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Errata

Title & Document Type: 8160A Programmable Pulse Generator Operation/Service Manual

Manual Part Number: 08160-90002

Revision Date: March 1979

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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HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

8160A PROGRAMMABLE PULSE GENERATOR

(Including Options 001, 020 and 907 to 910)

SERIAL NUMBERS

This manual applies directly to instruments with serial number 1804G00161 and higher. Any changes made in instruments having serial numbers higher than the above number will be found in a "Manual Changes" supplement supplied with this manual. Be sure to examine this supplement for any changes which apply to your instrument and record these changes in the manual. Backdating information for instruments with lower serial numbers can be found in Section 7 (yellow pages).

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FEDERAL REPUBLIC OF GERMANY

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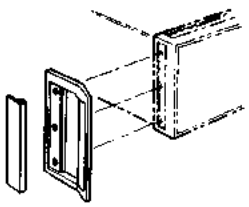
8160A



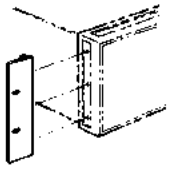
FUSE F1
8A/4A

POWER CORD

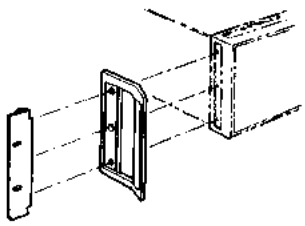
Figure 1–1. 8160A and Supplied Accessories (instrument shown with Option 020 fitted)



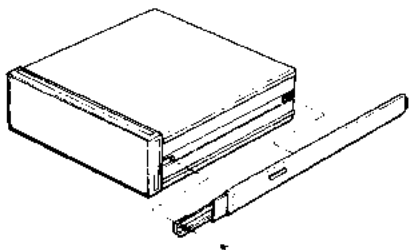
Front handle
Order Option 907
(H.P. Part No.
5061–0090)



Rack flange
Order Option 908
(H.P. Part No.
5061–0078)



Rack flange with front handle
Order Option 909
(H.P. Part No.
5061–0084)



Standard slide kit
(H.P. Part No. 1494–0017)
See also § 1–24

Figure 1–2. Available Rack Mounting Accessories

SECTION I
GENERAL INFORMATION

1–1 INTRODUCTION

1–2 This Operating Manual contains information required to install, operate and test the Hewlett-Packard Model 8160A. Figure 1–1 shows the mainframe and accessories supplied. This section covers instrument identification, description, accessories, specifications, and other basic information.

1–3 A Microfiche version of this manual is available on 4 x 6 inch microfilm transparencies (order number on title page). Each microfilm contains up to 60 photoduplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1–4 SPECIFICATIONS

1–5 Instrument specifications are listed in Table 1–2. These specifications are the performance standards or limits against which the instrument is tested.

1–6 SAFETY CONSIDERATIONS

1–7 The Model 8160A is a Safety Class 1 instrument (it has an exposed metal chassis that is directly connected to earth via the power supply cable).

1–8 Before operation, the instrument and manual, including the red safety page, should be reviewed for safety markings and instructions. These must then be followed to ensure safe operation and to maintain the instrument in a safe condition.

1–9 INSTRUMENTS COVERED BY MANUAL

1–10 Attached to the rear of this instrument is a serial number plate (Figure 1–3). The first four digits of the serial number only change when there is a significant change to the instrument. The last five digits are assigned to instruments sequentially. The contents of this manual apply directly to the instrument serial number quoted on the title page. For instruments with lower serial numbers, refer to the backdating information in Section VII of this manual. For instruments with higher serial numbers, refer to the Manual Change sheets at the end of this manual. In addition to change information, the Manual Change sheets may contain information for correcting errors in the manual. To keep this manual as up-to-date and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Change supplement. The supplement for this manual is identified with this manual's print date and part number, both of which appear on this manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.

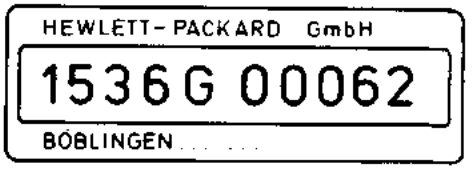


Figure 1–3. Serial Number Plate

1–11 DESCRIPTION

1–12 The 8160A is a programmable pulse generator with applications as a bench instrument or part of an automatic test system. It is available with one (standard) or two (option 020) independent channels and can be rack-mounted with input/output connectors on the rear panel if required.

1–13 All parameters are indicated by an alphanumeric display above the keyboard. This eliminates both the need for an oscilloscope to monitor the output and the associated problem of misreading a parameter. All front panel controls are pushbuttons, thus outputs can be very easily and quickly set up and repeatability problems disappear.

1–14 All operations within the 8160A are microprocessor-controlled which further simplifies operation whether performed from the front panel controls or programmed over the HP-IB*. The microprocessor also enables sophisticated error detection routines to detect and display any incompatible pulse settings.

1–15 The output frequency of the 8160A is 1 Hz to 50 MHz if the output amplifier is being used. All specifications are given in Table 1–2 at the end of this section.

1–16 8160A OPTIONS

1–17 **Option 020.** The standard 8160A has one channel. Option 020 provides a second channel with all parameters variable. Both channels are completely independent except for repetition rate and burst.

1–18 **Option 001** is a standard 8160A with the four BNC input/output connectors taken to the rear panel instead of the front panel. Blanking plugs are then fitted to the front panel. This option is most useful in system applications where the 8160A is rack mounted and all connections must be inside the rack.

1–19 **Options 907, 908, 909** provide handles and/or rack mounting flanges (see Figure 1–2).

1–20 **Option 910** provides an extra copy of the Operating and Service Manual.

1–21 All options will be delivered with the instrument if ordered at the same time as the instrument.

1–22 ACCESSORIES SUPPLIED

1–23 The 8160A is supplied complete with the following items (see figure 1–1).

ITEM	HP PART NUMBER
4A fuse for 230V operation	2110–0036
8A fuse for 115V operation	2110–0055
Power cable	see figure 2–2

1–24 ACCESSORIES AVAILABLE

1–25 Equipment slides are recommended when rack mounting the 8160A. Slide kits available are as follows:

ITEM	HP PART NUMBER
Standard slide kit – includes two slides for installation into HP rack enclosures (see figure 1–2).	1494–0017
Standard tilt slide kit – same as standard slide kit plus permits tilting instrument up or down 90°.	1494–0026
Slide adaptor bracket kit – brackets for adapting the standard slides above for use in non-HP rack system enclosures of adequate depth.	1494–0023

1–26 RECOMMENDED TEST EQUIPMENT

1–27 Equipment required to maintain the model 8160A is listed in Table 1–1. Alternative equipment can be substituted provided that it meets or exceeds the critical specifications listed in the table.

Table 1–1. Recommended Test Equipment

INSTRUMENT	RECOMMENDED MODEL	REQUIRED CHARACTERISTIC	USE *
Counter	HP 5345A	50μ Hz to 50 MHz, 8-digit display	P, A
DVM	HP 3455A	0.1–20V, ac sample, dc, 0.004% accuracy	P, A, T
Time marker		2ns to 10s	P, A
Time interval probes	HP 5363A	Dynamic range +9.99V to –9.99V	P, A
Sampling scope	HP 180C + 1810A	Dual channel, 10ps – 50μs/div.	P, A
Real-time scope	HP 1740A	100 MHz Bandwidth	A, T
Pulse generator	HP 8012B	1 Hz – 50 MHz, delay, pulse, ext. trigger	P, A
Logic analyzer	HP 1600A	16 bit	T
Logic probe	HP 545A	TTL, MOS	T
Logic probe	HP 10525E	ECL	T
System controller	HP 9825S + 98034A	Desktop computer, HP-IB interface	P, A
Cable assembly	11170C	50Ω, 122 cm (48 in.)	P, A
Cable assembly	11170B	50Ω, 61 cm (24 in.)	P, A
Cable assembly	11170A	50Ω, 12 cm (4.7 in.)	P, A
Power attenuator	NARDA 766–20	20dB, 20W	P, A
BNC-TEE	HP 1250–0781	1male, 2 female	P, A
Cable assembly (2)	HP 08160–61610	Cable-Output	A, T
BNC banana	HP 1250–2277	BNC(f) to dual banana plug	P, A
Adaptor	HP 1250–0082	type N male to BNC male	P, A
Adaptor	HP 1250–0240	type GR to type N female	P, A
20 dB attenuator	HP 8941A		P, A
Tee connector	HP 10221A	type GR	P, A
50Ω termination	HP 908A		P, A
Extender board (2)	HP 08160–66572	10 Pin special	T
Extender board	HP 08160–66573	40 Pin special	T
Extender board (2)	HP 5060–1785	15 Pin	T
Extender board	HP 5060–0630	22 Pin	T
Extender board	HP 5060–0049	15 Pin	T
50Ω feedthrough termination	HP 10100C	–	P, A, T

* P = Performance Test; A = Adjustments; T = Troubleshooting

Table 1–2. Specifications

Specifications are for 50 Ω source and load resistances unless stated otherwise.
Incompatible values prevented by microprocessor which monitors all pulse parameters. Refer to § 3–13 in Manual for further information.

