H02F | C4 |
| | 8 | 026179 | | 1 | | CAPACITOR, 15pf | SANGAMO | D105C150J10 | C5 |
| | 9 | 026315 | | 1 | | CAPACITOR, 50pf | SANGAMO | D105C500J10 | C6 |
| | 10 | 026630 | | 2 | | CAPACITOR, 300pf | SANGAMO | D105C301J10 | C7, C8 |
| | 11 | 028581 | | 1 | | CAPACITOR, 22uf, 15V | KEMET | T368B226K015AS | C9 |
| | 12 | | | | | | | | |
| | 13 | 040638 | | 1 | | DIODE, ZENER, 4.3V | NOT | MZ4623 | C11 |
| | 14 | | | | | | | | |

Figure 6-7. Parts List, Sheet 1 PLD5717C

| ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|--------------|----------|--|-----------|---------------------------|------------|---------------|----------------------|
| | | | | | | | | |
| 15 | | | | | | | | |
| 16 | 241879 | 1 | | | CONNECTOR, PAGE, 20 POS | AMP | 2-530844-6 | J1 |
| 17 | 241878 | 3 | | | CONNECTOR, PAGE, 36 POS | AMP | 2-530844-8 | J2, J3, J4 |
| 18 | 241929 | 1 | | | CONNECTOR, 10 POS | AMP | 499460-1 | J8 |
| 19 | 241921 | 1 | | | CONNECTOR, 9 POS | AMP | 745455-1 | J5 |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | 760025 | 1 | | | CHOKE, 2.2mH | J.W.MILNER | 70F223AL | L1 |
| 23 | | | | | | | | |
| 24 | 080473 | 2 | | | TRANSISTOR | FAIRCHILD | PN2369A | Q1, Q2 |
| 25 | | | | | | | | |
| 26 | 625270 | 1 | | | RESISTOR, 10K, 1/8W, 1% | CORNING | RN55D1002F | R1 |
| 27 | 625035 | 1 | | | RESISTOR, 5.62K, 1/8W, 1% | CORNING | RN55D5621F | R2 |
| 28 | 624641 | 1 | | | RESISTOR, 3.32K, 1/8W, 1% | CORNING | RN55D3321F | R3 |

Figure 6-7. Parts List, Sheet 2 PLD5717C

| ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|--------------|----------|---|--|-----------|---------------------------|---------|---------------|----------------------|
| | | | | | | | | | |
| 29 | 625377 | | 2 | | | RESISTOR, 15K, 1/8W, 1% | CORNING | RN55D1502F | R4, R6 |
| 30 | 624219 | | 1 | | | RESISTOR, 6810, 1/8W, 1% | CORNING | RN55D6810F | R5 |
| 31 | 624299 | | 2 | | | RESISTOR, 1K, 1/8W, 1% | CORNING | RN55D1001F | R7, R10 |
| 32 | 625597 | | 1 | | | RESISTOR, 26.7K, 1/8W, 1% | CORNING | RN55D2672F | R8 |
| 33 | 625746 | | 1 | | | RESISTOR, 57.6K, 1/8W, 1% | CORNING | RN55D5762F | R9 |
| 34 | | | | | | | | | |
| 35 | | | | | | | | | |
| 36 | 059014T | | 1 | | | I.C., HEX HYS RCVR | NAT | DM74LS14N | U1 |
| 37 | 060103T | | 1 | | | I.C., DUAL COMPARATOR | NAT | LM393N | U2 |
| 38 | 304855 | | 1 | | | XTAL 8.388608 MHZ | ERIE | SC251 | Y1 |
| 39 | | | | | | | | | |
| 40 | 366960 | | 1 | | | BUSS WIRE, 18 GA | ALPHA | 296 | W1 |
| 41 | | | | | | | | | |
| 42 | | | | | | | | | |

Figure 6-7. Parts List, Sheet 3 PLD5717C

| ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-------------|--------------|----------|-----|--|---------------------------|-------------|-------------|--|----------------------|
| | | | | | | | | | |
| 1 | N02169 | | 1 | | | FEC | | | |
| 2 | D5697 | | REF | | FABRICATION DWG | FEC | | | |
| 3 | D5699 | | REF | | SCHEMATIC DWG | FEC | | | |
| 4 | B2686-1 | | 2 | | BOARD STIFFENER | FEC | | (FOR USE WITH ITEM 1) | |
| 5 | 404203 | | 6 | | SCREW, SST, NO. 4x5/16" | T&C | PH4-40x5/16 | (TO MOUNT ITEM 4) | |
| 6 | 404880 | | 6 | | WASHER, SPLIT LOCK, NO. 4 | T&C | NO. 4 | (TO MOUNT ITEM 4) | |
| 7 | | | | | | | | | |
| 8 | 241196 | | 2 | | CONNECTOR, 34 PIN, SOLDER | AMP | 499460-8 | J1, J2 (SOLDER TO ITEM 1) | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | 304840 | | 1 | | CRYSTAL, 3686.400 KHZ | SC103 | | Y1 | |
| 12 | 305520 | | 1 | | CRYSTAL SOCKET | AUGAT | 8000-AG3 | (USE TO MOUNT Y1) (SOCKET SOLDERS TO BOARD) | |
| 13 | | | | | | | | | |
| 14 | | | | | | | | | |

Figure 6-8. Parts List, Sheet 1

PLD5698D

| CARD NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-------------|-------------|--------------|----------|----|--------------|----------------------------|--------------|----------------|---|
| | | | | | | | | | |
| | 15 | 021880 | | 44 | | CAP., 1UF, 50WVDC | KEMET | C630C104M5X5CA | C1-C7, C12-C14, C17-C46, C50, C52-C54 |
| | 16 | 021210 | | 4 | | CAP. DISC, 500PF, 1KV, 10% | CENTRAL LABS | DD-501 | C8-C11 |
| | 17 | 021030 | | 2 | | CAP. DISC, 20PF, 1KV, 10% | CENTRAL LABS | DD-200 | C15, C16 |
| | 18 | 028581 | | 3 | | CAP., 22UF, 15V, 10% | KEMET | T368B226K015AS | C47-C49 |
| | 19 | 028308 | | 1 | | CAP., 2.2UF, 20V, 10% | KEMET | T110A225K020AS | C51 |
| | 20 | | | | | | | | |
| | 21 | | | | | | | | |
| | 22 | | | | | | | | |
| | 23 | 040238 | | 10 | | DIODE, SIGNAL | FAIRCHILD | 1N914 | CR1-CR10 |
| | 24 | | | | | | | | |
| | 25 | | | | | | | | |
| | 26 | | | | | | | | |
| | 27 | 625098 | | 1 | | RES, 6.81K .1/8W, 1% | CORNING | RN55D6811F | R1 |
| | 28 | 625270 | | 15 | | RES, 10K, 1/8W, 1% | CORNING | RN55D1002F | R2, R3, R18, R23, R24, R33-R37, R39 R41, R42, R44, R45 |

Figure 6-8. Parts List, Sheet 2

| ITEM CARD CODE NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------------|--------------|----------|---|--------------|-----------------------|---------|---------------|----------------------|
| | | | | | | | | |
| 29 | 624146 | | 4 | | RES, 374Ω, 1/8W, 1% | CORNING | RN55D3740F | R4-R7 |
| 30 | 625181 | | 6 | | RES, 8.06KΩ, 1/8W, 1% | CORNING | RN55D8061F | R8-R13 |
| 31 | 624135 | | 1 | | RES, 1.50Ω, 1/8W, 1% | CORNING | RN55D1500F | R14 |
| 32 | 624931 | | 1 | | RES, 1.07Ω, 1/8W, 1% | CORNING | RN55D1070F | R15 |
| 33 | 624905 | | 1 | | RES, 301Ω, 1/8W, 1% | CORNING | RN55D3010F | R16. |
| 34 | 624118 | | 1 | | RES, 215Ω, 1/8W, 1% | CORNING | RN55D2150F | R17 |
| 35 | 624070 | | 1 | | RES, 37.4Ω, 1/8W, 1% | CORNING | RN55D37R4F | R19 |
| 36 | 624901 | | 1 | | RES, 53.6Ω, 1/8W, 1% | CORNING | RN55D53R6F | R21 |
| 37 | 624093 | | 1 | | RES, 75Ω, 1/8W, 1% | CORNING | RN55D75R0F | R22 |
| 38 | 624435 | | 1 | | RES, 1.69KΩ, 1/8W, 1% | CORNING | RN55D1691F | R25 |
| 39 | 624559 | | 1 | | RES, 2.43KΩ, 1/8W, 1% | CORNING | RN55D2431F | R26 |
| 40 | 624661 | | 1 | | RES, 3.4KΩ, 1/8W, 1% | CORNING | RN55D3401F | R27 |
| 41 | 624882 | | 1 | | RES, 4.87KΩ, 1/8W, 1% | CORNING | RN55D4871F | R28 |
| 42 | 624349 | | 1 | | RES, 1.21KΩ, 1/8W, 1% | CORNING | RN55D1211F | R29 |

Figure 6-8. Parts List, Sheet 3

| ITEM CARD CODE NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------------|--------------|----------|--|---|--------------|--------------------------|----------|---------------|-----------------------|
| | | | | | | | | | |
| 43 | 624245 | | | 1 | | RES, 866Ω, 1/8W, 1% | CORNING | RN55D8660F | R30 |
| 44 | 624178 | | | 1 | | RES, 604Ω, 1/8W, 1% | CORNING | RN55D6040F | R31 |
| 45 | 624946 | | | 1 | | RES, 432Ω, 1/8W, 1% | CORNING | RN55D4320F | R32 |
| 46 | 625618 | | | 1 | | RES, 30.1KΩ, 1/8W, 1% | CORNING | RN55D3012F | R38 |
| 47 | 625811 | | | 1 | | RES, 100KΩ, 1/8W, 1% | CORNING | RN55D1003F | R40 |
| 48 | 625341 | | | 1 | | RES, 13KΩ, 1/8W, 1% | CORNING | RN55D1302F | R43 |
| 49 | 624122 | | | 1 | | RES, 100Ω, 1/8W, 1% | CORNING | RN55D1000F | R20 |
| 50 | | | | | | | | | |
| 51 | | | | | | | | | |
| 52 | | | | | | | | | |
| 53 | | | | | | | | | |
| 54 | 722201 | | | 1 | | SWITCH, DIP, 8 POSITIONS | AMP | 435166-5 | S1 |
| 55 | | | | | | | | | |
| 56 | 061568 | | | 1 | | IC, BIT RATE GEN | MOTOROLA | MC14411P | U1 (USE WITH ITEM 94) |

Figure 6-8. Parts List, Sheet 4

PLD5698P

| ITEM NO. | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|--------------|-----------|-----------|-----------------------------------|----------|---------------|---------------------------|
| | | CHG. CODE | CHG. CODE | | | | |
| 57 | 059008T | | 4 | IC, QUAD 2 INPUT POS GATE | TI | SN74LS08 | U2, U4, U46, U48 |
| 58 | 059032T | | 3 | IC, 2 INPUT OR GATE | TI | SN74LS32 | U3, U24, U29 |
| 59 | 061085 | | 2 | IC, KEYBOARD ENCODER | HARRIS | HD-1-0165-5 | U5, U6 (USE WITH ITEM 94) |
| 60 | 060152 | | 1 | IC, LINE DRIVER | NATIONAL | LM1488J | U7 |
| 61 | 248700 | | 1 | IC, SOCKET, 14 PIN | AUGAT | 514-AG11D | U8 |
| 62 | 059393T | | 2 | IC, 4 BIT DECODE BINARY CNTR | TI | SN74LS393 | U9, U10 |
| 63 | 062706 | | 3 | IC, RESISTOR NETWORK, 10K | DALE | MSP06A01-103G | U11, U39, U45 |
| 64 | 059240T | | 5 | IC, OCTAL BUFFER, 3 STATE | TI | SN74LS240 | U12, U19, U38, U42, U43 |
| 65 | 059175T | | 2 | IC, QUAD D EDGE FLIP-FLOP | TI | SN74LS175 | U13, U26 |
| 66 | 059157T | | 2 | IC, QUAD 2-1 SEL MUX | TI | SN74LS157 | U14, U22 |
| 67 | 059125T | | 1 | IC, 4 BUS BUFFER GATES | TI | SN74LS125 | U15 |
| 68 | 061593 | | 1 | IC, USART | INTEL | 8251A | U16 (USE WITH ITEM 95) |
| 69 | 062723 | | 1 | IC, RESISTOR NETWORK, 10K RES. | DALE | MSP08A01-103G | U17 |
| 70 | 061780T | | 1 | IC, MICROPROCESSOR | INTEL | 88085A-2 | U18 (USE WITH ITEM 96) |

Figure 6-8. Parts List, Sheet 5 PLD5698D

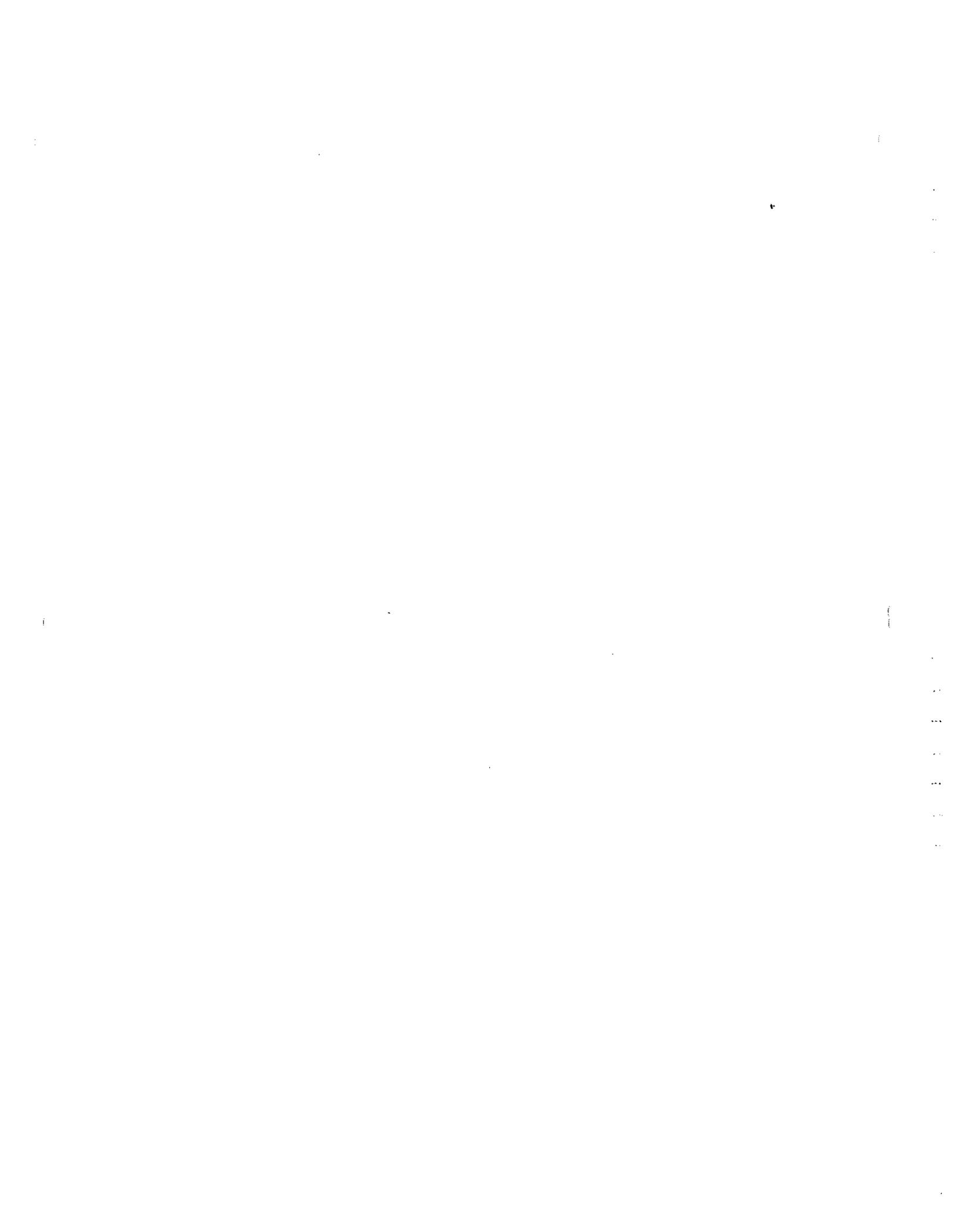
| ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-------------|--------------|----------|--|---|--------------------------------------|-------------|---------------|-----------------------------|----------------------|
| | | | | | | | | | |
| 71 | 062710 | | | 4 | IC, RESISTOR NETWORK, 10K, 9 RES. | DALE | MSP10A01-103G | U20, U36, U41, U44 | |
| 72 | 060102T | | | 4 | IC, QUAD COMPARATOR | NATIONAL | LM339NAT | U21, U28, U37, U47 | |
| 73 | 061778T | | | 1 | IC, 1024x4 STATIC RAM | NEC | UPD2114LC-3 | U23 | |
| 74 | 059138T | | | 2 | IC, 3-8 LINE DECODE DEMUX | TI | SN74LS138 | U25, U27 | |
| 75 | 061781 | | | 2 | IC, 256x4 STATIC RAM | XICOR | X2212 | U30, U31 | |
| 76 | SC582 | | | 2 | IC, 4Kx8 EPROM | FEC | | U32, U33 (USE WITH ITEM 94) | |
| 77 | 059374T | | | 1 | IC, OCTAL D TYPE FF | TI | SN74LS374 | U34 | |
| 78 | 061246 | | | 1 | IC, 1/8 CHAN MUX | RCA | CD4051AE | U35 | |
| 79 | 059373T | | | 1 | IC, OCTAL TRAN LT 3 ST. | TI | SN74LS373 | U40 | |
| 80 | 061827T | | | 1 | IC, QUAD LINE RCVR | NATIONAL | DS1489N | U49 | |
| 81 | 060103T | | | 1 | IC, DUAL COMPARATOR | NATIONAL | LM339NAT | U50 | |
| 82 | 060140 | | | 1 | IC, OPERATIONAL AMP | NATIONAL | LM741CN | U51 | |
| 83 | 060143 | | | 1 | IC, OPERATIONAL AMP | NATIONAL | LF351N | U52 | |
| 84 | | | | | | | | | |

Figure 6-8. Parts List, Sheet 6

PLD5698D

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|----|--|-------------------------|-------------|-----------|--|----------------------|
| | | | | | | | | | | |
| | 85 | | | | | | | | | |
| | 86 | | | | | | | | | |
| | 87 | | | | | | | | | |
| | 88 | | | | | | | | | |
| | 89 | | | | | | | | | |
| | 90 | | | | | | | | | |
| | 91 | | | | | | | | | |
| | 92 | 366960 | | 2" | | WIRE, SOLID BUS, 18 GA. | ALPHA | 296 | W1 | |
| | 93 | | | | | | | | | |
| | 94 | 248468 | | 5 | | SOCKET, IC, 24 PIN | AUCAT | 224-AG29D | INSTALL IN POSITIONS U1, U5, U6, U32, U33 | |
| | 95 | 248470 | | 1 | | SOCKET, IC, 28 PIN | AUCAT | 228-AG29D | INSTALL IN POSITION U16 | |
| | 96 | 248472 | | 1 | | SOCKET, IC, 40 PIN | AUCAT | 240-AG29D | INSTALL IN POSITION U18 | |
| | 97 | | | | | | | | | |
| | 98 | | | | | | | | r | |

Figure 6-8. Parts List, Sheet 7 PLD5698D



| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|-----|----------|-----------------------------|-------|----------------|---|
| | | | | | | | | | |
| | 1 | N02171 B | | 1 | | PRINTED WIRING BD. | FEC | | |
| | 2 | D5706 | | REF | | FABRICATION DWG. | FEC | | |
| | 3 | D5708 | | REF | | SCHEMATIC DWG. | FEC | | |
| | 4 | B2686-1 | | 2 | | BOARD STIFFENER | FEC | | (FOR ITEM 1) |
| | 5 | 404203 | | 6 | | SCREW, SST, NO.4 5/16 LG | T&C | PH4-40x5/16 | (TO MOUNT ITEM 4) |
| | 6 | 404880 | | 6 | | WASHER, SPLIT-LOCK NO. 4 | T&C | NO. 4 WASHER | (TO MOUNT ITEM 4) |
| | 7 | | | | | | | | |
| | 8 | | | | | | | | |
| | 9 | | | | | | | | |
| | 10 | | | | | | | | |
| | 11 | 021880 | | 89 | | CAP., .1uf, 50WVDC | KEMET | C630C104M5X5CA | C1-C5, C70-C80, C83-C89, C93, C94 C98-C101, C105, C108, C112-C117 |
| | | | | | | | | | C119-C135, C138, C139, C144, C145 C148, C150-C157, C159, C162-C173 |
| | | | | | | | | | C176, C177, C179, C183, C184, C187 C188 |
| | 12 | 029932 | | 64 | | CAP., .047uf, 50WVDC | KEMET | C320C473K5R5CA | C6-C69 |

Figure 6-9. Parts List, Sheet 1

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|----|----------|-------------|-----------------|--|----------------------|
| | | | | | | | | | |
| | 13 | | | | | | | | |
| | 14 | 029940 | | 7 | | KENET | C330C105M5ULCA | C90-C92, C95, C111, C136, C142 | |
| | 15 | 026439 | | 4 | | SANGAMO | D105C1111J0 | C102, C103, C107, C109 | |
| | 16 | 026660 | | 2 | | SANGAMO | D155C331J0 | C104, C106 | |
| | 17 | 029947 | | 2 | | KENET | C312C103M15RCA | C185, C186 | |
| | 18 | 028683 | | 1 | | KENET | T368B336K010AS | C118 | |
| | 19 | 029908 | | 2 | | IMB | BP6308G | C137, C143 | |
| | 20 | 029983 | | 4 | | IMB | BP6309G | C140, C141, C146, C147 | |
| | 21 | 028574 | | 1 | | KENET | T368B156K020AS | C149 | |
| | 22 | 028420 | | 4 | | SPRAGUE | 196D475X9035JA1 | C160, C161, C174, C175 | |
| | 23 | 028581 | | 3 | | KENET | T368B226K015AS | C180-C182 | |
| | 24 | 021510 | | 2 | | CENTRAL LAB | DD-502 | C158, C178 | |
| | 25 | | | | | | | | |
| | 26 | 040238 | | 36 | | FAIRCHILD | 1N914 | CR1-CR19, CR20-CR26, CR31-CR38, CR39, CR40 | |

Figure 6-9. Parts List, Sheet 2

PLD5707D

| ITEM CARD CODE NO. | FEC PART NO. | QUANTITY | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------------|--------------|----------|-------------|----------------------|-----------|---------------|---|
| | | | | | | | |
| 27 | 040682 | 2 | | DIODE, ZENER 5.6V | FAIRCHILD | 1N4734A | CR27, CR28 |
| 28 | 624010 | 2 | | RES, 10.2K, 1/8W, 1% | CORNING | RN55D10R2F | RL50, RL51 |
| 29 | 625880 | 1 | | RES, 182k, 1/8W, 1% | CORNING | RN55D1823F | R102 |
| 30 | 625765 | 1 | | RES, 66.5K, 1/8W, 1% | CORNING | RN55D6652F | R144 |
| 31 | 625251 | 2 | | RES, 9.76K, 1/8W, 1% | CORNING | RN55D9761F | R1, R9 |
| 32 | 625471 | 2 | | RES, 18.7K, 1/8W, 1% | CORNING | RN55D1872F | R2, R11 |
| 33 | 625638 | 2 | | RES, 34.8K, 1/8W, 1% | CORNING | RN55D3482F | R26, R108 |
| 34 | 625383 | 2 | | RES, 15.8K, 1/8W, 1% | CORNING | RN55D1582F | R4, R15 |
| 35 | 625014 | 2 | | RES, 5.23K, 1/8W, 1% | CORNING | RN55D5231F | R5, R10 |
| 36 | 624690 | 2 | | RES, 3.57K, 1/8W, 1% | CORNING | RN55D3571F | R6, R12 |
| 37 | 624475 | 2 | | RES, 1.96K, 1/8W, 1% | CORNING | RN55D1961F | R7, R13 |
| 38 | 625106 | 2 | | RES, 7.15K, 1/8W, 1% | CORNING | RN55D7151F | R8, R16 |
| 39 | 625270 | 51 | | RES, 10K, 1/8W, 1% | CORNING | RN55D1002F | R17, R32-R35, R37, R39, R43, R45, R49, R50, R52, R53, R55, R57, R28, R61, R66, R68-R70, R72, R75, R85 R87, R110, R103-R106, R113-R118 R121, R124, R126, R128, R129 R130, R132, R133, R136 R73, R81, R83 |

