Errata

Title & Document Type: 5340A Frequency Counter Operating and Service Manual

Manual Part Number: 05340-90021

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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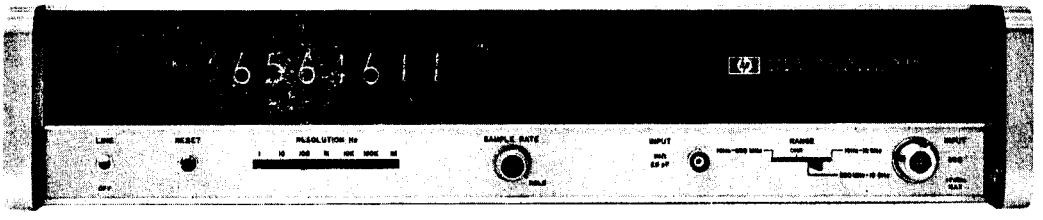
Agilent Technologies

OPERATING AND SERVICE MANUAL

FREQUENCY COUNTER
5340A



HEWLETT PACKARD

MODEL 5340A

FREQUENCY COUNTER

OPERATING AND SERVICE MANUAL

SERIAL PREFIX: 1532A

This manual applies directly to Hewlett-Packard Model 5340A Frequency Counters with serial prefix number 1532A.

SERIAL PREFIXES NOT LISTED

For serial prefixes above 1532A, a "Manual Change" sheet is included with this manual. For serial prefixes below 1532A, refer to Section VII of this manual.

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HEWLETT PACKARD

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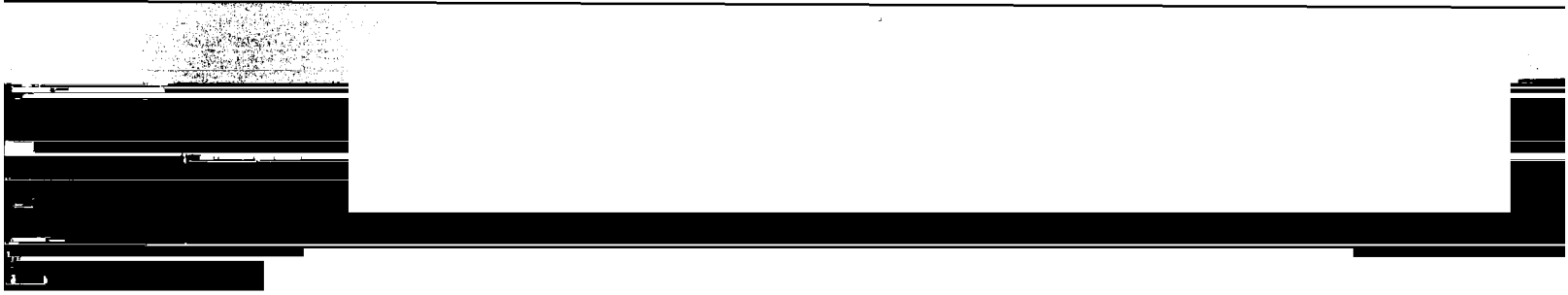

Figure

1-1.

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2-2.
2-3.
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2-5.
2-6.

3-1.
3-2.
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WARNING

115 VOLTS AC AND 175 VOLTS DC ARE USED IN THIS INSTRUMENT. SOME OF THE MAINTENANCE AND SERVICING OPERATIONS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT WHILE PROTECTIVE COVERS ARE REMOVED. EXERCISE EXTREME CARE WHEN PERFORMING THESE OPERATIONS. LINE VOLTAGE IS ALWAYS PRESENT ON TERMINALS INCLUDING THE POWER INPUT CONNECTOR, FUSE HOLDER, POWER SWITCH, ETC. IN ADDITION, WHEN THE INSTRUMENT IS ON, ENERGY AVAILABLE AT MANY POINTS MAY RESULT IN PERSONAL INJURY OR DEATH WHEN CONTACTED.

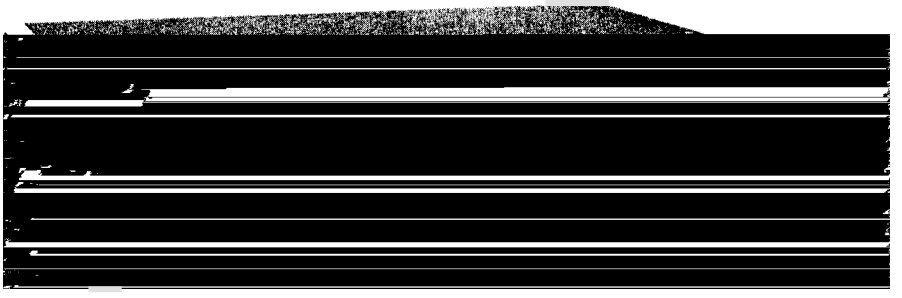
WARNING

THIS INSTRUMENT IS SUPPLIED WITH A THREE-WIRE POWER CABLE. THE CENTER THIRD WIRE IS INTENDED TO CONNECT THE INSTRUMENT CHASSIS TO EARTH GROUND WHEN USED WITH A PROPERLY WIRED THREE-CONDUCTOR OUTLET. REFER TO SECTION II FOR DETAILS OF POWER CONNECTION. IMPROPERLY GROUNDED EQUIPMENT CONFIGURATIONS MAY RESULT IN HAZARDOUS POTENTIALS BETWEEN THE CHASSIS OF TWO OR MORE INSTRUMENTS OR EARTH GROUND.

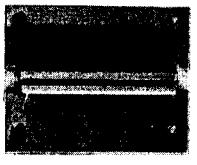
CAUTION

INPUT CIRCUITS AT THE 50 OHM INPUT CONNECTOR CAN BE DESTROYED WITH INPUT LEVELS EXCEEDING 1 **WATT.** PLEASE READ PARAGRAPH **3-21** REGARDING ACCEPTABLE INPUT LEVELS.

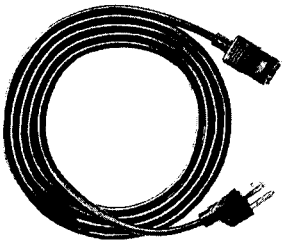
Figure 1-1. Model 5340A Frequency Counter, Rack Mount Kit, and Power Cord



Model 5340A



Rack Mount Kit



Power Cord

SECTION I

GENERAL INFORMATION

1–1. DESCRIPTION

11

Description	
Detachable Power Cord 7-½	

Table 1-3. Specifications

SIGNAL INPUT

Input 1

Range: 10 Hz to 18

10^{-7}
10^{-10}

10^{-7}

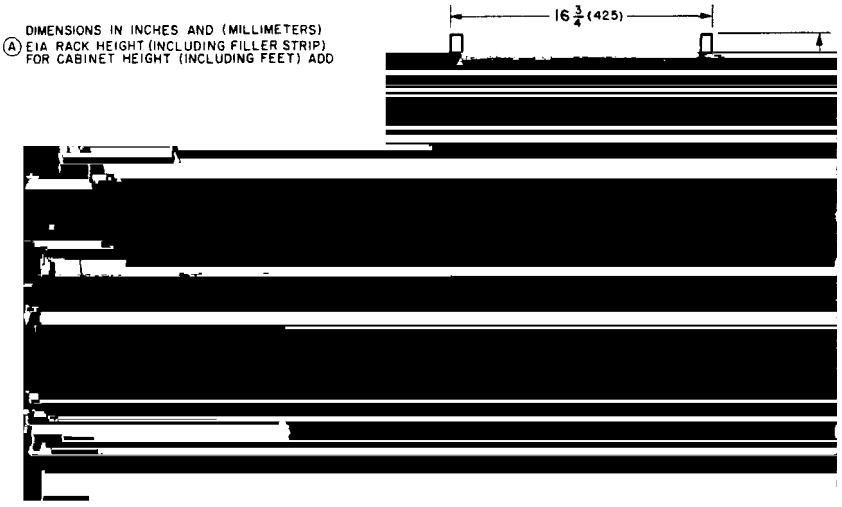
Table 1-3. Specifications (Continued)

OPTIONAL TIME BASE (Option 001)

Option 001 provides an oven controlled crystal oscillator time base with an aging rate near that of a time standard. This option results in better accuracy and longer periods between calibration. A separate power supply keeps the crystal oven ON and up to temperature when the instrument is turned off as long as it remains connected to the power line.

Frequency: 10 MHz.
Aging Rate: $<\pm 5 \times 10^{-10}$/day after 24 hour warm-up' and $<1.5 \times 10^{-7}$/year.
Short Term Stability:
1×10^{-10} for 1 s avg. time
1×10^{-10} for 10 s avg. time.
2×10^{-10} for 100 s avg. time.
Line Variation: $<1 \times 10^{-10}$ for ±10% change from nominal. A 10%change will cause a frequency change of <1 x
Temperature: $<7 \times 10^{-9}$ over 0°C to 50°C range.
Warmup: Within 5×10^{-9} of final2 value 20 minutes after turn-on, at 25°C.
Frequency Adjustment Range: $>1 \times 10^{-6}$
Frequency Adjustment: 1×10^{-9} (0.01 Hz) 18-turn control.

DIMENSIONS IN INCHES AND (MILLIMETERS)
(A) EIA RACK HEIGHT (INCLUDING FILLER STRIP)
FOR CABINET HEIGHT (INCLUDING FEET) ADD



2-1. INTRODUCTION

2-2. This section tells how to set up the 5340A Frequency Counter. Instructions for unpacking, inspecting, installing, and remote programming are included.

2-3. UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, inspect the counter for visible damage (scratches, dents, etc.). If the counter is damaged, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately (offices are listed at the back of this manual). Keep the shipping carton and packing material for the carrier's inspection. The Hewlett-Packard Sales and Service Office will arrange for repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

2-5. INSTALLATION REQUIREMENTS

CAUTION

BEFORE CONNECTING THE INSTRUMENT TO AC POWER LINES, BE SURE THAT THE LINE SELECTOR IS PROPERLY POSITIONED.

2-6. LINE VOLTAGE REQUIREMENTS. The 5340A is equipped with a line voltage switch to select 115-volt or 230-volt ac operation. Before applying power, the rear panel screwdriver-operated switch must be set to the correct position ("115" or "230" visible) and the correct fuse (as labeled on the rear panel) must be installed. See Figure 3-4 for rear panel features.

2-7. LINE FREQUENCY REQUIREMENTS. The counter will operate at line frequencies between 48 Hz and 66 Hz.

2-8. THREE CONDUCTOR POWER CABLE. To protect the operator, the counter uses a grounded three-conductor detachable power cable. The male connector end is a NEMA type connector, and the female connector end is a C.E.E. type connector that mates with the 5340A rear panel power connector. Connect the power cable to a power source receptacle with a NEMA grounded third conductor. If the line power receptacle is a standard two-pin type instead of the NEMA three-pin receptacle, use a two-to-three pin adaptor (HP Part No. 8120-1348) and connect the green pigtail on the adaptor to ground.

2-9. TEMPERATURE LIMITS. Maximum and minimum allowable operating temperatures

c. Remove the two adhesive-backed trim strips MP1 from side frames MP3 and MP12.

d. Using the three screws provided, attach the filler strip from the rack mount kit along the front of bottom cover MP9.

e. Attach the flanges from the rack mount kit to the front end of side frames MP3 and MP12. Orient the larger corner notch toward the bottom of the instrument.

2-11. REPACKING FOR SHIPMENT

2-12. If it becomes necessary to reship a counter, good commercial packing should be used. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Instruments should be packed securely in a strong corrugated container (350 lb/sq. in bursting test) with suitable filler pads between the instrument and container. Before returning instruments to Hewlett-Packard, contact the nearest Hewlett-Packard Sales and Service Office for instructions.

2-13. ENVIRONMENT DURING STORAGE AND SHIPMENT

2-14. Conditions during storage and shipment should normally be limited as follows:

a. Maximum altitude: 25,000 feet.
b. Minimum temperature: -40°F (-40°C).
c. Maximum temperature: +167°F (+75°C).

2-15. REMOTE PROGRAMMING AND DIGITAL OUTPUT

2-16. Option 011 adds remote programming and digital output capability to the 5340A Frequency Counter. These are accomplished with a bi-directional bus, via a 24-pin connector on the rear panel marked DIGITAL INPUT/OUTPUT. Associated with this connector are six slide switches used to address the instrument. A 5340A can be addressed to either send output data (TALK) or to accept program information (LISTEN). For the purposes of the Option 011 description, several terms are defined as follows:

a. A TALKER is the sender of information on the bus.

b. A LISTENER is the receiver or acceptor of information on the bus.

c. A CONTROLLER is an instrument that has the responsibility of managing the instruments connected to the bus. It is capable **of** addressing other instruments on the bus as TALKERS or as LISTENERS. It is a TALKER and may be a LISTENER.

d. "High" or "Ø" level of a line or switch is the relatively more positive signal level (≥2.4V).

e. "Low" or "1" level of a line or switch is the relatively less positive signal level (≤0.4V).

2-17. What Can Be Programmed

2-18. Also, the 5340A's octave range and its output mode can be selected. In addition, a controller can command the

followed by the appropriate multiplier to make the reading **Hz,** and a word terminator. Table 2–5 lists the order outputed and a description of the 16 output characters.

2–20. Bus Description

2–21. The 15–line bus consists of 8 data lines plus 7 control and status lines. Addresses, program and output information are communicated on the data lines. These are based on a character–serial, seven–bit ASCII code set.

2–22. Three control lines are used to execute the transfer of each byte of information on the data lines. They employ an interlocked "handshake" technique to pass information. This allows for asynchronous data transfer without timing restrictions being placed on either the 5340A **or** its controller. One line is driven by the 5340A to inform the controller of its status. The controller uses the three remaining lines to manage the 5340A's on the bus.

2–23. Several 5340A's can be connected to a common bus. The exact number depends on the drive capability of the controller (see LINE CHARACTERISTICS). A specific 5340A is made to send output data (TALK) or accept program data (LISTEN) by addressing it to do so.

2–24. All bus lines have been given names and mnemonic acronyms that convey the message being carried on that line. Each line is described below, followed by Table 2–1 which lists the relationship of the Attention line and the three handshake lines. Figure 2–1 shows the signal levels and timing relationship of the handshake and data lines. *ALL INSTRUMENTS CONNECTED TO THE BUS, INCLUDING THE CONTROLLER, MUST OBEY THESE DESCRIPTIONS.*

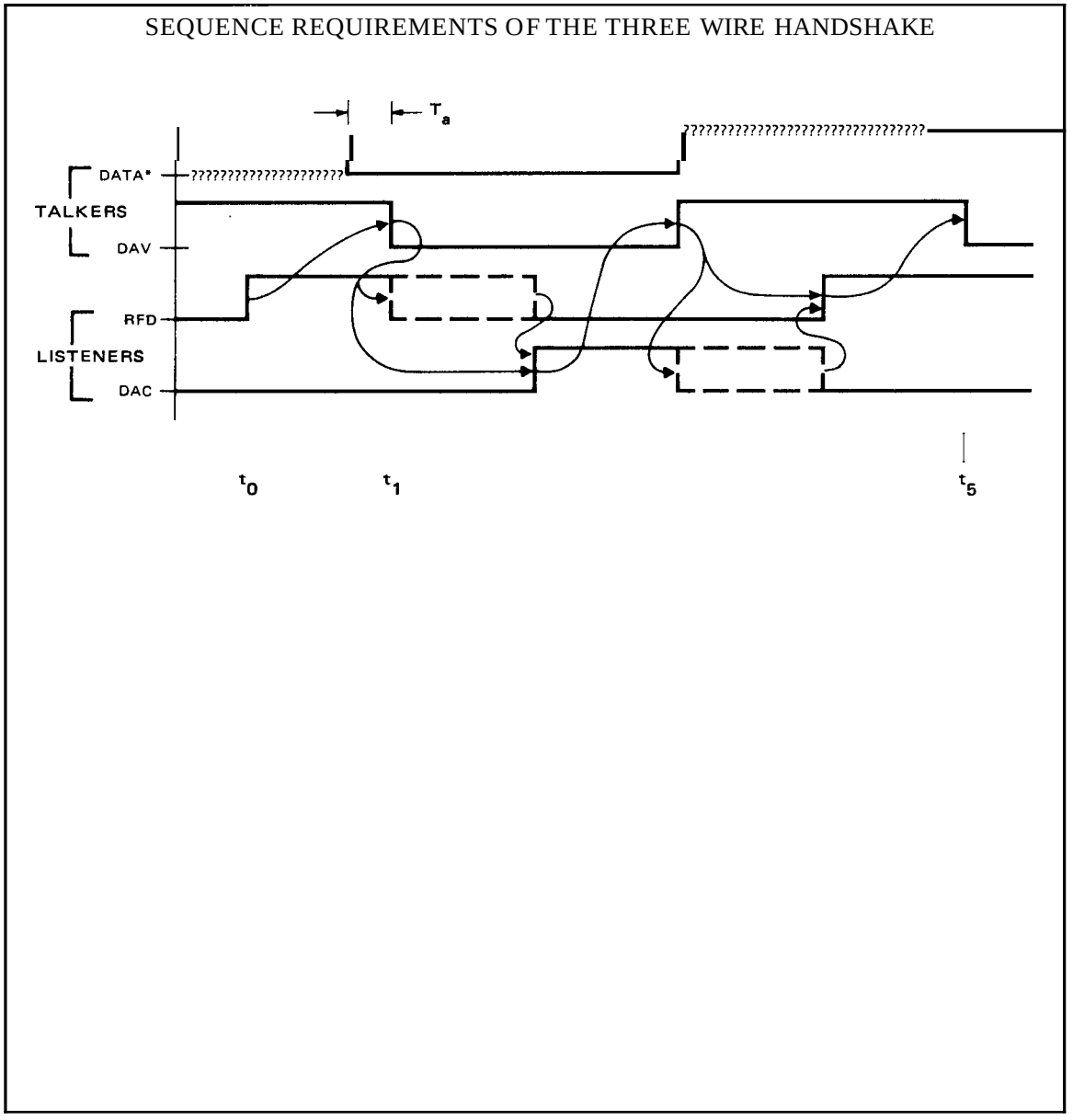
a. SERVICE REQUEST (SRQ)

By setting SRQ low, a 5340A indicates to the controller that it has completed a measurement and is ready to send data. The controller can then respond with a serial poll to determine which instrument requested service.

Model

	READY FOR DATA (RFD)			DATA VALID (DAV)
	LOW	HIGH		
	One or more LISTENERS are not ready	All addressed LISTENERS are ready for data	One or more LISTENERS have not	All addressed LISTENERS

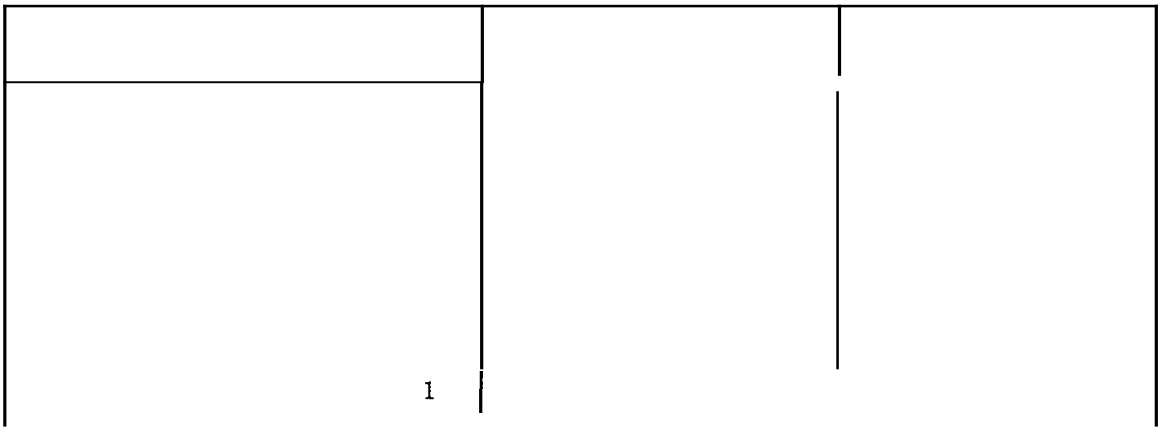
Figure 2–1. Handshake Timing



BITS				b_7 b_6 b_5	$0\,0\,0$	$0\,0\,1$	$0\,1\,0$	$0\,1\,1$	$1\,0\,0$	$1\,0\,1$	$1\,1\,0$	$1\,1\,1$
b_4	b_3	b_2	b_1	COLUMN / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x

≡

≡


1

2–40. Hardware

2–41. The 5340A's digital INPUT/OUTPUT connector is on the rear panel (Figure 2–2). Pin connections to this Type 57 Microribbon connector are shown in Figure 2–3.

2–42. Cables of three different lengths are available for connecting a 5340A to a controller or to another 5340A:

a. 3 feet long HP Part No. 10631A.
b. 6 feet long HP Part No. 10631B.
c. 12 feet long HP Part No.

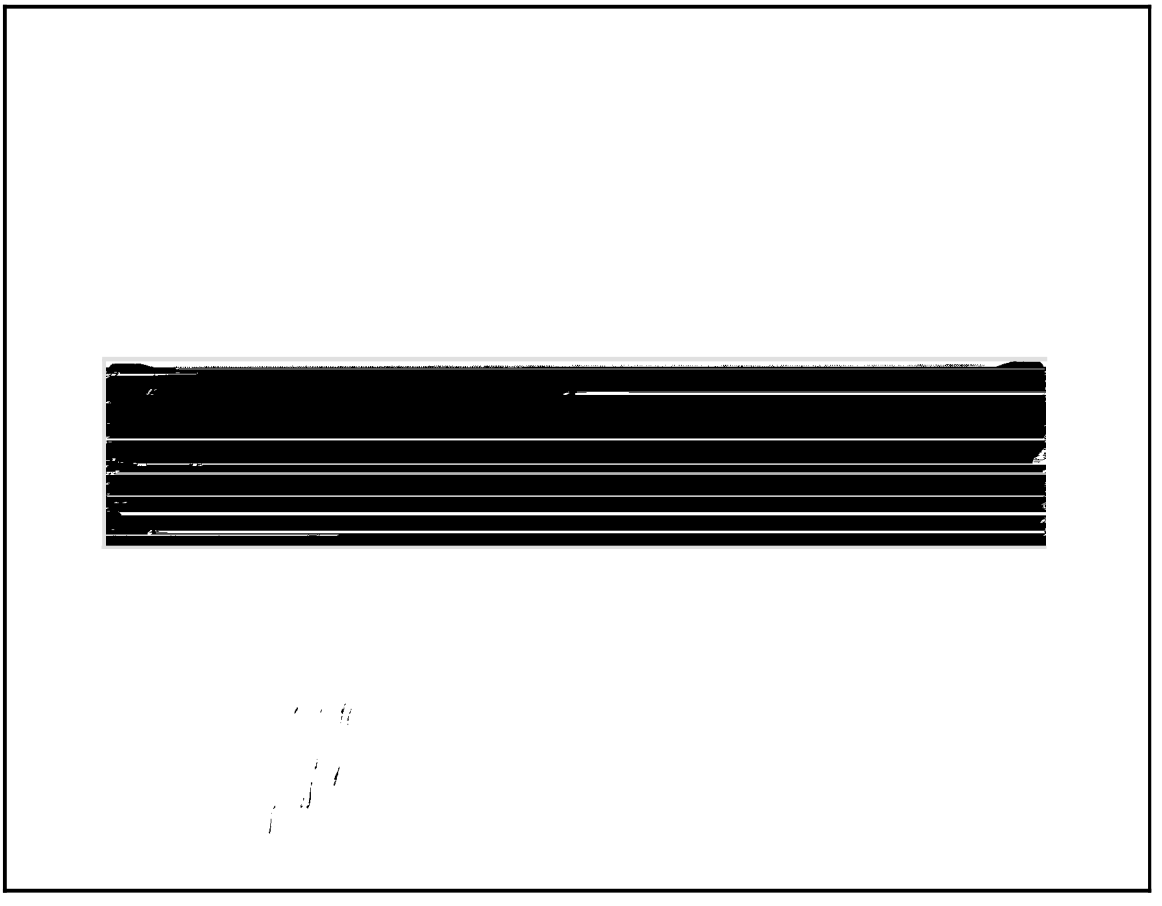


Table 2-4. 5340A Program Code Set

Resolution	Hz	ASCII	Binary							Octal
			B_7	B_6	B_5	B_4	B_3	B_2	B_1	
1	10^0	0	0	1	1	0	0	0	0	060
10	10^1	1	0	1	1	0	0	0	1	061
100	10^2	2	0	1	1	0	0	1	0	062
1K	103	3	0	1	1	0	0	1	1	063
10K	104	4	0	1	1	0	1	0	0	064
100K	105	5	0	1	1	0	1	0	1	065
1M	10^6	6	0	1	1	0	1	1	0	066
Ranges										
10 Hz - 250										,123
										125
										124
										120

II

in its remote programming storage cells the initial conditions of 0, P, @, J, L, and N. There are:

0 - 1 Hz resolution
P - 10 Hz to 18 GHz range
@ - AUTO (sweeps through all ranges)
J - Internal Sample Rate
L - Output ONLY IF addressed
N - Local operation

When taking remote control of the 5340A it is necessary to change only those cells that are different from the above. For example, if the 5340A is to be used under remote control, 1 Hz resolution, 10 Hz to 18 GHz range, automatic searching, sample rate HOLD and WAIT in output phase until addressed; it is only necessary to change the ASCII "J" to "K", "L" to "M", and "N" to "0". These changes can be made in any order.

II

2-47. What is Outputted

2-48. When addressed to TALK the 5340A outputs a string of 16 ASCII characters provided there is an addressed LISTENER on the bus. The handshake routine, necessary for passing information on the data lines, cannot be started unless there is both an addressed LISTENER and TALKER on the bus. The LISTENER must be able to recognize LF (line feed) as the end of the 5340A's output data. As soon as the LISTENER accepts LF (sets DAC high) the 5340A leaves the output phase and continues through its operating cycle.

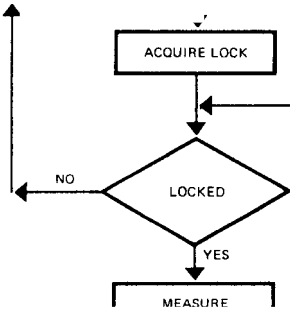
2-49. The 16 output characters, their description and the order in which they are outputted are shown in Table 2-5. Refer to Table 2-2 for signal levels.

Table 2-5. 5340A Output Code Set

ORDER OUTPUTTED	CHARACTER	DESCRIPTION
1	D/L	D - measurement made direct or L - measurement made using phase locked loops
2	O/SP	O - 5340A's display has overflowed or SP - Space (0 100 000 binary, 040 octal)
3	SP	Space
4 thru 11	0 - 9	Digits 0 thru 9 (blank display digits outputted as 0) most significant digit first
12	E	Power of 10 exponent to follow
13	+	Exponent is positive (0 101 011 binary, 053 octal)
14	0 - 6	One digit exponent
15	CR	Carriage return (0 001 101 binary, 015 octal)
16	LF	Line feed (used as a word terminator) (0 001 010 binary, 012 octal)

2-50. Modes of Operation

2-51. The 5340A has several remote operating modes. They depend on the Sample Rate and Output modes and the method used to initiate a measurement procedure. This section includes a description of these modes, a simplified flow chart (Figure 2-5) showing all operating modes and a sample program.


ACQUIRE LOCK
NO
LOCKED
YES
MEASURE

2-52. The two principal niodes of remote operation based on the Sample Rate and Output modes are described in (a) and (b) below. Modes (c) and (d) are possible by selecting the remaining combinations of the Sample Rate and Output modes.

a. Internal Sample Rate **(J)** and Output ONLY IF (L)

(1) If NOT addressed to TALK the 5340A makes measurements continuously at a rate determined by its Sample Rate time plus measurement time. It skips the output phase of its operating cycle.

(2) If 5340A is addressed to TALK, it no longer skips its output phase. The next and all subsequent measurements are outputted.

b. Sample Rate HOLD (K) and WAIT until addressed (M) the 5340A sequence is:

(1) Addressed to LISTEN.

(2) Instructed to make a measurement.

(3) Makes a measurement and stops in its output phase.

(4) Addressed to TALK.

(5) Outputs and stops in its Sample Rate phase.

(6) Addressed to LISTEN.

(7) Instructed to make measurement, then repeats 3 through 6.

c. Internal Sample Rate **(J)** and WAIT until addressed (M) the 5340A:

(1) Makes a measurement and stops in its output phase.

(2) Is addressed to TALK.

(3) Outputs, goes through its sample rate, and makes another measurement and if

(a) Still addressed to TALK it repeats (3).

(b) Not addressed to TALK it stops in its output phase and waits until so addressed then repeats (3).

d. Sample Rate HOLD (K) and Output ONLY IF addressed (L) the 5340A is:

(1) Addressed to LISTEN.

(2) Instructed to make a measurement.

(3) Makes the measurement and if:

(a) Addressed to TALK by the end of the measurement phase it outputs and stops in the Sample Rate phase until (1) and **(2)** are repeated.

(b)

(3) Clears the display.

(4) Initializes the phase locked loops forcing a new search procedure.

(5) Starts measurement phase of the 5340A's operating cycle.

c. Sample Triggers Instruction (I):

(1) Can be given only if the 5340A is stopped in the Sample Rate phase of its operating cycle. If given at any other time it will be ignored by 5340A.

(2) Does not change the information in the program storage cells.

(3) Does not clear the display.

(4) Does not initialize the phase locked loops, i.e., the 5340A does not go through a search procedure unless it has lost phase lock since the previous measurement.

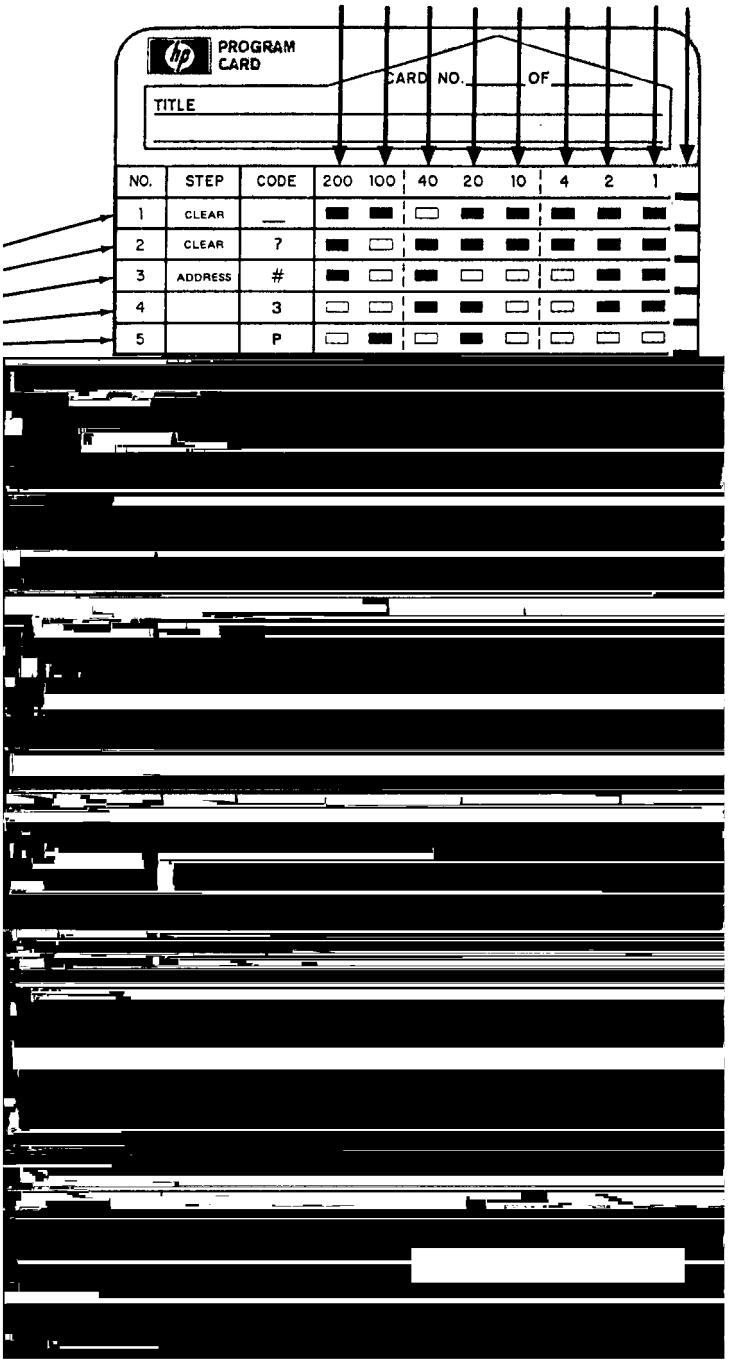
(5) Starts the measurement phase of the 5340A's operating cycle.

2-55. Examples of Programming

2-56. Assume that it is desired to program a 5340A for a measurment of approximately 3.5 GHz to a 1 kHz resolution. In addition, it is desired to instruct the 5340A to make a measurement and subsequently output when so instructed. One method of programming this is shown in Table 2-6. (Assume the

Table 2-6. 5340A Programming Example

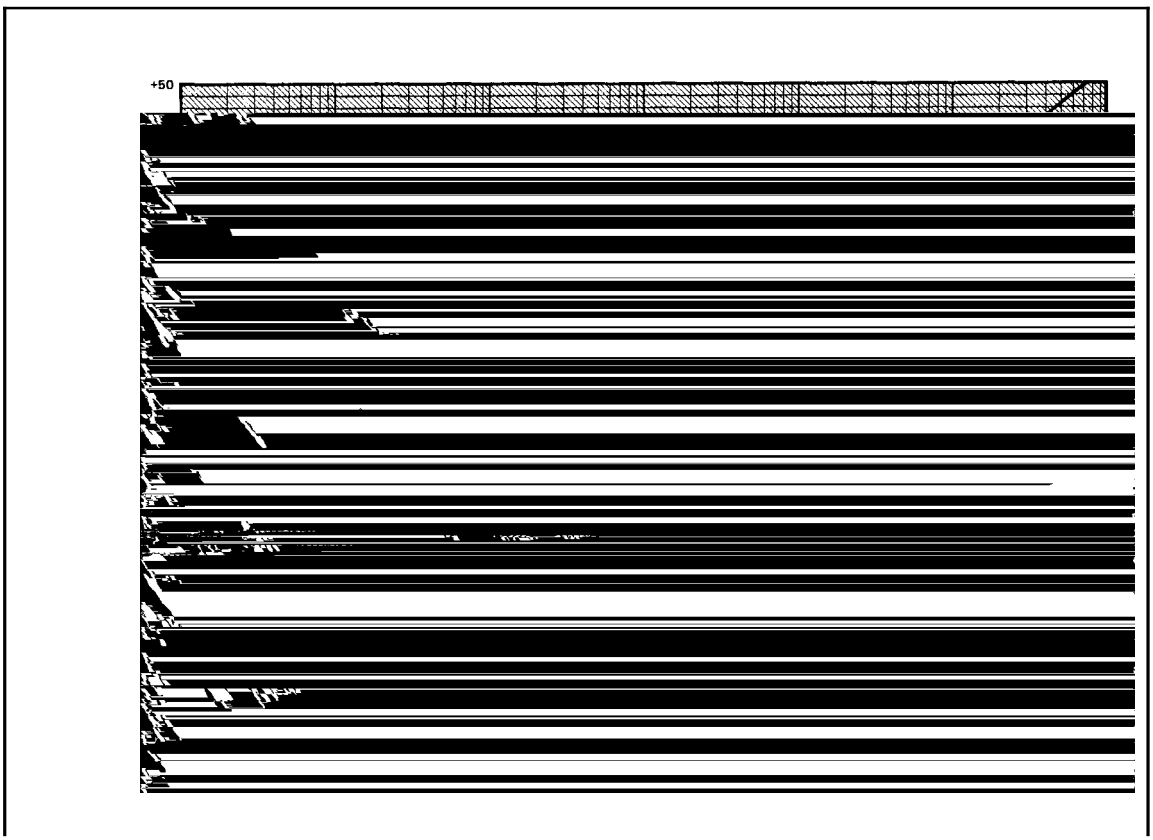
Sequence	Control and Status Lines				Data Lines ASCII Codes	Description of Program Sequence
	SRC	IFC	REN	AT		
1	H	H	H*	L	_ (underscore) or controller's talk address	Clears 5340A as a TALKER
2					?	Clears all LISTENERS
3					#	5340A LISTEN ADDRESS is on Data Lines
4				H		5340A is addressed to LISTEN
5						1 kHz resolution is selected 250 MHz to 18 GHz range selected 2 to selected Data 250025403 0c4.5333 0RATEected
6			L			
7						
8						
9				L		
10						
11						
12				H		
13				L		
14						
15						
16				H		
17						


PROGRAM CARD
CARD NO. ____ OF ____
TITLE
NO. STEP CODE 200 100 40 20 10 4 2 1
1 CLEAR
2 CLEAR 7
3 ADDRESS #
4 3
5 P

3-11. Sample Rate, Measurement Time, and Reset

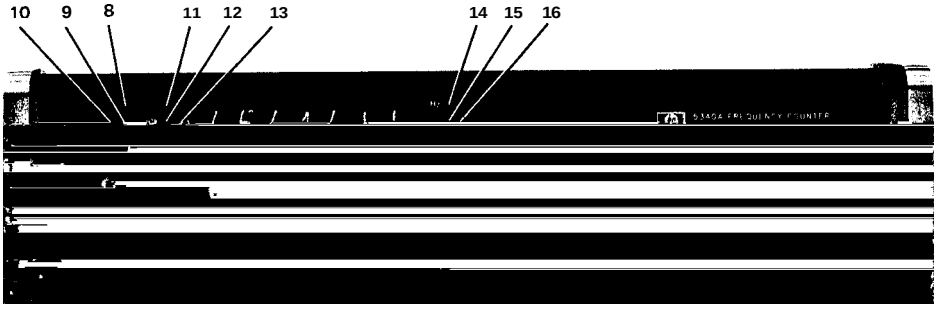
3-12. The sample rate control sets the interval between measurements, but not the interval of the measurement. On the **5340A,** the minimum sample rate is variable between approximately **50** milliseconds and **5** seconds. For **1** Hz RESOLUTION settings, an additional **1** sec delay is incurred. **A** hold feature can be selected to "freeze" a measurement display indefinitely.

3-13. The measurement (g 0 T c


+50

Model

Figure 3-3. Front Panel Controls and Indicators



1. LINE switch. Applies primary power to all circuits except crystal oven Option 001, when so equipped. When the counter is equipped with Option 001, the crystal oven connects through a thermal circuit breaker and fuse to the ac line. This allows the oven to maintain its operating temperature and accuracy when the LINE switch is OFF, thereby eliminating warm-up delays.

2. RESET switch. Resets display and internal count to zero and initiates a new measurement.

3. RESOLUTION Hz selector. Determines resolution of the measurement. See Paragraph 3-8 for a detailed description. In general, the 1 kHz setting is a good starting point.

4. SAMPLE RATE control. Adjusts the interval between measurements from approximately 50 milliseconds to 5 seconds. For 1 Hz RESOLUTION settings an additional 1 second delay is incurred. When rotated to the HOLD position, the display will be held indefinitely.

5. BNC 1 MEG Ω Input Connector. High impedance (1 Megohm) input for direct count measurements in the 10 Hz to 250 MHz range. Shunt input capacity is 25 pF maximum. Measurements made at this input require that the RANGE switch is set to the 10 Hz - 250 MHz position. Sensitivity is 50 millivolts rms and the coupling is ac.

6. RANGE switch. Selects input connectors and ranges as indicated by the black leader lines. When set to the CHECK position, the circuits count the frequency of the internal clock to verify proper counter operation.

CAUTION

DO NOT EXCEED +30 dBm (1 WATT) INPUT AT THE 50Ω N CONNECTOR. DAMAGE TO THE INTERNAL SAMPLERS MAY OCCUR. PLEASE READ PARAGRAPH 3-21 FOR DETAILS OF ACCEPTABLE INPUT LEVELS.

Figure 3-3. Front Panel Controls and Indicators (Continued)

7. N Type 50Ω Input Connector. Input for measurements in the 10 Hz to 18 GHz or 250 MHz to 18 GHz range as determined by the RANGE switch. Sensitivity is -30 dBm from 10 Hz to 500 MHz, -35 dBm from 500 MHz to 10 GHz and -25 dBm from 10 GHz to 18 GHz.

8. RMT annunciator. For counters equipped with Option 011 only. Lights when the counter is in remote operation.

9. DIR annunciator. Lights when counter is in direct measurement mode. (10 Hz to 250 MHz.)

10. * annunciator. Operative with Option 001 only. Lights when the oven is heating to indicate oscillator is not stabilized. Full counter accuracy is obtained when the oven has stabilized. Twenty minutes after turn on, additional oscillator error is less than 5 parts in 10^9 at 25°C. If the line voltage is low, the * may remain lit for longer periods of time.

NOTE

At low environmental temperatures, e.g., 0°C, the * annunciator may remain on for longer periods of time. When the oven temperature stabilizes, it may continue to draw power in order to maintain operating temperature.

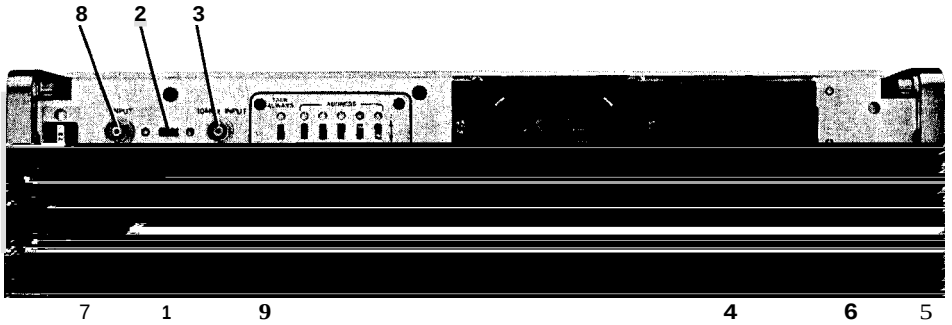
11. OVFL annunciator. Indicates that the period measurement overflowed (exceeded 99 999 999 counts).

12.

13.

14, 15, 16

Figure 3-4. Rear Panel Controls and Connectors



1. 10 MHz OUTPUT. Supplies a 10 MHz square wave output at 2.4 volts peak-to-peak or greater. Output is TTL compatible.

2. INT-EXT OSC switch. Selects time base source. When set to INT, the counter operates from its internal 10 MHz

3.

4.

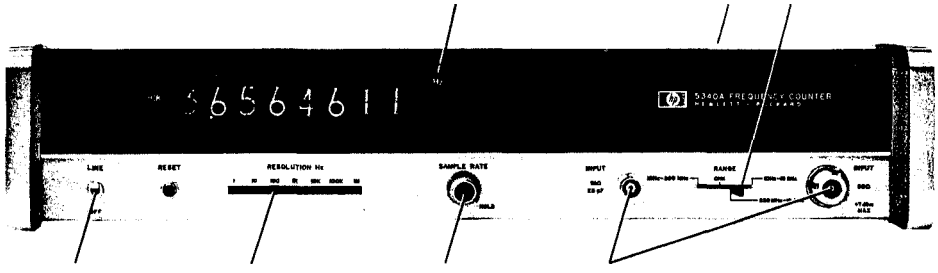
5.

6.

7.

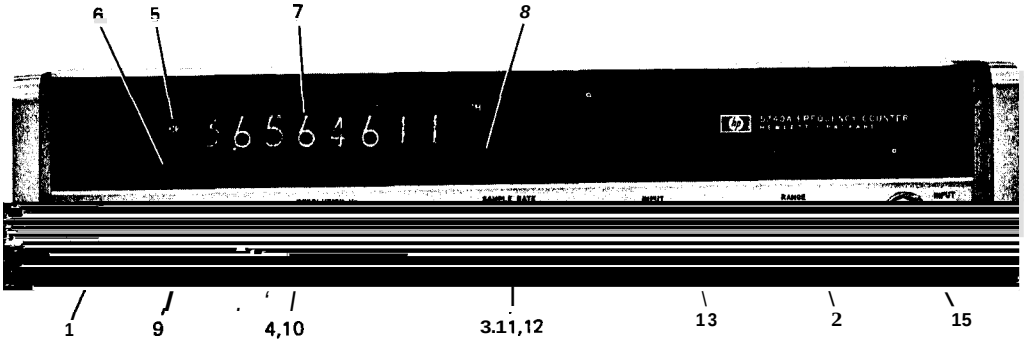
8.

9.


3656461 1
5340A FREQUENCY COUNTER
LINE
RESET
RESOLUTION Hz
SAMPLE RATE
HOLD
INPUT
RANGE
INPUT

CAUTION

Figure **3-6.** Self Check and Operational Check Procedures



1. Set LINE switch to on (up) position.
2. Set RANGE switch to CHK position.
3. Rotate SAMPLE RATE control fully ccw.
4. Set RESOLUTION switch to 1 Hz.
5. Check that DIR annunciator lights.
6. Check that GATE light flashes.
7. Check that display indicates 10.000000 ±1 count.
8. Check that MHz
9.
10.

Figure 3-6. Self Check and Operational Check Procedures (Continued)

11. For the 1 MHz RESOLUTION setting, check that GATE light flashes rapidly. Rotate SAMPLE RATE control fully clockwise but not in HOLD. Gate light should flash once approximately every 5 seconds.

12. Set SAMPLE RATE to HOLD and check that GATE light goes out and display is held indefinitely.

13. Connect a 220 MHz signal at 0 dBm (0.2236 volts rms)

14.

15.

16.

17.

18.

19.

SECTION IV

THEORY OF OPERATION

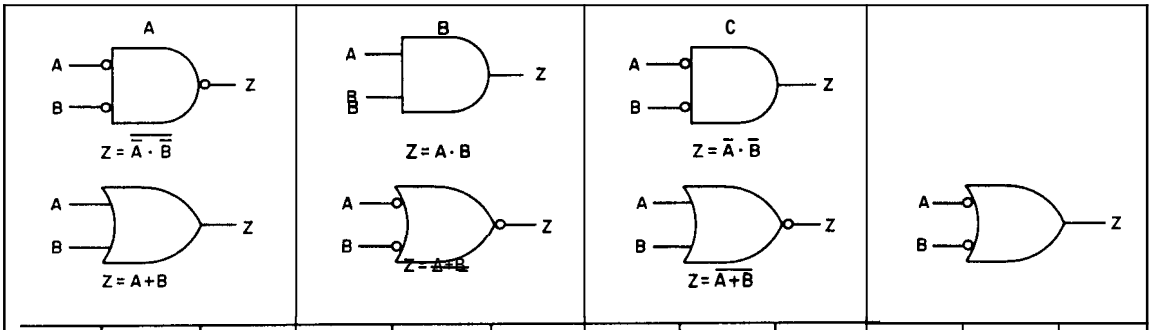
4-1. INTRODUCTION

4-2. This section describes the individual logic elements, overall counter operation, and theory of operation for each printed circuit assembly. The overall counter theory starts in Paragraph **4-103.** The theory for each pc board starts in Paragraph **4-137.**

4-3. LOGIC ELEMENTS

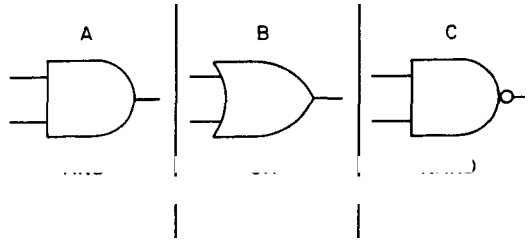
4-4. Two states exist in the binary system, **1** and 0. HIGH (H) and LOW (L) are used to represent the levels of **1** and 0. HIGH always represents the more positive level, whether it be positive or negative logic. Figure **4-1** shows four pairs of logic symbols that have the same truth tables and can be used interchangeably. The same function is performed by what appears to be two different logic symbols.

Figue **4-1.** Logic Comparison Diagrams



A	B	Z	A	B	Z	A			A	B	Z
L	L	L	L	L	L	L	L	H	L	L	H
L	H	H	L	H	L	L	H	L	L	H	H
H	L	H	H	L	L	H	L	L	H	L	H
H	H	H	H	H	H	H	H	L	H	H	L

IV


A
B
C

4-7. 5340A INTEGRATED CIRCUITS — THEORY OF OPERATION

4-8. The 5340A uses 70 different types of integrated circuits. Twenty-two of these are basic logic gates described in Paragraph **4-3.** The following paragraphs describe the integrated circuits used in the 5340A other than the basic logic types.

4-9. 256-Bit Read-Only-Memories 1816-0003,1816-0004,1816-0184, and 1816-0185

4-10. A read-only-memory is a device that allows storage of pre-programmed data for later retrieval. The **1816** series of ROM's are 16-pin dual in-line

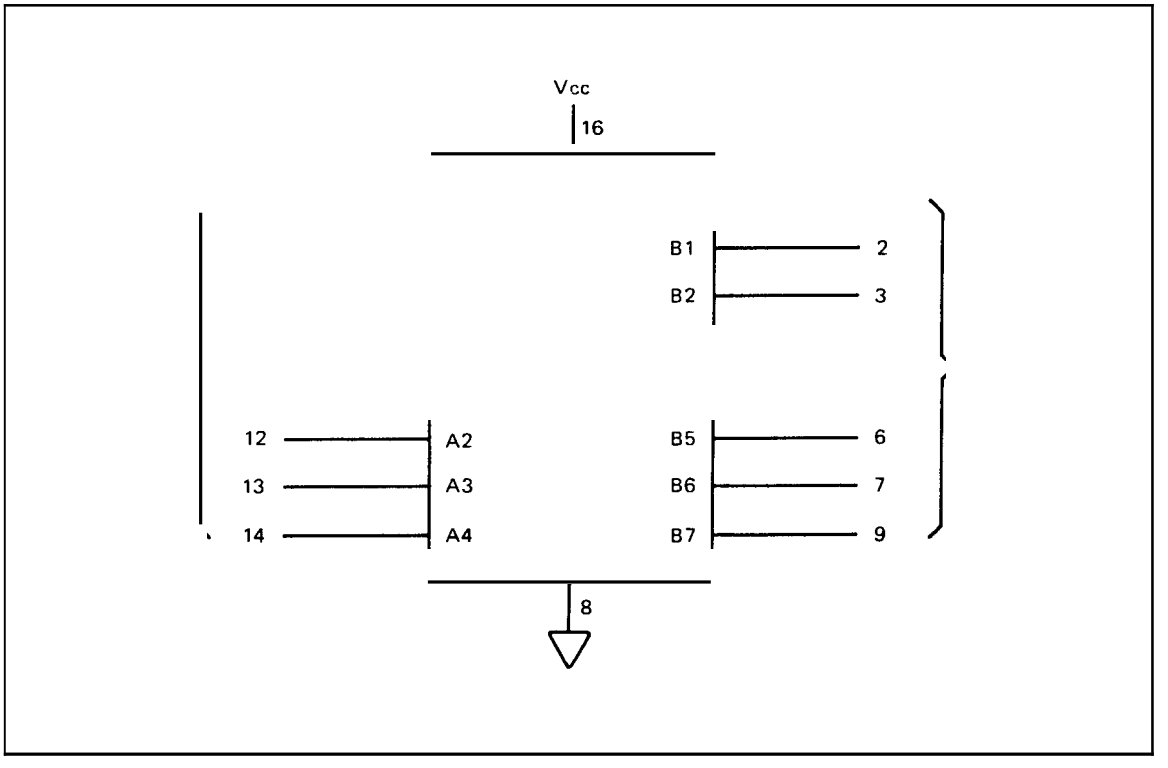
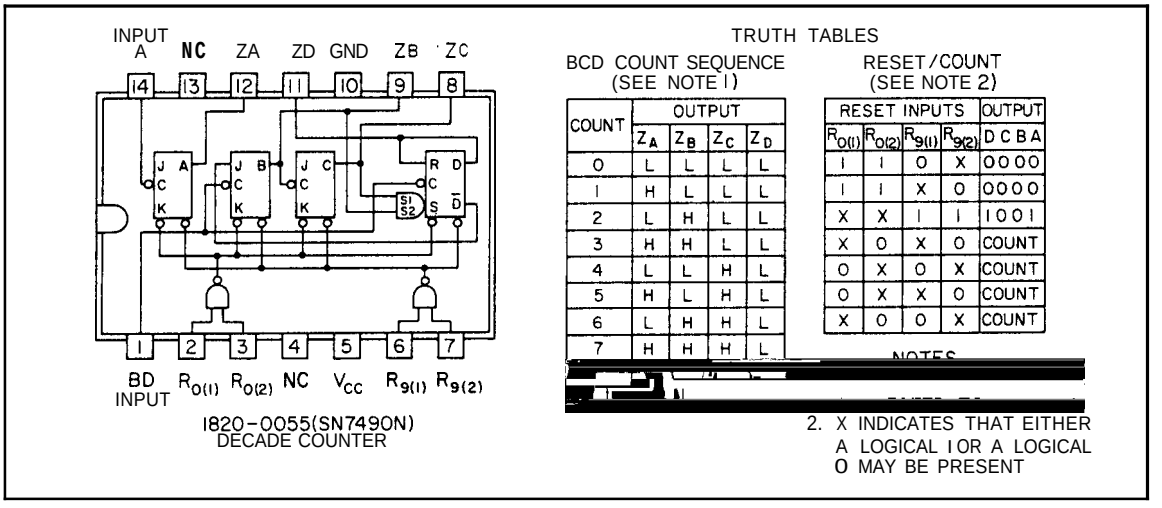


Figure 4-4. Decade Counter 1820-0055



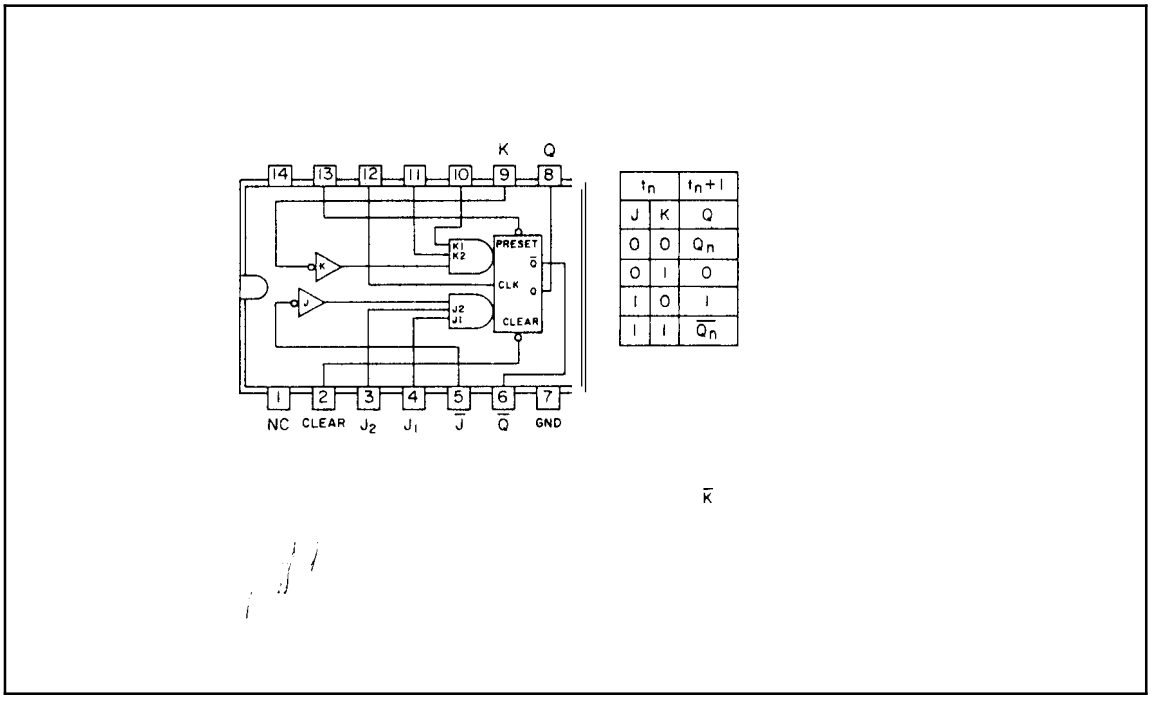
COUNT	OUTPUT			
	Z_A	Z_B	Z_C	Z_D
0	L	L	L	L
1	H	L	L	L
2	L	H	L	L
3	H	H	L	L
4	L	L	H	L
5	H	L	H	L
6	L	H	H	L
7	H	H	H	L

RESET INPUTS				OUTPUT
$R_{0(1)}$	$R_{0(2)}$	$R_{9(1)}$	$R_{9(2)}$	D C B A
1	1	0	X	0 0 0 0
1	1	X	0	0 0 0 0
X	X	1	1	1 0 0 1
X	0	X	0	COUNT
0	X	0	X	COUNT
0	X	X	0	COUNT
X	0	0	X	COUNT

4-15. J-K Flip-Flop 1820-0065

4-16. Figure 4-5 shows the logic diagram, outline drawing, and truth table for the 1820-0065 J-K flip-flop. The flip-flop is an edge-triggered type having direct clear and preset inputs. Input information will transfer to the outputs on tzansfer

IV



t_n		t_{n+1}
J	K	Q
0	0	Q_n
0	1	0
1	0	1
1	1	$\overline{Q_n}$

$\bar{Q}$

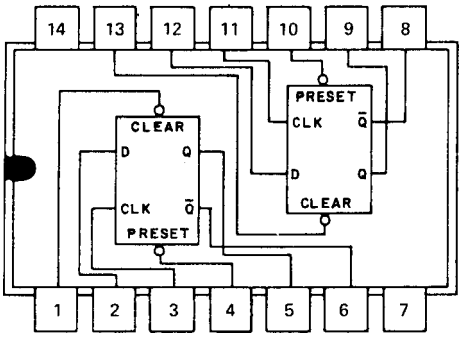
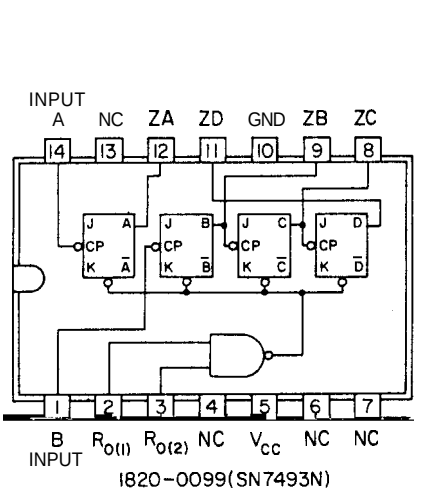

14
13
12
11
10
9
8
PRESET
CLK
$\bar{Q}$
D
Q
CLEAR
CLEAR
D
Q
CLK
$\bar{Q}$
PRESET
1
2
3
4
5
6
7

Figure 4-7. Four-Bit Binary Counter 1820-0099



(SEE NOTES 1&2)

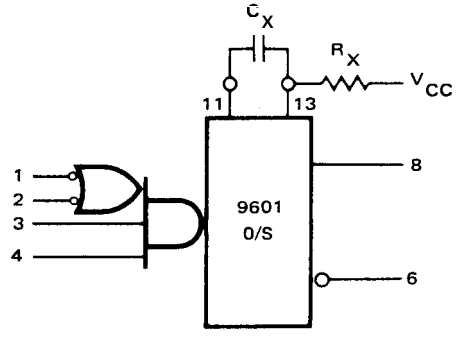
COUNT	OUTPUT			
	Z_D	Z_C	Z_B	Z_A
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H
10	H	L	H	L
11	H	L	H	H
12	H	H	L	L
13	H	H	L	H
14	H	H	H	L
15	H	H	H	H

NOTES

1. OUTPUT A CONNECTED TO INPUT B
2. TO RESET ALL OUTPUTS TO LOGICAL 0 BOTH $R_{0(1)}$ AND $R_{0(2)}$ INPUTS MUST BE AT LOGICAL 1
3. POSITIVE LOGIC: SEE TRUTH TABLE

IV

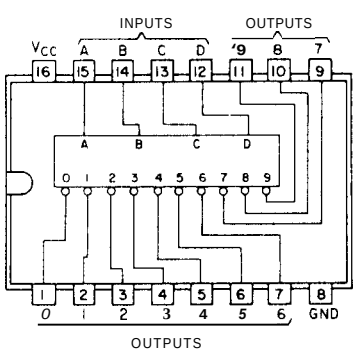
Figure 4-8. Monostable Multivibrator 1820-0207



4-23. Four-Line to Ten-Line Decoder 1820-0214

4-24. The 1820-0214 decoder (Figure 4-9) consists of eight inverters and 10 four-input NAND gates. As shown in the truth table, the unit accepts BCD inputs and provides the equivalent decimal output. The activiated output will be a logic low. For example, if the BCD input is DCBA = 0111, then the decimal 7 output will go low and all others will be high.

Figure 4-9. Four-Line to Ten-Line Decoder 1820-0214



TRUTH TABLE

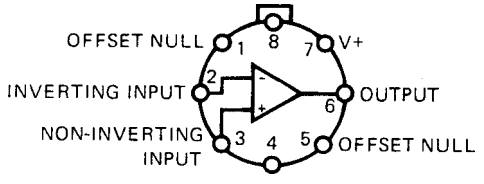
BCD INPUT				DECIMAL OUTPUT									
D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	1	1	0	1	1	1	1	1	1	1	1
0	0	1	0	1	1	0	1	1	1	1	1	1	1
0	0	1	1	1	1	1	0	1	1	1	1	1	1
0	1	0	0	1	1	1	1	0	1	1	1	1	1
0	1	0	1	1	1	1	1	1	0	1	1	1	1
0	1	1	0	1	1	1	1	1	1	0	1	1	1
0	1	1	1	1	1	1	1	1	1	1	0	1	1
1	0	0	0	1	1	1	1	1	1	1	1	0	1
1	0	0	1	1	1	1	1	1	1	1	1	1	0
1	0	1	0	1	1	1	1	1	1	1	1	1	1
1	0	1	1	1	1	1	1	1	1	1	1	1	1
1	1	0	0	1	1	1	1	1	1	1	1	1	1

IV

4-25. Operational Amplifier 1820-0216

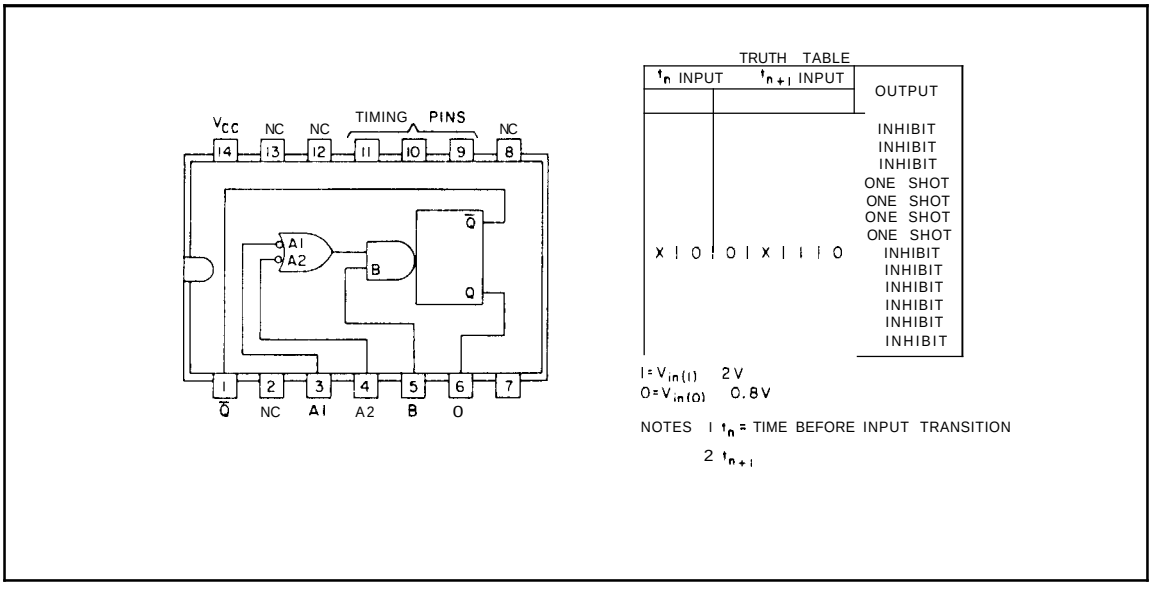
4-26. Figure **4-10** shows the diagram for the operational amplifier. Operational amplifiers are so named because they perform a mathematical operation in a circuit. The type of operation is determined by the feedback network. In the 5340A, this IC is used in a dc stabilizing feedback network on A17.