TIMING

PERIOD (PER)
Range: 20.0 ns to 999 ms (see table 2).
Resolution: 3 digits (best case 100 ps).
Accuracy: 3% of progr. value ± 0.3 ns (PER < 100 ns).
2% of prog. value (PER ≥ 100 ns).
Max. Jitter: 0.1% of programmed value + 50 ps.

WIDTH (WID)
Range: 10.0 ns to 999 ms (see table 2).
Resolution: 3 digits (best case 100 ps).
Accuracy: 1% of programmed value ± 1 ns.
Max. Jitter: 0.1% + 50 ps (WID ≤ 999 ns).
0.05% (999 ns < WID ≤ 9.99 μs).
0.005% (WID > 9.99 μs).

DELAY (DEL)
Range: 0.00 ns to 999 ms (measured from 50% point of leading edge of trigger output to 50% point of 3 ns LEE).
Resolution: 3 digits (best case 100 ps).
Accuracy: 1% of progr. value ± 1 ns (see table 2).
Max. Jitter: 0.1% + 50 ps (DEL ≤ 999 ns).
0.05% (999 ns < DEL ≤ 9.99 μs).
0.005% (DEL > 9.99 μs).

DOUBLE PULSE (DBL)
Range: 20.0 ns to 999 ms. (Spacing between leading edges of double pulse).
Resolution: 3 digits (best case 100 ps).
Accuracy: 1% of programmed value ± 1 ns.
Max. Jitter: 0.1% + 50 ps (DBL ≤ 999 ns).
0.05% (999 ns < DBL ≤ 9.99 μs).
0.005% (DBL > 9.99 μs).

OUTPUT SIGNALS

OUTPUT LEVELS
High level (HIL) Range: −9.89 V to 9.99 V.
Low Level (LOL) Range: −9.99 V to 9.89 V.
Resolution: 3 digits (10 mV).
Amplitude: 0.10 V min, 9.99 V max. (increase with hi-z source or load, see table 1).
Accuracy: 1% of programmed value ± 50 mV ± 1% of ampl.
Settling Time: 40 ns to specified accuracy.
Note: In 2 channel instruments, the difference between highest upper level and lowest lower level may not exceed 20 V.

cont'd.

OUTPUT SIGNALS (cont'd)

TRANSITION TIMES (10 – 90% ampl.)
Leading Edge (LEE): 06.0 ns to 9.99 ms (see table 2).
Trailing Edge (TRE): 06.0 ns to 9.99 ms (see table 2).
Leading and trailing edge transition times are independently programmable within a common range. Ranges are overlapping as shown below:

06.0 ns – 99.9 ns	05.0 μs – 99.9 μs
050 ns – 999 ns	050 μs – 999 μs
0.50 μs – 9.99 μs	0.50 ms – 9.99 ms

Resolution: 3 digits (best case 100 ps).
Accuracy: 3% of progr. value ± 1 ns (see table 2).
Linearity: 3% for transition times longer than 30 ns.

PRESHOOT, OVERSHOOT, RINGING: 5% amp. ± 10 mV.
A ADD B: Adds Channel A and B outputs (option 020).
OUTPUT FORMAT: Normal or complement.
SOURCE IMPEDANCE: See table 1.

Table 1. Output Levels (8160A into 50 Ω)

OUTPUT MODE	Typical Z_s	HIL min / max	LOL min / max	HIL/LOL accuracy	AMPL. min / max
A SEP B 50 Ω	50 Ω 25 pF	−9.89 V / +9.99 V	−9.99 V / +9.89 V	1% ± 1% ampl ± 50 mV	100 mV / 9.99 V
A SEP B 1 kΩ	1 kΩ 25 pF	−9.7 V / +9.9 V	−9.9 V / +9.7 V	1% ± 1% ampl ± 100 mV	200 mV / 19.9 V
A ADD B 50 Ω	48 Ω 60 pF	−9.89 V / +9.99 V	−9.99 V / +9.89 V	2 (A SEP B, 50Ω) ± 5%	100 mV / 100 mV / 19.5 V
A ADD B 1 kΩ	500 Ω 60 pF	−19.7 V / +19.9 V	−19.9 V / +19.7 V	2 (A SEP B, 1 kΩ) ± 5%	200 mV / 20.0 V

Table 2: Output Modes/Timing (8160A into 50 Ω)

OUTPUT MODE	PER min	WID min	DEL accuracy	LEE/TRE min	LEE/TRE accuracy
A SEP B, 50 Ω	20 ns	10 ns	1% ± 1 ns	6.0 ns	3% ± 1 ns
A SEP B, 1 kΩ	25 ns	12.5 ns	1% ± 2.5 ns	8.0 ns	3% ± 2 ns
A ADD B, 50Ω	50 ns	25 ns	1% ± 5 ns	15 ns	3% ± 4 ns
A ADD B, 1 kΩ	50 ns	25 ns	1% ± 10 ns	15 ns	3% ± 4 ns

OPERATING MODES

NORM: Continuous pulse stream.
GATE: External Signal enables rate generator. First output pulse sync with leading edge. Last pulse always complete.
TRIG: Each input cycle generates a single output pulse.
BURST: Each input cycle generates a programmable number (0 to 9999) of pulses. Min time between bursts is 1 period.

cont'd

OPERATING MODES (cont'd)

MAN: Simulates ext signal when EXT INPUT switched OFF.
SINGLE PULSE: Provides a single pulse independent of input and period settings.

AUXILIARY INPUTS AND OUTPUTS

EXTERNAL INPUT
Trigger Level: +10 to −10 V.
Max. Input: ± 12 V in 50 Ω, ± 20 V in 10 kΩ.
Minimum Amplitude: 500 mVpp.
Slope: Positive or negative.
Min. Pulse Width: 3 ns.
Typical Input Resistance: 50 Ω or (also in OFF) 10 kΩ.
Delay from Trigger Input to Trigger Output: 90 ns ± 10 ns.

TRIGGER OUTPUT
Output Amplitude: ≥ 2.5 V into 50 Ω,
≥ 5 V into open circuit.
Typical Source Resistance: 50 Ω.
Typical Pulse Width: 8 ns (PER < 100 ns),
40 ns (100 ns < PER < 1 μs),
400 ns (PER ≥ 1 μs).

HP-IB CAPABILITY

Code	Interface Function
SH 1	Source Handshake Capability.
AH 1	Acceptor Handshake Capability.
T 6	Talker (basic talker, serial poll, unaddress to talk if addressed to listen).
L 4	Listener (basic listener, unaddress to listen if addressed to talk).
SR 1	Service Request Capability
RL 1	Remote/Local Capability (incl. Local Lockout to prevent interference with a running progr.)
PP 0	No Parallel Poll Capability.
DC 0	No Device Clear Capability.
DT 1	Device Trigger Capability (Trig, Burst modes).
C 0	No Controller Capability.

All modes and parameters can be programmed.
EXT SLOPE POS/NEG programming can simulate Gate mode.
TRIG LEVEL adjustment, 50 Ω/10 kΩ/OFF switch and vernier keys are not programmable.

PROGRAMMING TIMES (time for 8160A to receive, verify and execute message) typical
Period, Delay, Double Pulse Spacing, Width: 140 ms.
Transition Times: 110 ms.
Output Levels: 150 ms.
Burst, Input Modes: 100 ms (existing burst will be interrupted when programming new burst).
Output Modes: 200 ms.

LISTEN TIME (time for 8160A to receive and verify message) typical
Input Modes: 50 ms
Paramters: 140 ms cont'd

HP-IB CAPABILITY (cont'd)
Output Modes: 5 ms (EN/DISABLE, NORM/COMPL),
70 ms (A SEP/ADD B, 50 Ω/1 kΩ).
Device Trigger: 30 ms (EXT TRIG),
80 ms (BURST).

TALK TIME (time for 8160A to transmit a message) message)
Status: 1 byte (indicates nature of programming error), < 5 ms typical.
Learn: 11 lines (18 in option 020) up to 14 characters plus CRLF. 10 ms/line av.

MEMORY: 9 addressable locations plus one for existing operating state.
Capacity: 1 complete operating state per location.
Access Time: < 20 ms (store).
< 1.2 s (recall).

