

# Technical Manual

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## MAINTENANCE MANUAL FOR

### MODEL 101 MAGNETIC TAPE RECORDER / REPRODUCER PORTABLE SYSTEM

**AUGUST 1984**

#### NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

This maintenance manual consists of the following individual manuals:

<u>TITLE</u>	<u>PART NUMBER</u>
SYSTEM	16783819-001
TRANSPORT	16783820-001
CONTROL SYSTEM	16783821-001
POWER SUPPLY	16783822-001
DUAL PREAMPLIFIER	16784297-001
CALIBRATOR	16781409-001
MEASUREMENT SUBSYSTEM	16784322-001
DATA HOUSING (16 X 16)	16783823-001
DATA HOUSING (32 X 2)	16783824-001
DIRECT RECORD	16781255-001
DIRECT REPRODUCE	16781436-001
FM RECORD	16781305-001
FM REPRODUCE	16781326-001
VOICE	16809823-001
AUXILIARY HOUSING	16783828-001
SERVO REPRODUCE	16783827-001

NOTE

The above manuals cannot be ordered as individual manuals.

ADDENDUM TO  
TECHNICAL MANUAL 16785818-001AD  
MODEL 101 MAINTENANCE

This addendum adds addendum 16783823-001U to the 16 X 16 Data Housing Manual and 16783824-001U to the 32 X 2 Data Housing manual.

HONEYWELL, INC.-Test Instruments Division-P.O. Box 5227-Denver, CO  
16785818-001AE-December, 1984

ADDENDUM TO  
TECHNICAL MANUAL 16783823-001T  
MODEL 101 16 X 16 DATA HOUSING

This addendum provides coverage for the 16784205-007 Data Housing Driver CCA. If your system does not have this assembly, disregard this addendum.

The 16784205-007 Data Housing Driver CCA is the same as the 16784205-006 except as follows:

THEORY OF OPERATION

Jumper J5 has been added to control the clear line of U14. This disables the U14 internal one-shot when in the 2X IRIG position.

PARTS LIST - TABLE 6-3

C3 and C18 have been changed to 0.22 UF,  $\pm 20\%$ , 50 VDC fixed ceramic dielectric capacitors; Honeywell part number, 16771020-020.

C19 has been changed to a 39 PF,  $\pm 5\%$ , 500 VDC fixed mica dielectric capacitor; Honeywell part number, 16759780-256.

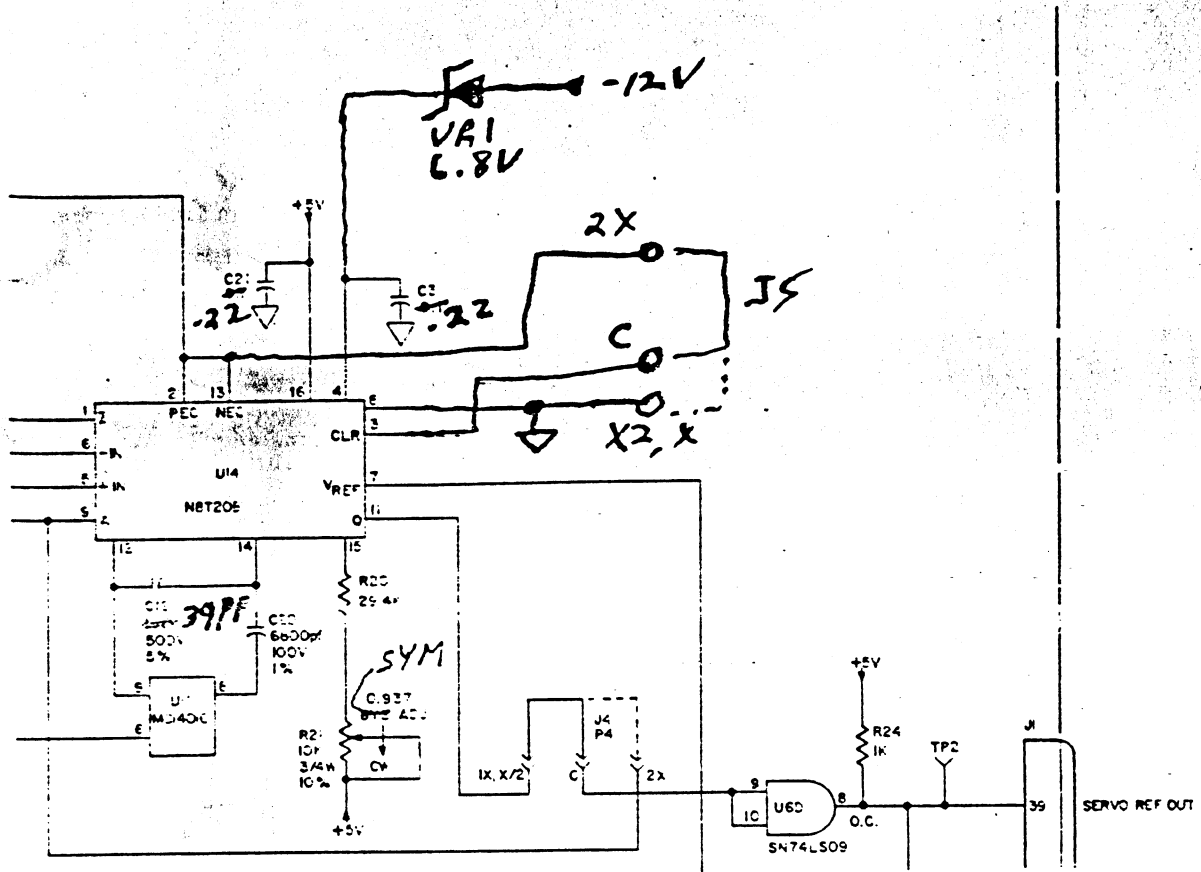
J5, Honeywell part number 16779270-001 has been added.

NOTE

NEW PART NUMBER IS INTERCHANGEABLE  
BACKWARD WITH ALL PREVIOUS PART  
NUMBERS; OLD PART NUMBERS ARE INTER-  
CHANGEABLE FORWARD WITH NEW PART NUMBER  
BUT WITH DEGRADED PERFORMANCE OR  
RELIABILITY.

SCHEMATIC - Figure 7-2, Sheet 2

Right hand side of schematic has been changed as shown in following partial schematic.



# Technical Manual

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**MAINTENANCE  
INSTRUCTIONS FOR  
DATA HOUSING (16×16)  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM**

**AUGUST 1984**

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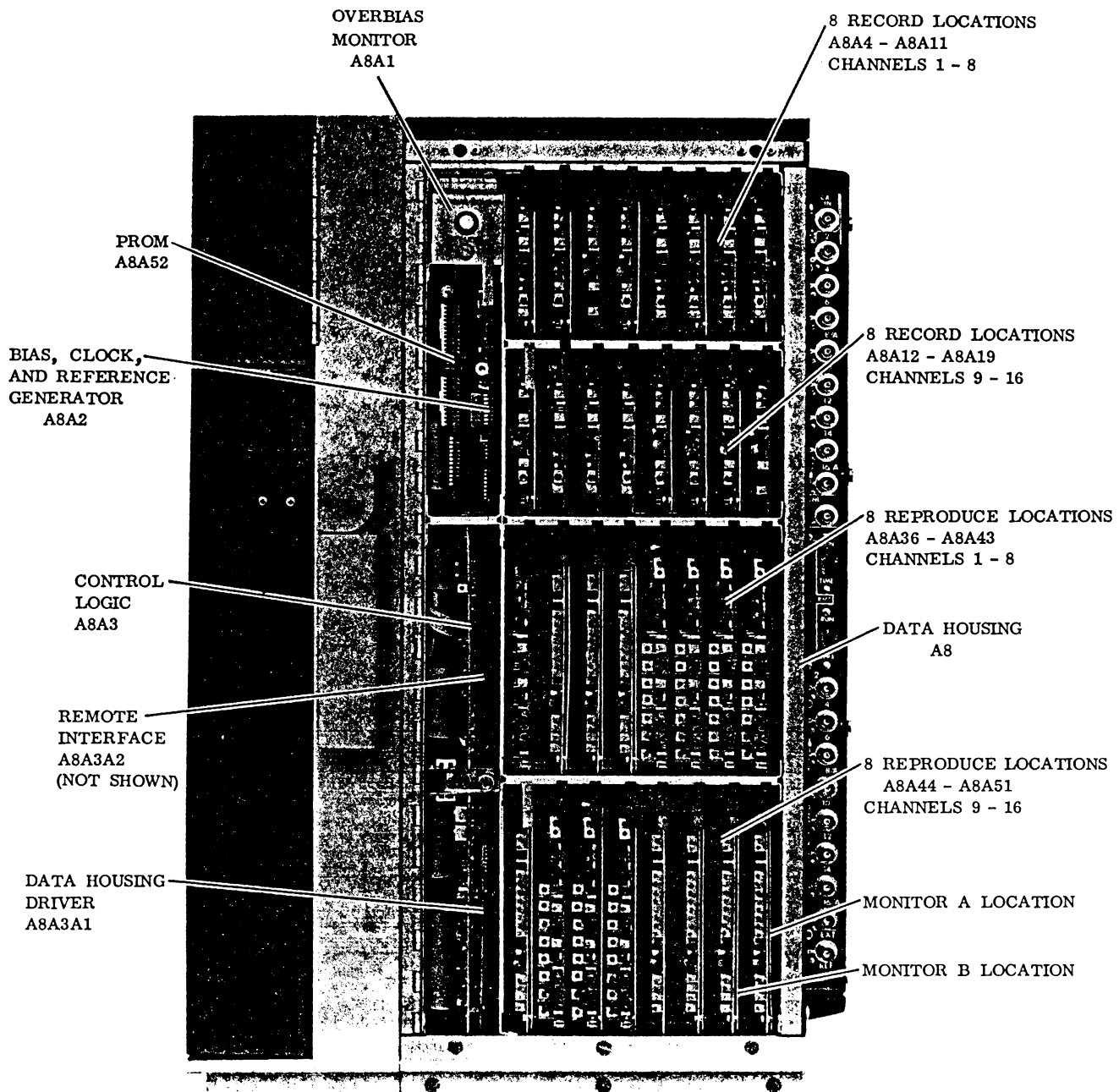


Figure 1-1. 16 x 16 Data Housing

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## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the 16 x 16 data housing, data housing driver circuit card assembly, and the preamplifier switching circuit card assembly used in the Model 101 Magnetic Tape System. This manual contains only the information that is applicable to those three assemblies. The Operator's Manual describes the interface and relationship to the rest of the Model 101 System.

#### 1-2. DESCRIPTION

The data housing occupies the entire right-hand side of the system. It houses the control logic (microcomputer and support logic); bias, clock and reference generator; PROM card (8K words of memory); overbias monitor; data housing driver, remote interface; up to 16 record cards; and up to 16 reproduce cards. (See Figure 1-1.)

The data housing driver, which is mounted on the control logic card in the data housing, interfaces the microcomputer with all the plug-in cards in the data housing. It provides adequate power to drive a full complement of data cards.

Also contained on the data housing driver is the servo reproduce interface section. This portion of the driver accepts the servo reference track from a direct reproduce card, or the optional servo reproduce card, and conditions the signal by filtering, squaring, and, when required, doubling the frequency. The output is presented to the control logic for use when servoing from a reference track prerecorded on the tape.

The preamplifier switching card is located in the top left rear section of the recorder. Its function is to provide solid-state differential switching of any preamplifier output to a common pair of output lines. These output lines can be switch-selected to any channel, rather than the normal channel 15 and 16 preamplifier outputs. This allows the channel 15 and 16 reproduce cards in the data housing to be used as monitor reproduce cards as selected by the channel selector. Five digital control lines provide switching capabilities for up to 16 channels.

#### 1-3. SPECIFICATIONS

##### A. DATA HOUSING

##### 1. Card Complement

- a. Record Cards: Up to a maximum of 16.

- b. Reproduce Cards: Up to a maximum of 16.
- c. Miscellaneous Cards: 1 Control Logic, 1 PROM, 1 Bias, Clock and Reference Generator, and 1 Overbias Monitor.

2. Input/Output Connectors

- a. Signal Input BNC's: 16 Record (one for each slot). 1 Calibration, 1 External Reference, and 1 auxiliary input (Ch 16 Reproduce).
- b. Signal Output BNC's: 16 Reproduce (one for each slot), 1 Monitor, and 1 Microphone.
- c. Miscellaneous Connectors: 1 Microphone input telephone jack, 1 50-pin ribbon connector for remote, and 1 34-pin ribbon connector for auxiliary MPU bus output.

3. Run Time Meters

Two run-time meters indicate the total elapsed time that the instrument has been operated in either the FWD or REV mode (not in the FAST mode). One meter is calibrated to 1,000 hours and the other to 3,000 hours. They are used for magnetic head warranty purposes.

4. Channel Read/Write CMD Decoder

Five control lines are decoded to provide 16 individual lines used to set up the individual record cards. The five control input lines are coded as shown in Table 1-1. (Note that control line 16 is not used by the data housing decoder.) The decoder is strobed by the channel Read/Write strobe. All control signals are TTL compatible and the decoded channels is a logic zero when the strobe is a logic zero.

5. Channel Select CMD Decoder

Five control lines are decoded to provide 16 individual lines, only 14 of which are used to select the individual reproduce channel in the channel select mode. Tracks 15 and 16 are selected by separate lines from the control system. The five control lines are coded as shown in Table 1-1. (Note that control line 16 is not used by the data housing decoder.) The decoder is strobed by the Monitor CMD. All control signals are TTL compatible and the decoded channel is a logic zero when the Monitor CMD is a logic zero.

Table 1-1. Control Line-to-Channel Code

CHANNEL NUMBER	CONTROL LINE					
	$\overline{16}$	16	8	4	2	1
1	1	0	0	0	0	0
2	1	0	0	0	0	1
3	1	0	0	0	1	0
4	1	0	0	0	1	1
5	1	0	0	1	0	0
6	1	0	0	1	0	1
7	1	0	0	1	1	0
8	1	0	0	1	1	1
9	1	0	1	0	0	0
10	1	0	1	0	0	1
11	1	0	1	0	1	0
12	1	0	1	0	1	1
13	1	0	1	1	0	0
14	1	0	1	1	0	1
15	1	0	1	1	1	0
16	1	0	1	1	1	1

6. E-E Signal Bus

The record frequency bus on record channels 1 through 8 is gated with the same bus on record channels 9 through 16 when the E-E Cal CMD is a logic one. The record frequency bus is connected to the E-E Signal Bus on each reproduce card and to the meter monitor. Signals are TTL compatible with a maximum frequency of 1.2 MHz and are capable of driving more than 16 FM reproduce cards.

7. CAL IN Clamp

Diode clamping is used to limit the CAL input signal to  $\pm 12$  volts. Maximum allowable input  $\pm 15$  volts.

8. DC Power

The data housing distributes power supply voltages of  $\pm 16$  volts,  $\pm 12$  volts, and +5 volts.

B. MPU BUFFER SECTION OF DATA HOUSING DRIVER

1. Power Supply Voltages

+5 Vdc (+5%) @ 205 mA, typical.

2. Logic Level Inputs

Certain logic lines may serve as inputs only. Certain other logic lines are bidirectional and may serve, under microprocessor control, as either inputs or outputs. In all cases, the logic levels (voltage) of all logic lines are TTL compatible.

- a. Logic Lines: The designation of each logic input line and bidirectional line is as follows:

INPUT LINE DESIGNATION	BIDIRECTIONAL LINE DESIGNATION
A <sub>0</sub>	D <sub>0</sub>
A <sub>1</sub>	D <sub>1</sub>
$\overline{\text{RESET}}$	D <sub>2</sub>
E	D <sub>3</sub>
R/ $\overline{\text{W}}$	D <sub>4</sub>
A <sub>15</sub>	D <sub>5</sub>
PIA ENABLE	D <sub>6</sub>
A <sub>6</sub>	D <sub>7</sub>
A <sub>5</sub>	
A <sub>4</sub>	
GROUND	

- b. PIA Addressing: The addressing requirements for the PIA's are summarized as follows:

ADDRESS	A <sub>15</sub>	A <sub>6</sub>	A <sub>5</sub>	A <sub>4</sub>	PE	A <sub>1</sub>	A <sub>0</sub>	PIA
0440 <sub>16</sub>	0	1	0	0	1	0	0	U2
0441 <sub>16</sub>	0	1	0	0	1	0	1	
0442 <sub>16</sub>	0	1	0	0	1	1	0	
0443 <sub>16</sub>	0	1	0	0	1	1	1	
0450 <sub>16</sub>	0	1	0	1	1	0	0	U3
0451 <sub>16</sub>	0	1	0	1	1	0	1	
0452 <sub>16</sub>	0	1	0	1	1	0	1	
0453 <sub>16</sub>	0	1	0	1	1	1	1	

3. Logic Conditions Data Housing Interface

- a. Channel Read/Write Commands: These six control lines are the binary coded signals 1, 2, 4, 8, 16, and  $\overline{16}$  which are decoded into 16 separate lines. The code shown in Table 1-1 is provided where zero is the low-level output and one is the high-level output. Each of the six lines drives a maximum of four low-power Schottky loads.
- b. Data Housing Type: This signal is an input to the PIA, zero volts (ground) indicates that the data housing is 16 x 16 maximum. +5 volts indicates that the data housing is 32 x 2.
- c. Read/Write Command: This signal is used to change the quad bus driver/receiver U4 from the receiver mode to the driver mode. Maximum loading 64 low-power Schottky TTL loads. Read is logic zero, write is logic one.
- d. Bidirectional Buses: Variable Cal Command, Normalized Cal Command, Channel Select Command, and Record Command.

The four bus lines are the ones referred to above. In the read mode, the control system recognizes, and stores for display on the channel selector, the following codes.

VAR CAL BUS	NORM CAL BUS	CHAN SEL BUS	REC CMD BUS	RECORD DATA CARD TYPE
1	1	1	1	No card or off
1	0	1	1	MBFM cal option
1	1	0	1	WMFM cal option
0	0	1	1	MB direct cal option
0	1	0	1	WB direct cal option
1	1	1	0	Voice or special
1	0	1	0	MBFM, no cal option
1	1	0	0	WBFM, no cal option
0	0	1	0	MB direct, no cal option
0	1	0	0	WB direct, no cal option

In the write mode, the four bus lines are used as control inputs to the record cards. Maximum loading on each bus line 32 low-power Schottky TTL loads. Logic zero to command the function, logic one to disable the function.

Variable Cal and Normalized Cal are a logic zero when commanded by the control panel and calibrator. Channel select command is a logic zero when selected by the channel selector. The record command is a logic zero when commanded by the record button on the control panel.

- e. E-E Cal Command: A logic zero level indicates that the E-E Cal is off. A logic one indicates E-E Cal is on. Maximum loading one Schottky TTL load.
- f. Run Time: A logic zero level indicates that the tape transport is running in either drive forward or drive reverse only (not fast). A logic one level indicates all other conditions, including tape break. Maximum loading less than 100 microamps.
- g. Channel Read/Write Strobe: This signal is used to strobe the data housing decoders. Two isolated negative-going pulses, synchronized with the read/write command, are required for each channel. The first pulse commands the reading of the record data card type, and the second pulse strobes the four control commands into four latches on each record card. Maximum loading four low-power Schottky TTL loads.
- h. Monitor Command: A logic zero (ground) indicates that the system is to use monitor cards via the switched preamplifiers. A logic one (open circuit) indicates preamplifier monitoring is not required.
- i. Monitor Command: This output signal is the inverted monitor command. Logic zero indicates monitoring via reproduce cards, and logic one indicates monitoring via the preamplifier switching unit. Maximum loading two low-power Schottky TTL loads.
- j. Channel Select Commands: These six control lines are similar to the channel read/write commands except that these signals are not cycled at a predetermined rate. They are incremented or decremented by the channel select pushbuttons on the meter monitor. The output code is detailed in Table 1-1. Output loading two low-power Schottky TTL loads.
- k. Reproduce Ident 1, 2, and 4: These three bus line inputs indicate, to the MPU, the type of reproduce card in the particular channel selected by the channel selector if the monitor command is a logic one. The code is as follows:



PIN NUMBER			REPRODUCE DATA CARD TYPE
29	31	30	
1	1	1	No card
1	0	1	MB FM
1	1	0	WB FM
0	0	1	MB direct
0	1	0	WB direct
0	0	0	Servo, voice, or special

- l. Monitor A and Monitor B Commands: A logic zero indicates selection of one of these two lines. Maximum loading two TTL loads.
- m. Calibrate Command: A logic zero indicates that the system is operating in any calibrate mode. A logic one indicates any of the operating or non-operating modes. Maximum 16 low-power Schottky TTL loads.
- n. Squelch Command Bus: A squelch signal level (logic one) is provided at all times except when the capstan is operating in phase lock. Then a logic zero is provided.
- o. Bias Oscillator Record Signal Command: A logic zero indicates that the system is operating in the record mode. A logic one indicates any other operating or non-operating modes. When the MPU switches from the record mode to any other mode, this line is delayed by 25 milliseconds (minimum) before switching from a logic one to a logic zero. Maximum eight low-power Schottky TTL loads.
- p. FWD/REV Bus: This signal is a logic one in any forward or standby mode, and a logic zero in any reverse mode. Maximum loading 15 low-power Schottky TTL loads.
- q. Reproduce Speed Buses 1, 2, and 4: The selected speed is coded on three lines as follows:

4	2	1	TAPE SPEED IPS
1	1	1	120
1	1	0	60
1	0	1	30
1	0	0	15
0	1	1	7.5
0	1	0	3.75
0	0	1	1.87
0	0	0	.937

Maximum loading 36 low-power Schottky TTL loads.

r. Power Failure Command: This is an input from the control panel dc power logic and indicates to the control system whether or not all dc power voltages are present. Logic one indicates power failure, logic zero indicates power ok.

C. SERVO REPRODUCE INTERFACE SECTION OF DATA HOUSING DRIVER

1. Power Supply Voltages

- a. +12 Vdc ( $\pm 5\%$ ).
- b. -12 Vdc ( $\pm 5\%$ ).
- c. +5 Vdc ( $\pm 5\%$ ).

2. Servo Reference Signal Input

- a. 1 volt peak-to-peak minimum.
- b. 5 volts peak-to-peak maximum.

3. Servo Reference Signal Output

TTL Compatible, will drive one TTL load.

4. Card Programming

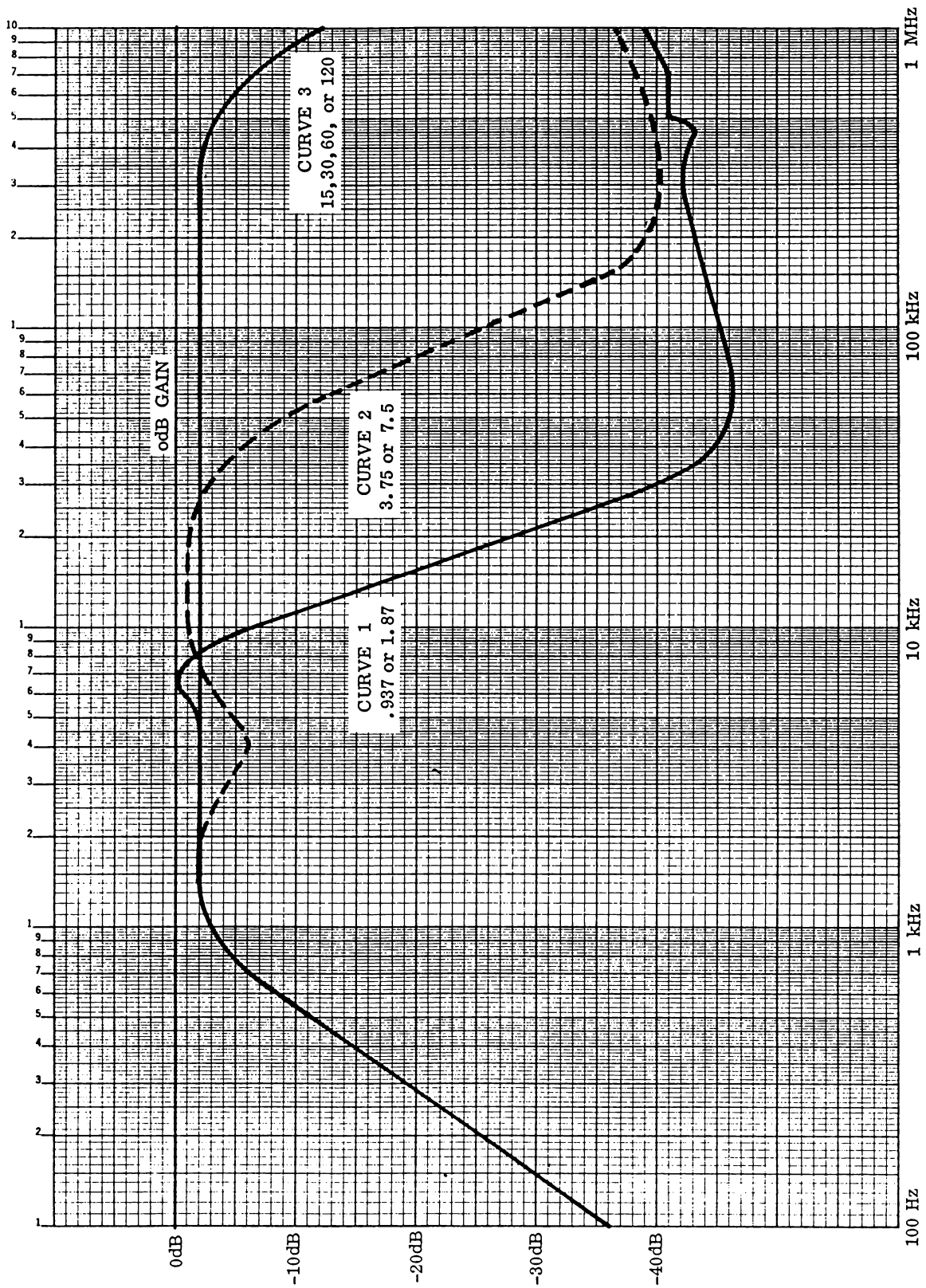
IRIG standard jumper

- a. C-2X is 2X IRIG.
- b. C-1X, X/2 is 1X IRIG or X/2 IRIG. (X/2 use requires the optional servo reproduce card.)

5. Signal Processing

Input Filtering (see Figure 1-2).

- a. .937 or 1.87 IPS is Curve 1 ( $\pm 4$  dB).
- b. 3.75 or 7.5 IPS is Curve 2 ( $\pm 4$  dB).
- c. 15, 30, 60, 120 IPS is Curve 3 ( $\pm 4$  dB).



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Figure 1-2. Input Filtering Response

6. Dropout Detector Stage

- a. Dropout Level: 0.160 ( $\pm 0.050$ ) Vrms.
- b. Hysteresis: 0.060 ( $\pm 0.040$ ) Vrms.
- c. A signal level below the dropout level clamps TP2 to a logic zero. A signal level above the dropout level plus the hysteresis allows normal operation at TP2.

7. Comparator and One-Shot Stage

- a. The TTL signal at U14 pin 9 is a logic one for a positive signal at TP3, and a logic zero for a negative signal at TP3.
- b. Hysteresis: 0.100 ( $\pm 0.040$ )V peak-to-peak.
- c. A TTL one pulse is generated at U14 pin 11 for each zero crossing of the signal at TP3. The pulse width is 100 nSec to 1.0 uSec for 1.87 IPS through 120 IPS operation. The pulse width is adjustable to 160 uSec (with R21) for .937 IPS operation.

8. Squelch

- a. When squelch is a logic one, the output signal is a logic zero.
- b. When squelch is a logic zero, the output operates normally.

D. PREAMPLIFIER SWITCHING

1. Power Supply Voltages

- a. +12 Vdc ( $\pm 0.2\%$ ) @ 23 mA, typical.
- b. -12 Vdc ( $\pm 0.2\%$ ) @ 23 mA, typical.
- c. -5 Vdc ( $\pm 5\%$ ) @ 10 mA, typical.

2. Signal Inputs

- a. Type: Differential.
- b. Voltage:  $\pm 1.5$ V peak ac typical,  $\pm 5.0$  peak ac maximum.
- c. Frequency: 100 Hz to 2 MHz.
- d. DC Offset: +0.6 to +1.5 Vdc common mode, +0.25 Vdc differential.

3. Source Impedance

100 ohms maximum.

4. Signal Output

a. Type: Differential.

b. Gain: X1.

c. Load Impedance: 2,500 ohms minimum, 200 pF maximum.

5. Control Inputs

Five control lines at TTL logic levels determine the channel selected according to the code in Table 1-1. The  $\overline{16}$  line is not used by the preamplifier switching.

E. ENVIRONMENT

Unless otherwise specified, the performance characteristics shall be obtained under any combination of the following environmental conditions.

Ambient Temperature	0°C to 70°C
Relative Humidity	5 to 95% non-condensing
Altitude	0 to 15,000 feet

SECTION 2  
INSTALLATION

2-1. DATA HOUSING

The data housing is hinge-mounted to the main vertical bulkhead with four mounting screws.

To remove the data housing, the rear cover and side panel must be removed first. Remove the bottom trim (three screws); then remove the four mounting screws that fasten through the center partition into the distribution board. These screws are located between the two rows of BNC connectors. Before removing the hinge screws, unplug the record head connector, the two connectors to J3 and J4 on the preamplifier switching, and the connector to J8 on the  $\pm 12V$  regulator/distribution.

**CAUTION**

System power must be turned off when installing or removing the data housing.

2-2. DATA HOUSING DRIVER

The data housing driver mounts on the lower half of the control logic. The rear of the data housing driver mounts to the rear of the control logic. A mylar insulator is required between the two units. Four screws attach the driver to standoffs on the rear of the control logic.

**CAUTION**

System power must be turned off when installing or removing the data housing driver.

Care must be taken to position the six-pin power connection properly when installing the driver.

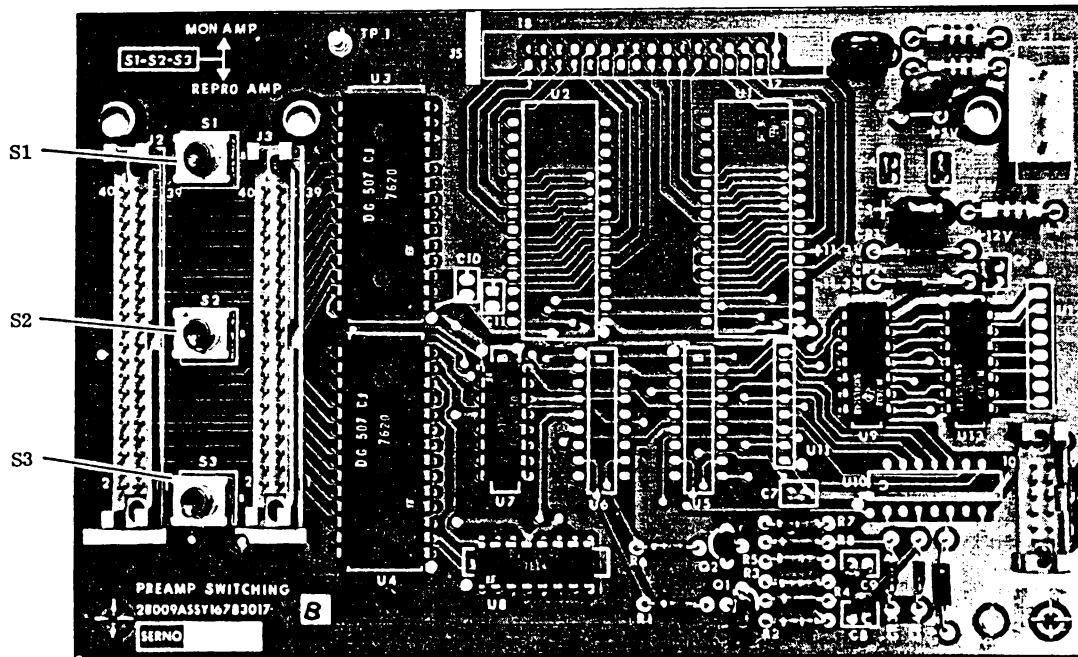
2-3. PREAMPLIFIER SWITCHING

The preamplifier switching circuit card assembly (CCA) mounts vertically in the top, rear of the Model 101 above the fans. The CCA is held in place with three

screws. Remove the top panel for access. Verify that the switches S1, S2, and S3 are positioned correctly. All three must be up or down. (See Figure 2-1.)

**CAUTION**

System power must be turned off when the preamplifier switching CCA is being installed or removed.



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Figure 2-1. Preamplifier Switching Circuit Card Assembly

## SECTION 3

### OPERATION

Operating procedures are not required for the data housing, data housing driver, or the preamplifier switching card. Refer to the Operator's Manual for general operating instructions.



## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the data housing, data housing driver, and the preamplifier switching card. Refer to Section 7 for the schematics.

#### 4-2. FUNCTIONAL DESCRIPTION

##### A. DATA HOUSING

The data housing assembly houses all the control and data electronics for the Model 101 tape system. All the data input/output connectors are mounted on the distribution printed wiring board. Additionally the remote connector, MPU bus output connector, and miscellaneous system input/outputs (such as voice) are mounted on this board. Two elapsed time indicators are used to indicate time that the system has been operating in either the drive forward or reverse modes.

##### B. DATA HOUSING DRIVER

###### 1. MPU Buffer Section

The interface between the microcomputer and the data housing is contained on the data housing driver. The data flow into and out of the data housing driver occurs through two (U2 and U3) peripheral interface adapter (PIA) circuits. Each PIA is connected to the microprocessor bus through the  $D_0$  through  $D_7$  bidirectional data lines and the  $\overline{\text{RESET}}$ ,  $R/\overline{W}$ , E, and PE unidirectional control lines.

To write into a PIA, it is first addressed by generating the proper address on the  $A_0$ ,  $A_1$ ,  $A_4$ ,  $A_5$ ,  $A_6$ , and  $A_{15}$  lines. U1 partially decodes the address lines to U2 and U3. In addition,  $\overline{\text{RESET}}$  and PE lines are made equal to a logical one. The  $R/\overline{W}$  signal determines if the information on the eight data lines will be stored in one of several registers within the PIA, or transferred out of the PIA onto the data bus.  $R/\overline{W}$  equal to zero transfers data from the PIA onto the data bus. Data transfer in either direction occurs when the E line is brought to a logical one state.

Once addressed, the MPU may program each of the 16 PIA output ports, plus the CA2 and CB2 ports, to be inputs or outputs. Because each PIA is capable of driving only one TTL load, buffers are required to drive a full complement of data cards. Four of the data lines provide bidirectional communication and are buffered by a tri-state quad bus driver/receiver on U4 (8T26). Nineteen lines are programmed as outputs and are buffered by U5, U7, U8, U9, and part of U15. Seven lines only drive four low-power Schottky TTL loads and are not buffered. Five lines are programmed as inputs and are not buffered.

## 2. Servo Reproduce Interface Section

This section contains the filters, pulse shaper, pulse doubler, and dropout detector that allow the MD101 to servo from a prerecorded reference track on the tape.

### C. PREAMPLIFIER SWITCHING

The preamplifier switching is accomplished with differential solid-state switches U3, U4, U7, and U8. Five digital lines control the switching.

With switches S1, S2, and S3 set to REPRO AMP, signals from preamplifier channels 1 through 16 enter via connector J2, and exit via connector J3 to the corresponding reproduce amplifiers in the data housing. With switches S1, S2, and S3 set to MON AMP, channels 1 through 14 operate as previously stated. The control lines select the output from one preamplifier and route it to channels 15 and 16 via connector J3.

## 4-3. CIRCUIT DESCRIPTION

### A. DATA HOUSING (Figure 7-1)

The record input and reproduce output BNC connectors route directly to the individual data cards. The CAL IN BNC is connected through a limiting resistor and two clamping diodes to prevent overdriving the CAL input on the calibrator, or the CAL input on the record cards. If no calibrator is installed in the system, then switch S1 is installed between the CAL IN and MON OUT. This switch directs the calibrate signal onto either the variable calibrate bus or the two normalized calibrate buses. When the calibrator is installed, this switching is done automatically under microcomputer control.

There are two separate decoders in the 16 x 16 data housing; U1 and U2 for the record cards, and U3 and U4 for the reproduce cards. Both operate the same. Two (74LS138) 3-to-8 line decoders are connected together to provide a 5-to-6 line decoder.

On the record side, the channel read/write strobe is used to cycle each one of the 16 outputs. This action provides two negative-going pulses, in sequence, to each of the 16 record cards. The first pulse is used by the record card to read out, from the four bidirectional buses, the type of record card. (See Table 4-1 for record card code.) After reading the record card type, the second pulse is used to write command status information into the four latches on the record card control inputs. The four status commands are record, channel select, variable, or normalized calibrate input. This reading and writing is cycled through each of the 16 record cards by the microcomputer.

On the reproduce side, operation is similar except that the  $\overline{\text{Monitor CMD}}$  is used to strobe the decoder. Thus when monitoring from the reproduce cards the decoder inputs are from the channel selector. The channel displayed on the front panel is decoded by U3 and U4, and the channel select input on the corresponding reproduce channel is selected (logic zero). Reproduce channels 15 and 16 are not connected to

Table 4-1. Record Card Type Code

PIN NUMBER				RECORD DATA CARD TYPE
12	19	9	10	
1	1	1	1	No card or off
1	0	1	1	MBFM cal option
1	1	0	1	WBFM cal option
0	0	1	1	MB direct cal option
0	1	0	1	WB direct cal option
1	1	1	0	Voice or special
1	0	1	0	MBFM no cal option
1	1	0	0	WBFM no cal option
0	0	1	0	MB direct no cal option
0	1	0	0	WB direct no cal option

the decoder outputs corresponding to channels 15 and 16; but are connected to two PIA output ports on the data housing driver, Mon A and Mon B. When monitoring from reproduce cards is required, the Monitor CMD is a logic zero and the two PIA outputs are programmed as channels 16 and 15, respectively. When monitoring via the preamplifier switching is required, the Monitor CMD is a logic one and the decoder is disabled. The two PIA outputs, Mon A and Mon B, are then programmed to match the reproduce card type to the record card in the record mode, or selected by the MON-SEL switch on the channel selector in the reproduce mode. (See Table 4-2 for the reproduce card type code.

Table 4-2. Reproduce Card Type Code

PIN NUMBER			REPRODUCE DATA CARD TYPE
29	31	30	
1	1	1	No card
1	0	1	MB FM
1	1	0	WB FM
0	0	1	MB direct
0	1	0	WB direct
0	0	0	Servo, Voice, or Special

The rest of the data housing distribution consists of all the interfacing and bus runs between various parts of the MDCM. Gates U5 are used to buffer the record frequency bus from FM record cards and isolate this bus from the reproduce port of the housing. If an FM record card is selected by the channel selector, the FM carrier is applied to the record frequency bus pin 15A. Channels 1 through 8 are wire-OR-ed

to U5 pin 9, and channels 9 through 16 are wire-OR-ed to U5 pin 10. The E-E Cal CMD is gated with the resulting output from U5 pin 8 enabling the record frequency bus (now called the E-E signal bus) to be applied to the reproduce channels only during the E-E Cal mode. Gates U5 also act as a buffer to provide sufficient drive to the meter monitor.

The Run CMD from the data housing driver is applied to two elapsed-time indicators. One indicator is calibrated from 0 to 1,000 hours, and the other is calibrated from 0 to 3,000 hours. These are used to indicate the length of time that the system has been operated in either the drive forward or drive reverse modes (not fast).

## B. DATA HOUSING DRIVER (Figure 7-2)

### 1. MPU Buffer Section

The PIA's on the data housing driver board are U2 and U3. Their base addresses are 440<sub>16</sub> and 450<sub>16</sub> respectively. Note that the addresses are partially decoded from A<sub>15</sub>, A<sub>6</sub>, A<sub>5</sub>, and A<sub>4</sub>, using U1. When A<sub>15</sub>, A<sub>5</sub>, and A<sub>4</sub> are zero and A<sub>6</sub> is one, pin 11 of U1 is zero and the PIA at base address 440<sub>16</sub> (U2) is selected. When A<sub>15</sub> and A<sub>5</sub> are zero and A<sub>6</sub> and A<sub>4</sub> are one, pin 10 of U1 is a zero and the PIA at the base address of 450<sub>16</sub> (U3) is selected. Three address locations above the base address are obtained by manipulating address lines A<sub>0</sub> and A<sub>1</sub>.

The outputs of the two PIA's are buffered as necessary to drive the required number of loads as presented by a full complement of data cards.

### 2. Servo Reproduce Interface Section

The signal on J2-6 (Servo Reproduce Bus) is a sine wave or TTL signal, depending on whether a direct reproduce card or a servo reproduce card is driving the bus. This signal is ac coupled through C9, and dc shifted to +2.5 Vdc for processing. The signal is gated to one of three low-pass filters. For tape speeds of 15, 30, 60, or 120 IPS, a two-pole filter (R8, L3, C12) is used. For 3.75 or 7.5 IPS speeds, the filter consists of R10, L2, and C11. For .937 or 1.87 IPS, the filter consists of R7, C10, R9, L1, R11, and C12. Filter selection is controlled by the tape speed lines through gates U6.

After passing through the selected low-pass filter, the signal is buffered by U12 and is routed through a 1 kHz, high-pass filter (R12, C13, and L4). The filter output is presented to the pulse shaper (U14 and associated components) and the dropout detector (U13).

The function of the pulse shaper is to provide noise rejection, pulse squaring, and frequency doubling. Resistors R13, R14, R16, and R17 provide noise rejection by means of positive feedback (hysteresis). Capacitor C14 helps reject high frequency noise. For twice IRIG or IRIG operation, no frequency doubling is required and the output is taken from output of the voltage comparator (U14-9). If half IRIG operation is selected, the frequency must be doubled. This is accomplished by using

the output of the bidirectional one-shot (U14-11). Narrow pulses are generated for 1.87 IPS or higher, but a square wave is generated at .937 IPS. This is necessary because the signal is again doubled in frequency on the control logic card. Gate U6 (open collector) drives the final output from the card (J1-39), which goes to the servo system via the control logic card. This point is inhibited (shorted to ground) by U15-14, (if squelched) or by U15-1 (if there is insufficient signal for servo-from-tape operation).

The signal at TP3 is half-wave rectified and filtered by U13, CR2, C18, and associated components. The result is compared in U15 against a preset threshold established by R19, R23, and R22. If there is insufficient signal at TP3 for proper servo-from-tape operation, U15-2 switches high causing U15-1 to short the output signal (J1-39) to ground.

## C. PREAMPLIFIER SWITCHING

### 1. Signal Switching

Switching is accomplished at two levels to minimize crosstalk between channels. The first level uses differential, eight-channel, analog, multiplex switches U3 and U4. The second level uses quad-analog switches U7 and U8. For a particular channel, two switches in one of the eight-channel multiplexers are on and the two switches in the following quad switch are on. The other eight-channel multiplexer switches are off, and the outputs from the other multiplexers not selected are grounded through the corresponding quad switches.

The output of the selected quad switch is applied to emitter followers Q1 and Q2, which provide buffering from the load impedance. Diodes CR3, CR4, and CR5 clamp the outputs at approximately -4 volts in case one or more of the inputs is not terminated. Resistors R2, R4, R7, and R8 limit the current in case of an output short to ground.

The differential output is also routed to S2 and S3 to be used in the MON AMP position as described previously.

### 2. Switching Control

Five logic lines determine the channel selected (see Section 1). The switching is divided into two major groups controlled by lines F and G. These are derived from inputs A and E through inverters U9A and U9B and gates U13A through U13D. Signal  $\bar{A}$  selects even channels, and A selects odd channels. Lines H and J are not used in the 16 x 16 system. Also used are the  $\bar{F}$  and  $\bar{G}$  functions developed by inverters U9C and U9D. Within one of the two groups, one channel of eight is selected by means of lines B, C, D, and F for odd-numbered channels, and B, C, D, and G for even-numbered channels.



For example, channel five is selected by input code 00100. Function F is equal to  $\bar{A}\bar{E}$ , or a logic one. This turns off two switches (2-3 and 14-15), and turns on two switches (6-7 and 10-11) in U7. Switch U7 is then set up to accept a signal from U3, which is enabled by the function F at  $E_N$  (pin 18). On U3, inputs B, C,

and D are applied to  $A_0$ ,  $A_1$ , and  $A_2$ , respectively. This selects channel three of the 507 multiplexer, which is the desired channel five input. Table 4-3 shows the channel select codes and switch (U3 or U4) output.

### 3. Power Supplies

The preamplifier switching circuitry operates from +12V, -12V, and +5 Vdc supplies. Inductors L1, L2, and L3 and capacitors C1, C2, C3, C4, C5, and C6 provide decoupling for the power supplies. Diodes CR1 and CR2 prevent reverse current from flowing if the input voltage should exceed the supply voltages.

Table 4-3. Preamplifier Switching Logic Channel-Select Codes

SELECTED CHANNEL	INPUT CODE*					DG201 LOGIC**							DG507 LOGIC			DG507 OUTPUT
	E	D	C	B	A	F	$\bar{F}$	G	$\bar{G}$	H	H	J	$\bar{J}$	A <sub>2</sub>	A <sub>1</sub>	
1	0	0	0	0	0	1	0	0	1	 NOT USED	0	0	0	U3: 1a, 1b		
3	0	0	0	1	0	1	0	0	1		0	0	1	U3: 2a, 2b		
5	0	0	1	0	0	1	0	0	1		0	1	0	U3: 3a, 3b		
7	0	0	1	1	0	1	0	0	1		0	1	1	U3: 4a, 4b		
9	0	1	0	0	0	1	0	0	1		1	0	0	U3: 5a, 5b		
11	0	1	0	1	0	1	0	0	1		1	0	1	U3: 6a, 6b		
13	0	1	1	0	0	1	0	0	1		1	1	0	U3: 7a, 7b		
15	0	1	1	1	0	1	0	0	1		1	1	1	U3: 8a, 8b		
2	0	0	0	0	1	0	1	1	0	 NOT USED	0	0	0	U4: 1a, 1b		
4	0	0	0	1	1	0	1	1	0		0	0	1	U4: 2a, 2b		
6	0	0	1	0	1	0	1	1	0		0	1	0	U4: 3a, 3b		
8	0	0	1	1	1	0	1	1	0		0	1	1	U4: 4a, 4b		
10	0	1	0	0	1	0	1	1	0		1	0	0	U4: 5a, 5b		
12	0	1	0	1	1	0	1	1	0		1	0	1	U4: 6a, 6b		
14	0	1	1	0	1	0	1	1	0		1	1	0	U4: 7a, 7b		
16	0	1	1	1	1	0	1	1	0		1	1	1	U4: 8a, 8b		

\*  $A=2^0=1$ ,  $B=2^1=2$ ,  $C=2^2=4$ ,  $D=2^3=8$ ,  $E=2^4=16$ ,  $F=\bar{A}\bar{E}$ ,  $G=A\bar{E}$ ,  $H=\bar{A}E$ , and  $J=AE$ .  
 \*\* $A_2=D$ ,  $A_1=C$ , and  $A_0=B$

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

There are no adjustments on the data housing, data housing driver MPU buffer section, or the preamplifier switching. The servo reproduce interface section of the data housing driver has one adjustment, R21 which is the 0.937 IPS symmetry. To adjust R21, set jumper J4 to "X/2, 1X" position; then apply a 1 Vrms sine wave or a TTL signal of 3.125 kHz to J2-6. Adjust R21 for a positive pulse of 160 (+5)  $\mu$ seconds at J1-39.

Refer to the Operator's Manual for description of switch and jumper settings.

5-2. TROUBLESHOOTING

A thorough understanding of the circuits described in Section 4 (Principles of Operation) is essential for troubleshooting. Refer to Section 4 and the schematics in Section 7.

The most straightforward method of troubleshooting the data housing driver and the preamplifier switching cards is to substitute a known good unit for the suspected bad one. If this is not possible, the following paragraphs provide additional troubleshooting information.

A. DATA HOUSING

There are only five integrated circuits (IC's) on the data housing. To isolate which IC may be defective, determine on which channel the problem occurs. For example, if channel five (record channel) cannot be controlled and it is determined that the channel five record card is working correctly (by substituting known good record card), then the problem is likely to be U1. Monitoring the output of U1 for channel five (pin 11) should show two negative-going pulses repeated every 200 to 300 milliseconds.

If the problem is on the reproduce side and (by substitution) it is determined that channel five reproduce cannot be called up by the monitor, U3 is the likely source of the problem. Selecting channel five on the channel selector applies the correct controls per Table 1-1. Verify that the channel five output (U3 pin 11) is at a low state.

To troubleshoot U5, FM record cards must be used. Place the system in FM Cal and verify that the VCO signal from a selected channel is available on the E-E Signal Bus (U5 pin 6).

B. DATA HOUSING DRIVER

1. MPU Buffer Section

The outputs of each of the buffers can be checked for the correct function as described in the specifications (Section 1).

The output of each of the two pins can similarly be checked. Observe that in most cases, there is an inversion between the PIA output and the buffer output. When testing these items, it is necessary that the PIA is being driven by the MPU bus. Therefore, testing should be done by operating the unit in a Model 101.

2. Servo Reproduce Interface Section

- a. Verify that signals within the bandwidth of each filter are not attenuated at U12-6 when the appropriate filter is selected.
- b. Check the dropout detector stage by applying a signal to J2-6 and passing it through the filters and through U12 to TP3.
- c. The comparator doubler may be checked in a similar manner.

C. PREAMPLIFIER SWITCHING

1. Verify that following power supply voltages are present. These voltages are identified by the circuit card silkscreen.

+12V, +11.3V, -12V, -11.3V, and +5V.

2. Verify channel select signals are present.

	<u>J4 PIN NO.</u>	<u>I. C. PIN NO.</u>	<u>BINARY VALUE</u>
A	7	U9-9	1
B	6	U10-11	2
C	4	U10-9	4
D	3	U10-13	8
E	5	U9-11	16

3. The channel selected by the channel selector on the front panel determines the code at J4. Refer to Table 4-3 for the input code at each of the solid-state switches.

4. Place switches S1, S2, and S3 in MON AMP position.



5. Select a channel with front-panel channel selector.
6. The differential output of the preamplifier switching can be monitored at the cathodes of CR3 and CR4 (see Figure 5-1). The selected channel can be traced through on the preamplifier switching schematic (see Figure 7-3). Table 4-3 shows which signals enable a particular channel.

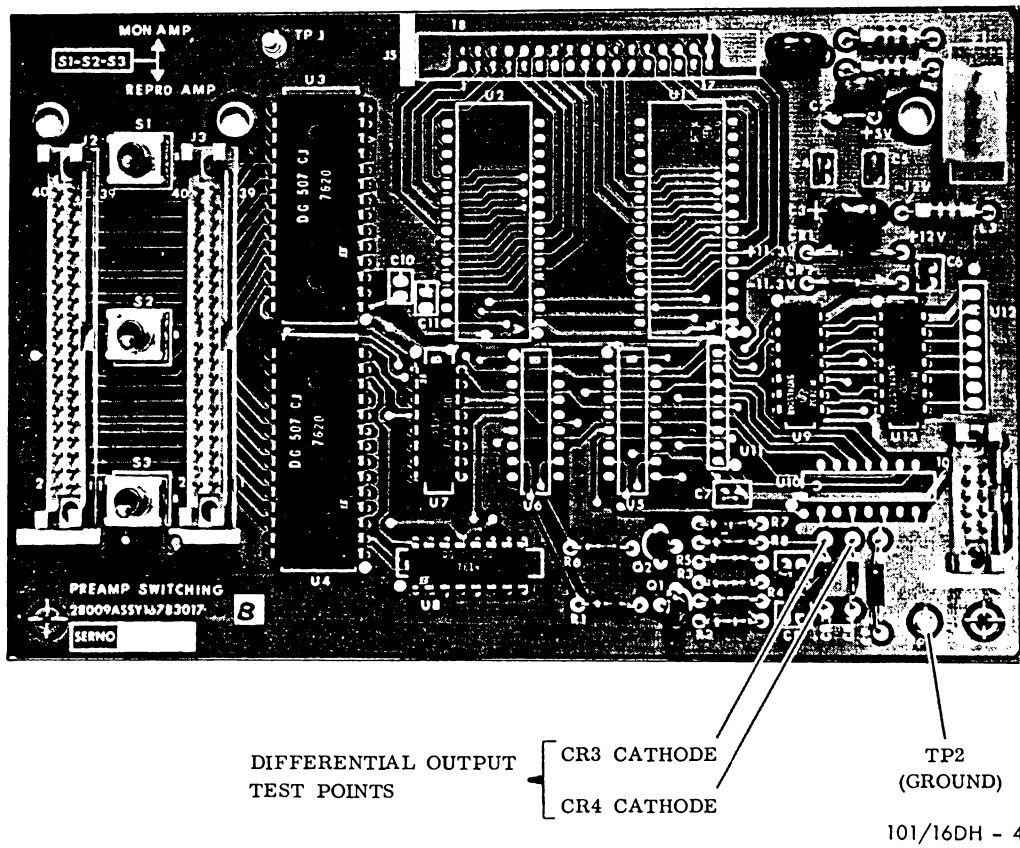


Figure 5-1. Preamplifier Switching Card Test Points

## SECTION 6

### ILLUSTRATED PARTS BREAKDOWN

#### 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

##### A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

##### B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

##### C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

##### D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

##### E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## SECTION 6

### 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

### 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

### 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
AMP INCORPORATED P.O. BOX 3608 HARRISBURG, PENNSYLVANIA 17105	00779	NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	MOLEX INC. CORPORATE HQ 2222 WELLINGTON COURT LISLE, ILLINOIS 60532	27264
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX 20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
UNICORP 534 MITCHELL STREET ORANGE, NEW JERSEY 07050	04729	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
MINNESOTA MINING AND MFG. CO. ADHESIVES COATINGS & SEALERS DIV 3M CENTER ST PAUL, MINNESOTA 55101	04963	WOVEN ELECTRONICS P.O. BOX 189 JENKIN STREET MAULDIN, SOUTH CAROLINA 29662	50561
VIKING INDUSTRIES INCORPORATED 21001 NORDHOFF CHATSWORTH, CALIFORNIA 91311	05574	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, BRULINGTON DIV. 2850 MT PLEASANT BURLINGTON, IOWA 52601	07716	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LAUTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
CTS OF BERNE INCORPORATED 406 PARR ROAD BERNE, INDIANA 46711	11236	NYTRONICS INCORPORATED 10 PELHAM PARKWAY PELHAM MANOR, NEW YORK 10803	72259
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
ELECTRO CUBE INCOR 1710 SOUTH DEL MAR AVENUE SAN GABRIEL, CALIFORNIA 91776	14752	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
SILICONIX, INC 2201 LAURELWOOD ROAD SANTA CLARA, CALIFORNIA 95054	17896	MINNESOTA MINING AND MFG CO ELECTRO PRODUCTS DIVISION 3M CENTER ST PAUL, MINNESOTA 55101	75037
SIGNETICS CORPORATION SUNNYVALE, CALIFORNIA 94086	18324	JOINT ELECTRONIC TYPE DESIGNATION SYSTEM	80058
CURTIS INSTRUMENTS 200 KISCO AVENUE MOUNT KISCO, NEW YORK 10549	18583	ELECTRONIC INDUSTRIES ASSOCIATION	80131
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
MINNESOTA MINING AND MFG CO INDUSTRIAL ELEC PRODUCTS DIV 3M CENTER ST PAUL, MINNESOTA, 55101	20999	SWITCHCRAFT INCORPORATED 5555 NORTH ELSTON AVENUE CHICAGO, ILLINOIS 60650	82389
BERG ELECTRONICS YORK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	ALCO ELECTRONICS PRODUCTS INC. 1551 OSGOOD STREET NORTH ANDOVER, MAINE 01845	95146
CORNELL-DURILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60018	25243	RUBBER TECK INCORPORATED P.O. BOX 389 GARDENA, CALIFORNIA 90247	98159
MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769	DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800

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6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
Cable Assy, Auxiliary Housing	16781743-005	D
	16781743-008	
Control Panel Switching, CCA	16781135-001	D
	16781135-003	
Data Electronics Housing Assy, 16 X 16	16781429-005	D
	16781429-007	D
	16781429-009	D
Data Housing Distribution, CCA	16781351-003	D
	16781351-005	
Data Housing Driver, CCA	16784205-005	C
	16784205-006	
Display Driver, CCA	16781137-007	D
	16781137-009	

DESCRIPTION	PART NUMBER	CODE

- CODE                      DEFINITION
- A    COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.
  - B    PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY.
  - C    PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

- CODE                      DEFINITION
- D    PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

SECTION 6

TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
<p>OPERATOR'S LEVEL RECOMMENDED SPARE PARTS AS DEFINED IN PARAGRAPH 6-2, ARE NOT REQUIRED FOR THIS MANUAL.</p>						

## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
1677707A-013	BENCH LEVEL SPARES KIT, DATA HOUSING 16 X 16					
14502704-001	INTEGRATED CIRCUIT	27014	DM74LS09N	1	1	
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	6	2	
16756961-002	SEMICONDUCTOR DEVICE, DIODE	04713	1N4002 5961-A80-4783	2	1	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-A706	2	1	
16774066-106	SEMICONDUCTOR DEVICE, DIODE	04713	1N5226B 5961-437-6391	1	1	
16774066-115	SEMICONDUCTOR DEVICE, DIODE	04713	1N5235H 5961-103-15A3	1	1	
16774985-001	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM310H	1	1	
16779092-002	INTEGRATED CIRCUIT	04713	MC140168CP	1	1	
16779221-002	MICROCIRCUIT	17896	DG201CJ	2	1	
16779730-001	INTEGRATED CIRCUIT	18324	M8T26AB	1	1	
16779793-001	MICROCIRCUIT	01295	SN74LS04N 5962-01-027-6863	2	1	
779948-001	BUS BAR	29593	B5153-100-2GS	1	2	
16780407-001	INTEGRATED CIRCUIT	01295	SN74LS37N	3	1	
16781061-001	MICROCIRCUIT	27014	LM339AN	1	1	
16781996-012	MICROCIRCUIT	17896	DG507ACJ	2	1	
99000279-001	MICROCIRCUIT	01295	SN74LS02N	1	1	
99000267-001	MICROCIRCUIT	27014	DM74LS138N	1	1	

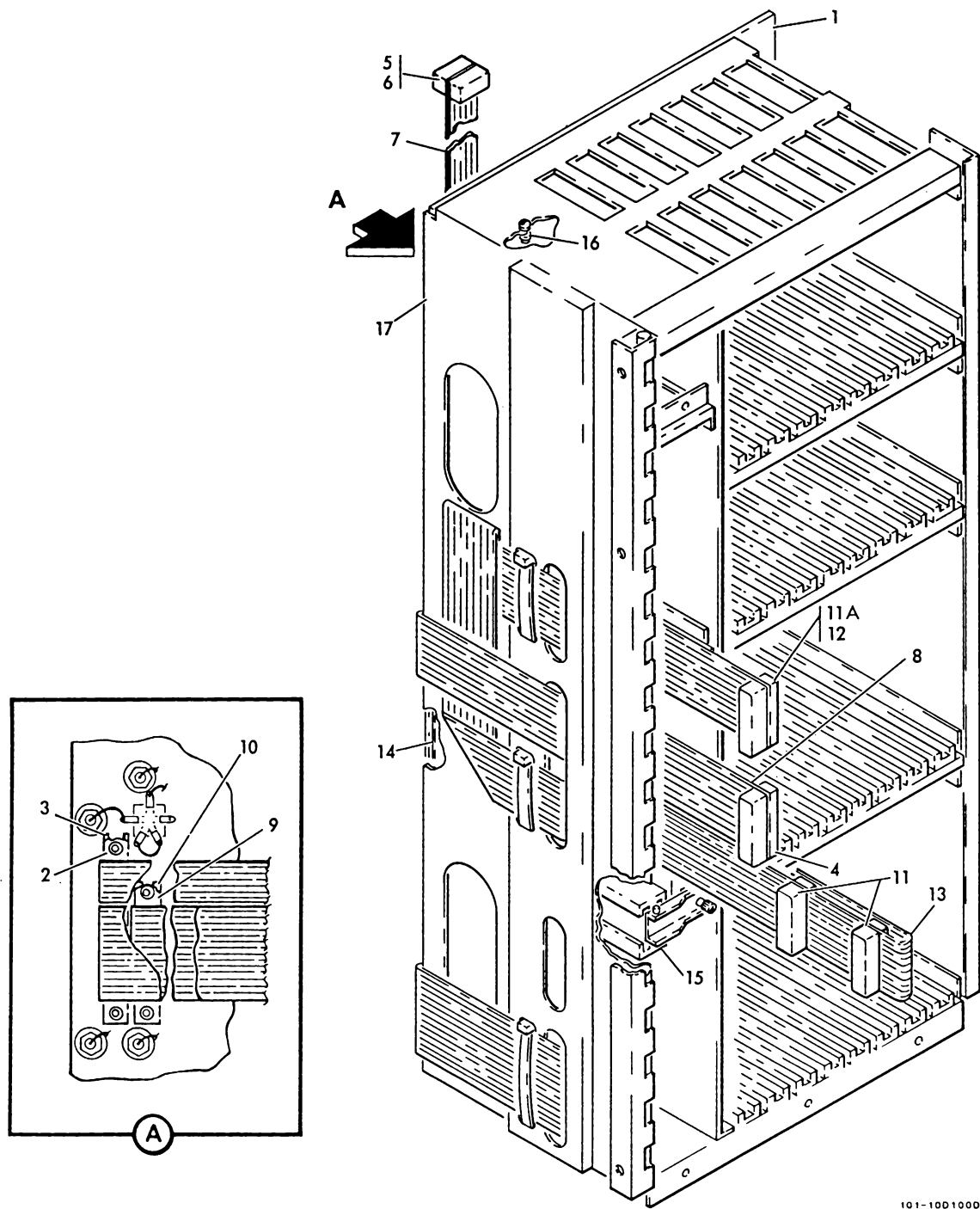


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TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST (CONT'D)

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			Federal Stock No.			
99000267-601	MICROCIRCUIT	18324	N74LS138NSB	4	1	
99000275-002	MICROCIRCUIT	04713	MC6821P	2	1	
99000403-601	MICROCIRCUIT	18324	N74LS40NSB	1	1	

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FIGURE 6-1. DATA ELECTRONICS HOUSING ASSEMBLY

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TABLE 6-1. DATA ELECTRONICS HOUSING ASSEMBLY

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1		A8	DATA ELECTRONICS HOUSING ASSEMBLY, 16 X 16	28009		16781429-003	REF	A	
6-1		A8	DATA ELECTRONICS HOUSING ASSEMBLY, 16 X 16	28009		16781429-005	REF	B	
6-1		A8	DATA ELECTRONICS HOUSING ASSEMBLY, 16 X 16	28009		16781429-007	REF	C	
6-1		A8	DATA ELECTRONICS HOUSING ASSEMBLY, 16 X 16	28009		16781429-009	REF	D	
			(SEE SYSTEM MANUAL, TABLE 6-1 FOR LOCATION IN NHA)						
6-1	1	A53	. CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION	28009		16781351-003	1	A-C	
6-1	1	A53	. CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION (SEE TABLE 6-2 FOR BREAKDOWN)	28009		16781351-005	1	D	
6-1	2		. PLATE, MOUNTING	28009		16785131-006	1		
6-1		W1	. CABLE ASSEMBLY, REMOTE	28009		16781743-007	1		
6-1	3	J22	. . CONNECTOR, PLUG, ELECTRICAL, . . (REMOVE PIN NO. 14)	75037	3331-0000	16781677-006	1		
6-1	4	P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3417-0000	16776705-005	1		
6-1	5	P3	. . CONNECTOR, PLUG, ELECTRICAL	04963	3421-0000	16776705-001	1		
6-1	6		. . KEY, POLARIZING	20999	3435-0000	16779175-001	1		
6-1	7		. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/16 COND	16776751-002	AR		
6-1	8		. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/20 COND	16776751-003	AR		
6-1	9		. PLATE, MOUNTING	28009		16785131-004	1		
6-1		W2	. CABLE ASSEMBLY, AUXILIARY HOUSING ELECTRICAL, BRANCHED			16781743-005	1	A,B	
6-1		W2	. CABLE ASSEMBLY, AUXILIARY HOUSING			16781743-008	1	C	
6-1	10	J21	. . CONNECTOR, ELECTRICAL	75037	3329-0000	16781677-004	1		
6-1	11	P1,P2	. . CONNECTOR, PLUG, ELECTRICAL	04963	3414-0000	16776705-002	2		
6-1	11A	P3	. . CONNECTOR, PLUG, ELECTRICAL	04963	3414-0000	16776705-002	1	A,B	
6-1	12		. . KEY, POLARIZING	20999	3435-0000	16779175-001	1		
6-1	13		. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/34 COND	16776751-005	AR		
6-1	14		. PLATE, ELECTRICAL SHIELD	28009		16781347-001	1		
6-1	15		. SLIDE ASSEMBLY, CIRCUIT CARD	28009		16781553-001	1		
6-1	16		. GUIDE, INSTALLATION	28009		16776974-002	1		
6-1	17		. CHASSIS ASSEMBLY, DATA ELECTRONICS	28009		16781428-001	1	A	
6-1	17		. CHASSIS ASSEMBLY, DATA ELECTRONICS	28009		16781428-002	1	B,C	

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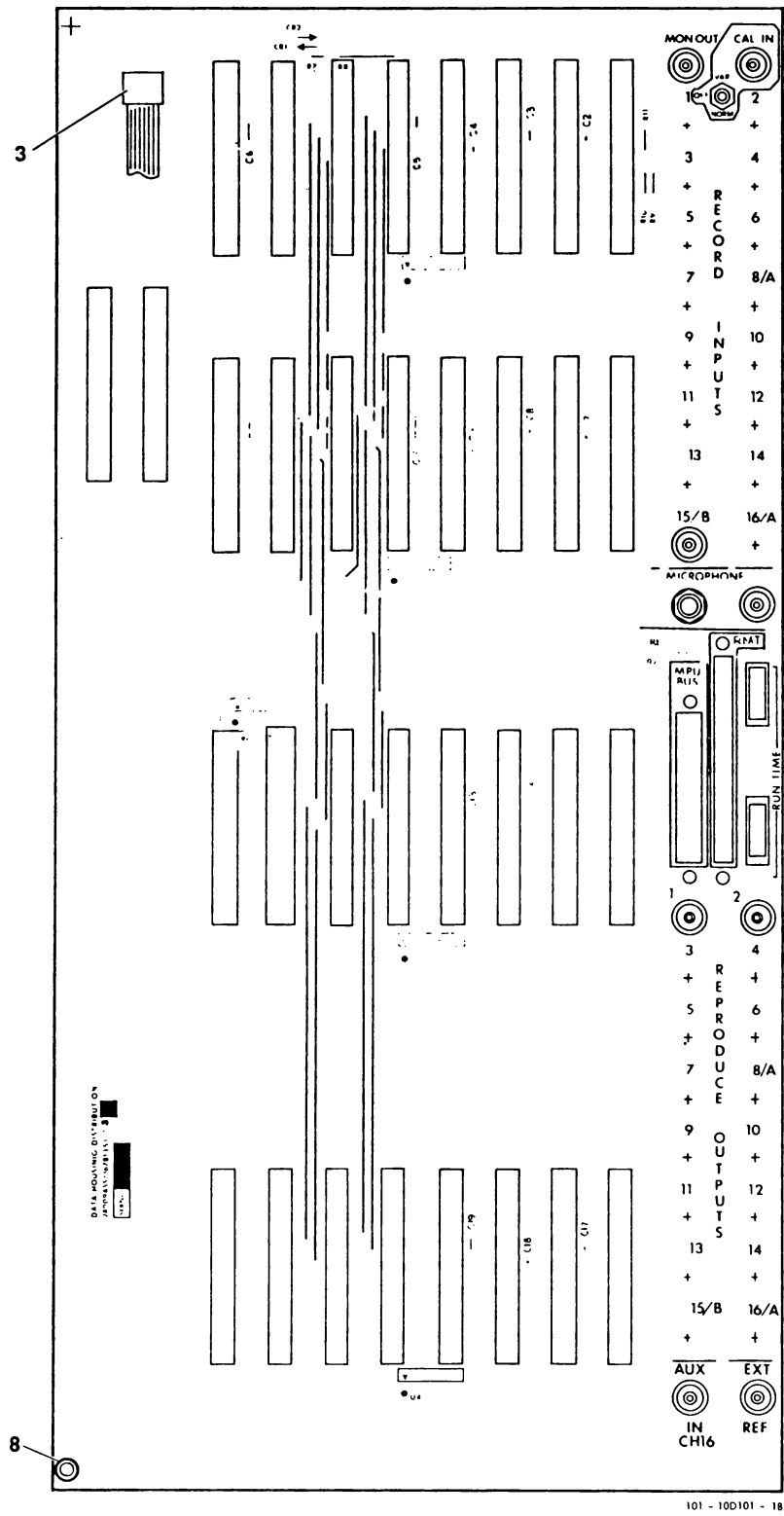


FIGURE 6-2. DATA HOUSING DISTRIBUTION CIRCUIT CARD ASSEMBLY (SHEET 1 OF 2)

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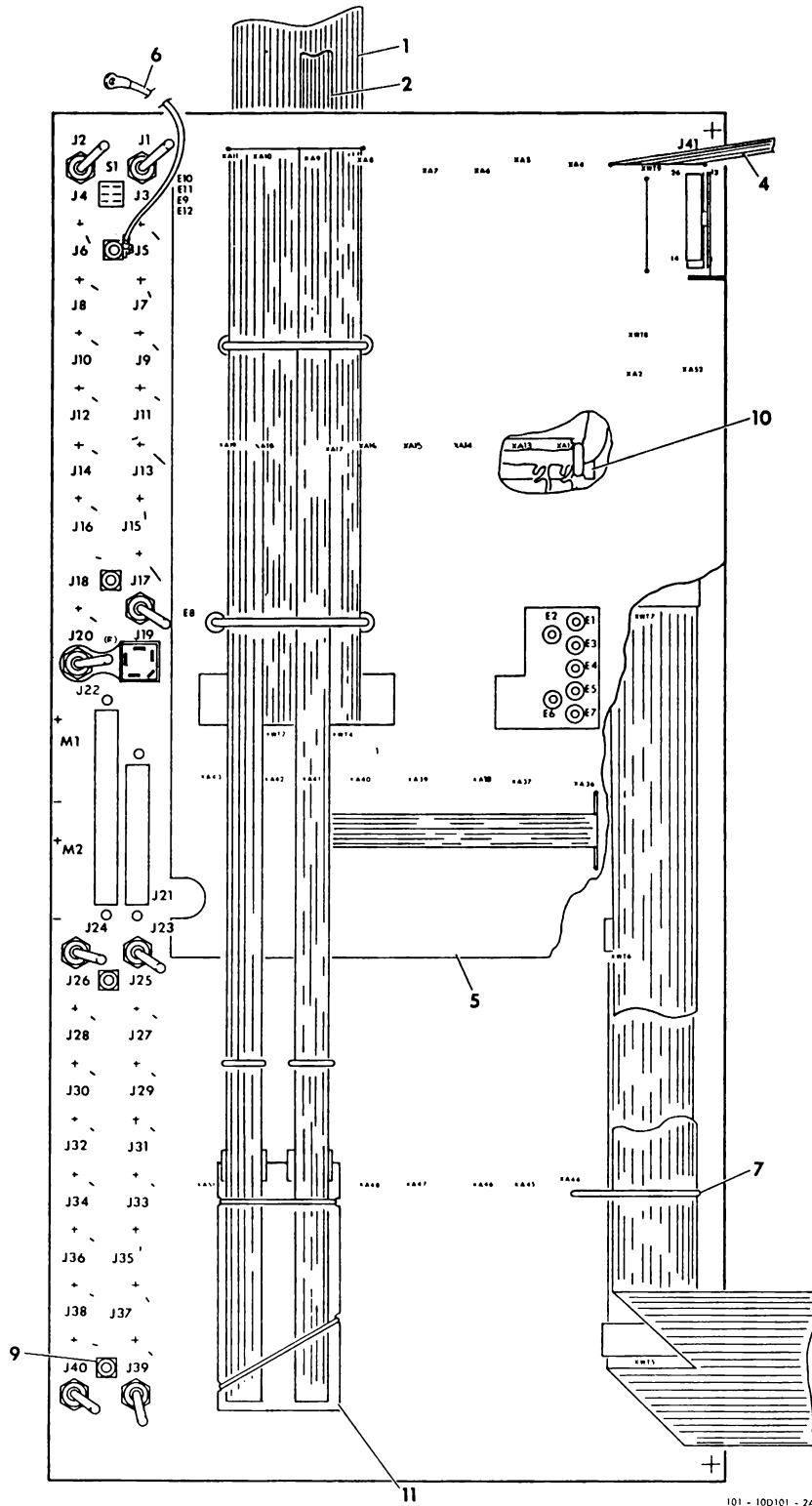


FIGURE 6-2. DATA HOUSING DISTRIBUTION CIRCUIT CARD ASSEMBLY (SHEET 2 OF 2)

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TABLE 6-2. DATA HOUSING DISTRIBUTION CCA (SHEET 1 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	LEADLINE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-2		AB53	CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION	28009		16781351-003	REF	A	
6-2		AB53	CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION (SEE TABLE 6-1 FOR LOCATION IN NMA)	28009		16781351-005	REF	B	
6-2		CR1,CR2	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	2		
6-2		C1-C14	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +/-20%, 50 VDC	61637	C320C104H5U1CA	16771020-018	14		
6-2		C15,C16	. NOT USED						
6-2		C17-C19	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +/-20%, 50 VDC	61637	C320C104H5U1CA	16771020-018	3		
6-2		E1-E7	. POST, ELECTRICAL / MECHANICAL, CLINCHING	28009		16781624-004	7		
6-2		J1-J18	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	18		
6-2		J19	. JACK, TELEPHONE	82389	L1148	16763367-002	1		
6-2		J20	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	1		
6-2		J21	. SEE FIG. 6-1. PART OF ABW2.						
6-2		J22	. SEE FIG. 6-1. PART OF ABW1.						
6-2		J23-J40	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	18		
6-2		J41	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3493-2003	16781104-503	1		
6-2		M1	. INDICATOR, ELAPSED TIME	28009		16779088-002	1	A	
6-2		M1	. INDICATOR, ELAPSED TIME, 5000 HR	18583	120 LC-5000	16779088-005	1	B	
6-2		M2	. INDICATOR, ELAPSED TIME	18583	120LC1	16779088-001	1		
6-2		R1	. RESISTOR, FIXED, METAL FILM, 2.15 MEG OHMS, +/-1%, 1/8W	91637	CMF-552154F	16757165-533	1	A	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 3.57 MEG OHMS, +/-1%, 1/8W			16757165-554	1	B	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 715K OHMS, +/-1%, 1/8W	81349	RNR55K7153FS	16757165-483	1		
6-2		R3,R4	. RESISTOR, FIXED, CARBON COMPOSITION, 300 OHMS, +/-5%, 1/4W	81349	RCR07G301JM	16750079-020	2		
6-2		R5	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +/-5%, 1/4W	81349	RCR07G202JM	16750079-040	1		
6-2		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 20 OHMS, +/-5%, 1/4W	81349	RCR07G200JM	16750079-142	1		
6-2		R7	. RESISTOR, FIXED, CARBON COMPOSITION, 12 OHMS, +/-5%, 1/8W	81349	RCR05G120JS 5905-00-491-6344	16780345-027	1		
6-2		R8-R11	. NOT USED						
6-2		U1-U4	. MICROCIRCUIT	18324	N74LS138NSB	99000267-601	4		
6-2		U5	. MICROCIRCUIT	18324	N74LS40NSB	99000403-601	1		
6-2	1	W1	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, BRANCHED	28009		16781734-001	1		
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	28009		16781475-003	AR		
6-2		P1-P3	. . CONNECTOR, PLUG, ELECTRICAL	04963	3417-0000	16776705-005	3		

NOTES:

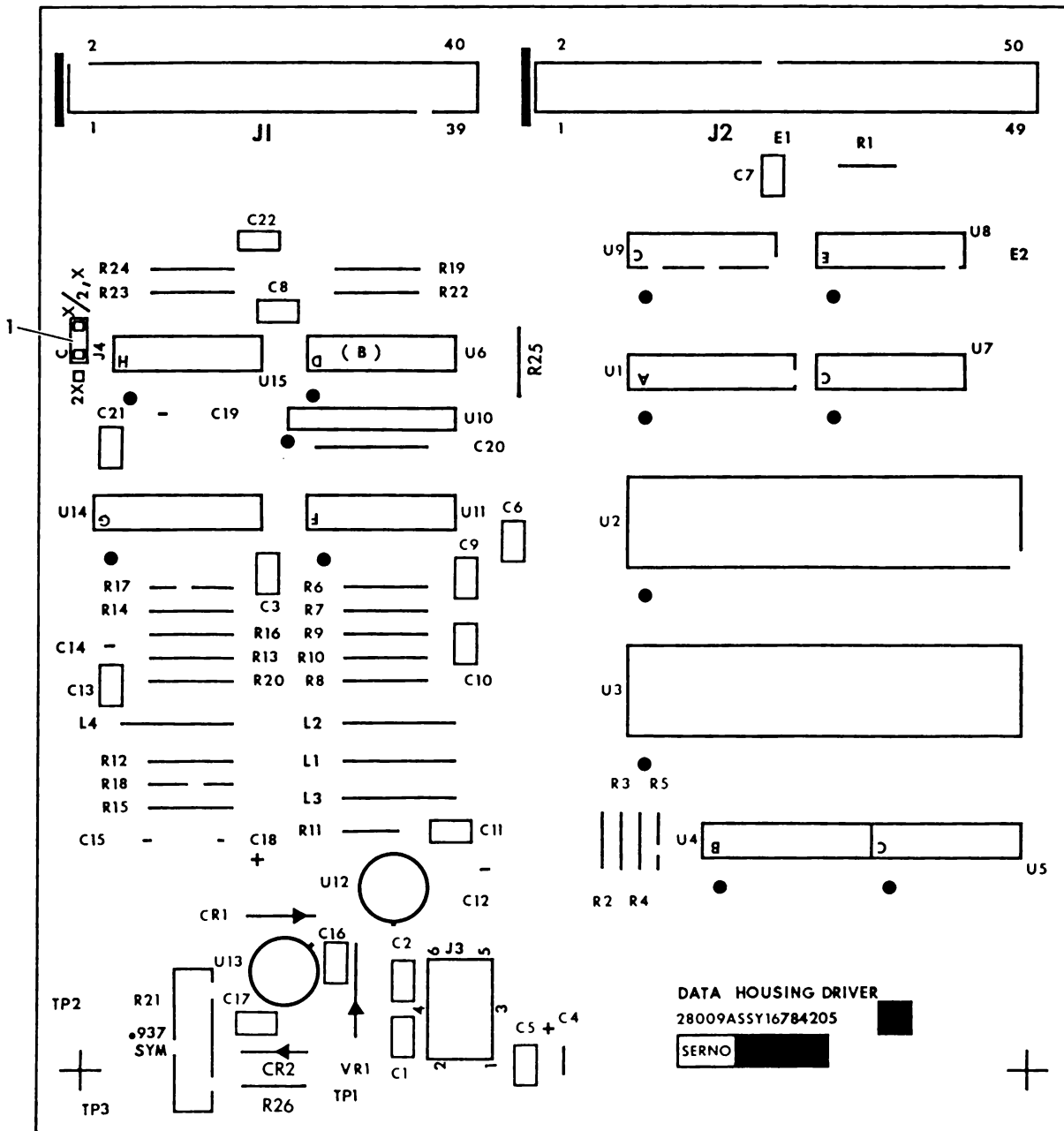
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TABLE 6-2. DATA HOUSING DISTRIBUTION CCA (SHEET 2 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
						NATIONAL STOCK NUMBER				
6-2		WT1-WT4	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3474-0001T		16776752-103	4		
6-2	2	W2	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, BRANCHED	28009			16781739-001	1		
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	28009			16776751-007	AR		
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3425-0000		16776705-003	1		
6-2		P2	. . CONNECTOR, PLUG, ELECTRICAL	04963	3473-0000		16776705-006	1		
6-2		WT1-WT4	. . NOT USED							
6-2		WT5-WT8	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3434-0001T		16776752-104	4		
6-2	3	W3	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16781741-001	1		
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/10 COND		16776751-008	AR		
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3473-0000		16776705-006	1		
6-2		WT1-WT8	. . NOT USED							
6-2		WT9	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3474-0001T		16776752-103	1		
6-2			. . KEY, POLARIZING	20999	3435-0000		16779175-001	1		
6-2	4	W4	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16783048-001	1		
6-2			. . CABLE, SPECIAL PURPOSE, ELECTRICAL, FLAT, WOVEN	50561	T17TP28-7UL1568N		16783026-001	AR		
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	00779	86896-1		16783027-002	1		
6-2		XA1	. NOT USED							
6-2		XA2	. CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VM22/1J0012		16778708-201	1		
6-2		XA3	. NOT USED							
6-2		XA4-XA19	. CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VM22/1J0012		16778708-201	16		
6-2		XA20-35	. NOT USED							
6-2		XA36-52	. CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VM22/1J0012		16778708-201	17		
6-2	5		. PLATE, ELECTRICAL SHIELD	28009			16783351-001	1		
6-2	6		. CABLE ASSEMBLY, GROUND ELECTRICAL	28009			16764178-018	2		
6-2	7		. STRAP, TIEDOWN, ELECTRICAL COMPONENTS	98159	2829-75-2 5975-441-1605		16755973-002	11		
6-2	8		. SPACER, SLEEVE, SELF-CLINCHING	04729	SU303-1F-7		16756409-302	27		
6-2	9		. POST, ELECTRICAL / MECHANICAL, CLINCHING	28009			16781624-005	4		
6-2	10		. PLATE, ELECTRICAL SHIELD	28009			16784372-001	2		
6-2	11		. PLATE, ELECTRICAL SHIELD	28009			16784372-002	1		

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FIGURE 6-3. DATA HOUSING DRIVER CIRCUIT CARD ASSEMBLY



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TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 1 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
			1 2 3 4 5 6 7						
6-3		AA3A1	CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28CC9			1	A	
6-3		AA7A1	CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28CC9			1	B	
6-3			CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28CC9			REF	C	
6-3		CR1,CR2	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148		2		
6-3		C1-C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-05C-651-104M		3		
6-3		C4	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 15VDC	26769	41KS107E015K1A		1		
6-3		C5-C9	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M		5		
6-3		C10	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-20%, 50VDC	18796	8121-05C-651-103M		1		
6-3		C11	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3300PF, +-5%, 50VDC	18796	8121-050W5R332J		1		
6-3		C12	. CAPACITOR, FIXED, MICA DIELECTRIC 10PF, +-5%, 50VDC	25243	CD10E0750JN1		1		
6-3		C13	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.15UF, +-20%, 50VDC	18796	8121-05C-651-154M		1		
6-3		C14	. CAPACITOR, FIXED, MICA DIELECTRIC 20PF, +-5%, 50 VDC	25243	CD10E02C0JN1		1	A, E	
6-3		C14	. CAPACITOR, FIXED, MICA DIELECTRIC 39PF, +-5%, 50VDC	25243	CD10E0390JN1		1	C	
6-3		C15	. CAPACITOR, FIXED, MICA DIELECTRIC 20PF, +-5%, 50 VDC	25243	CD10E02C0JN1		1		
6-3		C16,C17	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M		2		
6-3		C18	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.22UF, +-20%, 50VDC	18796	8131-05C-651-224M		1		
6-3		C19	. CAPACITOR, FIXED, MICA DIELECTRIC 10PF, +-5%, 50 VDC	25243	CD10C01C00N1		1		
6-3		C20	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 6000PF, +-1%, 100VDC	14752	41001B682F		1		
6-3		C21,22	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-05C-651-104M		2		
6-3		J1	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3495-10C2		1		
6-3		J2	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3496-10C2		1		
6-3		J3	. TERMINAL, PIN	22526	75401-0C7		6		
6-3		J4	. TERMINAL, PIN	22526	75401-C01		3		
6-3		L1	. COIL, RADIO FREQUENCY, 180MH, +-20%	72259	WEE180000		1		
6-3		L2	. COIL, RADIO FREQUENCY, 8.2MH +-10%	72259	WEE8200		1		
6-3		L3	. COIL, RADIO FREQUENCY, 1PH, +-10%	72259	WEE10C0 5950-00-755-8586		1		
6-3		L4	. COIL, RADIO FREQUENCY, 180MH, +-20%	72259	WEE1800C0		1		
6-3	1	P4	. BUS BAR	29593	B5153-1C0-26S		1		

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TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 2 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-3		R1-R5	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +-5%, 1/4W	81349	RCRC7G2C2JM	16750075-04C	5		
6-3		R6	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1C02FS S9C5-CC-138-1283	16757165-3C1	1		
6-3		R7	. RESISTOR, FIXED, METAL FILM, 2.94K OHMS, +-1%, 1/8W	81349	RNR55K2941FS S905-GC-007-7561	16757165-246	1		
6-3		R8	. RESISTOR, FIXED, METAL FILM, 3.65K OHMS, +-1%, 1/8W	81349	RNR55V3651FM	16757165-255	1		
6-3		R9	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2C01FR	16757165-23C	1		
6-3		R10	. RESISTOR, FIXED, METAL FILM, 1.69K OHMS, +-1%, 1/8W	81349	RNR55K1691FM	16757165-223	1		
6-3		R11	. RESISTOR, FIXED, CARBON COMPOSITION, 20K OHMS, +-5%, 1/4W	81349	RCRC7G2C3JM	16750075-064	1		
6-3		R12	. RESISTOR, FIXED, METAL FILM, 604 OHMS, +-1%, 1/8W	81349	RNR55K6040FP	16757165-176	1		
6-3		R13,R14	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1C01FS S9C5-CC-197-4289	16757165-201	2		
6-3		R15	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS S905-OC-138-1283	16757165-3C1	1		
6-3		R16,R17	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1C03FM S9C5-CC-407-216C	16757165-4C1	2		
6-3		R18	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS S9C5-OC-138-1283	16757165-3C1	1		
6-3		R19	. RESISTOR, FIXED, METAL FILM, 9.09K OHMS +-1%, 1/8W	81349	RNR55K9C91FR S905-OC-431-7833	16757165-293	1		
6-3		R20	. RESISTOR, FIXED, METAL FILM, 29.4K OHMS, +-1%, 1/8W	81349	RNR55K2942FM	16757165-346	1		
6-3		R21	. RESISTOR, VARIABLE, 1CK OHMS, +-10%, 3/4W	73138	B9PR10K S905-OC-003-2537	16775165-01C	1		
6-3		R22	. RESISTOR, FIXED, METAL FILM, 2.06K OHMS, +-1%, 1/8W	81349	RNR55K8C61FS	16757165-2PB	1		
6-3		R23	. RESISTOR, FIXED, METAL FILM, 150 OHMS, +-1%, 1/8W	81349	RNR55K1500FM	16757165-11E	1		
5		R24	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1C01FS S9C5-CC-197-4289	16757165-2C1	1		
6-3		R25	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +-5%, 1/4W	81349	RCRC7G2C2JM	16750075-04C	1		
6-3		R26	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCRC7G102JM S9C5-OC-110-7A2C	16750075-033	1		
6-3		TP1	. TERMINAL, STUD	71279	160-1558-02-01 S94C-00-853-6232	167502C1-022	1		
6-3		TP2,TP3	. TERMINAL, STUD	71279	2027-2 S94C-00-280-0A01	1675717C-002	2		
6-3		U1	. MICROCIRCUIT	27C14	DM74LS138N	990C0267-0C1	1		
6-3		U2,U3	. MICROCIRCUIT	04713	MC6821P	990C0275-002	2		
6-3		U4	. INTEGRATED CIRCUIT	1A324	N8T26AE	1677973C-0C1	1		
6-3		U5	. INTEGRATED CIRCUIT	01295	SN74LS37N	167804C7-0C1	1		
6-3		U6	. INTEGRATED CIRCUIT	27014	DM74LS09N	145C2764-001	1		
6-3		U7	. INTEGRATED CIRCUIT	01295	SN74LS37N	167804C7-0C1	1		
6-3		U8	. MICROCIRCUIT	01295	SN74LS04N S962-C1-027-6R61	16779753-0C1	1		

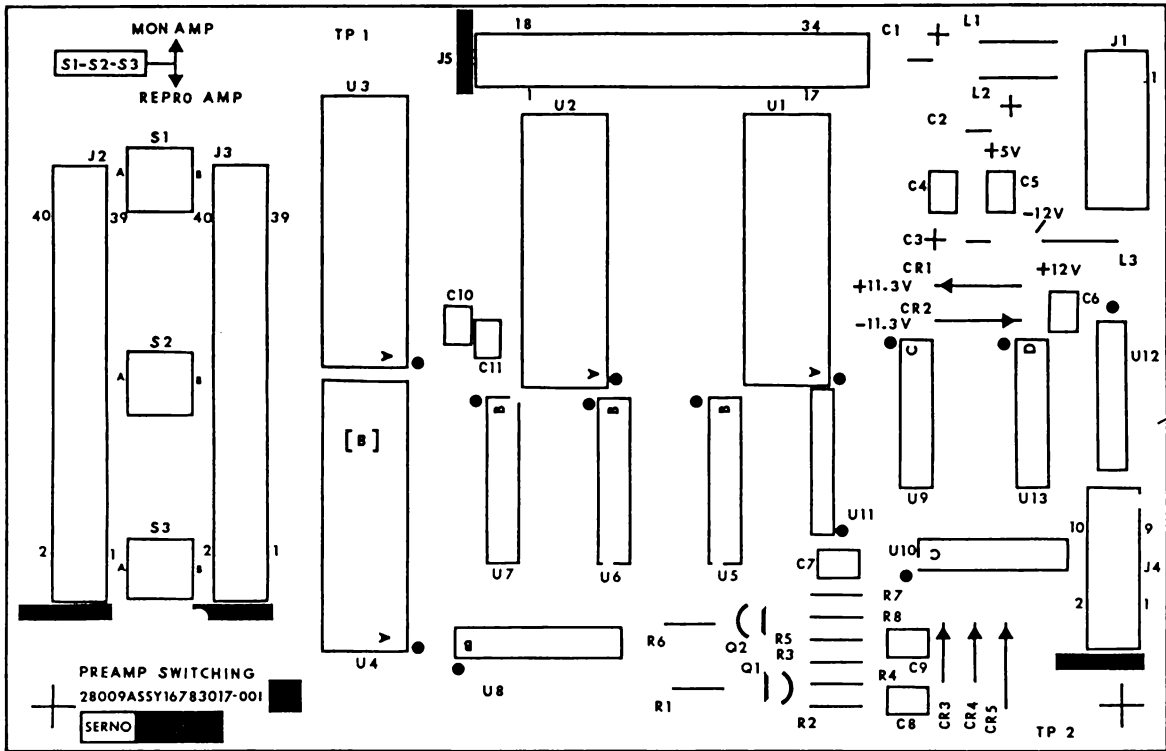
NOTES:

SECTION 6

TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 3 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-3		U9	. INTEGRATED CIRCUIT	01295	SN74LS37N	16780407-001	1		
6-3		U10	. RESISTOR, NETWORK	11236	750-81-R10KCHMS	16780508-008	1		
6-3		U11	. INTEGRATED CIRCUIT	04713	MC14016BCP	16779092-002	1		
6-3		U12	. INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM310M	16774985-001	1		
6-3		U13	. INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318M	16776656-001	1		
6-3		U14	. INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	NE720B	16776697-001	1		
6-3		U15	. MICROCIRCUIT	27014	LM339AN	16781061-001	1		
6-3		VR1	. SEMICONDUCTOR DEVICE, DIODE	04713	1N5235E 5961-103-1583	16774066-115	1		
NOTES:									

SECTION 6



101 - 10D103

FIGURE 6-4. PREAMPLIFIER SWITCHING 16 X 16 CIRCUIT CARD ASSEMBLY

SECTION 6

TABLE 6-4. PREAMPLIFIER SWITCHING 16 X 16 CCA (SHEET 1 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE OH CODE	NOTES
						NATIONAL STOCK NUMBER				
6-4		A6	CIRCUIT CARD ASSEMBLY, PREAMPLIFIER SWITCHING, 16 X 16	28CC9			16781C17-001	REF		
6-4		CR1,2	. SEMICONDUCTOR DEVICE, DIODE	04713	1N4C02 5961-C0-8A0-47E7		16756561-002	2		
6-4		CR3,4	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148		16756665-003	2		
6-4		CR5	. SEMICONDUCTOR DEVICE, DIODE	04713	1N5226E 5961-437-6391		16774C46-1C6	1		
6-4		C1	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4769015K1A		16759058-242	1		
6-4		C2	. CAPACITOR, FIXED, ELECTROLYTIC, 56UF, +-10%, 10VDC	26769	41KS5660010K1A		16759058-143	1		
6-4		C3	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A		16759058-242	1		
6-4		C4-9	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18756	8121-050-651-1C44		16771C2C-018	6		
6-4		J1	. CONNECTOR, RECEPTACLE, ELECTRICAL	27264	09-65-1C41		16781675-004	1		
6-4		J2	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3495-2CC2		167811C4-1C5	1		
6-4		J3	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3495-2CC2		167811C4-1C5	1		
6-4		J4	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3491-2CC2		167811C4-1C1	1		
6-4		J5	. NOT USED							
6-4		L1-3	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-P19-1990		16759875-254	3		
6-4		Q1,2	. TRANSISTOR	80131	2N3904 5961-CC-892-87C4		16762172-001	2		
6-4		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCRC7G1C1JM		1675CC75-009	1		
6-4		R2	. RESISTOR, FIXED, CARBON COMPOSITION, 180 OHMS, +-5%, 1/4W	81349	RCRC7G131JM		1675CC75-015	1		
6-4		R3	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCRC7G562JM		1675CC75-051	1		
6-4		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCRC7G220JM		16750079-166	1		
6-4		R5	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCRC7G562JM		1675CC75-051	1		
6-4		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCRC7G1C1JM		16750079-009	1		
6-4		R7	. RESISTOR, FIXED, CARBON COMPOSITION, 180 OHMS, +-5%, 1/4W	81349	RCRC7G131JM		16750079-015	1		
6-4		R8	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCRC7G220JM		1675CC75-166	1		
6-4		S1	. SWITCH, TOGGLE, DPDT	95146	TT2ING-PC-1		16781236-003	1		
6-4		S2,3	. SWITCH, TOGGLE, DPDT	95146	TT2ING-PC-1		16781236-003	2		
6-4		TP1,2	. TERMINAL, STUD	71279	160-155R-02-01 5940-00-853-6232		16750201-022	2		
6-4		U1,2	. NOT USED							
6-4		U3,4	. MICROCIRCUIT	17896	D65C7ACJ		16781996-012	2		
6-4		U5,6	. NOT USED							
6-4		U7,8	. MICROCIRCUIT	17896	D62C1CJ		16779221-002	2		
6-4		U9	. MICROCIRCUIT	01295	SN74LS04N 5962-C1-027-6863		16779793-001	1		

NOTES:

SECTION 6

TABLE 6-4. PREAMPLIFIER SWITCHING 16 X 16 CCA (SHEET 2 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-4		U10-U12	• NOT USED						
6-4		U13	• MICROCIRCUIT	01295	SN74LS02N		99000249-001	1	
6-4	1		• PRINTED WIRING BOARD	28009			16783016-001	1	
NOTES:									

SECTION 7  
SCHEMATICS

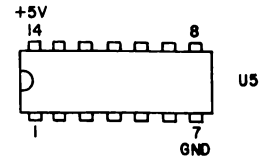
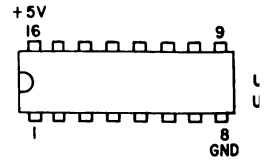
NOTES:

1. UNLESS OTHERWISE SPECIFIED:

ALL RESISTANCE VALUES ARE IN OHMS  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%  
 C2 THRU C14 AND C17, C18, C19 ARE 0.1 UF

2. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS. TOP VIEW SHOW:

3. INSTALLED ON -006 ONLY (WITHOUT CALIBRATOR).



RECORD CHANNEL CHART									
FUNCTION REC CH PIN NO DESTINATION PREFIX	CHAN NO	PC CONN	RECORD IN		RECORD OUT		BIAS 0 <sub>1</sub> OR 0 <sub>2</sub>	CHANNEL READ/WRITE CMD	RECORD FREQUENCY BUS
			SIGNAL	GND	SIGNAL	RETURN			
			22A	21A	5B	5A	1 A	21 B	15 A
			COND	SHIELD	A8 A53 W4 PI		XA2 PINS	U1, U2	U5
	1	XA 4	J3	J3	PIN 2	PIN 1	1A & 1B	U1 PIN 15	PIN 10
	2	XA 5	J4	J4	PIN 4	PIN 3	1A & 1B	U1 PIN 14	PIN 10
	3	XA 6	J5	J5	PIN 6	PIN 5	2A & 2B	U1 PIN 13	PIN 10
	4	XA 7	J6	J6	PIN 8	PIN 7	2A & 2B	U1 PIN 12	PIN 10
	5	XA 8	J7	J7	PIN 10	PIN 9	1A & 1B	U1 PIN 11	PIN 10
	6	XA 9	J8	J8	PIN 12	PIN 11	1A & 1B	U1 PIN 10	PIN 10
	7	XA 10	J9	J9	PIN 14	PIN 13	2A & 2B	U1 PIN 9	PIN 10
	8/A	XA 11	J10	J10	PIN 16	PIN 15	2A & 2B	U1 PIN 7	PIN 10
	9	XA 12	J11	J11	PIN 18	PIN 17	1A & 1B	U2 PIN 15	PIN 9
	10	XA 13	J12	J12	PIN 20	PIN 19	1A & 1B	U2 PIN 14	PIN 9
	11	XA 14	J13	J13	PIN 22	PIN 21	2A & 2B	U2 PIN 13	PIN 9
	12	XA 15	J14	J14	PIN 24	PIN 23	2A & 2B	U2 PIN 12	PIN 9
	13	XA 16	J15	J15	PIN 26	PIN 25	1A & 1B	U2 PIN 11	PIN 9
	14	XA 17	J16	J16	PIN 28	PIN 27	1A & 1B	U2 PIN 10	PIN 9
	15/B	XA 18	J17	J17	PIN 30	PIN 29	2A & 2B	U2 PIN 9	PIN 9
	16/A	XA 19	J18	J18	PIN 32	PIN 31	2A & 2B	U2 PIN 7	PIN 9

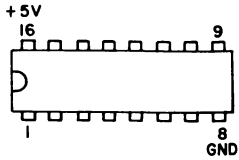
NOTE: A8A53W4PI PINS 33 & 34 - GND

REPRODUCE CHANNEL CHART										
FUNCTION REPRO CH PIN NO DESTINATION PREFIX	CHAN NO	PC CONN	REPRODUCE INPUT			REPRODUCE OUTPUT		CHANNEL SELECT CMD	AUX. INPUT	
			INPUT A	INPUT B	GND	SIGNAL	GND	SIGNAL	GND	
			1A	1B	2B	22A	21A	22B	5A	4A
			A8 A53 W1 PI			COND.	SHIELD	U 3 U 4	COND	SHIELD
	1	XA 36	PIN 37	PIN 38	PINS 29 30 39 40	J 23	J 23	U3 PIN 15		
	2	XA 37	PIN 17	PIN 18		J 24	J 24	U3 PIN 14		
	3	XA 38	PIN 35	PIN 36		J 25	J 25	U3 PIN 13		
	4	XA 39	PIN 15	PIN 16		J 26	J 26	U3 PIN 12		
	5	XA 40	PIN 33	PIN 34		J 27	J 27	U3 PIN 11		
	6	XA 41	PIN 13	PIN 14		J 28	J 28	U3 PIN 10		
	7	XA 42	PIN 31	PIN 32		J 29	J 29	U3 PIN 9		
	8/A	XA 43	PIN 11	PIN 12		J 30	J 30	U3 PIN 7		
	9	XA 44	PIN 27	PIN 28		J 31	J 31	U4 PIN 15		
	10	XA 45	PIN 7	PIN 8		J 32	J 32	U4 PIN 14		
	11	XA 46	PIN 25	PIN 26	J 33	J 33	U4 PIN 13			
	12	XA 47	PIN 5	PIN 6	J 34	J 34	U4 PIN 12			
	13	XA 48	PIN 23	PIN 24	J 35	J 35	U4 PIN 11			
	14	XA 49	PIN 3	PIN 4	J 36	J 36	U4 PIN 10			
	15/B	XA 50	PIN 21	PIN 22	J 37	J 37	* PIN 44			
	16/A	XA 51	PIN 1	PIN 2	J 38	J 38	* PIN 47	J 39	J 39	

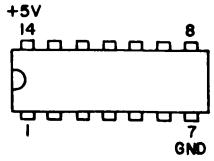
\* A8A53W2PI



S. TOP



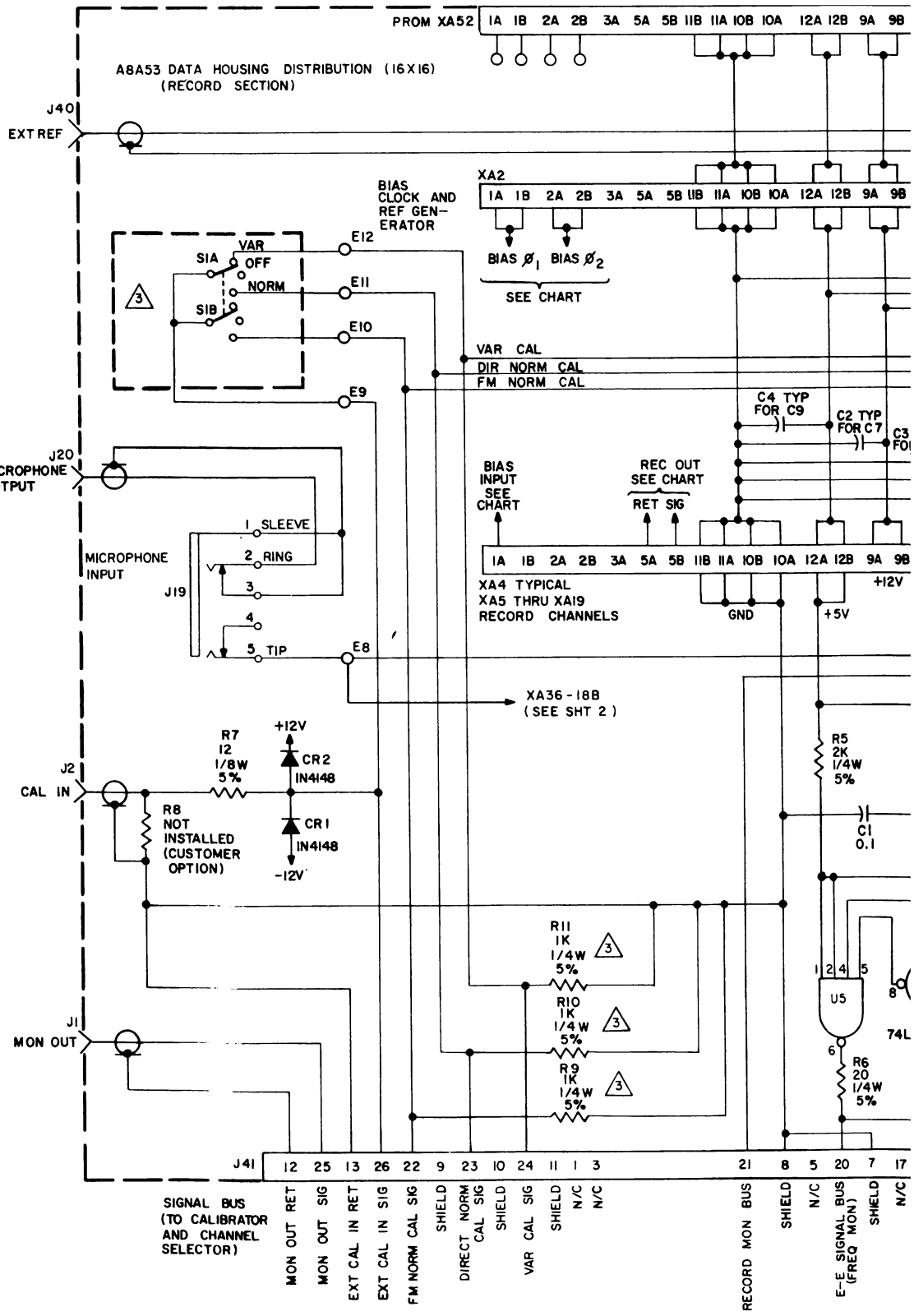
U1, U2, 74LS138  
U3, U4

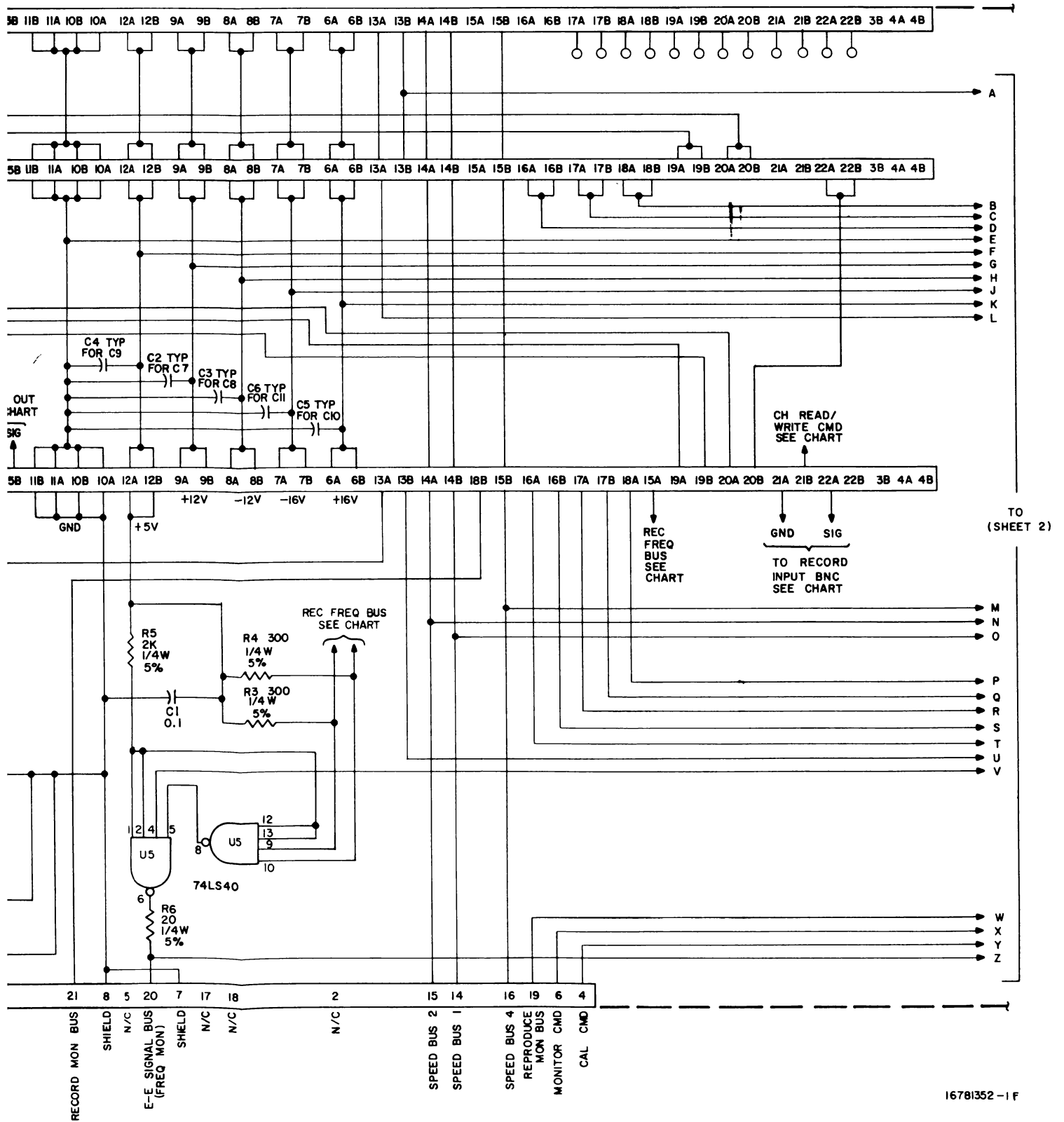


U5 74LS40

IN/WRIT MD	RECORD FREQUENCY BUS
I B	15 A
U2	U5
PIN 15	PIN 10
PIN 14	PIN 10
PIN 13	PIN 10
PIN 12	PIN 10
PIN 11	PIN 10
PIN 10	PIN 10
PIN 9	PIN 10
PIN 7	PIN 10
PIN 15	PIN 9
PIN 14	PIN 9
PIN 13	PIN 9
PIN 12	PIN 9
PIN 11	PIN 9
PIN 10	PIN 9
PIN 9	PIN 9
PIN 7	PIN 9

CHANNEL SELECT CMD	AUX. INPUT SIGNAL	GND
22B	5A	4A
U3 U4	COND	SHIELD
U3 PIN 15		
U3 PIN 14		
U3 PIN 13		
U3 PIN 12		
U3 PIN 11		
U3 PIN 10		
U3 PIN 9		
U3 PIN 7		
U4 PIN 15		
U4 PIN 14		
U4 PIN 13		
U4 PIN 12		
U4 PIN 11		
U4 PIN 10		
* PIN 44		
* PIN 47	J39	J39



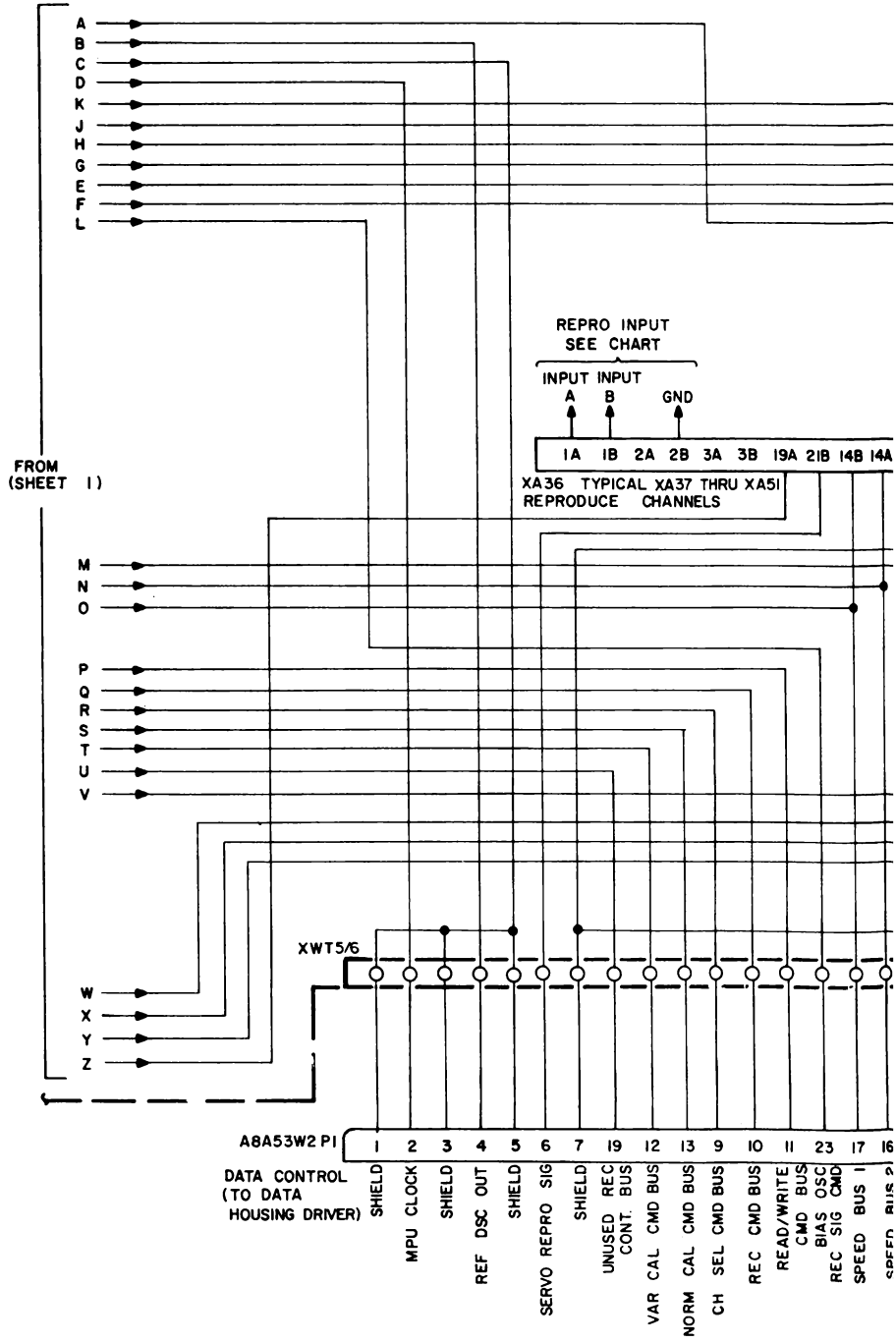


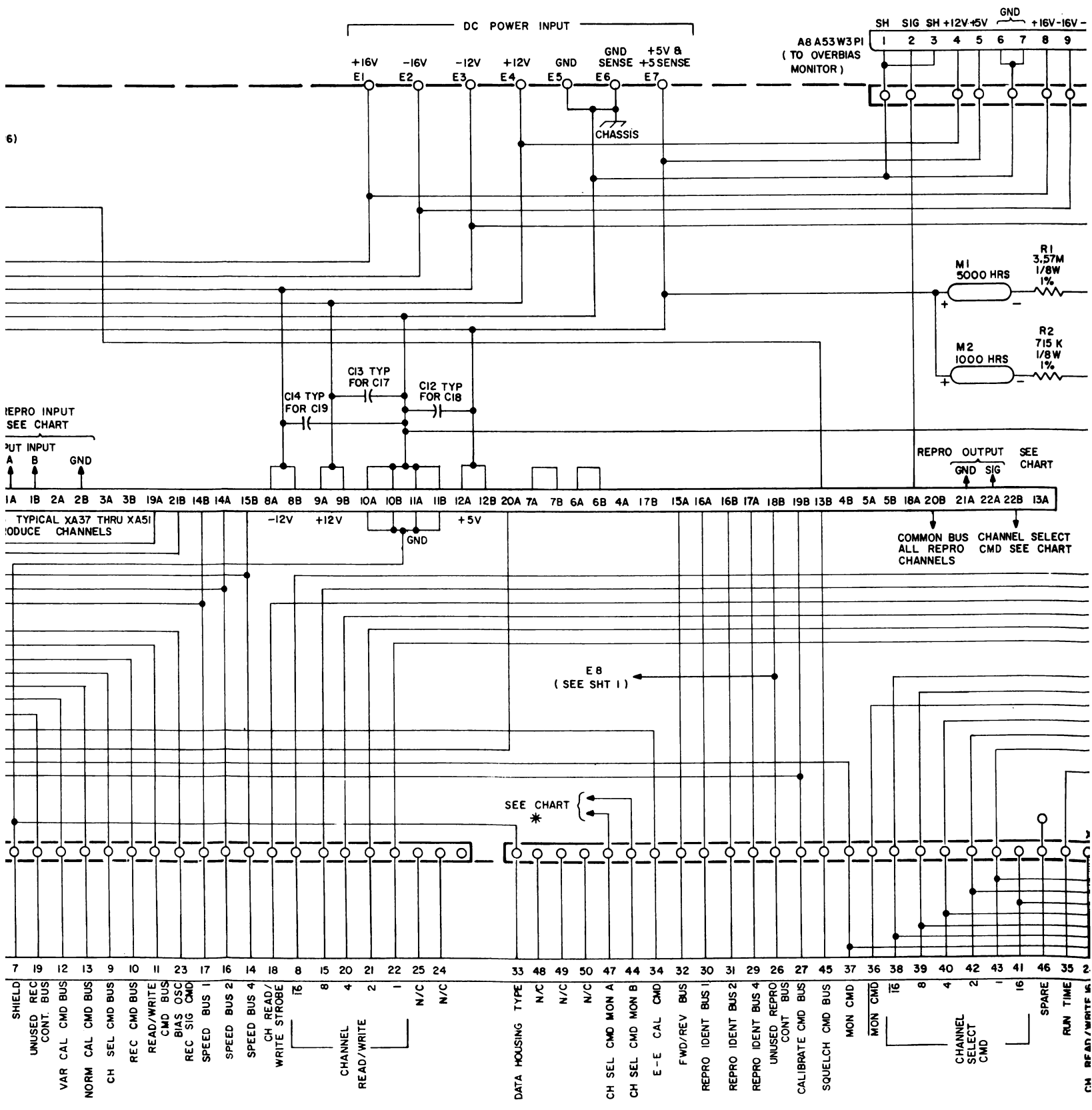
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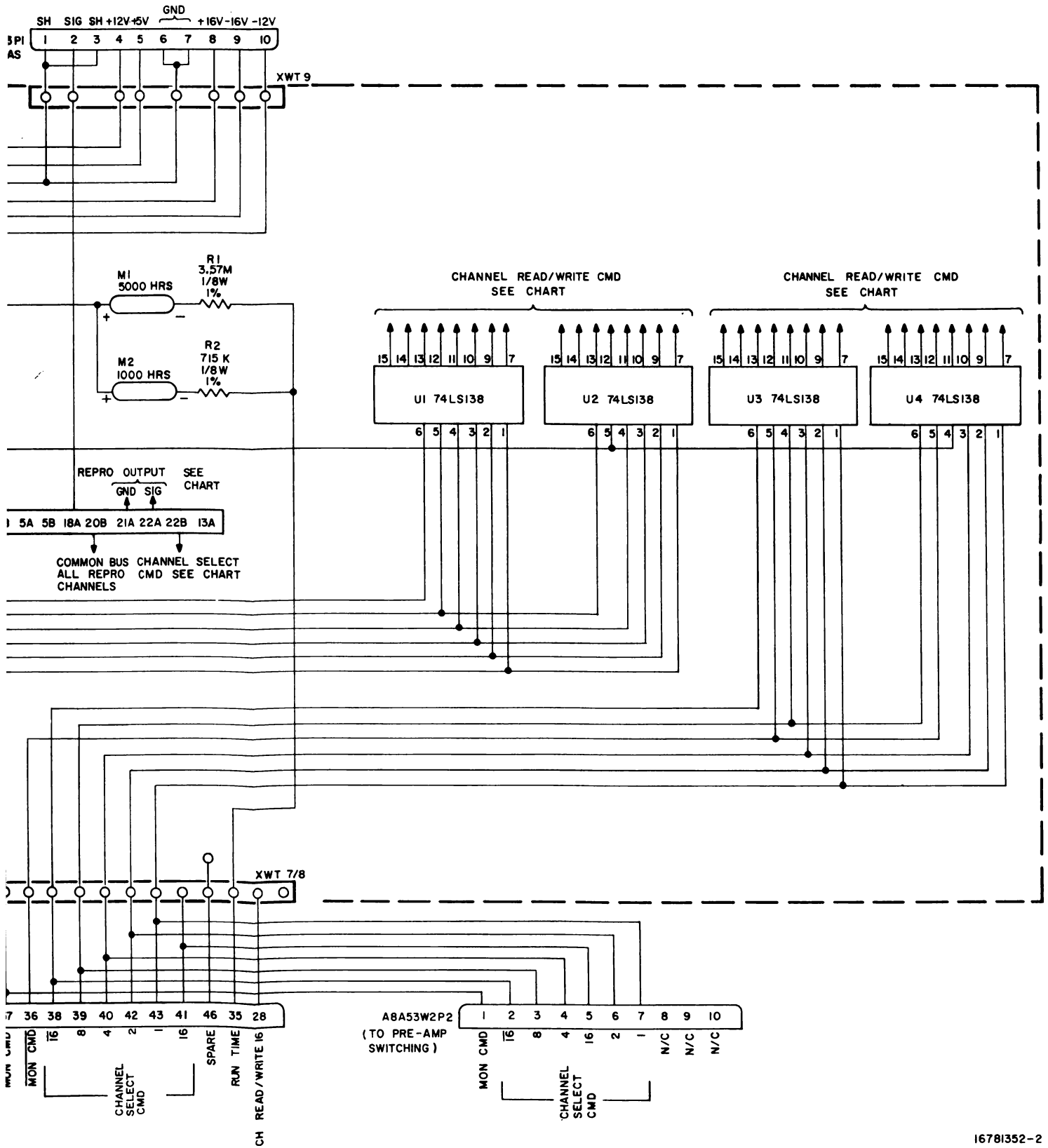
16781352- 1G

Figure 7-1. Data Housing Distribution Schematic (Sheet 1 of 2)

ABA53 DATA HOUSING DISTRIBUTION (16X16)  
(REPRODUCE SECTION)





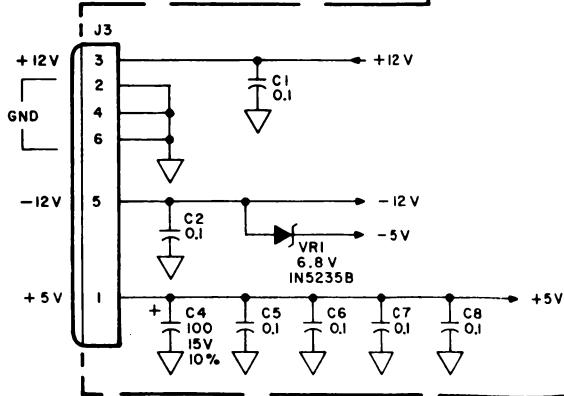
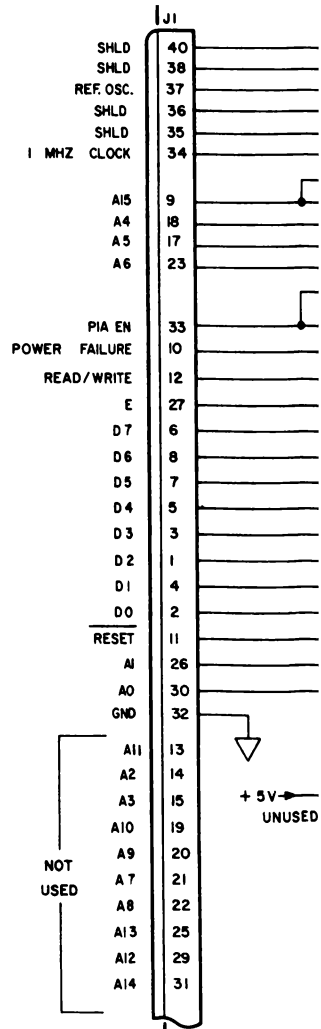
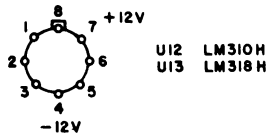
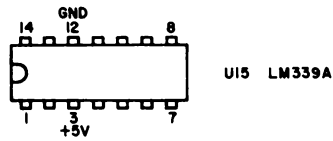
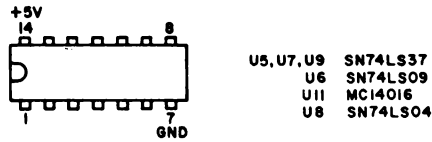
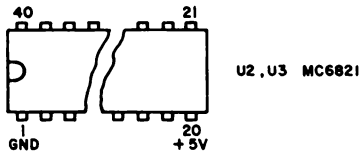
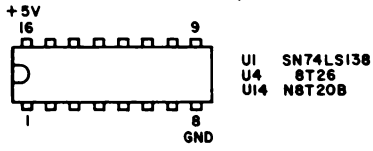


16781352-2

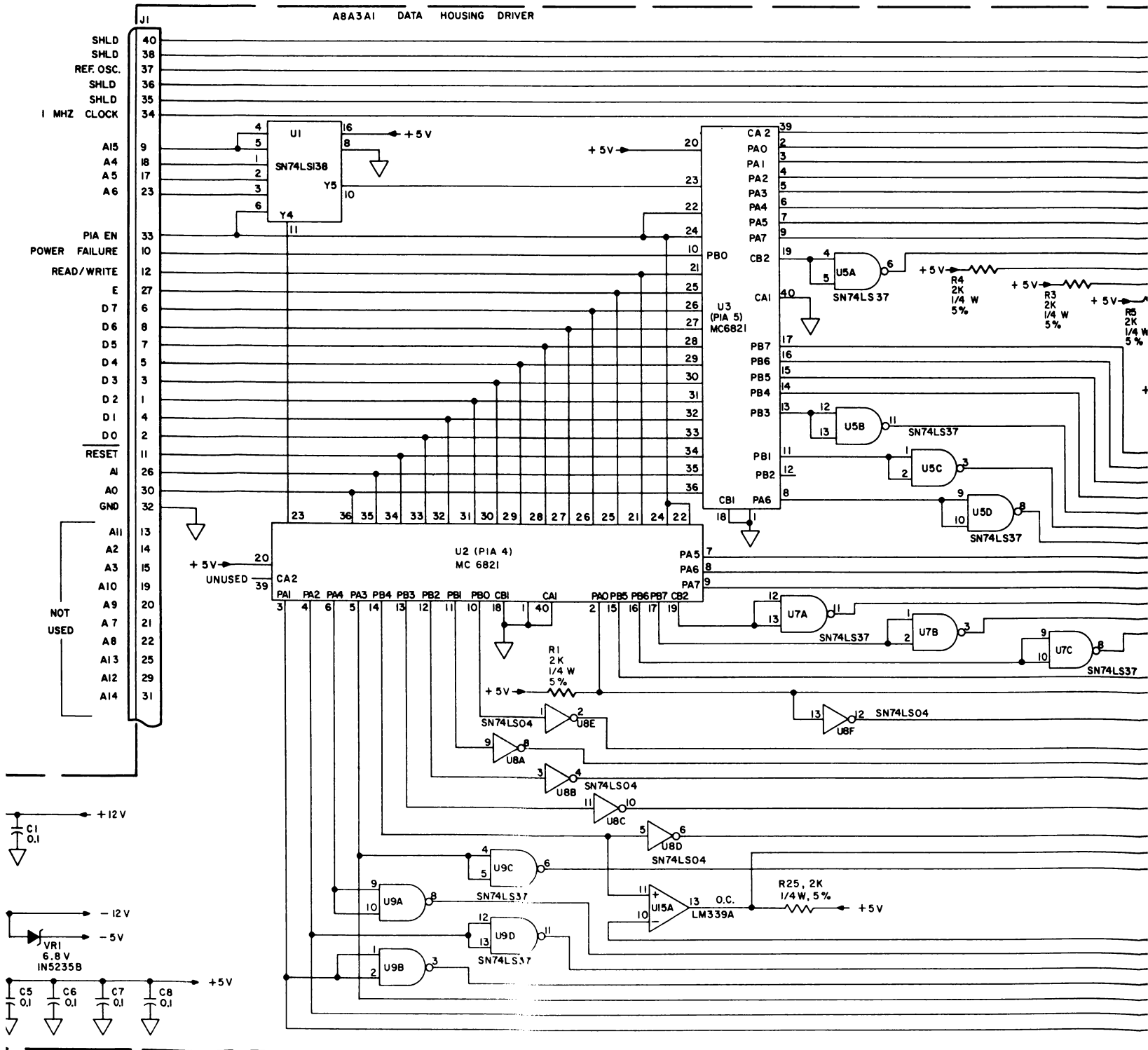
Figure 7-1. Data Housing Distribution Schematic (Sheet 2 of 2)

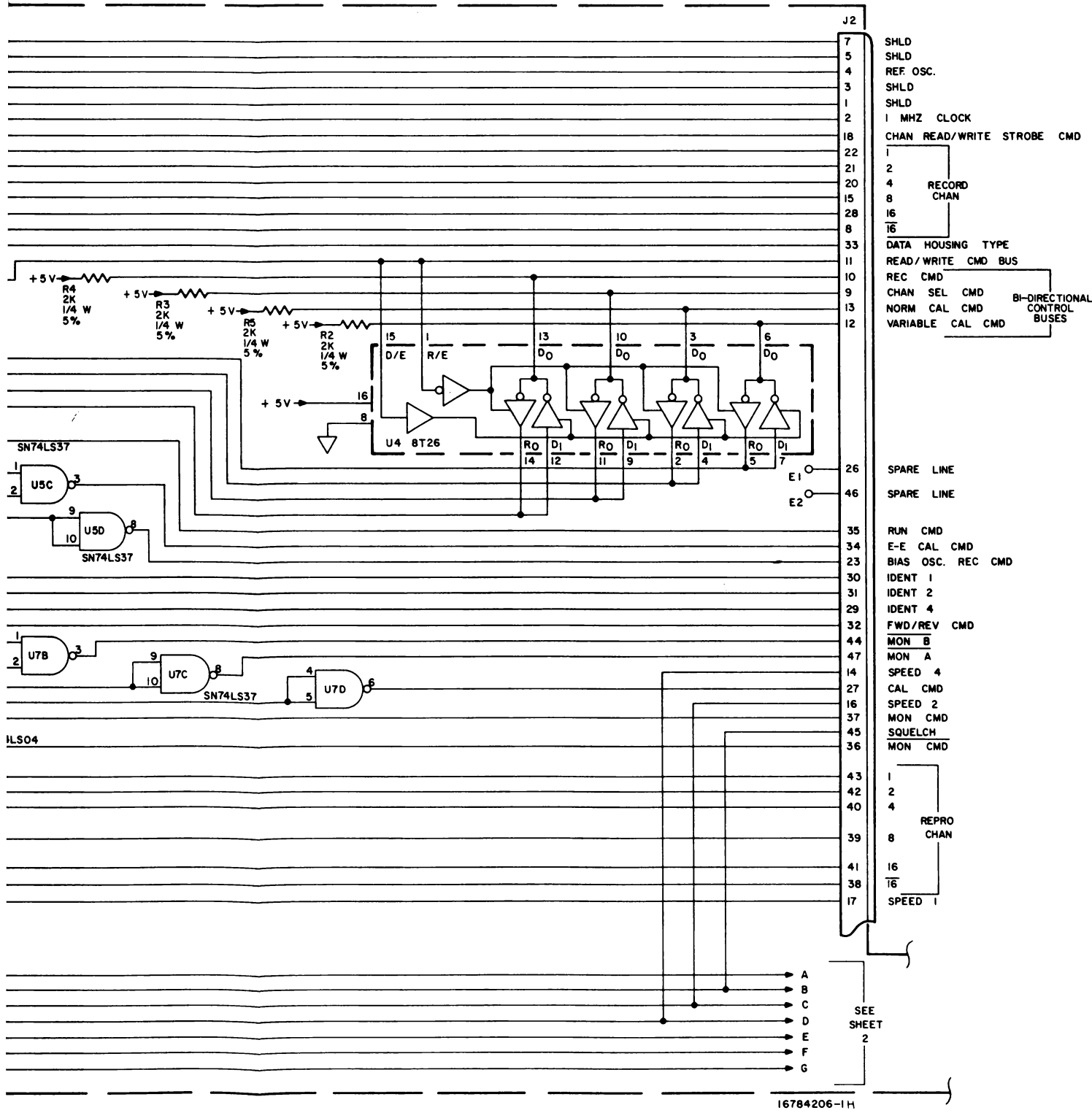
**NOTES**

1. UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%.  
ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.
2. ▽ DENOTES CIRCUIT COMMON.
3. O.C. DENOTES OPEN COLLECTOR.
4. △ UI0 IS A SEVEN RESISTOR ARRAY WITH VALUES OF 10K OHMS.
5. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



ABA3A1 DATA HOUSING DRIVER





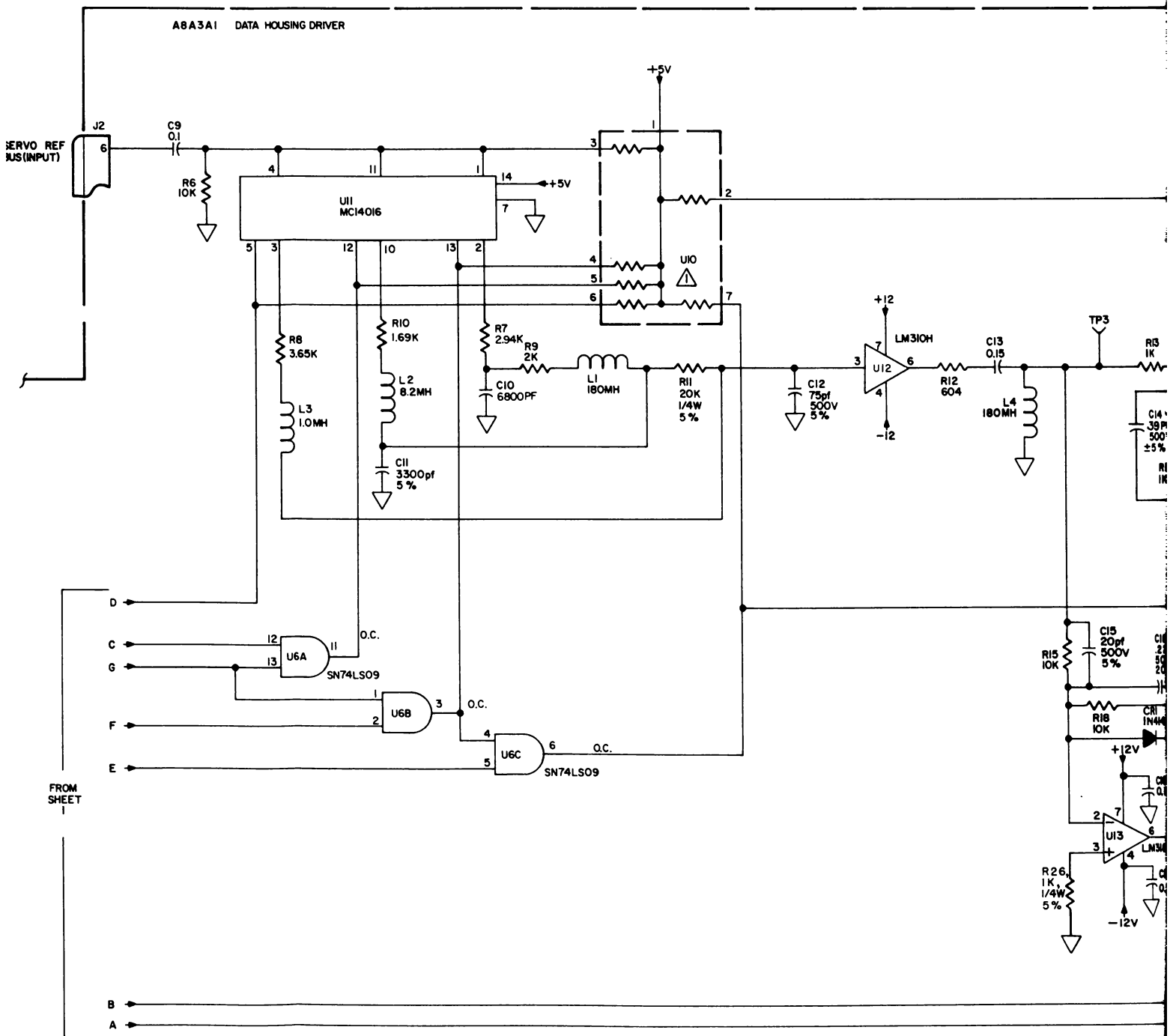
16784206-1H

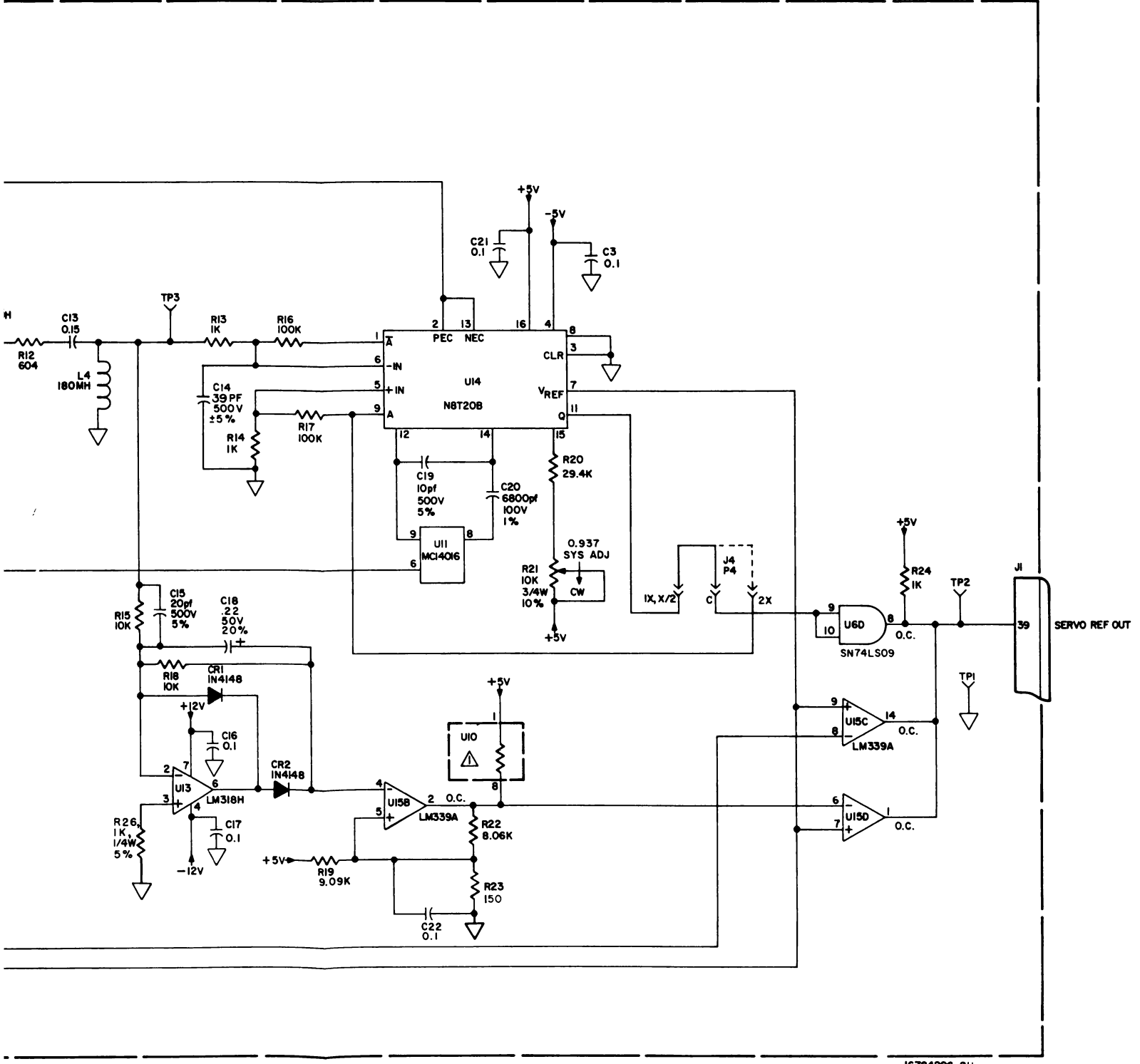
16784206-1J

Figure 7-2. Data Housing Driver Schematic (Sheet 1 of 2)



A8A3A1 DATA HOUSING DRIVER





16784206-2H

16784206-2K

Figure 7-2. Data Housing Driver Schematic (Sheet 2 of 2)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.

2.  $\nabla$  DENOTES SIGNAL GROUND.

3.  $\triangle$  DG201 I.C.S:  
 LOGIC 1 =  $V_{AH} \geq 2.4V =$  SWITCH OFF.  
 LOGIC 0 =  $V_{AL} \leq 0.8V =$  SWITCH ON.