Figure 6-9. Parts List, Sheet 3

| CARD CODE NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------|----------|--------------|----------|---|----------|--------------------------------|---------|---------------|---|
| | | | | | | | | | |
| | 40 | 624801 | | 2 | | RES, 4.22K Ω , 1/8W, 1% | CORNING | RN55D4221F | R18, R36 |
| | 41 | 625987 | | 2 | | RES, 200K Ω , 1/8W, 1% | CORNING | RN55D2003F | R19, R24 |
| | 42 | 625994 | | 4 | | RES, 274K Ω , 1/8W, 1% | CORNING | RN55D2743F | R21, R25, R109, R119 |
| | 43 | 625811 | | 2 | | RES, 100K Ω , 1/8W, 1% | CORNING | RN55D1003F | R20, R23, |
| | 44 | 624891 | | 2 | | RES, 4.99K Ω , 1/8W, 1% | CORNING | RN55D4991F | R27, R107 |
| | 45 | 624299 | | 7 | | RES, 1K Ω , 1/8W, 1% | CORNING | RN55D1001F | R40, R48, R76, R88, R97, R101, R138. |
| | 46 | 624161 | | 2 | | RES, 475 Ω , 1/8W, 1% | CORNING | RN55D4750F | R29, R30 |
| | 47 | 625701 | | 3 | | RES, 47.5K Ω , 1/8W, 1% | CORNING | RN55D4752F | R31, R56, R67 |
| | 48 | 625367 | | 2 | | RES, 14.3K Ω , 1/8W, 1% | CORNING | RN55D1432F | R38, R54 |
| | 49 | 625010 | | 8 | | RES, 5.11K Ω , 1/8W, 1% | CORNING | RN55D5111F | R41, R51, R78, R80, R90, R92, R98, R100 |
| | 50 | 625790 | | 2 | | RES, 75K Ω , 1/8W, 1% | CORNING | RN55D7502F | R44, R46 |
| | 51 | 625618 | | 1 | | RES, 30.1K Ω , 1/8W, 1% | CORNING | RN55D3012F | R59 |
| | 52 | 625433 | | 1 | | RES, 16.5K Ω , 1/8W, 1% | CORNING | RN55D1652F | R60 |
| | 53 | 624363 | | 1 | | RES, 1.33K Ω , 1/8W, 1% | CORNING | RN55D1331F | R63 |

Figure 6-9. Parts List, Sheet 4

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|---|-----------|---------------------------------|---------|---------------|----------------------|
| | | | | | | | | | |
| | 54 | 624882 | | 1 | | RES, 4.87K Ω , 1/8W, 1% | CORNING | RN55D4871F | R64 |
| | 55 | 625760 | | 1 | | RES, 64.9K Ω , 1/8W, 1% | CORNING | RN55D6492F | R65 |
| | 56 | 624641 | | 4 | | RES, 3.32K Ω , 1/8W, 1% | CORNING | RN55D3321F | R22, R71, R127, R148 |
| | 57 | 625435 | | 1 | | RES, 16.9 K Ω , 1/8W, 1% | CORNING | RN55D1692F | R140 |
| | 58 | 624905 | | 1 | | RES, 301 Ω , 1/8W, 1% | CORNING | RN55D3010F | R147 |
| | 59 | 625397 | | 1 | | RES, 16.2K Ω , 1/8W, 1% | CORNING | RN55D1622F | R58 |
| | 60 | 625095 | | 2 | | RES, 6.65K Ω , 1/8W, 1% | CORNING | RN55D6651F | R79, R91 |
| | 61 | 625614 | | 2 | | RES, 29.4K Ω , 1/8W, 1% | CORNING | RN55D2942F | R3, R14 |
| | 62 | 624589 | | 2 | | RES, 2.74k Ω , 1/8W, 1% | CORNING | RN55D2741F | R82, R94 |
| | 63 | 624069 | | 2 | | RES, 36.5 Ω , 1/8W, 1% | CORNING | RN55D36R5F | R83, R95 |
| | 64 | 625673 | | 2 | | RES, 40.2K Ω , 1/8W, 1% | CORNING | RN55D4022F | R134, R135 |
| | 65 | 625104 | | 2 | | RES, 6.98K Ω , 1/8W, 1% | CORNING | RN55D6981F | R42, R47 |
| | 66 | 625998 | | 1 | | RES, 324K Ω , 1/8W, 1% | CORNING | RN55D3243F | R99 |
| | 67 | 625880 | | 1 | | RES, 182K Ω , 1/8W, 1% | CORNING | RN55D1823F | R102 |

| ITEM CARD CODE NO. | FEC PART NO. | QUANTITY | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------------|--------------|----------|--------------|-----------------------------------|----------|---------------|------------------------|
| | | | | | | | |
| 68 | 625541 | 4 | | RES, 21.5K Ω , 1/8W, 1% | CORNING | RN55D2152F | R111, R112, R122, R123 |
| 69 | 625377 | 1 | | RES, 15K Ω , 1/8W, 1% | CORNING | RN55D1502F | R62 |
| 70 | 625571 | 1 | | RES, 24.3K Ω , 1/8W, 1% | CORNING | RN55D2432F | R141 |
| 71 | 624948 | 2 | | RES, 66.5 Ω , 1/8W, 1% | CORNING | RN55D66R5F | R131, |
| 72 | 624193 | 1 | | RES, 649 Ω , 1/8W, 1% | CORNING | RN55D6490F | R120 |
| 73 | 625358 | 1 | | RES, 14K Ω , 1/8W, 1% | CORNING | RN55D1402F | R137 |
| 74 | 625635 | 1 | | RES, 34K Ω , 1/8W, 1% | CORNING | RN55D3402F | R142 |
| 75 | 625704 | 1 | | RES, 48.7K Ω , 1/8W, 1% | CORNING | RN55D4872F | R143 |
| 76 | 625505 | 2 | | RES, 20K, 1/8W 1% | CORNING | RN55D2002F | R74, R86 |
| 77 | 625807 | 1 | | RES, 95.3K Ω , 1/8W, 1% | CORNING | RN55D9532F | R145 |
| 78 | 625828 | 1 | | RES, 130K Ω 1/8W, 1% | CORNING | RN55D1303F | R146 |
| 79 | 625305 | 1 | | RES, 11K Ω , 1/8W, 1% | CORNING | RN55D1102F | R139 |
| 80 | 080473 | 64 | | TRANSISTOR, NPN, SI, HI SPD SW | NATIONAL | PN2369A | Q1-Q64 |
| 81 | 722201 | 7 | | SWITCH, DIP, 8 SW | AMP | 435166-5 | S1-S7 |

Figure 6-9. Parts List, Sheet 6

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|-----------|------------------------------------|-----------|---------------|--|
| | | | | CHG. CODE | | | | |
| | 82 | 744550 | | 8 | TEST POINT, MALE PIN | BEADCHAIN | R62-3ET | TP1-TP8 |
| | 83 | 624132 | | 2 | RES, 274 Ω , 1/8W, 1% | CORNING | RN55D2740F | R84, R96 |
| | 84 | 765035 | | 1 | TRANSFORMER, AUDIO, 10K | TNI | TI-267 | TI |
| | 85 | | | | | | | |
| | 86 | | | | | | | |
| | 87 | 062750 | | 8 | IC, CUSTOM RESISTOR NETWORK, 9 RES | DALE | (SC135) | U1,U3,U6,U8, ,U31,U33,U35,U37, |
| | 88 | 061257T | | 13 | IC, 1/8 CHANNEL MULTIPLEXER | RCA | CD4051BEX | U2,U4,U5,U7,U9,U30,U32,U34, U36,U38,U62,U90,U92 |
| | 89 | 062975 | | 8 | IC, RESISTOR NETWORK, 4.7K, 9 RES | DALE | MSP10A01-472G | U10-U17 |
| | 90 | 059240T | | 7 | IC, OCTAL BUFFER, 3 STATE | TI | SN74LS240 | U18,U20,U22,U24,U26,U28,U99 |
| | 91 | 061293T | | 3 | IC, HEX NON INV BUFFER | NATIONAL | MM74C904NAT | U39,U40,U53 |
| | 92 | 059393T | | 4 | IC, 4 BIT DECODE BINARY CTR | TI | SN74LS393 | U41,U44,U55,U69 |
| | 93 | 059074T | | 4 | IC, FLIP-FLOP | TI | SN74LS74 | U42,U58,U66,U93 |
| | 94 | 059032T | | 2 | IC, 2 INPUT OR GATE | TI | SN74LS32 | U43,U100 |
| | 95 | 059244T | | 2 | IC, OCTAL BUFFER | TI | SN74LS244 | U45,U94 |

Figure 6-9. Parts List, Sheet 7

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|----|----------|------------------------------------|----------|---------------|---|
| | | | | | | | | | |
| | 96 | 061795 | | 3 | | IC, FREQUENCY SYNTHESIZER | HOLT | (SC140) | U46-U48 |
| | 97 | 061256T | | 3 | | IC, MULTIPLEXER | RCA | CD4053BE | U49, U65, U89 |
| | 98 | 061828T | | 12 | | IC, QUAD OP AMP | RAYTHEON | RC4156DB2 | U50-U52, U60, U75-U77, U87, U88, U102, U103, U106 |
| | 99 | 061217 | | 1 | | IC, DIV BY 8 CTR | RCA | CD4022BE | U54 |
| | 100 | 059002T | | 2 | | IC, QUAD 2 INPUT NOR GATES | TI | SN74LS02 | U56, U111 |
| | 101 | 059001T | | 1 | | IC, QUAD 2 INPUT NAND GATES | TI | SN74LS00 | U57 |
| | 102 | 059138T | | 4 | | IC, 3-8 LINE DECODE DEMULTIPLEXER | TI | SN74LS138 | U59, U70-U72 |
| | 103 | 062996 | | 3 | | IC, CUSTOM RESISTOR NETWORK, 8 RES | FEC | (SC498) | U61, U91, U105 |
| | 104 | 061206 | | 2 | | IC, COS/MOS QUAD CL, D LATCH | RCA | CD4042BE | U63, U64 |
| | 105 | 061291 | | 1 | | IC, HEX INV TTL BUFFER | NATIONAL | NM74C901N | U67 |
| | 106 | 060103T | | 3 | | IC, DUAL COMPARATOR | NATIONAL | LM393NAT | U68, U78, U101 |
| | 107 | 062723 | | 1 | | IC, RESISTOR NETWORK 10K, 7 RES | DALE | MSP08A01-103G | U73 |
| | 108 | 061780 | | 1 | | IC, MICROPROCESSOR | INTEL | B8085A-2 | U74 |
| | 109 | 060610 | | 1 | | IC, A TO D CONVERTER | NATIONAL | NM5357 | U79 |

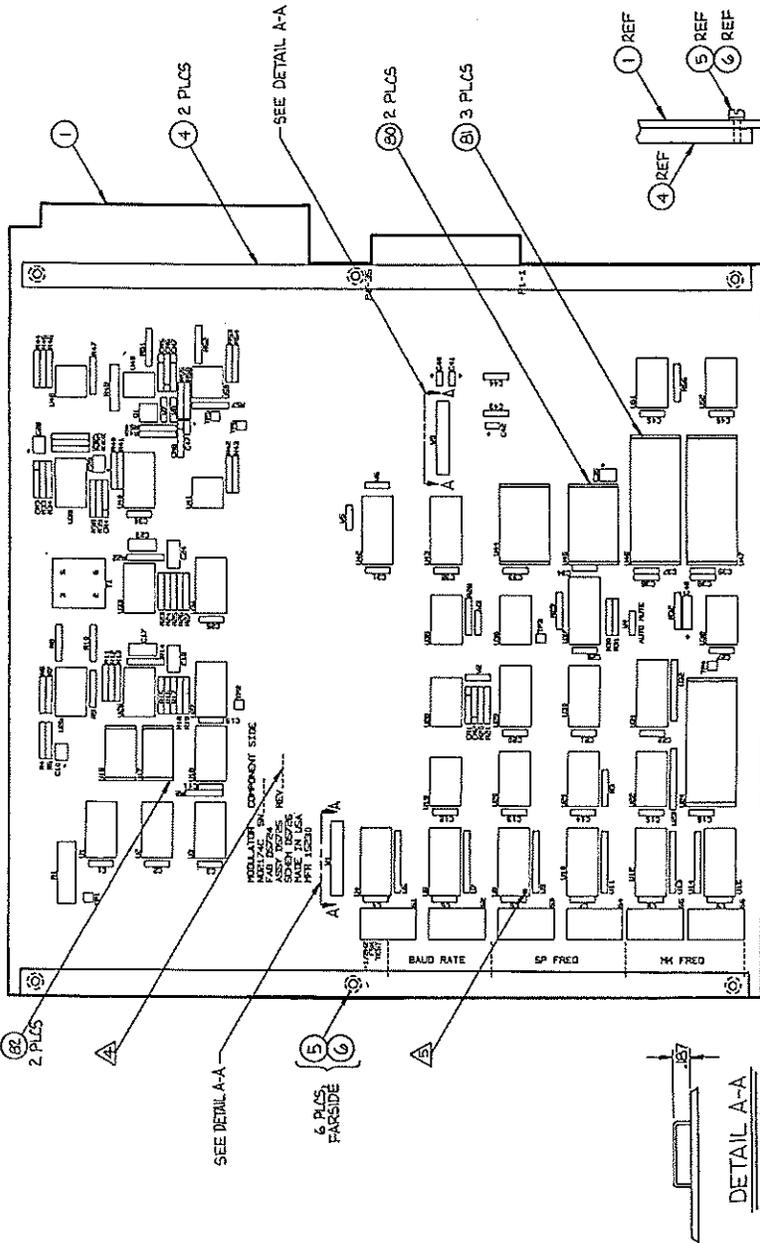
Figure 6-9. Parts List, Sheet 8

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|---|-----------|---|----------|---------------|-----------------------------------|
| | | | | | | | | | |
| | 110 | 061778T | | 2 | | IC, STATIC RAM, 1024x4 | NATIONAL | MM2114NL | U80, U81 |
| | 111 | SC583 | | 1 | | IC, 16K EPROM | FEC | | U83 |
| | 112 | 059373T | | 1 | | IC, OCTAL TRAN LT 3 STATE | TI | SN74LS373 | U84 |
| | 113 | 059008T | | 1 | | IC, QUAD 2 INPUT POS GATE | TI | SN74LS08 | U86 |
| | 114 | 062730 | | 2 | | IC, RESISTOR NETWORK, 10K, 4 RES, 8 PIN | CTS | 750-83-R10K | U109, U110 |
| | 115 | 061234T | | 1 | | IC, 4 CHANNEL MULTIPLEXER | RCA | CD4052B | U104 |
| | 116 | 061251T | | 1 | | IC, QUAD BILATERAL SWITCH | RCA | CD4066BEX | U95 |
| | 117 | 059125T | | 1 | | IC, 4 BUSS BUFFER GATES | TI | SN74LS125 | U96 |
| | 118 | 062706 | | 1 | | IC, RESISTOR NETWORK, 10K, 5 RES | DALE | MSP06A01-103G | U97 |
| | 119 | 059245T | | 1 | | IC, OCTAL TRCVR | TI | SN74LS245 | U98 |
| | 120 | 061056 | | 2 | | IC, 2 EIA LINE DRIVER 8 PIN DIP | TI | SN75150 | U107, U108 |
| | 121 | 059174T | | 1 | | IC, HEX D FLIP-FLOP | TI | SN74LS174 | U112 |
| | 122 | 062710 | | 7 | | IC, RESISTOR NETWORK, 10K, 9RES. | CALE | MSP10A01-103G | U19, U21, U23, U25, U27, U29, U85 |
| | 123 | | | | | | | | * |

Figure 6-9. Parts List, Sheet 9

| CARD CODE NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------|----------|--------------|----------|----|----------|------------------------------------|---------|----------------|---|
| | | | | | | | | | |
| | 124 | 248468 | | 2 | | SOCKET, IC, 24 PIN | AUCAT | 224-AG29D | INSTALL IN POSITIONS U82, U83 |
| | 125 | 248472 | | 4 | | SOCKET, IC, 40 PIN | AUCAT | 240-AG29D | INSTALL IN POSITIONS U46, U47, U48, U74 |
| | 126 | | | | | | | | |
| | 127 | | | | | | | | |
| | 128 | 366510 | | 3 | | JUMPER, WIRE, INSULATED | SQUIRES | JO.250x.250T22 | W1, W2, W4 |
| | 129 | 366960 | | 2" | | WIRE, BUSS, 18GA SOLID | ALPHA | 296 | W3 (JUMPER 1.000) |
| | 130 | | | | | | | | |
| | 131 | | | | | NOTE: DO NOT INSTALL U82, MAINTAIN | | | |
| | 132 | | | | | POSITION FOR FUTURE USE. | | | |
| | 133 | | | | | | | | |
| | 134 | | | | | | | | |
| | 135 | | | | | | | | |
| | 136 | | | | | | | | |
| | 137 | | | | | | | | |

Figure 6-9. Parts List, Sheet 10



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
 PCB BOARD-MS 2174
 PWB BOARD-MS 015-05724
 SCHEMATIC DWG-05726
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT NECESSARILY APPEAR ON PARTS.
3. SOLDER USING SN60 OR SN63 PER QQ-5-571.
- ▲ MARK CURRENT REVISION LEVEL IN .12 HIGH CHARACTERS USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.
- ▲ PIN 1 ORIENTATION DENOTED BY SQUARE PAD ON PWB.
6. DO NOT INSTALL U45, MAINTAIN POSITION FOR FUTURE USE.

Figure 6-10. Modulator PWB Assembly (DS725D)



| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|------|---------------------------|---------|-----------------|---|
| | | | CHG | COOK | | | | |
| | 1 | N02174C | 1 | | PRINTED WIRING BOARD | FEC | | |
| | 2 | D5724 | REP | | FABRICATION DWG | FEC | | |
| | 3 | D5726 | REP | | SCHEMATIC DWG | FEC | | |
| | 4 | B2686-1 | 2 | | STIFFENER, BOARD EDGE | FEC | | (FOR ITEM 1) |
| | 5 | 404203 | 6 | | SCREW, SST, No. 4, 5/16" | T&C | PH4-40x5/16 | (TO MOUNT ITEM 4 TO ITEM 1) |
| | 6 | 404880 | 6 | | WASHER, SPLIT-LOCK, No. 4 | T&C | No. 4 WASHER | (TO MOUNT ITEM 4 TO ITEM 1) |
| | 7 | | | | | | | |
| | 8 | | | | | | | |
| | 9 | | | | | | | |
| | 10 | 021880 | 35 | | CAP, .1UF, 50 WVDC | KEMET | C630C104M5X5CA | C1-C9, C11-C16, C19-C22, C25-C27, C30-C34, C36-C39, C43-C46 |
| | 11 | 028397 | 2 | | CAP, 3.3UF, 15V | SPRAGUE | 196D335X9015HA1 | C10, C35 |
| | 12 | 029908 | 4 | | CAP, .015UF, POLYCARB | IMB | BP2B153G | C17, C18, C23, C24 |
| | 13 | 028230 | 2 | | CAP, 1.0UF, 35V | SPRAGUE | 196D105X9035HA1 | C28, C29 |
| | 14 | 028581 | 4 | | CAP, 22UF, 15V | KENET | T368B226K015AS | C40-C42, C47 |

Figure 6-10. Parts List, Sheet 1 PLD5725D

| ITEM NO. | CARD CODE | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|-----------|--------------|----------|----------|--------------------------------|-----------|----------------|---|
| | | | | CHG COOL | | | | |
| 15 | | 028013 | 1 | | CAP, .022UF, 35V | SPRAGUE | 150D223X9035A2 | C48 |
| 16 | | | | | | | | |
| 17 | | 040238 | 7 | | DIODE, SIGNAL | FAIRCHILD | 1N914 | CR1-CR4, CR6-CR8 |
| 18 | | 040550 | 1 | | DIODE, RECT, 100V | MOTOROLA | 1N4002 | CR5 |
| 19 | | | | | | | | |
| 20 | | 080522 | 1 | | TRANSISTOR | MOTOROLA | 2N2907 | Q1 |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | 627396 | 1 | | POTENTIOMETER, 10K Ω | BOURNS | 3067P-1-103 | R1 |
| 24 | | 625559 | 1 | | RES, 22.1K Ω , 1/8W, 1% | CORNING | RN55D2212F | R2 |
| 25 | | 625270 | 15 | | RES, 10K Ω , 1/8W, 1% | CORNING | RN55D1002F | R3-R6, R7, R13, R20, R28, R30, R31, R34, R38, R52, R54, R56 |
| 26 | | | | | | | | |
| 27 | | 624178 | 2 | | RES, 604 Ω , 1/8W, 1% | CORNING | RN55D6040F | R8, R10 |
| 28 | | 624481 | 1 | | RES, 2K Ω , 1/8W, 1% | CORNING | RN55D2001F | R9 |

Figure 6-10. Parts List, Sheet 2 PLD5725D

| CARD NO. | ITEM NO. | FEC PART NO. | QUANTITY | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|----------|--------------|----------|---|-----------|--------------------------------|---------|---------------|------------------------------|
| | | | | | | | | | |
| | 29 | 624299 | | 4 | | RES, 1K Ω , 1/8W, 1% | CORNING | RN55D1001F | R11, R42, R45, R47 |
| | 30 | 625665 | | 1 | | RES, 33.2K Ω , 1/8W, 1% | CORNING | RN55D3322F | R12 |
| | 31 | 624497 | | 4 | | RES, 2.10K Ω , 1/8W, 1% | CORNING | RN55D2101F | R18, R19, R26, R27 |
| | 32 | 624435 | | 1 | | RES, 1.69K Ω , 1/8W, 1% | CORNING | RN55D1691F | R16 |
| | 33 | 624361 | | 6 | | RES, 1.30K Ω , 1/8W, 1% | CORNING | RN55D1301F | R14, R15, R17, R22, R23, R25 |
| | 34 | 624538 | | 2 | | RES, 2.21K Ω , 1/8W, 1% | CORNING | RN55D2211F | R21, R46, |
| | 35 | 624221 | | 1 | | RES, 698 Ω , 1/8W, 1% | CORNING | RN55D6980F | R24 |
| | 36 | 624161 | | 1 | | RES, 475 Ω , 1/8W, 1% | CORNING | RN55D4750F | R29 |
| | 37 | 625701 | | 1 | | RES, 47.5K Ω , 1/8W, 1% | CORNING | RN55D4752F | R32 |
| | 38 | 624641 | | 3 | | RES, 3.32K Ω , 1/8W, 1% | CORNING | RN55D3321F | R35-R37 |
| | 39 | 624879 | | 3 | | RES, 4.75K Ω , 1/8W, 1% | CORNING | RN55D4751F | R40, R41, R43 |
| | 40 | 625825 | | 1 | | RES, 115K Ω , 1/8W, 1% | CORNING | RN55D1153F | R44 |
| | 41 | 604175 | | 1 | | RES, 47 Ω , 1/2W, 10% | AB | RC20CF470K | R48 |
| | 42 | 624089 | | 1 | | RES, 68.1 Ω , 1/8W, 1% | CORNING | RN55D681F | R49 |

Figure 6-10. Parts List, Sheet 3 PLD5725D

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|--------------|-------------|--------------|----------|-------------|--------------------------------|---------------|---------------|-------------------------------------|
| | | | | CHG CODE | | | | |
| | 43 | 624046 | | 1 | RES, 22.1K Ω , 1/8W, 1% | CORNING | RN55D22R1F | R50 |
| | 44 | 625377 | | 3 | RES, 15K Ω , 1/8W, 1% | CORNING | RN55D1502F | R51, R33, R39 |
| | 45 | 625095 | | 1 | RES, 6.65K Ω , 1/8W, 1% | CORNING | RN55D6651F | R53 |
| | 46 | 625209 | | 1 | RES, 8.25K Ω , 1/8W, 1% | CORNING | RN55D8251F | R55 |
| | 47 | 624613 | | 2 | RES, 3.01K, 1/8W, 1% | CORNING | RN55D3011F | R57, R58 |
| | 48 | 722201 | | 6 | SWITCH, DIP, 8 POSITIONS | AMP | 435166-5 | S1-S6 |
| | 49 | | | | | | | |
| | 50 | | | | | | | |
| | 51 | 744550 | | 6 | TEST POINT, MALE PIN | BEAD CHAIN | R62-3ET | TP1-TP6 |
| | 52 | | | | | | | |
| | 53 | 766450 | | 1 | TRANSFORMER | SC493 | T2144 | T1 |
| | 54 | | | | | | | |
| | 55 | 061190T | | 4 | IC, DUAL 4 STATIC SHIFT REG | RCA | CD4015BEX | U1-U3, U18 |
| | 56 | 059240T | | 8 | IC, OCTAL BUF, 3 STATE | TI | SN74LS240 | U4, U6, U8, U10, U12, U15, U37, U42 |