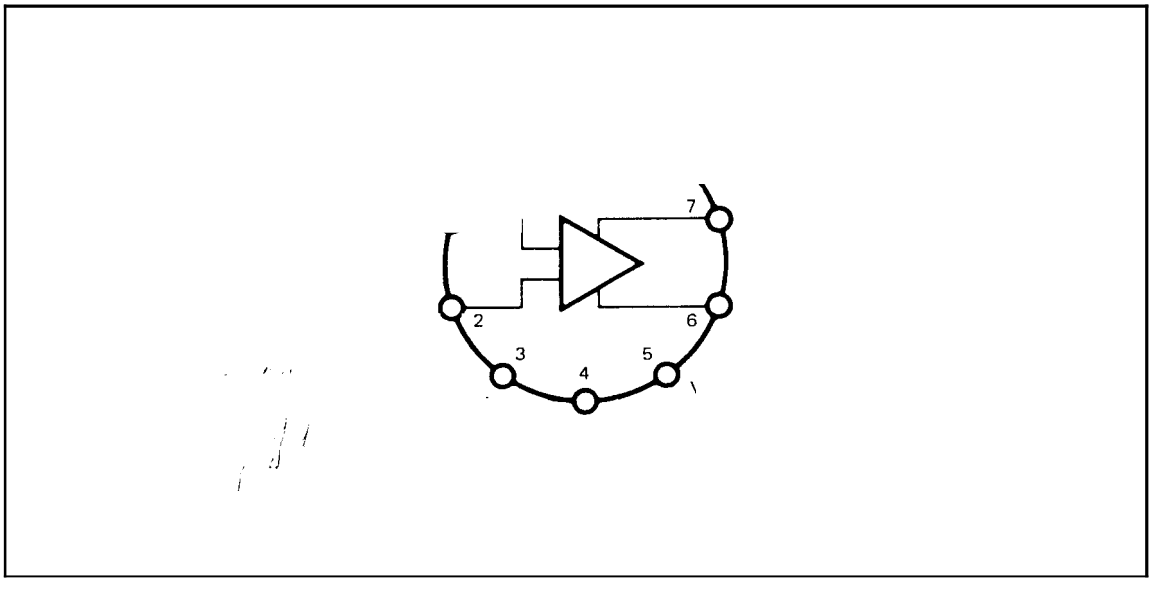
Figure 4-



circuit time constants. An internal timing resistor is available by connecting Vcc (pin **14)** to pin **9,** also an external resistor may be used between these two pins. The external timing capacitor connects between pins **10** and 11. The output pulse duration is determined by the RC time constant of the timing components. The truth table shows the logic states that result in a one-shot output. When the multivibrator fires, the outputs are independent of further input transitions and are dependent only on the timing components.

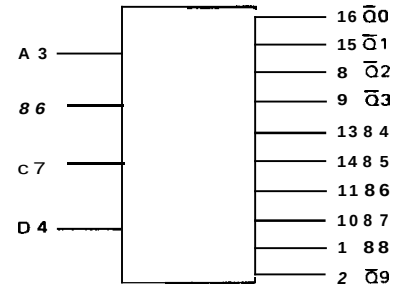
Figure **4-11.** Monostable Multivibrator **1820-0261**





IV

Figure **4-14.** BCD to Decimal Decoder **1820-0426**

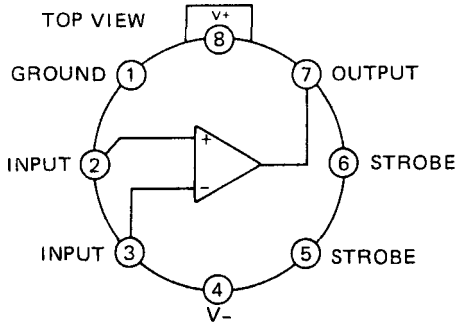


Input Loading Factor = 1
Total Power Dissipation = 105 mW typ/pkg

TRUTH TABLE

INPUT				OUTPUT									
D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	1	1	0	1	1	1	1	1	1	1	1
0	0	1	0	1	1	0	1	1	1	1	1	1	1
0	0	1	1	1	1	1	0	1	1	1	1	1	1
0	1	0	0	1	1	1	1	0	1	1	1	1	1
0	1	0	1	1	1	1	1	1	0	1	1	1	1
0	1	1	0	1	1	1	1	1	1	0	1	1	1
0	1	1	1	1	1	1	1	1	1	1	0	1	1
1	0	0	0	1	1	1	1	1	1	1	1	0	1
1	0	0	1	1	1	1	1	1	1	1	1	1	0

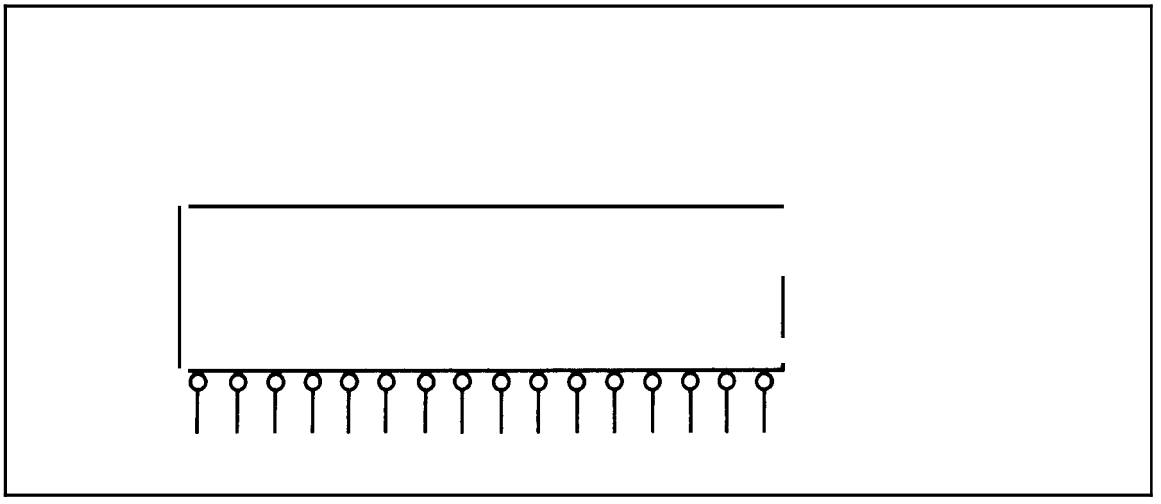
Figure **4-15.** Voltage Comparator/Buffer **1820-0475**

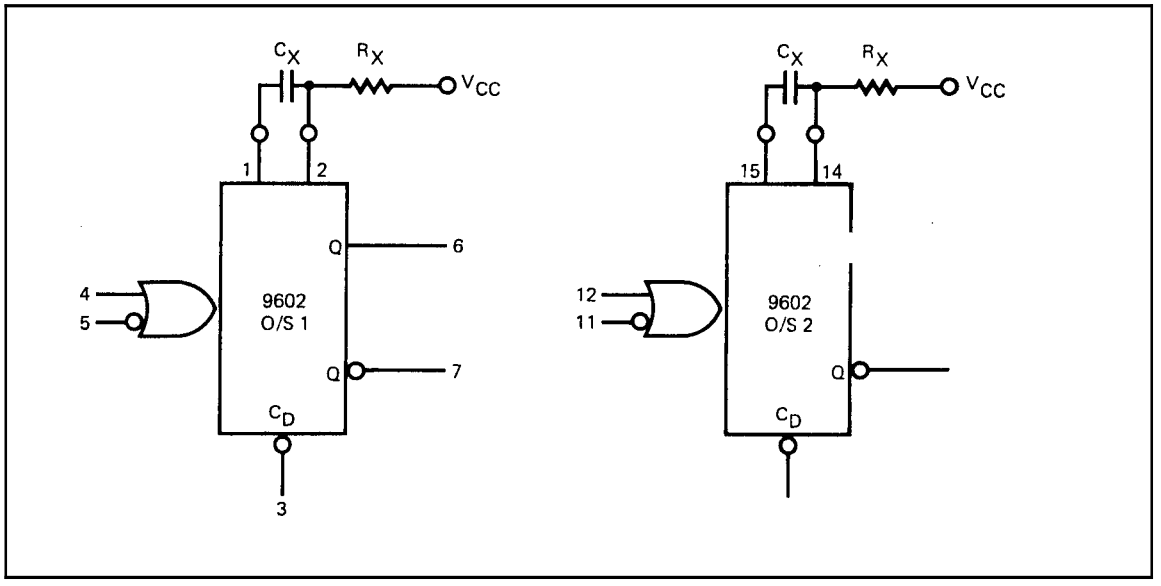


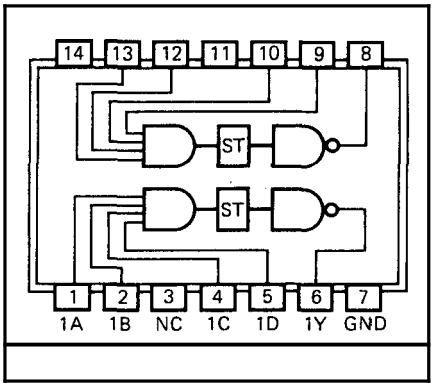
Note: Pin 4 connected to case.

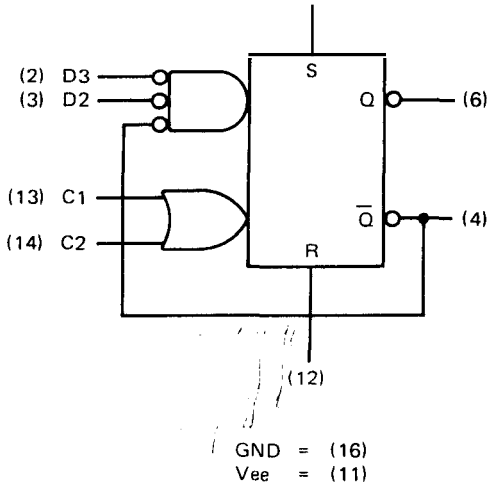
IV

4-37. Binary




C_X
R_X
V_{CC}
1
2
Q
6
4
5
9602
O/S 1
Q
7
C_D
3
C_X
R_X
V_{CC}
15
14
12
11
9602
O/S 2
Q
C_D





D2	D3	Qn+1
L	L	$\overline{Qn}$
H	X	H
X	H	X

S	R	Q
H	L	L
L	H	H
H	H	L
L	L	No Change

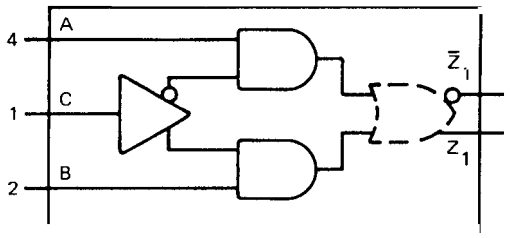
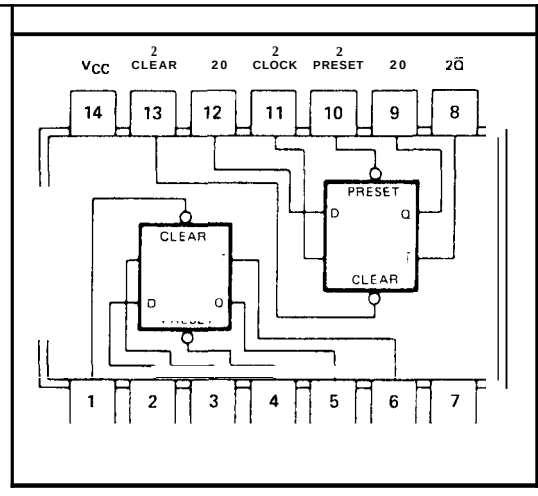

4
A
1
C
2
B
$\overline{Z}_1$
Z_1

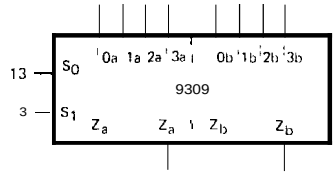
Figure 4-21. **Dual D-Type Edge Trigger Flip-Flops** 1820-0596

TRUTH TABLE (Each Flip-Flop)

t_n	t_{n+1}	
INPUT	OUTPUTS	
D	Q	$\bar{Q}$
L	L	H
H	H	L

NOTES: A. t_n = bit time before clock pulse.
B. t_{n+1} = bit time after clock pulse.





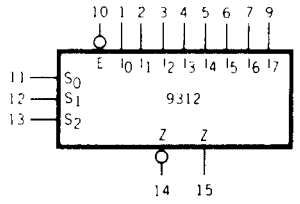
V_{CC} = Pin 16
GND = Pin 8

			I_{2a}	I_{3a}	
			X	X	
L	H		X	X	
L	X		X	X	
L	X		X	X	
H	X		L	X	
H	X		H	X	
H	X		X	L	
H	X		X	H	
S_1	I_{0b}		I_{2b}		
			X		
			X		
			X		
			X		
			L		
			H		
			X		
			X		

4–51. Eight-Input Multiplexer 1820-0615

4–52. The 1820-0615 (Figure 4–23) selects one-bit of output data from eight inputs. The unit has complementary outputs, and an enable input (low activates the multiplexer). With the enable line inactive, the multiplexer output (Z) is low and the complementary output ($\overline{Z}$) is high regardless of the input states. The logic operation is shown in the truth table.

Figure 4–23. Eight-Input Multiplexer 1820-0615



V_{CC} = Pin 16
GND = Pin 8

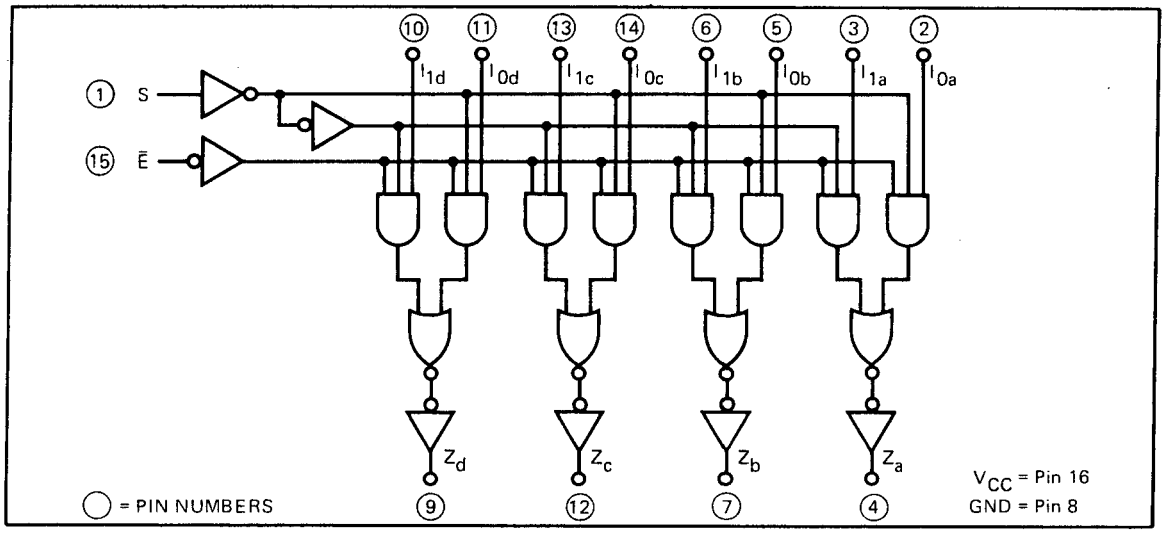
TRUTH TABLE

$\overline{E}$	S_2	S_1	S_0	I_0	I_1	I_2	I_3	I_4	I_5	I_6	I_7	$\overline{Z}$	Z
H	X	X	X	X	X	X	X	X	X	X	X	H	L
L	L	L	L	L	X	X	X	X	X	X	X	H	L
L	L	L	L	H	X	X	X	X	X	X	X	L	H
L	L	L	H	X	L	X	X	X	X	X	X	H	L
L	L	L	H	X	H	X	X	X	X	X	X	L	H
L	L	H	L	X	X	L	X	X	X	X	X	H	L
L	L	H	L	X	X	H	X	X	X	X	X	L	H
L	L	H	H	X	X	X	L	X	X	X	X	H	L
L	L	H	H	X	X	X	H	X	X	X	X	L	H
L	H	L	L	X	X	X	X	L	X	X	X	H	L
L	H	L	L	X	X	X	X	H	X	X	X	L	H
L	H	L	H	X	X	X	X	X	L	X	X	H	L
L	H	L	H	X	X	X	X	X	H	X	X	L	H
L	H	H	L	X	X	X	X	X	X	L	X	H	L
L	H	H	L	X	X	X	X	X	X	H	X	L	H
L	H	H	H	X	X	X	X	X	X	X	L	H	L
L	H	H	H	X	X	X	X	X	X	X	H	L	H

H = HIGH voltage level
L = LOW voltage level
X = Level does not affect output.

4–53. o2]TJ 05.2502 0 0 9.875 84329999 678.3202 Tm (-)Tj 10.375 0 0 9.875 814.72086678.3202 Tm (-nput)Tj 00.

Figure 4-24. Quad 2-Input Multiplexer 1820-0616

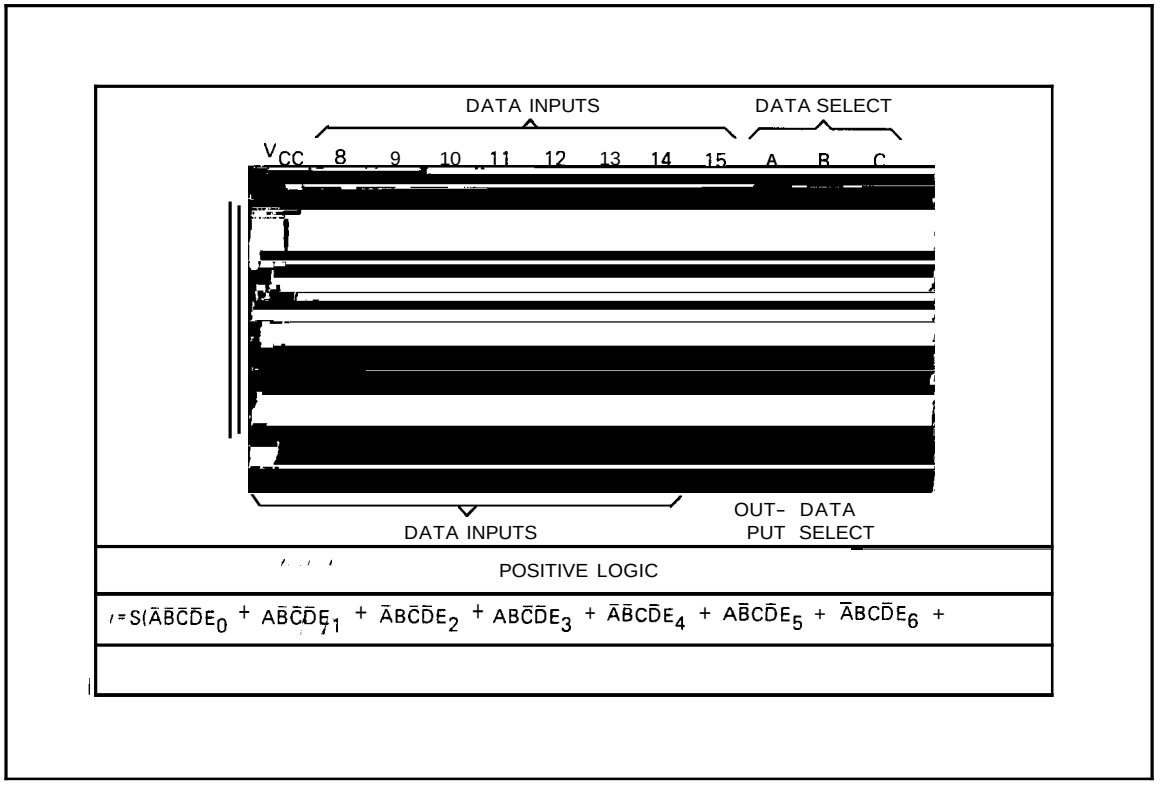


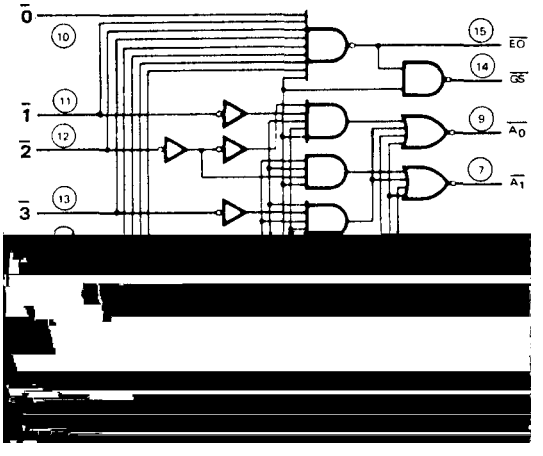
4-55. Data Selectors/Multiplexers 1820-0640

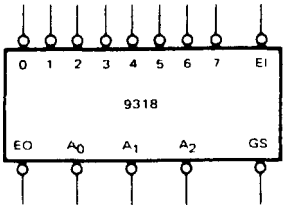
4-56. This IC (Figure 4-25) selects 1 of 16 data sources and can be used for parallel-to-serial conversion, multiplexing, or as a five-variable function generator. Four data select lines are used to select which input is routed to the output. The select lines perform binary decoding. When the strobe input is driven low, the multiplexers are enabled. The truth table shows the logic requirements of the multiplexers. For example, when the strobe is low, and the data select lines are **ABC̄D̄,** then input **E3** is gated to the output W line.

IV

Figure 4-25. Data Selectors/Multiplexers 1820-0640



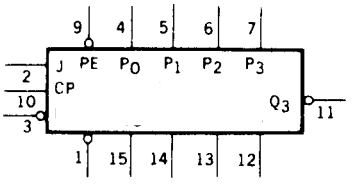

0
10
1
11
2
12
3
13
15
EO
14
GS
9
A0
7
A1

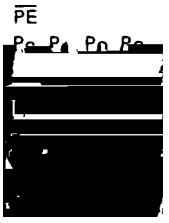

0 1 2 3 4 5 6 7 EI
9318
EO A0 A1 A2 GS

4–59. Low–Power 4–Bit Shift Register 1820–0659

4–60. Figure 4–27 shows the logic diagram and pin connections for the 1.08 1.71BT 2cQ BT4ic 0 Tr 9.75 0 0 9.87

$\overline{K}$ $\overline{K}$





IV

	Q_0 at t_{n+1}

D-Input (P_0, P_1, P_2 or P_3)	

	Q_0 at t_{n+1}
L H	L H

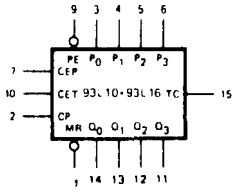
	$\overline{PE}$	P_0	P_1	P_2	P_3	J $\overline{K}$	$\overline{MR}$
	H	X	X	X	X	Refer to	H

4-61. Low-Power BCD Decade Counter 1820-0669

4-62. Figure **4-28** shows the logic diagram and pin connections for the **1820-0669.** The counter is fully synchronous with the clock pulse driving four master/slave flip-flops in parallel through a clock buffer. During the low to high clock transition, the master is inhibited from further change. After the masters are locked out, data is transferred from the master to the slaves and reflected at the outputs. When the clock is high, the masters are inhibited and the

Figure 4-28. Low-Power BCD Decade Counter 1820-0669

LOGIC SYMBOL



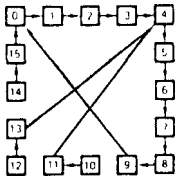
V_{CC} = Pin 16
GND = Pin 8

PIN NAMES

$\overline{PE}$	Parallel Enable (Active LOW) Input
P_0, P_1, P_2, P_3	Parallel Inputs
CEP	Count Enable Parallel Input
CET	Count Enable Trickle Input
$\overline{CP}$	Clock (Active HIGH Going Edge) Input
$\overline{MR}$	Master Reset (Active LOW) Input
Q_0, Q_1, Q_2, Q_3	Parallel Outputs
TC	Terminal Count Outputs

STATE DIAGRAM

93L10



LOGIC EQUATIONS
Count Enable = CEP . CET . PE
TC for 93L10 = CET $\cdot Q_0 \cdot \overline{Q_1} \cdot \overline{Q_2} \cdot Q_3$
TC for 93L16 = CET $\cdot Q_0 \cdot Q_1 \cdot Q_2 \cdot Q_3$
Preset = $\overline{PE}$. CP+ (rising clock edge)
Reset =

NOTE
The 931.10 can be preset to any state. bur will not count beyond 9 If preset to state 10, 11, 12, 13, 14, or 15. it will return to its normal sequence within two clock pulses

93L10 AND 93L16
MODE SELECTION

$\overline{PE}$	CEP	CET	MODE
L	L	L	Preset
L	L	H	Preset
L	H	L	Preset
L	H	H	Preset
H	L	L	No Change
H	L	H	No Change
H	H	L	No Change
H	H	H	Count

($\overline{MR}$ = HIGH)

TERMINAL COUNT GENERATION

CET	93L10 $(Q_0 \cdot \overline{Q_1} \cdot \overline{Q_2} \cdot Q_3)$	93L16 $(Q_0 \cdot Q_1 \cdot Q_2 \cdot Q_3)$	TC
L	L	L	L
L	H	H	L
H	L	L	L
H	H	H	H

TC = CET $\cdot Q_0 \cdot \overline{Q_1} \cdot \overline{Q_2} \cdot Q_3$ (93L10)
TC = CET $\cdot Q_0 \cdot Q_1 \cdot Q_2 \cdot Q_3$ (93L16)

POSITIVE LOGIC = H = HIGH Voltage Level
L = LOW Voltage Level

IV

4-69. Synchronous Four-Bit Counter 1820-0716

4-70. This IC (Figure **4-31)** is a high-speed, synchronous, presettable, four-bit binary counter using an internal carry ahead circuit. The carry ahead circuitry provides for cascading counters for n-bit synchronous configurations without additional gating. Synchronous operation is achieved by clocking all flip-flops simultaneously to change all outputs coincidently. **A** buffered clock input triggers the four J-K master-slave flip-flops on the positive rising edge of the clock input. The counters are programmable and maybe preset to either state. Since presetting is synchronous, a low on the load input (pin 9) disables the counter and causes the outputs to agree with the data inputs after the next clock pulse. The clear input is synchronous and a low level at the clear input sets all four of the flip-flops low after the next clock pulse. The carry look-ahead function is accomplished with two count-enable inputs and a carry output. Both count-enable inputs (P and T) must be high to count, and input T is fed forward to enable the carry output. When enabled, the carry output will produce a positive output pulse with a duration approximately equal to the positive portion of the **QA** output. This positive overflow carry pulse can be used to enable successive cascaded stages. High-to-low-level transitions at the enable P or T inputs should occur only when the clock input is high.

Figure **4-31.** Synchronous Four-Bit Counter **1820-0716**

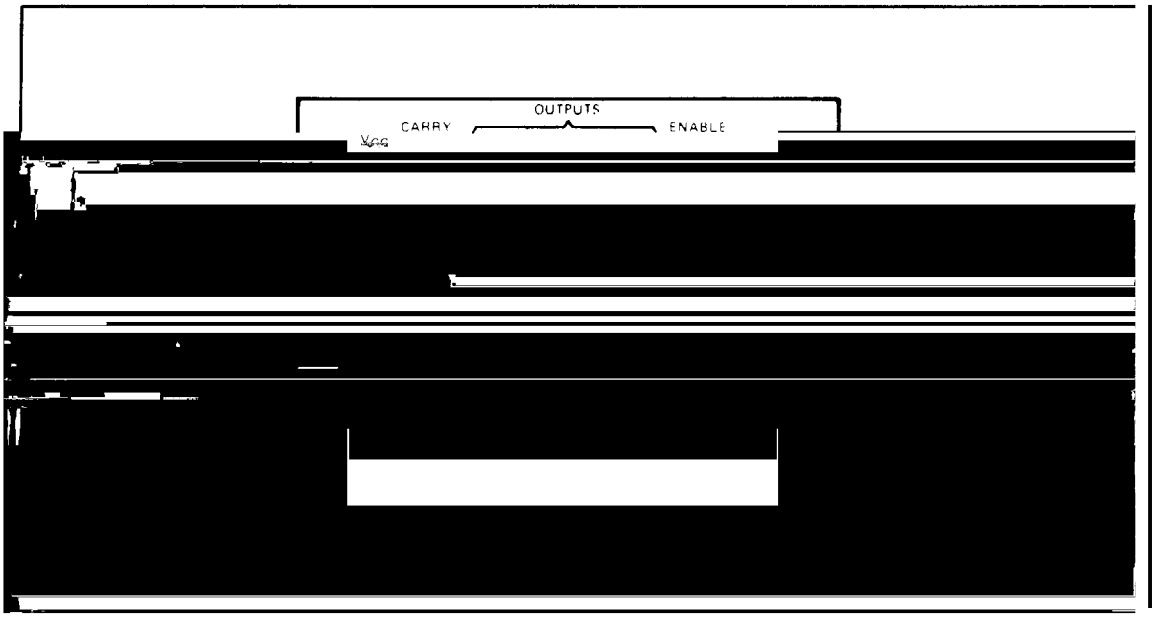
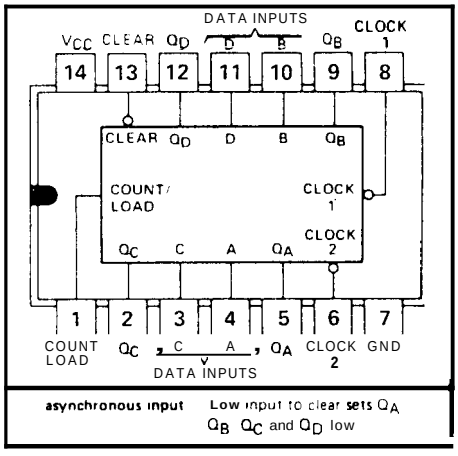
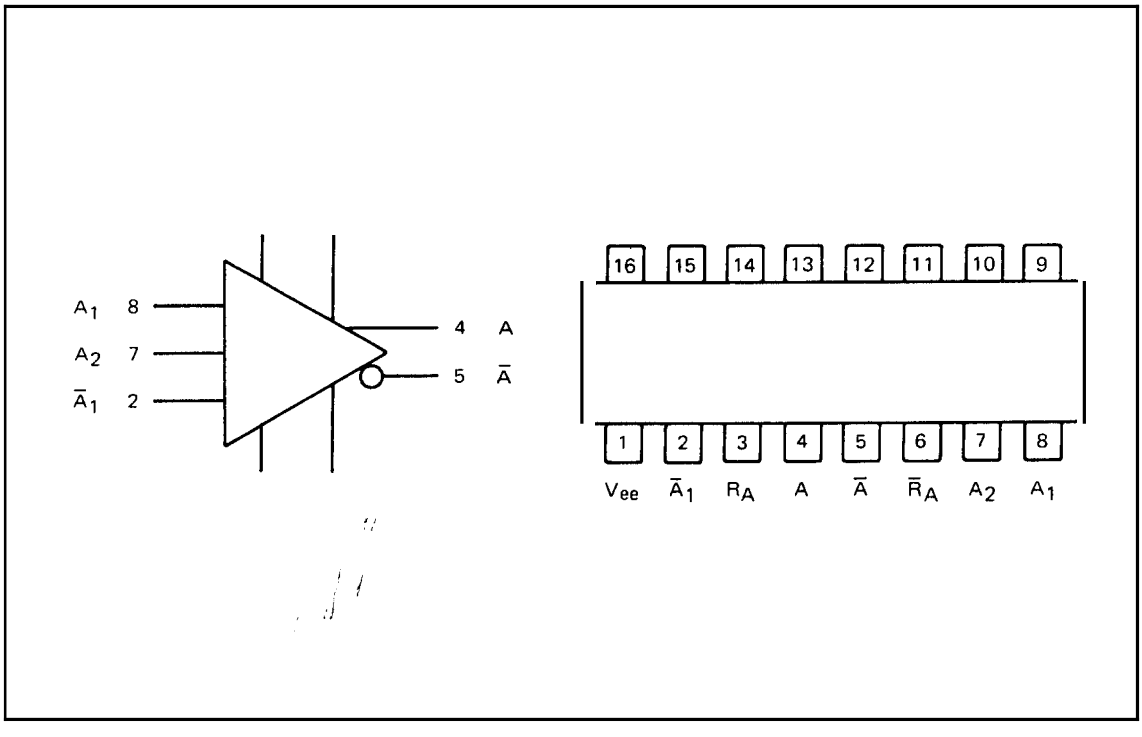


Figure 4-32. Presettable Decade Counter/Latch 1820-0751



4-73. EECL Differential Amplifier/Limiter 1820-0754

4-74. The differential amplifier/limiter (Figure 4-33) can be used for differential or single-ended amplification, balanced to unbalanced transformation or vice-versa, RF to EECL conversion, and Schmitt trigger circuits. The 1820-0754 has



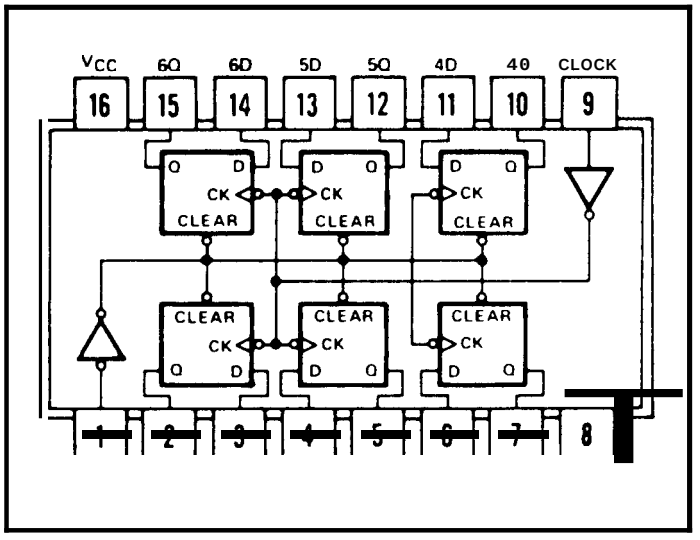
4–75. Presettable Binary Counter/Latch 1820-0765

4–76. The 1820–0765 is similar to the 1820–0751 except that the 1820–0765 has a ÷2 and ÷8 configuration.

4–77. Hex D-Type Flip-Flops 1820-0788

4–78. The 1820–0788 (Figure 4–34) consists of six positive–edge–triggered D flip–flops. Information at the D inputs is transferred to the Q outputs on the positive–going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive–going pulse. When the clock input is at either the high or low level, the D input has no effect on the output. A low input to pin 1 resets all Q outputs to low.

Figure 4–34. Hex D–Type Flip–Flops 1820–0788



Type 1

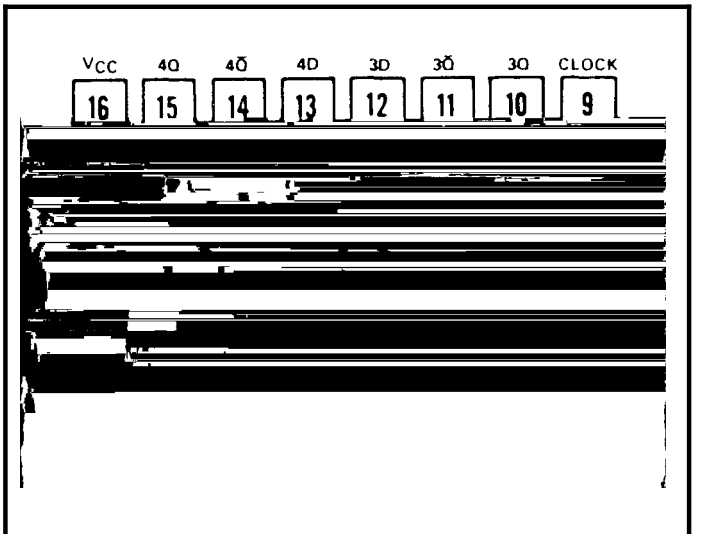
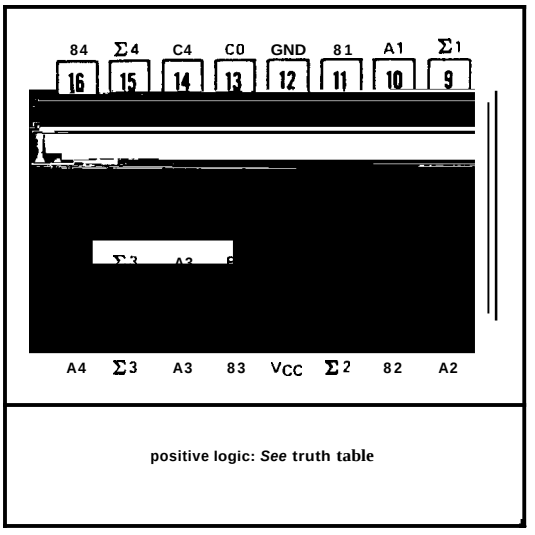
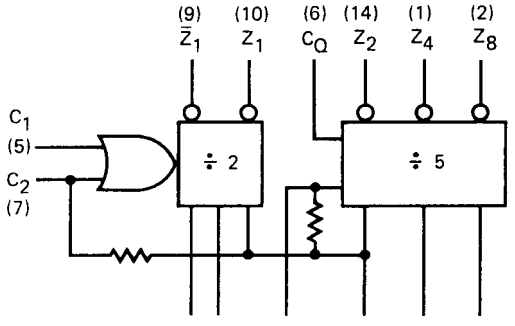

VCC
4Q
4Q̄
4D
3D
3Q̄
3Q
CLOCK
16
15
14
13
12
11
10
9

Figure 4-36. Four-Bit Binary Full Adder 1820-0910



TRUTH TABLE

A1 / A3	B1 / B	A2 / A4	B2 / B4	Σ1 / 23	22 / Σ4	C2 / C4	Σ1 / 23	Σ2 / 24	C2 / C
				WHEN C0 = L		WHEN C2 = L	WHEN C0 = H		WHEN C2 = H
L	L	L	L	L	L	L		L	L
H	L	L	L	H	L	L		H	L
L	H	L	L	H	L	L		H	L
H	H	L	L	L	H	L		H	L
L	L	H	L	L	H	L		H	L
H	L	H	L	H	H	L		L	H
L	H	H	L	H	H	L		L	H
H	H	H	L	L	L	H		L	H
L	L	L	H	L	H	L		H	L
H	L	L	H	H	H	L		L	H
L	H	L	H	H	H	L		L	H
H	H	L	H	L	L	H		L	H
L	L	H	H	L	L	H		L	H
H	L	H	H	H	L	H		H	H
L	H	H	H	H	L	H		H	H
H	H	H	H	L	H	H		H	H



COUNT	RESET LEVEL	
0	H	
1	L	
2	L	
3	L	
4	L	
5	L	
6	L	
	L	
9	L	
0	L	

IV

Model

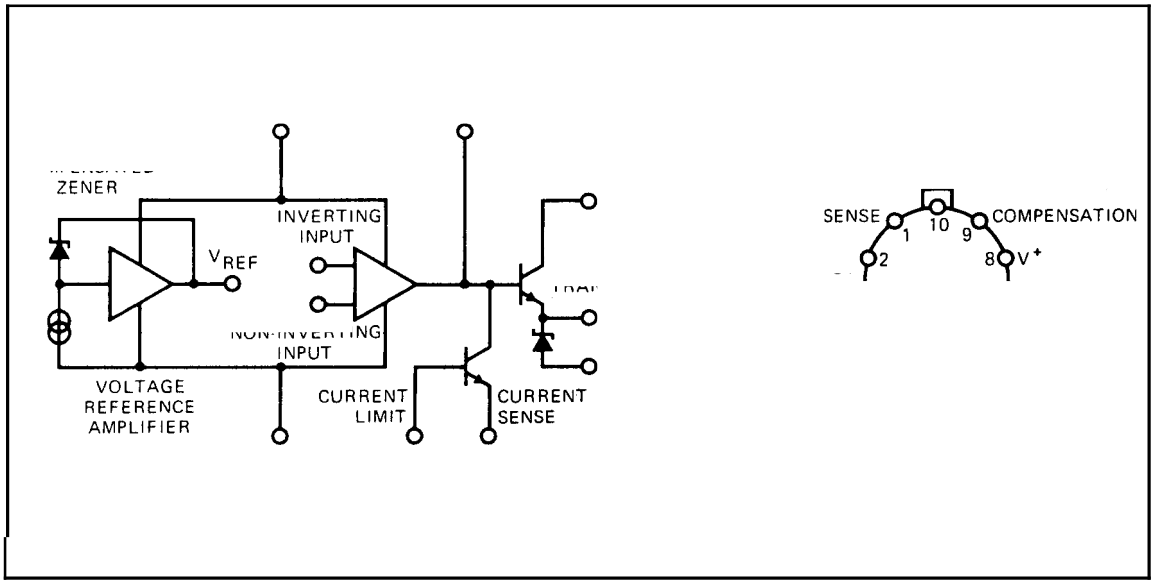

ZENER
INVERTING INPUT
V_{REF}
NON-INVERTING INPUT
VOLTAGE REFERENCE AMPLIFIER
CURRENT LIMIT
CURRENT SENSE
SENSE
1
10
9
COMPENSATION
2
8
V^+

Figure 4-39. Voltage Regulator 1826-0016

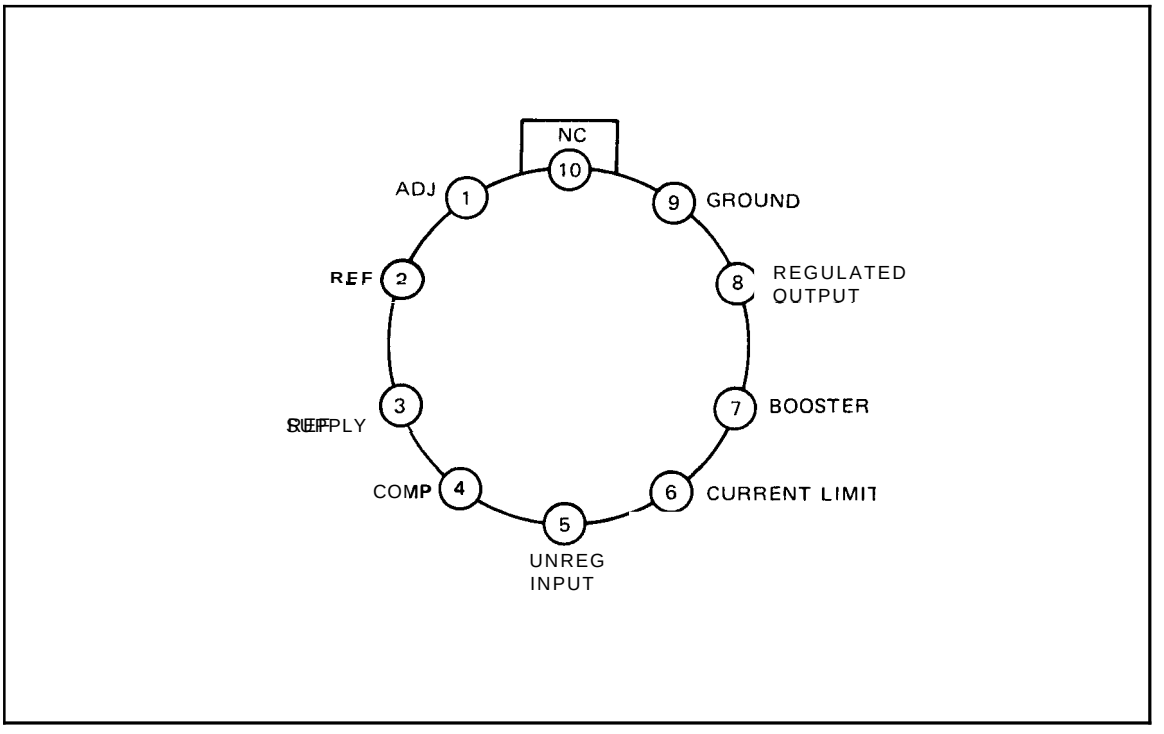
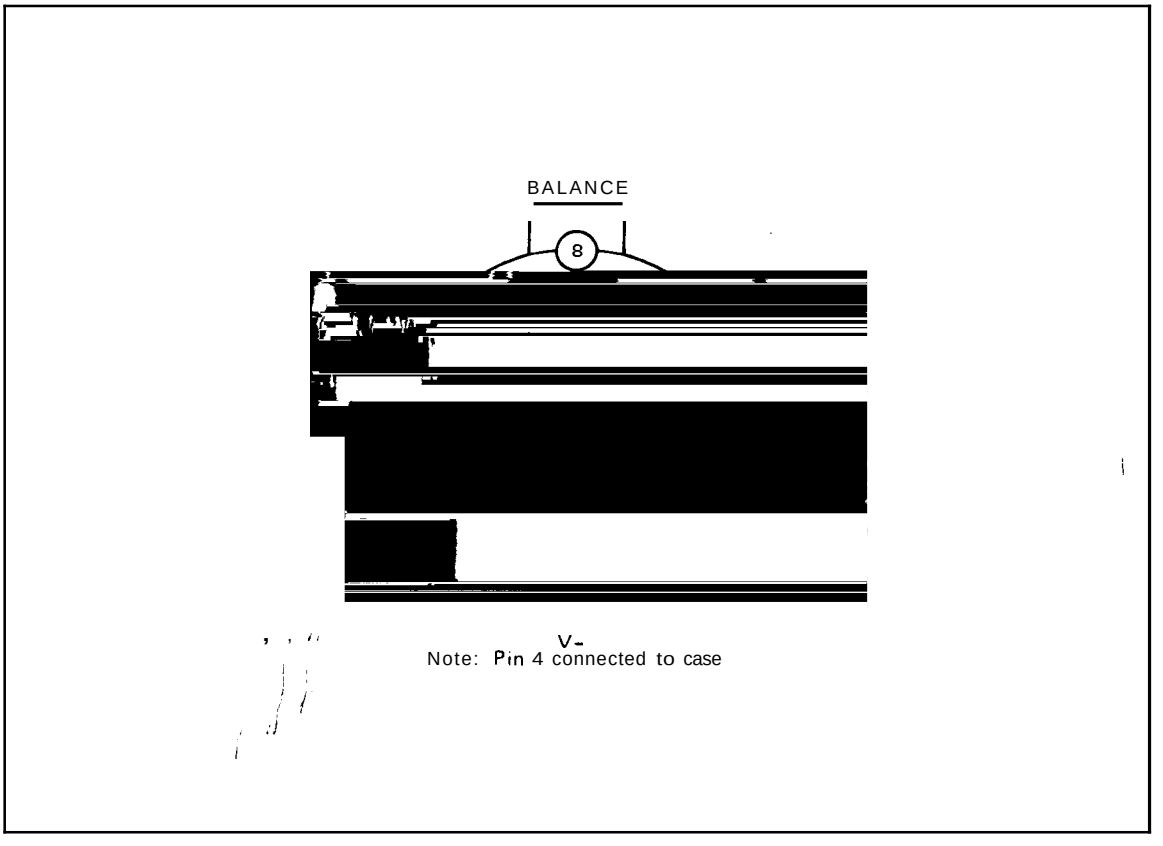
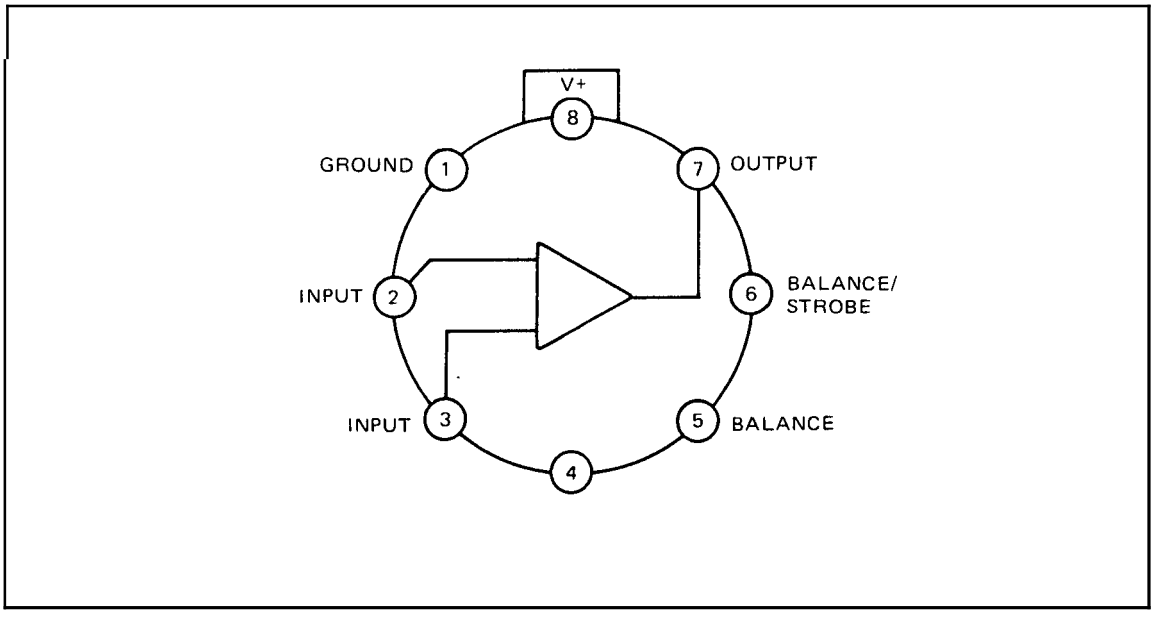
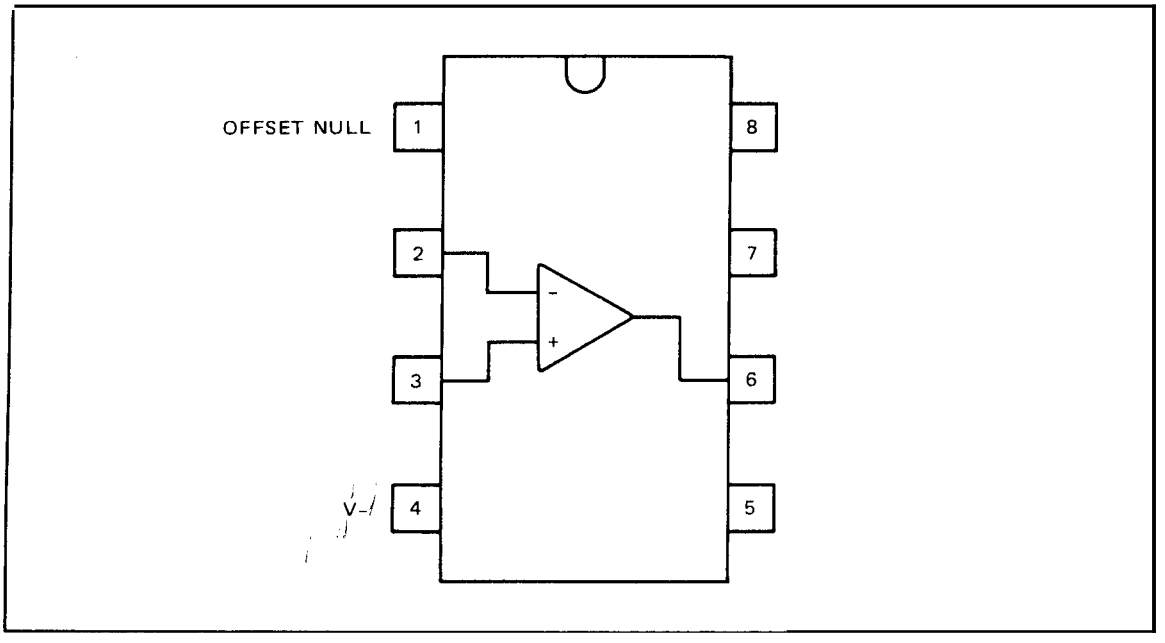


Figure 4-40. Operational Amplifier 1826-0021



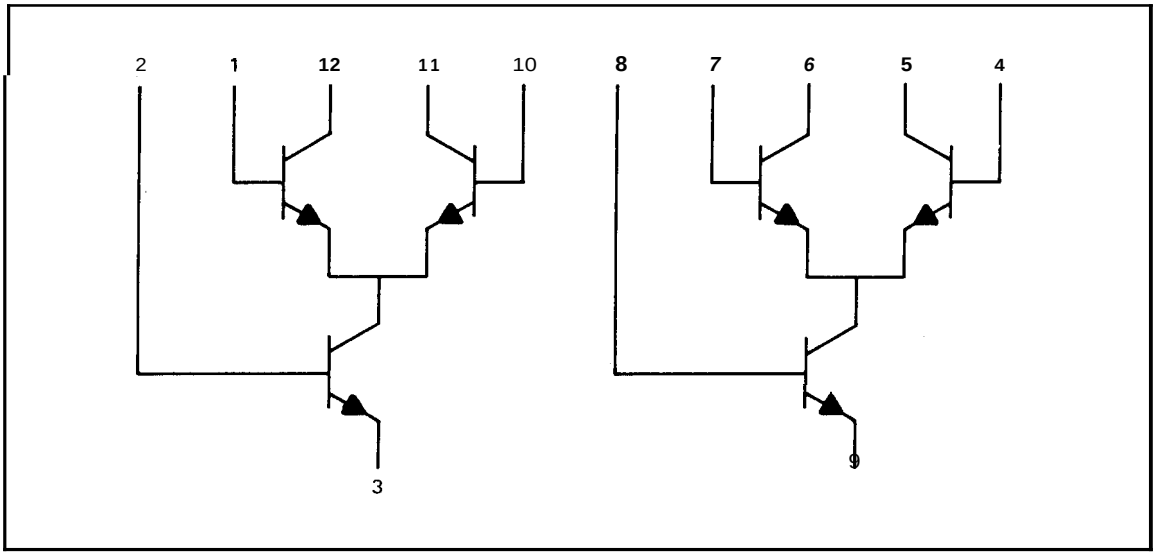

V+
8
GROUND
1
7
OUTPUT
INPUT
2
6
BALANCE/
STROBE
INPUT
3
5
BALANCE
4


OFFSET NULL
1
8
2
7
3
6
V-
4
5

4-99. Dual Differential Amplifier 1858-0004

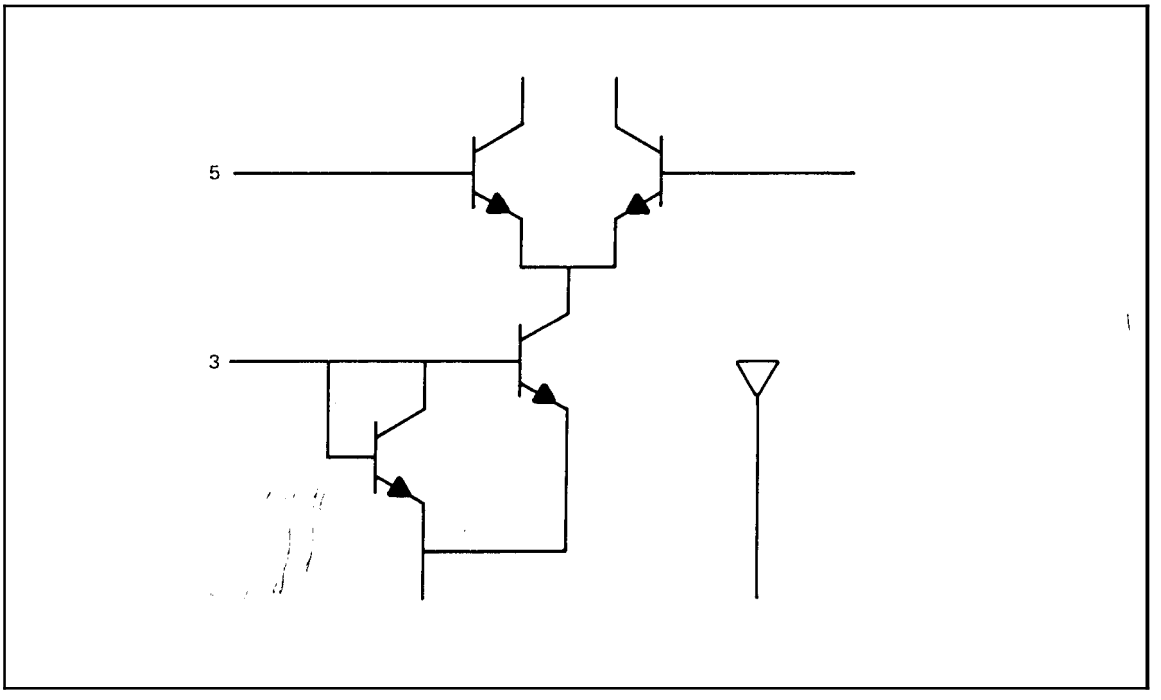
4-100. The 1858-0004 (Figure 4-43) consists of two independent differential amplifiers with associated constant current sources. The six npn transistors are high frequency devices making the IC useful to 500 MHz.

Figure 4-43. Dual Differential Amplifier 1858-0004



4-101. Transistor Array 1858-0018

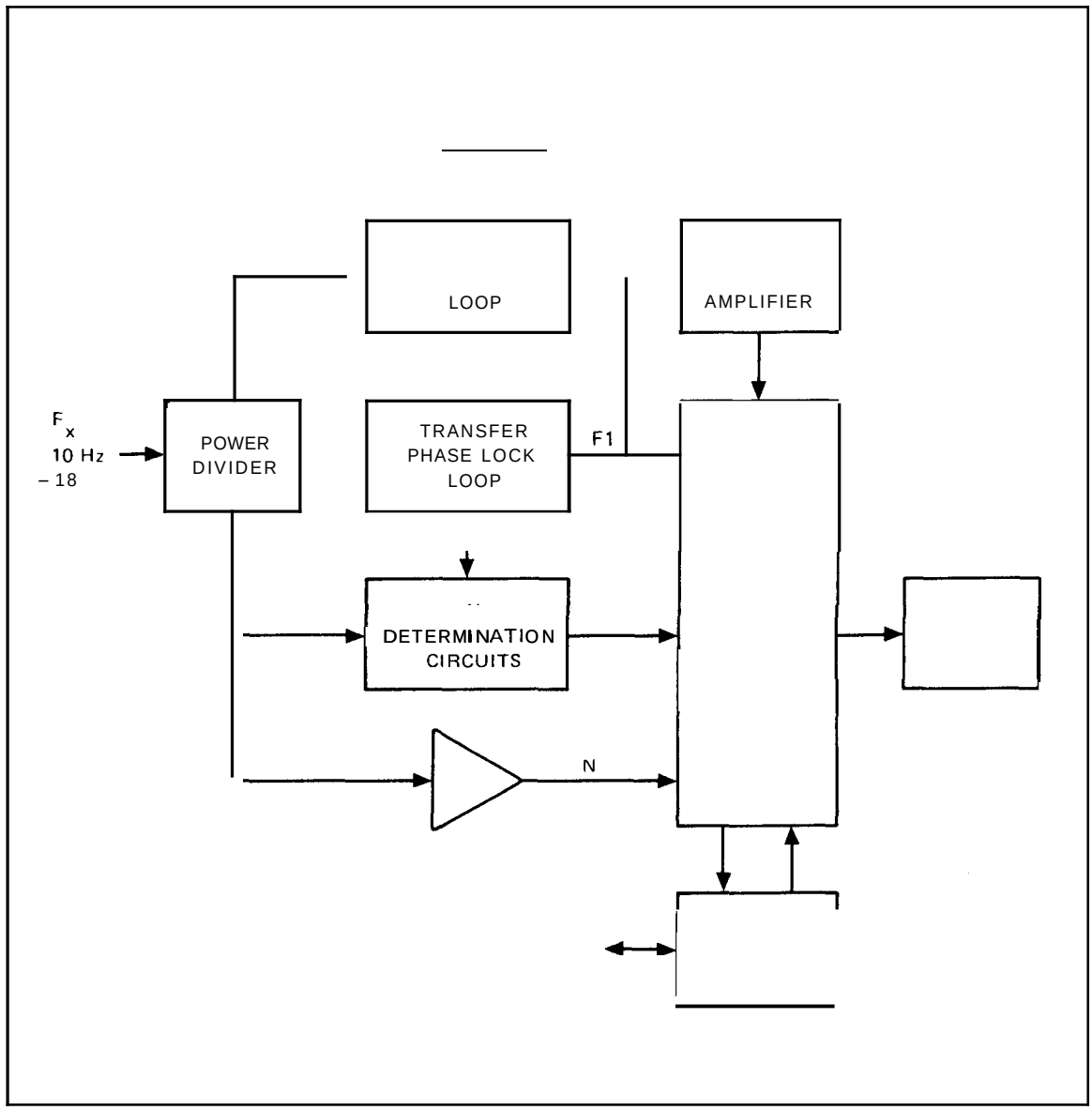
4-102. The 1858-0018 (Figure 4-44) contains four transistors and is used as approximately 1.5 GHz.