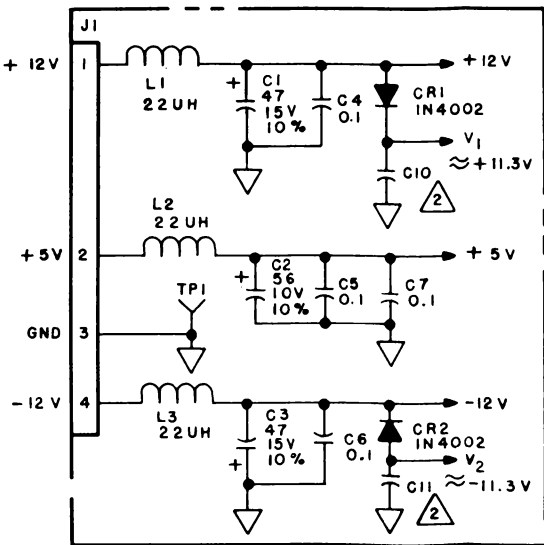
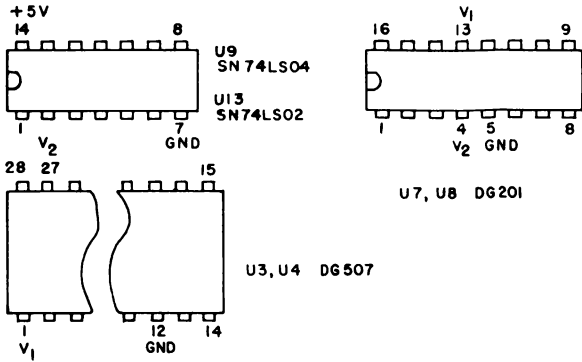
- $\triangle$  U11, U12, (2.2K) AND C10 AND C11 NOT INSTALLED.

$\triangle$  DG507 TRUTH TABLE:

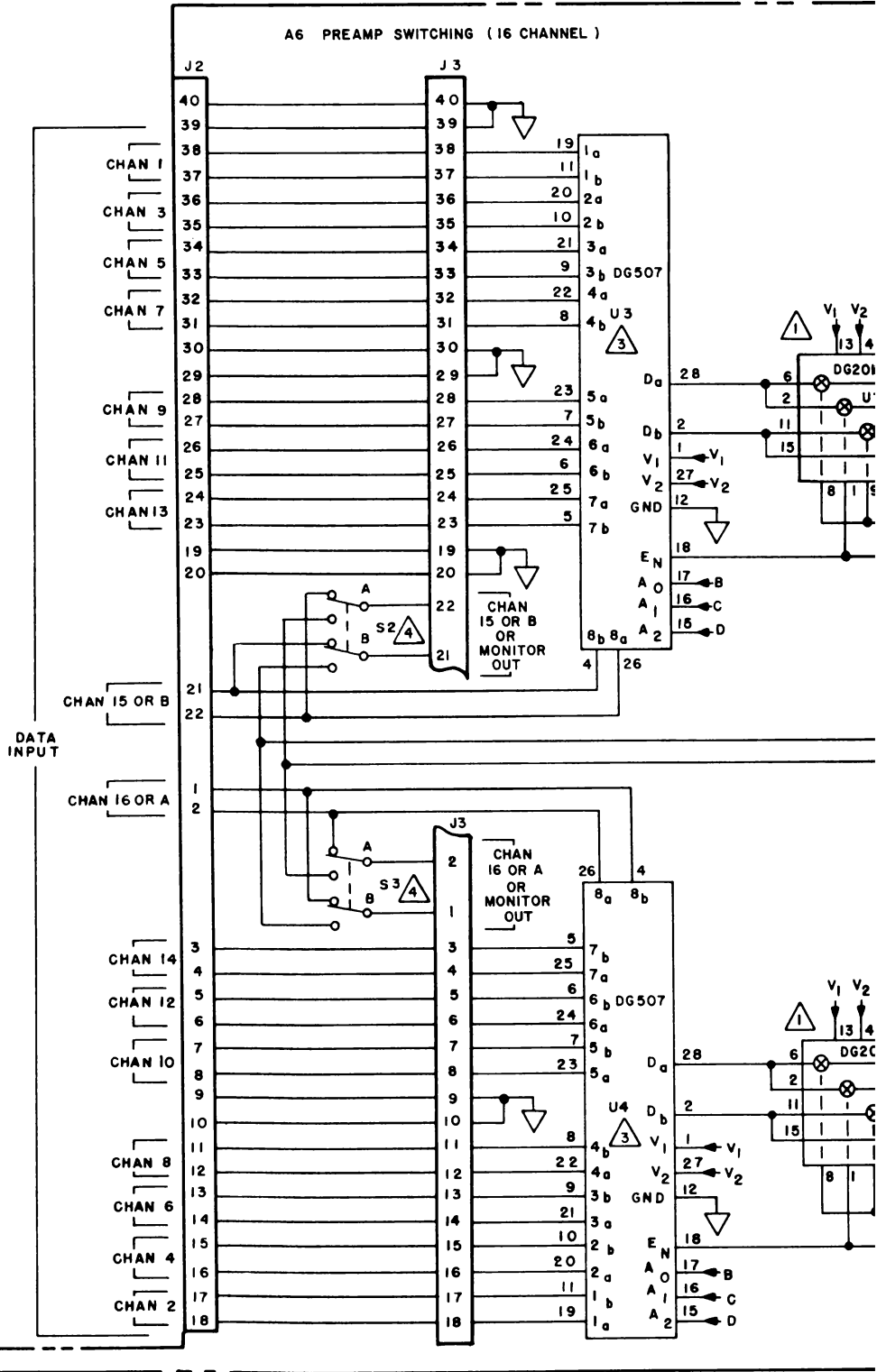
A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	E <sub>N</sub>	ON SWITCH PAIR
X	X	X	0	NONE
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	5
0	1	0	1	6
0	1	1	0	7
0	1	1	1	8

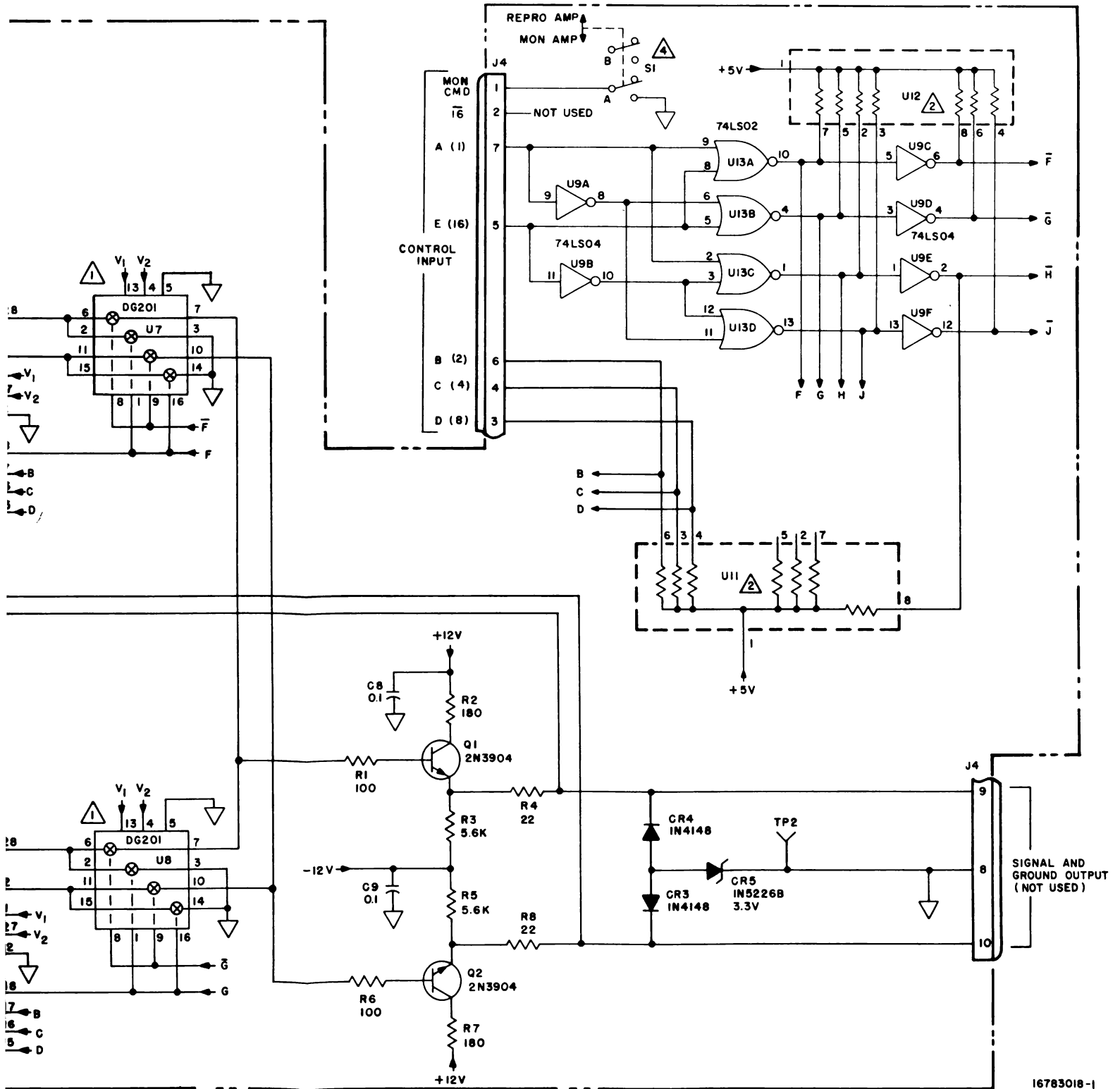
- $\triangle$  SWITCHES S1, S2 AND S3 POSITIONED EITHER ALL UP OR ALL DOWN.

4. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



A6 PREAMP SWITCHING (16 CHANNEL)





16783018-1

16783018-1C

Figure 7-3. Sixteen Channel Preamplifier Switching Schematic

# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
DATA HOUSING (32×2)  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

AUGUST 1984

## NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

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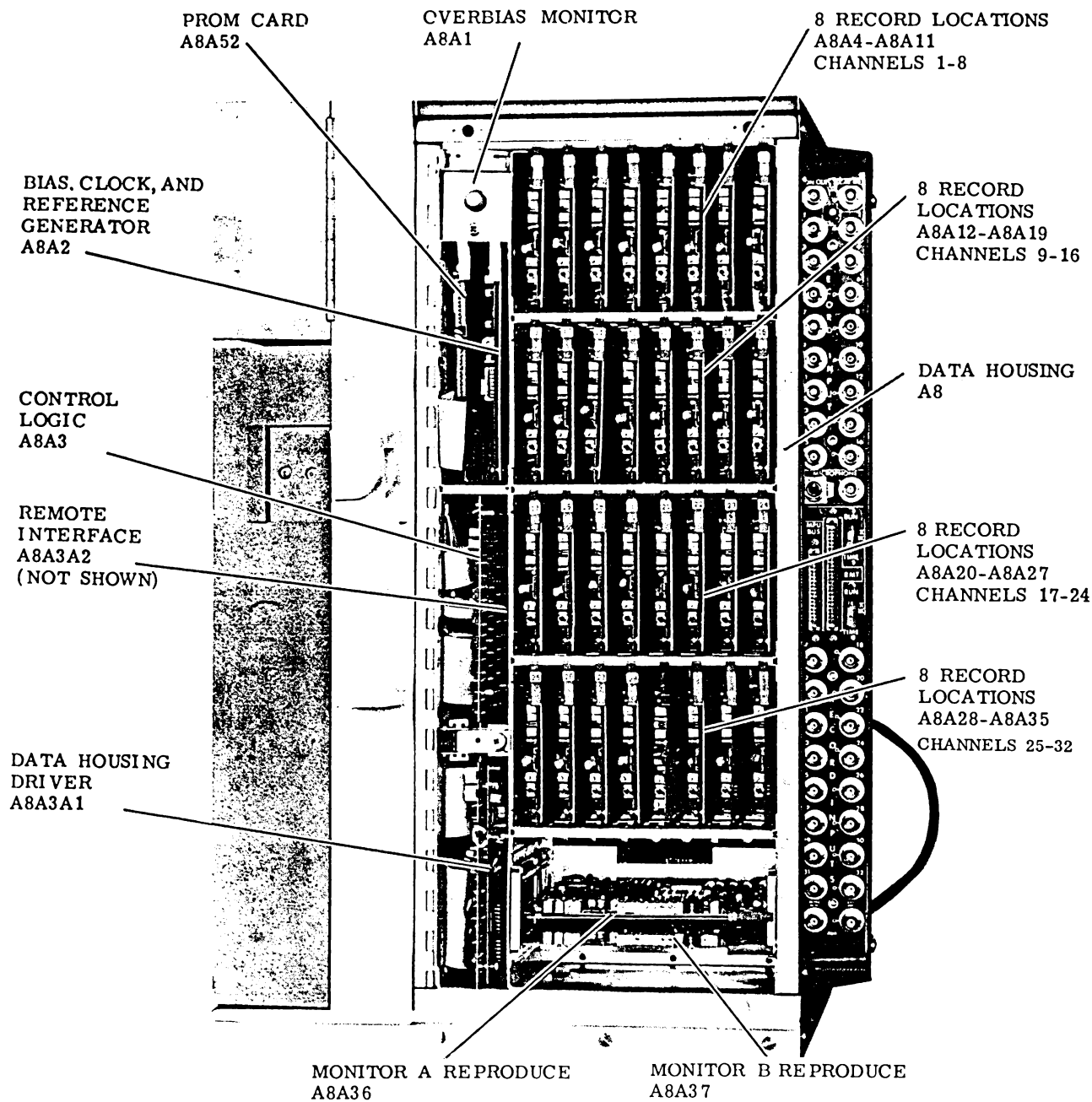
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101/32DH-1

Figure 1-1. Thirty-Two-By-Two Data Housing

101/32DH

## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the 32 x 2 data housing, data housing driver circuit card assembly, and the preamplifier switching circuit card assembly used in the Model 101 Magnetic Tape System. This manual contains only the information that is applicable to those three assemblies. The Operator's manual describes the interface and relationship to the rest of the Model 101 System.

#### 1-2. DESCRIPTION

The data housing occupies the entire right-hand side of the system. It houses the control logic (microcomputer and support logic); bias, clock, and reference generator; PROM card (8K words of memory); overbias monitor; data housing driver; remote interface; up to 32 record cards; and up to 2 monitor reproduce cards. (See Figure 1-1.)

The data housing driver, which is mounted on the control logic card in the data housing, interfaces the microcomputer with all the plug-in cards in the data housing. It provides adequate power to drive a full complement of data cards.

Also contained on the data housing driver is the servo reproduce interface section. This portion of the driver accepts the servo reference track from a direct reproduce card, or the optional servo reproduce card, and conditions the signal by filtering, squaring, and when required, doubling the frequency. The output is presented to the control logic for use when servoing from a prerecorded tape reference track.

The preamplifier switching card is located in the top left rear section of the recorder. Its function is to provide solid-state differential switching of any preamplifier output to a common pair of output lines. These output lines are connected to the monitor A and monitor B reproduce slots in the data housing. Five digital control lines provide switching capabilities for up to 32 channels.

#### 1-3. SPECIFICATIONS

##### A. DATA HOUSING

##### 1. Card Complement

- a. Record Cards: Up to a maximum of 32.
- b. Reproduce Cards: 2 maximum for monitoring.

- c. Miscellaneous Cards: 1 Control Logic; 1 PROM; 1 Bias, Clock, and Reference Generator; and 1 Overbias Monitor.

#### Input/Output Connectors

- a. Signal Input BNC's: 32 Record (one for each slot), 1 Calibration, and 1 External Reference.
- b. Signal Output BNC's: 1 Monitor Reproduce, 1 Microphone.
- c. Miscellaneous Connectors: 1 Microphone input telephone jack; 1, 50-pin ribbon connector for remote; 1, 34-pin ribbon connector for auxiliary housing MPU bus output; and 1, 10-pin ribbon connector for auxiliary housing signal bus.

### 3. Run Time Meters

Two run-time meters indicate the total elapsed time that the instrument has been operated in either the FWD or REV mode (not in the FAST mode). One meter is calibrated to 1,000 hours and the other to 3,000 hours. They are used for magnetic head warranty purposes.

### 4. Channel Read/Write CMD Decoder

Six control lines are decoded to provide the 32 individual lines used to set up the individual record cards. The six control input lines are coded as shown in Table 1-1. The decoder is strobed by the channel read/write strobe. All control signals are TTL compatible, and the decoded channel is a logic zero when the strobe is a logic zero.

### 5. E-E Signal Bus

The record frequency bus on record channels 1 through 8 is gated with the same bus on record channels 9 through 16, 17 through 24, and 25 through 32 when the E-E Cal Cmd is a logic one. The record frequency bus is connected to the E-E Signal Bus on each reproduce card and to the meter monitor. Signals are TTL compatible with a maximum frequency of 1.2 MHz and are capable of driving more than 16 FM reproduce cards.

Table 1-1. Control Line-to-Channel Code

CHANNEL NUMBER	CONTROL LINE						CHANNEL NUMBER	CONTROL LINE					
	$\overline{16}$	16	8	4	2	1		$\overline{16}$	16	8	4	2	1
1	1	0	0	0	0	0	17	0	1	0	0	0	0
2	1	0	0	0	0	1	18	0	1	0	0	0	1
3	1	0	0	0	1	0	19	0	1	0	0	1	0
4	1	0	0	0	1	1	20	0	1	0	0	1	1
5	1	0	0	1	0	0	21	0	1	0	1	0	0
6	1	0	0	1	0	1	22	0	1	0	1	0	1
7	1	0	0	1	1	0	23	0	1	0	1	1	0
8	1	0	0	1	1	1	24	0	1	0	1	1	1
9	1	0	1	0	0	0	25	0	1	1	0	0	0
10	1	0	1	0	0	1	26	0	1	1	0	0	1
11	1	0	1	0	1	0	27	0	1	1	0	1	0
12	1	0	1	0	1	1	28	0	1	1	0	1	1
13	1	0	1	1	0	0	29	0	1	1	1	0	0
14	1	0	1	1	0	1	30	0	1	1	1	0	1
15	1	0	1	1	1	0	31	0	1	1	1	1	0
16	1	0	1	1	1	1	32	0	1	1	1	1	1

6. CAL IN Clamp

Diode clamping is used to limit the CAL input signal to +12 volts. Maximum allowable input is +15 volts.

7. DC Power

The data housing distributes power supply voltages of +16 volts, +12 volts, and +5 volts.

B. MPU BUFFER SECTION OF DATA HOUSING DRIVER

1. Power Supply Voltages

+5 Vdc (+5%) @ 205 mA, typical.

2. Certain logic lines are inputs only. Certain other logic lines are bidirectional and operate under microprocessor control, as either inputs or outputs. In all cases, the logic levels (voltage) are TTL compatible.

a. Logic Lines: The designation of each logic input line and bidirectional line is as follows:

INPUT LINE DESIGNATION	BIDIRECTIONAL LINE DESIGNATION
A <sub>0</sub>	D <sub>0</sub>
A <sub>1</sub>	D <sub>1</sub>
$\overline{\text{RESET}}$	D <sub>2</sub>
E	D <sub>3</sub>
R/ $\overline{\text{W}}$	D <sub>4</sub>
A <sub>15</sub>	D <sub>5</sub>
PIA ENABLE	D <sub>6</sub>
A <sub>6</sub>	D <sub>7</sub>
A <sub>5</sub>	
A <sub>4</sub>	
GROUND	

- b. PIA ADDRESSING: The addressing requirements for the PIA's are as follows:

ADDRESS	A <sub>15</sub>	A <sub>6</sub>	A <sub>5</sub>	A <sub>4</sub>	PE	A <sub>1</sub>	A <sub>0</sub>	PIA
0440 <sub>16</sub>	0	1	0	0	1	0	0	U2
0441 <sub>16</sub>	0	1	0	0	1	0	1	
0442 <sub>16</sub>	0	1	0	0	1	1	0	
0443 <sub>16</sub>	0	1	0	0	1	1	1	
0450 <sub>16</sub>	0	1	0	1	1	0	0	U3
0451 <sub>16</sub>	0	1	0	1	1	0	1	
0452 <sub>16</sub>	0	1	0	1	1	0	1	
0453 <sub>16</sub>	0	1	0	1	1	1	1	

### 3. Logic Conditions Data Housing Interface

- a. Channel Read/Write Commands: These six control lines are the binary coded signals 1, 2, 4, 8, 16, and  $\overline{16}$  which are decoded into 32 separate lines. The code is shown in Table 1-1. Zero is the low-level output and one is the high-level output. Each of the six lines drives a maximum of four low-power Schottky loads.

- b. Data Housing Type: This signal is an input to the PIA. Zero volts (ground) indicates that the data housing is 16 x 16 maximum. +5 volts indicates that the data housing is 32 x 2.
- c. Read/Write Command: This signal is used to change quad bus driver/receiver U4 from the receiver mode to the driver mode. Maximum loading 64 low-power Schottky TTL loads. Read is logic zero, write is logic one.
- d. Bidirectional Buses: Variable Cal Command, Normalized Cal Command, Channel Select Command, and Record Command.

The four bus lines are the ones referred to above. In the read mode, the control system recognizes and stores for display on the channel selector, the following codes.

VAR CAL BUS	NORM CAL BUS	CHAN SEL BUS	REC CMD BUS	RECORD DATA CARD TYPE
1	1	1	1	No card or off
1	0	1	1	MBFM cal option
1	1	0	1	WMFM cal option
0	0	1	1	MB direct cal option
0	1	0	1	WB direct cal option
1	1	1	0	Voice or special
1	0	1	0	WBFM no cal option
1	1	0	0	WBFM no cal option
0	0	1	0	MB direct no cal option
0	1	0	0	WB direct no cal option

In the write mode, the four bus lines are used as control inputs to the record cards. Maximum loading on each bus line is 32 low-power Schottky TTL loads. Logic zero to command the function, logic one to disable the function.

Variable Cal and Normalized Cal are a logic zero when commanded by the control panel and calibrator. Channel select command is a logic zero when selected by the channel selector. The record command is a logic zero when commanded by the record button on the control panel.

- e. E-E Cal Command: A logic zero level indicates that the E-E Cal is off. A logic one indicates E-E Cal is on. Maximum loading one Schottky TTL load.
- f. Run Time: A logic zero level indicates that the tape transport is running in either drive forward or drive reverse only (not fast). A logic one level indicates all other conditions including tape break. Maximum loading less than 100 microamps.
- g. Channel Read/Write Strobe: This signal is used to strobe the data housing decoders. Two isolated negative-going pulses, synchronized with the read/write command, are required for each channel. The first pulse commands the reading of the record data card type. The second pulse strobes the four control commands into four latches on each record card. Maximum loading four low-power Schottky TTL loads.
- h. Monitor Command: A logic zero (ground) indicates that the system is to use monitor cards via the switched preamplifiers. A logic one (open circuit) indicates preamplifier monitoring is not required.
- i. Monitor Command: This output signal is the inverted monitor command. Logic zero indicates monitoring via reproduce cards. Logic one indicates monitoring via the preamplifier switching unit. Maximum loading two low-power Schottky TTL loads.
- j. Channel Select Commands: These six control lines are similar to the channel read/write commands except that these signals are not cycled at a predetermined rate. They are incremented or decremented by channel select pushbuttons on the meter monitor. The output code is detailed in Table 1-1. Output loading two low-power Schottky TTL loads.
- k. Reproduce Ident 1, 2, and 4: These three bus line inputs indicate, to the MPU, the type of reproduce card in the particular channel selected by the channel selector, if the monitor command is a logic one. The code is as follows.

PIN NUMBER			REPRODUCE DATA CARD TYPE
29	31	30	
1	1	1	No card
1	0	1	MB FM
1	1	0	WB FM
0	0	1	MB direct
0	1	0	WB direct
0	0	0	Servo, voice, or special

- l. Monitor A and Monitor B Commands: A logic zero indicates selection of one of these two lines. Maximum loading two TTL loads.
- m. Calibrate Command: A logic zero indicates that the system is operating in any calibrate mode. A logic one indicates any of the operating or non-operating modes. Maximum 16 low-power Schottky TTL loads.
- n. Squelch Command Bus: A squelch signal level (logic one) is provided at all times except when the capstan is operating in phase lock. Then a logic zero is provided.
- o. Bias Oscillator Record Signal Command: A logic zero indicates that the system is operating in the record mode. A logic one indicates any other operating or non-operating mode. When the MPU switches from the record mode to any other mode, this line is delayed by 25 milliseconds, minimum, before switching from a logic zero to a logic one. Maximum eight low-power Schottky TTL loads.
- p. FWD/REV Bus: This signal is a logic one in any forward or standby mode, and a logic zero in any reverse mode. Maximum loading 15 low-power Schottky TTL loads.
- q. Reproduce Speed Buses 1, 2, 4: The selected speed is coded on three lines as follows:

4	2	1	TAPE SPEED IPS
1	1	1	120
1	1	0	60
1	0	1	30
1	0	0	15
0	1	1	7.5
0	1	0	3.75
0	0	1	1.87
0	0	0	.937

Maximum loading 36 low-power Schottky TTL loads.

- r. Power Failure Command: This is an input from the control panel dc power logic and indicates to the control system whether or not all dc power voltages are present. Logic one indicates power failure, logic zero indicates power ok.



C. SERVO REPRODUCE INTERFACE SECTION OF DATA HOUSING DRIVER

1. Power Supply Voltages

- a. +12 Vdc ( $\pm 5\%$ ).
- b. -12 Vdc ( $\pm 5\%$ ).
- c. +5 Vdc ( $\pm 5\%$ ).

2. Servo Reference Signal Input

- a. 1 volt peak-to-peak minimum.
- b. 5 volt peak-to-peak maximum.

3. Servo Reference Signal Output

TTL Compatible, will drive one TTL load.

4. Card Programming

IRIG Standard Jumper

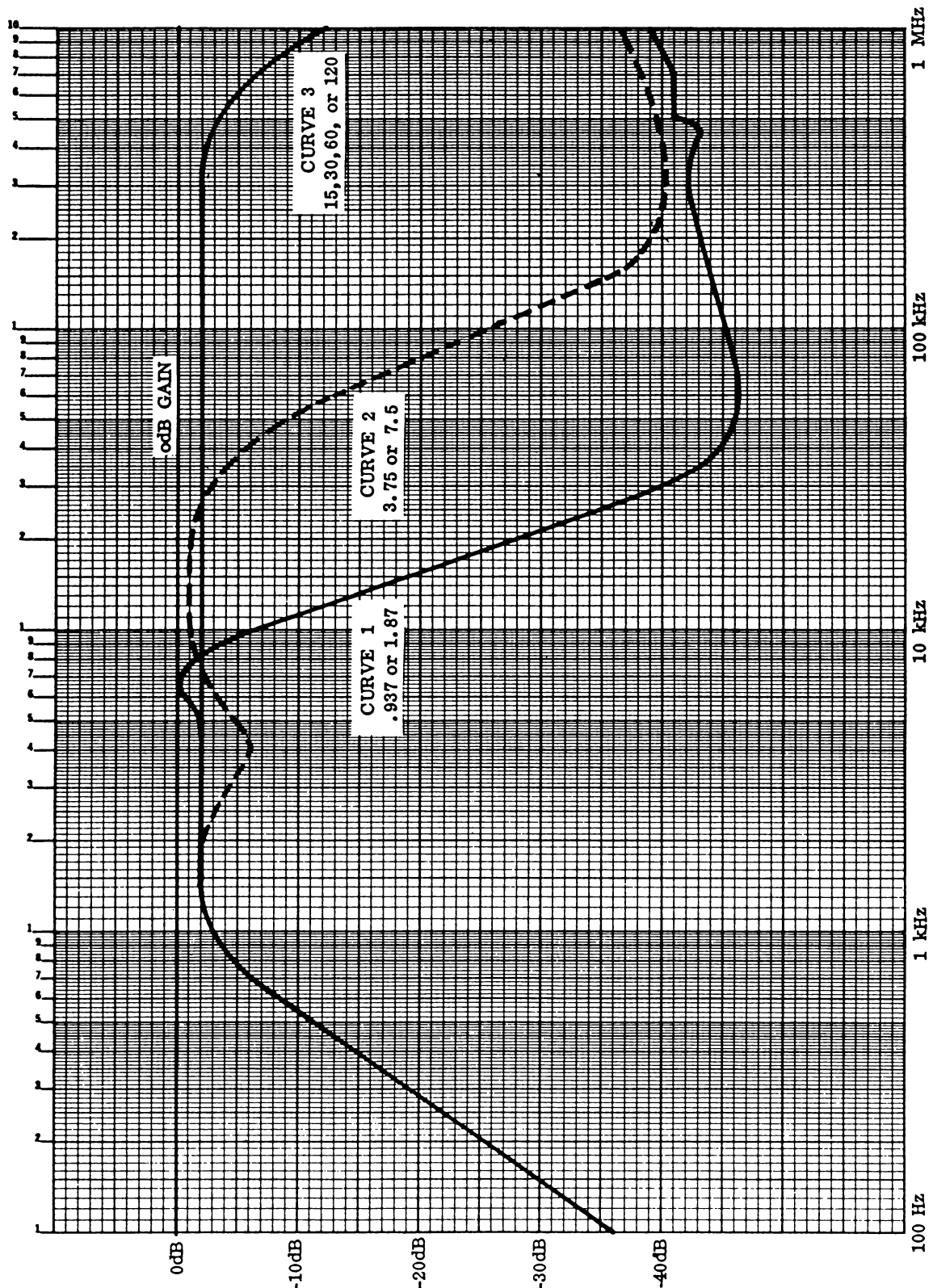
- a. C-2X is 2X IRIG.
- b. C-1X, X/2 is 1X IRIG or X/2 IRIG. (X/2 use requires the optional servo reproduce card.)

5. Signal Processing Input Filtering (See Figure 1-2)

- a. .937 or 1.87 IPS is Curve 1 ( $\pm 4$  dB).
- b. 3.75 or 7.5 IPS is Curve 2 ( $\pm 4$  dB).
- c. 15, 30, 60, or 120 IPS is Curve 3 ( $\pm 4$  dB).

6. Dropout Detector Stage

- a. Dropout Level: 0.160 ( $\pm 0.050$ ) Vrms.
- b. Hysteresis: 0.060 ( $\pm 0.040$ ) Vrms.
- c. A signal level below the dropout level clamps TP2 to a logic zero. A signal level above the dropout level, plus the hysteresis, allows normal operation at TP2.



101/32DH-4

Figure 1-2. Input Filtering Response

7. Comparator and One-Shot Stage

- a. The TTL signal at U14 pin 9 is a logic one for positive signal at TP3, and a logic zero for a negative signal at TP3.
- b. Hysteresis: 0.100 ( $\pm 0.040$ ) V peak-to-peak.
- c. A TTL one pulse is generated at U14 pin 11 for each zero crossing of the signal at TP3. The pulse width is 100 nSec to 1 uSec for 1.87 IPS through 120 IPS operation. The pulse width is adjustable to 160 uSec (with R21) for .937 IPS operation.

8. Squelch

- a. When squelch is a logic one, the output signal is a logic zero.
- b. When squelch is a logic zero, the output operates normally.

D. PREAMPLIFIER SWITCHING

1. Power Supply Voltages

- a. +12 Vdc ( $\pm 0.2\%$ ) @ 23 mA typical.
- b. -12 Vdc ( $\pm 0.2\%$ ) @ 23 mA typical.
- c. -5 Vdc ( $\pm 5\%$ ) @ 10 mA typical.

2. Signal Inputs

- a. Type: Differential.
- b. Voltage:  $\pm 1.5$ V peak ac typical,  $\pm 5.0$  peak ac maximum.
- c. Frequency: 100 Hz to 2 MHz.
- d. DC Offset: +0.6 to +1.5 Vdc common mode,  $\pm 0.25$  Vdc differential.

3. Source Impedance

100 ohms maximum.

3. Source Impedance

100 ohms maximum.

4. Signal Output

- a. Type: Differential.
- b. Gain: X1.
- c. Load Impedance: 2,500 ohms minimum, 200 pF maximum.

5. Control Inputs

Five control lines at TTL logic levels determine the channel selected according to the code in Table 1-1. The  $\overline{16}$  line is not used by the preamplifier switching.

E. ENVIRONMENT

Unless otherwise specified, the performance characteristics shall be obtained under any combination of the following environmental conditions.

Ambient Temperature	0°C to 70°C
Relative Humidity	5 to 95% non-condensing
Altitude	0 to 15,000 feet

## SECTION 2

### INSTALLATION

#### 2-1. DATA HOUSING

The data housing is hinge-mounted to the main vertical bulkhead with four mounting screws. To remove the data housing, the rear cover and side panel must be removed first. Remove the bottom trim (three screws) and remove the four mounting screws that fasten through the center partition into the distribution board. These screws are located between the two rows of BNC connectors. Before removing the hinge screws, unplug the record head connectors, the connector to J4 on the pre-amplifier switching, and the connector to J8 on the +12V regulator/distribution.

#### **CAUTION**

System power must be turned off when installing or removing the data housing.

#### 2-2. DATA HOUSING DRIVER

The data housing driver mounts on the lower half of the control logic. The rear of the data housing driver mounts to the rear of the control logic. A mylar insulator is required between the two units. Four screws attach the driver to stand-offs on the rear of the control logic.

#### **CAUTION**

System power must be turned off when installing or removing the data housing driver.

Care must be taken to position the 6-pin power connection properly when installing the driver.

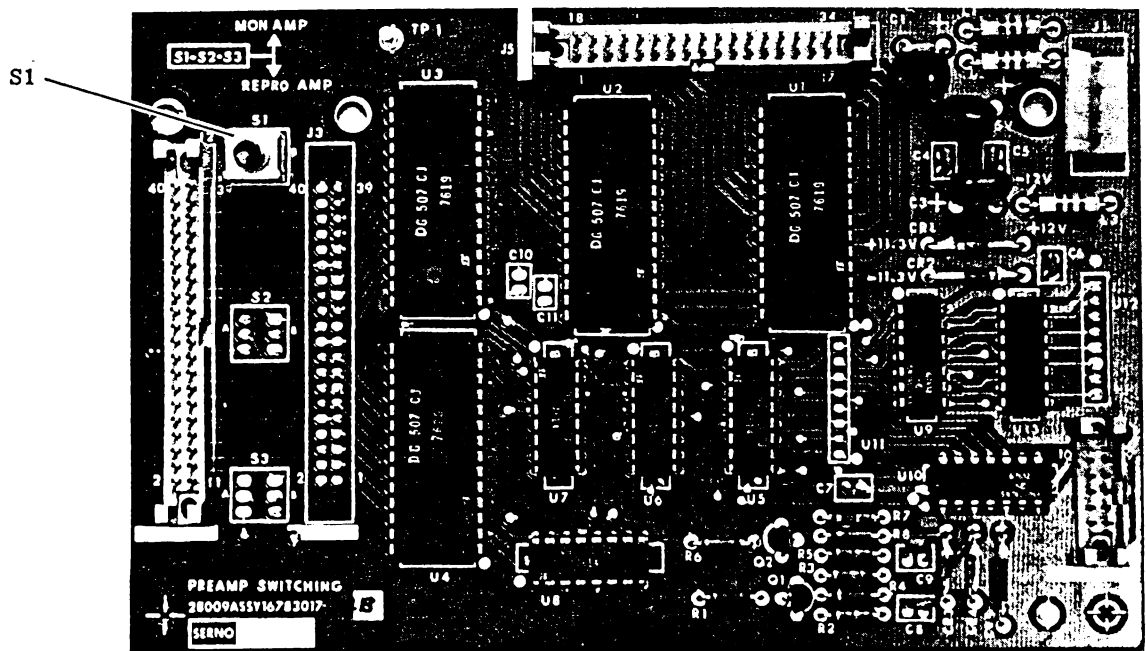
#### 2-3. PREAMPLIFIER SWITCHING

The preamplifier switching circuit card assembly (CCA) mounts vertically in the top, rear of the Model 101 above the fans. The CCA is held in place with three

screws. Remove top panel for access. Verify that switch S1 is positioned correctly. (See Figure 2-1.)

**CAUTION**

System power must be turned off when the preamplifier switching CCA is being installed or removed.



101/32DH-2

Figure 2-1. Preamplifier Switching Circuit Card Assembly

101/32DH

## SECTION 3

### OPERATION

Operating procedures are not required for the data housing, data housing driver, or the preamplifier switching. Refer to the Operator's Manual for general operating instructions.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the data housing, data housing driver, and the preamplifier switching. Refer to Section 7 for the schematics.

#### 4-2. FUNCTIONAL DESCRIPTION

##### A. DATA HOUSING

The data housing assembly houses all the control and data electronics for the Model 101 tape system. All the data input/output connectors are mounted on this printed wiring board. Additionally the remote connector, MPU bus output connector, and miscellaneous system input/outputs (such as voice) are mounted in this board. Two elapsed time indicators show the time that the system has been operating in either the drive forward or reverse modes.

##### B. DATA HOUSING DRIVER

###### 1. MPU Buffer Section

The interface between the microcomputer and the data housing is contained on the data housing driver. Data flows into and out of the data housing driver through two (U2 and U3) peripheral interface adapter (PIA) circuits. Each PIA is connected to the microprocessor bus through the  $D_0$  through  $D_7$  bidirectional data lines and the  $\overline{\text{RESET}}$ ,  $R/\overline{W}$ , E, and PE unidirectional control lines.

To write into a PIA, it is first addressed by generating the proper address on the  $A_0$ ,  $A_1$ ,  $A_4$ ,  $A_5$ ,  $A_6$ , and  $A_{15}$  lines. U1 partially decodes the address lines to U2 and U3. In addition,  $\overline{\text{RESET}}$  and PE lines are made equal to a logic one. The  $R/\overline{W}$  signal determines if the information on the eight lines is stored in one of several registers within the PIA, or transferred out of the PIA onto the data bus. When  $R/\overline{W}$  is a logic zero, data is transferred from the PIA onto the data bus. Data transfer in either direction occurs when the E line is brought to a logic one state.

Once addressed, the MPU may program each of the 16 PIA output ports, plus the CA2 and CB2 ports, to be inputs or outputs. Because each PIA is capable of driving only one TTL load, buffers are required to drive a full complement of data cards. Four of the data lines provide bidirectional communication and are buffered by a tri-state quad bus driver/receiver on U4 (8T26). Nineteen lines are programmed as outputs and are buffered by U5, U7, U8, U9, and part of U15.



Seven lines only drive four low-power Schottky TTL loads and are not buffered. Five lines are programmed as inputs and are not buffered.

## 2. Servo Reproduce Interface Section

This section contains the filters, pulse shaper, pulse doubler, and dropout detector that allow the MD101 to servo from a prerecorded reference track on the tape.

### C. PREAMPLIFIER SWITCHING

The preamplifier switching is accomplished with differential solid-state switches U1 through U8. Five digital lines control the switching. The preamplifier signals from channels 1 through 16 enter via connector J2, and the signals from channels 17 through 32 via connector J5. The control lines select the signal on one of the 32 channels and route it through connector J4 to the two monitor reproduce amplifiers in the data housing.

## 4-3. CIRCUIT DESCRIPTION

### A. DATA HOUSING (Figure 7-1)

The record input and reproduce output BNC connectors route directly to the individual data cards. The CAL IN BNC is connected through a limiting resistor and two clamping diodes to prevent overdriving the CAL input on the calibrator, or the CAL input on the record cards. If no calibrator is installed in the system, then switch S1 is installed between the CAL IN and MON OUT. This switch directs the calibrate signal onto either the variable calibrate bus or the two normalized calibrate buses. When the calibrator is installed, this switching is done automatically under microcomputer control.

A 6-to-32 line decoder (U1, U2, U3, and U4) is used on the record side to set up the status of each record card. Four 3-to-8 line decoders (74LS138) are connected together to provide the 6-to-32 line decoder. The channel read/write strobe is used to cycle each one of the 32 outputs. This provides two negative-going pulses, in sequence, to each of the 32 record cards. The first pulse is used by the record card to read out the type of record card on the four bidirectional buses. (See Table 4-1 for record card code.) After reading the record card type, the second pulse is used to write command status information into the four latches on the record card control inputs. The four status commands are record, channel select, variable, or normalized calibrate input. This reading and writing is cycled through each of the 32 record cards by the microcomputer.

On the reproduce side, there are only two reproduce cards. These are both used as monitors. Both inputs are common and are supplied by the output of the preamplifier switching unit. The control signal to select the required one of the two monitor cards is supplied from two PIA output ports on the data housing

Table 4-1. Record Card Type Code

PIN NUMBER				RECORD CARD TYPE
12	19	9	10	
1	1	1	1	No card or off
1	0	1	1	MBFM cal option
1	1	0	1	WBFM cal option
0	0	1	1	MB direct cal option
0	1	0	1	WB direct cal option
1	1	1	0	Voice or special
1	0	1	0	MBFM no cal option
1	1	0	0	WBFM no cal option
0	0	1	0	MB direct no cal option
0	1	0	0	WB direct no cal option

driver, MON A and MON B. These two output ports are programmed to match the reproduce card type to the record card type in the record mode, or are selected by the MON-SEL switch on the channel selector in the reproduce mode. (See Table 4-2 for the reproduce card type code.) Thus, the reproduce monitor output of the selected card is connected to the reproduce monitor bus and routed to the measuring system. Reed relay K1, driven by transistor Q1, selects the normal signal output from one of the two monitors and applies it to BNC connector J39 (reproduce monitor command). Therefore the output of the correct card type is automatically connected to the output BNC with the full 50-ohm drive capability.

Table 4-2. Reproduce Card Type Code

PIN NUMBER			REPRODUCE CARD TYPE
29	31	30	
1	1	1	No card
1	0	1	MB FM
1	1	0	WB FM
0	0	1	MB direct
0	1	0	WB direct
0	0	0	Servo, voice, or special

If an auxiliary 32-channel reproduce housing is connected to the Model 101, and monitoring from the reproduce amplifier in the auxiliary housing is required instead of the monitor cards via the preamplifier switching unit, then the microcomputer is programmed to disable the two monitor cards (a logic one on both MON A and MON B control lines) and the reproduce monitor signals are supplied to the measuring system via J42, instead of from the two monitor cards.

The rest of the data housing distribution consists of all the interfacing and bus runs between various parts of the Model 101. Gates U5 are used to buffer the record frequency bus from FM record cards, and to isolate this bus from the reproduce part of the housing. If an FM record card is selected by the channel selector, the FM carrier is applied to the record frequency bus, pin 15A. Channels 1 through 8 are wire-OR-ed to U5, pin 9. Channels 9 through 16 are wire-OR-ed to U5, pin 10. Similarly, channels 17 through 24 and channels 25 through 32 are wire-OR-ed to U5 pins 12 and 13, respectively. The E-E Cal CMD is gated with the resulting output from U5 pin 8 enabling the record frequency bus (now called the E-E signal bus) to be applied to the monitor reproduce cards only during the E-E Cal mode. Gates U5 also act as a buffer to provide sufficient drive to the meter monitor, and also to the auxiliary reproduce housing (via connector J42) when a full complement of reproduce cards is used.

The Run CMD from the data housing driver is applied to two elapsed time indicators. One indicator is calibrated from 0 to 1,000 hours, and the other is calibrated from 0 to 3,000 hours. These are used to indicate the length of time that the system has been operated in either the drive forward or drive reverse modes (not the fast mode).

## B. DATA HOUSING DRIVER (Figure 7-2)

### 1. MPU Buffer Section

The PIA's on the data housing driver board are U2 and U3. Their base addresses are  $0440_{16}$  and  $0450_{16}$ , respectively. Note that the addresses are partially decoded from  $A_{15}$ ,  $A_6$ ,  $A_5$ , and  $A_4$ , using U1. When  $A_{15}$ ,  $A_5$ , and  $A_4$  are zero and  $A_6$  is one, pin 11 of U1 is a zero and the PIA at base address  $440_{16}$  (U2) is selected. When  $A_{15}$  and  $A_5$  are zero and  $A_6$  and  $A_4$  are one, pin 10 of U1 is a zero and the PIA at the base address of  $450_{16}$  (U3) is selected. Three address locations above the base address are obtained by manipulating address lines  $A_0$  and  $A_1$ .

The outputs of the two PIA's are buffered as necessary to drive the required number of loads presented by a full complement of data cards.

### 2. Servo Reproduce Interface Section

The signal on J2-6 (servo reproduce bus) is a sine wave or TTL signal, depending on whether a direct reproduce card or a servo reproduce card is driving the bus. This signal is ac coupled through C9, and dc shifted to +2.5 Vdc for processing. The signal is gated to one of the three low-pass filters. For tape speeds of 15, 30, 60, or 120 IPS, a two-pole filter (R8, L3, C12) is used. For 3.75 or 7.5 IPS speeds, the filter consists of R10, L2, and C11. For .937 or 1.87 IPS, the filter consists of R7, C10, R9, L1, R11, and C12. Filter selection is controlled by the tape speed lines through gates U6.

After passing through the selected low-pass filter, the signal is buffered by U12 and is routed through a 1 kHz, high-pass filter (R12, C13, and L4). The filtered output is applied to the pulse shaper (U14 and associated components) and the dropout detector (U13).

The function of the pulse shaper is to provide noise rejection, pulse squaring, and frequency doubling. Resistors R13, R14, R16, and R17 provide noise rejection by means of positive feedback (hysteresis). Capacitor C14 helps reject high frequency noise. For twice IRIG or IRIG operation, no frequency doubling is required and the output is taken from output of the voltage comparator (U14-9). If half IRIG operation is selected, the frequency must be doubled. This is accomplished by using the output of the bidirectional one shot (U14-11). Narrow pulses are generated for 1.87 IPS or higher, but a square wave is generated at .937 IPS. This is necessary because the signal is again doubled in frequency on the control logic card. Gate U6 (open collector) drives the final output from the card (J1-39), which goes to the servo system via the control logic card. This point is inhibited (shorted to ground) by U15-14, (if squelched) or by U15-1 (if there is insufficient signal for servo-from-tape operation).

The signal at TP3 is half-wave rectified and filtered by U13, CR2, C18, and associated components. The result is compared in U15 against a pre-set threshold established by R19, R23, and R22. If there is insufficient signal at TP3 for proper servo-from-tape operation, U15-2 switches high causing U15-1 to short the output signal (J1-39) to ground.

### C. PREAMPLIFIER SWITCHING

#### 1. Signal Switching

Switching is accomplished at two levels to minimize crosstalk between channels. The first level uses differential, eight-channel, analog, multiplex switches U1 through U4. The second level uses quad-analog switches U6 through U8. For a particular channel, two switches in one of the eight-channel multiplexers are on, and the two switches in the following quad switch are on. The other eight-channel multiplexer switches are off and the outputs from the multiplexers not selected are grounded through their corresponding quad switches.

The output of the selected quad switch is applied to emitter followers Q1 and Q2, which provide buffering from the load impedance. Diodes CR3, CR4, and CR5 clamp the outputs at approximately -4 volts in case one or more of the inputs is not terminated. Resistors R2, R4, R7, and R8 limit the current in case of an output short to ground.

The differential output is connected to J4 to be used in the MON AMP mode as described previously.

## 2. Switching Control

Five logic lines determine the channel selected (see Section 1 and Table 4-3). Switching is divided into two major groups controlled by lines F, G, H, and J, which are derived from inputs A and E through inverters U9A and U9B and gates U13A through U13D. Signal  $\bar{A}$  selects even channels, and A selects odd channels. Signal E selects channels 1 through 16, and  $\bar{E}$  selects channels 17 through 32. Also used are the  $\bar{F}$ ,  $\bar{G}$ ,  $\bar{H}$ , and  $\bar{J}$  functions developed by inverters U9C through U9F. Within one of the four groups, one channel of eight is selected by lines B, C, D, and F for odd-numbered channels 1 through 15, and B, C, D, and G for even-numbered channels 2 through 16. Or by lines  $\bar{B}$ ,  $\bar{C}$ ,  $\bar{D}$ , and H for odd-numbered channels 17 through 31, and lines  $\bar{B}$ ,  $\bar{C}$ ,  $\bar{D}$ , and J for even-numbered channels 18 through 32. The inversions are provided by U10A, U10B, and U10C.

For example, channel five is selected by input code 00100. Function F is equal to  $\bar{A}\bar{E}$ , or a logic one. This turns off two switches (2-3 and 14-15), and turns on two switches (6-7 and 10-11) in U7. Switch U7 is then set up to accept a signal from U3, which is enabled by the function F at  $E_N$  (pin 18). On U3, inputs B, C, and D are applied to  $A_0$ ,  $A_1$ , and  $A_2$ , respectively. This selects channel three of the DG 507 multiplexer which is the desired channel five input.

## 3. Power Supplies

The preamplifier switching circuitry operates from +12V, -12V, and +5 Vdc supplies. Inductors L1, L2, and L3 and capacitors C1, C2, C3, C4, C5, and C6 provide decoupling for the power supplies. Diodes CR1 and CR2 prevent reverse current from flowing if the input voltage exceeds the supply voltages.

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

There are no adjustments on the data housing, data housing driver, MPU buffer section, or the preamplifier switching. The servo reproduce interface section of the data housing driver has one adjustment, R21 which is the 0.937 IPS symmetry. To adjust R21 set jumper J4 to C-X/2, 1X position; then apply a 1 V rms sine wave or a TTL signal of 3.125 kHz to J2-6. Adjust R21 for a positive pulse of 160 (+5)  $\mu$ seconds at J1-39.

Refer to the Operator's manual for description of switch and jumper settings.

5-2. TROUBLESHOOTING

A thorough understanding of the circuits described in Section 4 (Principles of Operation) is essential for troubleshooting. Refer to Section 4 and the schematics in Section 7.

The most straightforward method of troubleshooting the data housing driver and the preamplifier switching is to substitute a known good unit for the suspected bad one. If this is not possible, the following paragraphs provide additional troubleshooting information.

A. DATA HOUSING

There are only five integrated-circuits (IC's) on the data housing. To isolate which IC may be defective, determine on which channel the problem occurs. For example, if channel five (record channel) cannot be controlled and it is determined that the channel five record card is working correctly (by substituting known good record card), then the problem is likely to be U1. Monitoring the output of U1 for channel five (pin 11) should show two negative-going pulses repeated every 200 to 300 milliseconds.

To troubleshoot U5, FM record cards must be used. Place the system in FM Cal and verify that the VCO signal from a selected channel is available on the E-E signal bus (U5 pin 6).

B. DATA HOUSING DRIVER

1. MPU Buffer Section

The outputs of each of the buffers can be easily checked for the correct function as described in the specifications (Section 1).

The output of each of the two pins can similarly be checked. Observe that in most cases, there is an inversion between the PIA output and the buffer output. When testing these items, it is necessary that the PIA is being driven by the MPU bus. Therefore, testing should be done by operating the unit in a Model 101.

2. Servo Reproduce Interface Section

- a. Verify that signals within the bandwidth of each filter are not attenuated at U12-6 when the appropriate filter is selected.
- b. Check the dropout detector stage by applying a signal to J2-6 and passing it through the filters and through U12 to TP3.
- c. The comparator doubler may be checked in a similar manner.

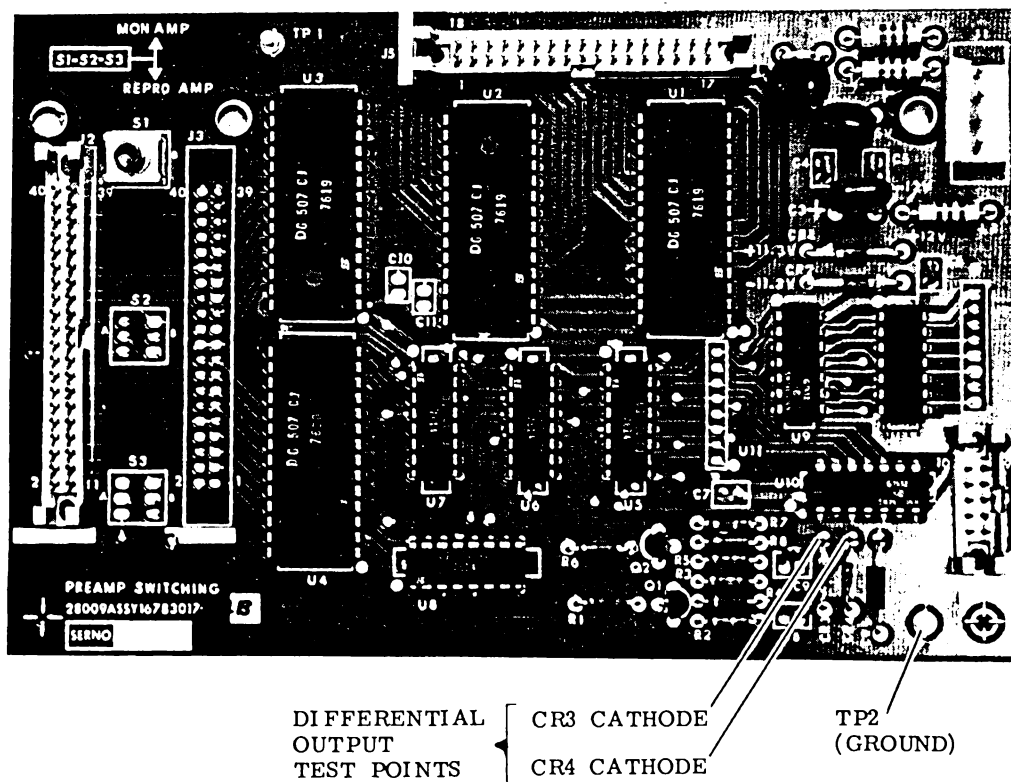
C. PREAMPLIFIER SWITCHING

- 1. Verify that following power supply voltages are present. These voltages are identified by the circuit card silkscreen. +12V, +11.3V, -12V, -11.3V, and +5V.
- 2. Verify channel select signals are present.

CONTROL INPUT	J4 PIN NO.	I.C. PIN NO.	BINARY VALUE
A	7	U9-9	1
B	6	U10-11	2
C	4	U10-9	4
D	3	U10-13	8
E	5	U9-11	16

- 3. The channel selected by the front panel channel selector determines the code at J4. See Table 4-3 for the input code and the code at each of the solid-state switches.
- 4. Place switch S1 in MON AMP position.
- 5. Select a channel with front-panel channel selector.

6. The differential output of the preamplifier switching can be monitored at the cathodes of CR3 and CR4. (See Figure 5-1.) The selected channel can be traced through on the preamplifier switching schematic (Figure 7-3). Table 4-3 shows which signals enable a particular channel.



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Figure 5-1. Preamplifier Switching Card Test Points



## SECTION 6

### ILLUSTRATED PARTS BREAKDOWN

#### 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

##### A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

##### B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

##### C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

##### D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

##### E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## SECTION 6

### 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

### 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

### 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
AMP INCORPORATED P.O. BOX 3608 HARRISBURG, PENNSYLVANIA 17105	00779	MOLEX INC. CORPORATE HQ 2222 WELLINGTON COURT LISLE, ILLINOIS 60532	27264
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX 20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
UNICORP 534 MITCHELL STREET ORANGE, NEW JERSEY 07050	04729	WOVEN ELECTRONICS P.O. BOX 189 JENKIN STREET MAULDIN, SOUTH CAROLINA 29662	50561
MINNESOTA MINING AND MFG. CO. ADHESIVES COATINGS & SEALERS DIV 3M CENTER ST PAUL, MINNESOTA 55101	04963	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, BRULINGTON DIV. 2850 MT PLEASANT BURLINGTON, IOWA 52601	07716	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LAUTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
CTS OF BERNE INCORPORATED 406 PARR ROAD BERNE, INDIANA 46711	11236	NYTRONICS INCORPORATED 10 PELHAM PARKWAY PELHAM MANOR, NEW YORK 10803	72259
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET EPIE, PENNSYLVANIA 16512	72982
ELECTRO CURE INCOR 1710 SOUTH DEL MAR AVENUE SAN GABRIEL, CALIFORNIA 91776	14752	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
ELECTRONIC INSTRUMENT AND SPECIALTY CORPORATION STONEHAM, MASSACHUSETTS 02180	14908	MINNESOTA MINING AND MFG CO ELECTRO PRODUCTS DIVISION 3M CENTER ST PAUL, MINNESOTA 55101	75037
SILICONIX, INC 2201 LAURELWOOD ROAD SANTA CLARA, CALIFORNIA 95054	17896	JOINT ELECTRONIC TYPE DESIGNATION SYSTEM	80058
SIGNETICS CORPORATION SUNNYVALE, CALIFORNIA 94086	18324	ELECTRONIC INDUSTRIES ASSOCIATION	80131
CURTIS INSTRUMENTS 700 KISCO AVENUE MOUNT KISCO, NEW YORK 10549	18583	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	SWITCHCRAFT INCORPORATED 5555 NORTH ELSTON AVENUE CHICAGO, ILLINOIS 60630	82389
MINNESOTA MINING AND MFG CO INDUSTRIAL ELEC PRODUCTS DIV 3M CENTER ST PAUL, MINNESOTA, 55101	20999	MAGNECRAFT ELECTRIC COMPANY 5575 NORTH LYNCH AVENUE CHICAGO, ILLINOIS 60630	94696
BERG ELECTRONICS YOKU EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	ALCO ELECTRONICS PRODUCTS INC. 1551 OSGOOD STREET NORTH ANDOVER, MAINE 01845	95146
CORNELL-DUBILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60018	25243	RUBBER TECK INCORPORATED P.O. BOX 389 GARDENA, CALIFORNIA 90247	98159
MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769	DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800
NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014		

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SECTION 6

6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
Cable Assy, Auxiliary Housing	16781743-005	D
	16781743-008	
Data Electronics Housing Assy, 32 X 2	16781431-005	D
	16781431-007	D
	16781431-009	D
Data Housing Distribution, CCA	16781354-003	
	16781354-005	
Data Housing Driver, CCA	16784205-005	C
	16784205-006	

DESCRIPTION	PART NUMBER	CODE

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CODE	DEFINITION
A	COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.
B	PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY.
C	PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

CODE	DEFINITION
D	PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

SECTION 6

TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
<p>OPERATOR'S LEVEL RECOMMENDED SPARE PARTS AS DEFINED IN PARAGRAPH 6-2, ARE NOT REQUIRED FOR THIS MANUAL.</p>						

## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
1677076-001	BENCH LEVEL SPARES KIT, DATA HOUSING 32 X 2					
14502704-001	INTGRATED CIRCUIT	27014	DM74LS09N	1	1	
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	5	2	
16756961-002	SEMICONDUCTOR DEVICE, DIODE	04713	1N4002 5961-880-4783	2	1	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	3	1	
16774066-106	SEMICONDUCTOR DEVICE, DIODE	04713	1N5226B 5961-437-6391	1	1	
16774066-115	SEMICONDUCTOR DEVICE, DIODE	04713	1N5235B 5961-103-1583	1	1	
16774985-001	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM310H	1	1	
16776656-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	1	1	
16776697-001	INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	N8T20B	1	1	
16779092-002	INTEGRATED CIRCUIT	04713	MC14016BCP	1	1	
16779221-002	MICROCIRCUIT	17896	DG201CJ	4	1	
16779730-001	INTEGRATED CIRCUIT	18324	N8T26AB	1	1	
16779793-001	MICROCIRCUIT	01295	SN74LS04N 5962-01-027-6863	3	1	
16779948-001	BUS BAR	29593	B5153-100-2G3	1	1	
16780407-001	INTEGRATED CIRCUIT	01295	SN74LS37N	3	1	
16781061-001	MICROCIRCUIT	27014	LM339AN	1	1	
16781996-012	MICROCIRCUIT	17896	DG507ACJ	4	1	

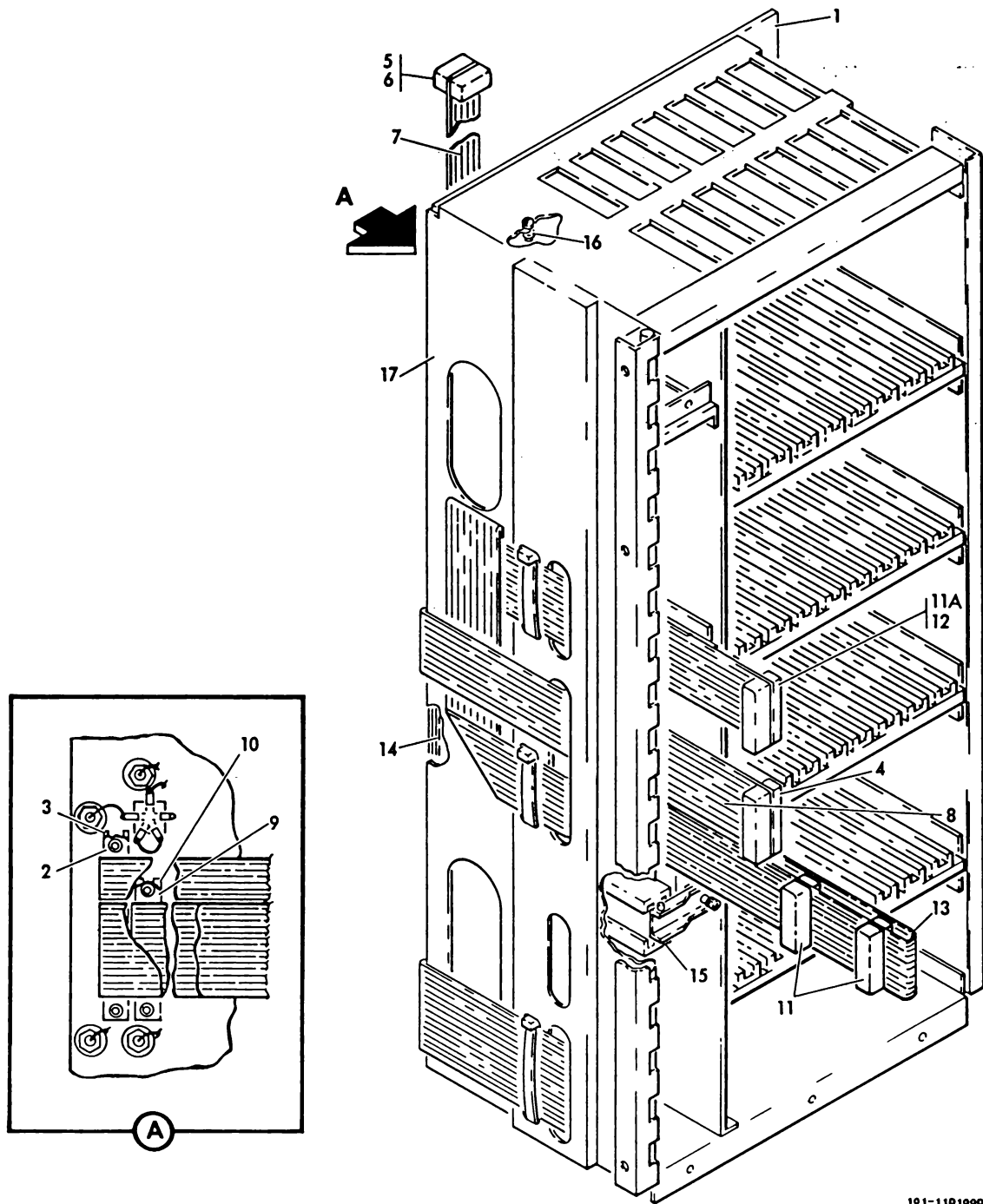
## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST (CONT'D)

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			Federal Stock No.			
99000249-001	MICROCIRCUIT	01295	SN74LS02N	1	1	
99000267-001	MICROCIRCUIT	27014	DM74LS138N	1	1	
99000267-601	MICROCIRCUIT	18324	N74LS138NSB	4	1	
99000275-002	MICROCIRCUIT	04713	MC6821P	2	1	
99000403-601	MICROCIRCUIT	18324	N74LS40NSB	1	1	



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FIGURE 6-1. DATA ELECTRONICS HOUSING ASSEMBLY

## SECTION 6

TABLE 6-1 DATA ELECTRONICS HOUSING ASSEMBLY

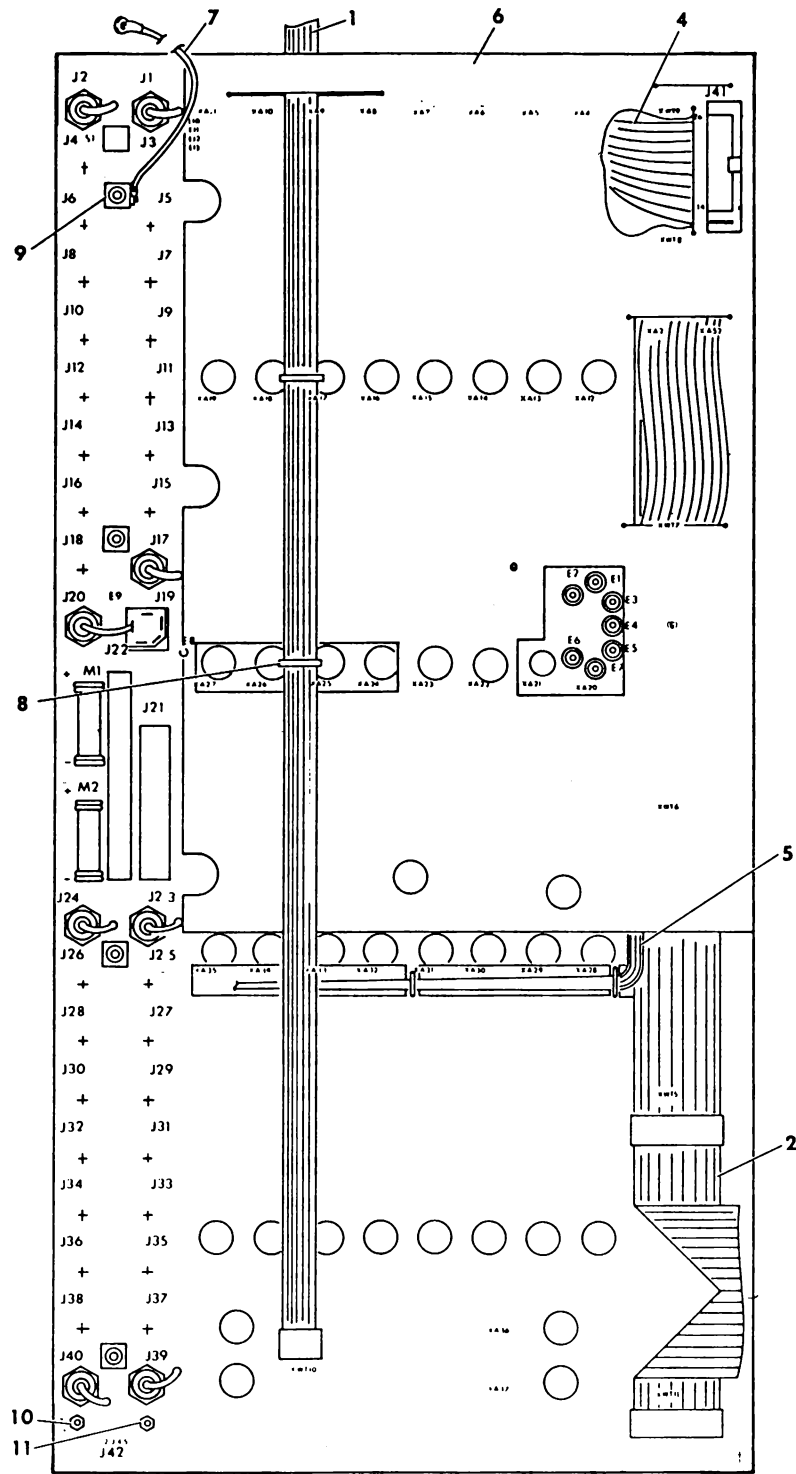
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
						NATIONAL STOCK NUMBER			
6-1		AR	DATA ELECTRONICS HOUSING ASSEMBLY, 32 X 2	28009		16781431-003	REF	A	
6-1		AB	DATA ELECTRONICS HOUSING ASSEMBLY, 32 X 2	28009		16781431-005	REF	B	
6-1		AB	DATA ELECTRONICS HOUSING ASSEMBLY, 32 X 2	28009		16781431-007	REF	C	
6-1		AB	DATA ELECTRONICS HOUSING ASSEMBLY, 32 X 2	28009		16781431-009	REF	D	
6-1	1	A39	(SEE SYSTEM MANUAL, TABLE 6-1 FOR LOCATION IN MHA) • CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION	28009		16781354-003	1	A-C	
6-1	1	A39	• CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION (SEE TABLE 6-2 FOR BREAKDOWN)	28009		16781354-005	1	D	
6-1	2		• PLATE, MOUNTING	28009		16785131-006	1		
6-1		W1	• CABLE ASSEMBLY, REMOTE	28009		16781743-007	1		
6-1	3	J22	• . CONNECTOR, PLUG, ELECTRICAL, • . (REMOVE PIN NO. 14)	75037	3331-0000	16781677-006	1		
6-1	4	P1	• . CONNECTOR, PLUG, ELECTRICAL	04963	3417-0000	16776705-005	1		
6-1	5	P3	• . CONNECTOR, PLUG, ELECTRICAL	04963	3421-0000	16776705-001	1		
6-1	6		• . KEY, POLARIZING	20999	3435-0000	16779175-001	1		
6-1	7		• . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/16 COND	16776751-002	AR		
6-1	8		• . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/20 COND	16776751-003	AR		
6-1	9		• PLATE, MOUNTING	28009		16785131-004	1		
6-1		W2	• CABLE ASSEMBLY, AUXILIARY HOUSING ELECTRICAL, BRANCHED			16781743-005	1	A,B	
6-1		W2	• . CABLE ASSEMBLY, AUXILIARY HOUSING			16781743-008	1	C	
6-1	10	J21	• . CONNECTOR, ELECTRICAL	75037	3329-0000	16781677-004	1		
6-1	11	P1,P2	• . CONNECTOR, PLUG, ELECTRICAL	04963	3414-0000	16776705-002	2		
6-1	11A	P3	• . CONNECTOR, PLUG, ELECTRICAL	04963	3414-0000	16776705-002	1	A,B	
6-1	12		• . KEY, POLARIZING	20999	3435-0000	16779175-001	1	A,B	
6-1	13		• . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/34 COND	16776751-005	AR		
6-1	14		• PLATE, ELECTRICAL SHIELD	28009		16781757-001	1		
6-1	15		• SLIDE ASSEMBLY, CIRCUIT CARD	28009		16781553-001	1		
6-1	16		• GUIDE, INSTALLATION	28009		16776974-002	1		
6-1	17		• CHASSIS ASSEMBLY, DATA ELECTRONICS	28009		16781430-001	1	A	
6-1	17		• CHASSIS ASSEMBLY, DATA ELECTRONICS	28009		16781430-003	1	B,C	

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FIGURE 6-2. DATA HOUSING DISTRIBUTION CIRCUIT CARD ASSEMBLY (SHEET 2 OF 2)

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TABLE 6-2. DATA HOUSING DISTRIBUTION CCA (SHEET 1 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY IN ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-2		A8A39	CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION	28009		16781354-003	REF	A	
6-2		A8A39	CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION (SEE TABLE 6-1 FOR LOCATION IN NHA)	28009		16781354-005	REF	B	
6-2		CR1-2	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	2		
6-2		C1-C26	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	26		
6-2		E1-E7	. POST, ELECTRICAL / MECHANICAL, CLINCHING	28009		16781624-004	7		
6-2		J1-J18	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	18		
6-2		J19	. JACK, TELEPHONE	82389	L114B	16763367-002	1		
6-2		J20	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	1		
6-2		J21	. SEE FIG. 6-1. PART OF A8W2.						
6-2		J22	. SEE FIG. 6-1. PART OF A8W1.						
6-2		J23-J40	. CONNECTOR, RECEPTACLE, BNC	80058	UG1094U 5935-00-172-4596	16737991-021	18		
6-2		J41	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3493-2003	16781104-503	1		
6-2		J42	. CONNECTOR, RECEPTACLE, ELECTRICAL	00779	87474-1	16783211-001	1		
6-2		K1	. RELAY, REED	14908	1697-1C5	16809521-001	1		
6-2		M1	. INDICATOR, ELAPSED TIME, 3000 HR	28009		16779088-002	1	A	
6-2		M1	. INDICATOR, ELAPSED TIME, 5000 HR	18583	120 LC-5000	16779088-005	1	B	
6-2		M2	. INDICATOR, ELAPSED TIME, 1000 HR	18583	120LC1	16779088-001	1		
6-2		Q1	. TRANSISTOR	04713	2N3904-S 5961-00-243-6426	16762172-001	1		
6-2		R1	. RESISTOR, FIXED, METAL FILM, 715K OHMS, +-1%, 1/8W	81349	RNR55K7153FS	16757165-483	1		
6-2		R2	. RESISTOR, FIXED, METAL FILM, 2.15 MEG OHMS, +-1%, 1/8W	91637	CHF-552154F	16757165-533	1	A	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 3.57 MEG OHMS, +-1%, 1/8W			16757165-554	1	B	
6-2		R3-R6	. RESISTOR, FIXED, CARBON COMPOSITION, 300 OHMS, +-5%, 1/4W	81349	RCR076301JM	16750079-020	4		
6-2		R7	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +-5%, 1/4W	81349	RCR076202JM	16750079-040	1		
6-2		R8	. RESISTOR, FIXED, CARBON COMPOSITION, 20 OHMS, +-5%, 1/4W	81349	RCR076200JM	16750079-142	1		
6-2		R9	. RESISTOR, FIXED, CARBON COMPOSITION, 12 OHMS, +-5%, 1/8W	81349	RCR05G120JS 5905-00-491-6344	16780345-027	1		
6-2		R10-R13	. NOT USED						
6-2		R14	. RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/4W	81349	RCR076392JM	16750079-047	1		
6-2		U1-U4	. MICROCIRCUIT	18324	M74LS138NSB	99000267-601	4		
6-2		U5	. MICROCIRCUIT	18324	M74LS40NSB	99000403-601	1		
6-2	1	W1	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009		16781742-001	1		

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SECTION 6

TABLE 6-2. DATA HOUSING DISTRIBUTION CCA (SHEET 2 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/10 COND		16776751-008	AR	
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3473-0000		16776705-006	1	
6-2		WT1-WT9	. . NOT USED						
6-2		WT10	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3474-0001T		16776752-103	1	
6-2	2	W2	. . CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, BRANCHED	28009			16781740-001	1	
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	28009			16776751-007	AR	
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3425-0000		16776705-003	1	
6-2		WT1-WT4	. . NOT USED						
6-2		W5-WT8	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3434-0001T		16776752-104	4	
6-2		WT9,WT10	. . NOT USED						
6-2		WT11	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3434-0001T		16776752-104	1	
6-2	3	W3	. . CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16781741-001	1	
6-2			. . CABLE, ELECTRICAL, FLAT RIBBON	75037	3365/10 COND		16776751-008	AR	
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	04963	3473-0000		16776705-006	1	
6-2		WT1-WT8	. . NOT USED						
6-2		WT9	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3474-0001T		16776752-103	1	
6-2	4	W4	. . CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16783048-001	1	
6-2			. . CABLE, SPECIAL PURPOSE, ELECTRICAL, FLAT, WOVEN	50561	T17YP28-7UL1568N		16783026-001	AR	
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	00779	86896-1		16783027-002	1	
6-2	5	W5	. . CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL, BRANCHED	28009			16783049-001	1	
6-2			. . CABLE, SPECIAL PURPOSE, ELECTRICAL, FLAT, WOVEN	50561	T17YP28-7UL1568N		16783026-001	AR	
6-2		P1	. . CONNECTOR, PLUG, ELECTRICAL	00779	86987-1		16783027-001	1	
6-2		XA1	. . NOT USED						
6-2		XA2	. . CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VH22/1J0012		16778708-201	1	
6-2		XA3	. . NOT USED						
6-2		XA4-XA37	. . CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VH22/1J0012		16778708-201	34	
6-2		XA38-51	. . NOT USED						
6-2		XA52	. . CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VH22/1J0012		16778708-201	1	
6-2	6		. . CIRCUIT CARD ASSEMBLY, DATA HOUSING DISTRIBUTION	28009			16781351-001	1	
6-2	7		. . CABLE ASSEMBLY, GROUND ELECTRICAL	28009			16764178-018	1	
6-2	8		. . STRAP, TIEDOWN, ELECTRICAL COMPONENTS	98159	2829-75-2 5975-441-1605		16755973-002	9	
6-2	9		. . POST, ELECTRICAL / MECHANICAL, CLINCHING	28009			16781624-005	4	
6-2	10		. . JACK, SCREW, HAND (STUD)	00779	200874-4 5935-00-458-6650		16783229-001	1	

NOTES:

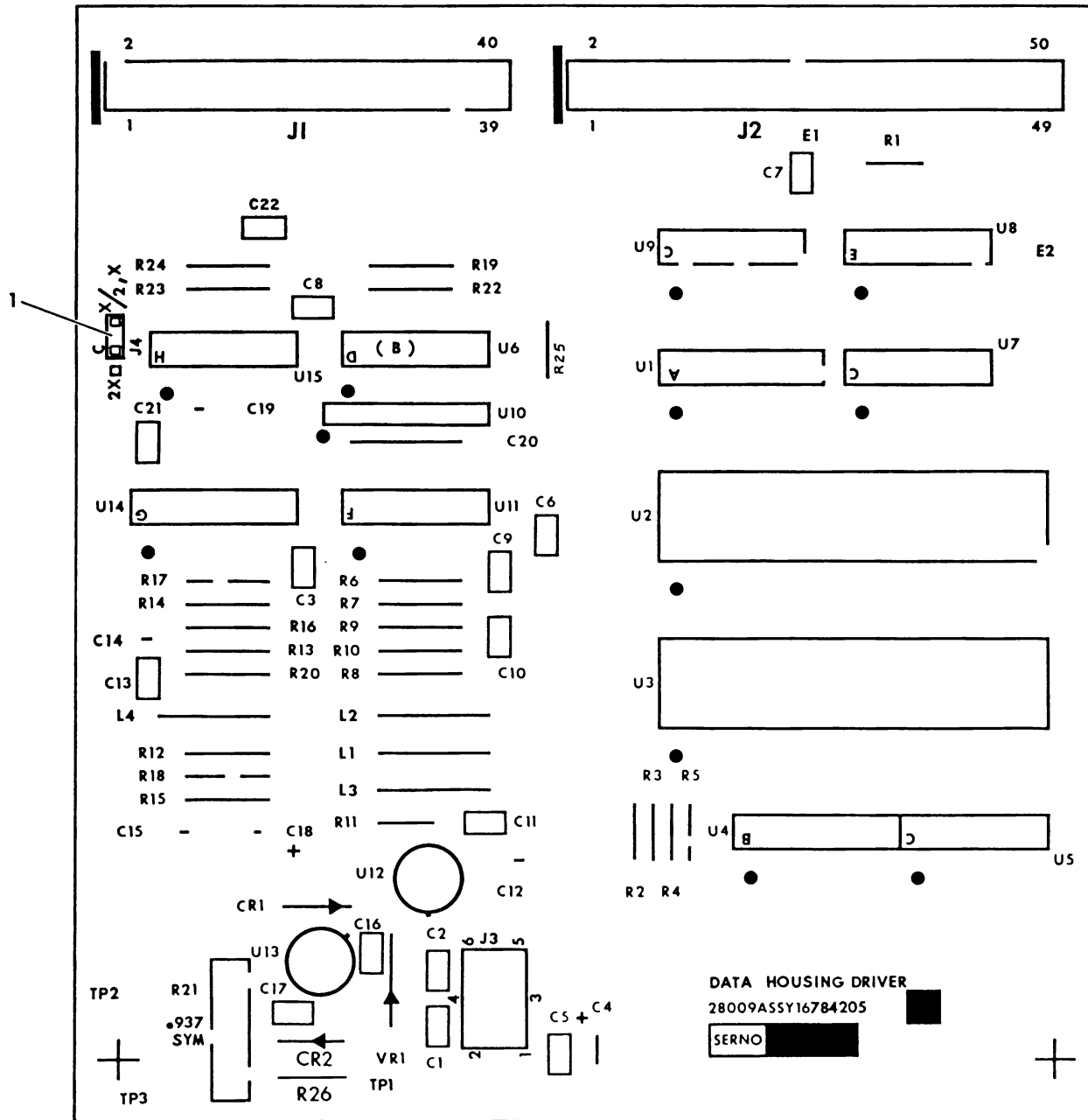
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TABLE 6-2. DATA HOUSING DISTRIBUTION CCA (SHEET 3 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2	11		. JACK, SCREW, HAND (SOCKET)	00779	200875-4 5935-00-458-6651	16783229-002	1		
6-2	12		. SPACER, SLEEVE, SELF-CLINCHING	04729	SJ301-1F7	16756409-301	34		
NOTES									

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FIGURE 6-3. DATA HOUSING DRIVER CIRCUIT CARD ASSEMBLY



SECTION 6

TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 1 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
			1 2 3 4 5 6 7						
6-3		ABA3A1	CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28C09			16784205-004	REF	A
6-3		ABA3A1	CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28009			16784205-005	REF	A
6-3		ABA3A1	CIRCUIT CARD ASSEMBLY, DATA HOUSING DRIVER	28C09			16784205-006	REF	C
6-3		CR1,CR2	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148		16756865-003	2	
6-3		C1-C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +20%, 50 VDC	18796	8121-050-651-104M		16771020-018	3	
6-3		C4	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +10%, 15VDC	26769	41K5107E015K1A		16758058-246	1	
6-3		C5-C9	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +20%, 50 VDC	18796	8121-050-651-104M		16771020-018	5	
6-3		C10	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +20%, 50VDC	18796	8121-050-651-103M		16771020-011	1	
6-3		C11	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3300PF, +5%, 50VDC	18796	8121-050W5R332J		16771674-038	1	
6-3		C12	. CAPACITOR, FIXED, MICA DIELECTRIC 18PF, +5%, 50VDC	25243	CD10ED750JM1		16759780-263	1	
6-3		C13	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.15UF, +20%, 50VDC	18796	8121-050-651-154M		16771020-019	1	
6-3		C14	. CAPACITOR, FIXED, MICA DIELECTRIC 20PF, +5%, 50 VDC	25243	CD10ED2C0JM1		16759780-246	1	A, E
6-3		C14	. CAPACITOR, FIXED, MICA DIELECTRIC 39PF, +5%, 50VDC	25243	CD10ED390JM1		16759780-256	1	C
6-3		C15	. CAPACITOR, FIXED, MICA DIELECTRIC 20PF, +5%, 50 VDC	25243	CD10ED200JM1		16759780-249	1	
6-3		C16,C17	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +20%, 50 VDC	18796	8121-050-651-104M		16771020-018	2	
6-3		C18	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.22UF, +20%, 50VDC	18796	8131-050-651-224M		16771020-020	1	
6-3		C19	. CAPACITOR, FIXED, MICA DIELECTRIC 10PF, +5%, 50 VDC	25243	CD10CD1C0DM1		16759780-245	1	
6-3		C20	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 6800PF, +1%, 100VDC	14752	410D18682F		16783473-111	1	
6-3		C21,22	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +20%, 50 VDC	18796	8121-050-651-104M		16771020-018	2	
6-3		J1	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3495-1002		16781104-005	1	
6-3		J2	. CONNECTOR, RECEPTACLE, ELECTRICAL	75037	3496-1002		16781104-006	1	
6-3		J3	. TERMINAL, PIN	22526	754C1-007		1677927C-007	6	
6-3		J4	. TERMINAL, PIN	22526	75401-001		16779270-001	3	
6-3		L1	. COIL, RADIO FREQUENCY, 180MH, +20%	72259	WEE180000		16779408-010	1	
6-3		L2	. COIL, RADIO FREQUENCY, 8.2MH, +10%	72259	WEE8200		16779408-007	1	
6-3		L3	. COIL, RADIO FREQUENCY, 1MH, +10%	72259	WEE1000 5950-00-755-8586		16779408-004	1	
6-3		L4	. COIL, RADIO FREQUENCY, 180MH, +20%	72259	WEE180000		16779408-010	1	
6-3	1	P4	. BUS BAR	29593	B5153-100-26S		1677994E-001	1	
6-3		R1-R5	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +5%, 1/4W	81349	RCR07G202JM		16750079-040	5	

NOTES:

## SECTION 6

TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 2 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE PART CODE	NOTES
						NATIONAL STOCK NUMBER				
6-3		R6	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K10G2FS 5905-00-138-1223		16757165-301	1		
6-3		R7	. RESISTOR, FIXED, METAL FILM, 2.94K OHMS, +-1%, 1/8W	81349	RNR55K2941FS 5905-00-007-7561		16757165-246	1		
6-3		R8	. RESISTOR, FIXED, METAL FILM, 3.45K OHMS, +-1%, 1/8W	81349	RNR55K3651FM		16757165-255	1		
6-3		R9	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2001FR		16757165-230	1		
6-3		R10	. RESISTOR, FIXED, METAL FILM, 1.69K OHMS, +-1%, 1/8W	81349	RNR55K1691FM		16757165-223	1		
6-3		R11	. RESISTOR, FIXED, CARBON COMPOSI- TION, 20K OHMS, +-5%, 1/4W	81349	RCR07G203JM		16750075-064	1		
6-3		R12	. RESISTOR, FIXED, METAL FILM, 604 OHMS, +-1%, 1/8W	81349	RNR55K604CFM		16757165-176	1		
6-3		R13,R14	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289		16757165-201	2		
6-3		R15	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS 5905-00-138-1223		16757165-301	1		
6-3		R16,17	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160		16757165-401	2		
6-3		R18	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS 5905-00-138-1223		16757165-301	1		
6-3		R19	. RESISTOR, FIXED, METAL FILM, 9.09K OHMS +-1%, 1/8W	81349	RNR55K9091FR 5905-00-431-7833		16757165-293	1		
6-3		R20	. RESISTOR, FIXED, METAL FILM, 29.4K OHMS, +-1%, 1/8W	81349	RNR55K2942FM		16757165-346	1		
6-3		R21	. RESISTOR, VARIABLE, 10K OHMS, +-10%, 3/4W	73138	89PR10K 5905-00-003-2537		16775165-010	1		
6-3		R22	. RESISTOR, FIXED, METAL FILM, 7.15K OHMS, +-1%, 1/8W	81349	RNR55K7151FM		16757165-283	1		
6-3		R23	. RESISTOR, FIXED, METAL FILM, 150 OHMS, +-1%, 1/8W	81349	RNR55K1500FM		16757165-118	1		
6-3		R24	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289		16757165-201	1		
6-3		R25	. RESISTOR, FIXED, CARBON COMPOSI- TION, 2K OHMS, +-5%, 1/4W	81349	RCR07G202JM		16750075-040	1		
6-3		R26	. RESISTOR, FIXED, CARBON COMPOSI- TION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620		16750075-033	1		
6-3		TP1	. TERMINAL, STUD	71279	160-1558-02-01 5940-00-853-6232		16750201-022	1		
6-3		TP2,TP3	. TERMINAL, STUD	71279	2027-2 5940-00-280-0601		16757170-002	2		
6-3		U1	. MICROCIRCUIT	27014	DM74LS138N		99000267-001	1		
6-3		U2,U3	. MICROCIRCUIT	04713	MC6821P		99000275-002	2		
6-3		U4	. INTEGRATED CIRCUIT	18324	N8T26AB		16779730-001	1		
6-3		U5	. INTEGRATED CIRCUIT	01295	SN74LS37N		16780407-001	1		
6-3		U6	. INTEGRATED CIRCUIT	27014	DM74LS09N		14502704-001	1		
6-3		U7	. INTEGRATED CIRCUIT	01295	SN74LS37N		16780407-001	1		
6-3		U8	. MICROCIRCUIT	01295	SN74LS04N 5962-01-027-6863		16779793-001	1		
6-3		U9	. INTEGRATED CIRCUIT	01295	SN74LS37N		16780407-001	1		

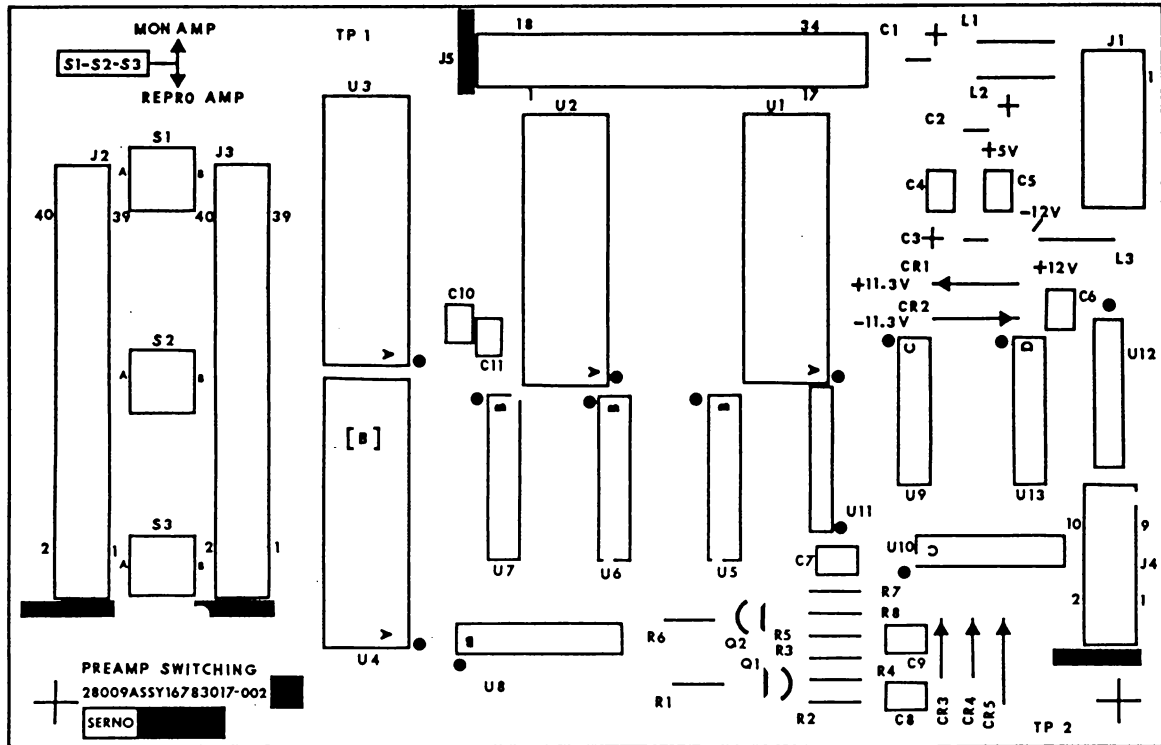
NOTES:

SECTION 6

TABLE 6-3. DATA HOUSING DRIVER CCA (SHEET 3 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
			1 2 3 4 5 6 7						
6-3		U10	RESISTOR NETWORK	11236	750-81-R10KOHMS	16780508-003	1		
6-3		U11	INTEGRATED CIRCUIT	04713	MC140162CP	16779692-002	1		
6-3		U12	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM310H	16774685-001	1		
6-3		U13	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	16774656-001	1		
6-3		U14	INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	N8T20F	16775697-001	1		
6-3		U15	MICROCIRCUIT	27014	LM339AN	16781061-001	1		
5		VP1	SEMICONDUCTOR DEVICE, DIODE	04713	1N5235B 5961-103-15R3	16774066-115	1		
NOTES:									

SECTION 6



101-11D103A

FIGURE 6-4. PREAMPLIFIER SWITCHING 32 X 2 CIRCUIT CARD ASSEMBLY

SECTION 6

TABLE 6-4. PREAMPLIFIER SWITCHING 32 X 2 CCA

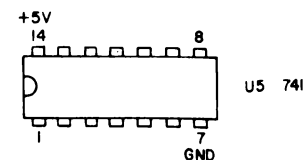
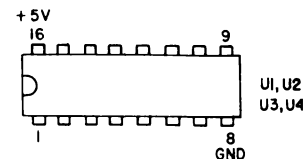
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
						NATIONAL STOCK NUMBER				
			1 2 3 4 5 6 7							
6-4		A6	CIRCUIT CARD ASSEMBLY, PREAMPLIFIER SWITCHING, 32 X 2	2PCC9			167E3C17-002	REF		
6-4		CR1,CR2	. SEMICONDUCTOR DEVICE, DIODE	04713	1N4002 5961-00-880-4723		16756961-002	2		
6-4		CR3,CR4	. SEMICONDUCTOR DEVICE, DIODE	81349	1N414P		16756E65-003	2		
6-4		CR5	. SEMICONDUCTOR DEVICE, DIODE	04713	1N5226B 5961-437-6351		16774C66-106	1		
6-4		C1	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A		16758C58-242	1		
6-4		C2	. CAPACITOR, FIXED, ELECTROLYTIC, 56UF, +-10%, 10VDC	26769	41KS5660010K1A		16758C58-143	1		
6-4		C3	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A		16758C58-242	1		
6-4		C4-C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18756	8121-05C-651-1C4M		1677102C-018	6		
6-4		J1	. CONNECTOR, RECEPTACLE, ELECTRICAL	27264	C9-65-1C41		167E1625-004	1		
6-4		J2	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3495-2CC2		167811C4-105	1		
6-4		J3	. NOT USED							
6-4		J4	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3491-2CC2		167E11C4-101	1		
6-4		J5	. CONNECTOR, RECEPTACLE, ELECTRICAL	75C37	3494-2CC2		167E11C4-104	1		
6-4		L1-L3	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99ECC	1537-44 595C-815-1950		16750875-254	3		
6-4		Q1,Q2	. TRANSISTOR	80131	2N3904 5961-00-892-87C6		167E2172-001	2		
6-4		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCRC7G1C1JM		16750075-009	1		
6-4		R2	. RESISTOR, FIXED, CARBON COMPOSITION, 180 OHMS, +-5%, 1/4W	81349	RCRC7G1E1JM		16750075-015	1		
6-4		R3	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCRC7G5E2JM		16750075-051	1		
6-4		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCRC7G220JM		16750075-166	1		
6-4		R5	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCRC7G5E2JM		16750075-051	1		
6-4		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCRC7G101JM		16750075-009	1		
6-4		R7	. RESISTOR, FIXED, CARBON COMPOSITION, 180 OHMS, +-5%, 1/4W	81349	RCRC7G1E1JM		16750075-015	1		
6-4		R8	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCRC7G220JM		16750075-166	1		
6-4		S1	. SWITCH, TOGGLE, DPDT	95146	TT21NG-FC-1		167E1236-003	1		
6-4		TP1,TP2	. TERMINAL, STLD	71279	160-1558-02-01 594C-00-853-6232		167502C1-022	2		
6-4		U1-U4	. PICRCCIRCUIT	17856	D65C7ACJ		167E1996-012	4		
6-4		U5-U8	. PICRCCIRCUIT	17856	D62C1CJ		16779221-002	4		
6-4		U9,U10	. PICRCCIRCUIT	01255	SK74L5C4N 5962-01-027-6863		16779793-001	2		
6-4		L11,L12	. NOT USED							
6-4		L13	. PICRCCIRCUIT	01255	SK74L5C2N		590C0245-001	1		

NOTES:

SECTION 7  
SCHEMATICS

NOTES:

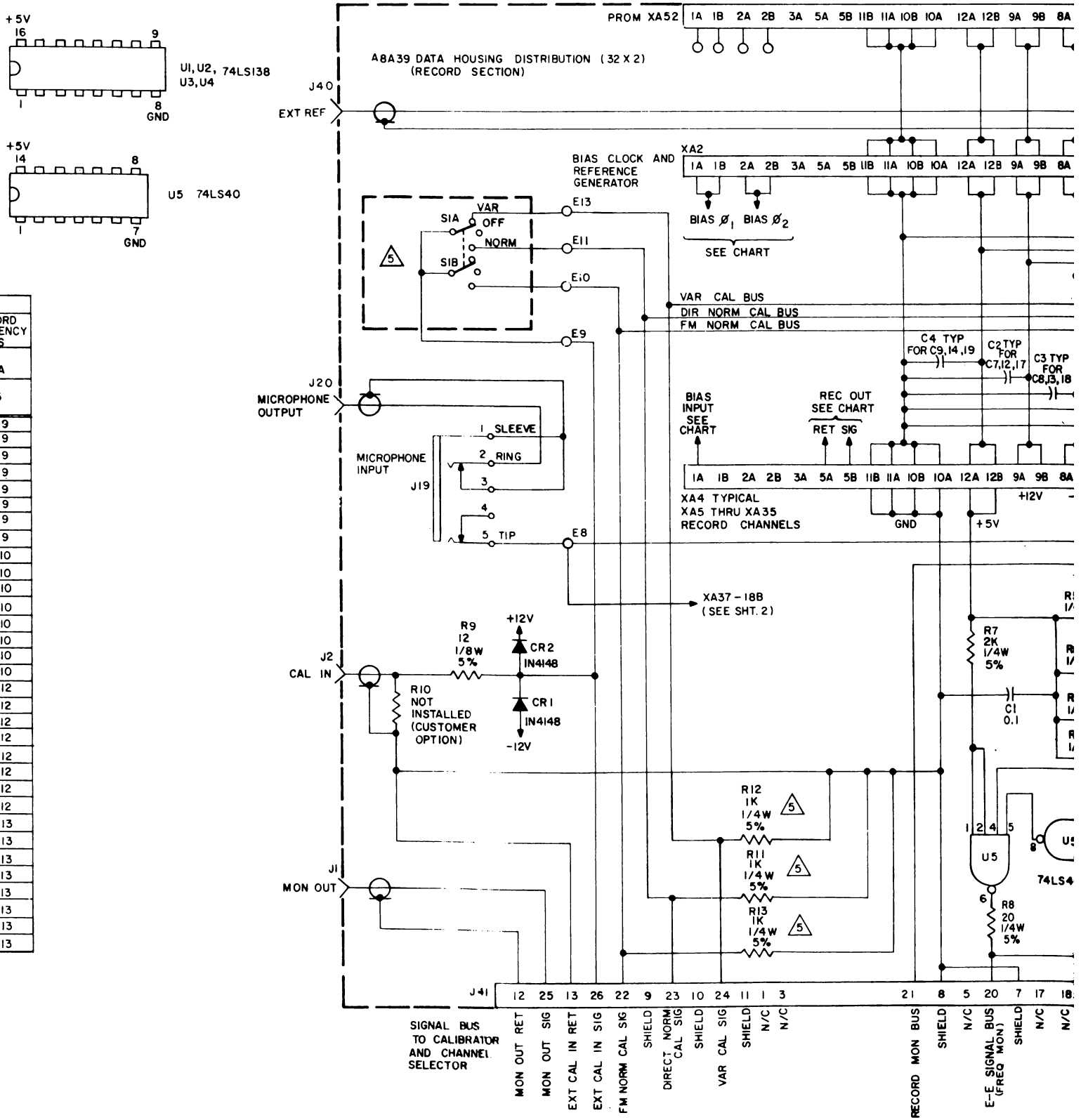
1. UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS  
ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%  
C2 THRU C26 ARE 0.1UF.
2. LIKE LETTERS INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3. ▽ DENOTES CIRCUIT COMMON
4. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS. TOP VIEW SHOWN:
5. △ INSTALLED ON -006 ONLY (WITHOUT CALIBRATOR).



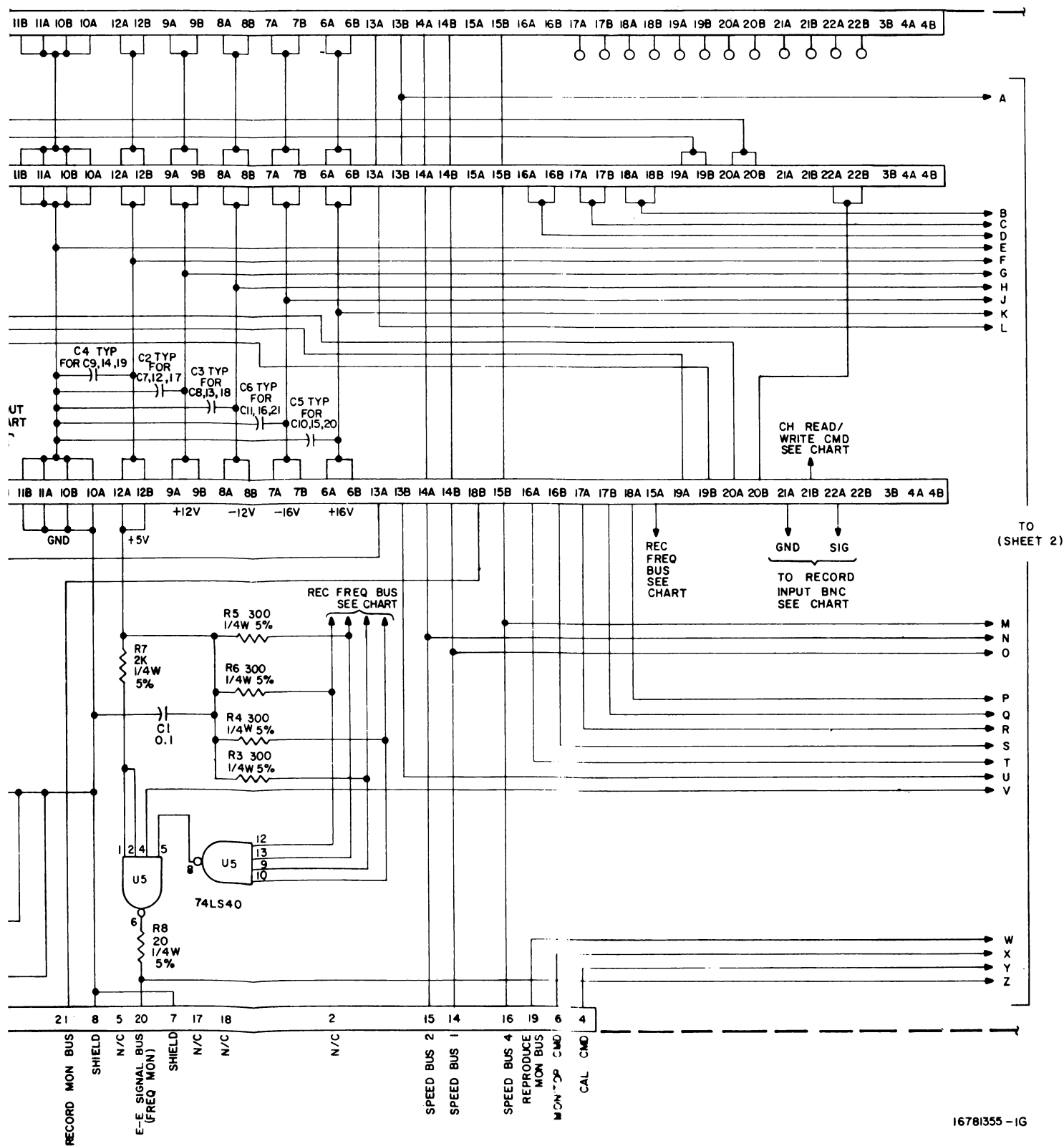
RECORD CHANNEL PIN NO DESTINATION PREFIX CHAN NO PC CONN		RECQRD CHANNEL CHART						
		RECORD IN		RECORD OUT		BIAS Ø1 OR Ø2	CHANNEL READ/WRITE CMD	RECORD FREQUENCY BUS
		SIGNAL	GND	SIGNAL	RETURN			
		22 A	21 A	5 B	5 A	1 A	21 B	15 A
		COND	SHIELD	ABA 39 W4 PI *ABA 39 W5 PI	W4 PI W5 PI	XA2 PINS		U 5
1	XA 4	J3	J3	PIN 2	PIN 1	1 & 21	U1 PIN 15	PIN 9
2	XA 5	J4	J4	PIN 4	PIN 3	1 & 21	U1 PIN 14	PIN 9
3	XA 6	J5	J5	PIN 6	PIN 5	2 & 22	U1 PIN 13	PIN 9
4	XA 7	J6	J6	PIN 8	PIN 7	2 & 22	U1 PIN 12	PIN 9
5	XA 8	J7	J7	PIN 10	PIN 9	1 & 21	U1 PIN 11	PIN 9
6	XA 9	J8	J8	PIN 12	PIN 11	1 & 21	U1 PIN 10	PIN 9
7	XA 10	J9	J9	PIN 14	PIN 13	2 & 22	U1 PIN 9	PIN 9
8	XA 11	J10	J10	PIN 16	PIN 15	2 & 22	U1 PIN 7	PIN 9
9	XA 12	J11	J11	PIN 18	PIN 17	1 & 21	U2 PIN 15	PIN 10
10	XA 13	J12	J12	PIN 20	PIN 19	1 & 21	U2 PIN 14	PIN 10
11	XA 14	J13	J13	PIN 22	PIN 21	2 & 22	U2 PIN 13	PIN 10
12	XA 15	J14	J14	PIN 24	PIN 23	2 & 22	U2 PIN 12	PIN 10
13	XA 16	J15	J15	PIN 26	PIN 25	1 & 21	U2 PIN 11	PIN 10
14	XA 17	J16	J16	PIN 28	PIN 27	1 & 21	U2 PIN 10	PIN 10
15	XA 18	J17	J17	PIN 30	PIN 29	2 & 22	U2 PIN 9	PIN 10
16	XA 19	J18	J18	PIN 32	PIN 31	2 & 22	U2 PIN 7	PIN 10
17	XA 20	J23	J23	*PIN 18	*PIN 1	1 & 21	U3 PIN 15	PIN 12
18	XA 21	J24	J24	*PIN 19	*PIN 2	1 & 21	U3 PIN 14	PIN 12
19	XA 22	J25	J25	*PIN 20	*PIN 3	2 & 22	U3 PIN 13	PIN 12
20	XA 23	J26	J26	*PIN 21	*PIN 4	2 & 22	U3 PIN 12	PIN 12
21	XA 24	J27	J27	*PIN 22	*PIN 5	1 & 21	U3 PIN 11	PIN 12
22	XA 25	J29	J28	*PIN 23	*PIN 6	1 & 21	U3 PIN 10	PIN 12
23	XA 26	J29	J29	*PIN 24	*PIN 7	2 & 22	U3 PIN 9	PIN 12
24	XA 27	J30	J30	*PIN 25	*PIN 8	2 & 22	U3 PIN 7	PIN 12
25	XA 28	J31	J31	*PIN 26	*PIN 9	1 & 21	U4 PIN 15	PIN 13
26	XA 29	J32	J32	*PIN 27	*PIN 10	1 & 21	U4 PIN 14	PIN 13
27	XA 30	J33	J33	*PIN 28	*PIN 11	2 & 22	U4 PIN 13	PIN 13
28	XA 31	J34	J34	*PIN 29	*PIN 12	2 & 22	U4 PIN 12	PIN 13
29	XA 32	J35	J35	*PIN 30	*PIN 13	1 & 21	U4 PIN 11	PIN 13
30	XA 33	J36	J36	*PIN 31	*PIN 14	1 & 21	U4 PIN 10	PIN 13
31	XA 34	J37	J37	*PIN 32	*PIN 15	2 & 22	U4 PIN 9	PIN 13
32	XA 35	J38	J38	*PIN 33	*PIN 16	2 & 22	U4 PIN 7	PIN 13

NOTE: ABA39W4PI PINS 33 & 34 ARE GROUND  
ABA39W5PI PINS 17 & 34 ARE GROUND

INEL WRITE D	RECORD FREQUENCY BUS
B	15 A
	U 5
15	PIN 9
14	PIN 9
13	PIN 9
12	PIN 9
11	PIN 9
10	PIN 9
9	PIN 9
7	PIN 9
115	PIN 10
114	PIN 10
113	PIN 10
112	PIN 10
111	PIN 10
110	PIN 10
109	PIN 10
107	PIN 10
115	PIN 12
114	PIN 12
113	PIN 12
112	PIN 12
111	PIN 12
110	PIN 12
109	PIN 12
107	PIN 12
115	PIN 13
114	PIN 13
113	PIN 13
112	PIN 13
111	PIN 13
110	PIN 13
109	PIN 13
107	PIN 13





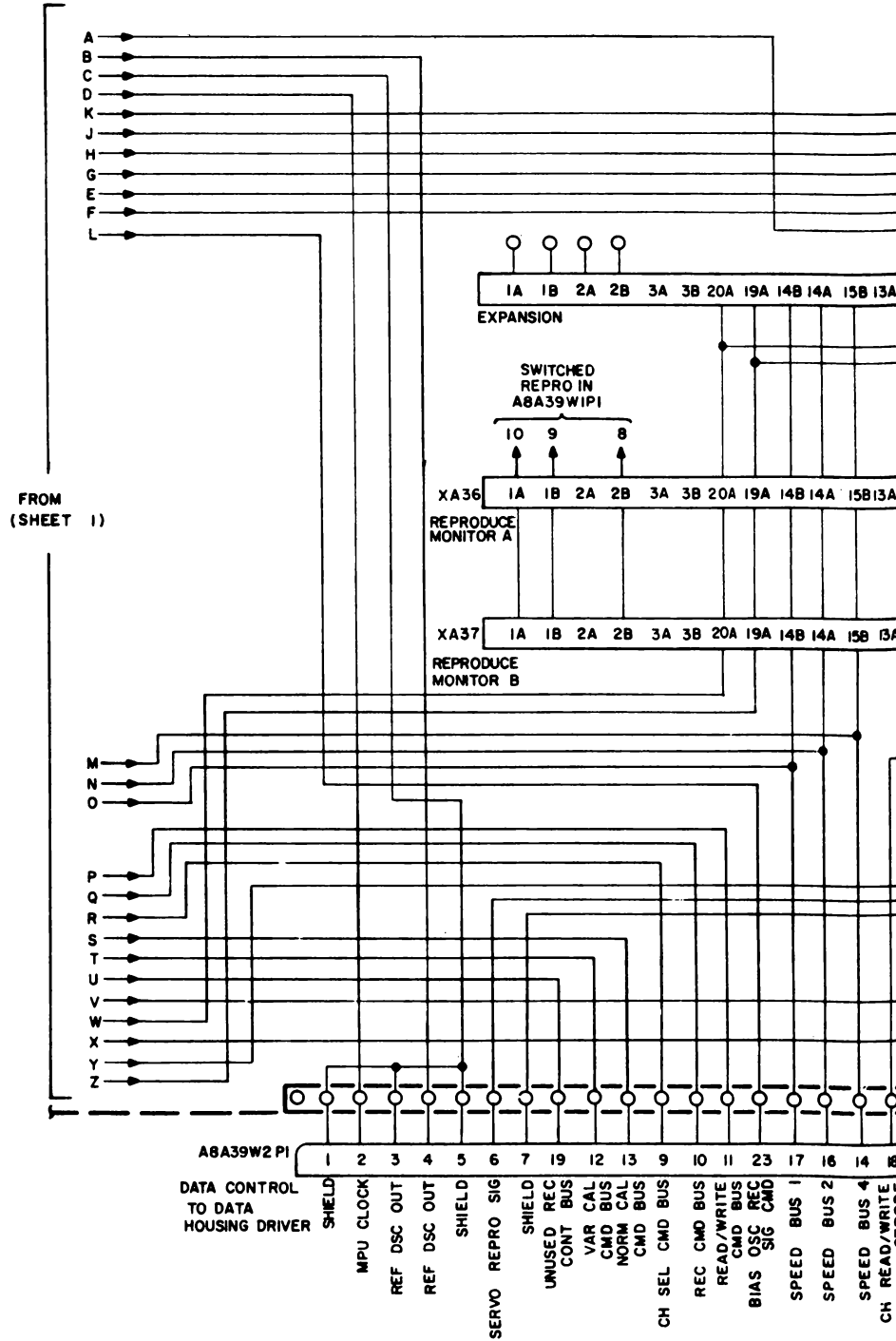


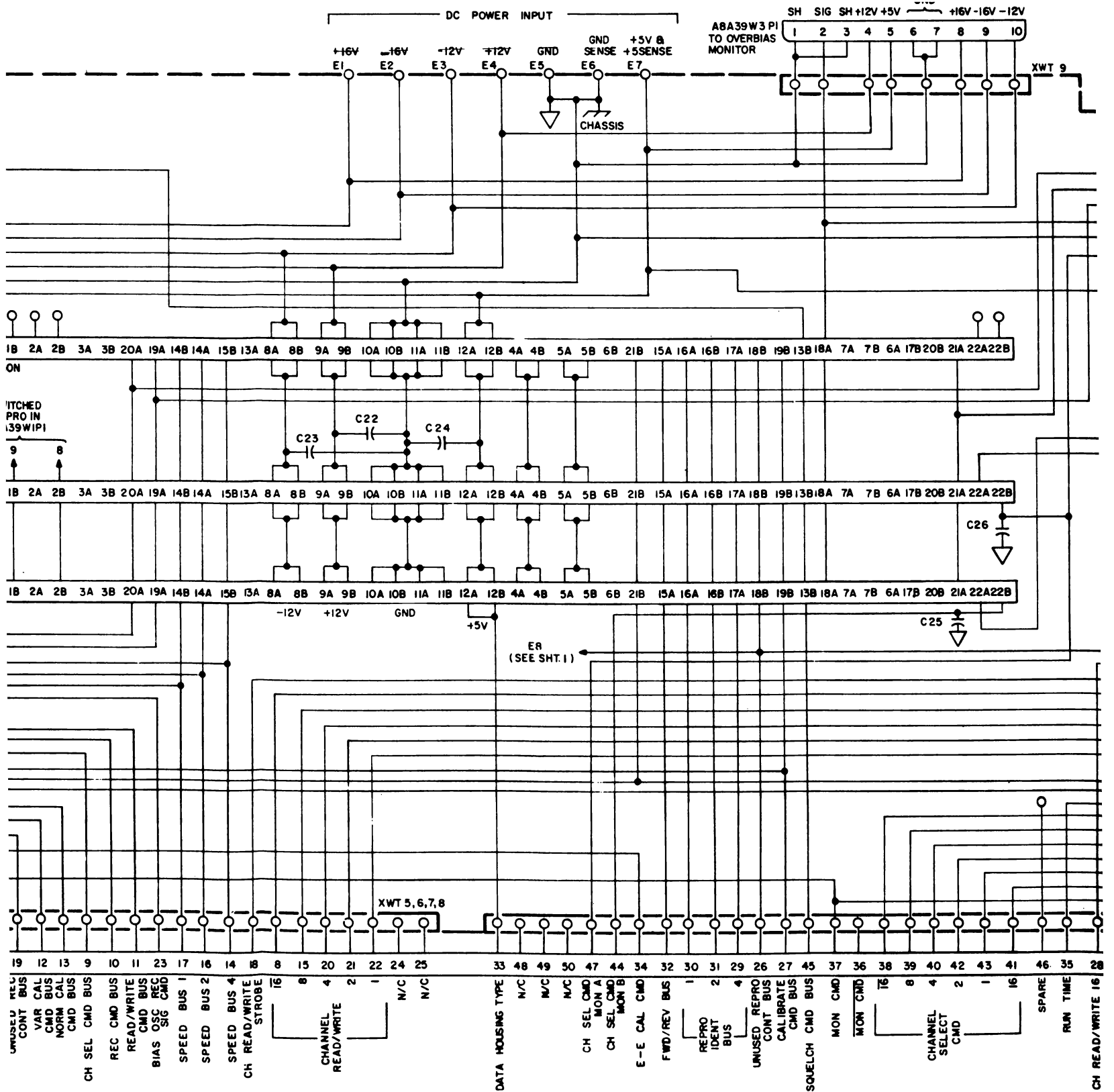
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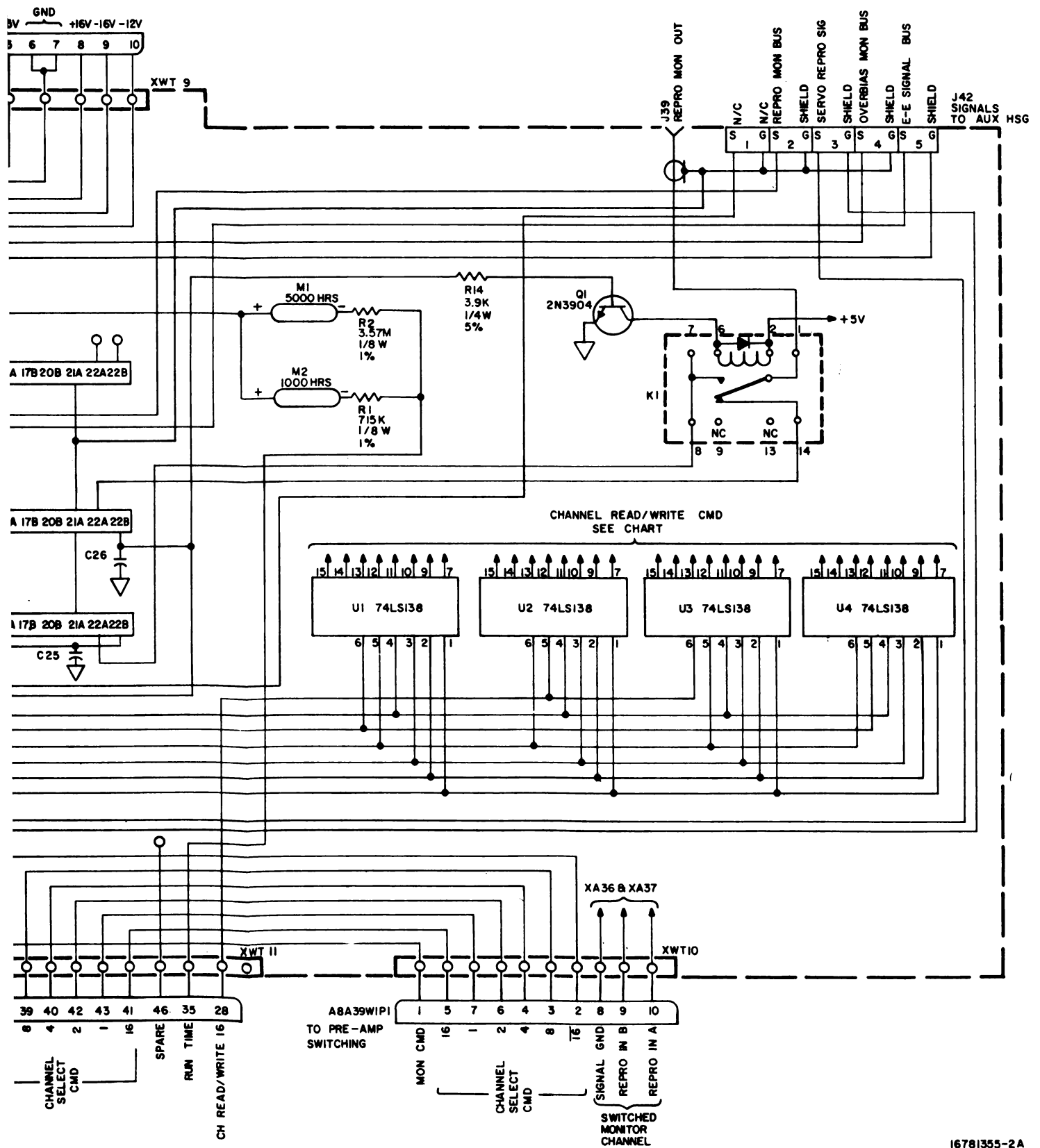
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Figure 7-1. Data Housing Distribution Schematic (Sheet 1 of 2)

A8A39 DATA HOUSING DISTRIBUTION (32 X 2)  
(REPRODUCE SECTION)





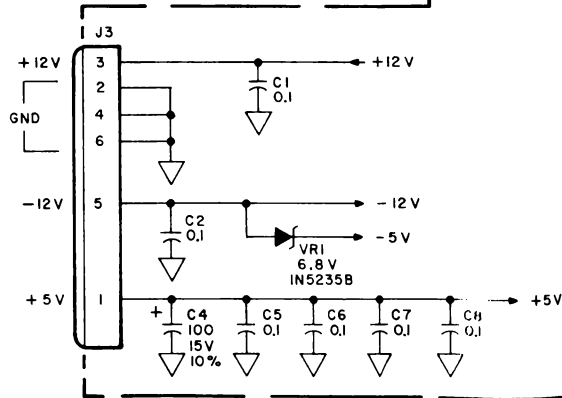
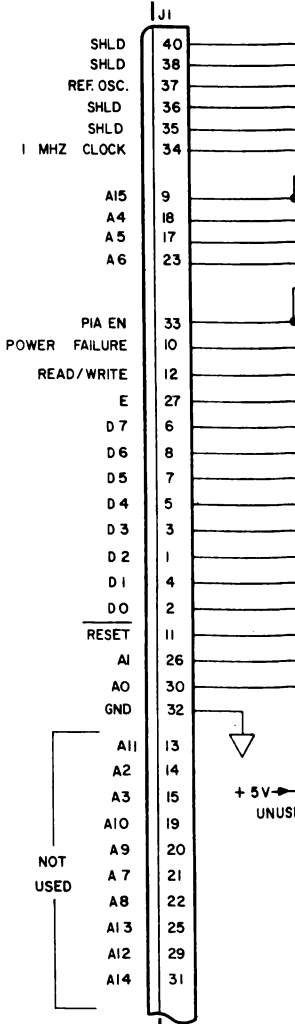
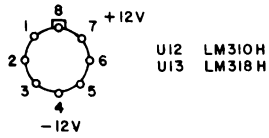
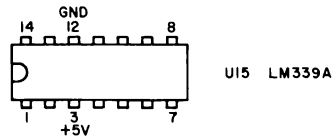
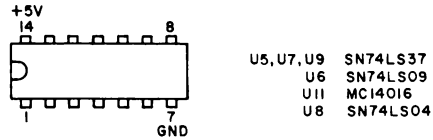
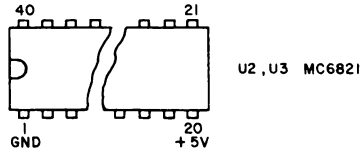
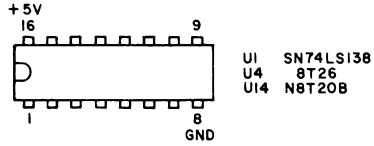


16781355-2A

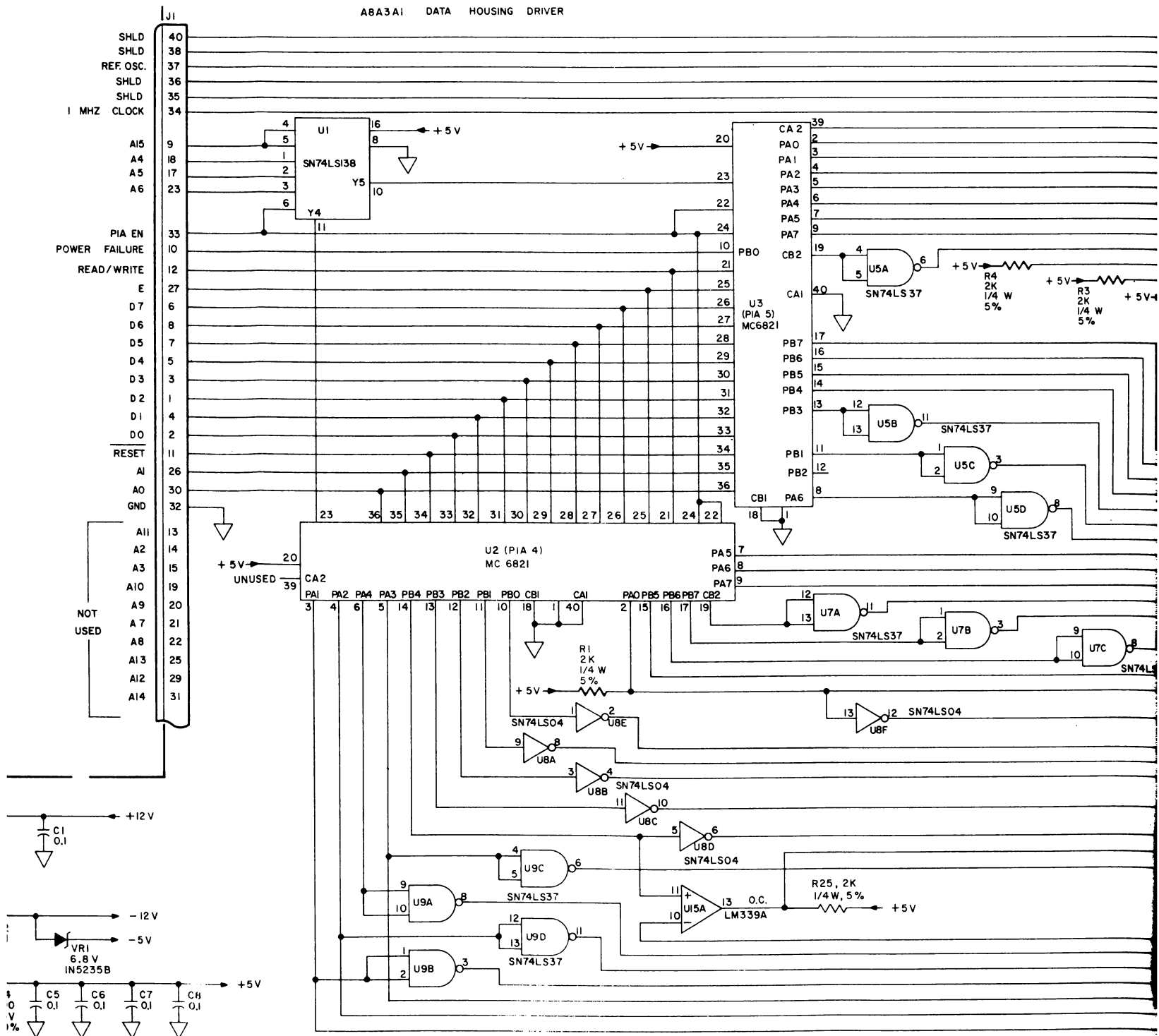
Figure 7-1. Data Housing Distribution Schematic (Sheet 2 of 2)

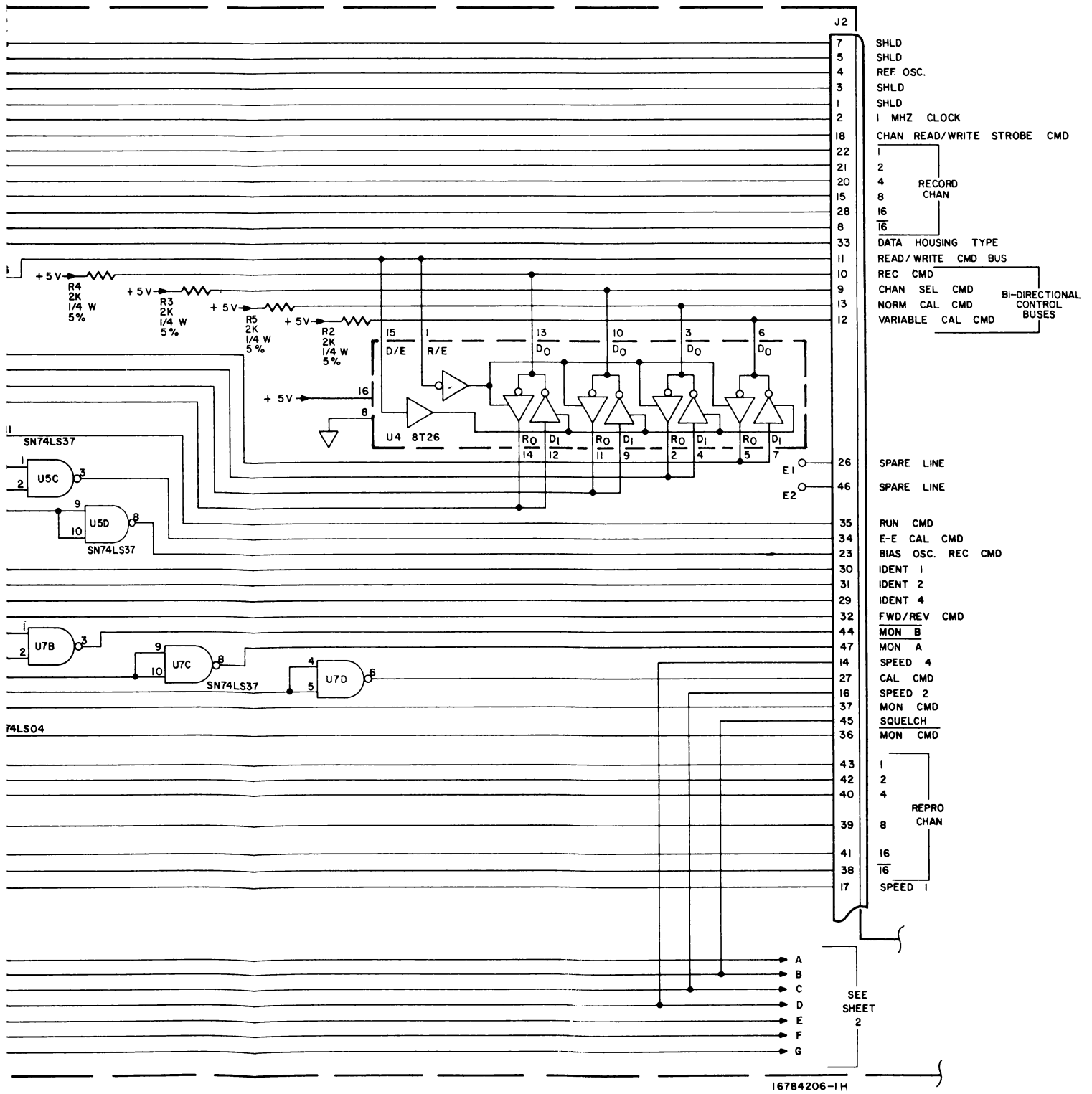
NOTES

1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.
2. ▽ DENOTES CIRCUIT COMMON.
3. O.C. DENOTES OPEN COLLECTOR.
4. △ UI0 IS A SEVEN RESISTOR ARRAY WITH VALUES OF 10K OHMS.
5. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



ABA3A1 DATA HOUSING DRIVER

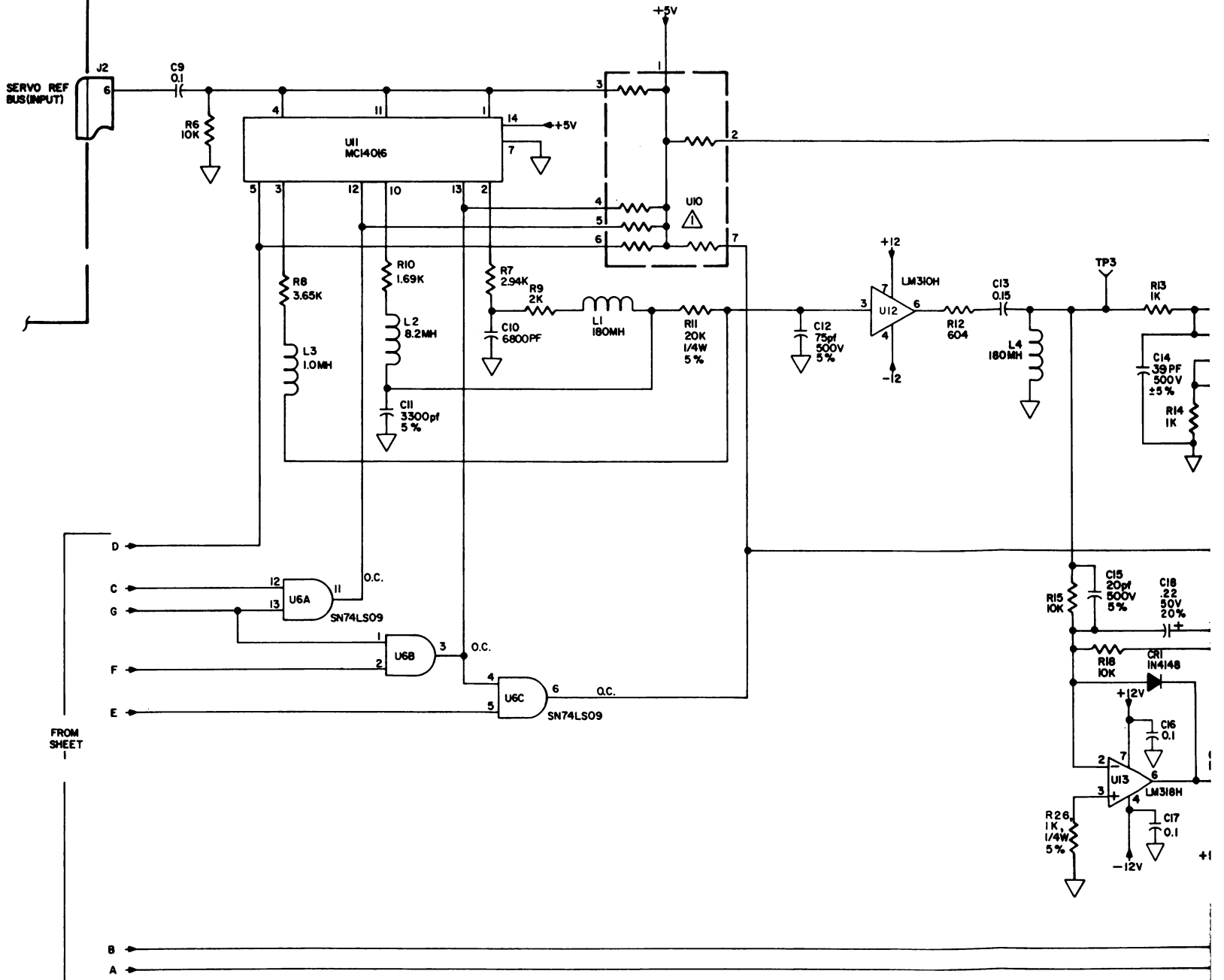




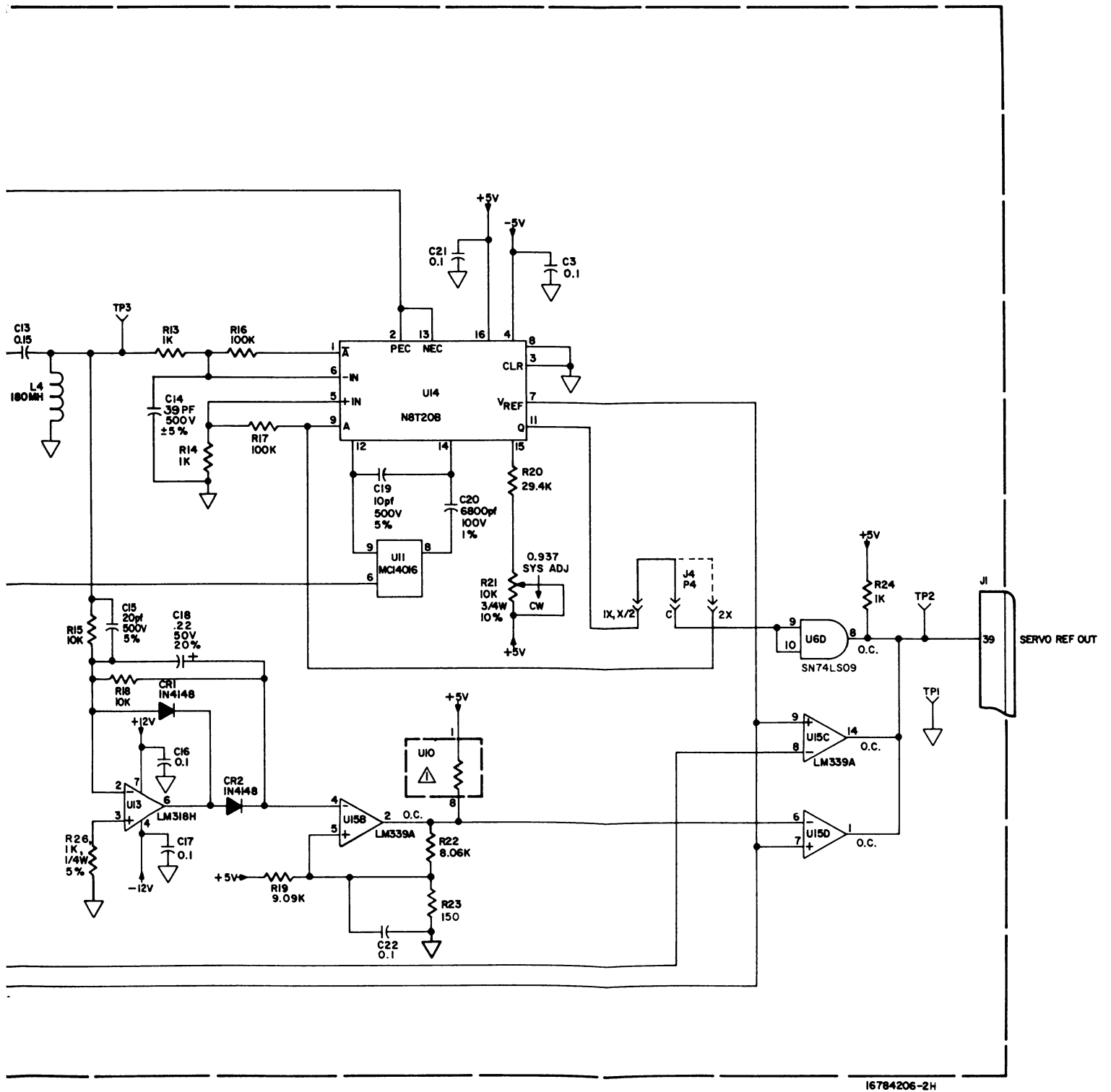
REF: 16784206-1K

Figure 7-2. Data Housing Driver Schematic (Sheet 1 of 2)

A8A3A1 DATA HOUSING DRIVER







16784206-2H

REF: 16784206-2K

Figure 7-2. Data Housing Driver Schematic (Sheet 2 of 2)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.

2. ▽ DENOTES SIGNAL GROUND.

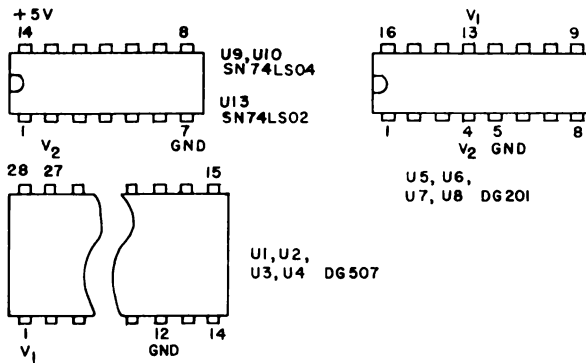
3. ⚠ DG201 I.C.S:  
 LOGIC 1 =  $V_{AH} \geq 2.4V$  = SWITCH OFF.  
 LOGIC 0 =  $V_{AL} \leq 0.8V$  = SWITCH ON.

- ⚠ U11, U12, (2.2K) AND C10 AND C11 NOT INSTALLED.