Figure 6-10. Parts List, Sheet 4

PLD5725D

| ITEM CARD NO. | FEC PART NO. | QUANTITY | | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------------|--------------|-------------|------|--|----------|---------------|-------------------------------------|
| | | CHG COOK | COOK | | | | |
| 57 | 062710 | | 8 | IC, RES NETWORK, 10K OHM, 9 RESISTORS | DALE | MSP10A01-103G | U5, U7, U9, U11, U13, U14, U23, U32 |
| 58 | 062929 | | 2 | IC, RES NETWORK, CUSTOM, 15 RESISTORS | EPITEK | SC490 | U16, U17 (USE WITH ITEM 82) |
| 59 | 059008T | | 1 | IC, QUAD 2 IN POS GATE | TI | SN74LS08 | U19 |
| 60 | 059138T | | 3 | IC, 3-8 LINE DECODE DEMUX | TI | SN74LS138 | U20-U22 |
| 61 | 061780T | | 1 | IC, MICROPROCESSOR | INTEL | B8085A-2 | U24 (USE WITH ITEM 81) |
| 62 | 061828T | | 4 | IC, QUAD OP AMP | RAYTHEON | RC4156DB2 | U25, U26, U33, U39 |
| 63 | 061259T | | 2 | IC, 12 STAGE CNTR | RCA | CD4040BCN | U27, U34 |
| 64 | 059001T | | 1 | IC, QUAD 2 IN NAND GATE | TI | SN74LS00 | U28 |
| 65 | 061778T | | 2 | IC, RAM 1024x4 | NEC | UPD21141C-3 | U29, U30 |
| 66 | 059373T | | 1 | IC, OCTAL TRAN LT 3 STATE | TI | SN74LS373 | U31 |
| 67 | 059032T | | 1 | IC, 2 IN OR GATE | TI | SN74LS32 | U35 |
| 68 | 059014T | | 1 | IC, HEX HYS RCVR | TI | SN74LS14 | U36 |
| 69 | 060103T | | 2 | IC, DUAL COMPARATOR | NATIONAL | LM393NAT | U48, U50 |
| 70 | 059393T | | 1 | IC, 4 BIT DECODE BINARY CNTR | TI | SN74LS393 | U38 |

Figure 6-10. Parts List, Sheet 5 PLD5725D

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|--------------|-------------|--------------|----------|----------------|-------------|----------------------------|----------|----------------|---------------------------------------|
| | | | | | | | | | |
| | 71 | 061256T | | 1 | | IC, MULTIPLEXER | RCA | CD4053BE | U40 |
| | 72 | 060140 | | 1 | | IC, OP AMP | NATIONAL | LM741CN | U41 |
| | 73 | 059244T | | 1 | | IC, OCTAL BUFFER | TI | SN74LS244 | U43 |
| | 74 | SC584 | | 1 | | IC, 16K EPROM | PEC | | U44 (USE WITH ITEM 80) |
| | 75 | 061795 | | 2 | | IC, FREQ SYNTH | HOLT | (SC140) | U46, U47 (USE WITH ITEM 81) |
| | 76 | 060438 | | 1 | | IC, PHOTO COUPLED ISOLATOR | GE | (SC005) H11A | U49 |
| | 77 | 059074T | | 1 | | IC, FLIP-FLOP | TI | SN74LS74 | U51 |
| | 78 | 061291 | | 1 | | IC, HEX INV | NATIONAL | MM74C901N | U52 |
| | 79 | | | | | | | | |
| | 80 | 248468 | | 2 | | SOCKET, IC, 24 PIN | AUGAT | 224-AG29D | INSTALL IN POSITIONS U44, U45 |
| | 81 | 248472 | | 3 | | SOCKET, IC, 40 PIN | AUGAT | 240-AG29D | INSTALL IN POSITIONS U24, U46, U47 |
| | 82 | 248462 | | 2 | | SOCKET, IC, 16 PIN | AUGAT | 216-AG29D | INSTALL IN POSITIONS U16, U17 |
| | 83 | 366960 | | 4 ^u | | WIRE, 18 GA., SOLID BUSS | ALPHA | 296 | W1, W9 |
| | 84 | 366511 | | 7 | | JUMPER, INSULATED | SQUIRES | J0.312x.250T24 | W2-W8 |

Figure 6-10. Parts List, Sheet 6 PLD5725D

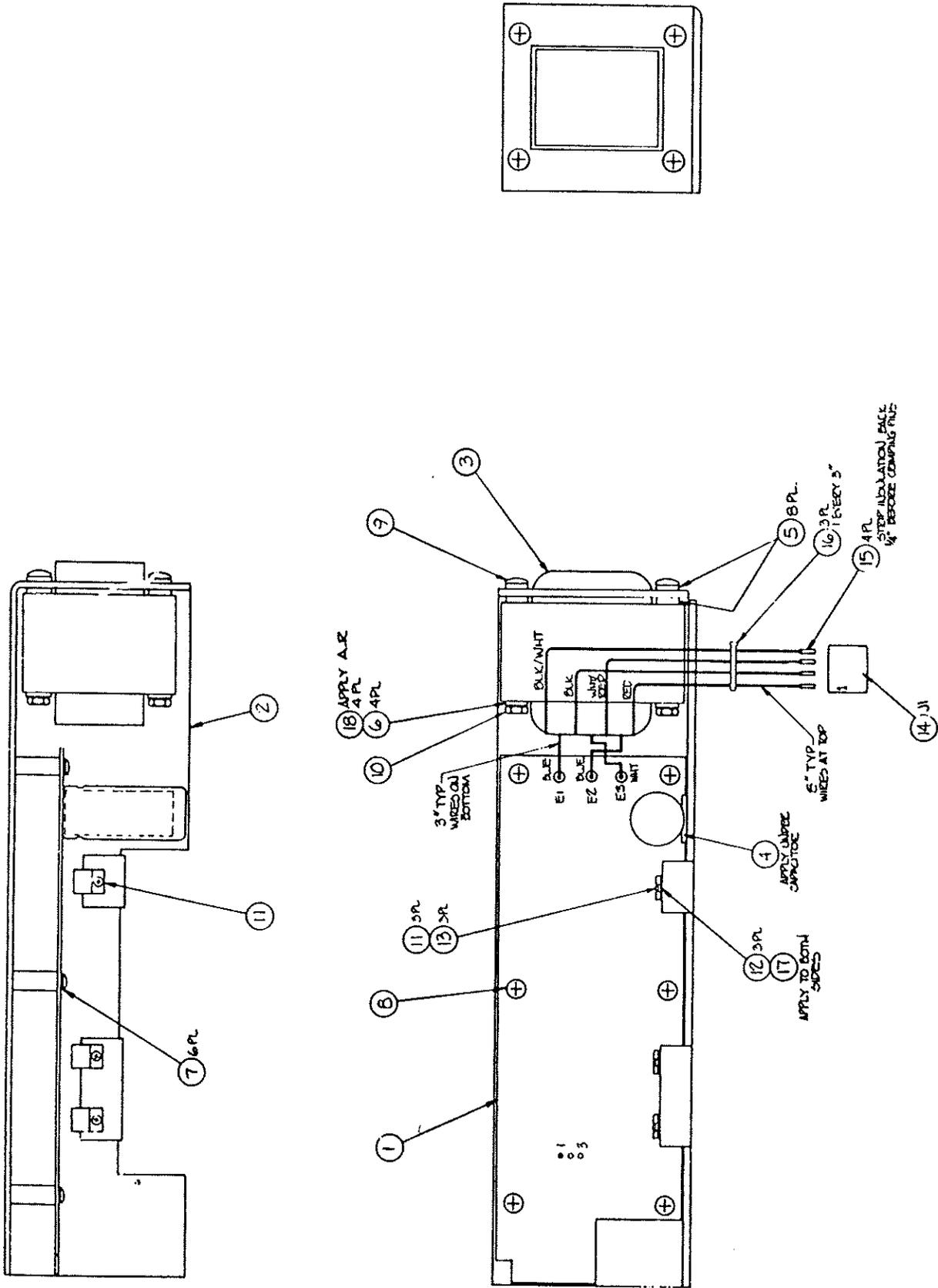
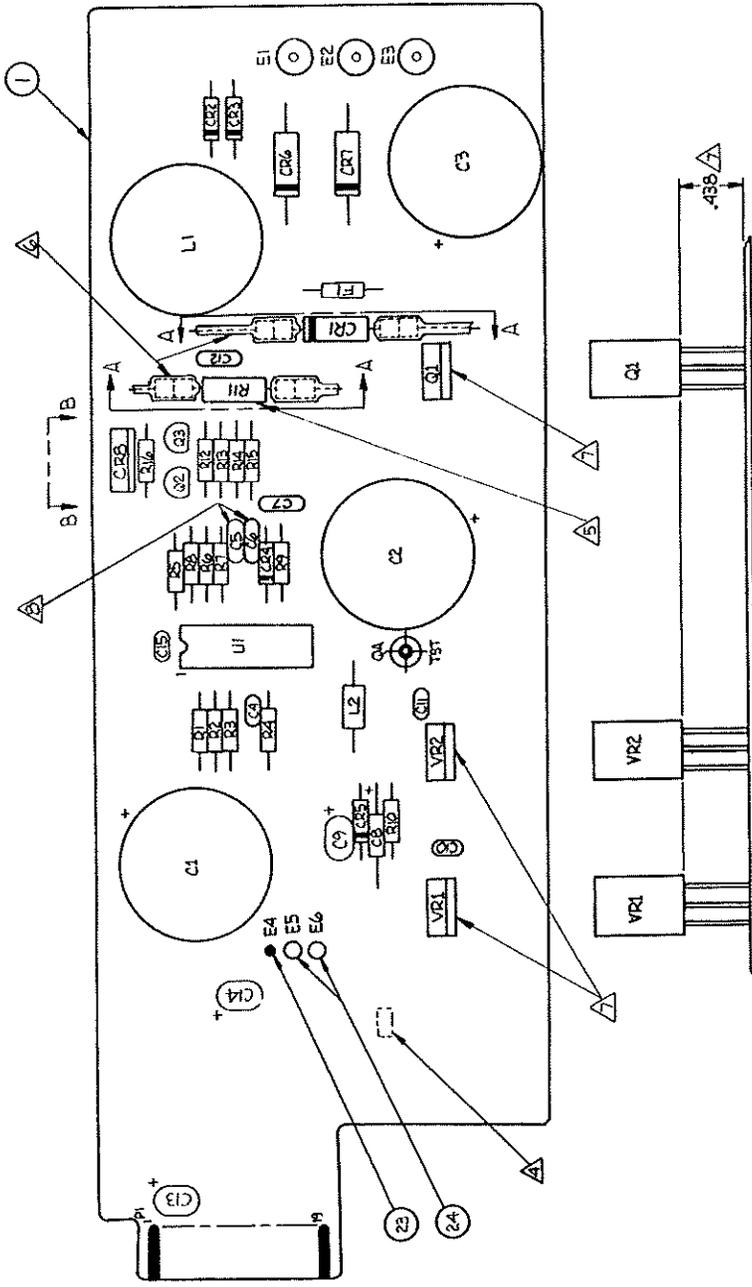


Figure 6-11. AC Power Supply Assembly

| ITEM NO. | FEC PART NO. | QUANTITY | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|--------------|----------|----------|---------------------------|------------|---------------|----------------------|
| | | | | | | | |
| 1 | D5805 | 1 | | ASSY. P/S BD. | PEC | NO2176 | |
| 2 | D5675 | 1 | | HEATSINK | PEC | | |
| 3 | SC497 | 1 | | TRANSFORMER | TNI | T2060 8240 | |
| 4 | 801141 | 1 75 | | FOAM TAPE DOUBLE SIDED | 3M | 4016 | |
| 5 | 404856 | 8 | | SHOULDER WASHER #10 | SMITH | 2156 | |
| 6 | 404915 | 4 | | INT TOOTH WASHER #10 | T&C | MS35333-73 | |
| 7 | 404895 | 6 | | SPLITLOCK WASHER #6 | T&C | MS35338-136 | |
| 8 | 404395 | 6 | | SCREW PH #6-32x9/16 | T&C | MS51957-123 | |
| 9 | 404701 | 4 | | SCREW PH #10-32x2.0 | T&C | MS51958-71 | |
| 10 | 403055 | 4 | | NUT, HEX #10-32x5/16 | T&C | NMS671C10 | |
| 11 | 403985 | 3 | | SHOULDER WASHER | THERMALLOY | 7721-7 | |
| 12 | 080857 | 3 | | INSULATOR | THERMALLOY | 43-77-9 | |
| 13 | 404212 | 3 | | SCREW PH 4-40x3/8 | T&C | MS51957-15 | |
| 14 | 246186 | 1 | | CONNECTOR, 4 POS PLUG | MOLEX | 03-09-1042 | |

Figure 6-11. Parts List, Sheet 1



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
P.C. BOARD-NR2176
FABRICATION DWG-D5804
SCHEMATIC DWG-D5806
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT NECESSARILY APPEAR ON PARTS.
3. SOLDER USING SN60 OR SN63 PER QQ-5-571.
- △ MARK CURRENT REVISION LEVEL IN 12 HIGH CHARACTERS USING BLACK EPOXY INK, APPROXIMATELY WHERE SHOWN. SEE VIEW A-A.
- △ R11 SHOULD BE RAISED OFF BOARD 1/4".
- △ INSTALL 2 FERRITE BEADS (ITEM 21) ON EACH SIDE OF R11 AND CR1, AND INSTALL HEATSHRINK TUBING (ITEM 22) OVER BEADS.
- △ VR1, VR2, AND Q1 ARE TO BE FIXTURED WITH A DUMMY PANEL.
- △ DO NOT CRIMP C5 & C6.

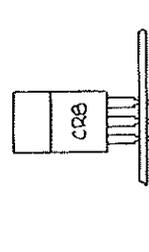
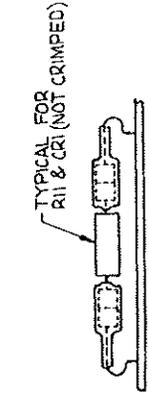


Figure 6-12. Power Supply PWB Assembly

| ITEM CODE NO. | FEC PART NO. | QUANTITY | | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------------|--------------|----------|-------------|--|-------------|------------------------|----------|----------------|------------------------------------|
| | | | | | | | | | |
| 1 | N02176D | | 1 | | | P.W.B. | FEC | | |
| 2 | D5804 | | R E F | | | FABRICATION DWG | FEC | | |
| 3 | D5806 | | R E F | | | SCHEMATIC DWG | FEC | | |
| 4 | | | | | | | | | |
| 5 | 023772 | | 1 | | | CAPACITOR, 6,800uf,16V | NICHICON | 80D682P016HD2 | C1 |
| 6 | 023587 | | 1 | | | CAPACITOR, 2,200uf,35V | NICHICON | 80D222P035JA2 | C2 |
| 7 | 023771 | | 1 | | | CAPACITOR, 6,800uf,35V | NICHICON | 80D682P035JE2 | C3 |
| 8 | 029899 | | 1 | | | CAPACITOR, .01uf, 50V | KEMET | C321C103K5R5CA | C4 |
| 9 | | | | | | | | | |
| 10 | 029940 | | 4 | | | CAPACITOR, 1uf, 50V | KEMET | C330C105M5UJCA | DO NOT CRIMP C5 & C6 C5-C7, C12 |
| 11 | 028506 | | 1 | | | CAPACITOR, 10uf, 20V | KEMET | T110B106K020AS | C8 |
| 12 | 028624 | | 3 | | | CAPACITOR, 22uf, 35V | KEMET | T368C226K035AS | C9,C13,C14 |
| 13 | 029936 | | 3 | | | CAPACITOR, .1uf, 50V | KEMET | C320C104K5R5CA | C10,C11,C15 |
| 14 | | | | | | | | | |

Figure 6-12. Parts List, Sheet 1 PLD5805F

| ITEM CARD CODE NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------------------------|--------------|----------|--|--|------------------------|--------------------|---------------|------------------------|----------------------|
| | | | | | | | | | |
| 15 | | | | | | | | | |
| 16 | 040890 | 1 | | | DIODE, 5 AMP | GI | SR550 | CR1 | |
| 17 | 040572 | 2 | | | DIODE, RECT 400V | FAIRCHILD | 1N4004 | CR2, CR3 | |
| 18 | 040238 | 2 | | | DIODE, SILICON | FAIRCHILD | 1N914 | CR4, CR5 | |
| 19 | 040230 | 2 | | | DIODE, | NOT | MR821 | CR6, CR7 | |
| 20 | 080895 | 1 | | | XSTR N CHAN | MOT | 2N6400 | CR8 | |
| 21 | 440280 | 8 | | | FERRITE BEAD | FERROXCUBE CORP | K500100/3B | USE WITH ITEMS 16 & 43 | |
| 22 | 500565 | 1.19 " | | | THERMO-FIT TUBING, BLK | RAYCHEM | TAT 3/16 | USE WITH ITEM 21 | |
| 23 | 744550 | 1 | | | PIN, MALE | BEADCHAIN | R62-3ET | E4 | |
| 24 | 744555 | 2 | | | PIN, FEMALE | BEADCHAIN | M93-102ET | E5, E6 | |
| 25 | 368362 | 1 | | | FUSE, 5 AMP PECO | LITTELFUSE | 275.005 | F1 | |
| 26 | | | | | | | | | |
| 27 | 760052 | 1 | | | CHOKE, 220uH | RENCO | RL-1256-3-220 | L1 | |
| 28 | 760025 | 1 | | | CHOKE, 2.20MH | J.W.MILLER | 70F223AI. | L2 | |

Figure 6-12. Parts List, Sheet 2

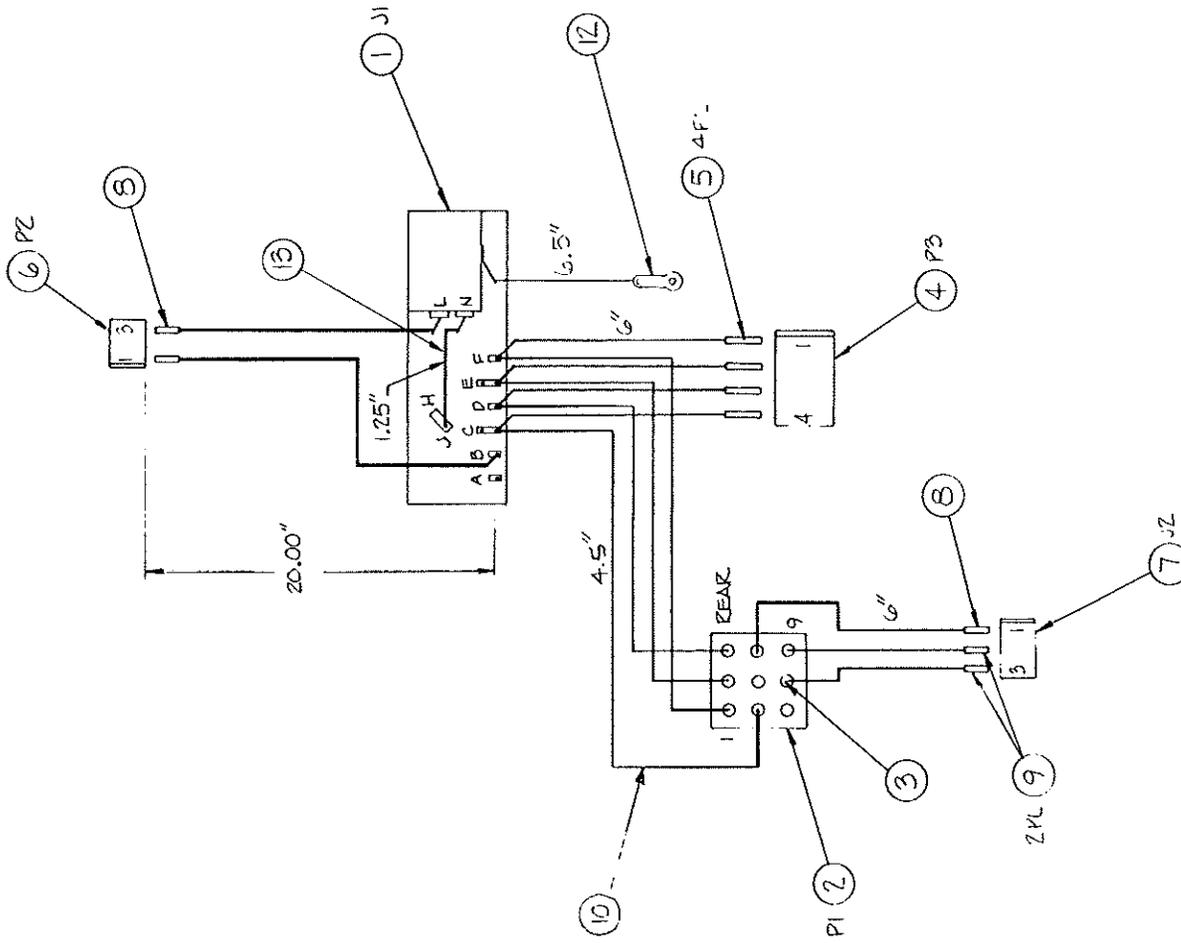
| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|--------------|-------------|--------------|----------|--|-------------|-----------------------------------|-----------|---------------|----------------------|
| | | | | | | | | | |
| | 29 | | | | | | | | |
| | 30 | 080803 | 1 | | | TRANSISTOR | RCA | RCA9230A | Q1 |
| | 31 | 080525 | 2 | | | XSTR PNP SI | FAIRCHILD | 2N2907 | Q2, Q3 |
| | 32 | | | | | | | | |
| | 33 | 624822 | 1 | | | RESISTOR, 4.42K, 1/8W, 1% | CORNING | RN55D4421F | R1 |
| | 34 | 624709 | 1 | | | RESISTOR, 3.74 K, 1/8W, 1% | CORNING | RN55D3741F | R2 |
| | 35 | 601882 | 1 | | | RESISTOR, 220K, 1/4W, 5% | A/B | RC07CF224J | R3 |
| | 36 | 601416 | 2 | | | RESISTOR, 4.7K, 1/4W, 5% | A/B | RC07CF473J | R4, R13 |
| | 37 | 624940 | 1 | | | RESISTOR, 267 Ω , 1/8W, 1% | CORNING | RN55D2670F | R5 |
| | 38 | 624879 | 1 | | | RESISTOR, 4.75K, 1/8W, 1% | CORNING | RN55D4751F | R6 |
| | 39 | 625035 | 1 | | | RESISTOR, 5.62K, 1/8W, 1% | CORNING | RN55D5621F | R7 |
| | 40 | 624946 | 1 | | | RESISTOR 432 Ω , 1/8W, 1% | CORNING | RN55D4320F | R8 |
| | 41 | 601256 | 2 | | | RESISTOR, 1K, 1/4W, 5% | A/B | RC07CF102J | R9, R16 |
| | 42 | 601544 | 2 | | | RESISTOR, 10K, J/4W, 5% | A/A | RC07CF103J | R10, R15 |

Figure 6-12. Parts List, Sheet 3

PLD5805F

| CARD CODE NO. | ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|---------------------|-------------|--------------|----------|---|--|--------------|-------------------------------|-----------|---------------|----------------------|
| | | | | | | | | | | |
| | 43 | 622003 | | 1 | | | RESISTOR, .025Ω, 3W | AMF | L0-3-025-3-BP | R11 |
| | 44 | 624538 | | 1 | | | RESISTOR, 2.21K, 1/8 W, 1% | CORNING | RN55D2211F | R12 |
| | 45 | 625311 | | 1 | | | RESISTOR, 11.5K 1/8 W, 1% | CORNING | RN55D1151F | R14 |
| | 46 | 061901 | | 1 | | | PWM, VOLTAGE REGULATOR | TI | TL594IN | U1 |
| | 47 | | | | | | | | | |
| | 48 | | | | | | | | | |
| | 49 | 060018 | | 1 | | | VOLTAGE REGULATOR | FAIRCHILD | μA79M12UC | VR1 |
| | 50 | 060098 | | 1 | | | VOLTAGE REGULATOR | FAIRCHILD | μA7812UC | VR2 |
| | 51 | | | | | | | | | |
| | 52 | | | | | | | | | |
| | 53 | | | | | | | | | |
| | 54 | | | | | | | | | |
| | 55 | | | | | | | | | |
| | 56 | | | | | | | | | |