GENERAL

REPEATABILITY: 50% of specified accuracy.
POWER-OFF STORAGE: Batteries maintain all stored data for up to 2 weeks with instrument switched off. Hardwired addressable location contains a fixed operating state for confidence check (standard parameter set).
POWER: 115/230 V AC + 10%, −22%; 48–66 Hz; 675 VA max.
ENVIRONMENTAL
Temperature Range: 15 – 35°C as specified.
Accuracy Derating Factors for Temp: 0 – 15°C or 35 – 50°C:
Delay, Width, Double Pulse: 0.07%/°C, typical.
Period, High Level, Low Level: 0.14%/°C, typical.
Leading Edge, Trailing Edge: 0.21%/°C, typical.
WEIGHT: Net 20.8 kg (46 lbs), Shipping 25 kg (55 lbs).
DIMENSIONS: 178 mm high, 426 mm wide, 430 mm deep (7 x 16.8 x 17 in).

OPTIONS

001	Rear Panel Input and Outputs
020	Second Channel. Includes delay, width, double pulse, transition times, and output amplifier
907	Front Handle Kit (Part No. 5061-0090)
908	Rack Flange Kit (Part No. 5061-0078)
909	Rack Flange and Front Handle Combination Kit (Part No. 5061-0084)
910	Additional Operating and Service Manual (Part No. 08160–90002)

Specifications describe the instrument's warranted performance. Supplemental characteristics – identified by the word "typical" – are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters.

SECTION II
INSTALLATION

WARNING

This instrument weighs 20.7 kg (45.5 lbs). Care must be exercised when lifting to avoid personal injury. Equipment slides are recommended when rack mounting (see paragraph 1–24).

2–1 INTRODUCTION

2–2 This section provides installation instructions for the instrument and its accessories. It also includes information about initial inspection and damage claims, preparation for use, and packaging, storage and shipment.

2–3 INITIAL INSPECTION

2–4 Inspect the shipping container for damage. If the container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1–1 plus any accessories that where ordered with the instrument. Procedures for checking the electrical operation are given in Section 4. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the operator's checks, notify the nearest Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for settlement.

2–5 PREPARATION FOR USE

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, meters).

2–6 Power Requirements

2–7 The instrument requires a power source of 115V, or 230V (+10%, −22%) at a frequency of 48 to 66 Hz single phase. The maximum power consumption is 675VA.

2–8 Line Voltage Selection

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT make sure that the instrument is set to the local line voltage.

2–9 Figure 2–1 provides information for line voltage and fuse selection:



VOLTAGE:	230V	115V
FUSE:	4A	8A

Figure 2–1. Switch Settings for the various Normal Power line Voltages

2–10 Power Cable

WARNING

To avoid the possibility of injury or death, the following precautions must be followed before the instrument is switched on:

a. If this instrument is to be energized via an autotransformer for voltage reduction, make sure that the common terminal is connected to the grounded pole of the power source.

b. The power cable plug shall only be inserted into a socket outlet provided with a protective ground contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

c. Before switching on the instrument, the protective ground terminal of the instrument must be connected to a protective conductor of the power cable. This is verified by checking that the resistance between the instrument chassis and the front panel and the ground pin of the power cable plug is zero ohms.

2–11 In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable shipped with each instrument depends on the country of destination. Refer to Figure 2–2 for the part number of the power cords available.

2–12 The following work should be carried by a qualified electrician and all local electrical codes must be observed. If the plug on the cable supplied does not fit your power outlet, or if the cable is to be attached to a terminal block, then cut the cable at the plug end and re-wire it. The colour coding used in the cable will depend on the cable supplied (see figure 2–2). If a new plug is to be connected, the plug should meet local safety requirements and include the following features:

adequate load-carrying capacity (see table of specifications in section 1)

ground connection

cable clamp

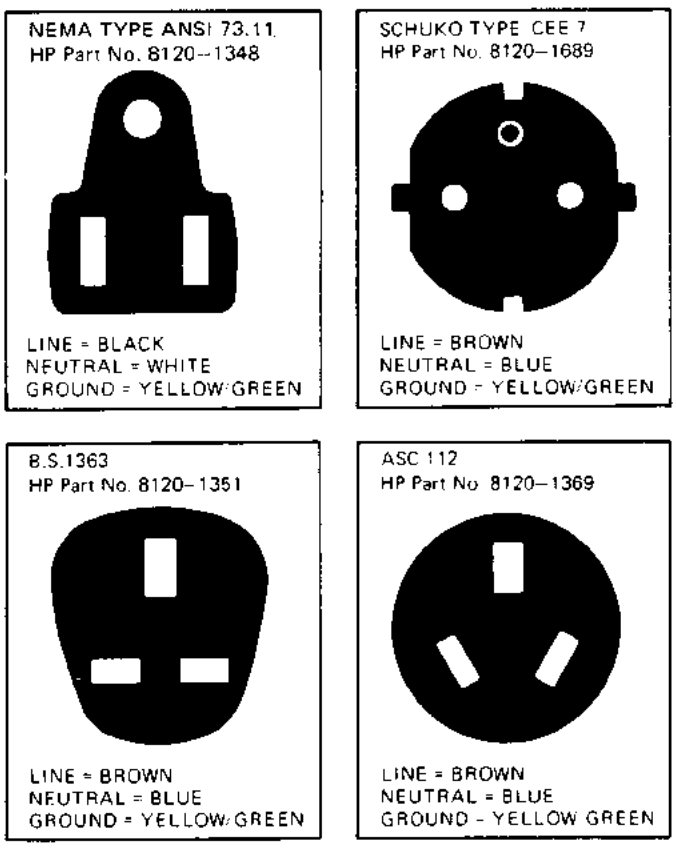


Figure 2–2. Power Cables Available: Plug Identification

2–13 HP-IB Connector

2–14 The rear panel HP-IB connector (Figure 2–3) is compatible with the connectors on Cable Assemblies 10631A, B, C and D. If a cable is to be locally-manufactured, use connector male, HP part number 1251–0293.

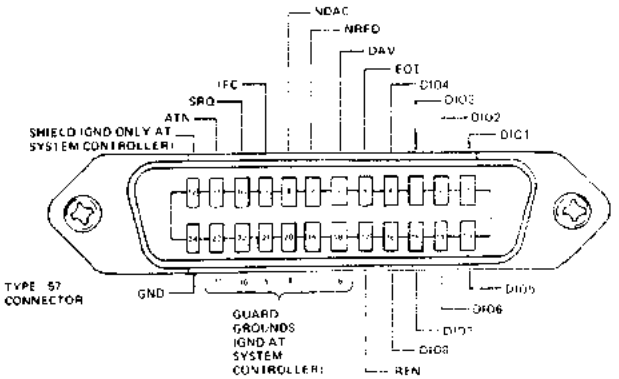


Figure 2–3. HP-IB Connector

2–15 HP-IB Logic Levels

2–16 The 8160A HP-IB lines use standard TTL logic. Logic levels are as follows:

True = low = digital ground or 0V dc to +0.4V dc.
False = high = open or +2.5V dc to +5V dc.

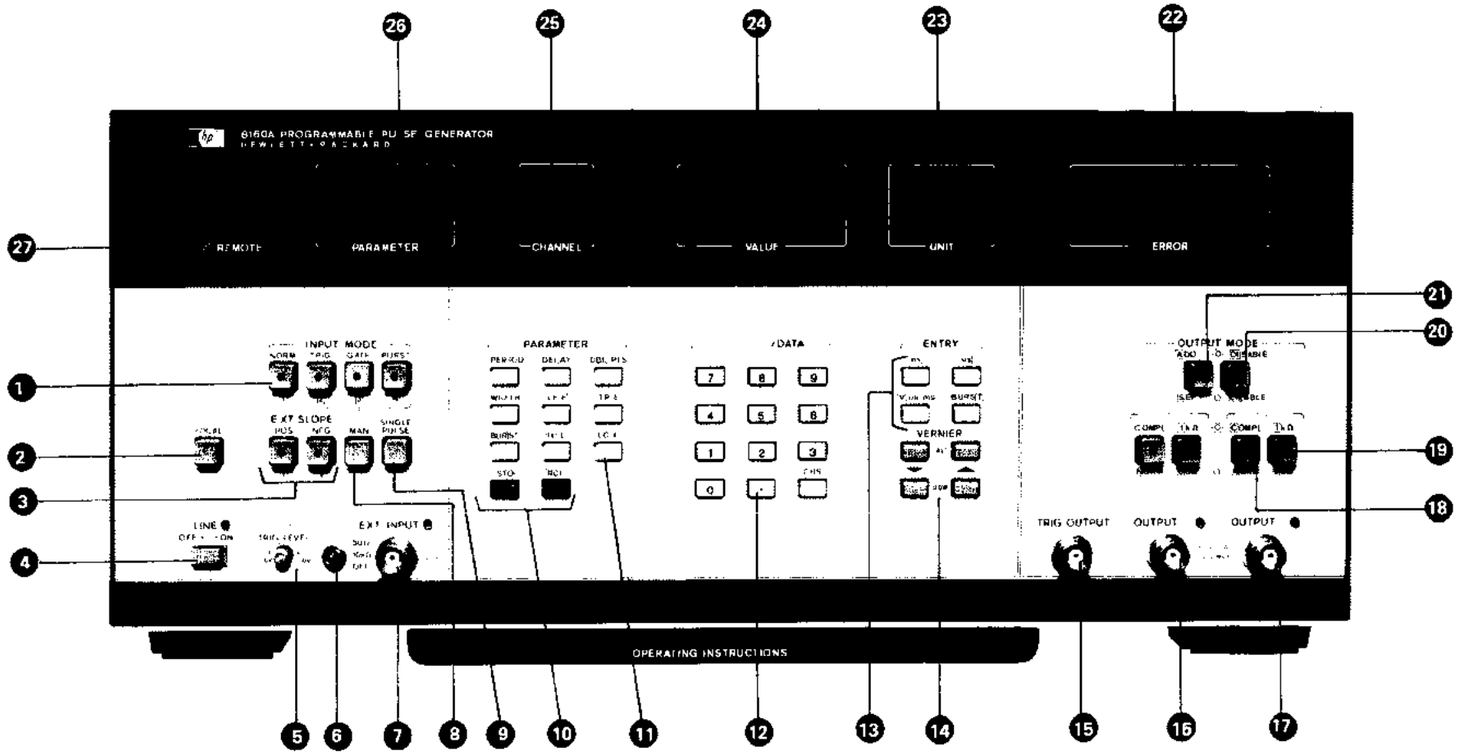
All HP-IB lines have LOW assertion ("1") states. High states are held at +3V dc by pullups within the instrument. When a line functions as an input, approximately 3.2mA of current is required to pull it low through a closure to digital ground. When a line functions as an output, it will sink up to 48mA in the low state and approximately 0.6mA in the high state.