4–103. SIMPLIFIED BLOCK DIAGRAM DESCRIPTION

4–104. Figure 4–45 illustrates

Figure **4-45.** Simplified Block Diagram



4–117. Preamplifier board

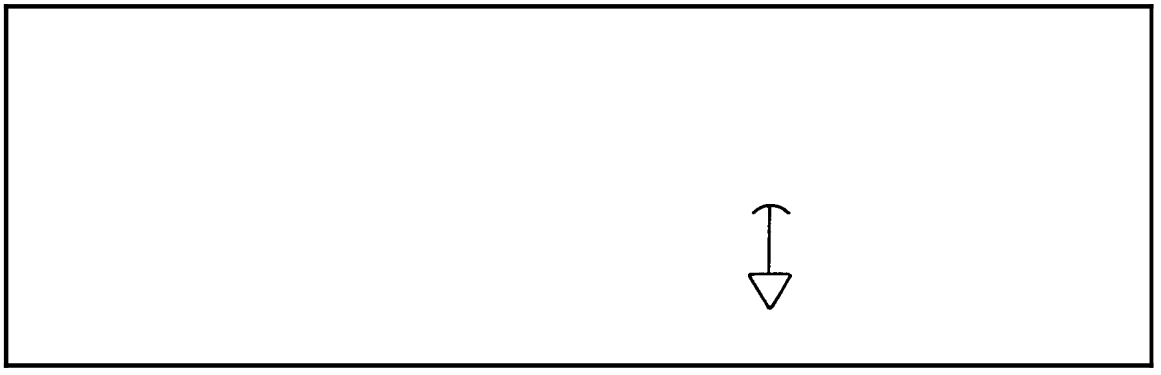
4-124. Harmonic Determination Circuitry

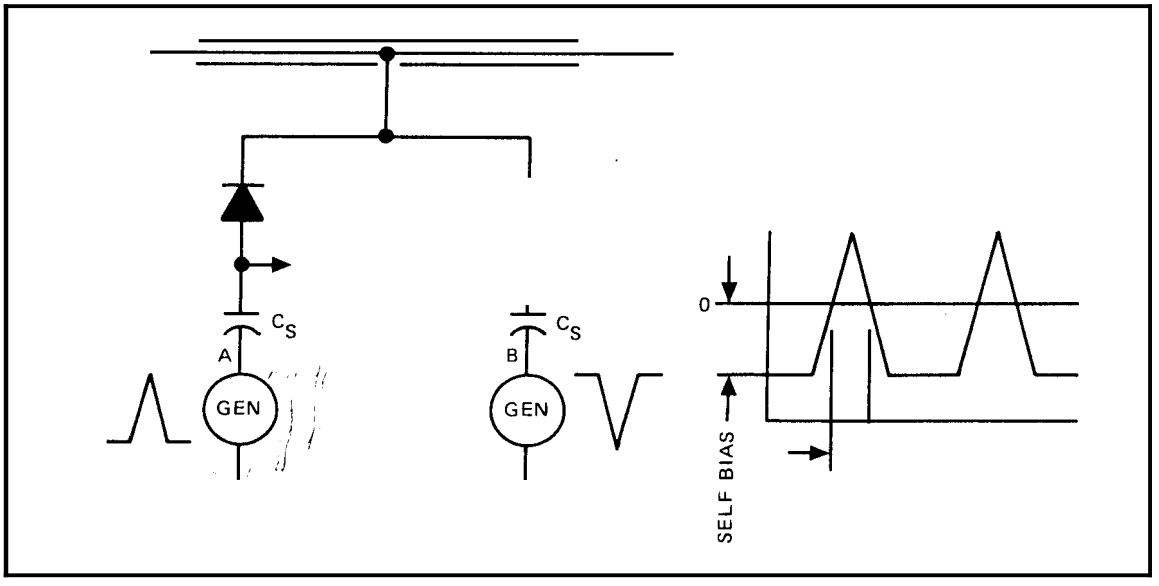
4-125. When sampler No. 2 produces an F_{IF2} output, the bandpass filter and preamp A2A4 provide a 6 MHz bandpass. Limiter amplifier-mixer **A14** receives F_{IF2}, and the 20 MHz reference from **A15.** When 20 MHz is mixed with F_{IF2}, a difference frequency that is equal to N • 20 kHz is produced. The value of N is determined in the counter circuits and used as a gate extension factor.

4-126. SAMPLING THEORY

4-127. Sampling techniques are used for measuring frequencies that are too high to count with direct counting circuits. This method provides an output signal whose frequency is a fraction of the input frequency and low enough to count directly. The 5340A uses a 20 MHz phase lock loop. However for simplicity, a dc phase lock loop will be described followed by an explanation of the type of phase lock techniques used in the 5340A.

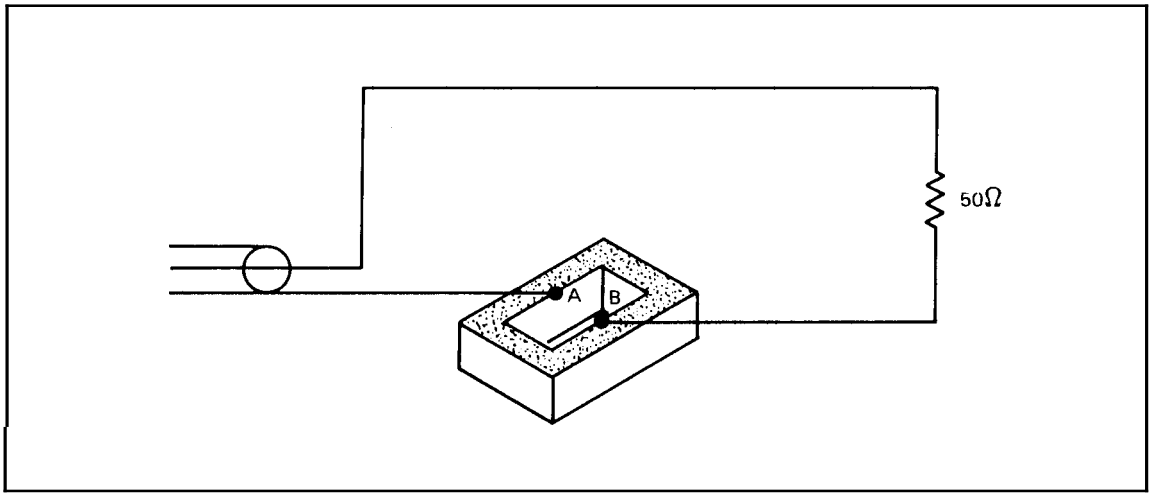
4-128. A

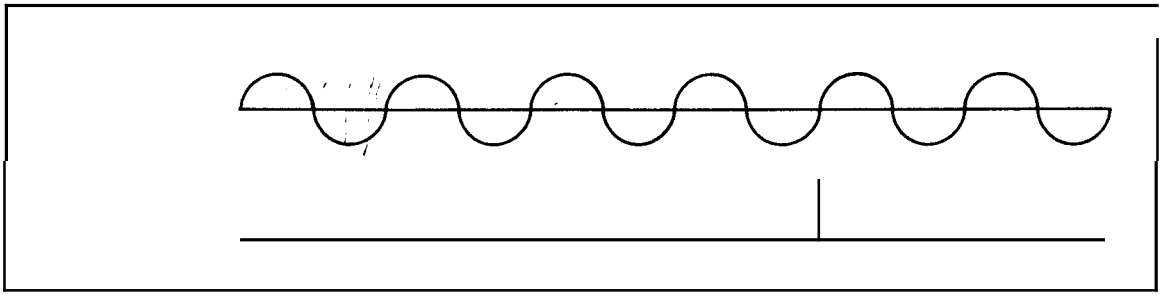




IV

Model





4–136. As shown in Figure 4–49, sampling occurs at the zero crossing of the input signal, and the sampler output is zero volts. When the sampler output goes positive, it indicates that the sampling occurs later than the correct time. This generates an error signal to increase the sampling frequency so that sampling occurs at the zero crossing. In this example, the VCO frequency is exactly one–half the input frequency. Thus, an output frequency is obtained that is harmonically related to the input frequency and is also low enough to be counted. When phase lock occurs, the VCO frequency is some fraction of the input frequency. Additional circuitry is needed to determine the ratio between the input frequency and the output frequency. This instrument does not use a DC phase–lock loop, but instead uses a 20 MHz intermediate frequency (IF) circuit such that the sampler output will be exactly 20 MHz when phase lock occurs. The relationship between the input signal and

VCO f08 T1-OT0361 580:560407 0 Nj 01027.16

$$NF_{VCO} - F_{input} = 20\ MHz$$

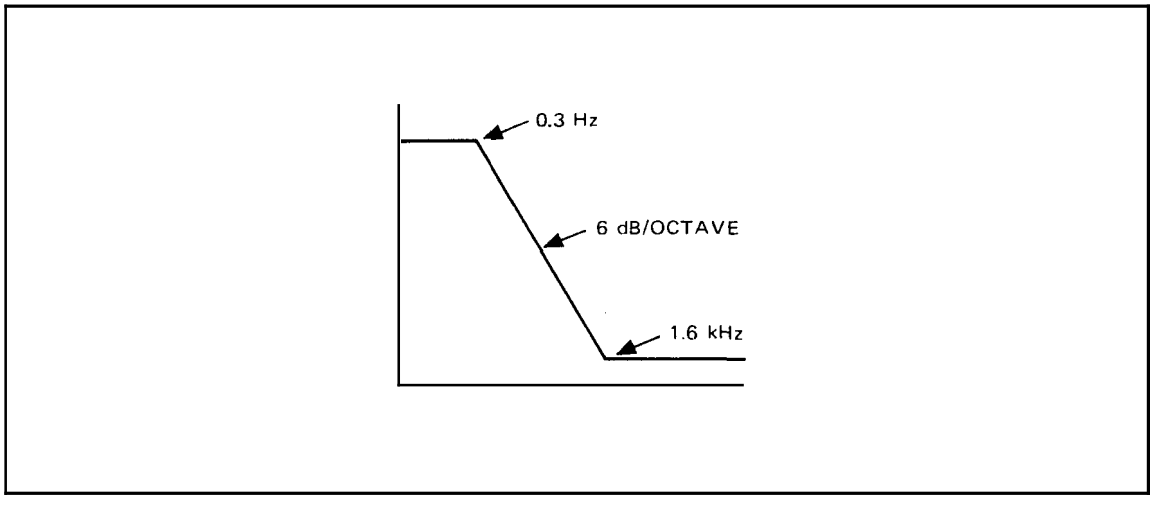
Model

A negative level at pin 8 turns U2 and U4 off which turns off Q1. Q1 determines when the search ramp signal is routed to DC Compensation Amplifier A7. The search ramp signal is derived from the search pulse signal which is supplied from Search Programmer A6. U1 and U3 function as an integrator to provide a ramp voltage output. C7 is the integrating capacitor and R15 sets the dc level for the ramp signal.

4-156. A6 SEARCH PROGRAMMER ASSEMBLY, 05340-60004

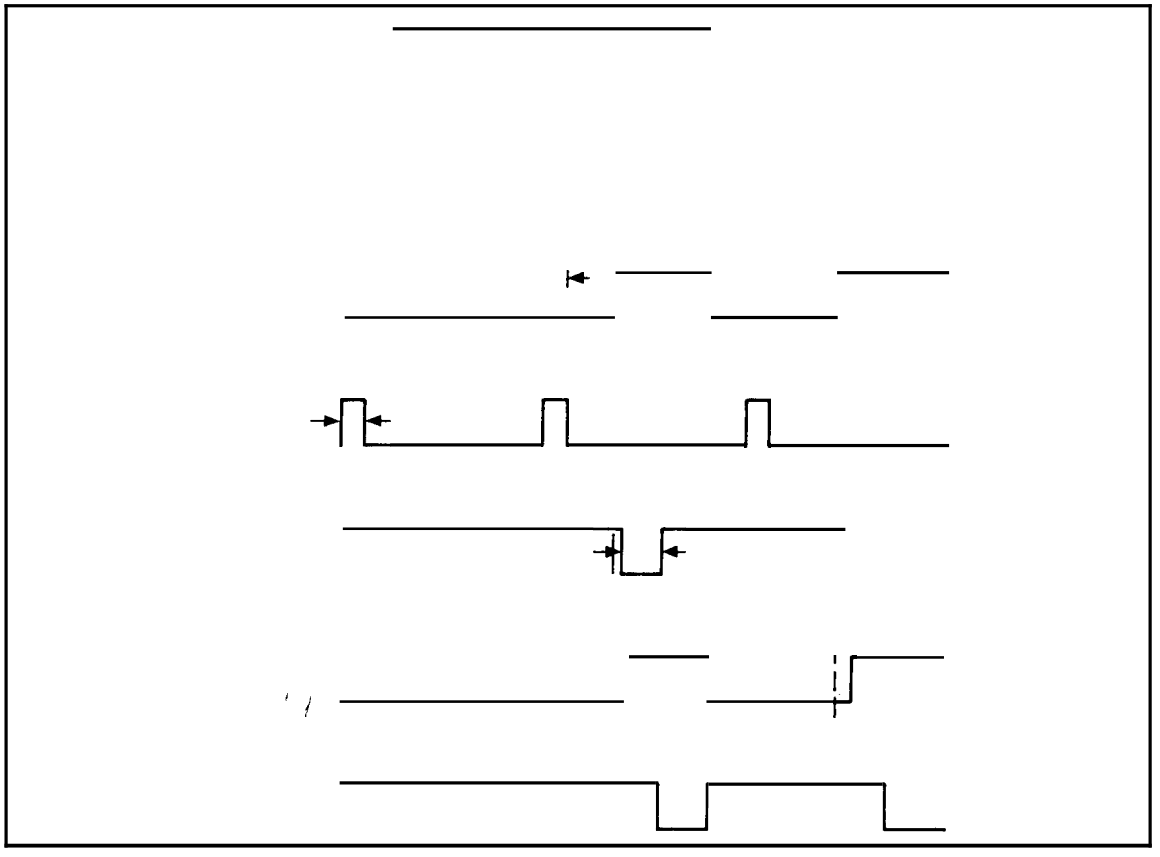
4-157. The Search Programmer (Figure 8-12) determines the search ramp amplitude and sets the loop gain compensation. The circuits consist of t tdsigha 0.0602 5 1.202idecoder Td (to)T3-0.03611

pulse is determined by R20 and C19. The multivibrator can be retriggered at any time during the 50 psec period to establish a new 50 psec pulse output. As long as the multivibrator is retriggered within 50 psec, the Q output U3(10) will remain high. In practice, this is the manner in which the circuit operates. Since U2 turns on and off for each cycle of its input, U3B will be retriggered as long as the signal at U2(2) is sufficient to trigger comparator U2. When lock is achieved, U3B(10)



4–172. U2 serves as a summing amplifier for the phase detector output and the output of U4. The gain of U2 for the phase detector signal is 5 as set by R20 and R15. The gain for the output of U4 is 1 as determined by R20 and R13. The output of U2 is between +5 and +13volts and is used to fine tune VCO 2.

4–173. The search signal is a sawtooth waveform which is developed across C8. When the level at A9(8) is low, Q1 is off and Q3 is on. This allows C8 to charge through Q3 and R12 toward +15 volts. The high–impedance tie point is a teflon–insulated connector that prevents humidity from discharging C8. The ramp developed on C8 couples through a voltage follower U4 to comparator U3. U3 has a +5V reference input at pin 2. After **30** milliseconds, the ramp voltage at U4(6) will reach +5 volts and U3(7) will trigger one–shot multivibrator U6A for 2.5 milliseconds. When U6A(6) goes high, Q2 turns on to discharge C8. This develops the flyback portion of the sawtooth, which



4-186. A13 LIMITER/AMPLIFIER ASSEMBLY, 05340-60010

4-187. Figure 8-19 shows the schematic diagram for A13. The Limiter/Amplifier input receives the 20

4-196. U3 operates as a differential amplifier with

4-207. The sample rate circuitry consists of A19Q1, A19U1A, A19U2E, R1, and R2. R1 and R2 are located off of the pc board on the main chassis. The sample rate circuitry determines the length of waiting time between measurements. At the end of a measurement, XA19P1A(4) goes low, allowing A19C1 to be charged through R1 and R2. Sample rate potentiometer R1 varies the rate of charge on A19C1. When A19C1 charges sufficiently, Q1 conducts to trigger Schmitt trigger U1A. When U1A triggers, U2E(11) goes low and XA19P1A(6) goes high.

4-208. Schmitt trigger U1B generates a reset when the RANGE and RESOLUTION switches are

4-219. Counter U3 identifies what digit is currently being shifted in the serial display. U21 compares this data with the RESOLUTION information and subtracts a "2" offset at the appropriate time during a phase lock measurement. For direct count measurements, a zero is subtracted, leaving the number unchanged. U4C detects the seventh character shift. U15 is used to strobe output data into U11 by comparing counts from U3 and U12.

4-220. At the completion of a measurement for which an ASCII output is desired, U22A will set, supplying a low on U16C(10). An output is also generated when the TALK line (J1-8) is driven low by the controller, this is gated along with the PE line from A21 to set U8A, causing U8A(5) to give a high to A21 and A34.

4-221. U12 is a ÷ 16 presettable counter that sets to 13 when the PE line (P1A-15) goes low. U12(12) goes high to switch U13A(3) low, which switches ROM U7 to read a character and switches U6 to read the output of U12. Character "10" is detected by U4A.

4-222. The logic level of the Inhibit line at P1A(N) is low for Phase Lock measurements and drives U6(2) low. The ROM interprets this data and outputs an ASCII "L" to indicate the Phase lock mode. When P1A(N) is high, the ROM outputs an ASCII "D" to indicate the Direct mode.

4-223. A21 then sets DAV low, indicating to the bus that this data is valid, and then again goes high, incrementing counter U12 to 14. This code causes U6 to select the output of U12, which causes U7 to output the ASCII code for "space", or overflow, if overflow has occurred. DAV again cycles and U12 increments to 15, which similarly causes a "space". U12 then increments to 0 (zero). This causes U6 to select the output of four pole switch U5, which is accepting displayed digit information from quad flip-flop U11. Eight digits of data are processed as U12 counts from 0 to 7. When U12 increments to 8, the output of U12 is fed thrpláÿþ• ÿ?ÿtÿ• 724.6193 0 Td (U6)Tj 0.0241 T

4–227. Sample rate time is then started. If U2A (pins 1 and 2) are high, the front panel Sample Rate control will determine the delay until the next measurements. Sample rate delay can be terminated by an ASCII "J".

4–228. The 5340A can be reset externally by supplying an ASCII "H" to U25. This turns on U9C, generating a reset through U9B. Moving resolution switch A27 between detents also generates a reset throughthrough

			L		

4-234. U3A generates the "N Gate" qualifier for test #2 of the program (N Gate ? has been determinted). When the count of U6 reaches 2, U13C(6) goes Low to drive the Q output of U11A High. This signal is a qualifier for test #7 of the program (N ≥ 2 ?). BCD to decimal decoder U28 decodes the A6 Search Assembly information which indicates what range the instrument is on. U26, 27, 19, and 20 are comparators that monitor the inverted outputs of U6 and U7 and compares them with the output of U28.

4-235. The purpose of these circuits is to determine if N is within its limits. There are six possible ranges of N for the

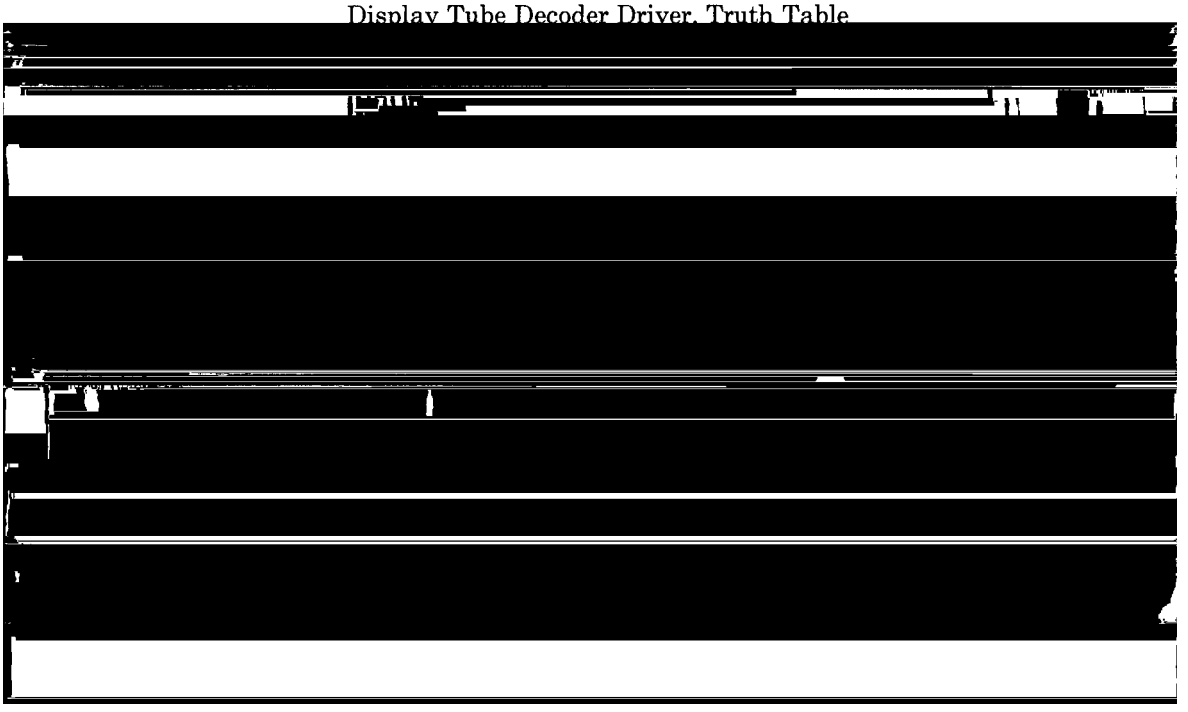
4–243. For example, assume we are completing the step in the fifth symbol in Figure 5–4 marked "Done ? 14". ROM U3 input on pins 14, 13, 12, 11, and 10 is LLHLH and will output LLHLHHLL on pins 9, 7, 6, 5, 4, 3, 2, and 1, respectively. For the present program address, U4's output will be HLHH HHHL on pins 1, 2, 3, 4, 5, 6, 7, and 9, respectively.

4–244. U13 will select action #11, ("Start Delay") by activating U5D, U5C, U9B. U12 will select test #14 ("Done?") that will drive U12(10) low when the delay is complete. U2's input on pins 11, 6, 13, 4, and 3 will be LLHLL, respectively, as U1 switches to the 0_C 0_B and 0_A inputs, because of the low from U12. **At** the next clock pulse, U2 will feed the LLHLL on its input to U3 and U4.

4–245. U3 will then output LHHH HHLH. U4 will output HLLH HLLL, causing U13 to select action #9 (clear) and causing U12 to select test

Model

Display Tube Decoder Driver, Truth Table

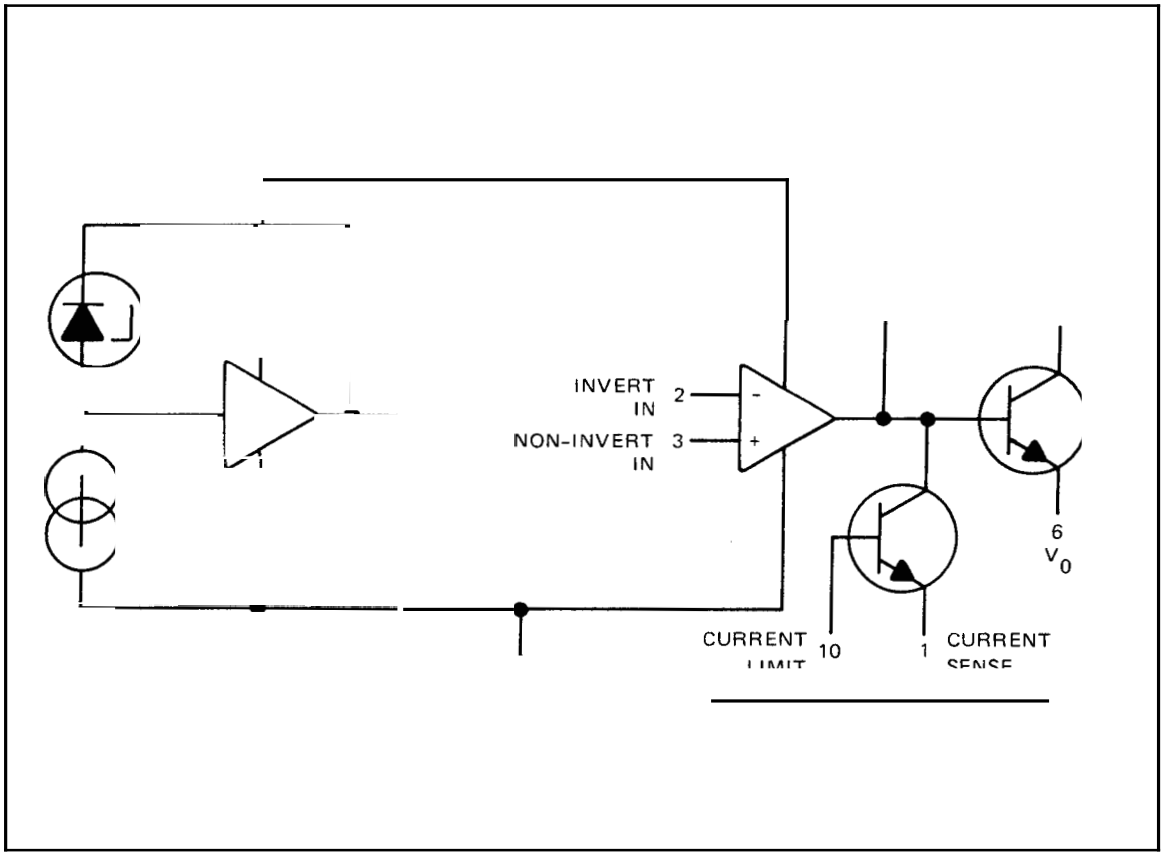


4-265. A26 BLANKING ASSEMBLY, 05340-60037

4-266. The Blanking Assembly (Figure 8-32) is controlled by logic circuits on A25 and controls the +175V supply to the display tube(s) that require blanking thus suppressing insignificant zeroes. For example, with a TTL low on the emitter of Q5, Q5 conducts to turn on Q10 which in turn supplies +175V to the display tube. Similarly the other four tubes are controlled.

4-267. POWER SUPPLIES

4-268. The power supplies include Time Base Power Supply A33 (part of Option [illegible]


INVERT IN
2
NON-INVERT IN
3
-
+
6
V_0
CURRENT LIMIT
10
1
CURRENT SENSE

4-276. In the event that the +15 volt reference fails or falls below 11 volts, A32CR3 conducts to turn off A32Q2 thereby disabling the supply. This prevents A32U1 from locking in the off position. The series pass transistor in

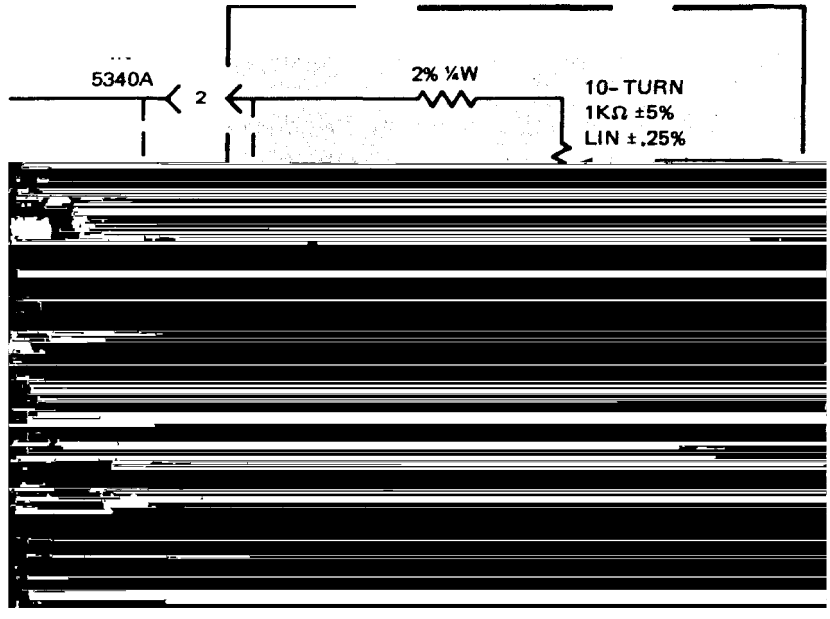
Model

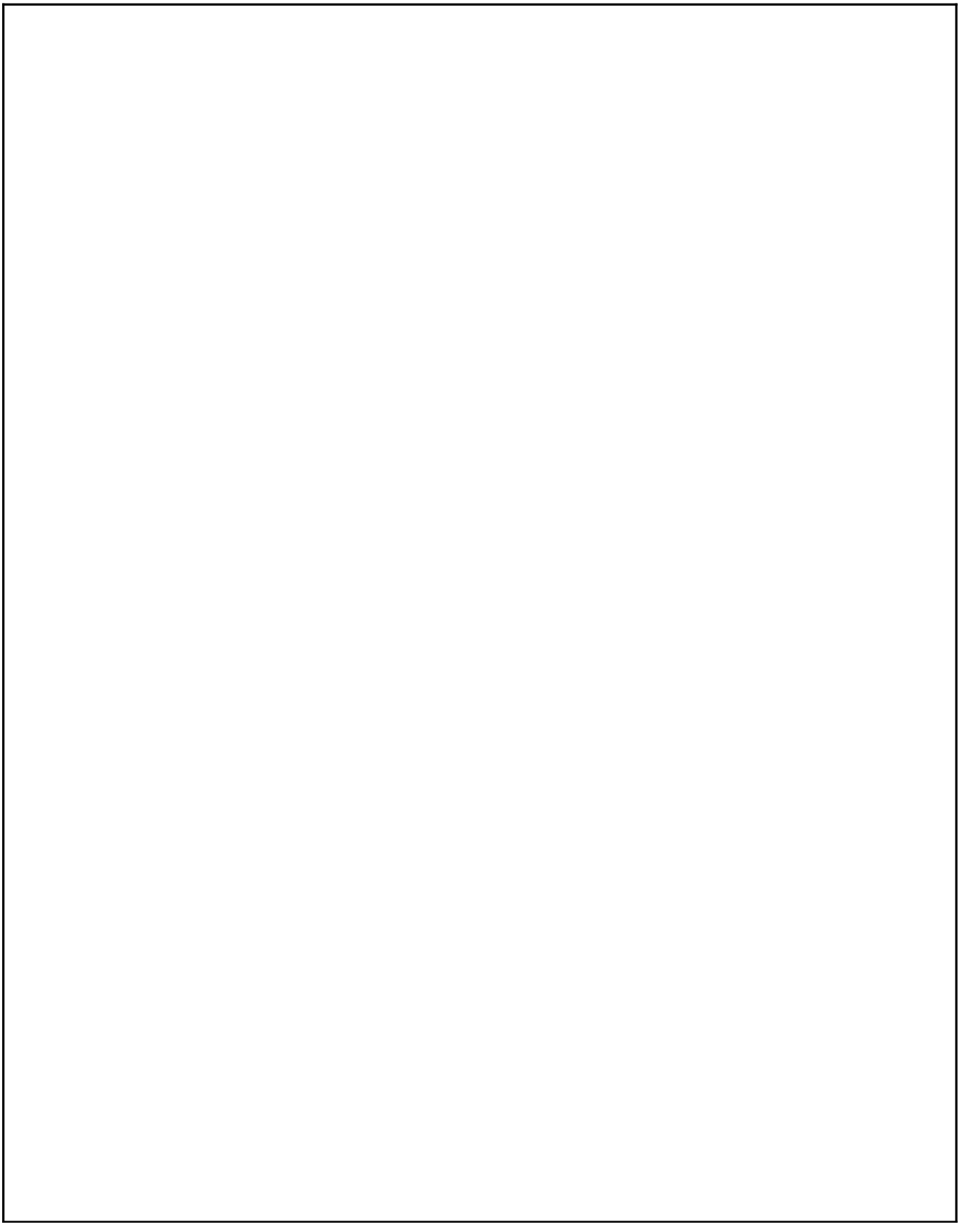
Table 5-1. Assembly Identification

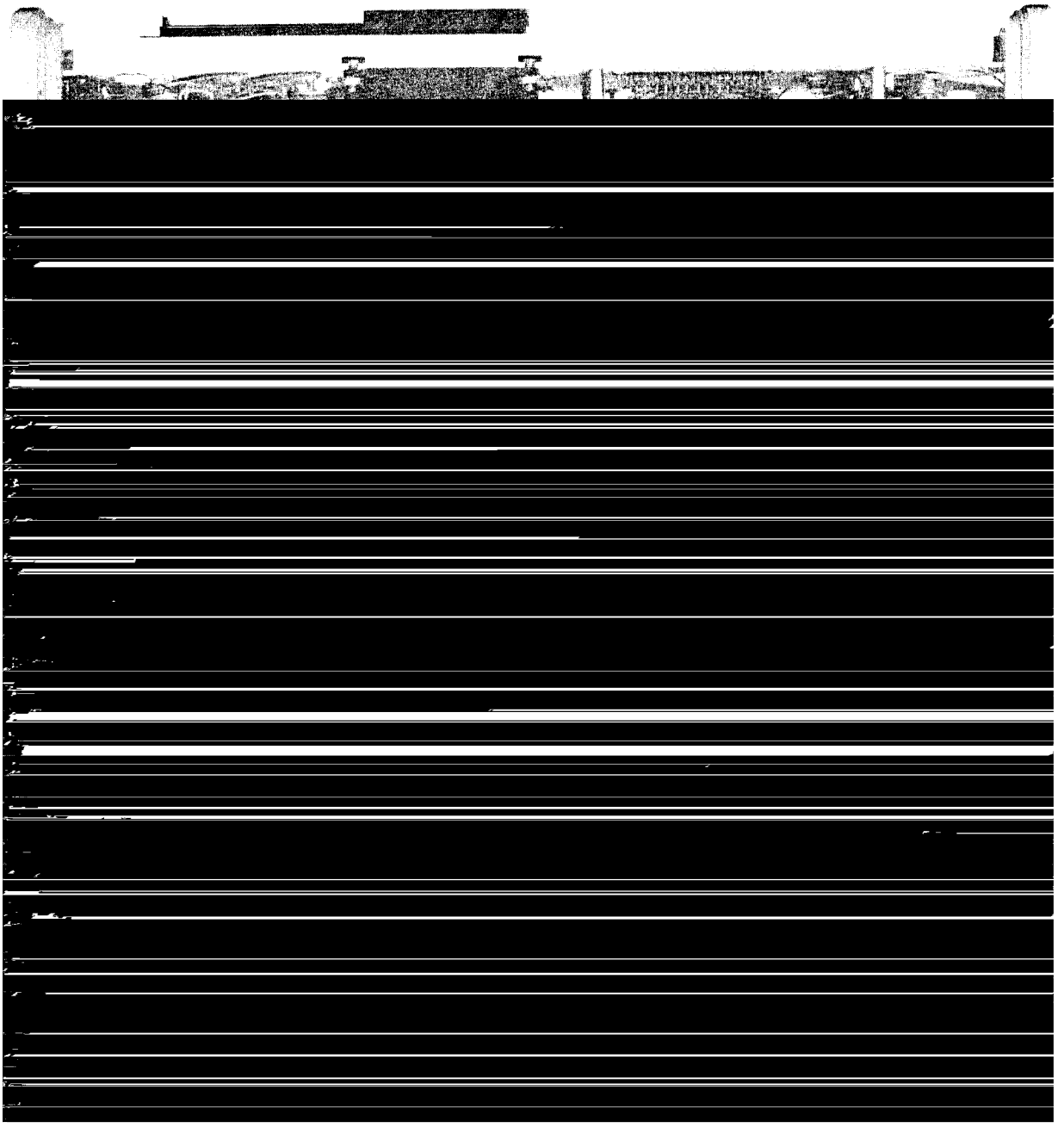
Reference Designation		
A1 A1A1 A1A2 A1A3 A1A4 A1A5 A1A5A1 A2 A2A1 A2A2		

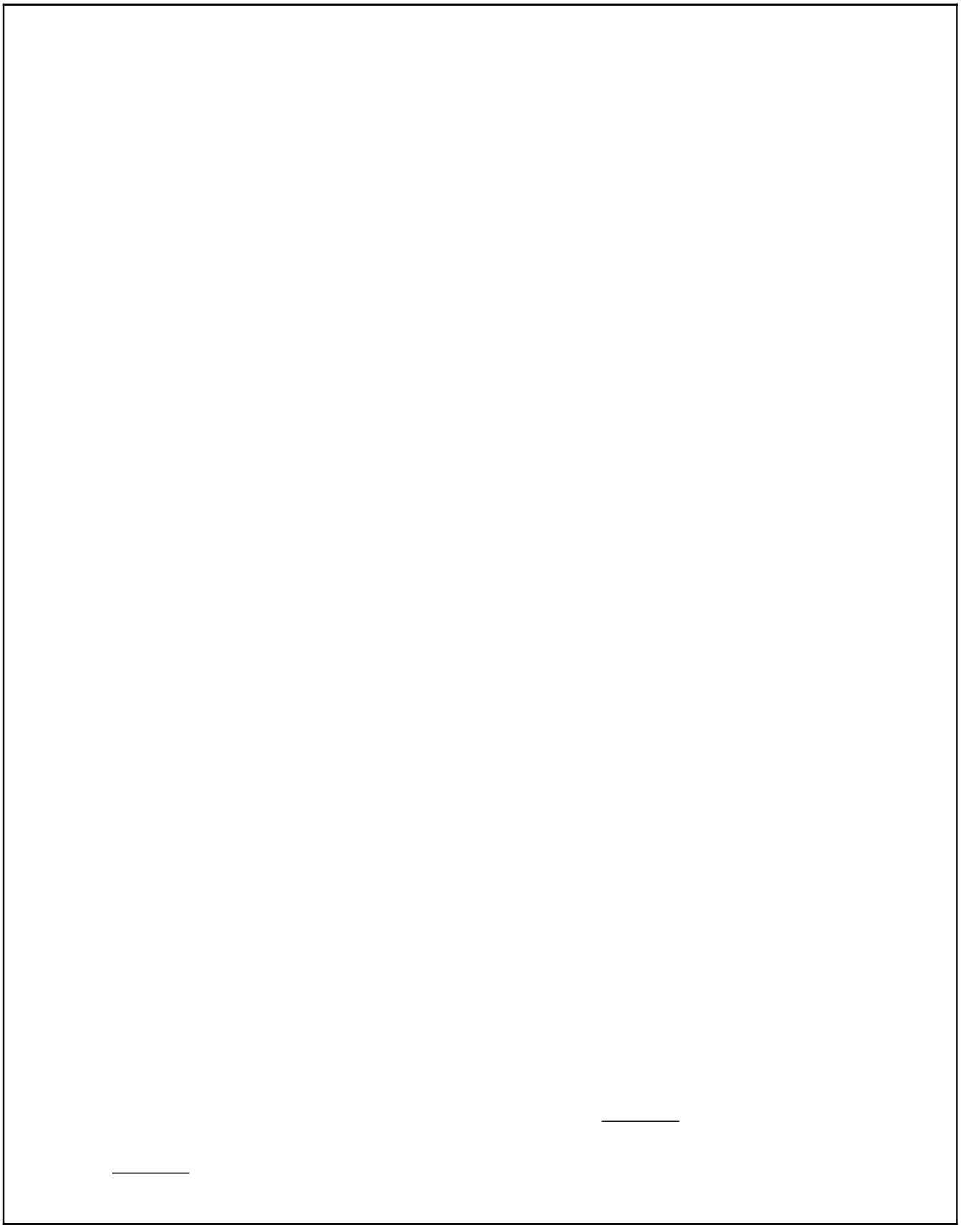
Table 5–2. Recommended Test Equipment

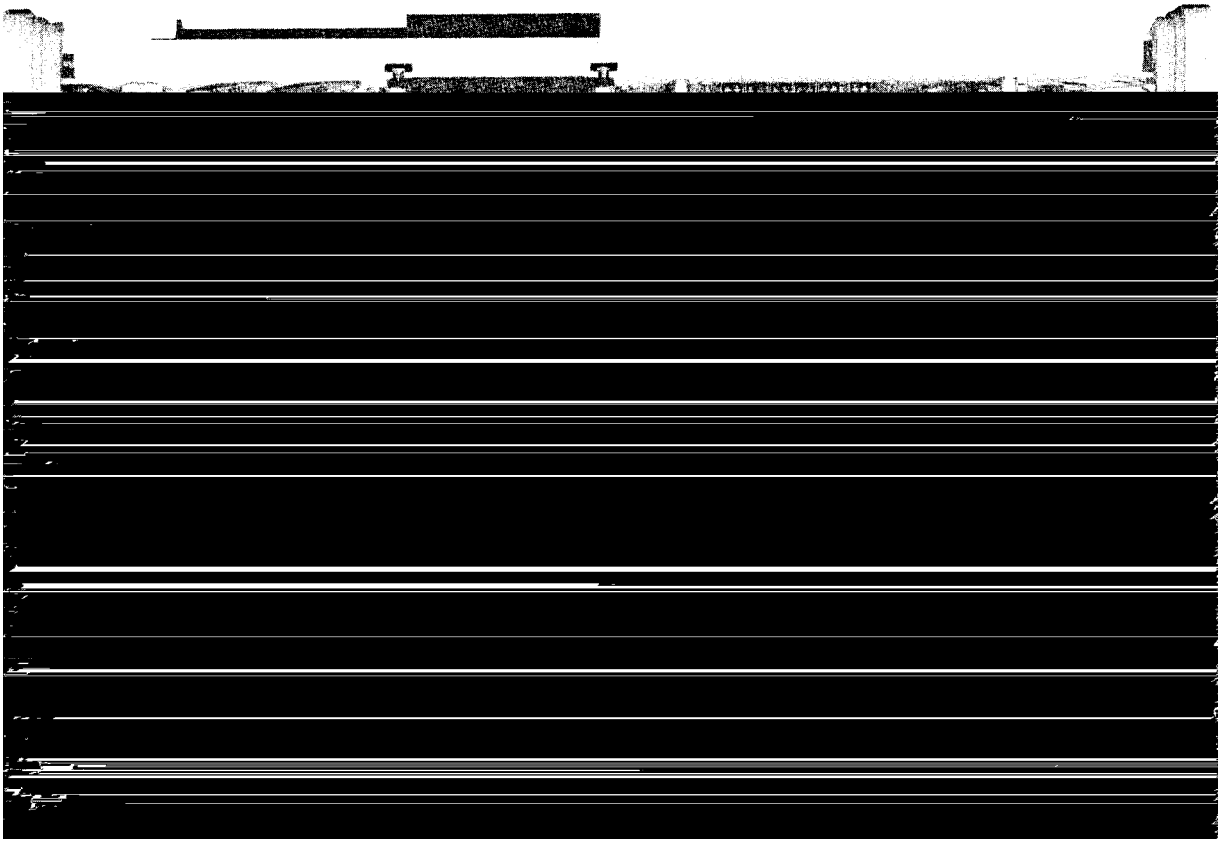
Instrument		
Oscilloscope Divider Probes (3) Test Oscillator Signal Generator Signal Generator Signal Generator Signal Generator Signal Generator Signal Generator		



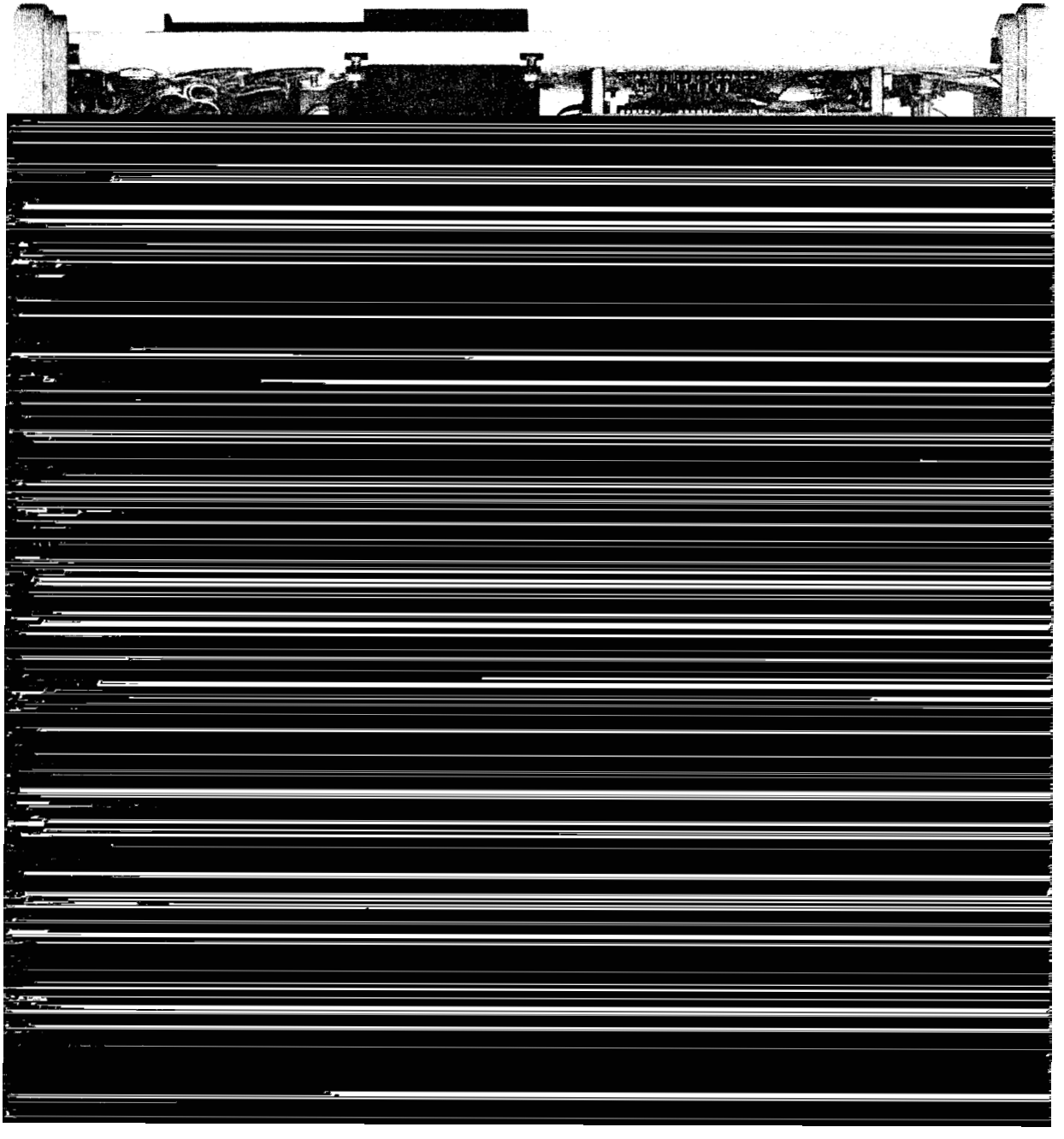




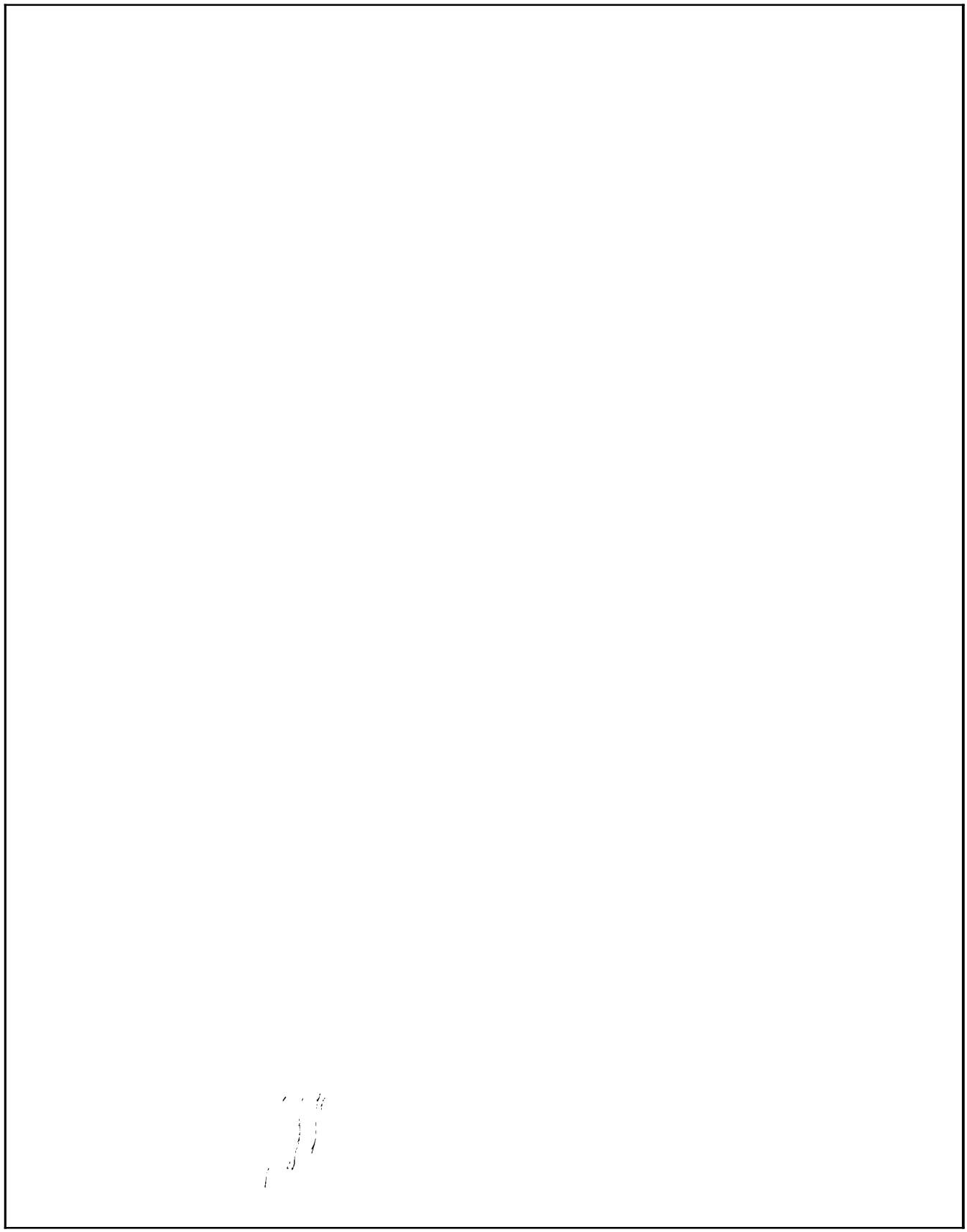




Model

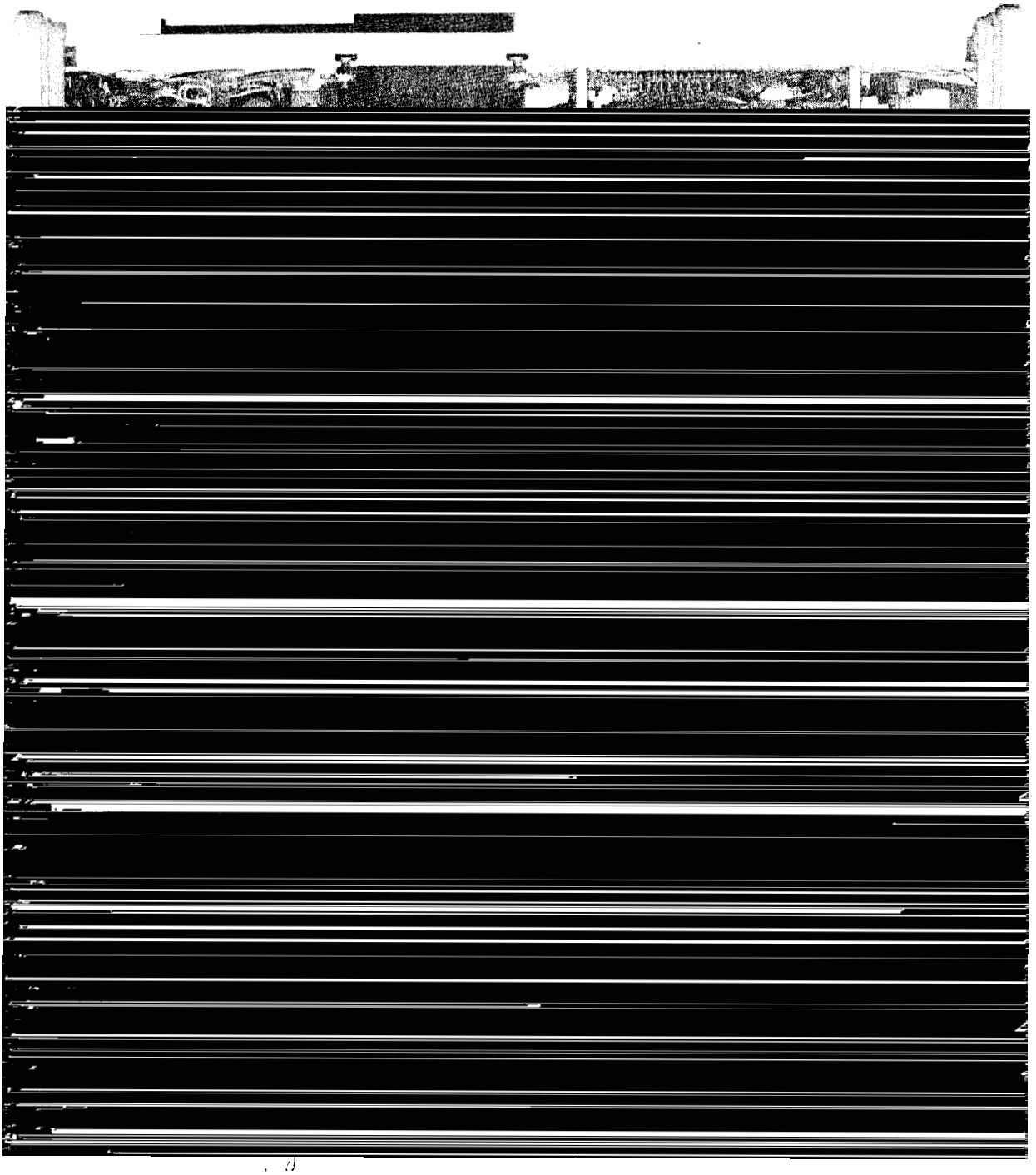


Model



V

Figure 5–2. Adjustment Procedures (Continued)



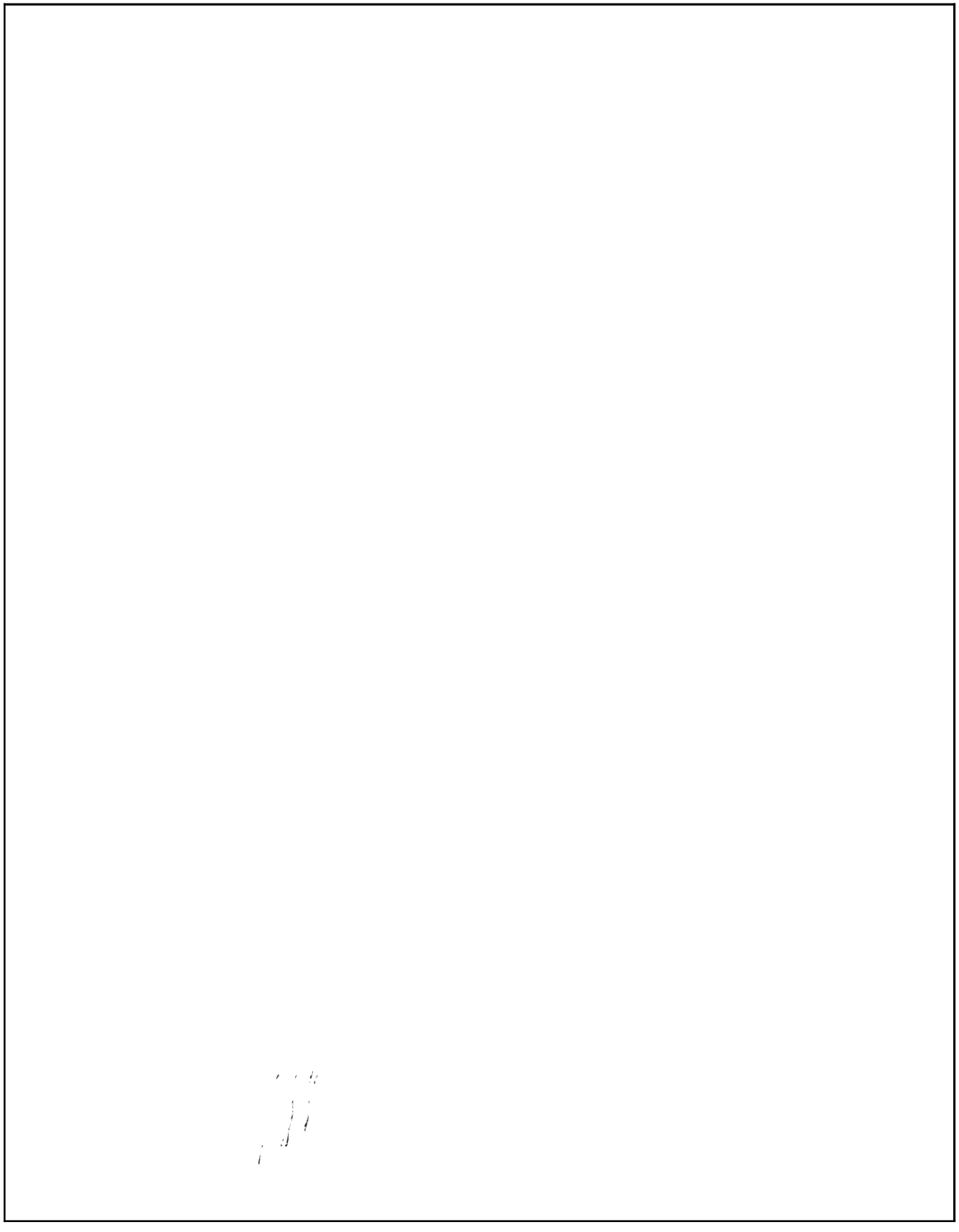


Table 5-3. In-Cabinet Performance Check

1.

2.

3.

4.

5-16. PROGRAM CONTROL FLOW DIAGRAMS

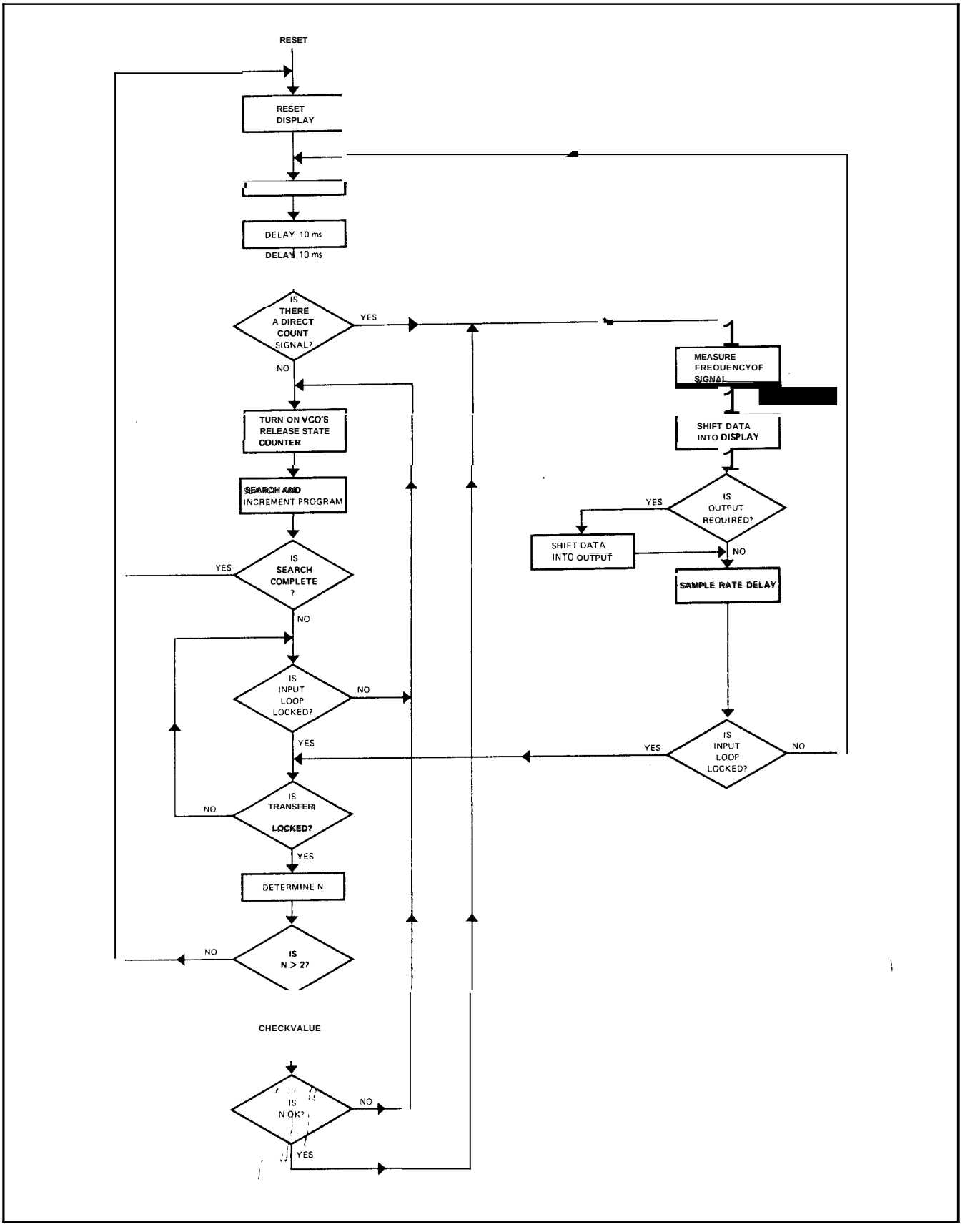
5-17. Figures **5-3** and **5-4** are flow diagrams showing the sequence of actions required in making a measurement. Figure **5-3** is a simplified version of Figure **5-4.** The **A21** Control Board theory explains how decisions are made in the flow diagram. See Paragraph **4-236.**

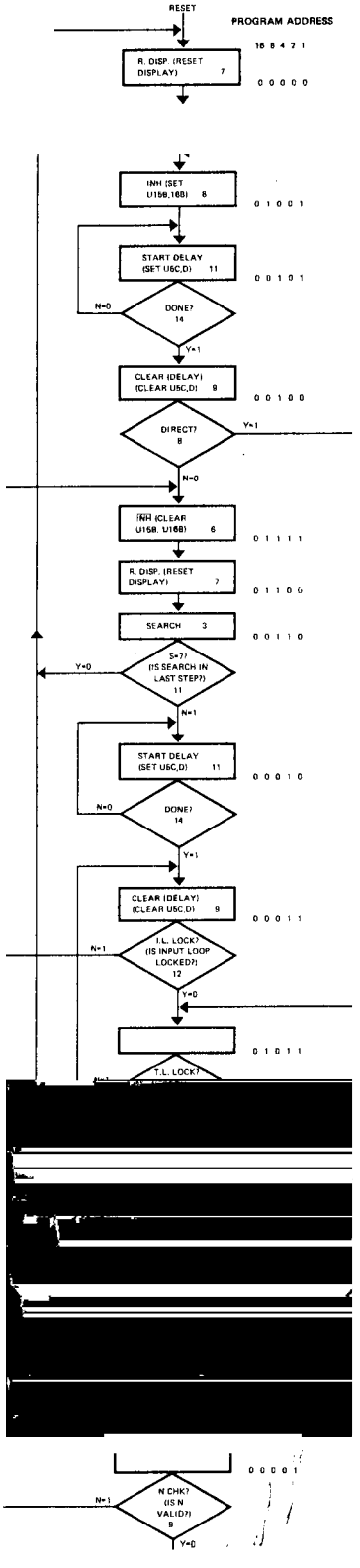
5-18. Figure **5-4** lists three sets of numbers: the program address, the selected test number, and selected action number.

5-19. The program address is the 5-bit binary number placed to the right of the rectangle and diamond symbols in the diagram. These **5** bits are the inputs to ROM's **A21U3** and **A21U4.** When an HP **10528A** Logic Clip is installed on **A21U4,** the program address appears on pins **10** through **14.** Note that the logic clip diagram shown on Figure **5-4** uses circles to designate these pins.

5-20. Inside each rectangle is a decimal number that indicates what action is required and this corresponds to the action of **A21U13.** This number can be read in binary on pins **5, 6, 7,** and **9** of **A21U4.** These pins have 05 482 Tc 2.105 0 Td (ha• 0Td s875 53.2793 545.0405 Tm (of)Tj ET /Suÿj Eð• Áÿ9)pe

Figure 5-3. Simplified Flow Diagram of 5340A Program Control




RESET
PROGRAM ADDRESS
16 8 4 2 1
R. DISP. (RESET DISPLAY) 7
0 0 0 0 0
INH (SET U16B,16B) 8
0 1 0 0 1
START DELAY (SET U6C,D) 11
0 0 1 0 1
N=0
DONE? 14
Y=1
CLEAR (DELAY) (CLEAR U5C,D) 9
0 0 1 0 0
DIRECT? 8
Y=1
N=0
INH (CLEAR U16B, U16B) 6
0 1 1 1 1
R. DISP. (RESET DISPLAY) 7
0 1 1 0 0
SEARCH 3
0 0 1 1 0
S=7? (IS SEARCH IN LAST STEP?) 11
Y=0
N=1
START DELAY (SET U6C,D) 11
0 0 0 1 0
N=0
DONE? 14
Y=1
CLEAR (DELAY) (CLEAR U5C,D) 9
0 0 0 1 1
I.L. LOCK? (IS INPUT LOOP LOCKED?) 12
N=1
Y=0
0 1 0 1 1
T.L. LOCK?
0 0 0 0 1
N CHK? (IS N VALID?) 9
N=1
Y=0

Resolution	

5-28. Connect the output of an HP Model 651A signal generator to the external trigger input of an HP Model 222A pulse generator. Disconnect the harmonic frequency cable connected to A16J2. Use suitable push-on to BNC (such as Sealectro 50-074-6800, HP P/N 1250-0831) and connect the cable to the output of the pulse generator.