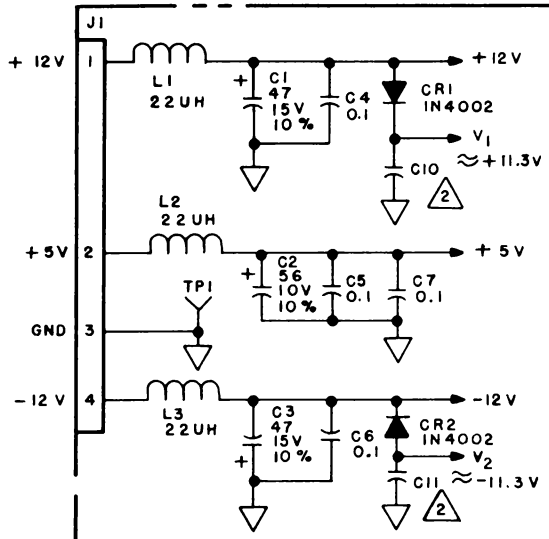
⚠ DG507 TRUTH TABLE:

A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	E <sub>N</sub>	ON SWITCH PAIR
X	X	X	0	NONE
0	0	0	0	1
0	0	1	0	2
0	1	0	0	3
0	1	1	0	4
1	0	0	0	5
1	0	1	0	6
1	1	0	0	7
1	1	1	0	8

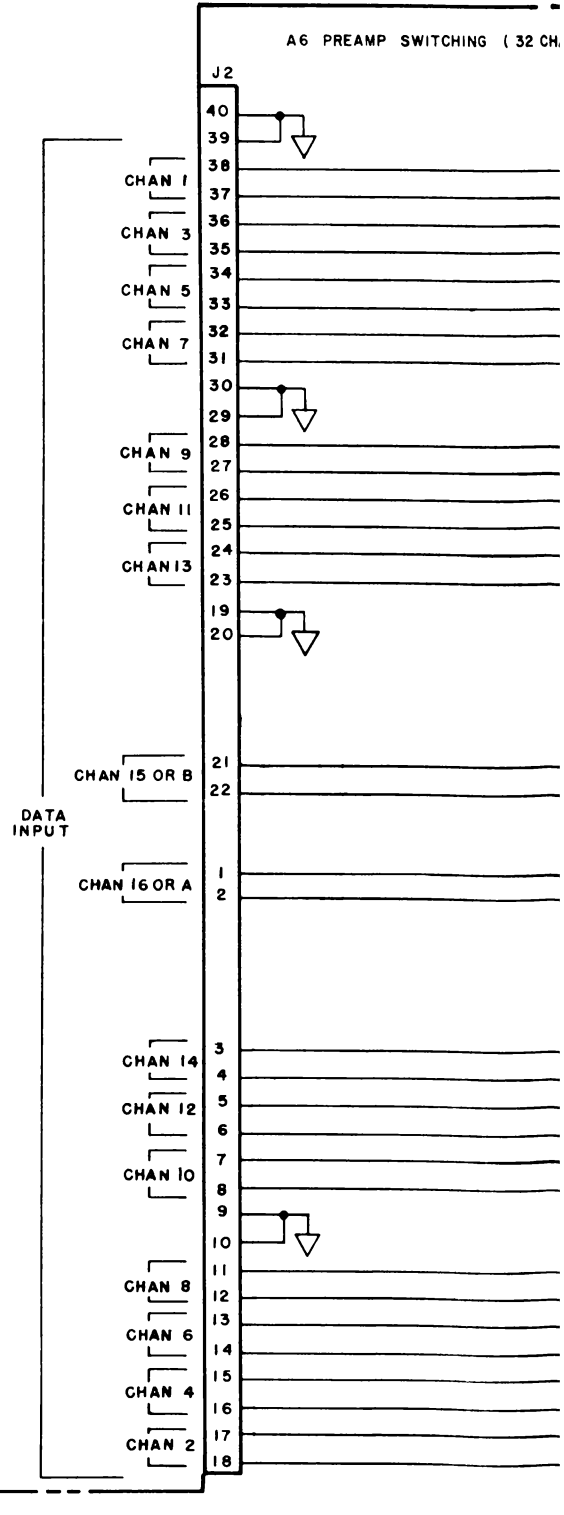
4. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



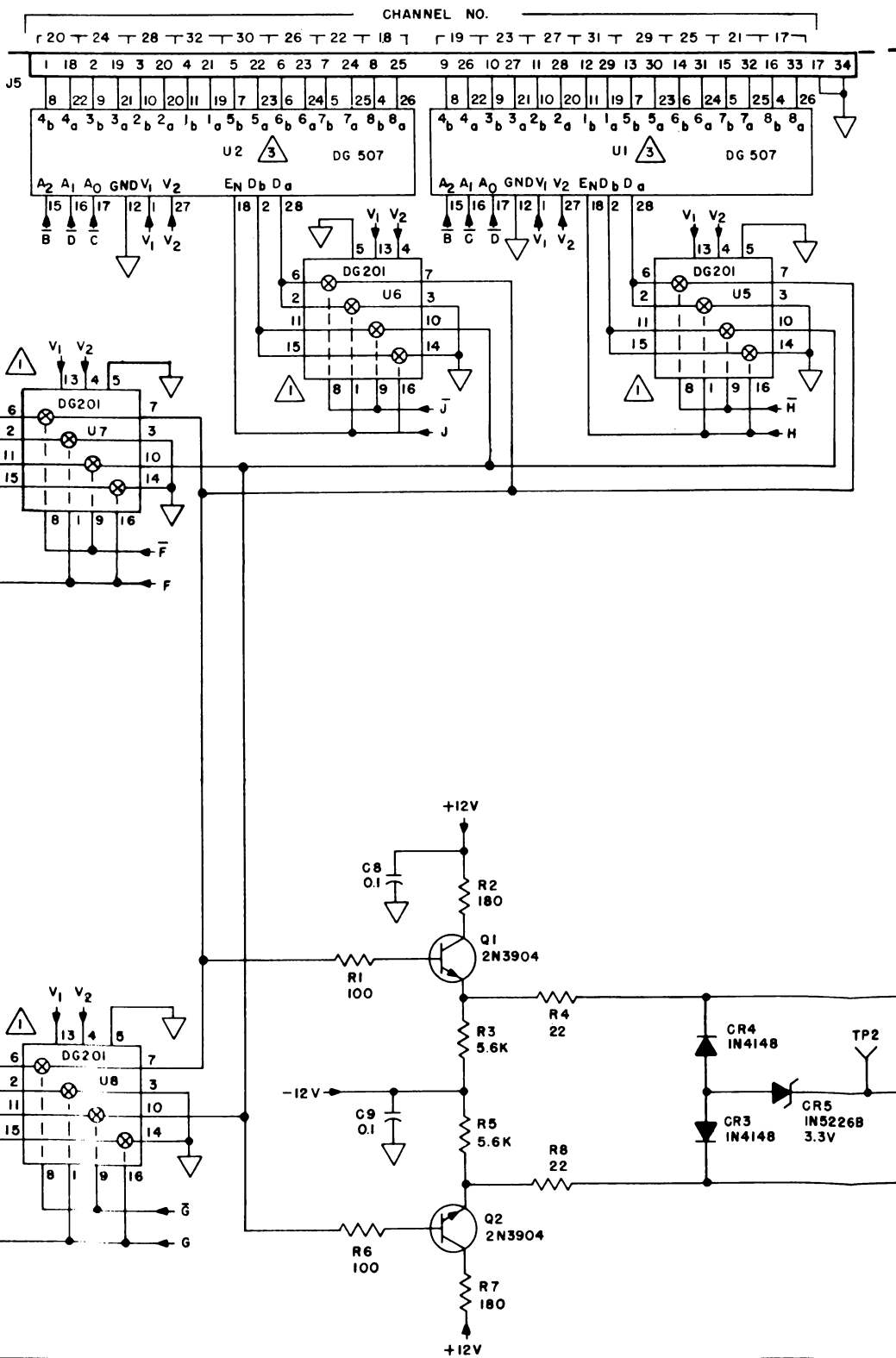
(NOTES CONT BELOW)

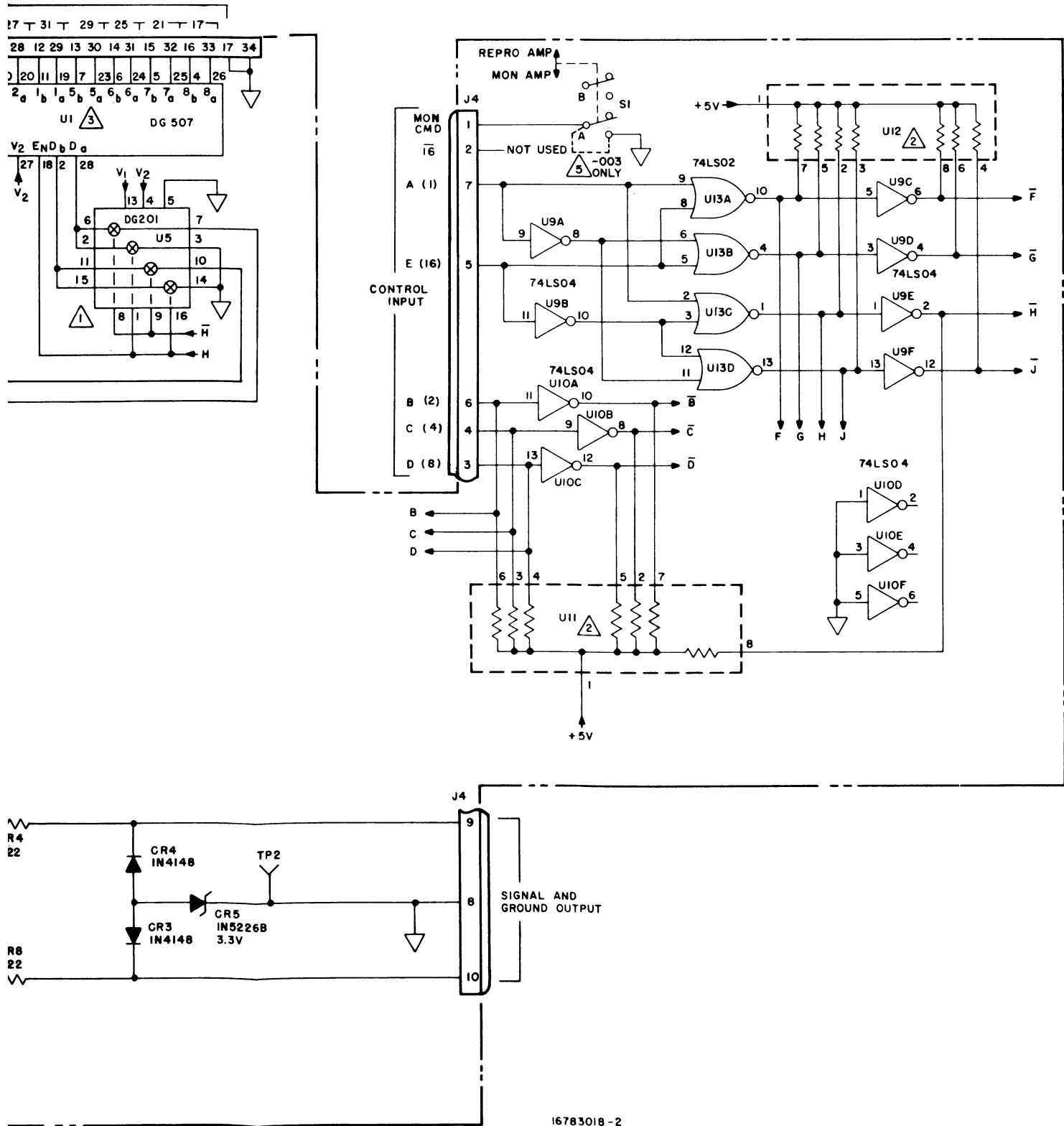


- ⚠ -003 ASSY ONLY - SW "SI" OMITTED AND JUMPER "W1" PLACED BETWEEN "A" AND "GND".



A6 PREAMP SWITCHING ( 32 CHANNEL )





16783018-2

REF: 16783018-2C

Figure 7-3. Thirty-Two Channel Preamplifier Switching Schematic

101/32DH

8/84

7-11/7-12

ADDENDUM TO  
TECHNICAL MANUAL 16783824-001T  
MODEL 101 32 X 2 DATA HOUSING

This addendum provides coverage for the 16784205-007 Data Housing Driver CCA. If your system does not have this assembly, disregard this addendum.

The 16784205-007 Data Housing Driver CCA is the same as the 16784205-006 except as follows:

THEORY OF OPERATION

Jumper J5 has been added to control the clear line of U14. This disables the U14 internal one-shot when in the 2X IRIG position.

PARTS LIST - TABLE 6-3

C3 and C18 have been changed to 0.22 UF,  $\pm 20\%$ , 50 VDC fixed ceramic dielectric capacitors; Honeywell part number, 16771020-020.

C19 has been changed to a 39 PF,  $\pm 5\%$ , 500 VDC fixed mica dielectric capacitor; Honeywell part number, 16759780-256.

J5, Honeywell part number 16779270-001 has been added.

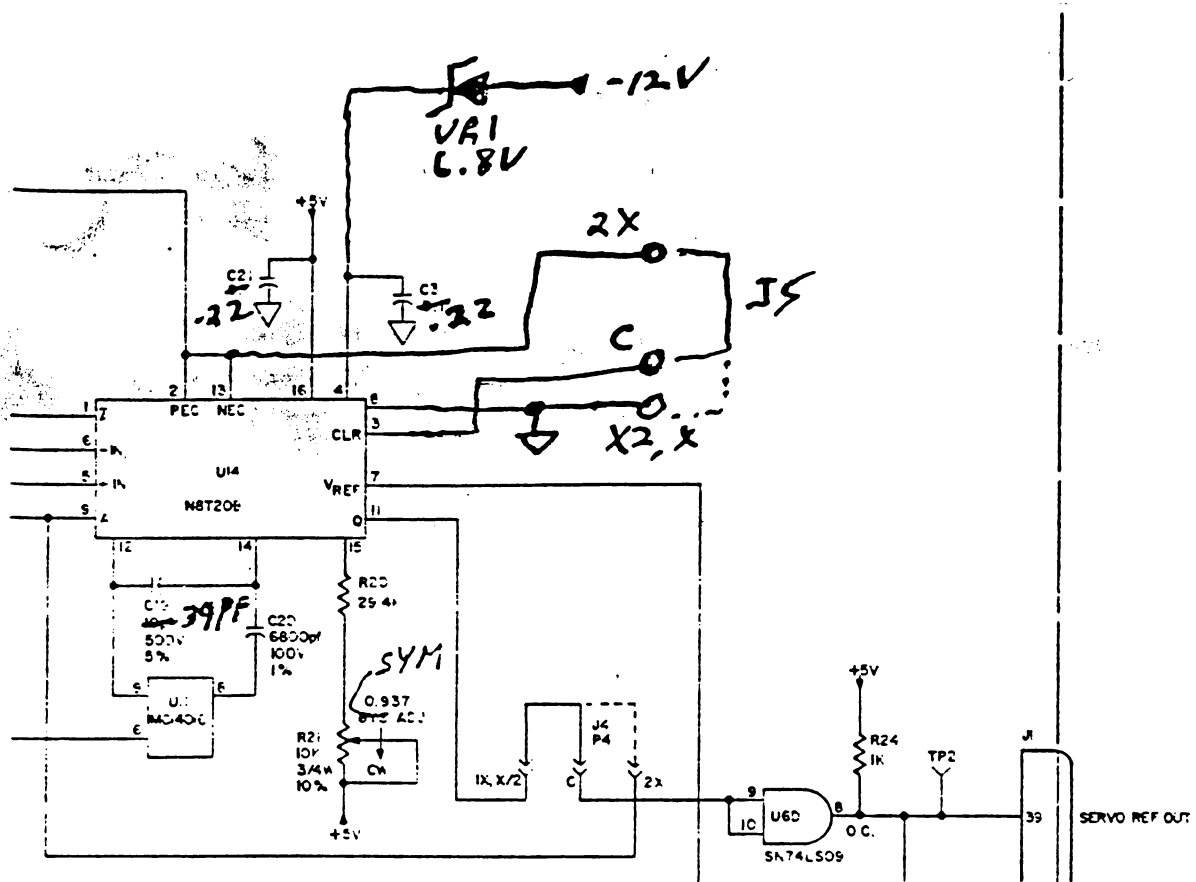
NOTE

NEW PART NUMBER IS INTERCHANGEABLE  
BACKWARD WITH ALL PREVIOUS PART  
NUMBERS; OLD PART NUMBERS ARE INTER-  
CHANGEABLE FORWARD WITH NEW PART NUMBER  
BUT WITH DEGRADED PERFORMANCE OR  
RELIABILITY.

HONEYWELL, INC.-Test Instruments Division-P.O. Box 5227-Denver, CO  
16783824-001U-December, 1984 .

SCHEMATIC - Figure 7-2, Sheet 2

Right hand side of schematic has been changed as shown in following partial schematic.



# Technical Manual

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**MAINTENANCE  
INSTRUCTIONS FOR  
DIRECT RECORD  
CIRCUIT CARD ASSY  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM**

**AUGUST 1984**

## **NOTICE**

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

16781255-001P - 300 - AUGUST, 1984 - Printed in U.S.A.

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## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the direct record circuit card assembly used with the Model 101 Magnetic Tape System. This manual contains only the information that is applicable to this card. The Operator's manual describes the relationship of the card to the system.

#### 1-2. DESCRIPTION

The record card contains both a record amplifier and a head driver amplifier. The record amplifier conditions external data input signals, and the head driver amplifier provides gain for a bias signal internal to the Model 101. The two signals are linearly mixed in the record head. The data and bias current levels are independently adjustable.

Provisions are made for calibration, servo reference mixing, and a normalized monitor output. Solid-state switching of the data and calibration inputs and the monitor output is controlled by the Model 101 microprocessor.

#### 1-3. SPECIFICATIONS

##### A. POWER

+16.5: +2.3, -0.5 Vdc; 35 mA typical, 45 mA maximum.  
-16.5: +0.05, -2.3 Vdc; 35 mA typical, 45 mA maximum.  
+12:  $\pm 0.12$  Vdc; 20 mA typical, 30 mA maximum.  
-12:  $\pm 0.12$  Vdc; 20 mA typical, 30 mA maximum.  
+5:  $\pm 0.1$  Vdc; 16 mA typical, 30 mA maximum.

##### B. MAXIMUM INPUT VOLTAGE

75 ohms Input:  $\pm 5$  Vdc or peak ac.  
20 Kohms Input:  $\pm 14$  Vdc or peak ac.

##### C. MAXIMUM LOAD AT OUTPUT

Short Circuit.

##### D. PERFORMANCE

###### 1. Conditions

Performance specifications are valid only for the following conditions:

- a. Power as specified in 1.3A.
- b. Environmental as specified in 1.3E.
- c. Source Impedance: 75 ohms maximum to meet specifications, or 600 ohms maximum with some degradation in frequency response.

d. Load Impedance:

Medium Band (mb): 16-turn ferrite head plus 47 pF in parallel.  
Wideband (wb): 10-turn ferrite head plus 47 pF in parallel.

e. Signal Inputs

(1) Data

Selectable Voltage Range

J3 PWB Jumpers: 1-4, 2-3; 0.1 to 1 Vrms.  
J3 PWB Jumpers: 1-2, 3-4; 1 to 7.1 Vrms.

Frequency

100 Hz to 2 MHz.

(2) Bias

Type: Sine wave

Voltage:  $\pm 2$ V peak, typical,  
 $\pm 1.6$ V peak, minimum.

Frequency mb: 4 MHz.  
wb: 8 MHz.

(3) Variable Calibrate

Voltage: 0.1 to 1 Vrms (1:1 attenuation).  
1 to 7.1 Vrms (10:1 attenuation).

Frequency: 100 Hz to 2 MHz.

(4) Normal Calibrate

Voltage: 1 V rms.

Frequency: 100 Hz to 2 MHz.

(5) Servo Reference

J2 PWB Jumper, 1-2: ON

J2 PWB Jumper, 2-3: OFF

Voltage: 1(+0.05) V rms.

Frequency: 500 Hz to 1 MHz.

Source Impedance: 50 ohms maximum.

NOTE

This signal is inverted in phase  
to the monitor and data outputs.

f. Digital Inputs

TTL Logic Control lines

Channel Read/Write (unique to each channel location).

Read Bus (Common to all channel locations).

Variable calibrate }  
Channel select } Bidirectional (read/write)  
Record }

2. Data Amplifier Output

The data amplifier output is adjustable for up to 4 mA RMS  
at 30 kHz mb, or 100 kHz wb.

a. Output Impedance: Mb @ 30 kHz, 380 ohms minimum.  
Wb @ 100 kHz, 380 ohms minimum.

b. Output Current Frequency Response, referred to 10 kHz.

100 Hz to 100 kHz, 0(+1) db.

Mb Pre-emphasis @ 600 kHz, 1(+0.5) db.

Wb Pre-emphasis @ 2 MHz, 3.9(+1) db.

c. Output Current Distortion, 2nd or 3rd Harmonic.

Mb @ 30 kHz, 2 mA rms;	0.3% maximum.
Wb @ 100 kHz, 2 mA rms;	0.3% maximum.

d. Output Current Noise, referred to 2 mA.  
RMS level, 100 Hz to 2 MHz, -52 db minimum.

e. Gain Drift, input to output at TP4., 0-70°C, 0.5 db.

3. Normalized Output (Without Calibration Option)

Test Point 5 output is normalized (using the GAIN control) for any data input within the specified range.

Output Level: 1 VRMS.

Frequency Response, (referred to 10 kHz): 100 Hz to 2 MHz, 0(+1) db.

Output Impedance, at 10 kHz: 500 ohms, maximum.

Distortion, 2nd or 3rd Harmonic: @ 100 kHz, 0.3% maximum.

4. Bias Amplifier Output

The bias amplifier output level is adjusted for the proper overbias condition.

Input Impedance: 3K minimum, 6K maximum;  
10 pF, maximum.

Output Impedance (measured with 5.6  $\mu$ H in series with the output and the tuning capacitor adjusted for minimum impedance):

Mb $\pm$ 4 MHz,	100 ohms, maximum.
Wb @ 8 MHz	100 ohms, maximum.

Output Current: 25 mA rms minimum.

Output Current Distortion:

2nd Harmonic @ 20 mA rms, 1% maximum.

Gain Drift (input to output at TP3) 0 to 70°C, 0.5 db maximum.

## 5. Amplifier Switching

Four bidirectional lines (A, B, C, and D) and two command lines (E and F) allow the Model 101 microprocessor to control the switching functions on the card.

### a. Control Line Functions

<u>Line</u>	<u>Function (Logic 0 = True)</u>
Variable calibrate:	Turns off the data input switch and turns on the variable calibrate input switch (adjust normalizing gain resistor for 1V rms at monitor output).
Normal Calibrate (Calibrate Option Only):	Turns on normal calibrate input (produces 1V rms output inverted in phase for 1 V rms input).
	NOTE: The variable calibrate switch must be on but with zero signal level.
Channel Select:	Switches normalized output to monitor bus line.
Record:	Switches bias and data signals to output.
Channel Read/Write:	Selects read/write commands for a particular channel location.
Read Bus:	Controls readout of card identification.

### b. Control Sequence

<u>Step</u>	<u>Read Bus</u>	<u>Channel Read/Write Line</u>	<u>Function</u>
1	0	0	Enable read gates. Read mb, wb, or disabled card.
2	0	1	Disable read gates.
3	1	1	Write new data onto bidirectional lines.
4	1	0	Latch new data into flip-flops on 1 to 0 transition of read/write line.

6. Record Enable/Disable Switch (Switch up = Enable)

A two-position, card-edge switch controls the read code as outlined above. Logic 1 read on lines A, B, and C requires a logic 1 to be written in on lines A, B, C, and D from the Model 101 microprocessor.

7. Record LED

A card, edge-mounted LED indicates the presence of bias current.

8. Servo Reference

Gain to monitor output: Fixed -1 ( $\pm 0.05$ ).

Frequency Response, 500 Hz to 1 MHz, referred to 10 kHz: 0( $\pm 1$ ) db.

9. Options

a. Servo reference, with buffer and gain control.

Gain to monitor output: Adjustable, 0 to -0.95.

Frequency Response, 500 Hz to 1 MHz, referred to 10 kHz. 0( $\pm 1$ ) db

b. Calibration (Normalized Monitor Output)

A separate, internally-buffered output is normalized to 1 V rms for any data input within the range specified.

Output: Adjustable to 1 V rms.

Frequency Response, 100 Hz to 2 MHz, referred to 10 kHz: 0( $\pm 1$ ) db

Output Impedance, at 10 kHz: 100 ohms, maximum.

Distortion, 2nd or 3rd Harmonic at 100 kHz: 0.3% maximum.

10. Adjustments

Data current,



SECTION 2  
INSTALLATION

The direct record card mounts in the data housing. The component side of the card faces left when installed. Prior to installing the card in the housing, verify that all jumper pins and the switch are in the proper positions.

**CAUTION**

System power must be turned off when the circuit card is being installed or removed.

## SECTION 3

### OPERATION

Operating procedures are not required for the direct record circuit card assembly. Refer to Operator's Manual for general operating instructions

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the direct record and head driver amplifiers. For the functional description refer to the block diagram Figure 4-1. For the detailed circuit description refer to both the block diagram and the schematics in Section 7.

#### 4-2. FUNCTIONAL DESCRIPTION

The bias input voltage is applied through level-adjusting BIAS control R1 to the bias amplifier. The amplifier output is mixed in the record head with the data signal.

The data input signal is applied through input impedance selector J1, relay K1, input attenuator J3, and GAIN control R30 to amplifier U2 (gain=10). The normalized signal, 1 V rms at TP5, is applied to RECORD LEVEL control R46 and then to amplifier U3 (gain = 10). The output of U3 drives the record head. The normalized output is also available on the monitor bus by means of the unity-gain buffer and switch U8B.

When relay K1 is not energized, a VARIABLE CALIBRATION signal may be applied to the data amplifier. Using an anticipated signal level, the GAIN control is adjusted for a normalized 1 V rms at TP5 or at the monitor bus. Using the NORMALIZED CALIBRATION input through switch U8A, a 1 V rms normalized signal may be produced at TP5 for calibration purposes.

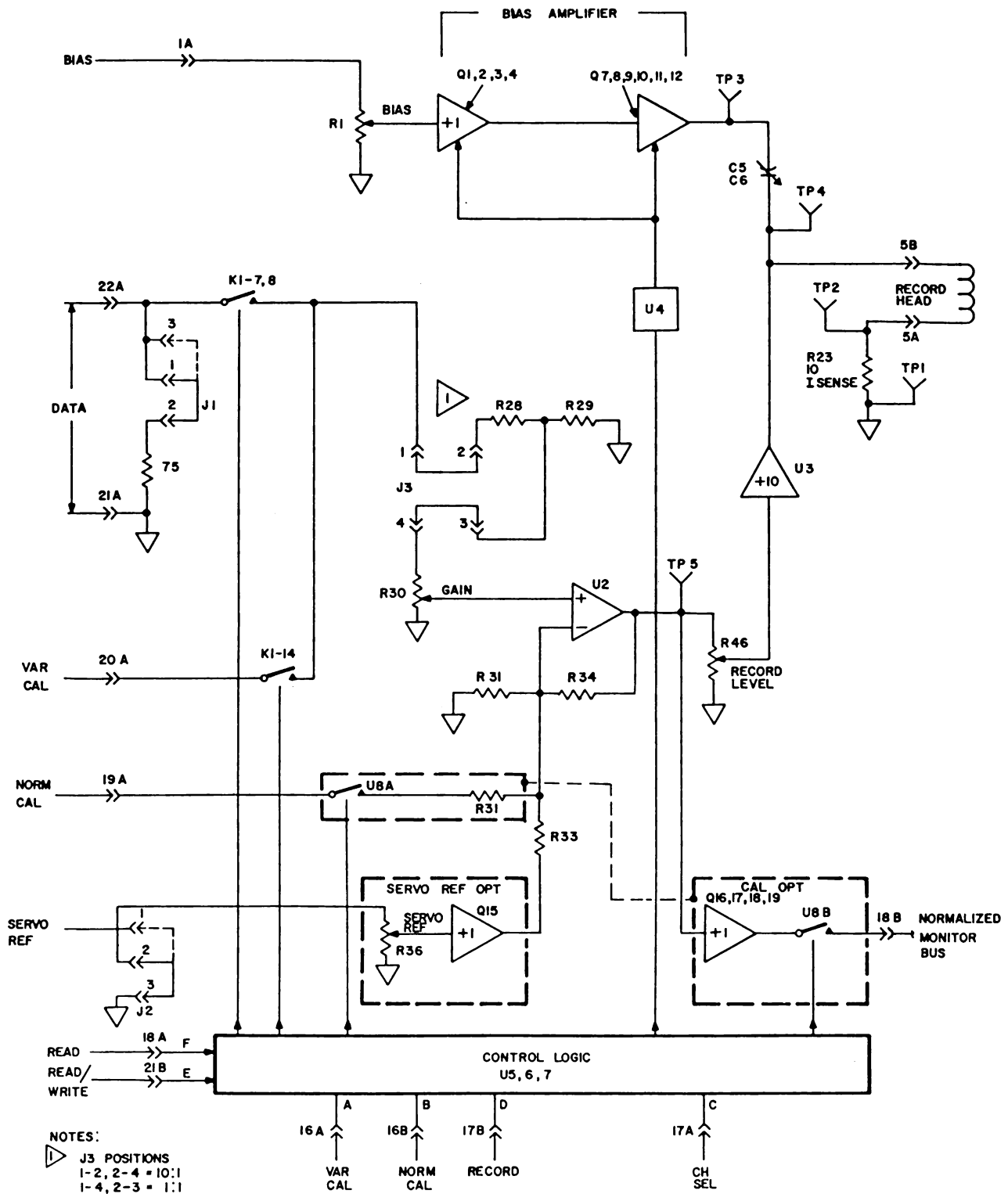
The control logic governs the action of solid-state switches U8A, U8B and relay K1, and also turns the bias amplifier on/off through amplifiers U4A and U4B.

A servo reference signal may be applied through J2 (1-2), SERVO REFERENCE control R-36, and the unity-gain buffer to amplifier U2.

#### 4-3. CIRCUIT DESCRIPTION

##### A. BIAS AMPLIFIER (Figure 7-1)

The bias voltage is applied through BIAS adjustment control R1 to a unity-gain buffer made up of Q1, Q2, Q3, Q4, and associated components. Resistors R4 and R5 stabilize the operating current for Q3 and Q4. The bias is then applied through C1 and C2 to an amplifier made up of Q7 and Q8. Resistors R7, R8, R9, and R10 establish bias voltages for the bases of Q7 and Q8, and resistors R11 and R12 establish the current in the transistors. Resistor R13, in conjunction with R11 and R12, sets the voltage gain of the stage. Transistors Q9, Q10, Q11, and Q12 provide current gain to drive the record head through tuning elements C5, C6, and L4. Capacitor C5 is adjusted



101/DR - 1A

Figure 4-1. Direct Record Block Diagram

for series resonance to reduce the voltage swing requirements for the bias amplifier. The current through Q11 returns to the +15 supply through LED CR10. Thus the presence of head current is indicated. Resistor R17 keeps CR10 turned off for the small quiescent current that flows through Q11 when the bias is turned off. Potentiometer R16 supplies a small amount of dc to the head to reduce second harmonic distortion.

The bias is switched on/off by Q5 and Q6, as described later. When the bias is off, R6 and R20 reference the coupling capacitors (C1, C2, C5, and C6) to common to prevent the dc voltage from drifting off zero.

#### B. DATA AMPLIFIER

The data signal is applied through J1 (1-2 for 75 ohms, and 1-3 for 20 K ohms) and CMOS switch to the attenuator associated with J3. (1-2 and 3-4 for 10:1 attenuation, and 1-4 and 2-3 for 1:1 attenuation.) Resistor R27 and diodes CR1 and CR2 provide input overload protection. Capacitors C11 and C12 couple the signal to the attenuator and remove the dc component. GAIN potentiometer R30 sets the output of amplifier U2 to a normalized level of 1 V rms. The gain of U2 is set by R34 and R31 to approximately 10.

Capacitor C16 removes any dc offset picked up in U2 and couples the signal through R44 to RECORD LEVEL potentiometer R46, which sets the data drive level to the head. Amplifier U3 is set to a gain of approximately 10 by R47 and R48. Resistors R49 and R50 and diodes CR8 and CR9 set the voltage bias for driver transistors Q13 and Q14. Resistors R51, R52, R53, and R54 current limit the drive of this stage. The data signal is applied through pre-emphasis network R56, R57, and C23, and bias trap C24, C25, and L5 to the record head. See Figure 4-2 for response curve.

#### C. MONITOR OUTPUT

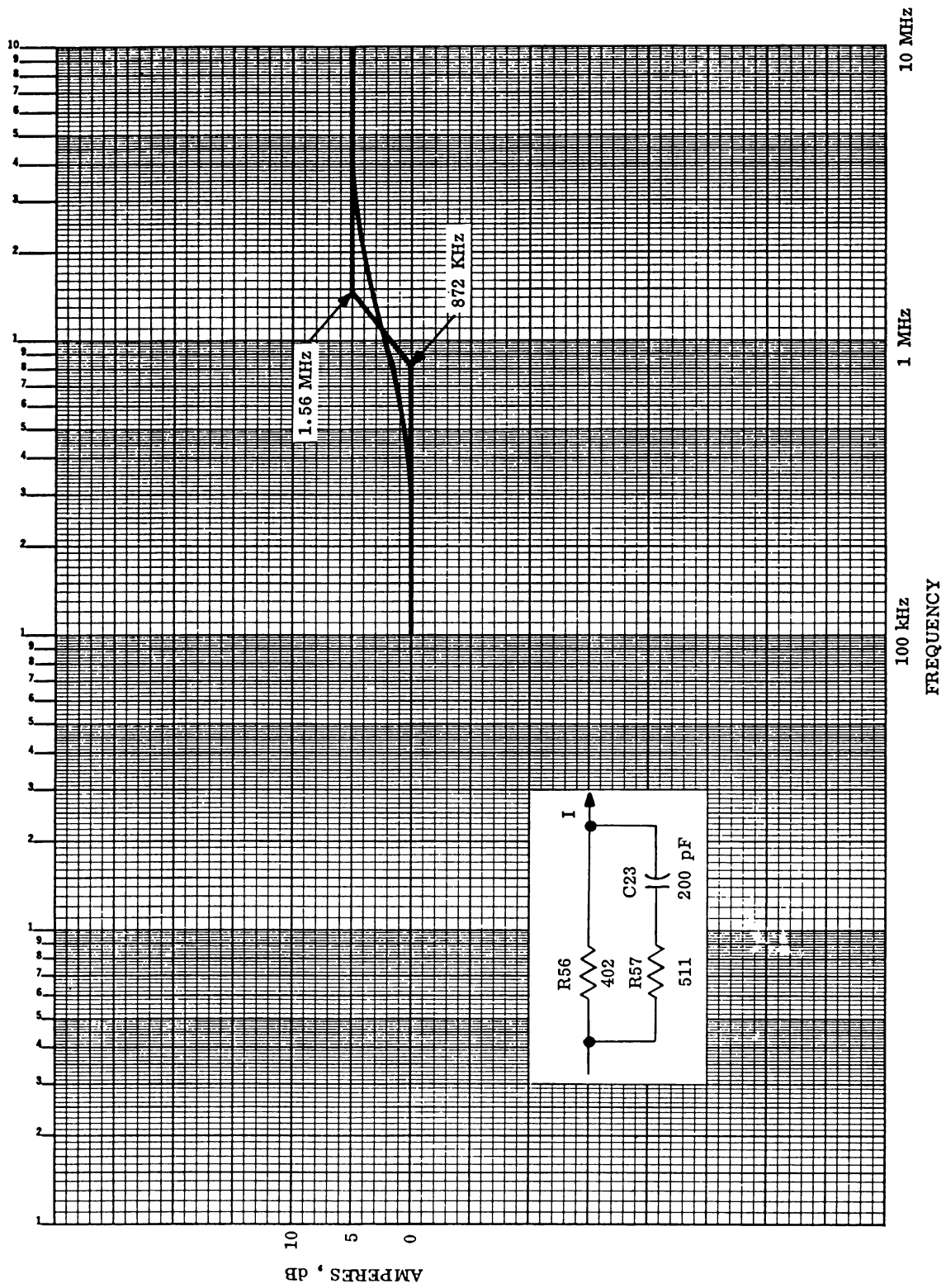
The normalized (1 V rms) at TP5 is applied through the unity-gain buffer (made up of Q16, Q17, Q18, Q19, and associated circuitry) and the CMOS switch U8-B to the monitor bus, when the switch is turned on by the control logic.

#### D. CALIBRATION

There are two calibration inputs, VARIABLE and NORMAL. The variable signal is applied through K1, when K1 is deenergized. The normalized signal is applied through CMOS switch U8-A and R32 to the summing node of U2. The applied signal appears inverted in phase at the output of U2.

#### E. SERVO REFERENCE

When J2 is in the 1-2 position the servo reference is applied to level control R36 and buffer transistor Q15 which drives the summing node of U2 through R33. This signal is also inverted at the output of U2.



101/DR-2

Figure 4-2. Pre-emphasis Network Response Curve

101/DR

## E. SERVO REFERENCE

When J2 is in the 1-2 position the servo reference is applied to level control R36 and buffer transistor Q15 which drives the summing node of U2 through R33. This signal is also inverted at the output of U2.

## F. CONTROL LOGIC

The solid-state switches are controlled by U7, Type-D flip-flops. Flip-flop U7A controls relay K1. Switch U8-A is controlled by U7-B, and U8-B is controlled by U7-D. A logic 0 turns the switches on. Amplifiers U4-A and U4-B control the bias through U7-C as follows.

### 1. Bias Off

The output of U7C-3 is close to zero volts, thus U4A-5 is zero volts through R40. Resistors R37 and R39 then force the output of U4-A to -5 Vdc (the magnitude is actually slightly less than this due to the positive offset of U7C-3). This action turns off NPN transistor Q5. The output of U4-A is inverted by U4-B, and this positive voltage turns off PNP transistor Q6.

### 2. Bias On

The output of U7C-3 is pulled to +5 Vdc by R41. This voltage on U4A-5 causes the output of U4-A to go to +11.7 Vdc by means of R38 and R39. This turns Q5 on, and the inverted voltage at U4B-1 turns Q6 on. Transistor Q5 supplies biasing current through R2 and R14, and Q6 supplies biasing current through R3 and R15. Thus the bias amplifier is enabled for operation. Turn on and turn off of the bias amplifier is slowed by R40 and C17 to avoid magnetization of the record head.

In the write mode of operation, the type of circuit card is indicated by the outputs of gates U6. The three outputs (A, B, and C) are programmed by wire jumpers W2, W3, and W4. In the read mode of operation, the data present on the D inputs of U7 is latched into the flip-flops on the positive-going transition of U5-B. For further description of the operation of the control logic see specifications in Section 1.

## G. SUPPLY VOLTAGES

The bias amplifier operates from unregulated +16.5V supplies. The data amplifier operates from regulated +12 Vdc supplies. The +5 Vdc is used in the logic control section. The capacitors, inductors, and resistors associated with these supplies are used to reduce noise that may be present on the supplies.

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

Adjustments to the direct record circuit card are described in the Model 101 Operator's Manual.

5-2. TROUBLESHOOTING

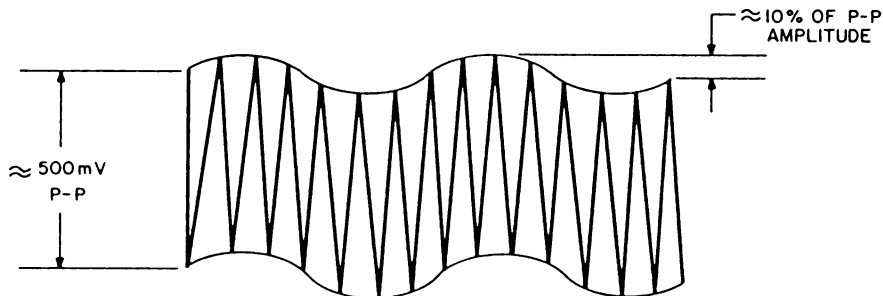
A. BIAS LED

<u>SYMPTOM</u>	<u>PROBABLE CAUSE</u>
Bias LED not lighted during record.	LED defective. Insufficient bias. Incorrect bias frequency.
Bias LED lit dimly during record.	Insufficient bias-record head lead open.

If bias LED is defective, bias applied to the head will be severely distorted.

B. DEFECTIVE RECORD CARD

1. To determine if record card is defective, check TP2 for bias and record signal. Apply calibrator 60 IPS, .1 BE signal to record card or apply external record signal. Waveform at TP2 should look like waveform shown.





2. Remove record signal and expand bias signal. Bias should not look distorted. Place record card on an extender card; then check power supply voltages on record card. Voltages are identified on the front of the card with silkscreen, and on the back in clad.

Connector Pin Number

9A, 9B: +12V.  
8A, 8B: -12V.  
12A, 12B: +5V.  
6A, 6B: +16.5V (-0.5, +2.3V).  
7A, 7B: -16.5V (+0.5V, -2.3).  
+15V (Back, in clad):+14.5 to 18V.  
-15V: -14.5 to -18V.

C. VERIFY RECORD LOGIC

Set record switch S1 to Enable (up), (record OFF).

U7 Pin 6 = 0V - Data signal turned on  
U1 Pin 5 should have data signal.

U7 Pin 7 = 5V - Variable calibrate signal  
turned off.

U7 Pin 10 = 5V - Normal calibrate turned off.

U7 Pin 15 = +5V - Turns off normalized monitor output.

0V - Turns on normalized output.

D. RECORD ON

Apply 1 V rms 100 kHz (wb) or 30 kHz (mb) signal to data input BNC for appropriate channel. Adjust R30 for 1 V rms at TP5.

## SECTION 6

### ILLUSTRATED PARTS BREAKDOWN

#### 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

##### A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

##### B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

##### C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

##### D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

##### E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## SECTION 6

### 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

### 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

### 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769
RADIO CORPORATION OF AMERICA SOLID STATE DIVISION ROUTE 202 SOMERVILLE, NEW JERSEY 08876	02735	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO. BOX 20922, 5005 E. MC DONELL RD PHOENIX, ARIZONA 85036	04713	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
PLASTIGLIDE MFG CORP P.O. BOX 867 1757 STANFORD STREET SANTA MONICA, CALIFORNIA 90406	11897	SPRAGUE ELECTRIC COMPANY NORTH ADAMS, MASSACHUSETTS 01247	56289
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
ELECTRONIC INSTRUMENT AND SPECIALTY CORPORATION STONEHAM, MASSACHUSETTS 02180	14908	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
SCANBE MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
BERG ELECTRONICS YORK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	ELECTRONIC INDUSTRIES ASSOCIATION	80131
ANALOG DEVICE, INCORPORATED P.O. BOX 280 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES OSA	81349
CORNELL-DUBILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60018	25243	AUGAT INCORPORATED 33 PERRY AVENUE ATTLEBORO, MASSACHUSETTS 02703	91506
8/83		ALCO ELECTRONICS PRODUCTS INC. 1551 OSGOOD STREET NORTH ANDOVER, MAINE 01845	95146
		DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800



SECTION 6

TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number National Stock No.			
6781252-117	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH CALIBRATE	28009	}	NOTE 1	NOTE 2	
6781252-122	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH CALIBRATE	28009				
6781252-119	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH SERVO REFERENCE AND CALIBRATE	28009				
6781252-124	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH SERVO REFERENCE AND CALIBRATE	28009				
<p>NOTES:</p> <ol style="list-style-type: none"> <li>1. CUSTOMER SELECTED ASSEMBLY CHECK EQUIPMENT FOR PART NUMBER AND QUANTITY USED.</li> <li>2. SPARE ONE ASSEMBLY FOR EACH DIFFERENT ASSEMBLY IN USE.</li> </ol>						

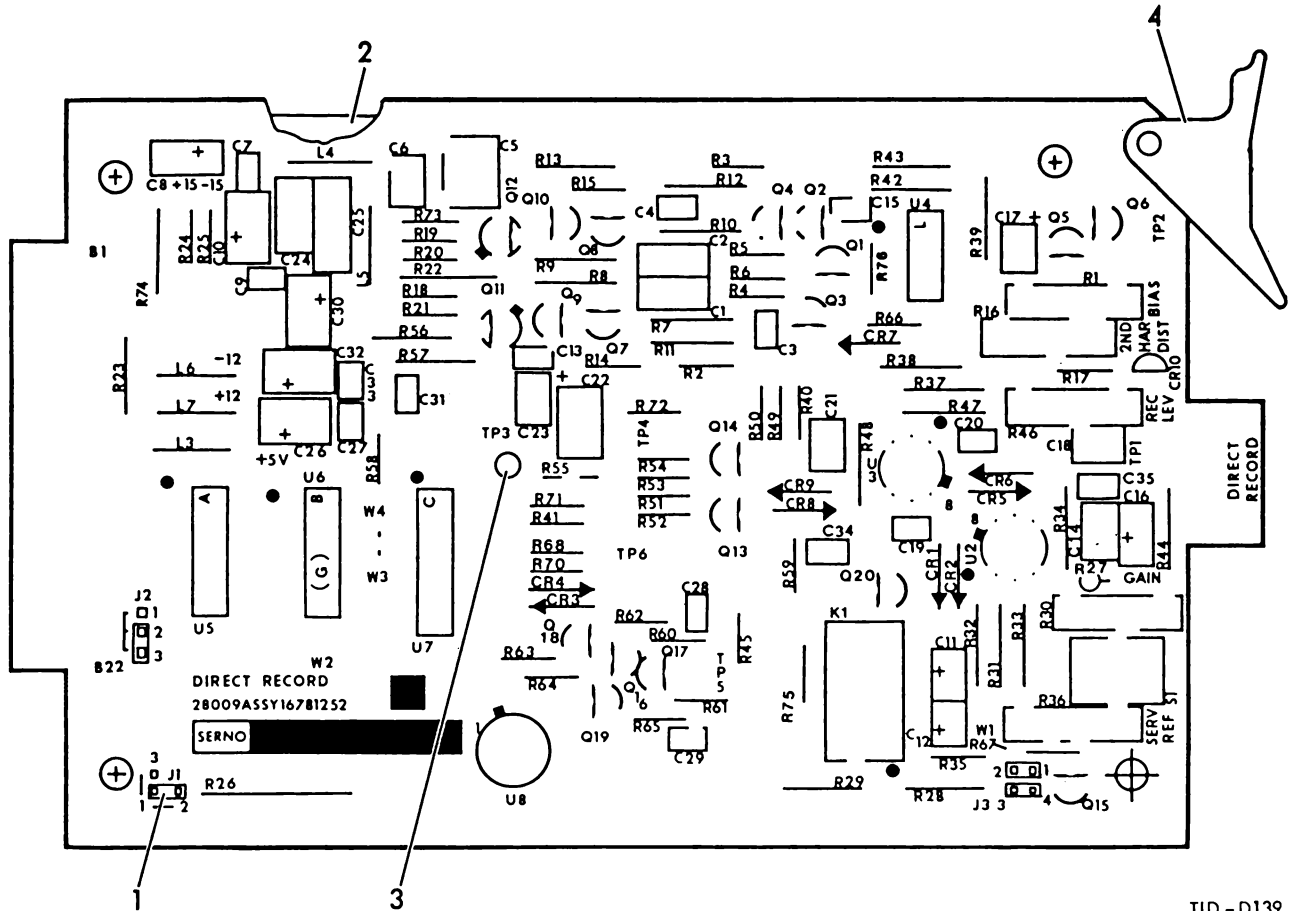
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SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-007	BENCH LEVEL SPARES KIT, DIRECT RECORD					
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	9	2	
16757925-007	TRANSISTOR	04713	2N2222A 5961-00-490-7299	1	1	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	8	2	
16762173-001	TRANSISTOR	04713	2N3906 5961-00-072-0128	7	2	
16769052-022	TRANSISTOR	04713	MPS404A5	1	1	
16775977-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	MC1458C	1	1	
16776979-001	TRANSISTOR	04713	SPS-8716	1	1	
16778597-003	SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING	28480	HLMP1301	1	1	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	2	1	
16779198-001	TRANSISTOR	80131	2N2907A 5961-00-904-4262	1	1	
16779948-001	BUS BAR	29593	B5153-100-2G8	7	4	
16781236-001	SWITCH, TOGGLE	95146	TT1106-RA-1	1	1	
16781332-002	MICROCIRCUIT	02735	CA3100E	2	1	
16781367-001	MICROCIRCUIT	01295	SN74LS38N	1	1	
99000249-001	MICROCIRCUIT	01295	SN74LS02N	1	1	
99000271-001	MICROCIRCUIT	01295	SN74LS175N 5962-00-595-8253	1	1	





TID-D139

FIGURE 6-1. DIRECT RECORD. CIRCUIT CARD ASSEMBLY

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 1 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH CALIBRATE	28009			167R1252-113	AR	A	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH CALIBRATE	28009			167R1252-114	AR	B	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH SERVO REFERENCE AND CALIBRATE	28009			167R1252-115	AR	C	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH SERVO REFERENCE AND CALIBRATE	28009			167R1252-116	AR	D	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH CALIBRATE	28009			167R1252-117	AR	E	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH CALIBRATE	28009			167R1252-118	AR	F	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, MEDIUM BAND, WITH SERVO REFERENCE AND CALIBRATE	28009			167R1252-119	AR	G	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH SERVO REFERENCE AND CALIBRATE	28009			167R1252-120	AR	H	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH CALIBRATE	28009			167R1252-122	AR	J	
6-1		ARA4-35	CIRCUIT CARD ASSEMBLY, DIRECT RECORD, WIDEBAND, WITH SERVO REFERENCE AND CALIBRATE	28009			167R1252-124	AR	K	
6-1		CR1-9	. SEMICONDUCTOR DEVICE, DIODE	81349	144148		16756865-003	9		
6-1		CR10	. SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING	28480	HLMP1371		16778597-003	1		
6-1		C1,2	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-20%, 50VDC	56289	C0239500E103M		16757455-002	2		
6-1		C3,4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA		16771020-018	2		
6-1		C5	. CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, 15-60PF, 200VDC	59660	53R-006F15-60		16753335-019	1	A,C,E,G	
6-1		C5	. CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, 9-35PF	59660	53R-00609-35		16753335-018	1	B,D,F,H-K	
6-1		C6	. CAPACITOR, FIXED, MICA DIELECTRIC 15PF, +-5%, 500VDC	25243	C010C0150JN1		16759780-247	1	A,C,E,G	
6-1		C6	. CAPACITOR, FIXED, MICA DIELECTRIC 18PF, +-5%, 500VDC	25243	C010C0180JN1		16759780-248	1	B,D,F,H-K	
6-1		C7	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA		16771020-018	1		
6-1		CR	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 20VDC	26769	41K52760020K1A		1675R058-339	1	A-D	
6-1		CR	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 25VDC	26769	41K5276E025K1A		1675R058-439	1	E-K	
6-1		C9	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA		16771020-018	1		
6-1		C10	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 20VDC	26769	41K52760020K1A		1675R058-339	1	A-D	
6-1		C10	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 25VDC	26769	41K5276E025K1A		1675R058-439	1	E-K	
6-1		C11,12	. CAPACITOR, FIXED, ELECTROLYTIC, 2.2UF, +-10%, 20VDC	26769	41K5275A020K1A		1675R058-326	2		

NOTES

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 2 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
					HOWEY PART NUMBER				
6-1		C13	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	1		
6-1		C14	. CAPACITOR, FIXED, MICA DIELECTRIC 2PF, +-5%, 500VDC	25243	CD10C0020C003	16759780-301	1		
6-1		C15	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	1		
6-1		C16	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 20VDC	26769	41KS106B020K1A	16758058-334	1		
6-1		C17	. CAPACITOR, FIXED, ELECTROLYTIC, 2.2UF, +-10%, 20VDC	26769	41KS275A020K1A	16758058-326	1		
6-1		C18	. CAPACITOR, FIXED, MICA DIELECTRIC 33PF, +-5%, 500VDC	25243	CD10E0330JN1	16759780-254	1		A,C,E,G
6-1		C18	. CAPACITOR, FIXED, MICA DIELECTRIC 10PF, +-5%, 500 VDC	25243	CD10C01000N1	16759780-245	1		B,D,F,H-K
6-1		C19,20	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	2		
6-1		C21	. CAPACITOR, FIXED, MICA DIELECTRIC 2PF, +-5%, 500VDC	25243	CD10C0020C003	16759780-301	1		
6-1		C22	. CAPACITOR, FIXED, ELECTROLYTIC, 56UF, +-10%, 10VDC	26769	41KS5660010K1A	16758058-143	1		
6-1		C23	. CAPACITOR, FIXED, MICA DIELECTRIC 200PF, +-5%, 500VDC	25243	CD10F0201JN1	16759780-273	1		
6-1		C24	. CAPACITOR, FIXED, MICA DIELECTRIC 2PF, +-5%, 500VDC	25243	CD10C0020C003	16759780-301	1		B,D,F,H-K
6-1		C25	. CAPACITOR, FIXED, MICA DIELECTRIC 180PF, +-1%, 100VDC	72136	DM15FA161F04CR	16770436-014	1		A,C,E,G
6-1		C25	. CAPACITOR, FIXED, MICA DIELECTRIC 82PF, +-1%, 100VDC	72136	DM15EA920F04CR	16770436-007	1		B,D,F,H-K
6-1		C26	. CAPACITOR, FIXED, ELECTROLYTIC, 56UF, +-10%, 10VDC	26769	41KS5660010K1A	16758058-143	1		
6-1		C27	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	1		
6-1		C28,29	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	2		
6-1		C30	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A	16758058-242	1		
6-1		C31	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	1		
6-1		C32	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A	16758058-242	1		
6-1		C33	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	1		
6-1		C34,35	. NOT USED						
6-1		J1-3	. TERMINAL, PIN	22526	75401-001	16779270-001	10		
6-1		K1	. RELAY, REED	14908	1697-1C5	16809521-001	1		
6-1		L1,2	. NOT USED						
6-1		L3	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-R19-1990	16750875-254	1		
6-1		L4,5	. COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167	16750875-246	2		A,C,E,G
6-1		L4,5	. COIL, RADIO FREQUENCY, 4.70 UH, +-10%	99800	1537-28 5950-00-837-6229	16750875-238	2		B,D,F,H-K

NOTES:

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 3 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY IN ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		L6,7	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-819-1990	16750875-254	2		
6-1	1	P1-4	. BUS BAR	70611	3800S103AUS	16779948-001	4		
6-1		71	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-1		Q2,3	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	2		
6-1		Q4	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-1		Q5	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-1		Q6,7	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	2		
6-1		Q8	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-1		Q9	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-1		Q10	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-1		Q11	. TRANSISTOR	04713	2N2222A 5961-00-490-7299	16757925-007	1		
6-1		Q12	. TRANSISTOR	80131	2N2907A 5961-00-904-4262	16779198-001	1		
6-1		Q13	. TRANSISTOR	04713	SPS-8716	16776979-001	1		
6-1		Q14	. TRANSISTOR	04713	MPS404A5	16769052-022	1		
6-1		Q15	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		C,D,G,H-K
6-1		Q16	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-1		Q17,18	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	2		
6-1		Q19	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-1	1	Q20	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-1		R1	. RESISTOR, VARIABLE, 5K OHMS, +-10%, 3/4W	73138	89PR5K	16775165-009	1		
6-1		R2,3	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCR07G562JM	16750079-051	2		
6-1		R4,5	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	2		
6-1		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-1		R7	. RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FS 5905-00-406-9959	16757165-239	1		
6-1		R8,9	. RESISTOR, FIXED, METAL FILM 12.6K OHMS, +-1%, 1/8W	81349	RNR55K1242FM	16757165-310	2		
6-1		R10	. RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FS 5905-00-406-9959	16757165-239	1		
6-1		R11,12	. RESISTOR, FIXED, METAL FILM, 182 OHMS, +-1%, 1/8W	81349	RNR55K1820FM	16757165-126	2		
6-1		R13	. RESISTOR, FIXED, METAL FILM, 511 OHMS, +-1%, 1/8W	81349	RNR55K5110FS	16757165-169	1		A-H

NOTES:

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 5 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
6-1		R42,43	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS 5905-00-138-1283	16757165-301	2			
6-1		R44	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289	16757165-201	1			
6-1		R45	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM	16750079-023	1			
6-1		R46	. RESISTOR, VARIABLE, 1K OHMS, +-10%, 3/4W	73138	R9PR1K	16775165-007	1			
1		R47	. RESISTOR, FIXED, METAL FILM, 332 OHMS, +-1%, 1/8W	81349	RNR55K3320FM	16757165-151	1			
6-1		R48	. RESISTOR, FIXED, METAL FILM, 3.01K OHMS, +-1%, 1/8W	81349	RNR55K3011FS	16757165-247	1			
6-1		R49,50	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCR07G562JM	16750079-051	2			
6-1		R51	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	1			
6-1		R52,53	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	2			
6-1		R54	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	1			
6-1		R55	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1			
6-1		R56	. RESISTOR, FIXED, METAL FILM, 402 OHMS, +-1%, 1/8W	81349	RNR55K4020FM	16757165-159	1			
6-1		R57	. RESISTOR, FIXED, METAL FILM, 511 OHMS, +-1%, 1/8W	81349	RNR55K5110FS	16757165-169	1			
6-1		R58,59	. RESISTOR, FIXED, CARBON COMPOSITION, 2.2K OHMS, +-5%, 1/4W	81349	RCR07G222JM	16750079-041	2			
6-1		R60,61	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCR07G562JM	16750079-051	2			
6-1		R62	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM	16750079-023	1			
6-1		R63,64	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	2			
1		R65	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM	16750079-023	1			
6-1		R66	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	1			
6-1		R67	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1	C, D, G, H-K		
5-1		R68	. RESISTOR, FIXED, CARBON COMPOSITION, 3.3K OHMS, +-5%, 1/4W	81349	RCR07G332JM	16750079-045	1			
6-1		R70,71	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	2			
6-1		R72,73	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	2			
6-1		R74	. RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/8W	81349	RNR55K1000FM	16757165-101	1	A, C, E, G		
5-1		R74	. WIRE, SOLID, BARE	23172	298	16750957-009	1	B, D, F, H-K		
6-1		R75	. RESISTOR, FIXED, CARBON COMPOSITION, 1.8K OHMS, +-5%, 1/4W	81349	RCR07G182JM	16750079-039	1			

NOTES

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 5 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
6-1		R42,43	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS 5905-00-138-1283		16757165-301	2		
6-1		R44	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289		16757165-201	1		
6-1		R45	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM		16750079-023	1		
6-1		R46	. RESISTOR, VARIABLE, 1K OHMS, +-10%, 3/4W	73138	R9PR1K		16775165-007	1		
4-1		R47	. RESISTOR, FIXED, METAL FILM, 332 OHMS, +-1%, 1/8W	81340	RNR55K3320FM		16757165-151	1		
6-1		R48	. RESISTOR, FIXED, METAL FILM, 3.01K OHMS, +-1%, 1/8W	81349	RNR55K3011FS		16757165-247	1		
6-1		R49,50	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCR07G562JM		16750079-051	2		
6-1		R51	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM		16750079-009	1		
6-1		R52,53	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM		16750079-166	2		
6-1		R54	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM		16750079-009	1		
6-1		R55	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM		16750079-057	1		
6-1		R56	. RESISTOR, FIXED, METAL FILM, 402 OHMS, +-1%, 1/8W	81349	RNR55K4020FM		16757165-159	1		
6-1		R57	. RESISTOR, FIXED, METAL FILM, 511 OHMS, +-1%, 1/8W	81349	RNR55K5110FS		16757165-169	1		
6-1		R58,59	. RESISTOR, FIXED, CARBON COMPOSITION, 2.2K OHMS, +-5%, 1/4W	81349	RCR07G222JM		16750079-041	2		
6-1		R60,61	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/4W	81349	RCR07G562JM		16750079-051	2		
6-1		R62	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM		16750079-023	1		
6-1		R63,64	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM		16750079-166	2		
1		R65	. RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, +-5%, 1/4W	81349	RCR07G391JM		16750079-023	1		
6-1		R66	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM		16750079-009	1		
6-1		R67	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620		16750079-033	1	C, D, G, H-K	
4-1		R68	. RESISTOR, FIXED, CARBON COMPOSITION, 3.3K OHMS, +-5%, 1/4W	81349	RCR07G332JM		16750079-045	1		
4-1		R70,71	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM		16750079-057	2		
6-1		R72,73	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM		16750079-009	2		
6-1		R74	. RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/8W	81349	RNR55K1000FM		16757165-101	1	A, C, E, G	
5-1		R74	. WIRE, SOLID, BARE	23172	798		16750957-009	1	B, D, F, H-K	
6-1		R75	. RESISTOR, FIXED, CARBON COMPOSITION, 1.8K OHMS, +-5%, 1/4W	81349	RCR07G182JM		16750079-039	1		

NOTES

SECTION 6

TABLE 6-1. DIRECT RECORD CCA (SHEET 6 OF 6)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		R76	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR076102JM 5905-00-110-7620	16750079-033	1		
6-1		S1	. SWITCH, TOGGLE	95146	TY1106-RA-1ETY	16781236-001	1		
6-1		TP1	. TERMINAL, STUD	71279	160-1558-02-01 5940-00-853-6232	16750201-022	1		
6-1		TP2-5	. TERMINAL, STUD	71279	2027-2 5940-00-280-0601	16757170-002	4		
6-1		TP6	. TERMINAL, STUD	71279	160-1558-02-01 5940-00-853-6232	16750201-022	1		
6-1		U2,3	. MICROCIRCUIT	02735	CA3100E	16781332-002	2		
6-1		U4	. INTEGRATED CIRCUIT	04713	MC1458C	16775977-001	1		
6-1		U5	. MICROCIRCUIT	01295	SN74LS02N	99000249-001	1		
6-1		U6	. MICROCIRCUIT	01295	SN74LS38N	16781367-001	1		
6-1		U7	. MICROCIRCUIT	01295	SN74LS175N 5962-00-595-8253	99000271-001	1		
6-1		U8	. INTEGRATED CIRCUIT	24355	A07913JM	16779188-002	1		
6-1	2		. SHIELD, CIRCUIT CARD	28009		16781263-001	1		
6-1	3		. BUMPER, PLASTIC	11897	13RNN5324	16780426-003	1		
6-1	4		. EJECTOR, CIRCUIT CARD ASSEMBLY	18677	202YELLOW	16760704-006	1		A,C,E,G
6-1	4		. EJECTOR, CIRCUIT CARD ASSEMBLY	18677	202BLUE	16760704-010	1		B,D,F,H-K
NOTES:									

12/83

**SECTION 7**  
**SCHEMATICS**



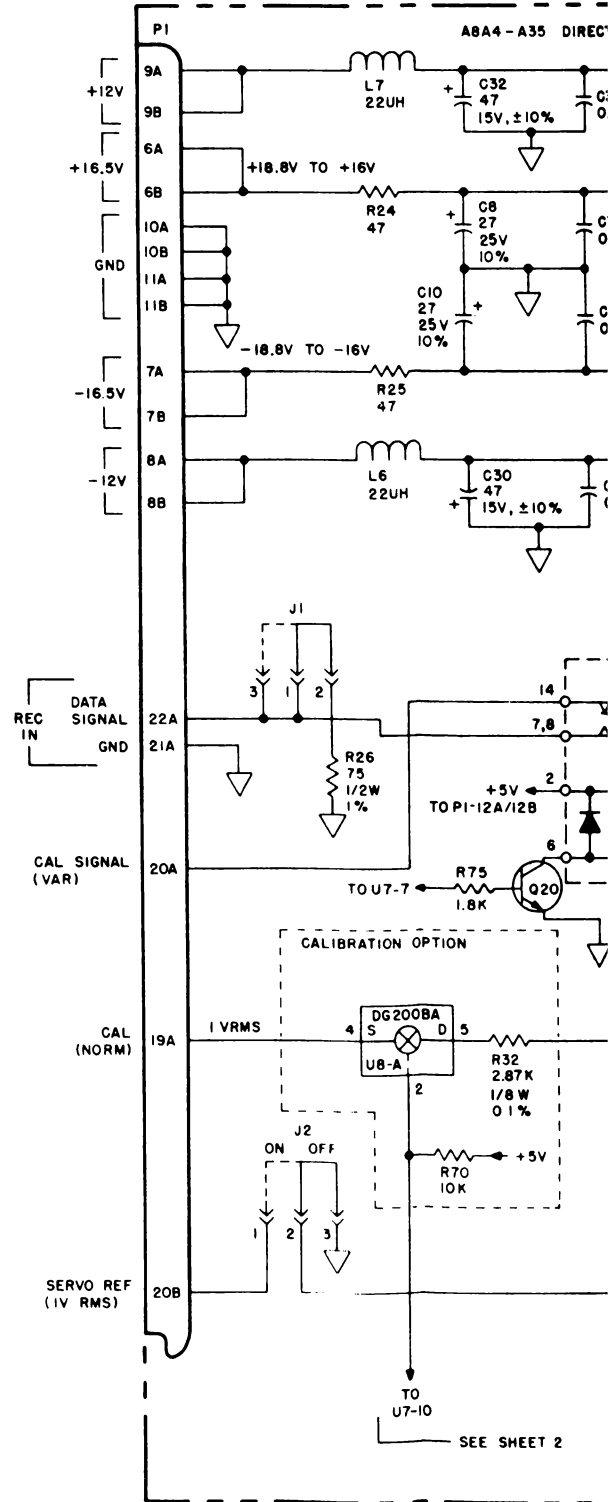
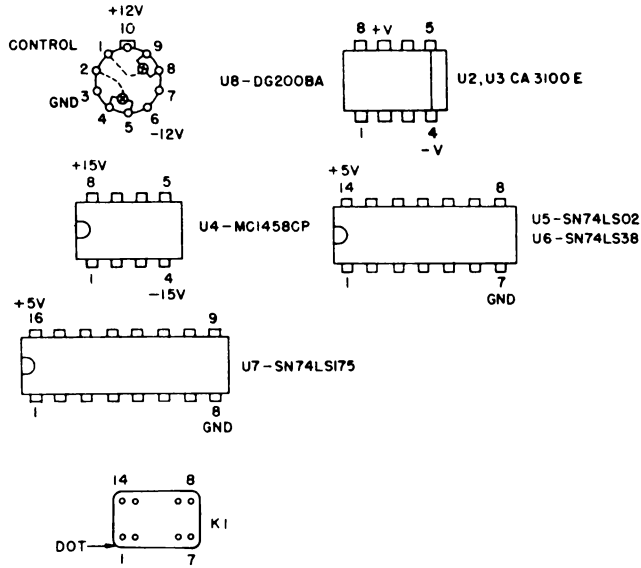
NOTES

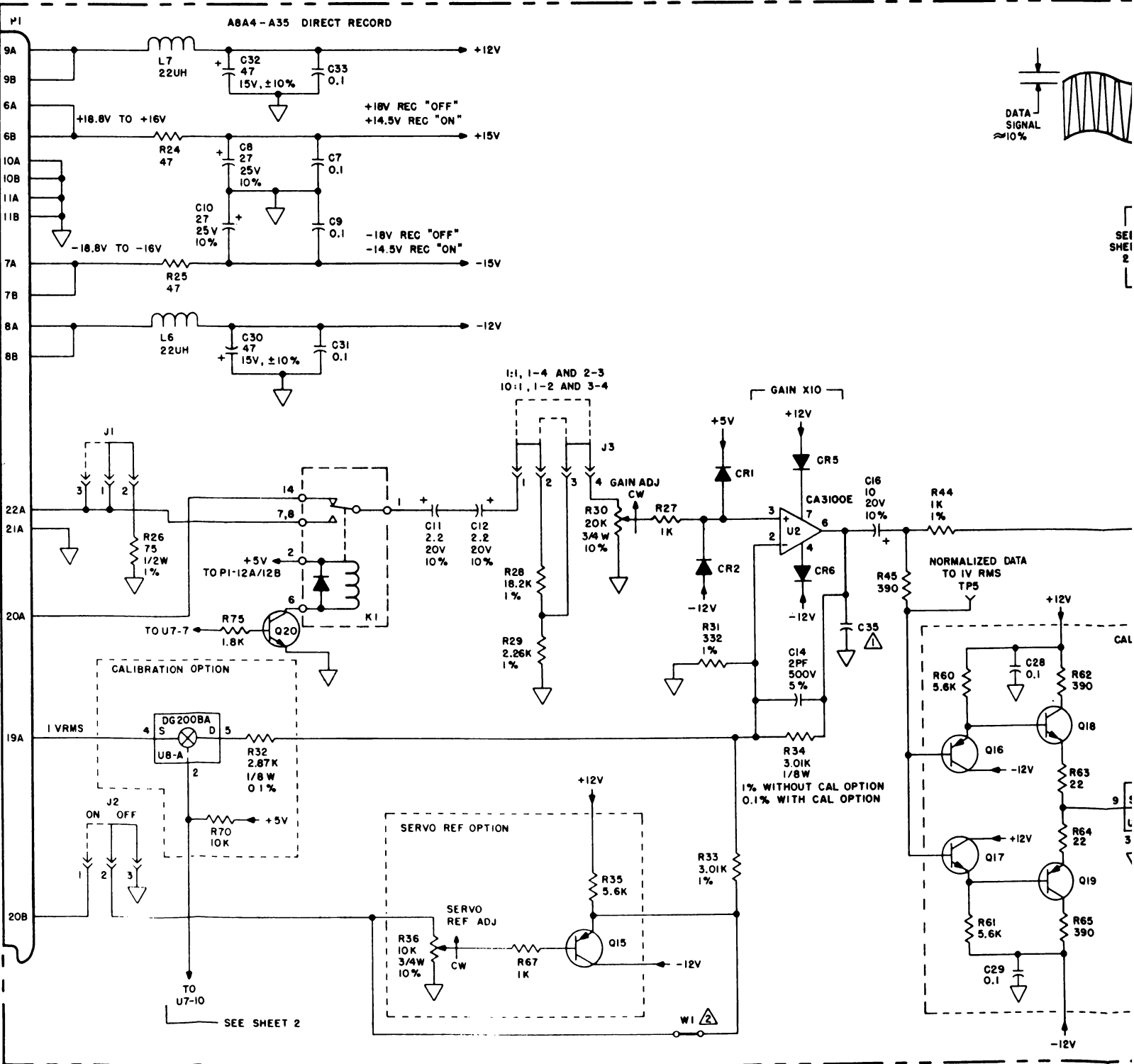
1. UNLESS OTHERWISE SPECIFIED:  
 ALL 1% RESISTORS ARE 1/8W  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL NPN TRANSISTORS ARE 2N3904.  
 ALL PNP TRANSISTORS ARE 2N3906.

2. ▽ DENOTES CIRCUIT COMMON.
3. [ ] DENOTES MED. BAND VALUES.
4. ⚠ C34, C35 NOT INSTALLED.

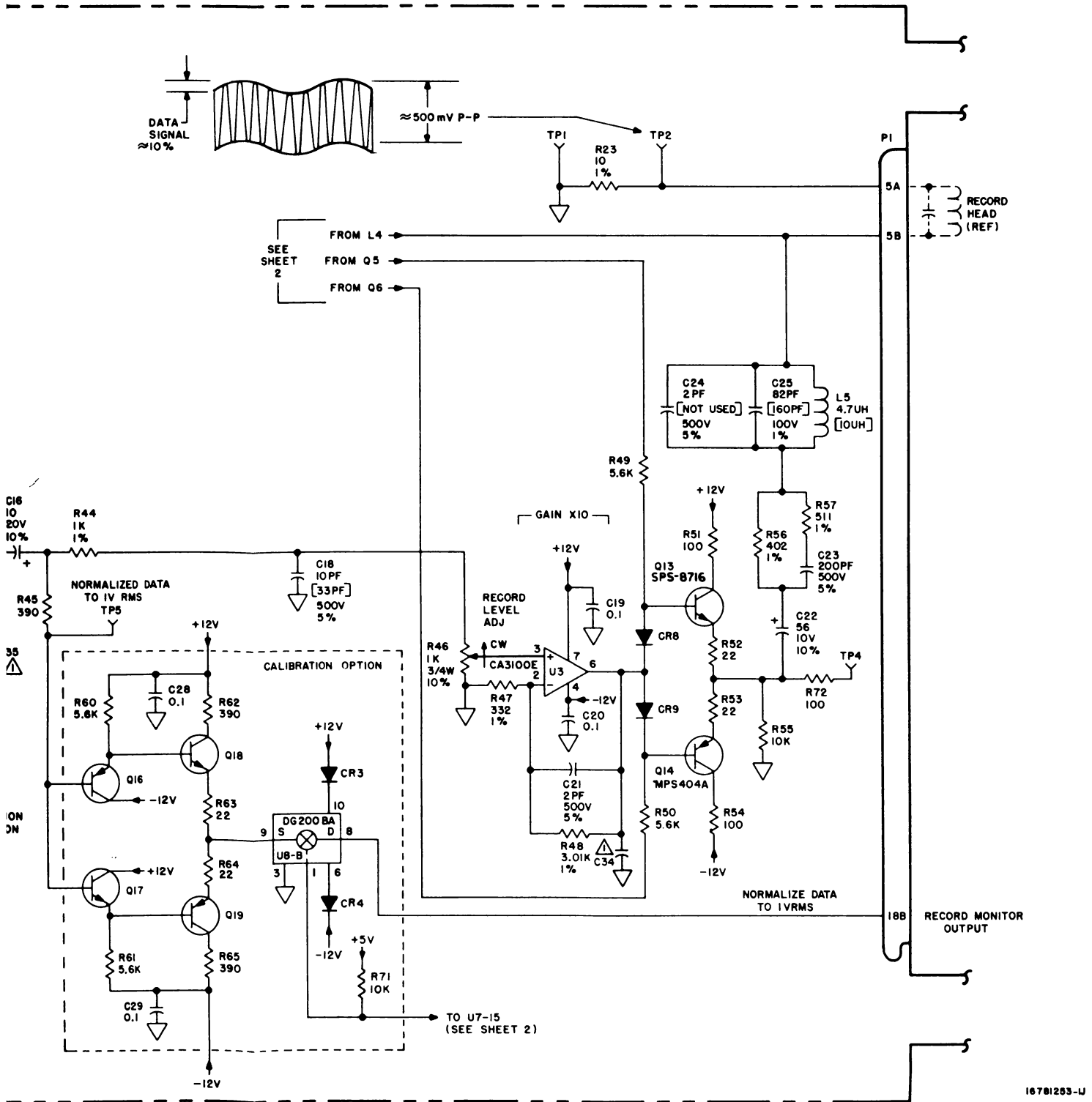
WIRE	DASH NO REF
W1	-015, -020, -117, -122 ONLY
W2	-015, -020, -017, -124 ONLY
W3	-015, -017, -117, -119 ONLY
W4	-020, -022, -122, -124 ONLY

5. INTEGRATED CIRCUIT PIN CONFIGURATION IS AS FOLLOWS, TOP VIEW SHOWN:





SEE SHEET 2

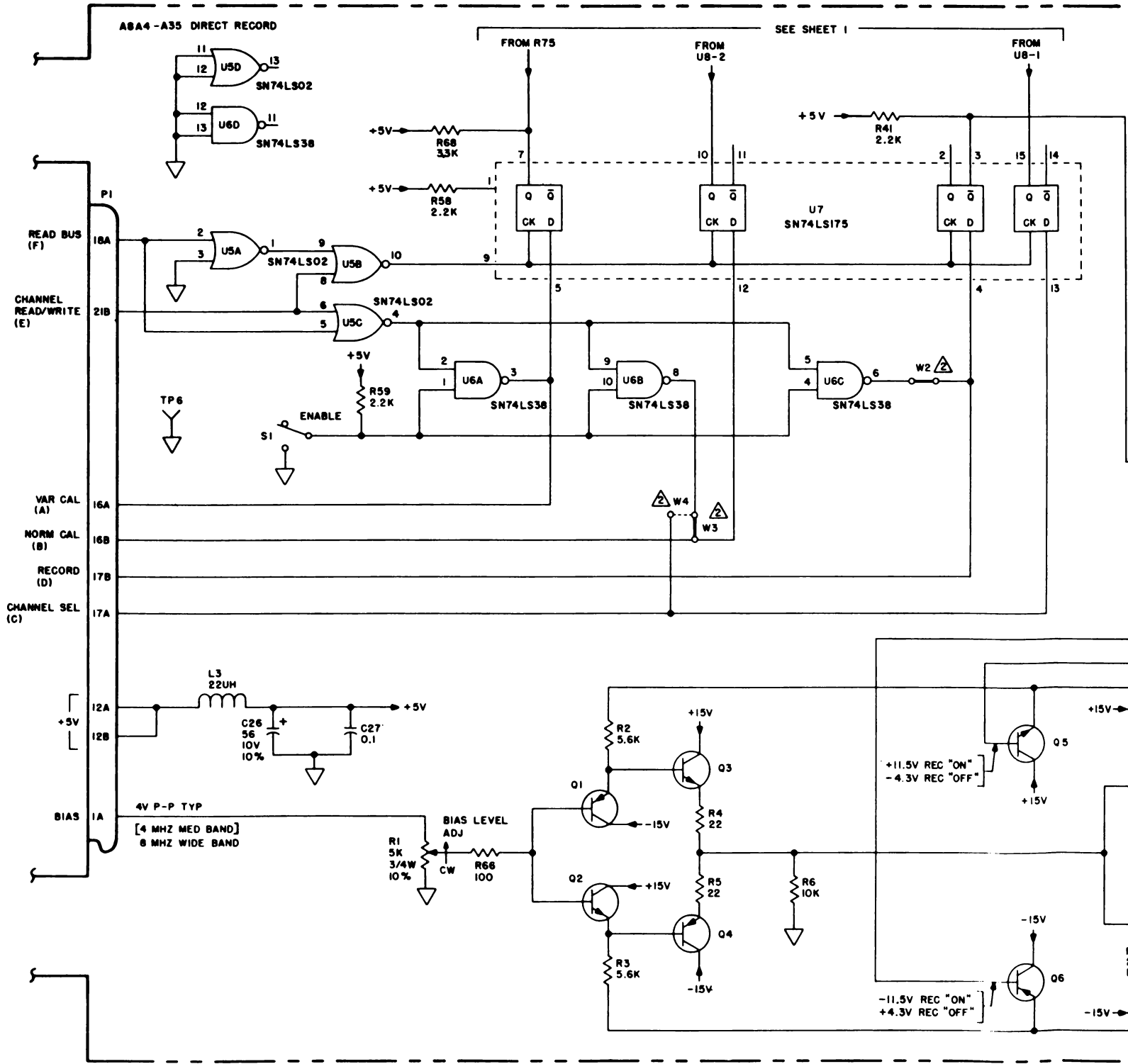


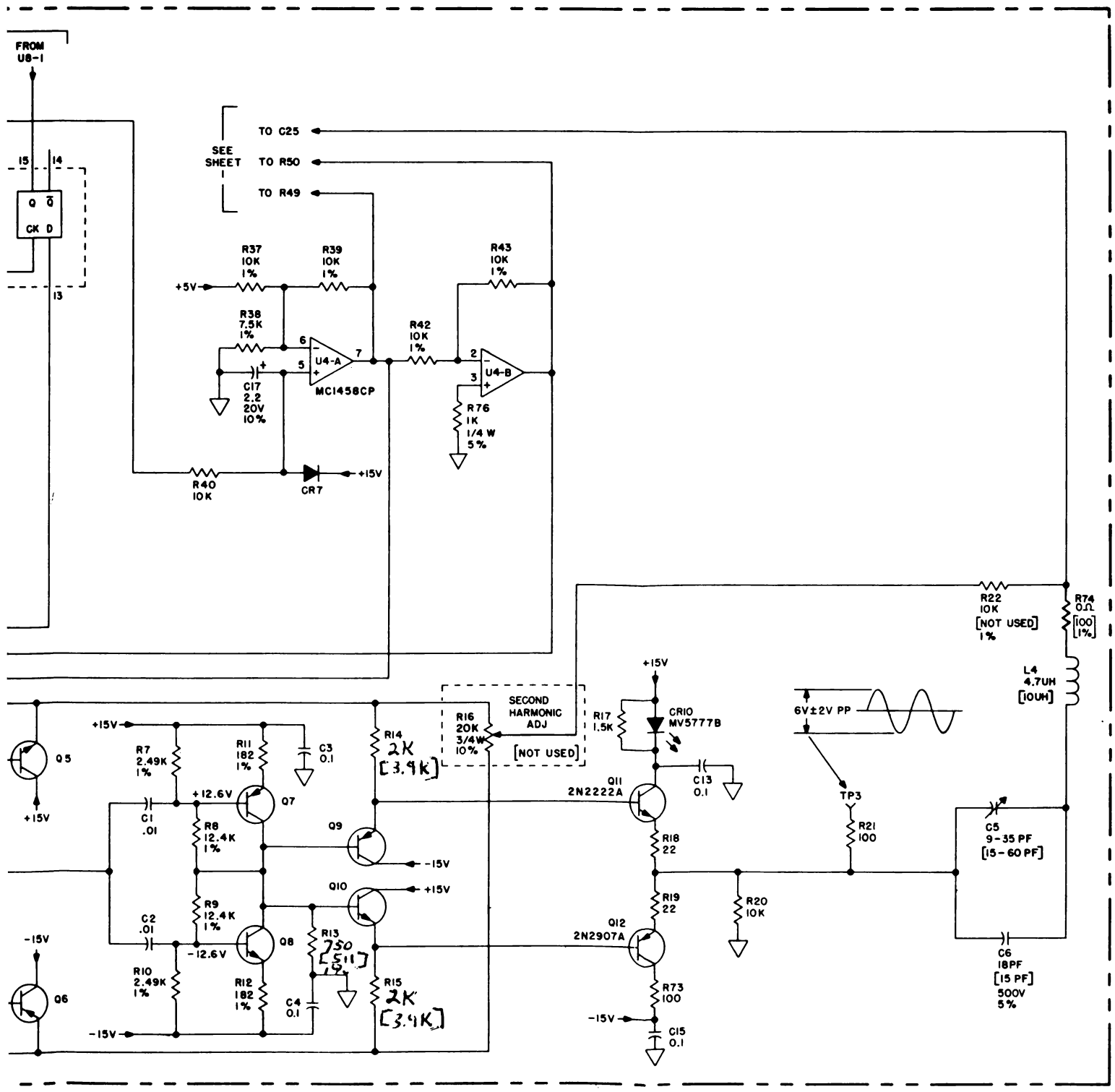
16781253-U

REF 16781253- 1K  
Figure 7-1. Direct Record Card Schematic (Sheet 1 of 2)

101/DR  
12/83

7-3/7-4





REF 16781253-2 K  
 Figure 7-1. Direct Record Card Schematic (Sheet 2 of 2)

101/DR  
 12/83

7-5/7-6

# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
DIRECT REPRODUCE  
CIRCUIT CARD ASSY  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

AUGUST 1984

## NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
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## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the direct reproduce circuit card assembly used on the Honeywell Model 101 Magnetic Tape System. This manual contains only the information that is applicable to the direct reproduce card. The relationship of the reproduce amplifier to the rest of the system is described in the Operator's manual.

#### 1-2. DESCRIPTION

The reproduce amplifier consists of an input buffer/phase equalizer, an amplitude equalizer, a high-pass filter, a low-pass filter, an output amplifier, and a monitor bus driver with switches.

The buffer/phase equalizer accepts the differential signal from the preamp and provides common-mode rejection, gain, gain adjustment, single-ended output, and phase correction.

The high-pass and low-pass filters limit the bandwidth to improve the signal-to-noise ratio.

The output filter provides voltage and current gain for the equalized and filtered signal, and low output impedance for driving external coax cables.

The monitor buffer drives the reproduce monitor bus and the overbias bus through solid-state switches.

#### 1-3. SPECIFICATIONS

##### A. POWER

+12 (+0.12) Vdc; @ 66 mA typical, 80 mA dc maximum.\*

-12 (+0.12) Vdc; @ 60 mA typical, 74 mA dc maximum.\*

+5 (+0.25) Vdc; @ 17 mA typical, 25 mA dc maximum.

\*Quiescent values. Add 10 mA dc when driving 1 V rms across a 50-ohm load.

B. MAXIMUM INPUT VOLTAGE

+3 V dc or peak ac

C. MAXIMUM LOAD AT OUTPUT

Short circuit.

D. PERFORMANCE

1. Conditions

Performance specifications are valid only for the following conditions.

- a. Power as specified in 1-3.A.
- b. Environment as specified in 1-3.E.
- c. Source Impedance: 100 ohms maximum.
- d. Load Impedance: 50 ohms in parallel with 300 pF (up to 10 feet of 50-ohm coax cable).

e. Signal Inputs

Type:	Differential.
Frequency:	MB, 100 Hz to 600 kHz. WB, 400 Hz to 2 MHz.
Amplitude:	Up to 1 V rms.

f. Digital Inputs

Three Speed Lines $2^2$ , $2^1$ , and $2^0$ (See Table 1-1):	TTL Logic
---	-----------

Channel Select Command Line:	TTL Logic
---------------------------------	-----------

Calibrate Command Line:	TTL Logic
-------------------------	-----------

g. Signal Outputs

Type:	Single ended.
-------	---------------

Amplitude: Adjustable to normal level of 1 V rms across 50 ohms in parallel with 300 pF, or 2 V rms across 600 ohms in parallel with 300 pF.

NOTE: The output level may be increased 1.6 times the normal level without clipping of the signal.

Frequency Response: Flat  $\pm 1.5$  db for each speed using the appropriate input signal level and frequency from Tables 1-1 and 1-2. Nominal output level: 0 db = 775 mV rms.

Stability: Less than  $\pm 1$  db change, 10 to 50°C.  
Less than  $\pm 2$  db change, 0 to 70°C.

Distortion (relative to normal output level):

WB@ 100 kHz, 60 IPS: 2nd HD, -48 db minimum;  
3rd HD, -60 db minimum.

MB@ 30 kHz, 60 IPS: 2nd HD, -48 db minimum;  
3rd HD, -60 db minimum.

Noise (relative to normal output level-10 Hz to 10 MHz-inputs grounded):

WB: @ 120 IPS, -30 db minimum.

MB: @ 120 IPS, -40 db minimum.

#### h. Monitor Outputs

Reproduce: Switched to reproduce bus when the channel select command line is logic 0.

Overbias: Switched to the overbias bus when the channel select and the calibrate command lines are both at logic 0.

i. ID Outputs

<u>Band</u>	<u>Channel Select</u>	<u>ID<sub>1</sub></u>	<u>ID<sub>2</sub></u>	<u>ID<sub>4</sub></u>
WB or MB	1	1	1	1
WB	0	0	1	0
MB	0	1	0	0

j. Adjustments

Potentiometers are provided for trimming of the frequency response.

<u>Function</u>	<u>Potentiometer</u>
Gain	R10
0.1 BE, 120 IPS	R29
0.1 BE, 60 IPS	R79
0.1 BE, 30 IPS	R85
0.1 BE, 15 IPS	R91
0.1 BE, 7.5 IPS	R97
0.1 BE, 3.75 IPS	R103
0.1 BE, 1.87 IPS	R109
0.1 BE, .937 IPS	R115
0.8 BE	R56
BE	R48
120 BE	R50
60 BE	R49

Also, phase potentiometer R17 is provided to adjust for optimum square wave response.

On WB only, potentiometer R54 is used to adjust the peaking frequency of the bandpass amplifier.

E. ENVIRONMENT

<u>Operating</u>	
Ambient Temperature	0 to 70° C
Relative Humidity (Non-condensing)	5 to 95%
Altitude	0 to 15000 feet

Table 1-1. Logic Code and Test Frequencies

SPEED IPS	LOGIC CODE 2 <sup>2</sup> 2 <sup>1</sup> 2 <sup>0</sup>			MEDIUM BAND				
				LOWER BE HZ	REF FREQ HZ	0.1 BE kHz	0.8 BE kHz	UPPER BE kHz
.937	0	0	0	100	250	.469	3.75	4.69
1.87	0	0	1	100	250	.938	7.5	9.38
3.75	0	1	0	100	500	1.88	15	18.8
7.5	0	1	1	100	500	3.75	30	37.5
15	1	0	0	100	1000	7.5	60	75
30	1	0	1	150	1000	15	120	150
60	1	1	0	300	1000	30	240	300
120	1	1	1	300	1000	60	480	600

SPEED IPS	LOGIC CODE 2 <sup>2</sup> 2 <sup>1</sup> 2 <sup>0</sup>			WIDEBAND				
				LOWER BE HZ	REF FREQ HZ	0.1 B kHz	0.8 BE kHz	UPPER BE kHz
.937	0	0	0	400	750	1.5	12.5	15
1.87	0	0	1	400	750	3.12	25	31.2
3.75	0	1	0	400	1500	6.25	50	62.5
7.5	0	1	1	400	1500	12.5	100	125
15	1	0	0	400	3000	25	200	250
30	1	0	1	400	3000	50	400	500
60	1	1	0	400	3000	100	800	1000
120	1	1	1	400	3000	200	1600	2000

Table 1-2. Input Levels (db)

	FREQ/IPS	120	60	30	15	7.5	3.75	1.87	.937
WIDEBAND	LBE	-49.7	-52.0	-52.0	-52.1	-52.1	-52.3	-52.5	-52.8
	REF	-35.9	-35.9	-35.8	-35.9	-41.9	-42.2	-48.1	-48.4
	0.1 BE	-4.7	-10.1	-15.9	-21.8	-27.7	-33.3	-39.4	-45.0
	0.8 BE	-13.0	-20.1	-26.6	-32.7	-38.6	-44.0	-50.4	-55.9
	BE	-16.7	-23.8	-30.5	-36.3	-42.4	-47.8	-54.3	-60.5
MEDIUM BAND	LBE	-40.6	-40.6	-49.3*	-49.3	-49.3	-49.5	-49.6	-49.7
	REF	-30.7	-30.7	-30.7	-30.7	-36.6	-37	-42.9	-43.2
	0.1 BE	+2.8	-3.2	-9.0	-15	-20.9	-27	-33.1	-38.9
	0.8 BE	+3.2	-3.2	-10.1	-16.4	-22.1	-27.9	-34.3	-40
	BE	-0.5	-6.1	-13.1	-19.3	-25.1	-30.8	-37.1	-43
*100 Hz Note: Input Level 0 db = 224 m V rms.									

SECTION 2  
INSTALLATION

The direct reproduce circuit card mounts in the data housing. The component side of the card faces left when installed.

**CAUTION**

System power must be turned off when the direct reproduce card is being installed or removed.

## SECTION 3

### OPERATION

Operating procedures are not required for the direct reproduce card. Refer to the Operator's Manual for general operating instructions.



## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the Model 101 direct reproduce amplifier. The description is provided in two parts: a functional description referenced to the block diagram of Figure 4-1; and a detailed circuit description referenced to the schematics in Section 7.

#### 4-2. FUNCTIONAL DESCRIPTION (Figure 4-1)

The direct reproduce amplifier provides adjustable gain and speed-selected amplitude and phase equalization for direct data being reproduced from tape.

The main elements of the amplifier are the phase equalizer, amplitude equalizer, (integrator and bandpass amplifier), high-pass filter, low-pass filter, output amplifier, control circuitry, and bus driver. One set of speed dependent components is shown in Figure 4-1.

The phase equalizer corrects for the phase shift caused by the amplitude equalizer and also serves as an input buffer.

The integrator and the bandpass amplifier provide amplitude equalization to correct for the non-linear frequency response of the reproduce head.

The high-pass filter is used to remove system noise that is below the lower bandedge frequency.

The low-pass filter is used to remove system noise that is above the upper bandedge frequency.

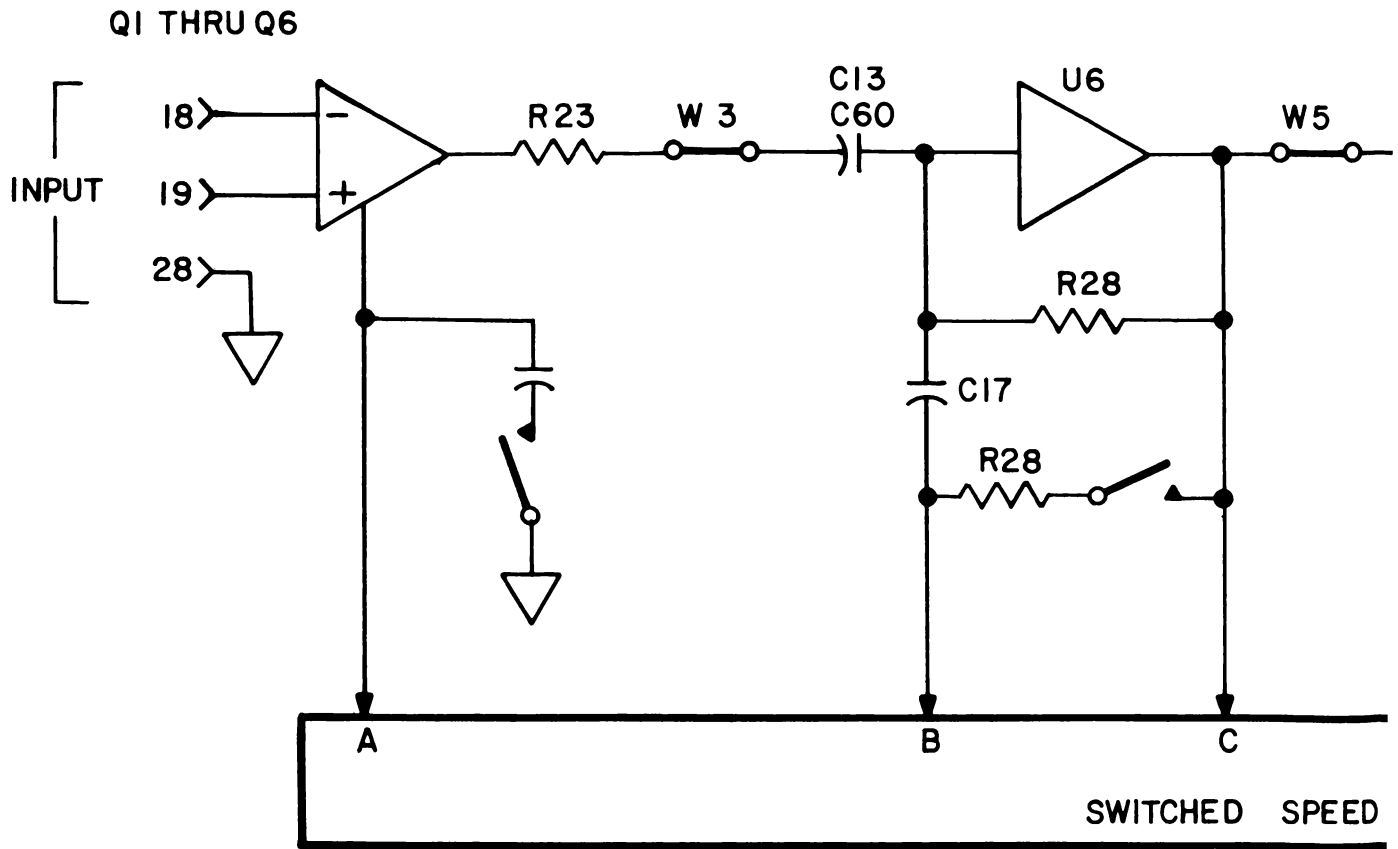
The output amplifier provides voltage and current gain and a 50-ohm output impedance for driving coaxial cables.

The control circuits provide encoding, decoding, and level shifting to drive the solid-state switches and to identify the circuit card type for the Model 101 micro-processor.

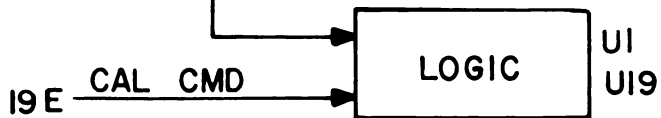
The unity-gain buffer allows the output signal to be switched to the reproduce monitor bus or to the overbias monitor bus by means of solid-state switch U9.

PHASE  
EQUALIZER

INTEGRATOR



22B —————> CH SEL



14 B —————>

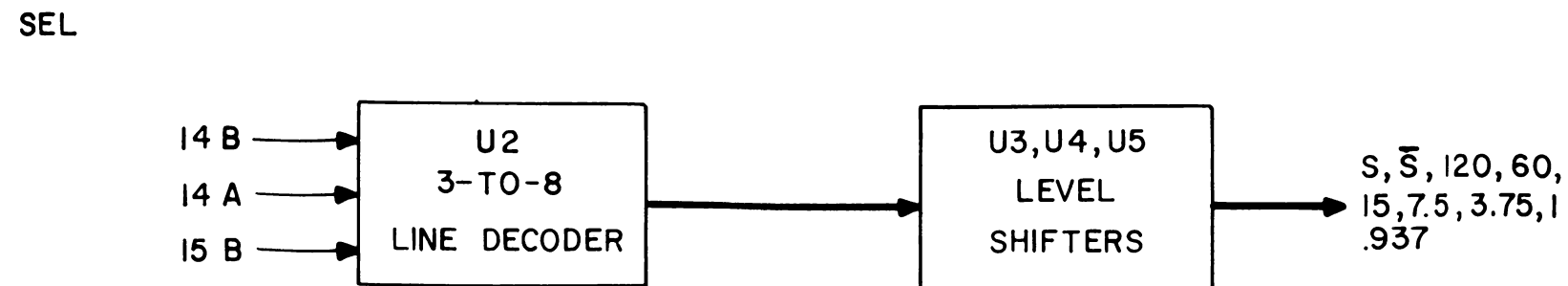
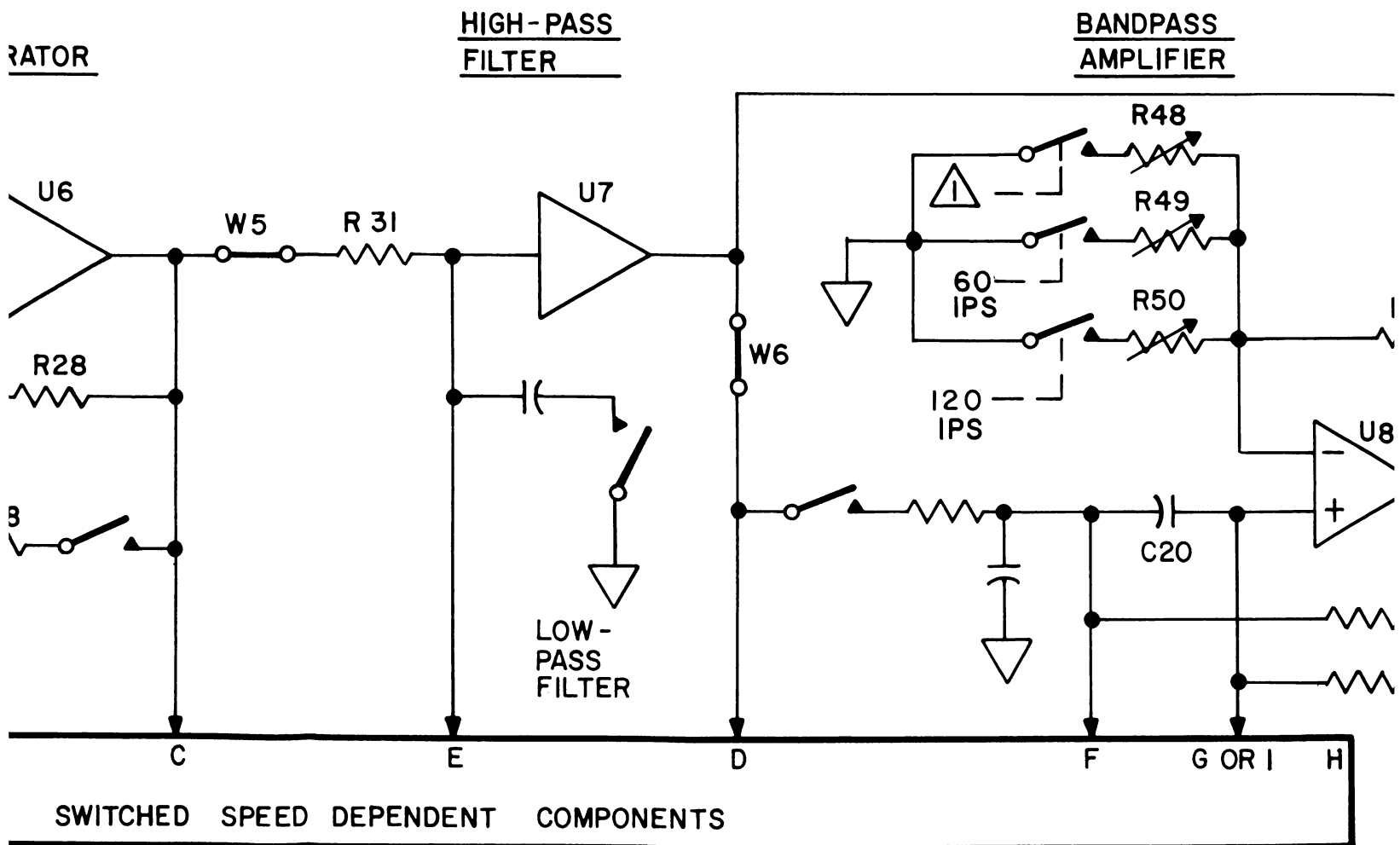
14 A —————>

15 B —————>

NOTES

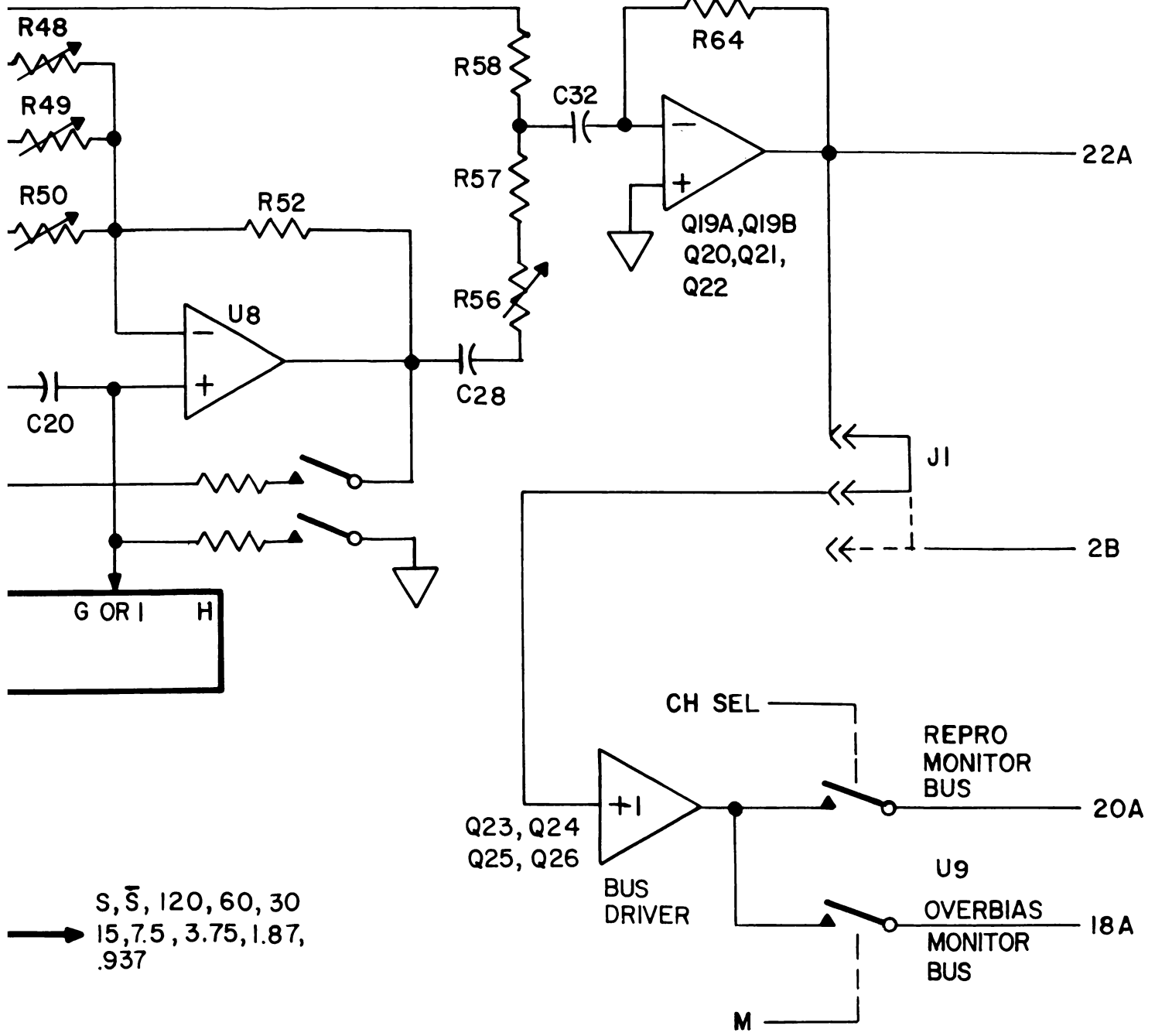


ALL SPEEDS  
BELOW 60 IPS



NDPASS  
PLIFIER

OUTPUT  
AMPLIFIER



→ S,  $\bar{S}$ , 120, 60, 30  
15, 7.5, 3.75, 1.87,  
.937

101/DREP-1

Figure 4-1. Direct Reproduce Block Diagram

#### 4-3. CIRCUIT DESCRIPTION (Figure 7-1)

##### A. PHASE EQUALIZER

The input from the reproduce head is applied to Q1 and Q3. Capacitor C8 in conjunction with L4 provides a bias trap, and R3 and R5 provide base returns to common. Transistors Q2 and Q4 (and associated circuitry) form current sources for Q1 and Q3. The gain of the stage is adjusted by variable resistor R10, with R11 limiting the maximum gain and C9 providing ac coupling. For dc the stage is balanced. There are equal dc voltage drops across R7 and R9, therefore the dc voltages across R19 and R20 are equal. However, for ac the load on the collector of Q1 is R7 in parallel with R8 (providing 500 ohms), whereas the load on the collector of Q3 is 1Kohm. Therefore, the dynamic or ac current change in R20 is twice that of R19 at low frequencies (ignoring the effect of capacitance at point A). The currents from Q5 and Q6 are summed at R23. Assume the total resistance between the emitters of Q1 and Q3 is set to 1 K ohm and that a low frequency is applied to the input. The gain then from the input to the output at R23 (with W3 removed) is +1. Resistor R17 and the capacitance switched to common at point A form a low-pass filter for the signal applied to the base of Q6. For frequencies well above the corner frequency, the gain of the stage is -1. This reduced gain occurs because the signal comes through only from Q5, and not from Q6. Thus in going from a low to high frequency, the gain remains constant; but the phase changes from  $0^{\circ}$  to  $180^{\circ}$ . This phase shift is used to cancel the phase shift generated in the amplitude equalizer (primarily in the band pass amplifier). A different capacitor is switched to point A for each speed selected. Figure 4-2 provides a typical response of the phase equalizer normalized to approximately 0.25 BE.

##### B. INTEGRATOR

The current changes in Q5 and Q6 are coupled to the summing node of lossy integrator U6 through W3, C60, and C13. The integrator provides equalization from low-to-middle frequencies. Capacitor C17 is the integrator capacitor, and R28 establishes the gain at dc and low frequencies. For each speed a different variable resistor (0.1 BE adj.) is switched in across points B to C to flatten out the response of the integrator at higher frequencies. The typical integrator response is shown in Figure 4-3 for MB, and Figure 4-4 for WB.

##### C. LOW-PASS FILTER

The output of the integrator is applied through W5 to R31 and a resistor and capacitor combination at point E. A different combination is switched for each speed. Small differences in response between speeds is compensated for by the resistance. The switched capacitance in combination with the switched resistance and R31 form a low-pass filter.

##### D. HIGH-PASS FILTER

Operational amplifier U7 and associated circuitry form a two-pole, high-pass filter which reduces low frequency noise present on the signal. For wideband

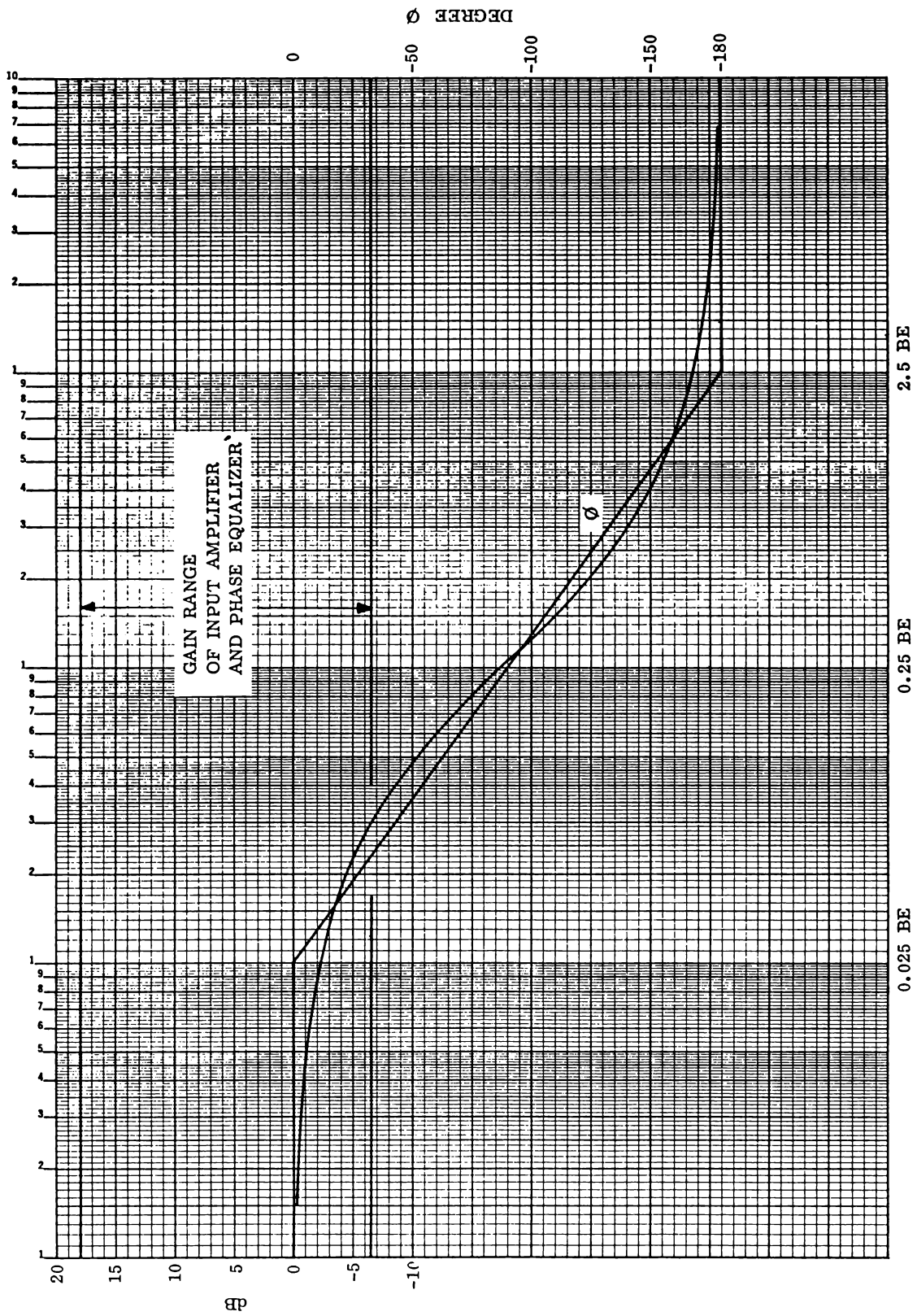


Figure 4-2. Direct Reproduce Input Amplifier and Phase Equalizer Response

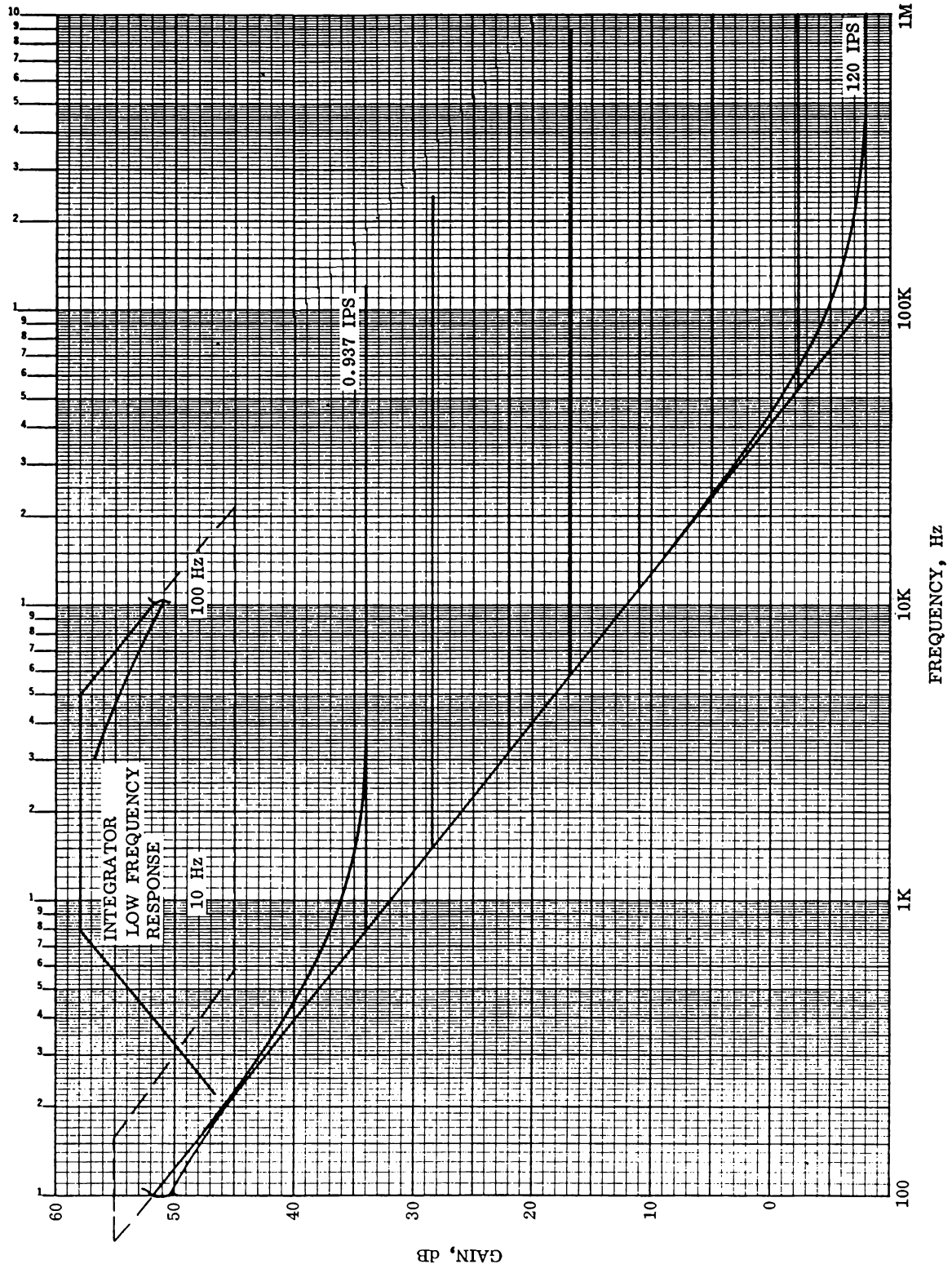


Figure 4-3. Medium band Integrator Response

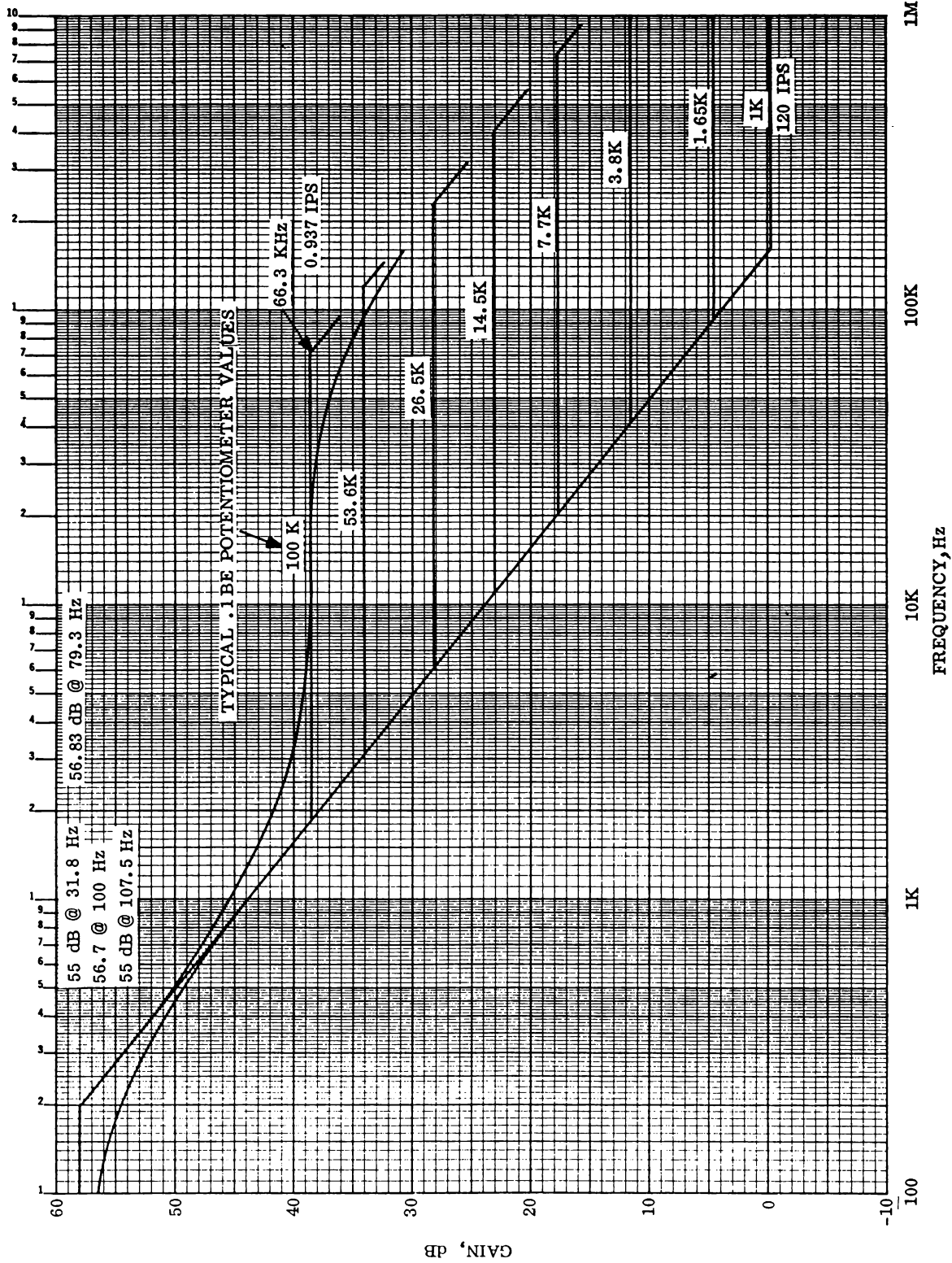


Figure 4-4. Wibeband Integrator Response



operation the corner frequency is moved to a higher frequency for 120 IPS operation. This is accomplished by switch Q16 placing R38 in parallel with R39, and switch Q17 placing R40 in parallel with R41. For medium band the operation is similar except that the corner frequency is moved up for both 60 and 120 IPS. Typical high-pass filter response is shown in Figure 4-5.

#### NOTE

On 32 track direct record/reproduce machines signal strength rolls off when on 120 ips at 700 Hz. This is due to a high pass filter switched in at 120 ips only. This filter can be disabled with decreased signal to noise by cutting jumper W7 on reproduce card or if reproducing a signal below 700Hz at 120 ips, gain may be turned up to account for this roll off.

#### E. BANDPASS FILTER

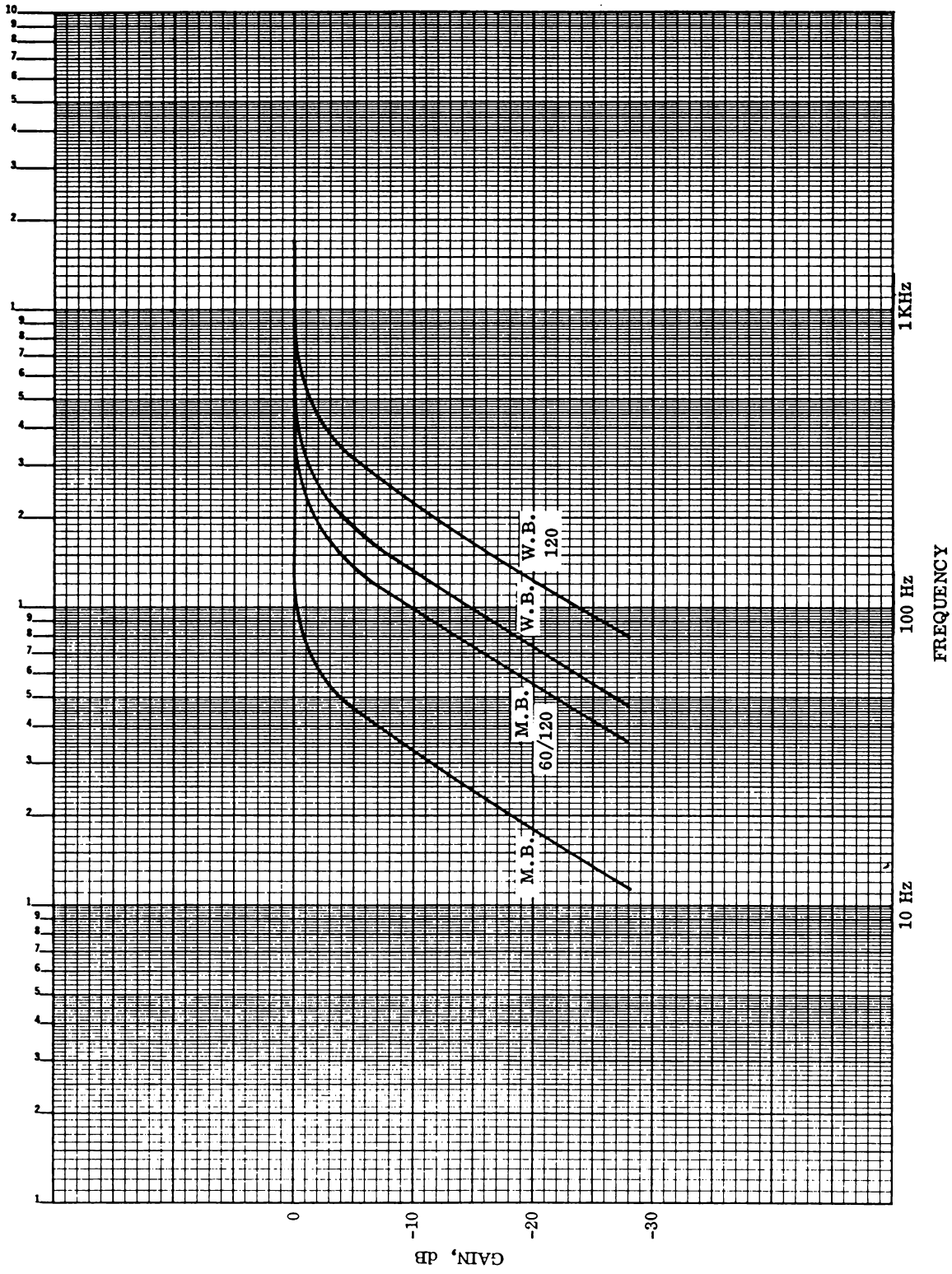
The bandpass filter, made up of U8 and associated circuitry, provides amplitude equalization for frequencies at the high end of the speed range. The frequency determining elements of this filter are fixed capacitors C19 and C20, and switched resistors between D and F, F and H, and G or I to common. The peaking amplitude or Q of the filter is determined by feedback resistors R51, R52, and potentiometers R48, R49, R50 used for BE, 60 IPS BE, and 120 IPS BE, respectively. BE covers all other speeds except 60 and 120 IPS. Potentiometer R56 controls the amount of bandpass filter output that is summed with the high-pass filter output at the junction of R57 and R58. For WB operation, R54 is used to control the peaking frequency of the filter at 120 IPS. A typical bandpass filter response normalized to upper bandedge (BE) is shown in Figure 4-6.

#### F. OUTPUT AMPLIFIER

The outputs of the high-pass filter (for low to medium frequencies) and the bandpass filter (for high frequencies) are summed through R58, R56, and R57 into the summing node (junction of R57 and R58) of the output amplifier. Transistor switch Q70, R120, and C56 serve to further equalize the midfrequency amplitude response for 60 and 120 IPS. Transistors Q19A, Q19B, Q20, Q21, and Q22 and associated circuitry from an operational amplifier with R64 providing feedback. Voltage gain is provided by differential pair Q19A and Q19B and Q20. Transistors Q21 and Q22, biased on by diodes CR6 and CR7, provide current gain to drive the output load. Resistors R67 and R68 establish the current in this class AB stage and also current limit the output, as do resistors R66 and R69. Resistor R70, in conjunction with the closed-loop output impedance, provides a drive impedance of approximately 50 ohms.

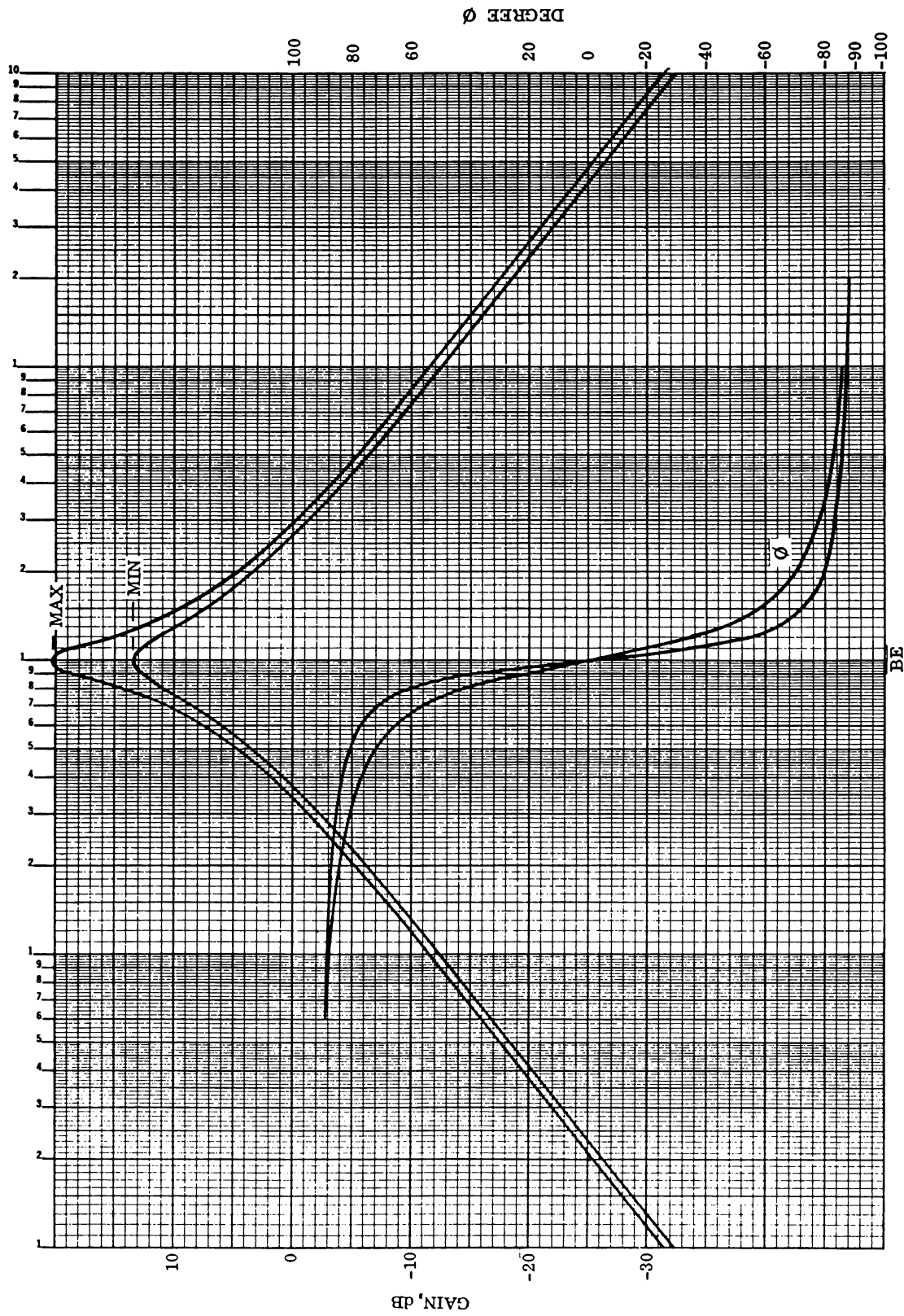
#### G. MONITOR OUTPUTS

A unity-voltage gain buffer (consisting of Q23, Q24, Q25, Q26, and associated resistors) is used to drive CMOS switches U9, the reproduce monitor bus, and the overbias monitor bus. Switches U9 are controlled by the CHannel SElect and M lines.



101/DREP-5

Figure 4-5. High-Pass Filter Response



FREQUENCY, Hz

Figure 4-6. Bandpass Filter Response

## H. CONTROL CIRCUITRY

When the input CHannel SElect (P1-22B) is logic 0, the output is switched to the reproduce monitor bus. When both the CHannel SElect and CALibrate CMD are logic 0, the output is switched to the overbias monitor bus by U1 A, B, and C and control line M.

The outputs of three-line-to-eight-line decoder U2 are used to drive level-shifting quad amplifiers U4 and U5. Approximately  $\pm 10$  Vdc is obtained at the outputs of U4 and U5 (.937 ips through 120 ips) to drive the transistor switches. Gate U1-D and dual amplifier U3 provide control lines S and  $\bar{S}$ . For speeds other than 60 or 120 ips, S is positive and  $\bar{S}$  is negative. Resistor U10-D, CR3, and CR4 bias one input of amplifiers U3, U4, and U5 to approximately +1.2 Vdc to enable operation from the TTL outputs of U2.

## I. SWITCHING

For each speed, six transistors (used as switches) select a set of components for the equalizers and filters. For example; for 120 ips, switches Q7, Q8, Q9, Q10, Q11, and Q12 are on and the corresponding switches for all other speeds are off. Each transistor switch has a 10 k ohm base resistor. Thus when the drive is positive there is approximately 1 mA base current to keep the transistor on. When the drive is negative the emitter-base junction is reverse biased keeping the device turned off.

## J. POWER SUPPLIES

Voltages of +12, -12, and +5 are used by the reproduce amplifier. The inductors and capacitors related to these supply lines reduce noise that may be present. The input phase equalizer has a special decoupling circuit formed by C7, C58, R22, R2, and Q69 for the +8 Vdc; and C10, C59, R25, R4, and Q18 for -8 Vdc. Resistors R6, R18, and R16 set the voltage at +8.7 and -8.7, thus obtaining +8 Vdc and -8 Vdc at the emitters of Q69 and Q18. Components R6/C58 and R16/C59 form low-pass filters to attenuate noise and ripple on the +12 Vdc and -12 Vdc supplies.

## SECTION 5

### MAINTENANCE

#### 5-1. ADJUSTMENTS

Adjustments to the direct reproduce card are provided in the Model 101 Operator's Manual.

#### 5-2. TROUBLESHOOTING

Remove power and place circuit card on an extender card. Restore power.

##### A. POWER SUPPLY AND SPEED LINES

Verify the following power supply voltages.

##### Card Edge Connector Pin

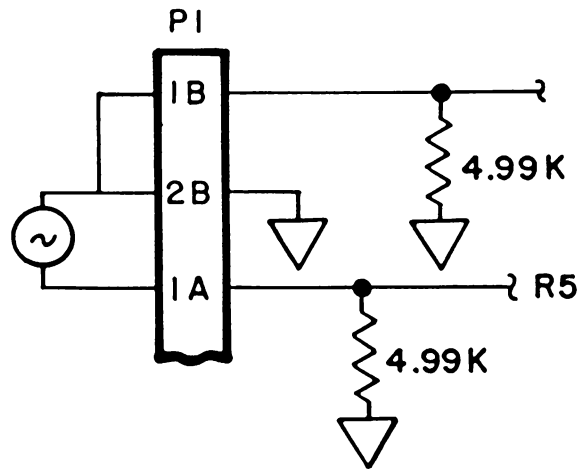
9A, B	+12V
8A, B	-12V
12A, B	+5V
End of L6 marked +12VA	+12V
End of L5 marked -12V	-12V
Emitter Q69 marked +8V	+8V
Emitter Q18 marked -8V	-8V
W3	

0V (±1) V indicates input amplifier and phase equalizer are operating correctly.

Verify speed lines are operating correctly. Corners of U4 and U5 are marked with the appropriate speed. When the speed marked is selected on the front panel, the voltage should be +9V to +12 Vdc indicating that speed is on. All others should be -9 V to -12 Vdc.

##### B. INPUT AMPLIFIER AND PHASE EQUALIZER

The input amplifier and phase equalizer can be checked by removing W3 on the direct reproduce card and the preamplifier for the appropriate channel. Apply a 1V p-p signal as shown:

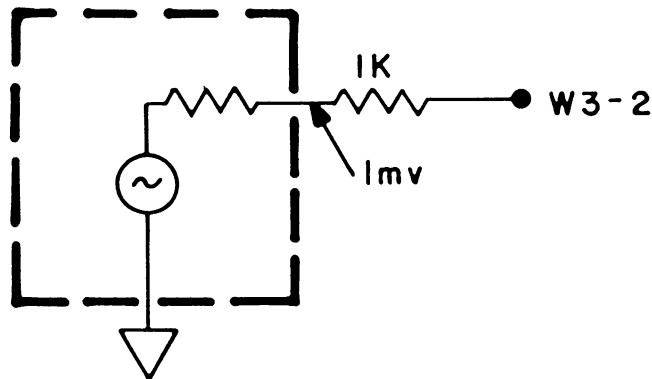


101/DREP-7

With the  $\phi$  adj. potentiometer set to midrange, the phase angle from R5 to the collector of Q6 should be approximately  $-90^\circ$  at 0.25 BE for all speeds. The phase angle can be trimmed to  $-90^\circ$  with the phase adjust potentiometer at any individual speed. The gain range for input amplifier and phase equalizer is -6 db to 20 db.

### C. INTEGRATOR

Remove W5 in addition to W3. W3 pin 2 may be driven from a signal generator as shown.

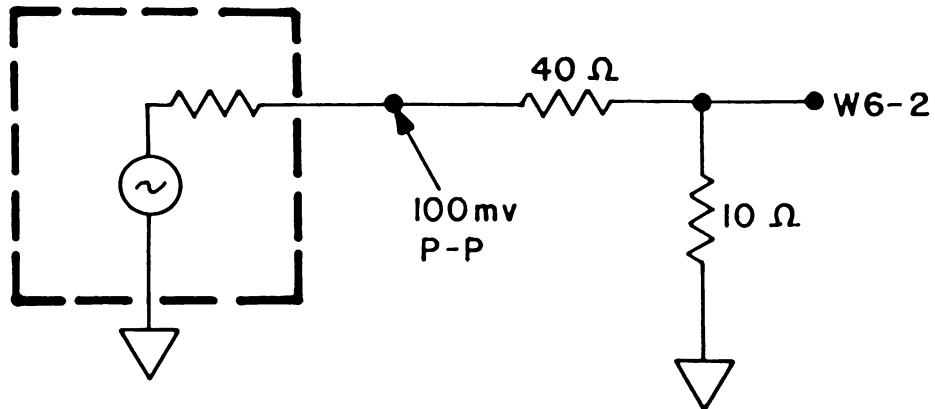


101/DREP-8

The gain of the integrator is approximately 44 db for all speeds at 1 kHz for WB. The gain is approximately 44 db for all speeds at 250 Hz for MB. See Bode response to check other points.

#### D. BANDPASS AMPLIFIER

Remove W6 and drive the bandpass amplifier as shown:

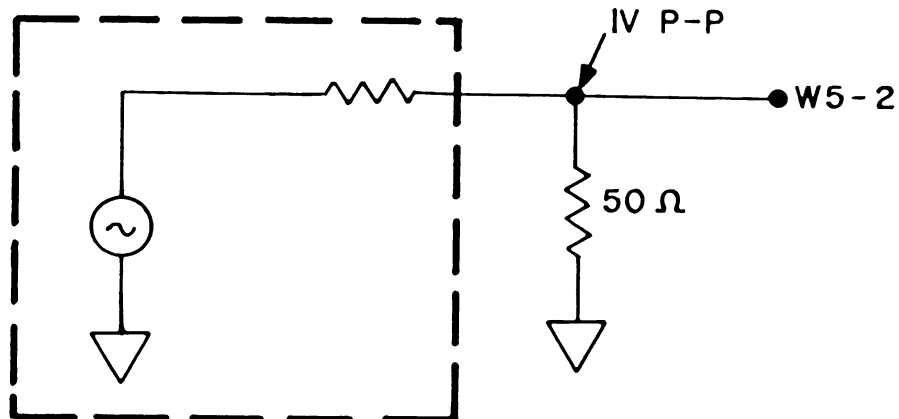


101/DREP-9

The amplitude should peak at BE for all speeds. The BE potentiometer should be adjustable for a minimum of 13 db peaking at pin 6 of U8. Leave W6-2 terminated in 10 ohms.

#### E. HIGH-PASS FILTER

Drive W5-2 as shown:



101/DREP-10

At U7 pin 6 amplitude should be:

- 0 db at 1 kHz to 2 MHz.
- 3 db at 225 Hz, WB all speeds except 120 ips.
- 3 db at 375 Hz, WB 120 ips.
- 3 db at 56 Hz, MB .937 ips through 30 ips.
- 3 db at 169 Hz, MB 60 ips and 120 ips.

At TP2 gain should be 20 db at 5 MHz if channel is not terminated in 50 ohms.

At the monitor output BNC the gain should be the same with load impedances greater than 1 K ohm. Try channel selector to verify reproduce monitor bus switch is ok, Reinstall all wire jumpers.