Figure 6-12. Parts List, Sheet 4 PLD5805F



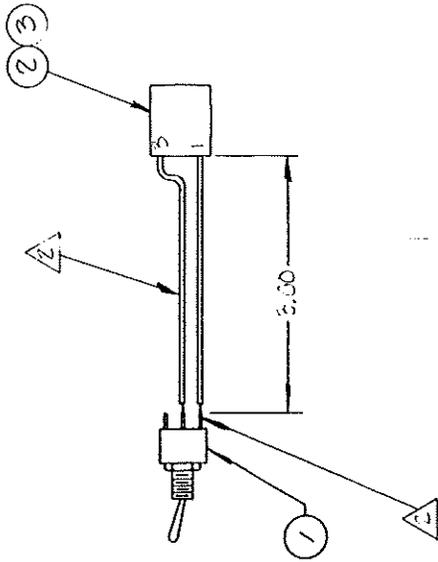
1. STEP AND TIN ALL LEADS 1/4" PICO TO ASSEMBLY
2. APPLY 1/2" HEAT SHRINK TUBING (3:TE/11) TO PIN TERMINALS
3. LABEL PERK 50437

Figure 6-13. Power Filter Assembly

| CARD NO. | ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|----------|--------------|----------|--|----|-----------|-------------------------------|--------|---------------|----------------------|
| | | | | | | | | | | |
| | 1 | 365515 | | | 1 | | POWER LINE FILTER | CORCOR | 6J4 | |
| | 2 | 241197 | | | 1 | | CONNECTOR HIGH VOLT. 9 POS | AMP | 350782-1 | |
| | 3 | 744875 | | | 7 | | PIN, FEMALE, CRIMP | AMP | 350550-1 | |
| | 4 | 246185 | | | 1 | | CONNECTOR, 4 POS | MOLEX | 03-09-2042 | |
| | 5 | 744432 | | | 4 | | PIN, MALE, CRIMP | MOLEX | 02-09-2042 | |
| | 6 | 246250 | | | 1 | | CONNECTOR, 3 POS | MOLEX | 1625-3P1 | |
| | 7 | 246275 | | | 1 | | CONNECTOR, 3 POS | MOLEX | 1625-3R1 | |
| | 8 | 744410 | | | 3 | | PIN, CRIMP, FEMALE | MOLEX | 02-06-1101 | |
| | 9 | 744400 | | | 2 | | PIN, MALE, CRIMP | MOLEX | 02-06-2101 | |
| | 10 | 366685 | | | AR | | WIRE, 18 GA STR WHITE | ALPIA | 1857-WIT-18CA | |
| | 11 | 500590 | | | 4" | | HEAT SHRINK TUBING 1/4 | MARKEL | 1/4 WHITE | |
| | 12 | 242750 | | | 1 | | GROUND LUG #10 | SMITH | 1414-10 | |
| | 13 | 366960 | | | 1 | | 1.25" 18GA BUSS WIRE | ALPIA | 296 | |

Figure 6-13. Parts List

PLC4083A

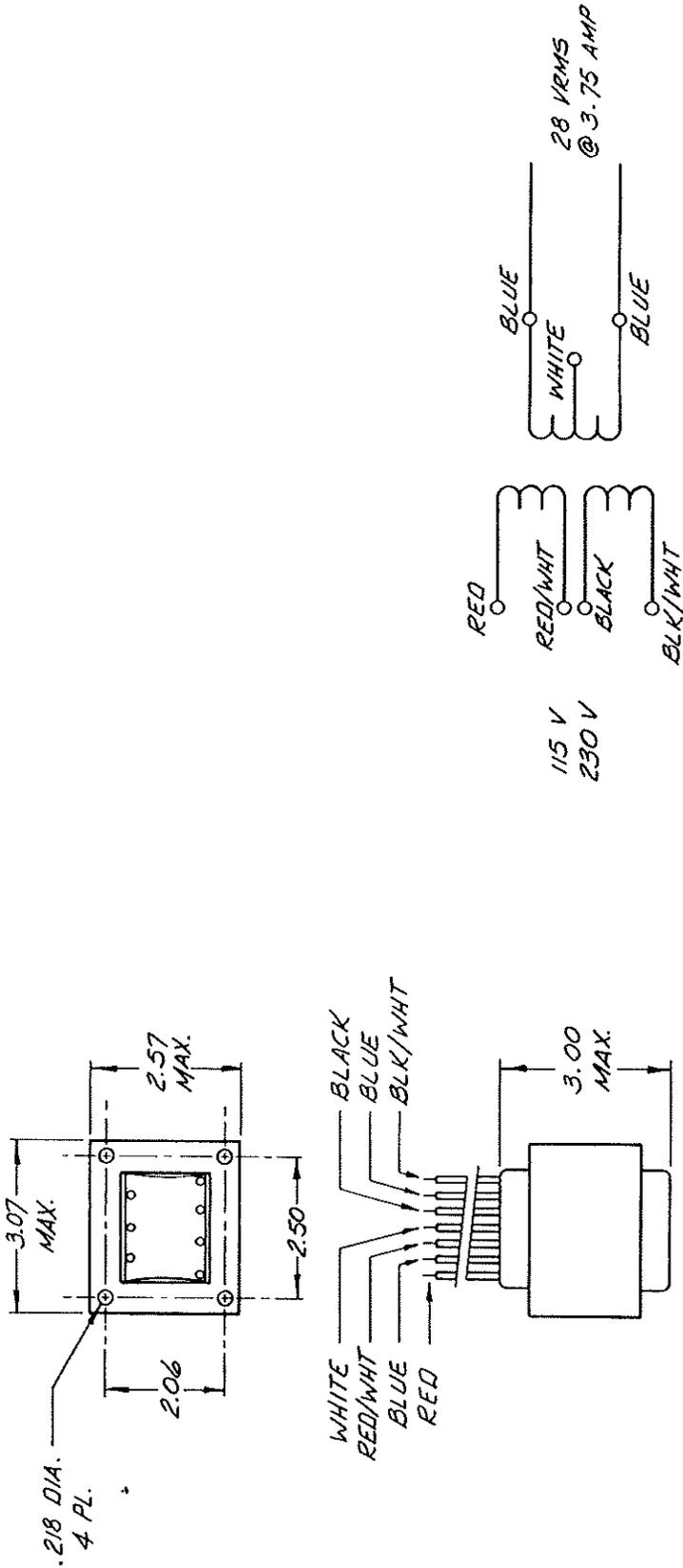


NOTE:
 △ LAVE. REF. SC427
 △ AND OTHER TYPING TO TEM 13PL

| QTY | ITEM | PART NO. | DESCRIPTION | MFR | MFR P/N |
|-----|------|----------|-----------------------------|---------|------------|
| 1 | 6 | 500568 | THERMOFIT TUBING 1/8" | | 1/8 WHITE |
| 1 | 5 | 184750 | CABLE TIE | PARQUIT | 55T-1M |
| 2 | 4 | 366685 | WIRE, 18 GA. STRANDED, WHIT | ALPHA | 1857 |
| 2 | 3 | 744400 | PHI. WALLE, CRIMP | MOLEX | 02-06-2101 |
| 1 | 2 | 246275 | CONNECTOR, 3 POS. | MOLEX | 03-06-1032 |
| 1 | 1 | 727410 | SWITCH | JBT | MPC-123 |

LIST OF MATERIAL

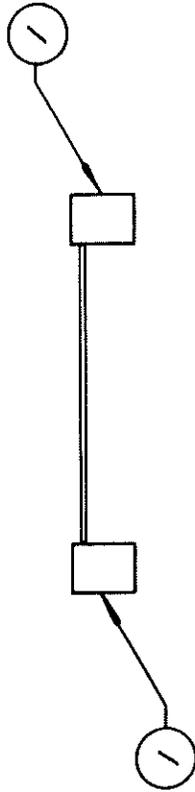
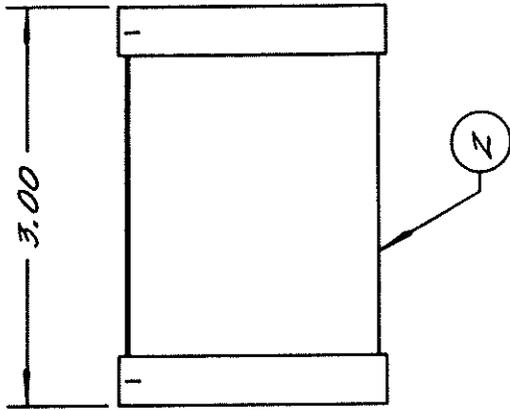
Figure 6-14. Power Switch Assembly C4084A



HIGHPOT 1000 VDC
 WDG TO WDG.
 WDG'S TO CORE

- NOTES:
1. ALL LEADS ARE 22 GA. UL LEAD-IN-WIRE
 12" MIN. FINISHED LENGTH FROM BOBBIN.
 TINNED 1/2".
 2. FEC 765965

Figure 6-15. Transformer SC497

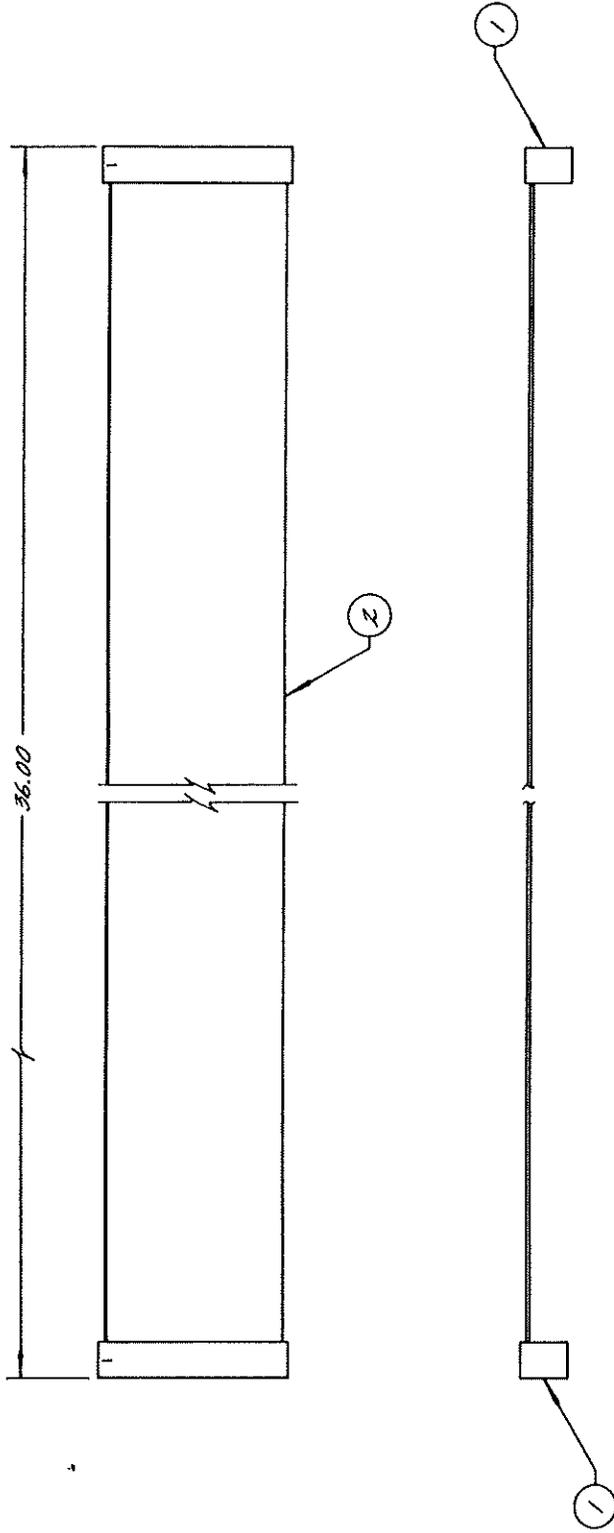


| 3" | Z | 366988 | RIBBON CABLE, 34 COND. | ANISLEY | 171-34 |
|------|------|----------|------------------------|---------|----------|
| Z | 1 | 241115 | CONNECTOR, 34 PIN | AMP | 499579-9 |
| QUAN | ITEM | PART NO. | DESCRIPTION | MFR | MFR P/N |

LIST OF MATERIAL

Figure 6-16. Interconnect Cable

C4079

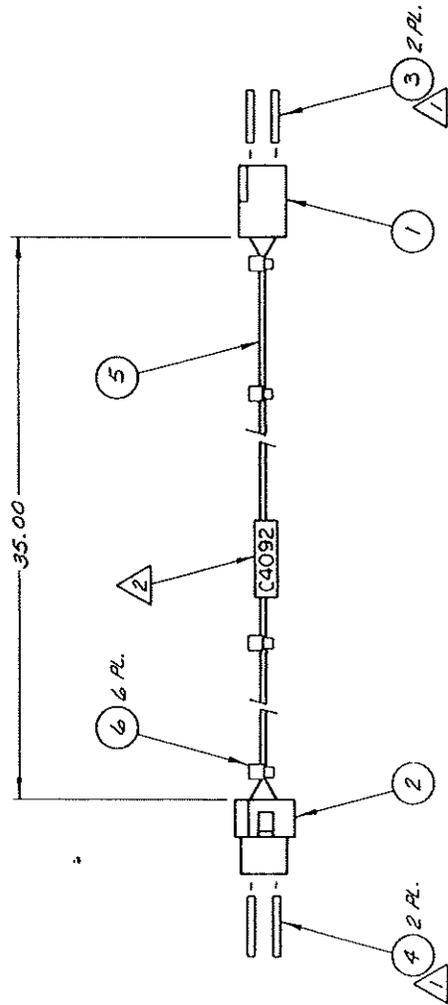


| QTY | ITEM | PART NO. | DESCRIPTION | MFR | MFR P/N |
|-----|------|----------|-----------------------|--------|----------|
| 36" | Z | 366988 | RIBBON CABLE, 34 COND | AUSLEY | 171-34 |
| Z | 1 | 29115 | CONNECTOR, 34 PIN | AMP | 999579-9 |

LIST OF MATERIAL

Figure 6-17. Test Cable

C4076



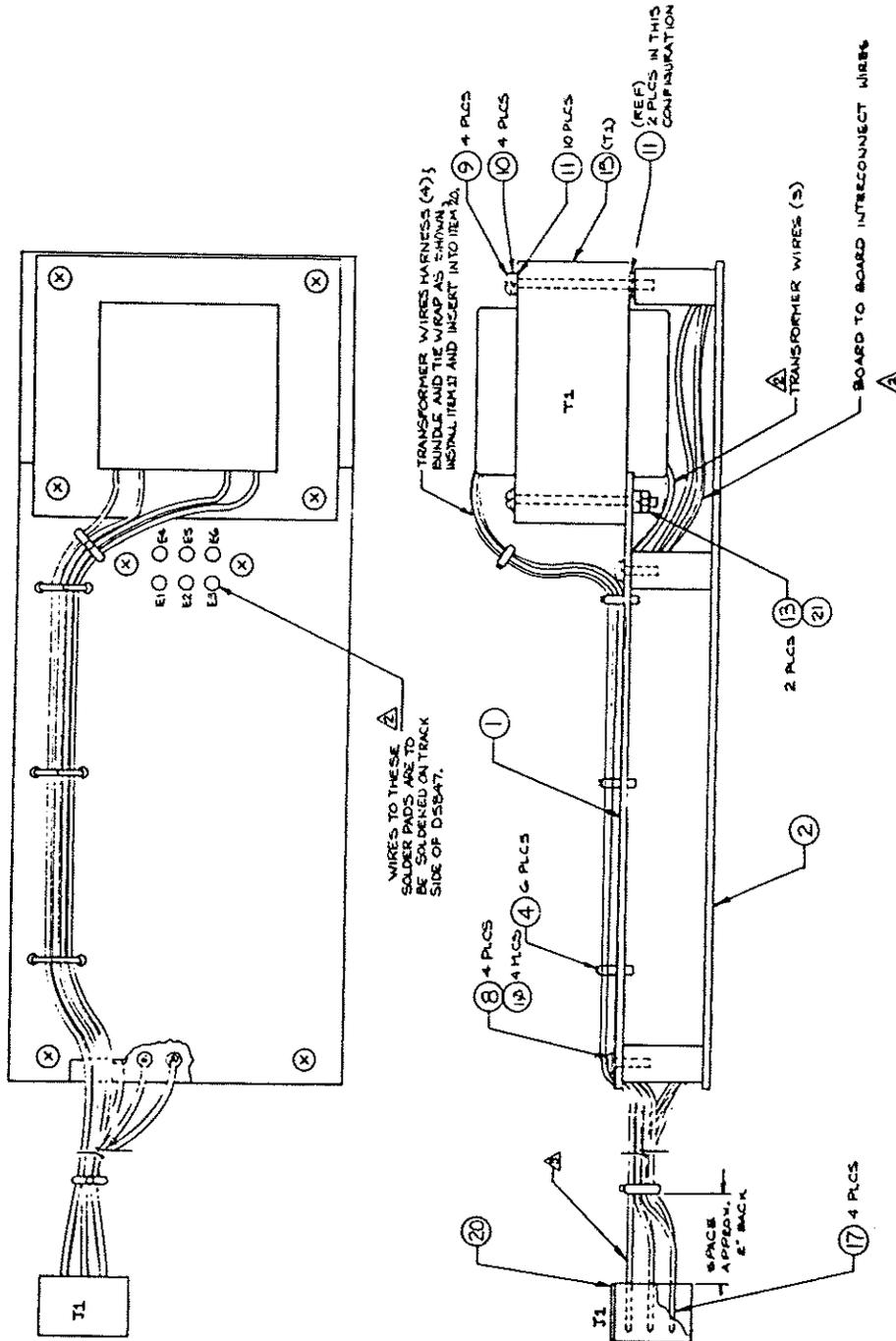
NOTES:

- ① INSTALL ITEMS 3 AND 4 IN POSITIONS 1 AND 3.
- ② LABEL ASSY PER SC437.

| QTY | ITEM | PART NO. | DESCRIPTION | MFR | SSST-IM |
|-----|------|----------|----------------------------|----------|----------------|
| 6 | 6 | 184750 | TIE WRAP | PANQUIIT | SSST-IM |
| 72* | 5 | 366685 | WIRE, 18 GA, WHT, STRANDED | ALPHA | 1857-WHT-18GA. |
| 2 | 4 | 744410 | PIN, FEMALE, CRIMP | MOLEX | 02-06-1101 |
| 2 | 3 | 744400 | PIN, MALE, CRIMP | ↑ | 02-06-2101 |
| 1 | 2 | 246250 | CONNECTOR, 3 POS, FEMALE | ↑ | 1625-3PI |
| 1 | 1 | 246275 | CONNECTOR, 3 POS, MALE | MOLEX | 1625-3RI |
| | | | DESCRIPTION | MFR | MFR P/N |

LIST OF MATERIAL

Figure 6-18. Power Switch Test Cable C4092A



NOTES: UNLESS OTHERWISE SPECIFIED
 1. REFERENCE DOCUMENTS:
 SUB-ASSEMBLY - D5847
 SUB-ASSEMBLY - D5851
 WIRE INSTRUCTIONS:
 T1 GREEN WIRE TO D5847 E4
 T1 GREEN/WHITE WIRE TO D5847 E5
 T1 GREEN WIRE TO D5847 E2
 ITEM NO. 6 WIRE:
 D5847 E1 TO D5851 E4
 D5847 E2 TO D5851 E5
 D5847 E3 TO D5851 E4
 WIRE INSTRUCTIONS:
 T1 BROWN WIRE TO T1-1
 T1 RED WIRE TO T1-3
 T1 ORANGE WIRE TO T1-2
 T1 YELLOW WIRE TO T1-4
 D5851 E1 TO T1-4
 D5851 E2 TO T1-4
 D5851 E3 TO T1-6

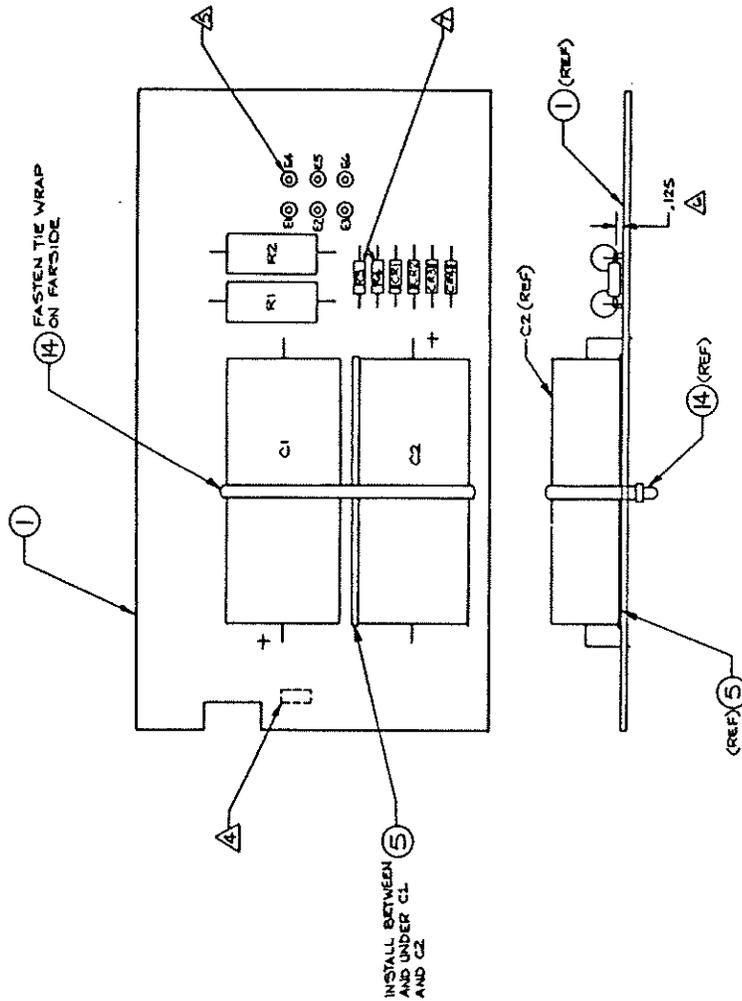
Figure 6-19. Optional High Level Assembly

| ITEM NO. | FEC PART NO. | QUANTITY | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATION |
|----------|--------------|----------|----------------------------------|---------|---------------|--|
| 1 | D5847 | 1 | SUB-ASSY LOOP PHR SUPPLY | FEC | | |
| 2 | D5851 | 1 | SUB-ASSY QUAD HIGH LEVEL KEYS | FEC | | |
| 3 | | | | | | |
| 4 | 184750 | 5 | SMALL TIE WRAP | PANDUIT | SST-1H | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | 404369 | 4 | SCREW, PH6-12x5/16 | T&C | MS1957-27 | TO MOUNT ITEM 1 TO 2 |
| 9 | 404433 | 4 | SCREW, PH6-12x1 3/8 | T&C | MS1957-125 | TO INSTALL T1 |
| 10 | 404895 | 8 | WASHER, SPLIT-LOCK, #6 | T&C | MS1338-116 | USED WITH ITEM 9 |
| 11 | 404891 | 10 | WASHER, FLAT, #6 | T&C (1) | AR960-C6L | USE WITH ITEM 8 & 9 AND USE BETWEEN ITEM 2 & 15 |
| 12 | | | | | | |
| 13 | 403035 | 2 | NUT, HEX, 6-12 | T&C | NAS671-C6 | USE WITH ITEM 9 |
| 14 | | | | | | |

Figure 6-19. Parts List, Sheet 1

| ITEM NO. | FEC PART NO. | QUANTITY | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|----------|--------------|----------|---------------------|---------------------|---------------|----------------------|
| 15 | 766625 | 1 | TRANSFORMER, THJ144 | SC024 TRANSI INC | TH-7344 | T1 |
| 16 | | | | | | |
| 17 | 744876 | 4 | PTN, HALP, CRIMP | AMP | 350690-1 | USE WITH ITEM 20 |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | 241198 | 1 | AMP CONNECTOR, PLUG | AMP | 350720-1 | UES WITH ITEM 17 |
| 21 | 801190 | A / R | TORQUE SEAL | ORGANIC PRODUCTS | F900, GREY | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |

Figure 6-19. Parts List, Sheet 2



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS:
 PC BOARD - NO2205
 FABRICATION DWG - D5846
 SCHEMATIC DWG - D5848
 FULL ASSEMBLY DWG - D5853
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT NECESSARILY APPEAR ON PARTS.
3. SOLDER USING 50/50 OR 50/63 PER QR-6-571.
- ▲ MARK CURRENT REVISION LEVEL IN .12 HIGH CHARACTERS USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.
- ▲ THIS BOARD ASSEMBLES TO D5851 (NO2207) USE ASSEMBLY DRAWING D5853.
- ▲ SPACE 2W RESISTORS APPROXIMATELY .125 OFF BOARD.
- ▲ SPACE R3 AND R4 APPROXIMATELY .500 OFF BOARD.