5-29. Set 651A frequency to 40 kHz at 0.8V rms

222A pulse polarity to +
222A rep rate to man/ext +
222A pulse delay to .1
222A pulse width to .03 - .05
vernier to mid-position
222A pulse amplitude to 5
vernier to mid-position
5340A

		6			x	all zeros
		6			x	some number
		6			x	some number
		6			x	all zeros
	3	5				
	4	5				
	8	5				
	9	5				
		4				
		4				
		4				
		4				
		3	x			
		3	x			
		3	x			
		3	x			
		2	x			
		2	x			
		2	x			
		2	x			
		1	x			
		1	x			
		1	x			
		1	x			

5-39. Power Supply Troubleshooting

a. Determine which power supplies are regulating at an incorrect voltage by measuring the output voltage.

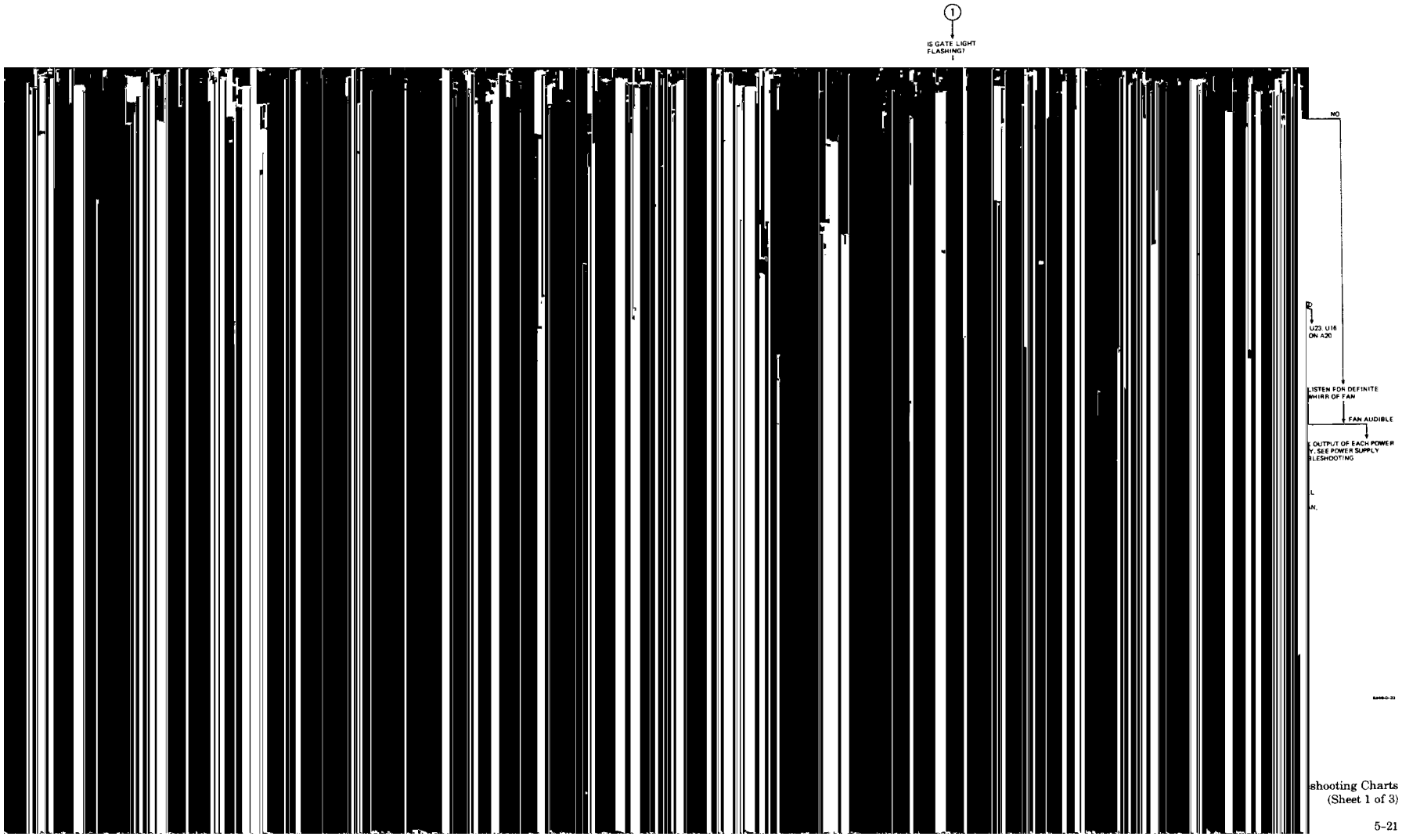
b. If any supply is at or near zero volts, the supply could be current limiting. Disconnect the output leads for that supply at the A30 power supply motherboard.

c. Again measure the voltage. If the output is still bad, the failure exists in the power supply circuit. Use the typical voltage charts shown to isolate the defective components.

d. If the output obtained in step **3** is now good, there could be a short circuit in the instrument, or the supply could be current-limiting improperly. Substitute a resistive load for the supply under test as listed on the next page.

e. If the output is still good, an excessive load exists somewhere in the instrument. Connect an ohmmeter between ground and on the feeder line in question (which is still disconnected from its power supply). Start removing the plug-in PC boards until a significant change is observed on the ohmmeter. Then isolate the execessive load. Check also for shorted wires.

f. If the output obtained in step **4** is bad, the power supply is not able to provide the necessary current. Use the typical voltage charts to isolate to the defective component. **Look** especially for the same voltage on any two leads of a transistor, indicating a shorted transistor.



shooting Charts
(Sheet 1 of 3)

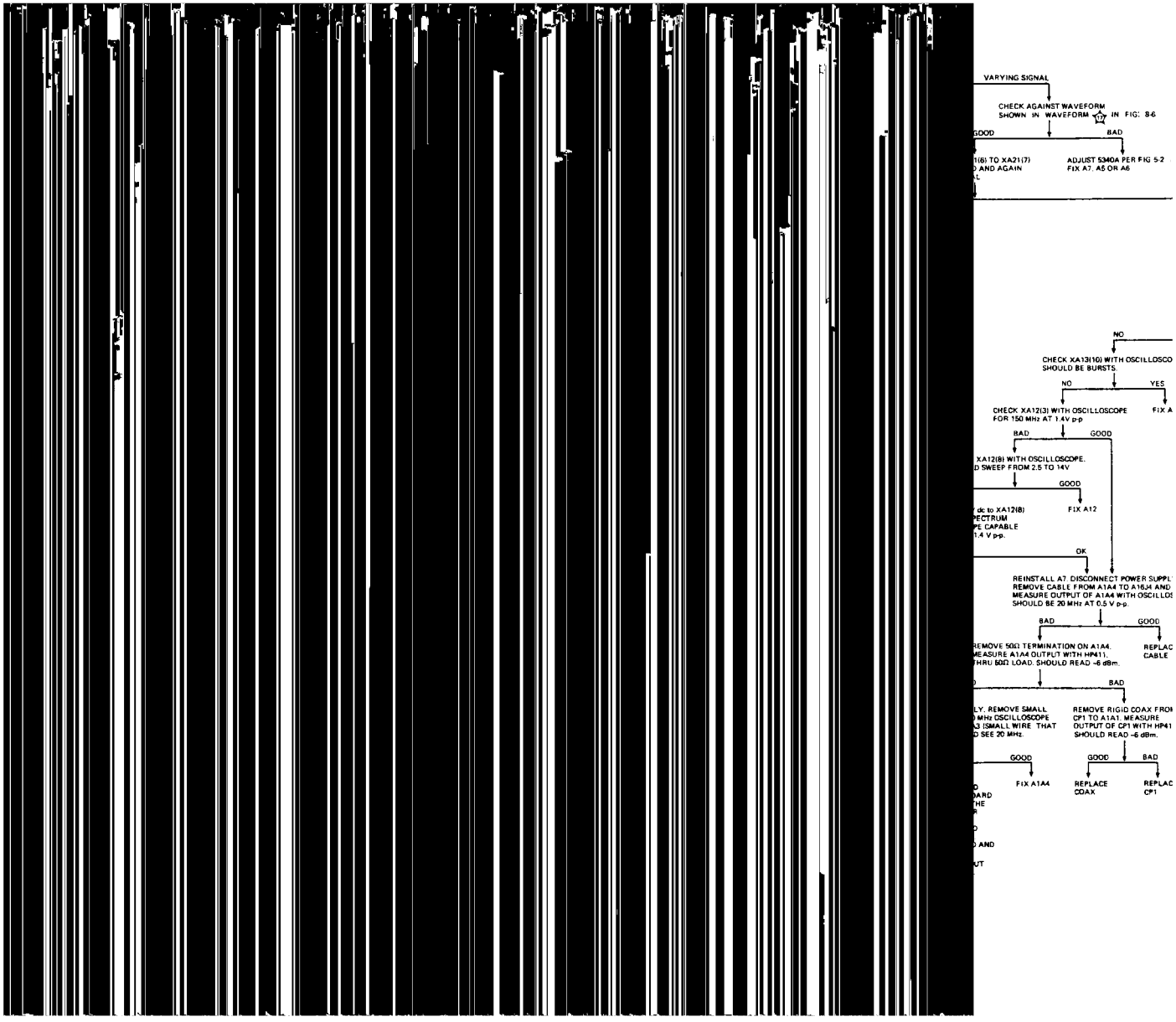
(2)

DISCONNECT GENERATOR FROM HI Z INPUT. CONNECT BNC CABLE TO REAR PANEL TIME BASE (OSC) JACK. CONNECT OTHER END TO HI Z INPUT. DOES THE COUNTER NOW DISPLAY 10 MHz?

YE

VERIFY GENERATOR IS OUTPUTTING
MALFUNCTION IS FREQUENCY DEPE
SHOOTING TREE BELOW TO TRACE S
OR SPECTRUM ANALYZER CAPABLE
OF INTEREST.

3
DISCONNECT GENERATOR FROM INPUT. USING BNC CABLE, CONNECT REAR PANEL TIME BASE (OSC) OUTPUT TO 50Ω INPUT. DOES COUNTER NOW DISPLAY 10 MHz?
YES
NO
VERIFY GENERATOR IS OUTPUTTING AT LEAST 0 dBm. SEE IF MALFUNCTION IS FREQUENCY DEPENDENT. USE TROUBLE-
CHECK A17P1(13) FOR TTL HIGH (2.4 TO 5V)
NOT CORRECT


VARYING SIGNAL
CHECK AGAINST WAVEFORM SHOWN IN WAVEFORM 12 IN FIG. 8-6
GOOD
BAD
ADJUST 5340A PER FIG 5-2
FIX A7, A5 OR A6
NO
CHECK XA13(10) WITH OSCILLOSCO
SHOULD BE BURSTS.
NO
YES
CHECK XA12(3) WITH OSCILLOSCOPE
FOR 150 MHz AT 1.4V p-p
FIX A
BAD
GOOD
XA12(8) WITH OSCILLOSCOPE.
SWEEP FROM 2.5 TO 14V
GOOD
FIX A12
OK
REINSTALL A7. DISCONNECT POWER SUPPL
REMOVE CABLE FROM A1A4 TO A15J4 AND
MEASURE OUTPUT OF A1A4 WITH OSCILLOS
SHOULD BE 20 MHz AT 0.5 V p-p.
BAD
GOOD
REPLAC
CABLE
REMOVE 50Ω TERMINATION ON A1A4.
MEASURE A1A4 OUTPUT WITH HP41.
THRU 50Ω LOAD. SHOULD READ -6 dBm.
BAD
REMOVE RIGID COAX FRO
CP1 TO A1A1. MEASURE
OUTPUT OF CP1 WITH HP41
SHOULD READ -6 dBm.
GOOD
FIX A1A4
GOOD
BAD
REPLACE
COAX
REPLAC
CP1

ABBREVIATIONS

DSB	= double uidehand
DTL	= diode transistor logic
DVM	= digital voltmeter
ECL	= emitter coupled logic
EMF	= electromotive force
EDP	= electronic data proresuing
ELECT	= electrolytic
ENCAP	= encapsulated
EXT	= external
F	= farad
FET	= field-effect transistor
F/F	= flip-flop
FH	= flat head
FIL H	= fillister head
FM	= frequency modulation
FP	= front panel
FREQ	= frequency
FXD	= fixed
g	= gram
GE	= germanium
GH7	= gigahertz
GL	= glass
GND	= ground(ed)
H	=henry
h	= hour
HET	=heterodyne
HEX	=hexagonal
HD	=head
HDW	=hardware
HF	=high frequency
HQ	= mercury
HI	=high
HP	= Hewlett-Packard
HPF	= high pass filter
HK	= hour (used in parts list)
HV	=high voltage
H7	= Hertz
IC	= integrated circuit
ID	= inuide diameter
IF	= intermediate frequency
IMPG	= impregnated
in	= inch
INCD	= incandescent
INCL	= include(s)
INP	= input
INS	=insulation
INT	= internal
kg	= kilogram
kH7	= kilohertz
kΩ	= kilohm
kV	=kilovolt
lb	= pound
LC	= inductance-rapacitance
LED	= light-emitting diode
LF	= low frequency
LG	= long
LH	= left hand
LIM	= limit
LIN	= linear taper (used in parta list)
lin	= linear
LK WASH	= lock wauher
LO	= low: local oucillator
LOG	= logarithmir taper (used in parts list)
log	= logarithm(ic)
LPF	= low pass filter
LV	= low voltage
m	= meter (distance)
mA	= milliampere
MAX	= maximum
MΩ	= megohm
MEG	= meg (10^6) (used in parts list)
MET FLM	= metal film
MET OX	= metal oxide
MF	= medium frequency; mirrofarad (used in parts list)
MFR	
mg	
MHz	
mH	
mho	
MIN	
min	
MINAT	
mm	
MOD	
MOM	
MOS	
mu	(10^{-6})
MTG	
MTR	
mV	
mVac	
mVdc	
mVpk	
mV P-P	
mVrms	
mW	
MUX	
MY	
μA	
μF	
μH	

VI

Prefix	Component/Part/Material
1854-	Transistors, Silicon NPN
1855-	Field-Effect-Transistors
1900- thru 1912-	Diodes
1920- thru 1952-	Vacuum Tubes
1990-	Seminconductor Photosensitive and Light-Emitting Diodes
3100- thru 3106-	Switches
8120-	Cables
9100-	Transformers, Coils, Chokes, Inductors, and Filters

For example, 1854-0037, 1854-0221, and 1851-0192 are all NPN transistors. The first two are silicon and the last is germanium.

6-12. General Usage Parts

6-13. The following list gives the prefixes for HP manufactured parts used in several instruments, e.g., side frames, feet, top and bottom covers, etc. These are eight-digit part numbers with the four digit prefix identifying the type of parts as shown below:

Type of Part	Prefix
Sheet Metal	5000- to 5019-
Machined	5020- to 5039-
Molded	5040- to 5059-
Assemblies	5060- to 5079-
Components	5080- to 5099-

For example, power splitter 5088-7003 is a c mponent and pc board support 5040-0170 is a molded part.

6-14. Specific Instrument Parts

6-15. These are HP manufactured parts for use in individual instruments or series of instruments. For these parts, the prefix indicates the instrument and the suffix indicates the type of part. For example, 05340-60001 is an assembly used in the 5340A. Following is a list of suffixes commonly used.

Type of Part	P/N Suffix
Sheet Metal	-00000 to -00499
Machined	-20000 to -20499
Molded	-40000 to -40499
Assembly	-60000 to -60499
Component	-80000 to -80299
Documentation	-90000 to -90249

VI

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty	Description		
A1	05340-60017	1	BOARD ASSEMBLY, PREAMPLIFIER #1		
	05340 00009	1	PLATE, SAUPLER		
	05340-00012	3	SHIELD, SIMPLER		
	05340 00017	3	COVER, PREAMPLIFIER		
	05340-00019	2	PLATE. SAMPLER		
	05340-20033	1	HOUSING		
A1C1	0160 0204	5	CAPACITOR-FXO 5500PF200WVDC CCR		
A1C2	0160-0204		CAPACITOP-FXC 5500PF200WVDC CER		
A1R1	1810 0118	1	TERMINATION:COAX SYA 50 OHU 1W		
A1A1*	5088 7004	2	THIN FILM SAMPLER ASSEMBLY *PART OF A1, NOT SEPARATELY REPLACEABLE		
A1A2*	5088-7035	2	SAMPLER DRIVE ASSEMBLY *PART OF A1, NOT SEPAPATELY REPLACEABLE		
A1A3*	05340-60042	1	SAMPLER WTPUT BOARD ASSEMBLY (LOADED ON 05340 20042 BLANK BOARD) *PART OF A1, NOT SEPAPATELY REPLACEABLF		05340-60042
A1A3C1	0160-3277	85	CAPACITOR-FXD .01UF +-20% SOWVDC CFR		
A1A3C2	0160 3277		CIPACITOR-FXO .01UF +-20% 50WVDC CER		
A1A3L1	9100-2256	2	COIL FXO MOLOEO RF CHOKE .56UH 10%		
A1A3R1	0757-0963	1	RESISTOR 43K 2% .125W F TC=0+ 100		
AIA4	05340 65014	1	PREAMPLIFIER BOARD ASSEMBLY (SERIES 1220 (LOADED ON 05340-20014 BLANK BOARD)		
A1A4C1	0160-3277		CAPACITOP-FXO .01UF +-20% 50WVDC CER		
A1A4C2	0160-3277		CAPACITOR FXO .01UF + 20% SOWVOC CES		
A1A4C3	0160-2238	1	CAPACITOR FXO 1.5PF + .25PF 500WVDC CER		
A1A4C4	0160-3284	1	CAPACITOR-FXO 22PF +-10% 100WVDC CER		
A1A4C5	0160-3028	1	CAPACITOR FXO 10PF + 10% 100WVDC CER		
A1A4C6	0160-3277		CAPACITOR FXD .01UF + 20% 50WVDC CER		
A1A4C7	0160-3277		CAPACITOR FXO .01UF + 20% 50WVDC CEP		
A1A4C8	0180-0197	32	CAPACITPR FXD; 2.2UF+ 10% 20VDC TA		
A1A4C9	0160-2198	2	CAPACITOR FXO 20PF + 5% 300WVDC MICA		
A1A4C10	0140-0224	1	CAPRCITOR FXO 280PF + 1% 300WVDC UICA		
A1A4C11	0160-2150	2	CAPACITOR FXD 33PF + 5% 300WVDC MICA		
A1A4C12	0140-0217	1	CAPACITOR FXO 140PF + 2% 300WVDC MICA		
A1A4C13	0160-2150		CAPACITCR FXO 33PF + 5% 300WVOC UICA		
A1A4C14	0180-0197		CAPLCITOR FXO: 2.2UF+ 10% 20VDC TA		
A1A4C15	0160-2198		CAPACITOR FXD 20PF + 5% 300WVDC MICA		
A1A4C16	0160-3277		CAPACITCR FXO .01UF + 20% 50WVDC CER		
A1A4C17	0160-3277		CAPACITOR FXO .01UF + 20% SOWVOC CER		
A1A4C18	0160-3277		CAPACITOR FXO .01UF + 20% 50WVDC CER		
A1A4C19	0160-3277		CAPACITOR FXD .01UF + 20% 50WVDC CER		
A1A4C20	0160-3277		CAPACITOR. FXO .01UF + 20% 50WVDC CER		
A1A4C21	0160-3277		CAPACITOR FXD .01UF + 20% 50WVDC CER		
A1A4C22	0160-3277		CAPACITOR FXO .01UF + 20% 50WVDC CER		
A1A4C23	0160-3277		CAPACITOR FXO .01UF + 20% 50WVDC CER		
A1A4C24	0160-2743	1	CAPACITOR FXD 33PF + 10% 200WVDC CER		
A1A4L1	9100-2247	7	COIL FXO MOLDED RF CHOKE .1UH 10%		
A1A4L2	9100-2265	11	COIL FXO MOLDED RF CHOKE 10UH 10%		
A1A4L3	9100-0368	11	COIL FXD MOLOEO RF CHOKE .33UH 10%		
A1A4L4	9100-0368		COIL FXO MOLDED RF CHOKE .33UH 10%		
A1A4L5	9100-2265		COIL FXO MOLDED RF CHOKE 10UH 10%		
A1A4L6	9100-0368		COIL FXO' MOLDED RF CUOKF .33UH 10%		
A1A4L7	9100-0368		COIL FXD MOLDED RF CHOKE .33UH 10%		
A1A4L8	9100-0368		COIL FXO MOLDED RF CHOKE .33UH 10%		
A1A4L9	9100-2247		COIL FXO MDLOEO RF CHOKF .1UH 10%		
A1A4Q1	1854-0345	6	TRANSISTOR NPN 2N5179 SI TO 72 PD=200MW		
A1A4Q2	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW		
A1A4R1	3698-6242	2	RESISTOR 1.2K 5% .125W CC TC=0+882		
A1A4R2	0698 5182	2	RESISTOR 3.9K 5% .125W CC TC=0+882		
A1A4R3	0698-3374	4			
A1A4R4	3698-5174	11			
A1A4R5	0698-3380	3			
A1A4R6	0698 6283	1			
A1A4R7	0698-5178	1			
A1A4R8	0698-5181	1			
A1A4R9	0698-3374	1			
A1A4R10	0698-8128	3			
A1A4R11	0698 3380				
A1A4R12	1698-3380				
A1A4R13	0698-8128				
A1A4R14	0698-8128				
A1A4R15	1698-5426	2			

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Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty	Description	
A1A4R16	0698 7102	2	RESISTOP 5.1K 51 .125W CC TC=0+882	
A1A4R17	0698-5103	2	RESISTOR 430 5% .125W CC TC=0+892	
A1A4R18	0698-8127	1	RESISTOR 22 51 .125W CC TC=0+588	
A1A4R19	0698-3374		RESISTOR 20 5% .125W CC TC=0+588	
A1A4R20	0698-5174		PESISTLR 200 5% .125W CC TC=0+882	
A1A4R21	0698 5174		RESISTOR 200 5% .125W CC TC=0+832	
A1A4R22	0698-5174		RESISTOR 200 5% .125W CC TC=0+882	
A1A4R23	0698-5174		RESISTOR 200 51 .125W CC TC=0+882	
A1A4R24	0698-5174		RESISTOR 200 5% .125W CC TC=0+882	
A1A4R25	0698-5426		RESISTOR 10K 10% .125W CC TC=0+882	
A1A4R26	0698 7152		RESISTOR 5.1K 5% .125W CC TC=0+882	
A1A4R27	0698-3374		RESISTOR 20 5% .125W CC TC=0+588	
A1A4R28	0698-5103		RESISTOR 430 51 .125W CC TC=0+832	
A1A4R29	0674- 2405	1	RESISTOR 24 5% .125W CC TC=0+588	
A1A4R30	0698-5174		RESISTOR 200 51 .125W CC	
A1A4R31	0698 3378	4		
A1A4U1	1858 0004	5		
A1A5	05340-60077	1		
	05340-20074	2		
	05340 00030	1		
A1A5A1	05340-60075	1		
A1A5A1C1	0180-1745	6		
A1A5A1C2	0180 1745			
A1A5A1C3	0160 3879	15		
A1A5A1C4	0160-3879			
A1A5A1L1	9100-1620	4		
A1A5A1L2	9100-1620			
A1A5A1L3	9100-2272	5		
A1A5A1L4	9100-2272			
A2	05340-60027	1		
	05340 00012			
	05340-00017			
	05340 00018			
	05340-20035	1		
A2C1	0160 0204			
A2C2	G16P-0204			
A2C3	0160 0204			
A2FL1	5088-			
A2A1*	5088 .5.4			
A2A2*	5088-7005			
A2A3*	05340-60043	1		05340-60043
A2A3C1	0165-3277			
A2A3C2	0160-3277			
A2A3R1	0683-4745	10		
A2A4	05340-60040	1		
A2A4C1	0121-0060	1		
A2A4C2	0180-1743	6		
A2A4C3	0140 0201	1		
A2A4C4	0180-0197			
A2A4C5	0160-2327	2		
A2A4C6	0160-2262	2		
A2A4C7	0160 2262			
A2A4C8	0160-3277			
A2A4C9	0160-3277			
A2A4C10	0180- 0197			
A2A4C11	0160-3277			
A2A4C12	0160-3277			
A2A4C13	0160-3277			
A2A4C14	0160-2241	1		
A2A4C15				

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation					
A2A4C16					0160-3277
A2A4C17					0160-3277
A2A4C18					
A2A4C19					
A2A4C20					
A2A4C21			CAPACITOR FXD 20PF +5% 300WVDC MICA		
A2A4C22			CAPACITOR FXD 82PF +5% 300WVDC MICA		
A2A4L1*					
A2A4L2					
A2A4L3					
A2A4L4					
A2A4L5					
A2A4L6					
A2A4L7					
A2A4L8					
A2A4L9					
A2A4L10					
A2A4Q1					
A2A4Q2					
A2A4R1					
A2A4R2					
A2A4R3					
A2A4R4					
A2A4R5					
A2A4R6					
A2A4R7					
A2A4R8					
A2A4R9					
A2A4R10					
A2A4R11					
A2A4R12					
A2A4R13					
A2A4R14					
A2A4R15					
A2A4R16					
A2A4R17					
A2A4R18					
A2A4R19					
A2A4R20					
A2A4R21					
A2A4R22					
A2A4U1					
A2A5					
A2A5A1					
A2A5A1C1					
A2A5A1C2					
A2A5A1C3					
A2A5A1C4					
A2A5A1L1					
A2A5A1L2					
A2A5A1L3					
A2A5A					

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number
A3C16	0180-0197
A3C17	0180-0116
A3C18	0180-0116
A3CR1	1901-0040
A3CR2	1901-0040
A3CR3	1901-0040
A3CR4	1901-0040
A3CR5	1901-0376
A3CR6	1901-0376
A3CR7	1902-0025
A3CR8	1902-0025
A3CR9	1901-0535
A3CR10	1901-0535
A3E1	9170-ti029
A3E2	9170-0029
A3L1	9140-0114
A3L2	9140-0114
A3L3	9140-0114
A3L4	9140-0114
A3Q1	1855-0334
A3Q2	1853-0036
A393	1854-0215
A3R1	0683-1035
A3R2	0757-0908
A3R3	0683-1055
A3R4	0751-0920
A3R5	0757-0920
A3R6	0683-1015
A3R7	0757-0908
A3R8	0698-3446
A3R9	0757-0913
A3R10	2100-2520
A3R11	0757-0932
A3R12	06831025
A3R13	0683-5105
A3R14	0157-0917
A3R15	0757-0925
A3R16	0683-6815
A3R17	0683-3945
A3R18	0683-3945
A3R19	0683-1135
A3R20	0683-3345
A3R21	0683-3345
A3R22	
A3R23	0683-1135
A3R24	0757-0944
A3U1	1820-0754
A3XU1	1200-0475
A4	05340-60002
A4C1	0150-0093
A4C2	0150-0093
A4C3	0150-0093
A4C4	0150-0093
A4C5	0160-2255
A4C6	0150-
A4C7	
A4C8	
A4C9	
A4C10	
A4C11	
A4C12	
A4C13	
A4C14	
A U15	
A4C16	
A4CR1	
A4CR2	
A4CR3	
A4CR4	
AUR5	

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Table 6-1. Replaceable Parts, 5340A **Standard Instruments**

Reference Designation	HP Part Number				
A4CR6	1901-0179				
A4CR7	1901-0179				
A4CR8	1901-0179				
A4CR9	1901-0179				
A4CR10	1901-0022				
A4L1	9140-0105				
A4L2	9100-2257				
A4L3	9140-0098				
A4L4	9100-2260				
A491	1854-0071				
A402	1854-0071				
A4Q3	1854-0071				
A494	1854-0073				
A405	1854-0073				
A4Q6	1854-0073				
A4R1	0698-3440				
A4R2	0698-3440				
A4R3	0698-3155				
A4R4	0757-0438				
A4R5	0757-0438				
A4R6					
A4R7					
A4R8					
A4R9					
A4R10					
A4R11					
A4R12					
A4R13					
A4R14					
A4R15					
A4R16					
A4R17					
A4R18					
A4R19					
A4R20					
A4R21					
A4R22*					
A4R23					
A4R24					
A4R25					
A4R26					
A4R27					
A4R28					
A4R29					
A4R30					
A4R31					
A5					
A5C1					
A5C2					
A5C3					
A5C4					
A5C5					
A5C6					
A5C7					
A5C8					
A5CR1					
A5CR2					
A5CR3					
A5CR4					
A5CR5					
A5L1					
A5L2					
A5L3					
A591					
A5Q2					
A5Q3					
A5R1					
A5R2					
A5R3					
A5R4					
A5R5					

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number
A5R6	
A5R7	
A5R8	
A5R9	
A5R10	
A5R11	
A5R12	
A5R13	
A5R14	
A5R15	
A5R16	
A5R17	
A5R18	
A5R19	
A5R20	
A5U1	
A5U2	
A5U3	
A5U4	
A5U5	
A6	
A6C1	
A6C2	
A6C3	
A6C4	
A6C5	
A6C6	
A6C7	
A6C8	
A6C9	
A6C10	
A6CR1	
A6CR2	
A6CR3	
A6CR4	
A6CR5	
A6CR6	
A6CR7	
A6CR8	
A6CR9	
A6CR10	
A6CR11	
A6CR12	
A6CR13	
A6CR14	
A6CR15	
A6CR16	
A6CR17	
A6CR18	
A6CR19	
A6L1	
A691	
A692	
A693	
A694	
A695	
A696	
A697	
A698	
A6Q9	
A6910	
A6Q11	
A6912	
A6R1	
A6R2	
A6R3	
A6R4	
A6R5	
A6R6	
A6R7	
A6R8	
A6R9	
A6R10	

Table 6–1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number
A6R11	0757-0931
A6R12	0698-7185
A6R13	0757-0935
A6R14	0698-7185
A6R15	0757-0942
A6R16	0698-3376
A6R17	0698-3376
A6R18	0698-3376
A6R19	0698-3376
A6R20	0698-3376
A6R21	0698-3276
A6R22	0698-8072
A6R23	0698-5182
A6R24	0698-6242
A6R25	0698-5996
A6R26	0698-5175
A6R27	0698-5174
A6R28	0698-7185
A6R29	0698-7185
A6R30	0698-7185
A6R31	0698-7185
A6R32	0698-7185
A6R33	0696-7185
A6R34	0698-6294
A6R35	0698-6294
A6R36	0698-6294
A6R37	0698-6294
A6R38	0698-6294
A6R39	0698-6294
A6R40	0698-5999
A6R41	0698-5999
A6R42	0698-5999
A6R43	0698-5999
A6R44	
A6R45	
A6U1	
A6U2	
A6U3	
A6U4	
A6U5	
A7	
A7C1	
A7C2	
A7C3	
A7C4	
A7C5	
A7C6	
A7C7	
A7C8	
A7C9	
A7C10	
A7C11	
A7C12	
A7C13	
A7C14	
A7CR1	
A7CR2	
A7CR3	
A7CR4	
A7CR5	
A7CR6	
A7CR7	
A7CR8	
A7L1	
A7L2	
A7L3	
A7L4	
A7Q1	
A782	
A793	
A7Q4	
A705	

Table 6-1.

Reference Designation	HP Part Number			
A7Q6	1854-0215			
A7Q7	1854-0215			
A708	1854-0215			
A7Q9	1853-0036			
A7R1	[illegible]			
A7R2				
A7R3				
A7R4				
A7R5				
A7R6				
A7R7				
A7R8				
A7R9				
A7R10				
A7R11				
A7R12				
A7R13				
A7R14				
A7R15				
A7R16				
A7R17				
A7R18				
A7R19				
A7R20				
A7R21				
A7R22				
A7R23				
A7R24				
A7R25				
A7R26				
A7R27				
A7R28				
A7R29				
A7R30				
A7R31				
A7R32				
A7R33				
A7R34				
A7R35				
A7TP1				
A7TP2				
A7TP3				
A7TP4				
A7TP5				
A7TP6				
A7TP7				
A7U1				
A8				
A8C1				
A8C2				
A8C3				
A8C4				
A8C5				
A8C6				
A8C7				
A8C8				
A8C9				
A8C10				
A8C11				
A8C12				
A8C13				
A8C14				
A8C15				
A8C16				0160-3060
A8C17				DM15F501F0300WV1C
A8C18				5C11B7-CML
A8C19				0160-3060
A8C20				
A8C21				
A8C22				
A8C23				

Table **6-1.** Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number				
A8CR1	1902-3182				
A8CR2	1902-0025				
A8CR3	1902-0025				
A8L1					
A8L2					
A8L3					
A8L4					
A8Q1					
A802					
A8R1					
A8R2					
A8R3					
A8R4					
A8R5					
A8R6					
A8R7					
A8R8					
A8R9					
A8R10					
A8R11					
A8R12					
A8R13					
A8R14					
A8R15					
A8R16					
A8R17					
A8R18					
A8R19					
A8R20					
A8R21					
A8R22					
A8R23					
A8R24					
A8U1					
A8U2					
A8U3					
A9					
A9C1					
A9C2					
A9C3					
A9C4					
A9C5					
A9C6					
A9C7					
A9C8					
A9C9					
A9C10					
A9C11					
A9C12					
A9C13					
A9CR1					
A9CR2					
A9L1					
A9L2					
A9L3					
A9L4					
A9Q1					
A9Q2					
A903					
A9R1					
A9R2					
A9R3					
A9R4					
A9R5					
A9R6					
A9R7					
A9R8					
A9R9					
A9R10					

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number
A10R11	
A10R12	0698-0084
A10R13	0698-3441
A10R14	0698-3447
A10R15	0683-1015
A10R16	0683-5125
A10R17	0698-6000
A10R18	0683-7515
A10R19	0698-3378
A10R20	0683-1025
A10R21	0698-5174
A10R22	0757-0288
A10R23	0698-3113
A10R24	0698-3151
A10R25	2100-2413
A10T1	08553-6012
A10TP1	0360-0124
A10U1	1820-1179
A10Z1	9100-1788
A11	05340-60009
A11C1	0180-0374
A11C2	0180-0374
A11C3	0160-3789
A11C4	0160-3789
A11C5	0180-0374
A11C6	0180-0374
A11C7	0160-2055
A11C8	0160-2055
A11C9	0160-3060
A11C10	0160-3060
A11C11	0160-0155
A11C12	0160-3060
A11L1	
A11L2	
A11R1	
A11R2	
A11R3	
A11R4	
A11R5	
A11R6	
A11R7	
A11R8	
A11R9	
A11U1	
A11U2	
A12	
A13	
A13C1	
A13C2	
A13C3	
A13C4	
A13C5	
A13C6	
A13C7	
A13C8	
A13C9	
A13C10	
A13C11	
A13C12	
A13C13	
A13C13	
A13C14	

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty
A14C21	0180-1743	
A14C22	0160-3060	
A14C23	0160-2055	
A14C24		
A14C25	0180-0210	
A14C26	0160-2055	
A14C27	0180-0210	
A14CR1	1901-0050	
A14CR2	1901-0050	
A14CR3	1901-0050	
A14CR4	1901-0050	
A14CR5	1902-3182	
A14L1	9140-0137	
A14L2	9140-0137	
A14L3	9140-0137	
A14L4	9140-0137	
A14L5	9100-2265	
A14L6	9100-2265	
A14L7	9140-0158	
A14L8	9100-2272	
A1401	1854-0073	
A1402	1854-0073	
A1403	1854-0073	
A14R1	0757-0907	
A14R2	0757-0907	
A14R4	0757-0900	
A14R5	0757-0916	
A14R6	0757-0924	
A14R7	0757-0924	
A14R8	0757-0915	
A14R9	0757-0900	
A14R10	0757-0924	
A14R11		
A14R12		
A14R13		
A14R14		
A14R15		
A14R16		
A14R17		
A14R18		
A14R19		
A14R20		
A14R21		
A14R22		
A14R23		
A14R24		
A14U1		
A14U2		
A15		
A15C1		
A15C2		
A15C3		
A15C4		
A15C5		
A15C6		
A15C7		
A15C8		
A15C9		
A15C10		
A15C11		
A15C12		
A15C13		
A15C14		
A15C15		
A15CR1		
A15CR2		
A15L1		
A15L2		
A15L3		
A15L4		
A15L5		1/2

Reference Designation			
A15L6			
A15R1			
A15R2			
A15R3			
A15R4			
A15R5			
A15R6			
A15R7			
A15R8			
A15R9			
A15R10			
A15R11			
A15R12			
A15R13			
A15R14			
A15U1			
A16			
A16C1			
A16C2			
A16C3			
A16C4			
A16C5			
A16C6			
A16C7			
A16C8			
A16J1			
A1652			
A16J3			
A16J4			
41655			
A16J6			
A1657			
XA4		CONNECTOR:RT ANG MOUNT	
XA5		CONNECTOR:RT ANG MOUNT	
XA6		CONNECTOR:RT ANG MOUNT	
XA7			
XA8			
XA9			
XA10		CONNECTOR:RT-ANGL MOUNT	
XA11		CONNECTOR:RT-ANGL MOUNT	
XA12			
XA13			
XA14			
XA15			
A17			
A17W1			
A17A1			
A17A1C1			
A17A1C2			
A17A1C3			
A17A1C4			
A17A1C5			
A17A1C6			150D225X0020A2
A17A1C7			
A17A1C8			
A17A1C9			
A17A1C10			
A17A1C11			
A17A1C12			

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number			
A19C6	0160-3879			
A19CR1	1901-0040			
A19L1				
A19L2	9100-2247			
A19L3	9140-0158			
A1901	1854-0560			
A19R1	1810-0041			
A19R2	0683-2725			
A19R3	0683-1025	RESISTOR 1K 5% .5W	C=	
A19R4	0683-1025	RESISTOR 1K 5% .5W	C=	
A19R5	06831015	RESISTOR 100 5% .25W	TC	
A19R6	0683-2725			
A19R7	0683-2715			
A19R8	0683-2715			
A19R9	0683-4715			
A19R10	0683-2725			
A19R11	0683-2025	RESISTOR 5% .25W	TC=-400/+700	
A19R12	0683-2025	RESISTOR 5% .25W	TC -400/+700	
A19R13				
A19R14				
A19U1				
A19U2				
A19U3				
A19U4				
A19U5				
A19U6				
A19U7				
A1921				
A20				
A20C1				
A20C2				
A20C3				
A20R1				
A20R2				
A20R3				
A20R4				
A20U1				
A20U2				
A20U3				
A20U4				
A20U5				
A20U6				
A20U7				
A20U8				
A20U9				
A20U10				
A20U11				
A20U12				
A20U13				
A20U14				
A20U15				
A20U16				
A20U17				
A20U18				
A20U19				
A20U20				
A20U21				
A20U22				
A20U23				
A20U24				
A20U25				
A20U26				
A20U27				
A20U28				
A20Z1				

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Table 6–1. Replaceable Parts, 5340A Standard Instruments

Reference Designation				
A22916		TRANSISTOR NPN SI D 300MW FT=200MHZ		
A22917		TRANSISTOR NPN SI D 300 FT 200MHZ		
A22918		TRANSISTOR NPN SI 2N FT 300MHZ		
A22919		TRANSISTOR NPN 2N TO 18 D=300MW		
A22920		TRANSISTOR NPN SI FT 500MHZ		
A22921		TRANSISTOR NPN 200M		
A22R1		25!		
A22R2		RESISTOR 100 5% .25W FC 00/		
A22R3		RESISTOR 51 5% 25W C T % 0/+		
A22R4		RESISTOR 2K 2% .125W F T =0+-100		
A22R5		RESISTOR 2 .125W F T 100		
A22R6		2K 2% 125W TC=0+-100		
A22R7		2K 2% 125W TC=0+-100		
A22R8		R 2% 25W F TC=0+-100		
A22R9		R 2% 25W F TC=0+-100		
A22R10		R K ; .125W F TC 1		
A22R11		RESISTOR 510 ! 5W F		
A22R12		RESISTOR 2.7K 125W		
A22R13				
A22R14				
A22R15				
A22R16				
A22R17				
A22R18				
A22R19				
A22R20				
A22R21				
A22R22				
A22R23				
A22R24				
A22R25				
A22R26				
A22R27				
A22R28				
A22R29				
A22R30				
A22R31				
A22132				
A22133				
A22R34				
A22R35				
A22R36				
A22R37				
A22R38				
A22R39				
A22R40				
A22R41				
A22R42				
A22R43				
A22R44				
A22R45				
A22R46				
A22R47				
A22R48				
A22R49				
A22R50				
A22R51				
A22R52				
A22R53				
A22R54				
A22R55				
A22U1				
A22U2				
A22U3				
A22U4				
A22U5				
A22U6				
A22U7				
A22U8				
A22U9				
A				
A22XU8				

Table **6-1.** Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty			
A22XU9	1200-0475				
A22Z1	9100-1788				
A22Z2	9100-1788				
A23	05340-60030				
A23C1	0160-3879				
A23C2	0180-0106				
A23R1	0683-2725				
A23U1	1820-0596				
A23U2	1820-0986				
A23U3	1820-0986				
A23U4	1820-0986				
A23U5	1820-0986				
A23U6	1820-0986				
A23U7	1820.0986				
A23U8	1820-0659				
A23U9	1820-0659				
A23U10	1820-0910				
A23U11	1820-0910				
A23U12	1820-0583				
A23U13	1820-0588				
A23U14	1820-0054				
A23U15	1820-0054				
A23016	1820-0077				
A23U17	1820-0077				
A23U18	1820-0054				
A23U19					
A23U20					
A23U21					
A23Z1					VK200-20/48
A24					
A24C1					
A24C2					
A24J1A			CONNECTOR-PC EDGE	CONT/ROW 2-ROWS	
A24J1B			CONNECTOR-PC EDGE	CONT/ROW 2-ROWS	
A24U1					
A24U2					
A24U3					
A24U4					
A24U5					
A24U6					
A24U7					
A24U8					
A24U9					
A24U10					
A24U11					
A24U12					
A24U13					
A24U14					
A24U15					
A24U16					
A24U17					
A24U18					
A24Z1					
A24Z2					
L25					
L25C1					
L25C2					
L25CR1					
L25DS1		8			
L25XDS1		8			
L25DS2					
L25XDS2					
125053					
L25XDS3					

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number				
A25DS4	1970-0054				
A25XDS4	1200-0405				
A25DS5	1970-0054				
A25XDS5	1200-0405				
A25DS6	1970-0054				
A25XDS6	1200-0405				
A25DS7	1970-0054				
A25XDS7	1200-0405				
A25DS8	1970-0054				
A25XDS8	1200-0405				
A25DS9	2140-0313				
A25XDS9					
A25DS10	2140-0313				
A25DS11	2140-0313				
A25DS12	2140-0313				NE2H FROSTED
A250513	2140-0313				NE2H FROSTED
A25DS14	2140-0313				NE2H FROSTED
A250515	2140-0313				
A25DS16	2140-0313				
A25DS17	2140-0313				
A2591	1854-0533		TRANSISTOR NPN		
A2592	1854-0533		TRANSISTOR NPN		
A2593	1854-0533		TRANSISTOR NPN	PD=.625MW FT=100MHZ	
A2594	1854-0533		TRANSISTOR NPN	PD=.625MW FT=100MHZ	
A25Q5	1854-0533		TRANSISTOR NPN	PD=.625MW FT=100MHZ	
A25Q6	1854-0533		NPN	FT=100MHZ	
A2597	1854-0071		NPN	FT=200MHZ	
A25R1	[illegible]				
A25R2					
A25R3					
A25R4					
A25R5					
A25R6					
A25R7					
A25R8					
A25R9					
A25R10					
A25R11					
A25R12					
A25R13					C82725
A25R14					C82735
A25R15					C82725
A25R16			27K !	25W f TC= 400 +800	
A25R17			2.7K	.25W C TC -40 /+70	
A25R18			27K !	25W f T 400	
A25R19					
A25120					
A25R21					
A25R22					
A25R23					
A25R24					
A25R25					
A25R26					
A25R27					
A25U1					
A25U2					
A25U3					
A25U4					
A25U5					
A25U6					
A25U7					
A25U8					
A25U9					
A25U10					
	D5330 00027				
	D5330 40002				
	D5340-00006				

Table **6-1.** Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number
A26	05340-60037
A26Q1	1854-0533
A2602	1854-0533
A2693	1854-0533
A2604	1854-0533
A2695	
A2606	
A26Q7	
A2698	
A2609	
A26010	
A26R1	
A26R2	
A26R3	
A26R4	
A26R5	
A26R6	
A26R7	
A26R8	
A26R9	
A26R10	
A26R11	
A26R12	
A26R13	
A26R14	
A26R15	
A26R16	
A26R17	
A26R18	
A26R19	
A26R20	
A27	
A28	
A28C1	
A28C2	
A28C3	
A28C4	
A28C5	
A28C6	
A28C7	
A28CR1	
A28CR2	
A28CR3	
A28CR4	
A2801	
A2892	
A2803	
A28Q4	
A2805 FOR A28Q5	
A2806 FOR A28Q6	
A2807	
A2808	
A2809	
A28010 FOR A28Q10	
A28R1	
A28R2	
A28R3	
A28R4	
A28R5	
A28R6	
A28R7	
A28R8	
A28R9	
A28R10	

Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty	Description	
A28R11	0757-0900		RESISTOR 100 22 .125W F TC=0+ 100	
A28R12	0757-0900		RESISTOR 100 2% .125W F TC=0+ 100	
A28R13	0757-0924		RESISTOR 1K 2% .125W F TC=0+-100	
A28R14	0757-0952		RESISTOR 15K 21 .125W F TC=0+- 100	
A28R15	0698-5841	1	RESISTOR 11 51 .25W FC TC=-400/+500	
A28R16	0811-1672	1	RESISTOR 33 51 2W PW TC=0+-400	BWH2-3R3-J
A28TP1	0360-0124		TERMINAL-STUD SPCL PRESS HTG	
A28TP2	0360-0124		TERMINAL-STUD SPCL PRESS MTG	
A28U1	1826-0016	3	IC LM204H RGLTR	
A29	05340-60025	1	REGULATOR ASSEMBLY, +15 V. (SERIES 1220A) (LOADED ON 05340-20025 BLANK BOARD)	
A29C1	0180-0116		CAPACITOR-FXG: 6.8UF+-10% 35VDC TA	
A29C2	0180-0374		CAPACITOR-FXO; 10UF+-10% 20VDC TI-SOLID	
A29C3	0150-0050	3	CAPACITOR-FXO 1000PF +80-20% 1000WVDC	
A29C4	0180-0374		CAPACITOR-FXO; 10UF+-10% ZOVDC TA-SOLID	
A29CR1	1901-0040		DIODE-SWITCHING 30V 50NA 2NS DO 35	
A29CR2	1901-0040		DIODE-SWITCHING 30V 50NA 2NS DO-35	
A29CR3	1902-3234		DIODE-ZNR 19.6V 51 00-7 PD=.4W TC=+.073	
A2901	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	
A29Q2	1854-0420	1	TRANSISTOR NPN SI PD=40W FT=3MHZ	
FOR A29Q2	1205-0219		HEAT-OISSIPATDR SGL SHUNT PKG	
A2903	1854-0039		TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	
FOR A2903	1205-0033		HEAT-OISSIPATOR SGL TO-5/TO-39 PKG	
A29R1	0683-2725		RESISTOR 2.7K 5X .25W FC TC=-400/+700	
A29R2	0683-6805	1	RESISTOR 68 51 .25W FC TC=-400/+500	
A29R3	0757-0936		RESISTOR 3.3K 2% .125W F TC=0+-100	
A29R4	0757-0943		[illegible]	
A29R5	2100-2633			
A29R6	0757-0123			
A29R7	0683-0335	2		
A29R8	0757-0944			
A29R9	0757-0280	3		
A29R10	0683-0335			
A29U1	1826-0010	3		
A30	05340-60029	1		
A30C1	0180-2387	2		602D222G030A42A
A30C2	0180.2387			6 A2A
A30C3	0180-2386	2		6 A2A
A30C4	0180-2386			6 A2A
A30C5	0180-2385	2		
A30C6	0180-2385			602D402G015AA2A
A30CR1	1906-0027	3		
A30CR2	1906-0027			
A30CR3	1906-0027			
XA2B	1251-1886	4		
XA29	1251-1886		CONNECTOR-PC 15-CONT/ROW 2-ROWS	
XA31	1251-1886		CONNECTOR-PC 15-CONT/ROW 2-ROWS	
XA32	1251-1886		CONNECTOR-PC 15-CONT/ROW 2-ROWS	
A31	05340.60024	1		
A31C1	0180-0374			
A31C2	0180-0374			
A31C3	3180-0229	7		
A31C4	0160-2141			
A31C5	3160-2141			
A31C6	0180-0229			
A31C7	1180-0229			
A31CR1	1902-3149	1		
A31Q1	1854-0071			
A31Q2	1854-0071			
A31Q3	1853-0254			
FOR A31Q3	1205-0219			
A31Q4	1853-0020			

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Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number				
A31Q5	1853-0020				
A31Q6	1853-0012				
A31Q7	18530020				
A31Q8					
FOR A31Q8					
A31R1					
A31R2					
A31R3					
A31R4					
A31R5					
A31R6					
A31R7					
A31R8					
A31R9					
A31R10					
A31R11					
A31R12					
A31R13					
A31R14					
A31R15					
A31R16					
A31R17					
A31R18					
A31R19					
A31R20					
A31TP1					
A31TP2					
A31TP3					
A31U1					
A31U2					
A32					
A32C1					
A32C2					
A32C3					
A32C4					
A32C5					
A32C6					
A32C7					
A32C8					150D336X9010B2
A32C9					150D226X9015B2
A32C10					150D336X9010B2
A32CR1					
A32CR2					
A32CR3					
A32CR4					
A32CR5					
A32CR6					
A32Q1					
A32Q2					
A32Q3					
A32Q4					
A32Q5					
A32R1					
A32R2					
A32R3					
A32R4					
A32R5					
A32R6					
A32R7					
A32R8					
A32R9					
A32R10					
A32R11					
A32R12					
A32R13					
A32R14					
A32R15					
A32R16					
A32R17		1			
A32R18					

		Qty
		1

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Table **6-1.** Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty	Description		
		1	5340A CHASSIS PAFTS		
B1	3160-0209	1	FAN-TBAX 45-CFM 115V 50/60-HZ 1.5-THK		
C1	0160-3C43	1	CAPACITOR-FXC 5000 PF/5000PF +-201		
c 2	0180-022B	1	CAPACITOR-FXD; 22UF+-10% 15VDC TA- SOLID		
c 3	0160-3036	5	CAPACITOR-FXD 5000 PF +80-20% 200WVDC CER		
c4	0160-3036		CAPACITOR FXC 5000 PF +80-20% 200WVDC CER		
c5	0160-3036		CAPACITOR-FXO 5000 PF +80-20% 200WVDC CER		
C6	0160-3036		CAPACITOR-FXD 5000 PF +80-20% ZOOYVOC CEK		
c7	0160-3036		CAPACITOR-FXC 5000 PF +80-20% 200WVDC CER		
C8	0180-1743	1	CAPACITOR-FXC: .1UF+-10% 35VDC TA SOLID		
CP1	5088-7003	1	POWER SPLITTER ASSEMBLY		
CR1	1906-0038	1	DIODE-MULT FULL WAVE BRIDGE RECTIFIER		
CR2	1901-0028	1	DIODE-PWR RECT 400V 750NA DO-29		
E I	0340-0037	1	TERMINAL-STUC DBL TURRET PRESS MTG		
F1	2110-0002	1	FUSE 2A 250V 1.25X.25 UL IEC (FOR 115V CPERATIDNI		
F1	2110-0001	1	FUSE 1A 250V NORM-BLO 1.25X.25 UL IEC (FOR 230V CPEPATION)		
J1			(PART OF W2, FRONT-PANEL N CONNECTOR)		
J2			PART DF OPTION 0021 SEF TABLE 6-4		
J3	1250-LO83	3	CONNECTOP-		
J4	1250-0186	1			
J5	1250-0083				
J6	1251-2357	1			
J7	1250-0083				
J8					
J9					
L1	9140-0096	1			
L2	9100-2247	5			
L3	9100-2247				
L4	9100-2247				
L5	9100-2247				
L6	9100-2247				
MP1	5000-0050	1			
MP2	05340-00014	1			
MP3	05340-20068	1			
MP4	05340-00003	1			
MP5	05340 00010	1			
MP6	05340 — 00025	1			
MP7	05340. 20045	1			
MP8	05340-00023	1			
MP9	05340-00011	1			
MP10	05340-00013	1			
MP11	5060-0767	5			
MP12	5060-0730	1			
MP13	5000-8593	1			
MP14	1490-0030	1			
MP15	05340-00001	1			
MP16	05340 00005	1			
MP17	05340-00001	1			
MP18					
MP19	5040 0170	13			
MP20	05340 00008	1			
FOR MP20	0340-0486	2			
MP21	05340-00019	1			
MP22	05340-20027	1			
Q1	1854-0063	2			
FOR Q1	1200-0043	2			
FOR Q1	1200-0456	2		28480	
Q2	1854-0063			28480	
FOR Q2	1200-0043			76530	
FOR Q2	1200-0456				

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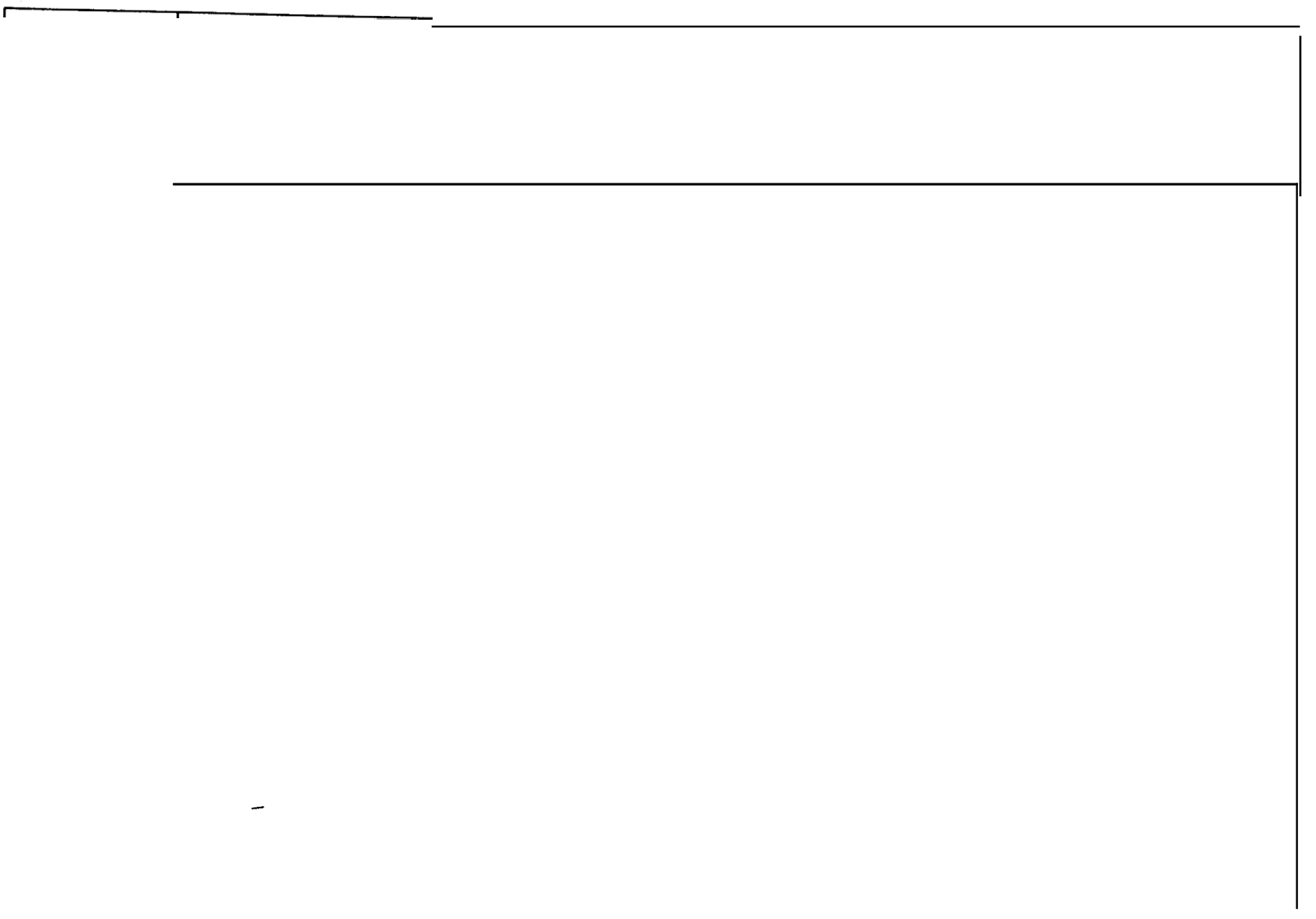
Table 6-1. Replaceable Parts, 5340A Standard Instruments

Reference Designation	HP Part Number	Qty	Description
R1 SAMPLE RATE	2100-3171	1	RESISTOR-VAR W/SW 1M 30% 10CW SPST-NC (SAYPLE RATE)
FOR R1	0370-1099	1	KNOB-RASE PTR .5 IN JGK SGI-DECAL
R2	0683-1025	1	RESISTOR 1K 5% .25W
R3	0683-2725	1	
R4			
S1	3101-1694	1	
S2	3101-1216	1	
S3			
S4	3100-2935	1	
FOR S4	0370-0432	1	
S5 (INT-EXT)	3101-0070	1	
S6 (115V-230V)	3101-1272	1	
S7			
S8			
S9			
S10			
S11			
S12			
T1	9100-3019	1	
T2			
TH1	3103-0022	1	
W1	05505-60019	1	
W2	05340-60028	1	
W8	05340-60033	1	
Y4	05340-60034	1	
W5	05340-60013	1	
W6	05340-60035	1	
Y7	05340-60044	1	
W8	8120-1378		
Y9	05340-60048	1	
W10	05340-60049	1	
W11	05340-60050	1	
W12	05340-60051	1	
W13	05340 60052	1	
Y14	05340-60053	1	
Y15	05340-60054	1	
W16	05340-60065	1	
W17			
W18			
W19			
W20			
W21			
XA1			
XA2			
XA3			
XA4			
XA5			
XA6			
XA7			
XA8			
XA9			
XA10			
XA11			
XA12			
XA13			
XA14			
XA15			
XA16			
XA17	1251-0160	1	
XA18	1251-0159		
XA19A	1251-0159	3	
XA19B	1251-0159		
XA20	1251-0233	5	
XA21	1251-0233		
XA22	1251-0233		
XA23	1251-0233		
XA24	1251-0233		



Reference Desinnation	HP Part Number
A18	10544A
A33	
A33C1	
A33C2	
A33C3	
A33C4	
A33C5	
A33C6	
A33C7	
A33CR1	
A33CR2	
A33CR3	
A33CR4	
A33CR5	
A33Q1	
A33R1*	
A33R2	
A33R3	
A33R4	
A33R5	
A33R6	
A33R7	
A33R8	
A33R9	
A33T1	
A33T2	
A33U1	

Qt

Reference Designation		Qty			
A19					05340-60067
A19C1					
A19C2					
A19C3					
A19C4					
A19C5					
A19C6					
A19CR1					
A19L1					
A19L2					
A19Q1					
A19R1					
A19R2					
A19R3					
A19R4					
A19R5					
A19R6					
A19R7					
A19R8					
A19R9					
A19R10					
A19R11					
A19R12					
A19U1					
A19U2					
A19U3					
A19U4					
A19U5					
A19U6					
A19U7					
A19U8					
A19U9					
A19U10					
A19U11					
A19U12					
A19U13					
A19U14					
A19U15					
A19U16					
A19U17					
A19U18					
A19U19					
A19U20					
A19U21					
A19U22					
A19U23					
A19U24					

Table 6-1, A14 Replaceable Parts:
Change series number for 05340-60011 (A14) to Series 1236A.
Change A14R1

CHANGE 5

Table 6-1, Replaceable Parts:

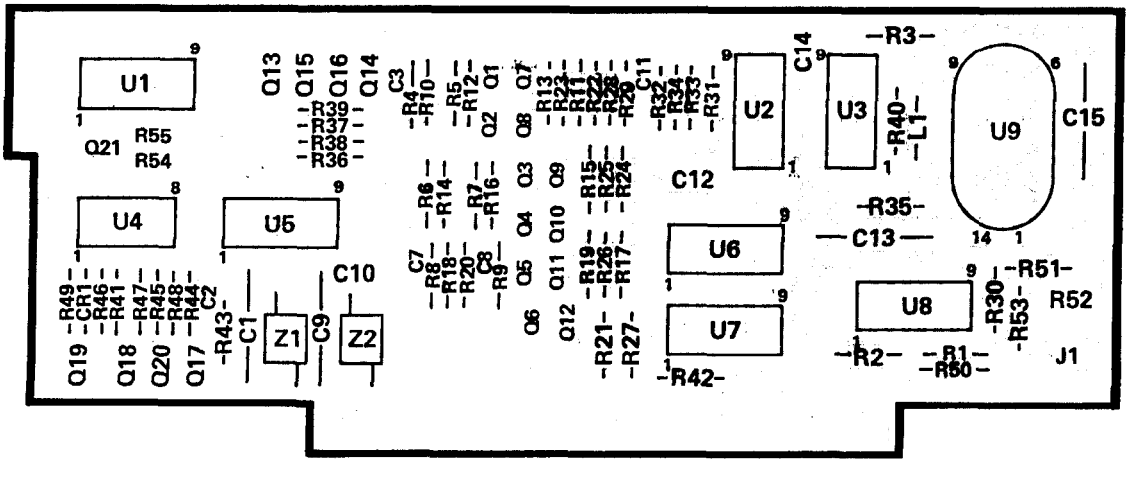
Change A3CR5 and CR6 to 1901-0535, Diode:Hybrid Hot Carrier, 28480,1901-0535.