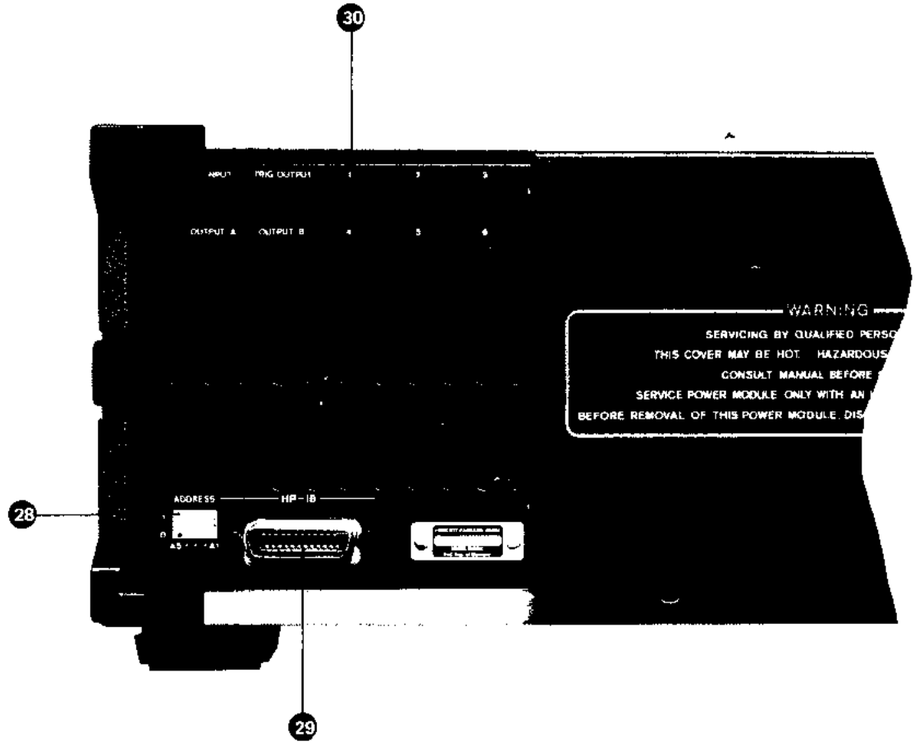
2–17 Operating Environment

2–18 The operating temperature limits for this instrument are 0°C to 50°C. However, the accuracy and repeatability specs only apply from 15°C to 35°C. Outside this range the accuracy and repeatability specs should be doubled.

2–19 FRONT HANDLE/RACK MOUNTING

2–20 Figure 1–2 and paragraph 1–24 give the possible handle/rack mounting configurations. If handles are fitted and subsequently need to be removed, the plastic trim must first be taken off as shown in Figure 2–4.





1 Pushbutton selectors with built-in indicators that light when the input mode is selected. Modes are as follows:

NORM — rate generator free-running

TRIG — a trigger signal, either external or via the MAN pushbutton, initiates one output pulse.

GATE — a gate signal, either external or via the MAN pushbutton, generates an output for as long as the gate is present.

BURST — a burst trigger, either external or via the MAN pushbutton, initiates one pulse burst.

2 RESET TO LOCAL is used when operating the 8160A via the HP-IB to reset the 8160A to local (front panel) control.

3 The POS and NEG EXT SLOPE selector pushbuttons determine whether the 8160A triggers on the positive-going or negative-going slope of the external input signal. Built-in indicators light for the selected slope.

4 LINE power on/off pushbutton with indicator lamp.

5 TRIG LEVEL enables the external input trigger level to be adjusted from +10 V to −10 V.

6 50 Ω/10KΩ /OFF switch matches the external input to 50 Ω or 10KΩ input impedance, or switches the external input off. An indicator shows when an external input signal is triggering the 8160A.

7 BNC connector for external input signals.

8 MAN pushbutton produces a trigger pulse each time it is pressed in TRIG, GATE or BURST modes.

9 SINGLE PULSE pushbutton initiates one output pulse each time it is pressed.

10 STO and RCL enable complete operating sets to be stored or recalled as required. Up to 9 sets can be stored/recalled by pressing STO or RCL followed by the appropriate digit 1–9. RCL0 sets up a standard pulse output.

11 12 13 PARAMETER, CHANNEL/DATA and ENTRY keys are used sequentially to change operating parameters. Changing pulse period or burst is a 3-step operation (parameter, (data, entry). Changing all other parameters is a 3-step operation (parameter, data, entry) for the standard 8160A, and a 4-step operation (parameter, channel, data, entry) when option 020 is fitted.

14 VERNIER keys enable all parameters to be varied.

15 BNC connector providing TRIG OUTPUT signal.

16 17 BNC connectors providing OUTPUT A & B signals. Indicators show when outputs are enabled.

18 COMPL/NORM pushbutton selects normal or complement format for outputs A and B. A built-in indicator lights for complement.

19 1K Ω /50 Ω pushbutton selects 1KΩ or 50 Ω output impedance for outputs A and B. A built-in indicator lights for 1K Ω .

20 DISABLE/ENABLE pushbutton disables/enables outputs. A built-in indicator lights when outputs are disabled.

21 A ADD B / A SEP B pushbutton adds outputs A and B in A ADD B mode. The combined outputs appear at output A. A built-in indicator lights when the outputs are added.

22 ERROR field indicates PARAM, TIMING, SLOPE and LEVEL errors.

23 UNIT field indicates the unit in which the currently displayed parameter is measured.

24 VALUE field indicates the numerical value of the currently displayed parameter.

25 CHANNEL indicates the channel whose parameters are currently being displayed.

26 PARAMETER indicates which parameter is currently being displayed.

27 REMOTE indicator shows when the 8160A is under the control of a system controller via the HP-IB.

28 HP-IB device address switch (5 bits, A 1 to A 5).

29 HP-IB connector.

30 INPUT/OUTPUT connectors mounted here (instead of front panel) with option 001.

Figure 3–1. 8160A Controls, Connectors and Indicators (instrument shown with option 020 fitted)

3–13 Error Indication

3–14 It is possible that while experimenting with different parameter settings you will get an error indication in the ERROR field. The error can be one of four types: PARAM, TIMING, SLOPE or LEVEL and means that you have attempted an invalid operation. For example you may have a TIMING error because you attempted to set a pulse width greater than the pulse period, or you may have a SLOPE error because you tried to set up a leading edge/trailing edge transition time ratio of greater than 20:1. The invalid setting will be accepted but will not be entered to the output until all error conditions have been removed. If you wish to start with an error-free parameter set, you can recall the standard parameter set by pressing keys RCL and 0 (see paragraph 3–46). To remove the error condition simply re-enter the parameter correctly.

3–15 In some instances the reason for the error indication may not be immediately apparent. This is particularly true when double pulse is active. To aid the user identify the error source in such cases, the following formulae, together with figure 3–3, are provided. These formulae are employed by the microprocessor to determine when an error indication is necessary.