## ILLUSTRATED PARTS BREAKDOWN

## 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

## A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

## B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

## C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

## D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

## E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN 'S NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

## 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

## 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY ALLAS, TEXAS 75231	01295	CORNELL-DUBILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60018	25243
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	HEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769
GENERAL ELECTRIC COMPANY ELEC. CAPACITOR & BATTERY DEPT. P.O. BOX 158 IRMO, SOUTH CAROLINA 29063	06001	NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014
MITE CORPORATION AMATOM ELECTRONIC HARDWARE DIV. 446 BLAKE STREET NEW HAVEN, CONNECTICUT 06515	06540	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
PRECISION MONOLITHICS, INC. 1500 SPACE PARK DRIVE SANTA CLARA, CALIFORNIA 95050	06665	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
DEUTSCH FASTENER CORPORATION P.O. BOX 92925 7001 WEST IMPERIAL HIGHWAY LOS ANGELES, CALIFORNIA 90045	08524	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
CTS OF BERNE INCORPORATED 406 PARR ROAD BERNE, INDIANA 46711	11236	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LAUTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
PLASTIGLIDE MFG CORP P.O. BOX 867 1757 STANFORD STREET SANTA MONICA, CALIFORNIA 90406	11897	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY ST PALM BEACH, FLORIDA 33402	14433	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
CHOMERICS INCORPORATED 77 DRAGON COURTS WOLBURN, MASSACHUSETTS 01801	18565	ELECTRONIC INDUSTRIES ASSOCIATION	80131
SCANBE MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES OSA	81349
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	ARCO ELECTRONICS INCORPORATED COMMUNITY DRIVE GREAT NECK, NEW YORK 11022	84171
BERG ELECTRONICS YORK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	AUGAT INCORPORATED 33 PERRY AVENUE ATTLEBORO, MASSACHUSETTS 02703	91506
ALPHA WIRE CORPORATION 2815 COLUMBIA AVENUE TORRANCE, CALIFORNIA 90503	23172	DALE ELECTRONICS INCORPORATED P.O. BOX 609 COLUMBUS, NEBRASKA 68601	91637
ANALOG DEVICE, INCORPORATED P.O. BOX 280 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	KEYSTONE ELECTRONICS CORPORATION 49 BLEECKER STREET BROOKLYN, NEW YORK 11231	91833
		DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800

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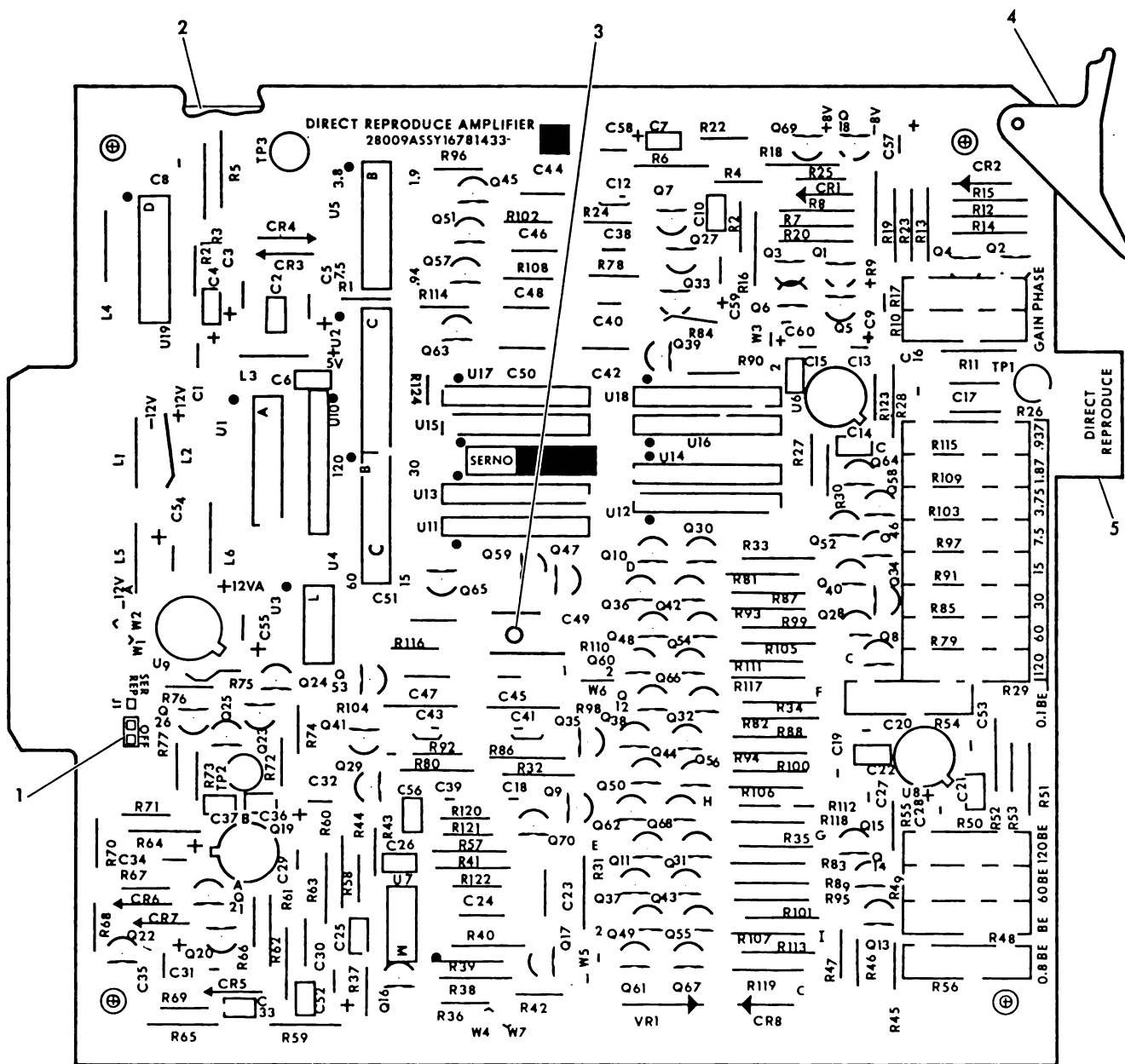
## SECTION 6

TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16781433-103	CIRCUIT CARD ASSEMBLY, DIRECT REPRODUCE, MEDIUM BAND WITH CALIBRATE	28009	}	NOTE 1	1	
16781433-104	CIRCUIT CARD ASSEMBLY, DIRECT REPRODUCE, WIDE BAND WITH CALIBRATE	28009				
<p>NOTE:</p> <p>1. CUSTOMER SELECTED ASSEMBLY CHECK EQUIPMENT FOR PART NUMBER USED.</p>						

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-009	BENCH LEVEL SPARES KIT, DIRECT REPRODUCE					
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	8	2	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	5	1	
16762173-001	TRANSISTOR	04713	2N3906 5961-00-072-0128	7	2	
16774066-106	SEMICONDUCTOR DEVICE, DIODE	04713	1N5226B 5961-437-6391	1	1	
16774985-003	INTEGRATED CIRCUIT	27014	LM310N	1	1	
16775977-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	SP5-8716	1	1	
16776656-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	1	1	
16776979-001	TRANSISTOR	04713	MPSA17-5	54	6	
16779015-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	24355	3408	1	1	
16779170-001	INTEGRATED CIRCUIT	27014	LM324N 5962-01-008-4826	2	1	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	1	1	
16779863-001	MICROCIRCUIT	01295	SN74LS00N 5962-00-308-9782	1	1	
16779948-001	BUS BAR	29593	B5153-100-2G3	1	2	
16781367-001	MICROCIRCUIT	01295	SN74LS38N	1	1	
16809301-001	TRANSISTOR	06665	MAT01-037H	1	1	
99000267-001	MICROCIRCUIT	27014	DM74LS138N	1	1	



101 - 7D1008

FIGURE 6-1. DIRECT REPRODUCE CIRCUIT CARD ASSEMBLY

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 1 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		A8A36	CIRCUIT CARD ASSEMBLY, DIRECT REPRODUCE, MEDIUM BAND	28009		16781433-103	AR	A	
		A8A51							
6-1		A8A36	CIRCUIT CARD ASSEMBLY, DIRECT REPRODUCE, WIDEBAND	28009		16781433-104	AR	B	
		A8A51							
6-1		CR1-8	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	8		
6-1		C1	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS476D015K	16758058-242	1		
6-1		C2	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-1		C3	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS476D015K	16758058-242	1		
6-1		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-1		C5	. CAPACITOR, FIXED, ELECTROLYTIC, 56UF, +-10%, 10VDC	26769	KNS566D010K	16758058-143	1		
6-1		C6,7	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-1		C8	. CAPACITOR, FIXED, MICA DIELECTRIC, 160PF, +-1%, 100VDC	72136	DM5FA161F04CR	16779445-136	1	A	
6-1		C8	. CAPACITOR, FIXED, MICA DIELECTRIC, 82PF, +-1%, 50VDC	72136	DM5EY820F04CR	16779445-229	1	H	
6-1		C9	. CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS396B006K	16758058-041	1	A	
6-1		C9	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 15VDC	26769	KNS106B015K	16758058-234	1	B	
6-1		C10	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-1		C11	. NOT USED						
6-1		C12	. CAPACITOR, FIXED, MICA DIELECTRIC, 430PF, +-5%, 500VDC	44171	DM15-431J 5910-440-2153	16761549-042	1	A	
6-1		C12	. CAPACITOR, FIXED, MICA DIELECTRIC, 120PF, +-5%, 500VDC	25243	CD10FD121JN1	16759780-268	1	B	
6-1		C13	. CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS396B006K	16758058-041	1	A	
6-1		C14	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 15VDC	26769	KNS106B015K	16758058-234	1	B	
6-1		C14,15	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-1		C16	. CAPACITOR, FIXED, MICA DIELECTRIC, 27PF, +-5%, 500VDC	25243	CD10FD270JN1	16759780-252	1		
6-1		C17	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0039UF, +-5%, 50VDC	06001	75F1R5C392	16763563-213	1	A	
6-1		C17	. CAPACITOR, FIXED, PLASTIC, DIELECTRIC, 0.001UF, +-5%, 200VDC	06001	75F1R5C102	16763563-205	1	B	
6-1		C18	. CAPACITOR, FIXED, MICA DIELECTRIC 100PF, +-5%, 500 VDC	25243	CD10FD101JN1	16759780-266	1	A	
6-1		C18	. CAPACITOR, FIXED, MICA DIELECTRIC, 27PF, +-5%, 500VDC	25243	CD10ED270JN1	16759780-252	1	A	
6-1		C19,20	. CAPACITOR, FIXED, MICA DIELECTRIC, 330PF, +-1%, 50VDC	72136	DM5FY331F04CR	16779445-244	2		

NOTES:



TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 2 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1		C21,22	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-1		C23,24	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.02UF, +-5%, 50VDC	06001	75F1R5C203	16763563-271	2	A	
6-1		C23,24	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.01UF, +-5%, 50VDC	06001	75F1R5C103	16763563-218	2	B	
6-1		C25,26	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-1		C27	. CAPACITOR, FIXED, MICA DIELECTRIC, 27PF, +-5%, 500VDC	25243	CD10ED270JN1	16759780-252	1		
6-1		C28	. CAPACITOR, FIXED, ELECTROLYTIC, 1UF, +-10%, 20VDC	26769	KNS105A020K	16758058-322	1		
6-1		C29	. CAPACITOR, FIXED, MICA DIELECTRIC, 300PF, +-5%, 500VDC	81349	CM05FD301J03 5910-456-0793	16761549-038	1		
6-1		C30	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 6VDC	26769	KNS107D006K	16758058-046	1	A	
6-1		C30	. CAPACITOR, FIXED, ELECTROLYTIC, 33UF, +-10%, 10VDC	26769	KNS336C010K	16758058-140	1	B	
6-1		C31	. CAPACITOR, FIXED, MICA DIELECTRIC, 5PF, +-5%, 500VDC	25243	CD10CD050DN1	16759780-244	1		
6-1		C32	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 6VDC	26769	KNS107D006K	16758058-046	1	A	
6-1		C32	. CAPACITOR, FIXED, ELECTROLYTIC, 33UF, +-10%, 10VDC	26769	KNS336C010K	16758058-140	1	B	
6-1		C33	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-1		C34,35	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS4760015K	16758058-242	2		
6-1		C36,37	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-1		C38	. CAPACITOR, FIXED, MICA DIELECTRIC, 910PF, +-5%, 100VDC	72136	DM15FD911J04CR	16761549-110	1	A	
6-1		C38	. CAPACITOR, FIXED, MICA DIELECTRIC, 270PF, +-5%, 500VDC	81349	CM05FD271J03 5910-460-0870	16761549-037	1	B	
6-1		C39	. CAPACITOR, FIXED, MICA DIELECTRIC, 180PF, +-5%, 500VDC	25243	CD10FC181JN	16759780-272	1	A	
6-1		C39	. CAPACITOR, FIXED, MICA DIELECTRIC, 56UF, +-5%, 500VDC	25243	CD10ED560JN1	16759780-260	1	B	
6-1		C40	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.001UF, +-5%, 50VDC	06001	75F1R5C182	16763563-208	1	A	
6-1		C40	. CAPACITOR, FIXED, MICA DIELECTRIC, 560PF, +-5%, 300VDC	72136	DM15FC561J04CR	16761549-105	1	B	
6-1		C41	. CAPACITOR, FIXED, MICA DIELECTRIC, 360PF, +-5%, 500VDC	81349	CM05FD361J03 5910-255-1608	16761549-040	1	A	
6-1		C41	. CAPACITOR, FIXED, MICA DIELECTRIC, 120PF, +-5%, 500VDC	25243	CD10FD121JN1	16759780-268	1	B	
6-1		C42	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 3600 PF, +-5%, 50 VDC	06001	75F1R5C472	16763563-262	1	A	
6-1		C42	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0012UF, +-5%, 50VDC	06001	75F1R5C122	16763563-206	1	B	
6-1		C43	. CAPACITOR, FIXED, MICA DIELECTRIC, 750PF, +-5%, 300VDC	72136	DM15FC751J04CR	16761549-108	1	A	
6-1		C43	. CAPACITOR, FIXED, MICA DIELECTRIC 240PF, +-5%, 500VDC	25243	CD10FC241JN1	16759780-275	1	B	

NOTES:

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 3 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1		C44	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0075UF, +-5%, 50VDC	06001	75F1R5C752	16763563-266	1	A	
6-1		C44	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0024UF, +-5%, 50VDC	06001	75F1R5C242	16763563-260	1	B	
6-1		C45	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0015UF, +-5%, 50VDC	06001	75F1R5C152	16763563-207	1	A	
6-1		C45	• CAPACITOR, FIXED, MICA DIELECTRIC, 510PF, +-5%, 500VDC	04171	DM15-511J 5910-649-2917	16761549-044	1	B	
6-1		C46	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.015UF, +-5%, 50VDC	06001	75F1R5C153	16763563-220	1	A	
6-1		C46	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0047UF, +-5%, 50VDC	06001	75F1R5C472	16763563-214	1	B	
6-1		C47	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.003 UF, +-5%, 50VDC	06001	75F1R5C302	16763563-261	1	A	
6-1		C47	• CAPACITOR, FIXED, PLASTIC, DIELECTRIC, 0.001UF, +-5%, 200VDC	06001	75F1R5C102	16763563-205	1	B	
6-1		C48	• CAPACITOR, FIXED, PLASTIC, DIELECTRIC, 0.027UF, +-5%, 50VDC	06001	75F1R5C273 5910-	16763563-223	1	A	
6-1		C48	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.01UF, +-5%, 50VDC	06001	75F1R5C103	16763563-218	1	B	
6-1		C49	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0062UF, +-5%, 50VDC	06001	75F1R5C622	16763563-265	1	A	
6-1		C49	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 2000 PF, +-5%, 50VDC	06001	75F1R5C202	16763563-258	1	B	
6-1		C50	• CAPACITOR, FIXED, PLASTIC, DIELECTRIC, 0.056UF, +-5%, 50VDC	06001	75F1R5C563 5910-127-4276	16763563-227	1	A	
6-1		C50	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.02UF, +-5%, 50VDC	06001	75F1R5C203	16763563-271	1	B	
6-1		C51	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.012UF, +-5%, 50VDC	06001	75F1R5C123	16763563-219	1	A	
6-1		C51	• CAPACITOR, FIXED, PLASTIC DIELECTRIC, 0.0039UF, +-5%, 50VDC	06001	75F1R5C392	16763563-213	1	B	
6-1		C52	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-1		C53	• NOT USED						
6-1		C54, 55	• CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS4760015K	16758058-242	2		
6-1		C56	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3900PF, +-10%, 50VDC	18796	8121-050M5R392K	16771625-039	1		
6-1		C57	• CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS3968006K	16758058-041	1	A	
6-1		C57	• CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 15VDC	26769	KNS1068015K	16758058-234	1	H	
6-1		C58, 59	• CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS4760015K	16758058-242	2		
6-1		C60	• CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS3968006K	16758058-041	1	A	
6-1		C60	• CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 15VDC	26769	KNS1068015K	16758058-234	1	H	
6-1		C61	• CAPACITOR, FIXED, MICA DIELECTRIC, 5PF, +-5%, 500VDC	25243	CD10C00500M1	16759780-244	1		
6-1		J1	• TERMINAL, PIN	22526	75401-001	16779270-001	3		

NOTES:

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 4 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER					
			1 2 3 4 5 6 7							
6-1		L1-3	. COIL, RADIO FREQUENCY, 22.0 UH, +-10X	99800	1537-44 5950-819-1990	16750875-254	3			
6-1		L4	. COIL, RADIO FREQUENCY, 10.0 UH, +-10X	99800	1537-36 5950-657-8167	16750875-246	1	A		
6-1		L4	. COIL, RADIO FREQUENCY, 4.70 UH, +-10X	99800	1537-28 5950-00-837-6029	16750875-238	1	B		
6-1		L5,6	. COIL, RADIO FREQUENCY, 22.0 UH, +-10X	99800	1537-44 5950-819-1990	16750875-254	2			
6-1	1	P1	. BUS BAR	29593	85153-100-268	16779940-001	1			
6-1		Q1	. TRANSISTOR	04713	MPS-A18-5	16783676-001	1	A		
6-1		Q1	. TRANSISTOR	80131	2N3904 5961-00-892-8706	16762172-001	1	B		
6-1		Q2	. TRANSISTOR	04713	MPS-A18-5	16783676-001	1			
6-1		Q3	. TRANSISTOR	04713	MPS-A18-5	16783676-001	1	A		
6-1		Q3	. NOT USED						B	
6-1		Q4	. TRANSISTOR	04713	MPS-A18-5	16783676-001	1			
6-1		Q5,6	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	2			
6-1		Q717	. TRANSISTOR	04713	SPS-8716	16776979-001	11			
6-1		Q18	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1			
6-1		Q19	. TRANSISTOR	06665	MAT01-037H	16809301-001	1			
6-1		Q20	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1			
6-1		Q21	. TRANSISTOR	80131	2N3904 5961-00-892-8706	16762172-001	1			
6-1		Q22	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1			
6-1		Q23	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1			
6-1		Q24,25	. TRANSISTOR	80131	2N3904 5961-00-892-8706	16762172-001	2			
6-1		Q26	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1			
6-1		Q27-68	. TRANSISTOR	04713	SPS-8716	16776979-001	42			
6-1		Q69	. TRANSISTOR	80131	2N3904 5961-00-892-8706	16762172-001	1			
6-1		Q70	. TRANSISTOR	04713	SPS-8716	16776979-001	1			
6-1		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1			
6-1		R2	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	1			
6-1		R3	. RESISTOR, FIXED, METAL FILM, 4.99K OHMS, +-1%, 1/8W	81349	RNR55K4991FS 5905-00-432-0421	16757165-268	1			
6-1		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	1			
6-1		R5	. RESISTOR, FIXED, METAL FILM, 4.99K OHMS, +-1%, 1/8W	81349	RNR55K4991FS 5905-00-432-0421	16757165-268	1			
6-1		R6	. RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FS 5905-00-406-9959	16757165-239	1			

NOTES:

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 5 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R7-9	• RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FH	16757165-201	3		
6-1		R10	• RESISTOR, VARIABLE, 5K OHMS, +-10%, 3/4W	73138	89-15-0	16775165-209	1	A	
6-1		R10	• RESISTOR, VARIABLE, 2K OHMS, +-10%, 3/4W	73138	89-14-0	16775165-208	1	B	
6-1		R11	• RESISTOR, FIXED, METAL FILM, 249 OHMS, +-1%, 1/8W	81349	RNR55K2490FH	16757165-139	1	A	
6-1		R11	• RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/8W	81349	RNR55K1000FH	16757165-101	1	B	
6-1		R12	• RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FH	16757165-201	1		
6-1		R13	• RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FH	16757165-239	1		
6-1		R14	• RESISTOR, FIXED, METAL FILM, 5.76K OHMS, +-1%, 1/8W	81349	RNR55K5761FS 5905-00-007-9194	16757165-274	1		
6-1		R15	• RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FH	16757165-201	1		
6-1		R16	• RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FH	16757165-239	1		
6-1		R17	• RESISTOR, VARIABLE, 2K OHMS, +-10%, 3/4W	73138	89PR2K	16775165-008	1		
6-1		R18	• RESISTOR, FIXED, METAL FILM, 14.3K OHMS, +-1%, 1/8W	81349	RNR55K1432FH	16757165-316	1		
6-1		R19,20	• RESISTOR, FIXED, METAL FILM, 499 OHMS, +-1%, 1/8W	81349	RNR55K4990FH	16757165-168	2		
6-1		R21	• RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-1		R22	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R23	• RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FH	16757165-201	1		
6-1		R24	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, +-5%, 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R25	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R26,27	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/4W	81349	RCR07G100JM	16750079-143	2		
6-1		R28	• RESISTOR, FIXED, METAL FILM, 806K OHMS, +-1%, 1/8W	81349	RNR55K8063FH	16757165-488	1		
6-1		R29	• RESISTOR, VARIABLE, 1K OHMS, +-10%, 3/4W	73138	89PR1K	16775165-007	1	A	
6-1		R29	• RESISTOR, VARIABLE, 2K OHMS, +-10%, 3/4W	73138	89PR2K	16775165-008	1	B	
6-1		R30	• RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/4W	81349	RCR07G392JM	16750079-047	1		
6-1		R31	• RESISTOR, FIXED, METAL FILM 750 OHMS, +-1%, 1/8W	81349	RNR55K7500FH	16757165-185	1		
6-1		R32	• RESISTOR, FIXED, METAL FILM, 3.48K OHMS, +-1%, 1/8W	81349	RNR55K3481FH	16757165-253	1		
6-1		R33,34	• RESISTOR, FIXED, METAL FILM, 953 OHMS, +-1%, 1/8W	81349	RNR55K9530FH	16757165-195	2	A	
6-1		R33,34	• RESISTOR, FIXED, METAL FILM, 267 OHMS, +-1%, 1/8W	81349	RNR55K2670FH	16757165-142	2	B	
NOTES									

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 6 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R35	• RESISTOR, FIXED, METAL FILM, 953 OHMS, +-1%, 1/8W	81349	RNR55K9530FM	16757165-195	1	A	
6-1		R35	• RESISTOR, FIXED, METAL FILM, 162 OHMS, +-1%, 1/8W	81349	RNR55K1620FS	16757165-121	1	B	
6-1		R36	• RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-1		R37	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/4W	81349	RCR07G100JM	16750079-143	1		
6-1		R38	• RESISTOR, FIXED, METAL FILM, 49.9K OHMS, +-1%, 1/8W	81349	RNR55K4992FM	16757165-368	1	A	
6-1		R38	• RESISTOR, FIXED, METAL FILM, 75K OHMS, +-1%, 1/8W	81349	RNR55K7502FM	16757165-385	1	B	
6-1		R39	• RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM	16757165-401	1	A	
6-1		R39	• RESISTOR, FIXED, METAL FILM, 49.9K OHMS, +-1%, 1/8W	81349	RNR55K4992FM	16757165-368	1	B	
6-1		R40	• RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM	16757165-401	1	A	
6-1		R40	• RESISTOR, FIXED, METAL FILM, 150K OHMS, +-1%, 1/8W	81349	RNR55K1503FM	16757165-418	1	B	
6-1		R41	• RESISTOR, FIXED, METAL FILM, 200K OHMS, +-1%, 1/8W	81349	RNR55K2003FM	16757165-430	1	A	
6-1		R41	• RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM	16757165-401	1	B	
6-1		R42	• RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-1		R43	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/4W	81349	RCR07G100JM	16750079-143	1		
6-1		R44	• RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/4W	81349	RCR07G392JM	16750079-047	1		
6-1		R45-47	• RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	3		
6-1		R48,49	• RESISTOR, VARIABLE, 200 OHMS, +-20%, 3/4W	73138	89PR200	16775165-005	2		
6-1		R50	• RESISTOR, VARIABLE, 500 OHMS, +-10%, 3/4 W	73138	89PR500	16775165-006	1		
6-1		R51	• RESISTOR, FIXED, METAL FILM, 499 OHMS, +-1%, 1/8W	81349	RNR55H4990FM	16757164-168	1		
6-1		R52	• RESISTOR, FIXED, METAL FILM, 1.5K OHMS, +-1%, 1/8W	81349	RNR55H1501FM	16757164-218	1		
6-1		R53	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/4W	81349	RCR07G100JM	16750079-143	1		
6-1		R54	• WIRE, SOLID, BARE	23172	298	16750957-009	AR	A	
6-1		R54	• RESISTOR, VARIABLE, 200 OHMS, +-20%, 3/4W	73138	89PR200	16775165-005	1	B	
6-1		R55	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/4W	81349	RCR07G100JM	16750079-143	1		
6-1		R56	• RESISTOR, VARIABLE, 1K OHMS, +-10%, 3/4W	73138	89PR1K	16775165-007	1	A	
6-1		R56	• RESISTOR, VARIABLE, 500 OHMS, +-10%, 3/4 W	73138	89PR500	16775165-006	1	B	
6-1		R57	• RESISTOR, FIXED, METAL FILM 750 OHMS, +-1%, 1/8W	81349	RNR55K7500FM	16757165-185	1	A	

NOTES:

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 7 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R57	• RESISTOR, FIXED, METAL FILM, 249 OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K2490FM	16757165-139	1	B	
6-1		R58	• RESISTOR, FIXED, METAL FILM, 499 OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K4990FM	16757165-168	1		
6-1		R59	• RESISTOR, FIXED, METAL FILM, 1K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K1001FM	16757165-201	1		
6-1		R60	• RESISTOR, FIXED, METAL FILM, 4.99K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K4991FM	16757165-268	1		
6-1		R61	• RESISTOR, FIXED, METAL FILM, 200 OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K2000FM	16757165-130	1		
6-1		R62	• RESISTOR, FIXED, METAL FILM, 4.02K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K4021FM	16757165-259	1		
6-1		R63	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R64	• RESISTOR, FIXED, METAL FILM, 4.99K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K4991FM	16757165-268	1		
6-1		R65	• RESISTOR, FIXED, METAL FILM, 2K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K2001FM	16757165-230	1		
6-1		R66	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R67,68	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G100JM	16750079-143	2		
6-1		R69	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R70	• RESISTOR, FIXED, CARBON COMPOSITION, 47 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G470JM	16750079-001	1		
6-1		R71	• RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G101JM	16750079-009	1		
6-1		R72,73	• RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G562JM	16750079-051	2		
6-1		R74	• RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G391JM	16750079-023	1		
6-1		R75,76	• RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G100JM	16750079-143	2		
6-1		R77	• RESISTOR, FIXED, CARBON COMPOSITION, 390 OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G391JM	16750079-023	1		
6-1		R78	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R79	• RESISTOR, VARIABLE, 2K OHMS, $\pm 10\%$ , 3/4W	73138	89PR2K	16775165-008	1	A	
6-1		R79	• RESISTOR, VARIABLE, 5K OHMS, $\pm 10\%$ , 3/4W	73138	89PR5K	16775165-009	1	B	
6-1		R80	• RESISTOR, FIXED, METAL FILM, 3.48K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K3481FM	16757165-253	1		
6-1		R81,82	• RESISTOR, FIXED, METAL FILM, 1.96K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K1961FM	16757165-229	2	A	
6-1		R81,82	• RESISTOR, FIXED, METAL FILM, 576 OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K5760FM	16757165-174	2	B	
6-1		R83	• RESISTOR, FIXED, METAL FILM, 1.96K OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K1961FM	16757165-229	1	A	
6-1		R83	• RESISTOR, FIXED, METAL FILM, 475 OHMS, $\pm 1\%$ , 1/8W	81349	RNR55K4750FM	16757165-166	1	B	
6-1		R84	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, $\pm 5\%$ , 1/4W	81349	RCR07G275JM	16750079-115	1		
NOTES									

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 8 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R85	• NOT USED						A
6-1		R85	• RESISTOR, VARIABLE, 10K OHMS, ±10%, 3/4W	73138	89PR10K	16775165-010	1		B
6-1		R86	• RESISTOR, FIXED, METAL FILM, 3.57K OHMS, ±1%, 1/8W	81349	RNR55K3571FM	16757165-254	1		
6-1		R87-89	• RESISTOR, FIXED, METAL FILM, 3.92K OHMS, ±1%, 1/8W	81349	RNR55K3921FM	16757165-258	3		A
6-1		R87-89	• RESISTOR, FIXED, METAL FILM, 1.13K OHMS, ±1%, 1/8W	81349	RNR55K1131FM	16757165-206	3		B
6-1		R90	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, ±5%, 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R91	• RESISTOR, VARIABLE, 10K OHMS, ±10%, 3/4W	73138	89PR10K	16775165-010	1		A
6-1		R91	• RESISTOR, VARIABLE, 20K OHMS, ±10%, 3/4W	73138	89PR20K	16775165-011	1		B
6-1		R92	• RESISTOR, FIXED, METAL FILM, 3.74K OHMS, ±1%, 1/8W	81349	RNR55K3741FM	16757165-256	1		
6-1		R93-95	• RESISTOR, FIXED, METAL FILM, 7.87K OHMS, ±1%, 1/8W	81349	RNR55K7871FM	16757165-287	3		A
6-1		R93-95	• RESISTOR, FIXED METAL FILM 2.32K OHMS, ±1%, 1/8W	81349	RNR55K2321FM	16757165-236	3		B
6-1		R96	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, ±5%, 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R97	• RESISTOR, VARIABLE, 20K OHMS, ±10%, 3/4W	73138	89PR20K	16775165-011	1		A
6-1		R97	• RESISTOR, VARIABLE, 50K OHMS, ±10%, 3/4W	73138	89PR50K 5905-138-1089	16775165-013	1		B
6-1		R98	• RESISTOR, FIXED, METAL FILM, 4.22K OHMS, ±1%, 1/8W	81349	RNR55K4221FS 5905-00-152-9798	16757165-261	1		
6-1		R99-101	• RESISTOR, FIXED, METAL FILM, 15.8K OHMS, ±1%, 1/8W	81349	RNR55K1582FM	16757165-320	3		A
6-1		R99-101	• RESISTOR, FIXED, METAL FILM, 4.64K OHMS, ±1%, 1/8W	81349	RNR55K4641FM	16757165-265	3		B
6-1		R102	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, ±5%, 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R103	• RESISTOR, VARIABLE, 50K OHMS, ±10%, 3/4W	73138	89PR50K 5905-138-1089	16775165-013	1		A
6-1		R103	• RESISTOR, VARIABLE, 100K OHMS, ±10%, 3/4W	73138	89PR100K	16775165-014	1		B
6-1		R104	• RESISTOR, FIXED, METAL FILM, 5.49K OHMS, ±1%, 1/8W	81349	RNR55K5491FM	16757165-272	1		
6-1		R105-107	• RESISTOR, FIXED, METAL FILM 31.6K OHMS, ±1%, 1/8W	81349	RNR55K3162FM	16757165-349	3		A
6-1		R105-107	• RESISTOR, FIXED, METAL FILM 9.31K OHMS, ±1%, 1/8W	81349	RNR55K9311FM	16757165-294	3		B
6-1		R108	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, ±5%, 1/4W	81349	RCR07G275JM	16750079-115	1		
6-1		R109	• RESISTOR, VARIABLE, 100K OHMS, ±10%, 3/4W	73138	89PR100K	16775165-014	1		A
6-1		R109	• RESISTOR, VARIABLE, 200K OHMS, ±20%, 3/4W	73138	89PR200K	16775165-015	1		B
6-1		R110	• RESISTOR, FIXED, METAL FILM 9.31K OHMS, ±1%, 1/8W	81349	RNR55K9311FM	16757165-294	1		

NOTES:

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 9 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R111-113	• RESISTOR, FIXED, METAL FILM, 63.4K OHMS, +-1%, 1/8W	81349	RNR55K6342FM	16757165-378	3	A	
6-1		R111-113	• RESISTOR, FIXED, METAL FILM, 18.7K OHMS, +-1%, 1/8W	81349	RNR55K1872FM	16757165-327	3	B	
6-1		R114	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, +-5%, 1/4W	81349	RCR07G275JH	16750079-115	1		
6-1		R115	• RESISTOR, VARIABLE, 200K OHMS, +-10%, 3/4W	73138	89PR200K	16775165-015	1		
6-1		R116	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, +-5%, 1/4W	81349	RCR07G275JH	16750079-115	1		
6-1		R117-119	• RESISTOR, FIXED, METAL FILM, 127K OHMS, +-1%, 1/8W	81349	RNR55K1273FM	16757165-411	3	A	
6-1		R117-119	• RESISTOR, FIXED, METAL FILM, 37.4K OHMS, +-1%, 1/8W	81349	RNR55K3742FM	16757165-356	3	B	
6-1		R120	• RESISTOR, FIXED, CARBON COMPOSITION, 7.5K OHMS, +-5%, 1/4W	81349	RCR07G752JH 5905-00-141-0717	16750079-054	1	A	
6-1		R120	• RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/4W	81349	RCR07G392JH	16750079-047	1	B	
6-1		R121	• RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JH	16750079-057	1		
6-1		R122	• RESISTOR, FIXED, CARBON COMPOSITION, 2.7 MEG OHMS, +-5%, 1/4W	81349	RCR07G275JH	16750079-115	1		
6-1		R123,124	• RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JH 5905-00-110-7620	16750079-033	2		
6-1		TP1	• TERMINAL, STUD, ELECTRICAL	06540	5176	16750201-021	1		
6-1		TP2	• TERMINAL, STUD	71279	2027-2 5940-00-280-0601	16757170-002	1		
6-1		TP3	• TERMINAL, STUD, ELECTRICAL	06540	5176	16750201-021	1		
6-1		U1	• MICROCIRCUIT	01295	SN74LS00N 5962-00-308-9782	16779863-001	1		
6-1		U2	• MICROCIRCUIT	27014	DM74LS138N	99000267-001	1		
6-1		U3	• INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	MC1458C	16775977-001	1		
6-1		U4,5	• INTEGRATED CIRCUIT	27014	LM324N 5962-01-008-4826	16779170-001	2		
6-1		U6	• INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	16776856-001	1		
6-1		U7	• INTEGRATED CIRCUIT	27014	LM310N	16774985-003	1		
6-1		U8	• INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	24355	3408	16779015-001	1		
6-1		U9	• INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	16779188-002	1		
6-1		U10	• RESISTOR NETWORK	11236	75-83R10KOHMS	16780508-005	1		
6-1		U11-18	• RESISTOR, NETWORK	11236	750-81R10K	16780508-008	8		
6-1		U19	• MICROCIRCUIT	01295	SN74LS38N	16781367-001	1		
6-1		VR1	• SEMICONDUCTOR DEVICE, DIODE	04713	1N5226B 5961-437-6391	16774066-106	1		
6-1		W1	• NOT USED					A	
6-1		W1	• PLUG, TIP	91506	8136-651P2	16781084-001	1	B	
6-1		W2	• PLUG, TIP	91506	8136-651P2	16781084-001	1	A	
6-1		W2	• NOT USED					B	

NOTES:



## SECTION 6

TABLE 6-1. DIRECT REPRODUCE CCA (SHEET 10 OF 10)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
						FEDERAL STOCK NUMBER				
6-1		W3	• WIRE, SOLID, BARE	23172	298		16750957-009	AR		
6-1		W4	• PLUG, TIP	91506	8136-651P2		16781084-001	1	A	
6-1		W4	• NOT USED						B	
6-1		W5,6	• WIRE, SOLID, BARE	23172	298		16750957-009	AR		
6-1	2		• SHIELD	28009			16781263-002	1		
6-1	3		• BUMPER, PLASTIC	11897	138NN5324		16780426-003	1		
6-1	4		• EJECTOR, PRINTED WIRING BOARD	18677	20ZYELLOW		16760704-006	1	A	
6-1			• EJECTOR, PRINTED WIRING BOARD	18677	20ZBLUE		16760704-010	1	B	
6-1	5		• PRINTED WIRING BOARD	28009			16781432-002	1		
NOTES										

SECTION 7  
SCHEMATICS

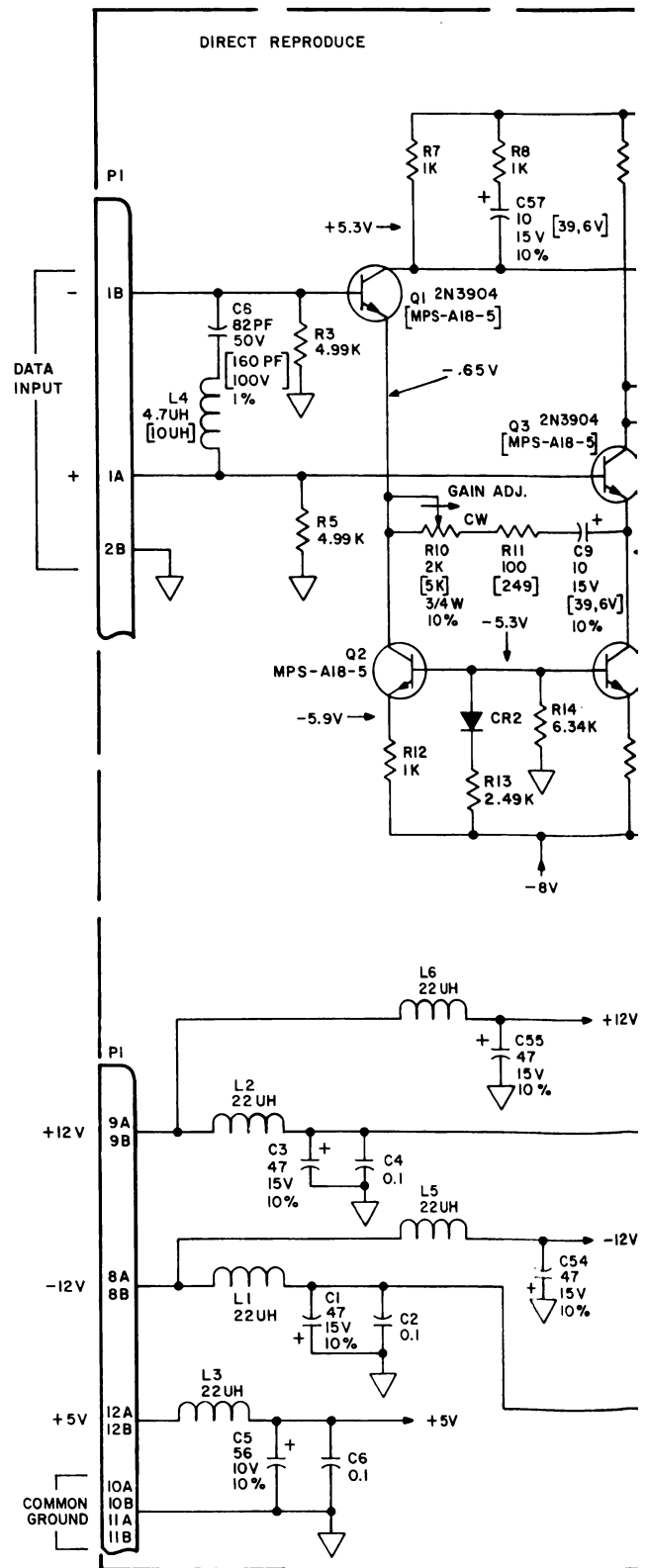
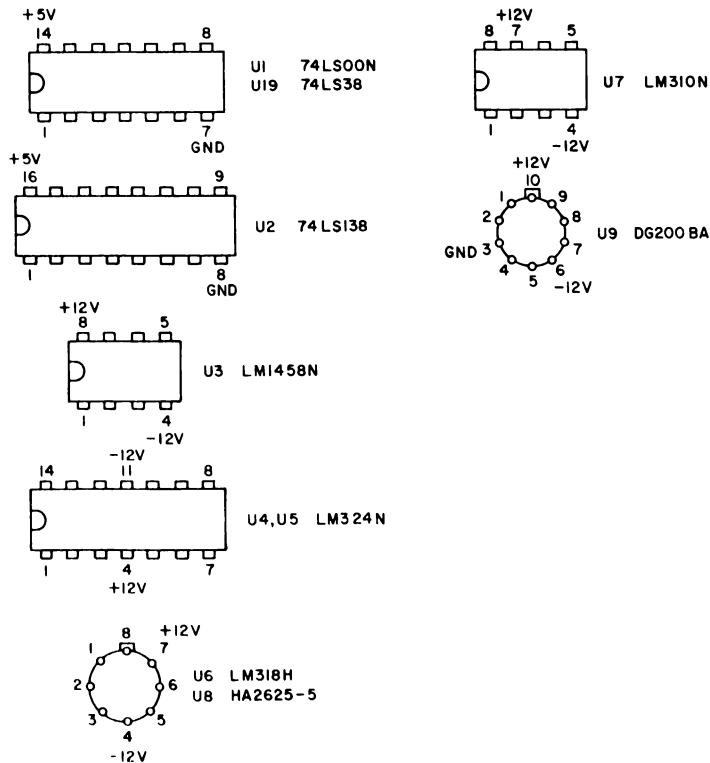
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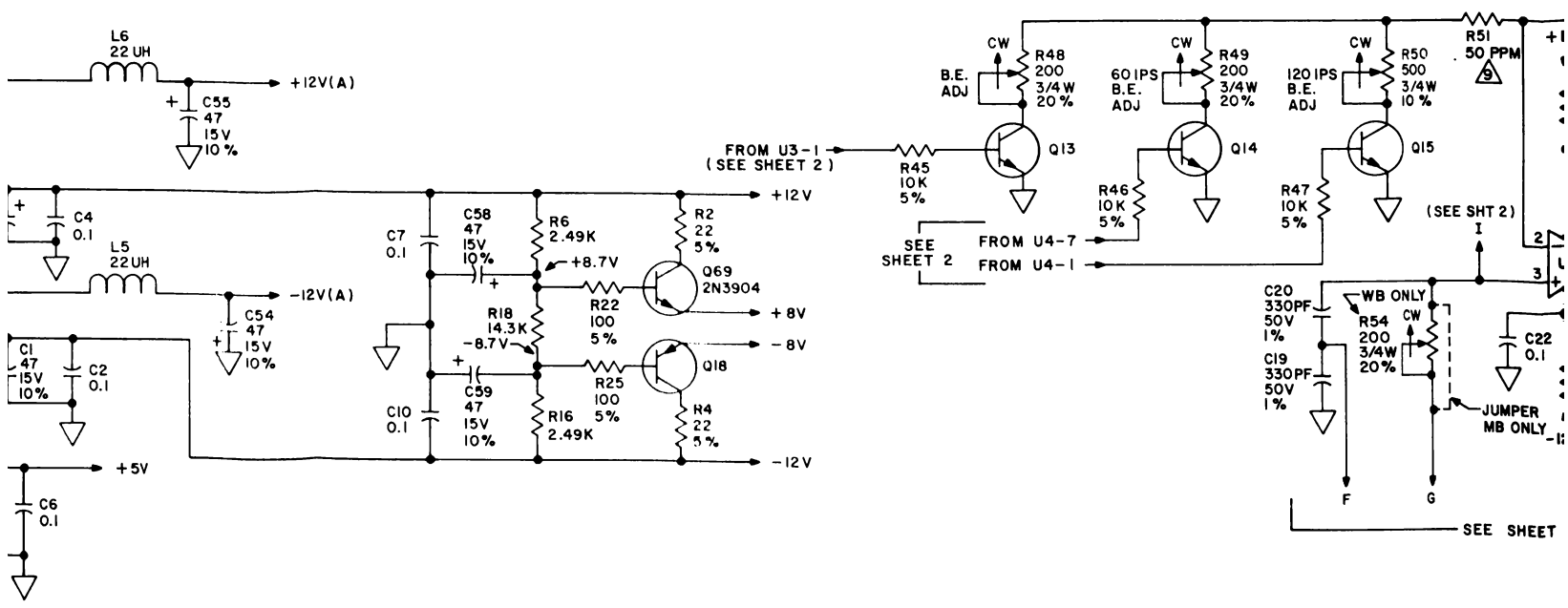
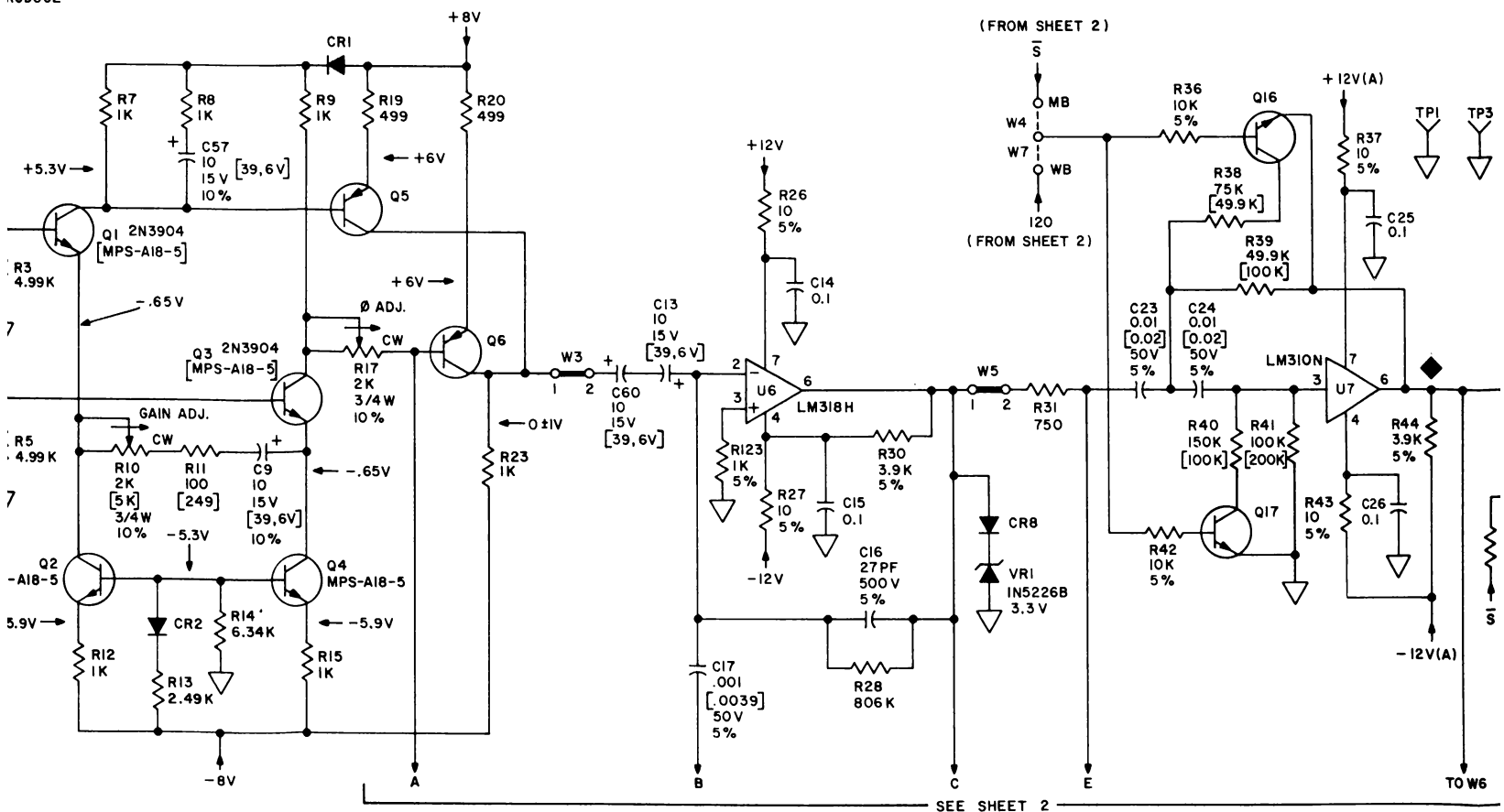
- UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%.  
ALL 5% RESISTORS ARE 1/4W.  
ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
ALL DIODES ARE 1N4148.  
ALL NPN TRANSISTORS ARE MPS-A17-5.  
ALL PNP TRANSISTORS ARE 2N3906.
- ▽ DENOTES CIRCUIT COMMON.
- LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
- [ ] INDICATES MEDIUM BAND VALUES.
- ◆ INDICATES POGO PAD.
- ① C53 NOT INSTALLED (OPTION).
- ② U3, U4, U5: IO CONTROL LINES TO TRANSISTOR SWITCHES;  
+9V TO +12VDC = SWITCH "ON"  
-9V TO -12VDC = SWITCH "OFF"

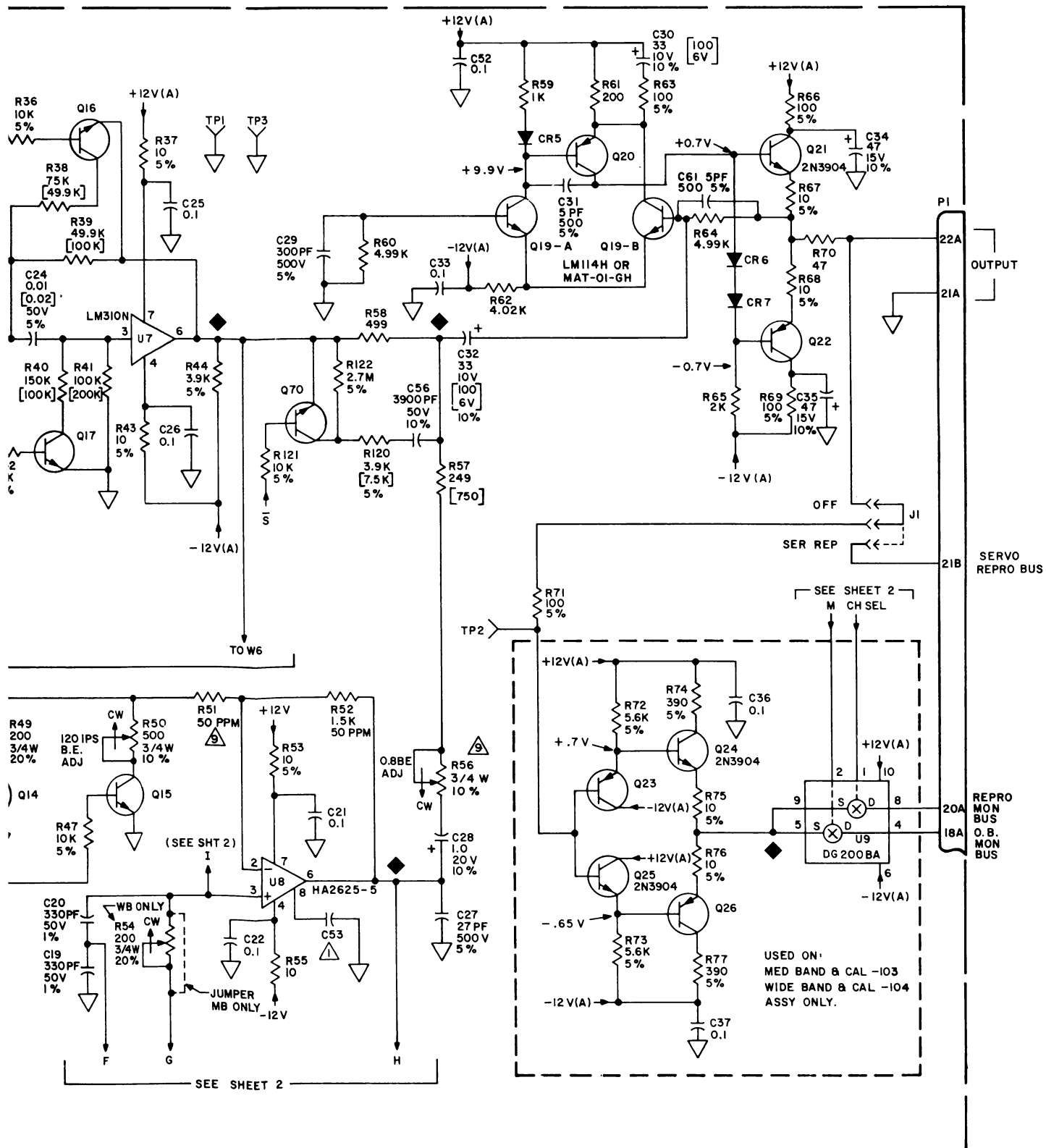
7. SPEED LINE CODE:

IPS	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>
120	1	1	1
60	1	1	0
30	1	0	1
15	1	0	0
7.5	0	1	1
3.75	0	1	0
1.87	0	0	1
.937	0	0	0

- INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



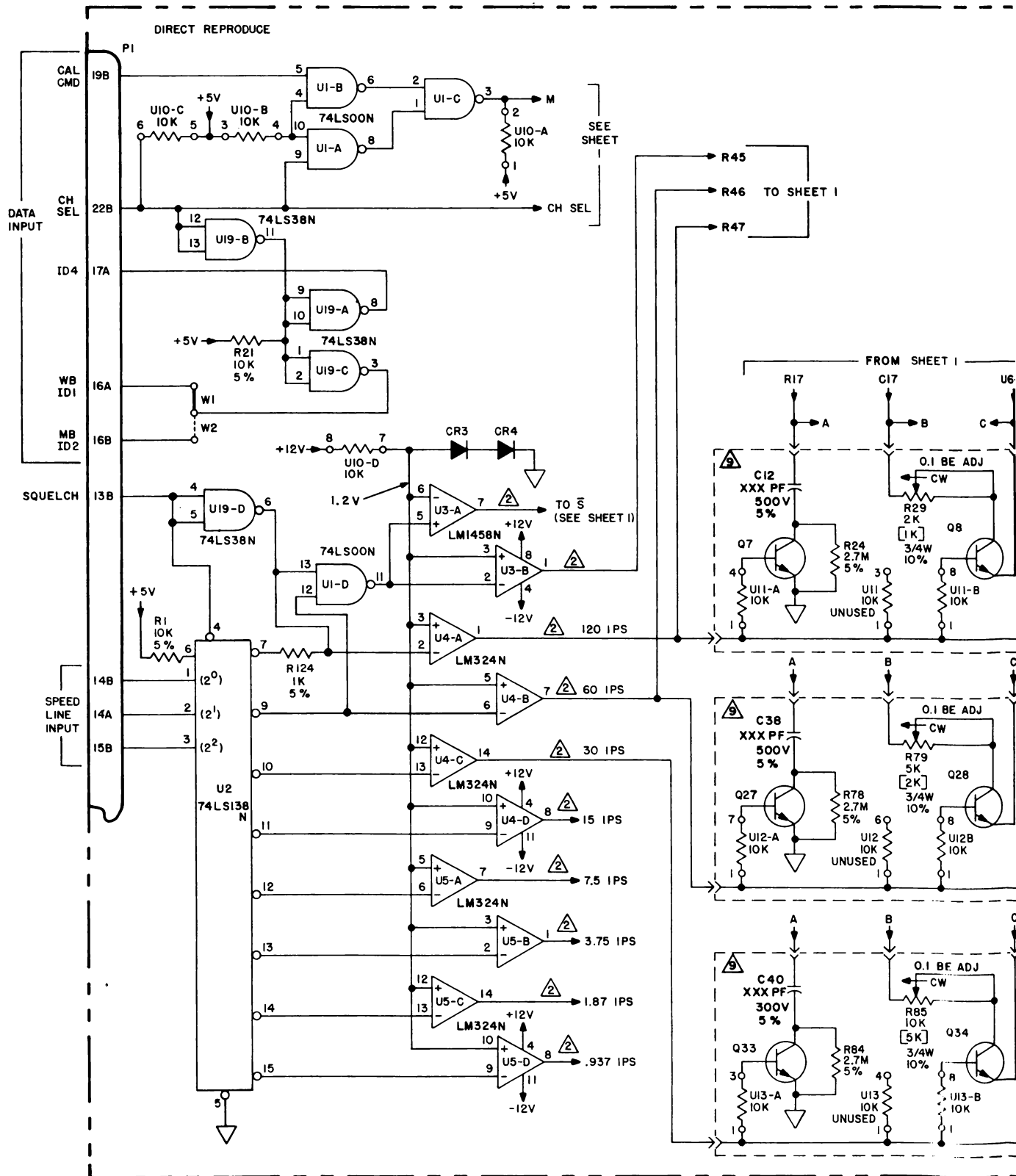




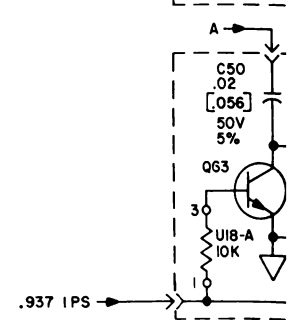
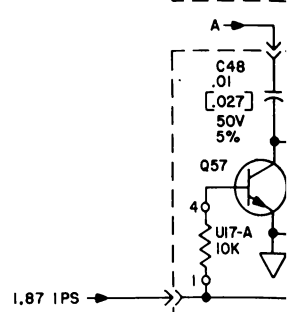
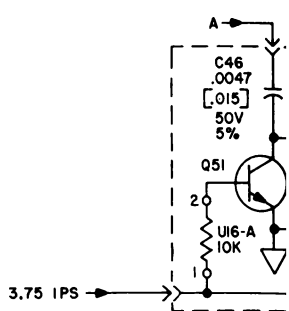
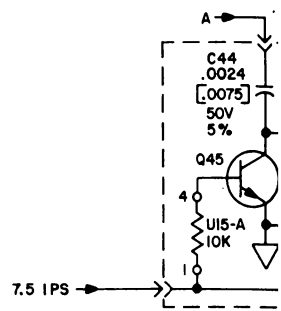
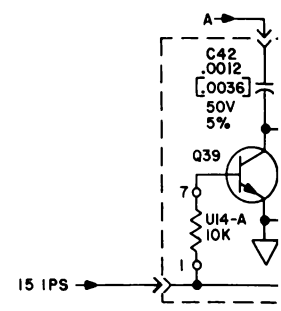
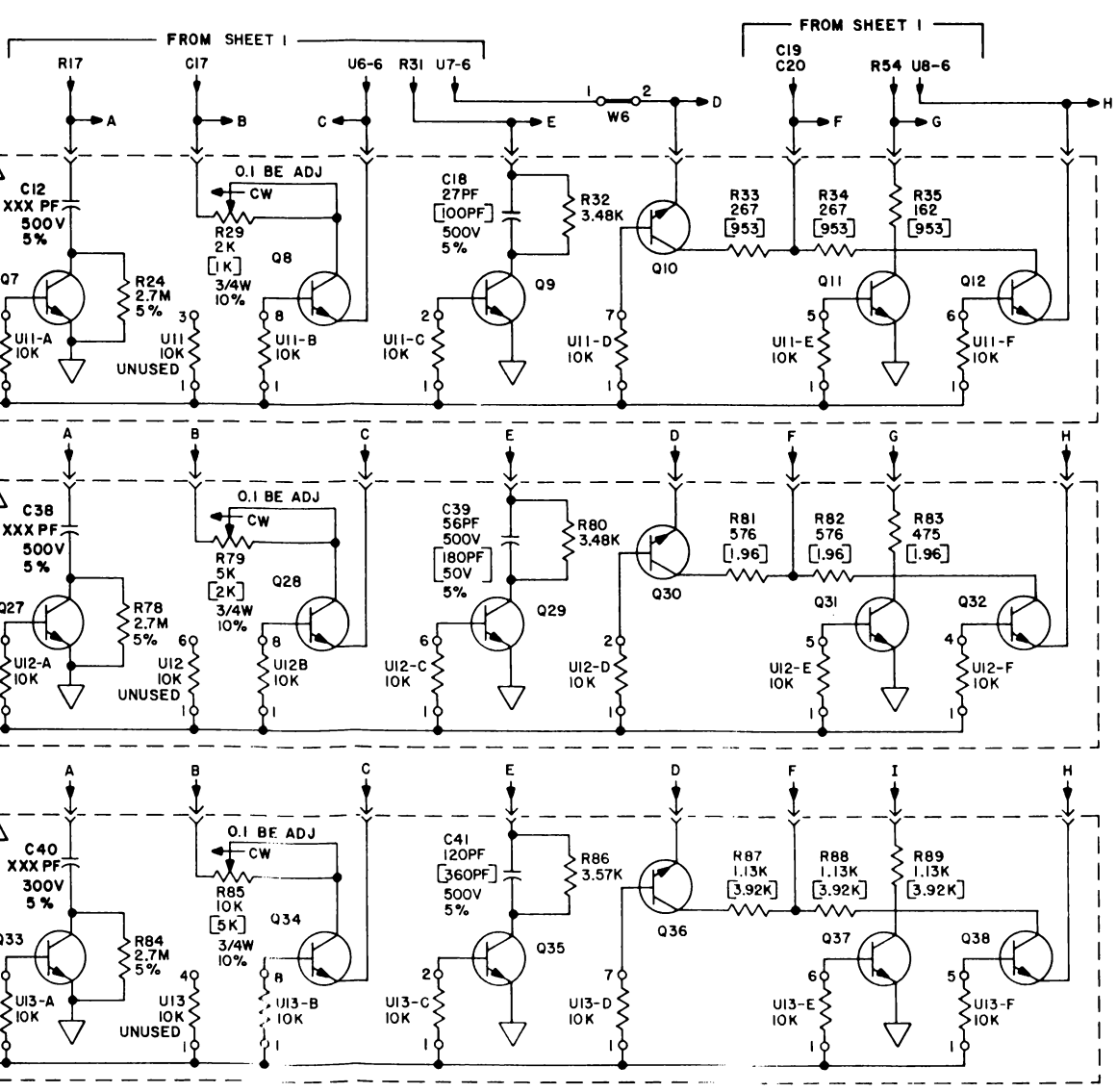
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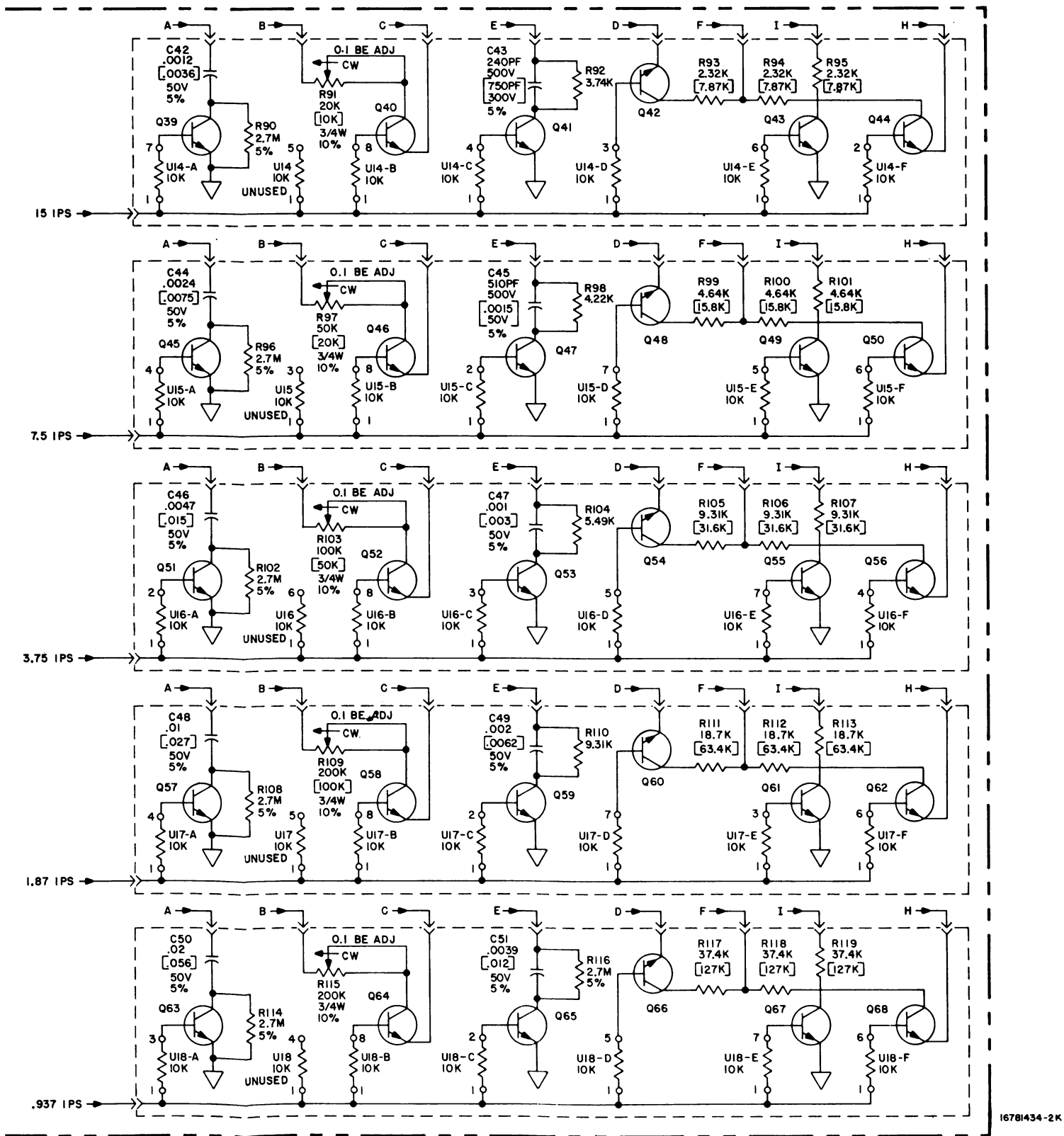
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Figure 7-1. Direct Reproduce Schematic (Sheet 1 of 2)



15  
16 TO SHEET I  
17





16781434-2-K

Figure 7-1. Direct Reproduce Schematic (Sheet 2 of 2)



# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
FM RECORD  
CIRCUIT CARD ASSY  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

APRIL 1984

## NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

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## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the FM record circuit card assembly used with the Honeywell Model 101 Magnetic Tape System. It contains only the information that is applicable to the record card. The operator's manual describes the relationship of the record card to the system.

#### 1-2. DESCRIPTION

The FM record card is a printed-circuit card exclusively designed for FM operation, at any of the three IRIG standard modes: Intermediate band, Wideband Group 1 and Wideband Group II if a "Wideband Card"; and Intermediate band and Wideband Group I only, if a "Mediumband Card". Accommodations are made for internal system calibrations.

#### 1-3. SPECIFICATIONS

##### A. FM RECORD AMPLIFIER

##### 1. Power

VOLTAGE (Vdc)	NOMINAL CURRENT (ma)
+16.5 (+2.3V)	61
-16.5 (+2.3V)	61
+12 (+120 mV)	24
-12 (+120 mV)	17
+ 5 (+50 mV)	120

##### 2. Input-Data (Pins 22A and 21A)

Impedance: J6 (C-75) 75 ohm (+1%)  
J6 (C-20K) 20K ohm (+10%)  
(All input impedances are in parallel  
with 50 pF maximum to ground).

Frequency: DC to 500 kHz (refer to Table 1-1).

Amplitude:  $\pm 10\text{V}$  peak with 20K ohm input impedance.  
(Max)  $\pm 4.24\text{V}$  peak with 75 ohm input impedance.

Amplitude: Bipolar:  $\pm 0.5\text{V}$  to  $\pm 10\text{V}$  peak.  
(operating) Unipolar: 1 to 10V peak.

3. Input-Bias (Pin 1A)

Impedance: 3K ohm to 6K ohm in parallel with  
10 pF maximum.

Signal type: Sinewave

Amplitude:  $\pm 2\text{V}$  peak typical,  $\pm 1.6\text{V}$  peak minimum.

Frequency: Medium Band (M.B.) = 4 MHz.  
Wideband (W.B.) = 8 MHz.

4. Input-Variable Cal (Pin 20A)

Impedance: 20K ohms ( $\pm 10\%$ )

Amplitude:  $\pm 0.5\text{V}$  to  $\pm 10\text{V}$  peak.

Frequency: 100 Hz to 10 kHz.

5. Input-FM Normalized Cal (Pin 19B)

Impedance: 18K ohms minimum.

Signal Type: DC Voltage.

Amplitudes:  $0.000 \pm 0.002$  Vdc for center frequency.  
 $-5.060 \pm 0.002$  Vdc for positive deviation.  
 $+5.060 \pm 0.002$  Vdc for negative deviation.

6. Output - Carrier Head Driver (Pin 5B to Pin 5A)

Impedance: Medium Band (MBFM/MB) @ 54 kHz =  
100 ohms maximum.  
Wideband (MB or WBFM/WB) @  
112.5 kHz = 100 ohms maximum.

Amplitude: Medium Band (MBFM into MB Head)  
@54 kHz = 20 mA p-p minimum.

(Max output) Wideband (MB or WBFM into WB head)  
@ 112.5 kHz = 15 mA minimum.

Frequency Response: Medium Band (MBFM/MB)

(Referenced to 10 kHz) with 7 and 14-Tk MB/Fe Heads =  
-3 dB  $\pm$ 0.5 dB @ 600 kHz.  
-35 dB minimum @ 4 MHz.

with 28 Tk MB Fe Heads =  
-3 dB  $\pm$ 0.5 dB @ 900 kHz.  
-40 dB  $\pm$ 3 dB @ 4 MHz.

Wideband (MB or WBFM/WB)

with WB Fe Heads = @  
+1.5 dB  $\pm$ 0.5 dB @ 900 kHz  
-3.0 dB  $\pm$  1 dB @ 2 MHz  
-40.0 db  $\pm$ 3 db @ 8 MHz

Maximum Load: Short to ground from Pin 5B.

7. Output-Bias Head Driver (Pin 5B to Pin 5A)

Impedance: Measured with 5.6  $\mu$ H in series with the output  
and the tuning capacitor (C66) adjusted for minimum  
impedance.

MB @ 4 MHz and WB @ 8 MHz = 100 ohms maximum.

Amplitude: MB and WB = 25 mA rms minimum.

(Max output)

Distortion: Measured @ 20 mA rms - 1% maximum 2nd harmonic  
distortion.

Gain Drift: (Input to W62) 0 to 70<sup>o</sup> C = 0.5 db.

Maximum Load: Short to ground from Pin 5B.

8. Output-Normalized Monitor (Pin 18B)

Impedance: 250 ohms maximum.

Amplitude: Normalized to 1.0V rms (or  $\pm$ 1.414V peak-non-sine)  
by gain control R3 and offset control R5, for data  
input levels within the range specified in paragraph  
1-3.A.2. to achieve full scale deviation (IB and WBI =  
 $\pm$ 40%, WBII =  $\pm$ 30%).

Frequency Response: DC to 500 kHz = 0  $\pm$ 0.5 dB  
(Referenced to 10 kHz)

Distortion: Total Harmonic Distortion = 1.0% maximum  
@ 166 kHz.

9. Output-Record Carrier Frequency (Pin 15A)

Signal Type: TTL Logic Level

Maximum Loading: 10 ohm in parallel with  
150 pF maximum.

10. Frequency Response

Flat within 0.5 dB total over the data frequency ranges  
specified in Table 1-1.

11. Linearity

Less than +0.25% of full deviation from best straight  
line through zero.

12. Amplitude Sensitivity Drift

Less than 0.5 dB from 0° to 50°C.

13. Center Frequency Drift

+0.25% of full deviation over 8 hours and 20°F (11°C)  
after 10 minutes warmup (+40% modes).

14. Command Logic

Logic 0 (enable) = 0.0 to +0.5 Vdc.

Logic 1 (inhibit) = +2.6 to +5.25 Vdc.

Four bidirectional lines and two command lines are used  
to allow the microprocessor to control the card functions:

Variable Cal Command (Pin 16A)

Normalized Cal Command (Pin 16B)

Channel Select Command (Pin 17A)

Record Command (Pin 17B)

Channel Read/Write Command (Pin 21B)

Read Bus Command (Pin 18A)

15. Speed Selection Logic (See Table 1-1)

Three speed lines (Pins 14B, 14A, 15B) which are decoded on the record card.

16. Mode Select (See Table 1-1)

Pin jumper selectable.

17. Selective Track Record

Record ON/OFF switch mounted at card edge allows manual selection of tracks enabled. In programmable (automatic) selective track record, the microprocessor controls the record cards, which have this record switch "ON".

18. Record Indicator (LED)

A card edge mounted LED indicates the presence of bias current when in record mode.

B. ENVIRONMENT

	<u>Storage</u>	<u>Operating</u>
Temperature:	-30 <sup>o</sup> to +75 <sup>o</sup> C	0 <sup>o</sup> to +50 <sup>o</sup> C
Humidity: (non-condensing)	5 to 95%	5 to 95%
Altitude (feet):	to 50,000	to 15,000



Table 1-1. FM Record Amplifier Specifications

SPEED IPS	LINE CODING			BIPOLAR/ UNIPOLAR	IRIG MODE	CARRIER DRIVE ON/OFF	CARD ID-CODE	INPUT IMPEDANCE (OHMS)	DATA BANDWIDTH DC to kHz	- (MINUS) DEVIATION kHz	CENTER FREQUENCY kHz	+ (PLUS) DEVIATION kHz
	P1 PINS											
	15B	14A	15B									
120	1	1	1	CF	C-WBII	C-N	C-WB	C-75	500	630.00	900.00	1,170.00
60	1	1	0	CF	C-WBII	C-N	C-WB	C-75	250	315.00	450.00	585.00
30	1	0	1	CF	C-WBII	C-N	C-WB	C-75	125	157.50	225.00	292.50
15	1	0	0	CF	C-WBII	C-N	C-WB	C-75	62.5	78.75	112.50	146.25
7.5	0	1	1	CF	C-WBII	C-N	C-WB	C-75	31.25	39.38	56.25	73.13
3.75	0	1	0	CF	C-WBII	C-N	C-WB	C-75	15.63	19.69	28.13	36.56
1.87	0	0	1	CF	C-WBII	C-N	C-WB	C-75	7.81	9.84	14.06	18.23
120	1	1	1	CF	C-WBI		C-MB		80	259.20	432.00	604.80
60	1	1	0	CF	C-WBI		C-MB		40	129.60	216.00	302.40
30	1	0	1	CF	C-WBI		C-MB		20	64.80	108.00	151.20
15	1	0	0	CF	C-WBI		C-MB		10	32.40	54.00	75.60
7.5	0	1	1	CF	C-WBI		C-MB		5	16.20	27.00	37.80
3.75	0	1	0	CF	C-WBI		C-MB		2.5	8.10	13.50	18.90
1.87	0	0	1	CF	C-WBI		C-MB		1.25	4.05	6.75	9.45
.937	0	0	0	CF	C-WBI		C-MB		.625	2.03	3.38	4.73
120	1	1	1	CF	C-IB		C-MB		40	129.60	216.00	302.40
60	1	1	0	CF	C-IB		C-MB		20	64.80	108.00	151.20
30	1	0	1	CF	C-IB		C-MB		10	32.40	54.00	75.60
15	1	0	0	CF	C-IB		C-MB		5	16.20	27.00	37.80
7.5	0	1	1	CF	C-IB		C-MB		2.50	8.10	13.50	18.90
3.75	0	1	0	CF	C-IB		C-MB		1.25	4.05	6.75	9.45
1.87	0	0	1	CF	C-IB		C-MB		.625	2.03	3.38	4.73
.937	0	0	0	CF	C-IB		C-MB		.313	1.01	1.69	2.36
120	1	1	1	CF to -	C-WBII		C-WB		500	630.00	1,170.00	---
120	1	1	1	CF to +	C-WBII		C-WB		500	---	630.00	1,170.00
120	1	1	1	CF to -	C-WBI		C-MB		80	259.20	604.80	---
120	1	1	1	CF to +	C-WBI		C-MB		80	---	259.20	604.80

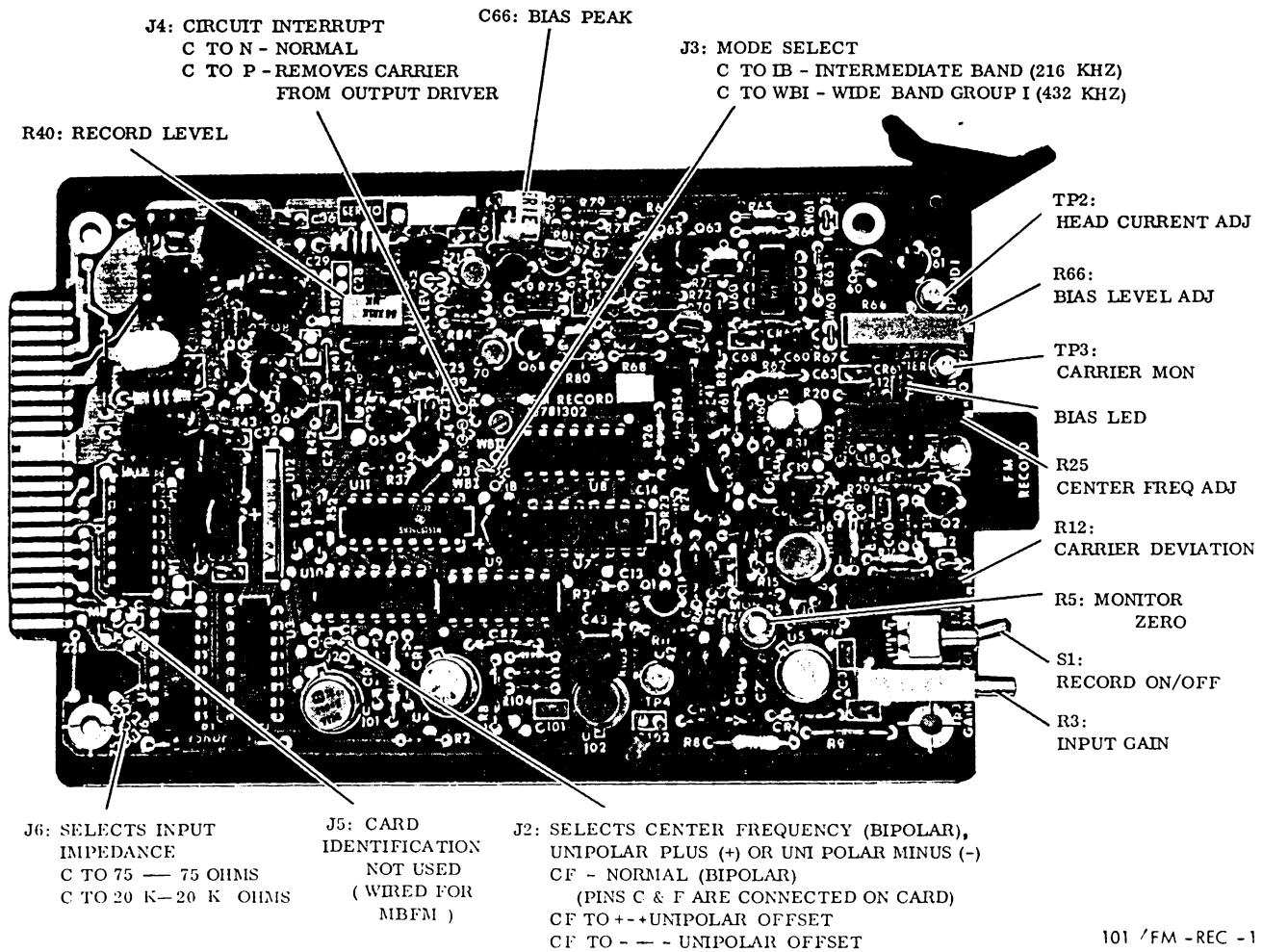
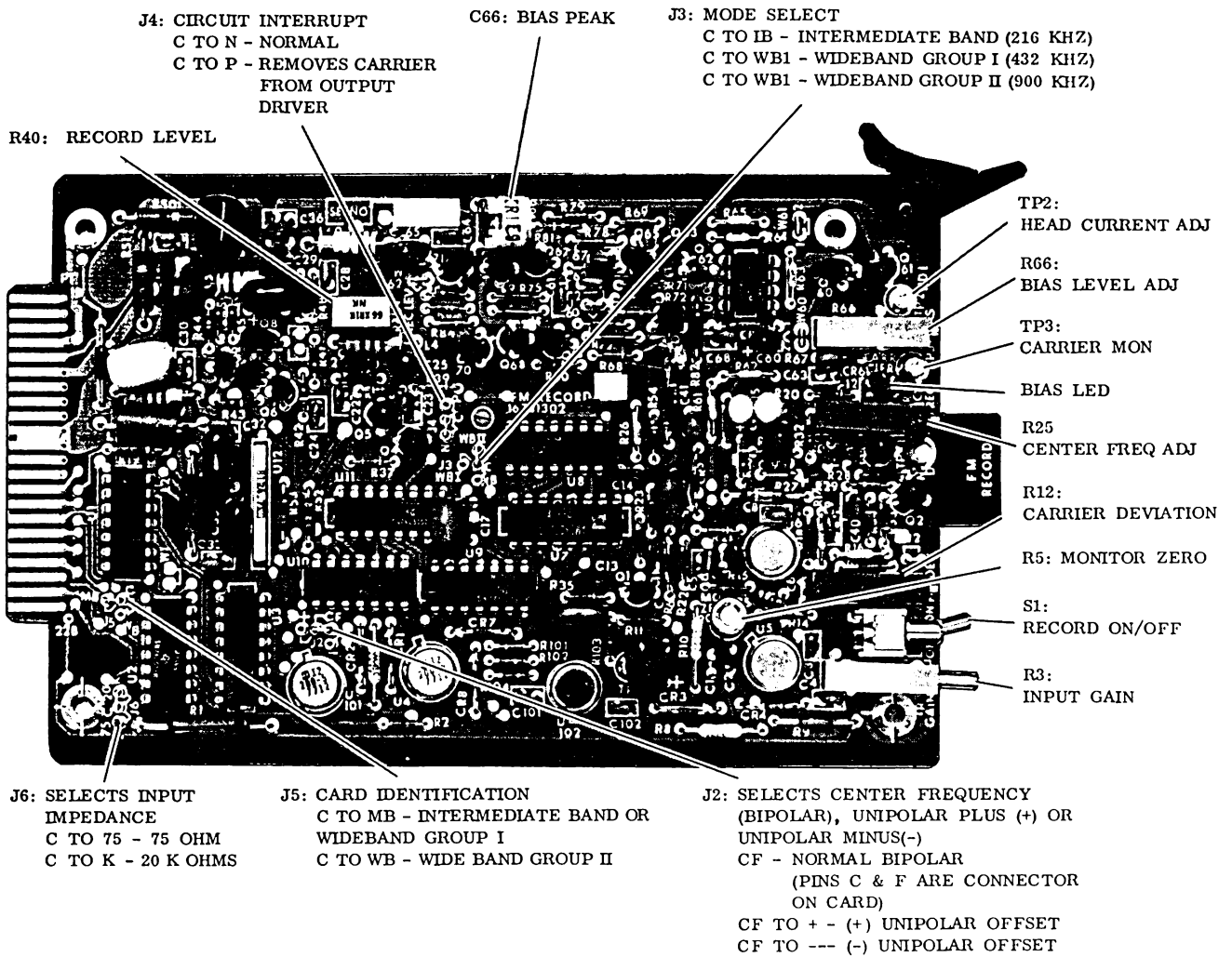


Figure 2-1. FM Record Card (MBFM)

101/FM  
RC



101 / FM -REC -2

Figure 2-2. FM Record Card (WBFM)

## SECTION 3

### OPERATION

Operating procedures are not required for the FM Record Card. Refer to the Operator's Manual for general operating instructions.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the FM Record Amplifier. The description is divided into two parts: a functional description (referenced to a block diagram) and a detailed circuit description (referenced to the schematics in Section 7).

#### 4-2. FM RECORD AMPLIFIER

##### A. FUNCTIONAL DESCRIPTION (Figure 4-1)

The FM Record Amplifier accepts input signals over a frequency range of dc to 500 kHz and converts them to frequency-modulated output signals. The amplitude of the input signal is converted to frequency, and the input signal frequency is the deviation rate. The FM Record Amplifier consists of an input circuit with switched data and calibrate signal lines, voltage-controlled oscillator (VCO), frequency divider circuit, carrier frequency driver, and a bias frequency driver, microcomputer interface control logic, and a normalized monitor buffer.

The data input signal, FM Normalized Cal Signal, or the Variable Cal signal is applied to the input circuit through P1-22A, 19B, or 20A respectively. The particular signal selected is commanded by the microcomputer. The microcomputer controls the analog switches through interface logic on the record card.

Jumper switch J6 provides for selection of either 75 ohms or 20 K ohms input impedance. Either bipolar or (+) or (-) unipolar input signals may be selected by positioning jumper J2. A buffer amplifier provides the low output impedance required to drive the VCO, via FM deviation pot (R12).

The VCO generates the basic carrier frequency, which is frequency-modulated by the signal from the data input circuit. The VCO is a closed-loop circuit, having feedback that maintains the correct frequency. The frequency-modulated output of the VCO is applied to the frequency divider circuit.

The frequency divider circuit which is controlled by the Record Command (Logic 0 - enables the Logic 1 - inhibits), provides appropriate signals for selection by the data selector integrated circuit dependent upon the code on the speed lines. The selected signal is applied to a buffer driver for the Electronics-to-Electronics (E-E) Cal Bus and to the Carrier Frequency output driver circuit.

The carrier frequency output driver circuit provides the proper current drive out P1-Pin 5B, through the head winding and into P1-Pin 5A, through

head return resistor (R49, 10 ohms, 1%) to ground. Test point TP2 (HDI) may be used to measure voltage drop across R49 to determine head current, which is adjustable by Record Level Pot R40

The bias frequency driver circuit receives an input on P1-Pin 1A of sufficient amplitude so that bias level pot R66 can be adjusted for optimum bias current through the head winding as it is summed with carrier frequency driver output at P1-Pin 5B. This driver circuit is controlled by the Record Command (Logic 0-enables), which is interfaced to switch the supply voltages within this driver circuit.

The microcomputer interface logic accepts commands from and sends identification codes to the microcomputer.

The normalized monitor buffer isolates the input-circuit output used for calibration purposes from the normalized monitor bus.

## B. CIRCUIT DESCRIPTION

### 1. Input Circuit (Figure 7-1, Sheet 1)

The input circuit provides switching, impedance selection, attenuation, unipolar/bipolar input accommodations and buffering. It consists of U4 (-103 and -104 only), U101, J6, R3, J2, U5 and associated components.

The input signal is applied to the FM Record Card through the BNC connectors designated RECORD INPUTS at the rear of the machine, and enters the card at P1-22A. The FM Normalized Cal signal enters the card at P1-19B, and the Variable Cal signal enters at P1-20A. The actual signal applied to the input pins of U5 is determined by analog switches U4 (-103 and -104 only) and U101 and their control from U3, which interfaces with the command signals from the microprocessor (MPU).

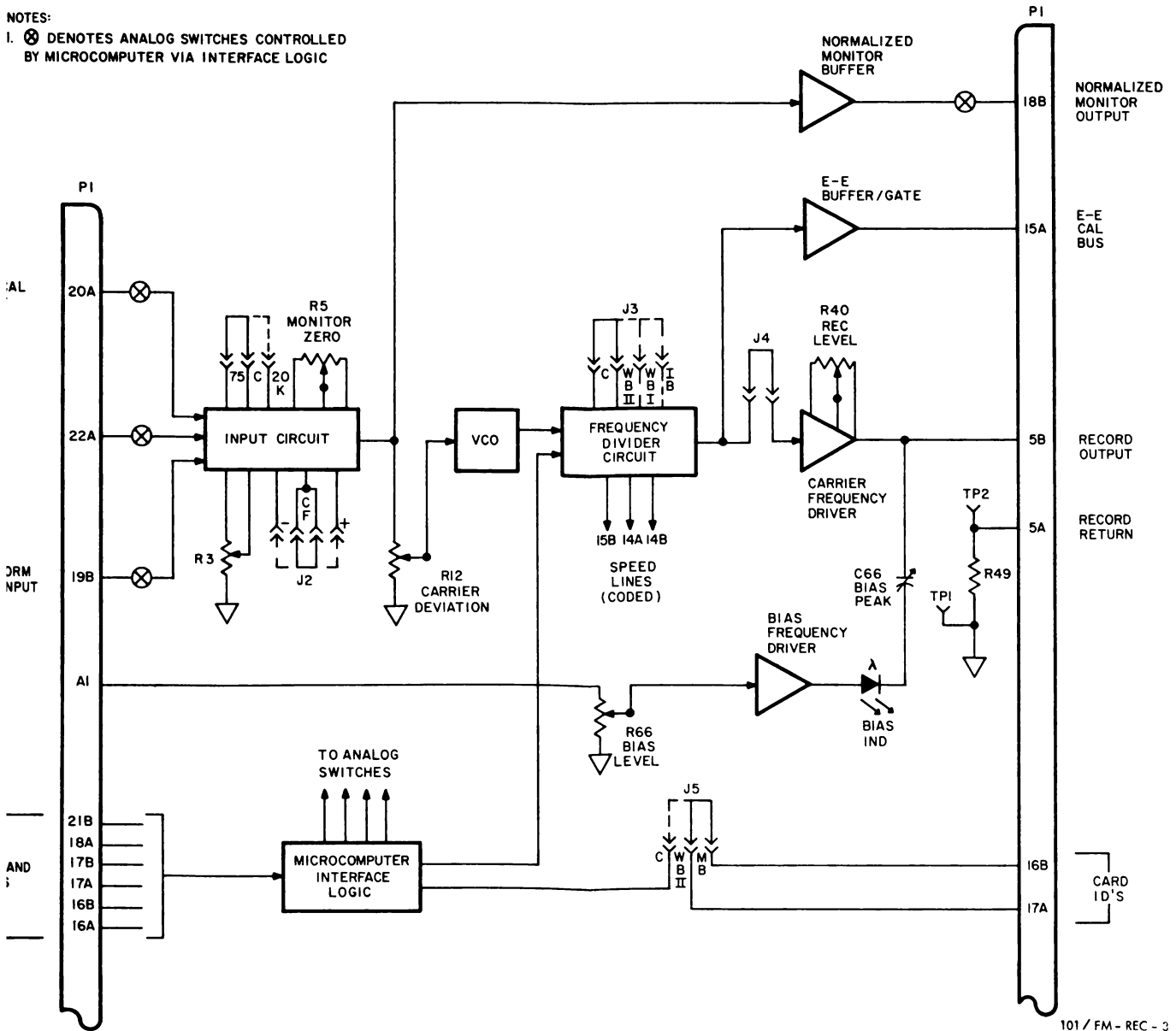
The Data input impedance may be selected by positioning jumper J6 to be either 75 ohms (J6, C to 75) or 20K ohms (J6, C to 20K).

The input GAIN attenuator (R3) can be adjusted so that any input signal level between  $\pm 0.5$  and  $\pm 10V$  peak will produce a normalized level of 1 V rms at the monitor level test point (TP4) and the normalized monitor output P1-18B. This signal is also applied through the FM deviation pot (R12) to VCO to produce the  $\pm 30$  or  $\pm 40$  percent deviation about the center frequency.

The jumper J2 provides accommodation for either unipolar or bipolar data input signal. When in the CF position, a zero volt dc input level causes the VCO to produce the standard center frequency. However, when in the CF to -(minus) position, a zero volt dc input level causes the VCO to produce the equivalent of the standard upper (+) deviation and, therefore, capable of accepting a data input signal of negative polarity only and the same peak-to-peak amplitude as the normal bipolar signal. And conversely, when in the CF to +(plus) position, a zero volt dc input level causes the VCO to produce the equivalent of the standard lower (-) deviation

NOTES:

I. ⊗ DENOTES ANALOG SWITCHES CONTROLLED BY MICROCOMPUTER VIA INTERFACE LOGIC



101 / FM - REC - 3

Figure 4-1. FM Record Amplifier Block Diagram

/FM  
RC

and therefore, capable of accepting a data input signal of positive polarity only and the same peak-to-peak amplitude as the normal bipolar signal. (Refer to Table 1-1 of Section 1.)

Buffer U5 has an approximate gain of 3.2 for data and Variable Cal signals at its Pin 3 input and provides a low output impedance drive to the monitor buffer (U102) and VCO input.

## 2. Voltage-Controlled Oscillator (VCO) (Figure 7-1, Sheet 1)

The VCO generates frequencies of six times the specified frequencies for WBII operation (Refer to Table 1-1 of Section 1) and twelve times the specified frequencies for WBI and IB operation. It can be deviated a maximum of plus or minus 30 percent for WBII and plus or minus 40 percent for WBI and IB operation, by the amplitude of the signal from the input circuit. The input and output of the VCO are constantly compared and adjusted (closed loop) to dynamically maintain the correct output frequency. The VCO consists of an active integrator, variable frequency oscillator (VFO), monostable multivibrator, and a precision-amplitude clamp amplifier.

The active integrator (C7, R14, R16 and U6) converts the ac signal from the input circuit to a proportional dc signal.

The feed forward compensation network (C5 and R15) extends the operating frequency range of U6. A temperature compensated bias network (R17, R18 and temperature-sensitive resistor R27) provide the necessary dc level at U6 Pin 3 for proper comparison of the feedback signal thru R16 to U6 Pin 2. Capacitors C6 and C10 provide for high frequency stability of U6.

The variable frequency oscillator (R21, R22, CR5, CR6, R23, R24, C11, C13, Q1 and first half of U7) takes the proportional dc signal from the integrator and converts it to a proportional frequency. This is accomplished by varying the base drive on the current source (Q1) changing the charge rate on C13. The VFO output is fed to the monostable multivibrator as less than 25 nanosecond (nsec) pulses of varying repetition rate.

The monostable multivibrator (R25, R26, C14 and the second half of U7) has an adjustable pulse width, controlled by CTR Freq pot (R25). The pulse width is nominally set to 92.6 nsec on the more positive level of the output waveform (test pad X) to the precision-amplitude clamp amplifier when in WBII mode. The pulse width is nominally set at 96.5 nsec for WBI and IB modes. This output of the multivibrator is also fed to the frequency divider circuit.

The precision-amplitude clamp amplifier (R28, R29, R30, R31, R32, R33, R34, C18, C19, C20, Q2 and Q3) shapes the input signal to a fast rise time (3 nsec) and fall time (6nsec) signal of precise amplitude near +6.2V peak at test pad W. The average output of the clamp amp is applied to U6 through R16. The feedback error is determined by the net current flow at U6 Pin 2 as provided by signals into R13 and R16. Since the low level portion of the waveform at test pad W is the adjusted



pulse width, changing repetition rate will change the average output level at this point. If the input level to R14 becomes more positive, the integrator output level goes less positive turning Q1 on more, charging C13 faster, which increases the VFO repetition rate output to monostable multivibrator. This multivibrator output pulse becomes a greater percentage of the increased frequency cycle time (shorter low level compared to high level) at test pad X. The clamp amplifier inverts this signal so that the average level of the signal at test pad W is less positive into R16 which offsets the more positive input level we started with so that the error current is near zero. The VCO output is taken from test pad X which has an increased frequency when a more positive input was applied as is desired. The VR1 circuit provides the precise voltage level for the clamp amplifier.

### 3. Frequency Divider Circuit (Figure 7-1, Sheet 2)

The frequency divider circuit (U8, U9, U10, U11 and J3) divides and selects the proper VCO frequency for mode and speed used. U8 is controlled by the Record Command (Logic 0-enables).

The VCO output enters U8 Pin 1 and is divided by six to be applied to mode select jumper J3-WBII. When J3 is in position C-WBII this signal is applied directly to Pin 13 input of the data selector (U11) which selects that input, when the 120 inches per second speed code is applied to U11 control pins 11, 10 and 9 (Logic 1 on all three lines for 120 ips), and outputs the selected signal on U11 Pin 6. Further division by two for each progressively lower speed is done in U9 and U10 and applied to successive inputs on U11 for selection by appropriate speed code. (Refer to Table 1-1). Selecting the C-WBI position on J3 applies the VCO divided by twelve signals from U8 to U11, Pin 12 for 120 ips use and again this signal is divided by two for each progressively lower speed and properly selected by U11 to output on Pin 6. For C-IB, position on J3, the VCO divided by twelve signal is further divided by two in U9 and applied by J3 to U11 Pin 12. From there, the same functions apply as in the other two modes.

The U11 Pin 6 output may be applied to the input of the carrier frequency driver through Jumper J4, and also applied to the E-E frequency monitor bus (P1-15A) through parallel gates of U2 and R19. The gates are controlled by the Channel Select Command (Logic 0 on P1-17A-enables). Carrier test point (TP3) monitors U11-6 through R20.

### 4. Carrier Frequency Driver (Figure 7-1, Sheet 2)

Speed and mode dependent signal from data selector U11 Pin 6 is applied as the Carrier Frequency driver input through jumper J4 when in the C-N (Normal) position. The C-P (park) position is furnished to aid in troubleshooting if circuit needs to be interrupted, or if bias frequency only is to be measured at TP2.

The carrier frequency driver consists of Q4, A5, Q6, Q7, Q8 and Q9, and associated components. Record Level pot R40 adjusts amplitude of the carrier frequency current through the head winding and may be monitored at Head Current

test point TP2 to ground (TP1) where voltage drop across a ten ohm resistor (R49) is measured. A nominal 75 mV peak-to-peak signal is to be expected (7.5 mA p-p head current). The inductor (L4) and capacitor (C26) provide some signal conditioning as well as R47, R48 and C28. Inductor L5 and capacitor C29 form a bias frequency trap. The carrier frequency is summed with the bias frequency at P1-5B, the output to the head. Pin P1-5A is the head return line to TP2.

#### 5. Bias Frequency Driver (Figure 7-1, Sheet 2)

The bias frequency driver (Q62 through Q71 with associated components) is controlled by the Record command at P1-17B (Logic 0 - enables). This command latched in by U3 controls the +15 volt power to part of the amplifier. By having a logic 1 level at U3-3 when enabled, U60 Pin 7 will go to the positive saturation level turning on Q60 to supply the switched +15 volts to the amplifier. Simultaneously U60 Pin 1 will go to the negative saturation level turning on Q61 for the switched -15 volts to the amplifier.

The bias frequency input is at P1-1A at a level of 2 volts peak at the frequency of 8 MHz for wideband systems and 4 MHz for medium band systems. This signal is applied across bias level pot (R66) which is the bias head current control. The current through the head winding can be measured as a voltage drop across the ten ohm resistor (R49) at TP2 to ground (TP1). Trimmer capacitor (C66) is used with inductor (L60) to match head impedances and is set for peak signal at TP2 (anominal 400 to 500 mV (WB) or 200 to 250 mV (MB) peak-to-peak bias signal is to be expected when calibrated). Jumper J60 is provided to interrupt the circuit as a troubleshooting aid. It allows the carrier frequency only to be measured at TP2 when J60 is removed.

An LED indicator (CR61) is provided near the card edge to indicate the presence of bias current in that the positive half of signal current flows through CR61.

#### 6. Microcomputer Interface Logic (Figure 7-1, Sheet 1)

The interface logic (U1, U2, U3, J5 and S1) interfaces commands from the microcomputer. The commands are written into the latch (U3) when a channel Read/Write command pulse occurs on P1-21B. This pulse is a short logic 0 pulse. When U1-12 goes low (Logic 0) while U1-5 is high (Logic 1) U1-4 and U1-11 are low, U1-13 goes high writing into the independent latches of U3, whatever commands are at the input Pins 5, 12, 13 and 4.

When a Read command is present on P1-18A and therefore U1-5, U1-4 and U1-11 will be high, causing U1-13 to stay low so no clock pulse appears at U3 Pin 9 when a Read/Write pulse occurs at U1-12. Thus, no commands are written into latches with this Read/Write pulse. What does happen is this: a Read command present (low) on U1-9 and a Read/Write pulse (low) on U1-8 causes U1-10 to be high which makes U2-5 and U2-9 high, and if Record ON/OFF switch (S1) is on, U2-4 and U2-10 will be high. Therefore, U2-6 and U2-8 will go low. U2-6 output is supplied to jumper J5-C which should be positioned in C-WBII or C-MB as dictated by mode

being used (Refer to Table 1-1). If in C-WBII position, the record card tells the microprocessor by the momentary Logic 0 on line P1-17A that it is in the WBII mode. If in the C-MB position, it tells the microprocessor by the momentary Logic 0 on line P1-16B, that it is in a medium band mode (J5 is soldered in C-MB position on medium band only cards, since WBII mode is not available).

If the Record ON/OFF switch (S1) is OFF, a logic 0 is on U2-4 and U2-10 causing U2-8 and U2-6 to both be a logic 1. A logic 1 on all I.D. lines (P1-16B, P1-17A, and P1-17B) during read strobe pulse of the Read/Write command, instructs the microprocessor that this record card should be turned off (that is turn off record and bias current) and treated the same as no card in that channel. When the microprocessor finds no card in a channel or S1 is off, the channel selector immediately advances to next channel.

Each output of latch U3 controls its respective point, be it analog witches or TTL logic. When P1-16A has a low level (logic 0-enable) while a write pulse occurs at P1-21B, U3-5 input is tranferred to the Q (U3-7) output as a low on U4-1, the analog switch portion between U4-8 and 9 is closed, Variable Cal Signal at P1-20A is applied as the input while U4-2 is a high level, inhibiting the data input signal at U4-4 and 5. Conversely, no Variable Cal command, P1-16A at a high level (Logic 1) and a write pulse occurs causing Q (U3-7) output to go high and Q (U3-6) output to go low. This shuts off analog switch U4-8 and 9 inhibiting the Variable Cal Signal and turns on U4-4 and 5 which passes the data signal as the input.

The other commands operate U13 in like manner to perform their functions. The Record Command enables U8 and the U60, Q60 and Q61 supply circuit if S1 is ON.

#### 7. Normalized Monitor Buffer (Figure 7-1, Sheet 1)

The normalized monitor buffer (U102 and associated components) isolates the output of the input circuit from the normalized monitor output bus. Gate U101 is controlled through U3 and switches the monitor buffer output to the normalized bus upon call by the channel select command. The other half of U101 switches the FM normalized cal signal upon call by the normalized cal command.

## SECTION 5

### MAINTENANCE

#### 5-1. ADJUSTMENTS

Adjustments to the Record Card are described in Section 4 of the Model 101 Operator's manual, except for the factory only adjustments, which are explained as follows:

A. MONITOR ZERO (R5) is used to dc balance U5 by selecting CAL, REC on system front panel. Verify INT light on calibrator control panel is on. If not, push the button below it to turn it on. Verify LF/ZERO light on calibrator control panel is on. If not, push button below the four lights until it is on. Verify Record ON/OFF switch (S1) is ON at card edge.

Select dc light on meter monitor control panel with the Left/Right shift buttons. Select REC with Repro/REC pushbutton and proper channel number to match data track slot the card in question is in with the Channel Selector.

This applies zero volts dc at P1-19B and gates on this FM Normalized Cal Signal to the input Circuit, while the normalized monitor buffer output of this channel is applied to Normalized Monitor Bus to be read by the meter monitor on the system front panel.

Set R5 for  $0.000V \pm mV$  on meter monitor.

B. RECORD LEVEL (R40) may be set by pulling jumper J60 in bias driver section and select CAL, REC on the system front panel. Monitor TP2 on record with scope using TP1 for ground. Set R40 to yield 75 mV p-p on scope for nominal setting. This may be trimmed slightly later for best SNR and distortion. Connect J60.

#### NOTE

J60 may be left installed, in which case bias is also present at TP2 of the record card. Then only the modulation at the Carrier Frequency at either the upper or lower portion of the composite signal must be measured.

C. (-105 and -106 and up assemblies) R57 is adjusted only after replacement of components in this circuit. Adjust CENTER FREQ (R25) to mid-range. Adjust R57 for applicable center frequency (See Table 1-1).

#### 5-2. TROUBLESHOOTING

Use this section in conjunction with the principles of operation (Section 4) and the schematics (Section 7). The procedures list will indicate the most probable

causes of the symptom to the stage level only. It is assumed that the necessary test equipment is available to make specified measurements; and that the problem has been isolated to the FM Record Card by substitution of cards and or channel location, and that power supply voltages have been verified on choke and dropping resistor ends opposite the connector.

If two problems exist in separate sections, it may be necessary to progress through troubleshooting flow chart until one of the problem areas are found; then return to box number one of chart and progress down alternate path to second problem area.

Other symptoms and shortcut procedures follow.

Symptom: Proper center frequencies for each speed and mode exist at Carrier Test Point TP3, but no deviation occurs when data signal is applied.

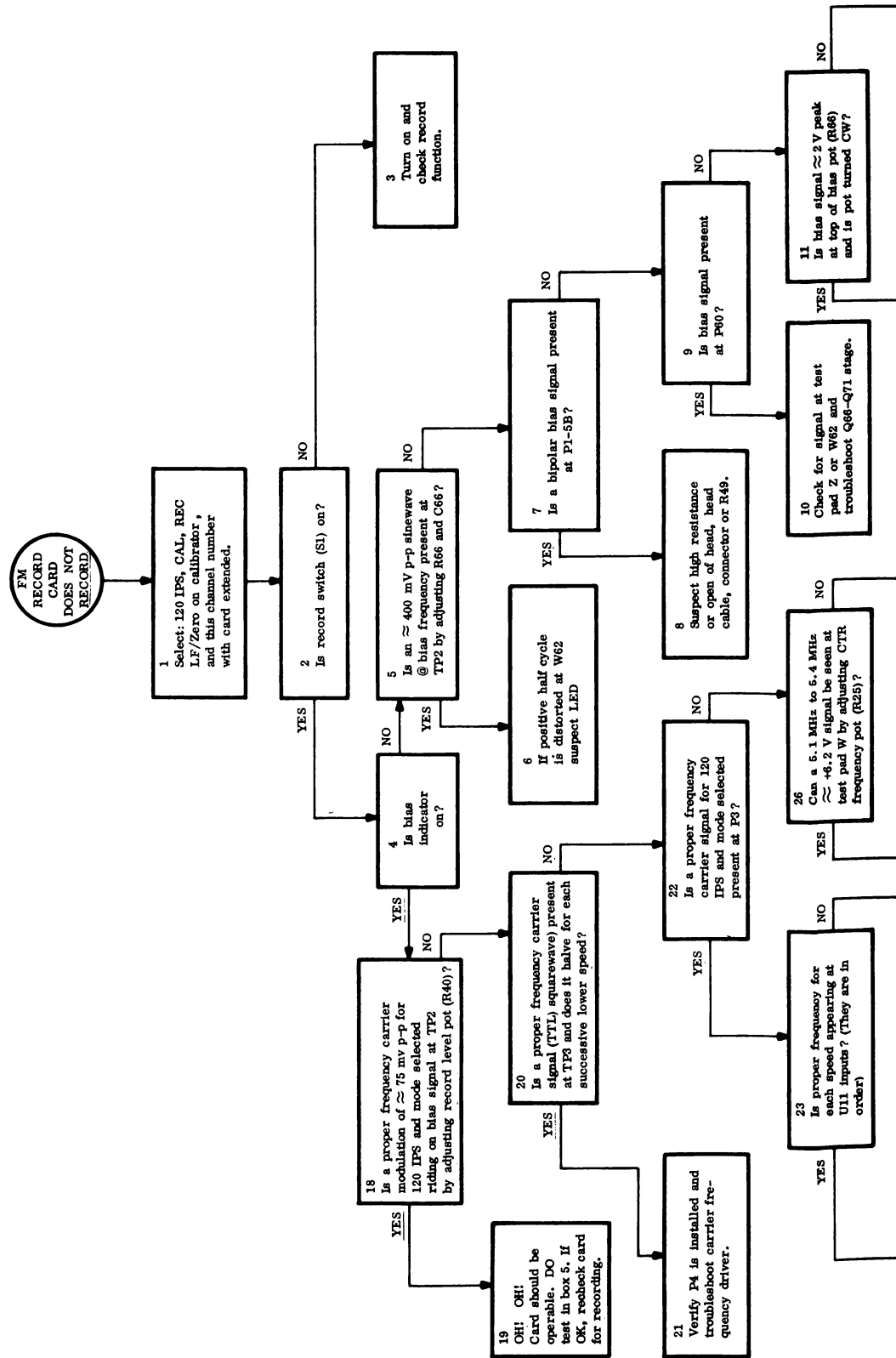
Procedure: Check for normalized amplitude data signal at W2 (1.414V peak) if signal is there, check FM deviation pot (R12) circuit and VCO. If signal is not there, troubleshoot U5 circuit back to P1-22A, including U4, U3 and U1.

Symptom: Proper center frequencies and deviation exist at TP3, but E-E Cal does not send signals from Record Card to Reproduce Card.

Procedure: Check for a logic "0" at P1-17A and a logic "1" at U3-14. If present, suspect U2 or open R19. If U3-14 not logic "1", troubleshoot command lines U1, and U3.

Symptom: Card is not identified on system front panel.

Procedure: Verify Record Switch (S1) is on and this channel selected by channel selector. Verify J5 position. If all are in order, suspect U1 and U2.



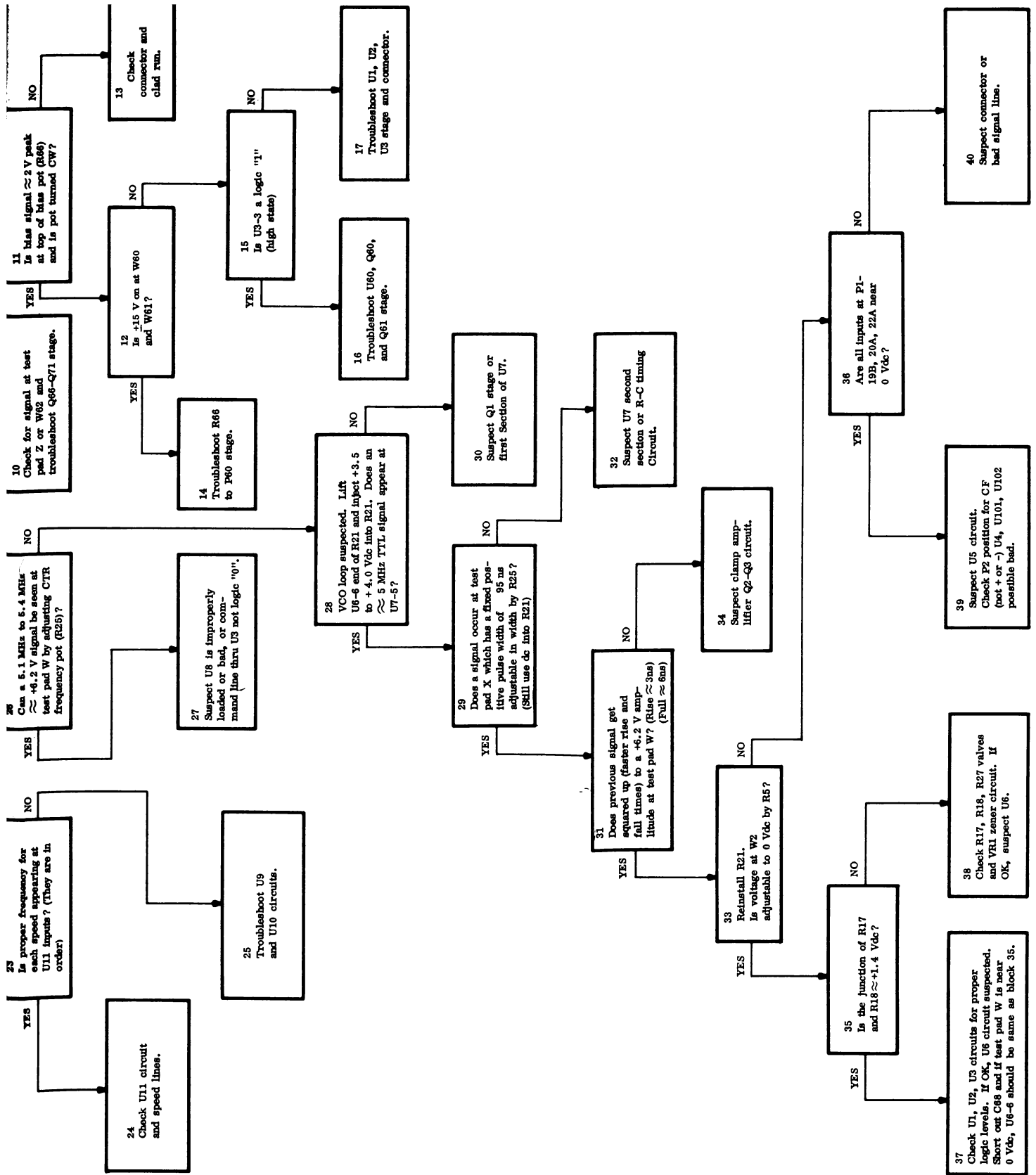


Figure 5-1. FM Record Amplifier Troubleshooting Flow Chart

## SECTION 6

### ILLUSTRATED PARTS BREAKDOWN

#### 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

##### A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

##### B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

##### C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

##### D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

##### E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.



## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## SECTION 6

### 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

### 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

### 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 1700 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769
FEPROXCUBE CORPORATION MT. MARION ROAD SAUGERTIES, NEW YORK 12477	02114	NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX 20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85016	04713	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
FAIRCHILD CAMERA AND INST. CORP. SEMICONDUCTOR DIVISION 464 ELLIS STREET MOUNTAIN VIEW, CALIFORNIA 94042	07263	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
CTS OF BERNE INCORPORATED 406 PARR ROAD BERNE, INDIANA 46711	11236	BURNS INCORPORATED TRIMPOT PRODUCTS DIVISION 1200 COLUMBIA AVENUE RIVERSIDE, CALIFORNIA 92507	32997
PLASTIGLIDE MFG CORP P.O. BOX 867 1757 STANFORD STREET SANTA MONICA, CALIFORNIA 90406	11897	ADVANCED MICRO DEVICES 901 THOMPSON PLACE SUNNYVALE, CALIFORNIA 94086	34335
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	HEWLETT PACKARD SEMICONDUCTOR DIV 350 WEST TRIMBLE ROAD SAN JOSE, CALIFORNIA 95131	50434
ELECTRONIC INSTRUMENT AND SPECIALTY CORPORATION STONEHAM, MASSACHUSETTS 02180	14908	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
AMETEC INC. RODAN DIV. 2095 BLUE STAR STREET SANTA MONICA, CALIFORNIA 92806	15454	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LAUTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
SCANRE MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
ROBINSON ELECTRONICS INCORPORATED 3580 SACRAMENTO DRIVE SAN LUIS OBISPO, CALIFORNIA 93401	19080	ELECTRONIC INDUSTRIES ASSOCIATION	80131
BERG ELECTRONICS YORK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
ANALOG DEVICE, INCORPORATED P.O. BOX 280 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	AUGAT INCORPORATED 33 PERRY AVENUE ATTLEBORO, MASSACHUSETTS 02703	91506
CORNELL-DUBILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60014	25243	ALCO ELECTRONICS PRODUCTS INC. 1551 OSGOOD STREET NORTH ANDOVER, MAINE 01845	95146
8/83		DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800

SECTION 6

6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
FM Record, 4 MHZ, Medium Band, CCA	16781302-107 16781302-109	B
FM Record, 8 MHZ, Wide Band, CCA	16781302-108 16781302-110	B

DESCRIPTION	PART NUMBER	CODE

- | CODE | DEFINITION   |
|------|--|
| A    | COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.   |
| B    | PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS; OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY. |
| C    | PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS; OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.  |

- | CODE | DEFINITION   |
|------|--|
| D    | PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD. |

SECTION 6

TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16781302-109	CIRCUIT CARD ASSEMBLY, FM RECORD, 4MHZ MEDIUM BAND	28009	}	NOTE 1	1	
16781302-110	CIRCUIT CARD ASSEMBLY, FM RECORD, 8MHZ WIDEBAND	28009				
<p>NOTE:</p> <p>1. CUSTOMER SELECTED ASSEMBLY CHECK EQUIPMENT FOR PART NUMBER USED.</p>						

## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

MODEL NUMBER - 101-6 LIST - B

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-008	BENCH LEVEL SPARES KIT, FM RECORD					
16757925-007	TRANSISTOR	04713	2N2222A 5961-00-490-7299	1	1	
16757931-005	SEMICONDUCTOR DEVICE, DIODE	80131	1N821A 5961-00-951-6375	1	1	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	9	2	
16762173-001	TRANSISTOR	04713	2N3906 5961-00-072-0128	9	2	
16774985-002	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210H	1	1	
16775629-022	TRANSISTOR	27014	PN5910-5	3	1	
16775630-021	TRANSISTOR	27014	PN4274-5	1	1	
16775977-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	MC1458C	1	1	
16776656-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	1	1	
16779015-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	24355	3408	1	1	
16779198-001	TRANSISTOR	80131	2N2907A 5961-00-904-4262	1	1	
16779340-001	INTEGRATED CIRCUIT, DATA SELECTOR/MULTIPLEXER	01295	SN74LS151N	1	1	
16779482-002	SEMICONDUCTOR DEVICE, DIODE	50522	MV5777B	1	1	
16779948-001	BUS BAR	29593	85153-100-2G3	6	2	
16780672-001	MICROCIRCUIT	34335	AM26S02PC	1	1	
16781367-001	MICROCIRCUIT	01295	SN74LS38N	1	1	
16781368-001	MICROCIRCUIT	01295	SN74LS92N	1	1	
16781827-001	MICROCIRCUIT	01295	SN74LS293N	2	1	
16783605-001	SEMICONDUCTOR DEVICE, DIODE	80131	1N4152 5961-00-899-8924	6	2	
99000249-001	MICROCIRCUIT	01295	SN74LS02N	1	1	
99000271-001	MICROCIRCUIT	01295	SN74LS175N 5962-00-595-8253	1	1	
99000937-001	SEMICONDUCTOR DEVICE, DIODE	50434	HSCH1001	2	1	

SECTION 6

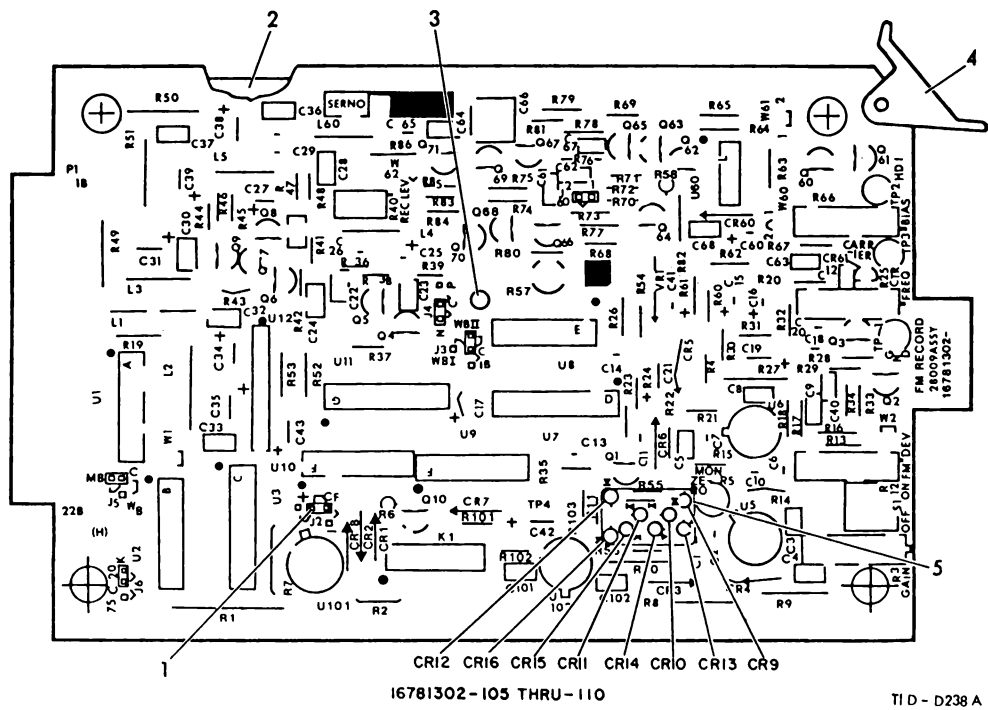
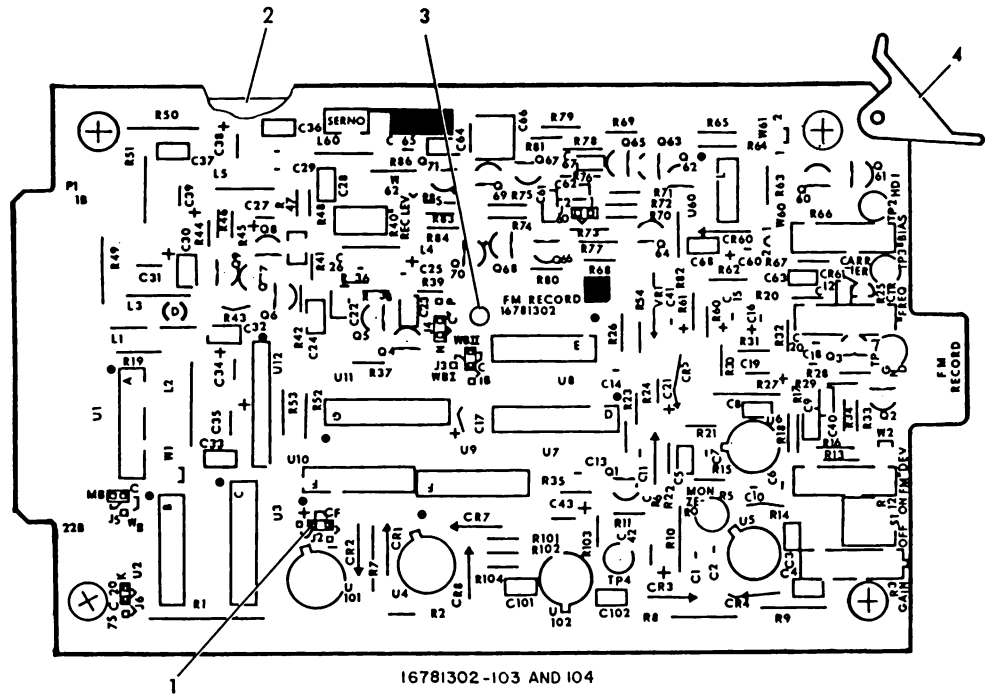


FIGURE 6-1. FM RECORD CIRCUIT CARD ASSEMBLY

SECTION 6

TABLE 6-1. FM RECORD CCA (SHEET 1 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 4MHZ, MEDIUM BAND	280C9		16781302-103	AR	A	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 8MHZ, WIDEBAND	280C9		16781302-104	AR	F	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 4MHZ, MEDIUM BAND	280C9		16781302-105	AR	C	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 8MHZ, WIDEBAND	280C9		16781302-106	AR	D	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 4MHZ, MEDIUM BAND	280C9		16781302-107	AR	E	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 8MHZ, WIDEBAND	280C9		16781302-108	AR	F	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 4MHZ, MEDIUM BAND	280C9		16781302-109	AR	G	
6-1		A8A4-35	CIRCUIT CARD ASSEMBLY, FM RECORD, 8MHZ, WIDEBAND	280C9		16781302-110	AR	H	
6-1		CR1-8	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	P		
6-1		CR9-59	. NOT USED						A, B
6-1		CR9-11	. SEMICONDUCTOR DEVICE, DIODE	80131	1N4152 5961-00-899-8924	16783605-001	3		C-H
6-1		CR12	. SEMICONDUCTOR DEVICE, DIODE	50434	HSCH1001	99000937-001	1		C-H
6-1		CR13-15	. SEMICONDUCTOR DEVICE, DIODE	80131	1N4152	16783605-001	3		C-H
6-1		CR16	. SEMICONDUCTOR DEVICE, DIODE	50434	HSCH1001	99000937-007	1		C-H
6-1		CR60	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	1		
6-1		CR61	. SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING	28480	HLMF1301	16778597-003	1		
6-1		C1,2	. CAPACITOR, FIXED, MICA DIELECTRIC, 7PF, +-1%, 300VDC	72136	DM5CC7R0F04CR	16779445-007	2		A, B
6-1		C1	. CAPACITOR, FIXED, MICA DIELECTRIC, 7PF, +-1%, 300VDC	72136	DM5CC7R0F04CR	16779445-007	1		C-H
6-1		C2	. CAPACITOR, FIXED, MICA DIELECTRIC 3PF, +-1%, 300VDC	72136	DM5CC03CF04CR	16779445-003	1		C-H
6-1		C3,4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C5	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	18796	8121-050-651-103M	16771020-011	1		
6-1		C6	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5CC220J04CR	16779445-315	1		
6-1		C7	. CAPACITOR, FIXED, MICA DIELECTRIC, 68PF, +-5%, 300VDC	72136	DM15EC680J04CR 591C-00-439-1525	16779445-327	1		
6-1		C8,9	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C10	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5CC220J04CR	16779445-315	1		
6-1		C11	. CAPACITOR, FIXED, MICA DIELECTRIC, 10PF, +-5%, 300VDC	72136	DM5CC10CJ04CR	16779445-310	1		
6-1		C12	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	1		
6-1		C13	. CAPACITOR, FIXED, MICA, DIELECTRIC, 27PF, +-5%, 300VDC	72136	DM5EC27CJ04CR	16779445-317	1		
6-1		C14	. CAPACITOR, FIXED, MICA DIELECTRIC, 18PF, +-5%, 300VDC	72136	DM5EC18CJ04CR	16779445-313	1		A, B

NOTES:



SECTION 6

TABLE 6-1. FM RECORD CCA (SHEET 2 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		C14	. CAPACITOR, FIXED, MICA DIELECTRIC, 1PPF, 4-1%, 300VDC	72136	DM5CC1ZCF04CR	16779445-013	1	C-H	
6-1		C15,16	. CAPACITOR, FIXED, ELECTROLYTIC, 8.2UF, +-10%, 15VDC	26769	41KS825A015K1A	16758058-233	2		
6-1		C17	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 6VDC	26769	41KS107E005K1A	16758058-046	1		
6-1		C18	. CAPACITOR, FIXED, MICA DIELECTRIC, 15PF, +-5%, 300VDC	72136	DM5CC150J04CR	16779445-312	1		
6-1		C19	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 25VDC	26769	41KS106CU25K1A	16758058-434	1		
6-1		C20	. CAPACITOR, FIXED, MICA DIELECTRIC, 12PF, +-5%, 300VDC	72136	DM5EC160J04CR	16779445-313	1		
6-1		C21	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 6VDC	26769	41KS107E006K1A	16758058-046	1		
6-1		C22-24	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	3		
6-1		C25	. CAPACITOR, FIXED, ELECTROLYTIC, 4.7UF, +-10%, 15VDC	26769	41KS475A015K1A	16758058-230	1		
6-1		C26	. CAPACITOR, FIXED, MICA DIELECTRIC, 180PF, +-1%, 100VDC	72136	DM5FA181J04CR	16779445-438	1	A,C,E,G	
6-1		C26	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5EC820J04CR	16779445-329	1	B,D,F,H	
6-1		C27	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A	16758058-242	1		
6-1		C28	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-5%, 50VDC	18796	8121-050W5R272J	16771624-037	1	B,D,F,H	
6-1		C29	. CAPACITOR, FIXED, MICA DIELECTRIC, 160PF, +-5%, 100VDC	72136	DM5FA161J04CR	16779445-436	1	A,C,E,G	
6-1		C29	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5EC820J04CR	16779445-329	1	B,D,F,H	
6-1		C30	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	1		
6-1		C31	. CAPACITOR, FIXED, ELECTROLYTIC, 270UF, +-10%, 6VDC	26769	41KS277E006K1A	16758058-052	1		
6-1		C32,33	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C34,35	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41KS4760015K1A	16758058-242	2		
6-1		C36,37	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C38,39	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 20VDC	90201	10M107KC20LE	16758058-346	2	A-F	
6-1		C38,39	. CAPACITOR, FIXED, ELECTROLYTIC, 52UF, +-10%, 25VDC	26769	41KS826G025K1A	16758058-445	2	G,H	
6-1		C40	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	1		
6-1		C41	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 10VDC	26769	41KS106A010K1A	16758058-134	1		
6-1		C42,43	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 20VDC	26769	41KS2760020K1A	16758058-339	2	A-F	
6-1		C42,43	. CAPACITOR, FIXED, ELECTROLYTIC, 27UF, +-10%, 25VDC	26769	41KS276E025K1A	16758058-439	2	G,H	
6-1		C60	. CAPACITOR, FIXED, ELECTROLYTIC, 1UF, +-10%, 20VDC	26769	41KS105A020K1A	16758058-322	1		

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TABLE 6-1. FM RECORD CCA (SHEET 3 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
					HONEYWELL PART NUMBER				
6-1		C61,c2	- CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01 UF, +-10%, 50 VDC	18796	3121-050W5R103K	16771625-044	2		
6-1		C63,c4	- CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C65	- CAPACITOR, FIXED, MICA DIELECTRIC 65PF, +-5%, 500VDC	25243	CD10C06P0JN1	16759786-242	1	A,C,E,G	
6-1		C65	- CAPACITOR, FIXED, MICA DIELECTRIC 10PF, +-5%, 500VDC	25243	CD10C01P0JN1	16759780-248	1	B,D,F,H	
6-1		C66	- CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, 15-65PF, 200VDC	729P2	538-006F15-60PF 5910-426-RC#3	16763335-019	1	A,C,E,G	
6-1		C66	- CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, 9-35PF	729P2	538-006P9-35 5910-00-761-1216	16763335-018	1	B,D,F,H	
6-1		C67,c8	- CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		C101,102	- CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	16771020-018	2		
6-1		J2	- TERMINAL, PIN	22526	75401-001	16779270-001	4		
6-1		J3	- TERMINAL, PIN	22526	75401-001	16779270-001	3	A,C,E,G	
6-1		J3	- TERMINAL, PIN	22526	75401-001	16779270-001	4	B,D,F,H	
6-1		J4	- TERMINAL, PIN	22526	75401-001	16779270-001	3		
6-1		J5	- TERMINAL, PIN	22526	75401-001	16779270-001	3	B,D,F,H	
6-1		J6	- TERMINAL, PIN	22526	75401-001	16779270-001	3		
6-1		J60	- TERMINAL, PIN	22526	75401-001	16779270-001	2		
6-1		K1	- RELAY, REED	149C8	1697-1C5	16805521-001	1	C-M	
6-1		L1,c2	- CHOKE, RADIO FREQUENCY	02114	VK200-09-38 5950-442-1940	16773775-001	2		
6-1		L3	- COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167	16750875-246	1		
6-1		L4	- COIL, RADIO FREQUENCY, 100UH, +-5%	99800	1537-28 5950-027-18C2	16750875-344	1	A,C,E,G	
6-1		L4	- COIL, RADIO FREQUENCY, 100 UH, +-5%	99800	1537-76 5950-893-0434	16750875-332	1	B,D,F,H	
6-1		L5	- COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167	16750875-246	1	A,C,E,G	
6-1		L5	- COIL, RADIO FREQUENCY, 4.70 UH, +-10%	99800	1537-28 5950-00-837-6029	16750875-238	1	B,D,F,H	
6-1		L60	- COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167	16750875-246	1	A,C,E,G	
6-1		L60	- COIL, RADIO FREQUENCY, 4.70 UH, +-10%	99800	1537-28 5950-00-837-6029	16750875-238	1	B,D,F,H	
6-1	1	P2-4	- BUS BAR	29593	85153-100-2G5	16779948-001	3		
6-1	1	P5	- PLUG, TIP	715C6	8136-651P2	16781084-001	1	A,C,E,G	
6-1	1	P5	- BUS BAR	29593	85153-100-2G5	16779948-001	1	B,D,F,H	
6-1	1	P6	- BUS BAR	29593	85153-100-2G5	16779948-001	1		
6-1	1	P60	- BUS BAR	29593	85153-100-2G5	16779948-001	1		
6-1		Q1	- TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1		
6-1		Q2	- TRANSISTOR	27014	PN5910-5	16775629-022	1		

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SECTION 6

TABLE 6-1 FM RECORD CCA (SHEET 4 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY IN ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
			1	2	3	4	5	6	7	
6-1		Q3	. TRANSISTOR	27014	P44274-5		16775630-021	1	A-D	
6-1		Q3	. TRANSISTOR	04713	P12369A5		16779202-003	1	E-M	
6-1		Q4,5	. TRANSISTOR	27014	PNS91C-5		16775629-022	2		
6-1		Q6	. TRANSISTOR	04713	2N3906 5961-00-072-012P		16762173-001	1		
6-1		Q7,8	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	2		
6-1		Q9	. TRANSISTOR	04713	2N3904 5961-00-072-012P		16762173-001	1		
6-1		Q10	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1	C-M	
6-1		Q60	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1		
6-1		Q61,62	. TRANSISTOR	04713	2N3906 5961-00-072-012B		16762173-001	2		
6-1		Q63,64	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	2		
6-1		Q65,66	. TRANSISTOR	04713	2N3906 5961-00-072-012P		16762173-001	2		
6-1		Q67	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1		
6-1		Q68	. TRANSISTOR	04713	2N3906 5961-00-072-012P		16762173-001	1		
6-1		Q69	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1		
6-1		Q70	. TRANSISTOR	04713	2N2222A 5961-00-490-7299		16757925-007	1	A,C,E,G	
6-1		Q70	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1	B,D,F,H	
6-1		Q71	. TRANSISTOR	80131	2N2907A 5961-00-904-4262		1677919E-001	1	A,C,E,G	
6-1		Q71	. TRANSISTOR	04713	2N3906 5961-00-072-012P		16762173-001	1	B,D,F,H	
6-1		R1	. RESISTOR, FIXED, METAL FILM, 75 OHMS, +-1%, 1/2W	81349	RNR65K7500FS		16757166-055	1		
6-1		R2	. RESISTOR, FIXED, CARBON COMPOSITION, 12 OHMS, +-5%, 1/8W	81349	RCR05G120JS 5905-00-491-6344		16780345-027	1	A-B	
6-1		R2	. RESISTOR, FIXED, CARBON COMPOSITION, 56 OHMS, +-5%, 1/4W	81349	RCR07G560JM		16750079-003	1	C-M	
6-1		R3	. RESISTOR, VARIABLE, 20K OHMS, +-10%, 3/4W	73138	89-17-0		16775165-211	1		
6-1		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 620 OHMS, +-5%, 1/8W	81349	RCR05G621JS 5905-00-422-379B		16780345-068	1		
6-1		R5	. RESISTOR, VARIABLE, 100K OHMS, +-20%, 1/2W	32957	3329H1-104 5905-00-501-155C		16771377-013	1		
6-1		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 1.8K OHMS, +-5%, 1/8W	81349	RCR05G182JS 5905-00-407-00E2		16780345-079	1	C-M	
6-1		R7	. RESISTOR, FIXED, METAL FILM, 48.7K OHMS, +-0.1%, 1/8W	81349	RNR55C4872B5		1675969E-367	1		
6-1		R8	. RESISTOR, FIXED, METAL FILM, 35.7K OHMS, +-0.1%, 1/8W	81349	RNR55C4872B5 5905-00-509-37B5		1675969E-354	1		
6-1		R9	. RESISTOR, FIXED, METAL FILM, 4.53K OHMS, +-1%, 1/8W	81349	RNR55K4531FM		16757165-264	1		

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TABLE 6-1. FM RECORD CCA (SHEET 5 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY IN ASSEMBLY	USABLE ON CODE	NOTES
						NATIONAL STOCK NUMBER				
6-1		R10	RESISTOR, FIXED, METAL FILM, 10K OHMS, +0.1%, 1/8W	81349	RNR55C1002BS		16759698-301	1		
6-1		R11	RESISTOR, FIXED, CARBON COMPOSITION, 200 OHMS, +5%, 1/8W	81349	RCR05G201JS 5905-00-466-1416		16780345-056	1		
6-1		R12	RESISTOR, VARIABLE, 200 OHMS, +20%, 3/4W	73138	89PR200		16775165-005	1		
6-1		R13	RESISTOR, FIXED, METAL FILM, 100 OHMS, +1%, 1/10W	81349	RNR50K1000FS 5905-00-139-9871		16780346-101	1		
6-1		R14	RESISTOR, FIXED, METAL FILM, 4.99K OHMS, +1%, 1/10W	81349	RNR50K4991FS		16780346-26E	1		
6-1		R15	RESISTOR, FIXED, CARBON COMPOSITION, 5.1K OHMS, +5%, 1/8W	81349	RCR05G512JS 5905-00-699-1290		16780345-090	1		
6-1		R16	RESISTOR, FIXED, METAL FILM, 6.19K OHMS, +1%, 1/10W	81349	RNR50K6191FS		16780346-277	1		
6-1		R17	RESISTOR, FIXED, METAL FILM, 11.8K OHMS, +1%, 1/10W	81349	RNR50K1182FS		16780346-30E	1		
6-1		R18	RESISTOR, FIXED, METAL FILM, 3.09K OHMS, +1%, 1/10W	81349	RNR50K3091FS		16780346-24E	1		
6-1		R19	RESISTOR, FIXED, CARBON COMPOSITION, 15 OHMS, +5%, 1/4W	81349	RCRC7G150JM		16750079-163	1		
6-1		R20,21	RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500		16780345-073	2		
6-1		R22,23	RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +5%, 1/8W	81349	RCR05G202JS 5905-00-470-9481		16780345-090	2		
6-1		R24	RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500		16780345-073	1		
6-1		R25	RESISTOR, VARIABLE, 2K OHMS, +10%, 3/4W	73138	89PR2K		16775165-009	1		
6-1		R26	RESISTOR, FIXED, METAL FILM, 6.65K OHMS, +1%, 1/10W	81349	RNR50K6651FS 5905-00-327-9694		16780346-280	1		
6-1		R27	RESISTOR, THERMAL, 270 OHMS, +5%, 1/2W	15454	0G125-271J		16774060-019	1		
6-1		R28	RESISTOR, FIXED, CARBON COMPOSITION, 5.1K OHMS, +5%, 1/8W	81349	RCR05G512JS 5905-00-689-1290		16780345-090	1		
6-1		R29	RESISTOR, FIXED, CARBON COMPOSITION, 1.5K OHMS, +5%, 1/8W	81349	RCR05G182JS 5905-00-407-0082		16780345-079	1		
6-1		R30	RESISTOR, FIXED, CARBON COMPOSITION, 910 OHMS, +5%, 1/8W	81349	RCR05G911JS 5905-00-422-3800		16780345-072	1		
6-1		R31	RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500		16780345-073	1		
6-1		R32	RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607		16780345-097	1		
6-1		R33,34	RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699		16780345-025	2		
6-1		R35,36	RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500		16780345-073	2		
6-1		R37	RESISTOR, FIXED, CARBON COMPOSITION, 2.4K OHMS, +5%, 1/8W	81349	RCR05G242JS 5905-00-485-7695		16780345-08E	1	A, E, C, G	
6-1		R37	RESISTOR, FIXED, CARBON COMPOSITION, 3K OHMS, +5%, 1/8W	81349	RCR05G302JS 5905-00-421-891E		16780345-084	1	B, D, F, H	
6-1		R38	RESISTOR, FIXED, CARBON COMPOSITION, 12K OHMS, +5%, 1/8W	81349	RCR05G123JS 5905-00-466-1215		16780345-099	1		
6-1		R39	RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500		16780345-073	1		

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TABLE 6-1. FM RECORD CCA (SHEET 6 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
			1 2 3 4 5 6 7						
6-1		R40	. RESISTOR, VARIABLE, 1K OHMS, +-10%, 1/2W	73178	66XR1K 5905-00-107-4443	16771217-207	1		
6-1		R41	. RESISTOR, FIXED, CARBON COMPOSITION, 200 OHMS, +-5%, 1/8W	81349	RCR05G201JS 5905-00-466-1416	16780345-056	1		
6-1		R42,43	. RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/8W	81349	RCRC5G392JS 5905-00-433-6483	16780345-C07	2		
6-1		R44	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCRC5G103JS 5905-00-492-7607	16780345-097	1		
6-1		R45,46	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/8W	81349	RCR05G220JS 5905-00-433-1853	16780345-033	2		
6-1		R47	. RESISTOR, FIXED, CARBON COMPOSITION, 56 OHMS, +-5%, 1/8W	81349	RCR05G560JS 5905-00-255-3701	16780345-043	1		
6-1		R48	. RESISTOR, FIXED, CARBON COMPOSITION, 15 OHMS, +-5%, 1/8W	81349	RCRG5K150JS 5905-00-197-0220	16780345-029	1	B,D,F,H	
6-1		R49	. RESISTOR, FIXED, METAL FILM, 10 OHMS, +-1%, 1/8W	81349	RNR55K10R0FS 5905-00-490-8223	16757165-001	1		
6-1		R50,51	. RESISTOR, FIXED, CARBON COMPOSITION, 27 OHMS, +-5%, 1/2W	81349	RCR20G270JM	16750076-511	2		
6-1		R52,53	. RESISTOR, FIXED, CARBON COMPOSITION, 56 OHMS, +-5%, 1/4W	81349	RCR07G560JM	16750076-003	2		
6-1		R54	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500	16780345-073	1		
6-1		R58	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500	16780345-073	1	C-H	
6-1		R57	. RESISTOR, VARIABLE, 2K OHMS, +-20%, 1/2 W	73138	62PR2K 59C5-484-2989	16771377-008	1	C-H	
6-1		R58	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/8W	81349	RCRC5G102JS 5905-00-458-9500	16780345-073	1	C-H	
6-1		R60	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCRC5E103JS 5905-00-492-7607	16780345-097	1		
6-1		R61	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/10W	81349	RNR50K1002FS	16780346-301	1		
6-1		R62	. RESISTOR, FIXED, METAL FILM, 7.50K OHMS, +-1%, 1/10W	81349	RNR50K7501FS	16780346-285	1		
6-1		R63-65	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/10W	81349	RNR50K1002FS	16780346-301	3		
6-1		R66	. RESISTOR, VARIABLE, 5K OHMS, +-10%, 3/4W	73138	89PR5K	16775165-009	1		
6-1		R67	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/8W	81349	RCRC5G101JS 5905-00-180-8301	16780345-049	1		
6-1		R68,69	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/8W	81349	RCR05G562JS 5905-00-411-1851	16780345-Q01	2		
6-1		R70,71	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/8W	81349	RCR05G220JS 5905-00-433-1853	16780345-033	2		
6-1		R72	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCRC5G103JS 5905-00-492-7607	16780345-097	1		
6-1		R73	. RESISTOR, FIXED, METAL FILM, 2.49K OHMS, +-1%, 1/10W	81349	RNR50K2491FS	16780346-239	1		
6-1		R74,75	. RESISTOR, FIXED, METAL FILM, 12.4K OHMS, +-1%, 1/10W	81349	RNR50K1242FS	16780346-310	2		
6-1		R76	. RESISTOR, FIXED, METAL FILM, 2.49K OHMS, +-1%, 1/10W	81349	RNR50K2491FS	16780346-239	1		
6-1		R77,78	. RESISTOR, FIXED, METAL FILM, 182 OHMS, +-1%, 1/10W	81349	RNR50K1820FS	16780346-126	2		

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TABLE 6-1. FM RECORD CCA (SHEET 7 OF 8)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
			1 2 3 4 5 6 7							
6-1		R79	RESISTOR, FIXED, METAL FILM, 511 OHMS, +-1%, 1/10W	81349	RNR50KS110FS		16780346-169	1		
6-1		R80,21	RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/2W	81349	RCR05G392JS 5905-00-433-6483		16780345-087	2		
6-1		R82	RESISTOR, FIXED, CARBON COMPOSITION, 1.5K OHMS, +-5%, 1/4W	81349	RCR07G152JM		16750079-037	1		
6-1		R83	RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607		16780345-097	1		
6-1		R84,25	RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/8W	81349	RCR05G220JS 5905-00-433-1853		16780345-033	2		
6-1		R86	RESISTOR, FIXED, CARBON COMPOSITION, 510 OHMS, +-5%, 1/4W	81349	RCR07G511JM 5905-00-116-2394		16750079-026	1		
6-1		R101	RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/8W	81349	RCR05G101JS 5905-00-180-8301		16780345-049	1		
6-1		R102	RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/8W	81349	RCR05G562JS 5905-00-411-1851		16780345-091	1		
6-1		R103	RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607		16780345-097	1		
6-1		S1	SWITCH, TOGGLE	95146	TT110G-RA-1		16781236-001	1		
6-1		TP1	TERMINAL, STUD	71279	160-1558-02-01 5940-00-853-6232		167502C1-022	1		
6-1		TP2-4	TERMINAL, STUD	71279	2027-2 5940-00-280-0601		16757170-002	3		
6-1		U1	MICROCIRCUIT	01295	SN74LS02N		99000249-001	1		
6-1		U2	MICROCIRCUIT	01295	SN74LS38N		16781367-001	1		
6-1		U3	MICROCIRCUIT	01295	SN74LS175N 5962-00-595-8253		99000271-001	1		
6-1		U4	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JM		16779188-002	1		A, B
6-1		U5	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	24355	3408		16779015-001	1		
6-1		U6	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H		16775656-001	1		
6-1		U7	MICROCIRCUIT	34335	AM26S02PC		16780672-001	1		
6-1		U8	MICROCIRCUIT	01295	SN74LS92N		16781368-001	1		
6-1		U9,1C	MICROCIRCUIT	01295	SN74LS293N		16781827-001	2		
6-1		U11	INTEGRATED CIRCUIT	01295	SN74LS151N		16779340-001	1		
6-1		U12	RESISTOR, NETWORK	11236	750-R1-R4.7KOHMS		16780505-011	1		
6-1		U60	INTEGRATED CIRCUIT	04713	MC1458C		16775977-001	1		
6-1		U101	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JM		16779188-002	1		
6-1		U102	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210H		16774985-002	1		
6-1		VP1	SEMICONDUCTOR DEVICE, DIODE	80131	1N821A 5961-00-951-6375		16757931-005	1		
6-1		W2	PLUG, TIP	91506	2136-A51P2		16781084-001	1		
6-1		W60-62	PLUG, TIP	91506	2136-A51P2		16781084-001	3		
6-1	2		SHIELD, CIRCUIT CARD	2PCC9			16781263-001	1		
6-1	3		EUMPER, PLASTIC	11507	138,NS324		16780426-003	1		
6-1	4		EJECTOR, CIRCUIT CARD ASSEMBLY	1R677	2029ED		16780704-004	1		A, E, C, G

NOTES:

SECTION 6

TABLE 6-1. FM RECORD CCA (SHEET 8 OF 8)

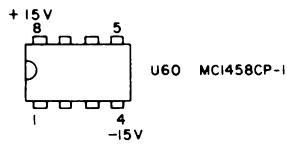
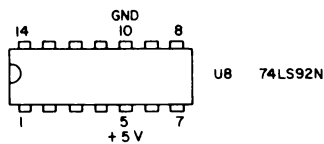
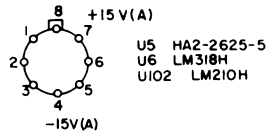
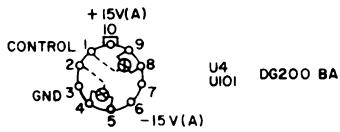
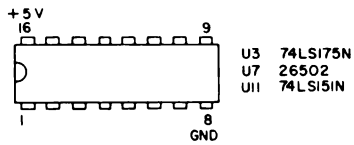
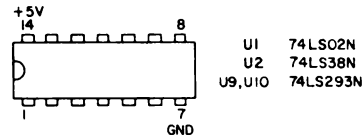
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1	4		. EJECTOR, CIRCUIT CARD ASSEMBLY	18677	202GREEN	16760704-008	1	B,D,F,H	
6-1	5		. SHELL, ELECTRICAL	19000	P05385700S3	16810451-001	1	E-H	
NOTES:									

SECTION 7  
SCHEMATICS

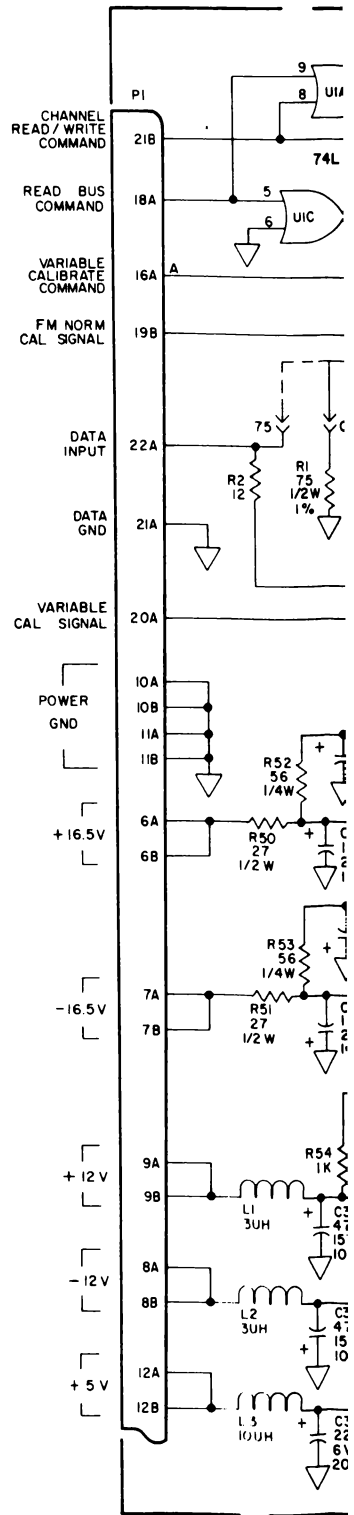


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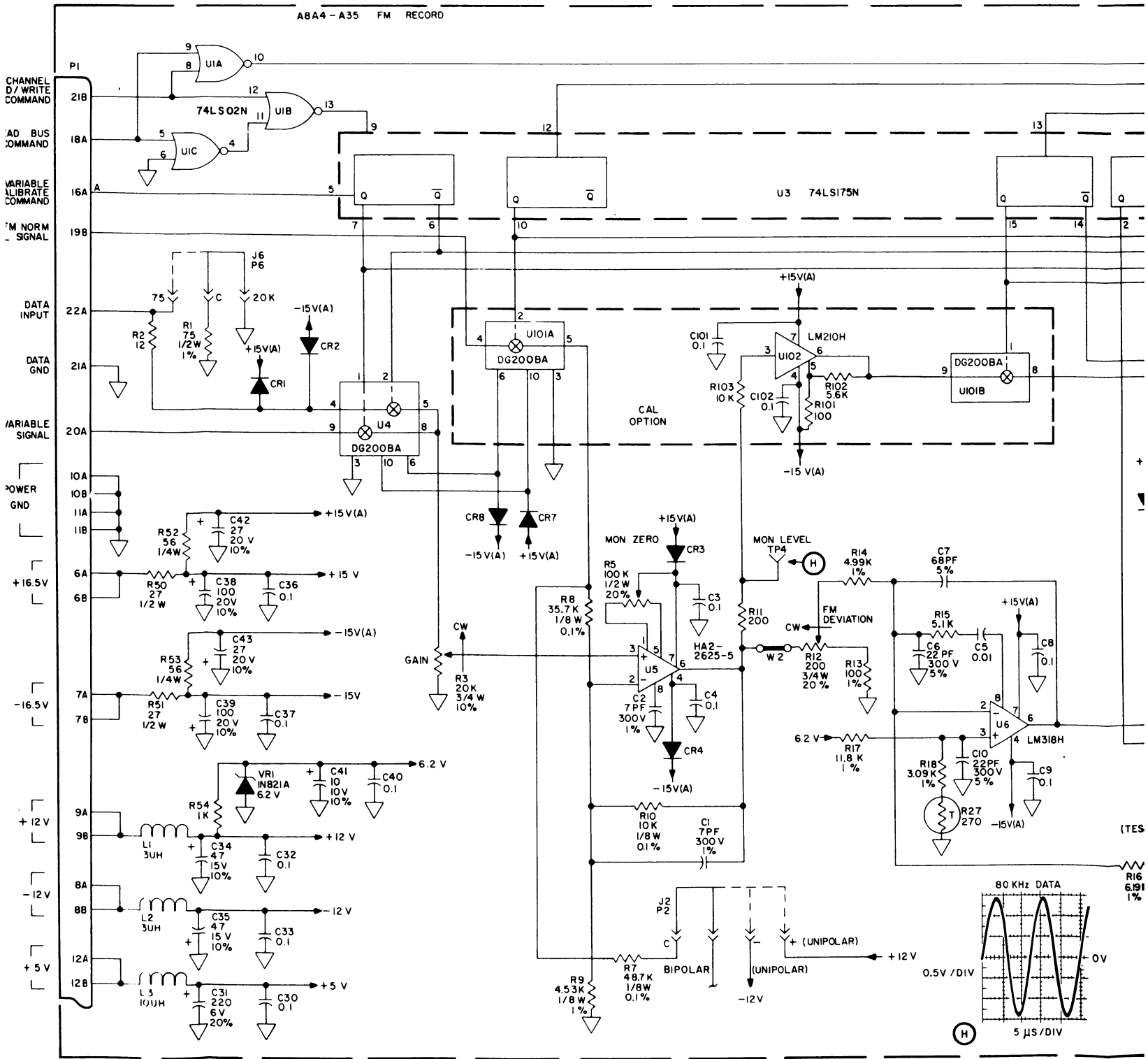
1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 5%.  
 ALL 1% RESISTORS ARE 1/10 W.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL NPN TRANSISTORS ARE 2N3904.  
 ALL PNP TRANSISTORS ARE 2N3906.
2. LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3. ▽ DENOTES CIRCUIT COMMON.
4. [ ] DENOTES WIDE BAND VALUES.
5. LOGIC FOR CONTROL LINES AND I.C. SWITCHES IS NEG. "0" TRUE.
6. △ UI2 IS RESISTOR ARRAY 4.7K, 2%.
7. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:

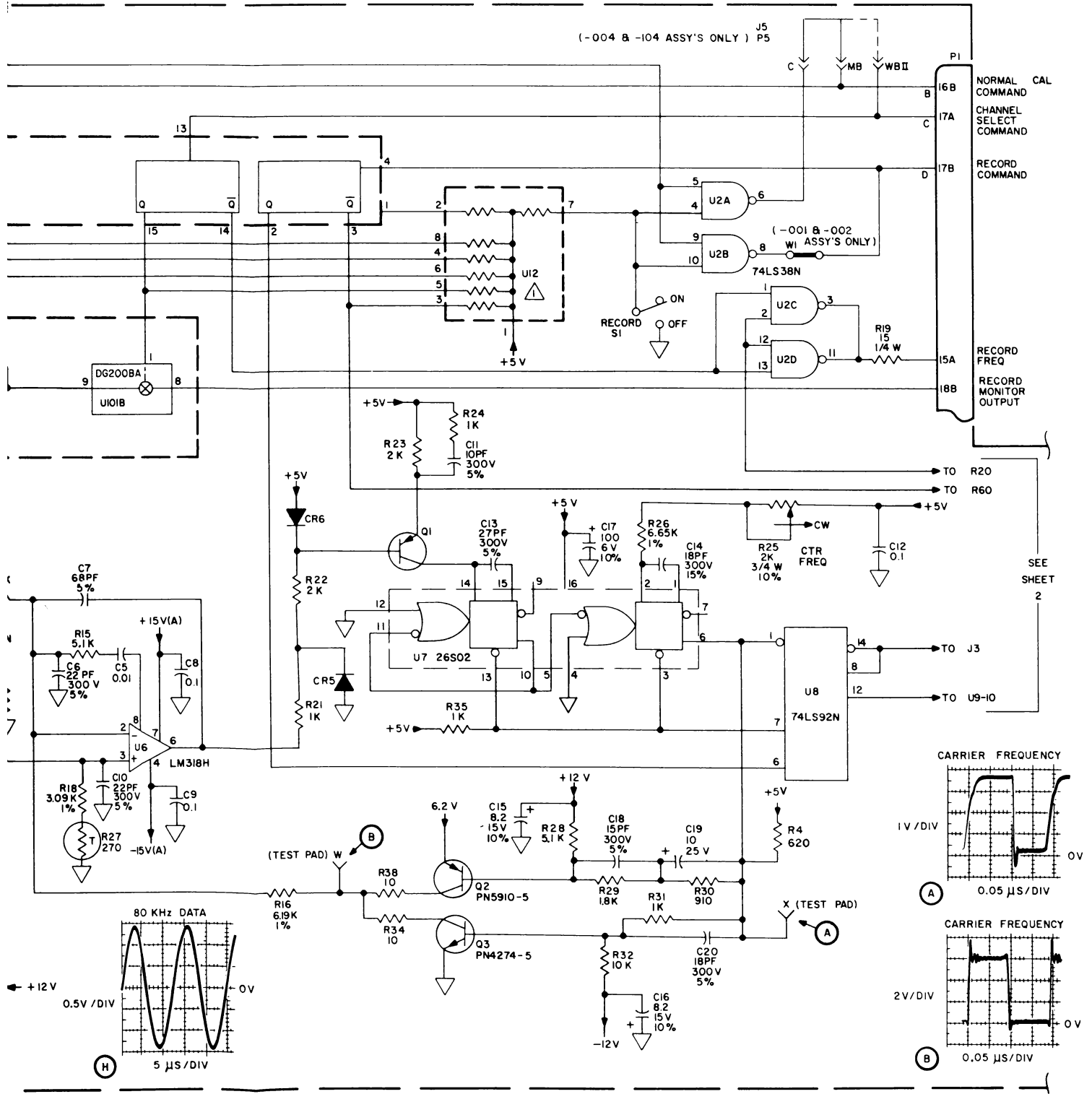


8. ALL WAVEFORMS TYPICAL FOR A MEDIUM BAND FM RECORD CARD, WBI MODE, 120 IPS. CARRIER IS UNMODULATED EXCEPT AS OTHERWISE NOTED.