Change A20C3

Change A1OR1 to 0698-3151 RFXD MET FLM 2.87K OHM 1% 1/8W, Change

05340-60018

A20Z1



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS, INDUCTANCE IN MICROHENRIES
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

...MT DIRECT COUNT TO A22J1

REFERENCE DESIGNATIONS

NO PREFIX	A17	A17A1
		C1-26
		CR1-5
	J1,2	J1,2
		L1-7
		R1-82
XA17	W1,2	U1-5

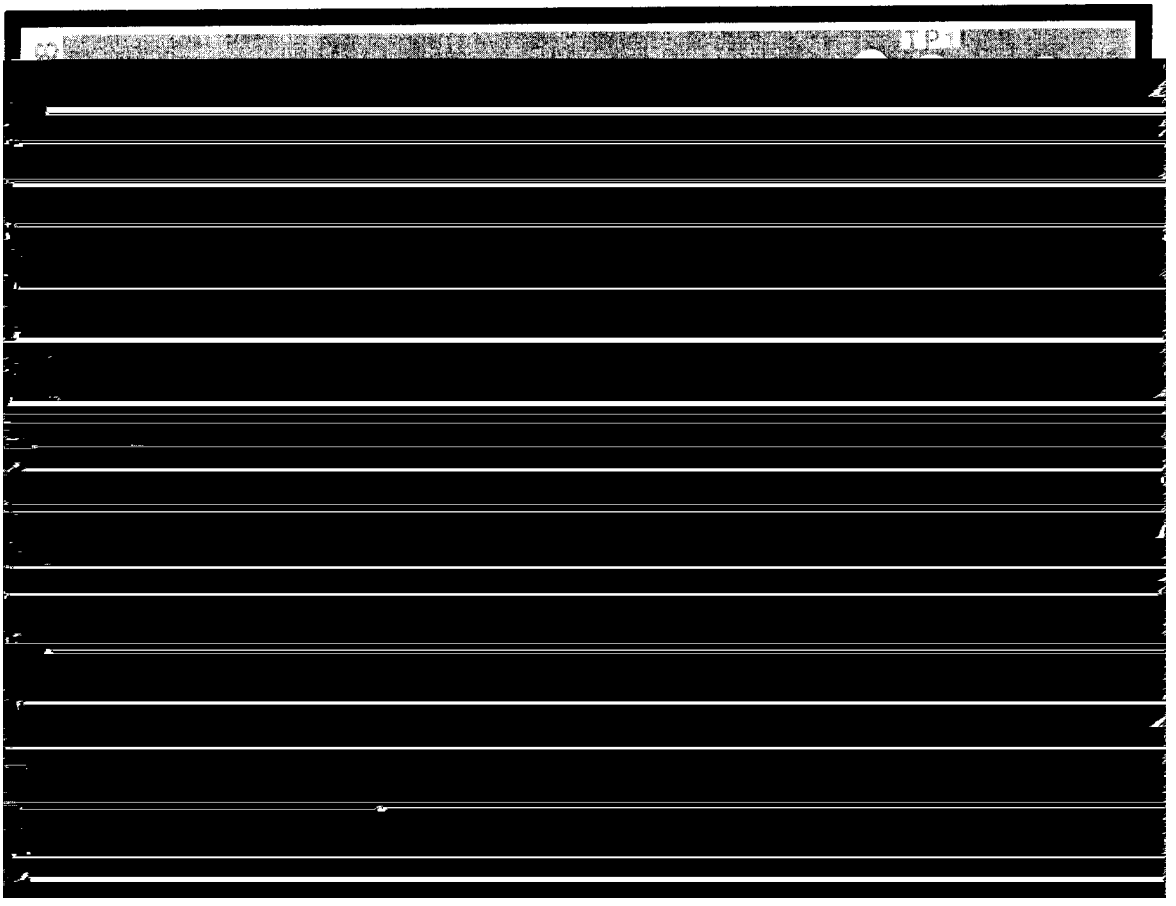
...BLE ...ROL (HIGH DURING DIRECT MODE INDETERMINATE 250 MHZ) C3 DELETED

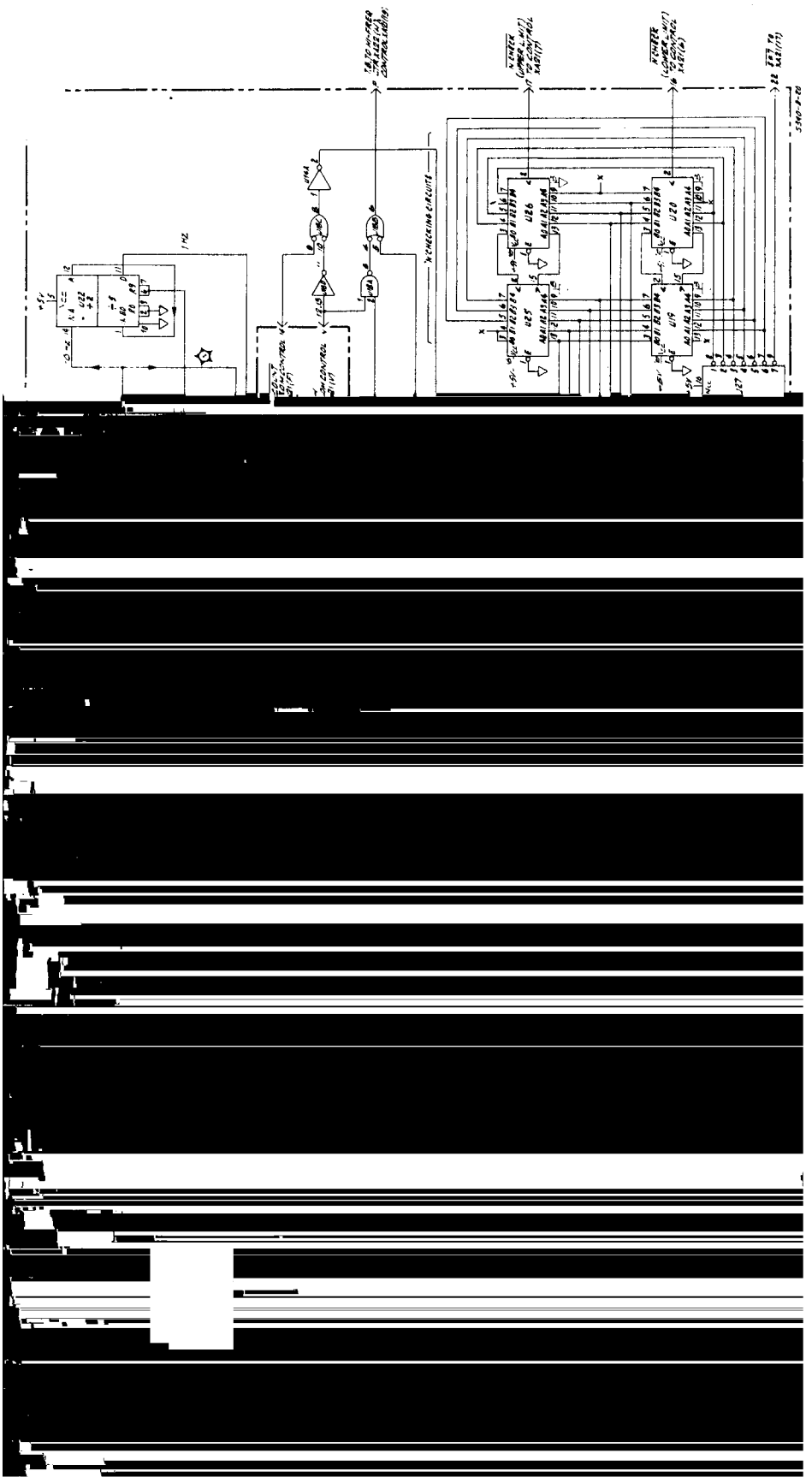
...D ...L

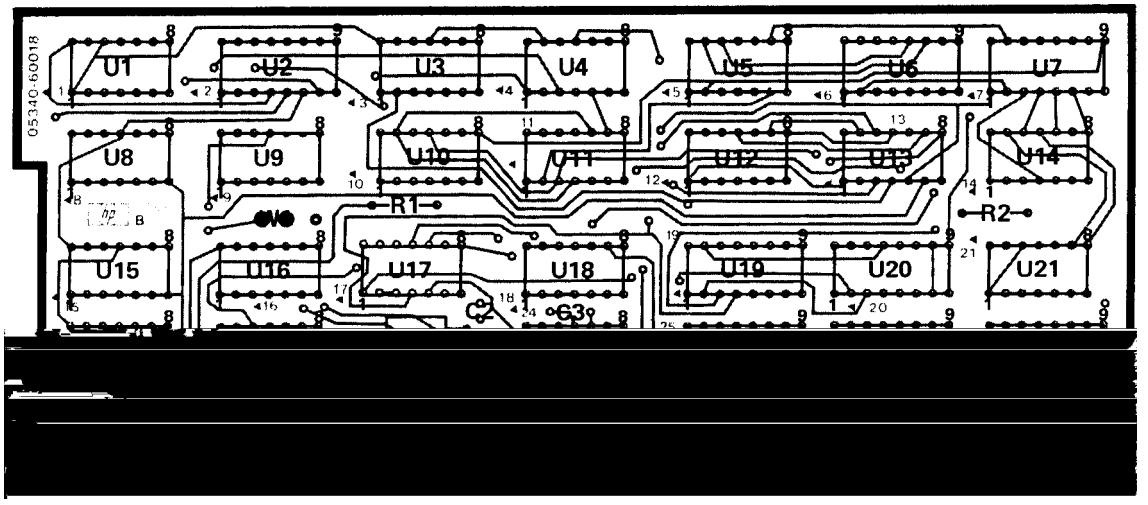
...COMPLETE PARTS LIST ...AR THIS ASSEMBLY STARTS ...PAGE 6-11.

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
...1, 2	1901-0535
...3	1901-2040
...4, 5	1901-0179
	1820-0216
	1826-0826 -M3 IN
...6	1820-0754
...4, 5	1820-0753







ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
U1, 8, 9, 15 16, 22	1820-0055 SN7490N
U2	1820-0615 9312
U3, 12, 21	1820-0099 SN7493N
U4, 18	1820-0054 SN7400N
U5	1820-0069 SN7420N
U6, 7	1820-0716 SN7416IN
U10, 11, 17	1820-0077 SN7474N
U13, 14	1820-0174 SN7404N
U19, 20, 25, 26	1820-0904 93L24
U23	1820-0751 SN74196N
U24	1820-0261 SN74121N
U27	1820-0214 SN7442N

REFERENCE DESIGNATIONS
A20
C1-3 R1-3 U1-27 Z1

A COMPLETE PARTS LIST FOR THIS ASSEMBLY STARTS ON PAGE 6-19.

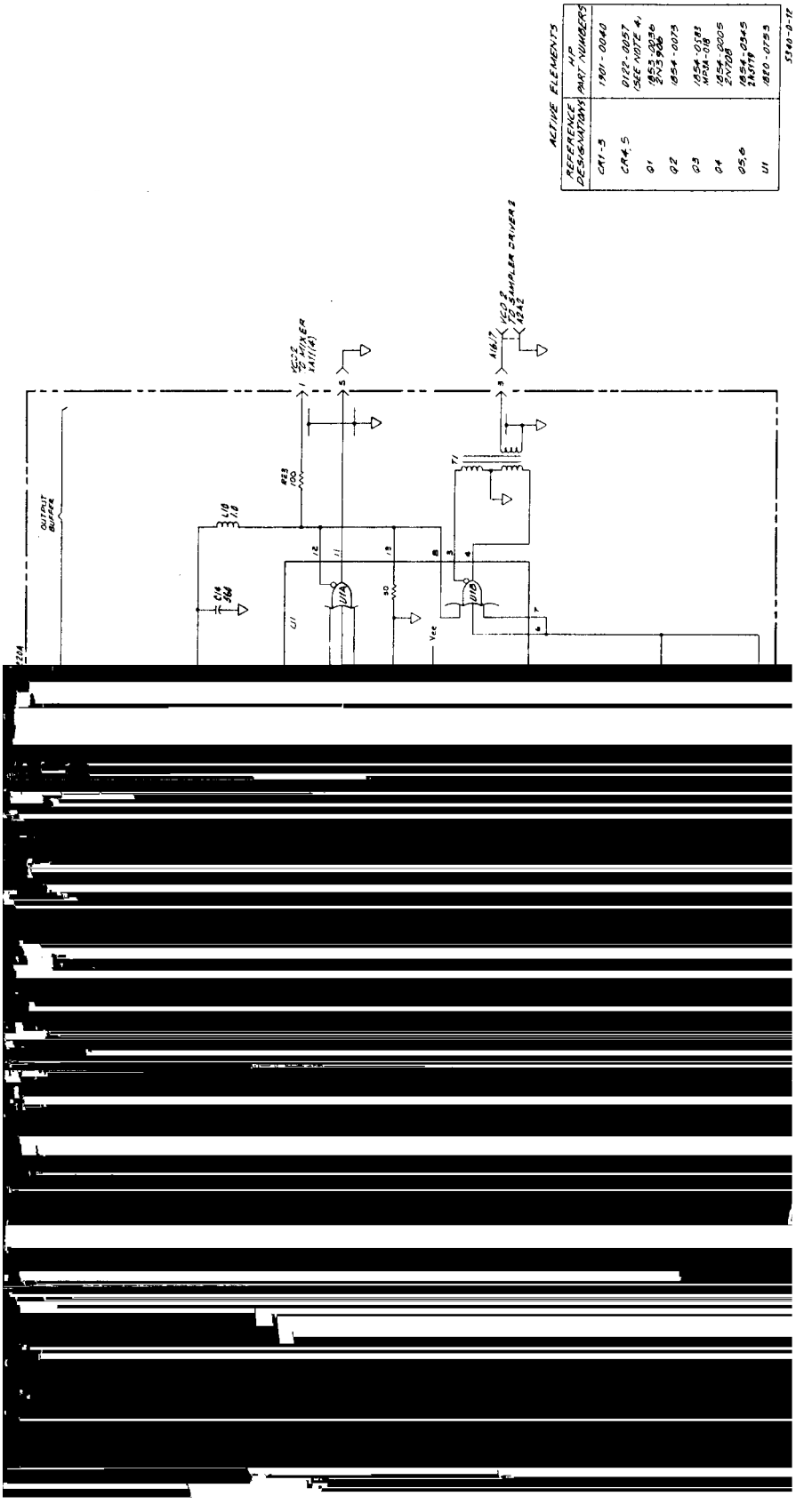
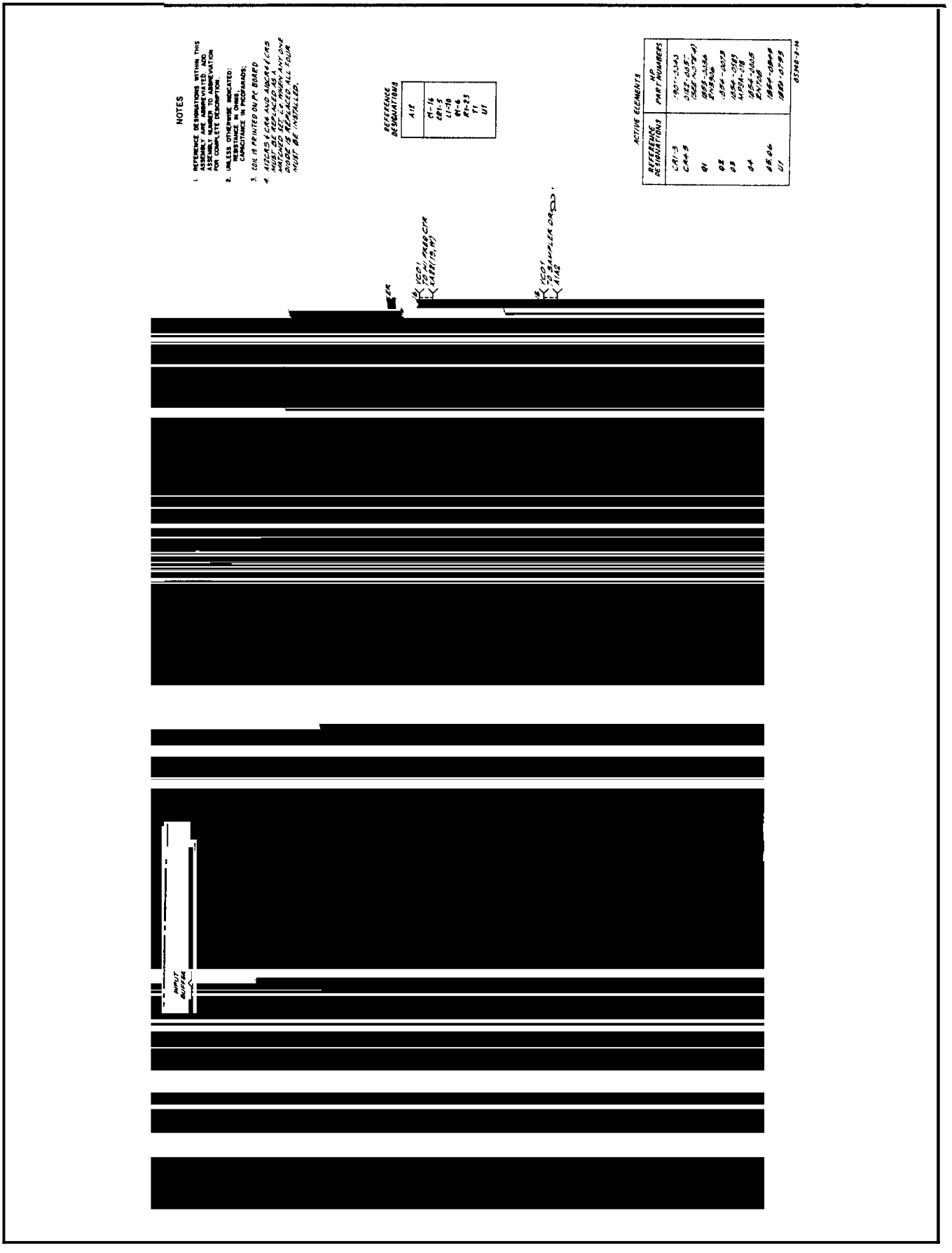

ACTIVE ELEMENTS
REFERENCE DESIGNATIONS
MP PART NUMBERS
CR1-5
CR6,7
Q1
Q2
Q3
Q4
Q5,6
U1
5140-0-12
VCO 2 (2 MIXER 1ST LO)
VCO 2 (2 SAMPLER DRIVER 1ST LO)
OUTPUT BUFFER
T1
R53 100
L16 1.0
C14 360
U1A
U1B
Vcc

Figure 7-7. A12 VCO No. 1 Assembly **(Series** 1220A), Schematic Diagram



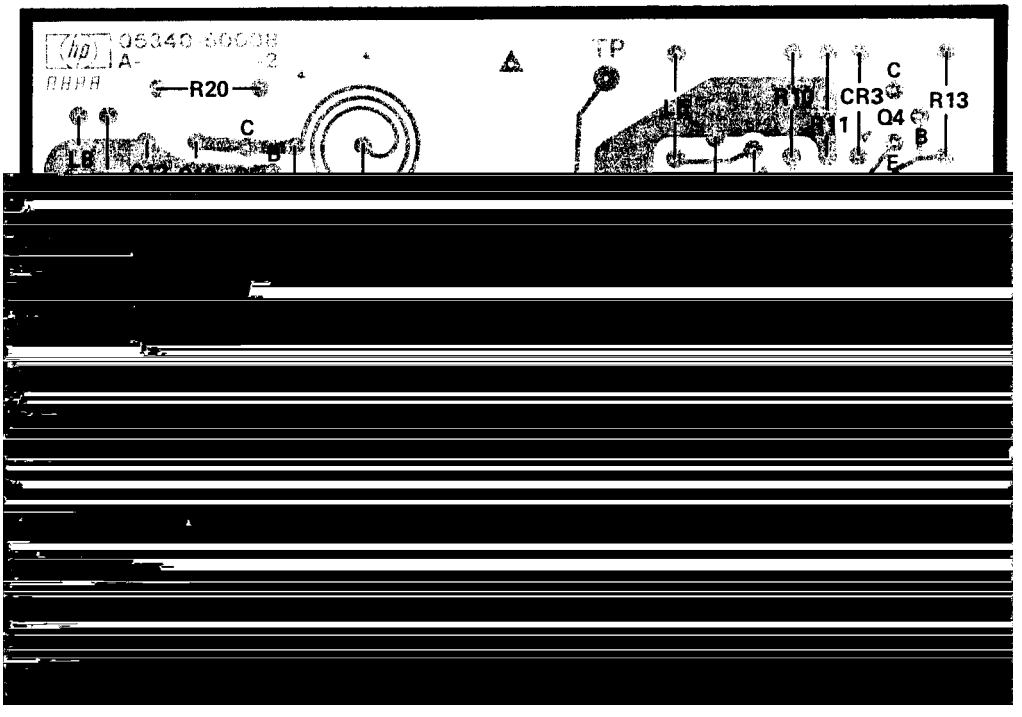

R20
C
B
TP
R10
R11
CR3
C
Q4
B
E
R13

Figure 7-9. A33 Power Supply (Series 1236A) Schematic Diagram

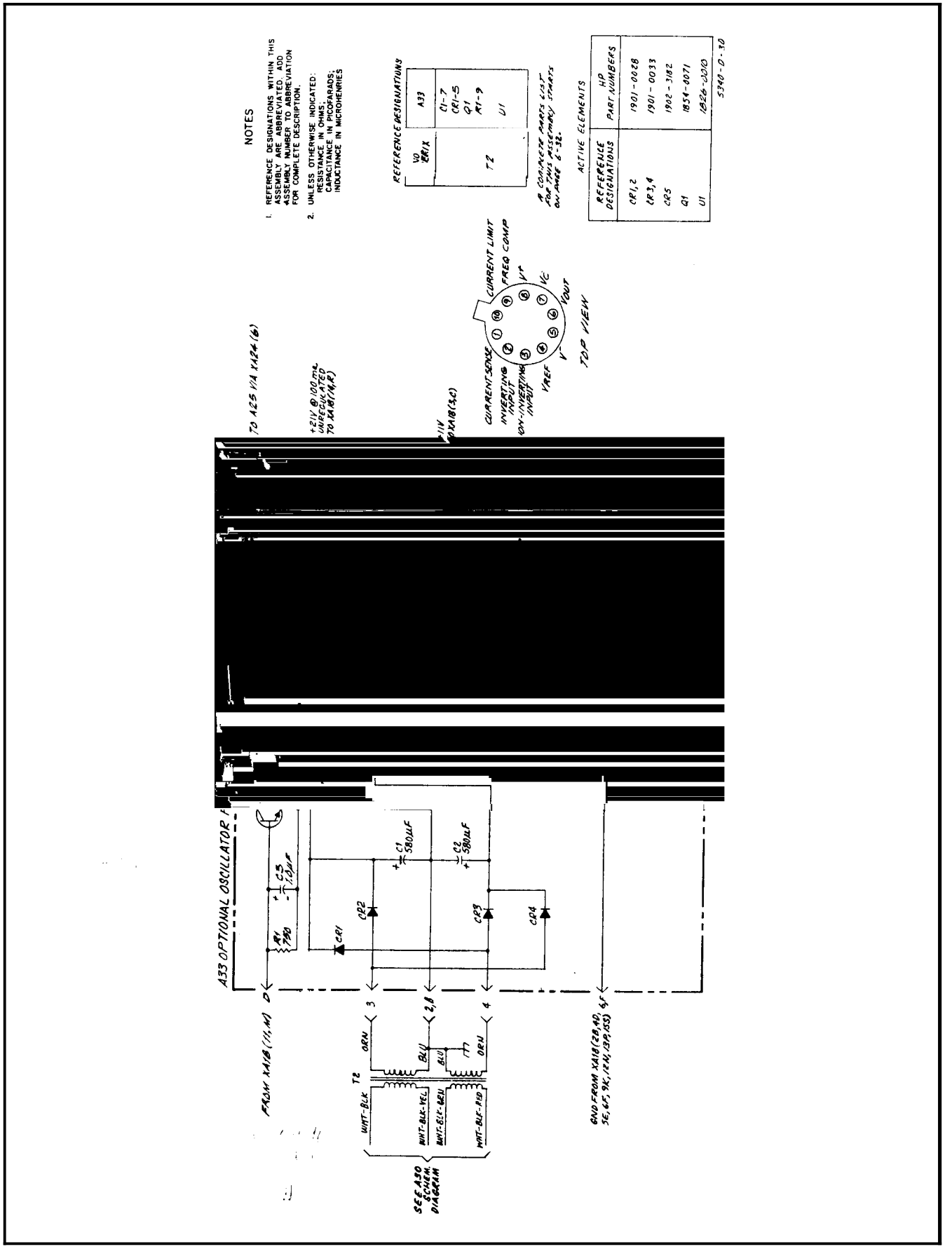
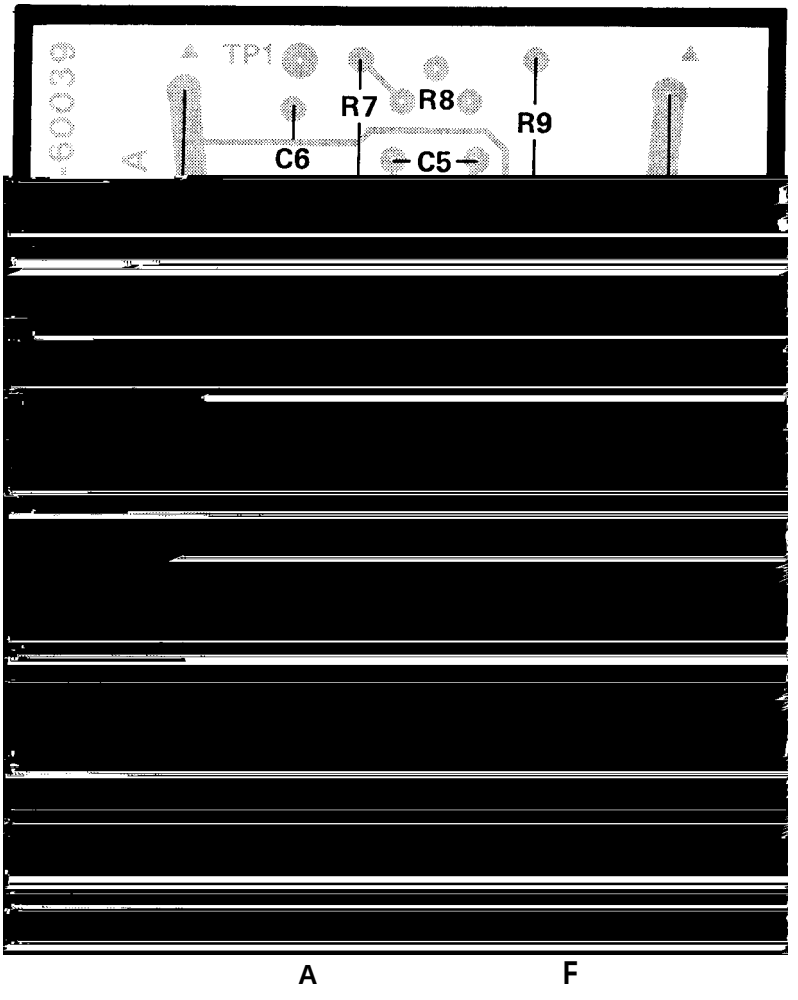
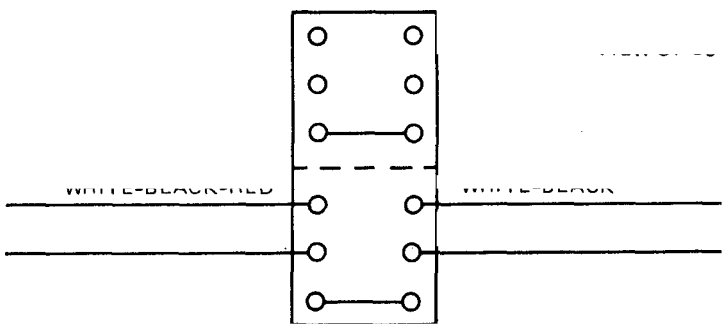


Figure 7-10. A33 Power Supply (Series 1236A), Component Locator



VII

see page 7-19



CAUTION

7-26. Installation of Option 011, Digital Input/Output

7-27. The following parts are required:

A19	
A34	
A35	
W19, W20	
A20	
CR2	

8-13. MNEMONICS AND ABBREVIATIONS

8-14. Table 8-1 lists mnemonics and abbreviations peculiar to the 5340A. Common abbreviations are given in Section VI.

Table 8-1. 5340A Mnemonics and Abbreviations

CHK	
CLK	
CONT	
CTR	
DAC	
DAV	
DIO	
DIR CNT	
DIR SW	
DISP REG	
D.P.	
IFC	
F.F.	
Fx	
HI-Z	
I.L.	
INH	
INT	
M. GATE	
ATN	
N.C.	
O'FLO	
PE	
P/O	
PROG	
P SHIFT	
P TRAN Q	
R COUNT	
R DISP	
REMT	
REN	
RES A	
RES B	
RFD	
R.N.	
S=7	
SEL	
S RATE	
S RATE Q	
SRQ	
SVCD	

Figure 8-1. Schematic Diagram Notes

SYMBOLS

FRONT PANEL

REAR PANEL

INTERIOR AND PC BOARDS

WIPER MOVES TOWARD "CW" WHEN CONTROL IS ROTATED CLOCKWISE

POWER LINE GROUND

CIRCUIT COMMON GROUND

FLOATING GROUND

CHASSIS GROUND

KNOB CONTROL

SCREWDRIVER ADJUST

MAIN SIGNAL PATH

FEEDBACK PATH

TEST POINT

"AND" GATE

"OR" GATE

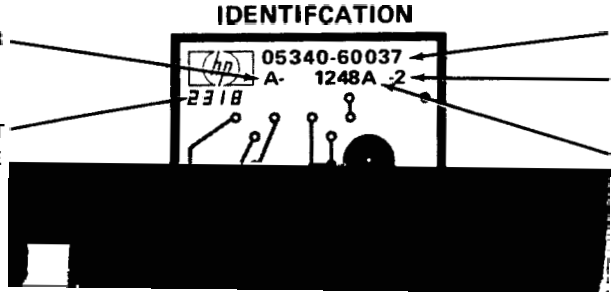
INVERTER

NAND GATE

NOR GATE

EXCLUSIVE NOR

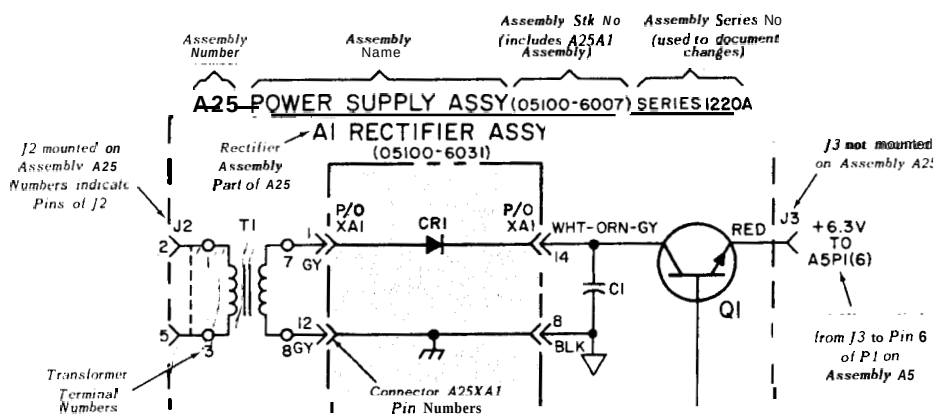
PRINTED CIRCUIT BOARD IDENTIFCATION

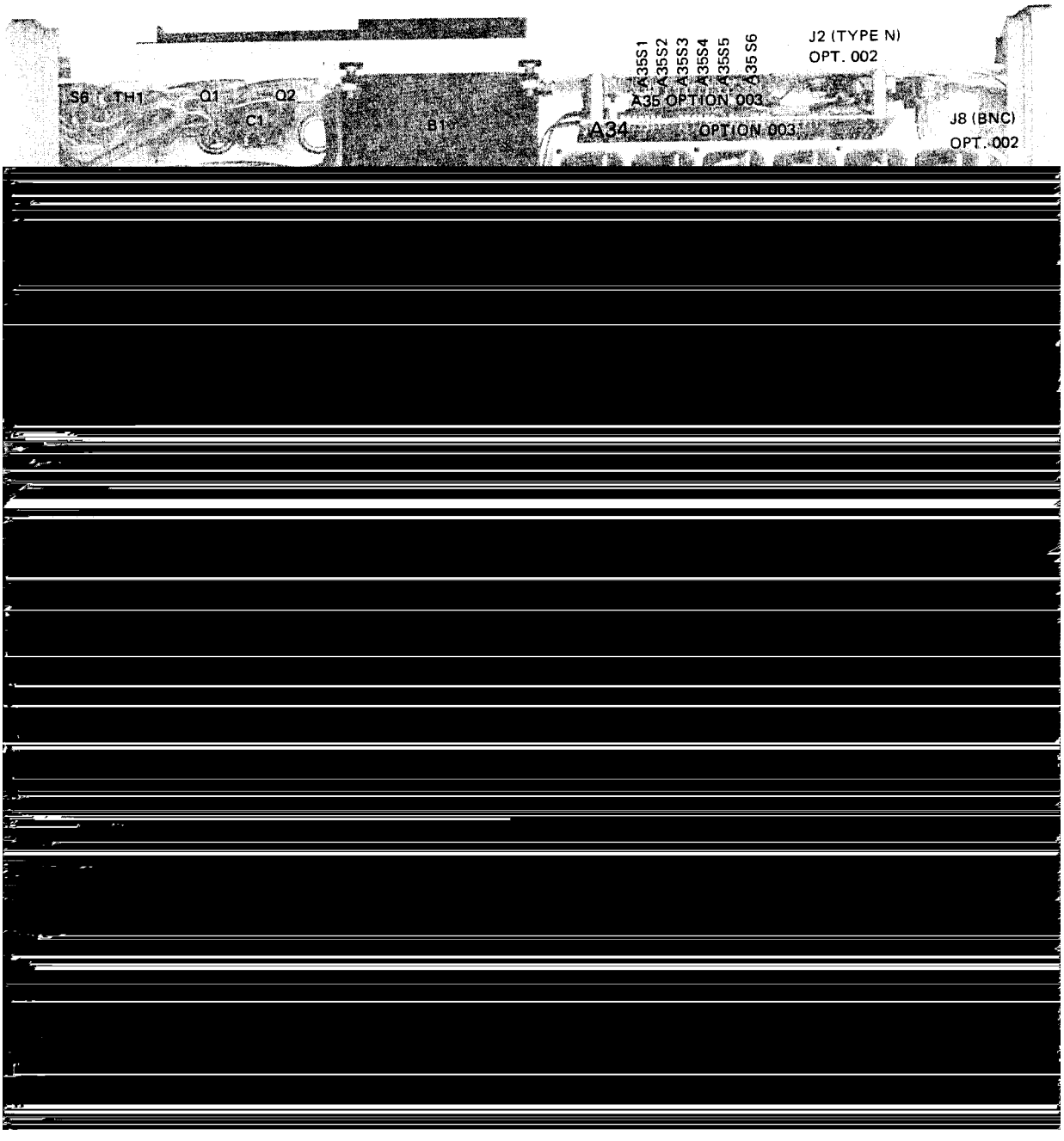


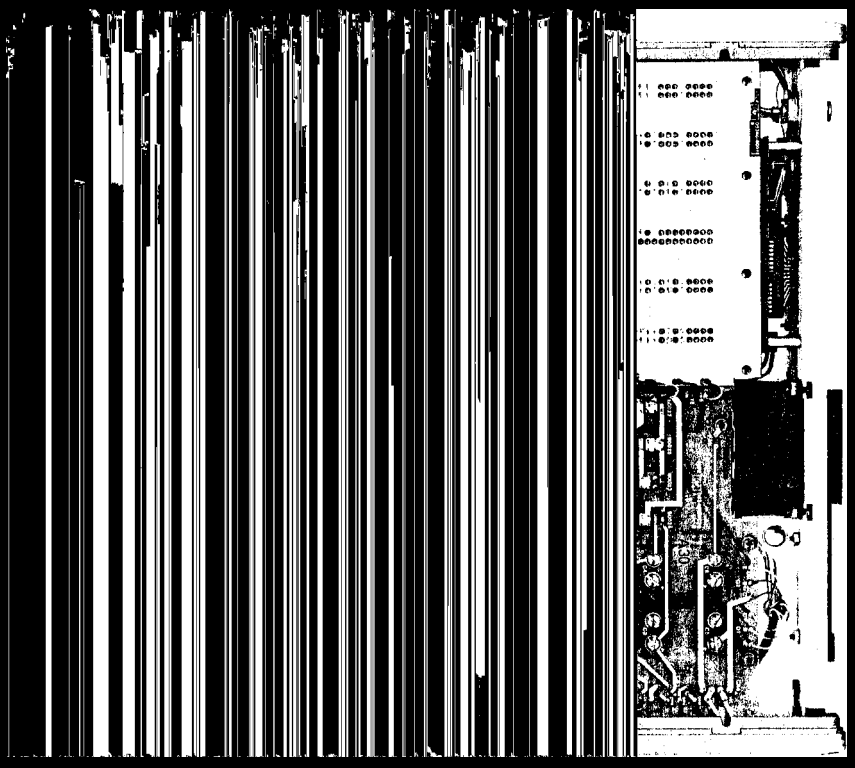
REFERENCE DESIGNATIONS

REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION. JACKS ARE THE STATIONARY CONNECTORS AND PLUGS ARE THE MORE MOVEABLE OF TWO CONNECTORS.

ASSEMBLY	ABBREVIATON	COMPLETE DESCRIPTION
A25	C1	A25C1
A25A1	CR1	A25A1CR1
NO PREFIX	J3	J3

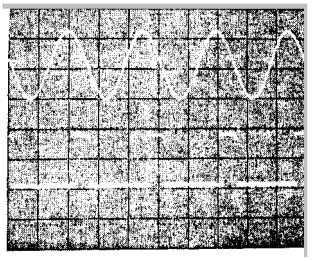



S6
TH1
Q1
Q2
C1
B1
A35S1
A3552
A3553
A3554
A3555
A35 S6
A35 OPTION 003
A34
OPTION 003
J2 (TYPE N)
OPT. 002
J8 (BNC)
OPT. 002



6 OV –

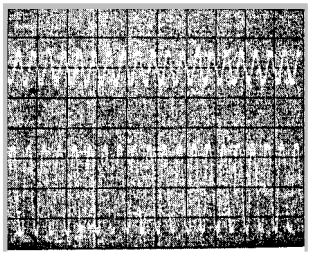
7 OV –



Top: .05V/div, dc
Bottom: .2V/div, dc
20 μs/div

8

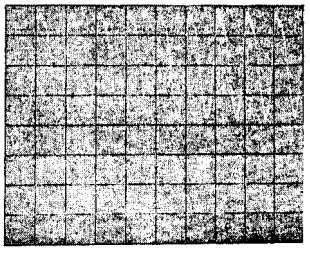
9



Top: .005V/div, ac
Bottom: .05V/div, ac
.1 μs/div

10

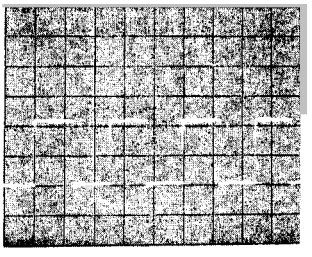
11



Top: .005V/div, ac
Bottom: .01V/div, ac
.05 μs/div

12

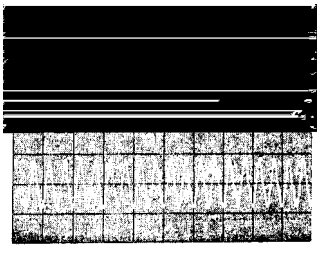
OV –



.2 V/div dc
10 μs/div

13

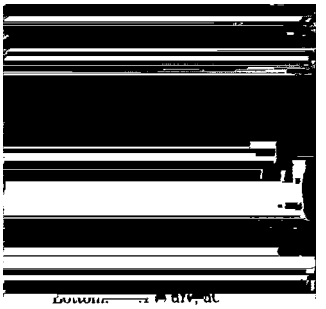
14



Top: .005V/div, ac
Bottom: .005V/div, ac
.1 μs/div

15 OV –

16 OV –



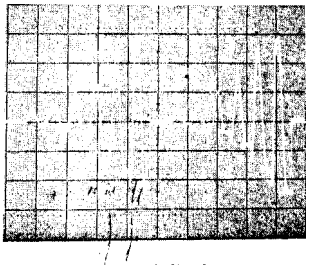
.1 μs/div

No Signal Input
to 5340A

17

Scope Sweep
Mode set to NORM

OV –



.2V/div, dc
20 ms/div

Except for 17, waveforms taken with 320 MHz input at -20 dBm. Waveforms 6 through 17 taken with HP Model 180A Oscilloscope with 1801A Vertical Amplifier and 1820B Time Base, 10:1 Divider Probe was used.

Set Oscilloscope controls to:

SWEEP MODE	AUTO
SYNC SOURCE	INT
Vertical Polarity	+ UP
MODE	ALT

Model 53
matic Diagr
A Block Diagr

Figure 8-4. 5340A Front Panel Reference Designations

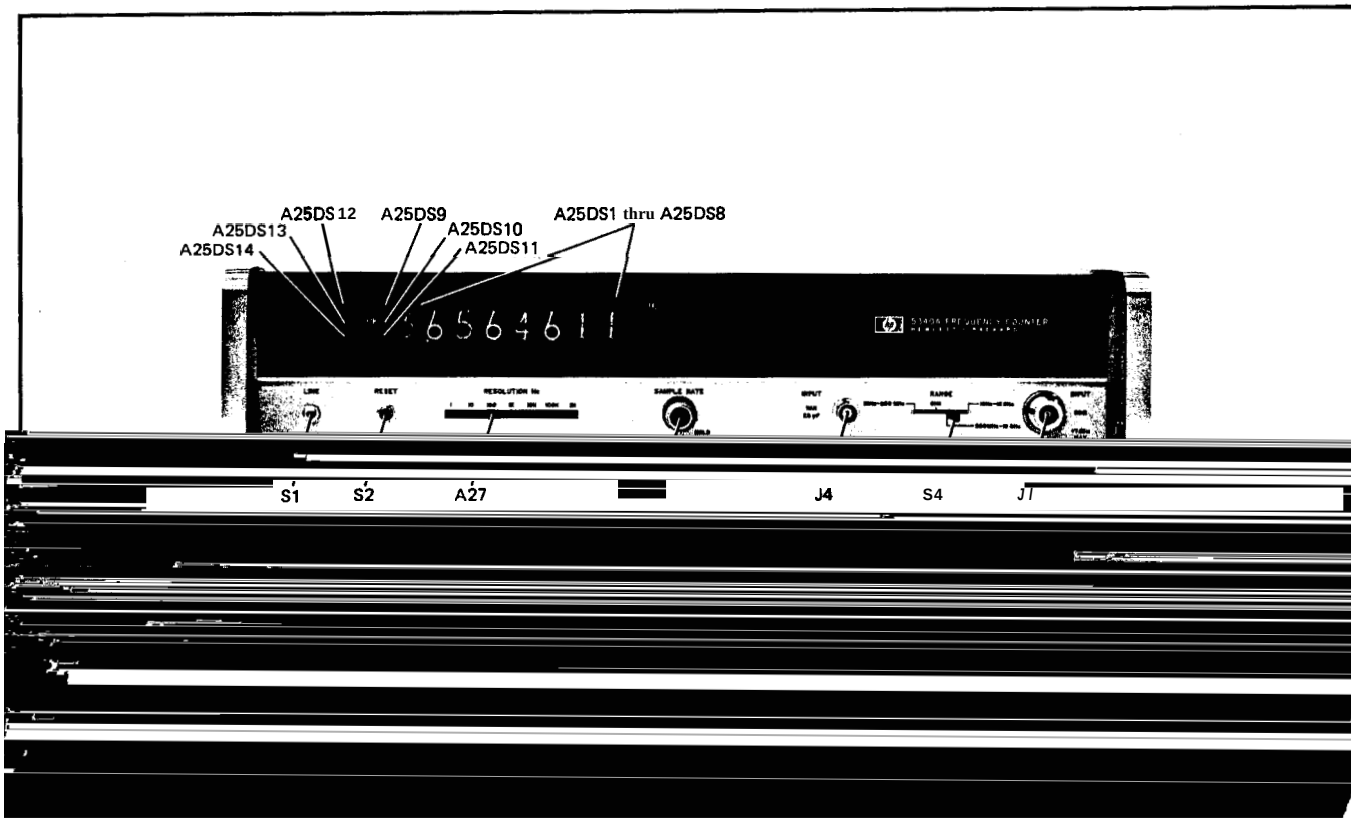
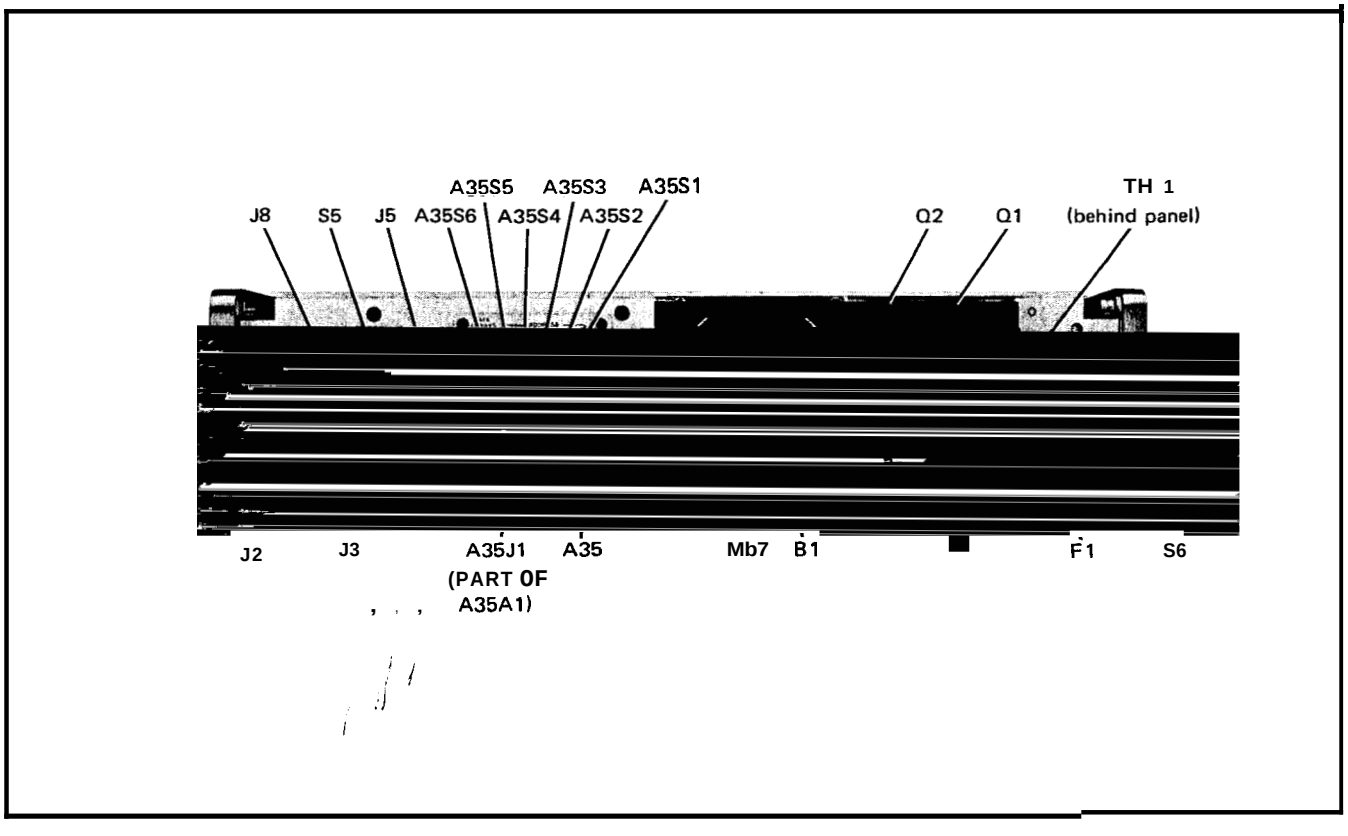
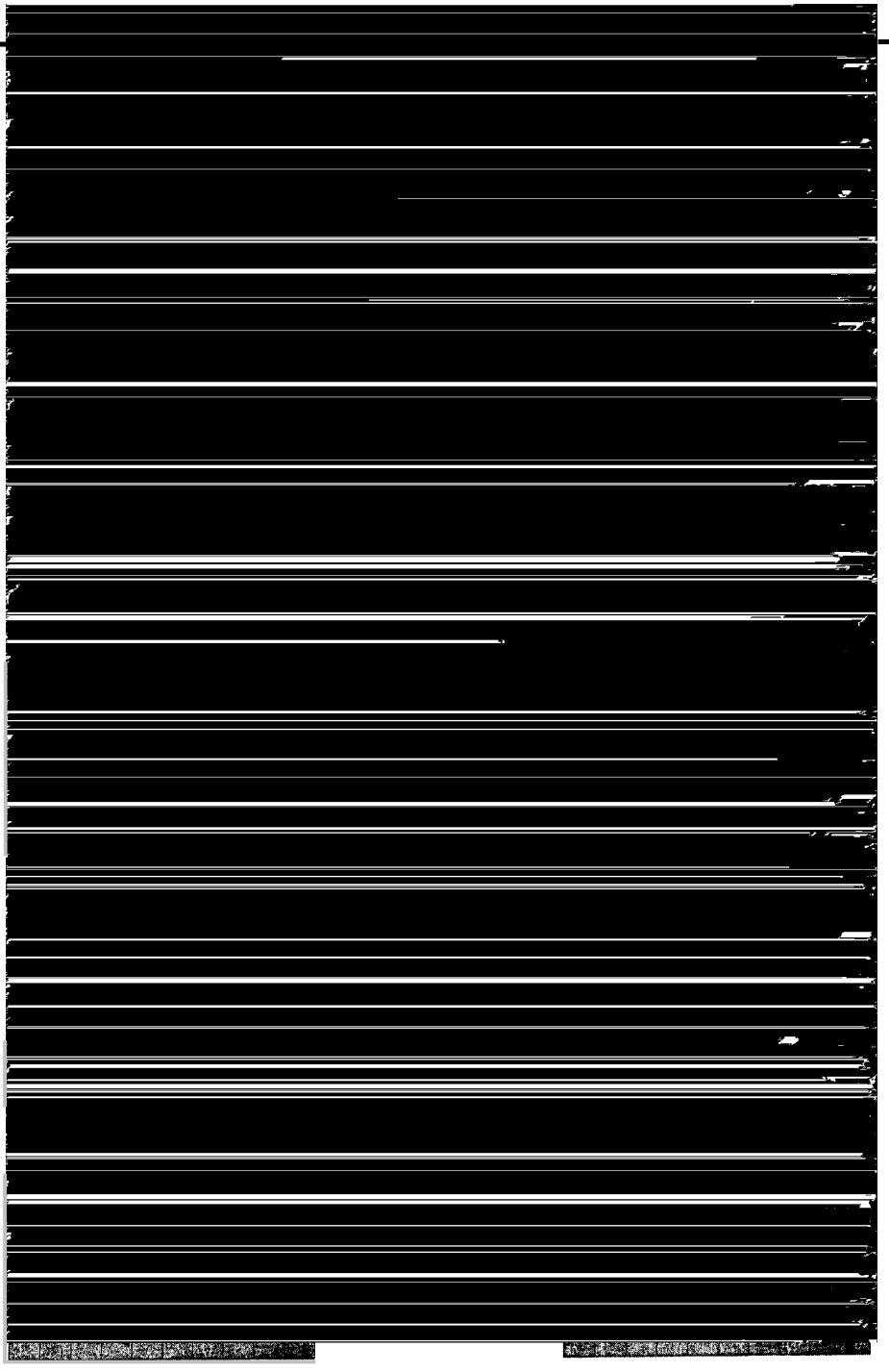


Figure 8-5. 5340A Rear Panel Reference Designations (with Options 002 and 011 Installed)





Waveforms (1) through (5) taken with an HP Model 183A Oscilloscope with HP 1830A Vertical Amplifier and 1840A Time Base. An HP Model 1120A 500 MHz Probe was used with its 10:1 divider probe.

Oscilloscope Controls Set to:

MODE ..... CHANNEL A
CHANNEL A ..... ON
CHANNEL B ..... OFF
TRIGGER ..... INT, DC, + 1, +
MODE ..... AUTO
SWEEP ..... .01 μs/div
VERTICAL SENSITIVITY ..... .02 v/div

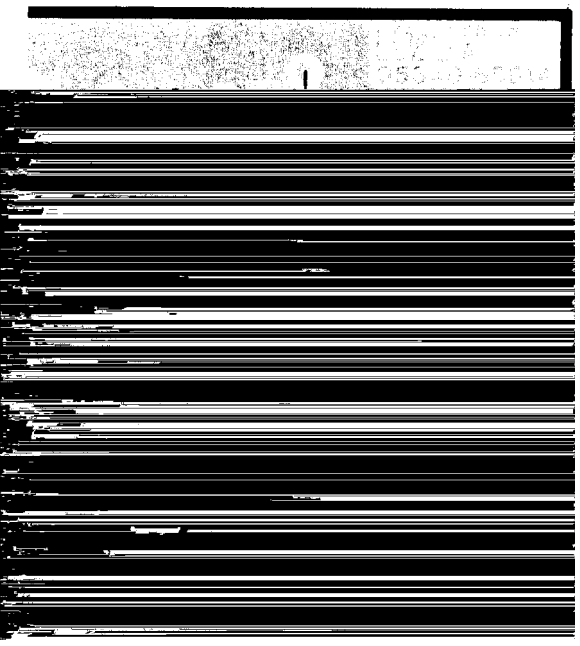
Probe Controls Set to:

COUPLING ..... AC
OFFSET ..... OFF

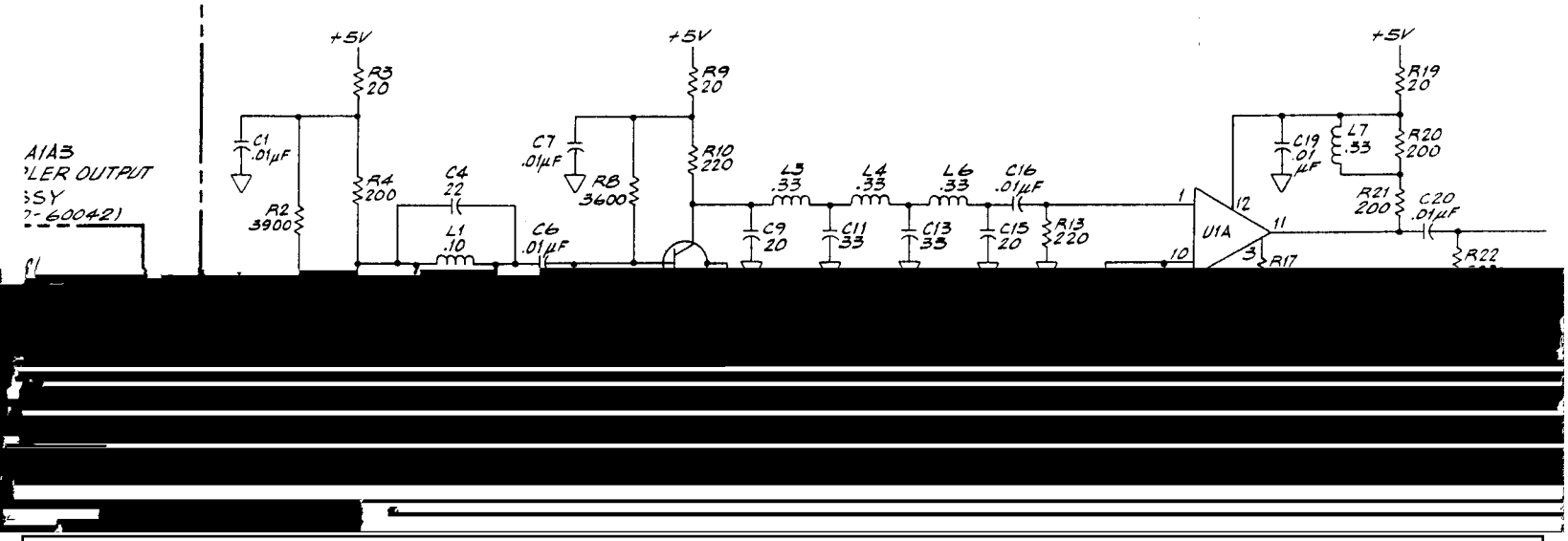
5340A Controls Set to:

RESOLUTION ..... 100 Hz
RANGE ..... 10 Hz - 18 GHz

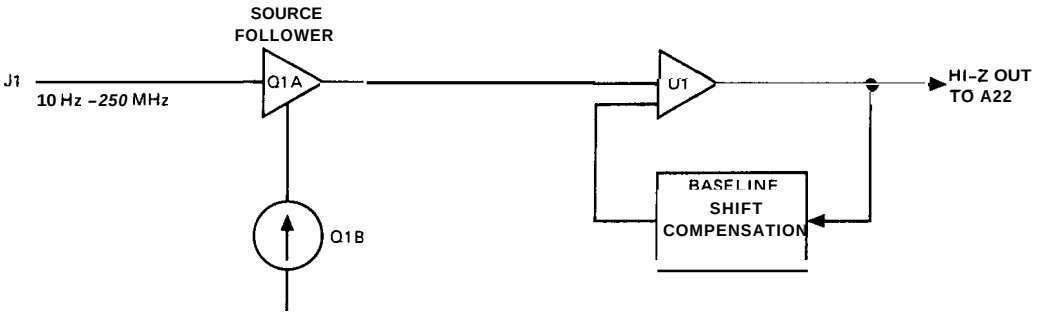
Waveforms A were taken with an HP Model 608C Signal Generator connected to the 5340A 50-ohm input connector. Waveforms B taken with no input signal.

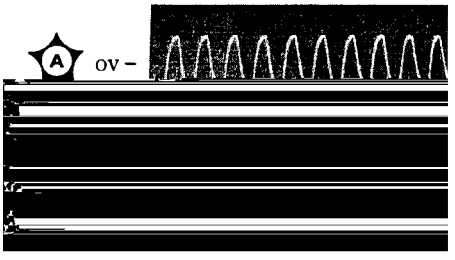


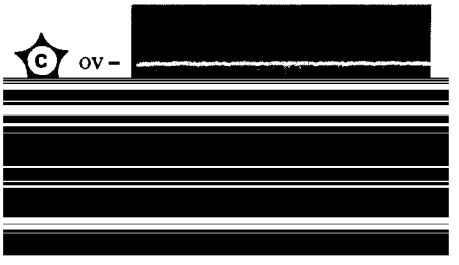
A1A4 PREAMPLIFIER BOARD ASSEMBLY (05340-60014) SERIES 1220A



Part of Figure 8-9. A3 HI-Z Input Amplifier Assembly

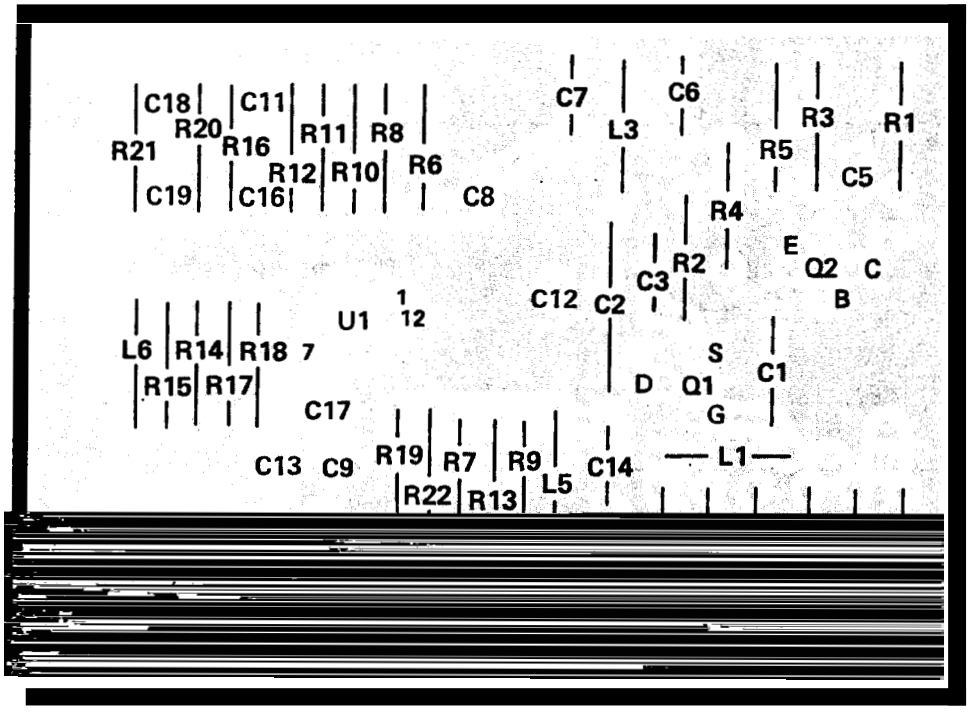


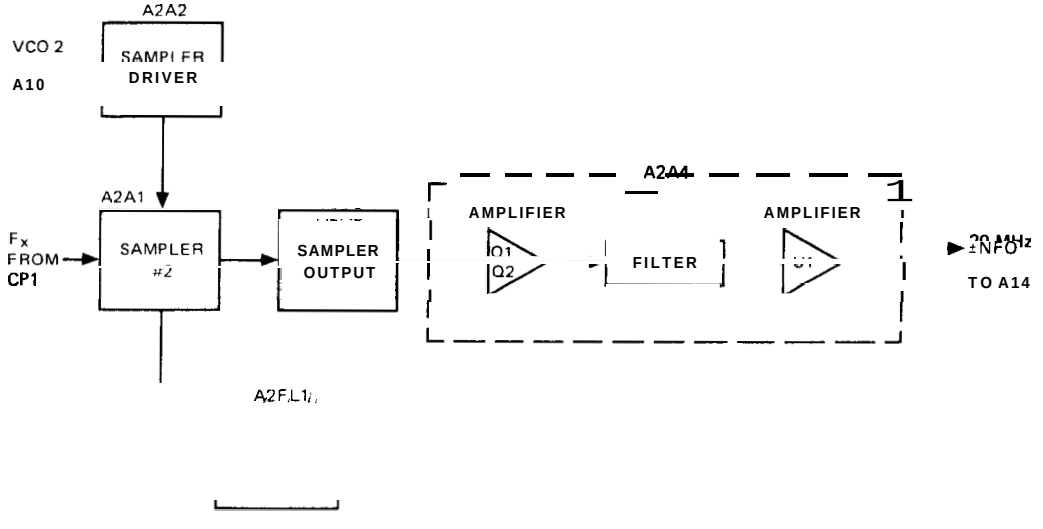


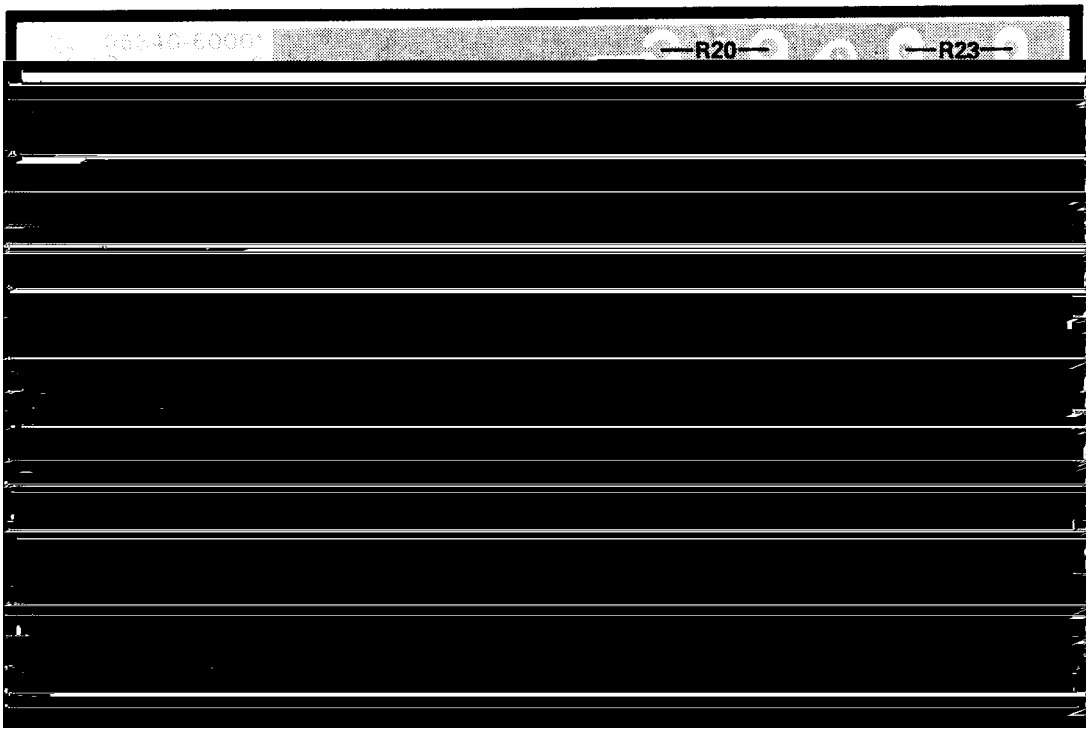


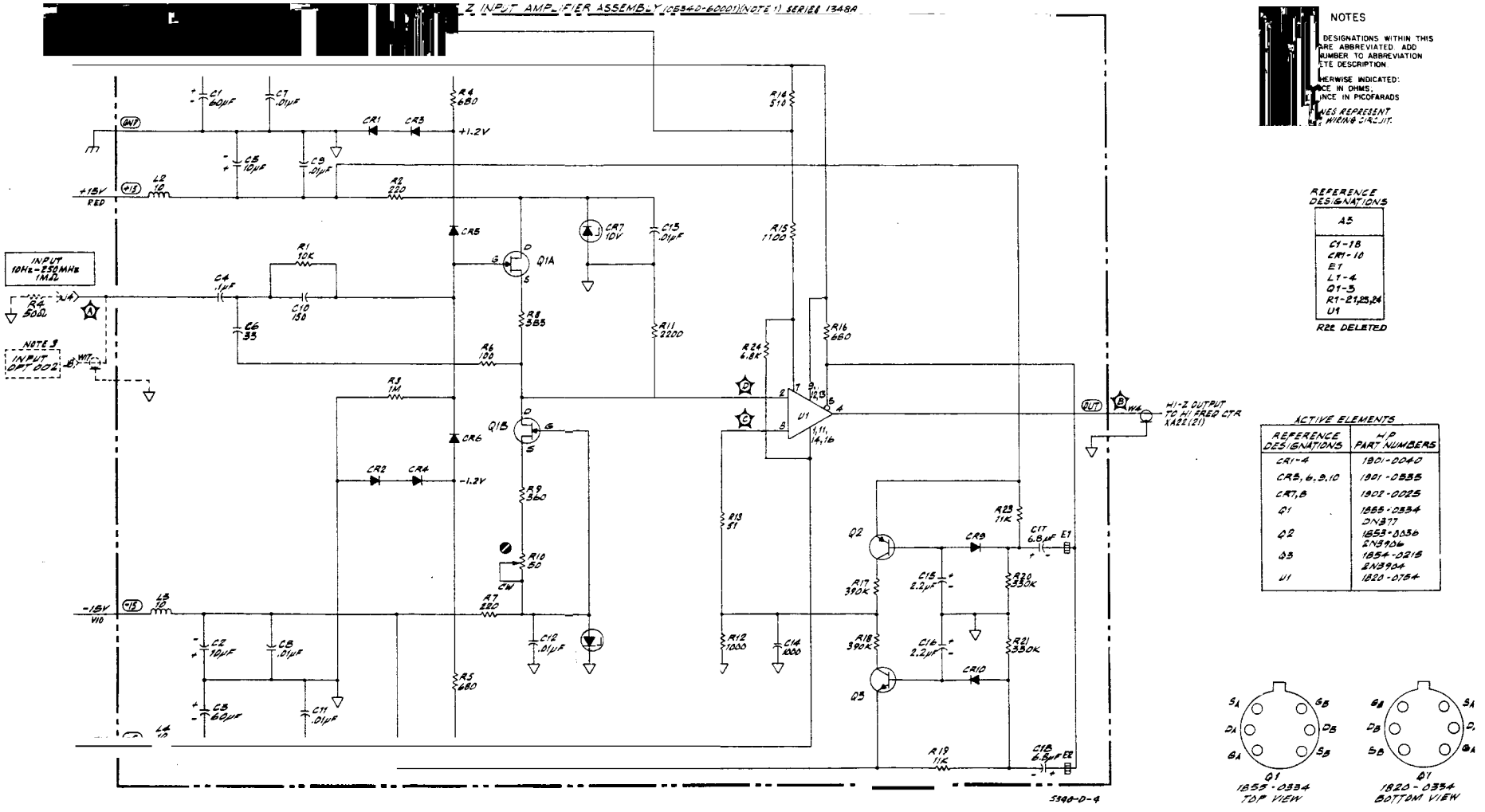
A 10 MHz into 50Ω termination at J4 input oscilloscope A settings - 1V/cm dc, .1 μs/div.