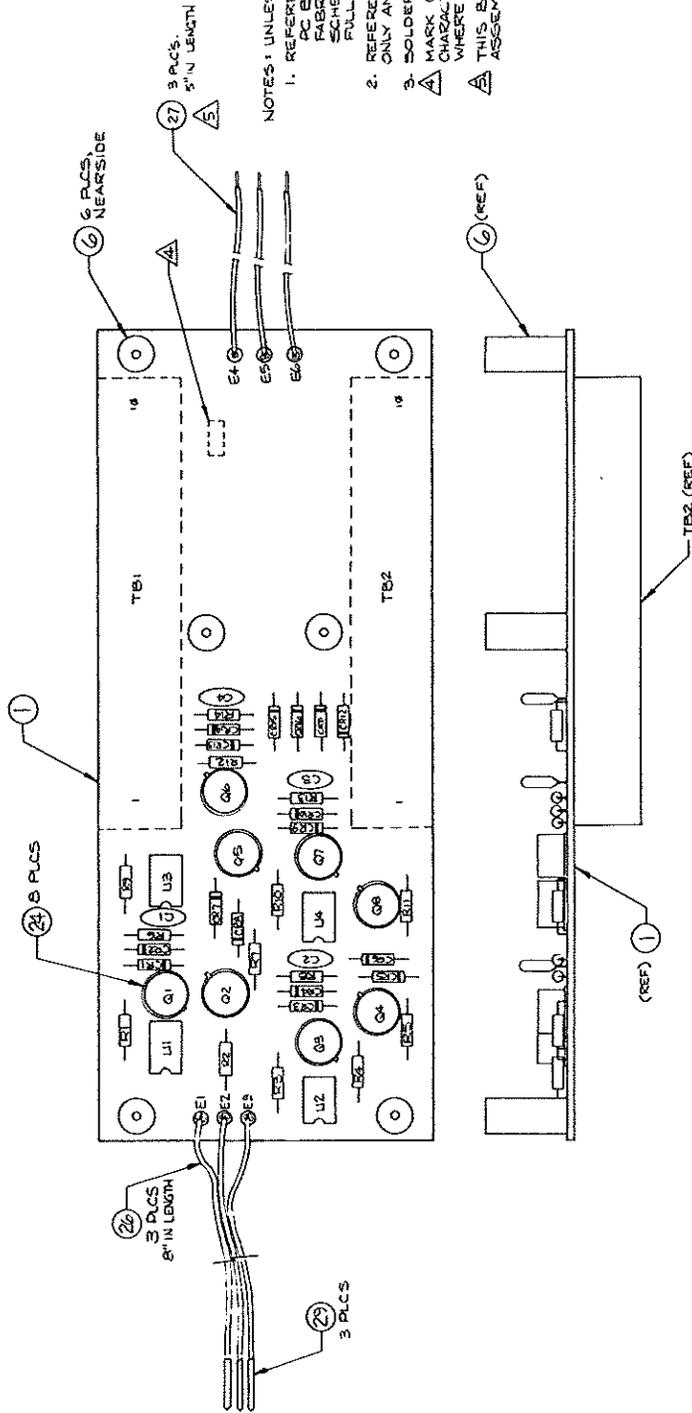
Figure 6-20. Optional Loop Power Supply Sub-Assembly

D5847A

| ITEM NO. | FEC PART NO. | QUANTITY | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR | CNO COPY |
|----------|--------------|----------|----------------------------|----------|----------------|---|----------|
| | | | | | | | |
| 1 | N02205A | 1 | PRINTED WIRING BOARD | FEC | | | |
| 2 | D5846 | 1 | FABRICATION DWG. | FEC | | REFERENCE DOCUMENT | |
| 3 | D5848 | 1 | SCHEMATIC DWG. | FEC | | REFERENCE DOCUMENT | |
| 4 | | | | | | | |
| 5 | 801915 | 1 | FOAM TAPE | JM | 4032 | USE BETWEEN AND UNDER C1 AND C2 | |
| 6 | 023464 | 2 | CAPACITOR, 580uF, 75VDC | SANGAMO | 066HJ.581T075B | C1, C2 | |
| 7 | | | | | | | |
| 8 | 040594 | 4 | DIODE, RECT, 500V | MOTOROLA | 1N4005 | CRI-CR4 | |
| 9 | | | | | | | |
| 10 | 601065 | 2 | RESISTOR, 22 OHMS, 1/4W, 5 | AB | RC07GF220J | (CARBON FILM RESISTOR R3, R4 ONLY) | |
| 11 | | | | | | | |
| 12 | 608585 | 2 | RESISTOR, 6.8K, 2W, 10% | AB | RC42GF602K | R1, R2 | |
| 13 | | | | | | | |
| 14 | 184755 | 1 | TIE WRAP | PANDUIT | SST-2M | (FOR USE WITH ITEM 1 & 6) TIE ON FAR SIDE | |

Figure 6-20. Parts List

PL-D5847A



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE DOCUMENTS
 AC BOARD - NO2207
 FABRICATION DWG - D5850
 SCHEMATIC DWG - D5852
 FULL ASSEMBLY - D5853
 2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT NECESSARILY APPEAR ON PARTS.
 3. SOLDER USING 50/50 OR 50/63 PER QQ-S-571.
- ▲ MARK CURRENT REVISION LEVEL IN .12 HIGH CHARACTERS USING WHITE EPOXY INK, APPROXIMATELY WHERE SHOWN.
- ▲ THIS BOARD ASSEMBLES TO D5847 (NO2206) USE ASSEMBLY DRAWING D5853.

Figure 6-21. Optional Quad High Level Keyer Subassembly D5851C

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | | CHG. CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|-----|--|-----------|------------------------------|--------------|---------------|---|
| | | | | | | | | | | |
| | 1 | N02207B | | 1 | | | PRINTED WIRING BOARD | FEC | | |
| | 2 | D5850 | | REF | | | FABRICATION DWG. | FEC | | REFERENCE DOCUMENT |
| | 3 | D5852 | | REF | | | SCHEMATIC DWG. | FEC | | REFERENCE DOCUMENT |
| | 4 | D5853 | | REF | | | FULL ASSEMBLY | FEC | | REFERENCE DOCUMENT |
| | 5 | | | | | | | | | |
| | 6 | 683210 | | 6 | | | STANDOFF, .625, 6-23TAP | CAMB. | 1246-14 | (INSTALL ON ITEM 1 COMPONENT SIDE) |
| | 7 | 184750 | | 2 | | | TIE WRAP | PANDUIT | SST-1H | USE WITH ITEM 26 |
| | 8 | 100370 | | 2 | | | TERMINAL BLOCK 10POSITION | REED DEVICES | 6PCV-10 | TB1, TB2 (INSTALL ON ITEM 1 TRACK SIDE) |
| | 9 | | | | | | | | | |
| | 10 | 021390 | | 4 | | | CAPACITOR, .003uf, 1KV, DISC | CENTRAL LAB | DD-302 | C1-C4 |
| | 11 | | | | | | | | | |
| | 12 | 040238 | | 8 | | | DIODE, SWITCHING | GE | 1N914 | CR1-CR4, CR9, CR10, CR13, CR14 |
| | 13 | 040594 | | 8 | | | DIODE, RECT, 500V | MOTOROLA | 1N4005 | CR5-CR8, CR11, CR12, CR15, CR16 |
| | 14 | | | | | | | | | |

Figure 6-21. Parts List, Sheet 1

D5851C

| CARD CODE | ITEM NO. | FEC PART NO. | QUANTITY | | CHG CODE | DESCRIPTION | MFR. | MFR. PART NO. | REFERENCE DESIGNATOR |
|-----------|----------|--------------|----------|-----|----------|---------------------------------------|----------|------------------|---|
| | | | | | | | | | |
| | 15 | 601870 | | 4 | | RESISTOR, 150K Ω , 1/4W, 5% | AB | RC07GF154J | R1, R3, R9, R10 |
| | 16 | 601172 | | 2 | | RESISTOR, 270 Ω , 1/4W, 5% | AB | RC07GF271J | R2, R4 |
| | 17 | 601544 | | 4 | | RESISTOR, 10K Ω , 1/4W, 5% | AB | RC07GF103J | R5, R7, R11, R12 |
| | 18 | 601888 | | 4 | | RESISTOR, 330K Ω , 1/4W, 5% | AB | RC07GF334J | R6, R8, R13, R14 |
| | 19 | | | | | | | | |
| | 20 | 060448 | | 4 | | IC, OPT. COUPLER | GE | 4N35 | UJ-U4 |
| | 21 | | | | | | | | |
| | 22 | 080889 | | 4 | | TRANSISTOR, PNP, SI, TO-5 | MOTOROLA | 2N5416 | Q1, Q3, Q5, Q7 |
| | 23 | 080566 | | 4 | | TRANSISTOR, NPN, SI, TO-5 | MOTOROLA | 2N3439 | Q2, Q4, Q6, Q8 |
| | 24 | 080836 | | 8 | | TRANSISTOR, MTC PAD, INSULATOR | ROSS | A10020 | (USE WITH Q1-Q8) |
| | 25 | | | | | | | | |
| | 26 | 366767 | | 24" | | WIRE, 22GA, WHT, STRANDED | ALPHA | M16878E/1A-8-F-8 | CUT TO 3 8" PIECES AND STRIP BOTH ENDS .250, E1, E2, E3 |
| | 27 | 366767 | | 15" | | WIRE, 22GA, WHT, STRANDED | ALPHA | M16878E/1A-8-F-8 | CUT TO 3 5" LENGTHS AND STRIP BOTH ENDS .250, E4, E5, E6 |
| | 28 | | | | | | | | |

Figure 6-21. Parts List, Sheet 2

D5851C

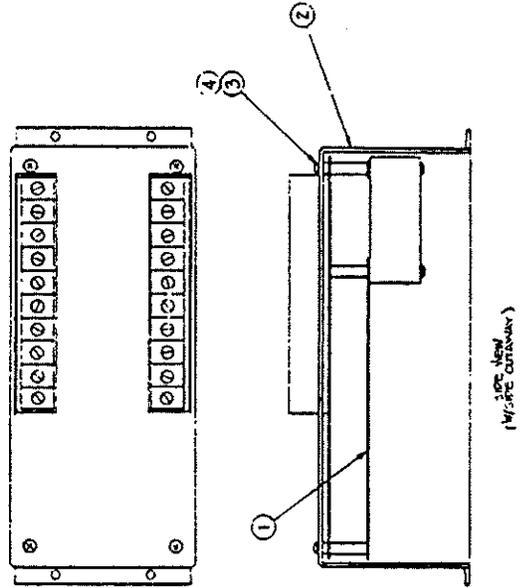
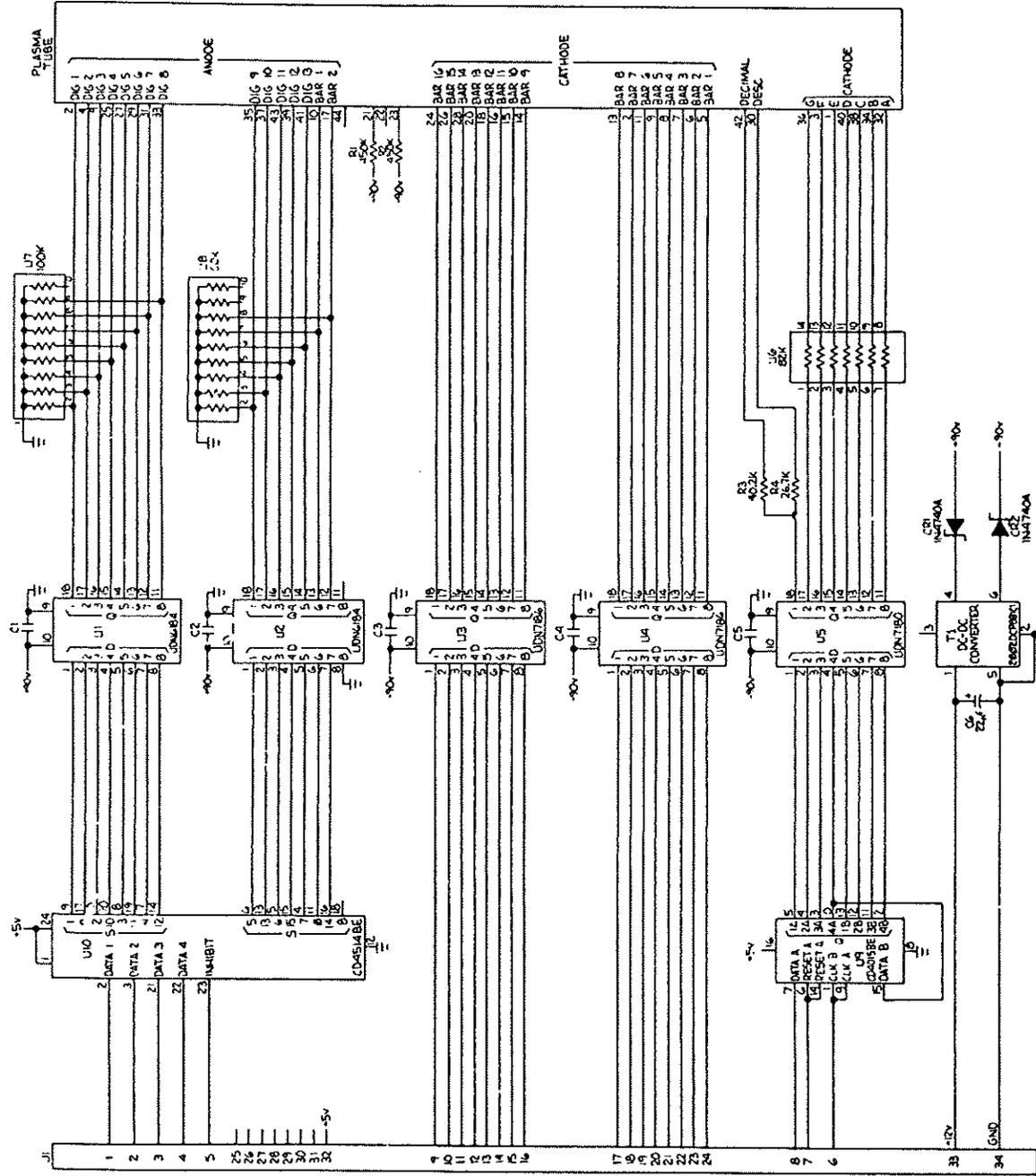


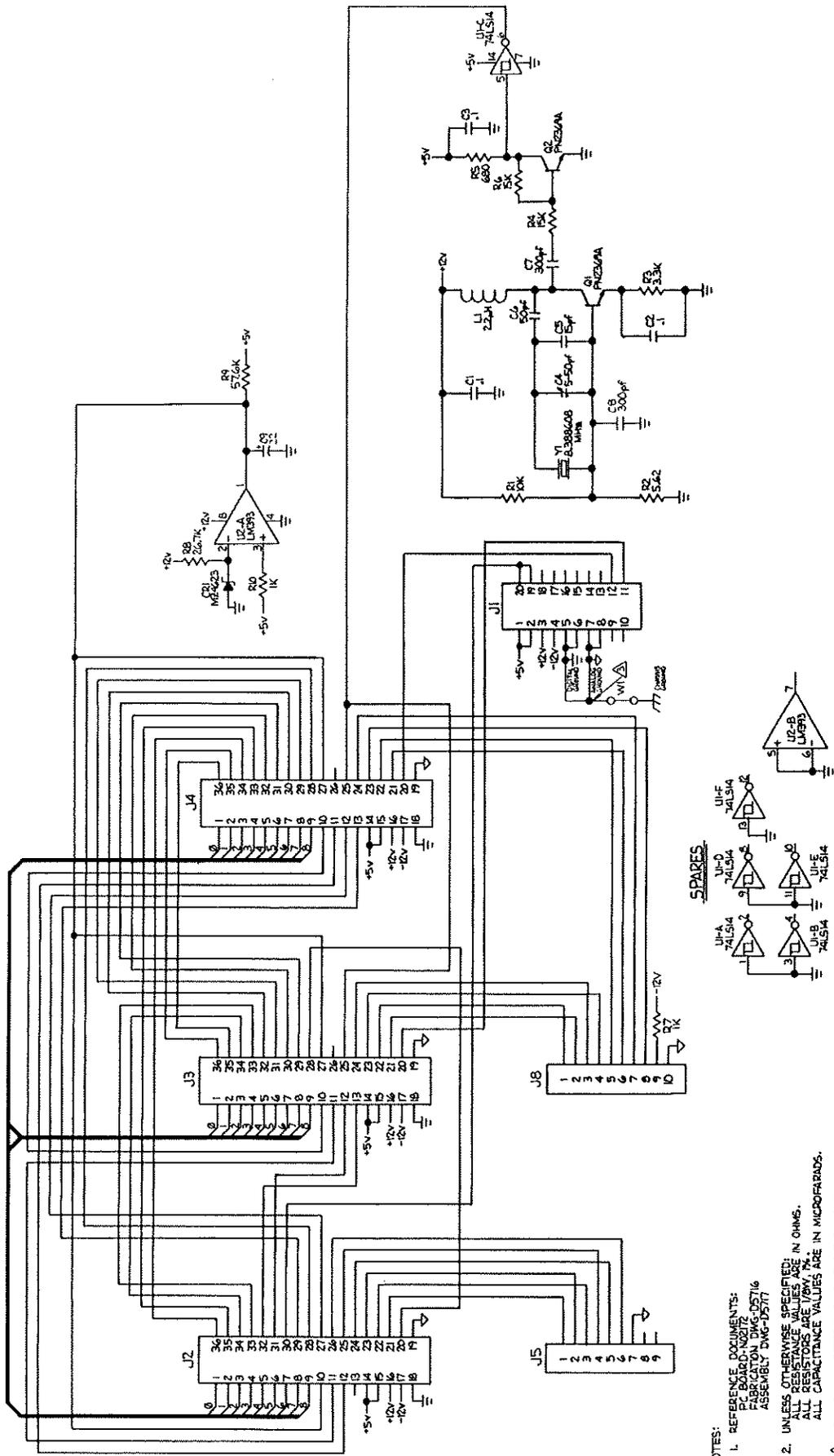
Figure 6-22. Optional High Level Interface Assembly D5865

SECTION VII
SCHEMATIC DIAGRAMS



- NOTES:
1. REFERENCE DOCUMENTS:
PC BOARD MFG-700
FABRICATION DWG-25700
ASSEMBLY DWG-25701
 2. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/8W, 1%.
ALL BYPASS CAPACITORS ARE .1μ.

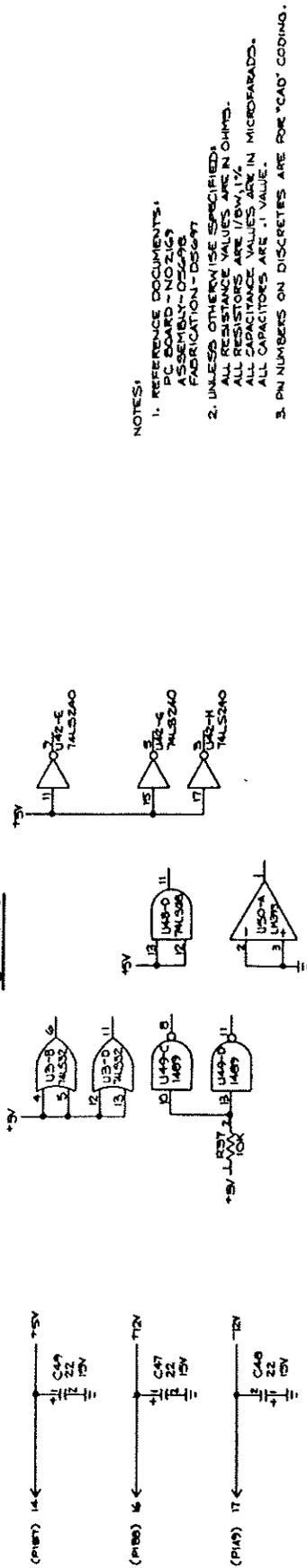
Figure 7-1. Front Panel Board Schematic



- NOTES:
1. REFERENCE DOCUMENTS:
 P.C. BOARD 100212
 FABRICATION DWG-D5716
 ASSEMBLY DWG-D5717
 2. UNLESS OTHERWISE SPECIFIED:
 ALL RESISTANCE VALUES ARE IN OHMS.
 ALL RESISTORS ARE 1/8W, 1%.
 ALL CAPACITANCE VALUES ARE IN MICROFARADS.
 ⚠️ GROUNDS CONNECTED THRU THRU HOLE, ONLY
 AT THIS POINT.

Figure 7-2. Backplane Board Schematic

SPARES



- NOTES:
1. REFERENCE DOCUMENTS:
PC BOARD - NOZIG
PC BOARD - DZDPM
FABRICATION - D00PT
 2. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS.
ALL CAPACITANCE VALUES ARE IN MICROFARADS.
ALL CAPACITORS ARE .1 VALUE.
 3. PN NUMBERS ON DISCRETES ARE FOR 'CAD' CODING.