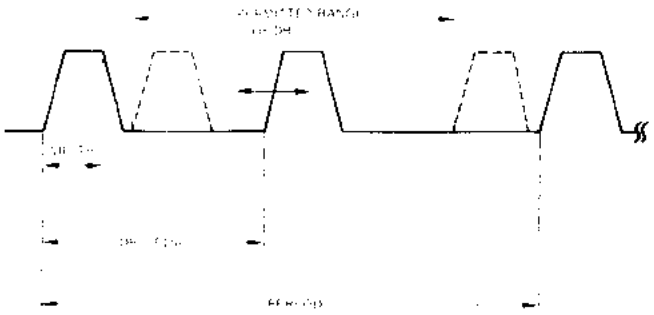


Figure 3–3. Double Pulse Limits

3–16 As can be seen from figure 3–3, there is a permitted 'time-zone' in which DBL may be programmed. Due to internal 8160A circuits, the minimum/maximum limits of this 'zone' vary according to three formulae, depending on the relative values of DBL, WID and PER. The 3 possibilities are:

1) DBL < 50 ns in which case the following formula applies:

$$\frac{WID + 9\text{ ns}}{0.96} \leqslant 0.94 \times PER - (WID + 9\text{ ns})$$

2) DBL ⩾ 50 ns and WID < 50 ns, in which case the following formula applies:

$$\frac{WID + 9\text{ ns}}{0.96} \leqslant DBL \leqslant \left.\begin{array}{l} 0.94 \times PER - (WID + 9\text{ ns}) \\ \text{or} \\ 0.94 \times PER - 31\text{ ns} \end{array}\right\}^{*}$$

* of these 2 formulae, the one which provides the smaller value for the prevailing parameters is decisive.

3) DBL ⩾ 50 ns and WID ⩾ 50 ns, in which case the following formula applies:

$$\frac{WID + 31\text{ ns}}{0.96} \leqslant DBL \leqslant 0.94 \times PER - (WID + 31\text{ ns})$$

Whenever an error indication occurs in double pulse mode, the user should observe his programmed values for DBL and WID to see which of the above formulae apply.

3–17 There are combinations of pulse parameters for which the 8160A will indicate SLOPE error, but will nevertheless accept and enter the parameters to the output. This occurs when the leading edge (LEE) or trailing edge (TRE) is increased to the point where it is incompatible with other parameters e.g. LEE programmed greater than width (WID). (NOTE: This error is 'allowed' only so long as the values for LEE and TRE are within the maximum 20:1 ratio). Using this operation feature, triangular waveforms, as well as complex waveforms in double pulse mode, can be generated.

3–18 As with DBL programming, the microprocessor employs certain formulae to determine when this allowable SLOPE error indication should be given. An explanation of these formulae, together with illustrative aids, is given in the following paragraphs.

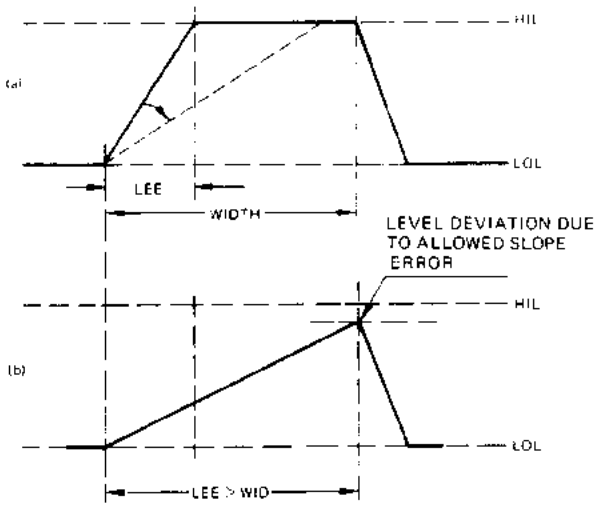


Figure 3–4. Leading Edge/Width (Delay active)

3–19 Figure 3–4 (a and b) illustrates the case when the leading edge is increased to the point where it is equal to or greater than the programmed width (WID) value. SLOPE error indication is given when:

$$LEE > \frac{WID}{1.4} - 1 \text{ ns (this formula applies for either DEL or DBL active)}$$

As can be seen from Figure 3–4 (b), as LEE is increased beyond the WID value, the actual high level at the 8160A output, no longer corresponds to the programmed high level (HIL).

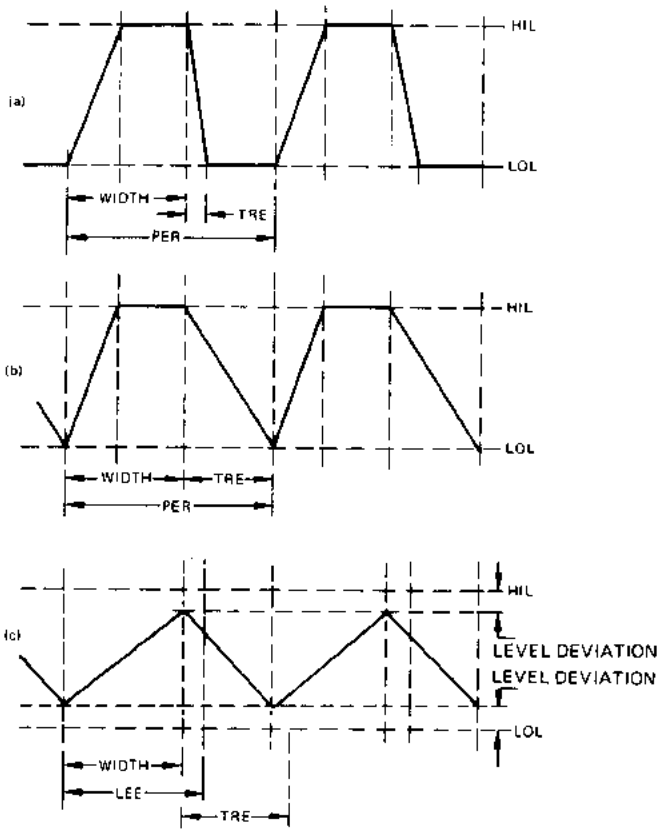


Figure 3–5. Trailing Edge/Period/Width (Delay Active)

3–20 Figure 3–5 (a and b) illustrates the case when DEL is active and the trailing edge (TRE) is increased to the point where the sum of width and trailing edge times is equal to or greater than the period (PER). SLOPE error indication is given when:

$$TRE > \frac{(0.94 \times PER) - WID}{1.4} - 1.5 \text{ ns}$$

Should the sum of trailing edge and width times be greater than the period, the actual low level at the output no longer corresponds to the programmed LOL value. Figure 3–5 (c) illustrates the possible output waveform for a combined leading edge and trailing edge SLOPE error.

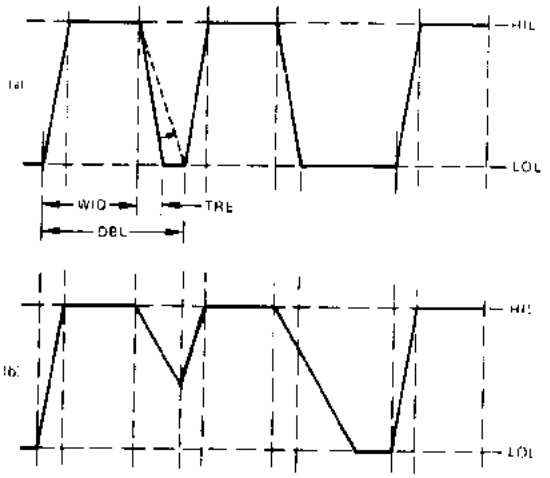


Figure 3–6. Trailing Edge/Double Pulse/Width

3–21 Figure 3–6 (a and b) illustrates the case when DBL is active and the trailing edge (TRE) is increased to the point where the sum of width (WID) and trailing edge (TRE) times is equal to or greater than the programmed DBL time. SLOPE error indication is given when:

$$TRE > \frac{(0.96 \times DBL) - WID}{1.4} - 1.5 \text{ ns}$$

Should the sum of width and trailing edge times exceed the period, then the actual low level within the pulse-pairs no longer corresponds to the programmed LOL value (see Figure 3–6 (b).