A3U1(8)


C18
C11
R20
R21
R16
R11
R8
R12
R10
R6
C19
C16
C8
C7
C6
L3
R3
R1
R5
C5
R4
E
R2
Q2
C
C3
C12
C2
B
U1
1
12
L6
R14
R18
7
S
C1
R15
R17
D
Q1
C17
G
C13
C9
R19
R7
R9
C14
L1
R22
R13
L5


A2A2
VCO 2
A10
SAMPLER
DRIVER
A2A1
Fx
FROM
CP1
SAMPLER
#2
SAMPLER
OUTPUT
A2A4
AMPLIFIER
Q1
Q2
FILTER
AMPLIFIER
TO A14


R20
R23



NOTES

DESIGNATIONS WITHIN THIS ARE ABBREVIATED. ADD NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.

UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS,
CAPACITANCE IN PICOFARADS

LINES REPRESENT PRINTED WIRING CIRCUIT.

REFERENCE DESIGNATIONS

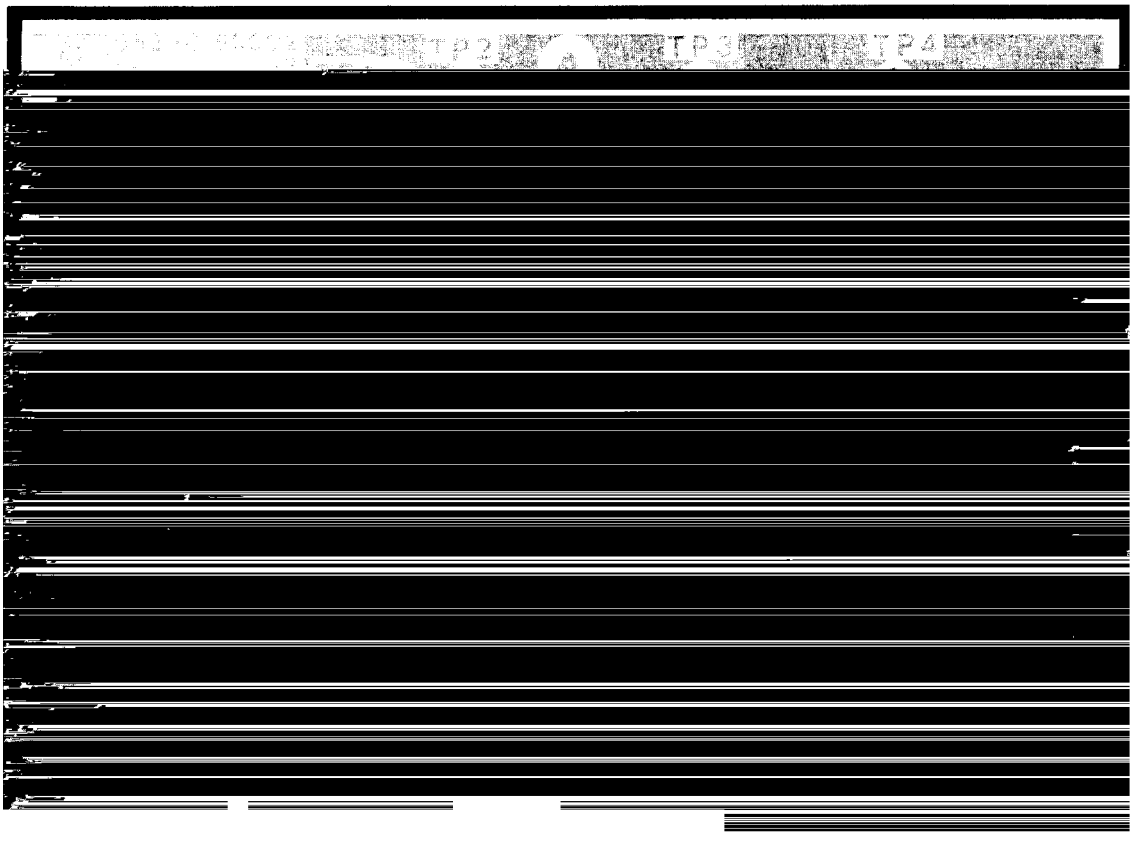
A3
C1-18
CR1-10
E1
L1-4
Q1-3
R1-21,23,24
U1

R22 DELETED

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1-4	1901-0040
CR5,6,9,10	1901-0055
CR7,8	1902-0025
Q1	1855-0334 2N3377
Q2	1853-0036 2N3906
Q3	1854-0215 2N3904
U1	1820-0754

Figure 8-9. A3 HI-Z Input Amplifier Assembly



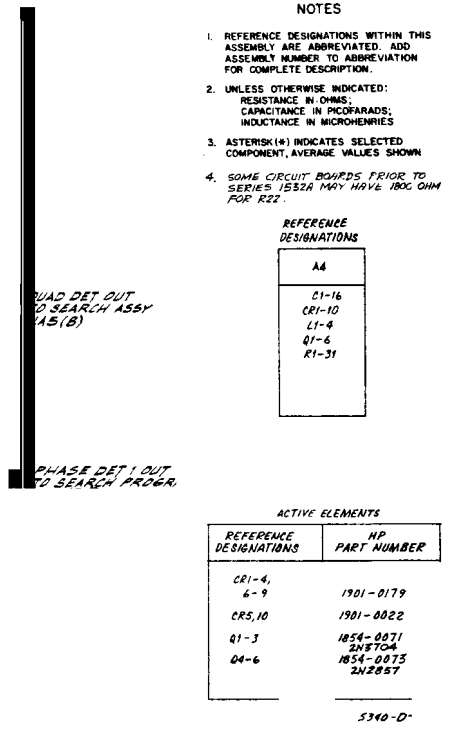
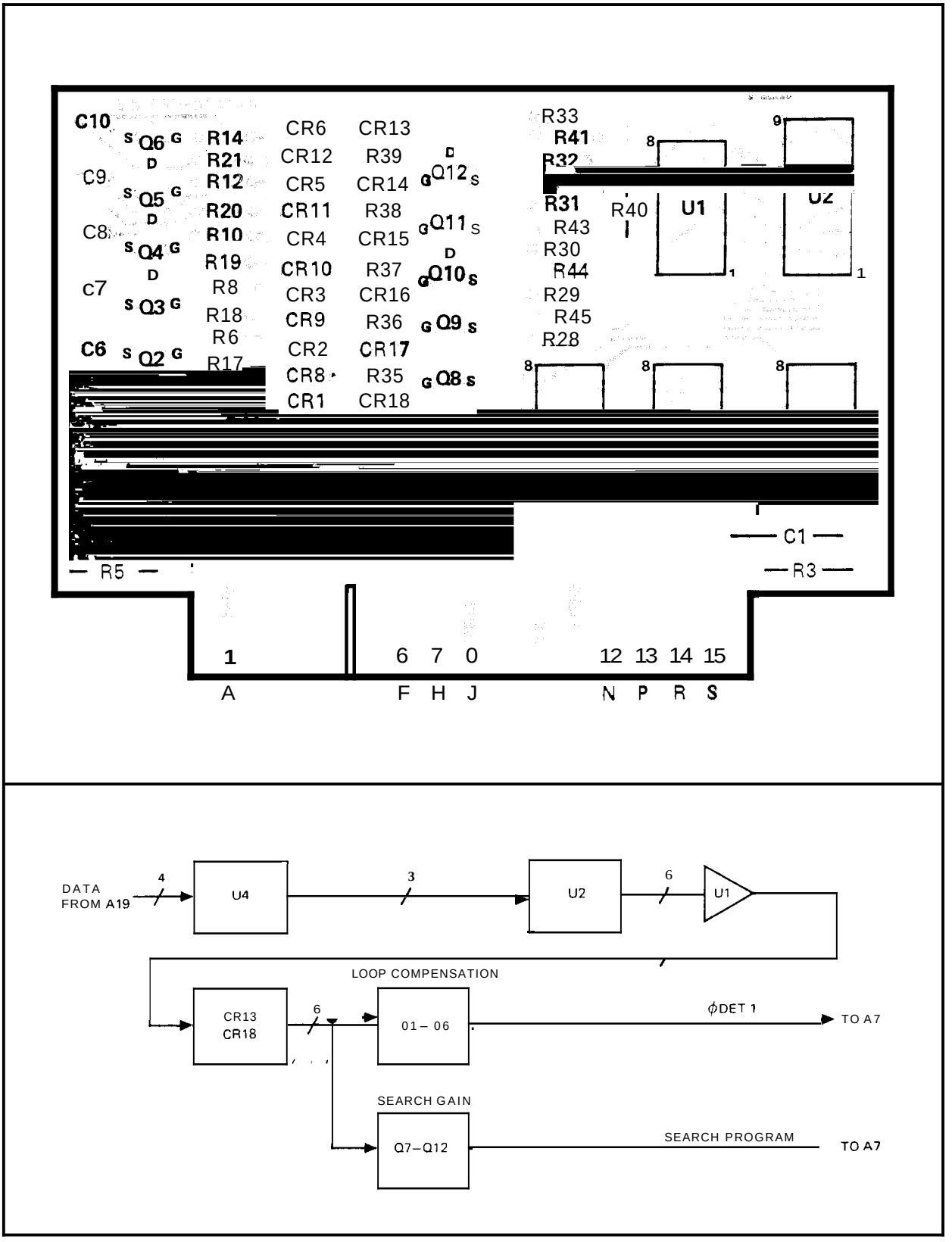
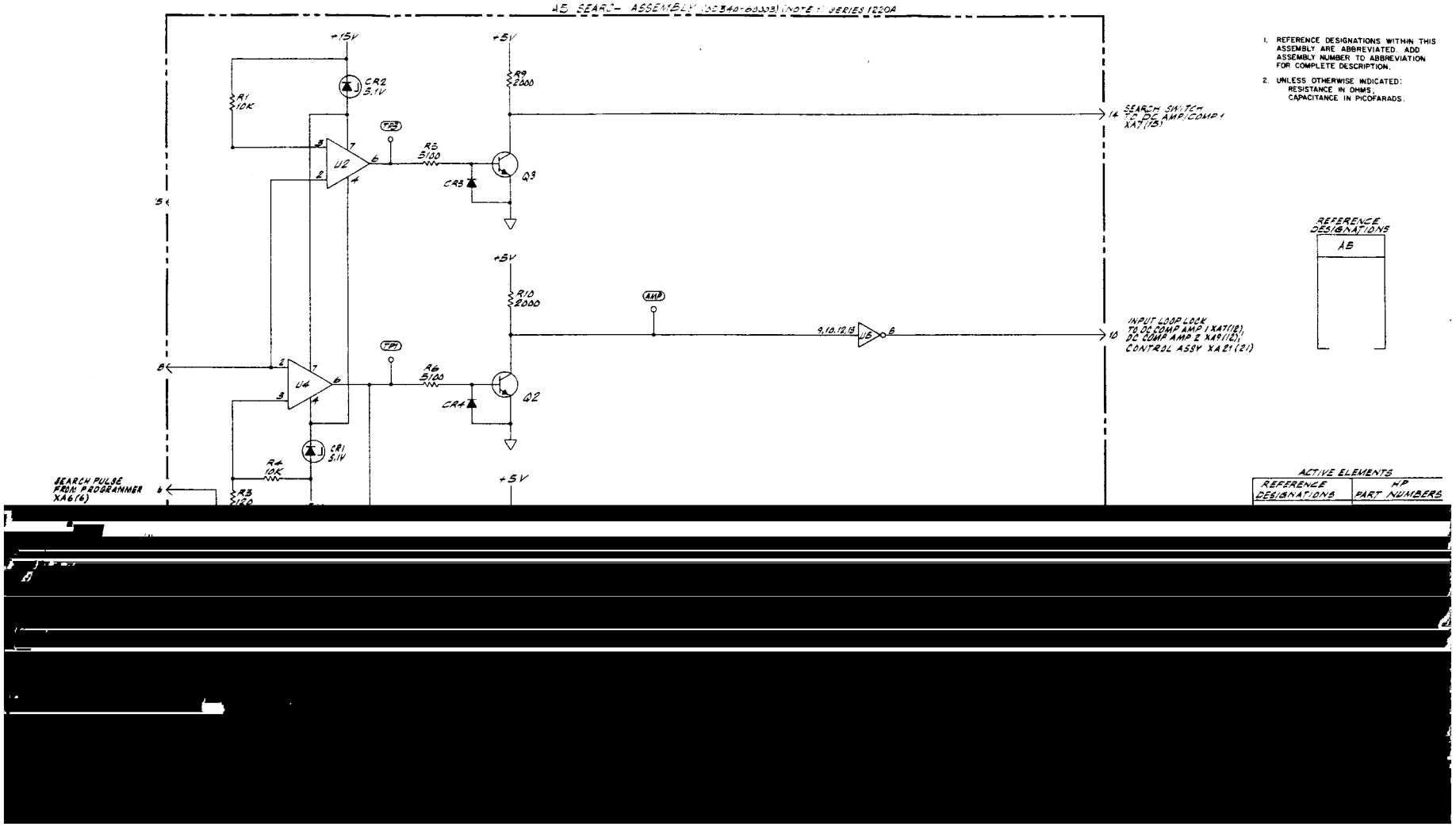
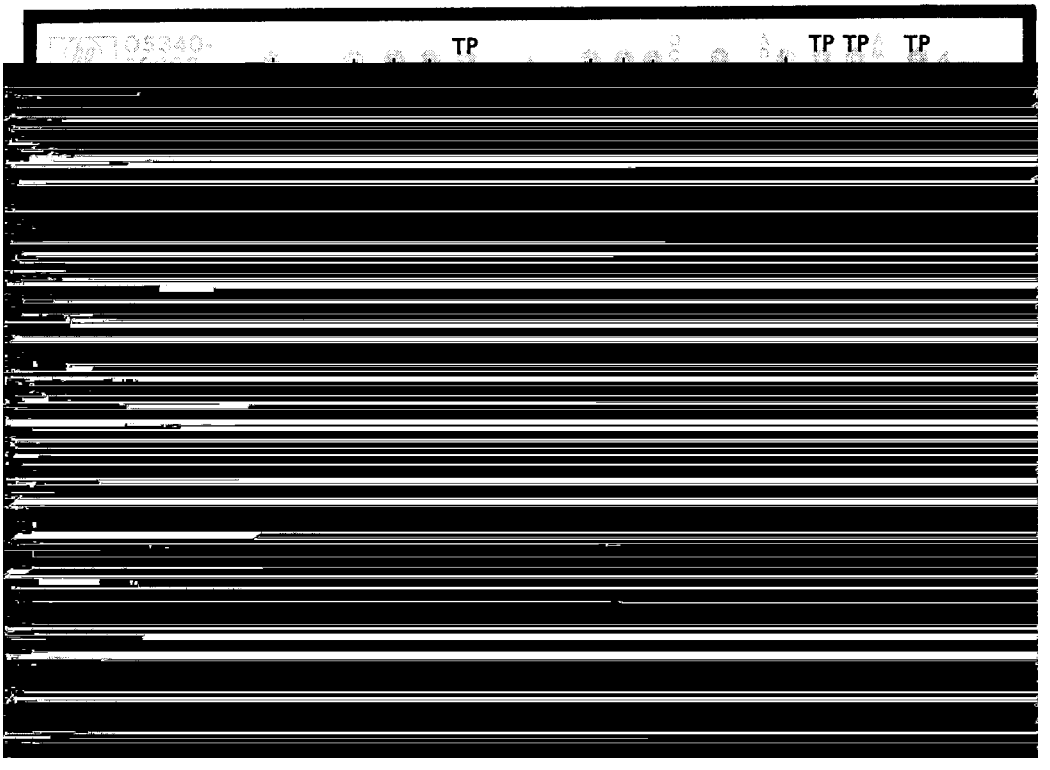


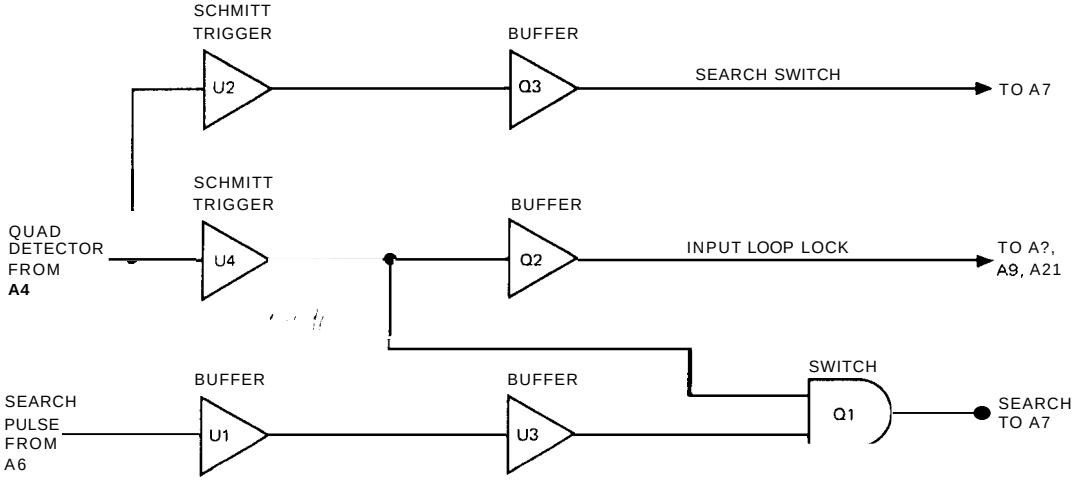
Figure 8-10. A4 Phase/Quad Detector Assembly

Part of Figure 8-12. **A6** Search Programmer Assembly




AB SEARCH ASSEMBLY (SC340-60003) (NOTE 1) SERIES 1220A
+15V
+5V
CR2 5.1V
R1 10K
R9 2000
U2
R5 5100
Q3
CR3
TP2
14 SEARCH SWITCH TO DC AMP/COMP 1 XA7(13)
R10 2000
AMP
9,10,12,13
U5
INPUT LOOP LOCK TO DC COMP AMP 2 XA7(12), DC COMP AMP 2 XA9(12), CONTROL ASSY XA21(21)
10
U4
R6 5100
Q2
CR4
TP1
CR1 5.1V
R4 10K
R3 1K Ω
SEARCH PULSE FROM PROGRAMMER XA6(6)
REFERENCE DESIGNATIONS
AB
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS.
ACTIVE ELEMENTS
REFERENCE DESIGNATIONS
MP PART NUMBERS


TP
TP TP TP


SCHMITT TRIGGER
U2
BUFFER
Q3
SEARCH SWITCH
TO A7
SCHMITT TRIGGER
QUAD DETECTOR FROM A4
U4
BUFFER
Q2
INPUT LOOP LOCK
TO A?, A9, A21
SWITCH
BUFFER
SEARCH PULSE FROM A6
U1
BUFFER
U3
Q1
SEARCH TO A7

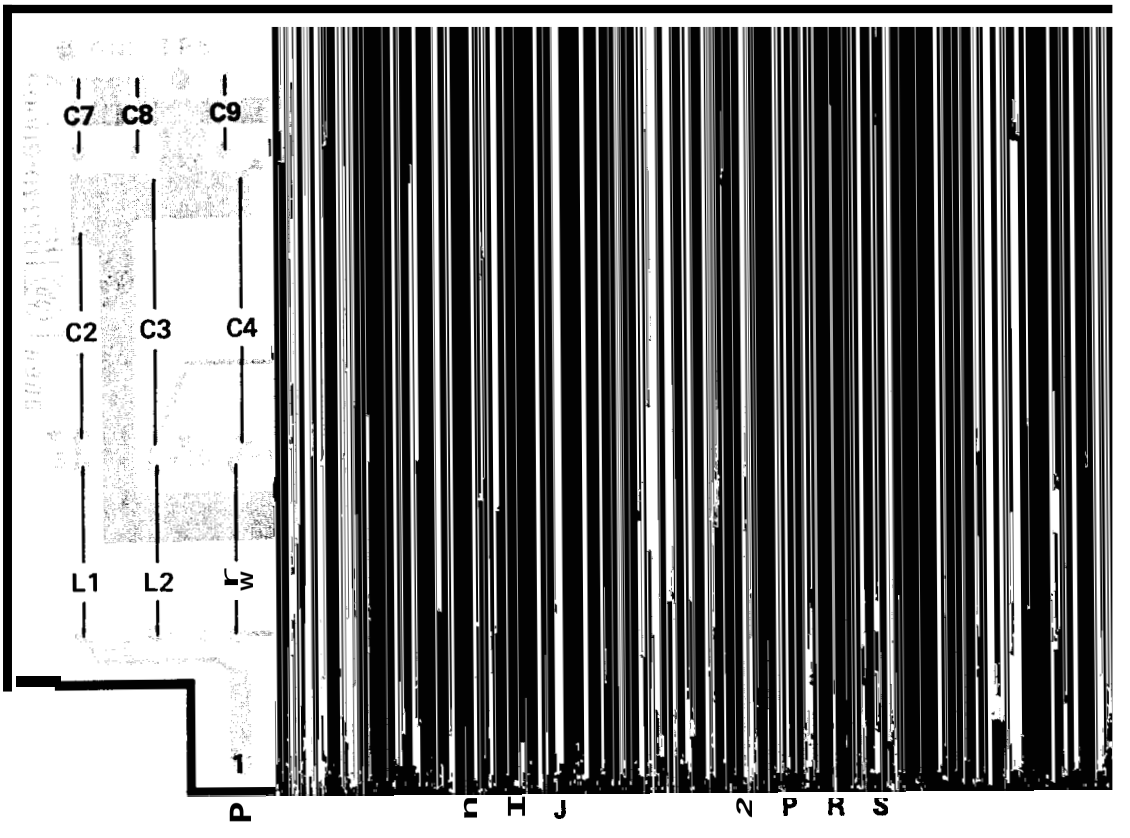
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN.

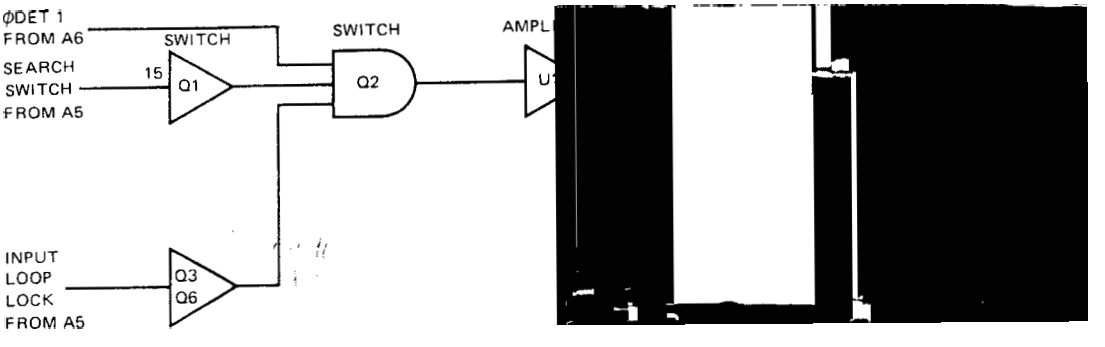
REFERENCE DESIGNATIONS

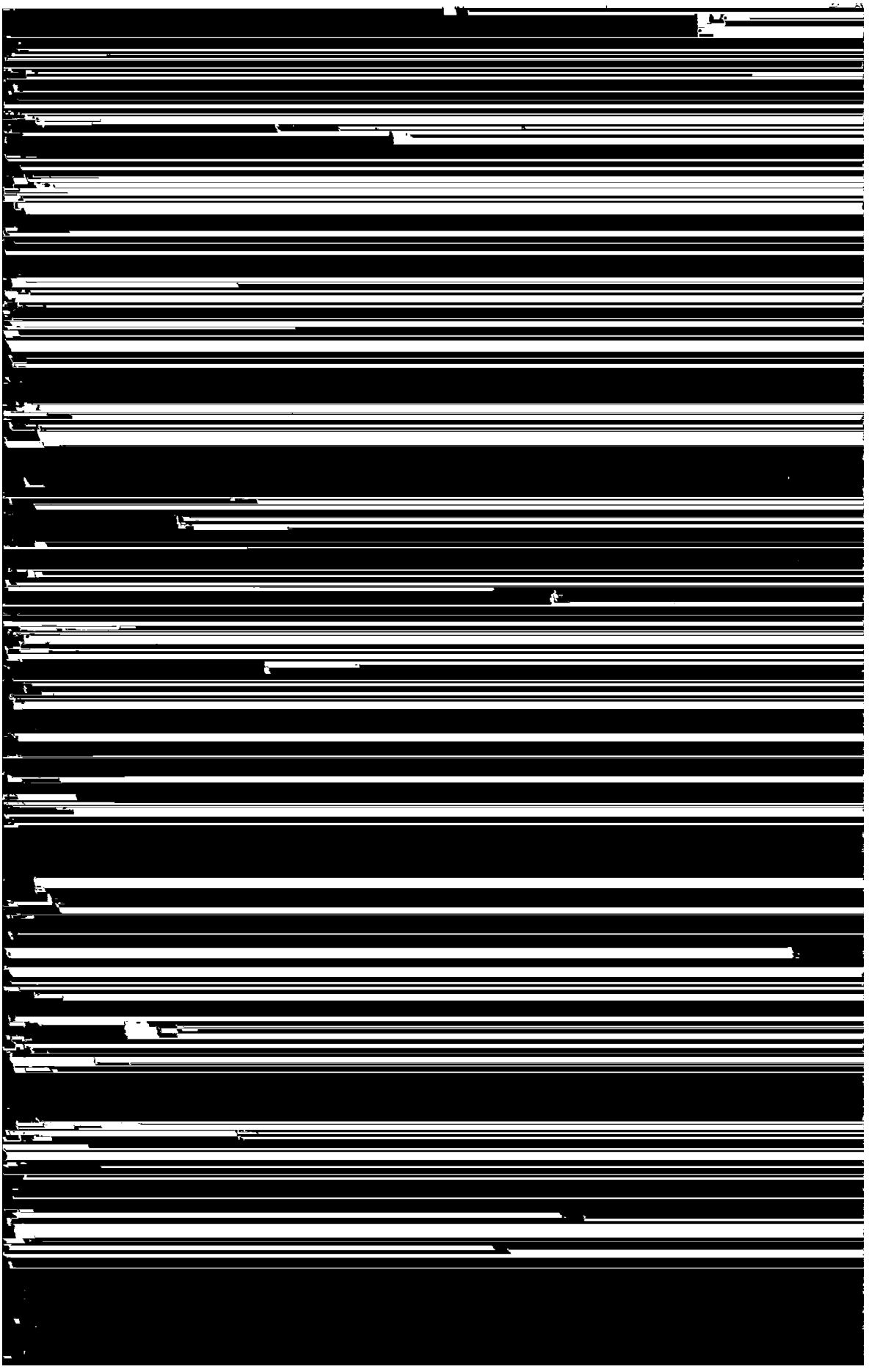
A16	A6
C1, 2, 4, 5, 7, 8	C1 - 10 CR1 - 19 L1 Q1 - 12 R1 - 45

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1-12, 19	1901 - 0040
CR13 - 18	1902 - 0025
Q1 - 12	1855 - 0020
U1	1820 - 0577
U2	1820 - 0214 SN7442N
U3	1820 - 0054 SN7400N
U4	1820 - 0765 SN74197N
U5	1820 - 0207


C7
C8
C9
C2
C3
C4
L1
L2
1


ϕDET 1
FROM A6
SEARCH
SWITCH
FROM A5
SWITCH
15
Q1
SWITCH
Q2
AMPL
INPUT
LOOP
LOCK
FROM A5
Q3
Q6



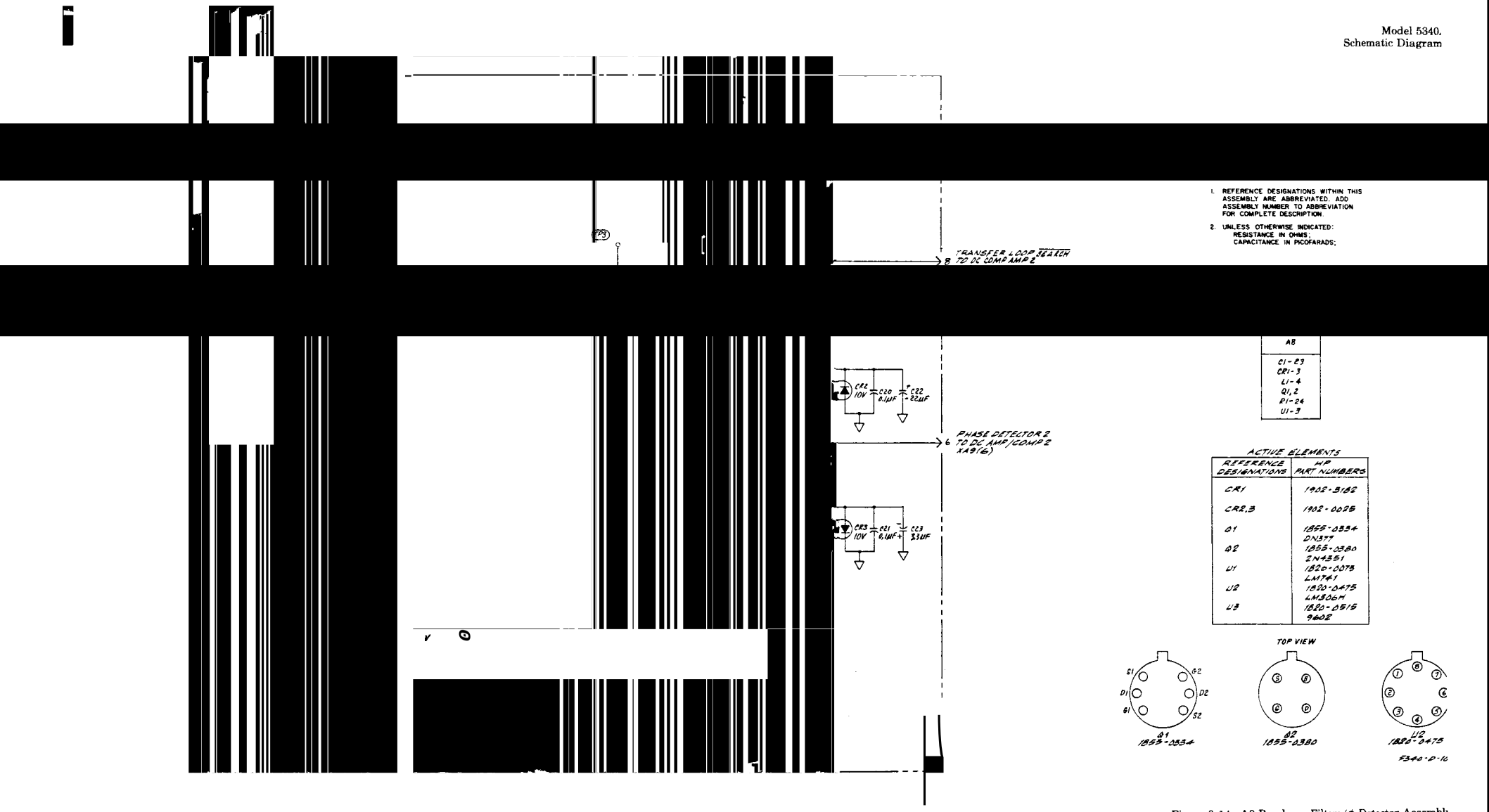


Figure 8-14. A8 Bandpass Filters/ϕ Detector Assembly

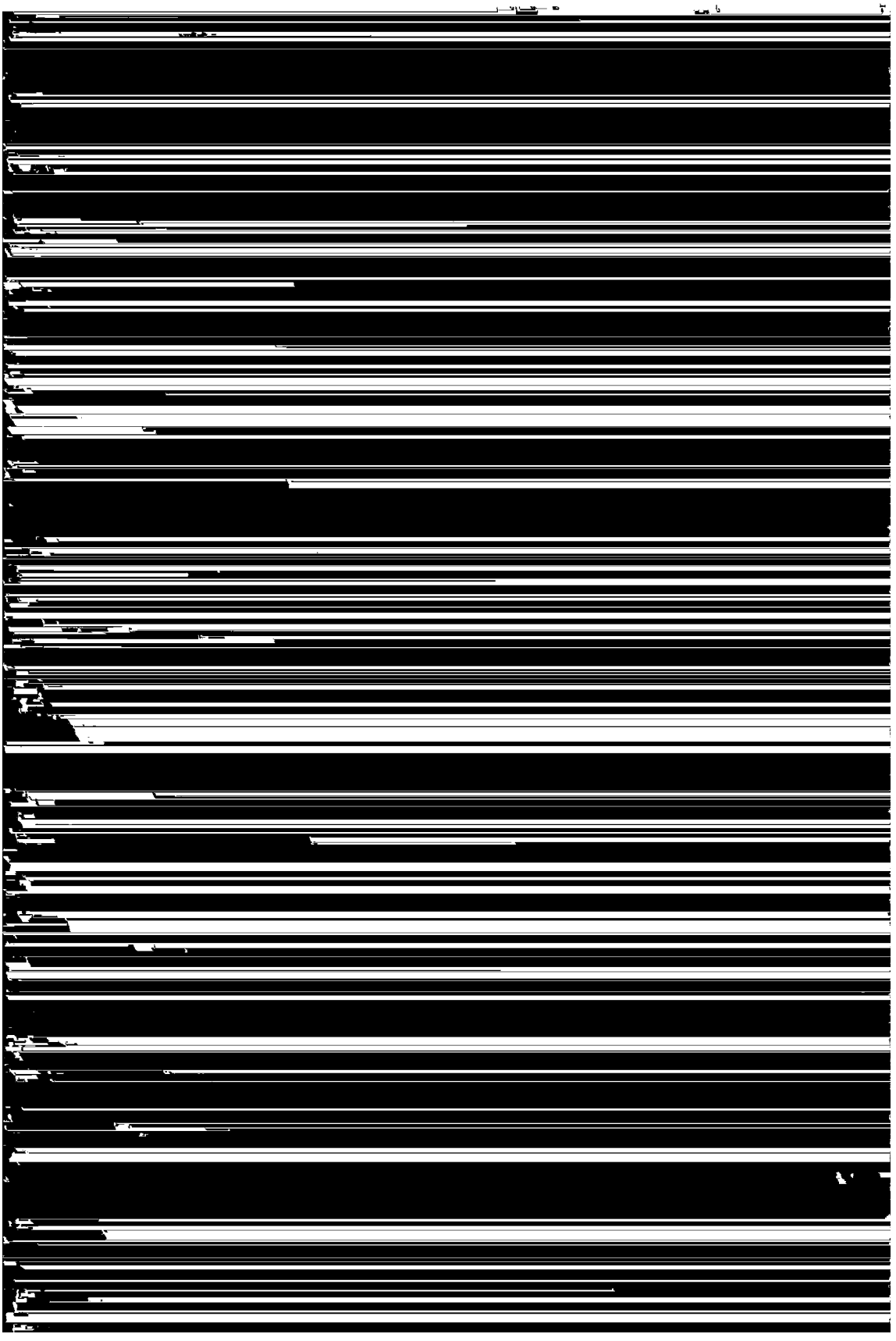
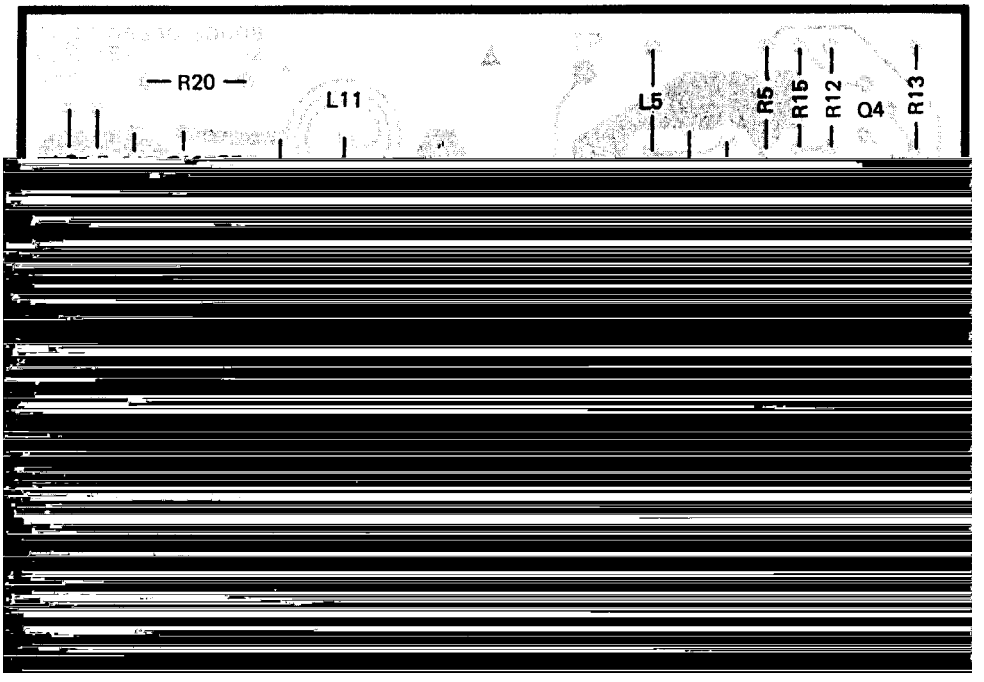
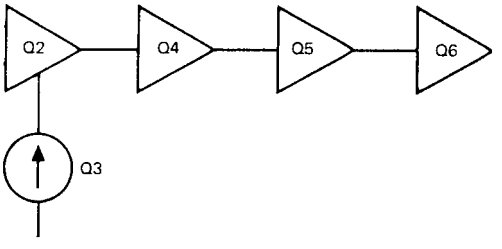
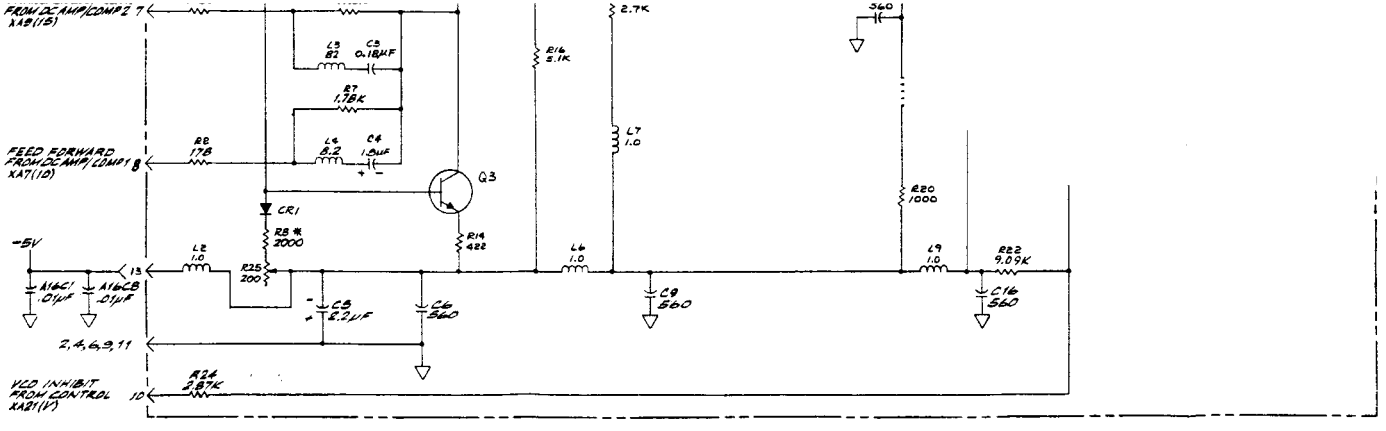


Figure 8-15. A9 DC Amplifier/Compensator No. 2 Assembly


R20
L11
L5
R5
R15
R12
Q4
R13


Q2
Q4
Q5
Q6
Q3

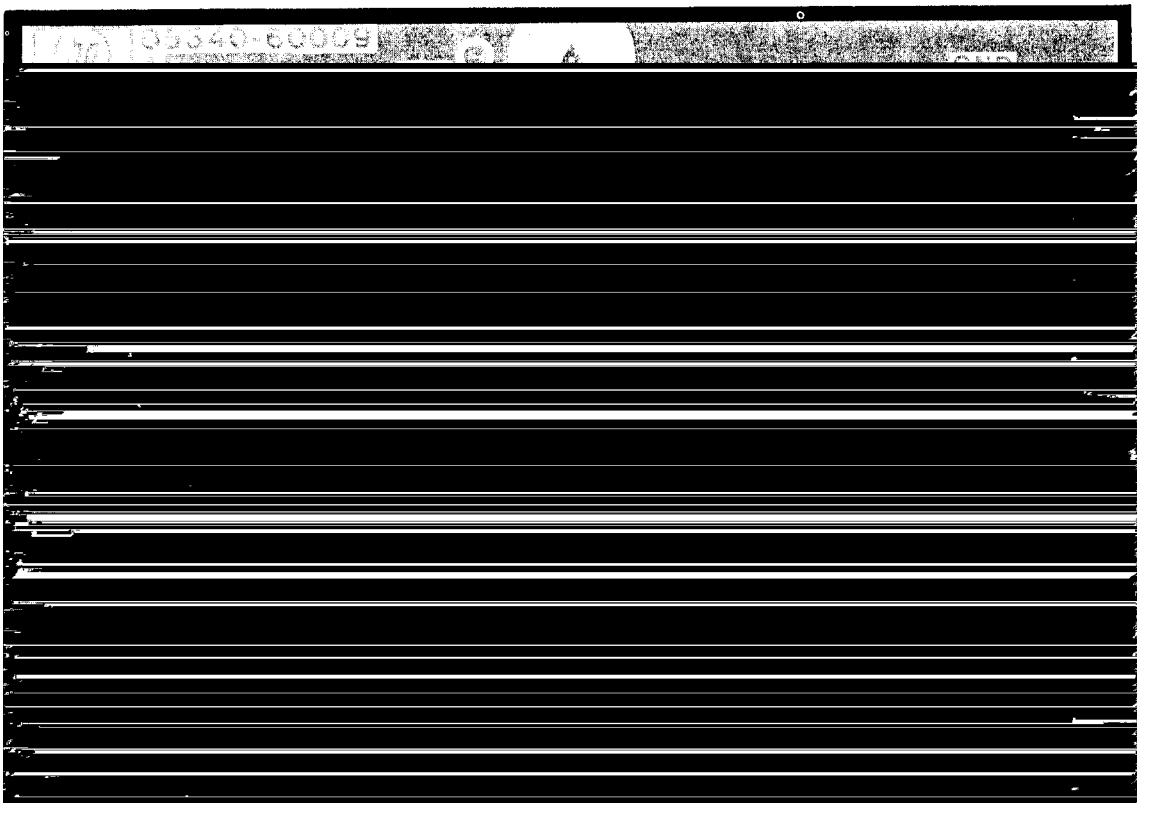


ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1, 2	1901-0040
CR4, 5	0E340-B3005 (SEE NOTE 4)
Q1	1853-0036 2N3906
Q2	1854-0073
Q3	1854-0583 MPSA-018
	1854-0005 2N708
	1854-0345 2N5179
U1	1820-1179

5340-D-12

Figure 8-16. A10 VCO No. 2 Assembly



U1

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUE SHOWN.

REFERENCE DESIGNATIONS

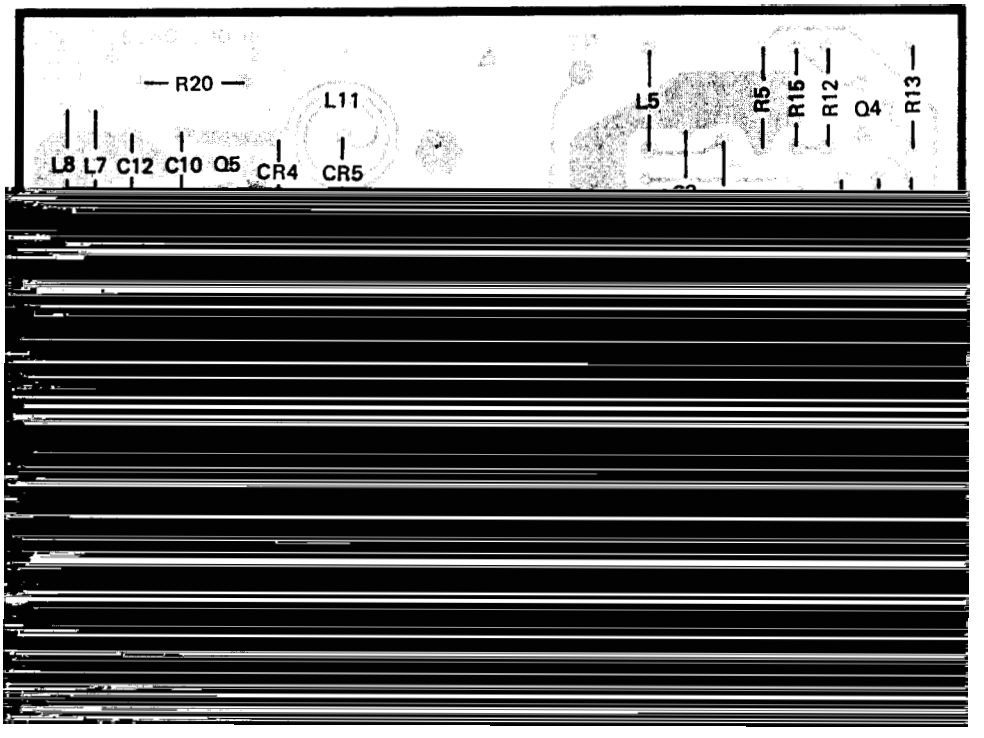
All
C1-12 L1,2 R1-9 U1,2

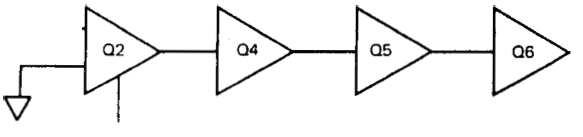
ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
U1	1826-0073
U2	1858-0018

5340-D-13

Figure 8-17.


R20
L11
L8
L7
C12
C10
Q5
CR4
CR5
L5
R5
R15
R12
Q4
R13


Q2
Q4
Q5
Q6

NOTES

1. REFERENCE DESIGNATIONS WITHIN T ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATIO FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES
3. COIL IS PRINTED ON PC BOARD
4. A12CR5 & CR6 AND A10CR4 & CR MUST BE REPLACED AS A MATCHED QUAD SET. IF WHEN A DIODE IS REPLACED, ALL FOU MUST BE INSTALLED.
5. ASTERISK (*) INDICATES SELE COMPONENT. AVERAGE VALUE SHOWN.

REFERENCE DESIGNATIONS

A12
C1-16 CR1,2,4,5 L1-10 Q1-6 R1-9, 12-25 T1 U1 Z1

CR3, R10, R11 DELETED

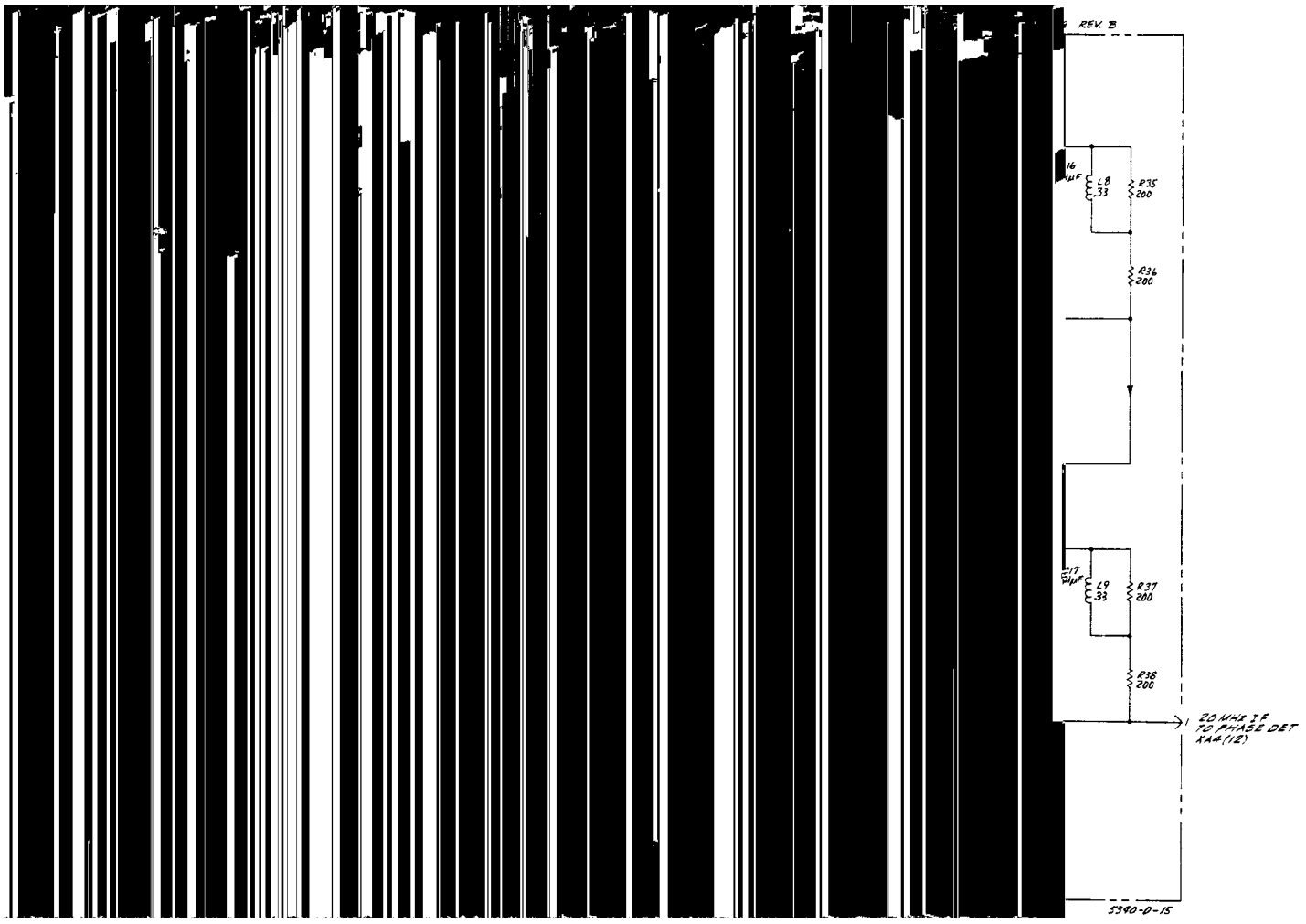
ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBE
CR1, 2	1901-0040
CR4,5	05340-80 (SEE NOTE
Q1	1853-0036 2N3906
Q2	1854-0071
Q3	1854-0587 MPSA-018
Q4	1854-0008 2N708
Q5,Q6	1854-0344 2N5179
U1	1820-1179

05340-D

Figure 8-18. A12 VCO No. 1 Assem

U1A



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
3. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUE SHOWN.