Figure 7-3. Control Board Schematic, Sheet 1 D5699A

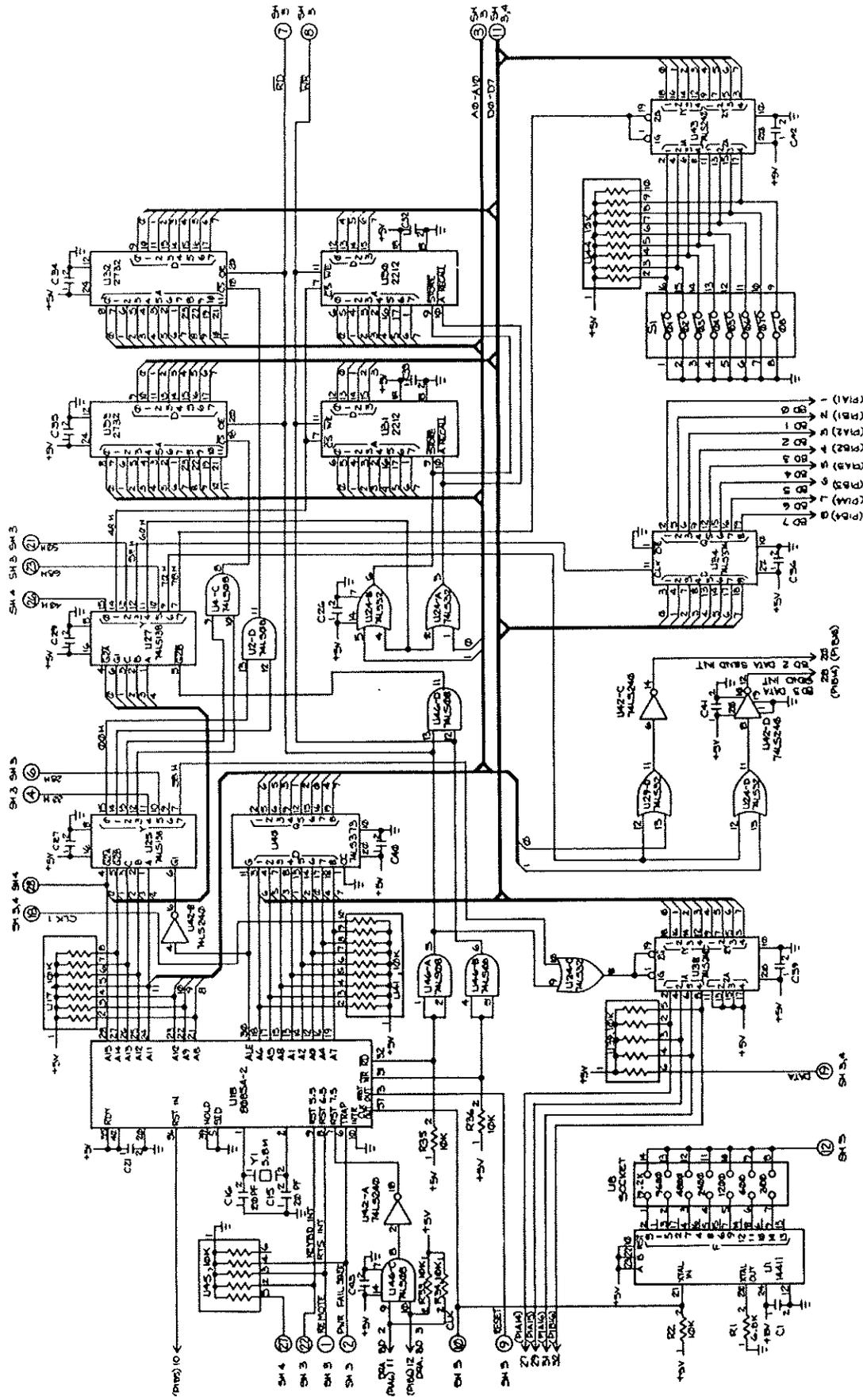


Figure 7-3. Control Board Schematic, Sheet 2 D5699A

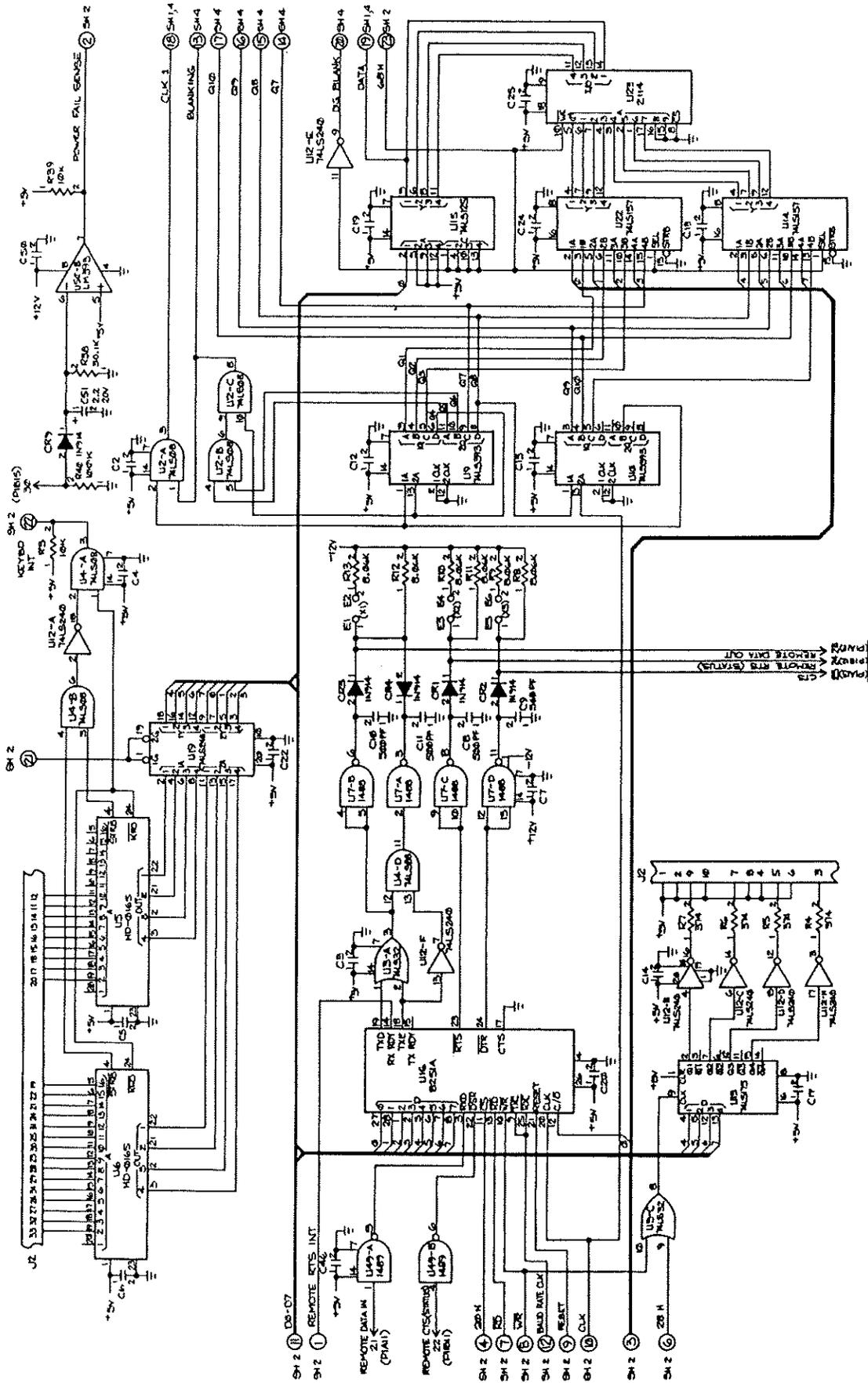


Figure 7-3. Control Board Schematic, Sheet 3 D5699A

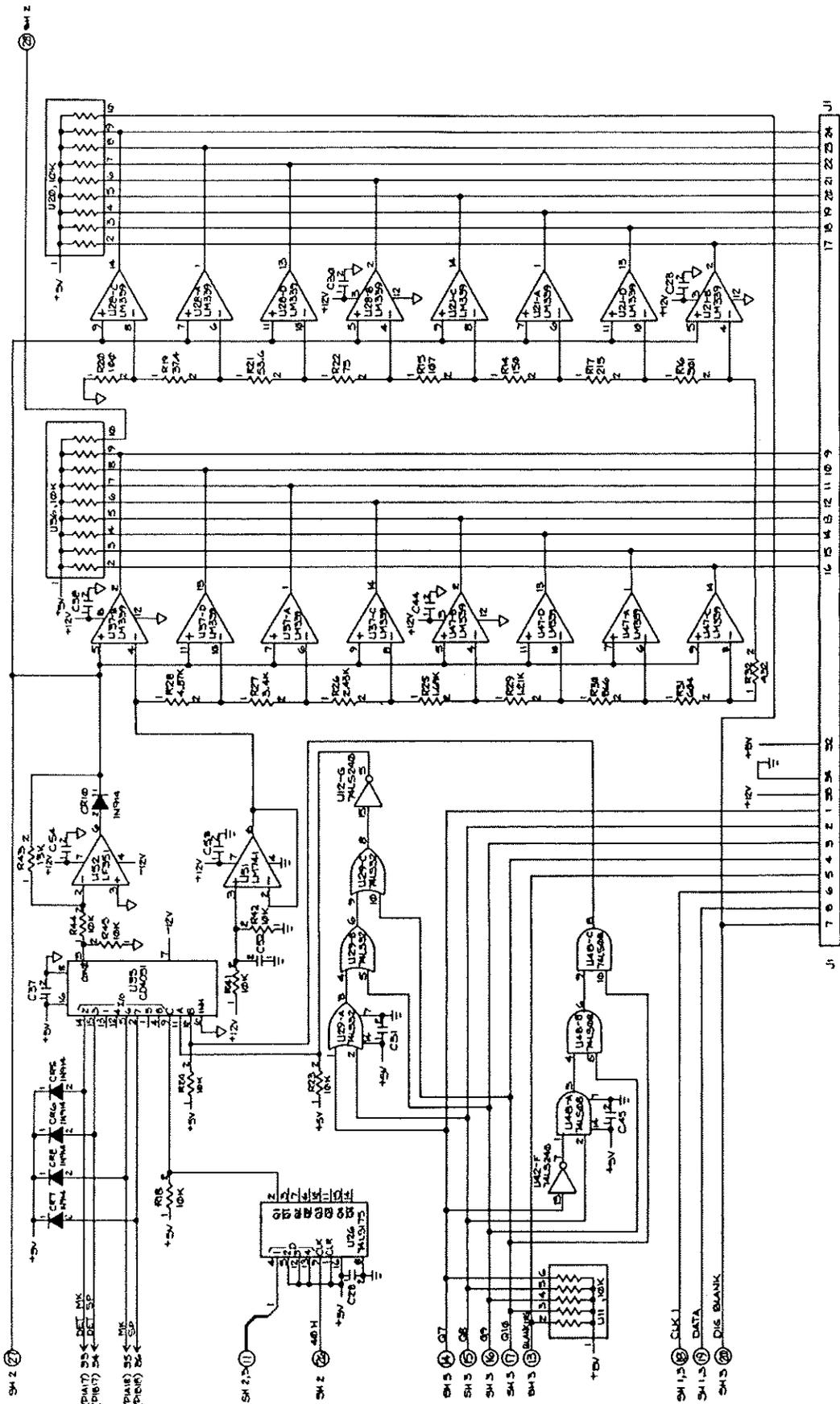
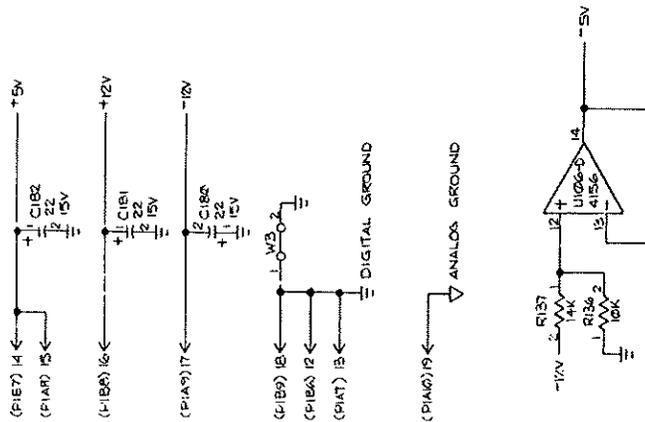
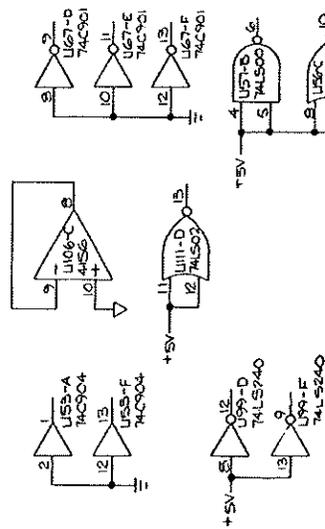


Figure 7-3. Control Board Schematic, Sheet 4 D5699A



SPARES



REFERENCE DESIGNATIONS
NOT USED:
CR29
CR37

- NOTES:
- 1) REFERENCE DOCUMENTS:
PC BOARD - N02171
PAB DWG - D5706
ASSEMBLY D05107
 - 2) UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE 1% IN OHMS.
ALL CAPACITANCE VALUES ARE IN MICROFARADS.
ALL CAPACITORS ARE .1 VALUE.
- CAO CODING INFORMATION:
PIN NUMBERS ON ALL DISCRETS ARE FOR
ALL CAPACITORS WITH CALLOUT A ARE CODED
AS PART OF THE IC, USING THE IC NAME AND
LAST TWO PIN NUMBERS. THE CAPACITOR
NAMES ARE TEXT ON THE artwork.
DO NOT INSTALL CR6 AND CR7.