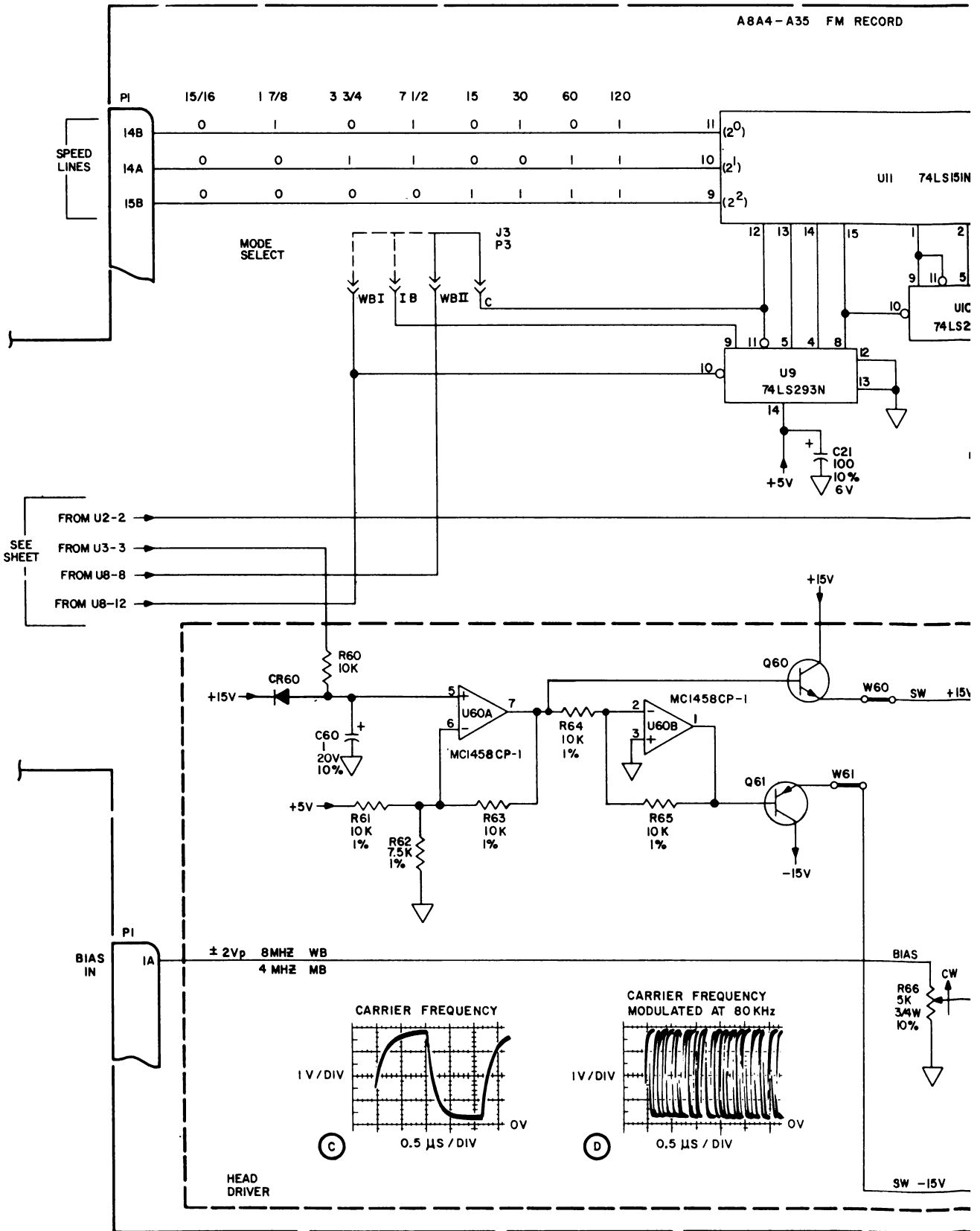
A8A4 - A35 FM RECORD

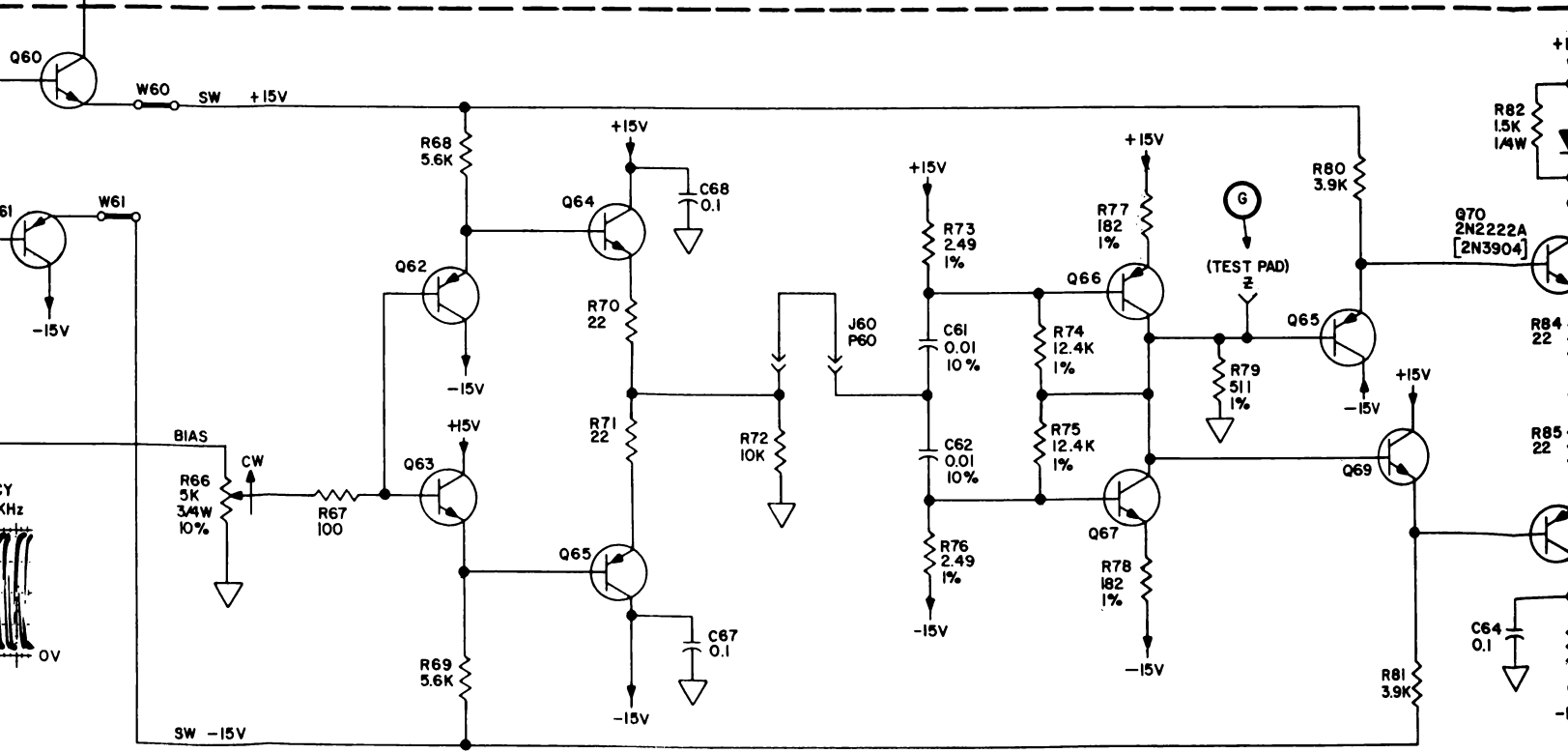
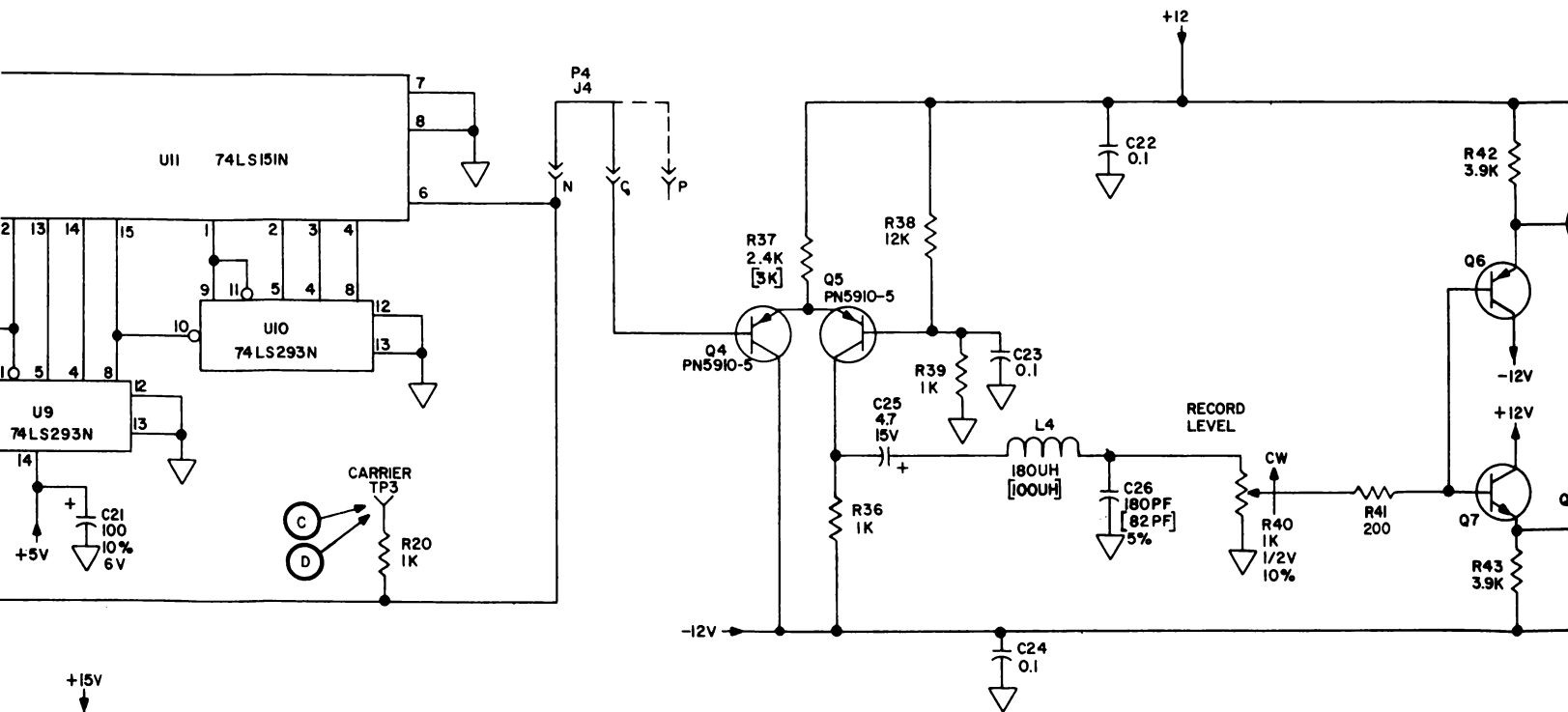


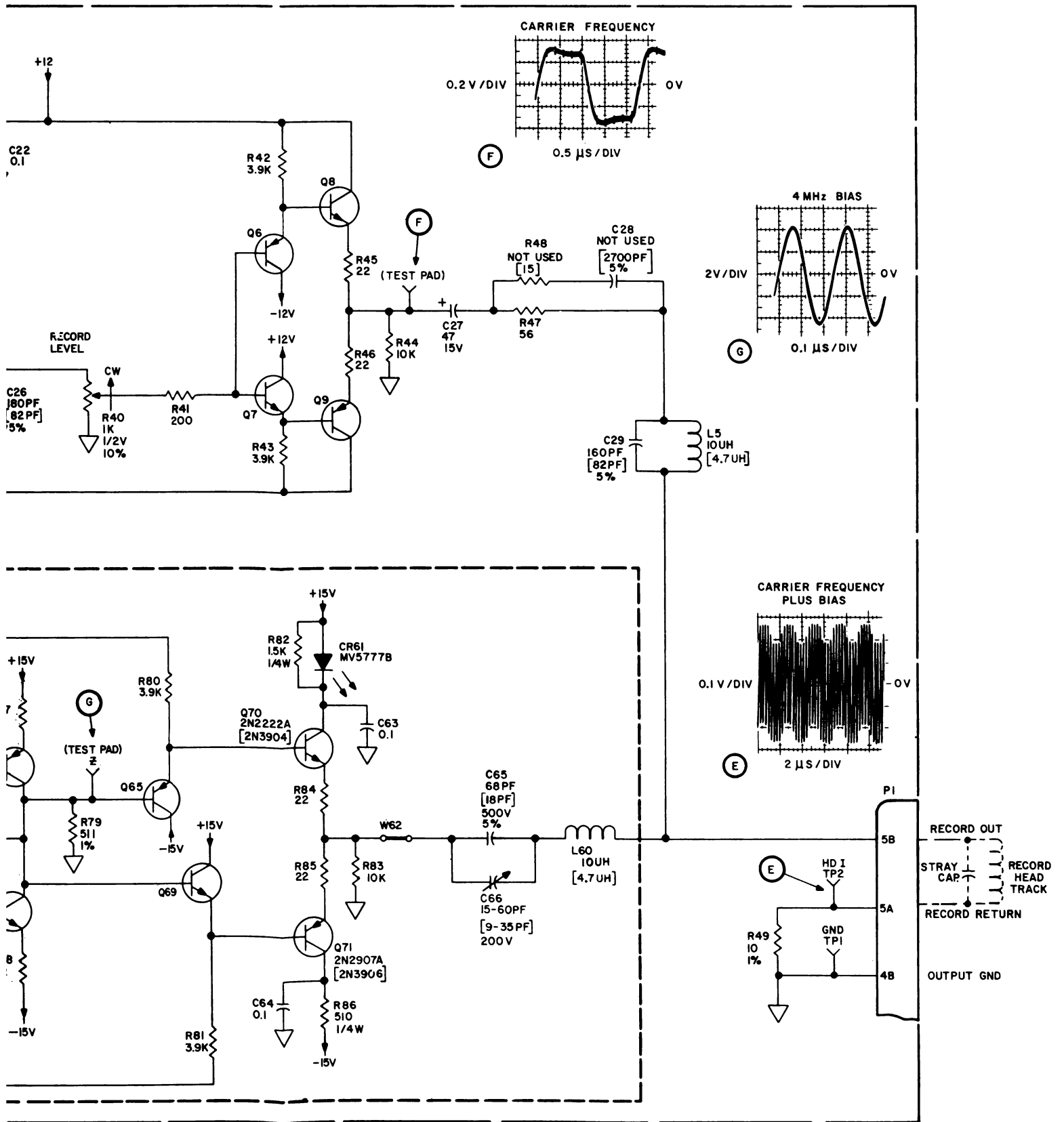


Used for 16781302-103 and -104 Assemblies

REF: 16781303G  
 Figure 7-1. FM Record Schematic  
 (Sheet 1 of 4)







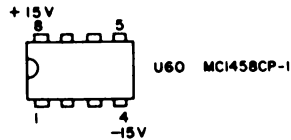
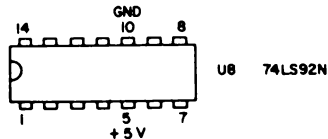
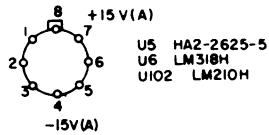
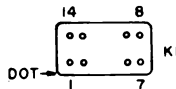
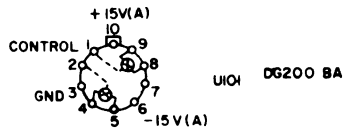
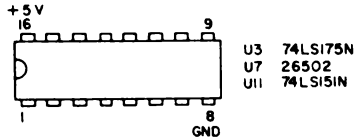
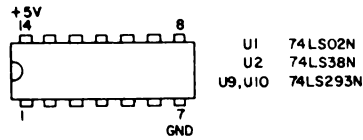
Used for 16781302-103 and -104 Assemblies

REF: 16781303F

Figure 7-1. FM Record Schematic (Sheet 2 of 4)

NOTES:

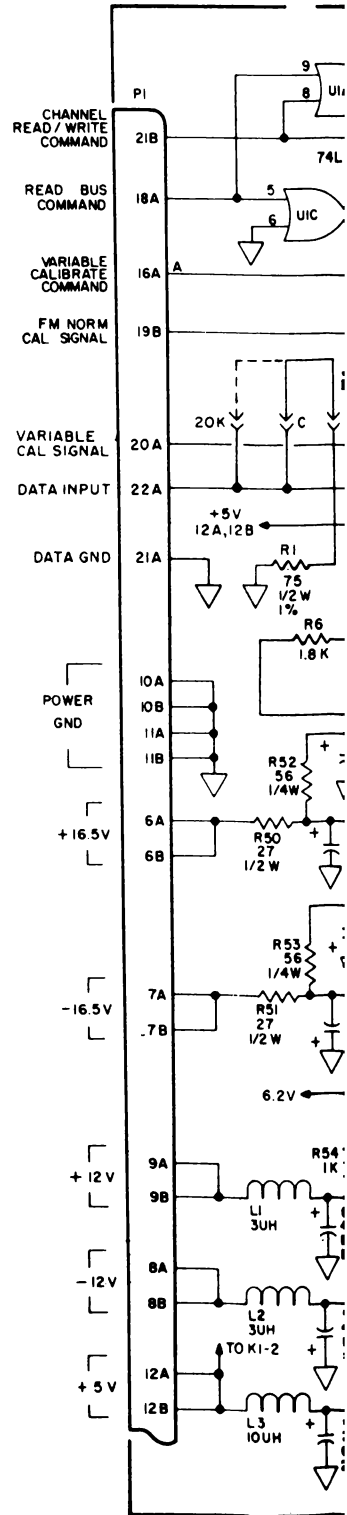
1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 5%.  
 ALL 1% RESISTORS ARE 1/10 W.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL NPN TRANSISTORS ARE 2N3904.  
 ALL PNP TRANSISTORS ARE 2N3906.
2. LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3. ▽ DENOTES CIRCUIT COMMON.
4. [ ] DENOTES WIDE BAND VALUES.
5. LOGIC FOR CONTROL LINES AND I.C. SWITCHES IS NEG. "0" TRUE.
6. △ UI2 IS RESISTOR ARRAY 4.7K, 2%.
7. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:



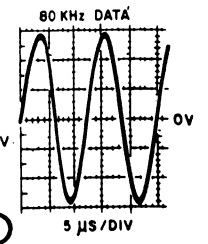
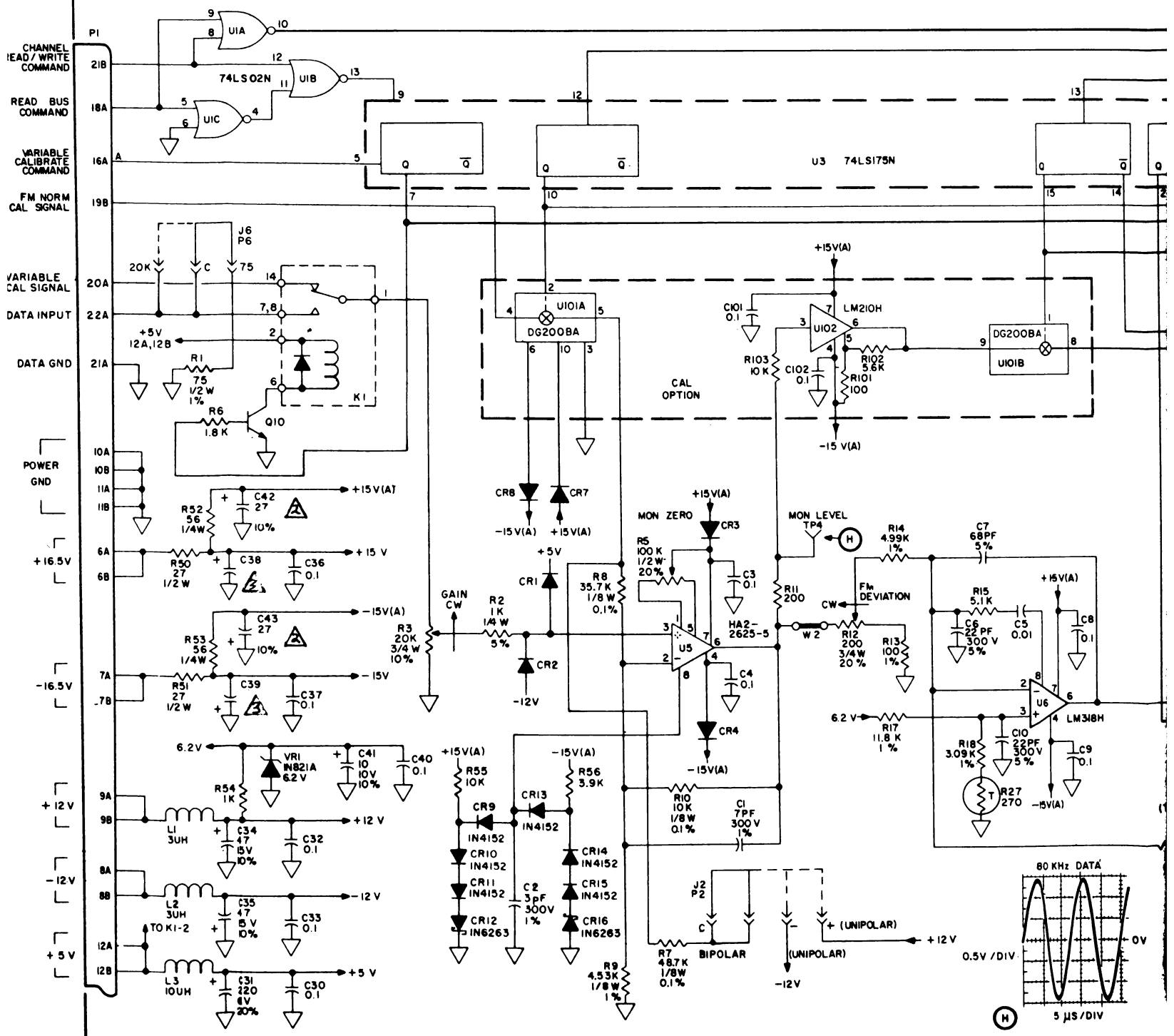
8. ALL WAVEFORMS TYPICAL FOR A MEDIUM BAND FM-RECORD CARD, WBI MODE, 120 IPS. CARRIER IS UNMODULATED EXCEPT AS OTHERWISE NOTED.

2 ASSYS -107 AND -108 ARE 20 VDC AND ASSYS -109 AND UP ARE 25 VDC

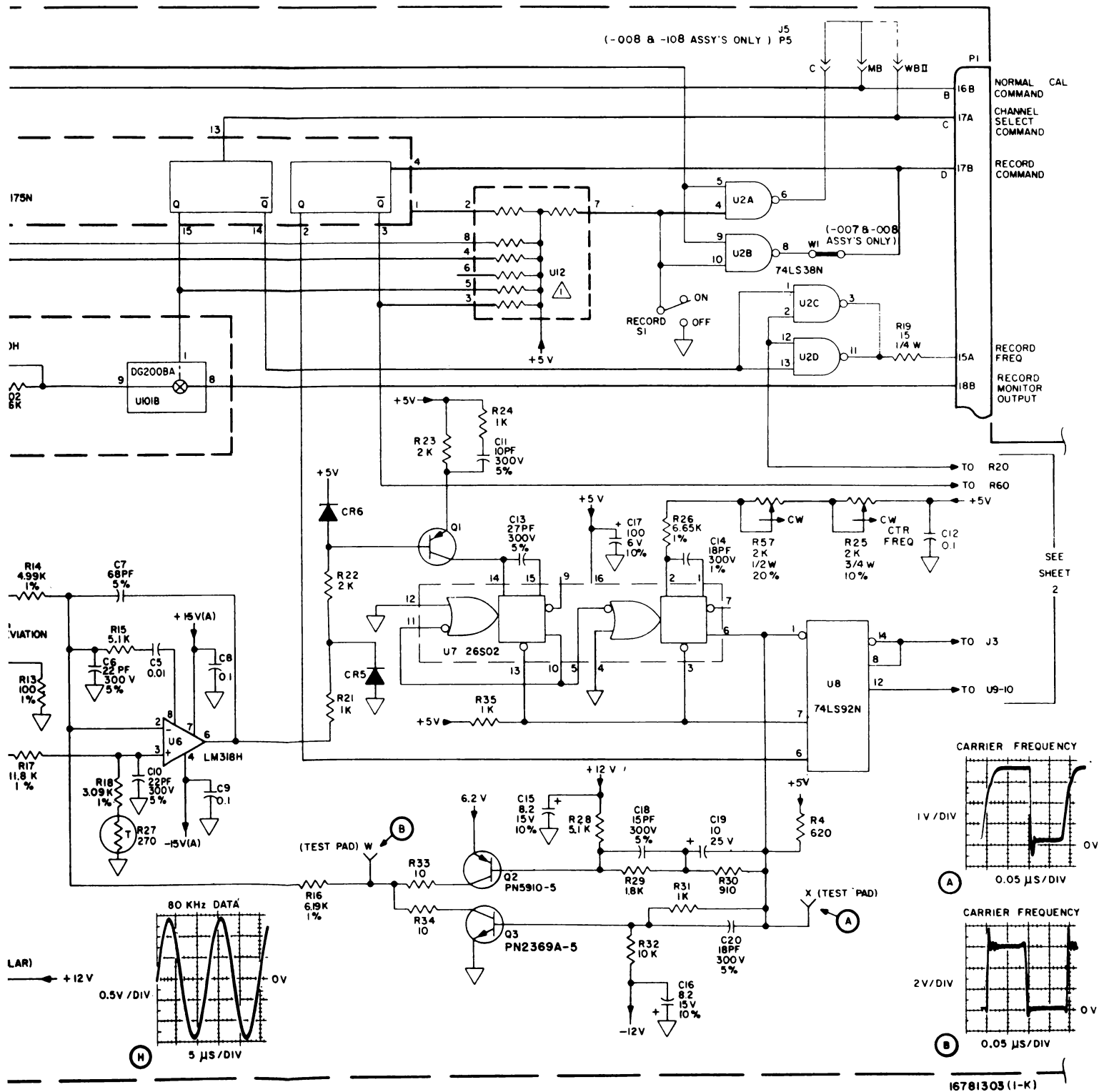
3 ASSYS -107 AND -108 ARE 100 MF, 20 VDC, 10% AND -109 ASSYS AND UP ARE 82 MF, 25 VDC, 10%



ABA4 - A35 FM RECORD

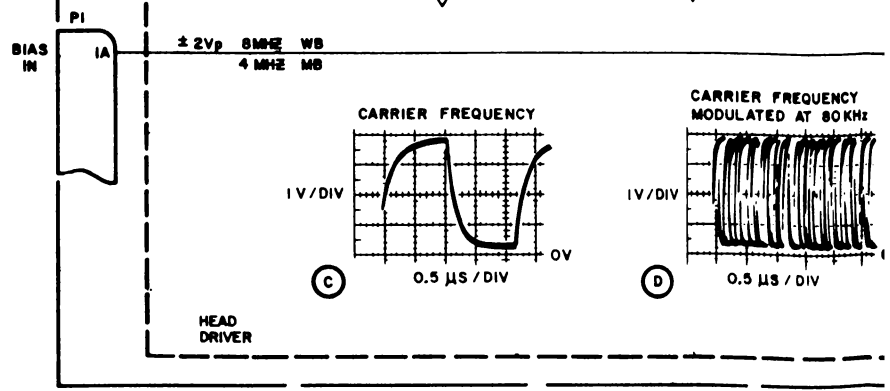
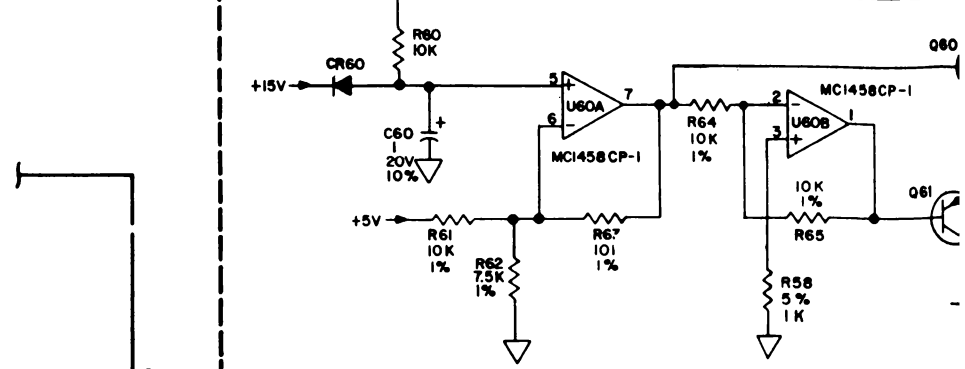
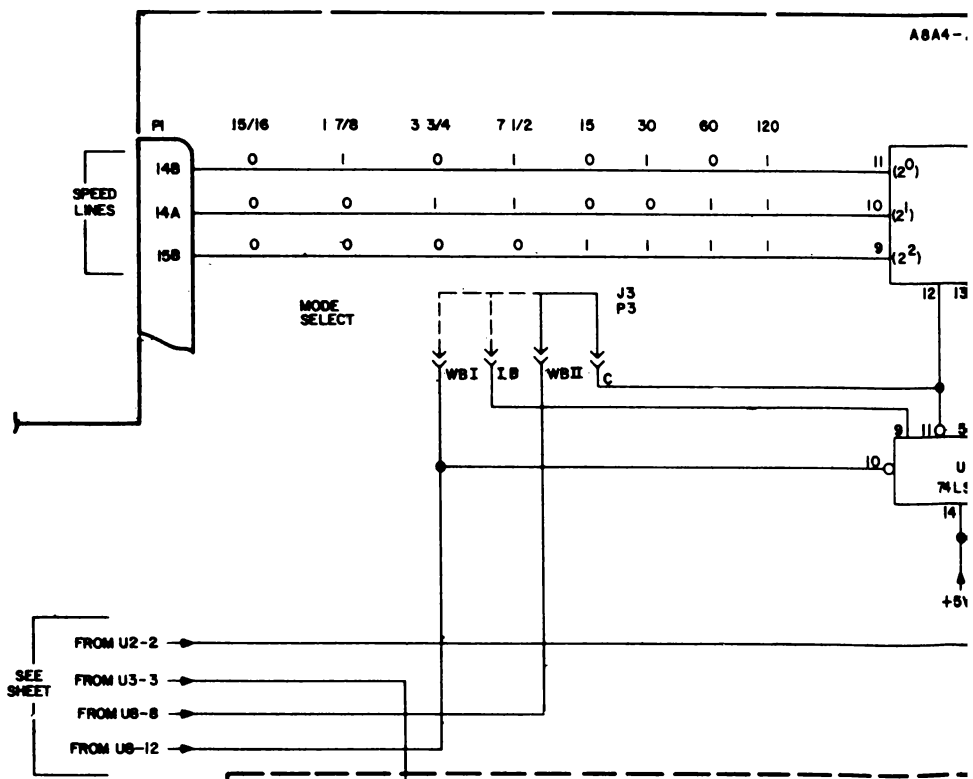




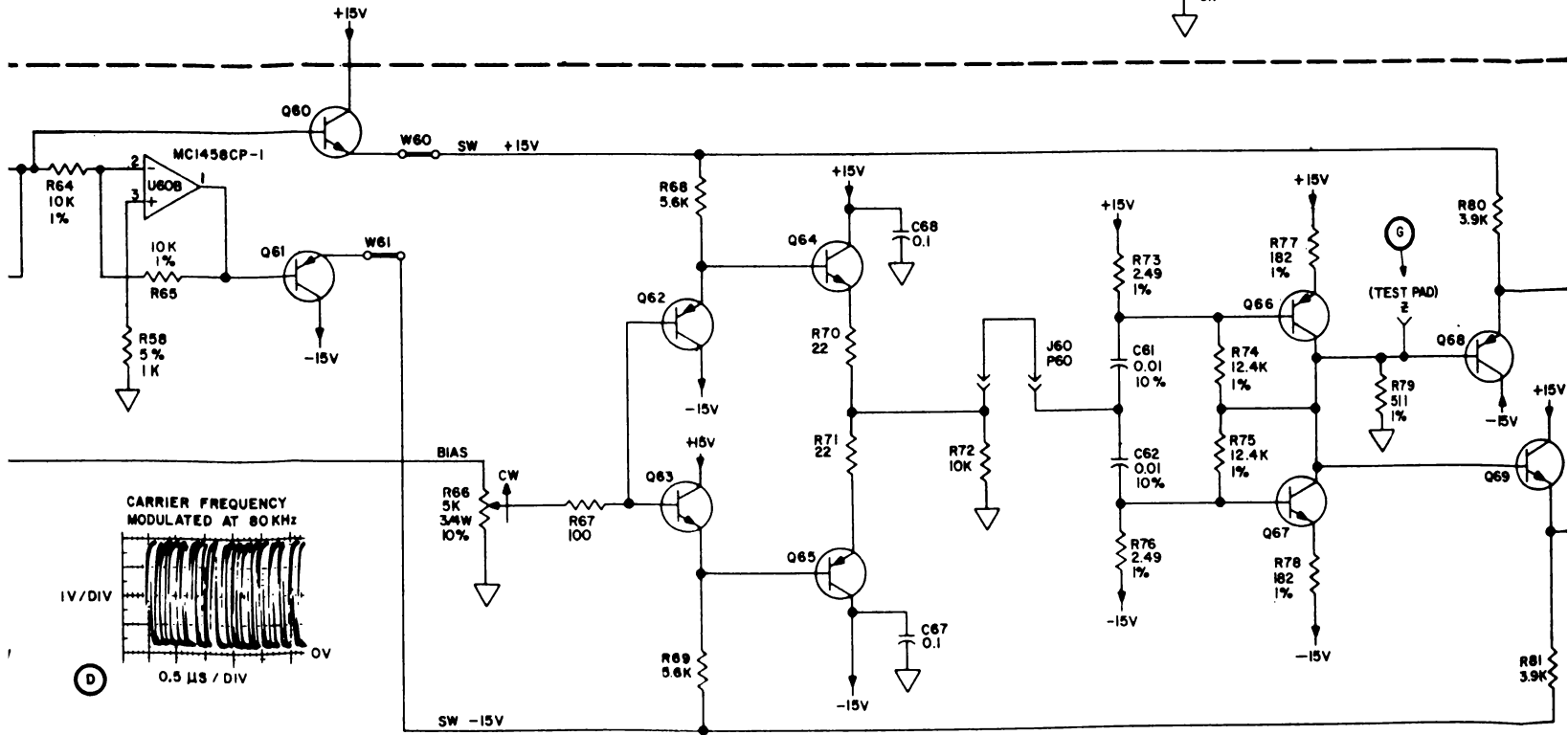
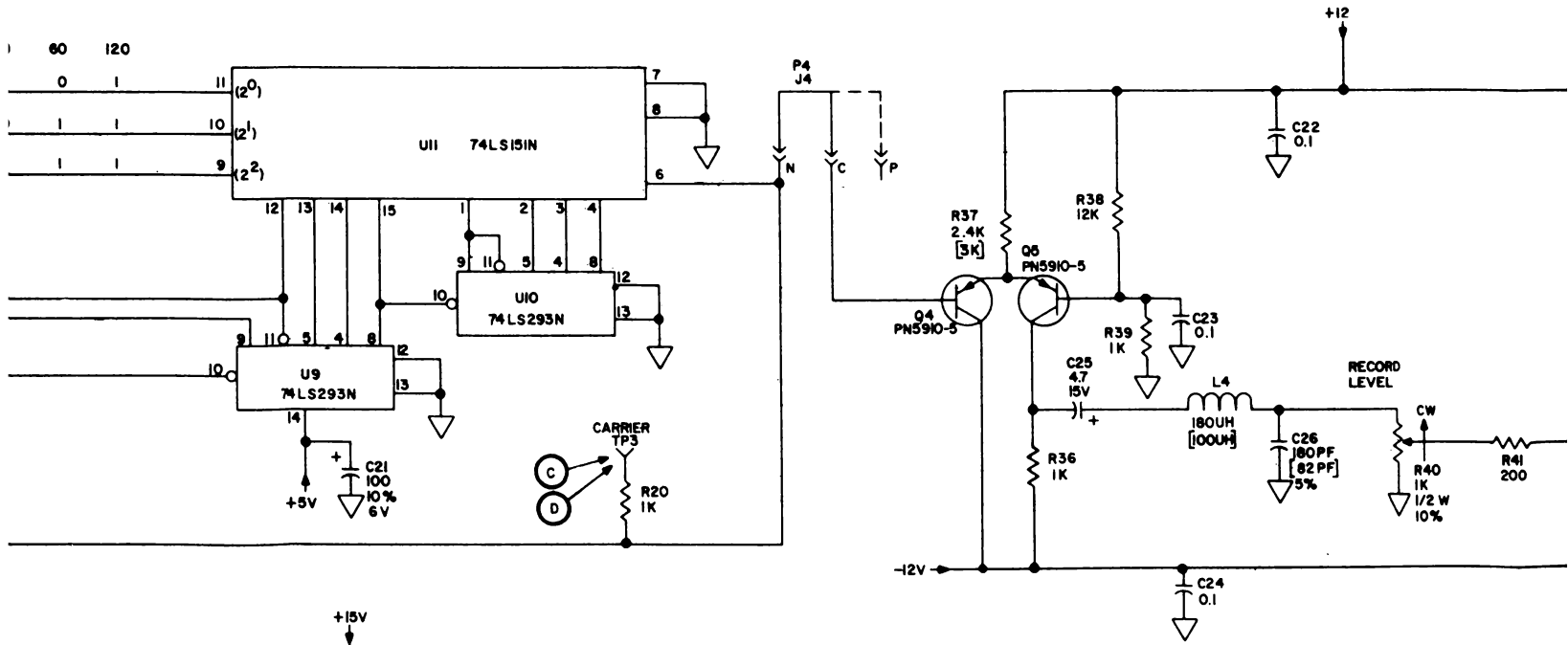


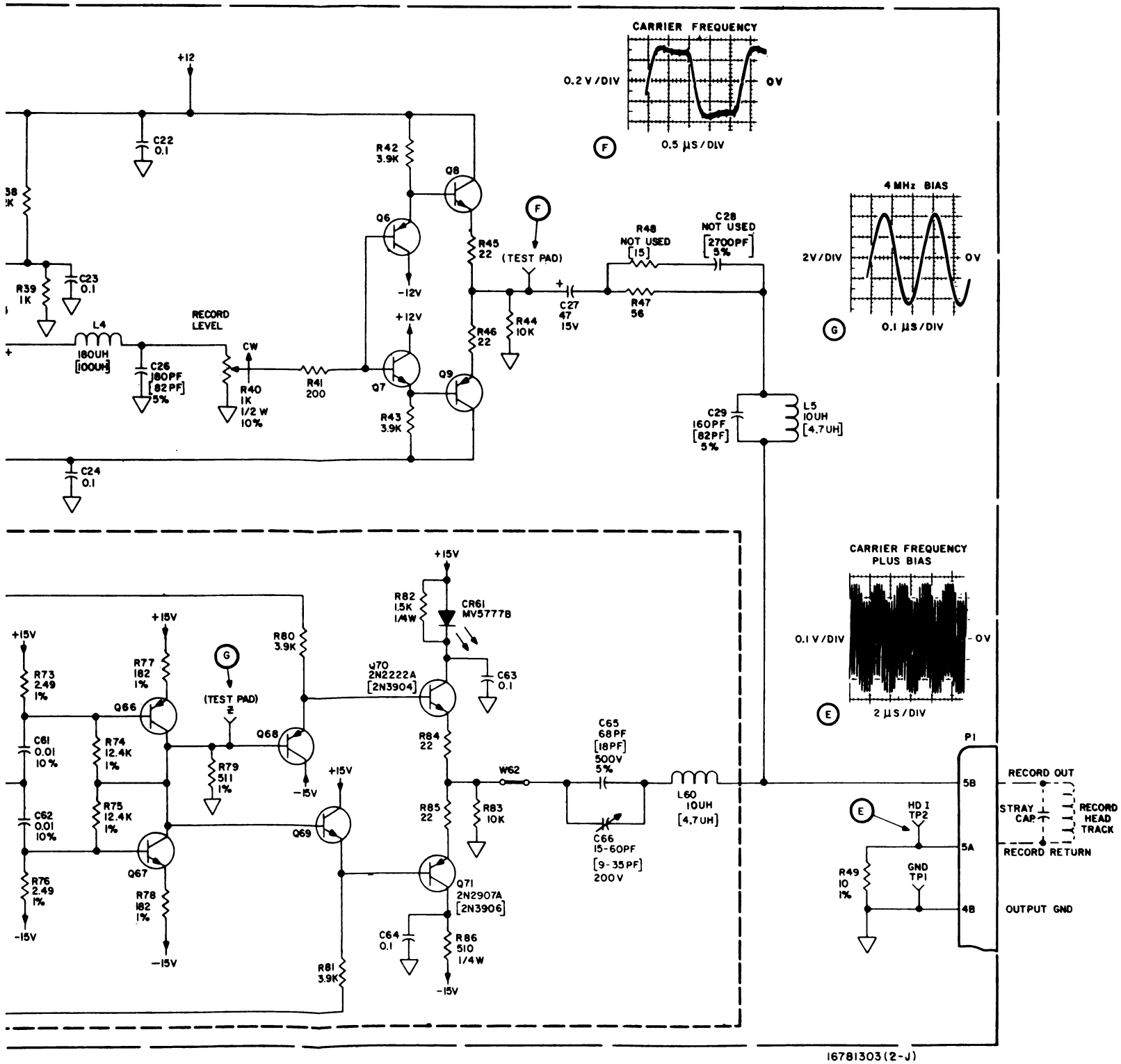
Used for 16781302-107, -108, -109, and -110 Assemblies

REF: 16781303L  
Figure 7-1. FM Record Schematic  
(Sheet 3 of 4)



A8A4-A35 FM RECORD





16781303(2-J)

Used for 16781302-107, -108, -109, and -110 Assemblies

REF: 16781303H  
 Figure 7-1. FM Record Schematic  
 (Sheet 4 of 4)

# Technical Manual

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**MAINTENANCE  
INSTRUCTIONS FOR  
FM REPRODUCE  
CIRCUIT CARD ASSY  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM**

**AUGUST 1984**

## **NOTICE**

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

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## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the FM reproduce circuit card assembly used with the Honeywell Model 101 Magnetic Tape System. This technical manual contains only the information that is applicable to the FM reproduce card. The system and operator's manual describe the relationship of the FM reproduce card to the system.

#### 1-2. DESCRIPTION

##### A. FM REPRODUCE CARD

The FM reproduce card is a printed-circuit card that contains the FM reproduce amplifier. Two cards are available. One is for units with wideband heads, the other is used for units with mediumband heads. The wideband card operates at any of three IRIG MODES (Intermediate Band, Wideband Group I, or Wideband Group II). The mediumband card operates at two IRIG MODES (Intermediate Band or Wideband Group I)

The FM reproduce card includes speed equalization, limiter and frequency doubler, oneshot, precision clamp amplifier, FM reproduce filters, data output amplifier, two monitor buffers, and calibration logic.

##### B. FM REPRODUCE FILTERS (Plug-in Assembly)

The FM reproduce filters pass the FM deviation rate frequency and attenuate the FM carrier frequency. The filter circuits are printed-circuit cards that plug into the FM reproduce card at 8 locations (120-FL1 through .937-FL8) as shown in Figure 2-1. Filter cards are identified by the bandwidth stamped on the filter card and are installed in locations on the FM reproduce card dependent upon speed and mode; for example, the 40 kHz filter card would be installed in location 120-FL1, if Intermediate Band Mode is to be used, however it would be installed in location 60-FL2, if Wideband Group I mode is to be used. There is one filter card for each speed, except in Wideband Group II Mode, where .937 IPS (FL8) is omitted. Table 1-3 lists the filter cards and their use.

#### 1-3. SPECIFICATIONS

##### A. FM REPRODUCE CARD

##### 1. Power Inputs

Refer to Table 1-1.

Table 1-1. Power Inputs

VOLTAGE (Vdc)	NOMINAL CURRENT	
	WITH ONE FILTER	WITH EIGHT FILTERS
+12 ( <u>+120</u> mV)	100 mA	170 mA
-12 ( <u>+120</u> mV)	95 mA	165 mA
+ 5 ( <u>+ 50</u> mV)	140 mA	140 mA

2. Load Impedance

Short to ground (maximum). Required 50 ohms in parallel with a maximum of 300 pF to ground to satisfy specifications.

	<u>Preamplifier (P1-1A, 1B)</u>	<u>E-E (19A)</u>
Maximum Voltage	<u>+12V</u> peak	TTL level
Impedance	4000 ohms differential	---

3. Output

Level: Adjustable to 1 Vrms across 50 ohms in parallel with 300 pF or 2 Vrms across 600 ohms in parallel with 300 pF.

Impedance: 50 ohms (+10%)

4. Risetime and Overshoot

Refer to FM reproduce filter specifications (Paragraph 1-3.B.).

5. Linearity

Less than +0.25% of full deviation from best straight line through zero.

6. Distortion (Total Harmonic)

1.5% maximum for intermediate band and Wideband Group I.

3.0% maximum for Wideband Group II.

7. Zero Drift

With carrier center-frequency input (Refer to Table 1-1), dc out-

put drift is less than 2.5% of a nominal full scale output of 2.82 V peak-to-peak, from 0° to 70°C.

8. Squelch

Output is clamped to less than  $\pm 100$  mVdc with a logic "1" at pin 13B. A logic "0" at 13B is a "no squelch" condition. Jumper J7 in C-2 position overrides the squelch command.

9. Tape Speed Lines

Three TTL logic lines (Refer to Table 1-2)

10. Logic Levels

Logic 1 = +2.6 to +5.25 Vdc.

Logic 0 = 0.0 to +0.5 Vdc.

11. Identification Outputs (P1-16A, 16B)

A TTL logic "0" on pin 16B identifies the FM reproduce card as a Mediumband card. A TTL logic "0" on pin 16A identifies the FM reproduce card as a Wideband Group II card. Card identification is made when a logic "0" on channel select command (P1-22B) occurs.

12. Monitor Buffers

Reproduce monitor buffer output is switched to the reproduce monitor bus (P1-20A) when the channel select command line (P1-22B) is at logic "0".

Overbias monitor buffer receives its input from the speed equalizer stage output. The buffer output is switched to the overbias monitor bus when the channel select and Cal Command lines are simultaneously at logic "0".

B. FM REPRODUCE FILTERS (See Table 1-3)

1. Power

+12  $\pm 0.12$  Vdc (Pin 4): 10 mA dc typical, 12 mAdc maximum.

-12  $\pm 0.12$  Vdc (Pin 5): 10 mAdc typical, 12 mAdc maximum.

Ground (Pin 2)

2. Input (between pins 7 and 6)

Signal amplitude: 0 to 6.5V peak sinusoidal or square wave.

Signal frequency: DC to 3.5 MHz.

Table 1-2. FM Reproduce

SPEED IPS	LOGIC CODE 2 <sup>0</sup> 2 <sup>1</sup> 2 <sup>0</sup>			FM CARRIER				
				MODE/ MAGNETIC HEAD	CENTER FREQ Hz	DEV %	CENT FRE AMPLIT INPUT -1 (dB)	
120	1	1	1	IB/MB ↑ ↓ IB/MB	216 K	+40	-14.5	
60	1	1	0		108 K	↑	-19.7	
30	1	0	1		54 K	↓	-25.3	
15	1	0	0		27 K		-30.9	
7-1/2	0	1	1		13.5 K		-36.4	
3-3/4	0	1	0		6.75K		-42.1	
1-7/8	0	0	1		3.38K		-44.5	
15/16	0	0	0		1.69K		+40	-47
120	1	1	1		WBI/MB ↑ ↓ WBI/MB		432 K	+40
60	1	1	0	216 K		↑	-21.8	
30	1	0	1	108 K		↓	-27.5	
15	1	0	0	54 K			-33.1	
7-1/2	0	1	1	27 K			-38.4	
3-3/4	0	1	0	13.5 K			-43.2	
1-7/8	0	0	1	6.75K			-46.2	
15/16	0	0	0	3.38K			+40	-49.3
120	1	1	1	IB/WB ↑ ↓ IB/WB			216 K	+40
60	1	1	0		108 K	↑	-29.5	
30	1	0	1		54 K	↓	-35	
15	1	0	0		27 K		-40.6	
7-1/2	0	1	1		13.5 K		-45.7	
3-3/4	0	1	0		6.75K		-50.5	
1-7/8	0	0	1		3.38K		-48.5--	
15/16	0	0	0		1.69K		+40	-55.5--
120	1	1	1		WBI/WB ↑ ↓ WBI/WB		432	+40
60	1	1	0	216		↑	-30	
30	1	0	1	108		↓	-35.8	
15	1	0	0	54			-41.5	
7-1/2	0	1	1	27			-47.1	
3-3/4	0	1	0	13.5			-51.6	
1-7/8	0	0	1	6.75K			-52.5--	
15/16	0	0	0	3.38K			+40	-58.5--
120	1	1	1	WBI/WB ↑ ↓ WBI/WB			900 K	+30
60	1	1	0		450 K	↑	-33.1	
30	1	0	1		225 K	↓	-38.6	
15	1	0	0		112.5K		-44.3	
7-1/2	0	1	1		56.25K		-49.8	
3-3/4	0	1	0		28.12K		-54.1	
1-7/8	0	0	1		14.06K		-59--62	
15/16	0	0	0		7.03K		+30	-64--66

\* INPUT LEVEL REQUIRED TO YIELD  
OF 100 OHMS TO SIMULATE A PR  
ADJUSTED AT 15/16 AT 15/16 IPS

-2. FM Reproduce

ED	LOGIC CODE 2 <sup>0</sup> 2 <sup>1</sup> 2 <sup>0</sup>			FM CARRIER			FM REPRODUCE			SNR								
				MODE/ MAGNETIC HEAD	CENTER FREQ Hz	DEV %	CENTER FREQ. AMPLITUDE INPUT + OR - (dB)*	ASSY.	JUMPER J2 C-	JUMPER J4 C-	E TO E (dB) RMS/RMS	OFF T (dB) RMS/F						
2	1	1	1	IB/MB ↑ ↓ IB/MB	216 K	+40	-14.5	-001 & -101 ↑	IB ↑ ↓ IB	IB ↑ ↓ IB	> 62DB ↑ ↓ ↑	51						
	1	1	0		108 K	↑	-19.7						51					
	1	0	1		54 K	↑	-25.3						51					
	1	0	0		27 K	↑	-30.9						50					
	0	1	1		13.5 K	↓	-36.4						49					
	0	1	0		6.75K	↓	-42.1						48					
8	0	0	1	3.38K	↓	-44.5	-001 & -101 ↓	IB ↓ ↑ IB	IB ↓ ↑ IB	> 62DB ↓ ↑ ↓	47							
6	0	0	0	1.69K	+40	-47						46						
2	1	1	1	WBI/MB ↑ ↓ WBI/MB	432 K	+40						-16.5	-001 & -101 ↓	WBI ↑ ↓ WBI	WBI ↑ ↓ WBI	> 62DB ↓ ↑ ↓	50	
	1	1	0		216 K	↑						-21.8						50
	1	0	1		108 K	↑						-27.5						50
	1	0	0		54 K	↑						-33.1						49
	0	1	1		27 K	↓	-38.4	48										
	0	1	0		13.5 K	↓	-43.2	47										
8	0	0	1	6.75K	↓	-46.2	-001 & -101 ↓	WBI ↓ ↑ WBI	WBI ↓ ↑ WBI	> 62DB ↓ ↑ ↓	46							
6	0	0	0	3.38K	+40	-49.3						42						
2	1	1	1	IB/WB ↑ ↓ IB/WB	216 K	+40						-24.2	-002 & -102 ↑	IB ↑ ↓ IB	IB ↑ ↓ IB	> 62DB ↑ ↓ ↑	47	
	1	1	0		108 K	↑						-29.5						47
	1	0	1		54 K	↑						-35						46
	1	0	0		27 K	↑						-40.6						46
	0	1	1		13.5 K	↓	-45.7	46										
	0	1	0		6.75K	↓	-50.5	45										
8	0	0	1	3.38K	↓	-48.5 - -65	-002 & -102 ↓	IB ↓ ↑ IB	IB ↓ ↑ IB	> 62DB ↓ ↑ ↓	44							
6	0	0	0	1.69K	+40	-55.5 - -66						40						
2	1	1	1	WBI/WB ↑ ↓ WBI/WB	432	+40						-25	-002 & -102 ↓	WBI ↑ ↓ WBI	WBI ↑ ↓ WBI	> 62DB ↓ ↑ ↓	46	
	1	1	0		216	↑						-30						46
	1	0	1		108	↑						-35.8						44
	1	0	0		54	↑						-41.5						44
	0	1	1		27	↓	-47.1	43										
	0	1	0		13.5	↓	-51.6	42										
8	0	0	1	6.75K	↓	-52.5 - -65	-002 & -102 ↓	WBI ↓ ↑ WBI	WBI ↓ ↑ WBI	> 62DB ↓ ↑ ↓	41							
6	0	0	0	3.38K	+40	-58.5 - -67						33						
2	1	1	1	WBII/WB ↑ ↓ WBII/WB	900 K	+30						-27.2	-002 & -102 ↓	WBII ↑ ↓ WBII	WBII ↑ ↓ WBII	> 52DB ↑ ↓ ↑	33	
	1	1	0		450 K	↑						-33.1						33
	1	0	1		225 K	↑						-38.6						32
	1	0	0		112.5K	↑						-44.3						31
	0	1	1		56.25K	↓	-49.8	29										
	0	1	0		28.12K	↓	-54.1	29										
8	0	0	1	14.06K	↓	-59 - -62	-002 & -102 ↓	WBII ↓ ↑ WBII	WBII ↓ ↑ WBII	> 52DB ↓ ↑ ↓	26							
6	0	0	0	7.03K	+30	-64 - -66						26						

\* INPUT LEVEL REQUIRED TO YIELD 0dB (3V P-P) +1dB OUTPUT AT W3 WITH A SOURCE OF 100 OHMS TO SIMULATE A PREAMP. POT R89 IS ADJUSTED AT 1-7/8 IPS AND P ADJUSTED AT 15/16 AT 15/16 IPS ON WBII, WBI, IB/WB TO YIELD 0dB (3V P-P).

TER EQ. FREQUENCY + OR - B)*	FM REPRODUCE			SNR		FREQUENCY RESPONSE DC TO _____ (fco) Hz WITHIN _____					
	ASSY.	JUMPER J2 C-	JUMPER J4 C-	E TO E (dB) RMS/RMS	OFF TAPE (dB) RMS/RMS						
	-001 & -101 ↑	IB ↑ ↓ IB	IB ↑ ↓ IB	> 62DB ↑	51	40K, 1 dB					
					51	20K, 1 dB					
					51	10K, 1 dB					
					50	5K, 1 dB					
					49	2.5K, 1 dB					
					48	1.25K, 1 dB					
					47	625, 1 dB					
					46	313, 1 dB					
						-001 & -101 ↓	WBI ↑ ↓ WBI	WBI ↑ ↓ WBI	> 62DB ↓	50	80K, 1 dB
										50	40K, 1 dB
50	20K, 1 dB										
49	10K, 1 dB										
48	5K, 1 dB										
47	2.5K, 1 dB										
46	1.25K, 1 dB										
42	625, 1 dB										
--65 --66	-002 & -102 ↑	IB ↑ ↓ IB	IB ↑ ↓ IB	> 62DB ↑						47	40K, 1 dB
										47	20K, 1 dB
					46	10K, 1 dB					
					46	5K, 1 dB					
					46	2.5K, 1 dB					
					45	1.25K, 1 dB					
					44	625, 1 dB					
					40	313, 1 dB					
					3 5 1 3 --65 --67	↓	WBI ↑ ↓ WBI	WBI ↑ ↓ WBI	> 62DB ↓	46	80K, 1 dB
										46	40K, 1 dB
44	20K, 1 dB										
44	10K, 1 dB										
43	5K, 1 dB										
42	2.5K, 1 dB										
41	1.25K, 1 dB										
33	625, 1 dB										
2 6	-002 & -102 ↓	WBII ↑ ↓ WBII	WBII ↑ ↓ WBII	> 52DB ↑						33	400K, +1, -2 dB; 500K, +1, -3 dB
										33	200K, +1, -2 dB; 250K, +1, -3 dB
					32	100K, +1, -2 dB; 125K, +1, -3 dB					
					31	50K, +1, -2 dB; 62.5K, +1, -3 dB					
					29	25K, +1, -2 dB; 31.25K, +1, -3 dB					
					29	12.5K, +1, -2 dB; 15.6K, +1, -3 dB					
					26	6.25K, +1, -2 dB; 7.81K, +1, -3 dB					

ELD 0dB (3V P-P) ±1dB OUTPUT AT W3 WITH A SOURCE RESISTANCE  
 REAMP. POT R89 IS ADJUSTED AT 1-7/8 IPS AND POT R90 IS  
 S ON WBII, WBI, IB/WB TO YIELD 0dB (3V P-P).

Table 1-3. FM Reproduce Filters

TYPE OF FILTER	ASSY DASH NO	FILTER BANDWIDTH DC TO (fco) Hz	INPUT IMPEDANCE OHMS MIN	FREQUENCY RESPONSE	
				OVERALL BANDWIDTH J1 - C to F	TRANSIENT J1 - C to T
MEDIUM BAND	-001	80 K	4.5K	Within 1 dB, DC to fco Within 0.25 dB @ .1 fco ↑ ↓ Within 1 kB, DC to fco Within 0.25 dB @ .1 fco	-4 dB max @ fco ↑ ↓ -4 dB max @ fco
	-002	40 K	9.0K		
	-003	20 K	18 K		
	-004	10 K	36 K		
	-005	5 K	72 K		
	-006	2.5 K	20 K		
	-007	1.25 K	40 K		
	-008	.625K	80 K		
	-009	.313K	60 K		
WIDEBAND GROUP II	-101	500 K	2.9K	0.0dB $\pm \frac{1}{3}$ dB, DC to fco Within 0.25 dB @ .1 fco ↑ ↓ 0.0 dB $\pm \frac{1}{3}$ dB, DC to fco Within 0.25 dB @ .1 fco	-6 dB max @ fco ↑ ↓ -6 dB max @ fco
	-102	250 K	3.0K		
	-103	125 K	6.0K		
	-104	62.5 K	12 K		
	-105	31.25 K	5.8K		
	-106	15.625K	11 K		
	-107	7.813K	22 K		
	-108	3.906K	45 K		

## SECTION 2

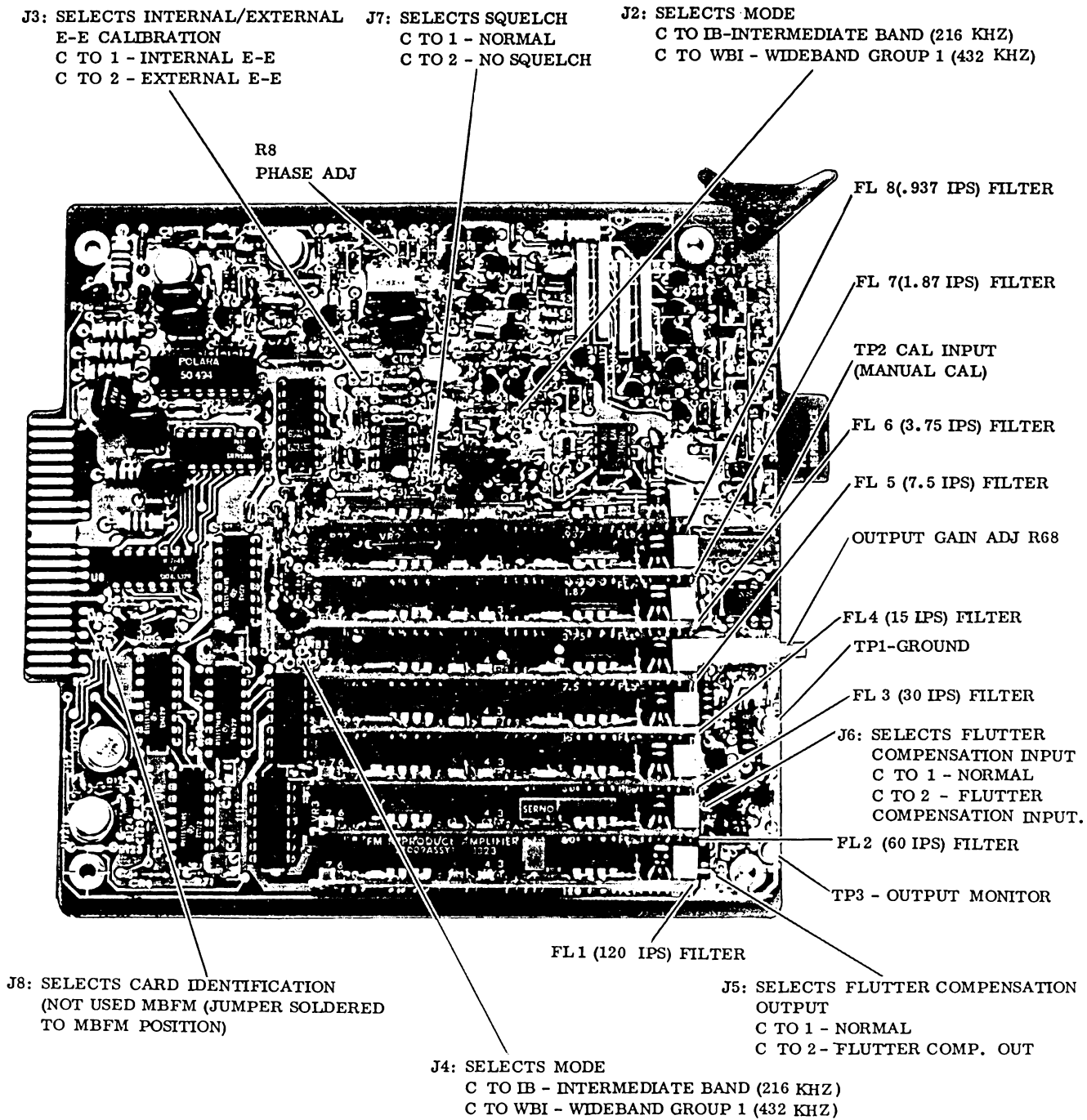
### INSTALLATION

The FM reproduce card mounts in slots A36 through A51 of the 16 x 16 data housing, A36 and A37 of the 32 x 2 data housing, and A4 through A35 of the 32 channel reproduce housing. The component side of the card faces left when installed. Prior to installing the FM reproduce card in the data housing, verify that the correct FM reproduce filter cards are mounted on the FM reproduce card. Also, verify that all jumpers are positioned correctly. (Refer to Section 1 and Figure 2-1, 2-2, and 2-3.)

#### **CAUTION**

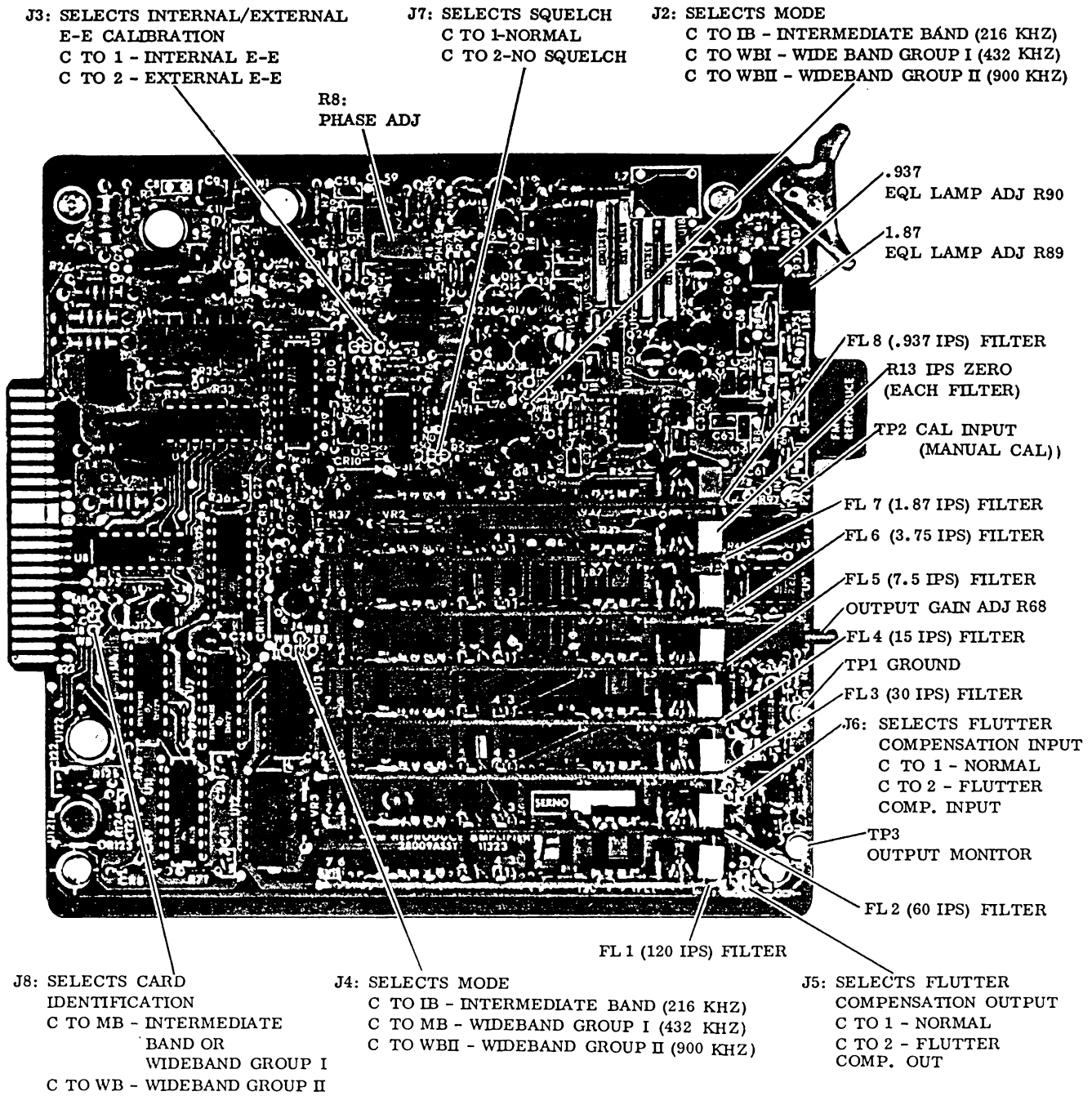
System power must be turned off when the FM Reproduce Card is being removed or installed.





101/FM REP-1

Figure 2-1. FM Reproduce Card (MBFM)

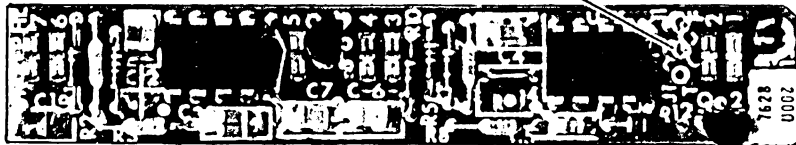


101/FM REP-2

Figure 2-2. FM Reproduce Card (WBFM)

/FM  
REP

J1: SELECTS FLAT OR TRANSIENT  
RESPONSE  
C TO F - FLAT  
C TO T - TRANSIENT



IPS ZERO ADJ  
R13

101FM/REP-3

Figure 2-3. FM Reproduce Filter (Typical)

## SECTION 3

### OPERATION

Operating procedures are not required for the FM reproduce card. Refer to the operator's manual for general operating instructions.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the FM reproduce card. The description is divided into two parts: a functional description referenced to the block diagram in Figure 4-1, and a detailed circuit description referenced to the schematics in Section 7.

#### 4-2. FUNCTIONAL DESCRIPTION (Figure 4-1)

The FM reproduce amplifier converts an FM signal to a signal with an amplitude proportional to the deviation frequency and a frequency equal to the FM deviation rate. The FM reproduce amplifier consists of a speed equalizer, limiter and frequency doubler, digital oneshot, FM reproduce filters, data output amplifier, two monitor buffers, calibration and speed logic.

The FM signal from the preamplifier output is applied to the speed equalizer through a differential input. The speed equalizer provides fixed input amplification with phase and gain response shaping dependent upon mode, speed, and input-signal frequency. The frequency of the signal from the speed equalizer is doubled by the limiter-doubler and applied to the digital oneshot (DO). The equalizer signal is also sent to the overbias monitor buffer.

The DO, programmed by mode jumper J4 and decoded speed line commands, produces logic "0" pulses whose width varies in binary increments with speed and mode. These pulses are applied to the precision clamp amplifier which produces logic "1" pulses of exact amplitude which when averaged is the demodulated FM signal.

The precision clamp amplifier output is applied to the FM reproduce filters. The filters are plug-in printed circuit cards which must be installed properly on the FM reproduce card according to bandwidth for particular speed and mode. The FM filters extract the FM carrier frequency from the composite signal, restoring the original data signal.

The data signal is then applied to the data output amplifier input, when un-squelched, where amplitude adjustment and dc compensation is added. The amplifier has a low impedance driver for system output as well as driving the reproduce monitor buffer. Provisions are made by jumpers J5 and J6 to accept or produce a flutter-compensation signal at P1-20B. Jumper J7 furnishes an option for disabling the squelch circuit which normally squelches the signal at the data output amplifier input if servo is not phase locked or carrier frequency is not present.

The reproduce monitor buffer has its output switched on to the reproduce monitor bus when the channel select command is logic "0". This bus is used for calibration system.

The overbias monitor buffer, mentioned previously, has its output switched on the overbias monitor bus when both the channel select command and cal command are at logic "0". This bus is used for the overbias monitor.

Calibration logic is used for internal selection and calibration of individual data channel Electronics-to-Electronics (E-E, FM record amplifier to FM reproduce amplifier), and card identification to the micorcomputer. Speed line decoding and interfacing are also included.

#### 4-3. CIRCUIT DESCRIPTION

##### A. FM REPRODUCE SPEED EQUALIZER (Figure 7-1)

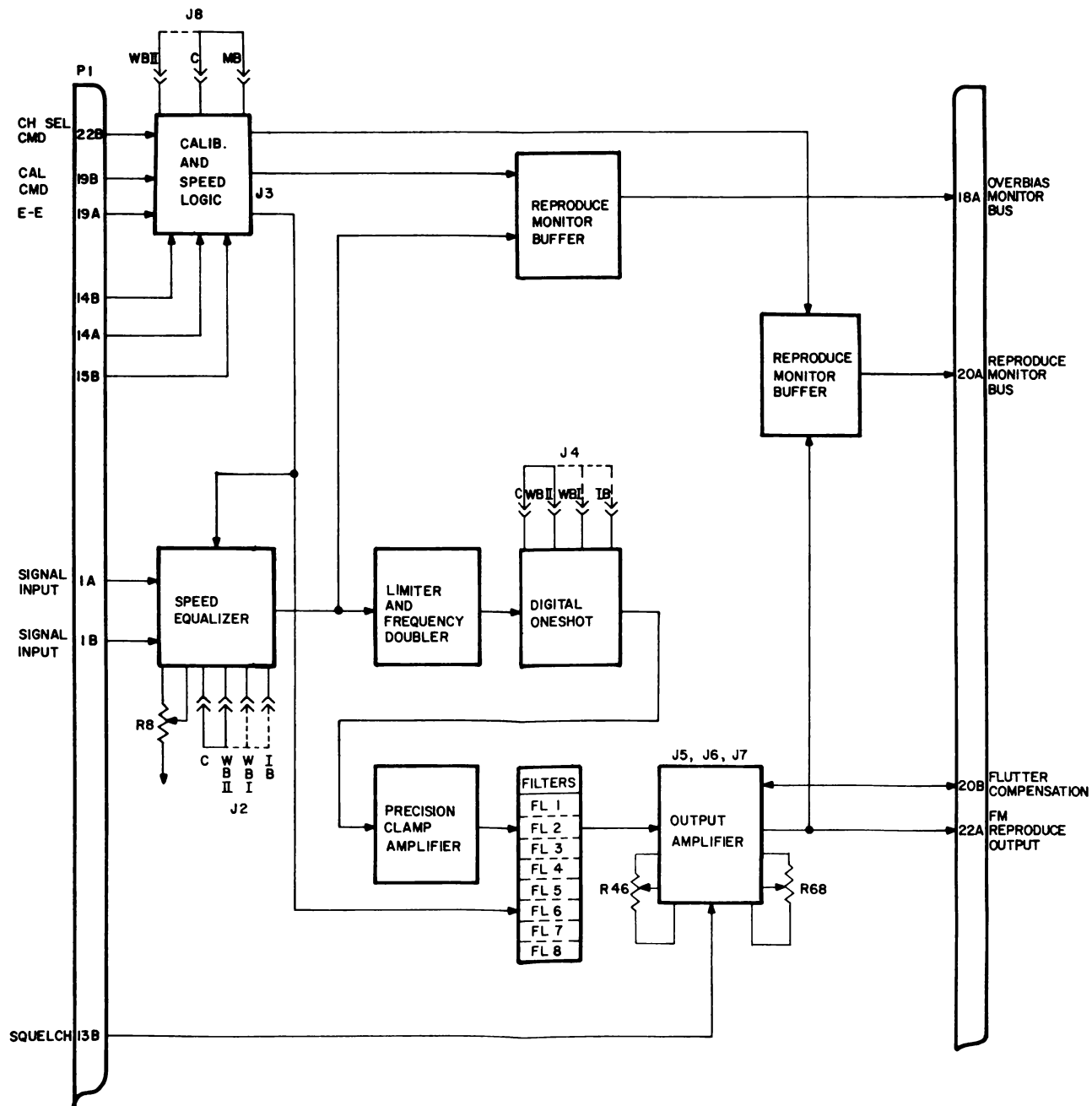
The speed equalizer circuit is furnished in one basic configuration laid out on the FM reproduce card. Two sets of component values are provided. One set is for Medium band modes (Intermediate band and Wideband Group I) used on Medium band heads. The other set of component values is for medium band modes and Wideband Group II mode used on wideband heads. The FM reproduce card has different dash numbers to differentiate between the two sets of component values. A jumper J2 is used in each case for mode selection.

The speed equalizer circuit consists of operational amplifiers U1 and U2, speed switches Q13 through Q31, and gain amplifier Q1 through Q4, and all associated components.

A differential input signal is applied to U1, which has a single-ended, low impedance output to drive U2 stage. The U1 stage has a gain of 0.825 on medium band cards and 2.68 on wideband cards.

The phase response of U2 is a function of input signal frequency and tape speed. A 90-degree phase lag is introduced at the appropriate frequency in each speed. The frequency is determined by the RC circuit consisting of R8, R9 and the selected phase-response capacitor C51 through C60. Variable resistor R8 (EQL PHASE) is used to adjust the phase lag for least distortion of the data signal. Switches Q13 through Q20 are used to switch in the correct phase-response capacitor for the speed selected. A +9.5 Vdc control signal to base resistors (U15 and U16) turns the switch on. The +9.5 Vdc signal is developed by the speed logic circuit, consisting of U11 and operational amplifiers U12 and U13. See page 4-8 and Figure 7-1.

The output of U2 is coupled to the amplitude equalizer by way of resistor R13, which is part of the low-pass switchable filter. This filter includes Q29 through Q31 with their associated filter capacitors (C72 through C75) and control resistors R94



101/FM REP-4

Figure 4-1. FM Reproduce Amplifier Block Diagram

through R96) which are operated from speed lines (.937 through 3.75 ips). The amplitude equalizer consists of Q1 through Q4 and associated components with gain compensation selectable by mode (Intermediate band, Wideband Group I and Wideband Group II) with jumper J2. Additional speed dependent gain switching is achieved by Q21 through Q28 and associated circuitry. The +9.5 Vdc level again form the speed logic circuit turns the particular speed switch on. Inductor L7 with a switched capacitor C61 through C71) from a series LC resonant circuit at frequencies near upper bandedge. The resistors across the switched capacitors control the Q of the LC circuit and if variable, are adjusted for least distortion. Output of the speed equalizer is capacity coupled (C20) to the limiter/frequency doubler circuit, and also is applied to the over-bias monitor buffer input.

#### B. LIMITER/FREQUENCY DOUBLER (Figure 7-1)

The limiter clamps the input signal to  $\pm 0.7V$  by diodes CR2 and CR3 and the Frequency Doubler (U3) produces a negative pulse (90 nsec wide) for each signal transition through 0 Vdc level. Pulse width is determined by C24 and R32.

A test signal for E-E calibration can be applied through jumper J3. In the C to 1 position, the FM internal E-E bus from the FM record card to be applied to the frequency doubler. Jumper J3 C to 2 is used when no internal E-E calibration is furnished and carrier signal is then patched by external cable from FM record card TP3 to the FM reproduce card TP2. The frequency doubler output is applied to the digital oneshot.

#### C. DIGITAL ONESHOT (Figure 7-1)

The digital oneshot (DO) converts the short pulses from the frequency doubler (U3) to longer pulse widths which are inversely proportional to speed and also mode dependent. Jumper J4 is used to select desired mode (IB, WBI, or WBII). The DO consists of U4, U5, U6, U7, 1/2 of U8 and U14.

The frequency doubler pulse sets the RS flip-flop U4 at pin 6 to a logic 1, which enables the delay line oscillator (U4, U14) which free-runs at approximately 7.75 MHz until the programmable counters (U5, U6 and U7) have counted down the predetermined number of pulses for that speed and mode, at which time the RS flip-flop is reset, which inhibits the delay line oscillator and clears the counters. The output of the DO is a negative pulse whose width is the time between the set pulse and the reset pulse. This pulse becomes the input to the precision clamp amplifier.

#### D. PRECISION CLAMP AMPLIFIER (Figure 7-1)

The precision clamp amplifier consists of Q5 and Q6 with their base bias circuitry, and speedup capacitors C29 and C30. A zener (VR2) regulated power source supplies the precise level voltage for the amplifier. Q5 and Q6 operate as saturated switches. When Q5 is turned on by the logic 0 level, Q6 is turned off and the output to the filters is near the zener supply level. When the input is at a logic 1 level, Q5 is turned off and Q6 is turned on, so the output to the filters is near ground level (0 volts).



#### E. FM REPRODUCE FILTERS (Figure 7-1)

The FM reproduce filters are active low-pass filters which pass the FM deviation rate frequency for a specific mode and speed, but attenuates the FM carrier frequency. The ten mediumband filters are fourth order, 1/2 db ripple Chebychev filters and the seven wideband filters are fifth order, 1.2 dB ripple Chebychev filters. The filters consist of voltage followers U1 and U2 as individual stages with their associated RC networks and Q1 and Q2 operated in the inverted mode as enable/inhibit switches controlled by speed lines.

Transistors Q1 and Q2 require a +9.5 Vdc level to enable and a -9.0 Vdc level to inhibit at filter pin 3. Two switches are used (Q1 and Q2) in order to get the required attenuation of signal in the unused filter when two or more filters are installed on the FM Reproduce card. One filter is enabled at a time.

The input (pin 7) is a precise-amplitude, fixed-pulse-width signal of varying duty cycle. The average value of this signal represents the amplitude of the data signal and the rate of the duty-cycle variation is the frequency.

The first filter stage, comprised of U1, R1, R2, R3, C1, C2 and C3, is a third order section for wideband filters. It becomes a second order section by the absence of C1 and making the value of R1 much less than the value of R2.

The second filter stage, comprised of U2, R7, R8, C4 and C5 is a second order section when combined with the first stage creates a filter of the desired order and characteristics.

Resistors R5 and R6 form a compensation attenuator used to equalize FM reproduce system gain and dc offset error, which are functions of mode and tape speed. Approximately 5.5 percent attenuation, maximum, is used on the 500 kHz (-101) filter.

Variable resistor R13 is used to adjust to dc zero, any offsets caused by U1 and U2.

Jumper J1 selects either flat mode (C to F) or transient mode (C to T) operation. When in the flat mode, the filter has a flat frequency response (within the specified ripple) to bandedge, and less than 18 percent overshoot for a step input. In the transient mode, the filter has a Bessel response (linear phase) with bandedge attenuated to a maximum of -4.0 dB for mediumband filters and a maximum of -6.0 dB for Wideband II filters. (Refer to Table 1-2). The overshoot for a step input is less than 8 percent in the transient mode, provided by the feedback resistor (R4). The filter output is applied to the output amplifier.

#### F. OUTPUT AMPLIFIER (Figure 7-1)

The output amplifier of the FM reproduce card provides a low output impedance for driving coaxial cables, has variable gain, squelches the output signal when not in servo phase lock or if the input carrier signal is lost. Jumper switch-

ing is provided for standard output, flutter compensated output, and transmitting flutter compensation signal. The output amplifier consists of operational amplifier (U9, Q9 and Q10) and the squelch and dc circuit (U10, Q8 and Q7).

### 1. Operational Amplifier

The filter output is summed with a negative dc voltage and applied to the input of the operational amplifier. The negative voltage compensates for the positive dc offset voltage from the FM reproduce filter. The negative voltage is supplied from U10-1 through resistors R45 and R46 (variable - coarse zero) to U9-3.

The gain of the operational amplifier (U9) is determined by resistors R58, R59, R68 and R69. Gain is adjusted by R68. Transistors Q9 and Q10 provide the current drive and low output impedance.

For normal operation, jumpers J5 and J6 are set to the C-1 position. To cancel the effect of flutter on the data output, a tape flutter signal (center-frequency carrier recorded on another FM track and applied to the compensation bus) at P1-20B may be summed with the filter output, data signal by setting jumper J6 to the C-2 position. A tape flutter signal is applied to the compensation bus by setting jumper J5 to the C-2 position. Jumpers J5 and J6 shall not be operated in the C-2 position simultaneously on any one FM reproduce card. One card is used as a transmitter (when J5 is C-2 and J6 is C-1) and other FM reproduce cards may be receivers (when J5 is C-1 and J6 is C-2).

### 2. Squelch and DC Circuit

The squelch circuit clamps the input of the output amplifier to ground when a logic "1" is applied to P1-13B or the input carrier signal is lost. One-half of operational amplifier U10 is used as a voltage comparator. When servo is phase locked, a logic "0" appears at P1-13B, which turns off Q8, allowing capacitor C34 to charge to an average DC level greater than the positive bias level on U10-5. This causes U10-7 output to go to near -10 Vdc, turning off Q7, allowing the filter output to pass to the output amplifier input if the input carrier signal is present. If the input carrier signal is not present under a phase locked condition, C34 would get no charging current from filter output; therefore, Q7 would be turned on, clamping the output amplifier input to ground. A logic "1" at P1-13B turns on Q8, preventing C34 from charging. The bias on U10-5 causes U10-7 to be near +11 Vdc, which turns on Q7, clamping filter output signal to ground.

The squelch circuit is inhibited by Jumper J7, when in the C-2 position.

### G. MONITOR BUFFERS (Figure 7-1)

1. Reproduce monitor buffer (U121) receives its input from the data output of the output amplifier, provides isolation, and has its output switched to the reproduce monitor bus (P1-20A) by the analog switch (U122) when the FM reproduce

card receives a logic "0" on channel select command line P1-22B. This reproduce monitor bus is utilized by the meter monitor calibration system.

2. Overbias monitor buffer (U120) is supplied an FM carrier signal from the speed equalizer output. The amplitude is reduced by one-half and the buffered output is switched to the overbias monitor bus (P1-18A) when a logic "0" appears on both the channel select command line (P1-22B) and the Cal command line (P1-19B). The overbias monitor bus serves the overbias monitor and is utilized for calibrating the recording bias level.

#### H. CALIBRATION AND SPEED LOGIC (Figure 7-1)

Calibration logic consists of gate U8 and identification circuitry Q11 and Q12. With a logic "0" on the channel select command line (P1-22B) Q12 is turned off which turns Q11 on, causing a logic "0" at P1-16A or P1-16B depending upon jumper J8 position. This identifies card type for the microcomputer. When in the C-MB position, J8 causes the card to identify itself as a mediumband FM card. In the C-WBII position, it is identified as a Wideband FM card.

The logic "0" on the channel select command also turns on the analog switch (U122) half that allows the reproduce monitor signal to be applied to the reproduce monitor bus (P1-20A).

With the channel select command and the Cal command, both at logic "0", the overbias monitor signal is applied to the overbias monitor bus (P1-18A) through the other half of analog switch U122. Under these command conditions, the TTL carrier signal, from the FM RECORD card in this channel, on the E-E bus (P1-19A) can pass through U8 from Pin 1 to Pin 3. If J3 is in the C-1 position, this TTL carrier signal is applied as input to the limiter/doubler circuit for FM reproduce card calibration purposes.

The speed logic circuit consists of a 3-to-8 line decoder (U11) which selects one output line out of the eight to be a logic "0" dependent upon the logic levels of the three speed line inputs. All three speed lines at a logic "0" represents .937 IPS speed with binary progression to all three speed lines a logic "1", representing 120 IPS speed. (Refer to Table 1-1.) Operational amplifiers (U12 and U13) are used to provide logic level shifting and inversion from TTL levels to approximately +9.5V level with a TTL logic "0" input and approximately -9.0V level with a TTL logic "1" input. These new levels are used for transistor switching in the speed equalizer and FM reproduce filter areas.

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

Adjustments to the FM reproduce card are described in Section 4 of the Model 101 Operator's Manual, except for the factory only adjustments, which are explained as follows:

A. EQUALIZER PHASE (R8) is adjusted for minimum second harmonic distortion of the FM reproduce output signal when a one-half bandedge signal is simultaneously recorded and reproduced. This may be done at a medium speed with a fine tune touchup at highest speed.

B. EQUALIZER AMPLITUDE (R83 through R89 - used on wideband FM reproduce cards only). Variable resistors for trimming the applicable filters for minimum second harmonic distortion of the FM reproduce output signal when a one-half bandedge signal is simultaneously recorded and reproduced. Adjust applicable resistors for each speed as shown in Table 5-1.

CAUTION

For speeds which do not have FM filter cards installed, the applicable resistor should be set at mid-range. Resistors are single turn.

Table 5-1. Wideband Adjustments

SPEED	15/16	1 7/8	3 3/4	7 1/2	15	30	60	120
RESISTOR	R90	R89	R88	R87	R86	R85	R84	R83
VALUE (in ohms)	50	100	200	200	500	1K	2K	5K

5-2. TROUBLESHOOTING

This section is to be used in conjunction with the principles of operation (Section 4) and the schematics (Section 7). This section indicates the most probable causes only of the symptom identified to a stage level. It is assumed that the necessary test equipment is available to make specified measurements, that the problem has been isolated to the FM reproduce card by substitution of cards and/or channel location, and that power supply voltages have been verified on coil ends opposite the connector.

If two problems exist in separate sections, it may be necessary to progress through troubleshooting flow chart until one of the problem areas is found: then return to box number one of chart and progress down alternate path to second problem area.

Symptoms and shortcut procedures are as follows:

Symptom: FM REPRODUCE CARD HAS NO OUTPUT AT P1-22A.

Procedure: See Figure 5-1.

Symptom: OVERBIAS MONITOR SIGNAL NOT PRESENT AT P1-18A.

Procedure: Monitor W3 with scope. Select: failed speed, CAL, REC, FWD, INT, BE/+DEV channel number of card being tested. If signal is present, troubleshoot U120 and U122 stage, checking for a logic "0" at U122-1 when P1-22B and 19B are both logic "0". If W3 has no signal, go to Figure 5-1.

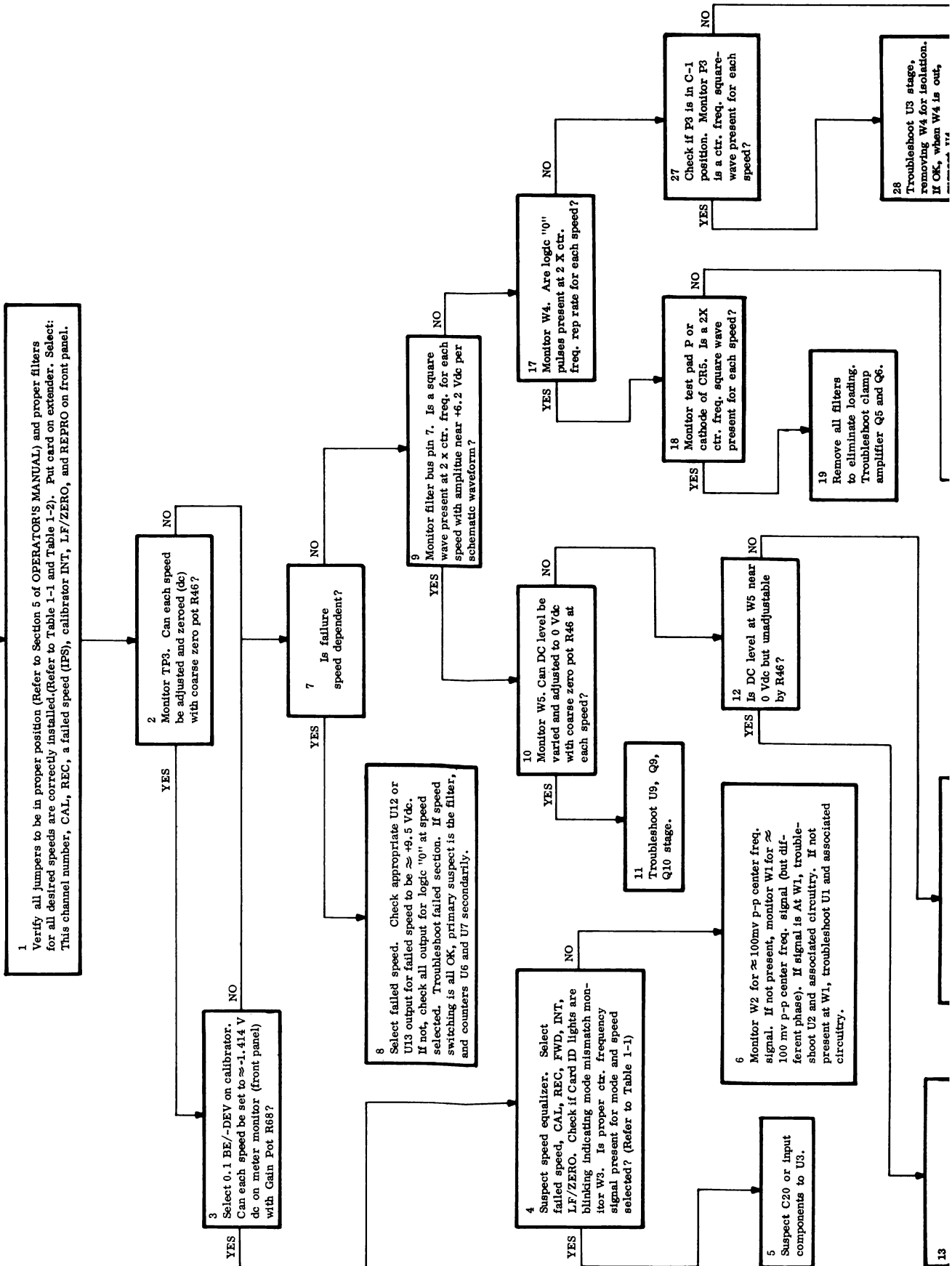
Symptom: REPRODUCE MONITOR SIGNAL NOT PRESENT AT P1-20A.

Procedure: Monitor TP3. Select: any speed for which there is a filter, CAL, REC, INT, 0.1 BE/-DEV, this channel number. A -1.414V dc level should be measured by adjusting gain pot R68. If ok, troubleshoot U121 and U122 stage, checking for logic "0" at U122-2. If dc level cannot be set at TP3, go to Figure 5-1, box #1 and follow chart.

Symptom: IMPROPER CARD ID ON CONTROL PANEL.

Procedure: Verify J8 is in proper position (refer to Section 5 of Operator's Manual), and monitor P8. A logic "0" should appear when this channel is selected (P1-22B is a logic "0"). If not, check bias circuit R71, CR8, CR9 for approximately +1.2 Vdc on base of Q11, troubleshoot Q11, Q12 stage.

FM  
REPRODUCE.  
CARD HAS  
NO OUTPUT  
AT P 1-22A



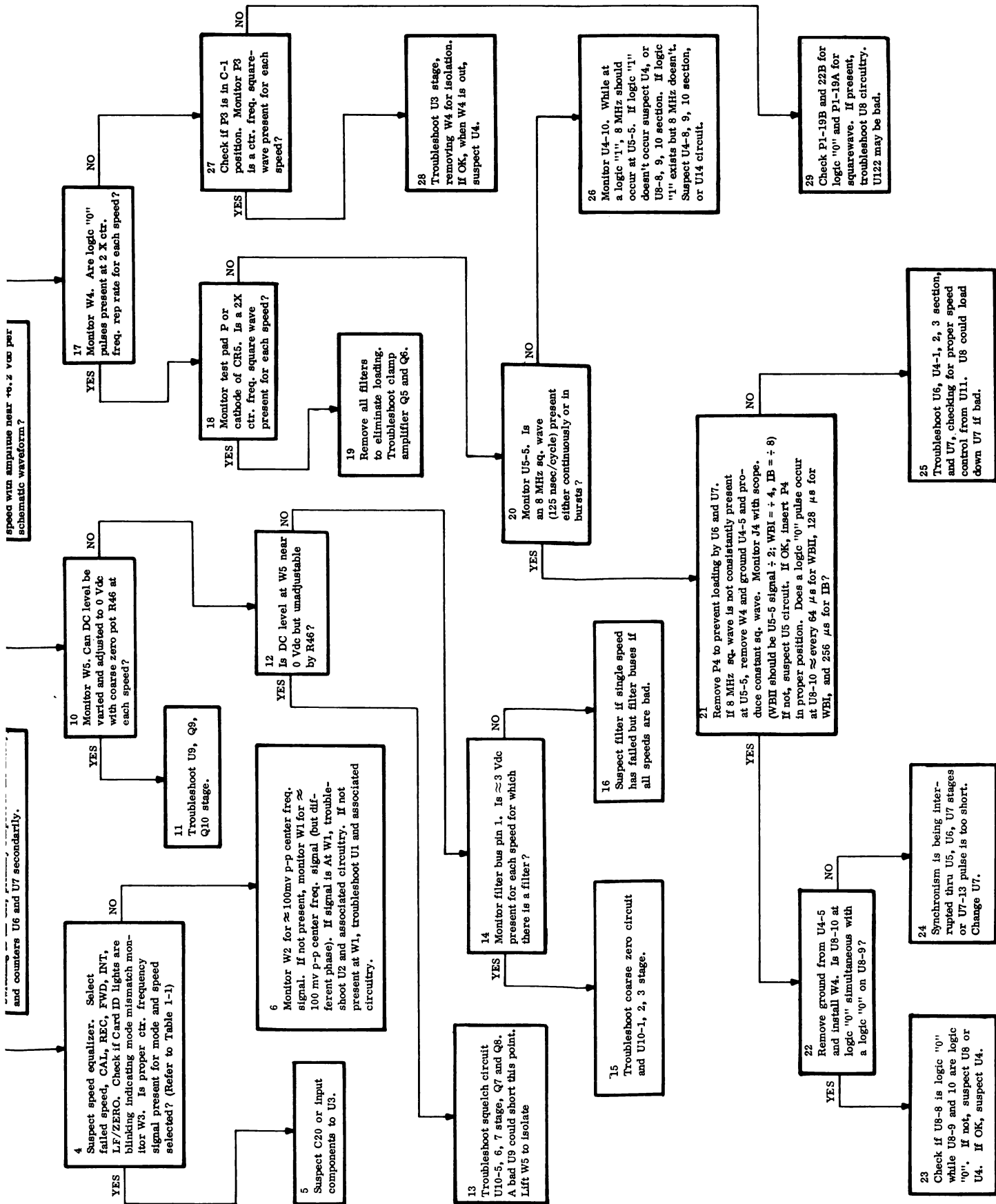


Figure 5-1. FM Reproduce Troubleshooting Chart

## SECTION 6

### ILLUSTRATED PARTS BREAKDOWN

#### 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

##### A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

##### B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

##### C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

##### D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H4-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

##### E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.



## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

## SECTION 6

### 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

### 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

### 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
SPECTROL ELECTRONICS CORPORATION 17070 EAST GALE AVENUE CITY OF INDUSTRY, CALIF. 91745	02111	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX 20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	POLARA ENGINEERING INCORPORATED 11206 GREENSTONE AVENUE SANTA FE SPRINGS, CAL. 90670	32155
CTS OF BERNE INCORPORATED 406 PARR ROAD BERNE, INDIANA 46711	11236	HEWLETT PACKARD SEMICONDUCTOR DIV 350 WEST TRIMBLE ROAD SAN JOSE, CALIFORNIA 95131	50434
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
SIGNETICS CORPORATION SUNNYVALE, CALIFORNIA 94086	18324	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LAUTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
SCANBE MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	ELECTRONIC INDUSTRIES ASSOCIATION	80131
BERG ELECTRONICS YORK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
ANALOG DEVICE, INCORPORATED P.O. BOX 280 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	AUGAT INCORPORATED 33 PERRY AVENUE ATTLEBORO, MASSACHUSETTS 02703	91506
MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769	VITRAMON INCORPORATED BOX 544 BRIDGEPORT, CONNETICUT 06601	95275
NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014	DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800

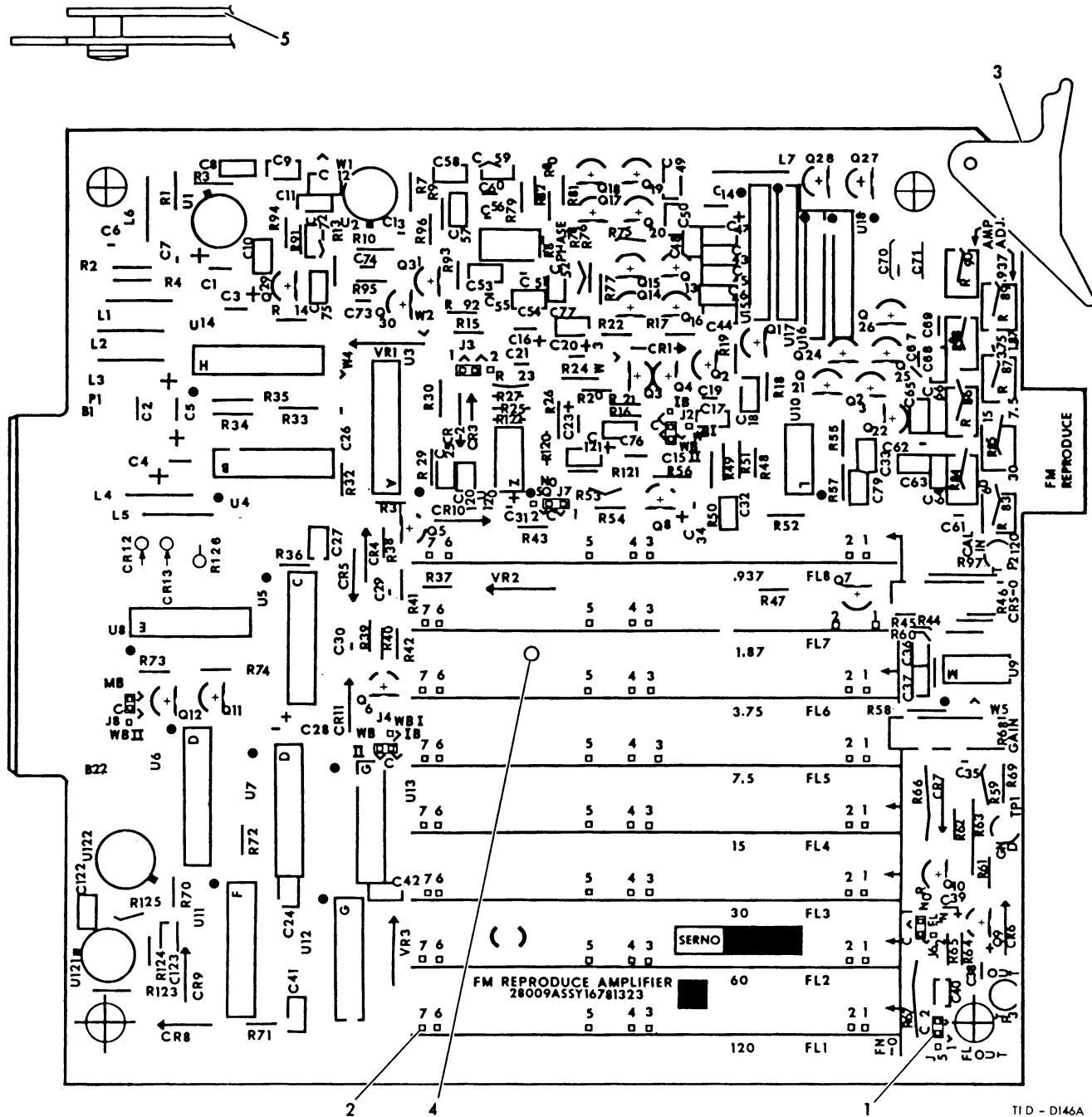
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## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-010	BENCH LEVEL SPARES KIT, FM REPRODUCE					
16737938-109	SEMICONDUCTOR DEVICE, DIODE	80131	1N4736A 5961-932-4026	1	1	
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	9	2	
16757931-001	SEMICONDUCTOR DEVICE, DIODE, ZENER	80131	1N821 5961-00-951-6375	1	1	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	5	1	
16762173-001	TRANSISTOR	04713	2N3906 5961-00-072-0128	3	1	
16774066-003	SEMICONDUCTOR DEVICE, DIODE,	04713	1N5223A	1	1	
16774985-002	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210H	1	1	
16774985-003	INTEGRATED CIRCUIT	27014	LM310N	3	1	
16775629-022	TRANSISTOR	27014	PN5910-5	1	1	
16775630-021	TRANSISTOR	27014	PN4274-5	1	1	
16775977-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	MC1458C	1	1	
16776155-001	INTEGRATED CIRCUIT, LOGIC GATE	01295	SN74300N	1	1	
16776656-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	2	1	
16776656-003	INTEGRATED CIRCUIT	27014	LM318N	1	1	
16776697-001	INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	N8T208	1	1	
16776979-001	TRANSISTOR	04713	SPS-8716	23	5	
16779170-001	INTEGRATED CIRCUIT	27014	LM324N 5962-01-008-4826	2	1	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	1	1	
16779459-002	MICROCIRCUIT	01295	SN74LS193N	1	1	
16779948-001	BUS BAR	29593	85153-100-263	8	2	
16780406-001	MICROCIRCUIT	01295	SN74LS32N	1	1	
99000267-001	MICROCIRCUIT	27014	DM74LS138N	1	1	
99000294-001	MICROCIRCUIT	01295	SN74LS191N	2	1	



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FIGURE 6-1. FM REPRODUCE CIRCUIT CARD ASSEMBLY

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 1 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		A8A36-51	CIRCUIT CARD ASSEMBLY, FM REPRODUCE, 4MHZ, MEDIUM BAND	28009		16781323-104	AR	A	
6-1		AAA36-51	CIRCUIT CARD ASSEMBLY, FM REPRODUCE, 8MHZ, WIDEBAND	28009		16781323-105	AR	B	
6-1		A8A36-51	CIRCUIT CARD ASSEMBLY, FM REPRODUCE, 4MHZ, MEDIUM BAND	28009		16781323-106	AR	C	
6-1		A8A36-51	CIRCUIT CARD ASSEMBLY, FM REPRODUCE, 8MHZ, WIDEBAND	28009		16781323-107	AR	D	
6-1		CR1-9	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	9		
6-1		CR10,11	. NOT USED						
6-1		CR12,13	. SEMICONDUCTOR DEVICE, DIODE	50434	MSCH1001	99000937-001	2		
6-1		C1-4	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS4760015K	16758058-242	4		
6-1		C5	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 6VDC	26769	KNS1070006K	16758058-046	1		
6-1		C6	. CAPACITOR, FIXED, MICA DIELECTRIC, 160PF, +-5%, 100VDC	72136	DM5FA161J04CR	16779445-436	1	A,C	
6-1		C6	. CAPACITOR, FIXED, MICA DIELECTRIC, 82PF, +-5%, 300VDC	72136	DM5EC820J04CR	16779445-329	1	B,D	
6-1		C7,8	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5CC220J04CR	16779445-315	2	A,C	
6-1		C9-12	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	4		
6-1		C13	. CAPACITOR, FIXED, MICA DIELECTRIC, 7PF, +-1%, 300VDC	72136	DM5CC7R0F04CR	16779445-007	1		
6-1		C14	. CAPACITOR, FIXED, ELECTROLYTIC, 68UF, +-10%, 6VDC	26769	KNS686C006K	16758058-044	1		
6-1		C15,16	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KNS4760015K	16758058-242	2		
6-1		C17	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2200PF, +-10%, 50VDC	18796	8121-050WSR222K	16771625-036	1	B,D	
6-1		C18	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 6800PF, +-10%, 50VDC	18796	8121-050WSR682K	16771625-042	1		
6-1		C19	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.012UF, +-10%, 50VDC	18796	8131-050WSR123K	16771625-045	1		
6-1		C20	. CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS3968006K	16758058-041	1		
6-1		C21	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1UF, +-20%, 50VDC	72982	8131-050-651-105M 5910-498-5856	16771020-025	1		
6-1		C22	. NOT USED						
6-1		C23	. CAPACITOR, FIXED, ELECTROLYTIC, 39UF, +-10%, 6VDC	26769	KNS3968006K	16758058-041	1		
6-1		C24,25	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	72982	8121-050-651-103M	16771020-011	2		
6-1		C26	. CAPACITOR, FIXED, MICA DIELECTRIC, 10PF, +-5%, 300VDC	72136	DM5CC100J04CR	16779445-310	1		
6-1		C27	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	72982	8121-050-651-103M	16771020-011	1		
6-1		C28	. CAPACITOR, FIXED, ELECTROLYTIC, 18UF, +-10%, 6VDC	26769	KNS186A006K	16758058-037	1		
6-1		C29,30	. CAPACITOR, FIXED, MICA DIELECTRIC, 22PF, +-5%, 300VDC	72136	DM5CC220J04CR	16779445-315	2		

NOTES:

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 2 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY IN ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1		C31	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 10VDC	26769	41KS106A010K1A	16758058-134	1		
6-1		C32,33	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104H5U1CA	16771020-018	2		
6-1		C34	. CAPACITOR, FIXED, ELECTROLYTIC, 0.33UF, +-10%, 20VDC	26769	41KS334A020K1A	16758058-316	1		
6-1		C35	. CAPACITOR, FIXED, MICA DIELECTRIC, 10PF, +-5%, 300VDC	72136	DH5CC100J04CR	16779445-310	1		
6-1		C36,37	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104H5U1CA	16771020-018	2		
6-1		C38,39	. CAPACITOR, FIXED, ELECTROLYTIC, 15UF, +-10%, 15VDC	26769	41KS156B015K1A	16758058-236	2		
6-1		C40	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3300PF, +-10%, 50VDC	61637	C320C332K1R5CA	16771625-038	1		
6-1		C41,42	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104H5U1CA	16771020-018	2		
6-1		C43-50	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-20%, 50VDC	61637	C320C103H5U1CA	16771020-011	8		
6-1		C51	. CAPACITOR, FIXED, MICA DIELECTRIC, 180PF, +-5%, 50VDC	72136	DH5FY181J04CR	16779445-538	1	A,C	
6-1		C51	. CAPACITOR, FIXED, MICA DIELECTRIC, 82PF, +-5%, 300VDC	72136	DH5EC820J04CR	16779445-329	1	B,D	
6-1		C52	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 470PF, +-5%, 50VDC	51406	RPE110C471J50V	16771624-028	1	A,C	
6-1		C52	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 220PF, +-5%, 100VDC	61637	C320C221J265CA	16771624-104	1	B,D	
6-1		C53	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000PF, +-5%, 50VDC	51406	RPE111C102J50V	16771624-032	1	A,C	
6-1		C53	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 470PF, +-5%, 50VDC	51406	RPE110C471J50V	16771624-028	1	B,D	
6-1		C54	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1800PF, +-5%, 50VDC	51406	RPE111C182J50V	16771624-035	1	A,C	
6-1		C54	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000PF, +-5%, 50VDC	51406	RPE111C102J50V	16771624-032	1	B,D	
6-1		C55	. CAPACITOR, FIXED, MICA DIELECTRIC, 200PF, +-5%, 50VDC	72136	DH5FY201J04CR	16779445-539	1	A,C	
6-1		C56	. CAPACITOR, FIXED, MICA DIELECTRIC, 200PF, +-5%, 50VDC	72136	DH5FY201J04CR	16779445-539	1		
6-1		C57	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3900PF, +-5%, 50VDC	51406	RPE111C392J50V	16771624-039	1	A,C	
6-1		C57	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1800PF, +-5%, 50VDC	51406	RPE111C182J50V	16771624-035	1	B,D	
6-1		C58	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 8200PF, +-5%, 50VDC	51406	RPE111C822J50V	16771624-043	1	A,C	
6-1		C58	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3900PF, +-5%, 50VDC	51406	RPE111C392J50V	16771624-039	1	B,D	
6-1		C59	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.015UF, +-5%, 50VDC	51406	RPE113C153J50V	16771624-046	1	A,C	
6-1		C59	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 8200PF, +-5%, 50VDC	51406	RPE111C822J50V	16771624-043	1	B,D	
6-1		C60	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.033UF, +-5%, 50VDC	51406	RPE113C333J50V	16771624-050	1	A,C	
6-1		C60	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.015UF, +-5%, 50VDC	51406	RPE113C153J50V	16771624-046	1	B,D	

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## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 3 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		C60	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.015UF, +-5%, 50VDC	18796	8131-050W5R153J	16771624-046	1	H,D	
6-1		C61	. CAPACITOR, FIXED, MICA DIELECTRIC, 130PF, +-5%, 50VDC	72136	DM5FY131J04CR	16779445-534	1	A,C	
6-1		C61	. CAPACITOR, FIXED, MICA DIELECTRIC, 56PF, +-5%, 300VDC	72136	DM5EC560J04CR	16779445-325	1	H,D	
6-1		C62	. CAPACITOR, FIXED, MICA DIELECTRIC, 62PF, +-5%, 50VDC	72136	DM5EY620J04CR	16779445-526	1	A,C	
6-1		C62	. CAPACITOR, FIXED, MICA DIELECTRIC, 15PF, +-5%, 300VDC	72136	DM5CC150J04CR	16779445-312	1	H,D	
6-1		C63	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600UF, +-5%, 50VDC	18796	8111-050W5R561J	16771624-029	1	A,C	
6-1		C63	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 330PF, +-5%, 50VDC	18796	8101-050W5R331J	16771624-026	1	H,D	
6-1		C64	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-5%, 50VDC	18796	8121-050W5R272J	16771624-037	1	A,C	
6-1		C64	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1500PF, +-5%, 50VDC	18796	8121-050W5R152J	16771624-034	1	B,D	
6-1		C65	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-5%, 50VDC	18796	8121-050W5R103J	16771624-044	1	A,C	
6-1		C65	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-5%, 50VDC	18796	8121-050W5R562J	16771624-041	1	B,D	
6-1		C66	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000 PF, +-10%, 50VDC	18796	8121-050W5R102K	16771625-032	1	A,C	
6-1		C66	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 560PF, +-10%, 50VDC	18796	8111-050W5R561K	16771625-029	1	H,D	
6-1		C67	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.039UF, +-5%, 50VDC	18796	8131-050W5R393J	16771624-051	1	A,C	
6-1		C67	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.022UF, +-5%, 50VDC	18796	8131-050W5R223J	16771624-044	1	H,D	
6-1		C68	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 4700PF, +-10%, 50VDC	18796	8121-050W5R472K	16771625-040	1	A,C	
6-1		C68	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-5%, 50VDC	18796	8121-050W5R272J	16771624-037	1	H,D	
6-1		C69	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.18UF, +-5%, 50VDC	18796	8131-050W5R184J	16771624-059	1	A,C	
6-1		C69	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1UF, +-5%, 50VDC	18796	8131-050W5R104J	16771624-056	1	H,D	
6-1		C70	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.68UF, +-10%, 50VDC	18796	8151-050W5R684K	16771625-066	1	A,C	
6-1		C70	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.39UF, +-10%, 50VDC	18796	8141-050W5R394K	16771625-063	1	B,D	
6-1		C71	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 2.7UF, +-10%, 50VDC	18796	8161-050X7R275K	16771625-070	1	A,C	
6-1		C71	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 1.5UF, +-10%, 50VDC	18796	8151-050X7R155K	16771625-069	1	B,D	
6-1		C72	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.018UF, +-10%, 50VDC	18796	8131-050W5R183K	16771625-047	1	A,C	
6-1		C72	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-5%, 50VDC	18796	8121-050W5R103J	16771624-044	1	H,D	
6-1		C73	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.039UF, +-10%, 50VDC	18796	8131-050-W5R-393K	16771625-051	1	A,C	
6-1		C73	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.018UF, +-10%, 50VDC	18796	8131-050W5R183K	16771625-047	1	H,D	

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## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 4 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER					
6-1		C74	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.082UF, +-10%, 50VDC	18796	8131-050NR823K		16771625-055	1	A,C	
6-1		C74	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.039UF, +-10%, 50VDC	18796	8131-050-MSR-393K		16771625-051	1	B,D	
6-1		C75	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 560PF, +-10%, 50VDC	18796	8111-050MSR561K		16771625-029	1	A,C	
6-1		C76,77	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	72982	8121-050-651-103M		16771020-011	2		
6-1		C78	. NOT USED							
6-1		C79	. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	72982	8121-050-651-103M		16771020-011	1		
6-1		C80-119	. NOT USED							
6-1		C120-123	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M		16771020-018	4		
6-1		J1	. NOT USED							
6-1		J2-7	. TERMINAL, PIN	22526	75401-001		16779270-001	18	A,C	
6-1		J2-7	. TERMINAL, PIN	22526	75401-001		16779270-001	20	B,D	
6-1		J8	. TERMINAL, PIN	22526	75401-001		16779270-001	3	B,D	
6-1		L1-4	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-819-1990		16750875-254	4		
6-1		L5	. COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167		16750875-246	1		
6-1		L6	. COIL, RADIO FREQUENCY, 10.0 UH, +-10%	99800	1537-36 5950-657-8167		16750875-246	1	A,C	
6-1		L6	. COIL, RADIO FREQUENCY, 4.70 UH, +-10%	99800	1537-28 5950-00-837-6029		16750875-238	1	B,D	
6-1		L7	. COIL, RADIO FREQUENCY, 330 UH, +-5%	99800	2500-04 5950-00-843-5042		16750875-614	1	A,C	
6-1		L7	. COIL, RADIO FREQUENCY, 150 UH, +-5%	99800	1537-84 5950-088-9182		16750875-340	1	B,D	
6-1		P1	. NOT USED							
6-1	1	P2-7	. BUS BAR	29593	85153-100-208		16779948-001	6		
6-1	1	P8	. PLUG, TIP	91506	8136-651P2		16781084-001	1	A,C	
6-1	1	P8	. BUS BAR	29593	85153-100-208		16779948-001	1	B,D	
6-1		Q1	. TRANSISTOR	04713	2N3906 5961-00-072-0128		16762173-001	1		
6-1		Q2,3	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	2		
6-1		Q4	. TRANSISTOR	04713	2N3906 5961-00-072-0128		16762173-001	1		
6-1		Q5	. TRANSISTOR	27014	PN5910-5		16775629-022	1		
6-1		Q6	. TRANSISTOR	27014	PN4274-5		16775630-021	1		
6-1		Q7,8	. TRANSISTOR	04713	SPS-8716		16776979-001	2		
6-1		Q9	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	1		
6-1		Q10	. TRANSISTOR	04713	2N3906 5961-00-072-0128		16762173-001	1		
6-1		Q11,12	. TRANSISTOR	80131	2N3904 5961-00-892-8706		16762172-001	2		

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## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 5 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1		Q13-31	. TRANSISTOR	04713	MPSA17-5	16776979-001	19		
6-1		R1,2	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/10W	81349	RNR50K2001FS	16780346-230	2		
6-1		R3,4	. RESISTOR, FIXED, METAL FILM, 1.65K OHMS, +-1%, 1/10W	81349	RNR50K1651FS	16780346-222	2	A,C	
6-1		R3,4	. RESISTOR, FIXED, METAL FILM, 5.36K OHMS, +-1%, 1/10W	81349	RNR50K5361FS	16780346-271	2	B,D	
6-1		R5,6	. NOT USED						
6-1		R7	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/10W	81349	RNR50K2001FS	16780346-230	1		
6-1		RR	. RESISTOR, VARIABLE, 2K OHMS, +-10%, 1/2W	73138	66XR2K 5905-00-098-8813	16771217-208	1	A,C	
6-1		RR	. RESISTOR, VARIABLE, 5K OHMS, +-10%, 1/2W	73138	66X5021/2W1PCT	16771217-209	1	B,D	
6-1		R9	. RESISTOR, FIXED, CARBON COMPOSITION, 750 OHMS, +-5%, 1/8W	81349	RCR05G751JS 5905-00-401-7429	16780345-070	1	A,C	
6-1		R9	. RESISTOR, FIXED, CARBON COMPOSITION, 1.2K OHMS, +-5%, 1/8W	81349	RCR05G122JS 5905-00-407-0081	16780345-075	1	B,D	
6-1		R10	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/10W	81349	RNR50K2001FS	16780346-230	1		
6-1		R11,12	. NOT USED						
6-1		R13	. RESISTOR, FIXED, CARBON COMPOSITION, 180 OHMS, +-5%, 1/8W	81349	RCR05G181JS 5905-00-458-9348	16780345-055	1		
6-1		R14,15	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/8W	81349	RCR05G101JS 5905-00-180-8301	16780345-049	2		
6-1		R16	. RESISTOR, FIXED, CARBON COMPOSITION, 30K OHMS, +-5%, 1/8W	81349	RCR05G303JS 5905-00-471-2226	16780345-108	1		
6-1		R17	. RESISTOR, FIXED, CARBON COMPOSITION, 2K OHMS, +-5%, 1/8W	81349	RCR05G202JS 5905-00-470-9481	16780345-080	1		
6-1		R18	. RESISTOR, FIXED, CARBON COMPOSITION, 12K OHMS, +-5%, 1/8W	81349	RCR05G123JS 5905-00-466-1215	16780345-099	1		
6-1		R19	. RESISTOR, FIXED, CARBON COMPOSITION, 20K OHMS, +-5%, 1/8W	81349	RCR05G203JS 5905-00-413-1200	16780345-104	1		
6-1		R20	. RESISTOR, FIXED, CARBON COMPOSITION, 4.7K OHMS, +-5%, 1/8W	81349	RCR05G472JS 5905-00-617-5091	16780345-089	1		
6-1		R21,22	. RESISTOR, FIXED, CARBON COMPOSITION, 51 OHMS, +-5%, 1/8W	81349	RCR05G510JS 5905-00-412-0758	16780345-042	2		
6-1		R23-26	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/10W	81349	RNR50K1001FS	16780346-201	4		
6-1		R27	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/8W	81349	RCR05G102JS 5905-00-458-9500	16780345-073	1		
6-1		R28	. NOT USED						
6-1		R29,30	. RESISTOR, FIXED, METAL FILM, 51.1K OHMS, +-1%, 1/10W	81349	RNR50K5112FS 5905-139-9873	16780346-369	2		
6-1		R31	. NOT USED						
6-1		R32	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1		
6-1		R33	. RESISTOR, FIXED, METAL FILM, 215 OHMS, +-1%, 1/10W	81349	RNR50K2150FS	16780346-133	1		
6-1		R34	. RESISTOR, FIXED, METAL FILM, 316 OHMS, +-1%, 1/10W	81349	RNR50K3160FS	16780346-149	1		

NOTES:

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 6 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R35	. RESISTOR, FIXED, METAL FILM, 75 OHMS, +-1%, 1/10W	81349	RNR50K75R0FS	16780346-085	1		
6-1		R36	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1		
6-1		R37	. RESISTOR, FIXED, CARBON COMPOSITION, 5.1K OHMS, +-5%, 1/8W	81349	RCR05G512JS 5905-00-689-1290	16780345-090	1		
6-1		R38	. RESISTOR, FIXED, CARBON COMPOSITION, 1.8K OHMS, +-5%, 1/8W	81349	RCR05G182JS 5905-00-407-0082	16780345-079	1		
6-1		R39	. RESISTOR, FIXED, CARBON COMPOSITION, 1.2K OHMS, +-5%, 1/8W	81349	RCR05G122JS 5905-00-407-0081	16780345-075	1		
6-1		R40	. RESISTOR, FIXED, CARBON COMPOSITION, 12K OHMS, +-5%, 1/8W	81349	RCR05G123JS 5905-00-466-1215	16780345-099	1		
6-1		R41,42	. RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699	16780345-025	2		
6-1		R43	. RESISTOR, FIXED, CARBON COMPOSITION, 560 OHMS, +-5%, 1/8W	81349	RCR05G561JS 5905-00-401-7428	16780345-067	1		
6-1		R44	. RESISTOR, FIXED, METAL FILM, 6.19K OHMS, +-1%, 1/10W	81349	RNR50K6191FS	16780346-277	1		
6-1		R45	. RESISTOR, FIXED, METAL FILM, 15.0K OHMS, +-1%, 1/10W	81349	RNR50K1542FS	16780346-319	1		
6-1		R46	. RESISTOR, VARIABLE, 10K OHMS, +-10%, 3/4W	73138	89PR10K 5905-00-003-2537	16775165-010	1		
6-1		R47	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1		
6-1		R48	. RESISTOR, FIXED, CARBON COMPOSITION, 470K OHMS, +-5%, 1/8W	81349	RCR05G474JS 5905-00-495-2022	16780345-137	1		
6-1		R49,50	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/10W	81349	RNR50K1003FS 5905-767-0830	16780346-401	2		
6-1		R51	. RESISTOR, FIXED, METAL FILM, 11.5K OHMS, +-1%, 1/10W	81349	RNR50K1152FS	16780346-307	1		
6-1		R52	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/10W	81349	RNR50K1002FS	16780346-301	1		
6-1		R53	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1		
6-1		R54	. RESISTOR, FIXED, CARBON COMPOSITION, 180K OHMS, +-5%, 1/8W	81349	RCR05G184JS 5905-00-480-6885	16780345-127	1		
6-1		R55	. RESISTOR, FIXED, CARBON COMPOSITION, 3.9K OHMS, +-5%, 1/8W	81349	RCR05G392JS 5905-00-433-6483	16780345-087	1		
6-1		R56	. RESISTOR, FIXED, METAL FILM, 6.9K OHMS, +-1%, 1/10W	81349	RNR50K6981FS	16780346-282	1		
6-1		R57	. RESISTOR, FIXED, METAL FILM, 10.2K OHMS, +-1%, 1/10W	81349	RNR50K1022FS	16780346-302	1		
6-1		R58	. RESISTOR, FIXED, METAL FILM, 23.7K OHMS, +-1%, 1/10W	81349	RNR50K2372FS 5905-137-4637	16780346-337	1		
6-1		R59	. RESISTOR, FIXED, METAL FILM, 5.3K OHMS, +-1%, 1/10W	81349	RNR50K5361FS	16780346-271	1		
6-1		R60	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/8W	81349	RCR05G101JS 5905-00-180-8301	16780345-049	1		
6-1		R61,62	. RESISTOR, FIXED, CARBON COMPOSITION, 6.2K OHMS, +-5%, 1/8W	81349	RCR05G622JS 5905-00-470-9163	16780345-092	2		
6-1		R63	. RESISTOR, FIXED, CARBON COMPOSITION, 150 OHMS, +-5%, 1/2W	81349	RCR20G151JM	16750076-529	1		
6-1		R64,65	. RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699	16780345-025	2		
NOTES:									