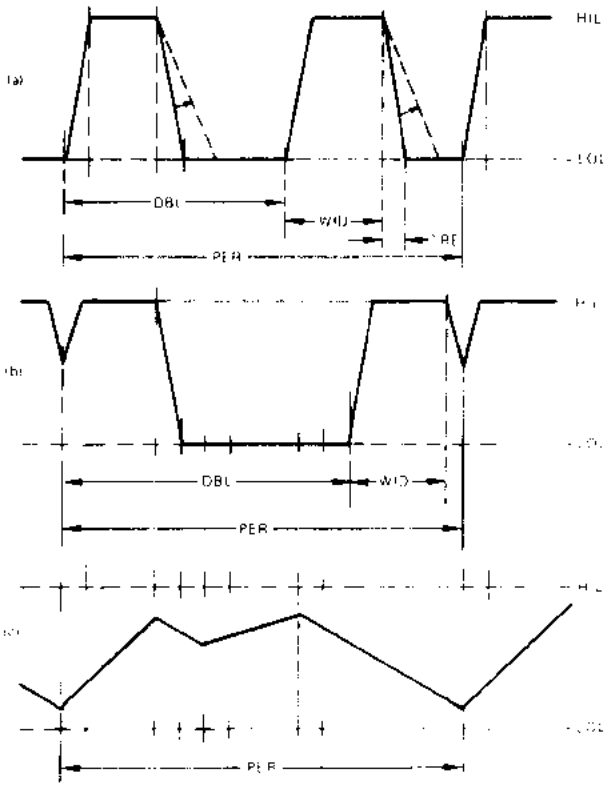


Figure 3–7. Trailing Edge/Double Pulse/Width/Period

3–22 Figure 3–7 (a and b) illustrates the case when DBL is active and the trailing edge (TRE) is increased to the point where the sum of the trailing edge (TRE), width (WID) and double pulse (DBL) times is equal to or greater than the programmed period (PER). SLOPE error indication is given when:

$$TRE > \frac{(0.94 \times PER) - (DBL+WID)}{1.4} - 1.5\,ns$$

Should the sum of trailing edge (TRE), width (WID) and double pulse (DBL) times exceed the period, then the actual low level **between consecutive pulse-pairs** no longer corresponds to the programmed LOL value (see Figure 3–7 (b)). Figure 3–7 (c) illustrates a double pulse waveform modified by all the allowable slope errors just described.

3–23 NORM Input Mode

3–24 The pushbuttons in the left hand section of the front panel determine the gate/trigger to which the 8160A output is synchronized. One of the four pushbuttons NORM, TRIG, GATE or BURST will be lit to indicate the current input mode. The mode you require initially is NORM so if the 8160A is not already in this mode, press NORM (see paragraph 3–57 for the other input modes). This means that the internal rate generator is free-running and provides the rate stimulus for the output (figure 3–8 shows example).

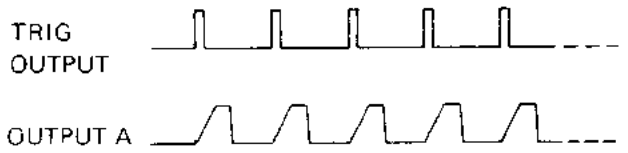


Figure 3–8. Normal Mode

3–25 Parameters

3–26 The keyboard in the centre section of the front panel is used to enter all pulse parameters. You press one of the nine grey PARAMETER keys on the left-hand side first to determine which parameter to set-up:

PERIOD	DELAY	DBL PLS (double pulse)
WIDTH	LEE (pulse leading edge)	TRE (pulse trailing edge)
BURST	HIL (pulse high level)	LOL (pulse low level)

3–27 Start by pressing PERIOD. The display will now show PER (blinking) in the PARAMETER field; nothing in the CHANNEL field; the current period value in the VALUE field; and the current time unit in the UNIT field. The parameter field blinks until the new period value and unit have been entered and accepted.

3–28 You can now enter the new period data in the centre section of 12 grey CHANNEL/DATA keys, e.g. 732. This value will appear in the display VALUE field.

3–29 Now complete the parameter by assigning a unit from the right-hand section of four grey ENTRY keys e.g. ms. This unit will appear in the display UNIT field and the PARAMETER field will stop blinking to indicate that the new parameter has been accepted as valid.

3–30 Thus setting up a new period parameter was a three-step operation; parameter, data, entry. The same applies for changes to the burst parameter e.g. enter PARAMETER key – BURST, DATA keys – 99, ENTRY key – BURST. However, because all other parameters are independently variable for each channel, should option 020 be fitted, parameter changing becomes a four-step operation; parameter, **channel**, data, entry. (For standard 8160A, only 3 steps are required for any parameter change).

3–31 As an example press PARAMETER key – WIDTH, CHANNEL/DATA key – A, CHANNEL/DATA keys – 126, and ENTRY key – ms. You have now set the pulse width of channel A to 126 ms. You can change parameters DELAY, DBL, PLS, LEE, TRE, HIL and LOL in the same way.

3–32 If you want to check any parameter, simply press the required PARAMETER and, where appropriate, CHANNEL keys and the value will be displayed.

3–33 Delay/Double Pulse Parameters

3–34 The 8160A can operate with either delay active (variable delay time between trigger and output pulse) or double pulse active (a second pulse following every output pulse with variable delay between the two) but not both. There is, therefore, a facility built in to the instrument that tells you which of the two is currently selected. If you press PARAMETER key – DELAY and the PARAMETER field of the display shows DEL^{+}, the $^{+}$ tells you that delay is not active (double pulse is selected). If you wish to select pulse delay, you simply enter the delay parameter as already described and the $^{+}$ will disappear indicating that delay is now active and not double

pulse. If you now press PARAMETER key – DBL PLS, DBL$^+$ will appear in the display.

3–35 Vernier Keys

3–36 A set of four VERNIER keys acts as a common vernier for all parameters.

3–37 Press PARAMETER key – WIDTH, CHANNEL/DATA key – A and then VERNIER key SLOW ▼ If you press and release the key, the channel A pulse width will decrement by one step in the last digit. If you hold the key down, after about one second the pulse width will start to decrement continuously. If you press and release FAST ▼ the pulse width will decrement by one step in the next-to-last digit. If you hold the key down, after about one second the pulse width will start to decrement continuously in large steps. The same applies for SLOW and FAST ▲ except that the chosen parameter increments rather than decrements.

3–38 The vernier is active for whichever parameter is currently displayed without having to press the PARAMETER key first, except:

a) after switch-on, store and recall.

b) when using the vernier with delay or double pulse parameters, the required parameter must first be made active by entering the unit (see paragraph 3–33) before the vernier can be used.

3–39 If you attempt to generate an incompatible setting while using the vernier keys, in all cases except one the parameter will stop at its valid limit. The one exception is when you exceed the leading/trailing edge transition time max. ratio of 20:1. The 8160A slope generator is designed in 6 overlapping ranges (see Figure 3–9).

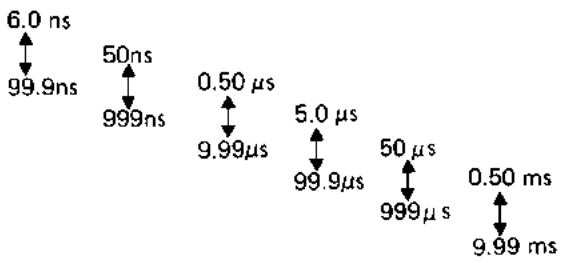


Figure 3–9. Slope Generator Ranges

3–40 Provided that both transition times are within the same 20:1 range, they are independently adjustable. If, however, one pulse edge is adjusted into the next range using the vernier, the other edge steps to within the limit of the same range.

3–41 As an example, suppose that you have set up a pulse leading edge of 50 ns and you increase the trailing edge time above 999 ns. The trailing edge vernier will continue to increment without showing an error, but the leading edge time will jump by a factor of 10, i.e. to 500 ns. Thus both edges are now in the third range. Note, however, that if you now decrement the trailing edge using the vernier, the leading edge will not jump back to 50 ns until the trailing edge is reduced below 500 ns.

3–42 Store and Recall

3–43 Using the STO (store) and RCL (recall) keys in conjunction with data keys 1–9 it is possible to store parameter sets for 9 output waveforms, and then to recall any of then as the current output.Note that the store function is not possible while an error condition exists or while the keyboard is active.

3–44 Set up a pulse output as previously explained then press STO and data key 1. Now change the parameters of the pulse and press STO 2.

3–45 If you now press RCL 1, the first set of parameters will be recalled. Press RCL 2 and the second set of parameters will be recalled. Up to 9 sets can be stored using STO 1–9 and recalled using RCL 1–9.

3–46 Standard Parameter Set

3–47 In addition to the storage locations for user waveforms there is an extra storage location that contains a standard parameter set. This parameter set can be recalled as the current output by pressing RCL followed by data key 0 (note that you can't store any other parameter in this location). The parameters of the standard pulse are as follows:

	CH A	CH B
Input mode	← NORM →	
Slope	← POS →	
Period	← 1 µs →	
Burst	← 10 bt →	
Delay (active)	100 ns	0 ns
Width	100 ns	8 ns
Double pulse (not active)	200 ns	18 ns
Leading edge	10 ns	4 ns
Trailing edge	10 ns	4 ns
High level	1.0 V	+ 0.1 V
Low level	0 V	– 0.1 V
Output	A SEP B	
50 Ω output	A5	B5
Normal output	AN	BN

3–48 The standard parameter set is automatically recalled at switch-on if the 8160A has been switched off for an extended period and the memory contents are no longer valid. The display shows the period of 1.00 µs together with PARAM in the ERROR field to inform you that the other memory locations contain random data. This feature prevents pulses with random parameters from being output.