Figure 7-4. Demodulator Board Schematic, Sheet 1 D5708C

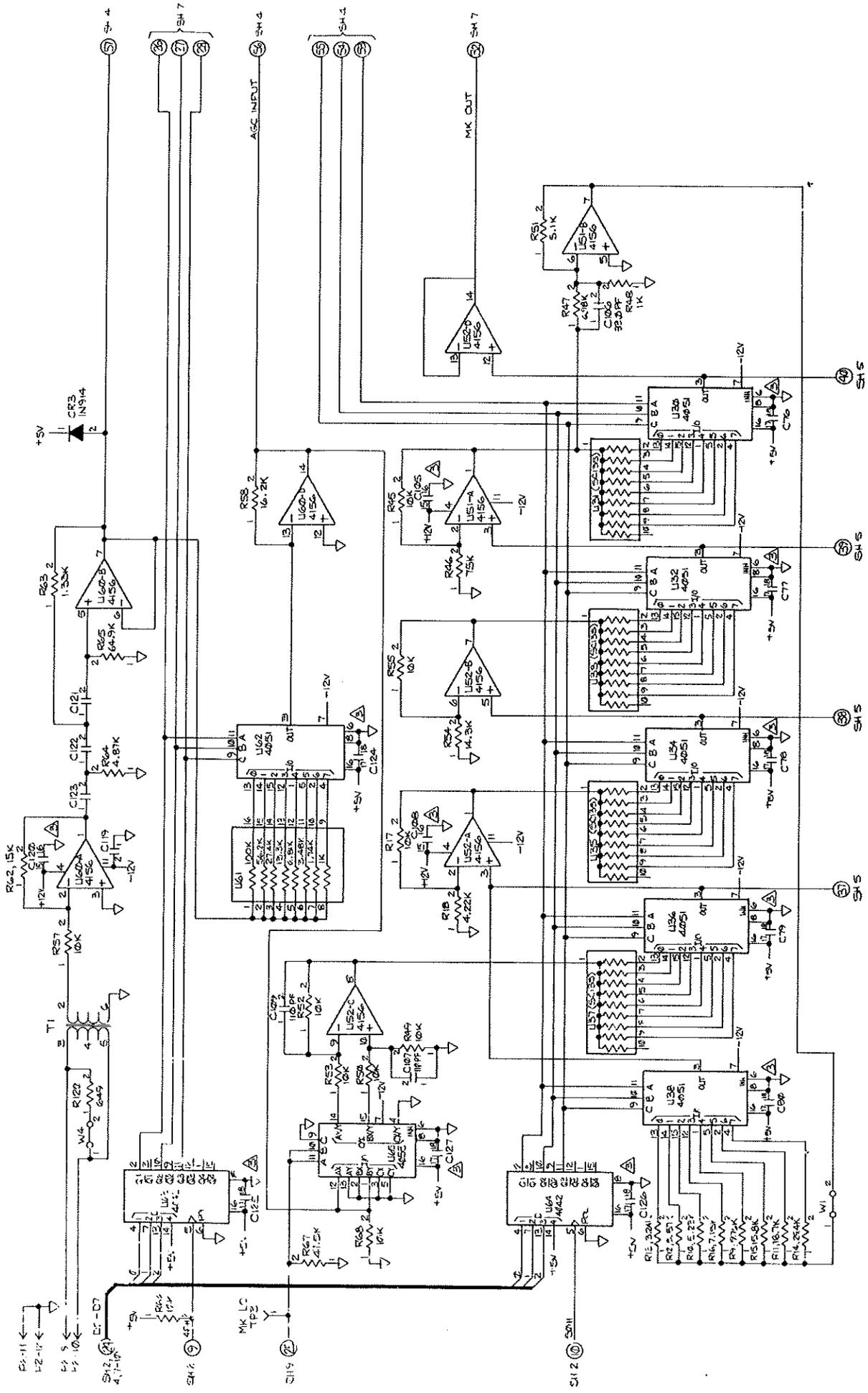


Figure 7-4. Demodulator Board Schematic, Sheet 3 D5708C

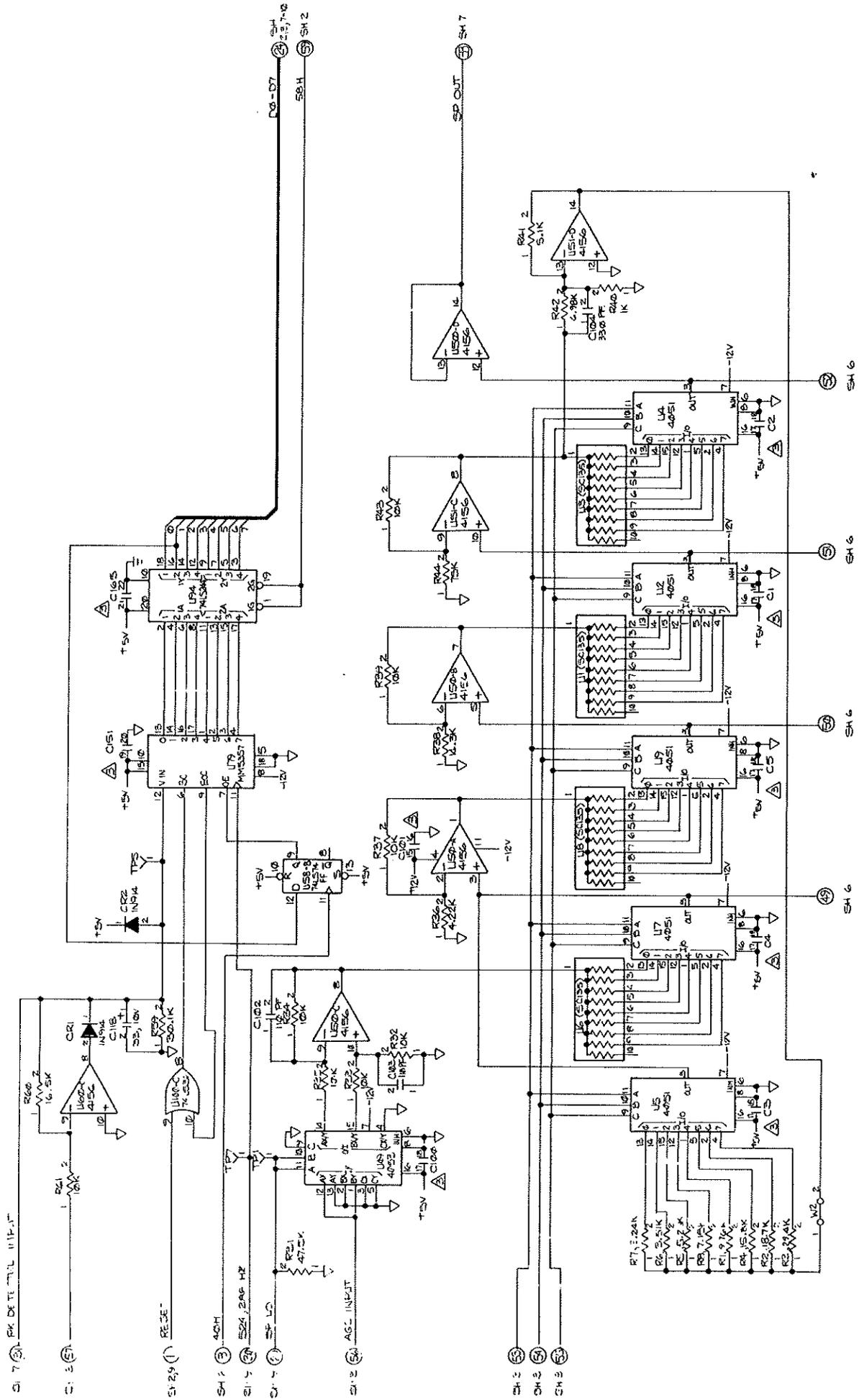


Figure 7-4. Demodulator Board Schematic, Sheet 4 D5708C

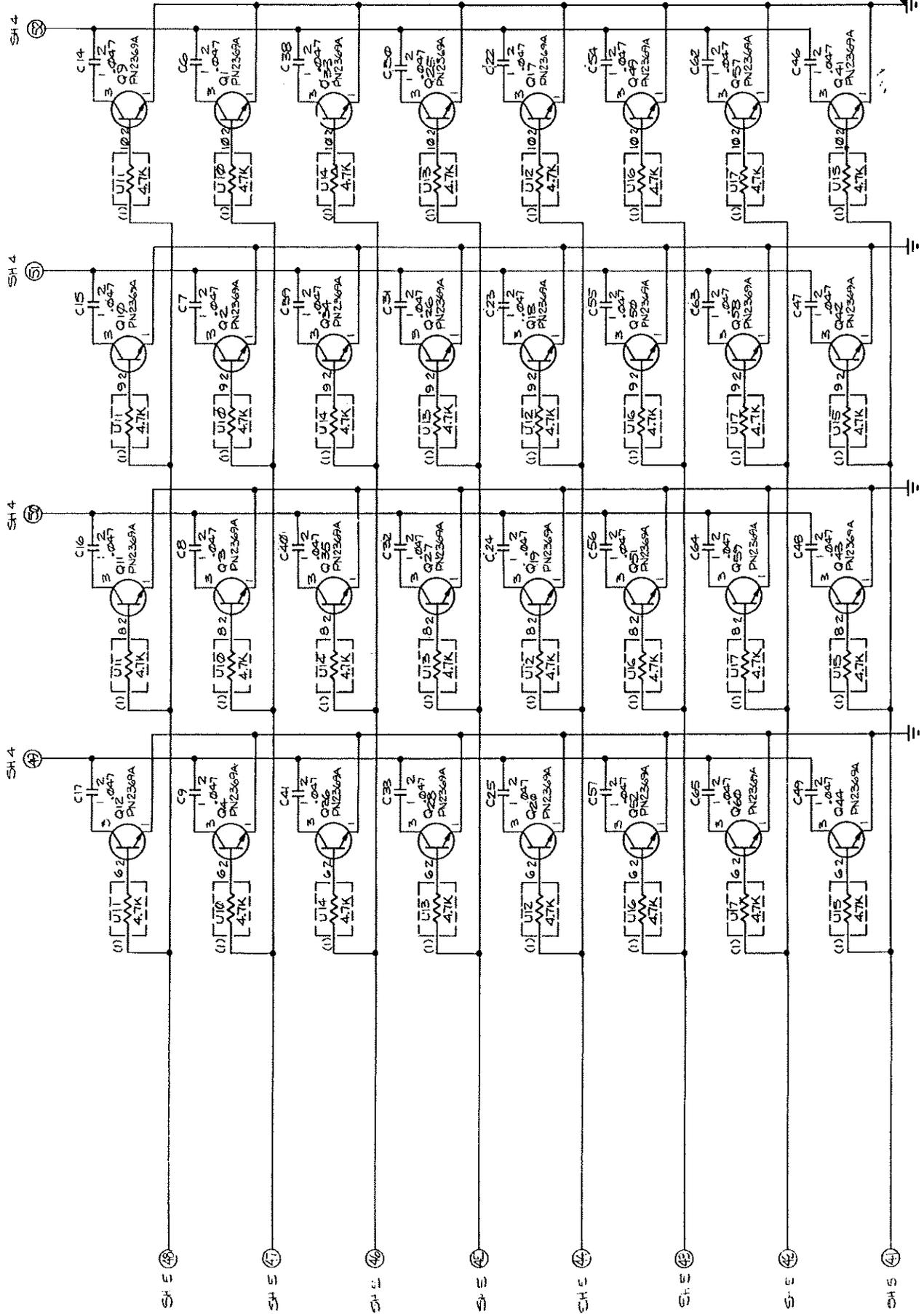


Figure 7-4. Demodulator Board Schematic, Sheet 6 D5708C

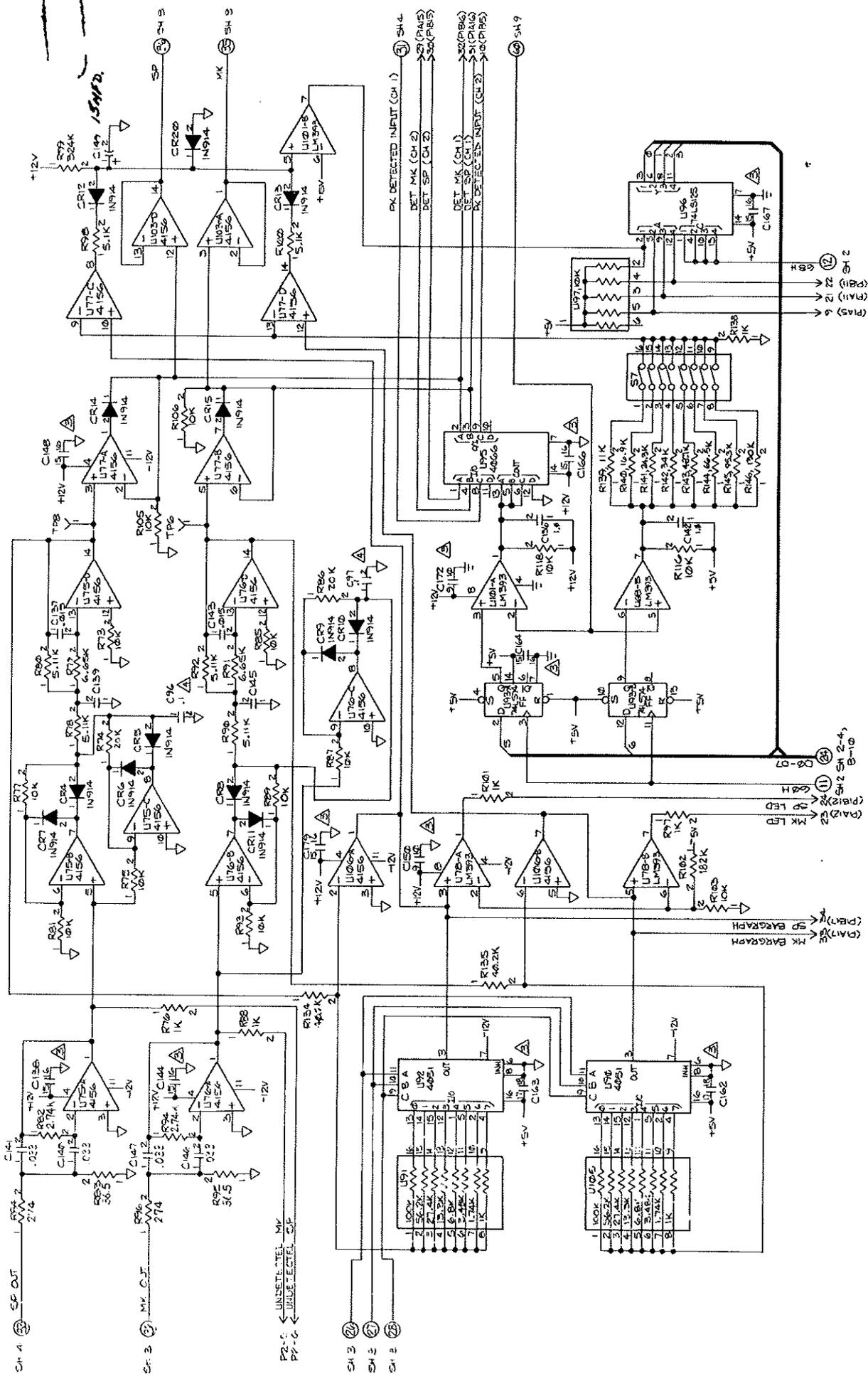


Figure 7-4. Demodulator Board Schematic, Sheet 7 D5708C

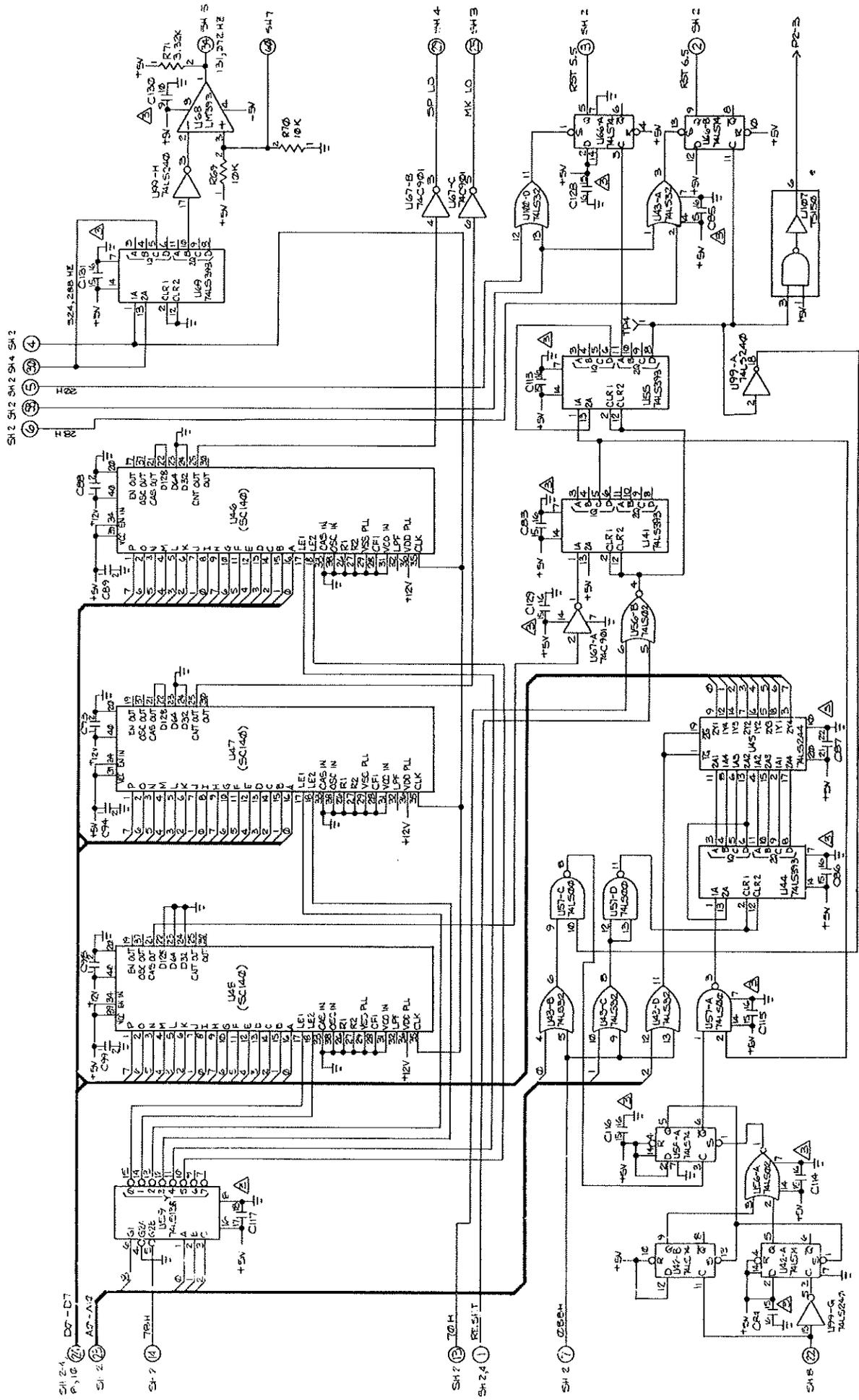


Figure 7-4. Demodulator Board Schematic, Sheet 9 D5708C

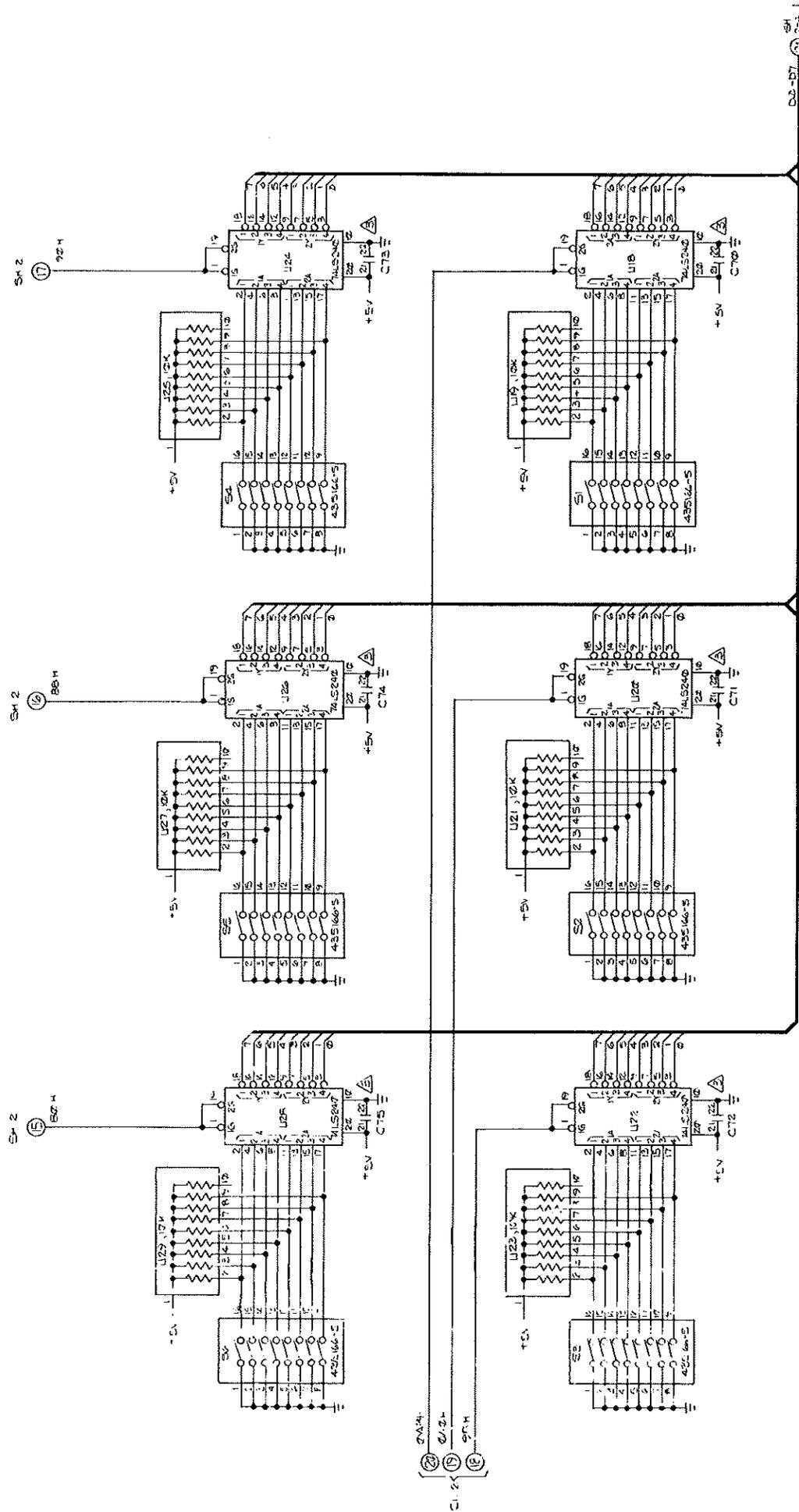
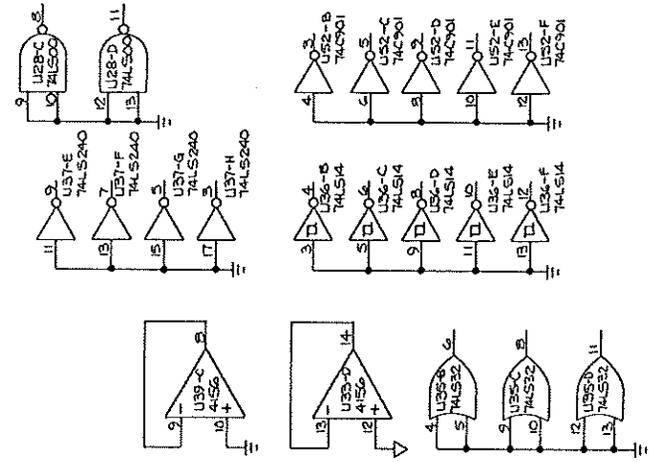
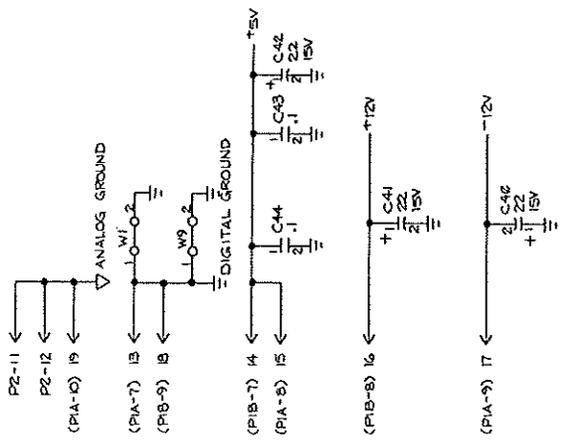


Figure 7-4. Demodulator Board Schematic, Sheet 10 D5708C

SPARES



- NOTES:
- 1) REFERENCE DOCUMENTS:
PC BOARD - NO2174
FABRICATION - D5724
ASSEMBLY - D5725
 - 2) UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/8W, 1/4 CARBON.
ALL CAPACITANCE VALUES ARE IN MICROFARADS.
ALL CAPACITORS ARE .1 VALUE.
 - 3) PIN NUMBERS ON ALL DISCRETES ARE FOR "GAD" CODING.