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 7 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-1		R66	. RESISTOR, FIXED, CARBON COMPOSITION, 150 OHMS, +-5%, 1/2W	81349	RCR20G151JM	16750076-529	1		
6-1		R67	. RESISTOR, FIXED, CARBON COMPOSITION, 47 OHMS, +-5%, 1/2W	81349	HCR20G470JM	16750076-517	1		
6-1		R68	. RESISTOR, VARIABLE, 500 OHMS, +-10%, 3/4W	73138	89-12-0	16775165-206	1		
6-1		R69	. RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/10W	81349	RNR50K1000FS 5905-00-139-9871	16780346-101	1		
6-1		R70	. RESISTOR, FIXED, CARBON COMPOSITION, 5.1K OHMS, +-5%, 1/8W	81349	RCR05G512JS 5905-00-689-1290	16780345-090	1		
6-1		R71	. RESISTOR, FIXED, CARBON COMPOSITION, 3.3K OHMS, +-5%, 1/8W	81349	RCR05G332JS 5905-00-401-7427	16780345-085	1		
6-1		R72-74	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	3		
6-1		R75-82	. RESISTOR, FIXED, CARBON COMPOSITION, 3 MEG OHMS, +-5%, 1/8W	81349	RCR05G305JS 5905-00-483-0425	16780345-156	4		
6-1		R83	. RESISTOR, FIXED, METAL FILM, 1.62K OHMS, +-1%, 1/10W	81349	RNR50K1621FS	16780346-271	1		A,C
6-1		R83	. RESISTOR, VARIABLE, 5000 OHMS, +-20%, 1/2W	02111	62-2-1-5000	16781746-109	1		B,D
6-1		R84	. RESISTOR, FIXED, METAL FILM, 806 OHMS, +-1%, 1/10W	81349	RNR50K8060FS	16780346-188	1		A,C
6-1		R84	. RESISTOR, VARIABLE, 2000 OHMS, +-20%, 1/2W	02111	62-2-1-2000	16781746-108	1		B,D
6-1		R85	. RESISTOR, FIXED, METAL FILM, 402 OHMS, +-1%, 1/10W	81349	RNR50K4020FS	16780346-159	1		A,C
6-1		R85	. RESISTOR, VARIABLE, 1000 OHMS, +-20%, 1/2W	02111	62-2-1-1000	16781746-107	1		B,D
6-1		R86	. RESISTOR, FIXED, METAL FILM, 196 OHMS, +-1%, 1/10W	81349	RNR50K1960FS	16780346-129	1		A,C
6-1		R86	. RESISTOR, VARIABLE, 500 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-106	1		B,D
6-1		R87	. RESISTOR, FIXED, METAL FILM, 97.6 OHMS, +-1%, 1/10W	81349	RNR50K97R6FS	16780346-096	1		A,C
6-1		R87	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200 5905-00-520-9442	16781746-105	1		B,D
6-1		R88	. RESISTOR, FIXED, CARBON COMPOSITION, 43 OHMS, +-5%, 1/8W	81349	RCR05G430JS 5905-00-407-0087	16780345-040	1		A,C
6-1		R88	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200 5905-00-520-9442	16781746-105	1		B,D
6-1		R89	. RESISTOR, FIXED, CARBON COMPOSITION, 30 OHMS, +-5%, 1/8W	81349	RCR05G300JS 5905-00-479-6619	16780345-036	1		A,C
6-1		R89	. RESISTOR, VARIABLE, 100 OHMS, +-20%, 1/2W	02111	62-2-1-101	16781746-104	1		B,D
6-1		R90	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/8W	81349	RCR05G220JS 5905-00-433-1853	16780345-033	1		A,C
6-1		R90	. RESISTOR, VARIABLE, 50 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-103	1		B,D
6-1		R91-93	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	3		
6-1		R94-96	. RESISTOR, FIXED, CARBON COMPOSITION, 3 MEG OHMS, +-5%, 1/8W	81349	RCR05G305JS 5905-00-483-0425	16780345-156	3		
6-1		R97	. RESISTOR, FIXED, METAL FILM, 10 OHMS, +-1%, 1/8W	81349	RNR55K10R0FS 5905-00-490-8223	16757165-001	1		

NOTES:

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 8 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
						FEDERAL STOCK NUMBER				
6-1		R98-119	. NOT USED							
6-1		R120,121	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	2			
6-1		R122	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/8W	81349	RCR05G562JS 5905-00-411-1851	16780345-091	1			
6-1		R123	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/10W	81349	RNR50K1002FS	16780346-301	1			
6-1		R124	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/8W	81349	RCR05G101JS 5905-00-180-8301	16780345-049	1			
6-1		R125	. RESISTOR, FIXED, CARBON COMPOSITION, 5.6K OHMS, +-5%, 1/8W	81349	RCR05G562JS 5905-00-411-1851	16780345-091	1			
6-1		R126	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1			
6-1		TP1	. TERMINAL, STUD	71279	1558-2 5940-813-0563	16750201-022	1			
6-1		TP2,3	. TERMINAL, STUD	71279	2027-2 5940-00-280-0601	16757170-002	2			
6-1		U1,2	. INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318M	16776656-001	2			
6-1		U3	. INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	NAT208	16776697-001	1			
6-1		U4	. INTEGRATED CIRCUIT, LOGIC GATE	01295	SN74300N	16776155-001	1			
6-1		U5	. MICROCIRCUIT	01295	SN74LS193N	16779459-002	1			
6-1		U6,7	. MICROCIRCUIT	01295	SN74LS191N	99000294-001	2			
6-1		U8	. MICROCIRCUIT	01295	SN74LS32M	16780406-001	1			
6-1		U9	. INTEGRATED CIRCUIT	27014	LM318N	16776656-003	1			
6-1		U10	. INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	04713	MC1458C	16775977-001	1			
6-1		U11	. MICROCIRCUIT	27014	DM74LS13AN	99000267-001	1			
6-1		U12,13	. INTEGRATED CIRCUIT	27014	LM324M 5962-01-008-4A26	16779170-001	2			
6-1		U14	. DELAY LINE	32155	50-494	16783172-001	1			
6-1		U15,16	. RESISTOR NETWORK	11236	75-83R10KOHMS	16780508-005	2			
6-1		U17,18	. RESISTOR NETWORK	11236	750-83R5-1KOHM	16780508-013	2			
6-1		U19-119	. NOT USED							
6-1		U120	. INTEGRATED CIRCUIT	27014	LM310M	16774985-003	1			
6-1		U121	. INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210M	16774985-002	1			
6-1		U122	. INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JM	16779188-002	1			
6-1		VR1	. SEMICONDUCTOR DEVICE, DIODE	80131	1N4736A 5961-932-4026	16737938-109	1			
6-1		VR2	. SEMICONDUCTOR DEVICE, DIODE, ZENER	80131	1N821 5961-00-951-6375	16757931-001	1			
6-1		VR3	. SEMICONDUCTOR DEVICE, DIODE,	04713	1N5223A	16774066-003	1			
6-1		W1-5	. PLUG, TIP	91506	A136-651P2	16781084-001	5			
6-1	2		. TERMINAL, PIN	22526	75401-003	16779270-003	56			
6-1	3		. EJECTOR, PRINTED WIRING BOARD	14677	202RED	16760704-004	1		A	

NOTES:

## SECTION 6

TABLE 6-1. FM REPRODUCE CCA (SHEET 9 OF 9)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
						FEDERAL STOCK NUMBER				
6-1	3		. EJECTOR, PRINTED WIRING BOARD	18677	202GREEN		16760704-00R	1	H	
6-1	4		. BUMPER, PLASTIC	11897	138NN5324		167R0426-003	1		
6-1	5		. SHIELD	28009			16781263-002	1		
NOTES:										

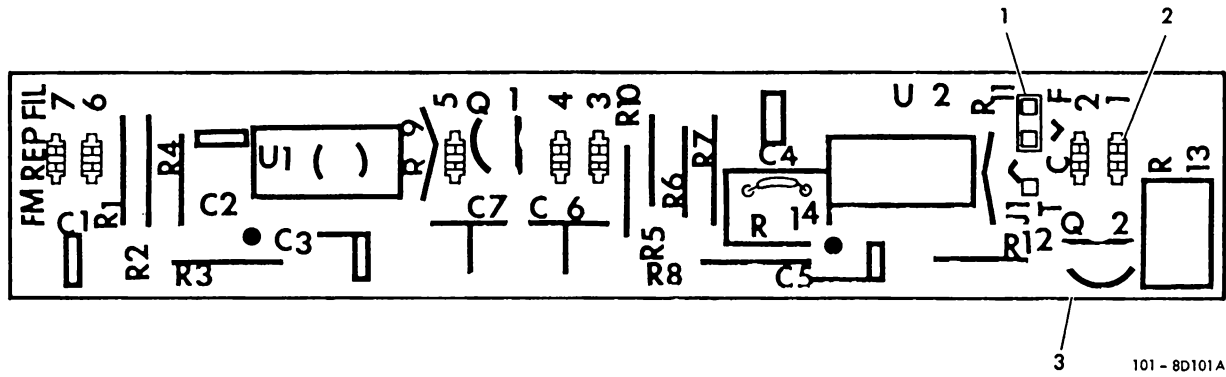


FIGURE 6-2. FM REPRODUCE FILTER CIRCUIT CARD ASSEMBLY



## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 1 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 80KHZ, MEDIUM BAND	28009		16781328-001	REF	A	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 40KHZ, MEDIUM BAND	28009		16781328-002	REF	B	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 20KHZ, MEDIUM BAND	28009		16781328-003	REF	C	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 10KHZ, MEDIUM BAND	28009		16781328-004	REF	D	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 5KHZ, MEDIUM BAND	28009		16781328-005	REF	E	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 2.5KHZ, MEDIUM BAND	28009		16781328-006	REF	F	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 1.25KHZ, MEDIUM BAND	28009		16781328-007	REF	G	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, .625KHZ, MEDIUM BAND	28009		16781328-008	REF	H	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, .313KHZ, MEDIUM BAND	28009		16781328-009	REF	J	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 500KHZ, WIDEBAND	28009		16781328-109	REF	K	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 250KHZ, WIDEBAND	28009		16781328-110	REF	L	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 125KHZ, WIDEBAND	28009		16781328-103	REF	M	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 62.5KHZ, WIDEBAND	28009		16781328-104	REF	N	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 31.3KHZ, WIDEBAND	28009		16781328-105	REF	P	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 15.6KHZ, WIDEBAND	28009		16781328-106	REF	Q	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 7.81KHZ, WIDEBAND	28009		16781328-107	REF	R	
6-2			CIRCUIT CARD ASSEMBLY, FM REPRODUCE FILTER, 3.9KHZ, WIDEBAND	28009		16781328-108	REF	S	
6-2		C1	• NOT USED						A-J
6-2		C1	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 330PF, +-1%, 100VDC	95275	VJ0905A331FF	16781886-034	1	K	
6-2		C1	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 620PF, +-1%, 100VDC	95275	VJ0905A621FF	16781886-040	1	L-N	
6-2		C1	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-1%, 100VDC	95275	VJ1808A272FF	16781886-049	1	P-S	
6-2		C2	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000PF, +-1%, 100VDC	95275	VJ0905A102FF	16781886-043	1	A-E	
6-2		C2	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 6800PF, +-1%, 100VDC	95275	VJ1812A682FF	16781886-055	1	F-J	
6-2		C2	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 680PF, +-1%, 100VDC	95275	VJ0905A681FF	16781886-041	1	K	
6-2		C2	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1300PF, +-1%, 100VDC	95275	VJ0905A132FF	16781886-045	1	L-N	
6-2		C2	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-1%, 100VDC	95275	VJ1812A562FF	16781886-054	1	P-S	
6-2		C3	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 490PF, +-1%, 100VDC	95275	VJ0905A491FF	16781886-037	1	A-E	

NOTES:

## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 2 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-2		C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3400PF, +-1%, 100VDC	95275	VJ1808A342FF	16781886-051	1	F-J	
6-2		C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 24PF, +-1%, 100VDC	95275	VJ0905A240FF	16781886-015	1	K	
6-2		C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 51PF, +-1%, 100VDC	95275	VJ0905A510FF	16781886-021	1	L-N	
6-2		C3	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 240PF, +-1%, 100VDC	95275	VJ0905A241FF	16781886-032	1	P-S	
6-2		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-1%, 100VDC	95275	VJ1812A562FF	16781886-054	1	A-F	
6-2		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.018UF, +-1%, 100VDC	95275	VJ1812A183FF	16781886-061	1	G-J	
6-2		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-1%, 100VDC	95275	VJ1808A272FF	16781886-049	1	K, L	
6-2		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-1%, 100VDC	95275	VJ1812A562FF	16781886-054	1	M-S	
6-2		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 160PF, +-1%, 100VDC	95275	VJ0905A161FF	16781886-029	1	A	
6-2		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 150PF, +-1%, 100VDC	95275	VJ0905A151FF	16781886-028	1	B-F	
6-2		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 510PF, +-1%, 100VDC	95275	VJ0905A511FF	16781886-038	1	G-J	
6-2		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 27PF, +-1%, 100VDC	95275	VJ0905A270FF	16781886-016	1	K	
6-2		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 62PF, +-1%, 100VDC	95275	VJ0905A620FF	16781886-023	1	M-S	
6-2		C6,7	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-20%, 25VDC	56289	11C0805XRT104M250A	16783247-021	2		
6-2		J1	. TERMINAL, PIN	22526	75401-001	16779270-001	3		
6-2	1	P1	. BUS BAR	29593	B5133A100-2G	16779948-001	1		
6-2		Q1,2	. TRANSISTOR	04713	SPS-8716	16776979-001	2		
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699	16780345-025	1	A	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 30 OHMS, +-5%, 1/8W	81349	RCR05G300JS 5905-00-479-6619	16780345-036	1	B	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699	16780345-025	1	C, D	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 1.5K OHMS, +-5%, 1/8W	81349	RCR05G152JS 5905-00-180-8303	16780345-077	1	E	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 10 OHMS, +-5%, 1/8W	81349	RCR05G100JS 5905-00-255-3699	16780345-025	1	F, G	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 1.8K OHMS, +-5%, 1/8W	81349	RCR05G182JS 5905-00-407-0082	16780345-079	1	H	
6-2		R1	. RESISTOR, FIXED, CARBON COMPOSITION, 1.5K OHMS, +-5%, 1/8W	81349	RCR05G152JS 5905-00-180-8303	16780345-077	1	J	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 3.01K OHMS, +-1%, 1/10W	81349	RNR50K3011F5	16780346-247	1	K	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 3.16K OHMS, +-1%, 1/10W	81349	RNR50K3161F5	16780346-249	1	L	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 6.34K OHMS, +-1%, 1/10W	81349	RNR50K6341F5	16780346-278	1	M	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 12.7K OHMS, +-1%, 1/10W	81349	RNR50K1272F5	16780346-311	1	N	

NOTES:

## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 3 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2		R1	. RESISTOR, FIXED, METAL FILM, 5.90K OHMS, +-1%, 1/10W	81349	RNR50K5901FS	16780346-275	1	P	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 11.8K OHMS, +-1%, 1/10W	81349	RNR50K1182FS	16780346-308	1	O	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 23.2K OHMS, +-1%, 1/10W	81349	RNR50K2322FS	16780346-336	1	R	
6-2		R1	. RESISTOR, FIXED, METAL FILM, 46.4K OHMS, +-1%, 1/10W	81349	RNR50K4642FS	16780346-365	1	S	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 4.64K OHMS, +-1%, 1/10W	81349	RNR50K4641FS	16780346-265	1	A	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 9.31K OHMS, +-1%, 1/10W	81349	RNR50K9311FS	16780346-294	1	B	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 18.7K OHMS, +-1%, 1/10W	81349	RNR50K1872FS	16780346-327	1	C	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 37.4K OHMS, +-1%, 1/10W	81349	RNR50K3742FS	16780346-356	1	D	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 73.2K OHMS, +-1%, 1/10W	81349	RNR50K7322FS	16780346-384	1	E	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 22.1K OHMS, +-1%, 1/10W	81349	RNR50K2212FS	16780346-334	1	F	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 44.2K OHMS, +-1%, 1/10W	81349	RNR50K4422FS	16780346-363	1	G	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 86.6K OHMS, +-1%, 1/10W	81349	RNR50K8662FS	16780346-391	1	H	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 178K OHMS, +-1%, 1/10W	81349	RNR50K1783FS	16780346-425	1	J	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 3.01K OHMS, +-1%, 1/10W	81349	RNR50K3011FS	16780346-247	1	K	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 3.16K OHMS, +-1%, 1/10W	81349	RNR50K3161FS	16780346-249	1	L	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 6.34K OHMS, +-1%, 1/10W	81349	RNR50K6341FS	16780346-278	1	M	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 12.7K OHMS, +-1%, 1/10W	81349	RNR50K1272FS	16780346-311	1	N	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 5.90K OHMS, +-1%, 1/10W	81349	RNR50K5901FS	16780346-275	1	P	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 11.8K OHMS, +-1%, 1/10W	81349	RNR50K1182FS	16780346-308	1	O	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 23.7K OHMS, +-1%, 1/10W	81349	RNR50K2372FS 5905-137-4637	16780346-337	1	R	
6-2		R2	. RESISTOR, FIXED, METAL FILM, 47.5K OHMS, +-1%, 1/10W	81349	RNR50K4752FS	16780346-366	1	S	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 4.75K OHMS, +-1%, 1/10W	81349	RNR50K4751FS	16780346-266	1	A	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 9.53K OHMS, +-1%, 1/10W	81349	RNR50K9531FS	16780346-295	1	B	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 19.1K OHMS, +-1%, 1/10W	81349	RNR50K1912FS	16780346-328	1	C	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 38.3K OHMS, +-1%, 1/10W	81349	RNR50K3832FS	16780346-357	1	D	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 76.8K OHMS, +-1%, 1/10W	81349	RNR50K7682FS	16780346-386	1	E	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 22.1K OHMS, +-1%, 1/10W	81349	RNR50K2212FS	16780346-334	1	F	

NOTES:

## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 4 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2		R3	. RESISTOR, FIXED, METAL FILM, 44.2K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K4422FS	16780346-363	1	G	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 88.7K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K8872FS 5905-00-137-4642	16780346-392	1	H	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 178K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K1783FS	16780346-425	1	J	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 3.32K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K3321FS	16780346-251	1	K,L	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 6.34K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K6341FS	16780346-278	1	M	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 12.7K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K1272FS	16780346-311	1	N	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 5.90K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K5901FS	16780346-275	1	P	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 11.8K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K1182FS	16780346-308	1	O	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 23.7K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K2372FS 5905-137-4637	16780346-337	1	R	
6-2		R3	. RESISTOR, FIXED, METAL FILM, 47.5K OHMS, $\pm 1\%$ , 1/10W	81349	RNR50K4752FS	16780346-366	1	S	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 13K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G133JS 5905-00-232-3113	16780345-100	1	A	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 24K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G243JS 5905-00-180-8313	16780345-106	1	B	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 51K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G513JS 5905-00-180-8314	16780345-114	1	C	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G104JS 5905-00-459-9346	16780345-121	1	D	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 0.20 MEG OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G204JS 5905-00-470-1319	16780345-128	1	E	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 68K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G683JS 5905-00-466-1217	16780345-117	1	F	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 0.13 MEG OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G134JS 5905-00-471-4797	16780345-124	1	G	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 0.22 MEG OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G224JS 5905-00-412-4044	16780345-129	1	H	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 0.43 MEG OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G434JS 5905-00-483-0428	16780345-136	1	J	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 8.2K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G822JS 5905-00-466-1218	16780345-095	1	K	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	1	L	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 22K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G223JS 5905-00-403-8837	16780345-105	1	M	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 39K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G393JS 5905-00-407-0086	16780345-111	1	N	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 22K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G223JS 5905-00-403-8837	16780345-105	1	P	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 39K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G393JS 5905-00-407-0086	16780345-111	1	O	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 75K OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G753JS 5905-00-407-0089	16780345-118	1	R	
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 0.15 MEG OHMS, $\pm 5\%$ , 1/8W	81349	RCR05G154JS 5905-00-484-7550	16780345-125	1	S	

NOTES:

## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 6 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2		R7	. RESISTOR, FIXED, METAL FILM, 8.06K OHMS, +-1%, 1/10W	81349	RNR50K8061FS	16780346-288	1	P	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 16.2K OHMS, +-1%, 1/10W	81349	RNR50K1622FS	16780346-321	1	Q	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	R	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	S	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/10W	81349	RNR50K2001FS	16780346-230	1	A	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 4.22K OHMS, +-1%, 1/10W	81349	RNR50K4221FS	16780346-261	1	B	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 8.45K OHMS, +-1%, 1/10W	81349	RNR50K8451FS	16780346-290	1	C	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 16.9K OHMS, +-1%, 1/10W	81349	RNR50K1692KS	16780346-323	1	D	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	E	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	F	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 40.2K OHMS, +-1%, 1/10W	81349	RNR50K4022FS	16780346-359	1	G	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 82.5K OHMS, +-1%, 1/10W	81349	RNR50K8252FS	16780346-389	1	H	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 162K OHMS, +-1%, 1/10W	81349	RNR50K1623FS	16780346-421	1	J	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 909 OHMS, +-1%, 1/10W	81349	RNR50K9090FS	16780346-193	1	K	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 1.78K OHMS, +-1%, 1/10W	81349	RNR50K1781FS	16780346-225	1	L	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 2.05K OHMS, +-1%, 1/10W	81349	RNR50K2051FS	16780346-231	1	M	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 4.12K OHMS, +-1%, 1/10W	81349	RNR50K4121FS	16780346-260	1	N	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 8.25K OHMS, +-1%, 1/10W	81349	RNR50K8251FS	16780346-289	1	P	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 16.5K OHMS, +-1%, 1/10W	81349	RNR50K1652FS	16780346-322	1	Q	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	R	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	S	
6-2		R9-12	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103JS 5905-00-492-7607	16780345-097	4		
6-2		R13	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200	16781746-005	1	A-J	
6-2		R13	. RESISTOR, VARIABLE, 500 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-006	1	K-S	
6-2		R14	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200	16781746-005	1	K	
6-2		R14	. RESISTOR, VARIABLE, 500 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-006	1	L	
6-2		U1,2	. INTEGRATED CIRCUIT	27014	LM310N	16774985-003	2		

NOTES:

## SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 6 OF 7)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2		R7	. RESISTOR, FIXED, METAL FILM, 8.06K OHMS, +-1%, 1/10W	81349	RNR50K8061FS	16780346-288	1	P	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 16.2K OHMS, +-1%, 1/10W	81349	RNR50K1622FS	16780346-321	1	Q	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	R	
6-2		R7	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	S	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/10W	81349	RNR50K2001FS	16780346-230	1	A	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 4.22K OHMS, +-1%, 1/10W	81349	RNR50K4221FS	16780346-261	1	B	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 8.45K OHMS, +-1%, 1/10W	81349	RNR50K8451FS	16780346-290	1	C	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 16.9K OHMS, +-1%, 1/10W	81349	RNR50K1692KS	16780346-323	1	D	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	E	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	F	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 40.2K OHMS, +-1%, 1/10W	81349	RNR50K4022FS	16780346-359	1	G	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 82.5K OHMS, +-1%, 1/10W	81349	RNR50K8252FS	16780346-389	1	H	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 162K OHMS, +-1%, 1/10W	81349	RNR50K1623FS	16780346-421	1	J	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 909 OHMS, +-1%, 1/10W	81349	RNR50K9090FS	16780346-193	1	K	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 1.78K OHMS, +-1%, 1/10W	81349	RNR50K1781FS	16780346-225	1	L	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 2.05K OHMS, +-1%, 1/10W	81349	RNR50K2051FS	16780346-231	1	M	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 4.12K OHMS, +-1%, 1/10W	81349	RNR50K4121FS	16780346-260	1	N	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 8.25K OHMS, +-1%, 1/10W	81349	RNR50K8251FS	16780346-289	1	P	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 16.5K OHMS, +-1%, 1/10W	81349	RNR50K1652FS	16780346-322	1	Q	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 33.2K OHMS, +-1%, 1/10W	81349	RNR50K3322FS 5905-00-774-3932	16780346-351	1	R	
6-2		R8	. RESISTOR, FIXED, METAL FILM, 66.5K OHMS, +-1%, 1/10W	81349	RNR50K6652FS	16780346-380	1	S	
6-2		R9-12	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/8W	81349	RCR05G103J5 5905-00-492-7607	16780345-097	4		
6-2		R13	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200	16781746-005	1	A-J	
6-2		R13	. RESISTOR, VARIABLE, 500 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-006	1	K-S	
6-2		R14	. RESISTOR, VARIABLE, 200 OHMS, +-20%, 1/2W	02111	62-2-1-200	16781746-005	1	K	
6-2		R14	. RESISTOR, VARIABLE, 500 OHMS, +-20%, 1/2W	02111	62-2-1-500	16781746-006	1	L	
6-2		U1,2	. INTEGRATED CIRCUIT	27014	LM310N	16774985-003	2		

NOTES:

SECTION 6

TABLE 6-2. FM REPRODUCE FILTER CCA (SHEET 7 OF 7)

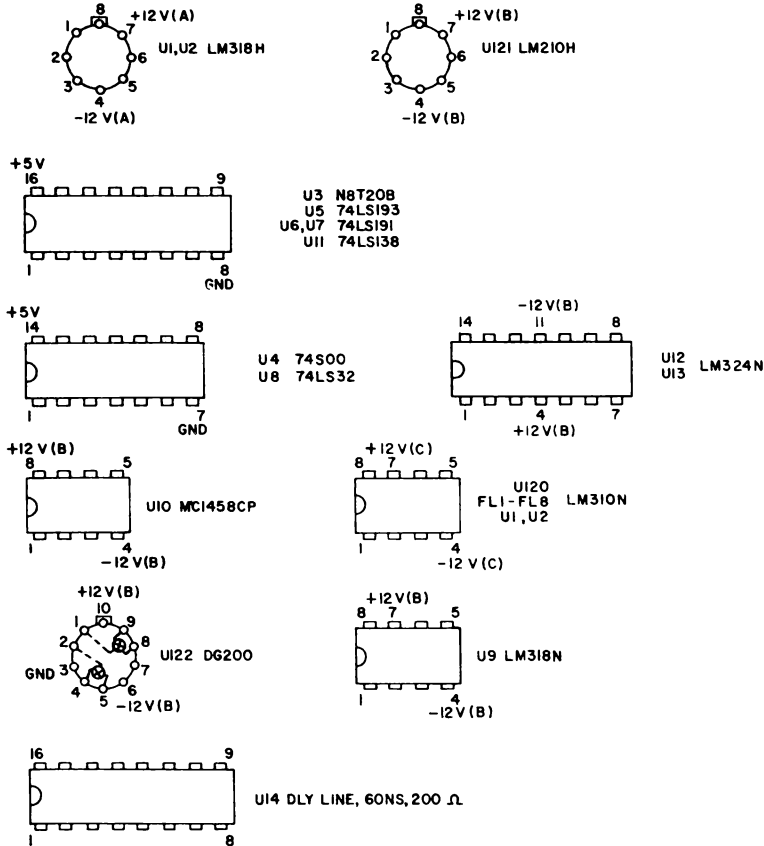
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2	2		. CONTACT, ELECTRICAL CONNECTOR	47874	22526	16776633-011	7		
6-2	3		. PRINTED WIRING BOARD	28009		16781327-001	1		
NOTES:									

SECTION 7  
SCHEMATICS

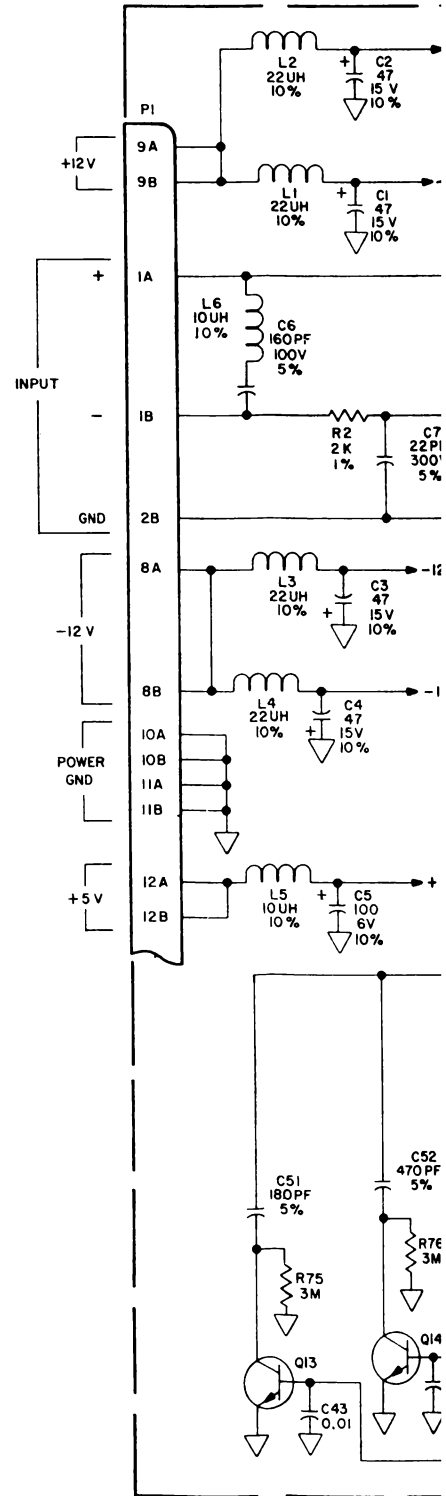


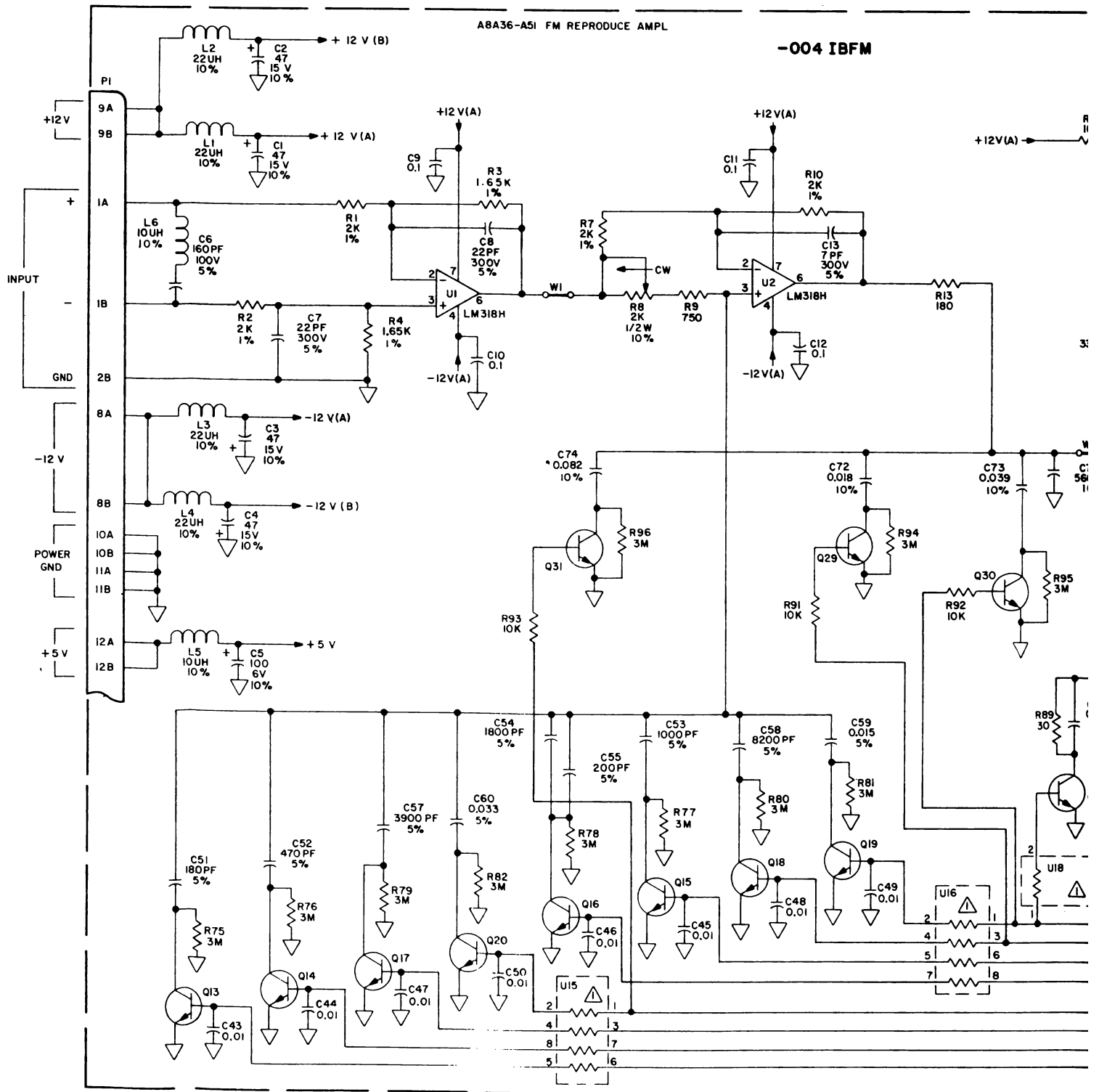
NOTES:

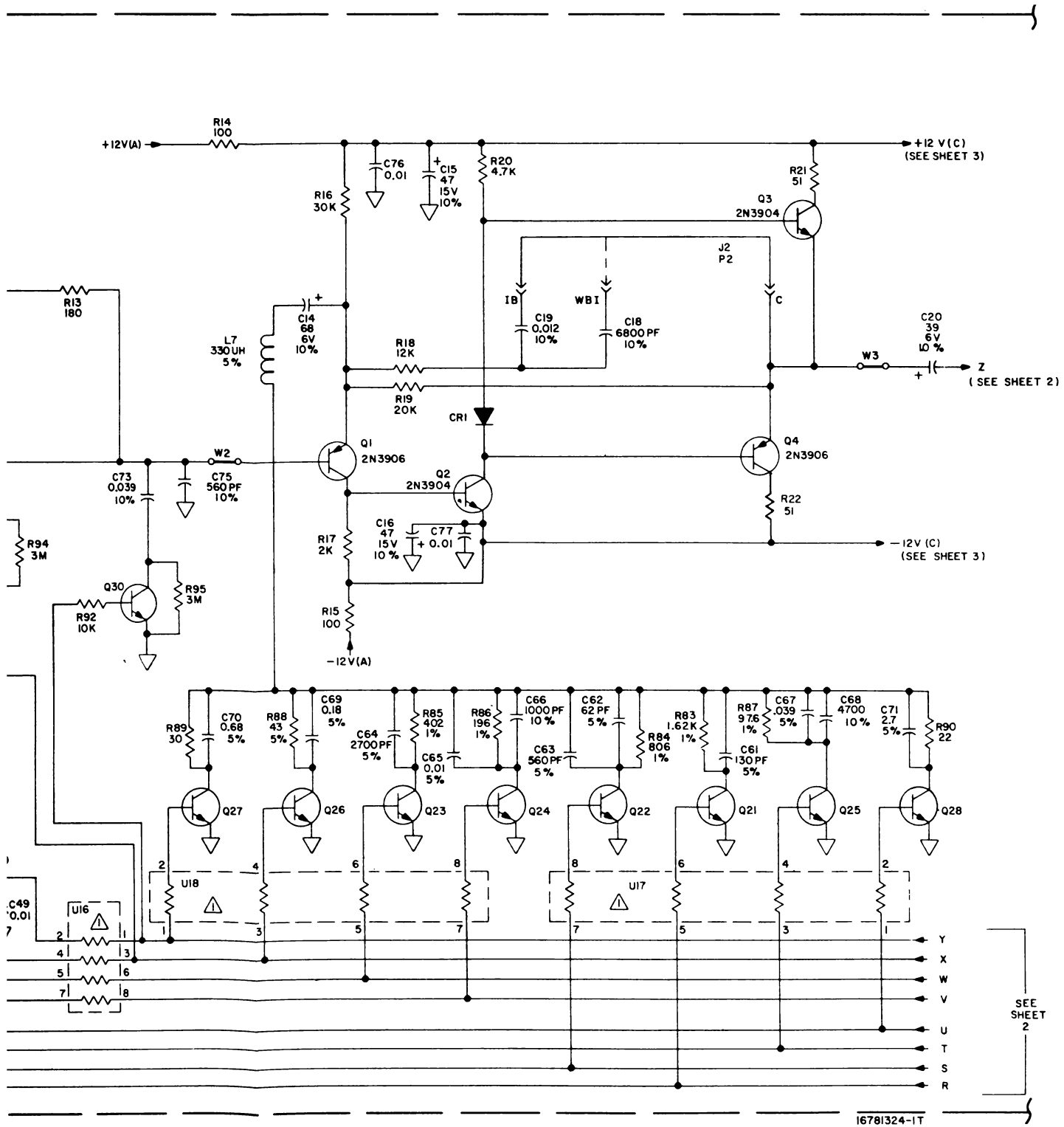
1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8 W, 5%.  
 ALL 1% RESISTORS ARE 1/10 W.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL TRANSISTORS ARE MPS A17-5.
2. LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3. ▽ DENOTES CIRCUIT COMMON, LIKE NUMBERS INDICATE COMMON TIE POINT.
4. ▲ U15 AND U16 ARE RESISTOR ARRAYS, 10K, 2%.  
 U17 AND U18 ARE RESISTOR ARRAYS, 5.1K, 2%.  
 ▲ LOGIC FOR CONTROL LINES AND I.C. SWITCHES IS NEG "0" TRUE.
5. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN



6. WAVEFORMS ARE TYPICAL OF MEDIUM BAND FM REPRODUCE CARDS,  
 WBI MODE, 120 IPS.  
 CARRIER FREQUENCY INPUT TO P1-19A (E TO E BUS) IS UNMODULATED ON  
 WAVEFORMS A, B, AND C, AND MODULATED BY 80KHz SINEWAVE ON WAVEFORMS D AND E.







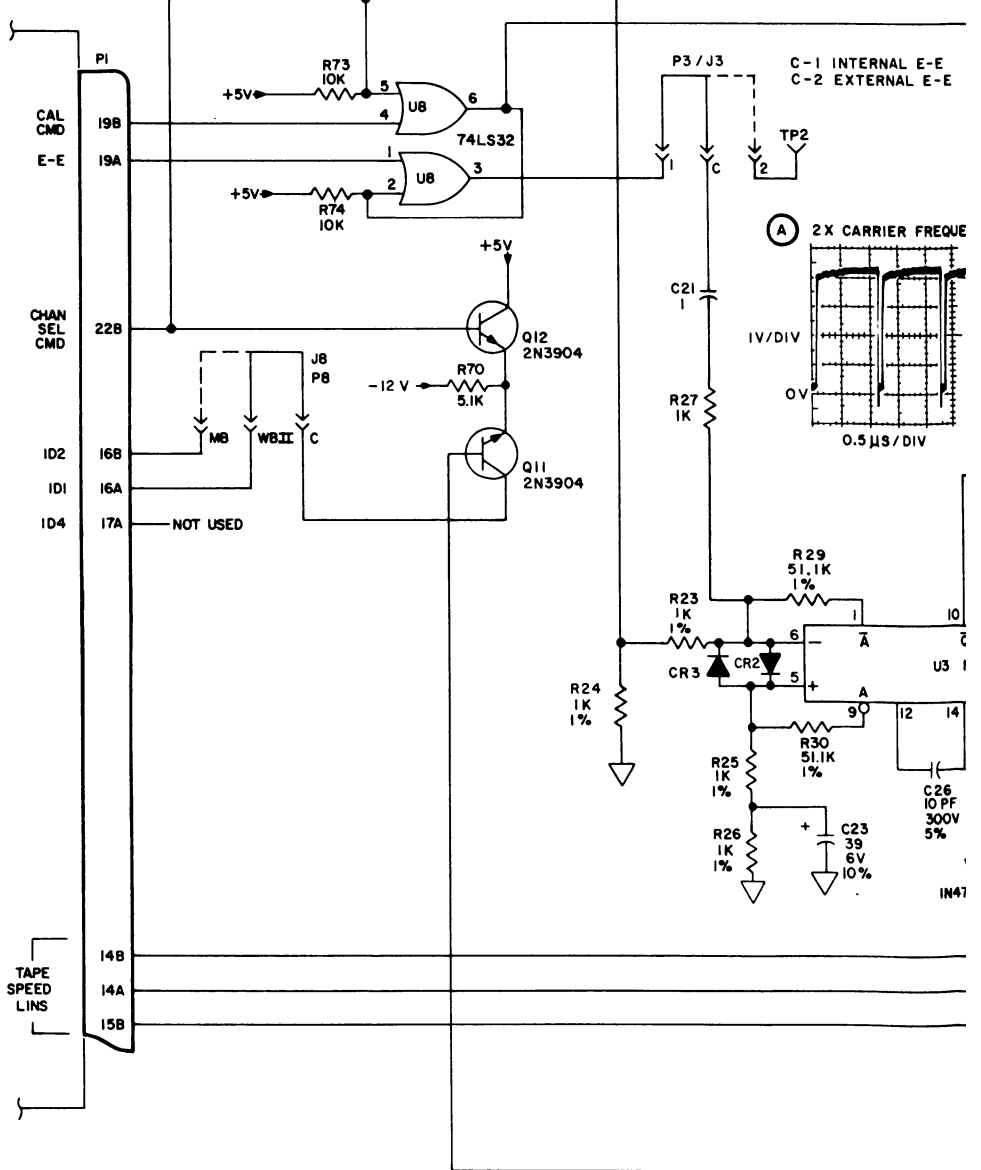
Used On - 101, 103, 104, and -105 Only

REF: 16781324-1N

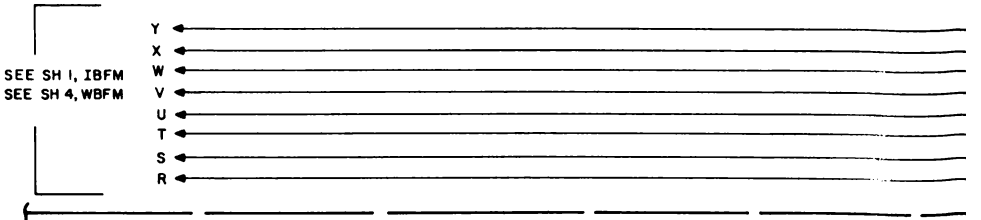
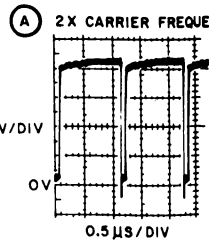
Figure 7-1. FM Reproduce Circuit Card Schematic  
(Sheet 1 of 9)

A8A36-A51 FM REPRODUCE AMPL

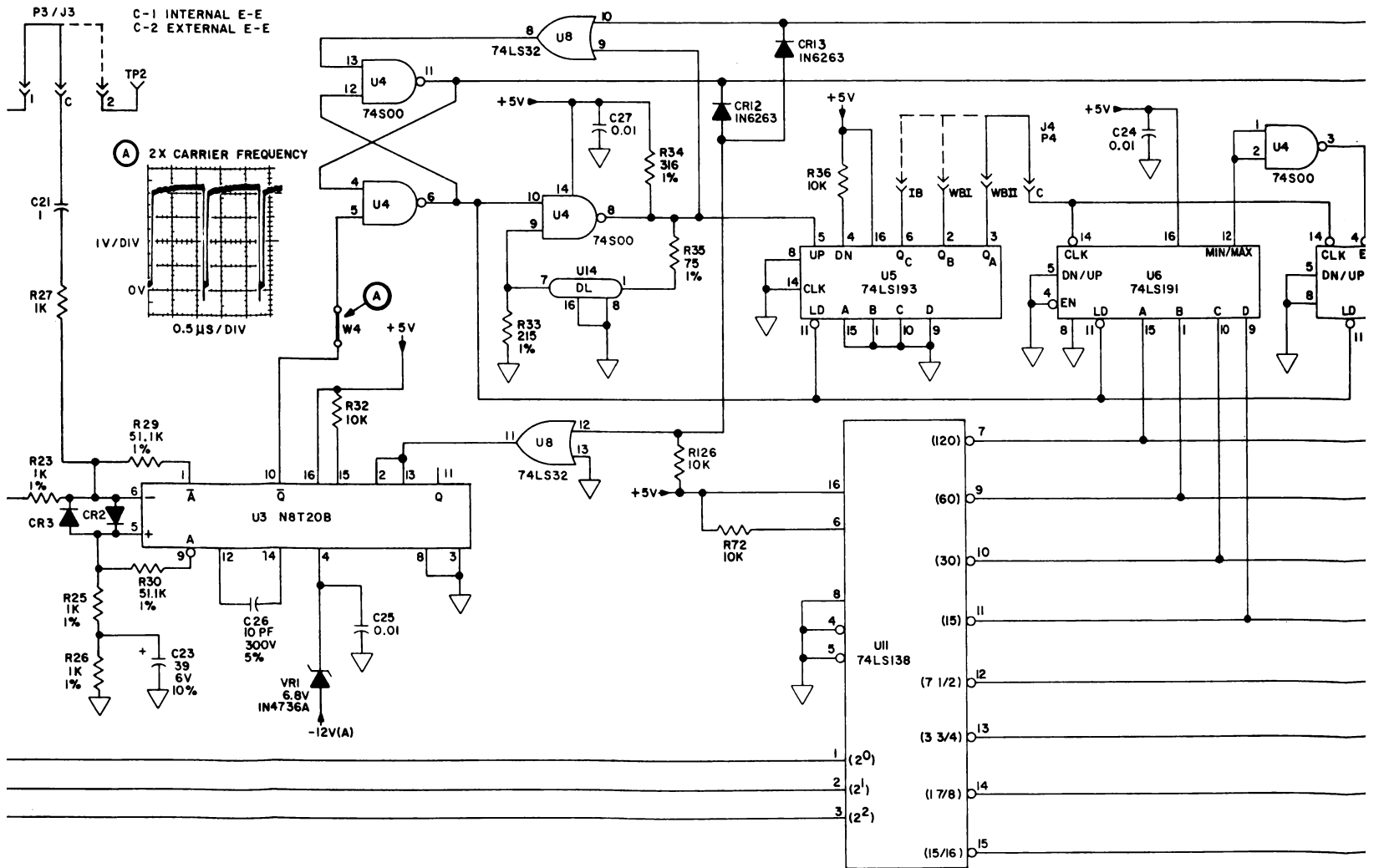
SEE Z, SH 1 IBFM  
SEE Z, SH 4 WBFM

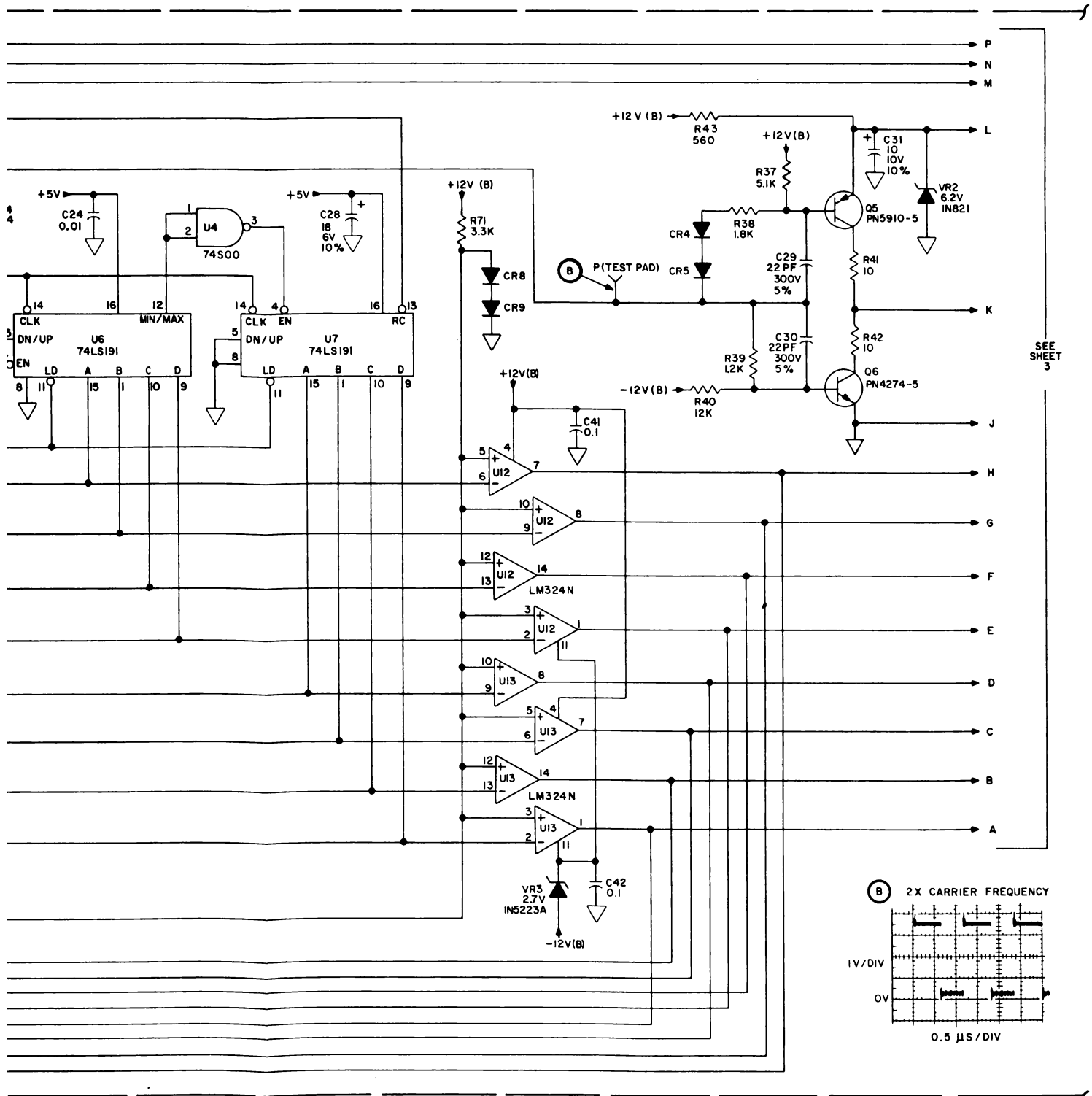


C-1 INTERNAL E-E  
C-2 EXTERNAL E-E

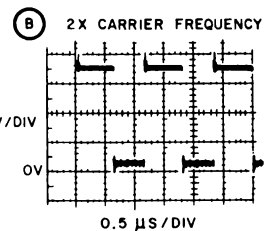


IBFM OR WBFM





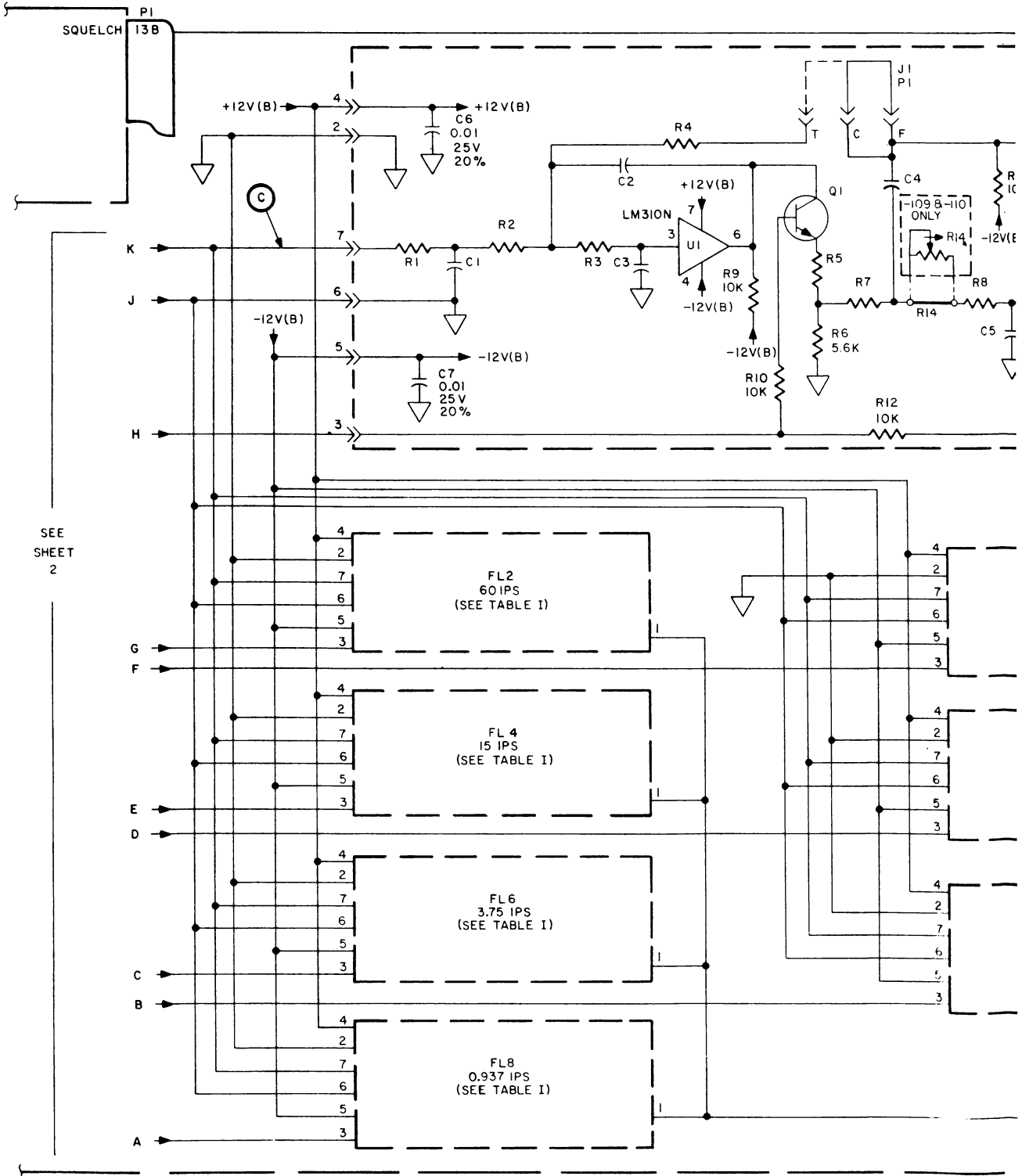
SEE SHEET 3



16781324-2 U

Used On - 101, -103, -104, and -105 Only  
 REF: 16781324-2N  
 Figure 7-1. FM Reproduce Circuit Card Schematic  
 (Sheet 2 of 9)

SEE SHEET 2



SEE SHEET 2

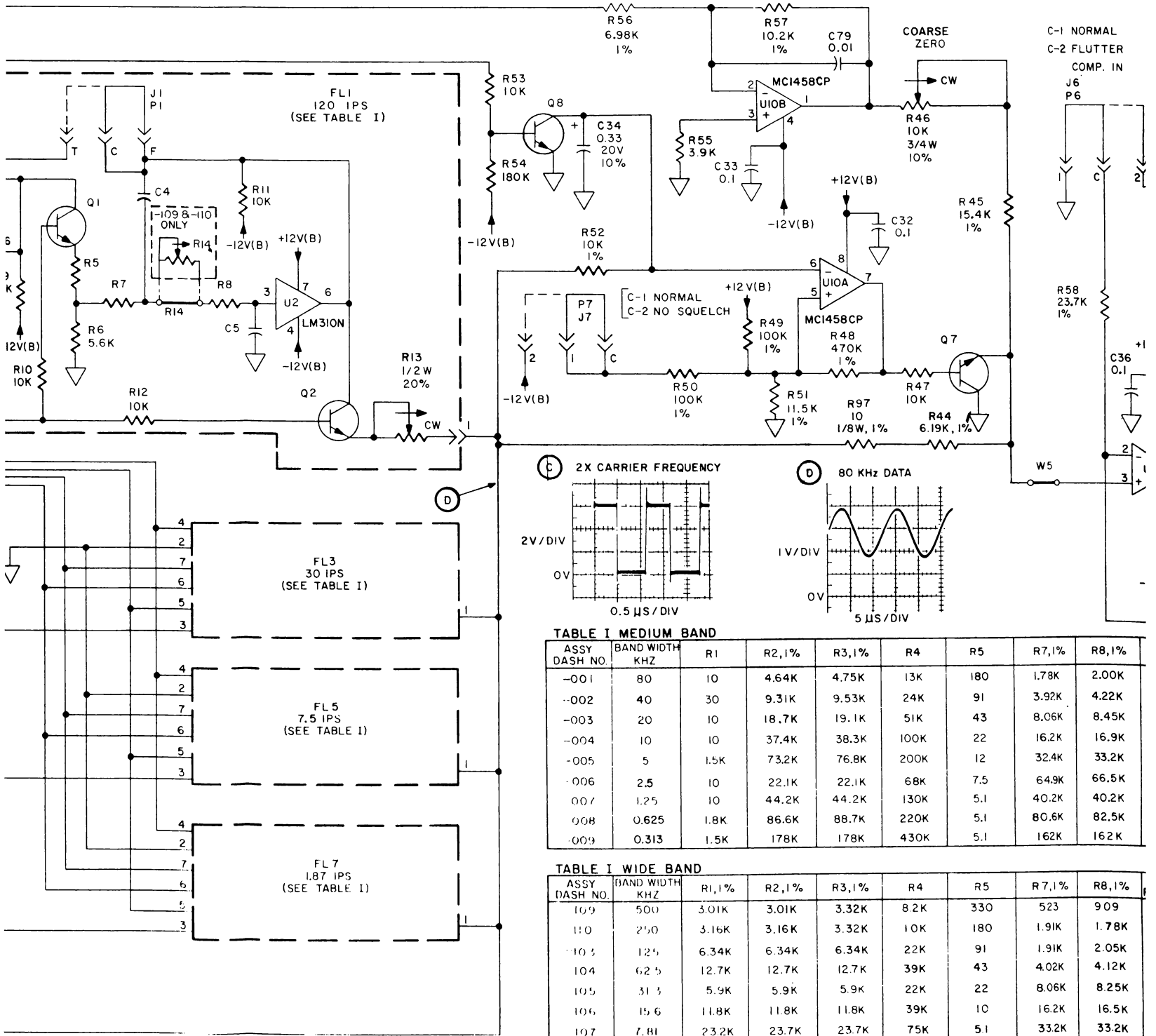


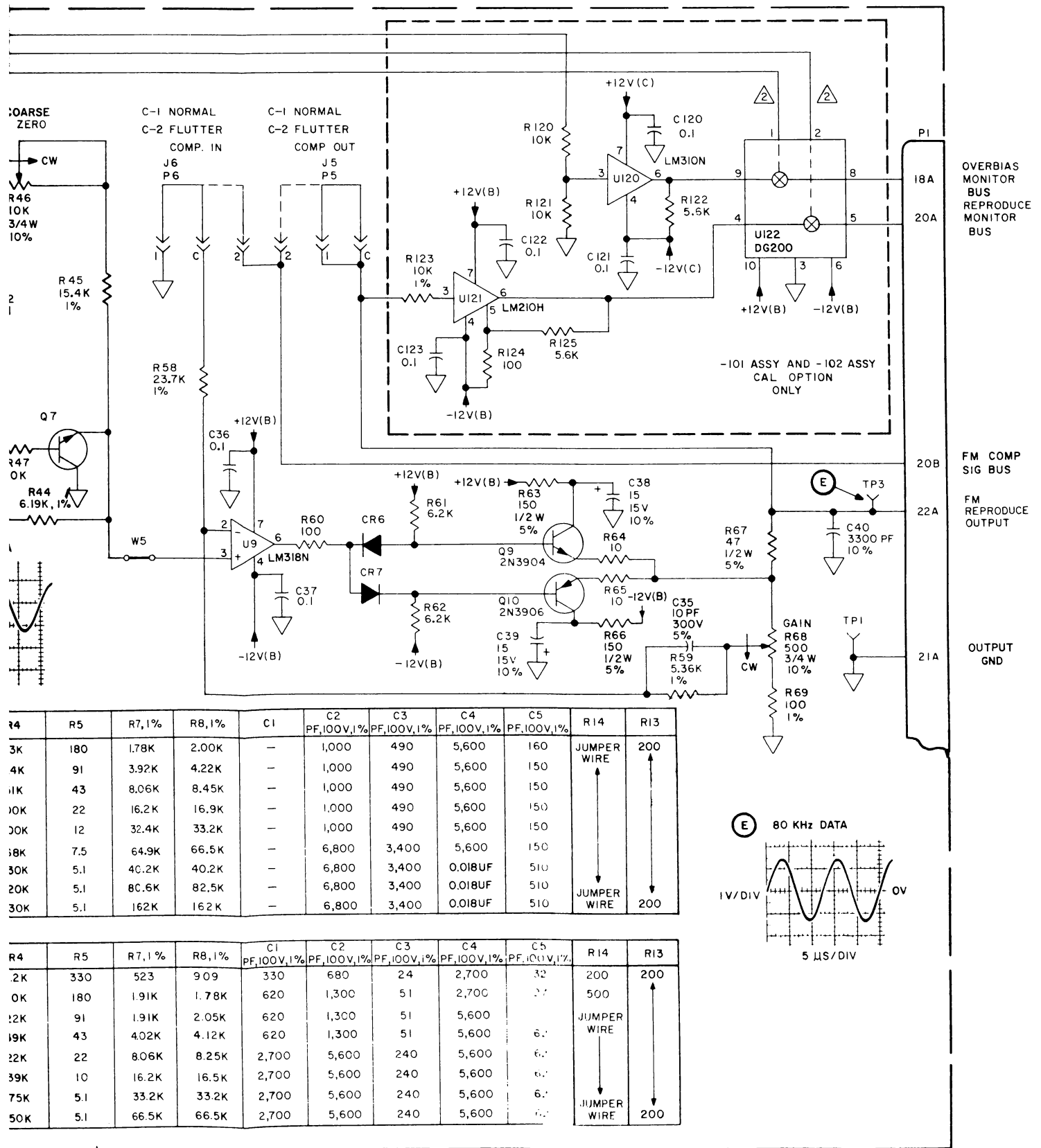
TABLE I MEDIUM BAND

ASSY DASH NO.	BAND WIDTH KHZ	R1	R2,1%	R3,1%	R4	R5	R7,1%	R8,1%
-001	80	10	4.64K	4.75K	13K	180	1.78K	2.00K
-002	40	30	9.31K	9.53K	24K	91	3.92K	4.22K
-003	20	10	18.7K	19.1K	51K	43	8.06K	8.45K
-004	10	10	37.4K	38.3K	100K	22	16.2K	16.9K
-005	5	1.5K	73.2K	76.8K	200K	12	32.4K	33.2K
-006	2.5	10	22.1K	22.1K	68K	7.5	64.9K	66.5K
007	1.25	10	44.2K	44.2K	130K	5.1	40.2K	40.2K
008	0.625	1.8K	86.6K	88.7K	220K	5.1	80.6K	82.5K
009	0.313	1.5K	178K	178K	430K	5.1	162K	162K

TABLE I WIDE BAND

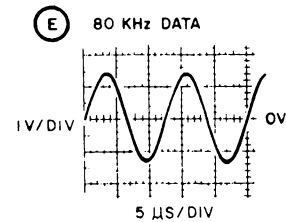
ASSY DASH NO.	BAND WIDTH KHZ	R1,1%	R2,1%	R3,1%	R4	R5	R7,1%	R8,1%
109	500	3.01K	3.01K	3.32K	82K	330	523	909
110	250	3.16K	3.16K	3.32K	10K	180	1.91K	1.78K
103	125	6.34K	6.34K	6.34K	22K	91	1.91K	2.05K
104	62.5	12.7K	12.7K	12.7K	39K	43	4.02K	4.12K
105	31.3	5.9K	5.9K	5.9K	22K	22	8.06K	8.25K
106	15.6	11.8K	11.8K	11.8K	39K	10	16.2K	16.5K
107	7.81	23.2K	23.7K	23.7K	75K	5.1	33.2K	33.2K
108	3.9	46.4K	47.5K	47.5K	150K	5.1	66.5K	66.5K





R4	R5	R7, 1%	R8, 1%	C1	C2 PF, 100V, 1%	C3 PF, 100V, 1%	C4 PF, 100V, 1%	C5 PF, 100V, 1%	R14	R13
3K	180	1.78K	2.00K	—	1,000	490	5,600	160	JUMPER WIRE	200
4K	91	3.92K	4.22K	—	1,000	490	5,600	150	JUMPER WIRE	200
11K	43	8.06K	8.45K	—	1,000	490	5,600	150	JUMPER WIRE	200
10K	22	16.2K	16.9K	—	1,000	490	5,600	150	JUMPER WIRE	200
20K	12	32.4K	33.2K	—	1,000	490	5,600	150	JUMPER WIRE	200
18K	7.5	64.9K	66.5K	—	6,800	3,400	5,600	150	JUMPER WIRE	200
30K	5.1	40.2K	40.2K	—	6,800	3,400	0.018UF	510	JUMPER WIRE	200
20K	5.1	80.6K	82.5K	—	6,800	3,400	0.018UF	510	JUMPER WIRE	200
30K	5.1	162K	162K	—	6,800	3,400	0.018UF	510	JUMPER WIRE	200

R4	R5	R7, 1%	R8, 1%	C1 PF, 100V, 1%	C2 PF, 100V, 1%	C3 PF, 100V, 1%	C4 PF, 100V, 1%	C5 PF, 100V, 1%	R14	R13
2K	330	523	909	330	680	24	2,700	32	200	200
0K	180	1.91K	1.78K	620	1,300	51	2,700	27	500	200
12K	91	1.91K	2.05K	620	1,300	51	5,600	62	JUMPER WIRE	200
19K	43	4.02K	4.12K	620	1,300	51	5,600	62	JUMPER WIRE	200
22K	22	8.06K	8.25K	2,700	5,600	240	5,600	62	JUMPER WIRE	200
39K	10	16.2K	16.5K	2,700	5,600	240	5,600	62	JUMPER WIRE	200
75K	5.1	33.2K	33.2K	2,700	5,600	240	5,600	62	JUMPER WIRE	200
50K	5.1	66.5K	66.5K	2,700	5,600	240	5,600	62	JUMPER WIRE	200



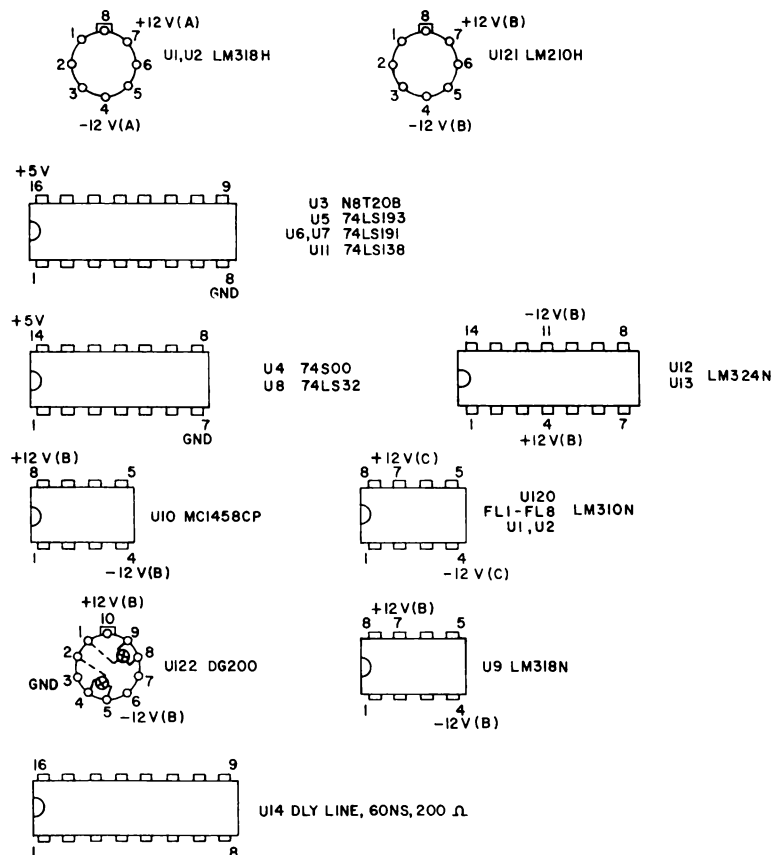
Used on -101, -103, -104, and -105 Only

REF: 16781324-3N

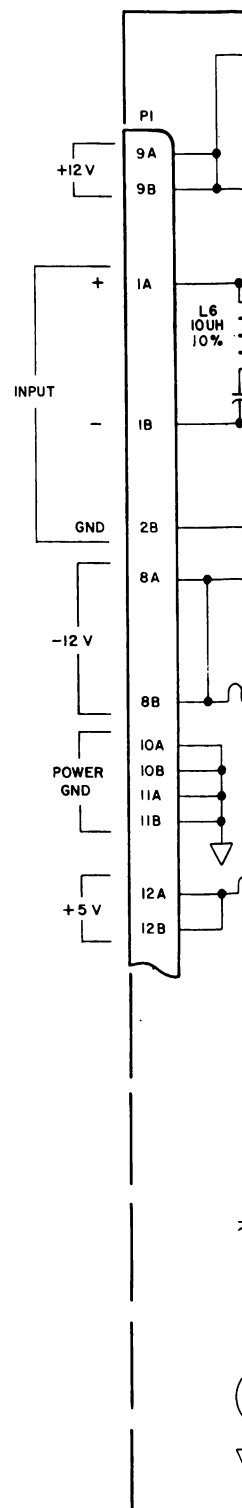
Figure 7-1. FM Reproduce Circuit Card Schematic  
(Sheet 3 of 9)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8 W, 5%.  
 ALL 1% RESISTORS ARE 1/10 W.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL TRANSISTORS ARE SPS-8716.
2. LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3.  $\nabla$  DENOTES CIRCUIT COMMON, LIKE NUMBERS INDICATE COMMON TIE POINT.
4.  $\triangle$  U15 AND U16 ARE RESISTOR ARRAYS, 10K, 2%.  
 U17 AND U18 ARE RESISTOR ARRAYS, 5.1K, 2%.  
 $\triangle$  LOGIC FOR CONTROL LINES AND I.C. SWITCHES IS NEG "0" TRUE.
5. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN

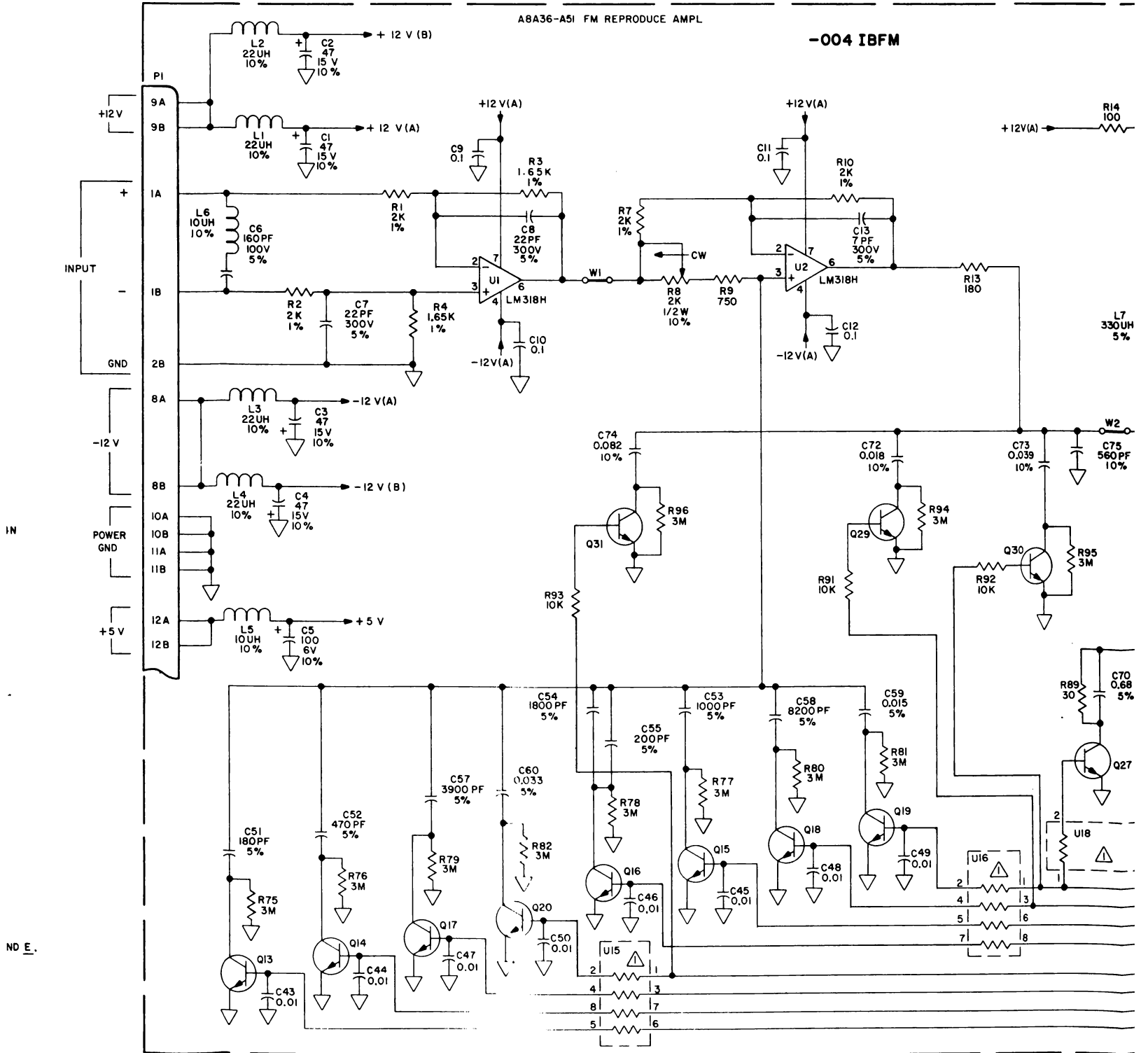


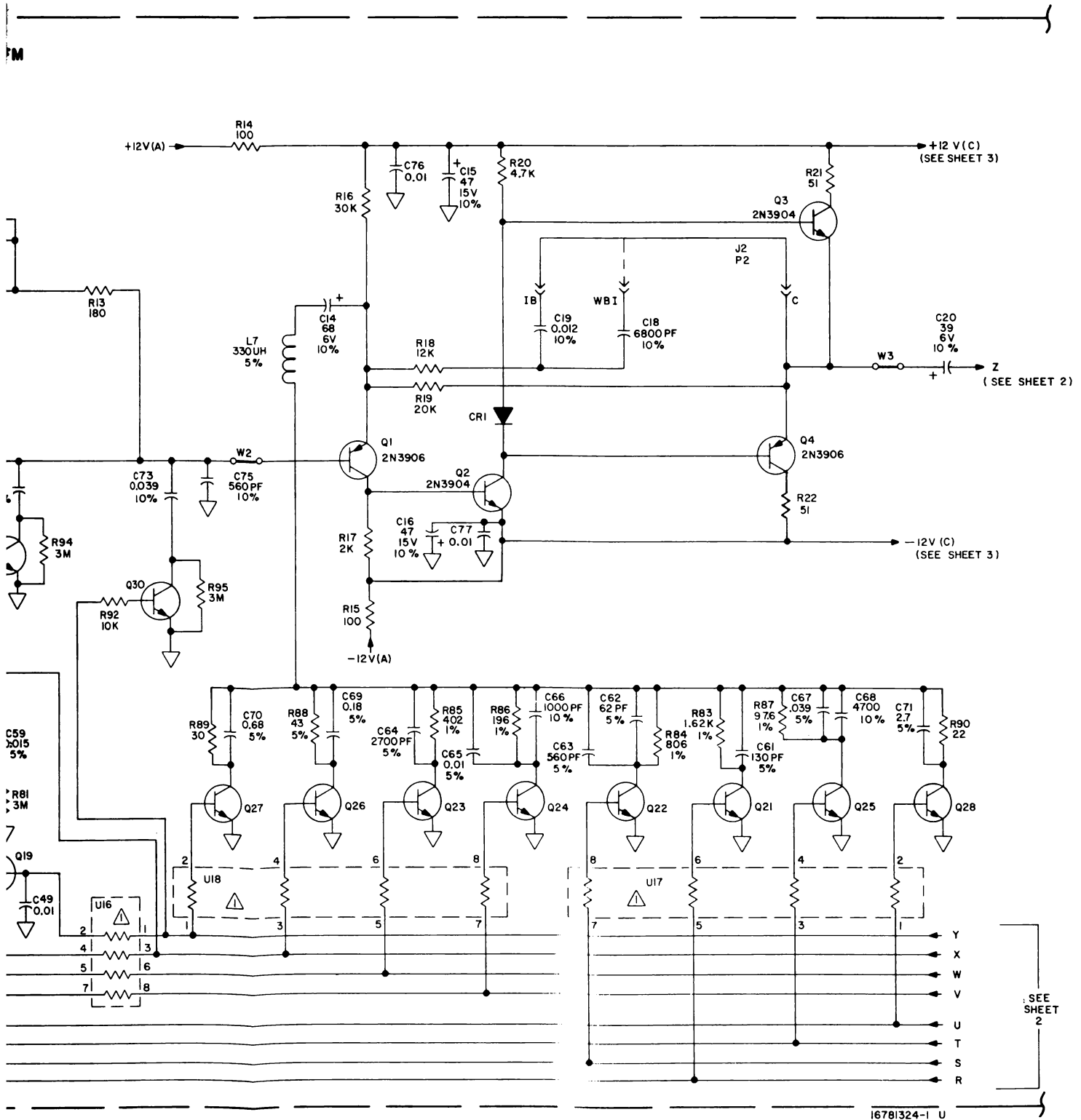
6. WAVEFORMS ARE TYPICAL OF MEDIUM BAND FM REPRODUCE CARDS,  
 WBI MODE, 120 IPS.  
 CARRIER FREQUENCY INPUT TO P1-19A (E TO E BUS) IS UNMODULATED ON  
 WAVEFORMS A, B, AND C; AND MODULATED BY 80KHz SINEWAVE ON WAVEFORMS D AND E.



8BA36-A5I FM REPRODUCE AMPL

-004 IBFM

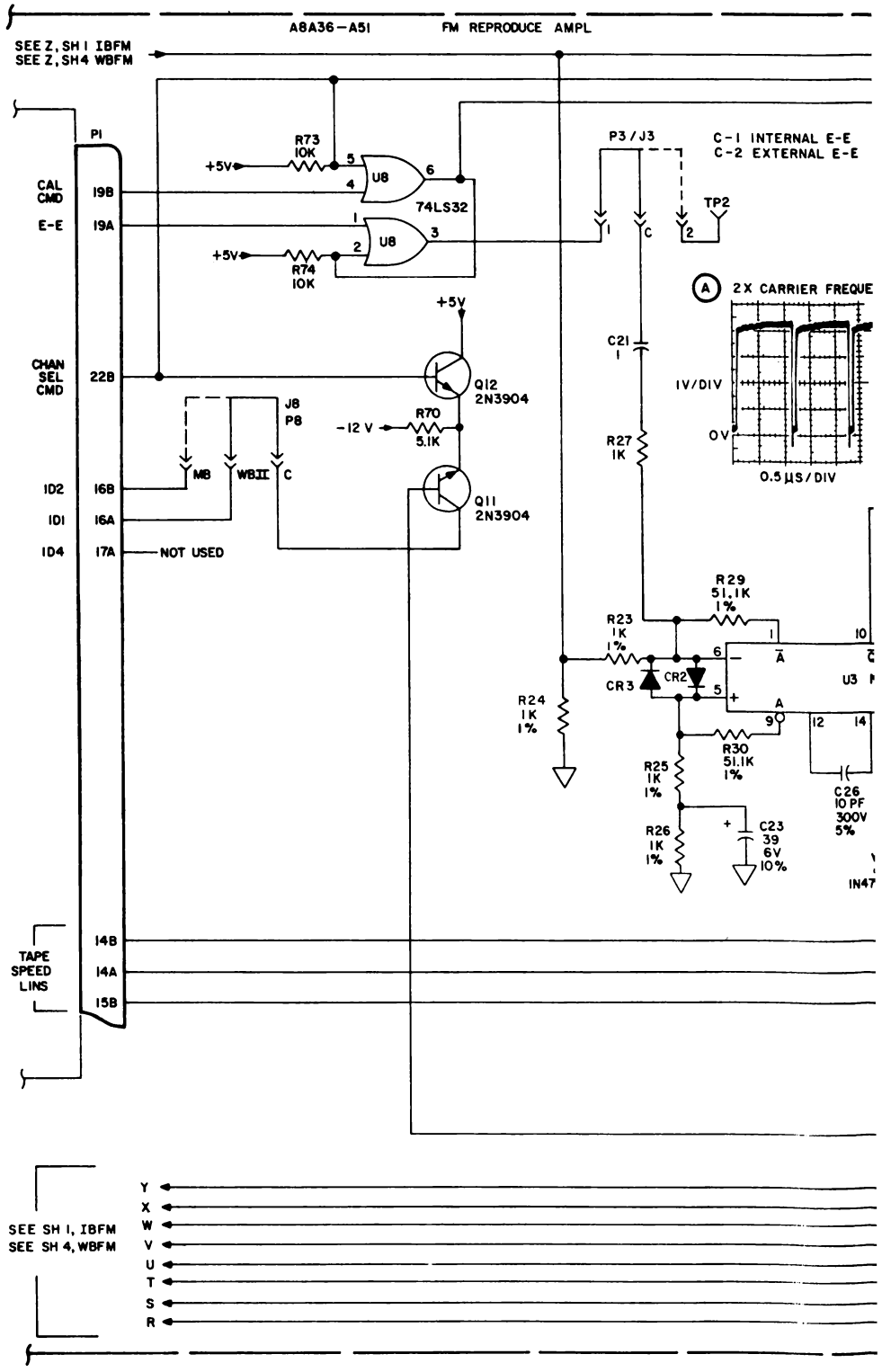




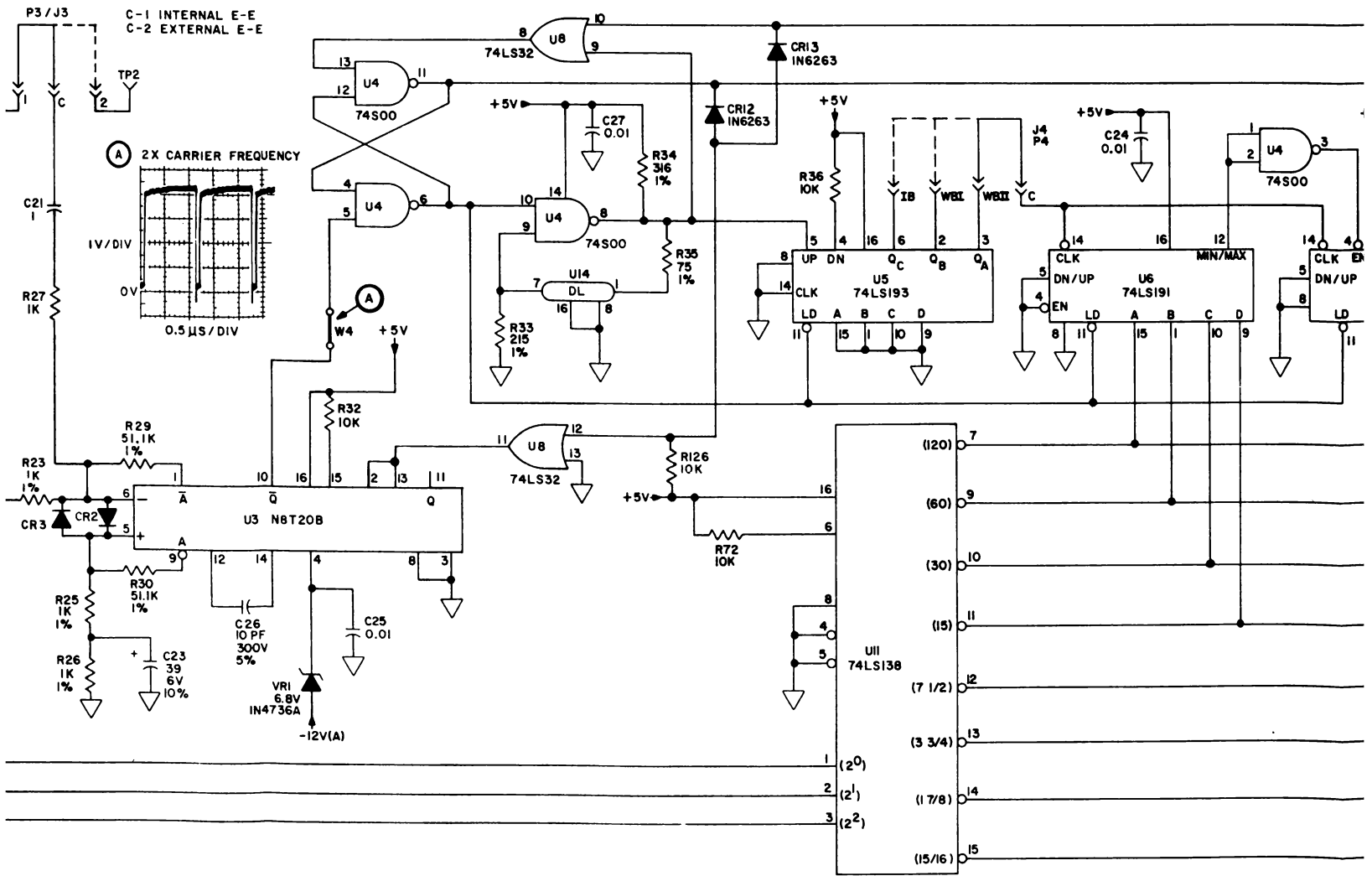
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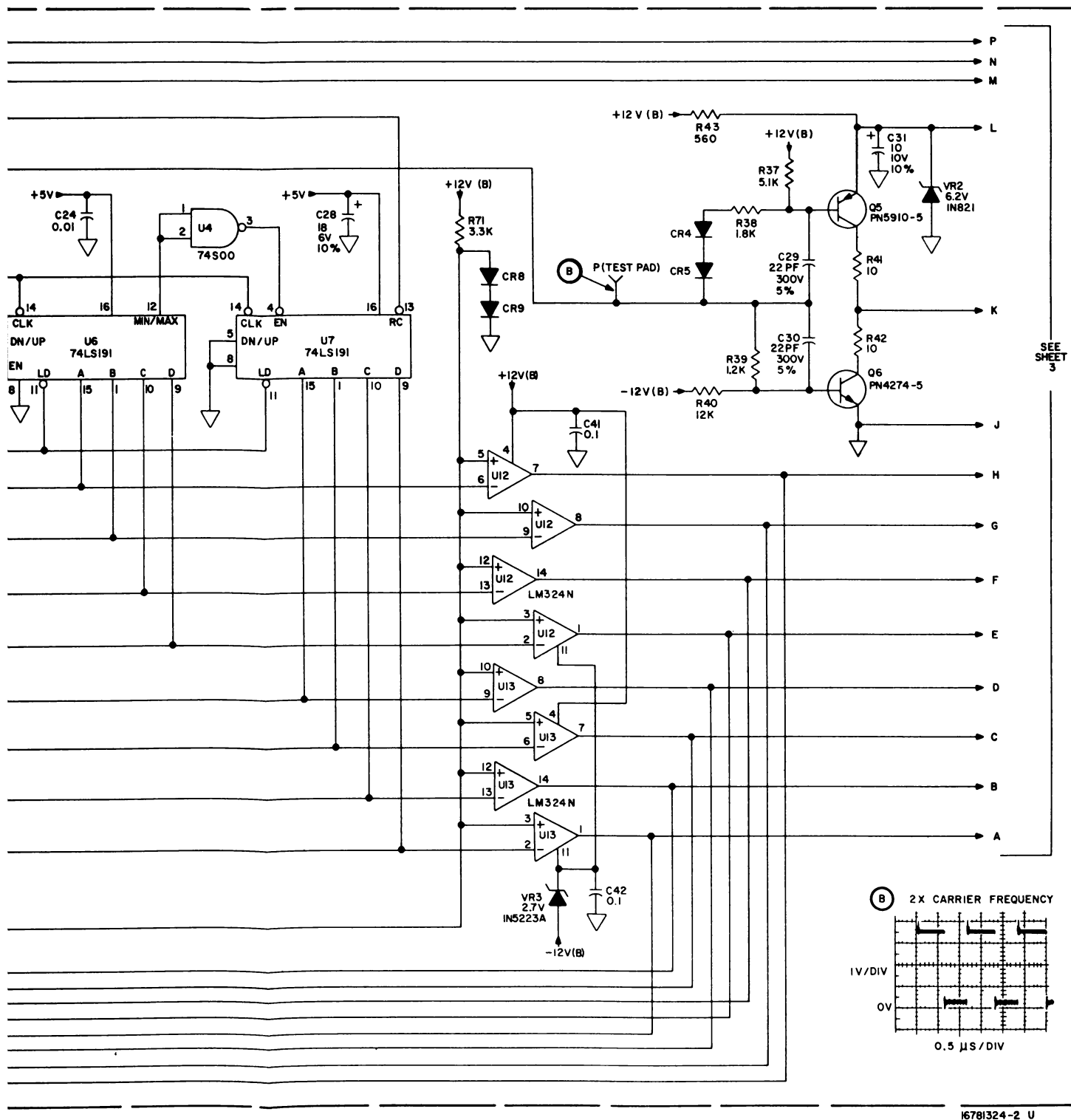
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Figure 7-1. FM Reproduce Circuit Card Schematic  
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IBFM OR WBFM





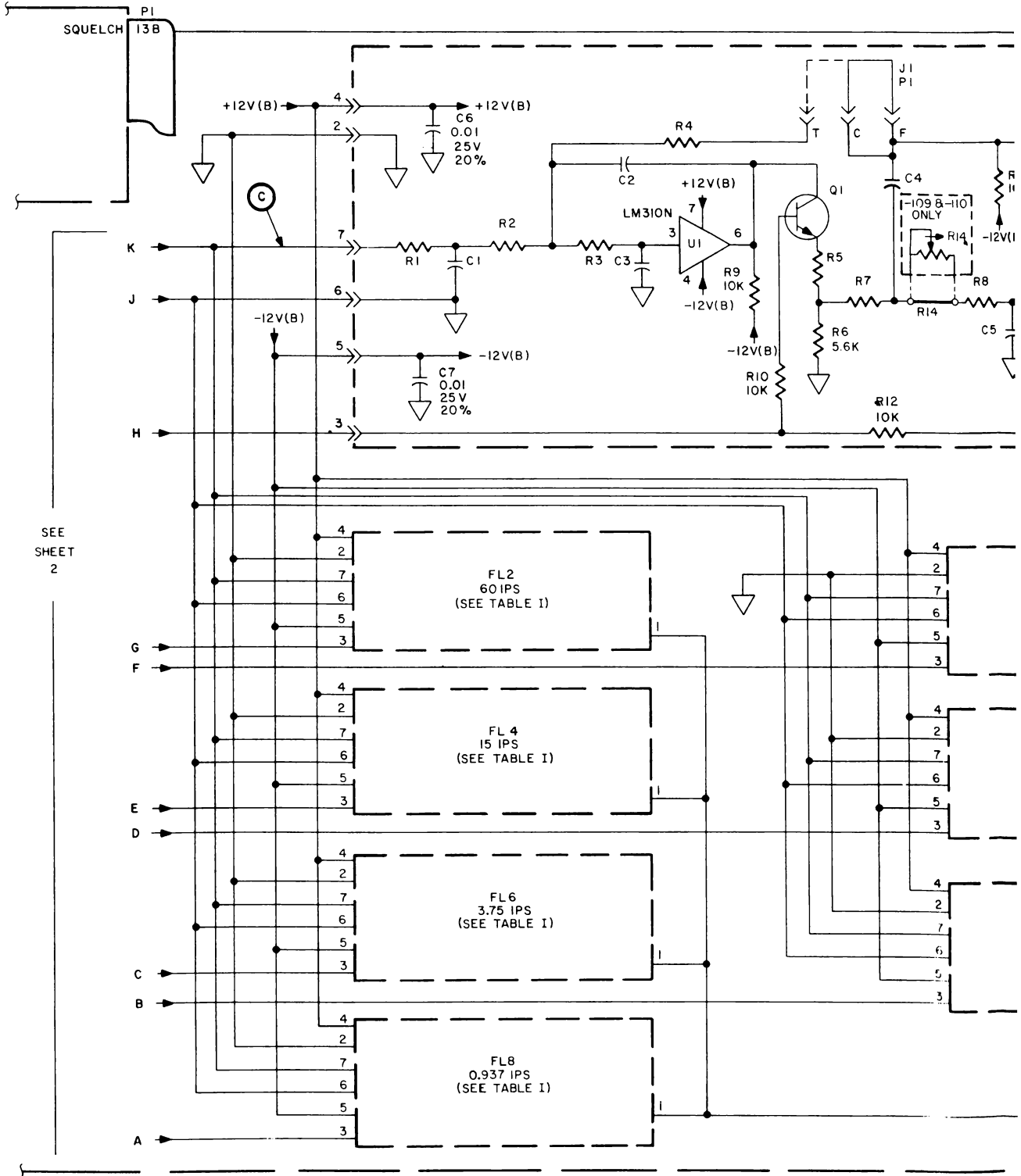
16781324-2 U

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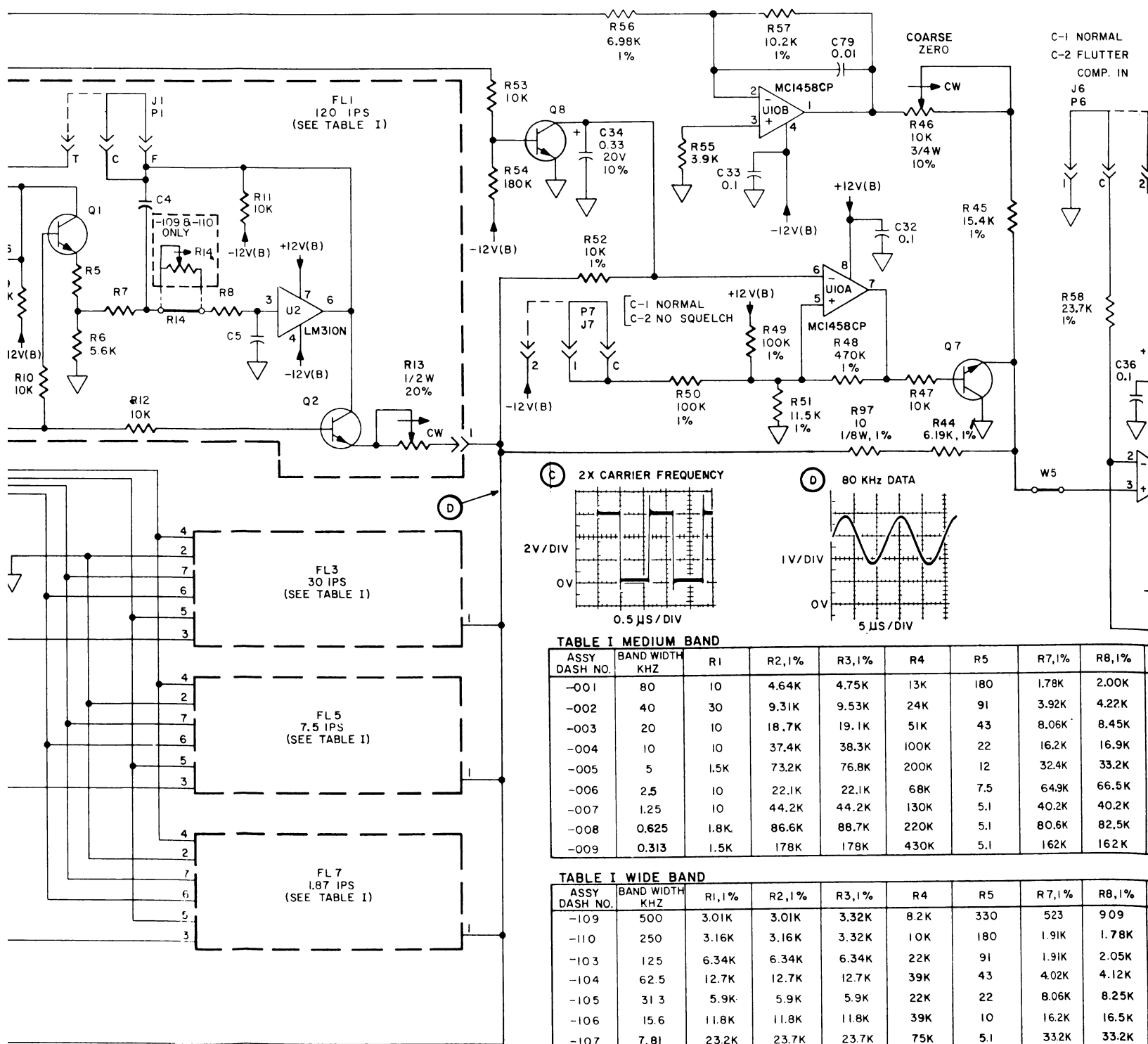
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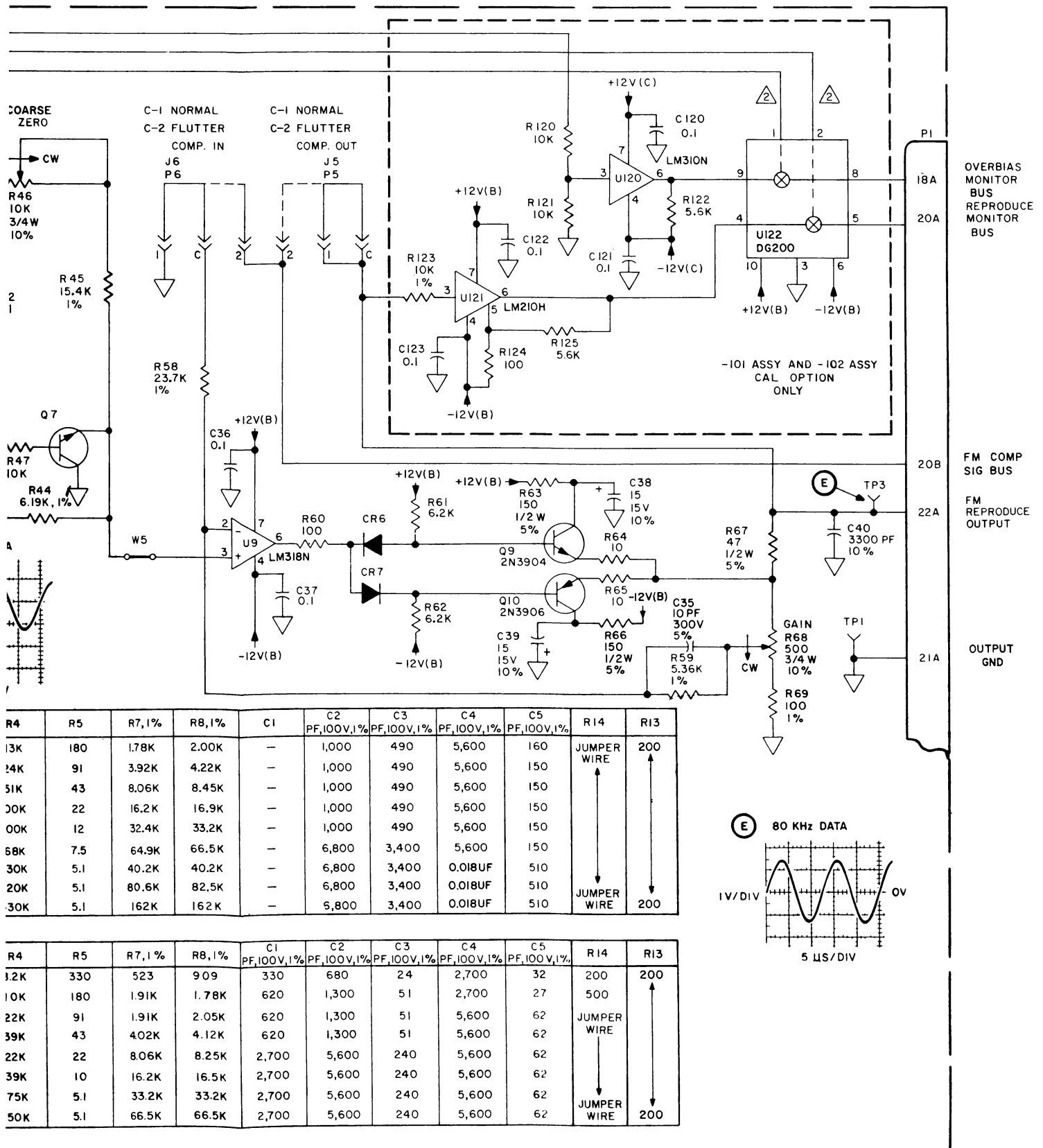
Figure 7-1. FM Reproduce Circuit Card Schematic  
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SEE SHEET 2









16781324-3R

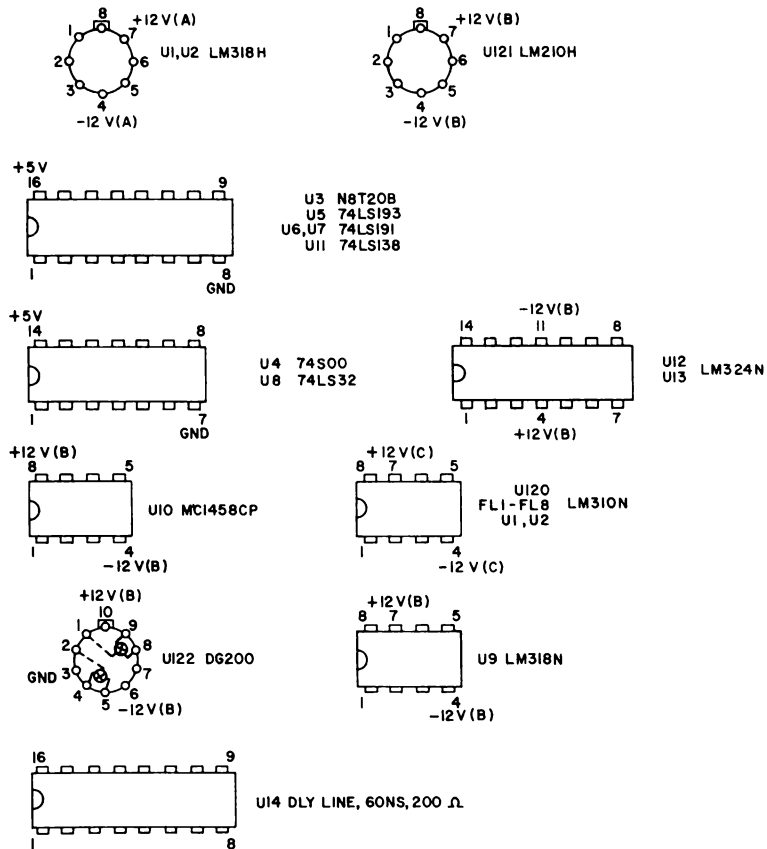
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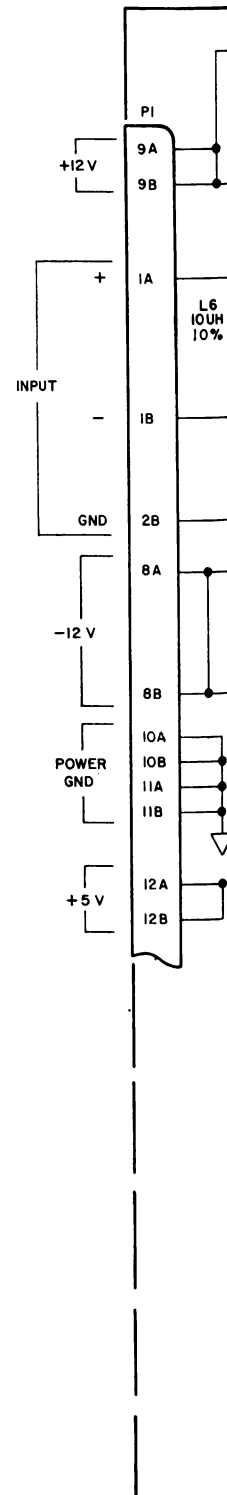
Figure 7-1. FM Reproduce Circuit Card Schematic  
(Sheet 6 of 9)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS, 1/8 W, 5%.  
 ALL 1% RESISTORS ARE 1/10 W.  
 ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%.  
 ALL DIODES ARE IN4148.  
 ALL TRANSISTORS ARE SP5-8716.
2. LIKE LETTERS IN PARENTHESIS ( ) INDICATE COMMON CONNECTIONS ON CIRCUIT CARD.
3. ▽ DENOTES CIRCUIT COMMON, LIKE NUMBERS INDICATE COMMON TIE POINT.
4. ▲ U15 AND U16 ARE RESISTOR ARRAYS, 10K, 2%.  
 U17 AND U18 ARE RESISTOR ARRAYS, 5.1K, 2%.  
 ▲ LOGIC FOR CONTROL LINES AND I.C. SWITCHES IS NEG "0" TRUE.
5. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN

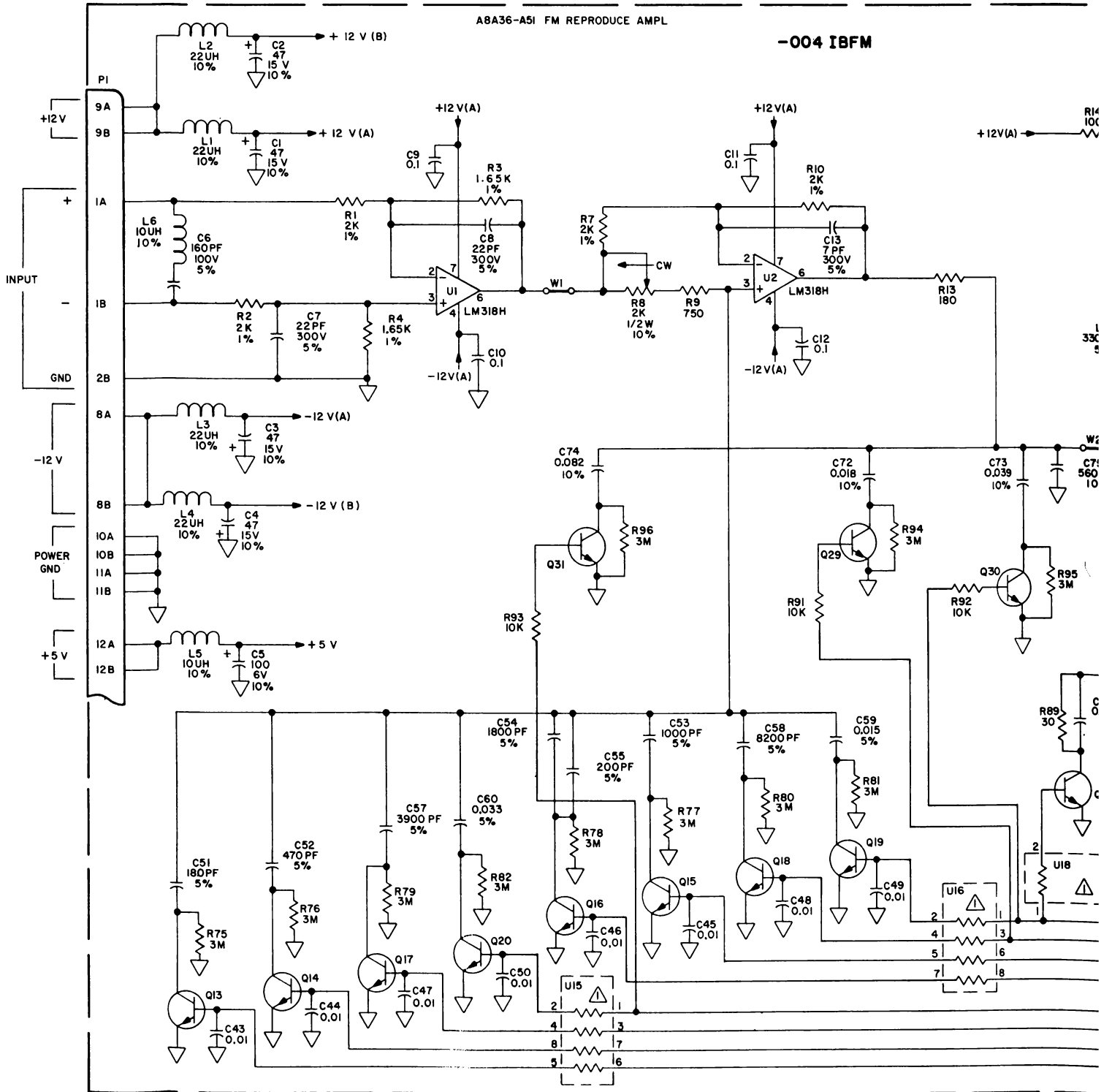


6. WAVEFORMS ARE TYPICAL OF MEDIUM BAND FM REPRODUCE CARDS,  
 WBI MODE, 120 IPS.  
 CARRIER FREQUENCY INPUT TO P1-19A (E TO E BUS) IS UNMODULATED ON  
 WAVEFORMS A, B, AND C; AND MODULATED BY 80KHz SINEWAVE ON WAVEFORMS D AND E.



ABA36-AS1 FM REPRODUCE AMPL

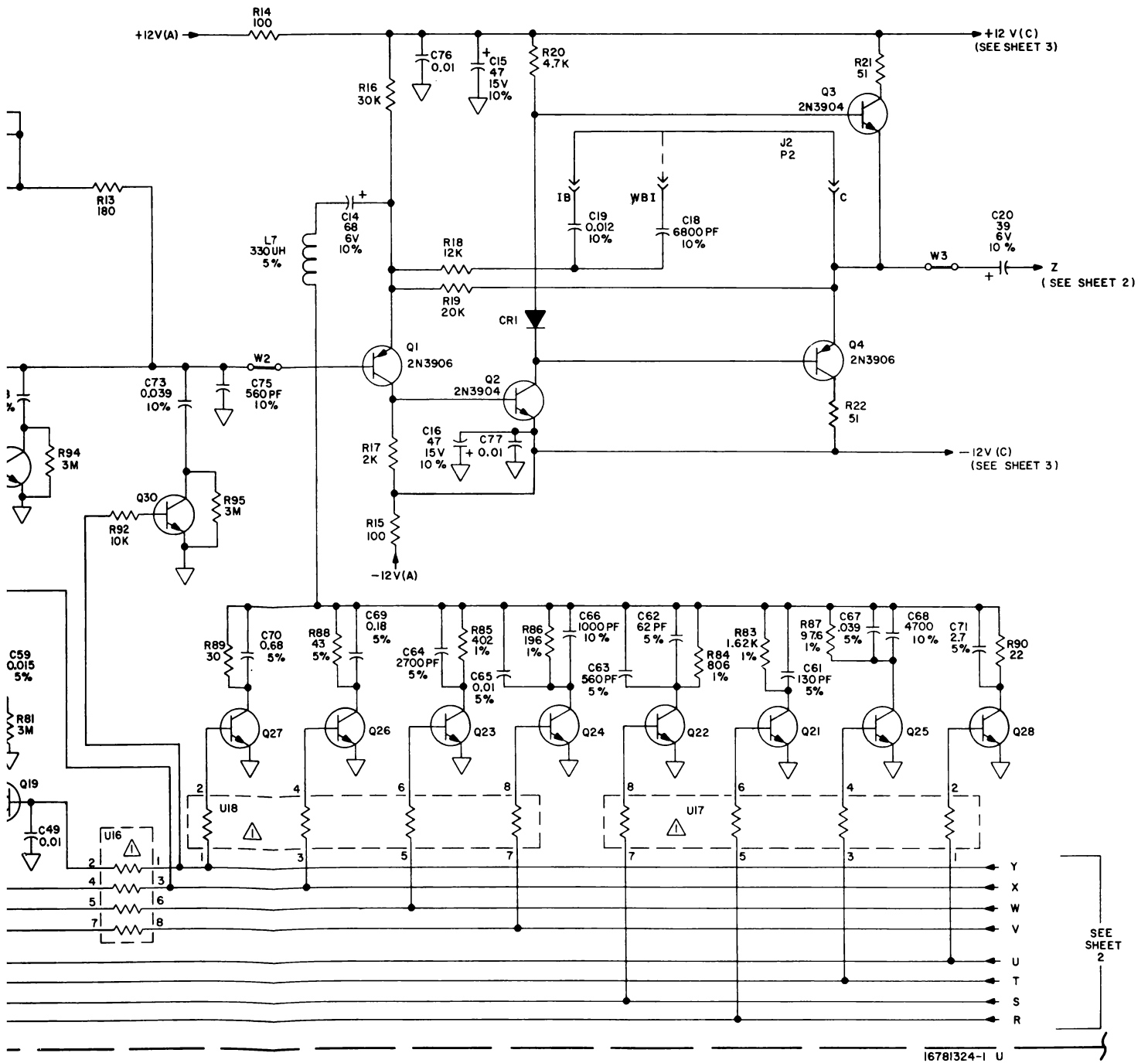
-004 IBFM



M324N

S D AND E.

FM



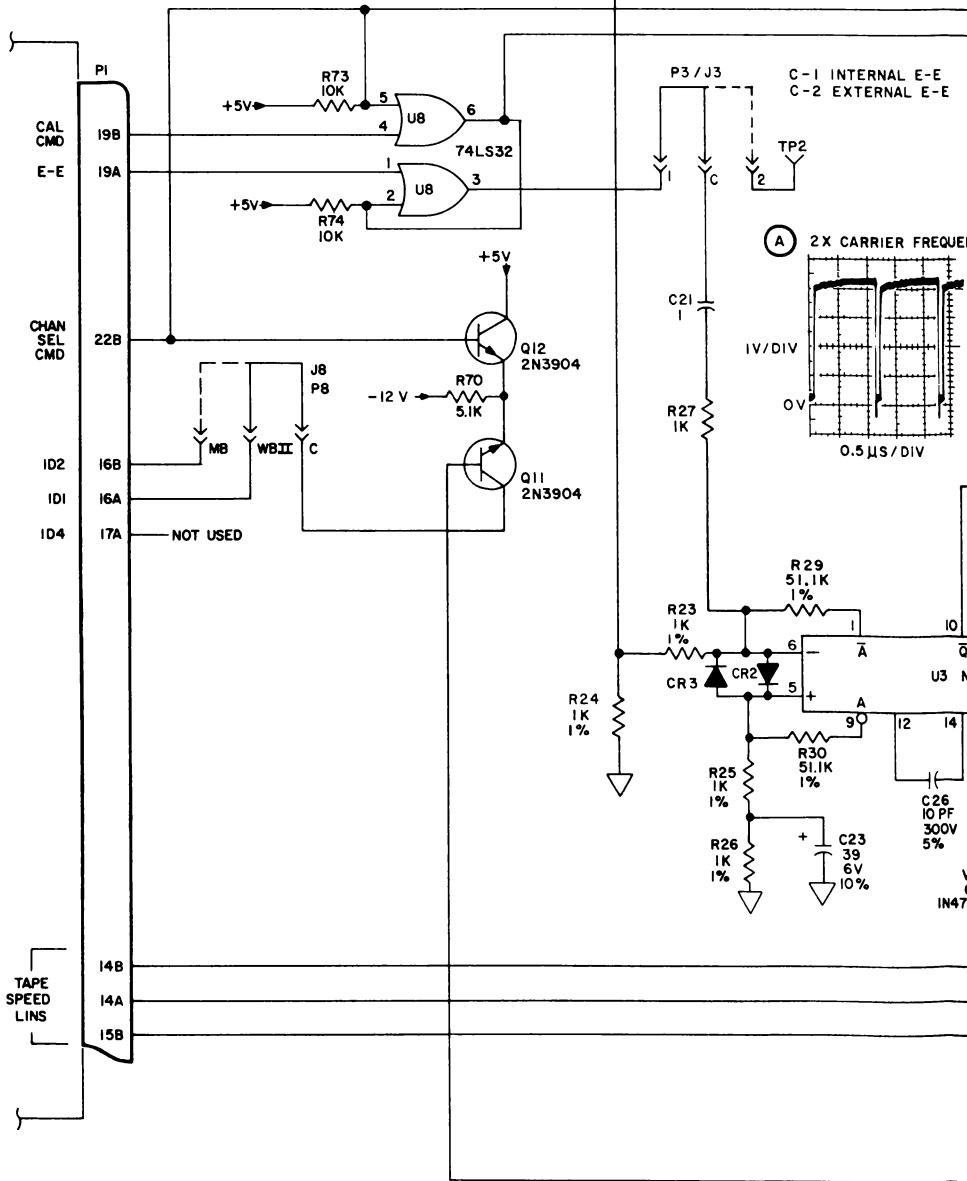
Used on -107 (WB) Only

REF: 16781324 U

Figure 7-1. FM Reproduce Circuit Card Schematic  
(Sheet 7 of 9)

ABA36-A51 FM REPRODUCE AMPL

SEE Z, SH 1 IBFM  
SEE Z, SH 4 WBFM



SEE SH 1, IBFM  
SEE SH 4, WBFM

Y ←

X ←

W ←

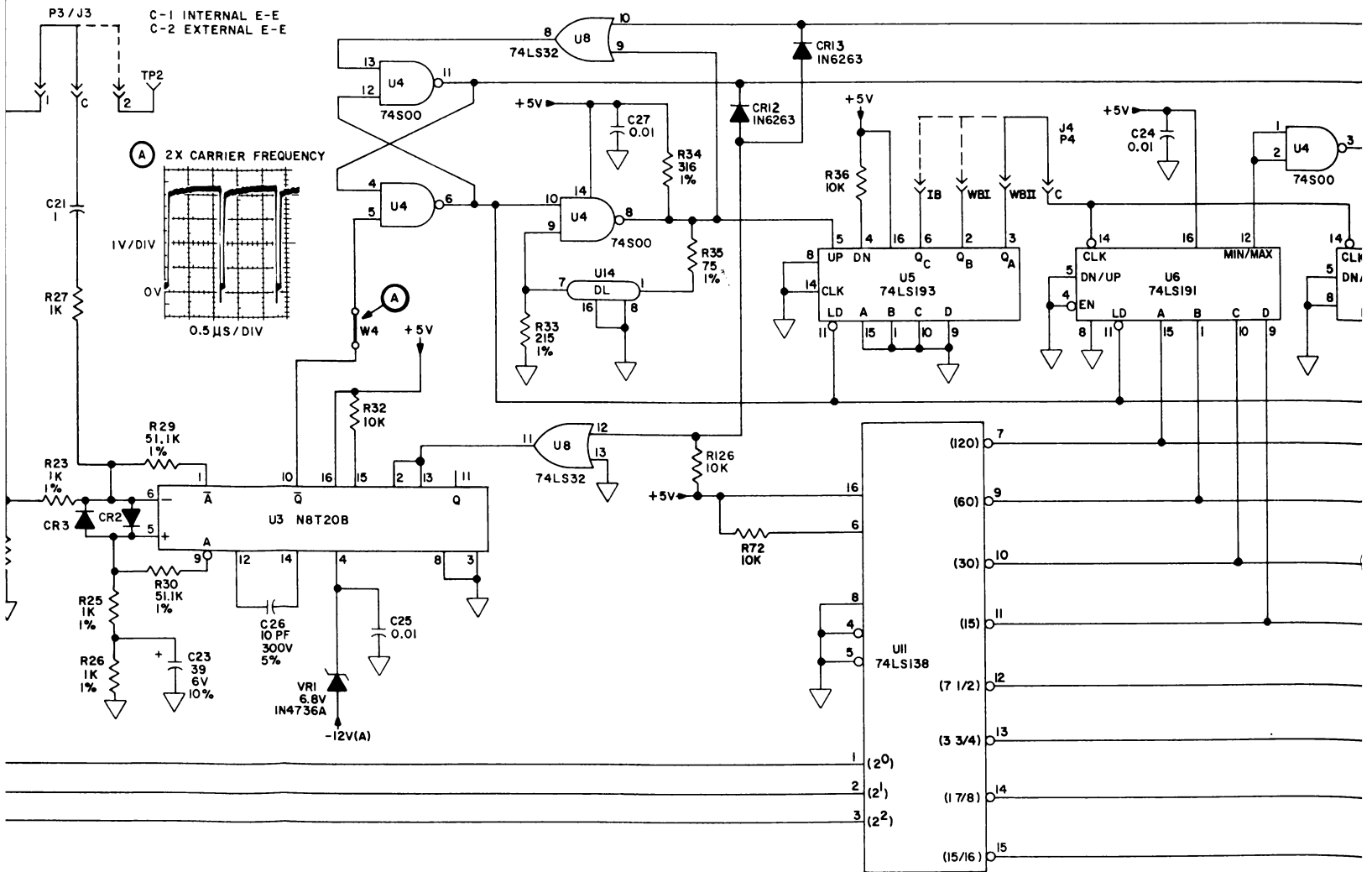
V ←

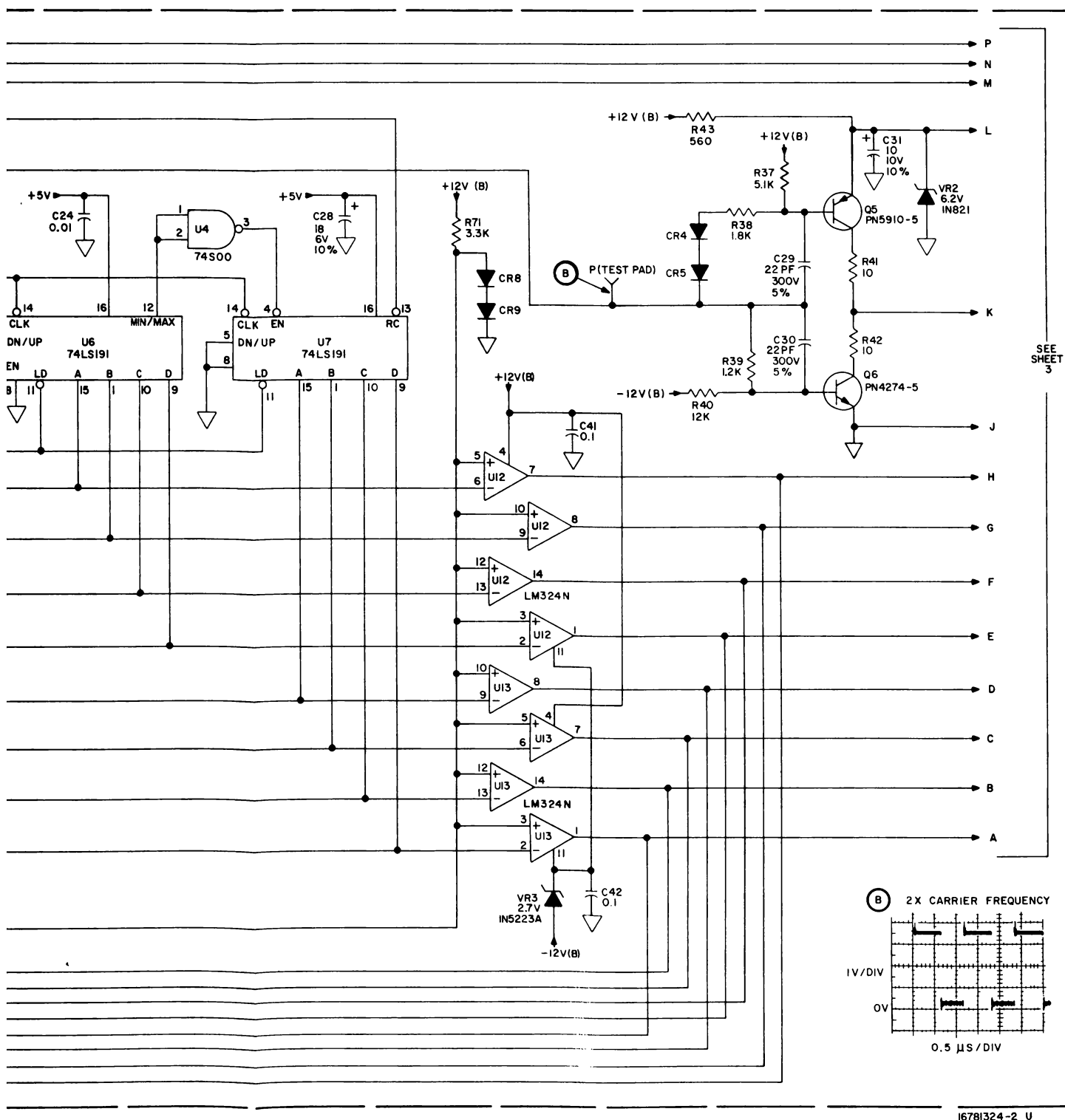
U ←

T ←

S ←

R ←



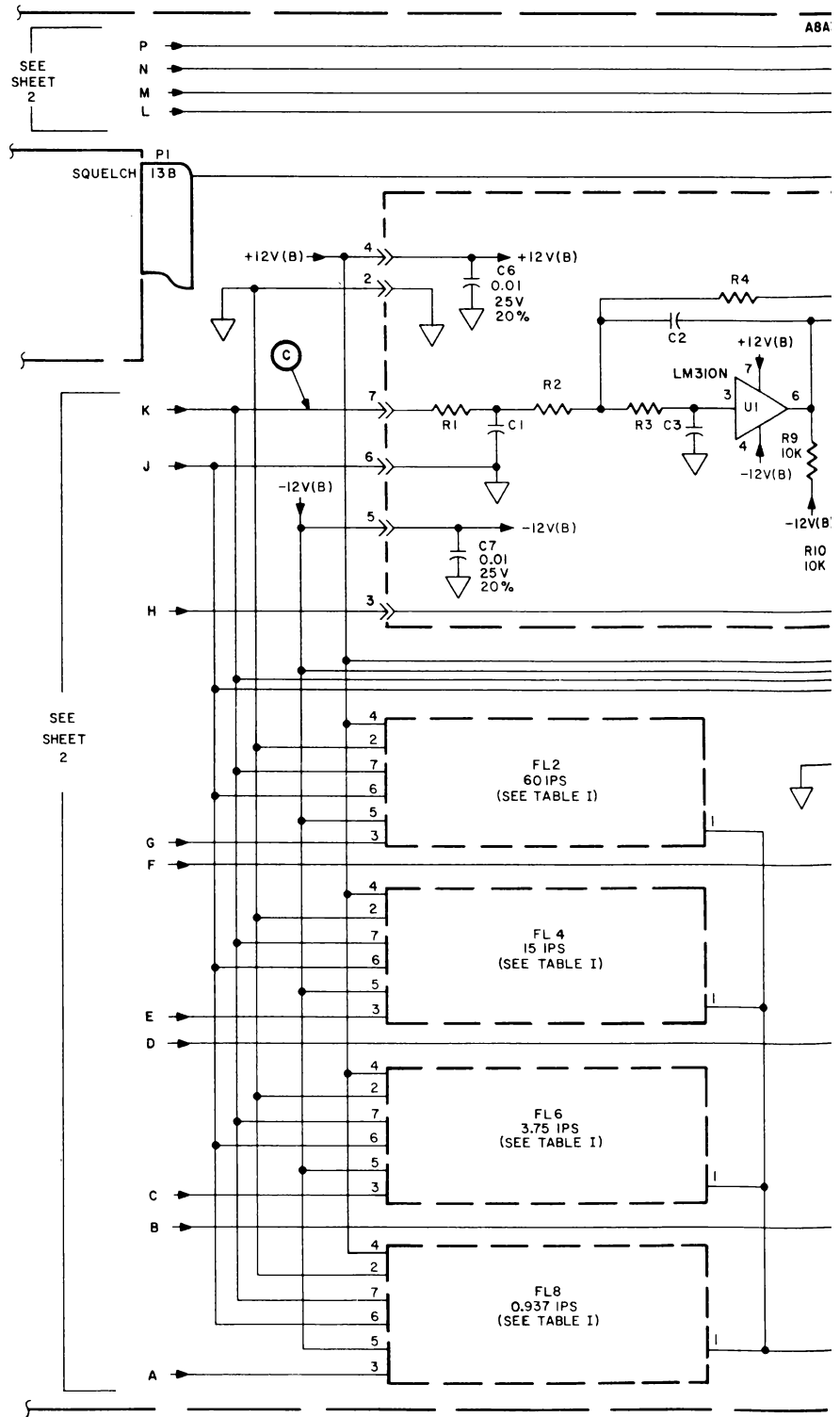


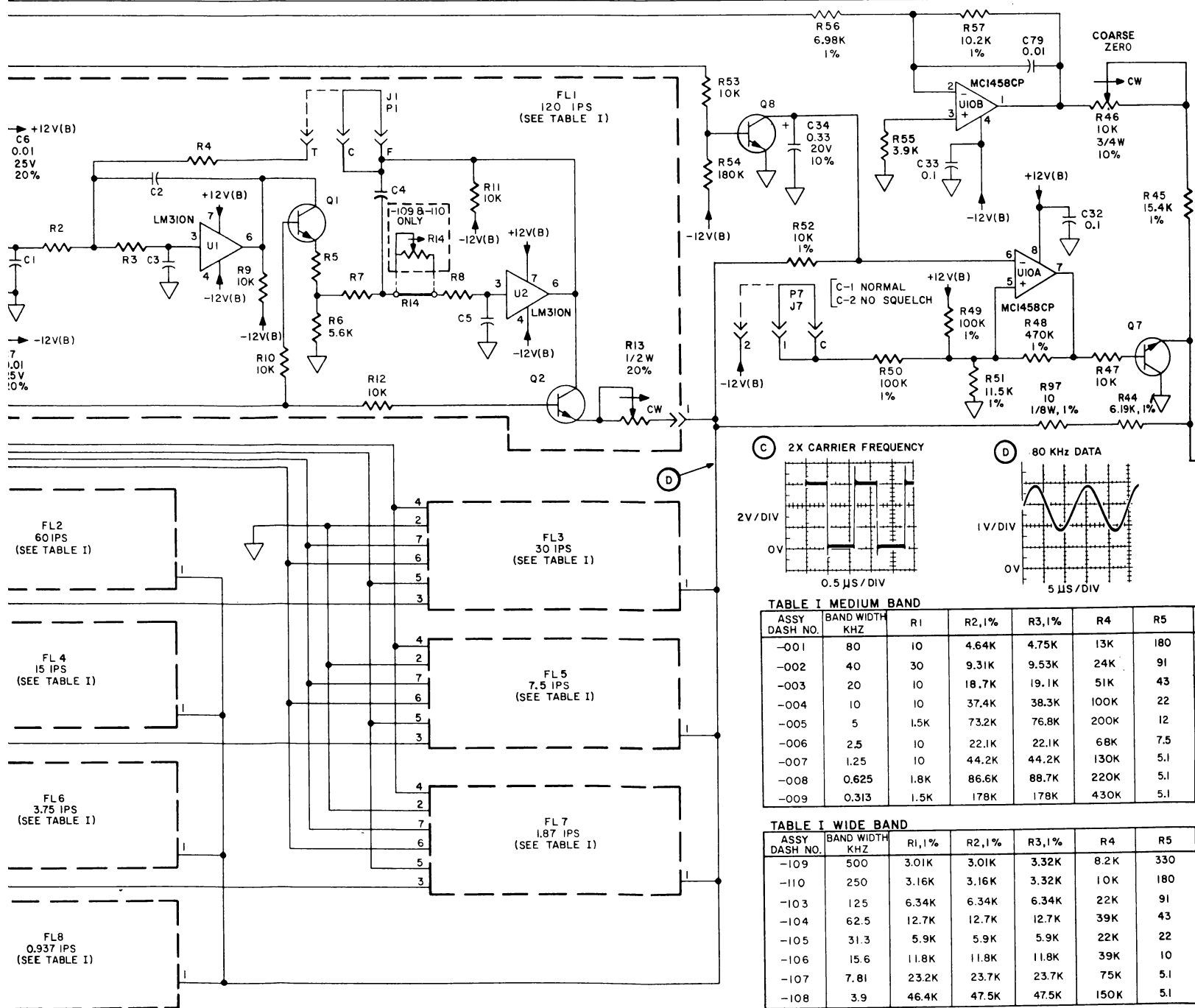
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Figure 7-1. FM Reproduce Circuit Card Schematic  
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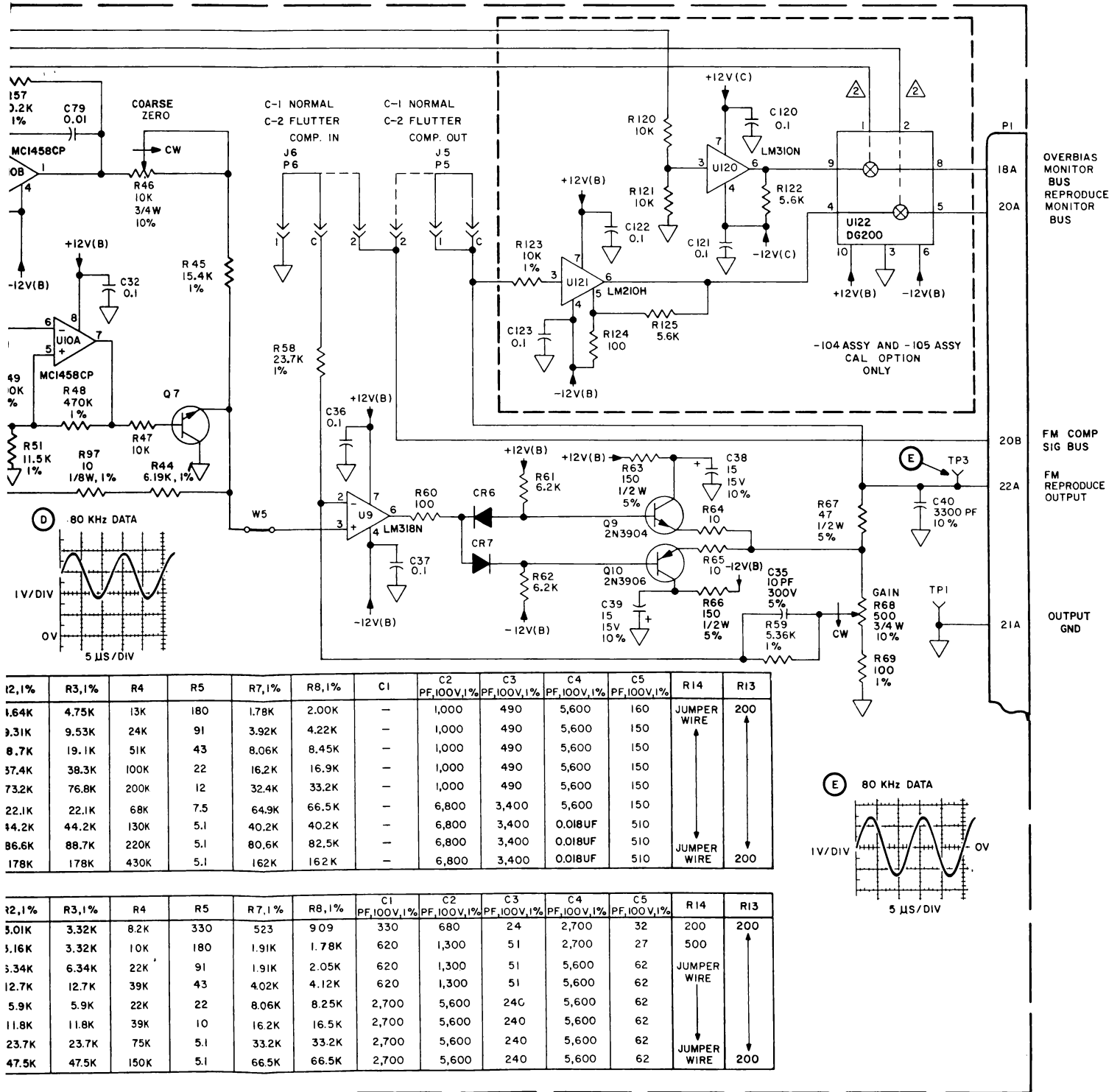


**TABLE I MEDIUM BAND**

ASSY DASH NO.	BAND WIDTH KHZ	R1	R2,1%	R3,1%	R4	R5
-001	80	10	4.64K	4.75K	13K	180
-002	40	30	9.31K	9.53K	24K	91
-003	20	10	18.7K	19.1K	51K	43
-004	10	10	37.4K	38.3K	100K	22
-005	5	1.5K	73.2K	76.8K	200K	12
-006	2.5	10	22.1K	22.1K	68K	7.5
-007	1.25	10	44.2K	44.2K	130K	5.1
-008	0.625	1.8K	86.6K	88.7K	220K	5.1
-009	0.313	1.5K	178K	178K	430K	5.1

**TABLE I WIDE BAND**

ASSY DASH NO.	BAND WIDTH KHZ	R1,1%	R2,1%	R3,1%	R4	R5
-109	500	3.01K	3.01K	3.32K	8.2K	330
-110	250	3.16K	3.16K	3.32K	10K	180
-103	125	6.34K	6.34K	6.34K	22K	91
-104	62.5	12.7K	12.7K	12.7K	39K	43
-105	31.3	5.9K	5.9K	5.9K	22K	22
-106	15.6	11.8K	11.8K	11.8K	39K	10
-107	7.81	23.2K	23.7K	23.7K	75K	5.1
-108	3.9	46.4K	47.5K	47.5K	150K	5.1



16781324-3 T

Used On -107 (WB) Only

REF: 16781324T

Figure 7-1. FM Reproduce Circuit Card Schematic  
(Sheet 9 of 9)

# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
VOICE OPTION  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

APRIL 1984

## NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

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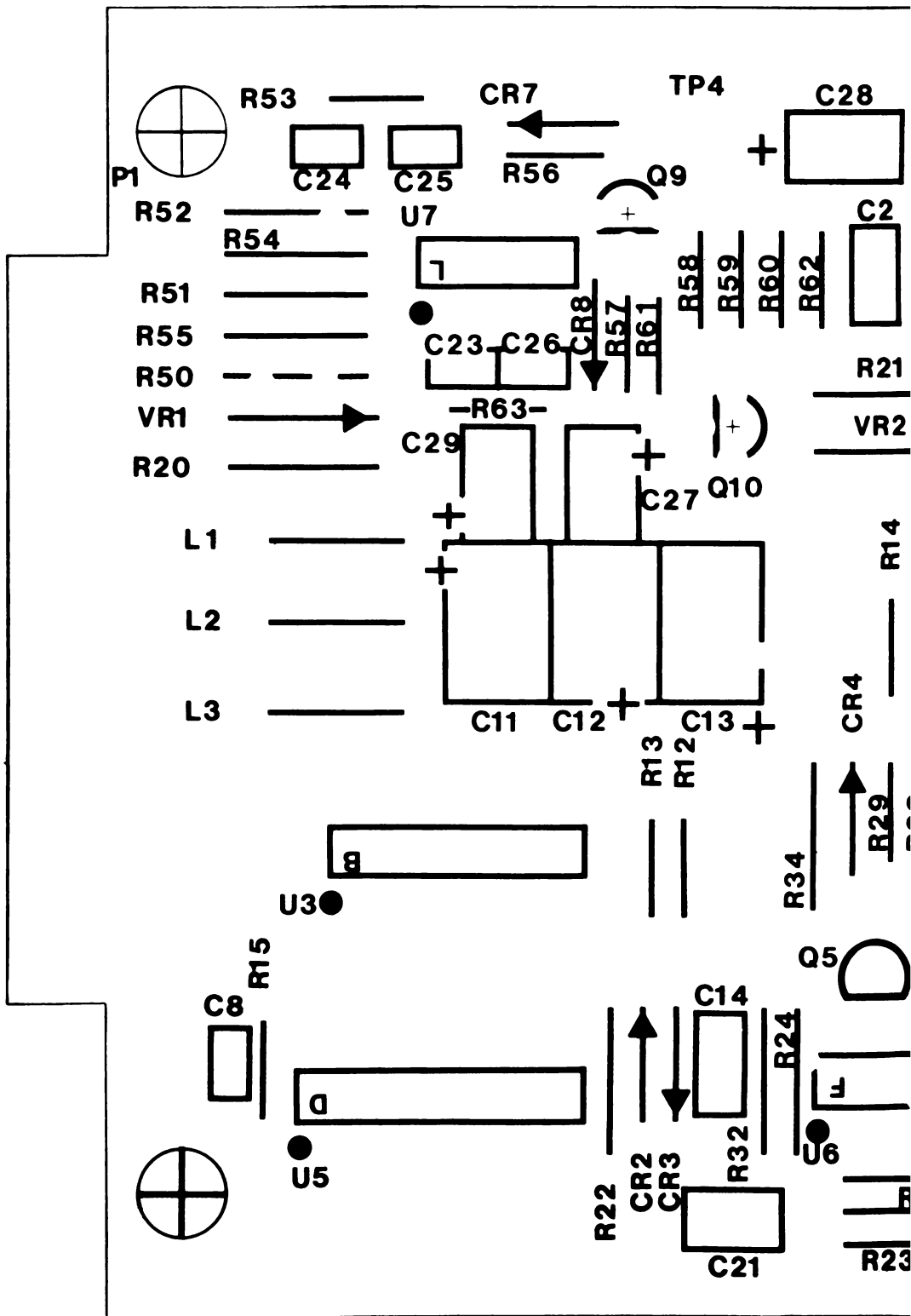
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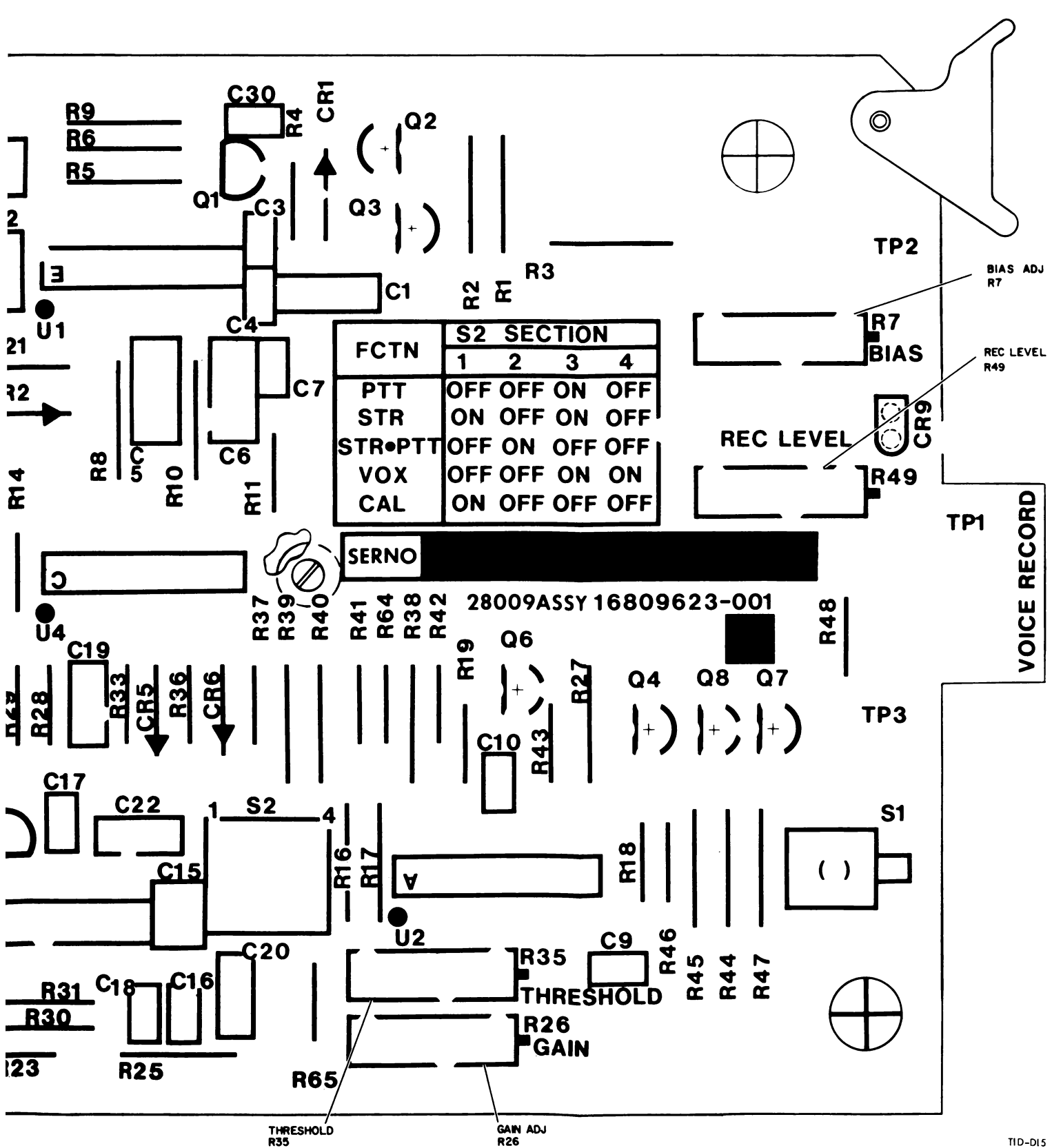


Figure 1-1. Voice Record Circuit Card Assembly

## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This technical manual describes the voice option used with the Honeywell Model 101 Magnetic Tape Recorder/Reproduce System. This technical manual contains only the information that is applicable to the Voice Option. The System Manual describes the relationship of the Voice Option to the System.