REFERENCE DESIGNATIONS

A13
C1-17 L1-9 R1-38 U1,2

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
U1,2	1858-0004

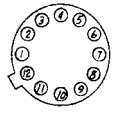
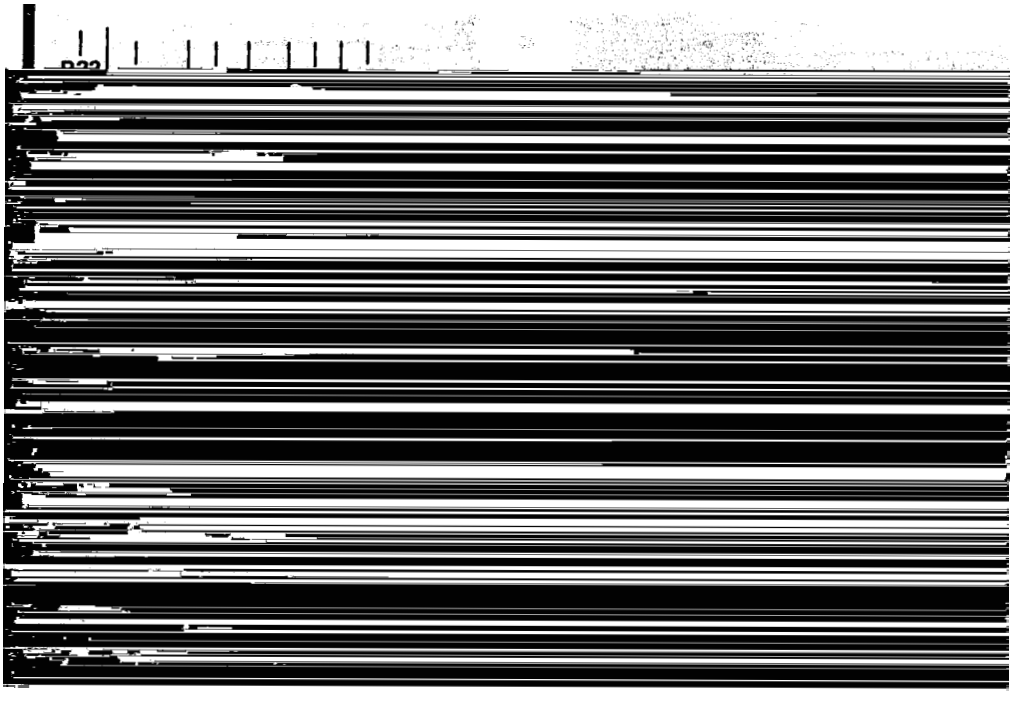


Figure 8-19. A13 Limiter/Amplifier Assembly



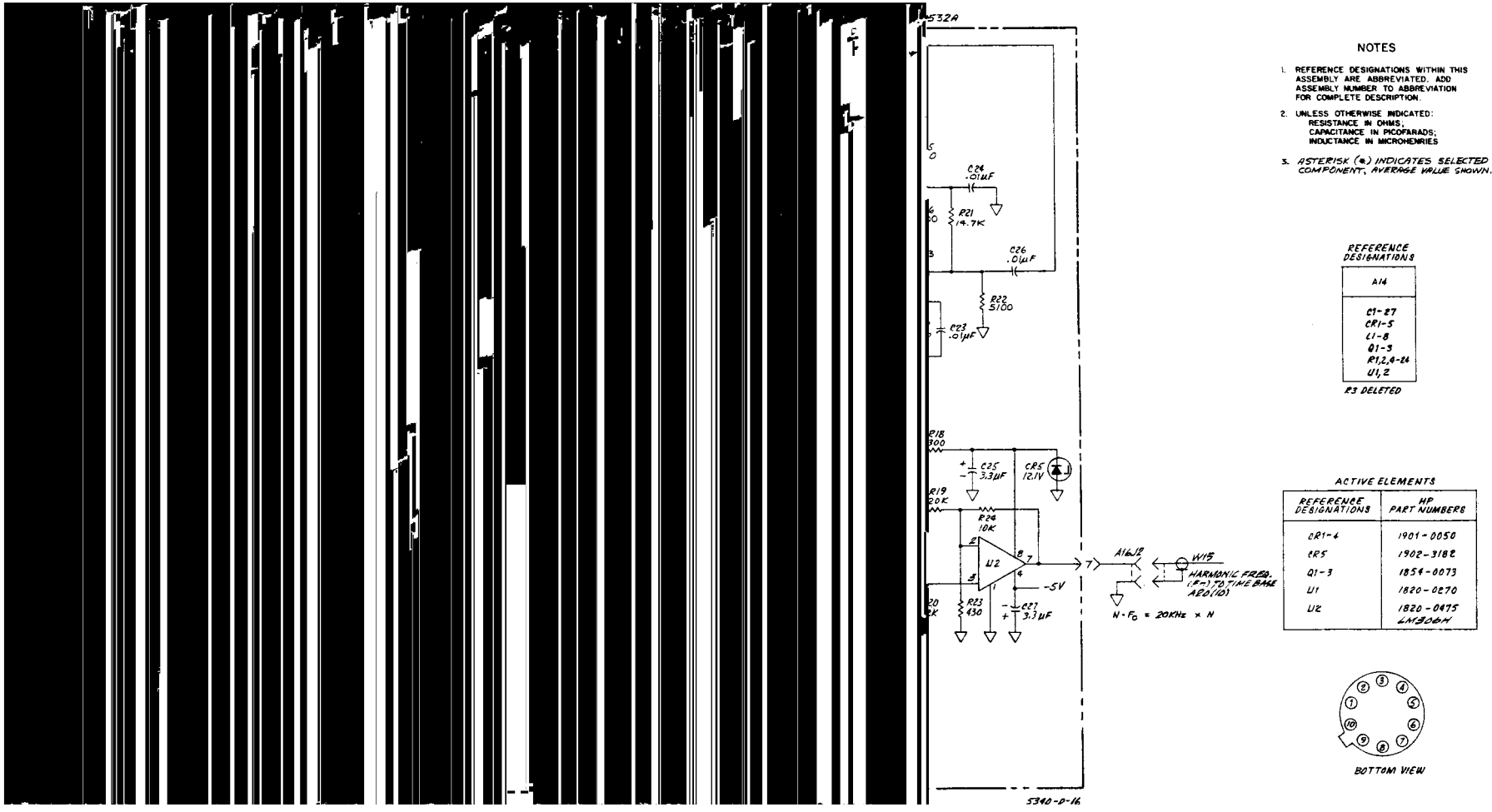
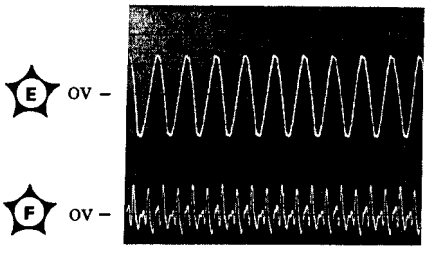
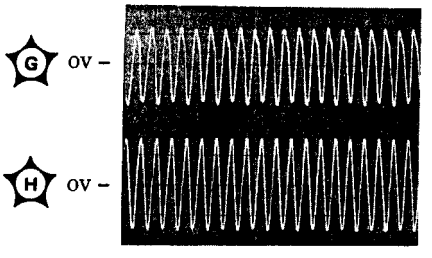


Figure 8-20. A14 Limiter/Amplifier/Mixer Assembly



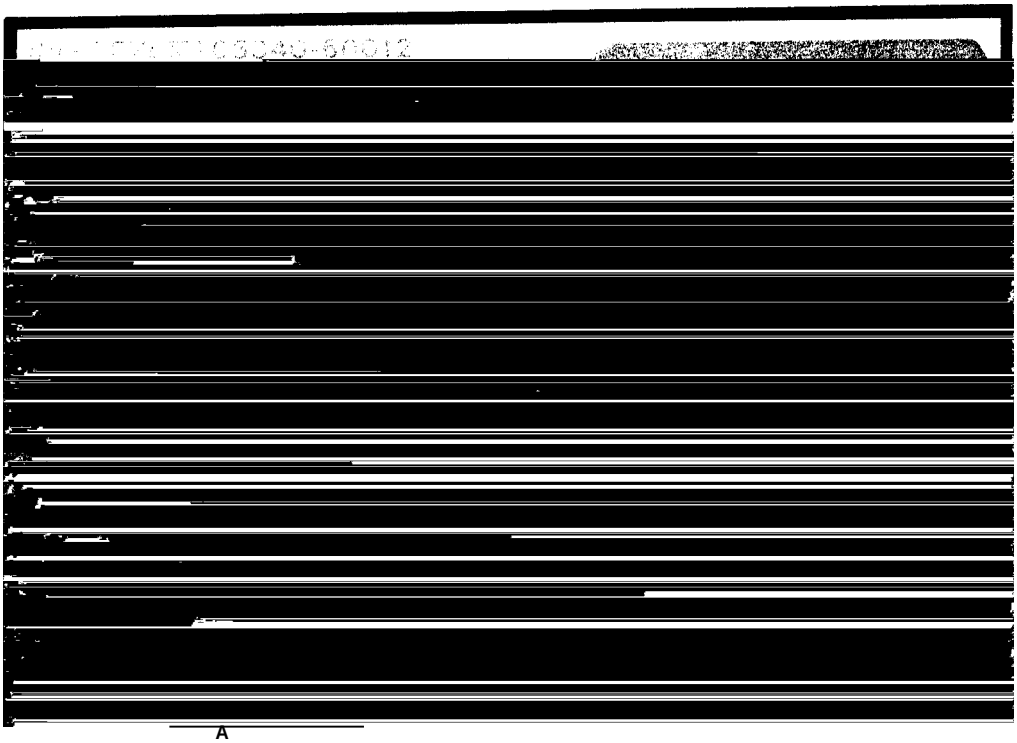
E A15C2 .1 V/cm, .1 μs/div

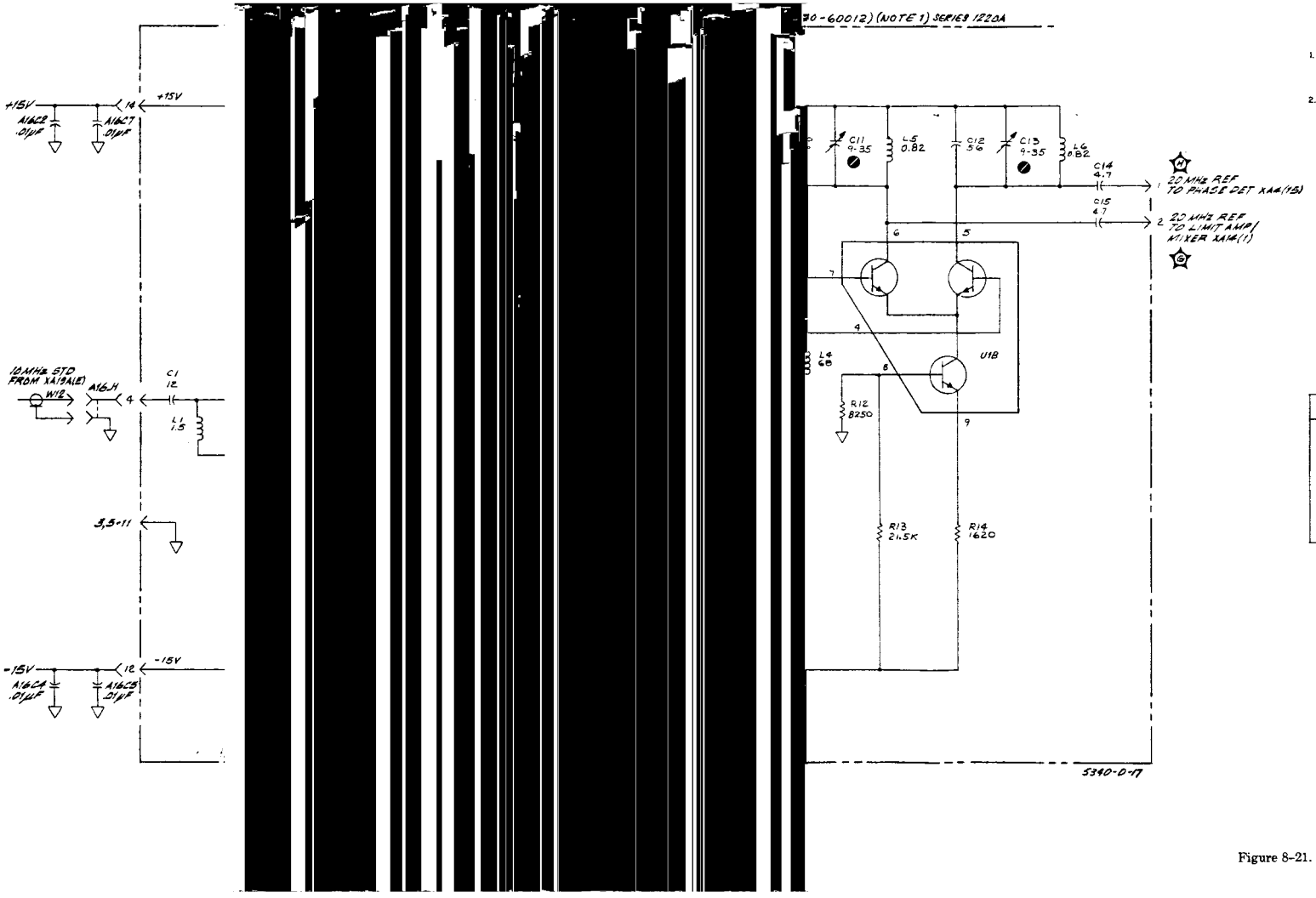
F A15U1(12) .05 V/cm, .1 μs/div



G XA15(2) .05 V/cm, .1 μs/div

H XA15(1) .05 V/cm, .1 μs/div


A



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES

REFERENCE DESIGNATIONS

A15
C1-15 CR1,2 L1-6 R1-14 U1

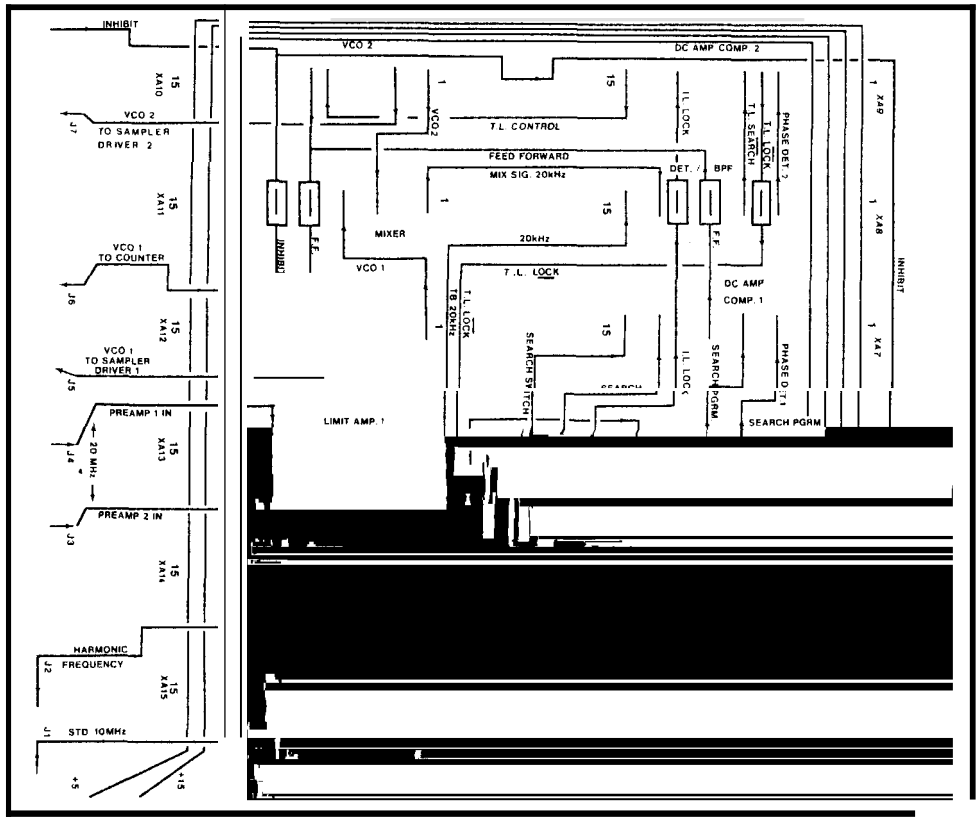
ACTIVE ELEMENTS

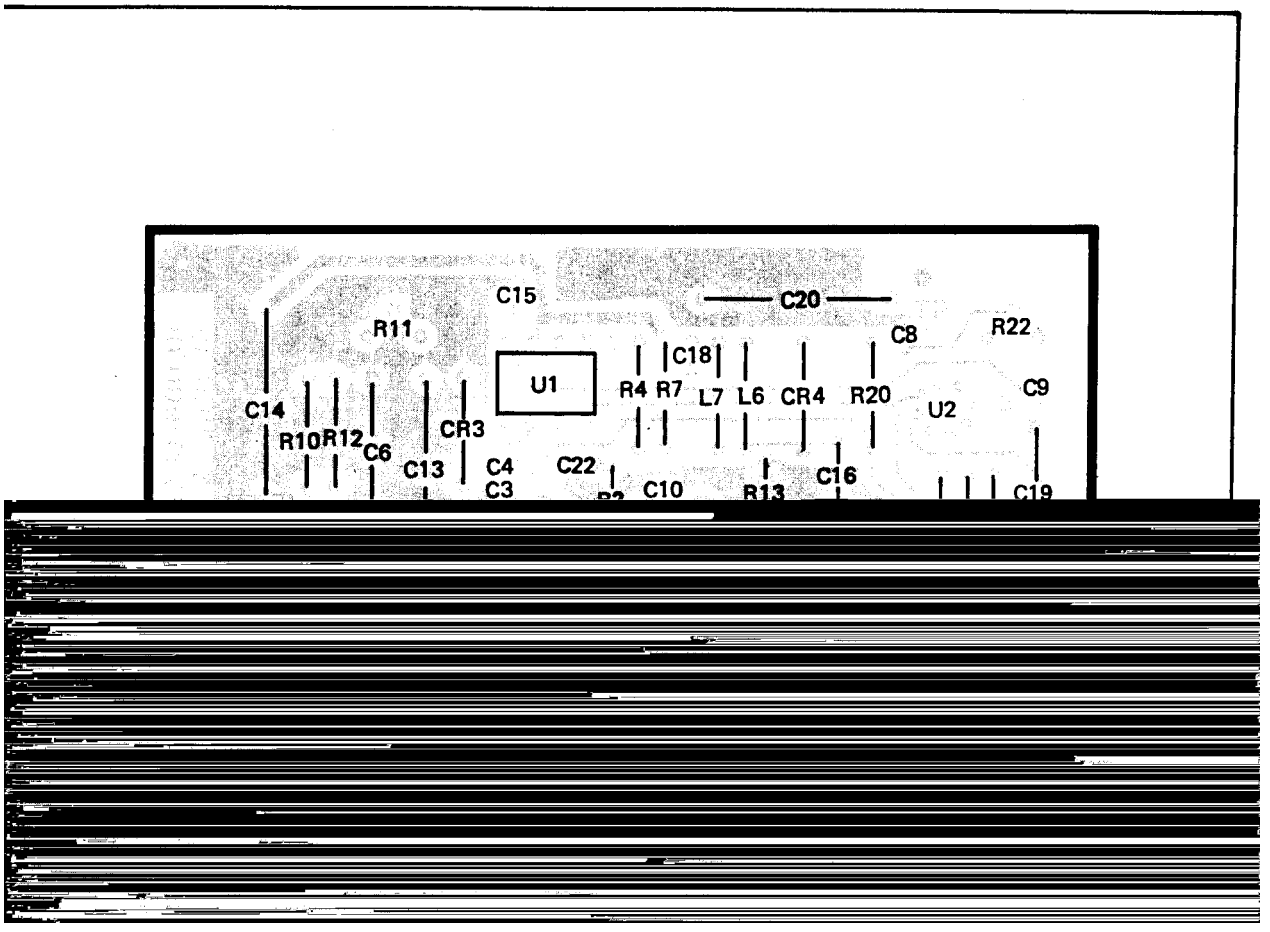
REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1,2	1901-0535
U1	1858-0004 CA3049

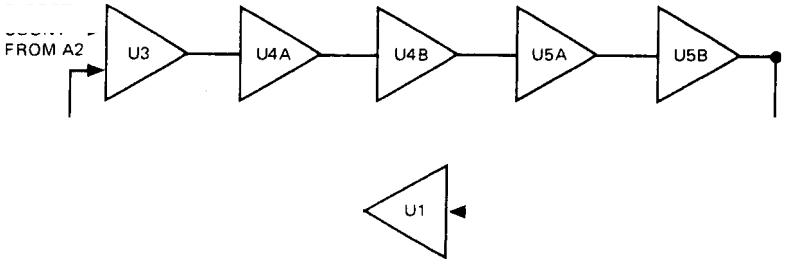
Figure 8-21. A15 10 MHz Doubler Assembly

A16 CASTING MOTHERBOARD ASSEMBLY 05340-60015

A16




C15
C20
R11
C8
R22
U1
C18
R4
R7
L7
L6
CR4
R20
C9
U2
C14
R10
R12
C6
C13
CR3
C4
C3
C22
C10
R13
C16
C19


FROM A2
U3
U4A
U4B
U5A
U5B
U1

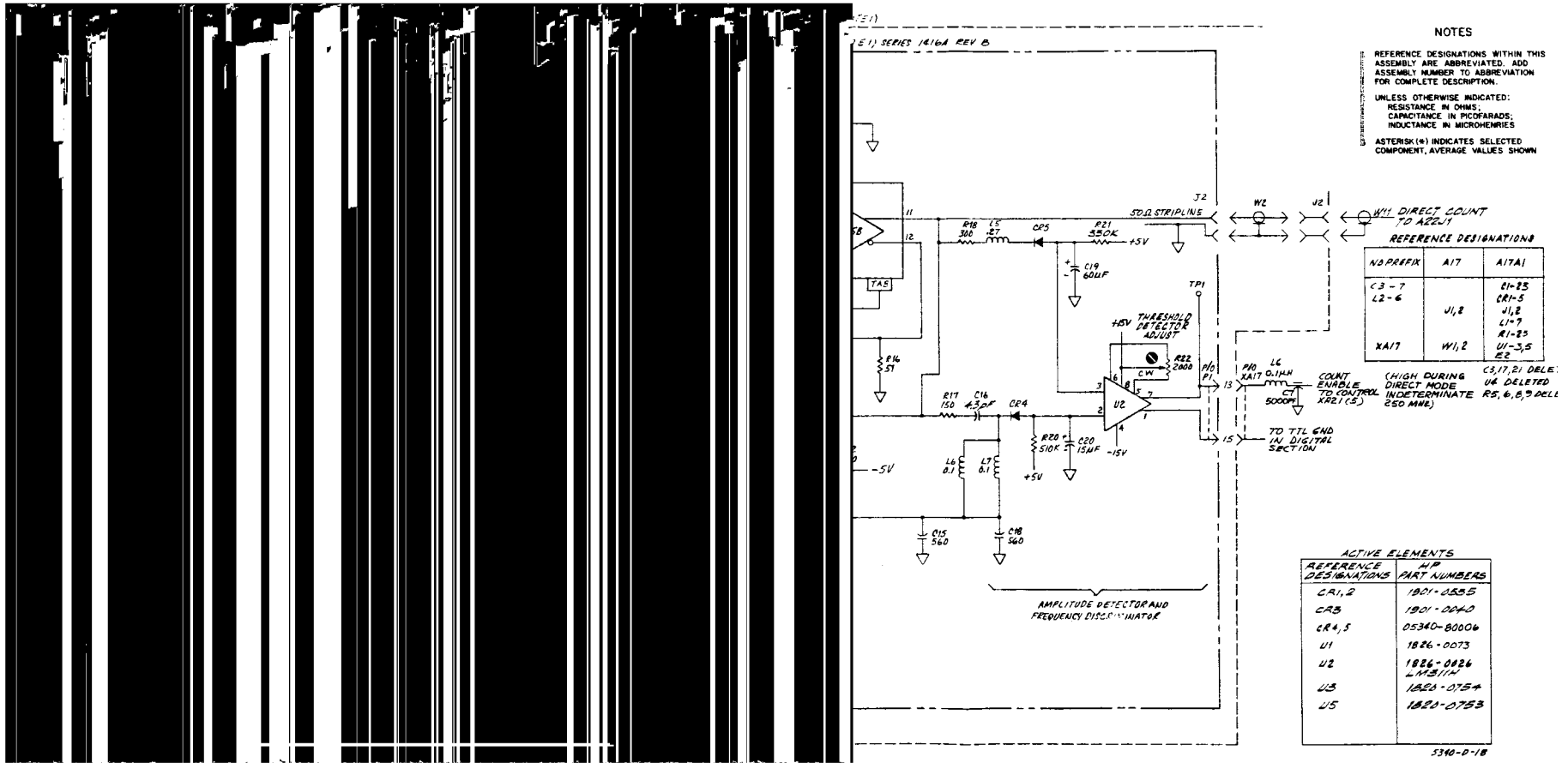
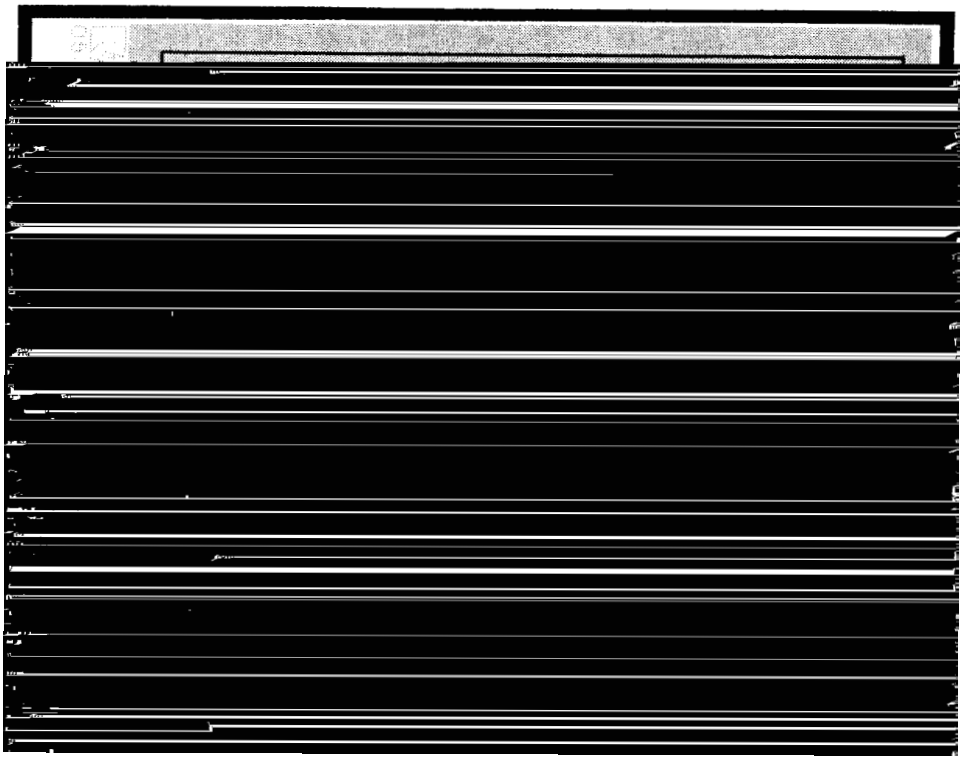
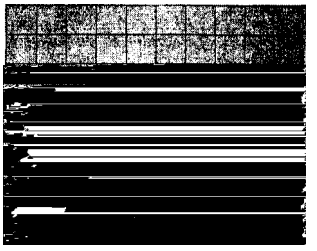
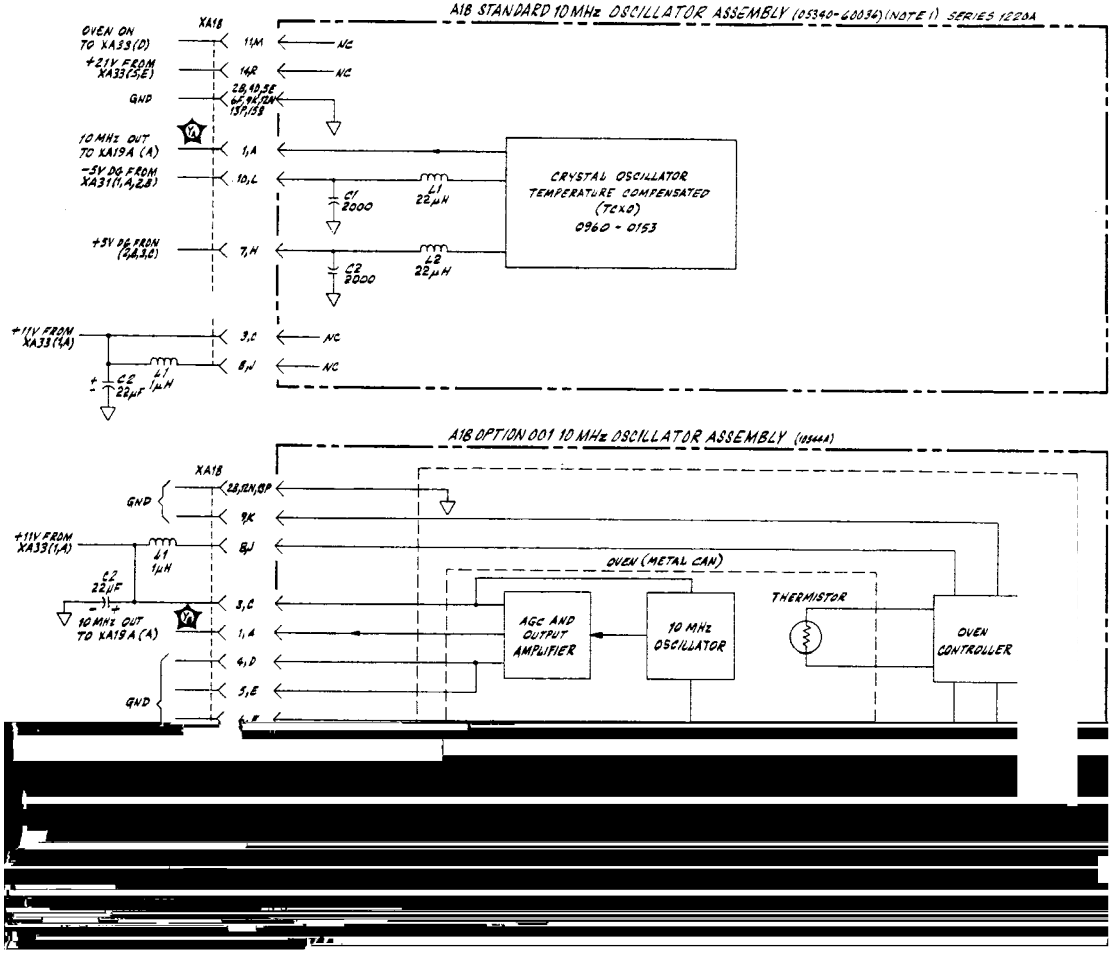
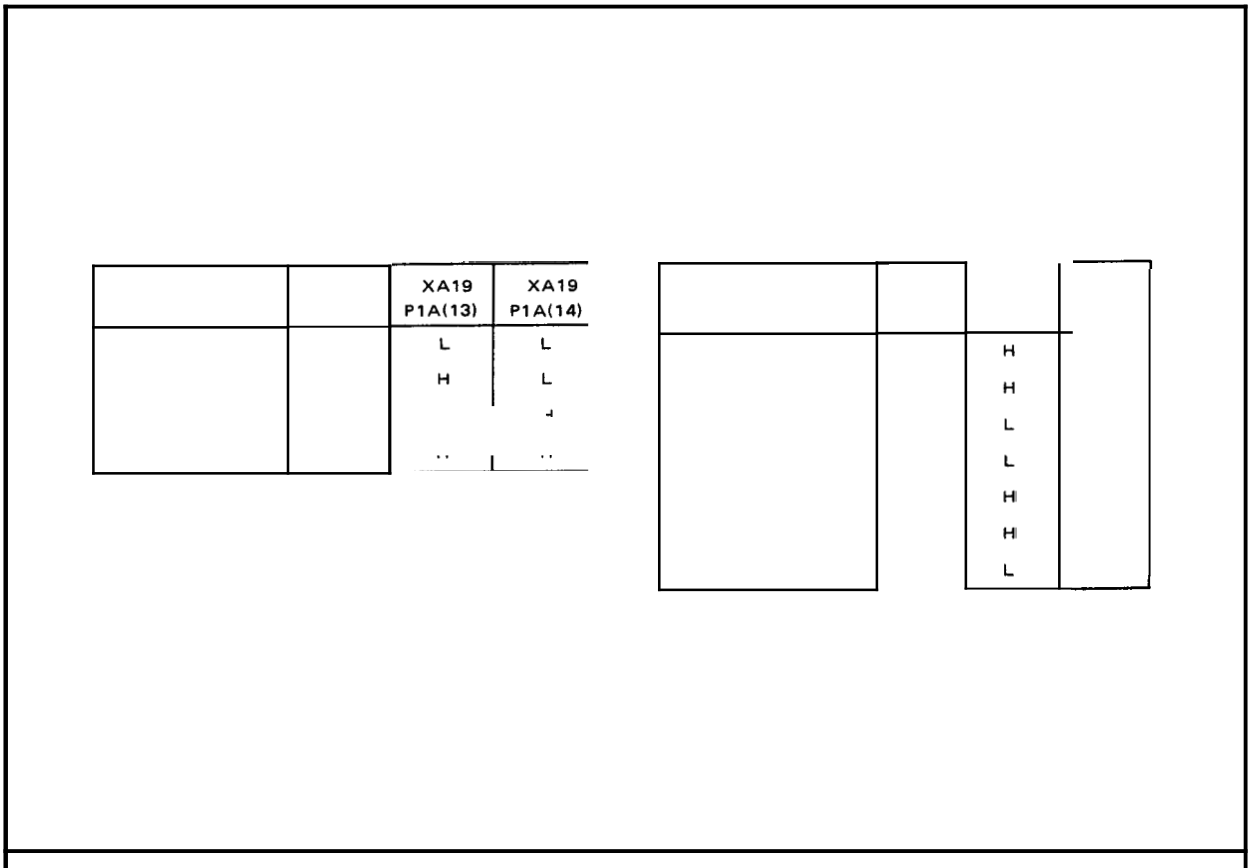


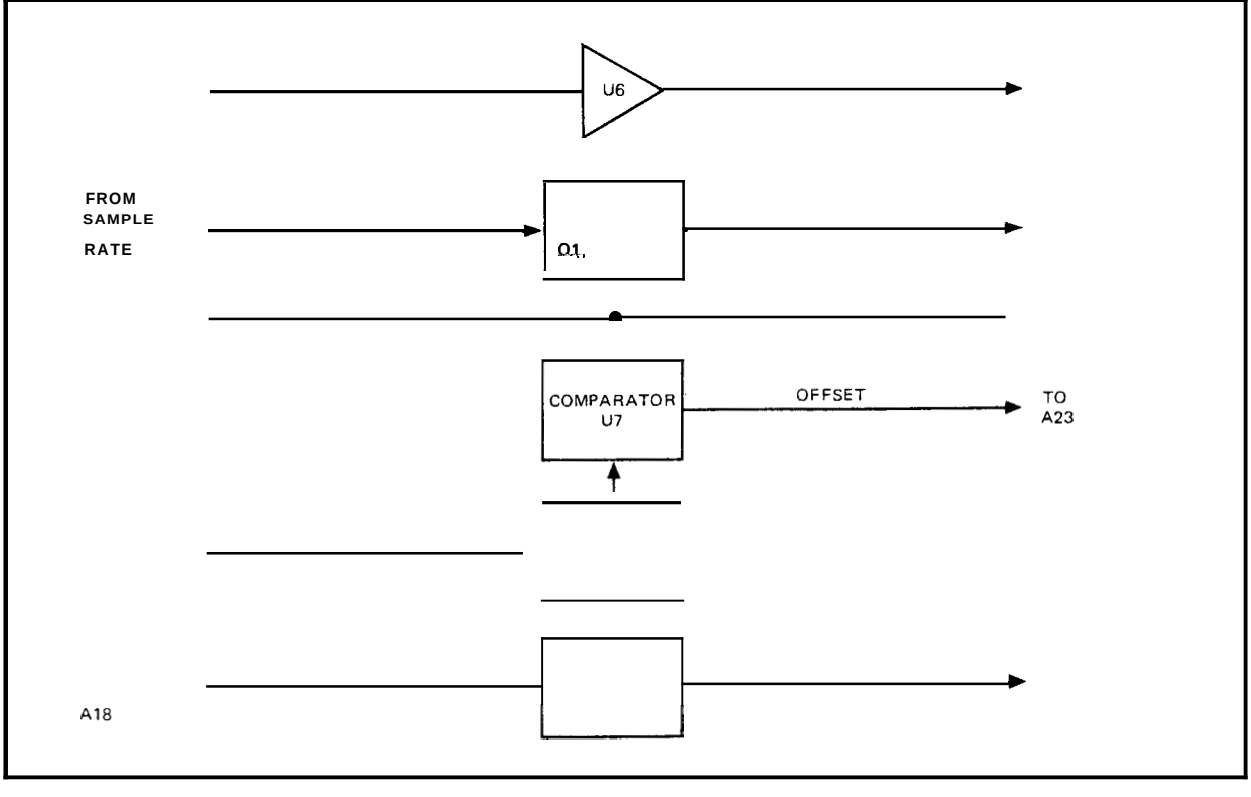
Figure 8-23. A17 Direct Count Amplifier Assembly





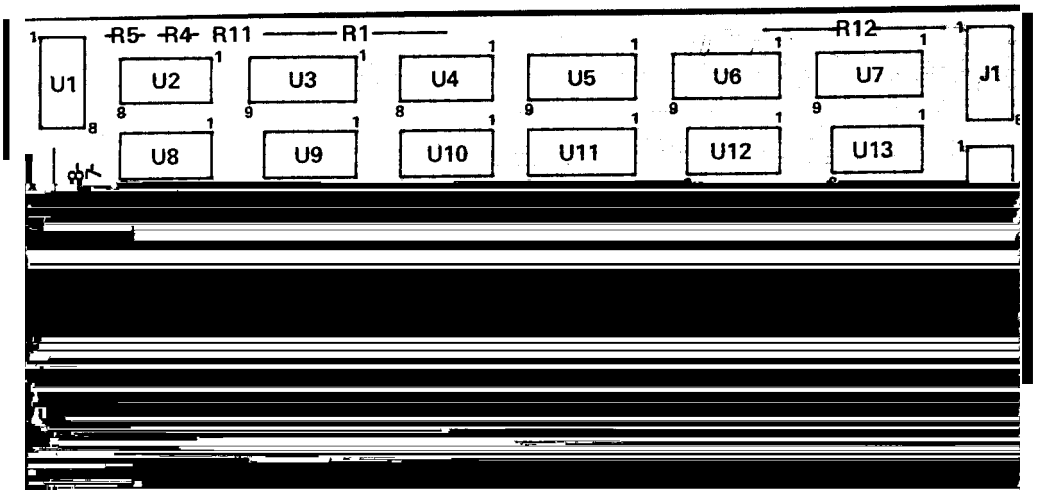

A1B STANDARD 10 MHz OSCILLATOR ASSEMBLY (05340-60036) (NOTE 1) SERIES 1220A
XA1B
OVEN ON TO XA33(D)
+21V FROM XA33(S,E)
GND
10 MHz OUT TO XA19A (A)
-5V DC FROM XA31(1,A,Z,B)
+5V DC FROM (Q,B,3,C)
+11V FROM XA33(1,A)
11,M
14,R
28,19,5E 6F,9K,2A 15,1,3B
1,A
10,L
7,H
3,C
8,J
NC
C1 2000
L1 22µH
C2 2000
L2 22µH
C2 22µF
L1 1µH
CRYSTAL OSCILLATOR TEMPERATURE COMPENSATED (TCXO) 0960-0153
A1B OPTION 001 10 MHz OSCILLATOR ASSEMBLY (05344A)
XA1B
GND
+11V FROM XA33(1,A)
L1 1µH
C2 22µF
10 MHz OUT TO XA19A (A)
28,2N,8P
9K
8J
3,C
1,A
4,D
5,E
GND
OVEN (METAL CAN)
AGC AND OUTPUT AMPLIFIER
10 MHz OSCILLATOR
THERMISTOR
OVEN CONTROLLER


XA19
P1A(13)
XA19
P1A(14)
L
H
L
L
H
H
L
L
H
H
L


U6
FROM
SAMPLE
RATE
Q1,
COMPARATOR
U7
OFFSET
TO
A23
A18

OUTPUTS

B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0



ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1	1901-0040

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES.

REFERENCE DESIGNATIONS

A19
C1-6 CR1 L1 Q1 R1-12 U1-26 Z1

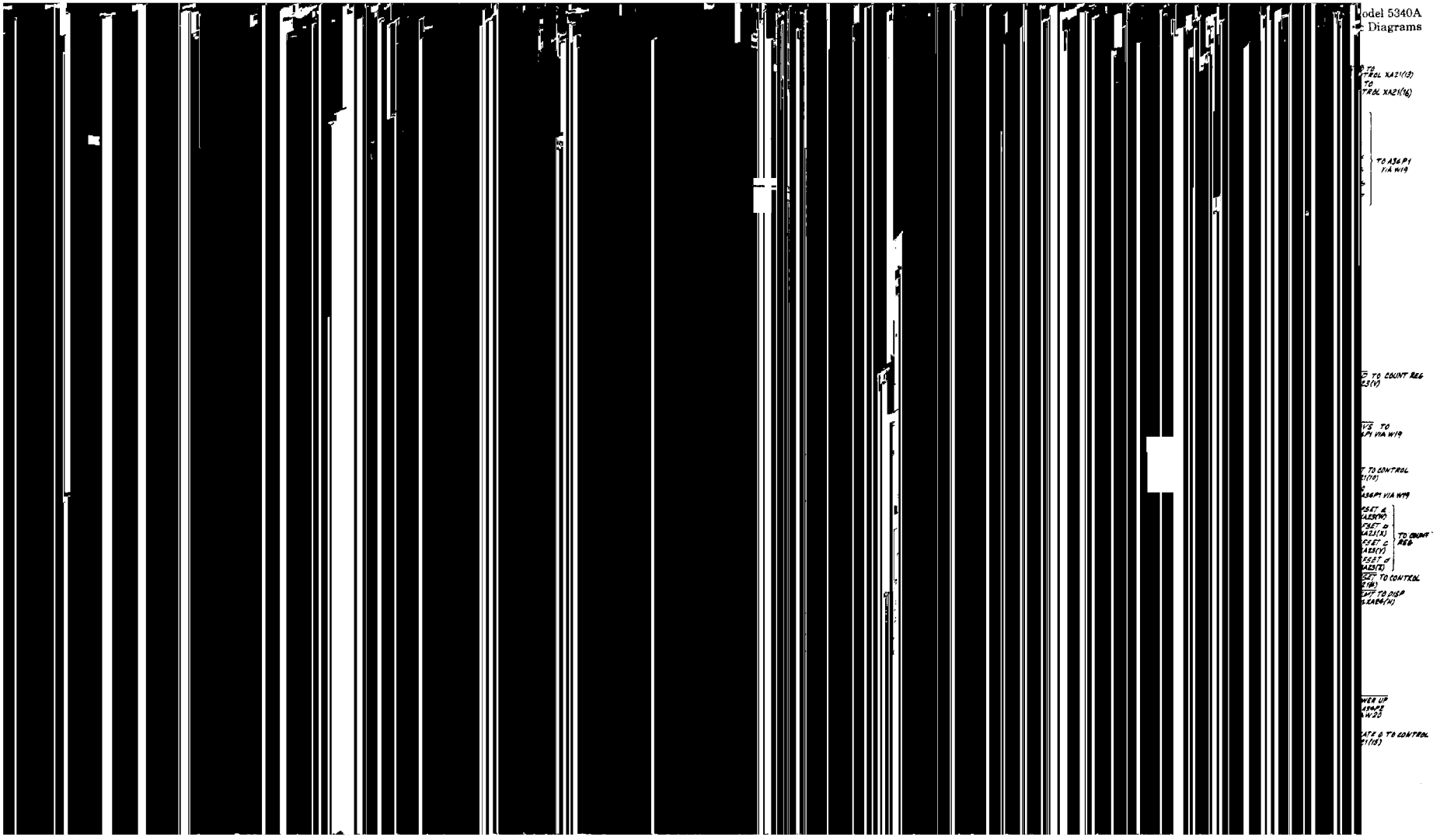
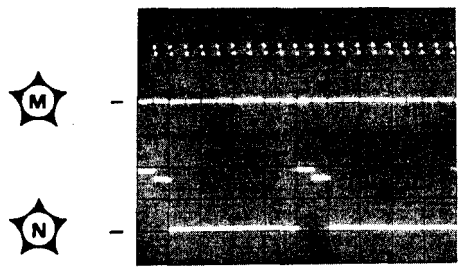


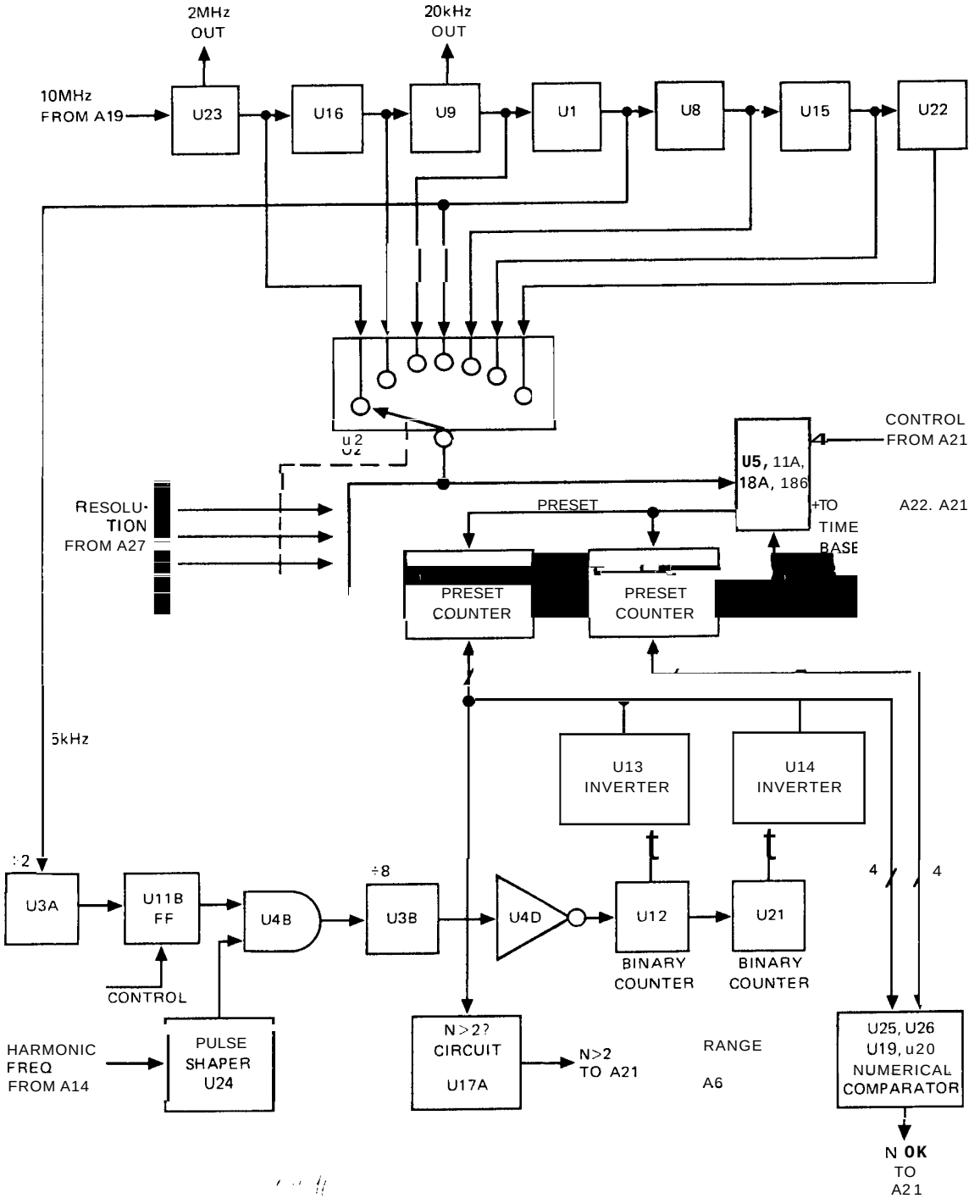
Figure 8-26. A19 Interface B Assembly (Part of Option 011)

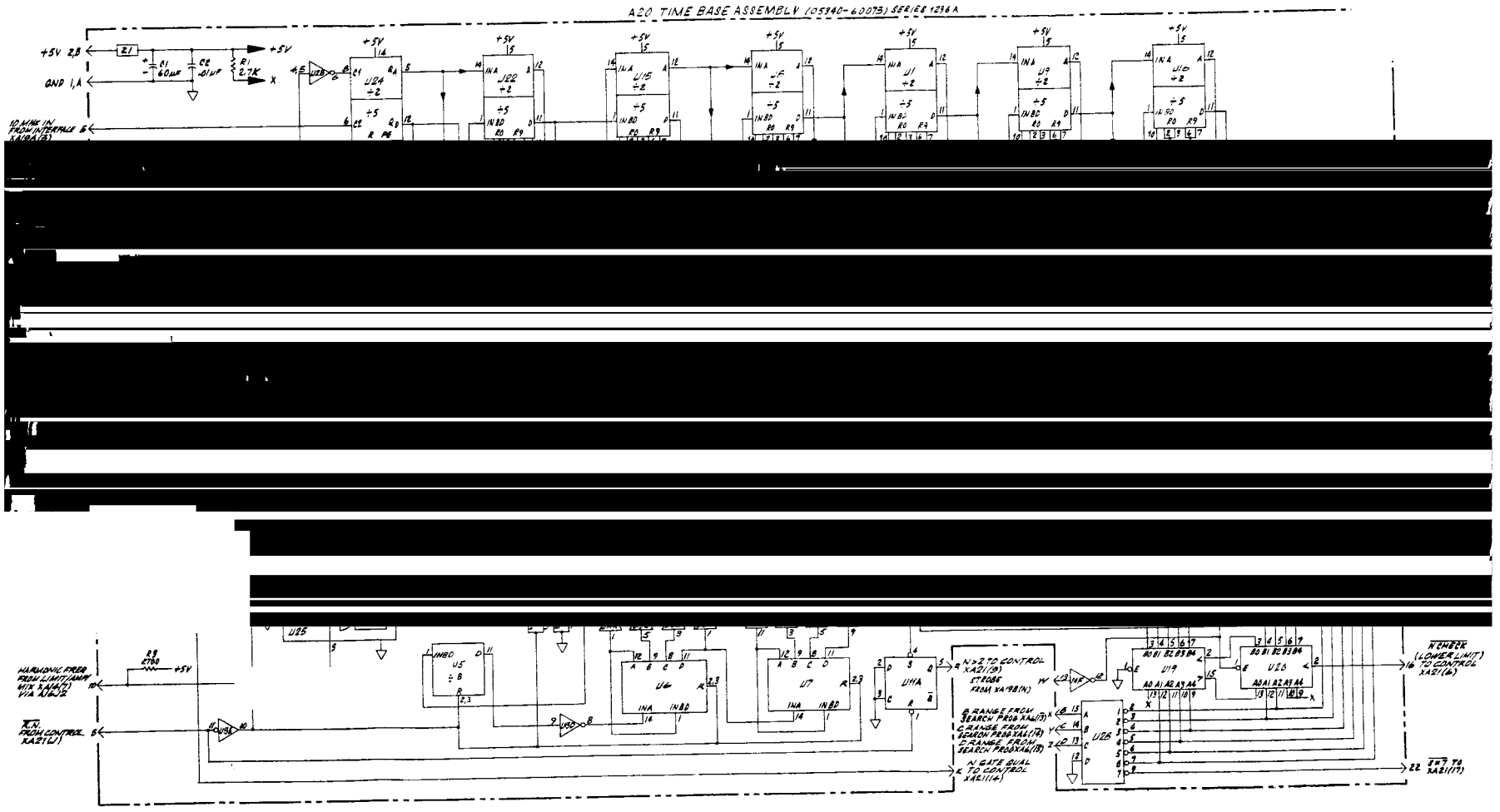


M A20U2(6) .2 V/cm, 20 ms/div

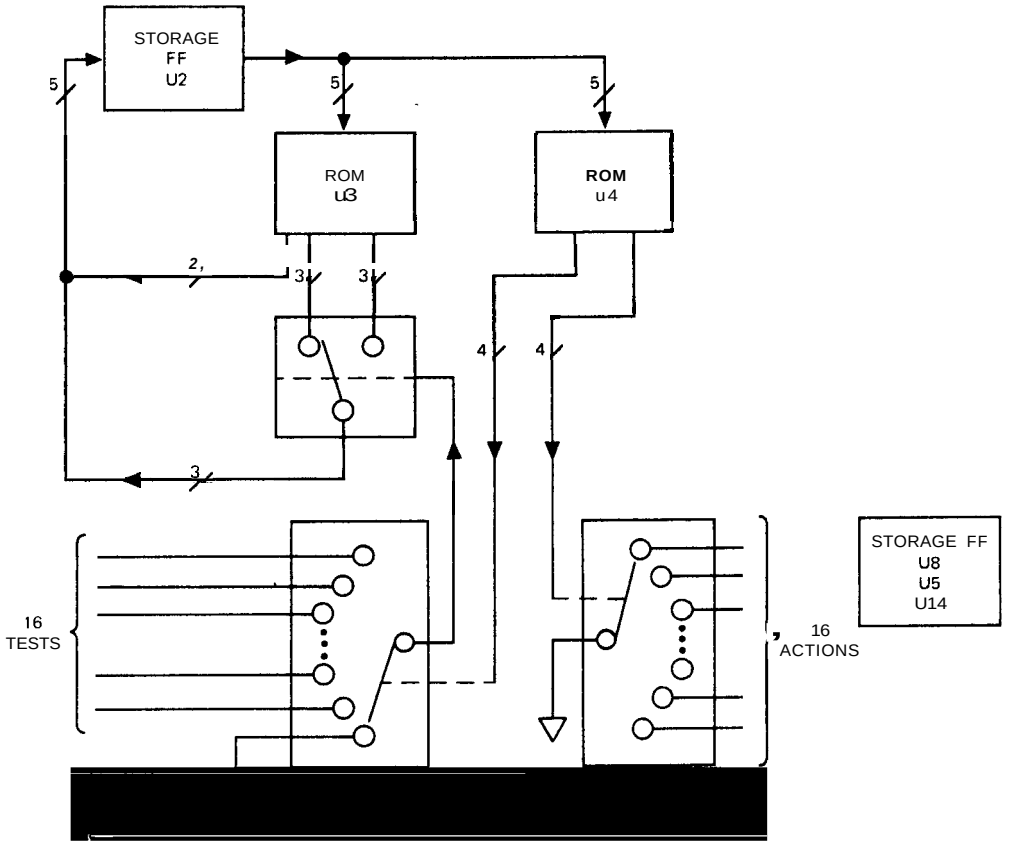
N A20U2(7) .2 V/cm, 20 ms/div

Part of Figure 8-27. A20 Time Base Assembly




A20 TIME BASE ASSEMBLY (05340-60073) SERIES 1236A
+5V 2,B
GND 1,A
10 MHz IN FROM INTERFACE A (XA10A(5))
R1
C1 .60μF
C6 .01μF
R1 2.7K
+5V
X
U24 ÷2 ÷5
U25
U26
U15 ÷2 ÷5
U6
U7
U1 ÷2 ÷5
U10 ÷2 ÷5
U11 ÷2 ÷5
U5 ÷B
U11A
U19
U20
U18
HARMONIC FREQ FROM LIMIT/AMP MIX XA9A(7) VIA XJ6J2
R9 2700
+5V
X IN FROM CONTROL XA21(J)
N≥2 TO CONTROL XA21(9) STROBE FROM XA19B(N)
A RANGE FROM SEARCH PROB XA6(13)
C RANGE FROM SEARCH PROB XA6(12)
D RANGE FROM SEARCH PROB XA6(13)
N GATE DUAL TO CONTROL XA21(14)
W
Z
U18
U18
U19
U20
U18
A0 A1 A2 A3 A4
B0 B1 B2 B3 B4
W OMEGA (LOWER LIMIT) TO CONTROL XA21(16)
22 TO XA21(17)

Part of Figure 8-28. **A21** Control Assembly

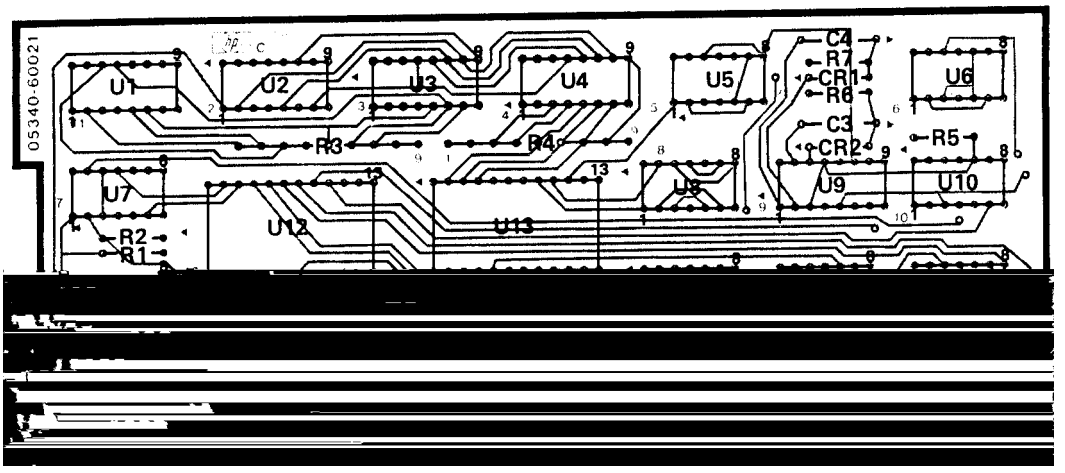


PRESENT-FUTURE ROM
U3 (1816-0003)Truth Table

ADDRESS	INPUTS					OUTPUTS								
	E	D	C	B	A	Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1
PIN NO.	14	13	12	11	10	9	7	5	5	4	3	2	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	1	0	1	1	0	1	1	1	1
2	0	0	0	1	0	0	0	0	1	0	0	1	1
3	0	0	0	1	1	0	1	0	1	1	1	1	1
4	0	0	1	0	0	0	1	1	1	1	1	0	1
	0	0	1	0	1	0	0	1	0	1	1	0	0
6	0	0	1	1	0	0	0	0	0	0	0	1	0
	0	0	1	1	1	1	0	1	0	1	0	0	0
											0	0	0
							0	1	0	1	0	0	0
	0	1	0	1	0	1	0	0	0	0	0	0	0
	0	1	0	1	1	0	0	1	1	1	0	1	1
	0	1	1	0	0	0	0	1	1	0	0	0	0
	0	1	1	0	1	0	1	1	1	0	0	0	0
	0	1	1	1	0	0	1	1	1	0	0	1	0
	0	1	1	1	1	0	1	1	0	0	0	0	0
							0	0	1	0	0	0	0
	1	0	0	0	1	1	0	1	0	0	0	0	0
	1	0	0	1	0	0	0	0	0	0	0	0	0
	1	0	0	1	1	0	0	0	0	0	0	0	0
	1	0	1	0	0	1	1	1	1	1	0	0	0
	1	0	1	0	1	1	0	1	0	1	1	1	1
	1	0	1	1	0	0	0	0	0	0	0	0	0
	1	0	1	1	1	0	0	0	0	0	0	0	1
	1	1	0	0	0	1	1	0	0	0	0	1	0
	1	1	0	0	1	1	1	1	0	1	0	0	1
	1	1	0	1	0	0	1	1	0	1	0	0	1
27	1	1	0	1	1	0	0	0	0	0	0	0	0
28	1	1	1	0	0	1	1	0	0	0	1	0	0
29	1	1	1	0	1	1	1	1	0	0	1	0	1
30	1	1	1	1	0	1	1	0	0	0	0	0	1
	1	1	1	1	1	1	1	1	1	0	1	1	1
	DESTINATION					U2"D"		U1 "1" INPUTS			U1 "0" INPUTS		

ACTION-TEST ROM
U4(1816-0004) Truth Table

						ACTION				TEST			
ADDRESS	INPUTS					OUTPUTS							
	E	D	C	B	A	Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1
PIN NO.	14	13	12	11	10	9	7	6	5	4	3	2	1
0													
2													
3													
4	0	0	1	0	0								
									0	0	0	0	0
	0	1	0	1	0	1	0	0	1	0	0	0	0
	0	1	0	1	1	0	0	0	0	1	1	0	1
	0	1	1	0	0	0	1	1	1	0	0	0	0
	0	1	1	0	1	0	0	0	1	0	0	0	0
	0	1	1	1	0	0	1	0	0	0	1	1	1
								0	0				
27										0	0	0	0
28	1	1	1	0	0	1	1	0	0	0	1	0	0
29	1	1	1	0	1	1	0	0	0	1	0	0	1
30	1	1	1	1	0	1	0	0	0	1	0	1	0
	1	1	1	1	1	0	0	0	0	0	0	1	1
	DESTINATION					U13 ADDRESS				U12 ADDRESS			



REFERENCE DESIGNATIONS

A21
C1-4 CR1, 2 R1-7 U1-16 Z1

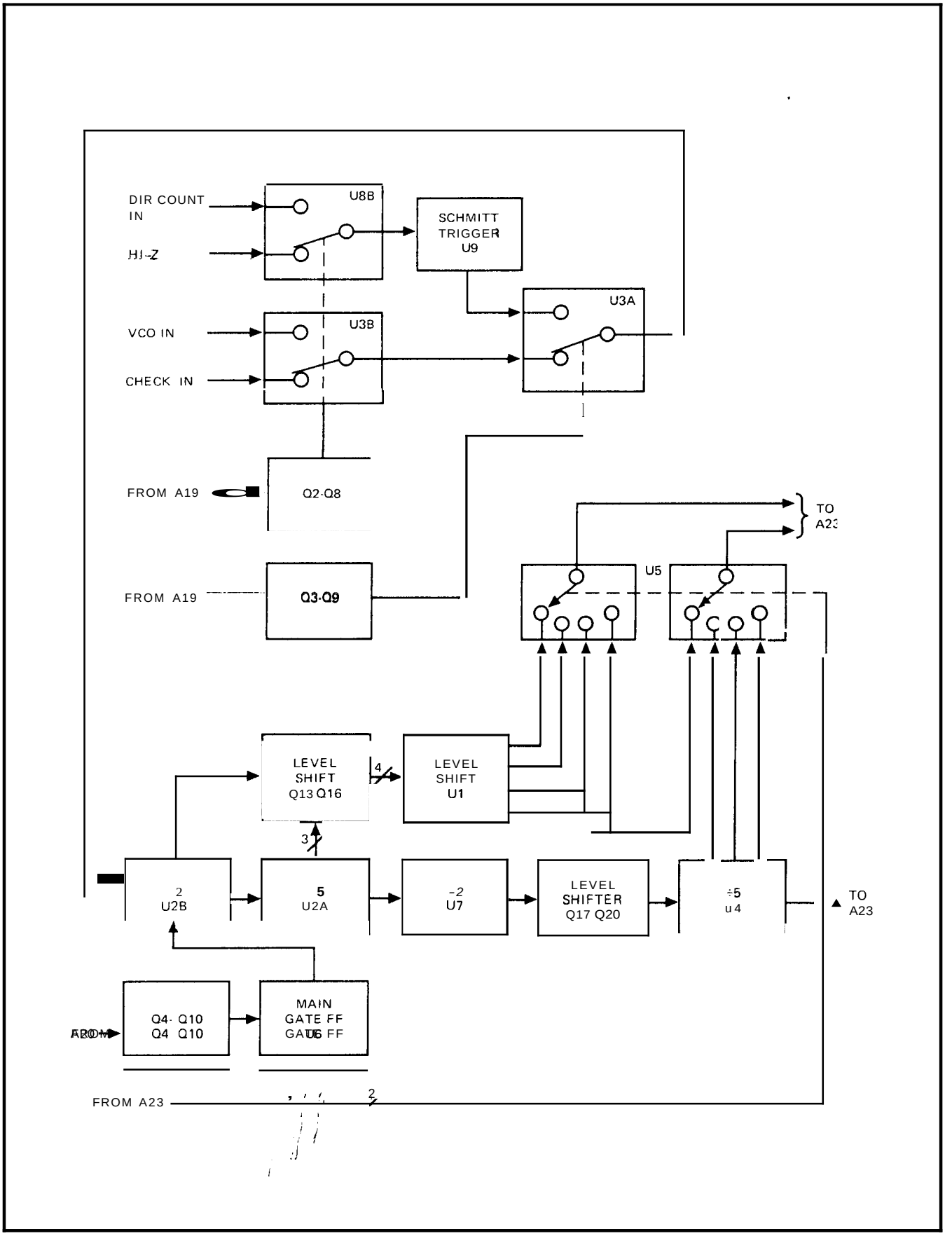
ACTIVE ELEMENTS

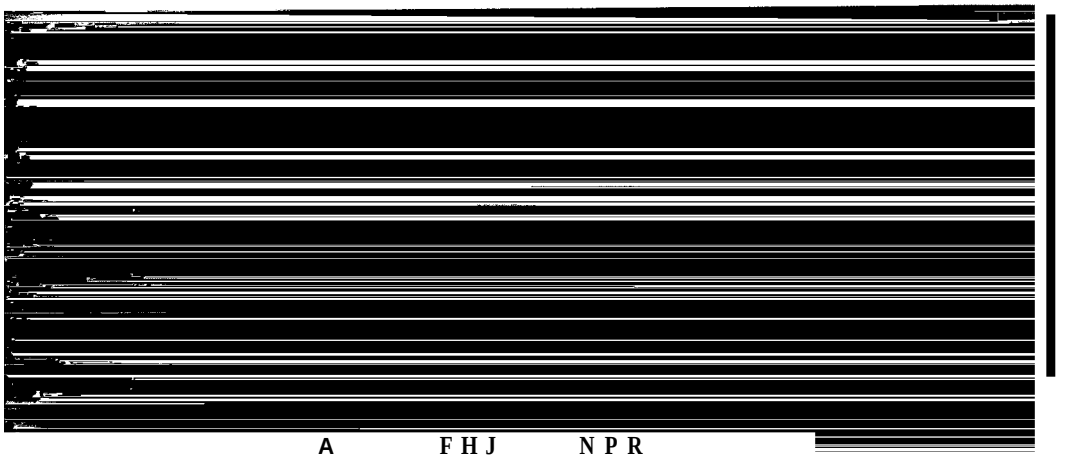
REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1, 2	1901-0040 1820-0616 9322 1820-0788 SN35431
	1816-0003
U4	1816-0004
U5, 6, 7, 8, 14, 15	1820-0054 SN7400N
U9	1820-0315 9602
U10	1820-0077 SN7474N
U11	1820-0174 SN7404N
U12	1820-0643 SN74150N
U13	1820-0495 SN74154N
U16	1820-0068 SN7410N

5340-D-3L

Figure 8-28. A21 Control Assembly

Part of Figure 8-29. **A22** High Frequency Counter Assembly





A F H J N P R

REFERENCE DESIGNATIONS

A22
C1-C3, C7-15 CR1 U1 L1 Q1-20 R1-53 U1-9 Z1, 2

C4-C6 DELETED

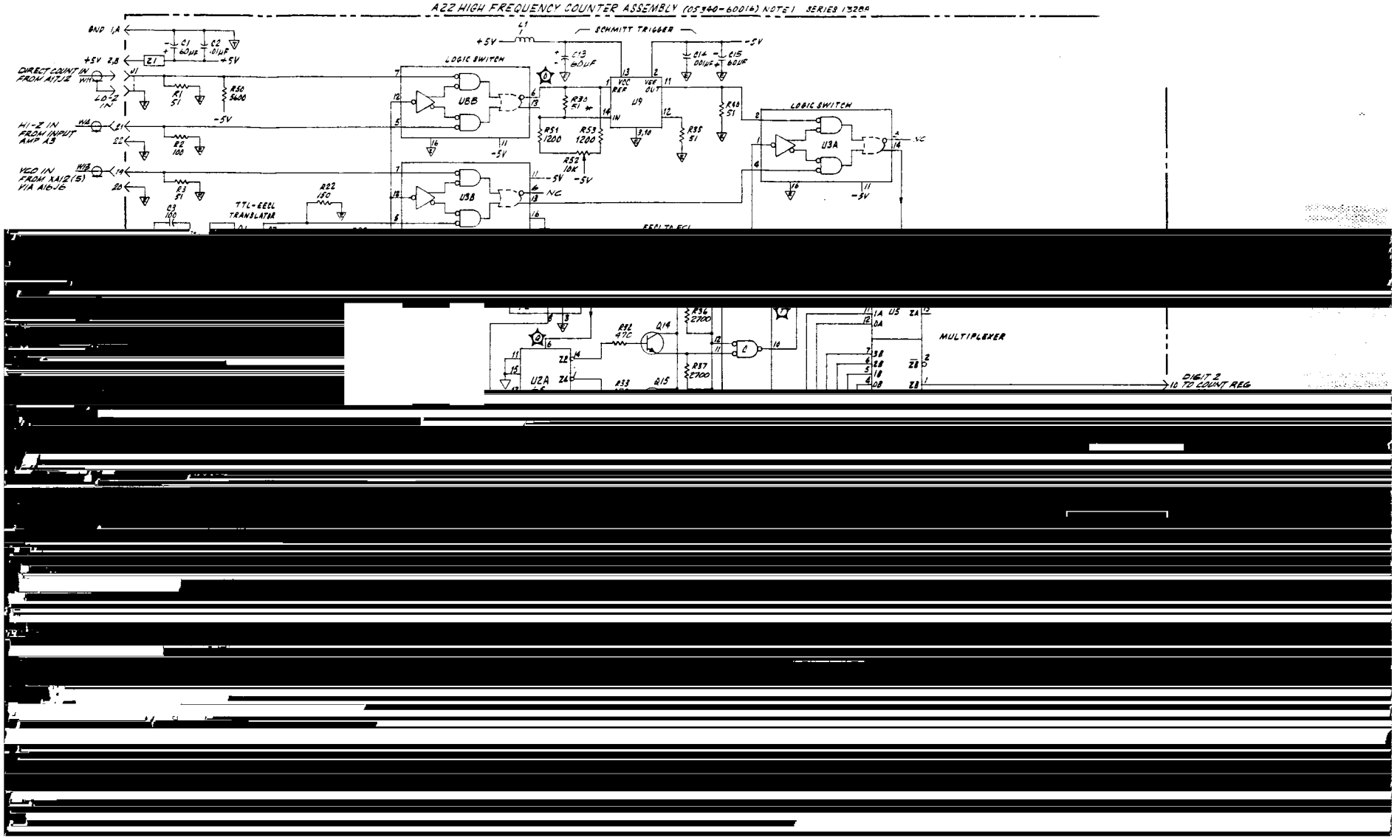
ACTIVE ELEMENTS

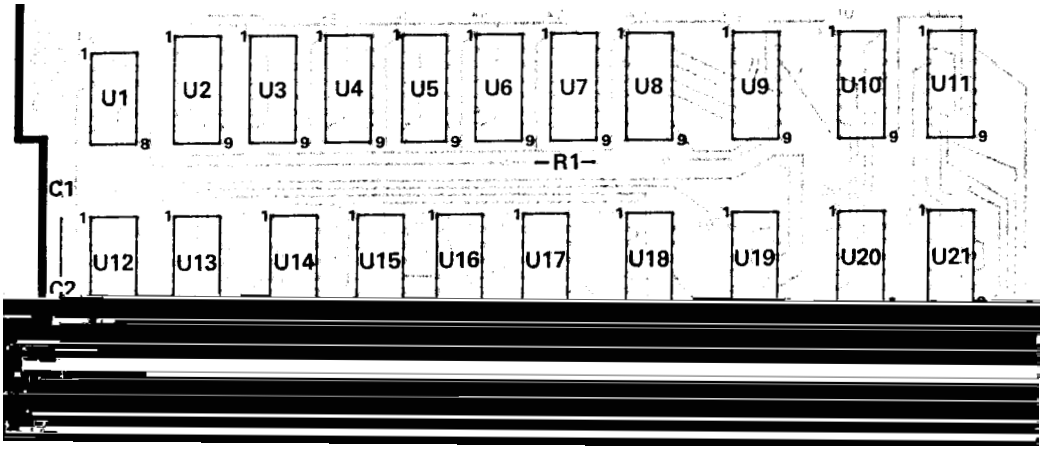
REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1	1901-0535
Q1-17, 21	1854-0071
Q18, 20	1854-0092 2N3563
Q19	1854-0009 2N709
U1	1820-0275 MC1039P
U2	1820-1019
U3,8	1820-0560
U4	1820-0751 SN74196N
U5	1820-0610 9309
U6,7	1820-0557
U9	5086-7089