Figure 7-5. Modulator Board Schematic, Sheet 1 D5726C

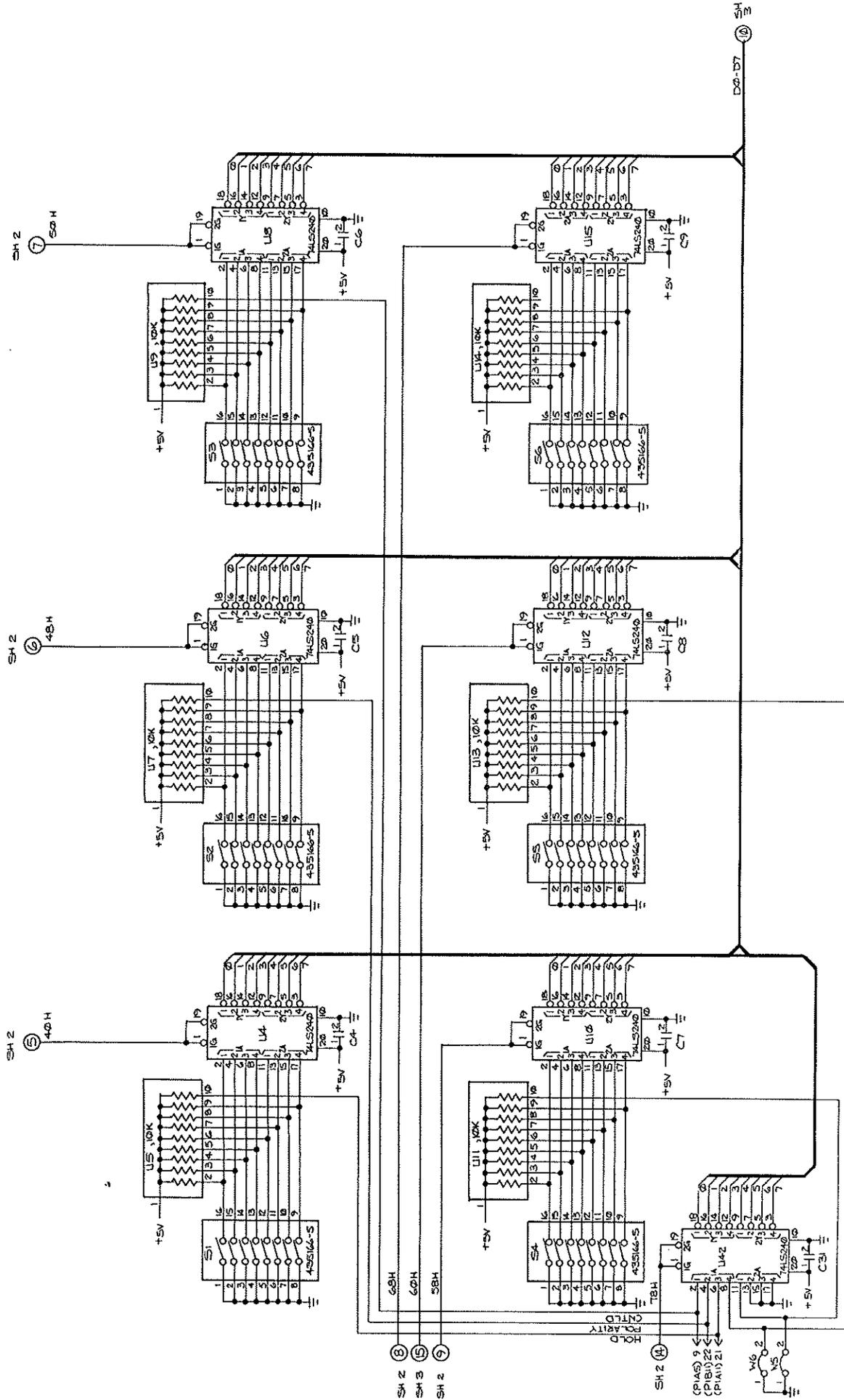


Figure 7-5. Modulator Board Schematic, Sheet 3 D5726C

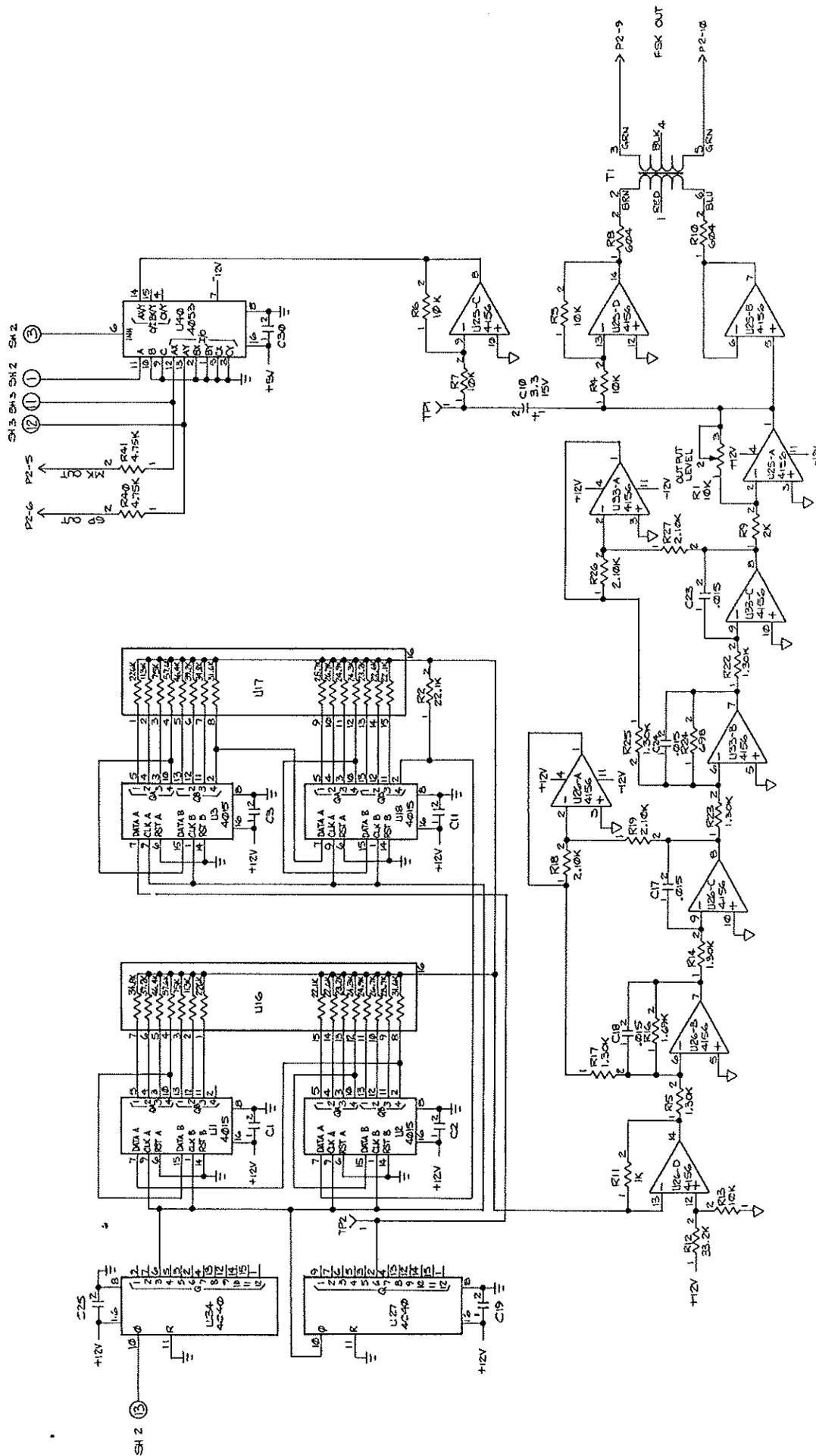


Figure 7-5. Modulator Board Schematic, Sheet 4 D5726C

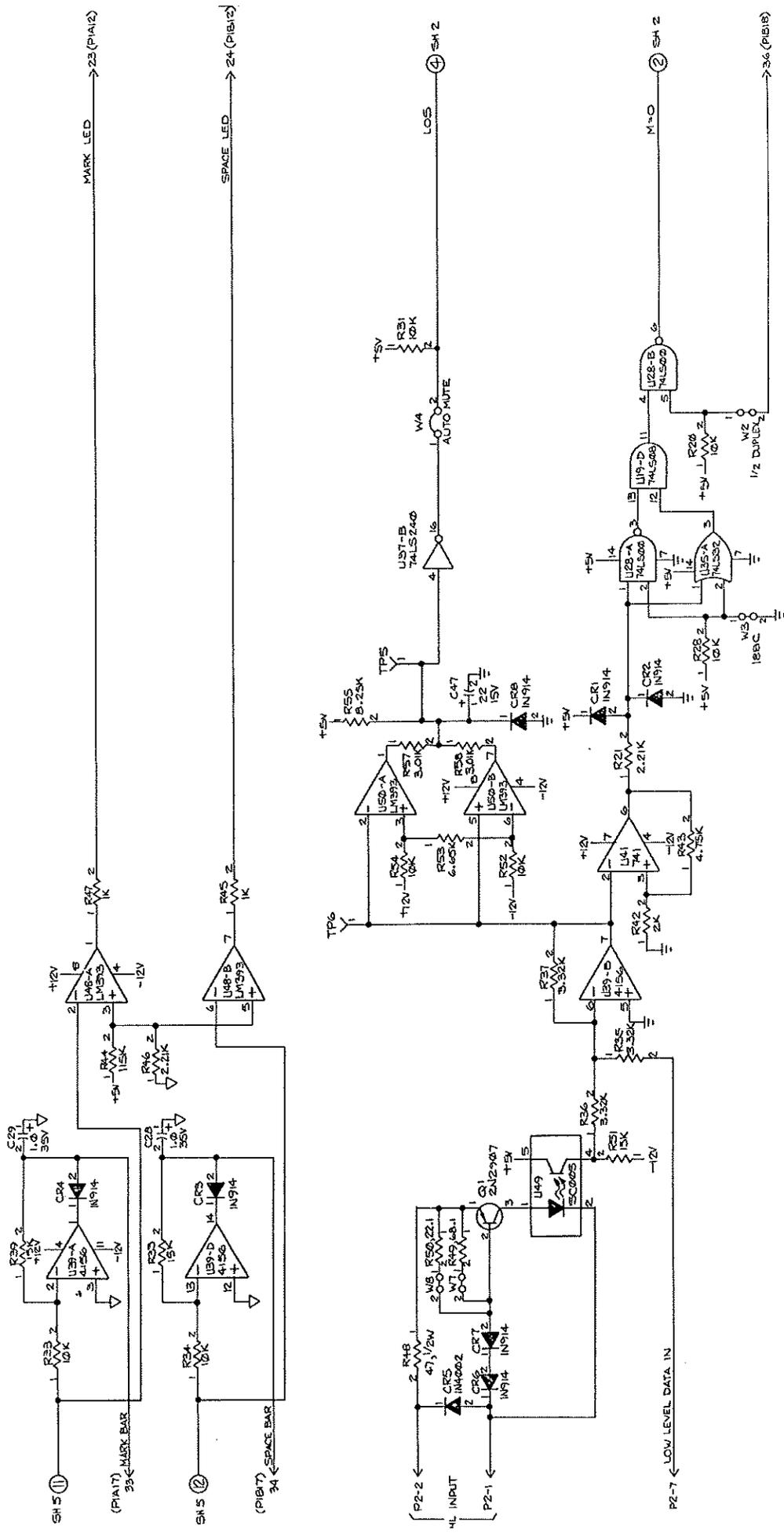
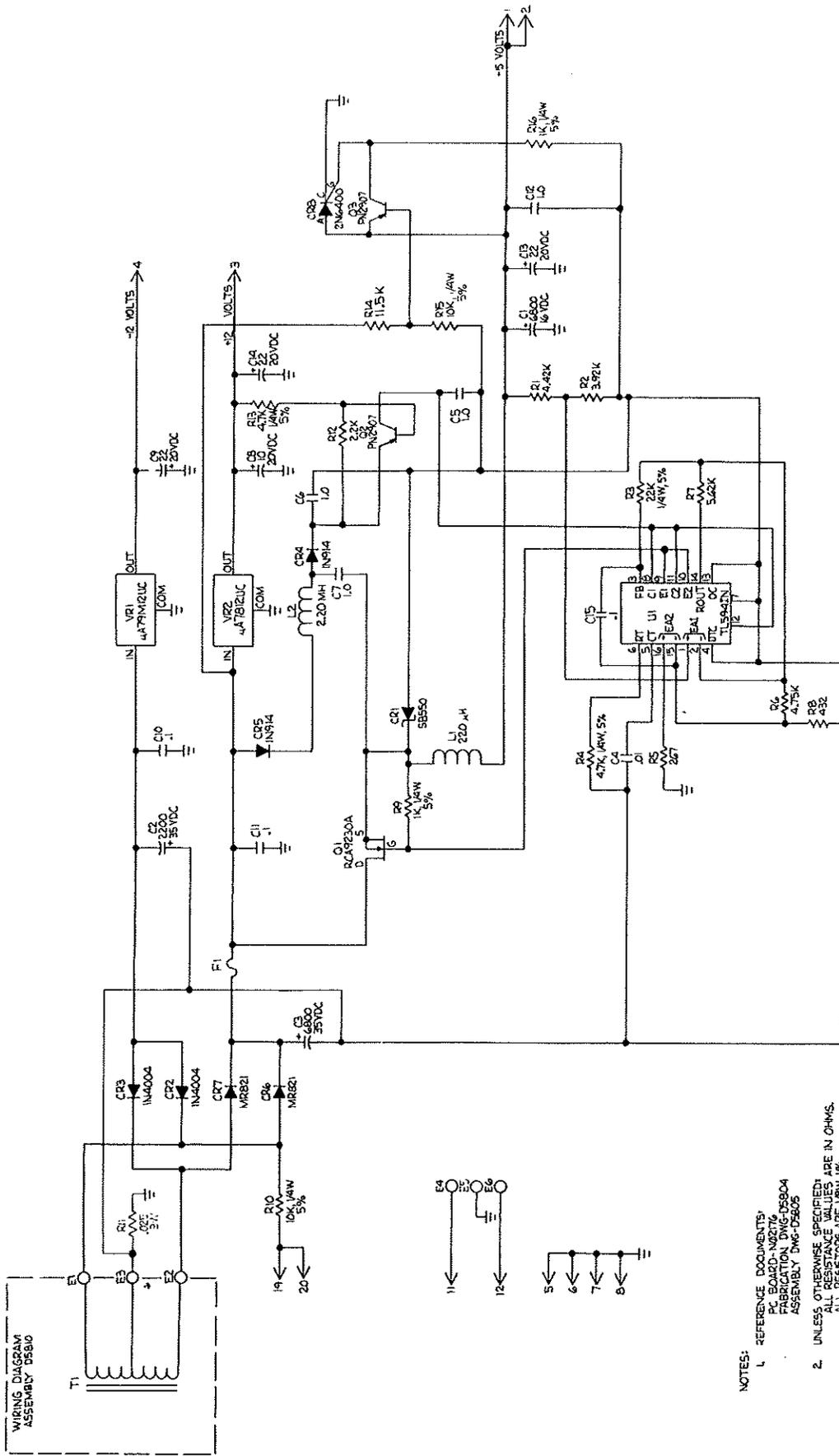
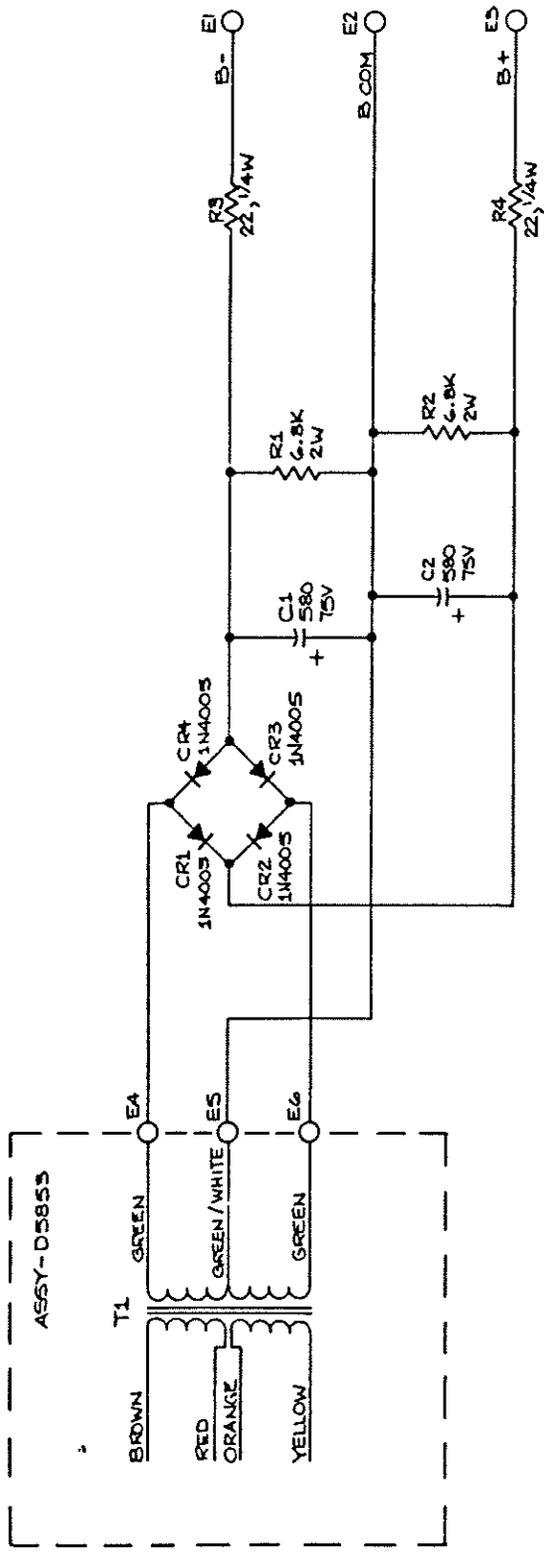


Figure 7-5. Modulator Board Schematic, Sheet 5 D5726C



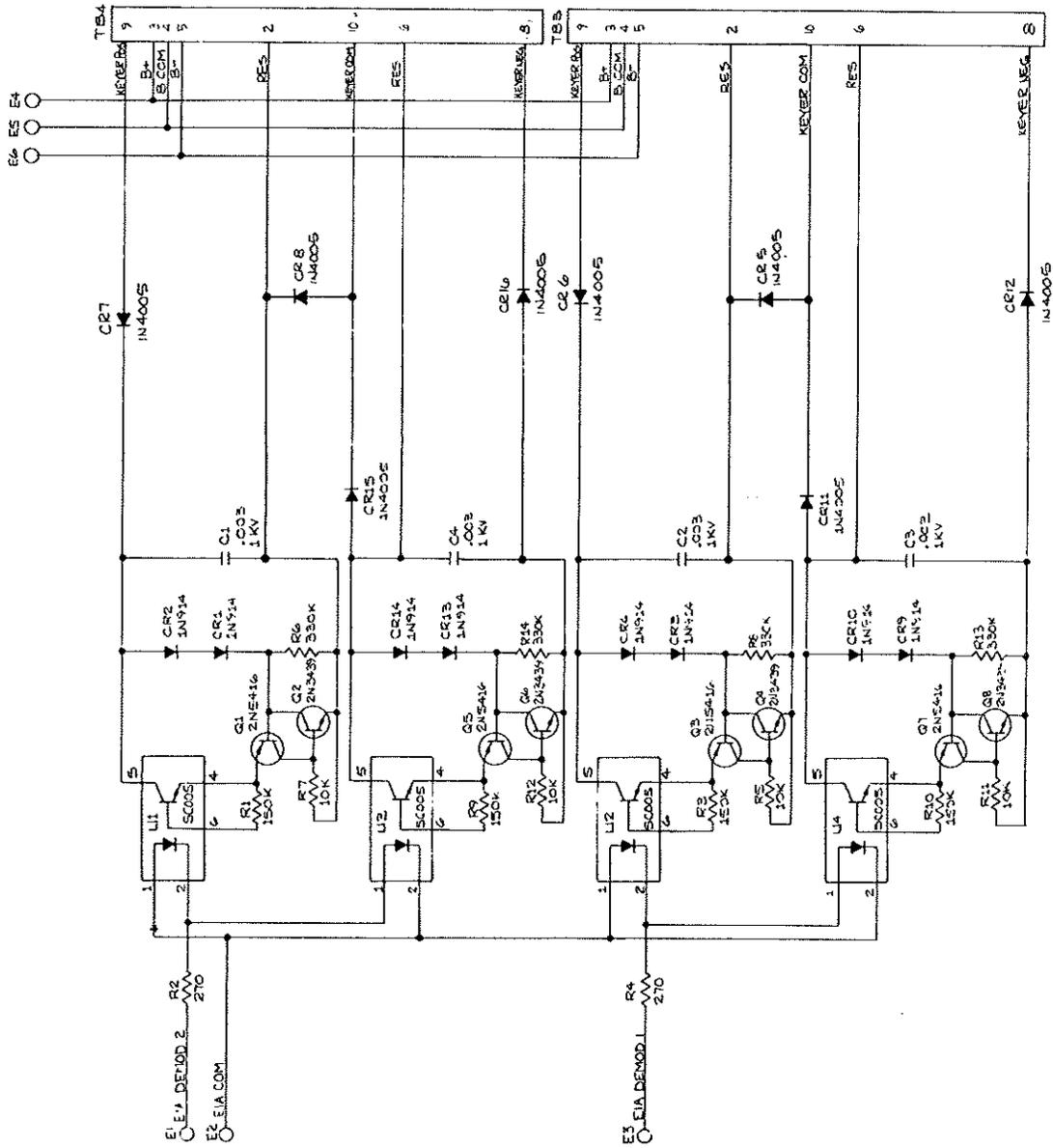
- NOTES:
1. REFERENCE DOCUMENTS:
PC BOARD: N0276
FABRICATION DWG: D5804
ASSEMBLY DWG: D5805
 2. UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
ALL RESISTORS ARE 1% UNLESS NOTED OTHERWISE.
ALL CAPACITANCE VALUES ARE MICROFARADS.

Figure 7-6. Power Supply Board Schematic D5806C



- NOTES:
1. REFERENCE DOCUMENTS:
 PC BOARD - N0220S
 SUB-ASSEMBLY DWG - D5847
 FULL ASSEMBLY DWG - D5855
 FABRICATION DWG - D5846
 2. UNLESS OTHERWISE SPECIFIED:
 ALL RESISTANCE VALUES ARE IN OHMS.
 ALL CAPACITANCE VALUES ARE IN MICROFARADS

Figure 7-7. Optional Loop Power Supply Schematic D5848A



NOTES:

1. REFER TO THE DOCUMENTS:
 DC BOARD - NO2207
 FABRICATION LOGS - D5850
 SUB-ASSEMBLY FW-05851
 FULL ASSEMBLY DWG-05852
2. UNLESS OTHERWISE SPECIFIED:
 ALL RESISTORS ARE 1/4 W. 5%.
 ALL CAPACITANCE VALUES ARE IN MICROFARADS.

Figure 7-8. Optional Quad High Level Keyer Schematic D5852B

APPENDIX A

MODEL 1280 MODEM

EMERGENCY (MANUAL) OPERATION

Should a situation arise with the Model 1280 where the Control Board or Front Panel Assembly fail and cannot be immediately repaired, the unit can be operated manually by the use of internally mounted programming switches.

To operate the unit manually the following procedures should be followed.

1. Remove power from the unit.
2. Remove the front panel and disconnect the two ribbon cables from front panel connectors J1 and J2.
3. Remove the control board from the unit.
4. Remove the modulator/demodulator cards from the unit and program the dip switches for the desired operating parameters.
5. Install the modulator/demodulator boards.
6. Install front panel and apply power to the unit.

Programming information for each internally mounted dip switch and slide position is provided in Tables A-1 and A-2. The location of the switches is illustrated in Figures A-1 and A-2.

Table A-1. Model 1280 Modulator Board Switch Controls

| ITEM | SWITCH CONTROLS | EXPLANATION |
|------|--|--|
| 1 | +.5 HZ S1-8 | +.5 HZ = ON: selects +.5 Hertz increment for mark and space frequencies. |
| 2 | FSK S1-7 S1-6 S1-5 | FSK = ON: selects FSK function for frequency shifts 200 Hertz and below. (ON = FSK, OFF = FEK) Not Used Not Used |
| 3 | Baud Rate S1-4 thru S1-1 Baud Rate S2-8 thru S2-5 | Binary coded decimal equivalent of the third (hundreds) baud rate digit read from right to left. <u>EXAMPLE:</u> Baud rate of 600, S1-4 thru 1 settings will equal a BCD-6. Set S1 4 = OFF <u>NOTE</u> 3 = ON ON = 1 OFF = 0 2 = ON 1 = OFF Binary coded decimal equivalent of the second (tens) baud rate digit read from right to left. <u>EXAMPLE:</u> Baud rate of 600, S2-8 thru 5 setting will equal a BCD-0. Set S2 8 = OFF <u>NOTE</u> 7 = OFF ON = 1 OFF = 0 6 = OFF 5 = OFF |

Table A-1. Model 1280 Modulator Board Switch Controls (cont.)

| ITEM | SWITCH CONTROLS | EXPLANATION |
|--------------|-----------------------------------|---|
| 3 (cont.) | Baud Rate S2-4 thru S2-1 | <p>Binary coded decimal equivalent of the first (ones) baud rate digit read from right to left.</p> <p><u>EXAMPLE:</u> Baud rate of 600, S2-4 thru 1 setting will equal a BCD-0.</p> <p>Set S2 4 = OFF 3 = OFF 2 = OFF 1 = OFF</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> |
| 4 | Space Frequency S3-8 thru S3-5 | <p>Binary coded decimal equivalent of the fourth (thousands) space frequency digit read from right to left.</p> <p><u>EXAMPLE:</u> Space frequency of 2425 Hertz, S3-8 thru 5 setting will equal a BCD-2.</p> <p>Set S3 8 = OFF 7 = OFF 6 = ON 5 = OFF</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> |
| | Space Frequency S3-4 thru S3-1 | <p>Binary coded decimal equivalent of the third (hundreds) space frequency digit read from right to left.</p> <p><u>EXAMPLE:</u> Space frequency of 2425 Hertz, S3-4 thru 1 setting will equal a BCD-4.</p> <p>Set S3 4 = OFF 3 = ON 2 = OFF 1 = OFF</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> |

Table A-1. Model 1280 Modulator Board Switch Controls (cont.)

| ITEM | SWITCH CONTROLS | EXPLANATION |
|--------------|---|--|
| 5 (cont.) | <p>S5-4 thru S5-1</p> <p>Mark Frequency S6-8 thru S6-5</p> <p>Mark Frequency S6-4 thru S6-1</p> | <p>Binary coded decimal equivalent of the third (hundreds) mark frequency digit read right to left.</p> <p><u>EXAMPLE:</u> Mark frequency 1575 Hertz, S5-4 thru 1 setting will equal a BCD-5.</p> <p>Set S5 4 = OFF 3 = ON 2 = OFF 1 = ON</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> <p>Binary coded decimal equivalent of the second (tens) mark frequency digit read right to left.</p> <p><u>EXAMPLE:</u> Mark frequency of 1575 Hertz, S6-8 thru 5 setting will equal a BCD-7.</p> <p>Set S6 8 = OFF 7 = ON 6 = ON 5 = ON</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> <p>Binary coded decimal equivalent of the first (ones) mark frequency digit read right to left.</p> <p><u>EXAMPLE:</u> Mark frequency of 1575 Hertz, S6-4 thru 1 setting will equal a BCD-5.</p> <p>Set S6 4 = OFF 3 = ON 2 = OFF 1 = ON</p> <p style="text-align: right;"><u>NOTE</u> ON = 1 OFF = 0</p> |
| 6 | Output Level Adjust (R1) | Adjusts output tone level from -20 to +6 dBm with a 600 ohm load. |

Table A-2. Model 1280 Demodulator Board Switch Controls

| ITEM | SWITCH CONTROLS | EXPLANATION |
|------|------------------------------------|---|
| 1 | +.5 Hz S1-8 | +.5 Hz = ON; Selects +.5 Hertz increment for mark and space frequencies. |
| 2 | SYNCH S1-7 | <p>SYNCH = ON; Synchronous Mode: regenerated data output RS-232C and MIL Standard 188C.</p> <p>SYNCH = OFF; Asynchronous Mode: demodulated data output RS-232C and MIL Standard 188C.</p> |
| 3 | DIV S1-6 | Two channel demodulator configuration only; DIV = ON Selects adjacent channel diversity operation. |
| 4 | AMH S1-5 | AMH = ON; Selects Auto Mark Hold function. |
| 5 | Baud Rate S1-4 thru 1 and S2 | Function identical to modulator rate. See Table 2-1 Item 3. |
| 6 | SPACE Frequency S3 and S4 | Function identical to modulator SPACE frequency. See Table 2-1 Item 4. |
| 7 | MARK Frequency S5 and S6 | Function identical to modulator MARK frequency. See Table 2-1 Item 5. |
| 8 | AMH Threshold S7 | Threshold value selectable between -18 dBm and -39 dBm in eight 3 dB steps. Slide 1 (-18 dB) to Slide 8 (-39 dB). |

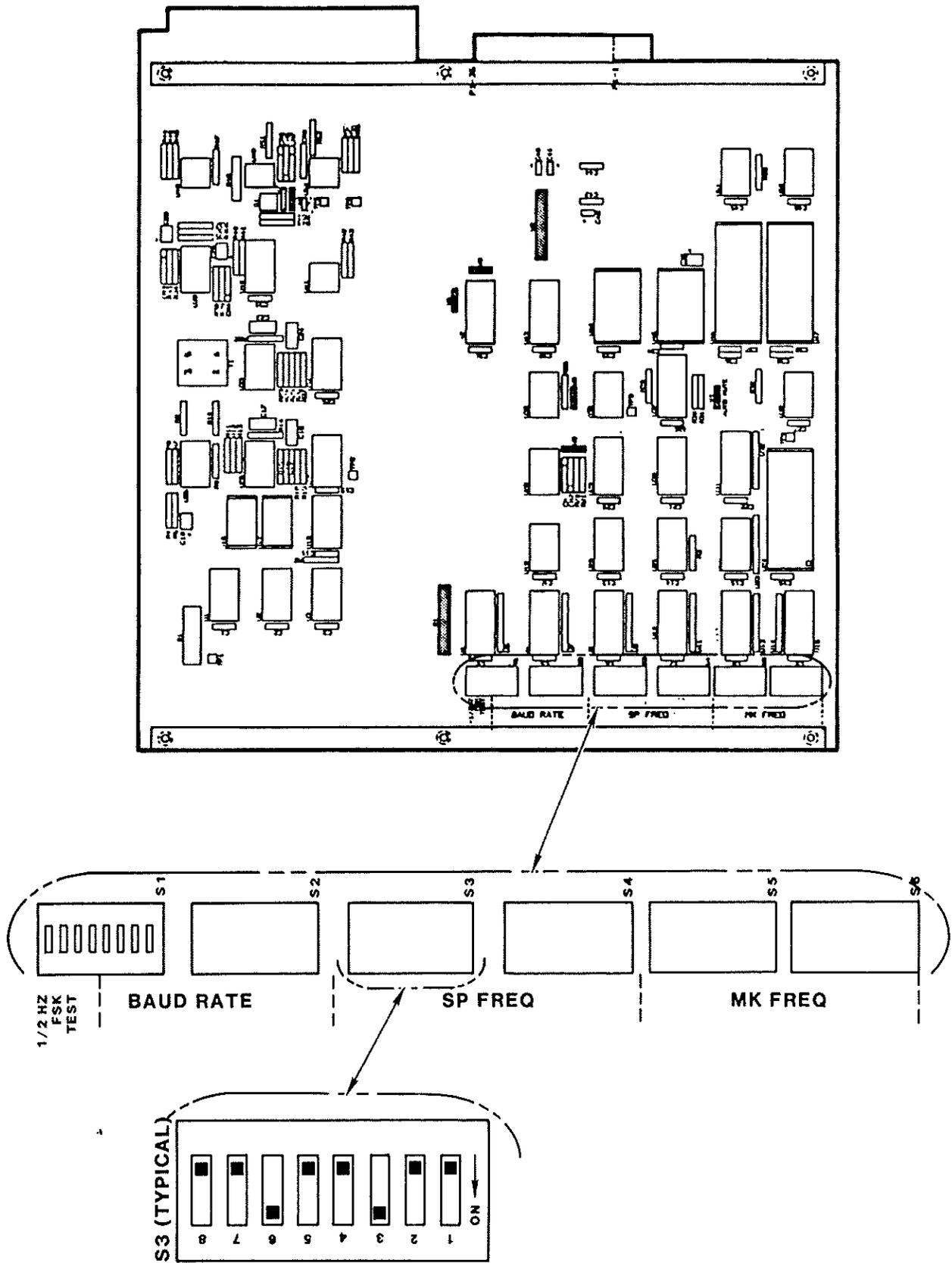


Figure A-1. Modulator Switch Locations

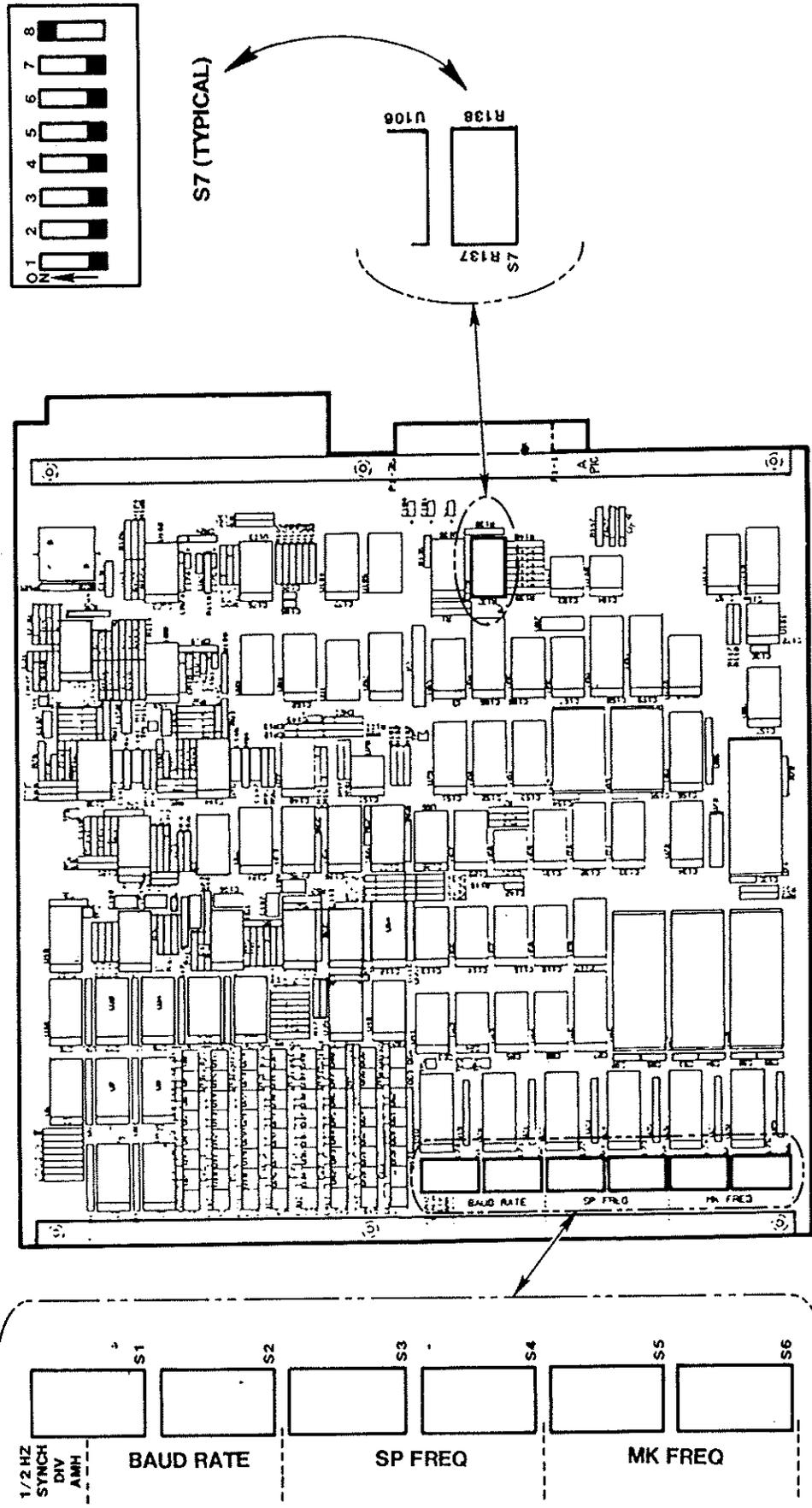


Figure A-2. Demodulator Switch Locations