3–49 The standard parameter set can also be recalled as a simple operator check that the instrument is working correctly.

3–50 Output Modes

3–51 Output modes for channels A and B are controlled by six pushbuttons on the right-hand side of the front panel. If the 8160A only contains channel A, the controls for channel B are still fitted but are ineffective.

3–52 A ADD B / A SEP B pushbutton adds together the channel A and channel B signals and outputs them at OUTPUT A when the pushbutton is lit; channel B is disabled and the OUTPUT B lamp is unlit. In the A SEP B mode, the two channels are output separately.

3–53 The DISABLE/ENABLE pushbutton disables both outputs when lit (OUTPUT A and OUTPUT B lamps are unlit).

3–54 CHANNEL A COMPL/NORM pushbutton complements OUTPUT A when lit.

3–55 CHANNEL A 1 kΩ / 50 Ω pushbutton sets the source impedance of OUTPUT A to 1 kΩ when lit. Note that, unlike conventional pulse generators, when the 8160A source impedance is changed from 50 Ω to 1 kΩ the high and low pulse output levels do not change (due to microprocessor control).

3–56 CHANNEL B COMPL/NORM and 1 kΩ / 50 Ω pushbuttons perform for channel B the same functions as described for channel A above.

3–57 TRIG/GATE/BURST Input Modes

3–58 An oscilloscope is necessary to check the operating of the TRIG (trigger), GATE and BURST input modes. In all three modes you can generate the trigger/gate signal using an external signal applied to the EXT INPUT connector, or using the MAN (manual) pushbutton, or via the HP-IB using a program instruction.

3–59 If you have an external input to generate the trigger/gate signal, you can adjust the triggering threshold of the external input from −10 V to +10 V using a trimpot on the front panel. You can also match the trigger source impedance to the external input using the 50 Ω / 1 kΩ switch. Set the switch to OFF if you are not using the external input, or using the MAN pushbutton.

3–60 An LED next to the external input lights whenever a trigger/gate signal (generated externally, manually or via HP-IB) occurs to inform you that a signal is present and is triggering/gating the 8160A.

3–61 Trigger Mode

3–62 In this mode the trigger signal initiates one complete output cycle (figure 3–10). The delay, width, transition times and output levels of the signal are determined by the 8160A settings.

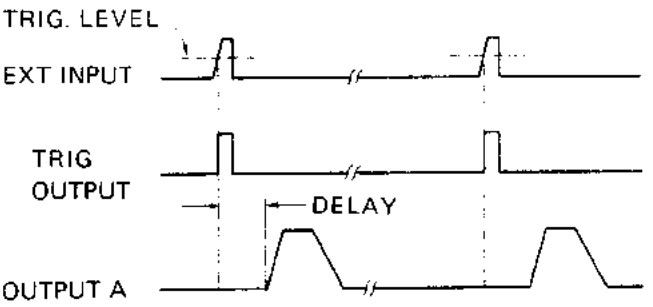


Figure 3–10. Trigger Mode

3–63 Gate Mode

3–64 In this mode the leading edge of the gate signal enables the rate generator synchronously and the gate trailing edge disables the rate generator. The first and last output pulses are always complete (figure 3–11).

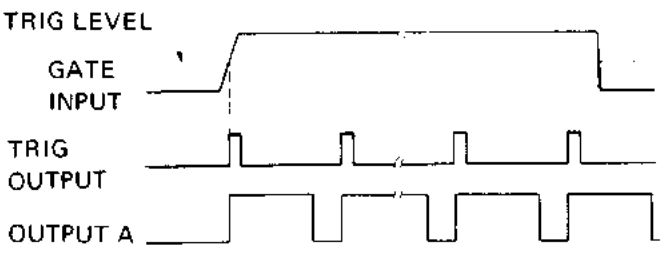


Figure 3–11. Gate Mode

3–65 Burst Mode

3–66 In burst mode a preset number of output pulses is generated with each trigger signal (figure 3–12). The burst length can be set between 1 and 9999 pulses either from the front panel or via the HP-IB. When operating from the front panel the burst length is set up as follows:

press PARAMETER key – BURST

press the required DATA keys to enter the burst length. The number will appear on the display.

press the ENTRY key – BURST.

The 8160A is now in burst mode with the burst length set. You can now trigger the burst as already described.

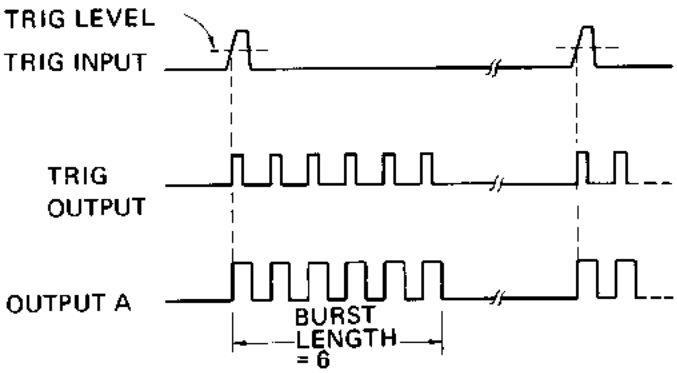


Figure 3–12. Burst Mode

3–67 PROGRAMMING INSTRUCTIONS

3–68 The 8160A operates on the HP-IB as follows:

listens to messages from the HP-IB system controller by means of which all 8160A operating parameters and modes can be programmed; access time (the time between program command and the implementation at the 8160A output) is 20 ms,

talks; provides error messages and reports operating or stored parameters.

3–69 The bus lines are as follows (all use negative logic):

8-bit data bus (lines DIO 1 to 8),

handshake lines – DAV (data valid), NRFD (not ready for data), NDAC (data not accepted),

control lines – IFC (interface clear), ATN (attention), SRQ (service request), REN (remote enable), EOI (end or identify).

The 8160A uses all lines except EOI. Terminations, logic levels and pinouts are described in Section II. In this manual, bus information will generally be restricted to 8160A specifics, for this reason, the handshake lines will not be discussed and the control lines will only be mentioned in connection with specific 8160A activity.

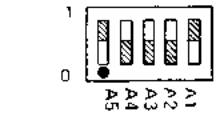
Permissible codes are presented in Table 3–8. For more bus information, refer to the condensed description in HP publication 59401–90030 and to IEEE Standard 488.

3–70 To use the 8160A on the bus, remote control must be implemented. This is done by setting the REN line true. A return to local control can be made manually (LOCAL RESET button), by sending the command GTL (go to local), or by setting REN false. Refer to § 3–78).

3–71 Addressing

Table 3–1. Available Addresses (ATN true)

Data bus (DIO lines)						Address in ASCII		
Fixed			Selectable					
8	7	6	5	4	3	2	1	Talk	Listen	
0	T	L	0	0	0	0	0	@	Space	
0	T	L	0	0	0	0	1	A	!	
0	T	L	0	0	0	1	0	B	"	
0	T	L	0	0	0	1	1	C	#	
0	T	L	0	0	1	0	0	D	$	
0	T	L	0	0	1	0	1	E	%	
0	T	L	0	0	1	1	0	F	&	
0	T	L	0	0	1	1	1	G	'	
0	T	L	0	1	0	0	0	H	(	
0	T	L	0	1	0	0	1	I	)	
0	T	L	0	1	0	1	0	J	*	
0	T	L	0	1	0	1	1	K	+	
0	T	L	0	1	1	0	0	L	,	
0	T	L	0	1	1	0	1	M	–	
0	T	L	0	1	1	1	0	N		
0	T	L	0	1	1	1	1	O	/	
0	T	L	1	0	0	0	0	P	0	
0	T	L	1	0	0	0	1	Q	1	**8160A set to this address at factory (17 Dec.)**
0	T	L	1	0	0	1	0	R	2	
0	T	L	1	0	0	1	1	S	3	
0	T	L	1	0	1	0	0	T	4	
0	T	L	1	0	1	0	1	U	5	Usually controller address!
0	T	L	1	0	1	1	0	V	6	
0	T	L	1	0	1	1	1	W	7	
0	T	L	1	1	0	0	0	X	8	
0	T	L	1	1	0	0	1	Y	9	
0	T	L	1	1	0	1	0	Z	:	
0	T	L	1	1	0	1	1	[	;	
0	T	L	1	1	1	0	0	\	<	
0	T	L	1	1	1	0	1	]	-	Forbidden setting! UNT, UNL commands
0	T	L	1	1	1	1	0	^	>	
0	T	L	1	1	1	1	1	_	?	