5340-D-21

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS:
   INWCTANCE IN MICROHENRIES


A22 HIGH FREQUENCY COUNTER ASSEMBLY (05340-60016) NOTE 1 SERIES 1328A
SCHMITT TRIGGER
LOGIC SWITCH
TTL-EECL TRANSLATOR
MULTIPLEXER
DIRECT COUNT IN FROM A17J2
HI-Z IN FROM INPUT AMP A3
VCO IN FROM A12J2(5) VIA A16J6
DIGIT 2 TO COUNT REG
+5V
-5V
U8B
U3A
U9
U5
U2A
Q14
Q15



ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
U1	1820-0596 DM74L74N
U2-7	1820-0986 8GL75
U8, 9	1820-0659 SL17145
U10, 11	1820-0910 SN74LS83N
U12	1820-0583 DM74L00N
U13	1820-0588 DM74L20N
U14, 15, 18	1820-0054 SN7400N
U16, 17, 19	1820-0077 SN7474N
U20	1820-0282 SN7486N
U21	1820-0068 SN7410N

REFERENCE DESIGNATIONS

NO PREFIX	A23
R3	C1, 2
	R1
	U1-21
	Z1

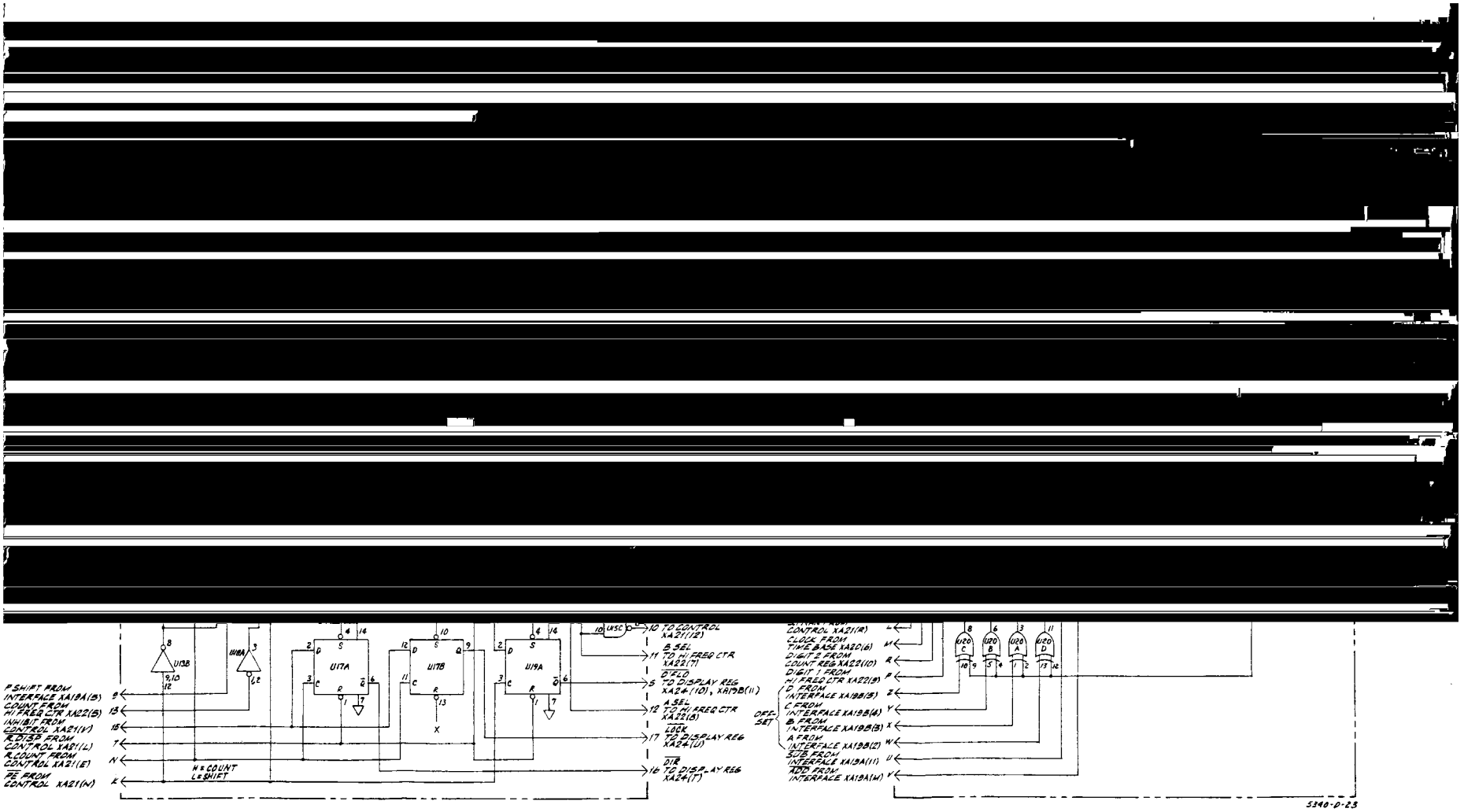
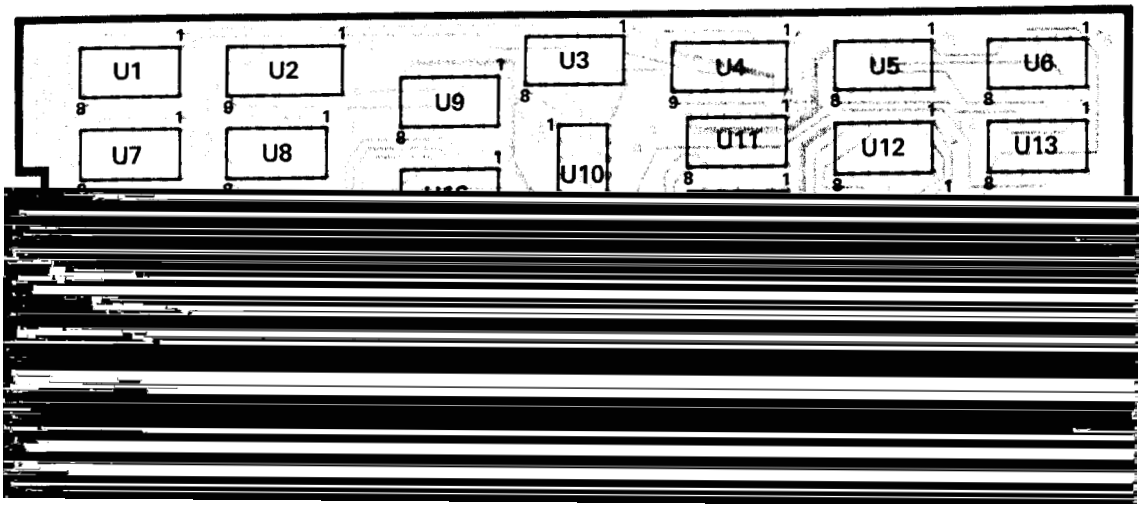


Figure 8-30. A23 Count Register Assembly



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN

A24
C1,2 J1 P1 U1-18 Z1,2

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	
U1,	1820-0294 509935 1820-0657 9318 1820-0174 SN7404N 1820-0616 9322 1820-0069 SN7420N 1820-0587 DM74L10N 1820-0583 DM74L00N 1820-0054 SN7400N 1820-0589 DM74L30N 1820-1047 SN74142A

5340-D-21

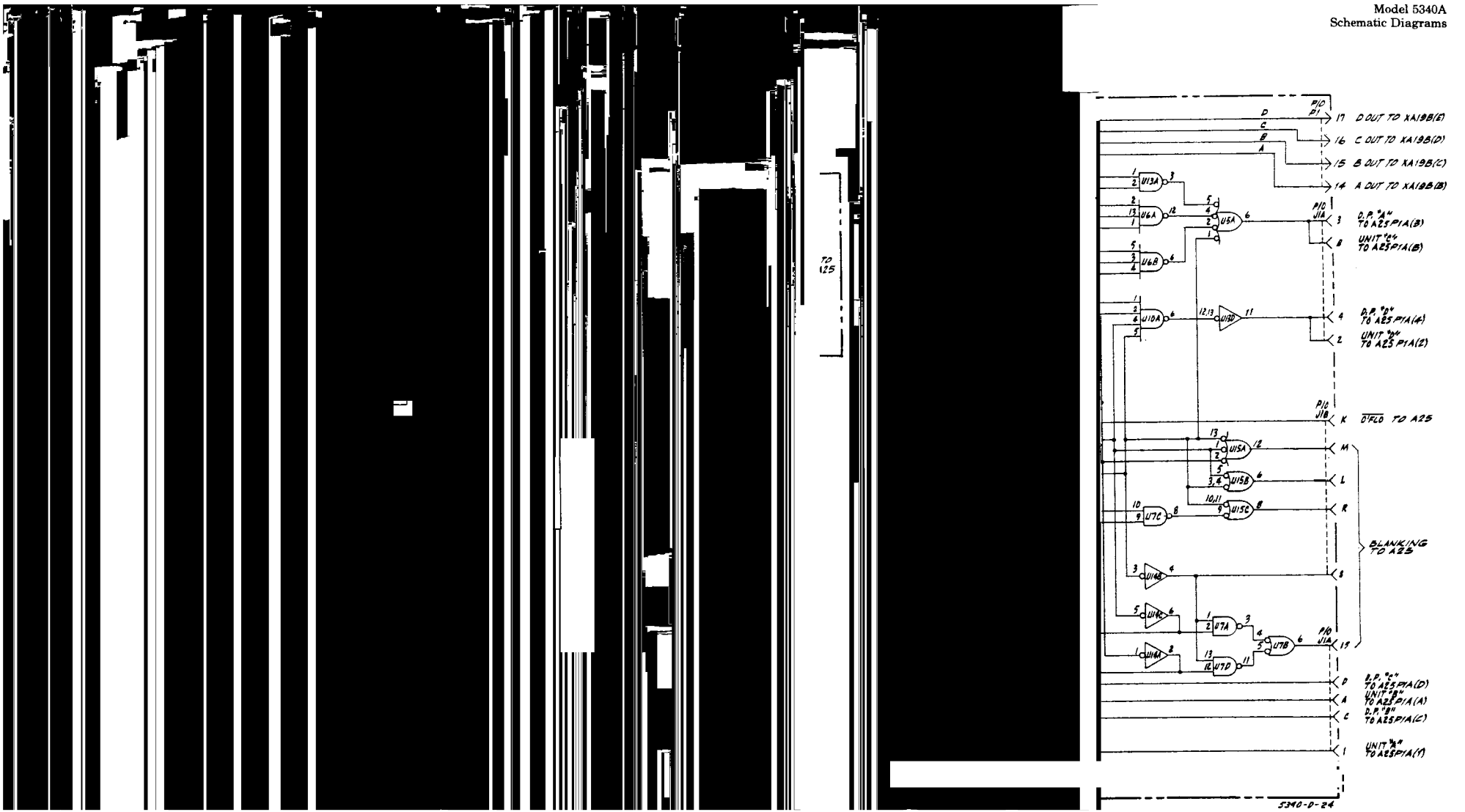
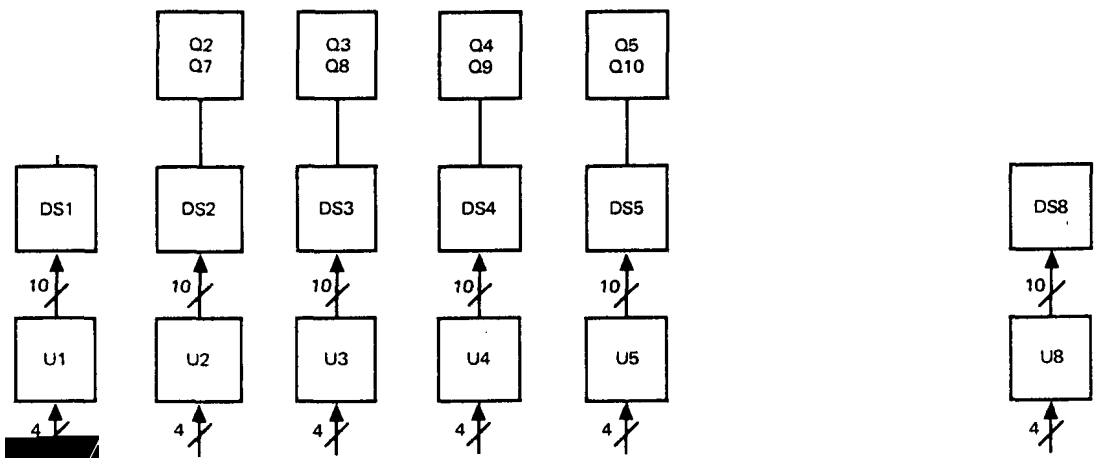
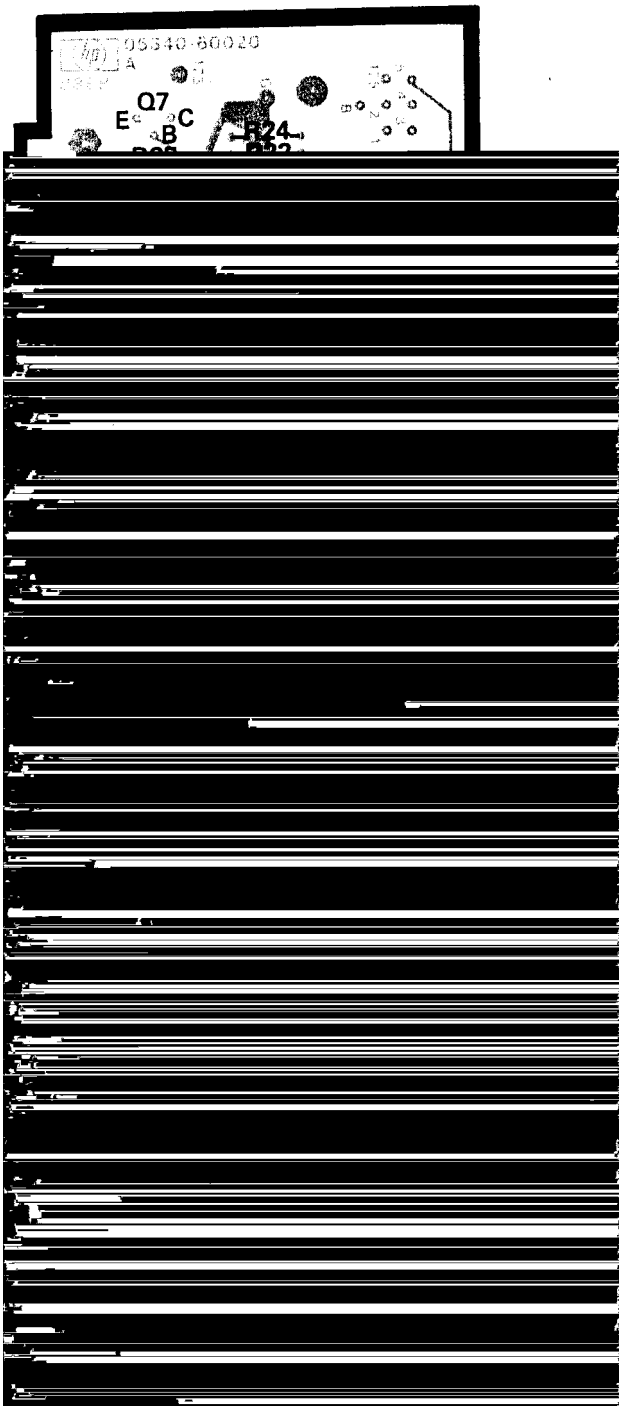
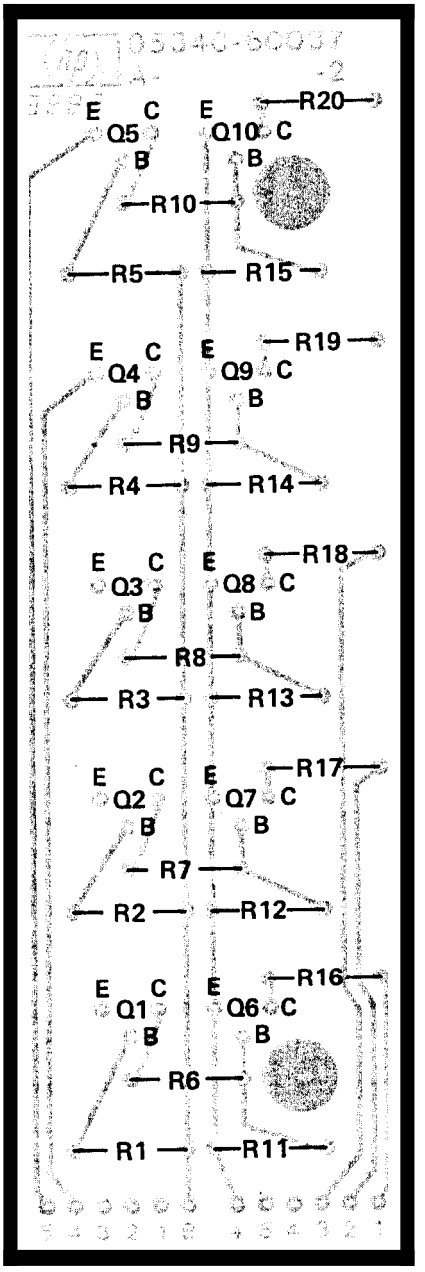


Figure 8-31. A24 Display Register Assembly


Q2
Q7
Q3
Q8
Q4
Q9
Q5
Q10
DS1
DS2
DS3
DS4
DS5
DS8
10
10
10
10
10
10
U1
U2
U3
U4
U5
U8
4
4
4
4
4
4


05340-60020
Q7
E
B
C
R24


05340-60037
E C
Q5
B
E C
Q10
B
R20
R10
R5
R15
E C
Q4
B
E C
Q9
B
R19
R9
R4
R14
E C
Q3
B
E C
Q8
B
R18
R8
R3
R13
E C
Q2
B
E C
Q7
B
R17
R7
R2
R12
E C
Q1
B
E C
Q6
B
R16
R6
R1
R11

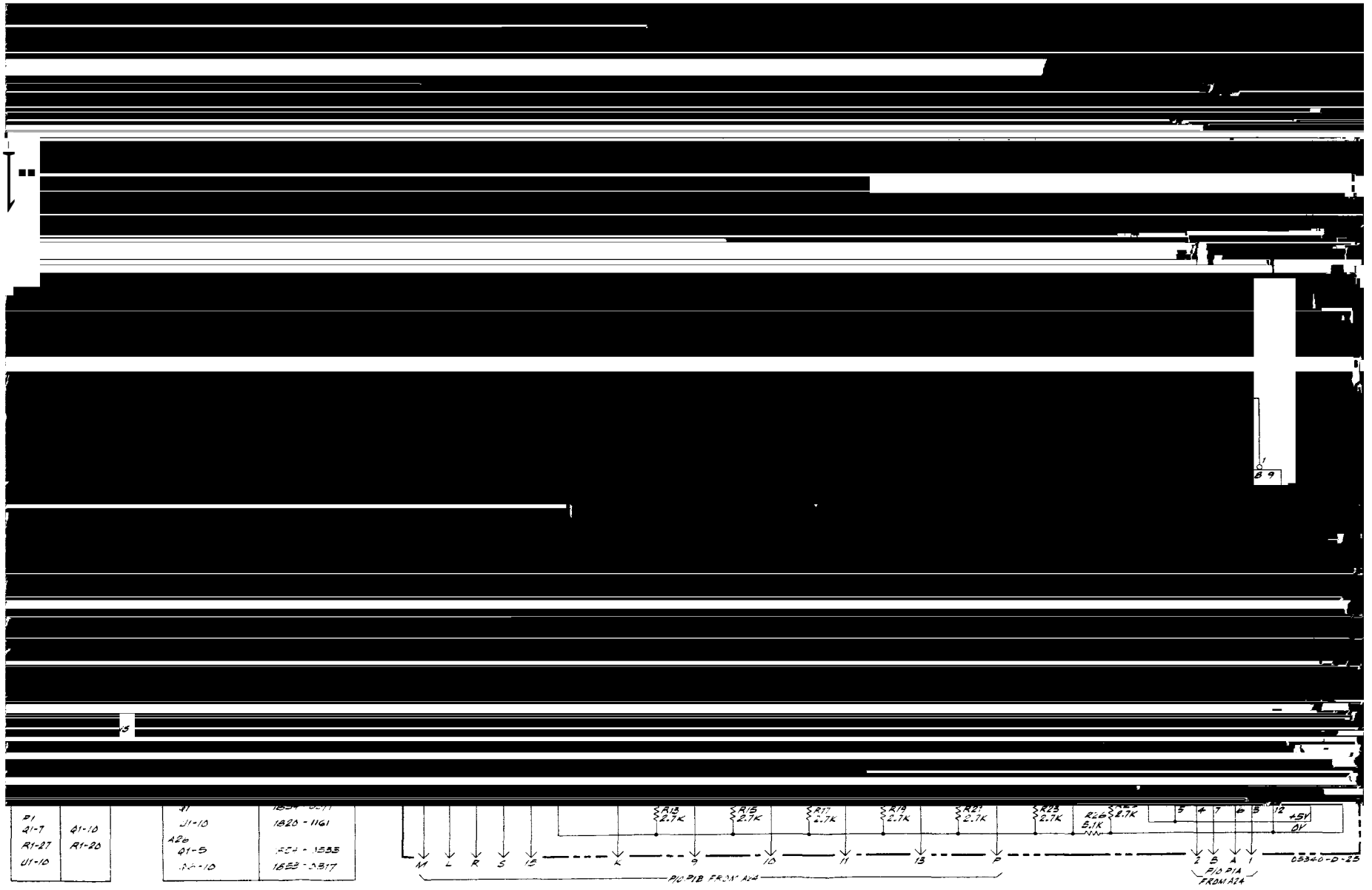
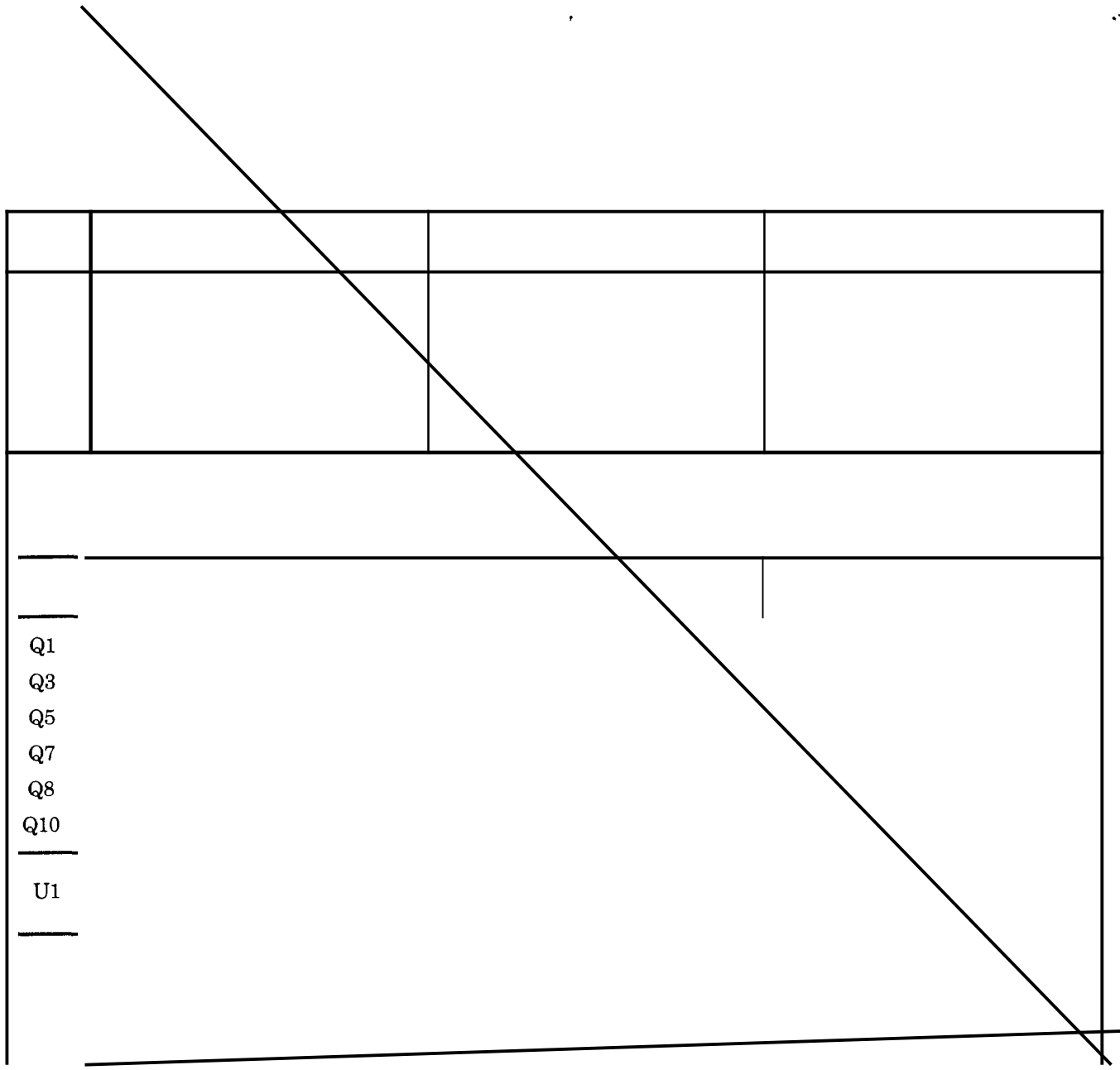
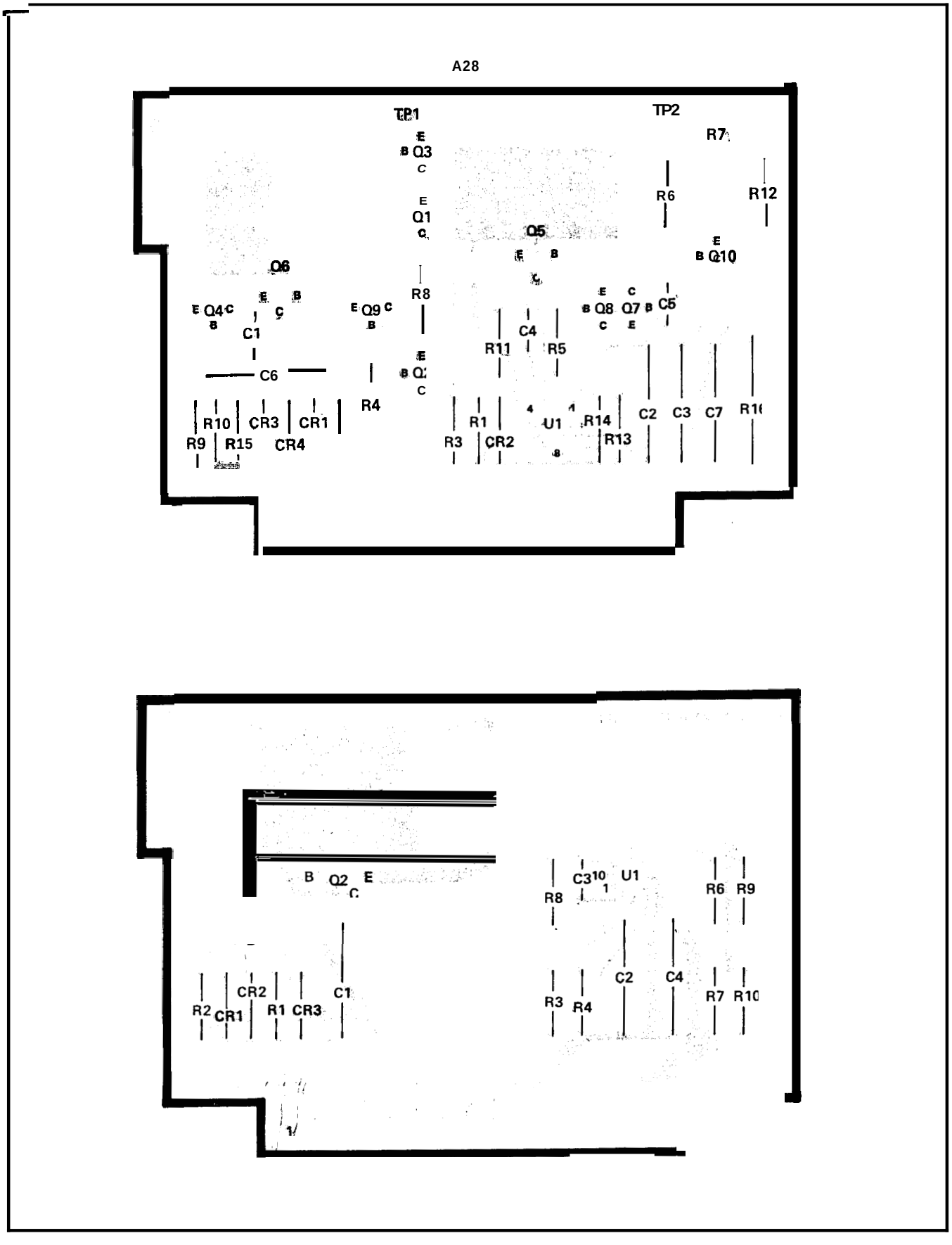


Figure 8-32. A25 Display Assembly, A26 Blanking Assembly



U1

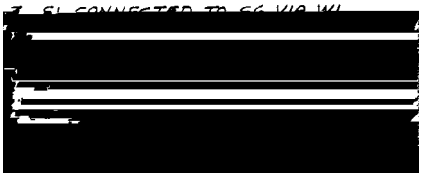
Part of Figure **8-33.** A28, **A29,** and **A30**



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN

3. S1 CONNECTED TO S6 VIA W1



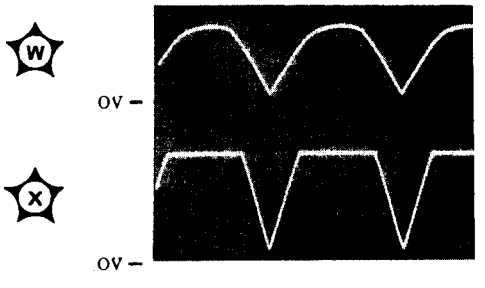
REFERENCE DESIGNATIONS

NO PREFIX	A28	A29	A30
B1	C1-7	C1-4	C1-6
C1	CR1-4	CR1-3	CR1-3
CR4	Q1-10	Q1-3	XA28,29
F1	R1-16	R1-10	
J6	TP1, 2	U1	
S1,6	U1		
T1			
TH1			

EMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
NO PREFIX	
CR4	1906 - 0038
Q1	1854 - 0072
	2N3054
Q2	1854 - 0063
	2N3055
A28	
CR1	1902 - 0049
CR2	1902 - 3234
CR3	1902 - 3428
CR4	1902 - 3399
Q1,3	1854 - 0071
Q2	1853 - 0240
Q4	1854 - 0232
Q5	1853 - 0254
Q6	1854 - 0330
Q7,8	1853 - 0020
Q9	1854 - 0533
Q10	1854 - 0039
	2N3053
U1	1826 - 0016
	LM204H
A29	
CR1,2	1901 - 0040
CR3	1902 - 3234
Q1	1853 - 0020
Q2	1854 - 0420
Q3	1854 - 0039
U1	1826 - 0010
A30	
CR1, 2, 3	1906 - 0027

5340-D-21



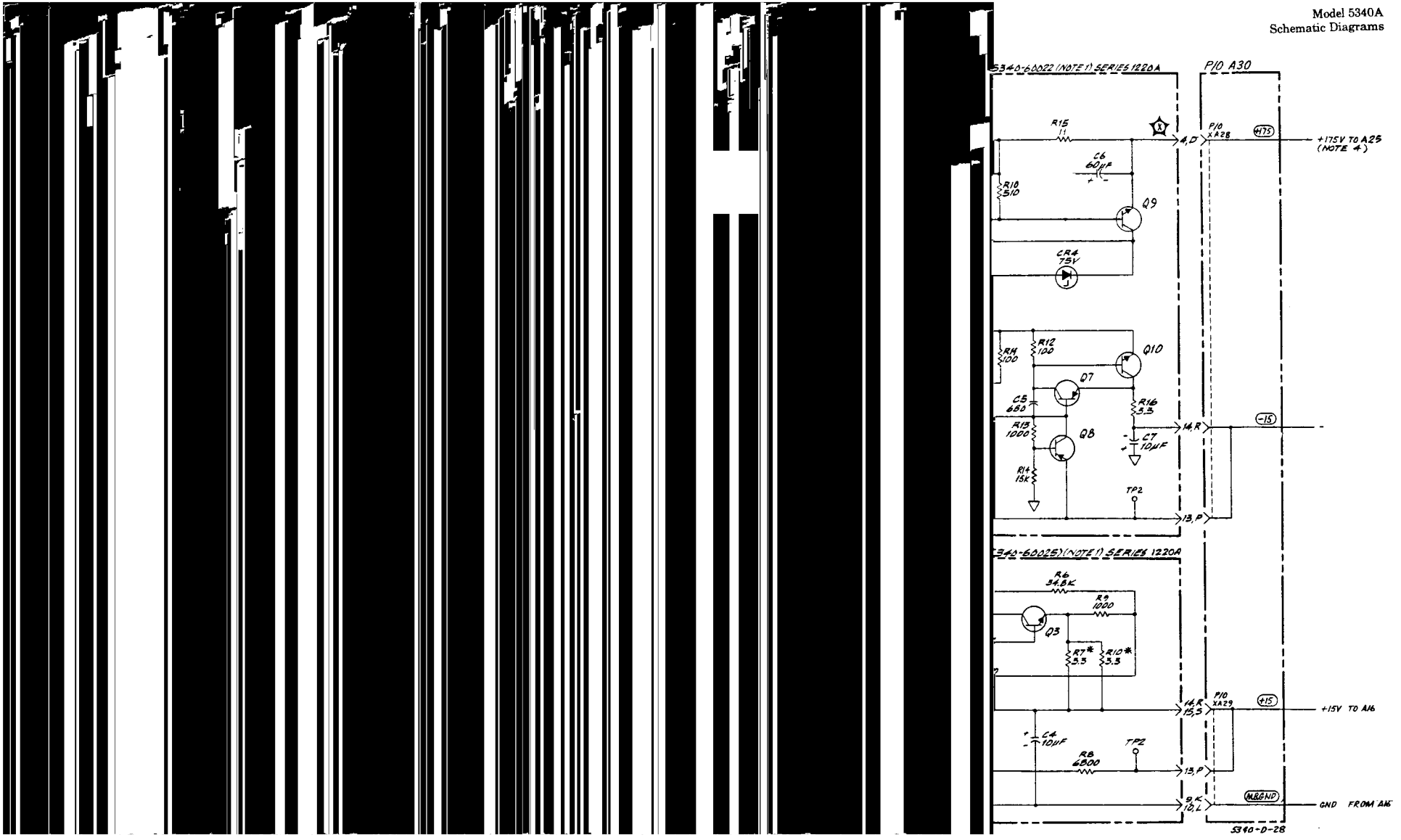
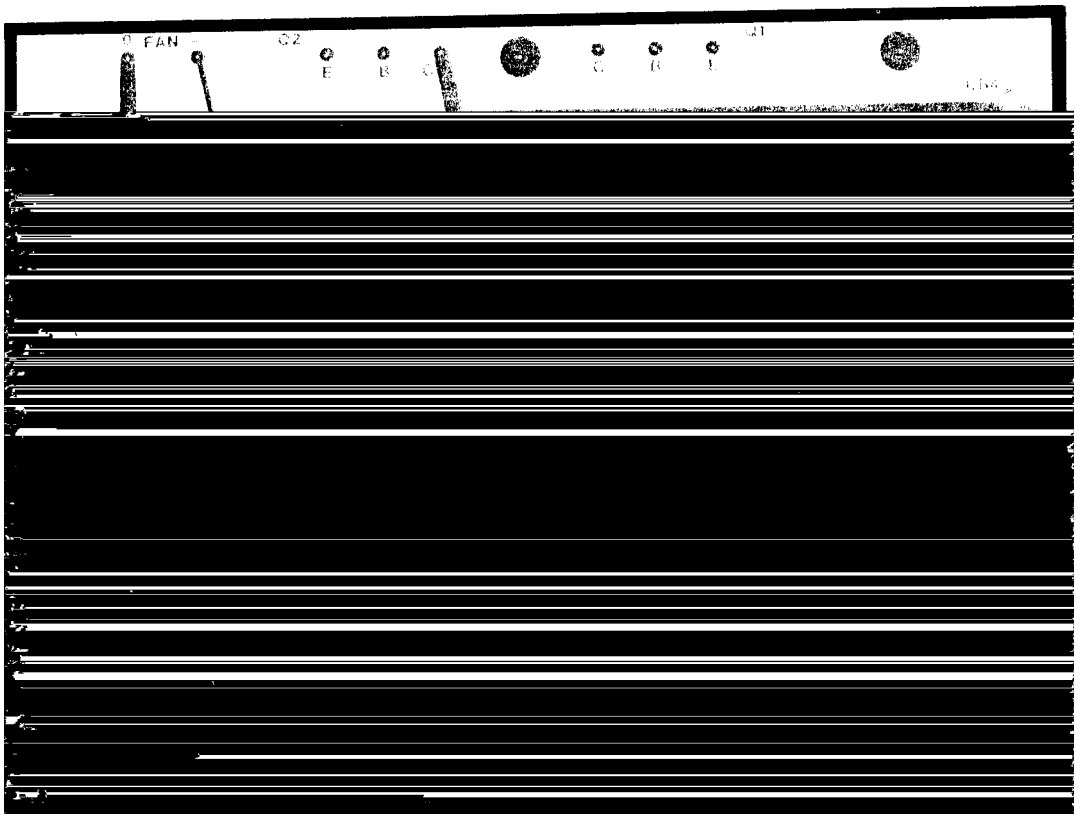


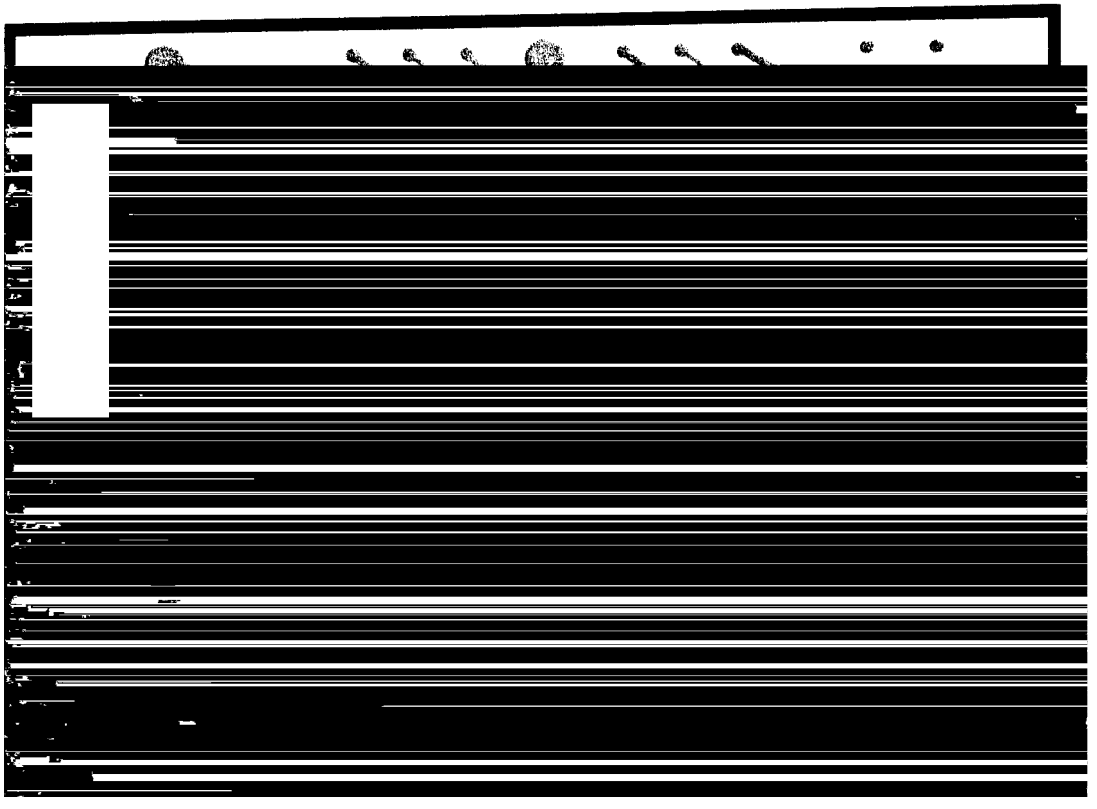
Figure 8-33. A28 -15V and +175V Regulators Assembly, A29 +15V Regulator Assembly, A30 Power Supply Motherboard

Part of Figure **8-34. A30, A31,** and **A32**

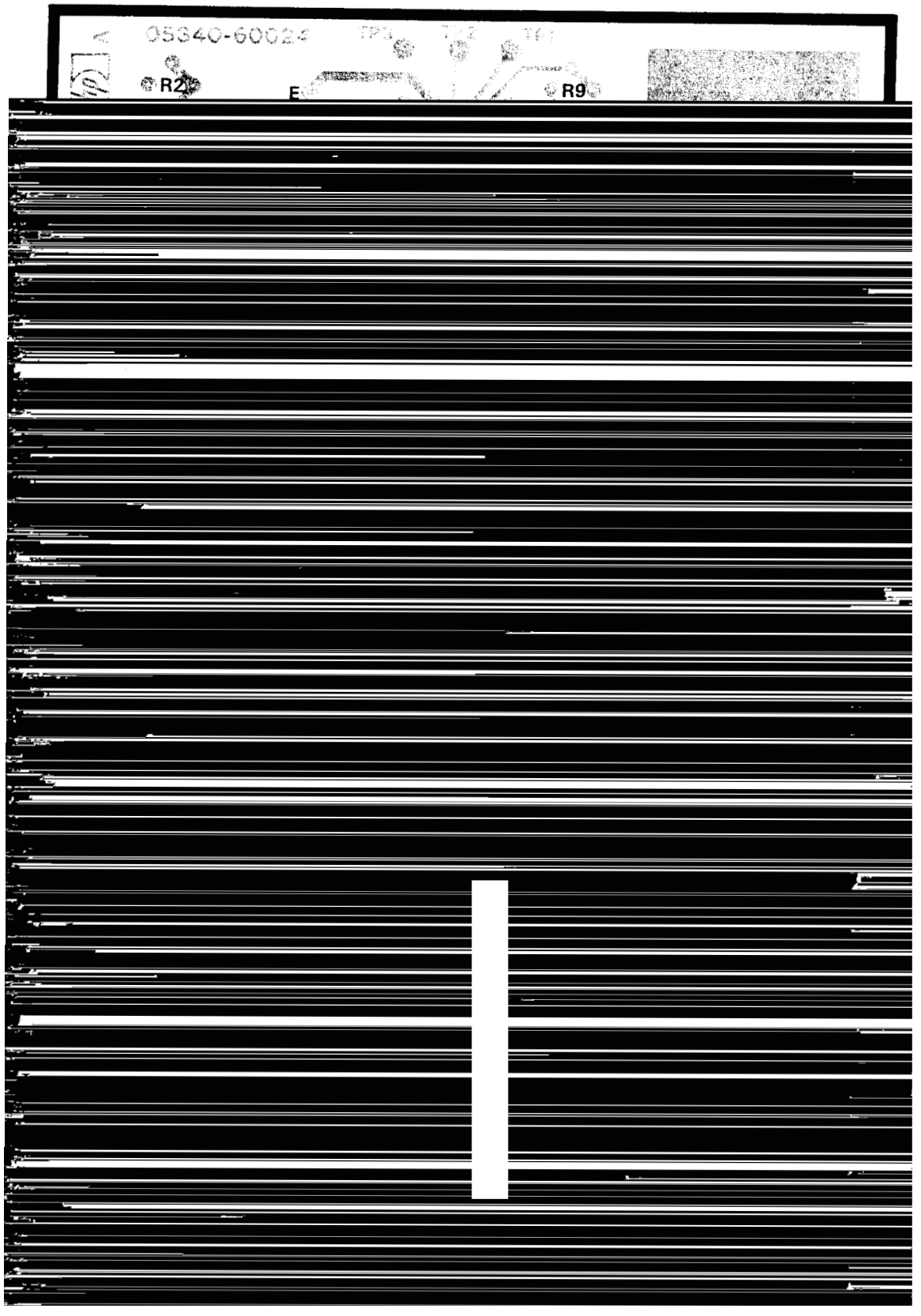
A30



A30



Model



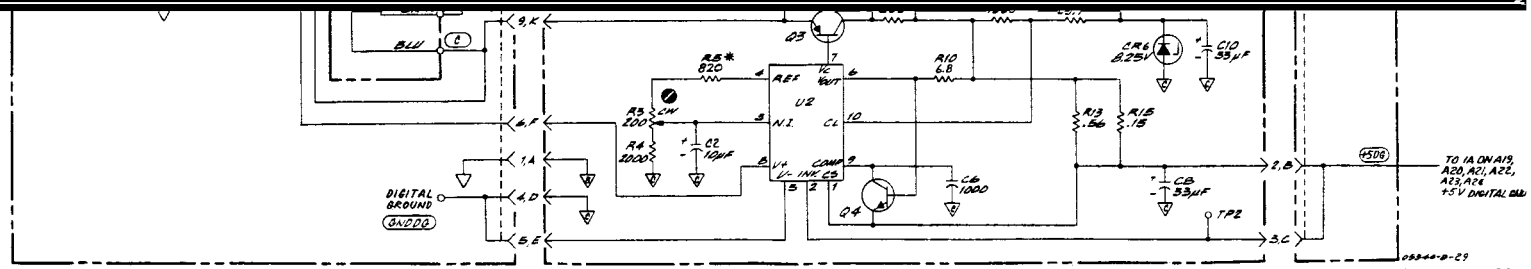


Figure 8-34. A30 Power Supply Motherboard, A31 -5V Regulator Assembly, A32 +5V Regulator Assembly

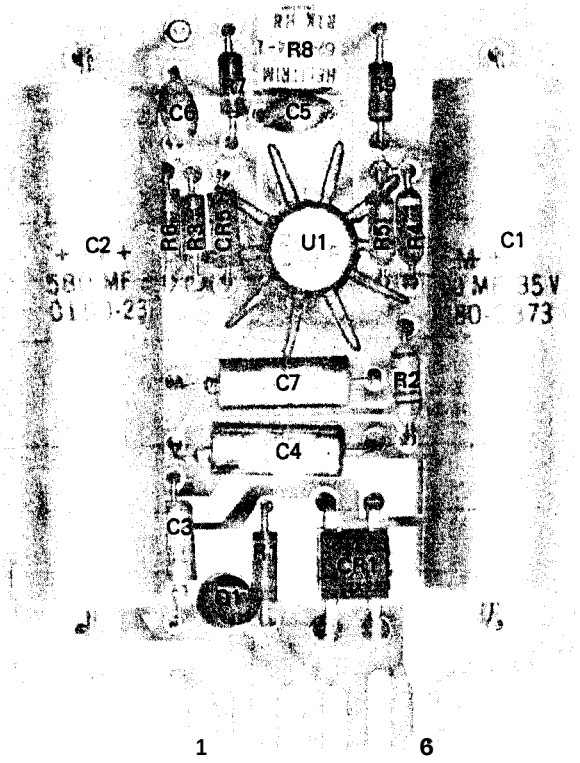
4. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUE SHOWN.

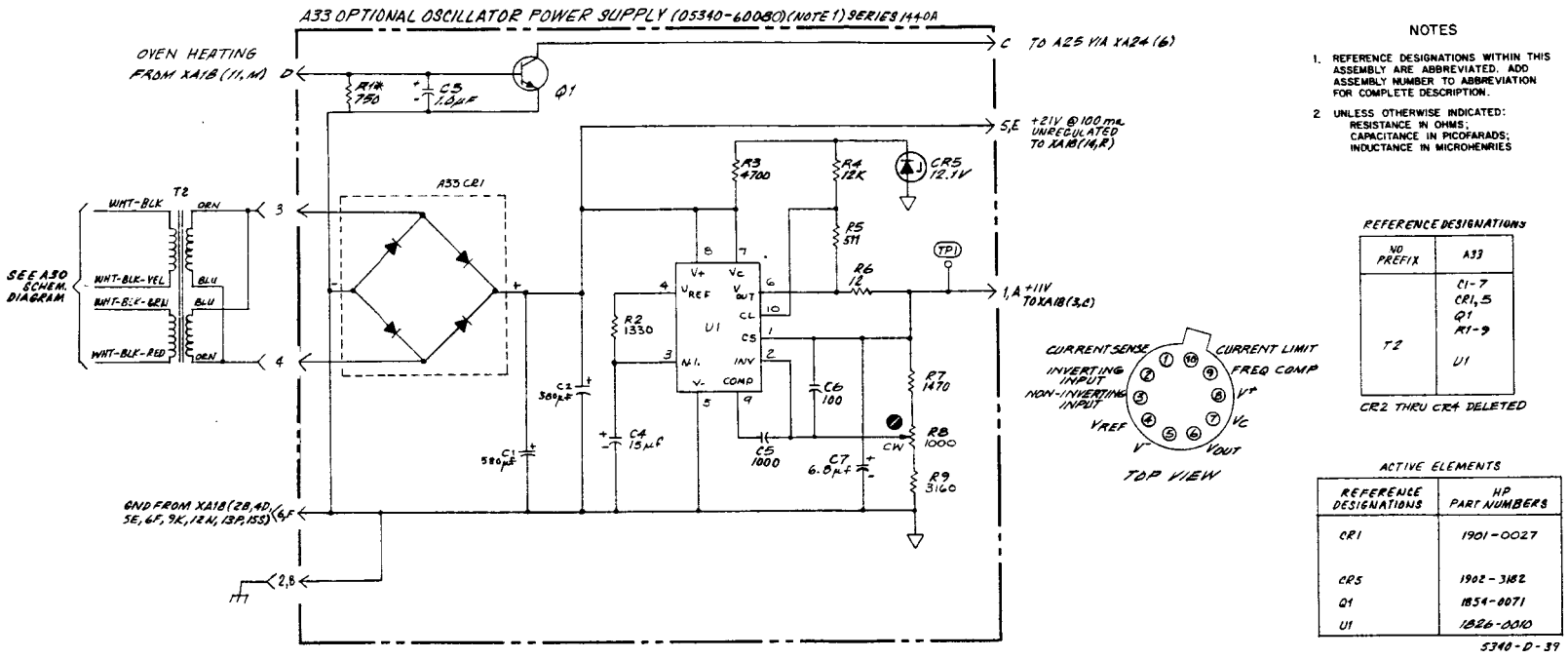
NO PREFIX	A30	A31	A32
B1	C1-6	C1-7	C1-10
C1	CR1-3	CR1	CR1-6
CR4	XA31,32	Q1-8	Q1-5
F1		R1-20	R1-18
J6		TP1-3	U1,2
Q1,2		U1,2	
S1,6			
T1			
TH1			

ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
NO PREFIX	
CR1	1906-0038
Q1	1854-0072
	2N3054
Q2	1854-0063
	2N3055
A30	
CR1,2,3	1906-0027
A31	
CR1	1902-3149
Q1,2	1854-0071
Q3	1853-0254
Q4,5,7	1853-0020
Q6	1853-0012
	2N2904A
Q8	1854-0039
	2N3053
U1,2	1826-0016
	LM204H
A32	
CR1,2,3,5	1901-0040
CR4	1902-3171
CR6	1902-3139
Q1	1853-0020
Q2	1854-0558
Q3	1853-0012
	2N2904A
Q4	1854-0071
Q5	1854-0300
U1,2	1826-0010

5340-D-27


R8
C6
C5
R6
R3
CR5
U1
R5
R4
C1
C2
C7
R2
C4
C3
CR1
R1
1
6
A
F



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES

REFERENCE DESIGNATIONS

NO PREFIX	A33
T2	C1-7 CR1, 5 Q1 R1-9 U1

CR2 THRU CR4 DELETED

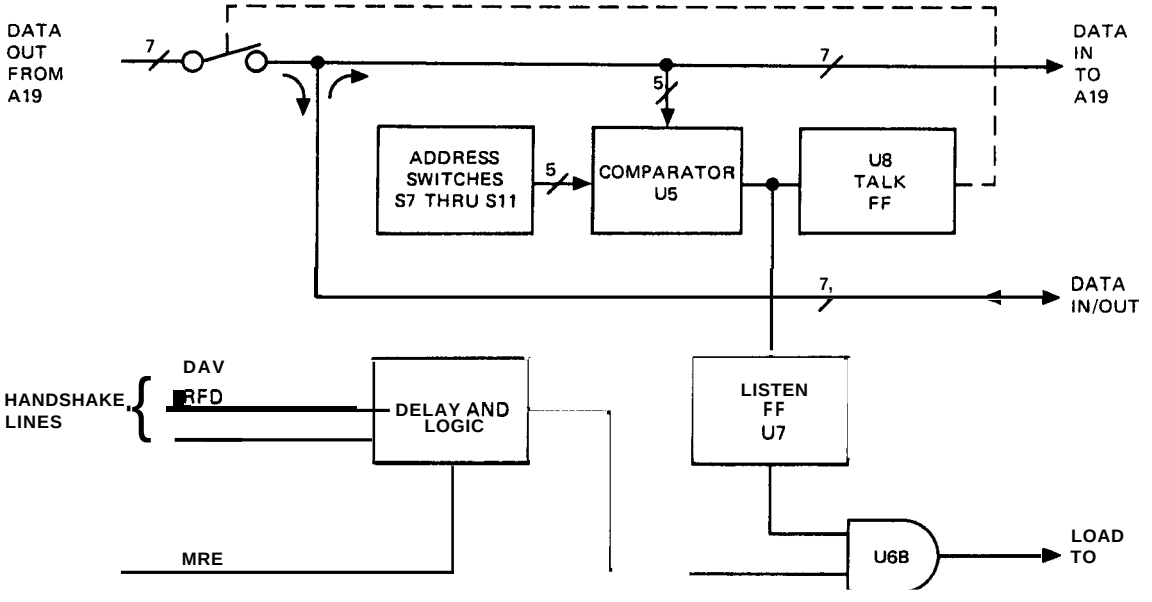
ACTIVE ELEMENTS

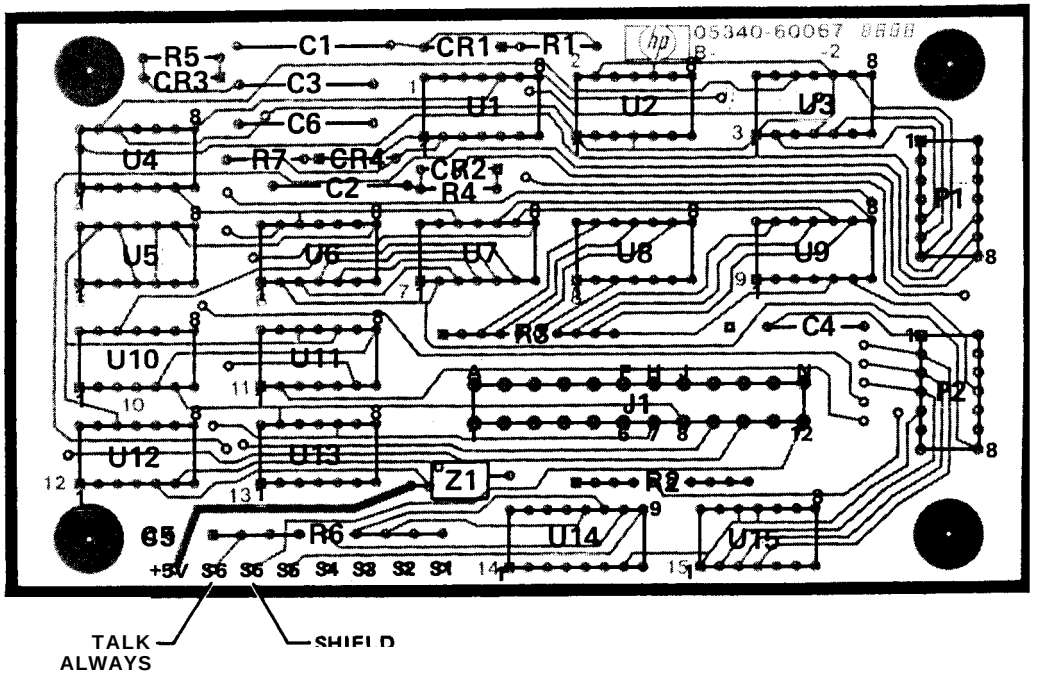
REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1	1901-0027
CR5	1902-3182
Q1	1854-0071
U1	1826-0010

5340-D-39

Figure 8-35. A33 Time Base Power Supply (Part f Option 001)

Part of Figure 8-36. A34 Bus Communicator Assembly, A35 Connector Assembly (Part of Option 011)





ACTIVE ELEMENTS

REFERENCE DESIGNATIONS	HP PART NUMBERS
CR1-4	1901-0040
U1, 13	1820-1056 SN74132
U2,3,10	1820-0621 SN7438N
U4,11	1820-0054 SN7400N
U5	1820-0588 DM74L20N
U6,7	1820-0065 SN7470N
U8, 9	1820-1053 SN7414N
U12	1820-0585 DM74L04N
U14	1820-0904 93L24
U15	1820-0589 DM74L30N

5340-0-37

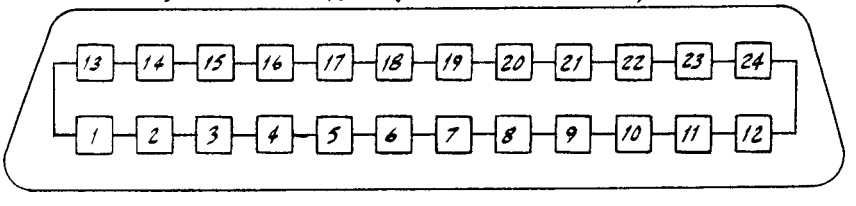
NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS
3. A34R2A, C, E, G, J, L, N, R EACH 3000 OHM
   A34R3A, C, E, G, J, L, N, R EACH 3000 OHM
   A34R2B, D, F, H, K, M, P, S EACH 6200 OHM
   A34R3B, D, F, H, K, M, P, S EACH 6200 OHM

REFERENCE DESIGNATIONS

A34	A35
C1-6 CR1-4	J1
R1-8	S1-6
U1-16	

A35J1 PIN LOCATIONS (REAR PANEL VIEW)



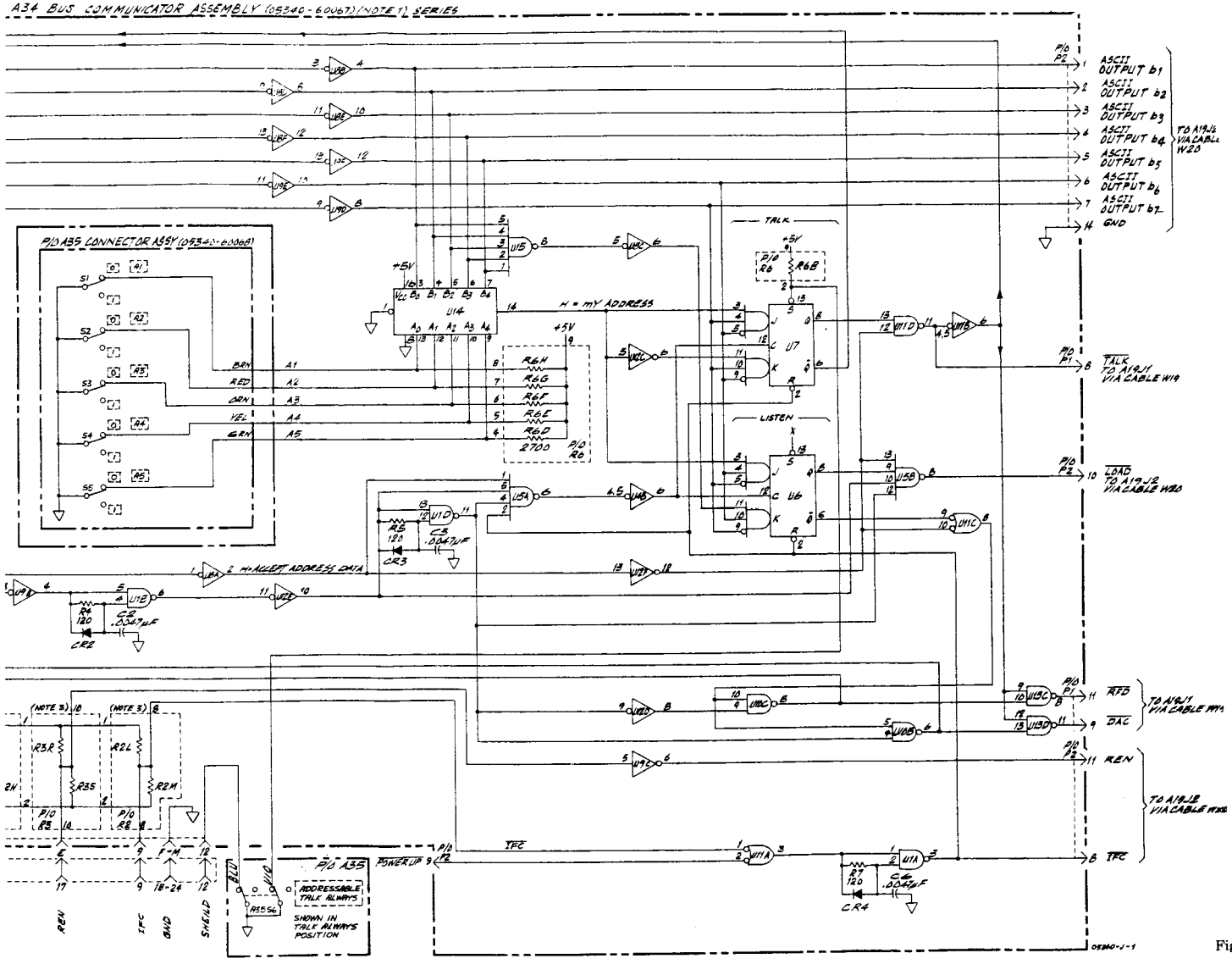


Figure 8-36. A34 Bus Communicator Assembly, A35 Connector Assembly (Part of Option 011)