#### 1-2. DESCRIPTION

The Voice Option provides the Model 101 with the capability of recording/reproducing voice annotation tracks. It consists of a voice record circuit card assembly, voice reproduce circuit card assembly, and voice headset assembly with accessory cables and adaptors.

##### A. VOICE RECORD CIRCUIT CARD ASSEMBLY (Figure 1-1)

The voice reproduce card is a printed-circuit card, that when installed in the data housing, has an input applied from the microphone via the MICROPHONE jack and RECORD INPUT BNC on the input/output panel.

##### B. VOICE REPRODUCE CIRCUIT CARD ASSEMBLY (Figure 1-2)

The voice reproduce card is a printed-circuit card that, when installed in the data housing, has an input from the head preamplifier. The output appears at the REPRODUCE OUTPUTS BNC for the particular track (channel) the card is mounted in.

##### C. VOICE HEADSET ASSEMBLY

The headset assembly consists of a microphone with a push-to-talk switch and a headphone. The two connector cables are patched into the Model 101 system input/output panel. The phone plug is inserted into the MICROPHONE phone jack and the BNC connector connects to the appropriate REPRODUCE OUTPUT BNC. An 18-inch BNC patch cable is supplied to patch the microphone BNC jack to the appropriate RECORD INPUT jack. A 10-foot extension cable and BNC adaptor are supplied to allow greater distance between headset and system.

### 1-3. SPECIFICATIONS

#### A. VOICE OPTION - GENERAL

##### 1. Environmental Conditions

	<u>Storage</u>	<u>Operating</u>
Ambient Temperature:	-20 to +75°C	0 to 50°C
Relative Humidity:	5 to 95% non-condensing	0 to 95% non-condensing
Altitude:	0 to 15,000 feet	0 to 50,000 feet

##### 2. Output Characteristics

Output from headset (or speaker when rack mount voice unit assembly is used) must be an intelligible reproduction of the voice signal recorded when used as specified.

#### B. VOICE RECORD CARD (See detailed Functional description in Section 4)

##### 1. Power

<u>Voltage</u>	<u>Current (Typical)</u>
+12 ( <u>+0.12</u> ) Vdc	40 mA (P1-9A,-9B)
-12 ( <u>+0.12</u> ) Vdc	20 mA (P1-8A,-8B)
+5 ( <u>+0.05</u> ) Vdc	30 mA (P1-12A,-12B)

##### 2. Input - Data (P1-22A to P1-21A - GND)

Maximum Amplitude:	10V p-p.
Operating Amplitude:	0.05 mVrms to 1 mVrms.
Frequency:	150 Hz to 7200 Hz.
Input Impedance:	2200 ohms ( <u>+10%</u> ) for specified input level.
Source:	150 ohms impedance dynamic microphone (headset Part No. 16784943-001, or equivalent).

##### 3. Input - Direct Normalized Cal Signal (P1-19A)

1 Vrms sine wave at frequencies between 300 Hz and 3 kHz.

4. Output - Head Driver (P1-5B to P1-5A)
  - a. Output Impedance: 100 ohms (+20%)
  - b. Maximum Load: Short circuit from P1-5B to P1-5A or ground.
  - c. Normal Load: Single record head track.
  - d. Record Current: (Measured at TP2) with a 1 Vrms normalized 1 kHz sine wave at TP3. Minimum adjustment range by REC LEV pot (R49) from 0 to 40 mA p-p (0 to 400 mV p-p across 10 ohm head resistor - R63).
  - e. Bias Current: (Measured at TP2) minimum adjustment range by BIAS pot (R7) from 1 mA p-p to 30 mA p-p (10 mV p-p to 300 mV p-p across 10 ohm head resistor - R63) with standard tracks of MB heads; or 1 mA p-p to 45 mA p-p with edge tracks of MB heads and all tracks of WB heads.

5. Bias Frequency

2.2 MHz (+10%) (measured at TP4).

6. Gain - ALC

Adjustable by ALC GAIN pot (R26) to a normalized 1 Vrms at TP3 with inputs applied as specified in 1-3.B.2. Amplitude to remain constant within 3 db over full input amplitude range.

7. Frequency Response

300 Hz to 3000 Hz (+3 db) (1 kHz reference)

8. Command Logic

Logic 0 (ENABLE) = 0.0 to +0.5 Vdc.

Logic 1 (INHIBIT) = +2.6 to +5.25 Vdc.

Two bidirectional lines and three command lines are used to allow the microprocessor to control the card functions:

Normalized Cal Command (P1-16B)

Record Command/card ID (P1-17B)

Voice Record Command (P1-13A) - Manual PTT control.

Read Command (P1-18A)

Channel Read/Write Command (P1-21B).

9. Function Select (See S2 Function Chart on Schematic or Card)

S2 switch selectable (Operator's Manual explains each function).

10. Selective Track Record

Record ON/OFF Switch mounted at card edge allows manual selection of tracks enabled. In programmable (automatic) selective track record, the micro-processor controls the record cards, which have this switch "ON".

11. Record Indicator (LED)

A card edge mounted LED indicates the presence of head current when card is enabled.

C. VOICE REPRODUCE CARD

1. Power

<u>Voltage</u>	<u>Current</u> (Typical)
+12 (+0.12) Vdc	250 mA (P1-9A,-9B)
-12 (+0.12) Vdc	4 mA (P1-8A,-8B)
+5 (+0.05) Vdc	8 ma (P1-12A,-12B)

2. Input - Data (P1-1A to P1-1B)

Sensitivity: Automatic level control (ALC) makes input level non-critical over an operating range from 0.2 mVrms to 10 mVrms differential sinewave.

Frequency: 300 Hz to 3 kHz.

3. Output - Speaker or Headset (P1-22A)

Output Level: Adjustable from 0 to 2.0 Vrms by VOLUME control (R24).

Output Impedance: Less than 3 ohms.  
Normal Load: 4-ohm Speaker or 500V to 600-ohm headset (16784943) or equivalent.  
Maximum Load: Short circuit to ground.  
Frequency Response: Within 6 db from 300 Hz to 3 kHz.

4. Output - Reproduce Monitor (P1-20A)

Final output is switched to reproduce monitor bus (P1-20A) when the channel select command (P1-22B) is at logic 0.

5. ALC (Automatic Level Control)

Output level to remain constant within  $\pm 3$  db over full input amplitude range (34 db input change) when referenced to 1.0 mVrms input = 0 db output. ALC level is adjusted by ALC GAIN POT (R14) to 20 mVrms at TP2 or 1 Vrms at Reproduce Monitor output when VOLUME pot R24 is fully clockwise, with input signal applied.

6. Jumper J2

Normally operated in C-to-SQUELCH position so the output is squelched while recording, or not phase locked. C-to-NO SQUELCH may be used to inhibit any squelching.

7. Command Logic

Channel Select: (P1-22B)  
Card ID: (P1-17A)  
Squelch: (P1-13B)  
Record Squelch: (P1-18B)

D. VOICE HEADSET ASSEMBLY (Part Number 16784943 or equivalent)

1. Microphone

150 ohm impedance dynamic microphone.

2. Headphone

500- to 600-ohm impedance.

NOTE:

The headset specified has a Push-To-Talk (PTT) switch that controls the Voice Record Card, but does not short out the microphone element. This permits operation in the VOX (Voice Operated Mode) as the microphone element has an output without the PIT switch pressed. Other microphones may not have an output unless switch is on.

NOTE:

The rack mount voice unit assembly is available in the rack mount assembly and contains the 3.2-ohm dynamic speaker with volume control which is driven directly from the voice reproduce output.

## SECTION 2

### INSTALLATION

#### 2-1. VOICE RECORD CARD

The voice record card mounts in slots A8A4 through A8A19 of the 16 x 16 data housing and slots A8A4 through A8A35 of the 32 x 2 data housing. The component side faces left when installed. Prior to card installation, verify that switch S2 is programmed as desired. (Refer to Section 1, Figure 1-1 and Operator's Manual.)

#### 2-2. VOICE REPRODUCE CARD

The voice reproduce card mounts in slots A8A36 through A8A51 of the 16 x 16 data housing, A8A36 and A8A37 of the 32 x 2 data housing, and A4 through A35 of the 32 channel reproduce housing. The component side of the card faces left when installed. Prior to card installation, verify that both jumpers are in desired positions. (Refer to Section 1, Figure 1-2 and Operator's Manual.)

#### 2-3. VOICE HEADSET ASSEMBLY

The voice headset assembly is patched into the Model 101 System by inserting the phone plug into the MICROPHONE phonejack at the rear of system. A BNC cable (furnished with kit) must be connected between the MICROPHONE BNC jack and the proper RECORD INPUT BNC jack for voice track used. The headset BNC connector must be connected to the proper REPRODUCE OUTPUT BNC jack for the voice track used.

#### CAUTION

System power must be turned off when voice record or voice reproduce cards are being removed or installed.



## SECTION 3

### OPERATION

Operating procedures are located in the Operator's Manual.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the voice option. The description is divided into two parts for each circuit card assembly - voice record and voice reproduce.

#### 4-2. VOICE RECORD CARD

##### A. FUNCTIONAL DESCRIPTION (Figure 4-1)

The voice record card accepts low level input signals from the microphone and amplifies them to a normalized 1 Vrms level automatically. A portion of this normalized signal is fed via the REC LEV (Record Level) pot R49 to the summing junction of the head driver amplifier. The bias signal from the bias oscillator is also summed in at this point. The bias signal level is determined by BIAS pot R7. The head driver amplifier output is capacitively coupled to the record head track. Control of the card is programmable by switch S2 and control logic interfacing with the microcomputer. The direct normalized CAL signal is used for initial record level adjustment. The voice record card consists of a programmable and adjustable automatic level control (ALC) amplifier with a controlled calibrate signal input, a bias oscillator, a head driver amplifier, and microcomputer interface logic.

The ALC amplifier in normal operation has an input from the microphone at P1-22A. When enabled, the ALC amplifier is adjusted by ALC GAIN pot R26 to yield a 1 Vrms level at TP3 when a microphone level signal is applied. The ALC amplifier may be enabled by four different functions, determined by the positions of programming switch S2. A 1 Vrms direct normalized calibrate signal is applied to TP3 when a normalized calibrate command is present. This TP3 signal is summed with the bias signal at the input of the head driver amplifier via the RECORD LEVEL pot (R49).

The bias oscillator is controlled in common with the ALC amplifier and thus enabled by the same four different functions, determined by the positions of the programming switch S2. It operates at a frequency of approximately 2.2 MHz. The bias oscillator output amplitude is adjustable by BIAS pot R7 which controls the amount of bias signal that is summed with the data signal at the input of the head driver amplifier.

The head driver amplifier combines the data and bias signals at different gains and apply the composite waveform to the record head track via P1-5B. P1-5A is the head return through resistor R63 (10 ohms, 1%) to ground. Test point TP2 may be used to measure the voltage drop across R63 to determine head current.

The microcomputer interface logic accepts commands from and sends identification code to the microcomputer.

## B. CIRCUIT DESCRIPTION (Figure 7-1)

### 1. ALC Amplifier

The ALC amplifier consists of U6A,-B,-C, R26, Q5 and associated components. The programming switch (S2) operates with the ALC so it is also covered in this description.

The input signal is applied to the voice record card through the BNC connectors designated RECORD INPUT on the input/output panel, and enters the card at P1-22A. The input signal is limited by R22, CR2, and CR3 to a peak amplitude of one diode drop before being capacitively coupled by C14 to Pin 6 of U6A. The input impedance is approximately 2000 ohms.

The ALC amplifier has three stages of gain. Amplifier U6A and U6C are fixed gain stages and U6B is a variable gain stage. The gain of U6B is set by ALC GAIN pot R26 to yield a 1 Vrms level at TP3 with an input level of approximately 1 mVrms. The feedback path through R29 and CR4 dynamically varies the gain of U6B around this set level, depending upon the input level.

As the input level is decreased, the signal level at TP3 would tend to decrease, however this is sensed at CR4 as a decrease in positively rectified signal which allows the gain of U6B to increase, thus offsetting the normal tendency of level decrease at TP3. With an increase of input level the inverse is true.

The ALC amplifier develops the input signal level. U6B, U6C, and Q8 form a feedback loop for the variable gain stages of the amplifier. U6A provides a fixed gain of 53dB over a bandpass of 150Hz to 7200 Hz. RC networks, R22/C14, and R18/C25, provide low frequency rolloff. R24/C15 and R31/C22 provide high frequency rolloff. The output of the ALC amplifier is applied at TP3.

A second input to TP3 is the direct normalized calibrate signal, input at P1-19A. A normalized calibrate command enables U5D to pass the direct normalized calibrate signal with approximately unity gain from P1-19A to TP3. U2D, U2C, and Q8 provide the signal path to TP3. A portion of the signal developed at TP3 is tapped off by the record level pot (R49), and input to the head driver amplifier.

Programming switch S2 has four switch sections. Various combinations of these sections being on or off, as shown on the chart schematic (Figure 7-1) and silkscreened on the circuit card, provide for the functions as described later. The bias oscillator (U1) and the ALC amplifier (U6A, U6B, and U6C) are both energized under the following conditions:

PTT function energizes the record card only when the microphone is switched on.

STR function energizes the record card when a system REC CMD is present at P1-17B. The microphone switch will also energize the record card even if REC CMD is not present.

STR ● PTT function energizes the record card only when the REC CMD is present and the microphone switch is on.

VOX function energizes the record card by the first syllable of speech.

#### CAUTION

Over recording is possible while in the VOX mode when rewinding or in playback mode if the microphone receives sounds sufficient to exceed threshold level. To guarantee against this, the microphone plug may be pulled out or the voice record card switch S2 may be reprogrammed to function other than VOX. (Card edge switch S1 does not control this mode).

CAL function is the same as STR except record sequelch is inhibited.

With the VOX function selected the threshold pot (R35) may be adjusted such that with no voice input to the microphone (background noise only) the red LED at card edge is on. This is done by turning R35 CW to a lower threshold level so that background noise turns the card on. Then adjusting R35 very slowly CCW to the point that the LED is just extinguished. Now speak directly into the microphone and test for recording of first syllable. If first syllable is missing, touch up R35 in the CW direction until the first syllable is recorded. A high background noise can be handled by using the same procedure, but use a "ten" code at the beginning of each voice statement. The word "ten" is very effective in turning the card on.

### 2. Bias Oscillator

The bias oscillator circuit consists of U1 and R7 and associated components. This circuit generates a sine wave of approximately 2.2 MHz whose amplitude output is variable by BIAS pot R7. This amplitude adjustment determines the bias current level through the head. The bias signal of TP4 is summed with the data signal at the head driver amplifier input.

### 3. Head Driver Amplifier

The head driver amplifier receives both data (voice) and bias signals as inputs. The two signals have independent gains in the head driver. The data signal gets a gain of 6 db and the bias signal gets a gain of 26 db. The transistor buffered output stage (Q1 and Q2) provides the necessary current drive, capacity coupled to the head. Head current may be measured as a voltage drop across the 10 ohm resistor (R63) by using TP2 and TP1.

#### 4. Microcomputer Interface Logic

The microcomputer interface logic circuit consists of U3, U4, U5, S1 and associated circuitry. It interfaces commands from the microcomputer and provides identification signals to the microcomputer. The commands, such as the record command on P1-17B and the normalized CAL command on P1-16B; are written into latch U5A when a channel READ/WRITE command P1 pin 18A is at a logic 1 (high) state.

When a read command (a logic 0) is present on P1-18A, U3A pin 4 is at a logic 1, which holds U3B pin 13 low so no clock pulse appears at U5A pin 9 when a read/write pulse occurs at P1-21B. Thus, no commands are written into latches with this read/write pulse. What does happen is this: A read command present (low) on U3C pin 9 allows U3C pin 10 to go high simultaneously with a high-going-low read/write pulse. Now, if the record ON/OFF switch (S1) is ON, a logic 1 also appears at U4A pin 10. Therefore, U4A pin 8 will go low for that pulse duration, which becomes the card identification to the microcomputer at P1 pin 17B.

If the record ON/OFF switch (S1) is OFF, a logic 0 is placed on U4A pin 10. This inhibits the pulse at U4A pin 9 from sending a logic 0 identification pulse out on P1-17B. When this stays at a high level during the reset strobe pulse the microcomputer interprets this as an instruction to turn off the record command and normalized CAL command and treats this channel the same as if no card was in the channel. When the microcomputer finds no card in a channel or the record ON/OFF switch (S1) is OFF, the channel selector immediately advances to next channel.

Each U5A latch output controls its respective circuitry. The U5A pin 10 output, when a logic 0, turns on the ALC amplifier and bias oscillator if the programming switch (S2) is programmed for Selective Track Record (STR) or CAL. That is: S2-1 is ON thus causing U3D pin 1 to be high (1), and causing U4B pin 3 to go to a logic 0. A logic 0 turns on both U1 and Q7, allowing both voice and bias to be outputted to the driver stage.

In the STR ● PTT function, S2-1 is OFF but S2-2 is ON. This makes it necessary to push the microphone switch ON and for the record command to be present to get a logic 0. A logic 0 enables Q7 and disables Q4, outputting both voice and bias to the drive stage. Note that S2-3 is OFF so that the microphone switch cannot energize the card directly.

Note also that when the Push-To-Talk (PTT) function is programmed, only S2-3 is ON. This allows the microphone switch only to make a logic 0 at U4B pin 3, which is an open collector circuit used as a "wired or" circuit. Since S2-1 and S2-2 are OFF, U3D pin 1 remains at a logic 0 thus U4B only goes low due to the microphone switch being on.

The U5B latch output is a logic 0 when the system is given a normalized CAL command. Then a logic 0 is present at P1 pin 16B, which gets written into the latch with the read/write pulse. This causes U2D pin 8 to be high and allows the direct normalized CAL signal to pass as an input to amplifier U2C. A signal of approximately 1 Vrms is then present at TP3, to be used to set up the RECORD LEVEL pot (R21).

## A. FUNCTIONAL DESCRIPTION (Figure 4-2)

The voice reproduce card receives its input signals from the system preamplifier at the reproduce head output. A normalized level appears across the volume control and a portion of this signal is fed to the power amplifier. The output of the power amplifier is applied to the headphones via the REPRODUCE OUTPUT BNC or if the rack mount voice unit assembly is used, this BNC output is applied to the speaker via the external volume control on the voice unit assembly. The amplitude of this final output may be monitored by the meter monitor unit when the voice channel and reproduce monitor bus (REPRO) are selected on front panel of the Model 101.

The voice reproduce card consists of an ALC amplifier, a power amplifier, reproduce monitor switch, channel select and card ID, and squelch logic.

The ALC amplifier receives a differential input signal from the system preamplifier output through a fixed frequency response shaping circuit. This signal is amplified and automatic level controlled to produce a normalized amplitude of approximately 40 mVrms at TP2. This amplitude is set by adjusting the ALC GAIN pot (R14).

The power amplifier has a fixed 34 db of voltage gain and the capability to drive either the headphones or the 3.2- ohm dynamic speaker in the voice unit assembly. A squelch control is also provided for the suppression of the reproduce output during the record mode, fast forward mode or fast rewind mode. When not squelched, the power amplifier output is delivered to the headphones or speaker and to the reproduce monitor switch.

The reproduce monitor switch passes the final output signal to the reproduce monitor bus upon command from the microcomputer via the channel select and card ID circuitry.

The channel select and card ID circuit receives an interrogation signal from the microcomputer and simultaneously sends back the unique identification for a voice reproduce card. At this same time the reproduce output is switched through the reproduce monitor switch to the reproduce monitor bus and measured by the meter monitor.

The squelch logic circuit receives two inputs. One is the phase lock squelch command and the other is the record squelch command. The logic is an "OR" configuration where either input can squelch the output. Jumper J2 is normally set in the C-to-SQ position to allow output squelching, however, if no squelch is desired the jumper would be placed in the C-to-NO SQ position. This function may be desirable if searching for voice annotation in the fast modes where no phase lock is acquired, or if simultaneous record and reproduce is needed.

## B. CIRCUIT DESCRIPTION (Figure 7-2)

### 1. ALC Amplifier

The ALC amplifier consists of U1C, U1D, R14, Q2 and associated components.

The differential inputs are capacitively coupled from P1-1A and P1-1B to the input stage (U1A and U1B) of the ALC amplifier. U1A has a gain of 20 db, and U1B has a gain of 22db. The ALC stage (U1C, U1D, and Q2) of the amplifier is a variable gain stage. The ALC gain pot (R14) is set to yield 40 mVrms at TP3. As the input level varies, the feedback path (R16, C12, and Q2) dynamically varies the gain of the stage to maintain the 40 mVrms.

Test point TP2 is available primarily for factory test purposes.

### 2. Power Amplifier

The input to the power amplifier is from the ALC amplifier through R20, R22, C13, C14 and volume pot R24. The resistor-capacitor network provides a lowpass filter of 3.5 kHz and a highpass of 350 Hz along with volume control.

The power amplifier (U2) has a fixed voltage gain of 34 db and is capable of providing 2 watts of power into a 3.2-ohm speaker. The output is capacitively coupled through P1-22A to the headphones or speaker due to the dc voltage of one-half the power supply voltage which appears at the LM 380N output (pin 8). (The RC network of R24 and C31 are provided to avoid oscillations.)

The squelch capability is achieved by pulling U2 pin 1 towards the +12V (A) supply voltage. This is done by transistor Q1 and associated components with an input through jumper J2 when in the C-to-SQ position. With J2 in the C-to-NO SQ position, the amplifier U2 remains on (no squelch).

### 3. Reproduce Monitor Switch

The reproduce monitor switch consists of U4 with the control from the channel select and card ID circuit. Upon command from this circuit the reproduce output is applied to the reproduce monitor bus to be measured by the meter monitor unit.

### 4. Channel Select and Card ID

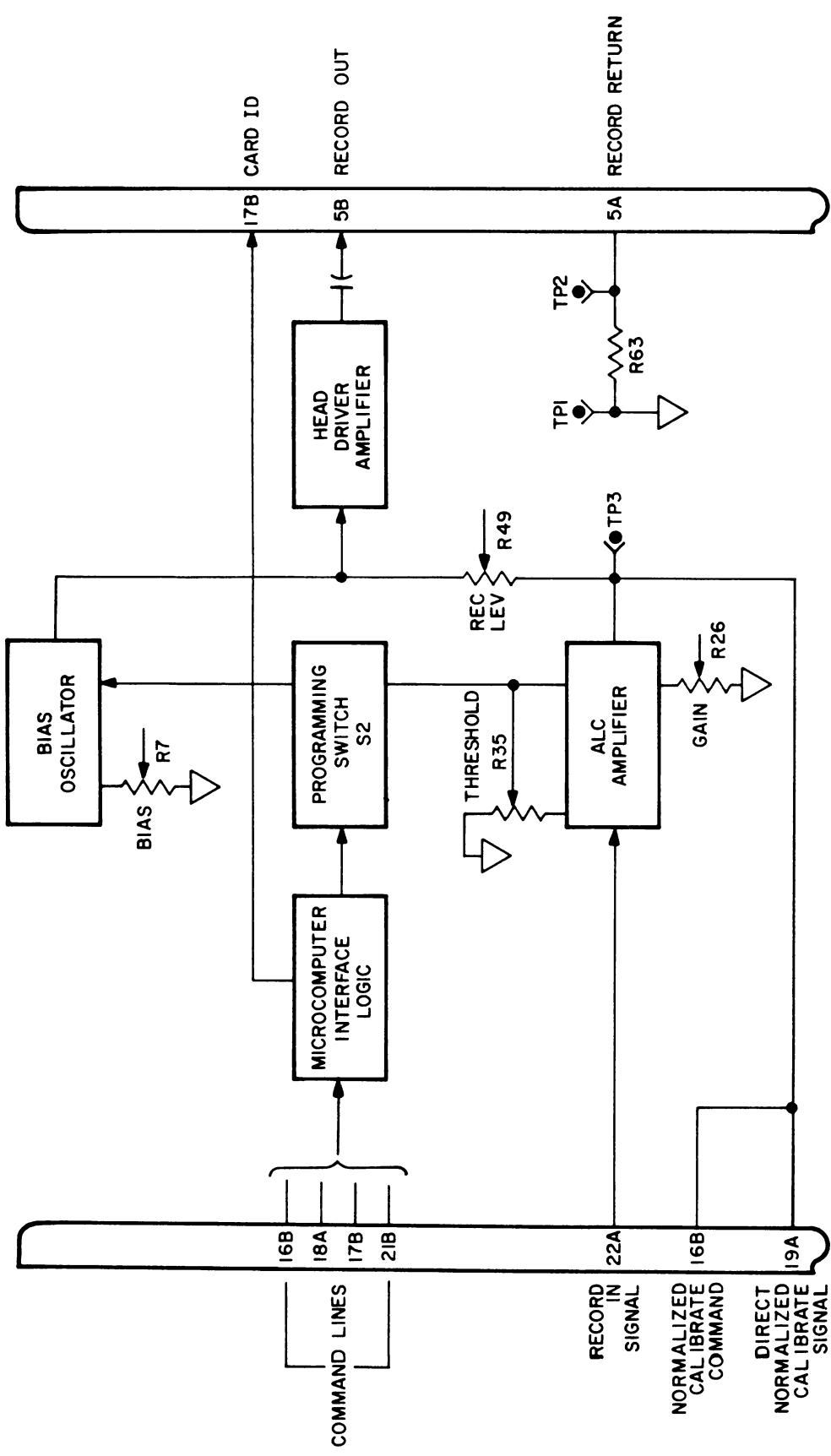
The channel select and card ID circuit consists of U3 with pullup resistors R31 and R32. When a channel select command (Logic 0) from the microcomputer is present at P1-22B the card ID output P1-17A is a logic 0. This is a unique ID for the voice reproduce card. Simultaneously with this condition, the reproduce monitor switch is turned on to present the voice reproduce output to the reproduce monitor bus on P1-20A.

## 5. Squelch Logic

The squelch logic circuit consists of 1/6 of U3, CR2, CR3 and pullup resistor R25. When the capstan servo is not phase locked, a logic 1 appears at P1-13B. This causes U3 pin 2 to go to a logic 0, and if J2 is in the C-to-SQ position, the power amplifier would be squelched. When the capstan servo acquires phase lock, U3 pin 2 will go to a logic 1 and the power amplifier is unsquelched.

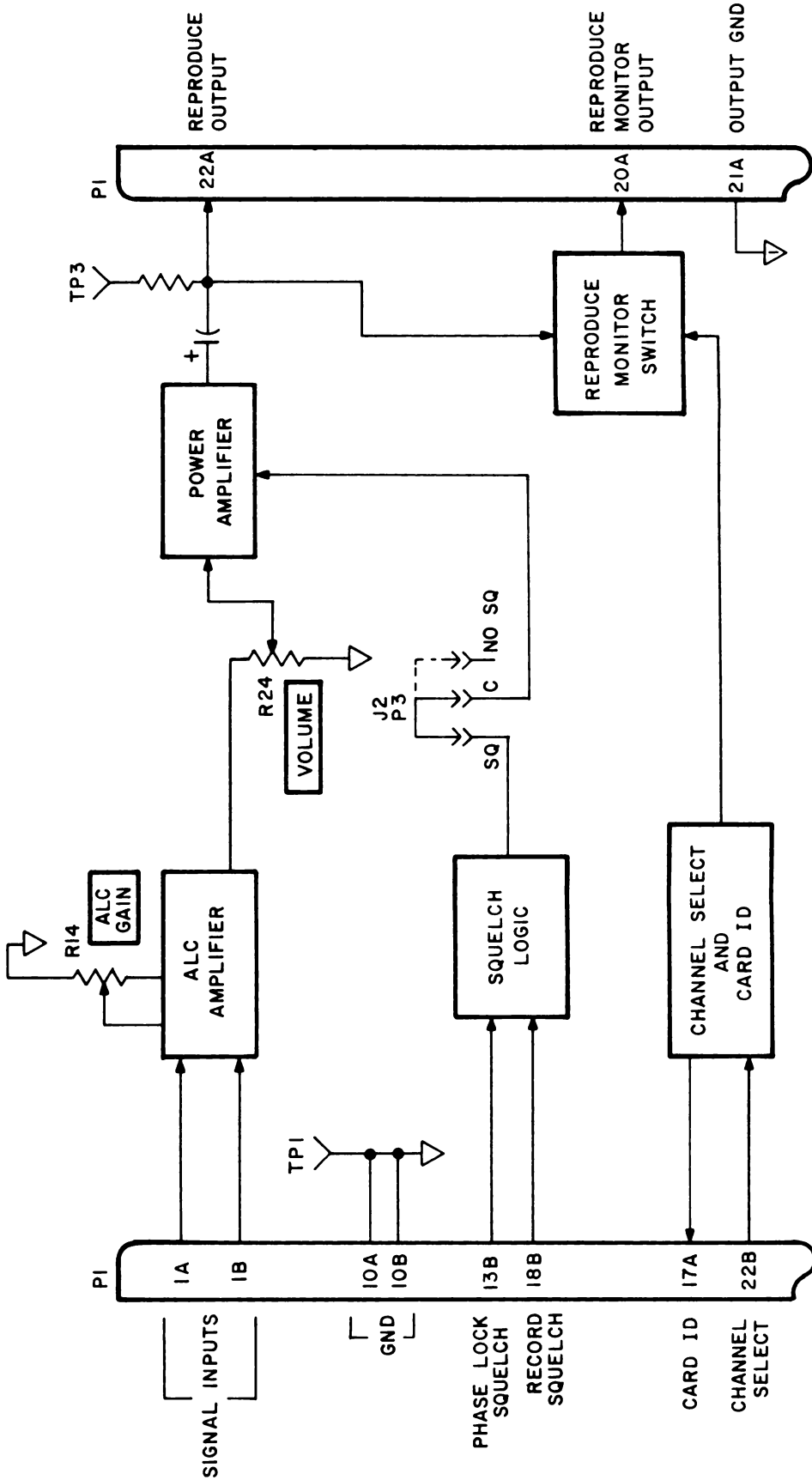
This logic circuit is an "OR" circuit which allows a logic 0 at record squelch P1 pin 18B to also squelch the power amplifier. The input at P1-18B can get a logic 0 directly from the microphone push-to-talk switch or from the voice record card P1-13A when in other modes as programmed by S2 on the voice record card. Jumper J2 inhibits squelching when in the C-to-NO SQ position.

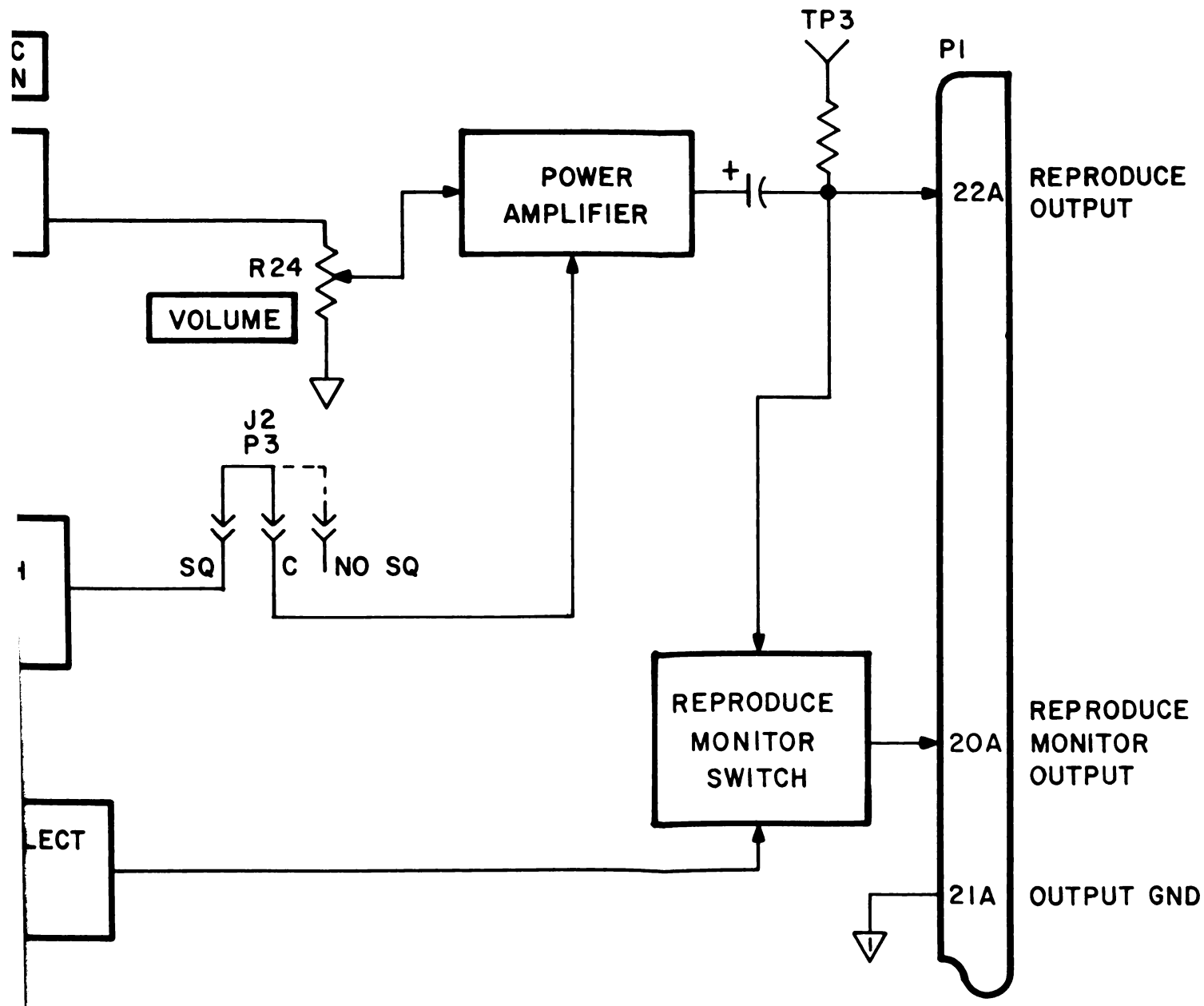




T1D-D18

Figure 4-1. Voice Record Block Diagram





TID-DI7

Figure 4-2. Voice Reproduce Functional Block Diagram

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

Adjustments to the voice option system are described in the Model 101 Operator's Manual. The ALC gain is adjusted at the factory. Adjustment is not normally needed in the field. If it becomes necessary to adjust the ALC gain, follow the procedure listed below.

A. Patch headset into system by inserting phone plug into MICROPHONE jack and connecting the headset BNC to the REPRODUCE OUTPUT BNC for channel being used for voice.

B. Verify that MICROPHONE BNC is patched to proper record input channel of voice record card and program switch S2 is set to CAL function.

C. On control panel, select STOP, CAL, REC, and channel being used for voice. Then, while whistling a constant tone into the microphone, adjust GAIN pot R26 on the voice record card for 1 Vrms at TP3. This setting normalizes the microphone level to 1 Vrms to match the calibration signal level at TP3 to assure proper record level.

5-2. TROUBLESHOOTING

Use this section in conjunction with the principles of operation (Section 4) and the schematics (Section 7). It is assumed that the necessary test equipment is available to make specified measurements and that the power supply voltages have been verified on the choke or dropping resistor ends opposite the connector.

A. VOICE RECORD CARD

Set program switch S2 on the voice record card for CAL function. On control panel, select a low speed (7.5 IPS preferred), CAL, REC, FWD, and LF on calibrator. If both bias frequency and record level frequency are present at normal operating levels ( 10 mA p-p of record current and 40 mA p-p of bias current) but no voice was recorded using microphone and S2 programmed for proper voice function, then suspect input connection from microphone, microphone itself, switch S2, or ALC amplifier U6A, or Q6 in that order. If both bias frequency and record level frequency were not available, proceed to the appropriate symptom listed in Table 5-1.

Table 5-1. Voice Record Card Troubleshooting

SYMPTOM	PROCEDURE
<p>1. <u>Neither</u> bias frequency <u>nor</u> record frequency available at TP3.</p>	<p>Check for logic 0 at U4B pin 3. If not, suspect connections to and from the record head, or the head driver amplifier. Check U2B Pin 1 for positive voltage.</p>
<p>2. Record frequency but <u>no</u> bias frequency available at TP3.</p>	<p>Check for bias frequency at TP4 while adjusting BIAS pot R7. Expect approximately 350 mV p-p maximum at TP4. If no signal appears at TP4, suspect bias oscillator circuit U1, U2 or Q4.</p>
<p>3. Bias frequency but <u>no</u> record frequency available at TP3.</p>	<p>Check U2C pin 14 for calibration signal. The signal level should be just under 1 Vrms, if not suspect U2C, U2D, Q8, or U5B. If no signal at U2C, check P1-19A for calibrate signal and P1-16B for normalized calibrate command.</p>
<p>4. Voice can be recorded in all functions except VOX.</p>	<p>Check programming switch S2 for proper settings. Try setup procedure in Operator's Manual for threshold pot R35. If still failing, suspect R35 and associated circuitry, switch S2, U6D, or Q6.</p>

B. VOICE REPRODUCE CARD

Before attempting to troubleshoot the voice reproduce card, verify that the jumpers are correctly installed and both ALC GAIN pot R14 and VOLUME pot R24 are adjusted to normally produce the desired output. Verify the voice record is functioning properly ( 10 mA p-p of record current and 40 mA p-p of bias current measured as a voltage drop across 100 ohm resistor R63 by testing TP2) under conditions specified in first paragraph in 5-2.A. If all conditions above are proper, proceed as described in Table 5-2 while the voice record card is programmed for the CAL function and recording at a low speed.

Table 5-2. Voice Reproduce Card Troubleshooting

SYMPTOM	PROCEDURE
<p>1. No test signal at TP3 or reproduce monitor output when recording in CAL mode.</p>	<p>Check if test signal appears at these points when jumper J2 is placed in NO SQ position. If not present, suspect the pins, 1-2-section of U3 or a short to a low dc level at CR2. If test signal is still not present, check for an approximate level of +6 volts at U3 pin 1. If this is near +11 volts suspect the Q1 circuit.</p>
<p>2. A test signal of approximately 40 mVrms can be acquired at TP3 by adjusting ALC GAIN pot (R14) but no signal appears at TP4 even with volume pot (R24) set fully clockwise.</p>	<p>Check for a 40 mVrms signal at U2 pin 6. If present, suspect shorted output circuit or bad U2 if U2 pin 1 is near +6 volts and supply voltage is present at U2 pin 14.</p>
<p>3. No test signal at TP3 while in CAL MODE.</p>	<p>Check for signal at U1C pin 1. If no signal present, check TP2 for a signal. If a signal is present at TP2, suspect U1B, U1C, CR1, Q2 or associated components. If no signal is present at TP2, check P1-1A and P1-1B for differential input signals.</p>
<p>4. Test signal appears at TP4 but not at reproduce monitor output P1 pin 20A.</p>	<p>Check for a logic 1 at U4 pin 1 when control panel is set on Repro and Voice Channel. If present, suspect U4 circuit is bad. If not present, suspect U3 circuitry.</p>
<p>5. CARD ID not functioning.</p>	<p>Check for a logic 1 at U3 pin 9 and a logic 0 at U3 pin 8, when channel select line P1 pin 22B is a logic 0. Suspect R31 open or a bad U3.</p>

## ILLUSTRATED PARTS BREAKDOWN

## 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

## A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

## B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

## C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

## D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

## E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.



## 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

## 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
 TEST INSTRUMENTS DIVISION  
 P.O. BOX 5227  
 DENVER, COLORADO 80217  
 ATTN: SPARE PARTS DEPT.

## 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
Voice Record, CCA	16809623-002 16809623-003	B

DESCRIPTION	PART NUMBER	CODE

8/83

- | CODE | DEFINITION   |
|------|--|
| A    | COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.   |
| B    | PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY. |
| C    | PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.  |

- | CODE | DEFINITION   |
|------|--|
| D    | PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD. |

## APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	HEWLETT PACKARD COMPANY 1501 PAGE HILL ROAD PALO ALTO, CALIFORNIA 94304	28480
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX 20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	TELEX COMMUNICATION INC. 9600 ALDRICH AVENUE SOUTH MINNEAPOLIS, MINNESOTA 55420	28856
CTS KEENE INCORPORATED 3730 RIVERSIDE AVENUE PASO ROBLES, CALIFORNIA 93446	11237	BUSSCO ENGINEERING INC P.O. BOX 652 EL SEGUNDO, CALIFORNIA 90245	29593
PLASTIGLIDE MFG CORP P.O. BOX 867 1757 STANFORD STREET SANTA MONICA, CALIFORNIA 90406	11897	HARRIS SEMICONDUCTOR P.O. BOX 883 MELBOURNE, FLORIDA 32901	34371
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	SPRAGUE ELECTRIC COMPANY NORTH ADAMS, MASSACHUSETTS 01247	56289
SCANBE MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
BERG ELECTRONICS YOUK EXPRESSWAY NEW CUMERLAND, PENNSYLVANIA 17070	22526	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
ANALOG DEVICE, INCORPORATED P.O. BOX 280 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	BUNKERRAMO CORPORATION THE AMPHENOL RF DIVISION 33 E. FRANKLIN STREET DANBURY, CONNECTICUT 06810	74868
CORNELL-DUBILIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DES PLAINES, ILLINOIS 60018	25243	JOINT ELECTRONIC TYPE DESIGNATION SYSTEM	80058
MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769	ELECTRONIC INDUSTRIES ASSOCIATION	80131
NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009	SWITCHCRAFT INCORPORATED 5555 NORTH ELSTON AVENUE CHICAGO, ILLINOIS 60630	82389
		ALCO ELECTRONICS PRODUCTS INC. 1551 OSGOOD STREET NORTH ANDOVER, MAINE 01845	95146
		DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST AURORA, NEW YORK 14052	99800

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TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-109	OPERATOR LEVEL SPARES KIT, VOICE CONTROL					
16737991-012	CONNECTOR, ELECTRICAL, BNC	80058	UG9148U	1	1	
16809623-003	CIRCUIT CARD ASSEMBLY, VOICE RECORD	28009		1	1	
16809626-001	CIRCUIT CARD ASSEMBLY, VOICE REPRODUCE	28009		1	1	

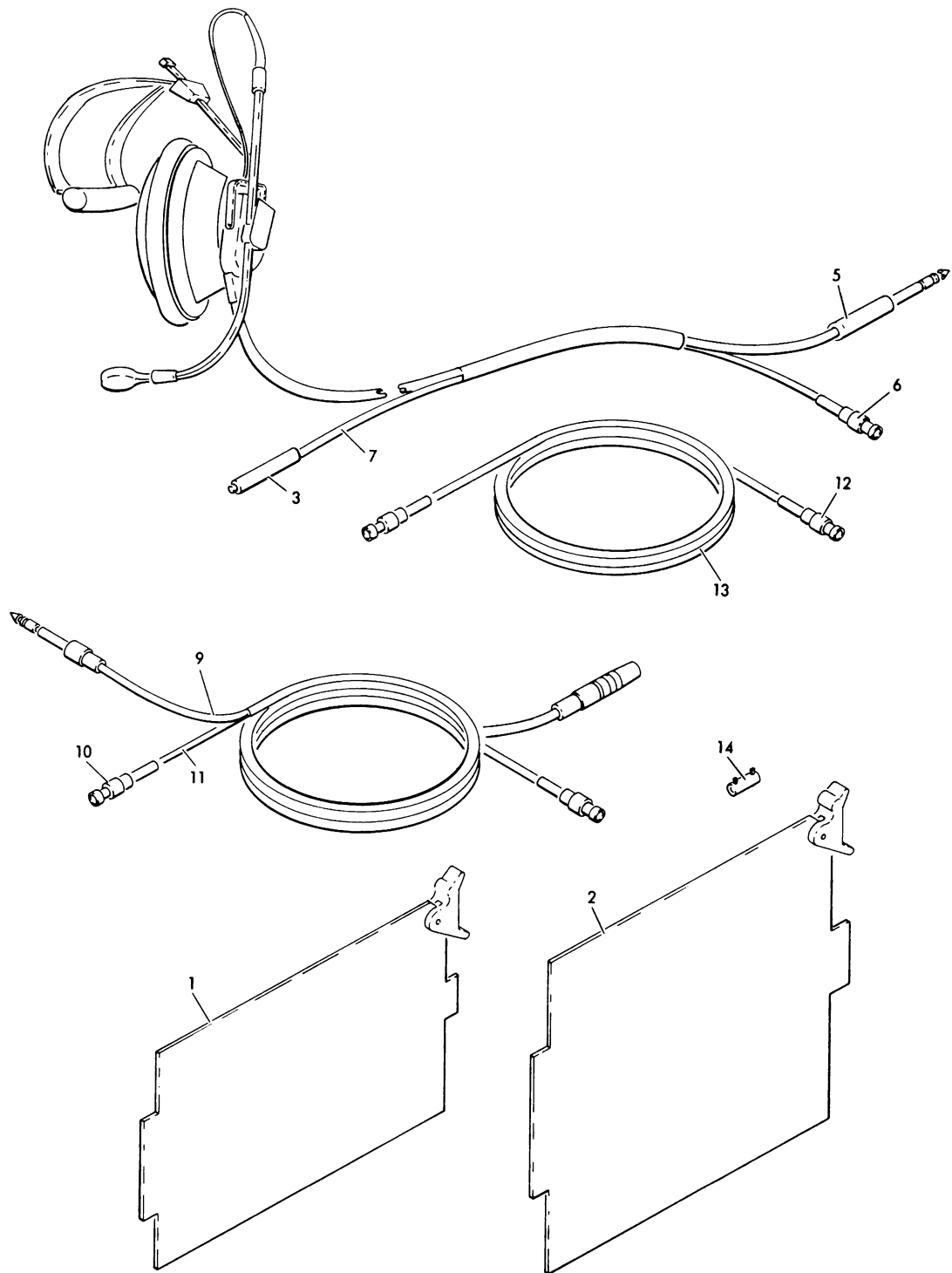
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## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-015	BENCH LEVEL SPARES KIT, AUXILIARY HOUSING					
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	11	3	
16762172-001	TRANSISTOR	80131	2N3904 5961-00-892-8706	4	1	
16762173-001	TRANSISTOR	04713	2N3906 5961-00-072-0128	2	1	
16765842-001	TRANSISTOR	80131	2N4302	2	1	
16765842-011	TRANSISTOR	27014	PN4302-18	1	1	
16776656-003	INTEGRATED CIRCUIT	27014	LM318N	1	1	
16776979-001	TRANSISTOR	04713	SPS-8716	3	1	
16776980-002	MICROCIRCUIT	27014	LM733CN	1	1	
16778597-003	SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING	28480	HLMP1301	1	1	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	1	1	
16779948-001	BUS BAR	29593	B5153-100-2G8	1	2	
16781367-001	MICROCIRCUIT	01295	SN74LS38N	1	1	
99000249-001	MICROCIRCUIT	01295	SN74LS02N	1	1	
99000271-001	MICROCIRCUIT	01295	SN74LS175N 5962-00-595-8253	1	1	
99000279-001	MICROCIRCUIT	27014	LM348N	2	1	
99000312-001	MICROCIRCUIT	01295	SN74LS05N	1	1	
99000568-001	MICROCIRCUIT	27014	LM380N	1	1	
99000629-002	MICROCIRCUIT	34371	HA1-4605-5	1	1	

SECTION 6



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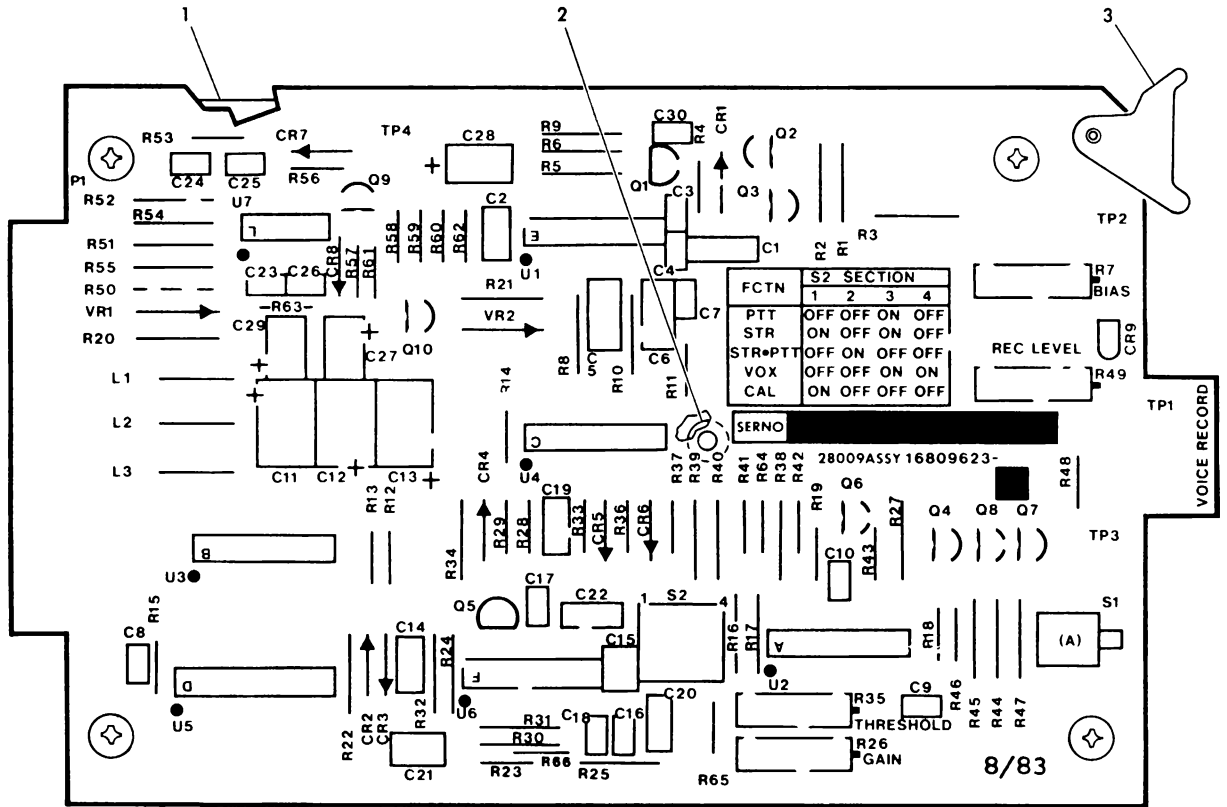
FIGURE 6-1. KIT, VOICE RECORD/REPRODUCE

SECTION 6

TABLE 6-1. KIT, VOICE RECORD/REPRODUCE

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1			KIT, VOICE RECORD/REPRODUCE	28009			AR		
6-1	1		. CIRCUIT CARD ASSEMBLY, VOICE RECORD (SEE TABLE 6-2 FOR BREAKDOWN)	28009			1		
6-1	2		. CIRCUIT CARD ASSEMBLY, VOICE REPRODUCE (SEE TABLE 6-3 FOR BREAKDOWN)	28009			1		
6-1			. HEADSET ASSEMBLY	28856	65421-000		1		
6-1	3		. SWITCH, PUSH	82389	EP913		1		
6-1	4		. NOT USED						
6-1	5		. PLUG, TELEPHONE	82389	267 5935-556-7480		1		
6-1	6		. CONNECTOR, PLUG, ELECTRICAL	74868	31-315 5935-01-079-7322		1		
6-1	7		. CABLE, RADIO FREQUENCY	81349	RG-174/U		AR		
6-1	8		. NOT USED						
6-1			. CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL, HEADSET EXTENSION	28009			1		
6-1	9		. CABLE ASSEMBLY, SPECIAL PURPOSE	82389	10BN81		1		
6-1	10		. CONNECTOR, PLUG, ELECTRICAL	74868	36775 5935-904-8372		2		
6-1	11		. CABLE, COAXIAL	80058	RG58AU		AR		
6-1			. CABLE ASSEMBLY, BNC	28009			1		
6-1	12		. CONNECTOR, PLUG, ELECTRICAL	74868	31-320		2		
6-1	13		. CABLE, COAXIAL	80058	RG58AU		AR		
6-1	14		. CONNECTOR, ELECTRICAL, BNC	80058	UG914BU		1		
			VOICE SPEAKER ASSEMBLY FOR PARTS BREAKDOWN, SEE SYSTEM MANUAL, FIGURE 6-3	28009			AR		

NOTES:



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FIGURE 6-2. VOICE RECORD CIRCUIT CARD ASSEMBLY



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TABLE 6-2. VOICE RECORD CCA (SHEET 1 OF 4)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURERS CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-2			CIRCUIT CARD ASSEMBLY, VOICE RECORD	28009		16809623-002	REF	A	
6-2			CIRCUIT CARD ASSEMBLY, VOICE RECORD (SEE TABLE 6-1 FOR LOCATION IN NHA)	28009		16809623-003	REF	B	
6-2	CR1-8		. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	8		
6-2	CR9		. SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING	28480	HLMP1301	16778597-003	1		
6-2	C1		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-20%, 50VDC	56289	C023B500E103M	16757455-002	1		
6-2	C2		. CAPACITOR, FIXED, MICA DIELECTRIC 68PF, +-5%, 500VDC	25243	C010E0680JN1	16759780-262	1		
6-2	C3,4		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	2		
6-2	C5,6		. CAPACITOR, FIXED, MICA DIELECTRIC, 27PF, +-5%, 500VDC	25243	C010E0270JN1	16759780-252	2		
6-2	C7		. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	61637	C320C103M5U1CA	16771020-011	1		
6-2	C8-10		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	3		
6-2	C11,12		. CAPACITOR, FIXED, ELECTROLYTIC, 68UF, +-10%, 20VDC	26769	41KS566E020K1A	16758058-344	2		
6-2	C13		. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 10VDC	26769	41KS107E010K1A	16758058-146	1		
6-2	C14		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.47UF, +-20%, 50VDC	61637	C330C474M5U1CA	16771020-023	1		
6-2	C15		. CAPACITOR, FIXED, MICA DIELECTRIC, 220UF, +-5%, 500VDC	25243	C010E0220JN1	16759780-250	1		
6-2	C16,17		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	2		
6-2	C18		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.47UF, +-20%, 50VDC	61637	C320C473M5U1CA	16771020-016	1		
6-2	C19		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1UF, +-20%, 50VDC	61637	C330C105M5U1CA	16771020-025	1		
6-2	C20		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.47UF, +-20%, 50VDC	61637	C330C474M5U1CA	16771020-023	1		
6-2	C21		. CAPACITOR, FIXED, MICA DIELECTRIC 220PF, +-5%, 500VDC	25243	C010F0221JN1	16759780-274	1		
6-2	C22		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1UF, +-20%, 50VDC	61637	C330C105M5U1CA	16771020-025	1		
6-2	C23,24		. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	61637	C320C103M5U1CA	16771020-011	2		
6-2	C25,26		. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	61637	C320C104M5U1CA	16771020-018	2		
6-2	C27-29		. CAPACITOR, FIXED, ELECTROLYTIC, 15UF, +-10%, 15VDC	26769	41KS156B015K1A	16758058-236	3		
6-2	C30		. CAPACITOR, FIXED, CERAMIC, DIELECTRIC, 0.01UF, +-20%, 50VDC	61637	C320C103M5U1CA	16771020-011	1		
6-2	L1-3		. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-819-1990	16750875-254	3		
6-2	Q1		. TRANSISTOR	80131	2N4302	16765842-001	1		

NOTES

## SECTION 6

TABLE 6-2. VOICE RECORD CCA (SHEET 3 OF 4)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-2		R24	. RESISTOR, FIXED, METAL FILM, 1.50 MEG OHMS, +-1%, 1/8W	07716	CCMT0-1504F	16757165-518	1		
6-2		R25	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	1		
6-2		R26	. RESISTOR, VARIABLE, 5K OHMS, +-10%, 3/4W	73138	89PR5K	16775165-009	1		
6-2		R27	. RESISTOR, FIXED, METAL FILM, 5.11K OHMS, +-1%, 1/8W	81349	RNR55K5111FS 5905-00-403-3156	16757165-269	1		
6-2		R28,29	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	2		
6-2		R30	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2001FR	16757165-230	1		
6-2		R31	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	1		
6-2		R32	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289	16757165-201	1		
6-2		R33	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-2		R34	. RESISTOR, FIXED, METAL FILM, 4.99K OHMS, +-1%, 1/8W	81349	RNR55K4991FS 5905-00-432-0421	16757165-268	1		
6-2		R35	. RESISTOR, VARIABLE, 2K OHMS, +-10%, 3/4W	73138	89-14-0	16775165-208	1		
6-12		R36	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-2		R37	. RESISTOR, FIXED, CARBON COMPOSITION, 1.5 MEG OHMS, +-5%, 1/4W	81349	RCR07G155JM	16750079-109	1		
6-2		R38	. RESISTOR, FIXED, METAL FILM, 7.68K OHMS, +-1%, 1/8W	81349	RNR55K7681FM	16757165-286	1		
6-2		R39	. RESISTOR, FIXED, METAL FILM, 20K OHMS, +-1%, 1/8W	81349	RNR55K2002FS 5905-00-247-4504	16757165-330	1		
6-2		R40	. RESISTOR, FIXED, METAL FILM, 75K OHMS, +-1%, 1/8W	81349	RNR55K7502FM	16757165-385	1		
6-2		R41	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	1		
6-2		R42	. RESISTOR, FIXED, CARBON COMPOSITION, 27K OHMS, +-5%, 1/4W	81349	RCR07G273JM	16750079-067	1		
6-2		R43	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-2		R44,45	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	2		
6-2		R46	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-2		R47	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	1		
6-2		R48	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-2		R49	. RESISTOR, VARIABLE, 10K OHMS, +-10%, 3/4W	73138	89PR10K 5905-00-003-2537	16775165-010	1		
6-2		R50	. RESISTOR, FIXED, METAL FILM, 49.9K OHMS, +-1%, 1/8W	81349	RNR55K4992FM	16757165-368	1		
6-2		R51,52	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	2	A	
6-2		R51,52	. RESISTOR, FIXED, METAL FILM, 49.9K OHMS, +-1%, 1/8W	81349	RNR55K4992FM	16757165-368	2	B	

NOTES

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TABLE 6-2. VOICE RECORD CCA (SHEET 2 OF 4)

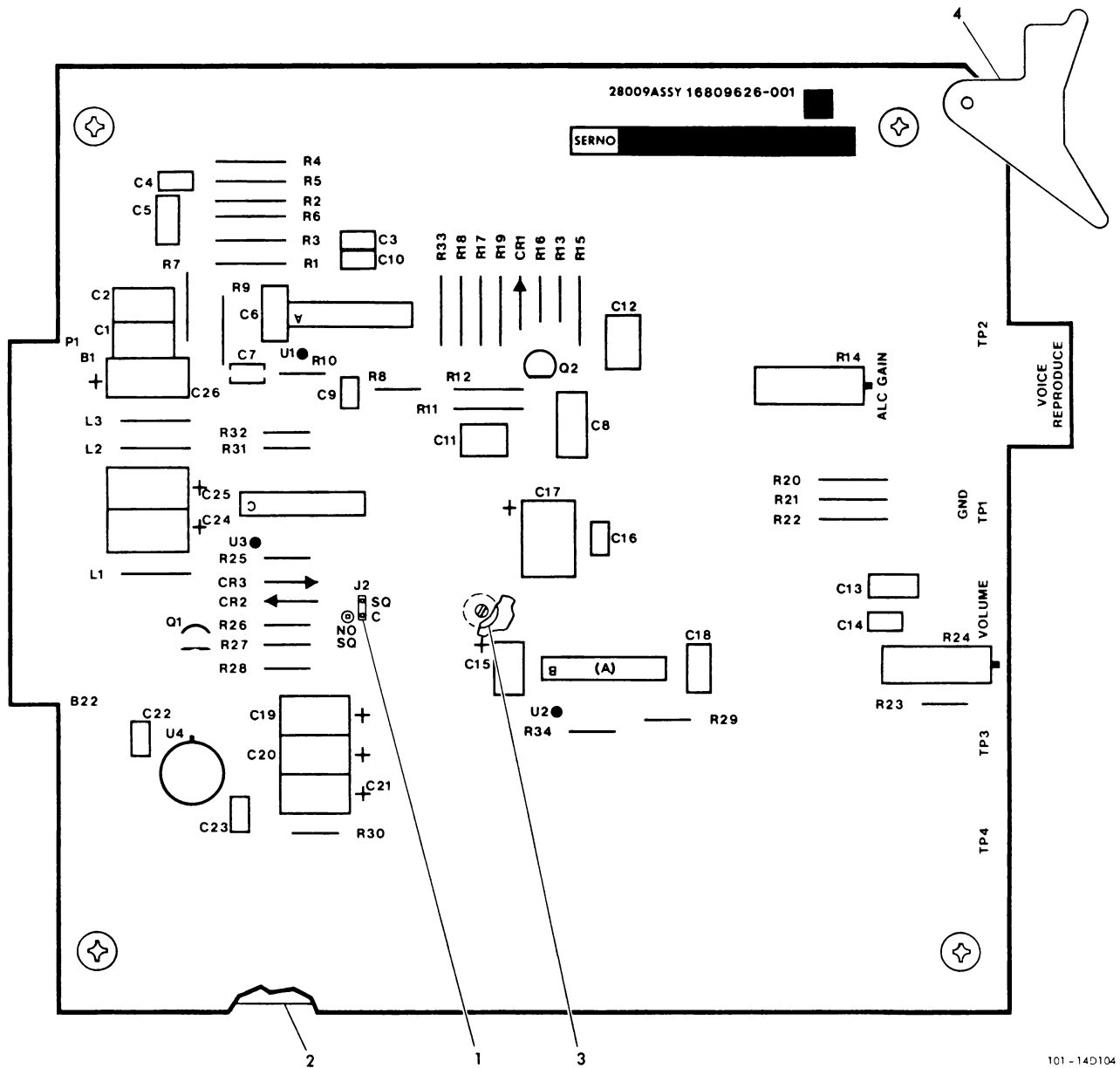
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-2		Q2,3	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	2		
6-2		Q4	. TRANSISTOR	04713	SPS-8716	16776979-001	1		
6-2		Q5	. TRANSISTOR	80131	2N4302	16765842-001	1		
6-2		Q6	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-2		Q7,8	. TRANSISTOR	04713	SPS-8716	16776979-001	2		
6-2		Q9	. TRANSISTOR	04713	2N3904-5 5961-00-243-6426	16762172-001	1		
6-2		Q10	. TRANSISTOR	04713	2N3906-5 5961-00-243-6441	16762173-001	1		
6-2		R1	. RESISTOR, FIXED, METAL FILM, 40.2K OHMS, +-1%, 1/8W	81349	RNR55K4022FM	16757165-359	1		
6-2		R2	. RESISTOR, FIXED, METAL FILM, 10.2K OHMS, +-1%, 1/8W	81349	RNR55K1022FS	16757165-302	1		
6-2		R3	. RESISTOR, FIXED, CARBON COMPOSITION, 330 OHMS, +-5%, 1/2W	81349	RCR20G331JM	16750076-537	1		
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 4.7K OHMS, +-5%, 1/4W	81349	RCR07G472JM	16750079-049	1		
6-2		R5	. RESISTOR, FIXED, METAL FILM 2.49K OHMS, +-1%, 1/8W	81349	RNR55K2491FS 5905-00-406-9959	16757165-239	1		
6-2		R6	. RESISTOR, FIXED, METAL FILM, 2.74K OHMS, +-1%, 1/8W	81349	RNR55K2741FS	16757165-243	1		
6-2		R7	. RESISTOR, VARIABLE, 10K OHMS, +-10%, 3/4W	73138	B9PR10K 5905-00-003-2537	16775165-010	1		
6-2		R8	. RESISTOR, FIXED, METAL FILM, 1.82K OHMS, +-1%, 1/8W	81349	RNR55C1821FM	16757165-226	1		
6-2		R9	. RESISTOR, FIXED, METAL FILM, 4.99K OHMS, +-1%, 1/8W	81349	RNR55K4991FS 5905-00-432-0421	16757165-268	1		
6-2		R10	. RESISTOR, FIXED, METAL FILM, 1.82K OHMS, +-1%, 1/8W	81349	RNR55C1821FM	16757165-226	1		
6-2		R11	. RESISTOR, FIXED, CARBON COMPOSITION, 2.4K OHMS, +-5%, 1/4W	81349	RCR07G242JM	16750079-042	1		
6-2		R12	. RESISTOR, FIXED, CARBON COMPOSITION, 39K OHMS, +-5%, 1/4W	81349	RCR07G393JM	16750079-071	1		
6-2		R13	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	1		
6-2		R14,15	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	2		
6-2		R16	. RESISTOR, FIXED, METAL FILM, 150K OHMS, +-1%, 1/8W	81349	RNR55K1503FS	16757165-418	1		
6-2		R17	. RESISTOR, FIXED, METAL FILM, 47.5K OHMS, +-1%, 1/8W	81349	RNR55K4752FS	16757165-366	1		
6-2		R18	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-2		R19	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-2		R20,21	. RESISTOR, FIXED, CARBON COMPOSITION, 150 OHMS, +-5%, 1/2W	81349	RCR20G151JM	16750076-529	2		
6-2		R22	. RESISTOR, FIXED, METAL FILM, 2.21K OHMS, +-1%, 1/8W	81349	RNR55K2211FM	16757165-234	1		
6-2		R23	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		

NOTES:

TABLE 6-3. VOICE REPRODUCE CCA (SHEET 1 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-3			CIRCUIT CARD ASSEMBLY, VOICE REPRODUCE (SEE TABLE 6-6 FOR BREAKDOWN)	28009		16809626-001		REF	
6-3		CM1-3	. SEMICONDUCTOR DEVICE, DIODE	14433	1N4148	16756865-003	3		
6-3		C1,2	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.47UF, +-5%, 50VDC	18796	8141-050W5R474J	16771624-064	2		
6-3		C3,4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-5%, 50VDC	18796	8121-050W5R103J	16771624-044	2		
6-3		C5	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1UF, +-5%, 50VDC	18796	8131-050W5R104J	16771624-056	1		
6-3		C6	. CAPACITOR, FIXED, MICA DIELECTRIC, 180PF, +-5%, 500VDC	25243	CD10FC181JN	16759780-272	1		
6-3		C7	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-5%, 50VDC	18796	8121-050W5R103J	16771624-044	1		
6-3		C8	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.47UF, +-5%, 50VDC	18796	8141-050W5R474J	16771624-064	1		
6-3		C9,10	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-3		C11	. CAPACITOR, FIXED, MICA DIELECTRIC 220PF, +-5%, 500VDC	25243	CD10FD221JN1	16759780-274	1		
6-3		C12	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1UF, +-20%, 50VDC	72982	8131-050-651-105M 5910-498-5856	16771020-025	1		
6-3		C13	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.022UF, +-5%, 50VDC	18796	8131-050W5R223J	16771624-048	1		
6-3		C14	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.033UF, +-20%, 50VDC	72982	8121-050-651-333M	16771020-015	1		
6-3		C15	. CAPACITOR, FIXED, ELECTROLYTIC, 10UF, +-10%, 20VDC	26769	KNS1068020K	16758058-334	1		
6-3		C16	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-3		C17	. CAPACITOR, FIXED, ELECTROLYTIC, 68UF, +-10%, 20VDC	26769	41K5566E020K1A	16758058-344	1		
6-3		C18	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.047UF, +-5%, 50VDC	18796	8131-050W5R-473J	16771624-052	1		
6-3		C19-21	. CAPACITOR, FIXED, ELECTROLYTIC, 68UF, +-10%, 10VDC	26769	KN8686010K	16758058-144	3		
6-3		C22,23	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-3		C24	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +-10%, 10VDC	26769	KNS107E10K	16758058-146	1		
6-3		C25,26	. CAPACITOR, FIXED, ELECTROLYTIC, 68UF, +-10%, 20VDC	26769	41K5566E020K 1A	16758058-344	2		
6-3		J1	. NOT USED						
6-3		J2	. TERMINAL, PIN	22526	75401-001	16779270-001	3		
6-3		L1-3	. COIL, RADIO FREQUENCY, 22.0 UH, +-10%	99800	1537-44 5950-819-1990	16750875-254	3		
6-3		P1	. NOT USED						
6-3	1	P2	. BUS BAR	29593	85153-100-268	16779948-001	1		
6-3		Q1	. TRANSISTOR	04713	2N3906 5961-00-072-0128	16762173-001	1		
6-3		Q2	. TRANSISTOR	27014	PN4302-18	16765842-011	1		

NOTES



101-14D104

FIGURE 6-3. VOICE REPRODUCE CIRCUIT CARD ASSEMBLY

## SECTION 6

TABLE 6-3. VOICE REPRODUCE CCA (SHEET 3 OF 3)

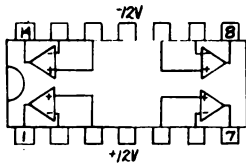
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-3		R31,32	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR076103JM	16750079-057	2		
6-3		R33	. RESISTOR, FIXED, METAL FILM 12.1K OHMS, +-1%, 1/8W	81349	RNR55K1212FM	16757165-309	1		
6-3		R34	. RESISTOR, FIXED, CARBON COMPOSITION, 1.1K OHMS, +-5%, 1/4W	81349	RCR076112JM	16750079-034	1		
6-3		TP1	. TERMINAL, STUD	71279	1958-2 5940-813-0563	16750201-022	1		
6-3		TP2-3	. TERMINAL, STUD	71279	2027-2 5940-00-280-0601	16757170-002	3		
6-3		U1	. MICROCIRCUIT	27014	LM368N	99000279-001	1		
6-3		U2	. MICROCIRCUIT	27014	LM380N	99000568-001	1		
6-3		U3	. MICROCIRCUIT	01295	8N74L805N	99000312-001	1		
6-3		U4	. INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JM	16779188-002	1		
6-3	2		. SHIELD	26009		16781263-002	1		
6-3	3		. BUMPER, PLASTIC	11897	138NN5324	16780426-003	1		
6-3	4		. EJECTOR, PRINTED WIRING BOARD	18677	202WHITE	16760704-001	1		
NOTES:									

SECTION 6

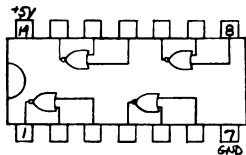
TABLE 6-3. VOICE REPRODUCE CCA (SHEET 2 OF 3)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-3		R1,2	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2001FR	16757165-230	2		
6-3		R3,4	. RESISTOR, FIXED, METAL FILM, 8.06K OHMS, +-1%, 1/8W	81349	RNR55K8061FS	16757165-288	2		
6-3		R5,6	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	2		
6-3		R7	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1002FS 5905-00-138-1283	16757165-301	1		
6-3		R8	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-3		R9	. RESISTOR, FIXED, METAL FILM, 127K OHMS, +-1%, 1/8W	81349	RNR55K1273FM	16757165-411	1		
6-3		R10	. RESISTOR, FIXED, CARBON COMPOSITION, 200K OHMS, +-5%, 1/4W	81349	RCR07G204JM	16750079-088	1		
6-3		R11	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2001FR	16757165-230	1		
6-3		R12	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8W	81349	RNR55K1003FM 5905-00-407-2160	16757165-401	1		
6-3		R13	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	1		
6-3		R14	. RESISTOR, VARIABLE, 5K OHMS, +-10%, 3/4W	73138	89PRS5K	16775165-009	1		
6-3		R15	. RESISTOR, FIXED, METAL FILM, 5.11K OHMS, +-1%, 1/8W	81349	RNR55K5111FS 5905-00-403-3156	16757165-269	1		
6-3		R16	. RESISTOR, FIXED, CARBON COMPOSITION, 100K OHMS, +-5%, 1/4W	81349	RCR07G104JM	16750079-081	1		
6-3		R17	. RESISTOR, FIXED, METAL FILM, 15K OHMS, +-1%, 1/8W	81349	RNR55K1502FM	16757165-318	1		
6-3		R18	. RESISTOR, FIXED, METAL FILM, 825 OHMS, +-1%, 1/8W	81349	RNR55K8250FM	16757165-189	1		
6-3		R19	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K1001FS 5905-00-197-4289	16757165-201	1		
6-3		R20	. RESISTOR, FIXED, METAL FILM, 2.43K OHMS, +-1%, 1/8W	81349	RNR55K2431FS	16757165-238	1		
6-3		R21	. RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/8W	81349	RNR55K1000FM	16757165-101	1		
6-3		R22	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2001FR	16757165-230	1		
6-3		R23	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		
6-3		R24	. RESISTOR, VARIABLE, 20K OHMS, +-10%, 3/4W	73138	89-17-0	16775165-211	1		
6-3		R25	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-3		R26	. RESISTOR, FIXED, CARBON COMPOSITION, 120K OHMS, +-5%, 1/4W	81349	RCR07G124JM	16750079-083	1		
6-3		R27	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR07G103JM	16750079-057	1		
6-3		R28	. RESISTOR, FIXED, CARBON COMPOSITION, 22 OHMS, +-5%, 1/4W	81349	RCR07G220JM	16750079-166	1		
6-3		R29	. RESISTOR, FIXED, CARBON COMPOSITION, 3.3 OHMS, +-5%, 1/4W	81349	RCR07G3R3JS 5905-00-128-6237	16750079-152	1		
6-3		R30	. RESISTOR, FIXED, CARBON COMPOSITION, 1K OHMS, +-5%, 1/4W	81349	RCR07G102JM 5905-00-110-7620	16750079-033	1		

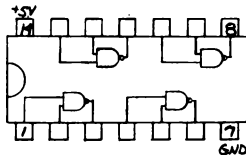
NOTES



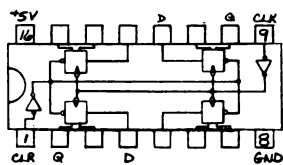
U2, LM348N  
U6, HA14605-5



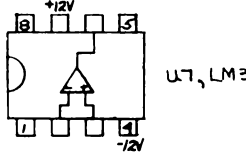
U3, 74LS02



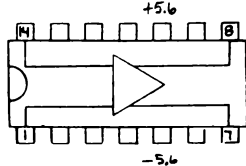
U4, 74LS38N



U5, 74LS175N



U7, LM318N



U1, LM733CN

VOICE  
REC  
COMMAND

CHANNEL  
READ/WRITE  
COMMAND

READ  
COMMAND

RECORD  
COMMAND

-12V

GND

+12V

+5V

RECORD IN  
SIGNAL

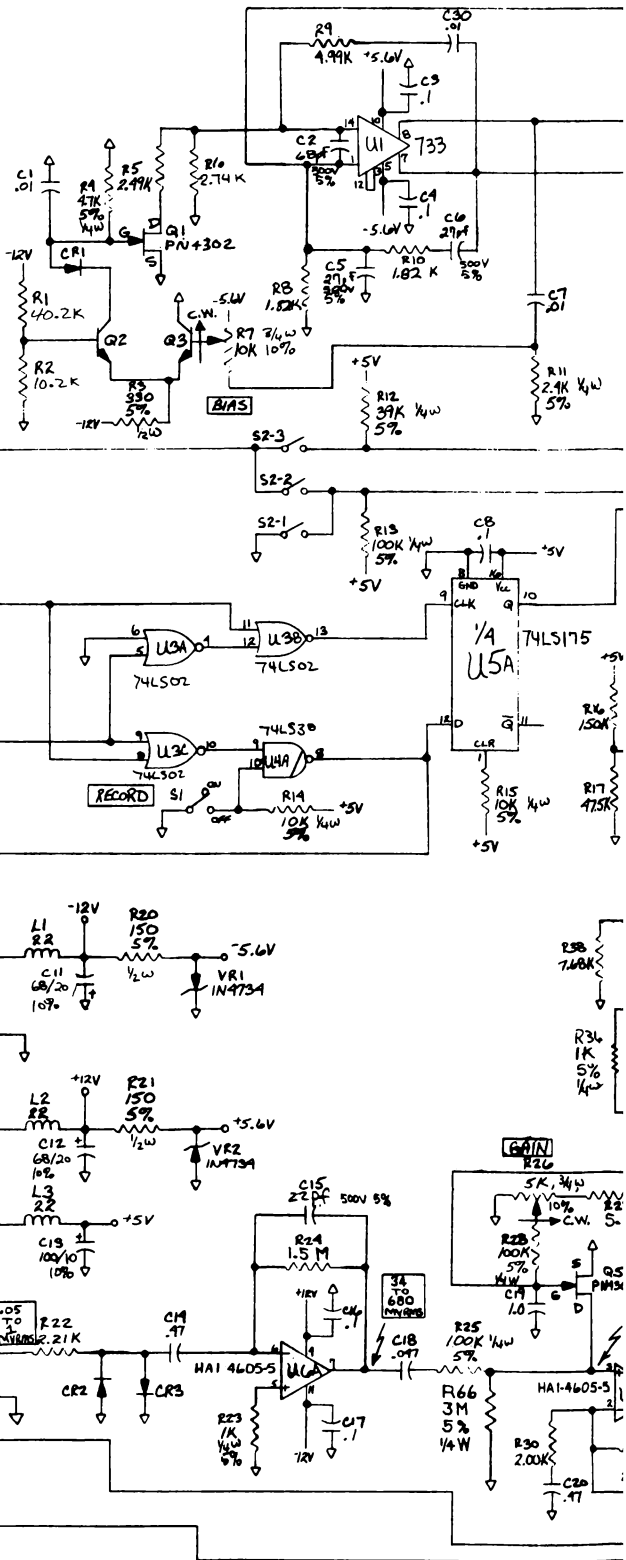
RECORD IN  
END

NORMALIZED

CALIBRATE  
COMMAND

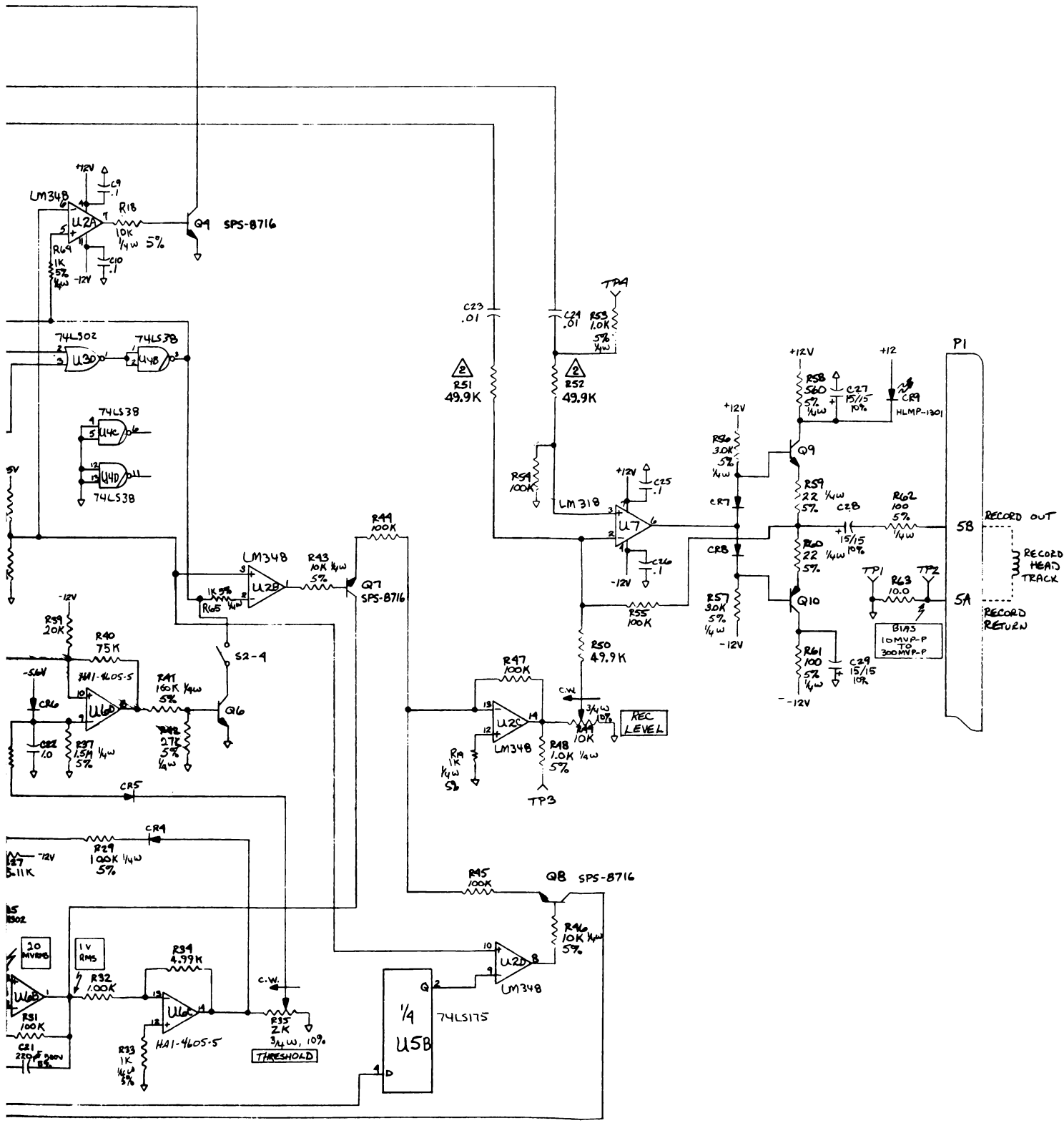
DIRECT  
NORMALIZED

CALIBRATE  
SIGNAL

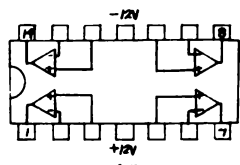


- I. UNLESS OTHERWISE SPECIFIED:  
 a ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{8}$  W, 1%.  
 b ALL CAPACITOR VALUES ARE IN UF, 50 V, 20%.  
 c ALL DIODES ARE 1N4148.  
 d ALL TRANSISTORS ARE  $\mu$ PNP - 2N3907.  
 PNP - 2N3906.  
 e ALL INDUCTOR VALUES ARE IN UH.  
 ⚠ R51, R52, 100K (-001 ONLY)

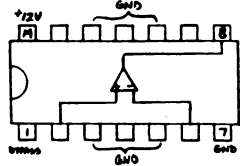




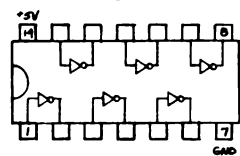
REF 16809624E  
 Figure 7-1. Voice Record Schematic



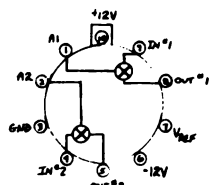
U1, LM388N



U2, LM380N



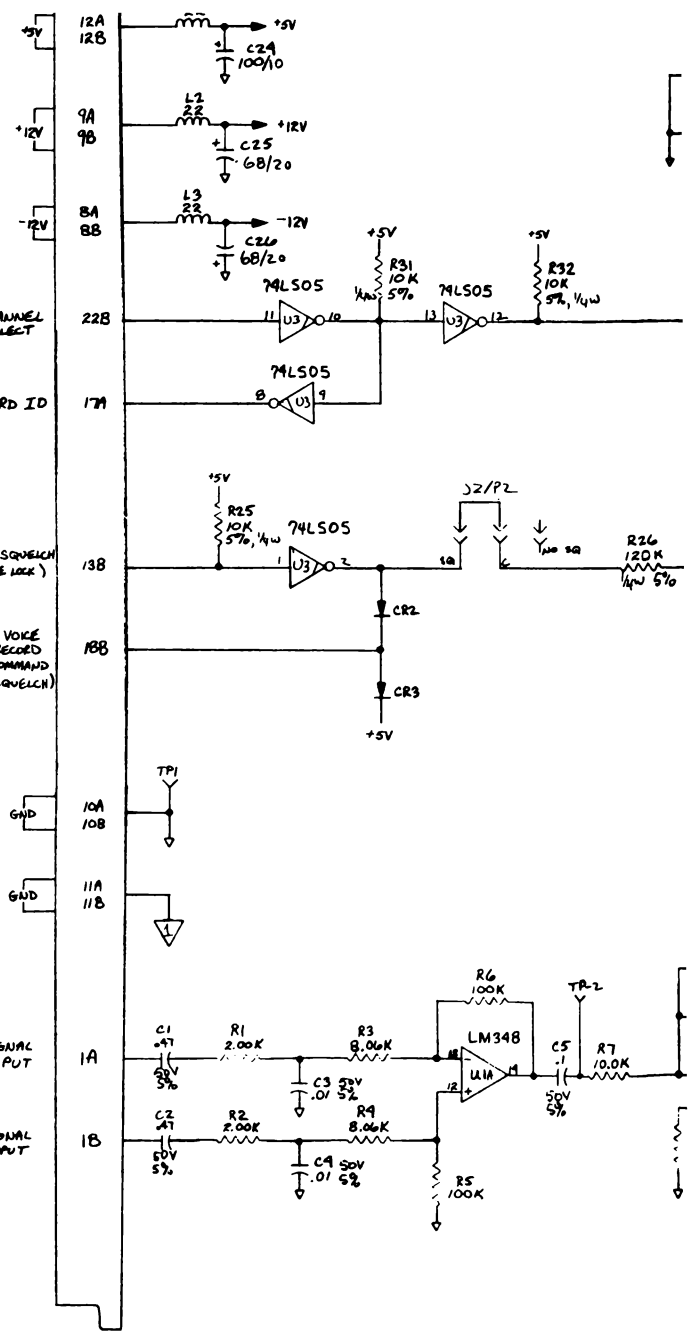
U3, 74LS05N



U4, DG200

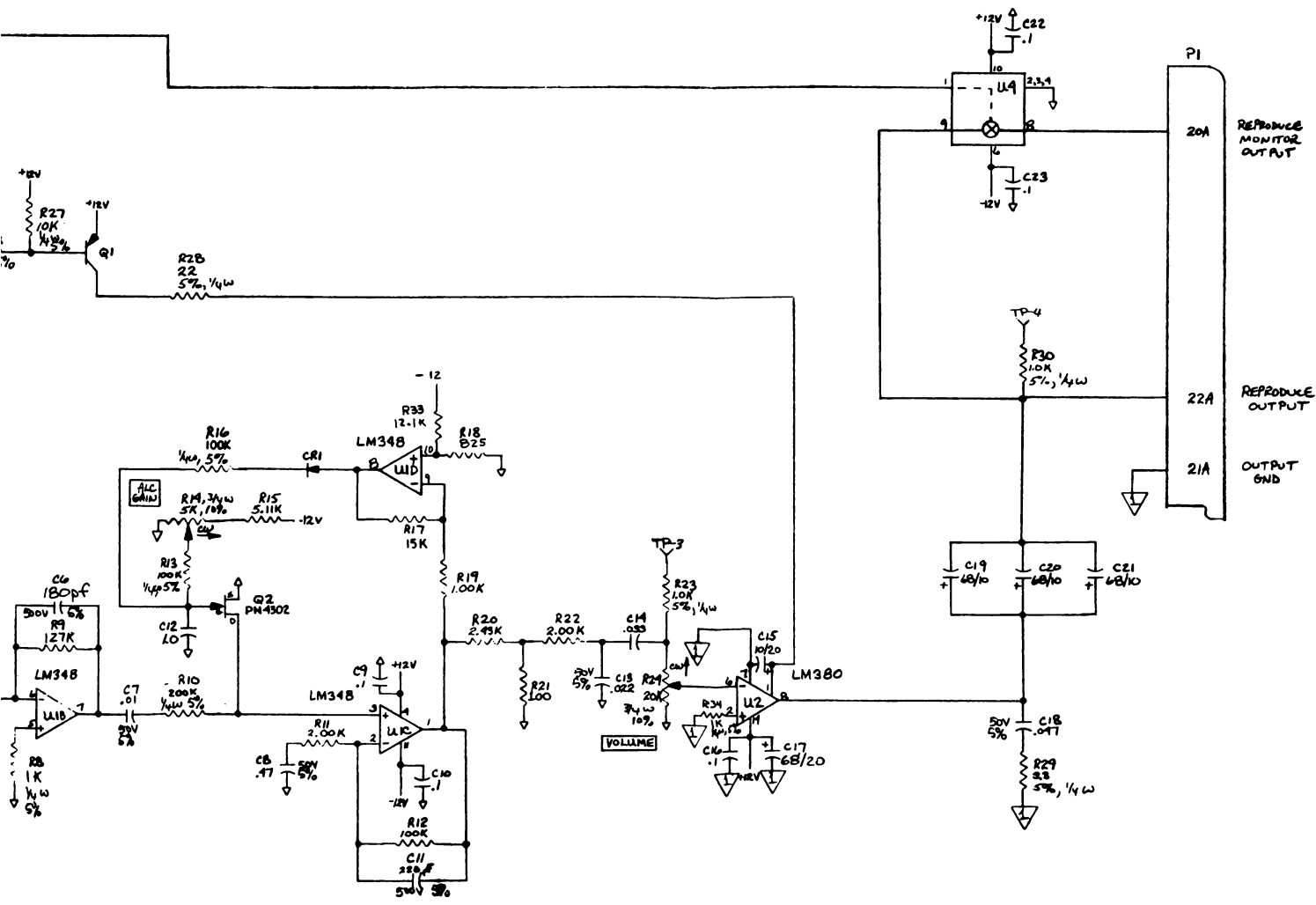
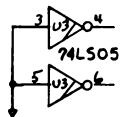
▽ DENOTES  
CIRCUIT COMMON

▽ DENOTES  
CIRCUIT COMMON,  
LIKE NUMBERS  
INDICATE COMMON  
TIE POINT



- I. UNLESS OTHERWISE SPECIFIED:
- a ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{8}$  W, 1 %.
  - b ALL CAPACITOR VALUES ARE IN UF, 50 V, 20 %.
  - c ALL DIODES ARE 1N4148.
  - d ALL TRANSISTORS ARE PNP 2N3906.
  - e. ALL INDUCTOR VALUES ARE IN UH.

74LS05



REF 16809627B  
Figure 7-2. Voice Reproduce  
Schematic

# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
SERVO REPRODUCE  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

**AUGUST 1984**

## NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217

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# SECTION 1

## INTRODUCTION

### 1-1. PURPOSE

This technical manual describes the servo reproduce cca (circuit card assembly) used with the Honeywell Model 101 Magnetic Tape System. This technical manual contains only the information that is applicable to the servo reproduce cca. The Operator's Manual describes the relationship of the servo reproduce cca to the system.

### 1-2. DESCRIPTION

The servo reproduce cca contains circuits to amplify and filter signals from the preamplifier cca or a direct reproduce cca. The zero crossing points of the processed signal are detected and used to generate a pulse on one or both zero crossings. This TTL output is sent to the data housing driver cca for further processing before going to the servo system. Also, on the servo reproduce cca is a signal drop-out detector to inhibit servo-from-tape operation if the received signal is too small for quality results. The servo reproduce cca can be plugged in to any reproduce card position in the Model 101.

### 1-3. SPECIFICATIONS

#### A. POWER

NOMINAL	MAXIMUM	CURRENT (TYPICAL)
+12 $\pm$ .12V	+13.0V	30 mA
-12 $\pm$ .12V	-13.0V	40 mA
+ 5 $\pm$ .25V	+ 6.0V	45 mA

#### B. LOADS

PIN	TYPICAL LOAD	MAXIMUM LOAD
P1-22A	50 ohms	Short to ground
P1-20A	20K ohms in parallel with 250 pF	100 ohms in parallel with 1000 pF
P1-18A	10K ohms in parallel with 250 pF	100 ohms in parallel with 1000 pF
P1-21B	2K ohms in parallel with 100 pF	Short to ground



## C. OUTPUT SIGNALS

### 1. Servo Reproduce Bus (P1-21B)

A logic compatible signal

0.0V zero level +0.5V

One level = +5V through at 1K ohm.

### 2. Reproduce Output (P1-22A)

Nominally a 1 Vrms unloaded or a 0.5 Vrms sine wave at the carrier frequency when loaded with 50 ohms.

### 3. Reproduce Monitor Output (P1-20A)

The same signal as the Reproduce Output (P1-22A).

### 4. Overbias Monitor Output (P1-18A)

Nominally, a 1 Vrms sine wave at the carrier frequency.

### 5. Card Identification Outputs

1D4 (P1-17A)

1D2 (P1-16B)

1D1 (P1-16A)

1D4, 1D2 and 1D1 are open collector logic outputs. The pull-up resistors are provided by the Model 101. The code for this card is 000 (1D4, 1D2 and 1D1 each a short to ground).

## D. INPUTS

### 1. Input levels from the preamplifier (differentially between P1-1A and P1-1B) $\pm 3$ dB - for reference only. (Refer to Table 1-1.)

### 2. Channel 16 Auxiliary Input (P1-5A) - 1 Vrms $\pm 3$ dB.

### 3. Squelch (P1-13B)

A TTL "1" will inhibit the signal at P1-21B.

### 4. Channel Select Command (P1-22B)

A TTL "0" will select this card (energize the Reproduce Monitor Output).

Table 1-1. Preamplifier Input Levels

SPEED IPS	IRIG 2X			IRIG 1X			IRIG X/2		
	FREQ. kHz	MB dBV	WB dBV	FREQ. kHz	MB dBV	WB dBV	FREQ. kHz	MB dBV	WB dBV
120	400	-14	-23	200	-13	-26	100	-13	-28
60	200	-20	-29	100	-19	-33	50	-19	-34
30	100	-26	-35	50	-25	-39	25	-25	-40
15	50	-32	-41	25	-31	-45	12.5	-31	-46
7.5	25	-38	-47	12.5	-37	-51	6.25	-37	-52
3.75	12.5	-44	-53	6.25	-43	-57	3.125	-43	-58
1.87	6.25	-50	-59	3.125	-49	-63	1.5625	-49	-64
.937	3.125	-56	-65	1.5625	-55	-69	.78125	-55	-70

5. Calibrate Command (P1-19B)

A TTL "0" in conjunction with the Channel Select Command will energize the Overbias Monitor Output.

TAPE SPEED	SPEED 4 (Pin 15B)	SPEED 2 (Pin 14A)	SPEED 2 (Pin 14B)
120	1	1	1
60	1	1	0
30	1	0	1
15	1	0	0
7.5	0	1	1
3.75	0	1	0
1.87	0	0	1
.937	0	0	0

E. CONTROLS (S1 and S2)

1. Reproduce Gain (R51) - Allows the signal level at TP3 to be adjusted (nominally 1 Vrms).
2. Doubler Symmetry (C44) - Used to adjust the doubler output symmetry for a 50% duty cycle.

### 3. Switches

CONTROL	LABEL	FUNCTION
S1-1	Preamp	ON = Preamp input signal OFF = Channel 16 AUX input signal
S1-2	MB X/2	ON for Medium Band, IRIG X/2 Operation
S1-3	MB 1X	ON for Medium Band, IRIG 1X Operation
S1-4	MB 2X	ON for Medium Band, IRIG 2X Operation
S1-5	WB X/2	ON for Wide Band, IRIG X/2 Operation
S1-6	WB 1X	ON for Wide Band, IRIG 1X Operation
S1-7	SB 2X	ON for Wide Band, IRIG 2X Operation
S2-1	ON	ON to connect the output of this card to the Servo Reproduce Bus
S2-2	2X, 1X	ON for IRIG 2X or 1X Operation
S2-3	X/2	ON for IRIG X/2 Operation
S2-4	2X	ON for IRIG 2X Operation
S2-5	1X	ON for IRIG 1X Operation
S2-6, S2-7	LO GAIN	S2-6 and S2-7 must both be ON or OFF. ON = 0 dB gain in first stage, OFF = +7.5 dB gain in first stage.

#### F. SIGNAL PROCESSING

1. Reproduce Monitor Control - The Reproduce Monitor Output port (P1-20A) will be active when the Channel Select Command (P1-22B) is a logic "0".
2. Overbias Monitor Control - The Overbias Monitor Output port (P1-18A) will be active when the Channel Select Command (P1-22B) and the Calibrate Command (P1-19B) are both logic "0's".
3. Carrier Frequency Control - The designated Carrier Frequency Control Line will be a logic "1" with the proper combination of tape speed and IRIG Standard is present. (Refer to BLOCK DIAGRAM - SECTION 4 and SCHEMATICS - SECTION 7. The .781 through 400 numbers relate to control lines so labelled on schematic.)

SPEED IPS	CARRIER FREQUENCY CONTROL LINE		
	IRIG 2X	IRIG 1X	IRIG X/2
120	400	200	100
60	200	100	50
30	100	50	25
15	50	25	12.5
7.5	25	12.5	6.25
3.75	12.5	6.25	3.125
1.87	6.25	3.125	1.56
.937	3.125	1.56	.781

4. Stage 1 (from P1-1A or P1-1B to U1-6): S2-6 = ON, S2-7 = ON, Gain = 0 dB  $\pm$  1 dB; S2-6 = OFF, S2-7 = OFF, Gain = +7.5 dB  $\pm$  1 dB.
5. Stage 2 (U1-6 to TP4) - Gain in dB  $\pm$  1 dB, except \* =  $\pm$  2 dB.

CARRIER FREQUENCY CONTROL	WB 2X	WB 1X	WB X/2	MB 2X	MB 1X	MB X/2
400	+15.6	-	-	+ 6.9	-	-
200	+21.6	+18.5	-	+12.9	+ 6.0	-
100	+27.6	+24.5	+21.3	+18.9	+12.0	+ 6.0
50	+33.6	+30.5	+27.3	+24.9	+18.0	+12.0
25	+39.6	+36.5	+33.3	+30.9	+24.0	+18.0
12.5	+45.6	+42.5	+39.3	+36.9	+30.0	+24.0
6.25	+51.6	+48.5	+45.3	+42.9	+36.0	+30.0
3.125	+57.6	+54.5	+51.3	+48.9	+42.0	+36.0
1.56	-	+60.5*	+57.3*	-	+48.0*	+42.0*
.781	-	-	+63.3*	-	-	+48.0

6. Stage 3 (TP4 to TP3) -  
Gain -5 dB for R51 full CCW and Carrier Frequency Control = 100  
Gain +5 dB for R51 full CW and Carrier Frequency Control = 100
7. Overall Frequency Response (P1-1A or P1-1B to TP3) R51 set for 1 Vrms at TP3 with input levels as specified in 1-3-D-1.

(Gain adjusted for 1 Vrms at TP3 for 15 IPS, WB2X at 50 kHz.  
All curves (Figures 1-1 and 1-2) are WB2X, except the 1.56/.781 filter which is WBX/2).

8. Dropout Detector (U15 and U20)

Signals are referred to TP3. Dropout Level:  $0.160 \pm 0.050$  Vrms.

Pickup Level:  $0.060 \pm 0.040$  Vrms above the dropout level.

A signal below the dropout level will clamp TP2 to a logic "0".

A signal level above the pickup level will allow normal operation at TP2.

9. Comparator and One-Shot (U18)

The TTL signal at U18-9 will be a logic "0" for a positive signal at TP3 and a logic "1" for a negative signal at TP3.

A minimum signal of +0.030 volts is required to trip the comparator.

A TTL "1" pulse should be generated at U18-11 for each zero crossing of the signal at TP3. The pulse widths are shown below. C44 must be adjusted for the 10 usec condition. (Refer to following chart.)

CARRIER FREQUENCY CONTROL	CARRIER FREQUENCY (kHz)	PULSE WIDTH (uSec)
100	100	$2.5 \pm 0.2$
50	50	$5.0 \pm 0.2$
25	25	$10.0 \pm 0.1$
12.5	12.5	$20 \pm 1$
6.25	6.25	$40 \pm 2$
3.125	3.125	$80 \pm 5$
1.56	1.5625	$160 \pm 10$
.781	.78125	$320 \pm 20$

10. Squelch - When Squelch is a logic "1", the signal at TP2 will be a logic "0". When Squelch is a logic "0", TP2 will have normal operation.

G. ENVIRONMENT

	<u>Storage</u>	<u>Operating</u>
Temperature	$-20^{\circ}$ to $+75^{\circ}$ C	$0^{\circ}$ to $+70^{\circ}$ C
Humidity	0 to 95%	5 to 95%
Altitude	0 to 50,000 ft.	0 to 15,000 ft.

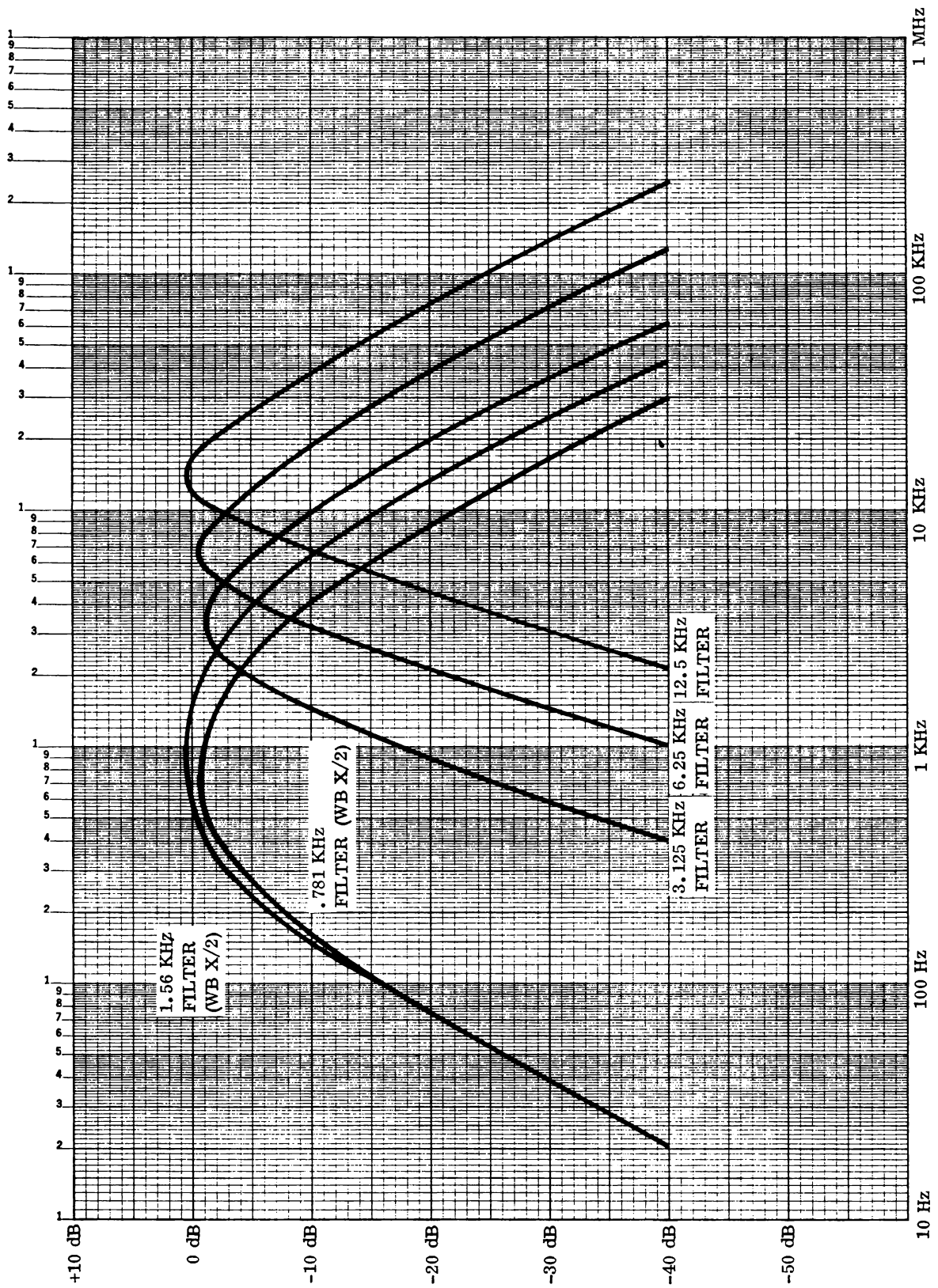
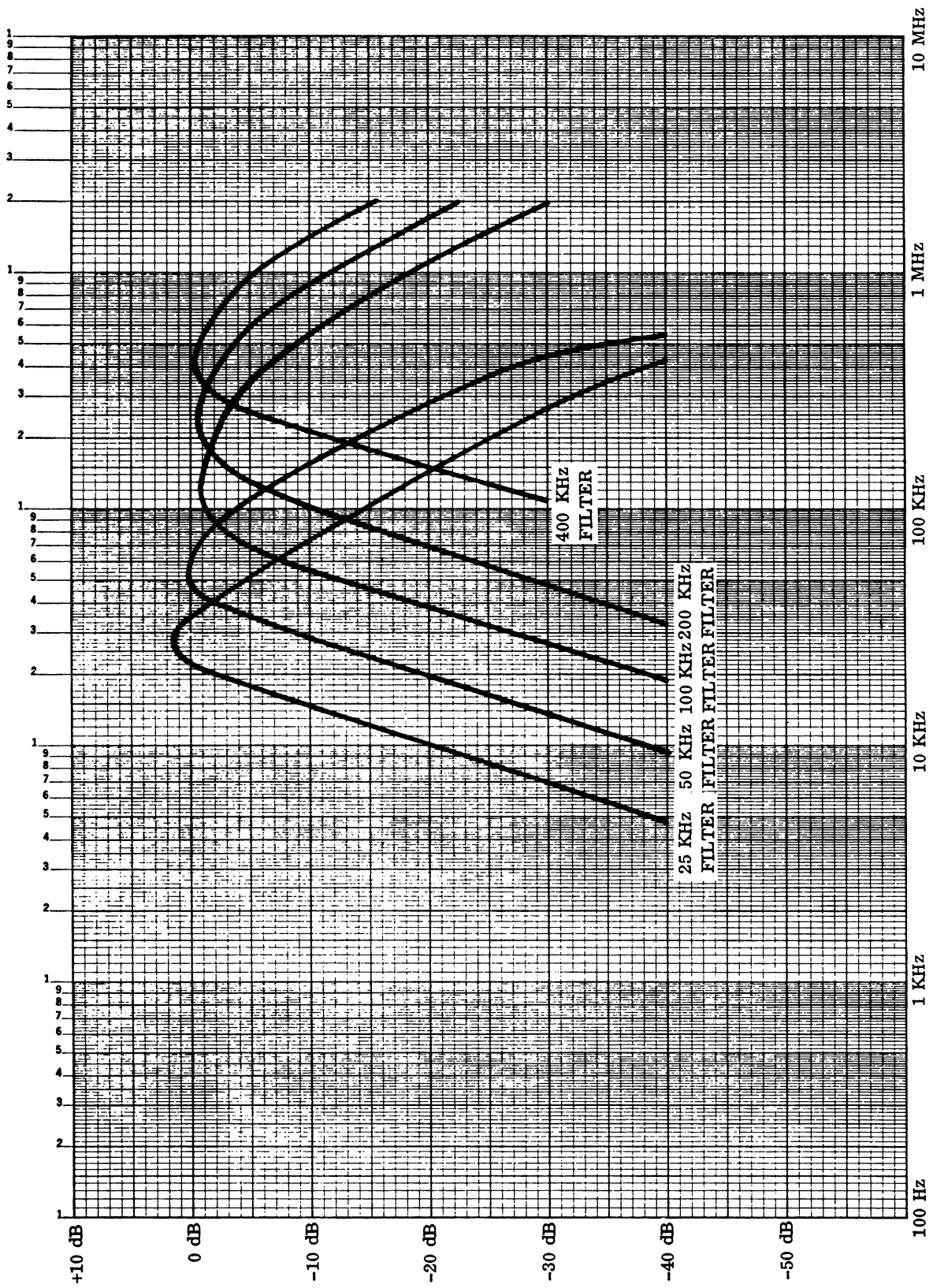


Figure 1-1. Input Frequency Response (1.56 kHz thru 12.5 kHz Filters)



SR-D3

Figure 1-2. Input Frequency Response (25 kHz thru 400 kHz Filters)

## SECTION 2

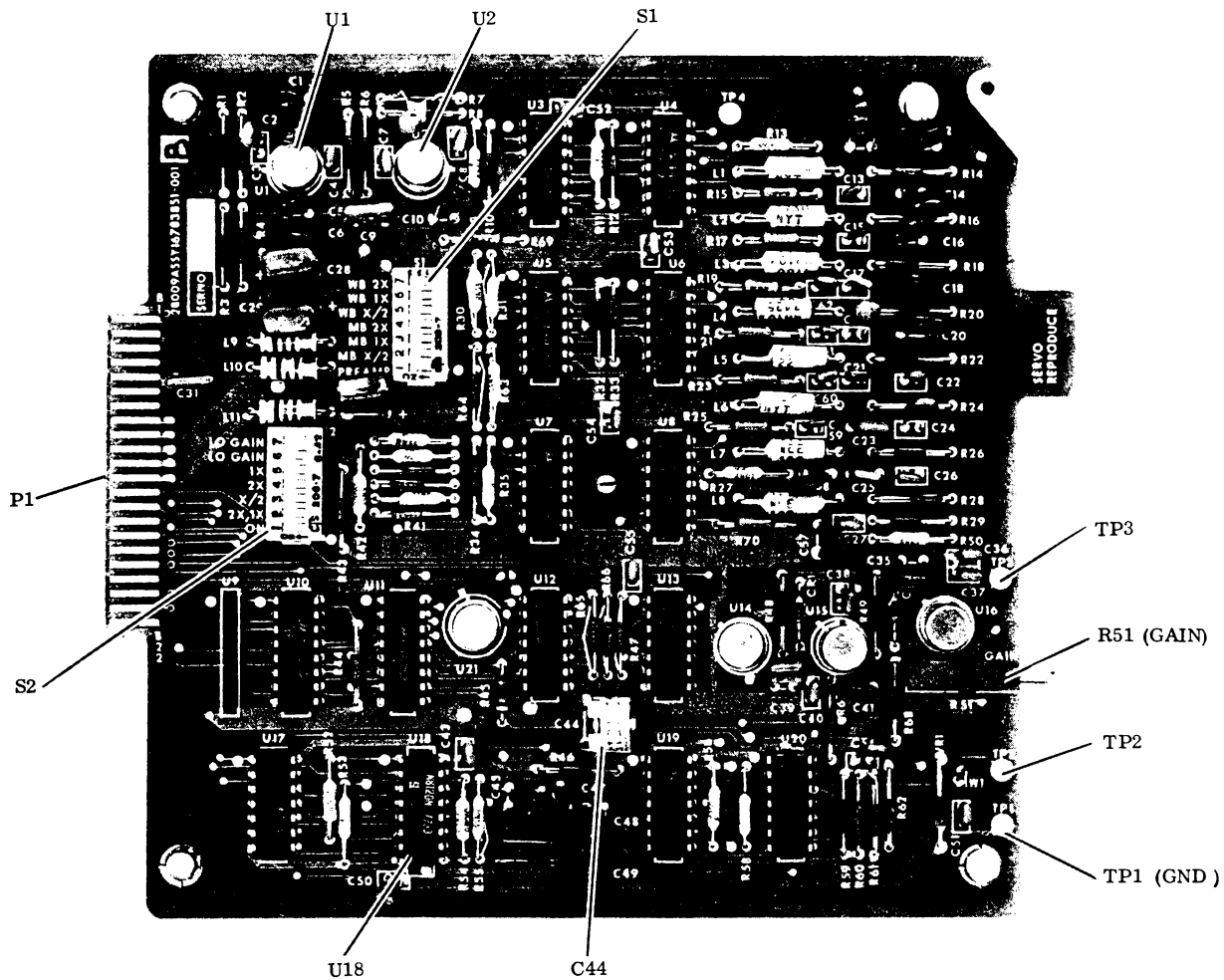
### INSTALLATION

The servo reproduce cca may be installed in any reproduce position in the Model 101. If the Channel 16 Aux input is to be used, the card may be installed only in the Channel 16 position. Prior to installing the card, verify that the switches are properly set (refer to Figure 2-1). Refer to the Operator's Manual for set up procedure.

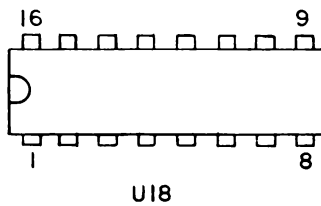
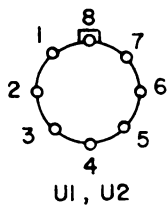
#### CAUTION

System power must be turned off when the servo reproduce cca is being removed or installed.





PIN LOCATORS



SR-P1A

Figure 2-1. Servo Reproduce CCA Test Points and Adjustments

## SECTION 3

## OPERATION

Operating and setup procedures are located in Section 3 of the Operator's Manual.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the servo reproduce cca. The functional description is referenced to Figure 4-1. Circuit descriptions are referenced to the schematics in Section 7.

#### 4-2. FUNCTIONAL DESCRIPTION

The incoming differential signal from the preamplifier is buffered and amplified by the input buffer and converted to a single ended signal. S2-6 and S2-7 program the gain of this stage.

The signal from the input buffer is then amplified by the gain equalizer. The amount of amplification is determined by setting S1-1 through S1-6 to the proper combination for wide band or medium band operation and the proper IRIG standard. The tape speed is electronically combined with the IRIG standard (S2-4 and S2-5) in the carrier frequency control and automatically programs the gain of the gain equalizer to the proper value. The carrier frequency control also selects the proper filter in the filter stage.

The filtered signal (TP3) drives the comparator doubler. The comparator output changes level at each zero crossing. The doubler output is a positive pulse for each change of the comparator output. The width of the pulse is programmed by the carrier frequency control. The Comparator output is used for IRIG 1X or 2X operation and the Doubler output is used for IRIG X/2 operation.

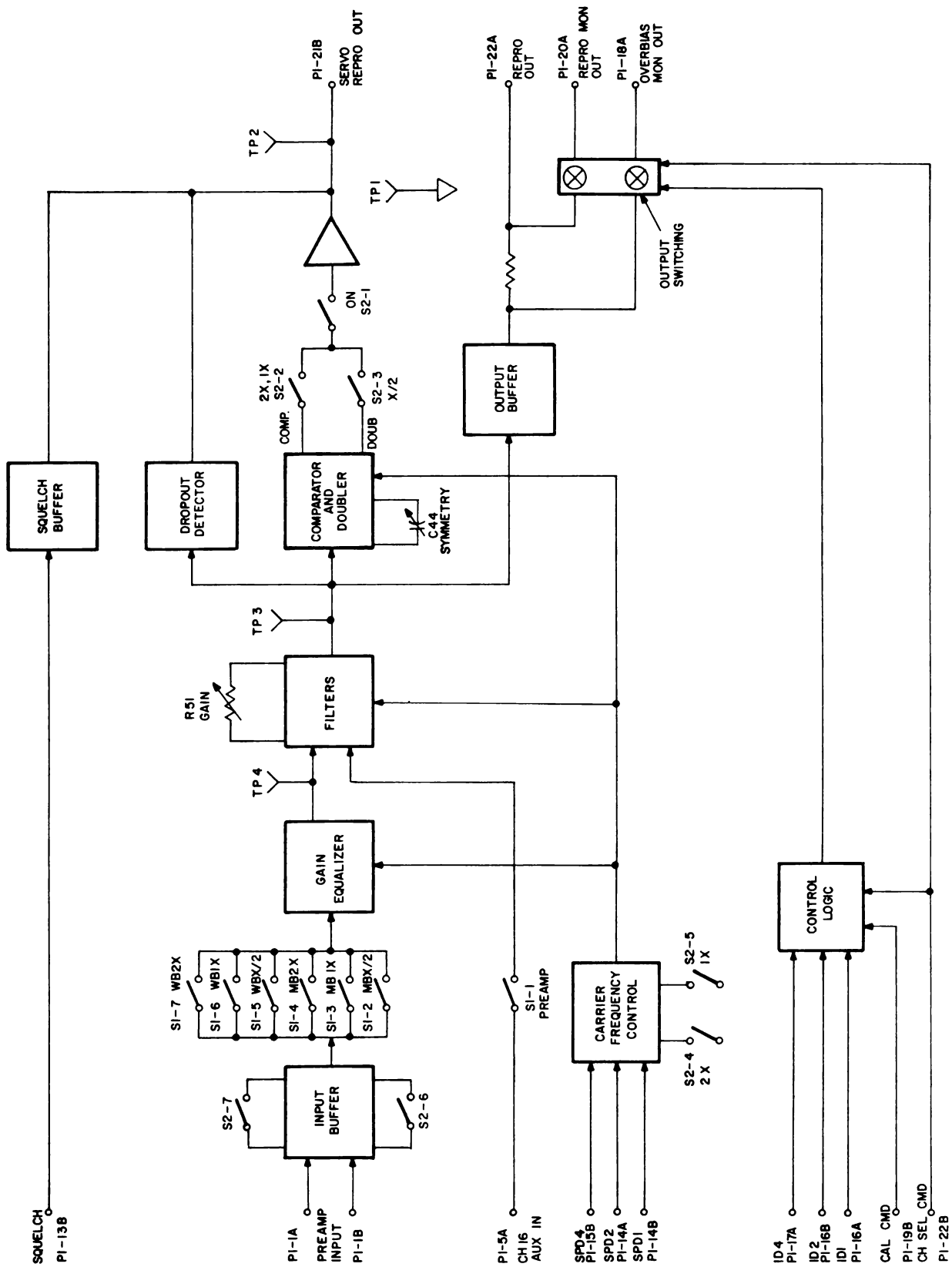
The signal at TP3 is rectified, filtered and compared with a preset threshold in the dropout detector. Signal levels below a prescribed value will cause the dropout detector to inhibit the output signal at TP2. The squelch buffer inhibits TP2 until Model 101 phase lock is achieved.

The output buffer provides low impedance drive for the reproduce output, reproduce monitor output and overbias monitor outputs. The output switching network gates the buffered output signals onto the appropriate buses under control of the control logic circuits. The control logic circuits also generate the card identification code.

#### 4-3. PRINCIPLES OF OPERATION (Figure 7-1)

##### A. INPUT BUFFER (U1) (Sheet 1)

Signals at P1-1A and P1-1B are amplified by U1 and its resistor set, R1-R6. The stage gain is 0 dB (S2-6 and S2-7 closed) or +7.5 dB (S2-6 and S2-7 open).



SR-01

Figure 4-1. Servo Reproduce Functional Block Diagram

## B. GAIN EQUALIZER (U2) (Sheet 1)

The ac portion of the signal from U1 is amplified by U2 by a factor of  $R_f/R_i$  where  $R_f$  is the feed back resistor as programmed by the carrier frequency control circuit and  $R_i$  is the input resistor as manually set by S1-1 through S1-6. The analog switches U3, U5 and U7 and also the analog switches in the filter stage (U4, U6, U7 and U8) operate between 0 Vdc and +5 Vdc. The signal is floated to a +2.5 Vdc level by R7 and R8 to remain within these limits. The amplified signal is approximately 1 Vrms.

## C. FILTER STAGE (U16) (Sheet 1)

The carrier frequency control circuit connects the signal from the gain equalizer stage to the filter that is appropriate for the carrier frequency expected. The 400, 200 and 100 kHz filters are three-pole, high-pass passive filters. The 50, 25, 12.5, 6.25 and 3.125 kHz filters are three-pole high-pass and one-pole low-pass passive filters. The .781/1.56 kHz filter is a one-pole high-pass and one-pole low-pass passive filter. One resistor in each filter is also used to sum the filter outputs into U16 (R29, R14, R16, R18, R20, R22, R24, R26, R28). R51 (GAIN) allows the operator to adjust the signal level at TP3 to 1 Vrms. U8 is used to short the 3.125, 6.25, 12.5 and 25 kHz filters when using the 50, 100, 200, or 400 kHz filters to eliminate signal feed through.

## D. COMPARATOR/DOUBLER (U18) (Sheet 2)

The signal at TP3 (sheet 1) is applied to the -IN terminal of U18 through R55. Positive feedback is obtained from U18-1 through R52 and R55. Similarly, R54 and R53 divide the signal at U18-9 for feedback to U18-5. The combination of these two feedback signals gives a symmetrical hysteresis for the incoming signal to help eliminate noise triggering. Each time the comparator changes state, the one-shot reaction of U18 is triggered. A positive pulse is generated at U18-11 for each trigger. The width (time) of these pulses is controlled by the capacitor/resistor set connected to U18-12/14/15. The pulse width is programmed by the carrier frequency control circuit through U12, U13 and U19. A pulse width trim is provided by C44.

## E. OUTPUT STAGE (U17, U20) (Sheet 2)

The signal selected by S2-3 (for IRIG X/2) or S2-2 (for IRIG 2X or 1X) is inverted by the open collector buffer, U17, to drive the servo reproduce bus (P1-21B). If the outputs of the open collector comparators (U20) are high, the signal at TP2 will be active. If either output is low, TP2 will be clamped to ground. When the Model 101 has not achieved tach phase lock U20-13 will clamp TP2 low to prevent TAPE phase lock.

## F. DROPOUT DETECTOR (U15, U20) (Sheet 2)

The signal at TP3 is rectified and filtered by U15, CR1, CR2 and C39 and compared with a threshold voltage at U20-4/5. U20-5 is the reference level and this voltage is determined by R59-R62. R60 provides hysteresis to prevent noise sensitivity. If the signal at TP3 drops below the dropout level, U20-1 clamps TP2 to ground.

G. OUTPUT BUFFER (U14) (Sheet 2)

U14 is a voltage follower bus driver. The signal at TP3 is buffered by U14 and applied to the overbias monitor bus (P1-18A) and the reproduce monitor bus (P1-20A) through the analog gate (U21). The reproduce output is P1-22A. The signal at U14-6 is nominally 1 Vrms. The signal at P1-22A or P1-20A will, of course, be nominally 0.5 Vrms if a 50 ohm load is connected to P1-22A or 1 Vrms if no load is connected.

H. CARRIER FREQUENCY CONTROL (U10, U11) (Sheets 1 and 2)

The IRIG standard (S2-4 and S2-5) will be added to the tape speed code by U10. The new binary code will control the U18 pulse width directly through U12, U13 and U19. The new code also is changed to a one-out-of-ten code by U11 and controls the gain equalizer stage through U3, U5 and U7 and the filter stage through U4, U6, U7 and U8. The codes are listed in Table 4-1.

Table 4-1. Speed Codes

SPEED IPS	SPEED CODE 4-2-1	ADDER B INPUT	ADDER OUTPUT	CARRIER FREQ. CONTROL	ADDER B INPUT	ADDER OUTPUT	CARRIER FREQ. CONTROL	ADDER B INPUT	ADDER OUTPUT	CARRIER FREQ. CONTROL
120	111	0010	1001	400	0001	1000	200	0000	0111	100
60	110	0010	1000	200	0001	0111	100	0000	0110	50
30	101	0010	0111	100	0001	0110	50	0000	0101	25
15	100	0010	0110	50	0001	0101	25	0000	0100	12.5
7.5	011	0010	0101	25	0001	0100	12.5	0000	0011	6.25
3.75	010	0010	0100	12.5	0001	0011	6.25	0000	0010	3.125
1.87	001	0010	0011	6.25	0001	0010	3.125	0000	0001	1.56
.937	000	0010	0010	3.125	0001	0001	1.56	0000	0000	.781

## SECTION 5

### MAINTENANCE

#### 5-1. ADJUSTMENTS

The servo reproduce cca may be adjusted while in operation in the Model 101 without an extender card.

For the symmetry adjustment, monitor TP2 (Figure 2-1), if using the IRIG X/2 mode, otherwise U18-11 must be monitored. Operate the system at 7.5 IPS, 2X, 15 IPS, 1X; or 30 IPS, X/2. Adjust C44 for a negative pulse width at TP2 (positive at U18-11) of  $10 \pm 0.1$  useconds.

R51 (GAIN) may be adjusted for 1 Vrms at TP3 by means of the channel selector/meter monitor or other means while reproducing a servo reference carrier signal. Refer to the Model 101 Operator's Manual for a detailed adjustment procedure.

#### 5-2. TROUBLESHOOTING

A thorough understanding of the circuits as described in the Principles of Operation (Section 4) is essential for troubleshooting the servo reproduce card cca. Refer to Section 4 and the schematics in Section 7.

- A. The quickest means of proving that a servo reproduce cca is a problem or not, is to substitute a known good unit for the suspected unit. Check the suspect card to insure that the switches are properly set.
- B. If step one is not possible or desirable, or if the same results are obtained, check the recording on tape with a direct reproduce cca. Check the position of jumper J4 on the data housing driver. Connect output of a direct reproduce cca (2X and 1X only) to the servo reproduce bus by means of J1 on the direct reproduce cca and check for proper operation of servo off tape. (This bypasses the servo reproduce cca.)
- C. If the problem has been isolated to the servo reproduce cca itself, proceed as follows.
- D. The circuit may be broken (if necessary) by means of S1-1 or W1. Plug the card into the Channel 16 reproduce position. Apply a 1 Vrms, 1 kHz sine wave to the channel 16 AUX IN BNC. Select the appropriate conditions to energize the .781/1.56 filter. Adjust R51 for 1 Vrms at TP3. Do a similar test for each of the other filters at each particular carrier frequency.

- E. An ac signal may be capacitively coupled to U2-3 to test the gain equalizer stage (measure the result at TP4).
- F. Apply a signal to P1-1A or P1-1B to test the input buffer stage (measure the result at U1-6).
- G. Check the carrier frequency control circuit according to Table 4-1.
- H. Check the dropout detector stage by using the Channel 16 AUX Input and setting S1-1 to OFF. Select any filter and use a sine wave of that frequency. Similarly, the output buffer stage may be tested.
- I. The comparator/doubler may also be energized in this way. Check each pulse width. Error patterns may be found which indicate which component is faulty.



## ILLUSTRATED PARTS BREAKDOWN

## 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

## A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

## B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

## C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

## D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

## E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.

6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
TEST INSTRUMENTS DIVISION  
P.O. BOX 5227  
DENVER, COLORADO 80217  
ATTN: SPARE PARTS DEPT.

6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

## SECTION 6

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

## 6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01255	NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION P.O. BOX 20922, 5005 E. MC DONELL RD PHOENIX, ARIZONA 85036	04713	HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O. BOX 5227 DENVER, COLORADO 80217	28009
TRW ELECTRONIC COMPONENTS, INC FIXED RESISTORS, BRUNLINGTON DIV. 2850 MT PLEASANT BRUNLINGTON, IOWA 52601	07716	CAMBRIDGE THERMIONIC CORPORATION 445 CONCORD AVENUE CAMBRIDGE, MASSACHUSETTS 02138	71279
CTS KEENE INCORPORATED 3230 RIVERSIDE AVENUE PASO ROBLES, CALIFORNIA 93446	11237	ELECTRO MOTIVE CORPORATION P.O. BOX 7600 LALTER AVENUE FLORENCE, SOUTH CAROLINA 29501	72136
PLASTIGLIDE MFC CORP P.O. BOX 867 1757 STANFORD STREET SANTA MONICA, CALIFORNIA 90406	11897	NYTRONICS INCORPORATED 10 PELHAM PARKWAY PELHAM MANOR, NEW YORK 10803	72259
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
ELECTRO CUBE INCORP 1710 SOUTH DEL MAR AVENUE SAN GABRIEL, CALIFORNIA 91776	14752	BECKMAN INSTRUMENTS INCORPORATED HELIPOT DIVISION 2500 HARBOR BOULEVARD FULLERTON, CALIFORNIA 92634	73138
SIGNETICS CORPORATION SUNNYVALE, CALIFORNIA 94086	18324	BUNKER RAMO CORPORATION THE AMPHENOL RF DIVISION 33 E. FRANKLIN STREET DANPURY, CONNECTICUT 06810	74868
SCARFF MANUFACTURING COMPANY 3445 FLETCHER AVENUE EL MONTE, CALIFORNIA 91731	18677	ELECTRONIC INDUSTRIES ASSOCIATION JOINT ELECTRONIC TYPE DESIGNATION SYSTEM	80131 80058
ERIE TECHNOLOGICAL PRODUCTS INC. STATE COLLEGE DIVISION STATE COLLEGE, PENNSYLVANIA 16801	18796	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
ANALOG DEVICE, INCORPORATED P.O. BOX 260 81 INDUSTRIAL WAY NORWOOD, MASSACHUSETTS	24355	AUGAT INCORPORATED 31 PERRY AVENUE ATTLEBORO, MASSACHUSETTS 02703	91506
CORNELL-DUELLIER ELECTRONICS DIVISION OF FEDERAL PACIFIC CO. 2070 MAPLE STREET DESO PLAINES, ILLINOIS 60018	25243	DELVAN DIVISION AMERICAN PRECISION INDUSTRIES INC 270 QUAKER ROAD EAST ALBANY, NEW YORK 14052	99800
MEFCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769		

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## 6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

## ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
Servo Reproduce, CCA	16783851-001	E
	16783851-002	

DESCRIPTION	PART NUMBER	CODE
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CODE	DEFINITION
A	COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.
B	PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS; OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY.
C	PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS; OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

CODE	DEFINITION
D	PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.
E	THE -002 IS INTERCHANGEABLE WITH THE -001; THE -001 IS NOT INTERCHANGEABLE WITH THE -002 BECAUSE R51 RESISTOR SHAFT (IN POSITIONS 14, 15, AND 16) INTERFERES WITH AUXILIARY HOUSING DOOR.



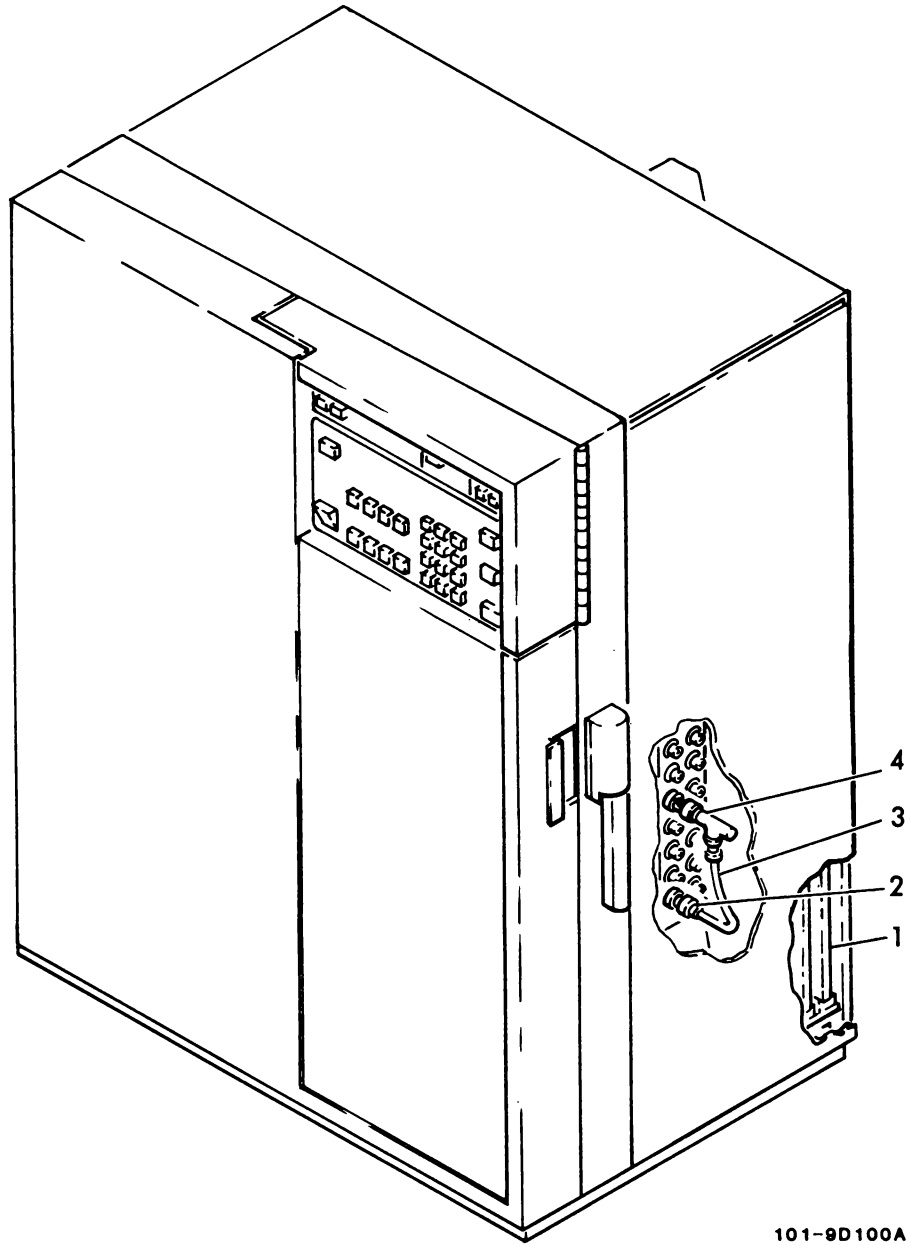
TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16783851-002	CIRCUIT CARD ASSEMBLY, SERVO REPRODUCE	28009		1	1	

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-011	BENCH LEVEL SPARES KIT, SERVO REPRODUCE					
16737938-109	SEMICONDUCTOR DEVICE, DIODE	80131	1N4736A 5961-932-4026	1	1	
16756865-003	SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	2	1	
16774985-001	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM310H	1	1	
16776656-001	INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27014	LM318H	3	1	
16776697-001	INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	N8T208	1	1	
16779092-002	INTEGRATED CIRCUIT	04713	MC14016BCP	9	2	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	1	1	
16779626-001	MICROCIRCUIT	04713	MC14028BCP	1	1	
16781061-001	MICROCIRCUIT	27014	LM339AN	1	1	
16781084-001	PLUG, TIP	91506	8136-651P2	1	2	
99000312-001	MICROCIRCUIT	01295	SN74LS05N	1	1	
99000408-001	MICROCIRCUIT	04713	MC14560BCP	1	1	





101-9D100A

FIGURE 6-1. SERVO REPRODUCE KIT

TABLE 6-1. SERVO REPRODUCE KIT

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-1			KIT, SERVO REPRODUCE	28CC9		167E4522-0C1	AR		
6-1	1	AEAS6-51	. CIRCUIT CARD ASSEMBLY, SERVO REPRODUCE (SEE TABLE 6-2 FOR BREAKDOWN)	28CC9		167E3E51-XXX	1		
6-1			. CABLE ASSEMBLY, ENC	28CC9		167E3E75-0C2	1		
6-1	2		. . CONNECTOR, PLUG, ELECTRICAL	74EEB	36775 5935-9C4-8372	16750123-0C5	2		
6-1	3		. . CABLE, COAXIAL	80C5E	RG58AU	16119113-0C1	AR		
6-1	4		. CONNECTOR, TEE, ENC	74EEB	219C0 5935-CC-940-7322	167E7E51-017	1		
NOTES:									



TABLE 6-2. SERVO REPRODUCE CCA (SHEET 1 OF 5)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-2		ABA36-51	CIRCUIT CARD ASSEMBLY, SERVO REPRODUCE (SEE TABLE 6-1 FOR LOCATION IN NHA)	280C9		16783851-0C1	REF	A	
6-2		ABA36-51	CIRCUIT CARD ASSEMBLY, SERVO REPRODUCE (SEE TABLE 6-1 FOR LOCATION IN NHA)	280C9		16783851-0C2	REF	B	
6-2		C1,2	• SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16756865-003	2		
6-2		C1,2	• CAPACITOR, FIXED, MICA DIELECTRIC 43PF, +-5%, 50VDC	25243	CD1CE0430JN1	1675978C-257	2		
6-2		C3,4	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, C.11 LF, +-20%, 50 VDC	18796	8121-C5C-651-1C4M	1677162C-018	2		
6-2		C5,6	• CAPACITOR, FIXED, MICA DIELECTRIC 62PF, +-5%, 50VDC	25243	CD1CE0620JN1	1675978C-261	2		
6-2		C7,8	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, C.11 LF, +-20%, 50 VDC	18796	8121-05C-651-1C4M	1677162C-018	2		
6-2		C9	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, C.370F, +-5%, 50VDC	18796	8141-C5CW5R334J	16771624-062	1		
6-2		C10	• CAPACITOR, FIXED, MICA DIELECTRIC, 27PF, +-5%, 50VDC	25243	CD1CE0270JN1	1675978C-252	1		
6-2		C11	• CAPACITOR, FIXED, MICA DIELECTRIC 24PF, +-5%, 50VDC	25243	CD1CFC241JA1	1675978C-275	1		
6-2		C12	• CAPACITOR, FIXED, MICA DIELECTRIC 15PF, +-5%, 50VDC	25243	CD1CC0150JA1	1675978C-247	1		
6-2		C13	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 470PF, +-5%, 50VDC	18796	8111-C5CW5R471J	16771624-028	1		
6-2		C14	• CAPACITOR, FIXED, MICA DIELECTRIC 39PF, +-5%, 50VDC	25243	CD1CE0390JN1	1675978C-256	1		
6-2		C15	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 820PF, +-5%, 50VDC	18796	8111-C5CW5R821J	16771624-031	1		
6-2		C16	• CAPACITOR, FIXED, MICA DIELECTRIC 62PF, +-5%, 50VDC	25243	CD1CE0620JA1	1675978C-261	1		
6-2		C17	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1500PF, +-5%, 50VDC	18796	8121-C5CW5R182J	16771624-035	1		
6-2		C18	• CAPACITOR, FIXED, MICA DIELECTRIC 130PF, +-5%, 50VDC	25243	CD1CF0131JA1	1675978C-265	1		
6-2		C19	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2700PF, +-5%, 50VDC	18796	8121-05CW5R272J	16771624-037	1		
6-2		C20	• CAPACITOR, FIXED, MICA DIELECTRIC, 270PF, +-5%, 50VDC	81349	CM05F0271J03 591C-46C-0870	16761545-037	1		
6-2		C21	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-5%, 50VDC	18796	8121-C5CW5R562J	16771624-041	1		
6-2		C22	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600UF, +-5%, 50VDC	18796	8111-C5CW5R561J	16771624-029	1		
6-2		C23	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, C.035UF, +-5%, 50VDC	18796	8131-C5CW5R153J	16771624-046	1		
6-2		C24	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000PF, +-5%, 50VDC	18796	8121-C5CW5R102J	16771624-032	1		
6-2		C25	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, C.033UF, +-5%, 50VDC	18796	8131-C5CW5R333J	16771624-050	1		
6-2		C26	• CAPACITOR, FIXED, CERAMIC DIELECTRIC, 5600PF, +-5%, 50VDC	18796	8121-C5CW5R562J	16771624-041	1		
NOTES:									

TABLE 6-2. SERVO REPRODUCE CCA (SHEET 2 OF 5)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-2		C27	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.033UF, +-20%, 50VDC	18796	8121-05C-651-333M	1677102C-015	1		
6-2		C28-30	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	41K54760015K1A	16759C5E-242	1		
6-2		C31	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.33UF, +-5%, 50VDC	18796	8141-05CW5R334J	16771624-042	1		
6-2		C32	. CAPACITOR, FIXED, ELECTROLYTIC, 18UF, +-10%, 6VDC	26769	41K5186A006K1A	16759C5E-077	1		
6-2		C35	. CAPACITOR, FIXED, MICA DIELECTRIC, 5PF, +-5%, 500VDC	25243	C01CC00500N1	1675978C-244	1		
6-2		C36-38	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-05C-651-104M	1677102C-01E	1		
6-2		C39	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.22UF, +-20%, 50VDC	18796	8131-05C-651-224M	1677102C-02C	1		
6-2		C40	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-05C-651-104M	1677102C-01E	1		
6-2		C41	. CAPACITOR, FIXED, MICA DIELECTRIC 20PF, +-5%, 500 VDC	25243	C01CED2C0JN1	1675978C-245	1		
6-2		C42,43	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-050-651-104M	1677102C-01e	2		
6-2		C44	. CAPACITOR, VARIABLE, CERAMIC DIELECTRIC, 15-60PF, 200VDC	72982	538-006F15-60PF 591C-426-80E3	16763335-015	1		
6-2		C45,46	. CAPACITOR, FIXED, MICA DIELECTRIC, 330PF, +-1%, 50VDC	72136	DM5FY331F04CR	16779445-244	2		
6-2		C47	. CAPACITOR, FIXED, MICA DIELECTRIC, 160PF, +-1%, 50VDC	72136	DM5FY161F04CR	16779445-236	1		
6-2		C48,49	. CAPACITOR, FIXED, PLASTIC DIELECTRIC, 6800PF, +-1%, 100VDC	14752	4100186E2F	16783473-111	2		
6-2		C50-56	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	18796	8121-05C-651-104M	1677102C-01E	2		
6-2		C57	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.022UF, +-5%, 50VDC	18796	8131-05CW5R223J	16771624-04E	1		
6-2		C58	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.01UF, +-5%, 50VDC	18796	8121-05CW5R103J	16771624-044	1		
6-2		C59	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 8200PF, +-5%, 50VDC	18796	8121-05CW5R222J	16771624-043	1		
6-2		C60	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 3900PF, +-5%, 50VDC	18796	8121-05CW5R392J	16771624-035	1		
6-2		C61	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 2200PF, +-5%, 50VDC	18796	8121-05CW5R222J	16771624-036	1		
6-2		C62	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 1000PF, +-5%, 50VDC	18796	8121-05CW5R102J	16771624-032	1		
6-2		L1	. COIL, RADIO FREQUENCY, 1PH, +-10%	72259	WEE1000 595C-00-755-858E	1677940E-004	1		
6-2		L2	. COIL, RADIO FREQUENCY, 2.2MH, +-10%	72259	WEE2200 595C-00-850-3536	1677940E-005	1		
6-2		L3	. COIL, RADIO FREQUENCY, 4.7PH, +-10%	72259	WEE4700 595C-00-978-668E	1677940E-006	1		
6-2		L4	. COIL, RADIO FREQUENCY, 10PH, +-10%	72259	WEE10000	1677940E-001	1		
6-2		L5	. COIL, RADIO FREQUENCY, 22PH, +-10%	72259	WEE22000 595C-00-761-111E	1677940E-002	1		
6-2		L6	. COIL, RADIO FREQUENCY, 47PH, +-10%	72259	WEE47000 595C-00-764-867E	1677940E-003	1		

NOTES:

TABLE 6-2. SERVO REPRODUCE CCA (SHEET 3 OF 5)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S TUBES CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
			1 2 3 4 5 6 7						
6-2		L7	. COIL, RADIO FREQUENCY, 1CCMH, +20%	72259	WEE10CC00	16779408-009	1		
6-2		L8	. COIL, RADIO FREQUENCY, 1ECPH, +20%	72259	WEE18C000	16779408-010	1		
6-2		L9-11	. COIL, RADIO FREQUENCY, 22.0 UH, +10%	99ECC	1537-44 595C-219-1950	16750E75-254	3		
6-2		R1-4	. RESISTOR, FIXED, METAL FILM, 2K OHMS, +-1%, 1/8W	81349	RNR55K2C01FR	16757165-230	4		
6-2		R5-7	. RESISTOR, FIXED, METAL FILM, 2.74K OHMS, +-1%, 1/8W	81349	RNR55K2741FS	16757165-243	3		
6-2		R8	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/8W	81349	RNR55K10C02FS 5905-CC-13P-12E3	16757165-301	1		
6-2		R9	. RESISTOR, FIXED, METAL FILM, 15.4K OHMS, +-1%, 1/8W	81349	RNR55K1542FS 5905-CC-008-424C	16757165-319	1		
6-2		R10	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R11	. RESISTOR, FIXED, METAL FILM, 3.83K OHMS, +-1%, 1/8W	81349	RNR55K3831FS 5905-CC-007-7568	16757165-257	1		
6-2		R12	. RESISTOR, FIXED, METAL FILM, 7.68K OHMS, +-1%, 1/8W	81349	RNR55K7681FF	16757165-260	1		
6-2		R13	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K10C01FS 5905-CC-197-42E9	16757165-201	1		
6-2		R14	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R15	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R16	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R17	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R18	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R19	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R20	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R21	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R22	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R23	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R24	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R25	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 5905-CC-007-9171	16757165-210	1		
6-2		R26	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	1		
6-2		R27	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8W	81349	RNR55K10C01FS 5905-CC-197-42E9	16757165-201	1		
6-2		R28,29	. RESISTOR, FIXED, METAL FILM, 30.1K OHMS, +-1%, 1/8W	81349	RNR55K3012FF	16757165-347	2		
6-2		R30	. RESISTOR, FIXED, METAL FILM, 249K OHMS, +-1%, 1/8W	81349	RNR55K2493FS 5905-CC-173-427C	16757165-435	1		

NOTES:

TABLE 6-2. SERVO REPRODUCE CCA (SHEET 4 OF 5)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
			1 2 3 4 5 6 7							
6-2		R31	. RESISTOR, FIXED, METAL FILM, 495K OHMS, +-1%, 1/8w	81349	RNR55K493FS		16757165-46E	1		
6-2		R32	. RESISTOR, FIXED, METAL FILM, 61.9K OHMS, +-1%, 1/8w	81349	RNR55K6192FM		16757165-377	1		
6-2		R33	. RESISTOR, FIXED, METAL FILM, 124K OHMS, +-1%, 1/8w	81349	RNR55K1243FS 59C5-CC-450-128E		16757165-41C	1		
6-2		R34	. RESISTOR, FIXED, METAL FILM, 1.1 MEG OHMS, +-1%, 1/8w	81349	RNR55K1104FS		16757165-505	1		
6-2		R35	. RESISTOR, FIXED, METAL FILM, 2.49 MEG OHMS, +-1%, 1/8w	07716	CCPTC-2494F		16757165-53F	1		
6-2		R36	. RESISTOR, FIXED, METAL FILM, 636 OHMS, +-1%, 1/8w	81349	RNR55K636CFM		16757165-17E	1		
6-2		R37	. RESISTOR, FIXED, METAL FILM, 509 OHMS, +-1%, 1/8w	81349	RNR55K509CFM		16757165-193	1		
6-2		R38	. RESISTOR, FIXED, METAL FILM, 1.33K OHMS, +-1%, 1/8w	81349	RNR55K1331FM		16757165-212	1		
6-2		R39	. RESISTOR, FIXED, METAL FILM, 1.74K OHMS, +-1%, 1/8w	81349	RNR55K1741FM		16757165-224	1		
6-2		R40	. RESISTOR, FIXED, METAL FILM, 3.83K OHMS, +-1%, 1/8w	81349	RNR55K3831FS 59C5-CC-007-756E		16757165-257	1		
6-2		R41	. RESISTOR, FIXED, METAL FILM, 7.68K OHMS, +-1%, 1/8w	81349	RNR55K7681FM		16757165-28E	1		
6-2		R42	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8w	81349	RNR55K1C01FS 59C5-CC-197-428E		16757165-2C1	1		
6-2		R43,44	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/8w	81349	RNR55K1C02FS 59C5-CC-138-128E		16757165-3C1	2		
6-2		R45	. RESISTOR, FIXED, CARBON COMPOSITION, 47 OHMS, +-5%, 1/4w	81349	RCRC76470JM		16750C76-0C1	1		
6-2		R46	. RESISTOR, FIXED, METAL FILM, 38.3K OHMS, +-1%, 1/8w	81349	RNR55K3832FM		16757165-357	1		
6-2		R47	. RESISTOR, FIXED, METAL FILM, 11.3K OHMS, +-1%, 1/8w	81349	RNR55K1132FS		16757165-36E	1		
6-2		R48,49	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/8w	81349	RNR55K1C02FS 59C5-CC-138-128E		16757165-3C1	2		
6-2		R50	. RESISTOR, FIXED, METAL FILM, 15.4K OHMS, +-1%, 1/8w	81349	RNR55K1542FS 59C5-CC-008-424C		16757165-315	1		
6-2		R51	. RESISTOR, VARIABLE, 50K OHMS, +-10%, 3/4w	7313E	89-19-C		16757165-213	1	A	
6-2		R51	. RESISTOR, VARIABLE, 50K OHMS, +-10%, 3/4w	7313E	89PR50K 59C5-138-1089		16757165-013	1	E	
6-2		R52	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8w	81349	RNR55K1C03FM 59C5-CC-407-216C		16757165-401	1		
6-2		R53	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8w	81349	RNR55K1C01FS 59C5-CC-197-428E		16757165-2C1	1		
6-2		R54	. RESISTOR, FIXED, METAL FILM, 100K OHMS, +-1%, 1/8w	81349	RNR55K1C03FM 59C5-CC-407-216C		16757165-4C1	1		
6-2		R55	. RESISTOR, FIXED, METAL FILM, 1K OHMS, +-1%, 1/8w	81349	RNR55K1C01FS 59C5-CC-197-428E		16757165-2C1	1		
6-2		R56	. RESISTOR, FIXED, METAL FILM, 33.2 K OHMS, +-1%, 1/8w	81349	RNR55K3322FR		16757165-351	1		
6-2		R58	. RESISTOR, FIXED, METAL FILM, 10.5K OHMS, +-1%, 1/8w	81349	RNR55K1052FM		16757165-303	1		
6-2		R59	. RESISTOR, FIXED, METAL FILM, 10K OHMS, +-1%, 1/8w	81349	RNR55K1C02FS 59C5-CC-138-128E		16757165-301	1		

NOTES:

TABLE 6-2. SERVO REPRODUCE CCA (SHEET 5 OF 5)

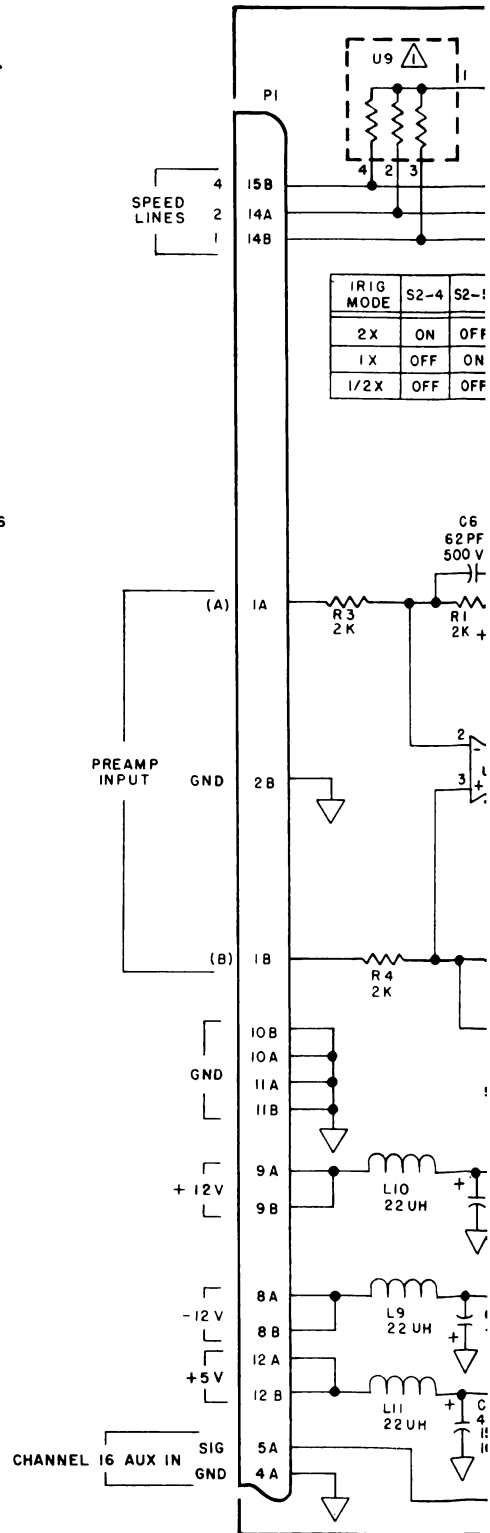
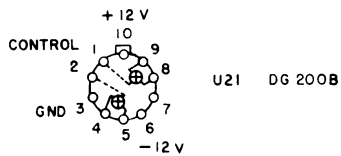
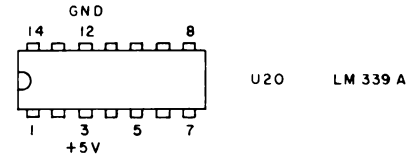
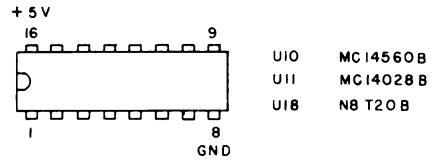
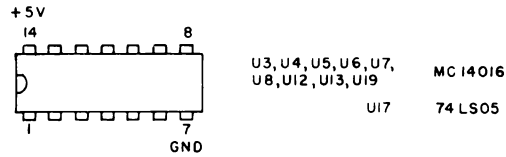
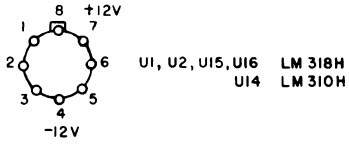
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-2		R60	. RESISTOR, FIXED, METAL FILM, 8.06K OHMS, +-1%, 1/8W	81349	RNR55K6C1FS	16757165-28E	1		
6-2		R60	. RESISTOR, FIXED, METAL FILM, 150 OHMS, +-1%, 1/8W	81349	RNR55K1500FF	16757165-11E	1		
6-2		R61	. RESISTOR, FIXED, METAL FILM, 9.09K OHMS +-1%, 1/8W	81349	RNR55K9C91FR 59C5-CC-431-7833	16757165-293	1		
6-2		R63	. RESISTOR, FIXED, METAL FILM, 3.01K OHMS, +-1%, 1/8W	81349	RNR55K3C11FS	16757165-247	1		
6-2		R64	. RESISTOR, FIXED, METAL FILM, 100 OHMS, +-1%, 1/8W	81349	RNR55K1C00FF	16757165-1C1	1		
6-2		R65-68	. RESISTOR, FIXED, METAL FILM 10K OHMS, +-1%, 1/8W	81349	RNR55K1000FS 5905-CC-138-1223	16757165-3C1	4		
6-2		R69	. RESISTOR, FIXED, METAL FILM, 200 OHMS, +-1%, 1/8W	81349	RNR55K2C00FF	16757165-13C	1		
6-2		R70	. RESISTOR, FIXED, METAL FILM, 1.43K OHMS, +-1%, 1/8W	81349	RNR55K1431FS 59C5-CC-007-9171	16757165-21E	1		
6-2		S1,2	. SWITCH, SLIDE	11237	206-7	16778217-0C4	2		
6-2		TP1	. TERMINAL, STLC	71279	16C-155E-02-01 594C-CC-853-6232	1675C2C1-022	1		
6-2		TP2-5	. TERMINAL, STLC	71279	2027-2 594C-CC-280-06C1	1675717C-0C2	4		
6-2		U1,2	. INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27C14	LM318H	16776656-0C1	2		
6-2		L3-8	. INTEGRATED CIRCUIT	04713	MC14016ECP	16779092-0C2	6		
6-2		L9	. RESISTOR, NETWORK	11236	75C-81-R10KCHMS	167EC5CE-00E	1		
6-2		L10	. MICROCIRCUIT	04713	MC1456CECP	990C040E-0C1	1		
6-2		L11	. MICROCIRCUIT	04713	MC14028ECP	16779626-0C1	1		
6-2		L12,13	. INTEGRATED CIRCUIT	04713	MC14016ECP	16779C92-0C2	2		
6-2		L14	. INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27C14	LM310H	16774585-0C1	1		
6-2		L15,16	. INTEGRATED CIRCUIT, OPERATIONAL AMPLIFIER	27C14	LM318H	16776656-0C1	1		
6-2		L17	. MICROCIRCUIT	01255	SN74LSC5N	990C312-0C1	1		
6-2		L18	. INTEGRATED CIRCUIT, MONOSTABLE MULTIVIBRATOR	18324	N8T20E	16776697-0C1	1		
6-2		L19	. INTEGRATED CIRCUIT	04713	MC14016ECP	16779C92-0C2	1		
6-2		L20	. MICROCIRCUIT	27C14	LM339AN	16781C61-0C1	1		
6-2		U21	. INTEGRATED CIRCUIT, ANALOG GATE	24255	AD7513JH	1677918E-0C2	1		
6-2		VR1	. SEMICONDUCTOR DEVICE, DIODE	80131	1N4736A 5961-932-4026	1672793E-1C5	1		
6-2		W1	. PLUG, TIP	915C6	813E-651P2	167E1C84-0C1	1		
6-2	1		. EJECTOR, CIRCUIT CARD ASSEMBLY	18677	202WHITE	167EC7C4-0C1	1		
6-2	2		. SHIELD	28CC9		167E1263-0C2	1		
6-2	3		. UPPER, PLASTIC	11E57	138ANS324	167E042E-0C3	1		
6-2	4		. PRINTED WIRING BOARD	28CC9		167E3E5C-0C1	1		

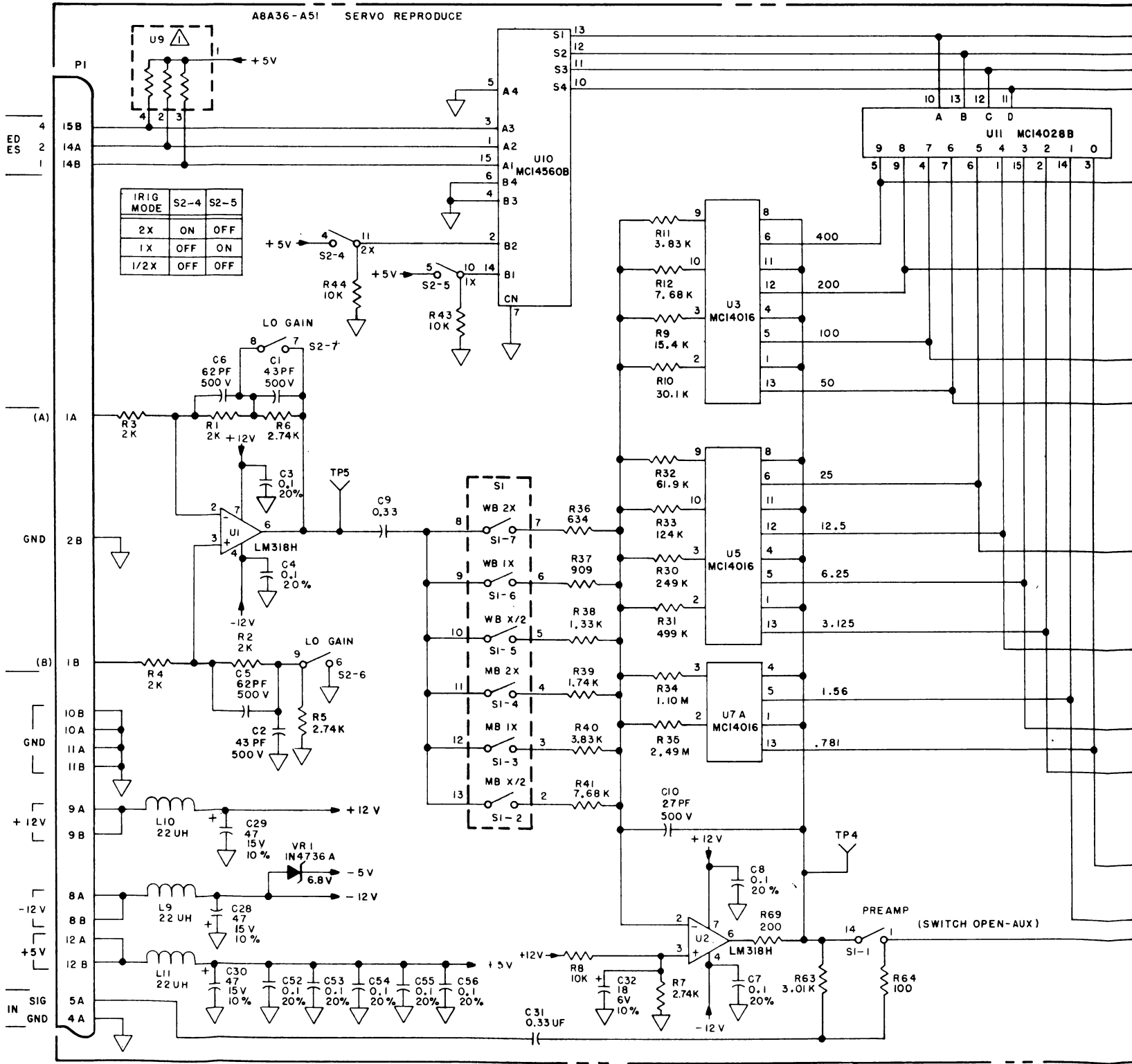
NOTES:



NOTES:

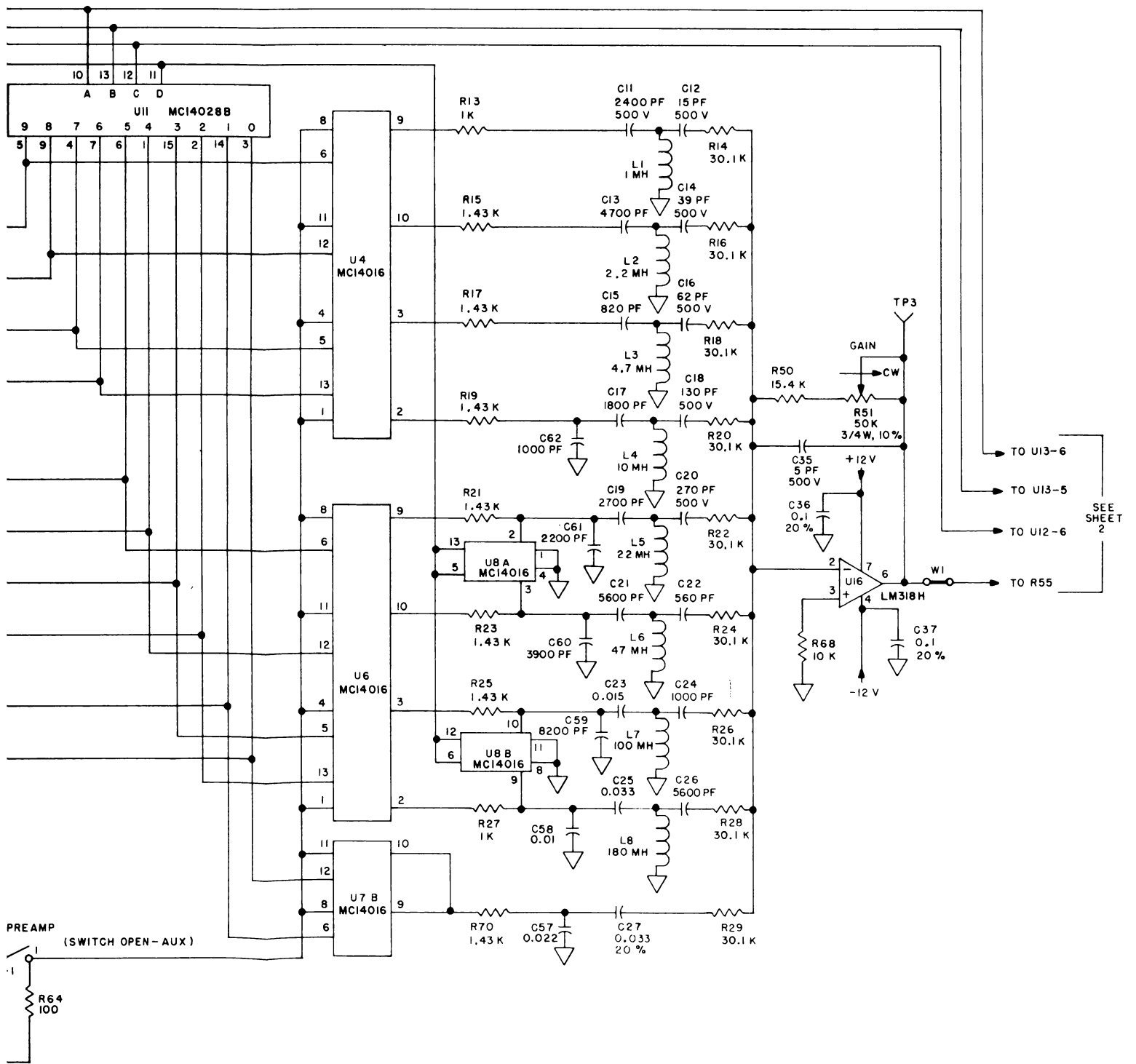
1. UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%.  
ALL CAPACITANCE VALUES ARE IN UF, 50V, 5%.
2. ▽ DENOTES CIRCUIT COMMON.
3. ▲ U9 IS SEVEN RESISTOR ARRAY 10K, 1.1W, 2%.
4. SWITCH FUNCTION AS DESIGNATED OCCURS WHEN SWITCH IS ON (CLOSED).
5. O.C. INDICATES AN OPEN COLLECTOR OUTPUT.
6. INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS, TOP VIEW SHOWN:





IRIG MODE	S2-4	S2-5
2X	ON	OFF
1X	OFF	ON
1/2X	OFF	OFF

U11 MCI4028B			
A	B	C	D
9	8	7	6
5	4	3	2
1	0	15	14
3	2	1	0

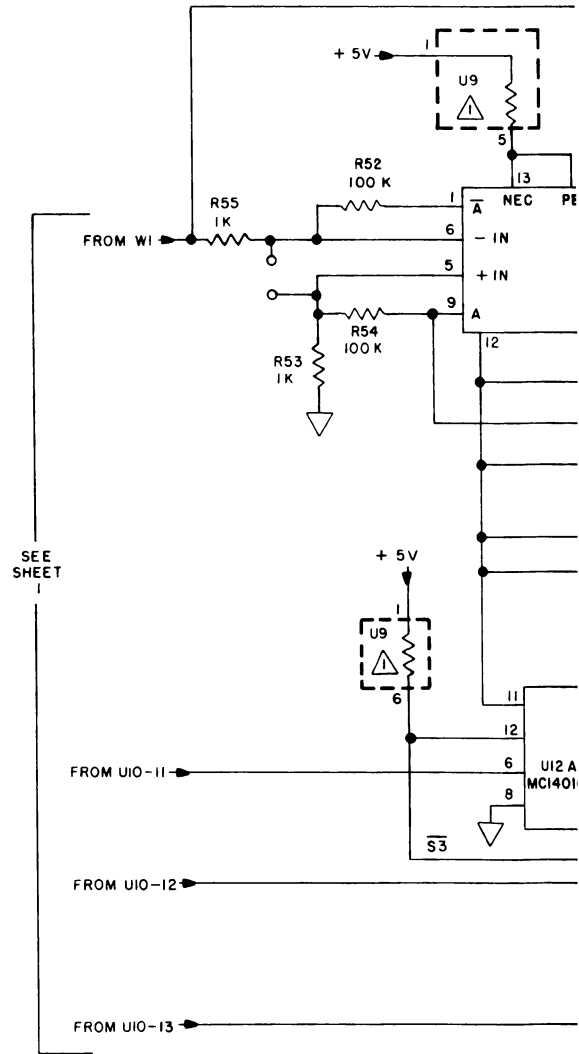


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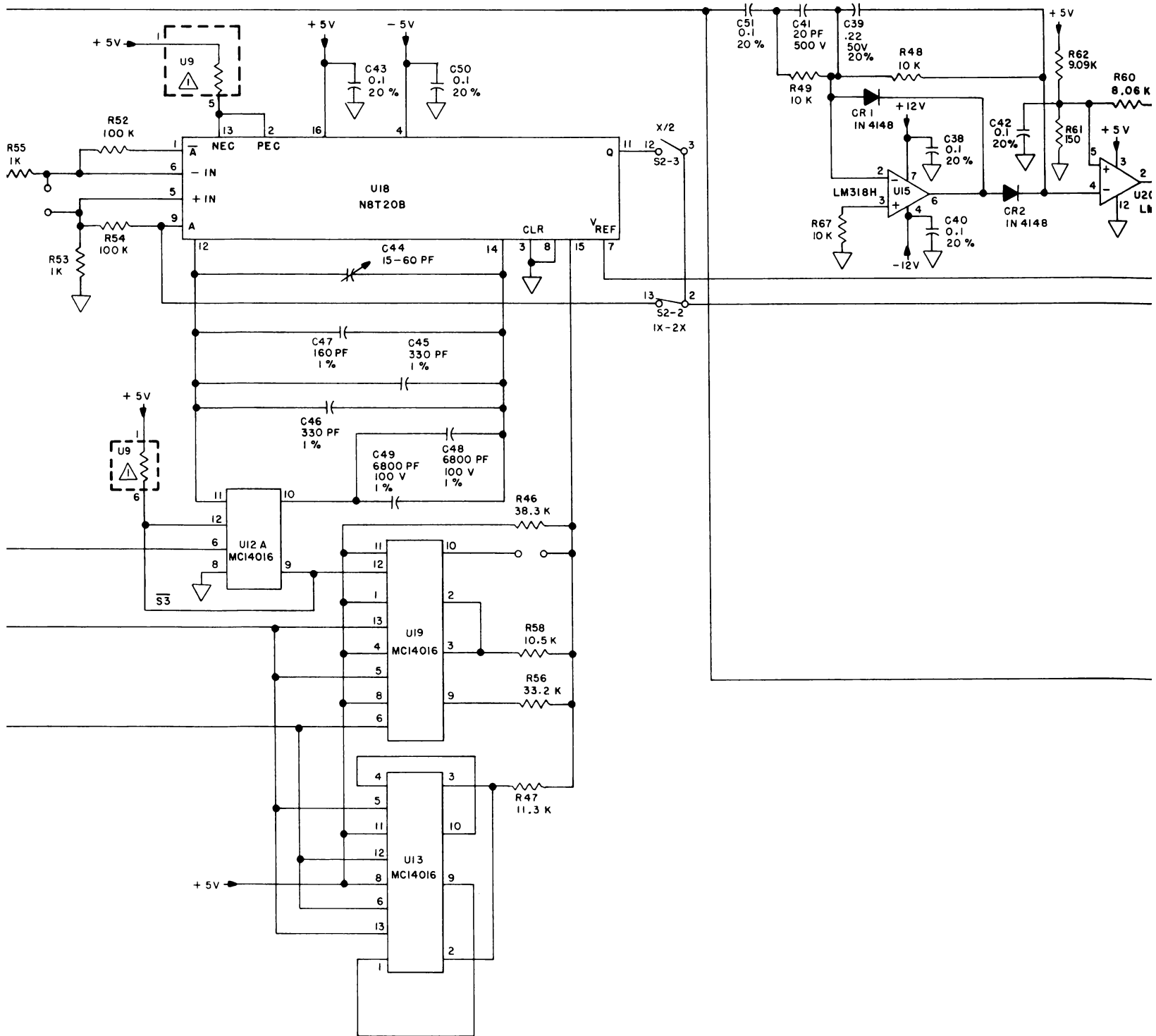
Figure 7-1. Servo Reproduce Schematic (Sheet 1)

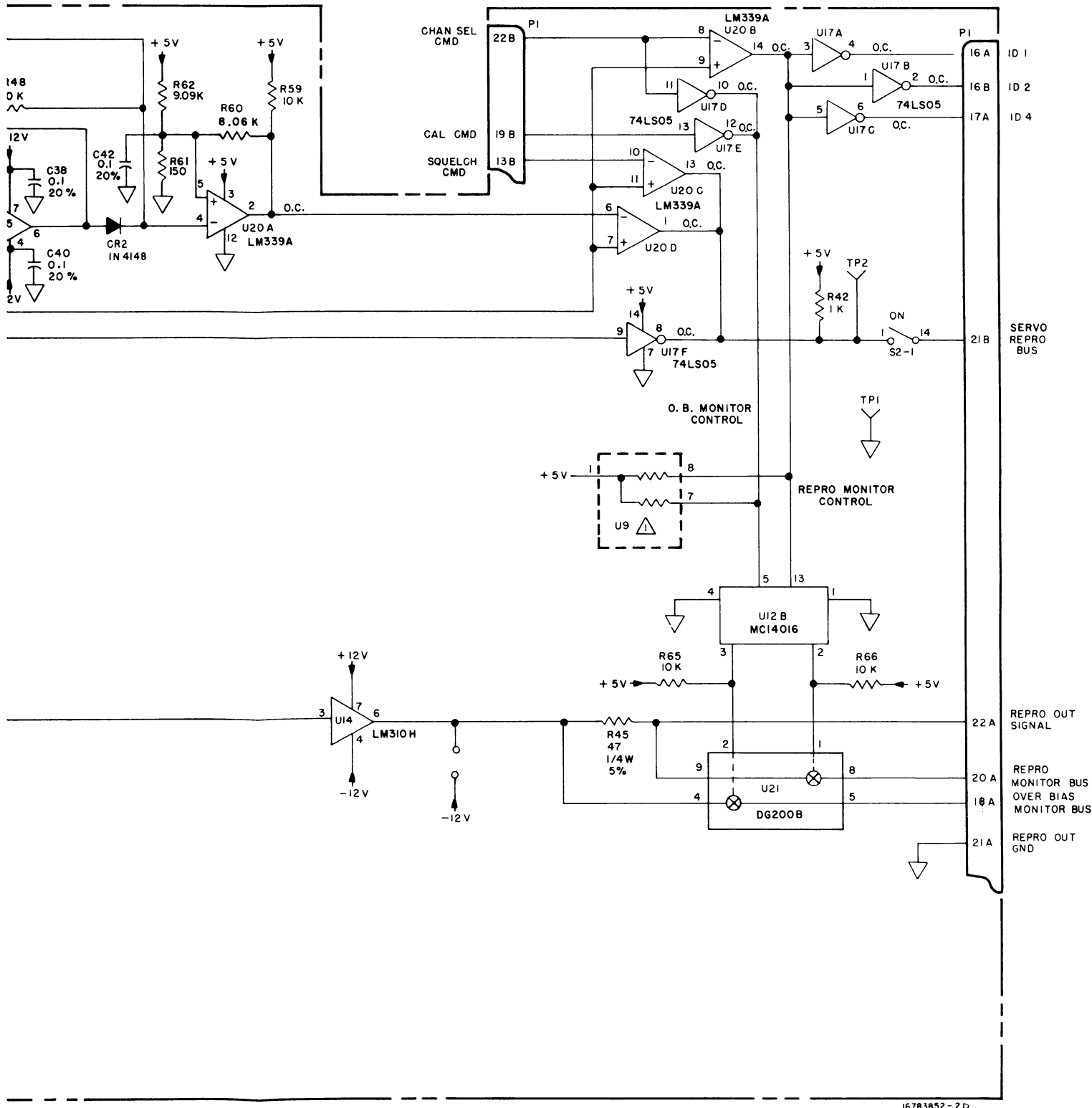
A8A36-A51 SERVO REP



+ 5V →







REF: 16783852-2E

Figure 7-1. Servo Reproduce Schematic  
(Sheet 2)

SECTION 7  
SCHEMATICS

# Technical Manual

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MAINTENANCE  
INSTRUCTIONS FOR  
**AUXILIARY HOUSING**  
MODEL 101  
MAGNETIC TAPE  
RECORDER/REPRODUCER  
PORTABLE SYSTEM

**APRIL 1984**

**NOTICE**

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

**Honeywell**

TEST INSTRUMENTS DIVISION  
P.O. BOX 5227 • DENVER, COLORADO • 80217



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SECTION 1  
INTRODUCTION

1-1. PURPOSE

This technical manual describes the 32 channel auxiliary housing used in conjunction with the Model 101 Magnetic Tape Recorder/-Reproducer System. This manual contains only the information applicable to the auxiliary housing. The Operator's and System Manual describes the interface and relationship to the Model 101 System.

1-2. DESCRIPTION

The auxiliary housing is a separate unit from the Model 101. It is connected through cables to the Model 101 to allow the system to function as a 32 record and 32 reproduce system. All of the functions available with a 16x16 system are available as a 32x32 system when a Model 101 and an auxiliary housing are used together. The auxiliary housing provides the BNC connectors for the 32 reproduce outputs. It contains its own power supplies and is available in 115 and 230 Vac versions.

For further description of the auxiliary housing, refer to Section 6 and to Section 1 of the Operator's Manual.

1-3. SPECIFICATIONS

A. INPUT POWER

105-127 Vac, 47 to 63 Hz

210-254 Vac, 47 to 63 Hz

B. POWER SUPPLY OUTPUT VOLTAGES

+5 Vdc  $\pm 0.050$  Vdc

+12 Vdc  $\pm 0.120$  Vdc

-12 Vdc  $\pm 0.120$  Vdc

C. CIRCUIT CARD COMPLEMENT

Reproduce Cards - up to a maximum of 32

#### D. INPUT/OUTPUT CONNECTORS

1. Signal Input - P34 (40 PIN) Preamp output channel 1-16  
- P35 (34 PIN) Preamp output channel 17-32
2. MPU BUS - P-36 (34 PIN)
3. AUX - P-37 (10-PIN) COAXIAL CABLE, BUS SIGNALS and Servo Repro, Voice Record
4. Signal Output BNC's - 32 reproduce outputs one for each channel

#### E. LOGIC SIGNALS (See Figure 7-2)

Certain logic lines may serve as inputs only. Certain other logic lines are bi-directional and may serve under MPU control as either inputs or outputs. In all cases, the logic (voltage) levels of all logic lines shall be TTL compatible.

##### 1. Logic Lines - Inputs

The pin number and designation of each logic input line is given below.

<u>PIN NUMBER</u>	<u>DESIGNATION</u>
P36-32	A0
P36-30	A1
P36-26	A4
P36-9	A5
P36-12	A6
P36-28	A8
P36-10	A10
P36-16	A14
P36-5	A15
P36-14	E
P36-6	Reset
P36-23	R/W
P36-25	OE2

## 2. Logic Lines - Bidirectional

The pin number and designation of each bi-directional logic line is given below:

<u>PIN NUMBER</u>	<u>DESIGNATION</u>
P36-18	D0
P36-19	D1
P36-1	D2
P36-2	D3
P36-3	D4
P36-4	D5
P36-21	D6
P36-20	D7

### F. PIA ADDRESSING (See Figure 7-2)

The base address of PIA U4 is hexadecimal 0530. This address is partially decoded from A15, A14, A10, A8, A6, A5 and A4, using U1 and U2. Where A15 = A14 = A6 = 0 and A10 = A8 = A5 = A4 = E = 1, pin 12 of U2 is a 0 and the PIA is selected. Three address locations above the base address are obtained by manipulating address lines A1 and A0.

The addressing requirements for U4 are summarized below:

Address	A15	A14	A10	A8	A6	A5	A4	E	A1	A0
0530	0	0	1	1	0	1	1	1	0	0
0531	0	0	1	1	0	1	1	1	0	1
0532	0	0	1	1	0	1	1	1	1	0
0533	0	0	1	1	0	1	1	1	1	1

A 0 output on 0E2 indicates that the PIA has been selected. This output is an open collector, low-power Schottky TTL with a pull-up resistor to +5 volts (this resistor is located on the Model 101).

### G. CHANNEL SELECT COMMANDS (See Table 1-1)

Six control lines are decoded to provide the one line out of 32 individual lines required to select a particular channel for calibration and monitoring. These six control lines are incremented and decremented by the channel selector increment  or decrement  pushbutton on the Model 101 control panel

Table 1-1. Control Line-to-Channel Code

CHANNEL NUMBER	CONTROL LINE					
	$\overline{16}$	16	8	4	2	1
1	1	0	0	0	0	0
2	1	0	0	0	0	1
3	1	0	0	0	1	0
4	1	0	0	0	1	1
5	1	0	0	1	0	0
6	1	0	0	1	0	1
7	1	0	0	1	1	0
8	1	0	0	1	1	1
9	1	0	1	0	0	0
10	1	0	1	0	0	1
11	1	0	1	0	1	0
12	1	0	1	0	1	1
13	1	0	1	1	0	0
14	1	0	1	1	0	1
15	1	0	1	1	1	0
16	1	0	1	1	1	1

CHANNEL NUMBER	CONTROL LINE					
	16	16	8	4	2	1
17	0	1	0	0	0	0
18	0	1	0	0	0	1
19	0	1	0	0	1	0
20	0	1	0	0	1	1
21	0	1	0	1	0	0
22	0	1	0	1	0	1
23	0	1	0	1	1	0
24	0	1	0	1	1	1
25	0	1	1	0	0	0
26	0	1	1	0	0	1
27	0	1	1	0	1	0
28	0	1	1	0	1	1
29	0	1	1	1	0	0
30	0	1	1	1	0	1
31	0	1	1	1	1	0
32	0	1	1	1	1	1

#### H. MONITOR COMMAND

This signal originates at the preamplifier switching unit and indicates to the MPU whether or not reproduce monitoring is to be done using individual reproduce cards or using monitor cards via switched pre-amps. In the auxiliary housing, this same signal is used to control the channel selection.

A logic 1 indicates that the system is to use the two monitor reproduce cards in the Model 101 and not the reproduce cards in the auxiliary housing. A logic 0 indicates that monitoring will be done via the reproduce cards in the auxiliary housing instead of the two monitor cards in the Model 101.

#### I. CALIBRATE COMMAND

A logic 0 will indicate that the system is operating in any calibrate mode. A logic 1 will indicate any of the operating or non-operating modes.

#### J. SQUELCH COMMAND

A squelch signal (Logic 1) is to be provided at all times except when the capstan is operating in phaselock when a logic 0 is provided.

K. SPEED BUSES 1, 2, AND 4

The selected speed shall be coded on these lines as follows:

4	2	1	TAPE SPEED IPS
1	1	1	120
1	1	0	60
1	0	1	30
1	0	0	15
0	1	1	7.5
0	1	0	3.75
0	0	1	1.87
0	0	0	.937

L. FWD/REV BUS

This signal will be a logic 1 in any forward or standby mode and a logic 0 in any Reverse mode.

M. REPRODUCE IDENT 1, 2 AND 4

These 3 bus lines are PIA inputs and will indicate to the MPU the type of reproduce card which is in the particular channel selected by the channel selector if the monitor command is a logic 1. The code will be as follows:

ID4	ID2	ID1	REPRODUCE DATA CARD TYPE
1	1	1	No Card
1	0	1	MB FM
1	1	0	WB FM
0	0	1	MB Direct
0	1	0	WB Direct
0	0	0	Servo
0	1	1	Voice

In the record mode, the MPU will compare record card type in the Model 101 with reproduce card type in the auxiliary housing. If no card is in the record slot, the channel selector will immediately step to the next channel. If no card or a mismatched reproduce card is in the reproduce slot, then a signal to flash the card identity lights on the channel selector will be generated by the MPU.

In the reproduce mode and with the monitor command a logic 0, the channel selector will step through each reproduce channel up to a maximum of 32. If no card is in a particular channel, then the MPU will step immediately to the next channel. The reproduce card type will be displayed on the meter monitor.



#### N. VOICE RECORD COMMAND

A "0" logic level exists whenever the voice record card is energized except when switch S2 on the record card is programmed for CAL function. The 0 logic level turns off (squelches) the voice reproduce output.

#### O. EE SIGNAL BUS

When the Model 101 is in the E-E CAL mode and an FM record card is selected, the FM carrier will be present on this bus as a TTL square wave. The signal is buffered by U10.

#### P. SERVO REPRODUCE BUS

The servo reproduce signal to be transmitted to the Model 101 data housing driver is applied to this bus from the direct reproduce or servo reproduce card desired.

#### Q. OVERBIAS MONITOR BUS

The overbias monitor signal from the reproduce card selected by the channel selector will be present on this bus.

#### R. 1-16 REPRODUCE MONITOR BUS

The reproduce monitor signal will be present on this bus if channels 1 through 16 are selected by the channel selector. This bus will be selected by U12 and buffered by U9 to drive the reproduce monitor bus of the Model 101. If the monitor mode is selected by the Model 101, K1 will be open, preventing any interference between the auxiliary housing and the Model 101 monitor cards.

#### S. 17-32 REPRODUCE MONITOR BUS

The reproduce monitor signal will be present on this bus if channels 17 through 32 are selected by the channel selector. This bus will be selected by U12 and buffered by U9 to drive the reproduce monitor bus of the Model 101. If the monitor mode is selected by the Model 101, K1 will be open, preventing any interference between the auxiliary housing and the Model 101 monitor cards.

#### T. PREAMPLIFIER INPUTS

The outputs of the Model 101 preamplifiers are connected to the reproduce cards through two twisted pair ribbon cables/connectors. Channels 1 through 16 are connected through P34 and channels 17 through 32 are connected through P35. The signal for each channel is differential.

SECTION 2  
INSTALLATION

2-1. GENERAL

The auxiliary housing may be mounted in a standard 19-inch rack or in its own optional case for portable use. There are four cables to connect and a ground strap. Care must be taken in connecting the cables to insure that the connectors are not reversed in their mating half or that the two 34-pin cables are not interchanged. See the Operator's Manual for cable connecting information.

CAUTION

The Model 101 power and the auxiliary housing power must be turned off when disconnecting the cables.

For best performance, do not allow the ground strap to touch any ground source such as the chassis of the Model 101 or the auxiliary housing.

2-2. POWER SUPPLY ASSEMBLY (Figure 2-1)

The power supply assembly slides in and out of the aux housing on two rails, and it is secured by two turn locks.

To remove power supply assembly:

- A. Remove trimstrip and door screw.
- B. Turn the turn lock screws about a quarter turn CCW.
- C. Slide power supply out of aux housing about half way. Then release catch lock and slide all the way out.
- D. The individual power supplies may now be adjusted or replaced.

2-3. RACK MOUNTING

Table 2-1 lists rack mounting components. Figure 2-1 shows the aux housing installation in a standard 19-inch rack.

To install in rack, proceed as follows:

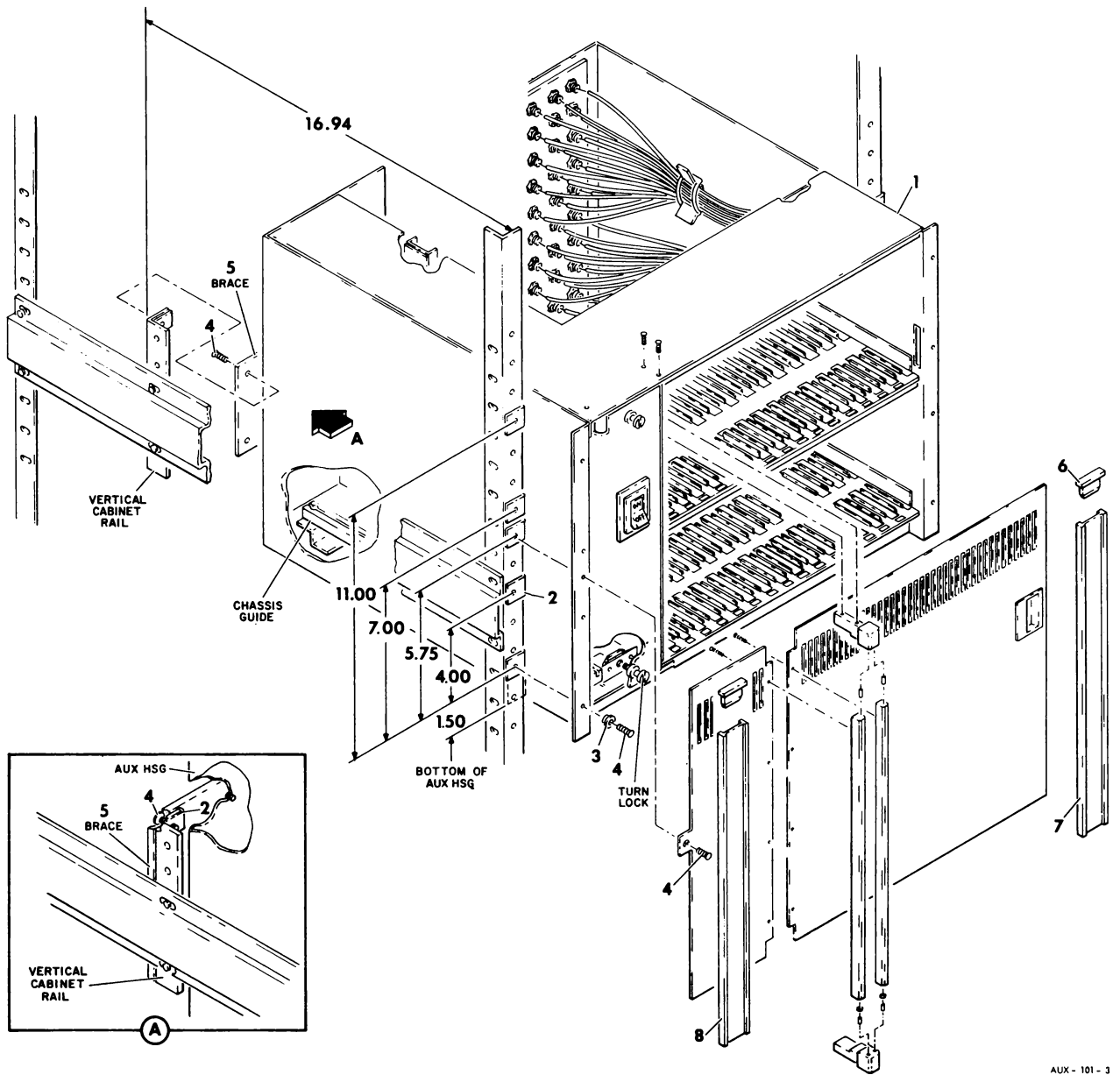
- A. Position rack vertical cabinet rails as shown in Figure 2-1.
- B. Install spring nuts (2), 7 on left side - 6 on right side per dimensions shown (Figure 2-1), starting with the spring nut 1.500 inch above bottom of aux housing.
- C. Attach aux housing chassis assembly (1) to rack front rail using trim strip retainers (3) and screws (4). Adjust aux housing chassis (1) so it is level and at right angles to the sides of the rack. Tighten screws (4) securely.
- D. Install brace (5) to rear of aux housing chassis (1) using screws (4). Two threaded brace mounting holes are provided on each side of the aux housing. The brace (5) should span gap between aux housing and vertical cabinet rails.
- E. Using spring nuts (2) and screws (4), two each for each vertical rail, attach bracket (5) to vertical rails, making sure aux housing is level.
- F. Secure power supply door to rack using screws (4).
- G. Install trimcaps into ends of trim strips (7) and (8). Then, snap trimstrips over retainer (3).
- H. Connect ground strap and cables to Model 101 according to instructions in the Operator's Manual.

2-4. PORTABLE CASE MOUNTING (Figure 2-2)

Using the rack mounting hardware supplied with the aux housing (See Figure 2-1) and the four screws with lock washers and flat washers supplied with portable case, install aux housing in portable case as follows.

- A. On left side of case install five sheet spring nuts in screw holes 3, 10, 12, 15, and 22 as counted from the top hole.
- B. On right side of case install 4 sheet spring nuts in screw holes 3, 10, 15, and 22.
- C. Feed power cord through large round hole with grommet in back of portable case.
- D. Feed cables through slit in back of portable case, observing position of each cable as shown in Figure 2-2 and printed on back of portable case.
- E. Slide aux housing into portable case.
- F. Secure aux housing to case using nine screws (4) in front and four screws (9) in rear. Use trimstrip retainers on top and bottom front screws on each side. Use lock and flat washers on the rear screws as shown in Figure 2-1.
- G. Install trimcaps into each end of trimstrips.
- H. Snap trimstrips over retainers.
- I. Connect ground strap and cables to Model 101 according to instructions in Operator's Manual.

INDEX	QTY	HONEYWELL PART NO.	DESCRIPTION
1	1	16783858-xxx	Auxiliary Housing
2	13	16759421-126	Nut, Sheet Spring (10-24)
3	8	16784329-001	Trimstrip Retainer
4	17	MS 35206-263	Screw, PNH (10-24x.500LG)
5	2	16784879-001	Brace
6	4	16784369-001	Cap, Trimstrip
7	1	16784328-001	Trimstrip, Right Hand
8	1	16784878-001	Trimstrip, Left Hand

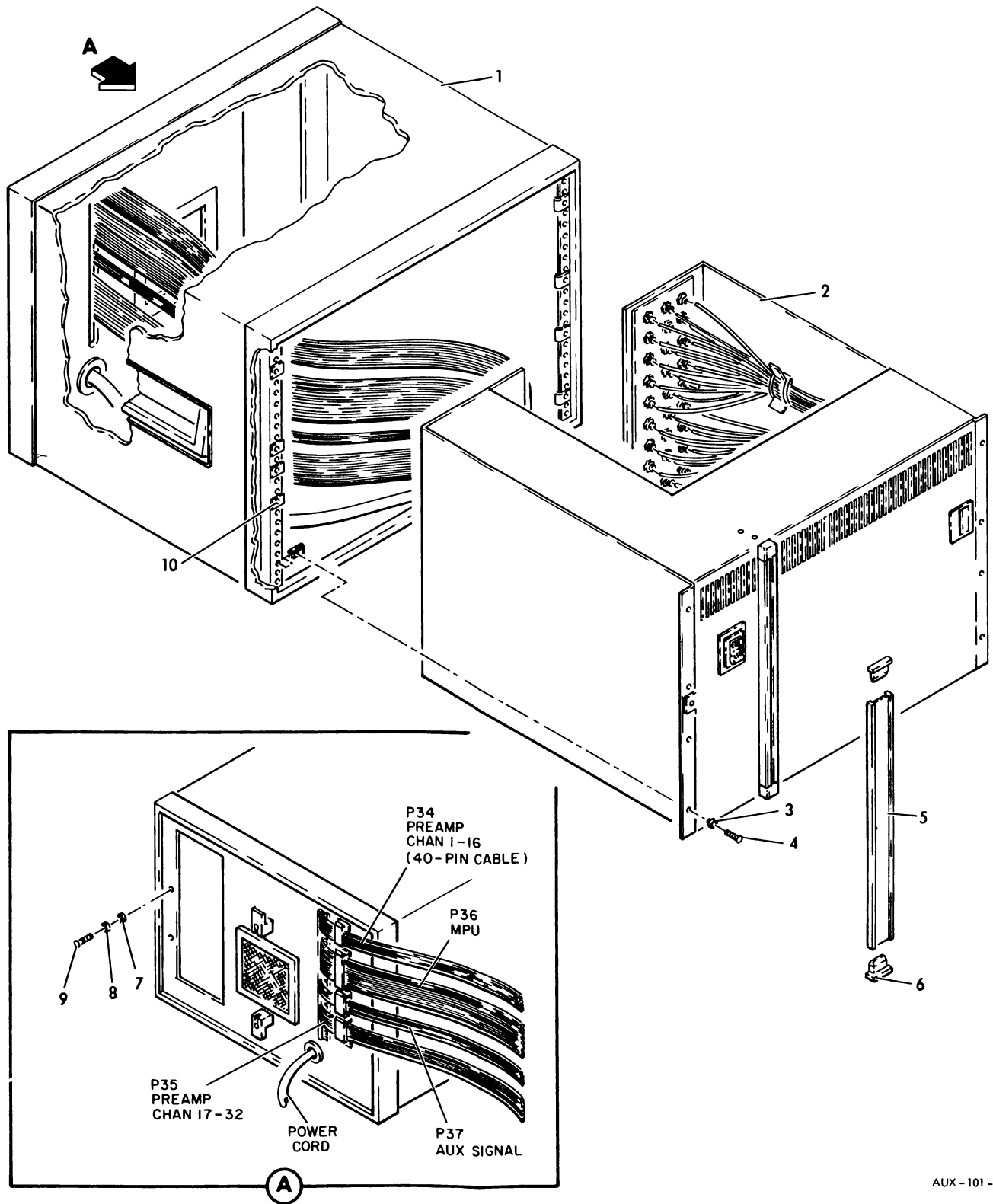


AUX - 101 - 3

Figure 2-1. Rack Mounting

INDEX	QTY	HONEYWELL PART NO.	DESCRIPTION
1	1	16785009-001	Portable Case Assembly
2	1	16783858-xxx	Auxiliary Housing
3	*	16784329-001	Trimstrip Retainer
4	9	MS35026-263	Screw, PNH (10-24x.500LG)
5	*	16784878-001	Trimstrip (Left Side)
6	*	16784369-001	Cap, Trimstrip
7	4	99000241-006	Washer, Flat
8	4	99000242-006	Washer, Lock
9	4	99000201-612	Screw, PNH (M5 x 12 mmL)
10	*	16784329-001	Nut, Sheet Spring

\* Supplied with aux housing for rack mounting



AUX - 101 - 4

Figure 2-1. Portable Case Mounting



SECTION 3

OPERATION

Operating procedures are located in the Operator's Manual.

## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. GENERAL

This section describes the operating principles of the auxiliary housing. Refer to Section 7 for the schematics.

#### 4-2. FUNCTIONAL DESCRIPTION

##### A. POWER SUPPLIES

There are three power supplies in the auxiliary housing. Each of these power supplies is similar in operation to the others. If a power supply should fail, it should be replaced in its entirety.

A power supply operates as follows. The 115 (or 230) Vac line is transformed to a lower ac voltage, rectified and filtered, and applied to a series pass element. The output from the power supply is fed back to a differential amplifier which compares the feedback voltage with an internal reference. The error signal from this comparison is used to control the series pass element.

##### B. DATA HOUSING/DISTRIBUTION

The function of the data housing distribution section of the auxiliary housing is to allow up to 32 FM or direct reproduce cards to be connected and receive power. The data housing distribution section also distributes preamplifier signals, control signals, and monitor signals to the data cards.

The signals from the preamplifiers are brought to the auxiliary housing through two twisted pair ribbon cables (a 34 wire, P35, and a 40 wire, P-34). The auxiliary housing internal wiring and the printed circuit card connect each of these twisted pairs to the pins of the appropriate reproduce card connector.

Power is brought from the power supply assembly through a 6-wire cable, J-34, and is distributed by the data housing circuit card.

The control signals from the microprocessor in the Model 101 are connected to the aux housing by 34-pin ribbon cable (P-36) and applied to the addressing and decoding circuits on the aux housing circuit card. The decoding circuits in turn generate the channel select, squelch, speed lines, FWD/REV, Cal and other commands as required in the auxiliary housing.

The signals required to calibrate, monitor and control the voice reproduce card enter/exit the auxiliary housing through the signal bus. These signals are E-E signal bus, overbias monitor bus, servo reproduce bus, reproduce monitor bus and the voice record command.

#### 4-3. CIRCUIT DESCRIPTION

##### A. POWER SUPPLIES

AC power enters the assembly through circuit breaker CB1 and is distributed to the three power supplies. In addition, a power on neon indicator receives current through a resistor. The positive and negative outputs of each power supply are brought out separately to a six-pin connector for the data housing. Line voltage is applied to the fan through a two pin connector.

##### B. DATA HOUSING/DISTRIBUTION

###### 1. MPU Buffer Section

The MPU address lines A15, A14, A10, A8, A6, A5, A4, A1, and A0 are decoded by U1, U2, and U4. The base address for the auxiliary housing is hexadecimal 0530. Three address locations above the base address are obtained by manipulating address lines A1 and A0.

PIA (U4) decodes the multiplexed MPU lines to produce the signals required at the reproduce cards. The squelch, speed 1, speed 2, speed 4, FWD/REV, and CAL commands are all buffered through U10 and U11 to drive up to 32 reproduce cards. Repro ident 1, repro ident 2, and repro ident 4 lines are encoded by U4 and applied to the MPU. The channel select commands are brought from U4 on lines PB4, PB3, PB2, PB1, PB0, and PA0 in a binary code and decoded to a 1 out of 32 code by U5, U6, U7, and U8. These 32 lines individually select any of the 32 channels for calibration or monitoring

###### 2. Signal Buffer Section

The E-E signal bus (a TTL square wave) is buffered by U10 to prevent resistive and capacitive loading of the signal and distributed to all of the reproduce card connectors for use in calibrating FM cards. The Overbias Monitor Bus and the Servo Reproduce Bus are not sensitive to variations in amplitude and are not buffered. The Reproduce Monitor Bus must not be loaded and therefore U12 and U9 are used to isolate the reproduce monitor output of the selected card from loading. Relay K1 disconnects U9 from the reproduce monitor bus when the Model 101 is programmed to use the monitor slots provided in the Model 101.

SECTION 5  
MAINTENANCE

5-1. ADJUSTMENTS

The only adjustments in the auxiliary housing are located in the power supply assembly. On each power supply, there is a potentiometer marked "VADJ". Adjust each of these controls while measuring the voltage on the data distribution board.

+5±0.005 Vdc from J34-4 to J34-2

+12±0.012 Vdc from J32-1 to J34-3

-12±0.012 Vdc from J34-5 to J34-6

If the power supply assembly must be adjusted without load, the voltages may be measured on the power supply terminals themselves. A2A1R1 and A2A3R1 are factory adjusted and should always be in the fully CW position.

5-2. TROUBLESHOOTING

A. POWER SUPPLY ASSEMBLY

The individual power supplies are replaced and not repaired if found to be faulty. However, the wiring external to the power supplies should be carefully checked to determine that it is not the cause of problems before replacing the suspected power supply.

B. DATA HOUSING DISTRIBUTION

A thorough understanding of the circuits described in Section 4 is essential for troubleshooting. Refer to Section 4 and the schematics in Section 7.

It is possible for a faulty auxiliary housing to cause seemingly unrelated faults in the Model 101. To isolate, disconnect the Model 101 from the auxiliary housing. Then exercise the Model 101 to determine if the fault is in the Model 101 or auxiliary housing.

If the auxiliary housing is faulty, the most probable cause is U1, U2, or U4 as these are the only active devices directly connected to the MPU bus.

If the problem is related to channel selection, measure the following points as each channel is selected in turn.

CHANNEL NUMBER	U4-14	U4-13	U4-12	U4-11	U4-10	PIN LOW - (ALL OTHERS HIGH)
1	1	1	1	1	1	U5-15
2	1	1	1	1	0	U5-14
3	1	1	1	0	1	U5-13
4	1	1	1	0	0	U5-12
5	1	1	0	1	1	U5-11
6	1	1	0	1	0	U5-10
7	1	1	0	0	1	U5-9
8	1	1	0	0	0	U5-7
9	1	0	1	1	1	U6-15
10	1	0	1	1	0	U6-14
11	1	0	1	0	1	U6-13
12	1	0	1	0	0	U6-12
13	1	0	0	1	1	U6-11
14	1	0	0	1	0	U6-10
15	1	0	0	0	1	U6-9
16	1	0	0	0	0	U6-7
17	0	1	1	1	1	U7-15
18	0	1	1	1	0	U7-14
19	0	1	1	0	1	U7-13
20	0	1	1	0	0	U7-12
21	0	1	0	1	1	U7-11
22	0	1	0	1	0	U7-10
23	0	1	0	0	1	U7-9
24	0	1	0	0	0	U7-7
25	0	0	1	1	1	U8-15
26	0	0	1	1	0	U8-14
27	0	0	1	0	1	U8-13
28	0	0	1	0	0	U8-12
29	0	0	0	1	1	U8-11
30	0	0	0	1	0	U8-10
31	0	0	0	0	1	U8-9
32	0	0	0	0	0	U8-7

The speed command lines operate as follows:

TAPE SPEED	U4-3	U4-4	U4-5
120	0	0	0
60	0	0	1
30	0	1	0
15	0	1	1
7.5	1	0	0
3.75	1	0	1
1.87	1	1	0
.937	1	1	1

U4-6 will be a 0 when the Model 101 has not achieved phase lock. U4-15 will be a 1 when the Model 101 is in the calibrate mode.

If the problem is related to voice, calibration or monitoring, the circuits connected to P37 (coax) should be examined. U12 selects the lower or the higher 16 channels for reproduce monitoring. U9 drives the reproduce monitor bus back to the Model 101 through K1. K1 should pass the signal except when the Model 101 is in the monitor mode. U10 buffers the E-E signal TTL.

## ILLUSTRATED PARTS BREAKDOWN

## 6-1. GENERAL

THE PARTS LIST CONTAINS ALL REPLACEABLE PARTS, EXCEPT HARDWARE, INDENTED UNDER THEIR RESPECTIVE ASSEMBLIES AND SUBASSEMBLIES. THE ARRANGEMENT OF THE PARTS LIST IS IN DISASSEMBLY SEQUENCE WITHIN EACH TABLE, AND EACH ASSEMBLY IS BROKEN DOWN TO ITS LOWEST REPLACEABLE PART. AN EXPLANATION OF EACH COLUMN CONTAINED IN THE TABLE FOLLOWS:

## A. FIGURE NUMBER

THIS COLUMN LISTS THE FIGURE NUMBER OF THE ILLUSTRATION ON WHICH A PARTICULAR INDEX NUMBER OR REFERENCE DESIGNATOR WILL BE FOUND.

## B. INDEX NUMBER

THIS COLUMN LISTS THE INDEX NUMBER OF AN ITEM WHICH IS USED TO LOCATE THE ITEM IN ITS NEXT HIGHER ASSEMBLY ILLUSTRATION.

## C. REFERENCE DESIGNATOR

THIS COLUMN LISTS THE SCHEMATIC, ASSEMBLY, OR ITEM REFERENCE DESIGNATION WHICH IS USED TO LOCATE ELECTRICAL AND ELECTRONIC ASSEMBLIES AND/OR ITEMS IN THEIR NEXT HIGHER ASSEMBLY ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.

## D. DESCRIPTION

THIS COLUMN LISTS, IN MOST CASES, THE APPROVED GOVERNMENT ITEM NAME AND MODIFIERS AS CONTAINED IN CATALOGING HANDBOOK H6-1. IN THE CASE OF STANDARD ELECTRONIC ITEMS AND HARDWARE, ADDITIONAL DATA HAS BEEN ADDED TO THE DESCRIPTION TO ENABLE PROCUREMENT OF A REPLACEMENT ITEM FROM LOCAL COMMERCIAL SOURCES.

## E. MANUFACTURER'S CODE

THIS COLUMN LISTS THE MANUFACTURER'S FEDERAL SUPPLY CODE AS CONTAINED IN THE FEDERAL SUPPLY CODE FOR MANUFACTURERS (CATALOGING HANDBOOK H4-2). FOR THOSE ITEMS WHERE CODE 28009 IS USED, PROCUREMENT MUST BE MADE FROM HONEYWELL INCORPORATED, TEST INSTRUMENTS DIVISION, P.O. BOX 5227, DENVER, COLORADO 80217.

## SECTION 6

THE FEDERAL SUPPLY CODES FOR MANUFACTURERS OF ITEMS USED IN THIS EQUIPMENT, AND CONTAINED IN THE PARTS LIST, ARE LISTED IN PARAGRAPH 6-5.

### F. MANUFACTURER'S PART NUMBER/FEDERAL STOCK NUMBER

THIS COLUMN LISTS THE MANUFACTURER'S PART NUMBER ON THE FIRST LINE AND THE FEDERAL STOCK NUMBER, WHEN AVAILABLE, ON THE SECOND LINE.

### NOTE

IN MOST INSTANCES WHERE FIXED COMPOSITION RESISTORS, FIXED FILM RESISTORS, AND STANDARD HARDWARE APPEAR IN THE PARTS LIST, THE GOVERNMENT SPECIFICATION PART NUMBER OR GOVERNMENT STANDARD PART NUMBER SHOWN MAY IDENTIFY AN ACCEPTABLE REPLACEMENT ITEM AND NOT NECESSARILY AN IDENTICAL REPLACEMENT ITEM.

### G. HONEYWELL PART NUMBER

THIS COLUMN LISTS THE HONEYWELL PART NUMBER FOR AN ITEM. THIS NUMBER MUST BE USED WHENEVER PROCUREMENT IS BEING MADE FROM HONEYWELL INCORPORATED.

### H. QUANTITY PER ASSEMBLY

THIS COLUMN LISTS THE NUMBER OF TIMES AN ITEM IS USED IN ITS NEXT HIGHER ASSEMBLY AT THE LOCATION INDICATED BY THE FIGURE AND INDEX NUMBER.

### I. USABLE ON CODE

IN SOME CASES, CERTAIN COMPONENTS AND SUBASSEMBLIES VARY FROM UNIT TO UNIT DUE TO THE MANY OPTIONS AVAILABLE. TO IDENTIFY THE USABILITY OF ANY COMPONENT ON AN ASSEMBLY, EACH FIGURE SHOWS A BREAKDOWN OF VARIANCES REQUIRED FOR THAT FIGURE ONLY. IF NO CODES ARE SHOWN, THE COMPONENT IS USED ON ALL UNITS.

### J. NOTES

THIS COLUMN LISTS THE NUMBER OF THE APPLICABLE NOTE LOCATED AT THE BOTTOM OF THE PAGE.



## 6-2. RECOMMENDED SPARE PARTS LIST

TABLES A AND B LIST THE RECOMMENDED NUMBER OF SPARE PARTS REQUIRED TO SUPPORT AN EQUIPMENT FOR ONE YEAR. THE SPARE PARTS RECOMMENDED ARE MOSTLY INSURANCE TYPE ITEMS AND THE QUANTITY WAS CALCULATED ON THE BASIS OF AN EQUIPMENT IN OPERATION FOR FIVE DAYS A WEEK AND EIGHT HOURS PER DAY OR 2,000 HOURS OF OPERATION.

TABLE A, OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WITH A MAXIMUM DOWN-TIME OF ONE HOUR. OPERATOR'S LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY THE OPERATOR AND/OR TECHNICIAN AT THE LOCATION OF THE EQUIPMENT AND WITHIN THE DOWN-TIME CRITERION.

TABLE B, BENCH LEVEL RECOMMENDED SPARE PARTS LIST, CONTAINS THE SPARE PARTS REQUIRED TO MAINTAIN THE EQUIPMENT WHERE DOWN-TIME IS NOT A FACTOR. BENCH LEVEL MAINTENANCE IS DEFINED AS MAINTENANCE PERFORMED BY A TECHNICIAN IN A SHOP AND CONSISTS OF TASKS WHICH EXCEED A DOWN-TIME OF ONE HOUR.

## 6-3. ORDERING INFORMATION

WHEN ORDERING SPARE OR REPLACEMENT PARTS FROM HONEYWELL, ALWAYS SPECIFY THE FOLLOWING:

- A. EQUIPMENT NAME
- B. MODEL NUMBER
- C. SERIAL NUMBER
- D. PART DESCRIPTION
- E. HONEYWELL PART NUMBER

SEND ALL ORDERS TO THE FOLLOWING ADDRESS:

HONEYWELL INCORPORATED  
 TEST INSTRUMENTS DIVISION  
 P.O. BOX 5227  
 DENVER, COLORADO 80217  
 ATTN: SPARE PARTS DEPT.

## 6-4. PARTS LIST AND ILLUSTRATIONS

THE TABLES IN SECTION 6 LIST ALL REPLACEABLE PARTS USED IN THE EQUIPMENT. THESE TABLES PROVIDE A MEANS OF LOCATING SPARE OR REPLACEMENT PART INFORMATION THROUGH THE USE OF

APPROPRIATE REFERENCES TO THEIR RELATED ILLUSTRATIONS.

6-5. MANUFACTURERS

THE FOLLOWING IS A NUMERIC LIST OF MANUFACTURER'S FEDERAL SUPPLY CODES APPEARING IN THE PARTS LIST ALONG WITH THE NAME AND ADDRESS OF THE MANUFACTURER.

NAME AND ADDRESS	CODE	NAME AND ADDRESS	CODE
AMP INCORPORATED P.O. BOX 3608 HARRISBURG, PENNSYLVANIA 17105	00779	POWER-ONE, INC. 531 DAWSON DRIVE CAMARILLO, CALIFORNIA 93010	54407
TEXAS INSTRUMENTS INCORPORATED SEMICONDUCTOR COMPONENTS DIVISION 13500 NORTH CENTRAL EXPRESSWAY DALLAS, TEXAS 75231	01295	BELDEN CORPORATION 415 S KILPATRICK CHICAGO, ILLINOIS 60644	70903
FERROXCUBE CORPORATION MT. MARION ROAD SAUGERTIES, NEW YORK 12477	02114	TRW CINCH CONNECTORS 1501 MORSE AVENUE ELK GROVE VILLAGE, IL. 60007	71785
BUNKER RAMO CORPORATION AMPHENOL NORTH AMERICA DIVISION 2801 SOUTH 25TH AVENUE BROADVIEW, ILLINOIS 60153	02660	ERIE TECHNOLOGICAL PRODUCTS INC. 644 WEST 12TH STREET ERIE, PENNSYLVANIA 16512	72982
MOTOROLA INCORPORATED SEMICONDUCTOR PRODUCTS DIVISION PO BOX20922, 5005 E. MC DOWELL RD PHOENIX, ARIZONA 85036	04713	FEDERAL SCREW PRODUCTS INC. 3917 NORTH KENZIE AVENUE CHICAGO, ILLINOIS 60618	73734
MINNESOTA MINING AND MFG. CO. ADHESIVES COATINGS & SEALERS DIV 3M CENTER ST PAUL, MINNESOTA 55101	04963	MINNESOTA MINING AND MFG CO ELECTRO PRODUCTS DIVISION 3M CENTER ST PAUL, MINNESOTA 55101	75037
VIKING INDUSTRIES INCORPORATED 21001 NORDHOFF CHATSWORTH, CALIFORNIA 91311	05574	EATON CORPORATION TINERMAN PLANT, P.O. BOX 6688 8700 BROOKPARK ROAD CLEVELAND, OHIO 44101	78553
MITE CORPORATION AMATOM ELECTRONIC HARDWARE DIV. 446 BLAKE STREET NEW HAVEN, CONNECTICUT 06515	06540	ELECTRONIC INDUSTRIES ASSOCIATION	80131
ITT SEMICONDUCTORS P.O. BOX 3049 ELECTRONICS WAY WEST PALM BEACH, FLORIDA 33402	14433	MILITARY SPECIFICATIONS PROMULGATED BY STANDARDIZATION DIRECTORATE OF LOGISTIC SERVICES DSA	81349
ALPHA WIRE CORPORATION 2815 COLUMBIA AVENUE TORRANCE, CALIFORNIA 90503	23172	AIRPAX ELECTRONICS, INC. WOODS ROAD CAMBRIDGE,	81541
MEPCO/ELECTRA 5900 AUSTRALIAN AVENUE WEST PALM BEACH, FLORIDA 33407	26769	ROTRON INCORPORATED CUSTOM DIVISION 9 HASBROUCK LANE WOODSTOCK, NEW YORK 12498	82877
NATIONAL SEMICONDUCTOR CORP. 2950 SAN YSIDRO WAY SANTA CLARA, CALIFORNIA 95051	27014	SEASTRON MANUFACTURING COMPANY 701 SONORA AVENUE GLENDALE, CALIFORNIA 91201	86928
HONEYWELL INCORPORATED TEST INSTRUMENTS DIVISION P.O BOX 5227 DENVER, COLORADO 80217	28009	JANCO CORPORATION 3111 WINONA AVENUE BURBANK, CALIFORNIA 91504	91812
HEYMAN MANUFACTURING COMPANY 147 NORTH MICHIGAN AVENUE KENILWORTH, NEW JERSEY 07033	28520	SOUTHCO INCORPORATED LESTER, PENNSYLVANIA 19113	94222
DEK, INCORPORATED 1555 HAWTHORNE LANE WEST CHICAGO, ILLINOIS 60185	34785	MAGNECRAFT ELECTRIC COMPANY 5575 NORTH LYNCH AVENUE CHICAGO, ILLINOIS 60630	94696
WOVEN ELECTRONICS P.O. BOX 189 JENKIN STREET MAULDIN, SOUTH CAROLINA 29662	50561	MILITARY STANDARDS PROMULGATED BY STANDARDIZATION DIVISION DIRECTORATE OF LOGISTIC SERVICES DSA	96906

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## 6-6. ASSEMBLY INTERCHANGEABILITY LIST

THE FOLLOWING LIST CONTAINS THE INTERCHANGEABILITY OF ASSEMBLY USED IN THIS EQUIPMENT. THIS LIST IS IN ALPHABETICAL ORDER BY ASSEMBLY WITH THE LATEST ASSEMBLY PART NUMBER LISTED LAST. THE DEFINITION FOR EACH CODE AT THE RIGHT OF EACH PART NUMBER IS AT THE BOTTOM OF EACH PAGE.

## ASSEMBLY INTERCHANGEABILITY LIST

DESCRIPTION	PART NUMBER	CODE
Auxiliary Housing Assy 115 VAC	16783858-003 16783858-005	C
Auxiliary Housing Assy 230 VAC	16783858-004 16783858-005	C
Power Supply Assy 115 VAC	16784607-001 16784607-003	C
Power Supply Assy 230 VAC	16784607-002 16784607-004	C

DESCRIPTION	PART NUMBER	CODE

CODE

DEFINITION

- A COMPLETE TWO WAY INTERCHANGEABILITY BETWEEN PART NUMBER AND ALL PREVIOUS PART NUMBERS.
- B PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE INTERCHANGEABLE FORWARD BUT WITH DEGRADED PERFORMANCE OR RELIABILITY.
- C PART NUMBER IS INTERCHANGEABLE BACKWARD WITH ALL PREVIOUS PART NUMBERS: OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

CODE

DEFINITION

- D PART NUMBER IS NOT INTERCHANGEABLE BACKWARD WITH ANY PREVIOUS PART NUMBERS AND OLD PART NUMBERS ARE NOT INTERCHANGEABLE FORWARD.

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## SECTION 6

TABLE B. BENCH LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			National Stock No.			
16777076-014	BENCH LEVEL SPARES KIT, VOICE					
14502704-001	INTGRATED CIRCUIT	27014	DM74LS09N	1	1	
16756865-003	SEMICONDUCTOR DEVICE, DIODE	R1349	1N4148	1	1	
16762172-002	TRANSISTOR	80131	2N3904 5961-892-8706	1	1	
16774985-002	INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210M	1	1	
16779188-002	INTEGRATED CIRCUIT, ANALOG GATE	24355	AD7513JH	1	1	
16779793-001	MICROCIRCUIT	01295	SN74LS04N 5962-01-027-6863	1	1	
16780407-001	INTEGRATED CIRCUIT	01295	SN74LS37N	2	1	
99000267-001	MICROCIRCUIT	27014	DM74LS138N	5	1	
99000275-002	MICROCIRCUIT	04713	MC6821P	1	1	

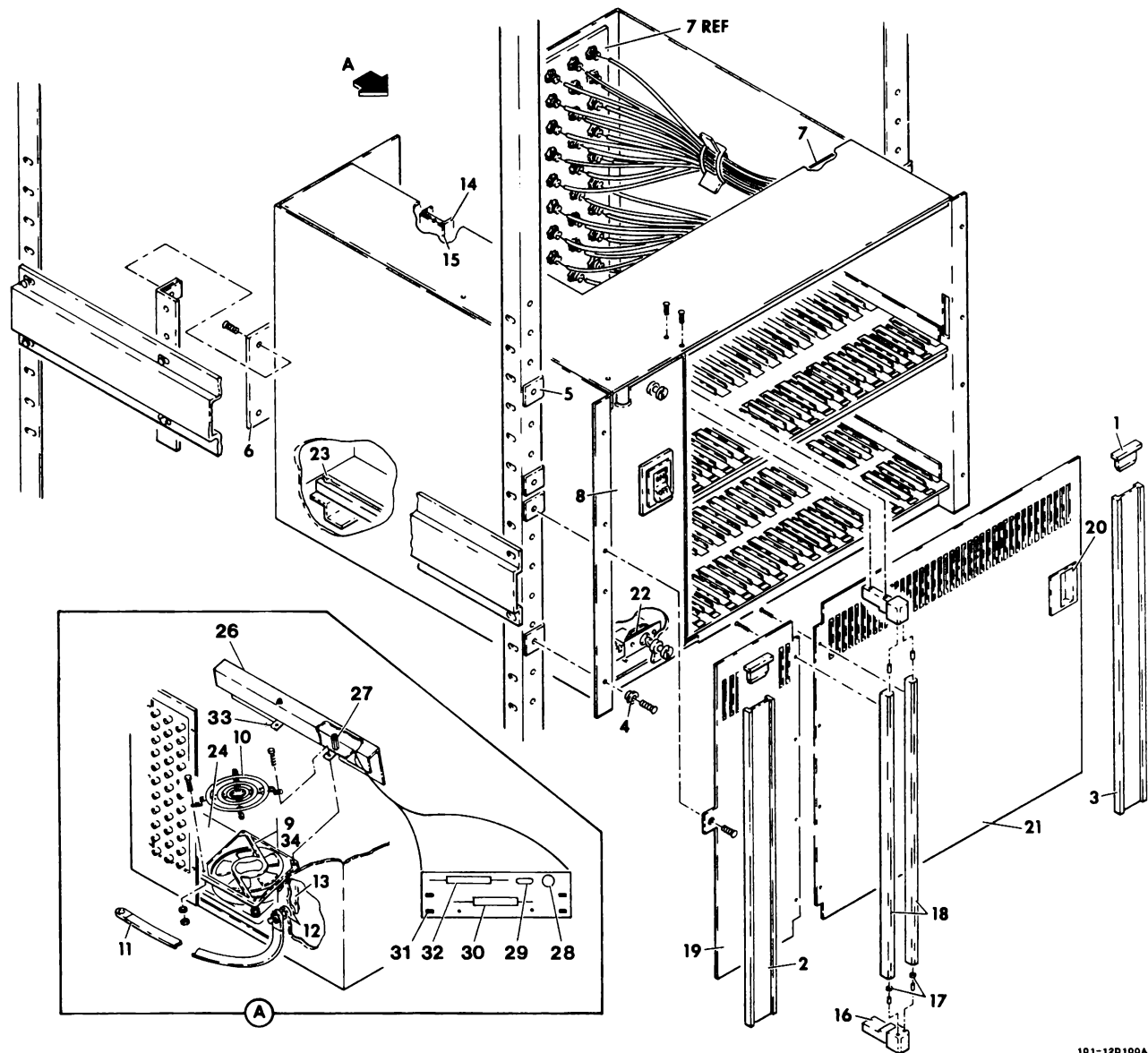
TABLE A. OPERATOR'S LEVEL RECOMMENDED SPARE PARTS LIST

Honeywell Part Number	Description	Manufacturer's		Qty/ Equip	Spares	Usable On Code
		Code	Part Number			
			Federal Stock No.			
	<p>OPERATOR'S LEVEL RECOMMENDED SPARE PARTS, AS DEFINED IN PARAGRAPH 6-2, ARE NOT RE- QUIRED FOR THE AUXILIARY HOUSING ASSEMBLY.</p>					

TABLE 6-1. AUXILIARY HOUSING ASSEMBLY (SHEET 1 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER	HONEYWELL PART NUMBER			
6-1			AUXILIARY HOUSING ASSEMBLY, 115VAC	28009		16783858-003	AR	A	
6-1			AUXILIARY HOUSING ASSEMBLY, 230VAC	28009		16783858-004	AR	B	
6-1			AUXILIARY HOUSING ASSEMBLY, 115VAC	28009		16783858-005	AR	C	
6-1			AUXILIARY HOUSING ASSEMBLY, 230VAC	28009		16783858-006	AR	C	
6-1	1		. TRIMCAP	94222	98-13-501-33	16784369-001	4		
6-1	2		. TRIMSTRIP, LH	28009		16784878-001	1		
6-1	3		. TRIMSTRIP, RH	94222	98-50-138-13	16784328-001	1		
6-1	4		. RETAINER, TRIMSTRIP	94222	98-12-501-33	16784329-001	4		
6-1	5		. NUT, SHEET SPRING, NO. 10-24	78553	C575-1024-27	16759421-126	13		
6-1	6		. BRACE, REAR	28009		16784879-001	2		
6-1	7	A1	. CIRCUIT CARD ASSEMBLY AUXILIARY HOUSING DISTRIBUTION (SEE TABLE 6-2 FOR BREAKDOWN)	28009		16784612-XXX	1		
6-1	8	A2	. POWER SUPPLY ASSEMBLY, 115VAC	28009		16784607-001	1	A	
	8	A2	. POWER SUPPLY ASSEMBLY, 230VAC	28009		16784607-002	1	B	
	8	A2	. POWER SUPPLY ASSEMBLY, 115VAC	28009		16784607-003	1	C	
	8	A2	. POWER SUPPLY ASSEMBLY, 230VAC (SEE TABLE 6-3 FOR BREAKDOWN)	28009		16784607-004	1	D	
6-1	9		. FAN, VENTILATING	82877	028316	16779227-002	1	A	
6-1	9		. FAN, VENTILATING	82877	028082	16779227-003	1	B	
6-1	10		. GRILLE, METAL	82877	476042	16757939-007	1		
6-1	11		. CABLE ASSEMBLY, GROUND	91812	740DH10-136	16750210-009	1		
6-1	12		. WASHER, SHOULDERED, NYLON	73734	105103	16757313-004	2		
6-1	13		. CABLE, GROUND, 20 IN. LG ELECTRICAL	91812	740 DH-10-80	16750210-004	1		
6-1	14		. CHANNEL, CABLE CLAMP	28009		16785155-001	1		
6-1	15		. TAPE, POLYURETHANE FOAM	28009		16502172-001	AR		
6-1			. AUXILIARY HOUSING SUBASSEMBLY	28009		16784494-002	1		
6-1	16		. . BLOCK, HINGE	28009		16784497-001	2		
6-1	17		. . WASHER, NYLON, 0.129 IN. ID BY 0.312 IN. OD BY 0.016 IN. THK	06540	2205N129	16737979-005	2		
6-1	18		. . HINGE, DOOR	28009		16784498-001	2		
6-1	19		. . DOOR, FRONT	28009		16784881-001	1		
6-1	20		. . LATCH, THUMB	94222	A3-50-925-12	16784873-001	1		
6-1	21		. . DOOR, FRONT	28009		16784506-001	1		
6-1	22		. . RECEPTACLE, TURNLOCK FASTENER	94222	85-45-101-15 5325-00-827-3068	16766547-001	2		
6-1	23		. . GUIDE, CHASSIS	28009		16784501-001	2		
6-1	24		. . BRACKET, FAN MOUNTING	28009		16784503-001	1		
6-1	25		. . CHASSIS	28009		16784495-002	1		

NOTES:



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FIGURE 6-1. AUXILIARY HOUSING ASSEMBLY

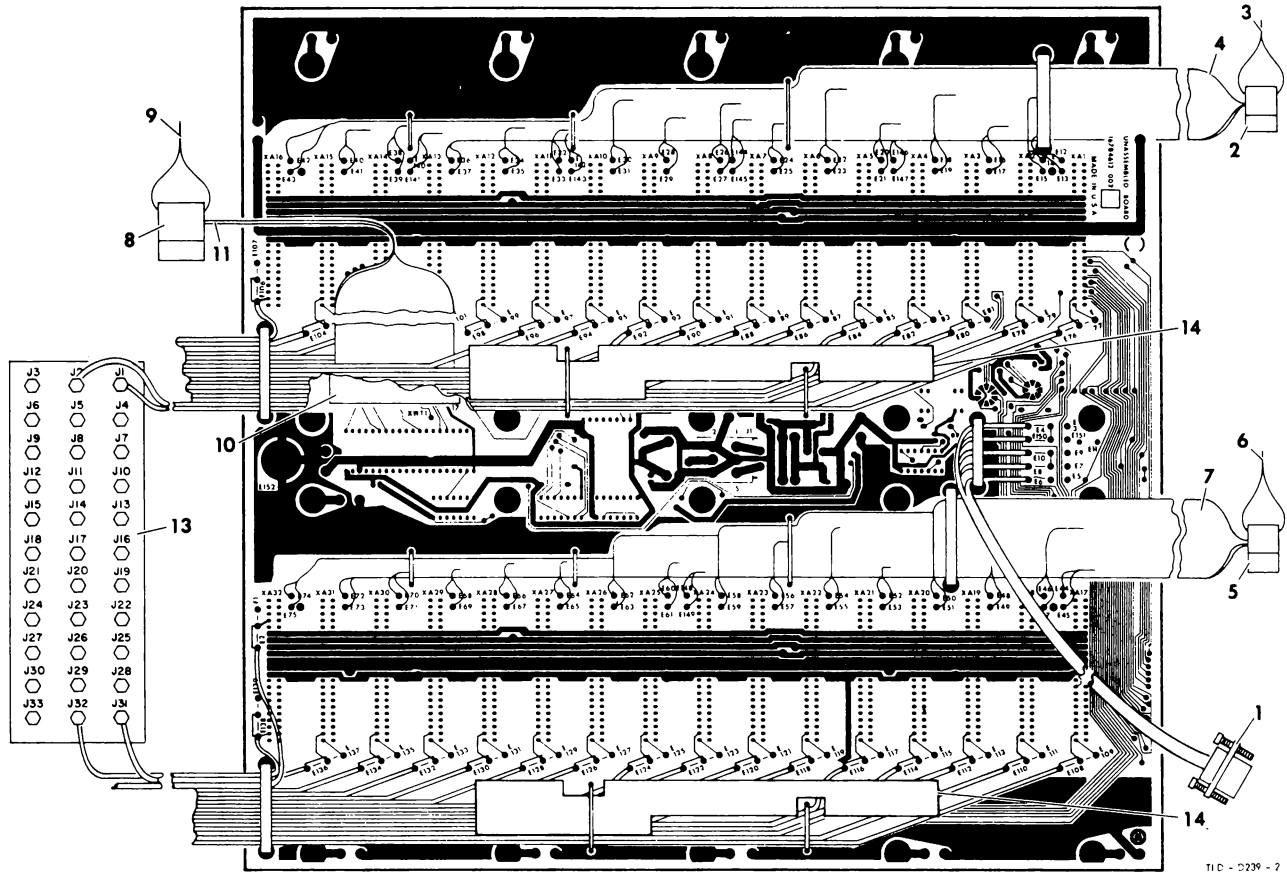


FIGURE 6-2. AUXILIARY HOUSING DISTRIBUTION CIRCUIT  
CARD ASSEMBLY (SHEET 2 OF 2)



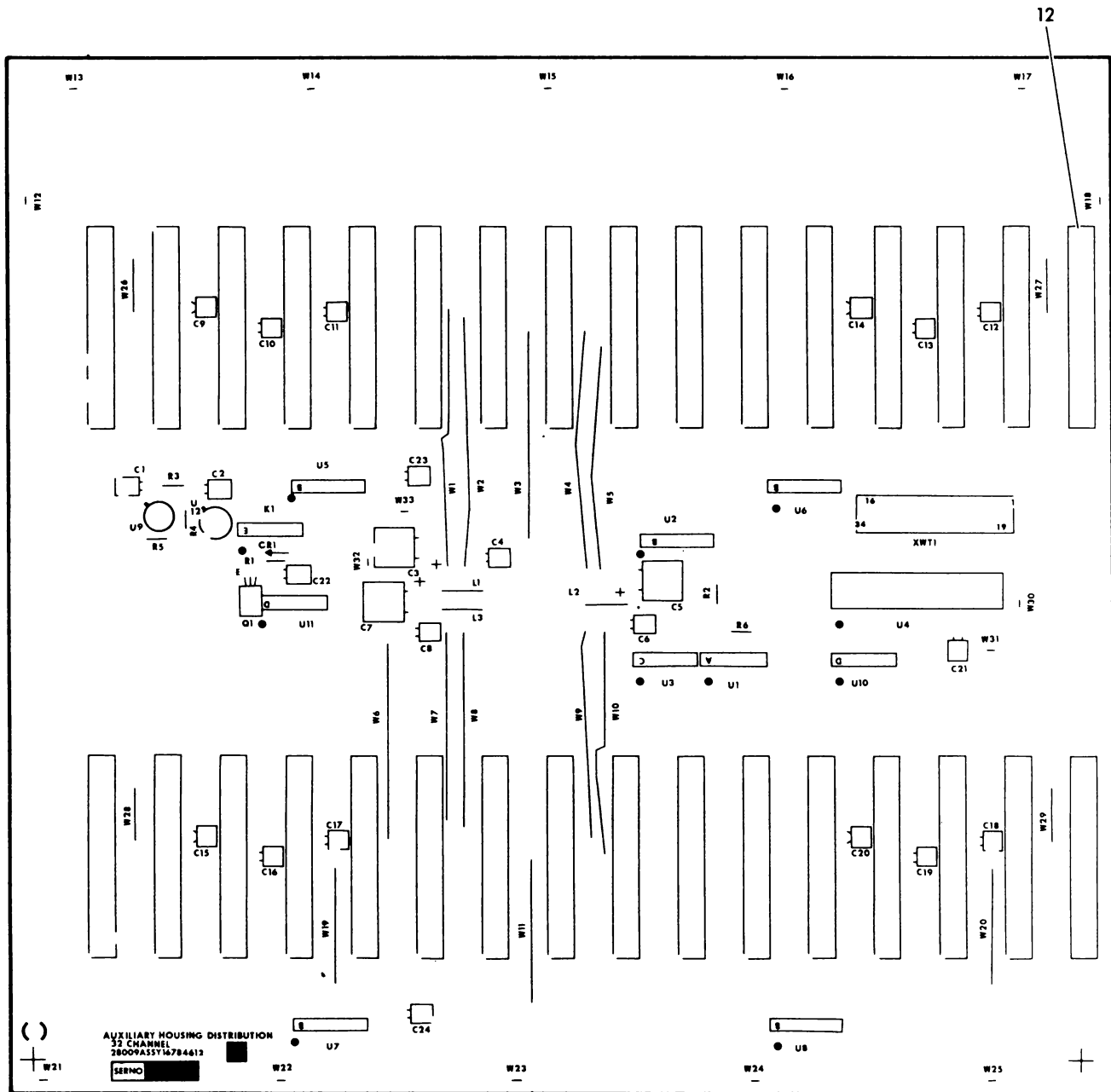
TABLE 6-1. AUXILIARY HOUSING ASSEMBLY (SHEET 1 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER					
6-1			LIST OF AVAILABLE ACCESSORIES							
6-1			. PORTABLE CASE ASSEMBLY (SEE TABLE 6-4 FOR BREAKDOWN)	28009			16785009-002	AR		
6-1			400 HZ FAN MODIFICATION FOR AUXILIARY HOUSING ASSEMBLY	28009			16787050-003	AR		
6-1	26		. COVER	28009			16786400-001	1		
6-1	27		. POST, ELECTRICAL-MECHANICAL EQUIPMENT	28009			16781584-003	2		
6-1			. CIRCUIT CARD ASSEMBLY, 400HZ FAN	28009			16786392-002	1		
6-1	28	CR1	. SEMICONDUCTOR DEVICE, RECTIFIER	14936	W04M 5961-00-163-3807		16759755-003	1		
6-1	29	C1	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 10000PF, +-20%, 500VDC	59660	811-000-75U0-103M		16761824-048	1		
6-1	30	C2	. CAPACITOR, FIXED, ELECTROLYTIC, 100UF, +75/-10%, 75VDC	56289	3901076075FL4		16763351-805	1		
6-1	31	J1,2	. TERMINAL, QUICK DISCONNECT	00779	62395-1		16785265-001	2		
6-1	32	R1	. RESISTOR, FIXED, WIREWOUND, 750 OHMS, +-5%, 10W	11502	AS10-750J		16763249-094	1		
6-1	33		. BRACKET, MOUNTING	28009			16786402-001	1		
6-1	34		. FAN, VENTILATING	28009			16809952-001	1		
NOTES:										

TABLE 6-2. AUXILIARY HOUSING DISTRIBUTION CCA (SHEET 2 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER		HONEYWELL PART NUMBER	QUANTITY ASSEMBLY	USABLE ON CODE	NOTES
						NATIONAL STOCK NUMBER				
6-2		W1-11	. WIRE, SOLID, HANE	23172	296		16750957-007	AR		
6-2		W12-19	. NOT USED							
6-2		W19,20	. WIRE, SOLID, BARE	23172	296		16750957-007	AR		
6-2		W21-25	. NOT USED							
6-2		W26-29	. WIRE, SOLID, BARE	23172	298		16750957-009	AR		
6-2		W30,31	. NOT USED							
6-2		W32,33	. WIRE, SOLID, HANE	23172	296		16750957-007	AR		
6-2	1	W34	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16783142-002	1		
6-2		W35	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16784441-001	1		
6-2	2		. . CONNECTOR, PLUG, ELECTRICAL	04963	3417-3000		16776705-105	1		
6-2	3		. . PULL TAB, CONNECTOR	04963	3490-4		16776705-904	1		
6-2	4		. . CABLE, SPECIAL PURPOSE, ELECTRICAL, FLAT, WOVEN	50561	T20TP2A-7UL1568N		16783026-002	AR		
6-2		W36	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16784439-001	1		
6-2	5		. . CONNECTOR, PLUG, ELECTRICAL	04963	3414-3000		16776705-102	1		
6-2	6		. . PULL TAB, CONNECTOR	04963	3490-3		16776705-903	1		
6-2	7		. . CABLE, SPECIAL PURPOSE, ELECTRICAL, FLAT, WOVEN	50561	T17TP2B-7UL1568N		16783026-001	AR		
6-2		W37	. CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	28009			16784437-001	1		
6-2	8		. . CONNECTOR, PLUG, ELECTRICAL	04963	3414-3000		16776705-102	1		
6-2	9		. . PULL TAB, CONNECTOR	04963	3490-3		16776705-903	1		
6-2	10	WT1	. . CONNECTOR, TRANSITION, ELECTRICAL TO FLAT CABLE	04963	3402-0000T		16776752-001	1		
6-2	11		. . CABLE, SPECIAL PURPOSE, ELECTRICAL	75037	3365-34COND		16776751-005	AR		
6-2	12	XA1-32	. CONNECTOR, RECEPTACLE, ELECTRICAL	05574	3VH22/1JDD12		16778708-201	32		
6-2	13		. PANEL, CONNECTOR MOUNTING	28009			16784502-001	1		
6-2	14		. SHIELD	28009			16784372-003	2		

NOTES:



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FIGURE 6-2. AUXILIARY HOUSING DISTRIBUTION CIRCUIT CARD ASSEMBLY (SHEET 1 OF 2)

TABLE 6-3. POWER SUPPLY ASSEMBLY (SHEET 1 OF 2)

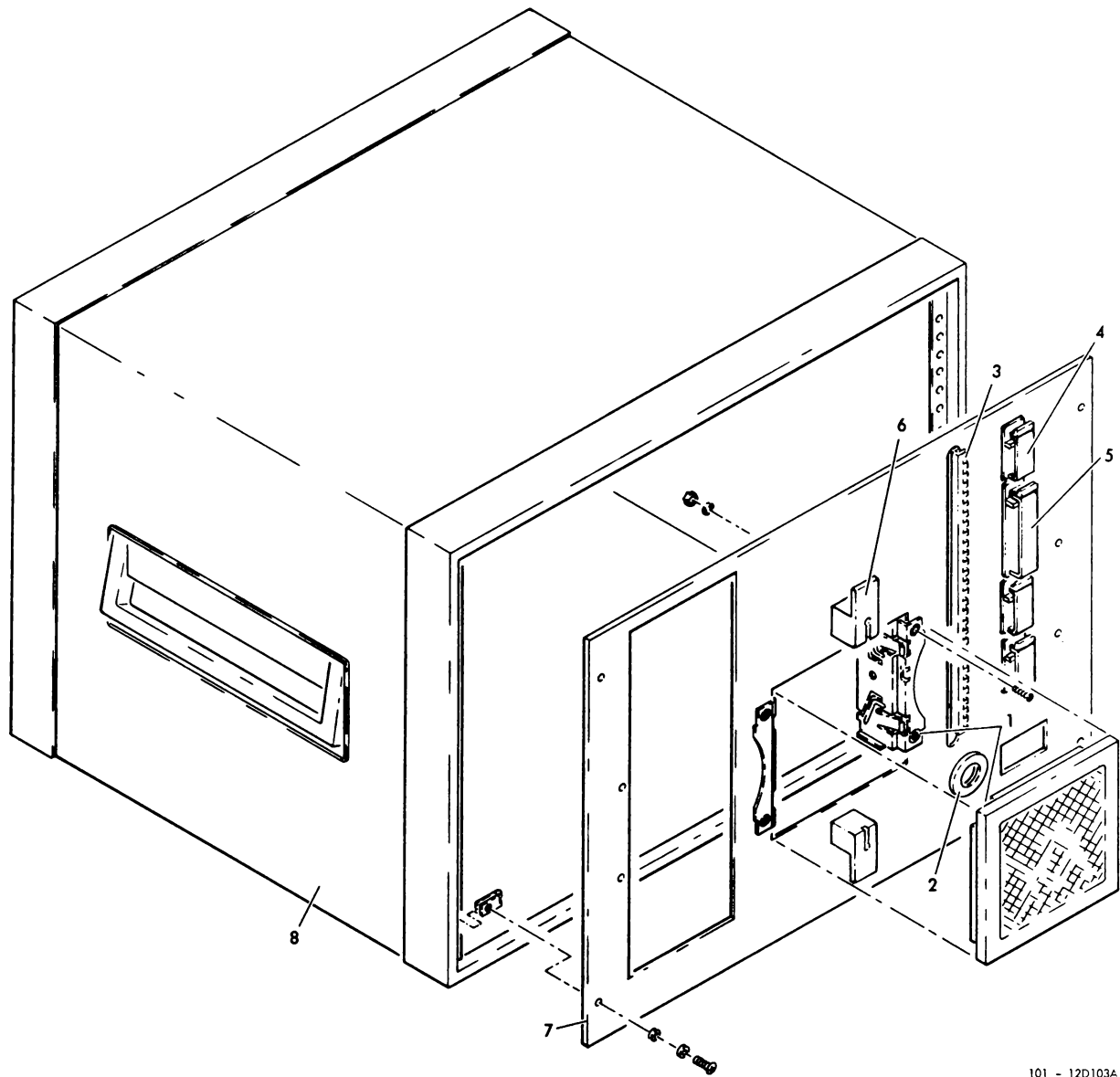
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-3		A2	POWER SUPPLY ASSEMBLY, 115VAC	28009		16784607-001	REF	A	
6-3		A2	POWER SUPPLY ASSEMBLY, 230VAC	28009		16784607-002	REF	B	
6-3		A2	POWER SUPPLY ASSEMBLY, 115VAC	28009		16784607-003	REF	C	
6-3		A2	POWER SUPPLY ASSEMBLY, 230VAC (SEE TABLE 6-1 FOR LOCATION IN NMA)	28009		16784607-004	REF	D	
6-3	1	A1	. POWER SUPPLY	54407	H012-6-8	16784802-001	1	A,B	
6-3	1	A1	. POWER SUPPLY, MODIFIED	28009		16815251-001	1	C,D	
6-3	2	A2	. POWER SUPPLY	54407	H05-6-0VP	16784802-002	1		
6-3	3	A3	. POWER SUPPLY	54407	H012-6-8	16784802-001	1	A,B	
6-3	3	A3	. POWER SUPPLY, MODIFIED	28009		16815251-001	1	C,D	
6-3	4	CB1	. CIRCUIT BREAKER	81541	203-22-1-61-502-4-1-1	16784803-001	1	A,C	
6-3	4	CB1	. CIRCUIT BREAKER	81541	203-22-1-61-252-4-1-1	16784803-002	1	B,D	
6-3	5	P3	. CONNECTOR BODY, PLUG, ELECTRICAL	00779	1-480270-0 5925-00-992-0693	16776775-006	1		
6-3	6	R1	. RESISTOR, FIXED, CARBON COMPOSITION, 30K OHMS, +-5%, 1/2W	81349	RCR206303JM 5905-00-890-4240	1675076-585	1		
6-3	7	TB1	. TERMINAL BOARD	71785	332-11-03-028	16750153-011	1		
6-3		W1	. WIRING HARNESS, BRANCHED	28009		16784915-001	1		
6-3	8		. CONTACT, ELECTRICAL CONNECTOR	00779	60619-1 5999-00-476-6327	16776776-006	6		
6-3	9		. TERMINAL, QUICK DISCONNECT, RED, 22-18 AWG, 0.250 X 0.032 TAB	00779	42599-2	16763355-001	2		
6-3	10		. TERMINAL, QUICK DISCONNECT, TRANSPARENT, 22-18 AWG, 0.110 X 0.020 TAB	00779	61060-2	16763355-302	2		
6-3	11		. RETAINER, STUD TURNLOCK FASTENER	94222	85-34-101-17 5340-720-6341	16755353-002	2		
6-3	12		. STUD, TURNLOCK FASTENER	94222	5-0-200	16769949-008	2		
6-3	13		. SPRING, TURNLOCK FASTENER	94222	14-18-150-24 5325-00-410-3130	16761966-002	2		
6-3	14		. WASHER, WEAR, NYLON	94222	85-46-101-39 5330-777-6032	16761964-002	2		
6-3	15		. GROMMET	96906	ME35489-48 5325-00-174-9332	16750481-025	1		
6-3	16		. CATCH, LOCK	28009		16784500-001	1		
6-3	17		. WASHER, SHOULDER, NYLON	06540	2638-24850N194	16757313-024	2		
6-3	18		. CHASSIS	28009		16784507-001	1		
6-3	19		. BUSHING, STRAIN RELIEF, CABLE	28520	SR5P4 5975-00-470-3304	16750479-011	1		
6-3	20		. BUSHING, STRAIN RELIEF, CABLE	28520	SR2P1 5975-926-7497	16750479-014	1		
6-3	21		. BUSHING, STRAIN RELIEF, CABLE	28520	SR-6N3-4	16750479-027	1		
6-3	22		. CABLE ASSEMBLY, POWER	82877	428056 5995-01-086-7960	16757939-008	1		
6-3	23		. TERMINAL, QUICK DISCONNECT, RED, 22-18 AWG, 0.250 X 0.032 TAB	00779	42599-2	16763355-001	2		

NOTES:

TABLE 6-2. AUXILIARY HOUSING DISTRIBUTION CCA (SHEET 1 OF 2)

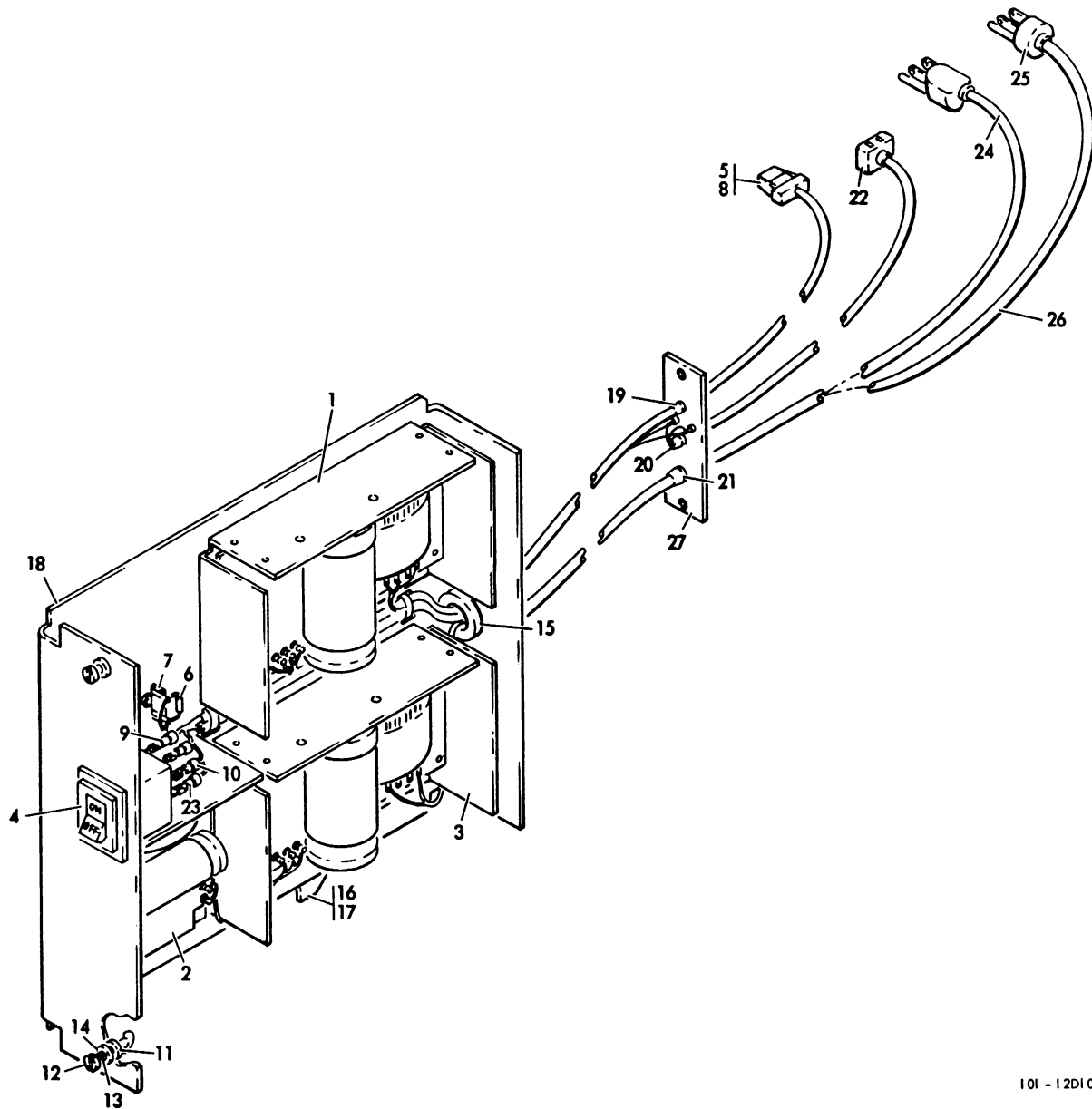
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					FEDERAL STOCK NUMBER				
6-2		A34	CIRCUIT CARD ASSEMBLY, AUXILIARY HOUSING DISTRIBUTION	28009		16784612-002	REF	A	
6-2		A34	CIRCUIT CARD ASSEMBLY, AUXILIARY HOUSING DISTRIBUTION (SEE TABLE 6-1 FOR LOCATION IN MHA)	28009		16784612-003	REF		
6-2		CR1	. SEMICONDUCTOR DEVICE, DIODE	81349	1N4148	16758865-003	1	A	
6-2		CR-1	. NOT USED					B	
6-2		C1,2	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	2		
6-2		C3	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KN8476D015K	16758058-242	1		
6-2		C4	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-2		C5	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KN8476D015K	16758058-242	1		
6-2		C6	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	1		
6-2		C7	. CAPACITOR, FIXED, ELECTROLYTIC, 47UF, +-10%, 15VDC	26769	KN8476D015K	16758058-242	1		
6-2		C8-24	. CAPACITOR, FIXED, CERAMIC DIELECTRIC, 0.1 UF, +-20%, 50 VDC	72982	8121-050-651-104M	16771020-018	17		
6-2		J1-J33	. CONNECTOR, RECEPTACLE, ELECTRICAL RF COAXIAL, INSULATED	82660	31-010	16780376-001	33		
6-2		J34	. CONNECTOR, RECEPTACLE, ELECTRICAL	00779	1-380999-0	16778138-002	1		
6-2		K1	. RELAY, REED	94696	1180IP95	16780953-006	1	A	
6-2		K1	. RELAY, REED	14908	1697-1C5	16809521-001	1	B	
6-2		L1-3	. COIL, RADIO FREQUENCY	02114	VK200-09-3B 5950-442-1940	16773778-001	3		
6-2		Q1	. TRANSISTOR	80131	2N3904 5961-892-8706	16762172-002	1		
6-2		R1-3	. RESISTOR, FIXED, CARBON COMPOSITION, 4.7K OHMS, +-5%, 1/4W	81349	RCR076472JM	16750079-049	3		
6-2		R4	. RESISTOR, FIXED, CARBON COMPOSITION, 100 OHMS, +-5%, 1/4W	81349	RCR076101JM	16750079-009	1		
6-2		R5	. RESISTOR, FIXED, CARBON COMPOSITION, 10K OHMS, +-5%, 1/4W	81349	RCR076103JM	16750079-057	1		
6-2		R6	. RESISTOR, FIXED, CARBON COMPOSITION, 330 OHMS, +-5%, 1/4W	81349	RCR076331JM	16750079-021	1		
6-2		U1	. INTEGRATED CIRCUIT	27014	DM74L809N	14502704-001	1		
6-2		U2	. MICROCIRCUIT	27014	DM74L8138N	99000267-001	1		
6-2		U3	. MICROCIRCUIT	01295	8N74L804N 5962-01-027-6863	16779793-001	1		
6-2		U4	. MICROCIRCUIT	04713	MC6821P	99000275-002	1		
6-2		U5-8	. MICROCIRCUIT	27014	DM74L8138N	99000267-001	4		
6-2		U9	. INTEGRATED CIRCUIT, VOLTAGE FOLLOWER	27014	LM210M	16774985-002	1		
6-2		U10,11	. INTEGRATED CIRCUIT	01295	8N74L837N	16780407-001	2		
6-2		U12	. INTEGRATED CIRCUIT, ANALOG GATE	24395	AD7513JM	16779188-002	1		

NOTES:



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FIGURE 6-4. PORTABLE CASE ASSEMBLY



101 - 12D1 02

FIGURE 6-3. POWER SUPPLY ASSEMBLY

TABLE 6-3. POWER SUPPLY ASSEMBLY (SHEET 2 OF 2)

FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-3	24		. CABLE, ELECTRICAL, POWER	80126	C2112-008(BL)	1675R632-104	1	A,C	
6-3	25		. CONNECTOR, PLUG, ELECTRICAL	74545	5666 5935-208-6072	16779369-001	1	B,D	
6-3	26		. CABLE, POWER, ELECTRICAL	70903	19130	16750959-005	1	B,D	
6-3	27		. PLATE, POWER CONNECTOR	28009		16784880-001	1		
NOTES:									

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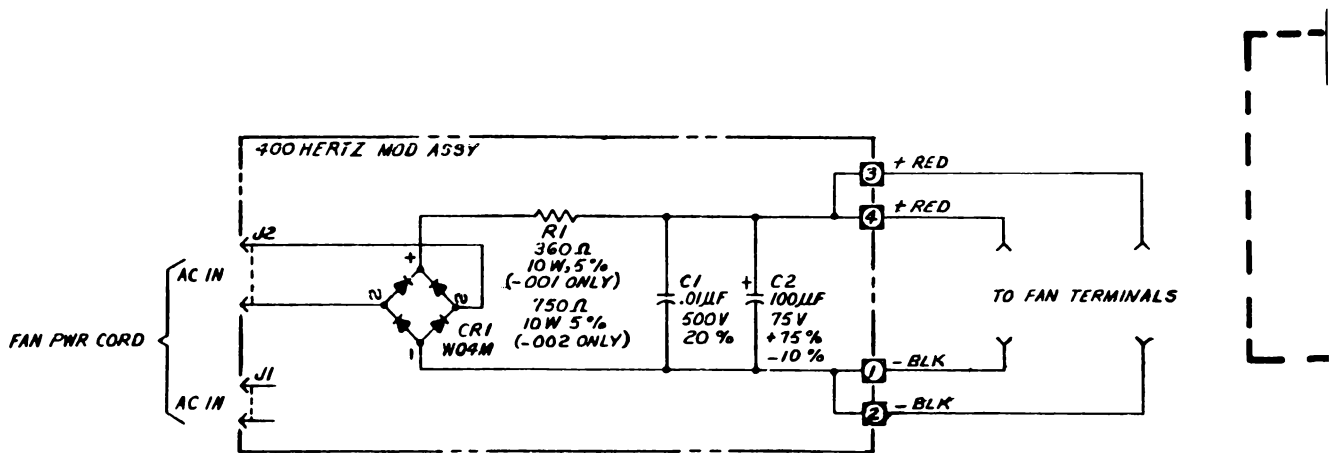
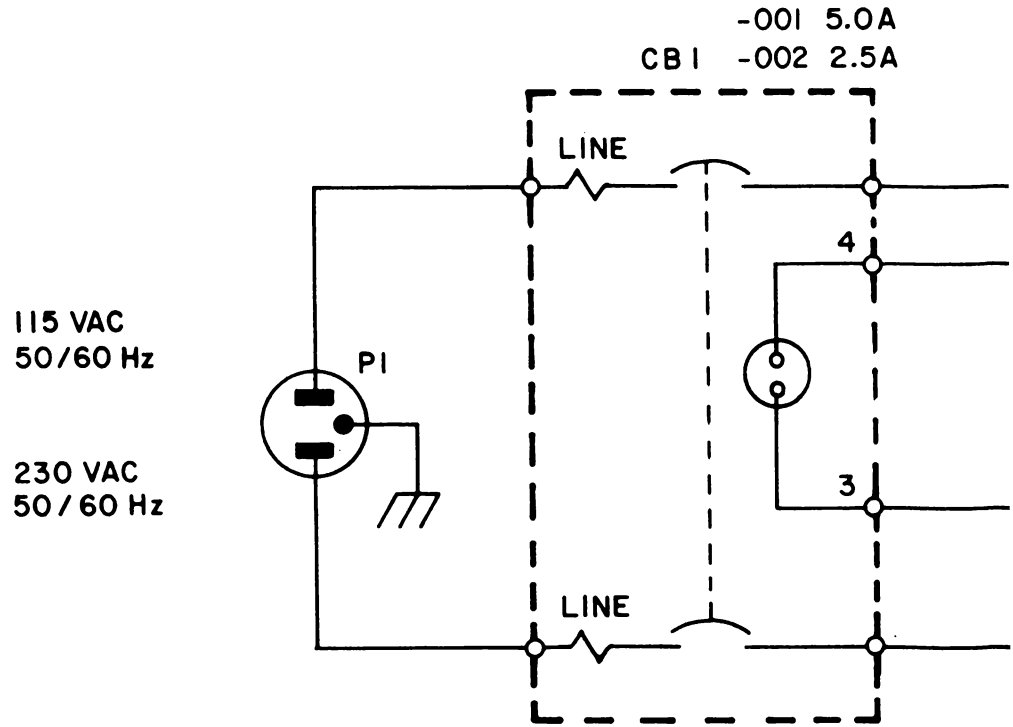
## SECTION 6

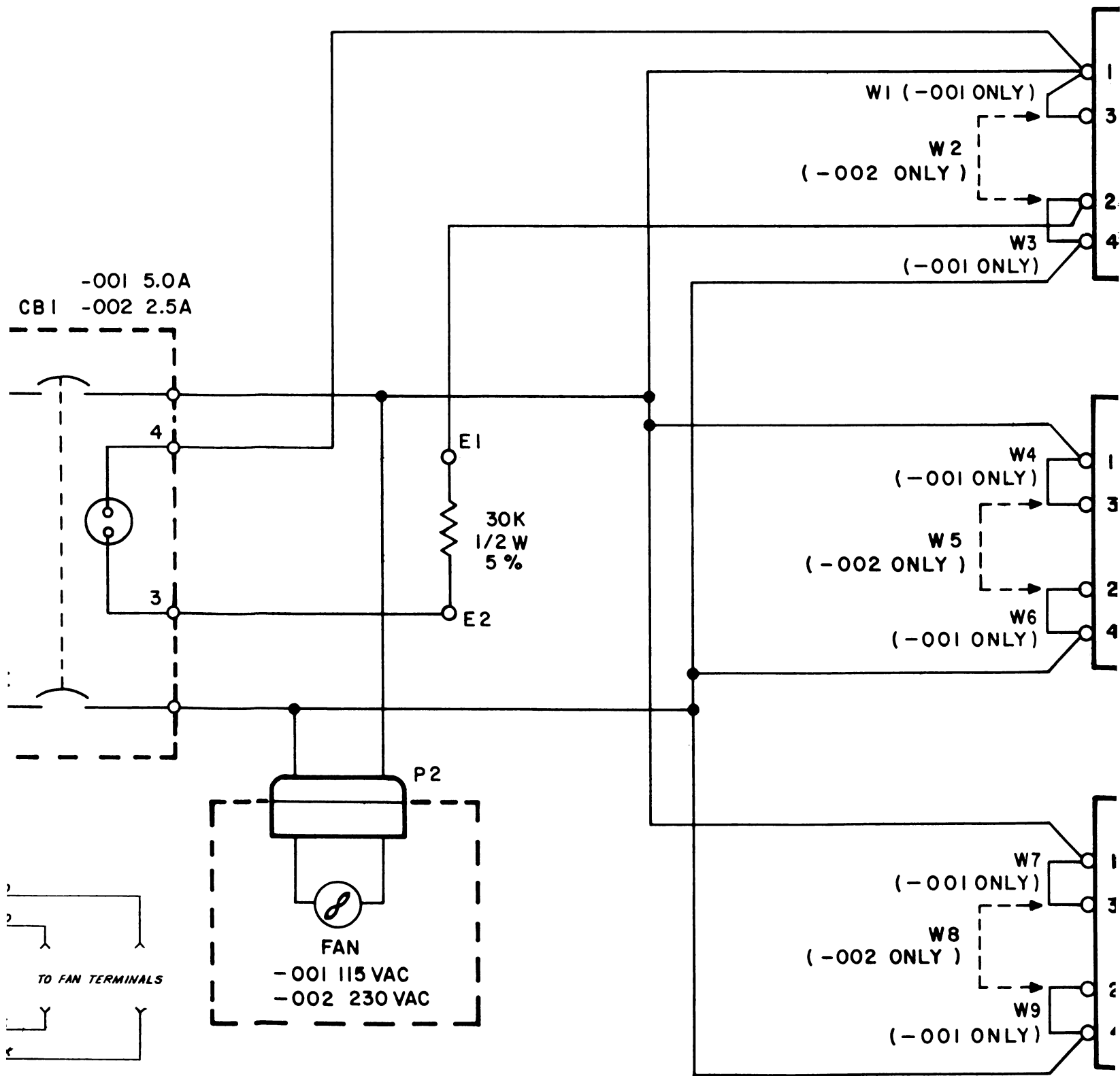
TABLE 6-4. PORTABLE CASE ASSEMBLY

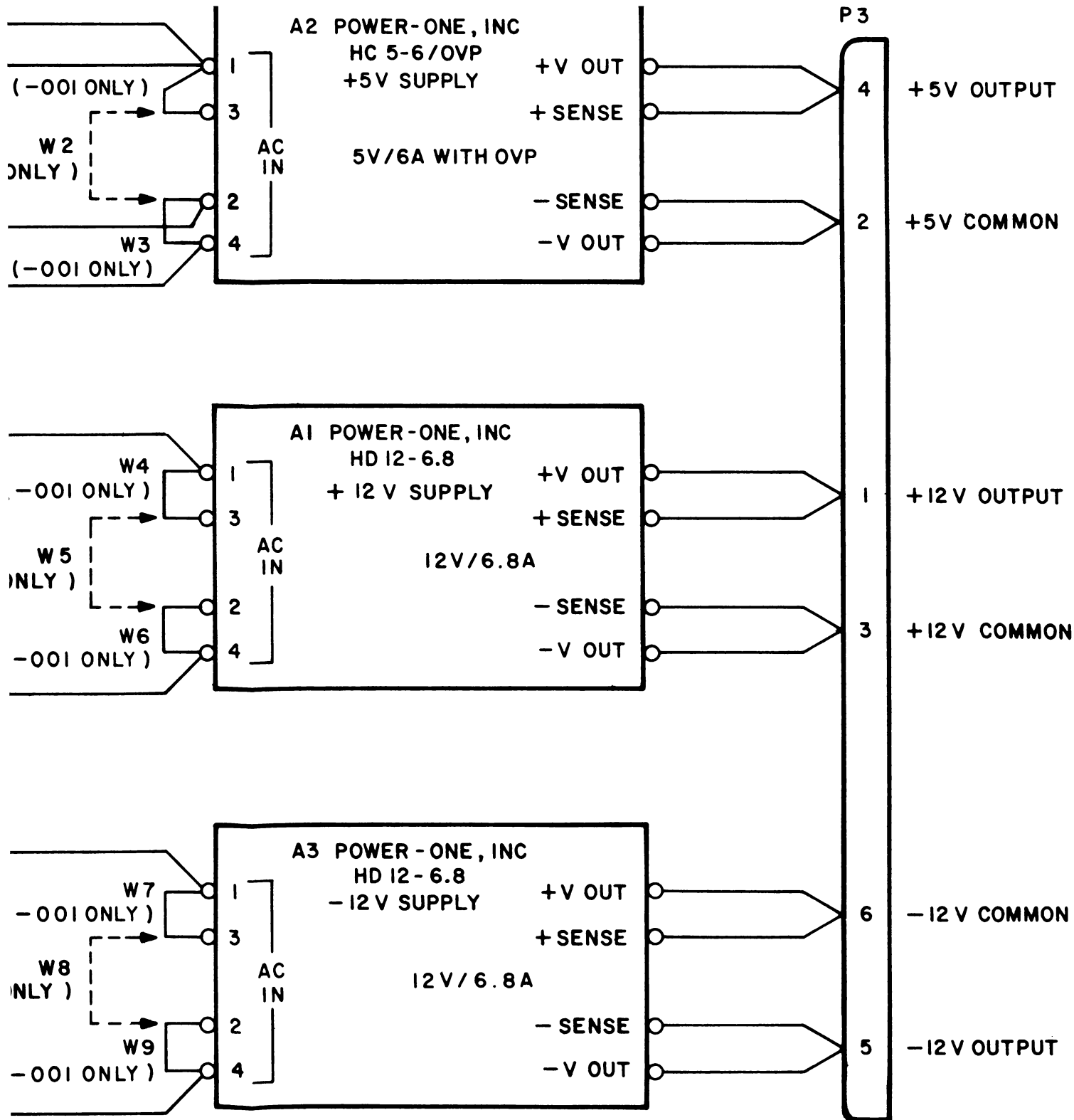
FIGURE NUMBER	INDEX NUMBER	REFERENCE DESIGNATOR	DESCRIPTION 1 2 3 4 5 6 7	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	HONEYWELL PART NUMBER	QUANTITY PER ASSEMBLY	USABLE ON CODE	NOTES
					NATIONAL STOCK NUMBER				
6-4			PORTABLE CASE ASSEMBLY	28009		16745009-002	AR		
6-4	1		. FILTER AND GRILLE ASSEMBLY	82877	477712 4130-01-484-0701	16757939-005	1		
6-4	2		. GROMMET	96906	5325-00-245-3345	4535489-56	1		
6-4	3		. GROMMET	96906	MS21266-SN 0390-926-1394	16750480-003	AR		
6-4	4		. CLIP, RETAINING	34775	037-0500	16745643-007	3		
6-4	5		. CLIP, RETAINING	34785	078-0750	16745643-010	1		
6-4	6		. HOOK, SUPPORT, CORD	21604	PP40055	16744369-001	1		
6-4	7		. PANEL, REAR	28009		16744505-001	1		
6-4	8		. CABINET, ELECTRICAL EQUIPMENT	28009		16744941-001	1		
NOTES:									

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-001 115 VAC, 50/60 Hz  
 -002 230 VAC, 50/60 Hz





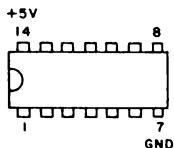


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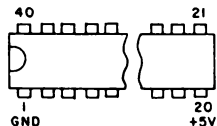
Figure 7-1. Aux Housing Power Supplies Schematic

NOTES:

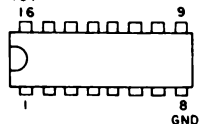
- UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS, 1/4 W, 5 %  
ALL CAPACITANCE VALUES ARE IN UF, 50V, 20%
- ▽ DENOTES CIRCUIT COMMON  
△ REPRODUCE CHANNEL WIRING CHART
- L1, L2, L3 ARE FERRITE
- INTEGRATED CIRCUIT PIN IDENTIFICATION IS AS FOLLOWS. TOP VIEW SHOWN:



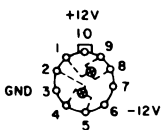
U1 74LS09  
U3 74LS04  
U10, U11 74LS37



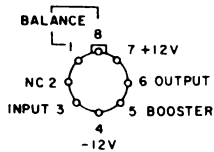
U4 MC6821



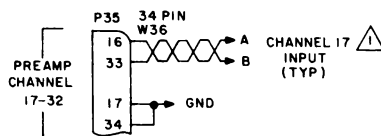
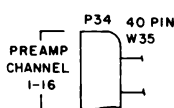
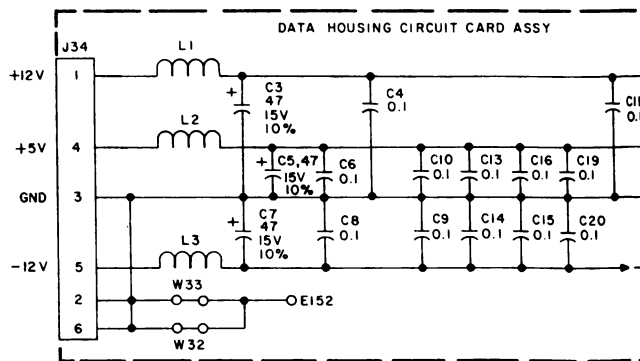
U2, U5  
U6, U7, U8 74LS138



U12 DG200



U9 LM210



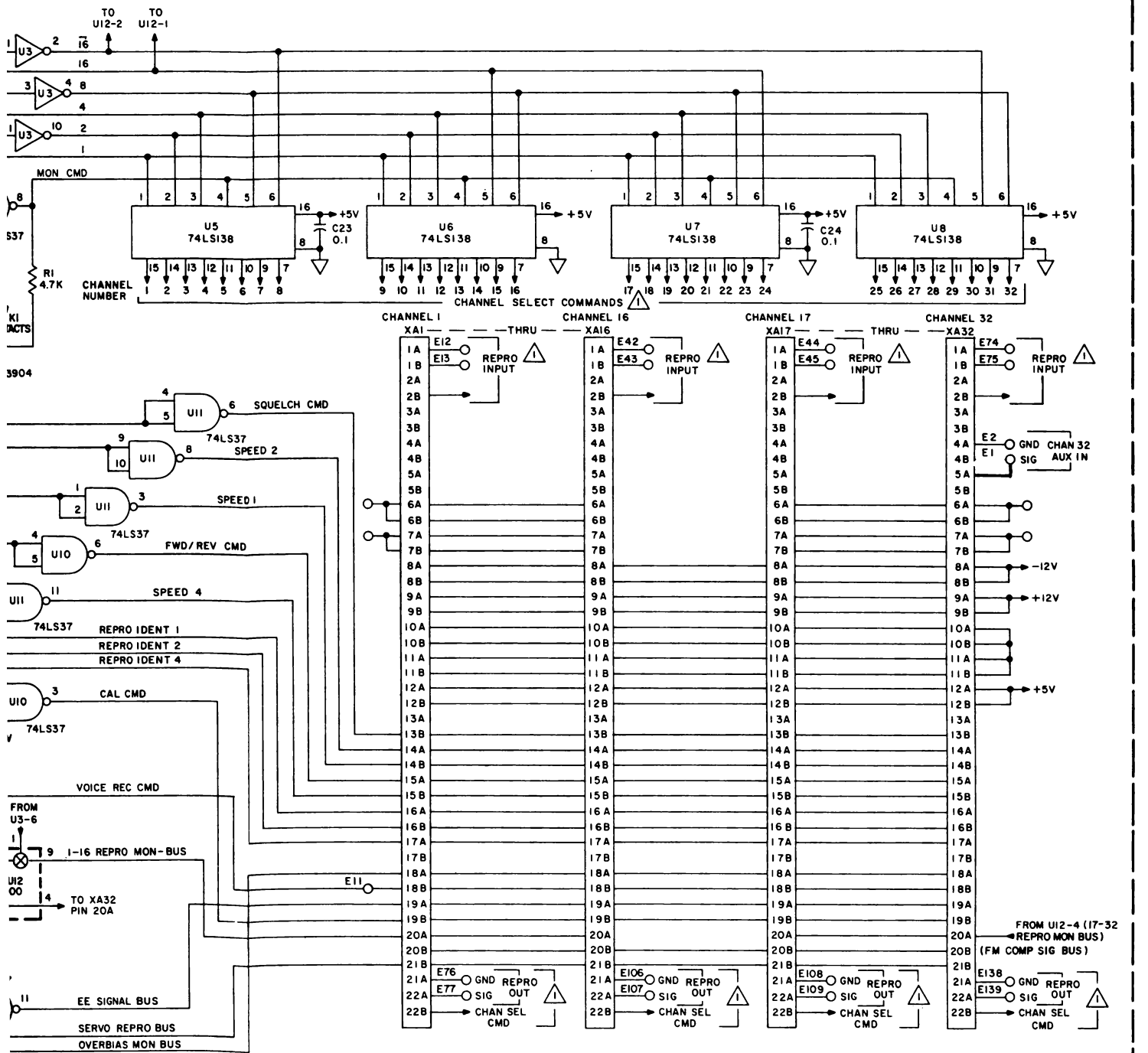
o16 o14 o12 o25  
o35 o31 o29 o27 o9 c  
o17 o15 o13 o11 o28 o  
o34 o32 o30 o28 o10

XW1  
COMPONENT S

△ REPRODUCE CHANNEL WIRING CHART

FUNCTION	REPRODUCE INPUT			A34W5 REPRODUCE OUTPUT		CHANNEL SELECT COMMAND
	INPUT A	INPUT B	GROUND	SIGNAL	GROUND	
REPRO CHAN PIN NO.	IA	IB	2B	22 A	21A	22B
DESTINATION PREFIX				COND	SHIELD	
CHAN NO.	PC CONNECTOR					C
1	XAI	P34-37 (E12)	P34-38 (E13)	J1 (E77)	J1 (E76)	U5-15
2	XA2	P34-17 (E14)	P34-18 (E15)	J2 (E79)	J2 (E78)	U5-14
3	XA3	P34-35 (E16)	P34-36 (E17)	J3 (E81)	J3 (E80)	U5-13
4	XA4	P34-15 (E18)	P34-16 (E19)	J4 (E83)	J4 (E82)	U5-12
5	XA5	P34-33 (E20)	P34-34 (E21)	J5 (E85)	J5 (E84)	U5-11
6	XA6	P34-13 (E22)	P34-14 (E23)	J6 (E87)	J6 (E86)	U5-10
7	XA7	P34-31 (E24)	P34-32 (E25)	J7 (E89)	J7 (E88)	U5-9
8	XA8	P34-11 (E26)	P34-12 (E27)	J8 (E91)	J8 (E90)	U5-7
9	XA9	P34-27 (E28)	P34-28 (E29)	J9 (E93)	J9 (E92)	U6-15
10	XAI0	P34-7 (E30)	P34-8 (E31)	J10 (E95)	J10 (E94)	U6-14
11	XAI1	P34-25 (E32)	P34-26 (E33)	J11 (E97)	J11 (E96)	U6-13
12	XAI2	P34-5 (E34)	P34-6 (E35)	J12 (E99)	J12 (E98)	U6-12
13	XAI3	P34-23 (E36)	P34-24 (E37)	J13 (E101)	J13 (E100)	U6-11
14	XAI4	P34-3 (E38)	P34-4 (E39)	J14 (E103)	J14 (E102)	U6-10
15	XAI5	P34-21 (E40)	P34-22 (E41)	J15 (E105)	J15 (E104)	U6-9
16	XAI6	P34-1 (E42)	P34-2 (E43)	J16 (E107)	J16 (E106)	U6-7
17	XAI7	P35-16 (E44)	P35-33 (E45)	J17 (E109)	J17 (E108)	U7-15
18	XAI8	P35-8 (E46)	P35-25 (E47)	J18 (E111)	J18 (E110)	U7-14
19	XAI9	P35-9 (E48)	P35-26 (E49)	J19 (E113)	J19 (E112)	U7-13
20	XA20	P35-1 (E50)	P35-18 (E51)	J20 (E115)	J20 (E114)	U7-12
21	XA21	P35-15 (E52)	P35-32 (E53)	J21 (E117)	J21 (E116)	U7-11
22	XA22	P35-7 (E54)	P35-24 (E55)	J22 (E119)	J22 (E118)	U7-10
23	XA23	P35-10 (E56)	P35-27 (E57)	J23 (E121)	J23 (E120)	U7-9
24	XA24	P35-2 (E58)	P35-19 (E59)	J24 (E123)	J24 (E122)	U7-7
25	XA25	P35-14 (E60)	P35-31 (E61)	J25 (E125)	J25 (E124)	U8-15
26	XA26	P35-6 (E62)	P35-23 (E63)	J26 (E127)	J26 (E126)	U8-14
27	XA27	P35-11 (E64)	P35-28 (E65)	J27 (E129)	J27 (E128)	U8-13
28	XA28	P35-3 (E66)	P35-20 (E67)	J28 (E131)	J28 (E130)	U3-12
29	XA29	P35-13 (E68)	P35-30 (E69)	J29 (E133)	J29 (E132)	U8-11
30	XA30	P35-5 (E70)	P35-22 (E71)	J30 (E135)	J30 (E134)	U8-10
31	XA31	P35-12 (E72)	P35-29 (E73)	J31 (E137)	J31 (E136)	U8-9
32	XA32	P35-4 (E74)	P35-21 (E75)	J32 (E139)	J32 (E138)	U8-7





16784613-D

101/Aux  
7/80

REF: 16784613 E  
Figure 7-2. Aux Housing Distribution Schematic

SECTION 7  
SCHEMATICS



TECHNICAL MANUAL  
MAINTENANCE INSTRUCTIONS  
FOR  
MODEL 101 MAGNETIC TAPE SYSTEM  
AUGUST 1984  
16785158-001AA - AUGUST 1984

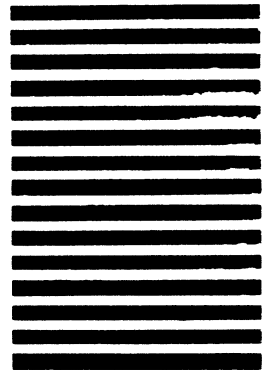


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