Selector on 8160A rear panel (factory setting).

L = 1 for listen address, 0 for talk address
T = 1 for talk address, 0 for listen address

3–72 Talk and listen addresses are transmitted by the system controller over the data bus with the ATN line true. When an instrument recognizes its address, it will adopt the appropriate bus mode (i.e., it will listen to the bus if its listen address has been transmitted, talk if the talk address has been transmitted). The 8160A's addresses are selected by a switch on the rear panel from the possibilities presented in Table 3–1. When allocating addresses, make sure no two instruments have the same address. When programming an address, set ATN true and arrange that the ASCII character derived from Table 3–1 appears on the bus. To deaddress, use UNL, UNT commands (or address another device as talker).

Table 3–2. Mode and Parameter-setting Messages (ATN false)

Message	Serial ASCII bytes	Comments
Input modes		
select normal	I1	
select trigger	I2	Trigger message (Table 3–3) can be used
select gate	I3	
select burst	I4	Trigger message (Table 3–3) can be used
External slope		
positive	E1	
negative	E2	
Parameters		
set period	PER	18NS – 999MS
set delay	DEL †	0NS – 999MS
set double pulse	DBL †	18NS – 999MS
set width	WID †	8NS – 999MS
set leading edge	LEE †	3NS – 9.99MS
set trailing edge	TRE †	
set high level	HIL †	–9.99 V ≤ HIL ≤ 9.99 V, –9.99 V ≤ LOL ≤ 9.99 V → 50 Ω
set low level	LOL †	–19.7 V ≤ HIL ≤ 19.9 V, –19.9 V ≤ LOL ≤ 19.7 V → 1 kΩ
set burst	BUR	0–9999 pulses
Channel		
A	A	
B	B	
Unit		
nanoseconds	NS	
microseconds	US	
milliseconds	MS	
burst entry	BT	
volts	V	
Output mode		
A add B	AA	Only effective if channel B is fitted (option 020)
A sep B	AS	
disable outputs	DI	
enable outputs	EN	
A complement	AC	
A normal	AN	
A 1 kΩ impedance	A1	

† For multi-channel instruments the channel must be specified when programming these parameters.

Examples:

Parameter	Channel	Unit
DEL	A	500NS
HIL	A	1.5 V
BUR		64

Table 3–2 (cont'd)

Message	Serial ASCII bytes	Comments
A 50 Ω impedance	A5	
B complement	BC	Only effective if channel B is fitted (option 020)
B normal	BN	
B 1 kΩ impedance	B1	
B 50 Ω impedance	B5	
Sign		
–	–	
+	+	
Decimal point		
.	.	
Memory		
store current operating modes and parameters in 8160A store location 'n'	STO 'n'	n is an integer 1–9
recall and adopt parameters in store location 'n'	RCL 'n'	n is an integer 0–9

See § 3–42

NOTES

Lower case letters can replace any or all of the ASCII capitals.
The order in which parameters are programmed is not significant. (but consideration should be taken of SRQ – see § 3–83).
Spaces are not essential.

3–73 Mode and Parameter Setting

3–74 When the 8160A has been listen addressed, it will be prepared to accept messages which will change a parameter or its operating mode. Each mode and parameter-setting message consists of a number of ASCII data bytes transmitted serially over the data lines with ATN false. The coding for the bytes is given on the front panel and also shown in Table 3–2 which summarizes all mode and parameter-setting messages, and provides an example. Reference may be made to Table 3–5 to convert each ASCII byte to a bit pattern on the data bus.

3–75 Control Messages and Commands (Table 3–3)

3–76 Programmed Trigger

3–77 When the 8160A is in trigger or burst modes, a trigger message (GET) will initate a single cycle or a burst.

3–78 Local, Remote and Local Lockout

3–79 When in remote, the 8160A's LOCAL RESET button can be inhibited by the local lockout command. To cancel local lockout, send GTL (go to local) or set the REN line false (or the 8160A may be switched off and on again at the LINE switch).

3–80 Learn Mode

3–81 When the 8160A is addressed as a talker after receiving the 'SET': message, it will output its current operating parameters to the bus (same coding as in Table 3–2). The message 'SET n' accesses addressable memory n (where n is an integer 0–9). In neither case are the store contents changed in any way. SET 0 will return the standard parameter set (see § 3–46).

Table 3–3. Control Messages and Commands

Message/Command	8160A	Serial ASCII bytes or ASCII character	Comments
Trigger (GET)	Listen	BS *	ATN true
Remote control	–	–	REN true
Local lockout (LLO)	Listen	DC1 *	ATN true
Cancel local lockout	–	–	REN false
Go to local (GTL)	Listen	SOH *	ATN true
Give current operating parameters	Listen	SET:	ATN false
	Talk	8160A transmits operating state, codes as Table 3–5	
Give parameter set in location n	Listen	Set *n*	*n* an integer 0–9
	Talk	8160A transmits stored state, codes as Table 3–5	
Service request	Listen	–	8160A sets SRQ true
Serial poll (SPE)		CAN *	
	Talk	8160A transmits error message: DIO 7 true if 8160A has set SRQ true, DIO 7 false if SRQ false (or SRQ set true by other instrument). Other bits: see Table 3–4	
		8160A clears SRQ when transmission completed.	
Serial poll disable (SPD)		EM *	Controller disables SPE.

* Single ASCII character, 1 byte only.

3–82 Error Reporting

3–83 In the event of a program attempting to put the 8160A into an error condition, the 8160A will remain in its previous operating condition (except for particular transition time errors – see paragraphs 3–17 to 3–22) and make a service request, i.e. set SRQ line true. Under these circumstances the system controller will normally respond by addressing the 8160A as a talker using a serial poll command (SPE). The 8160A will then place a status byte message on the data bus. The contents of this byte are shown in Table 3–4.

Note: An invalid SRQ can occur in character strings where more than one parameter is programmed. The reason is best explained by an example: e.g. current operating parameters of the 8160A include 1 ms width and 2 ms period. A character string then arrives which first attempts to re-program the width to 3 ms and then re-program to period to 4 ms. Immediately upon receiving the new width value, the 8160A sets SRQ true because this value is not compatible with the **current** period. Then when the new period arrives to validate the new width, **both** new values will be accepted by the 8160A and SRQ de-activated. Therefore SRQ can only be considered valid when it occurs at the end of a character string.

Table 3–4. Status Byte

Message / Value	DIO 8	SRQ DIO 7	Status Bits DIO 6	DIO 5	DIO 4 – DIO 1
0	not	Not Service Request	X	not	X X X X
1	used	Service Request	X	used	X X X X

DIO 6 '0' = allowed error
DIO 6 '1' = unallowed error

Status Bits 6 4 3 2 1	Meaning	Description
0 0 0 0 0	Syntax error	This type of error can only occur from an incorrect character sequence when programming the 8160A via the HP-IB.
0 0 0 0 1	Parameter error	a) The desired parameter or channel does not exist. b) You attempt to STO 0. c) You attempt to RCL n (n = 1 to 9) when the desired memory location contains invalid data.
0 0 0 1 1	Slope error (allowed)	The leading the trailing edge slopes are still within the same range but are excessively long and cause a loss of amplitude (see § 3–17 to 3–22).
1 0 0 1 0	Timing error	a) Period, delay, width or double pulse settings that are out of the 8160A's range *. b) Period, delay, width or double pulse settings that are incompatible with one another.
1 0 0 1 1	Slope error (unallowed)	a) A pulse with leading or trailing edges that are out of the 8160A total range. * b) A pulse with leading and trailing edges that are in different slope ranges (see § 3–39).
1 0 1 0 0	Level error	a) An output with high (HIL) or low (LOL) levels that are out of the 8160A's range *. b) An output with high and low levels that are spaced too far apart or too close. c) Two outputs with a difference between highest high level and lowest low level that exceeds 20 V. d) A pulse amplitude that is too great for the output impedance being used. e) A pulse amplitude that is too small for the output impedance being used.

* *These errors will only be reported if the parameter is programmed alone, or if within a string it has the last position.*

3–84 Error Recovery

3–85 It is important to realize that the 8160A status byte will show only one error, even if more than one error has occured.

3–86 In the case of unallowed errors, the invalid parameters must be corrected before the new data output can be executed.

3–87 Thus when an error occurs you may have to repeat the whole data string to be sure that all errors have been eliminated and the new data will be executed.

3–88 With 2-channel instruments it is also important to remember that while changing data for channel A, you can cause an error in channel B, e.g. if you change period for channel A, it also changes for channel B.

3–89 If you want to check what is currently being output, you can call for the operating parameter set using 'SET:' (see the end of the second programming example, paragraph 3–91).

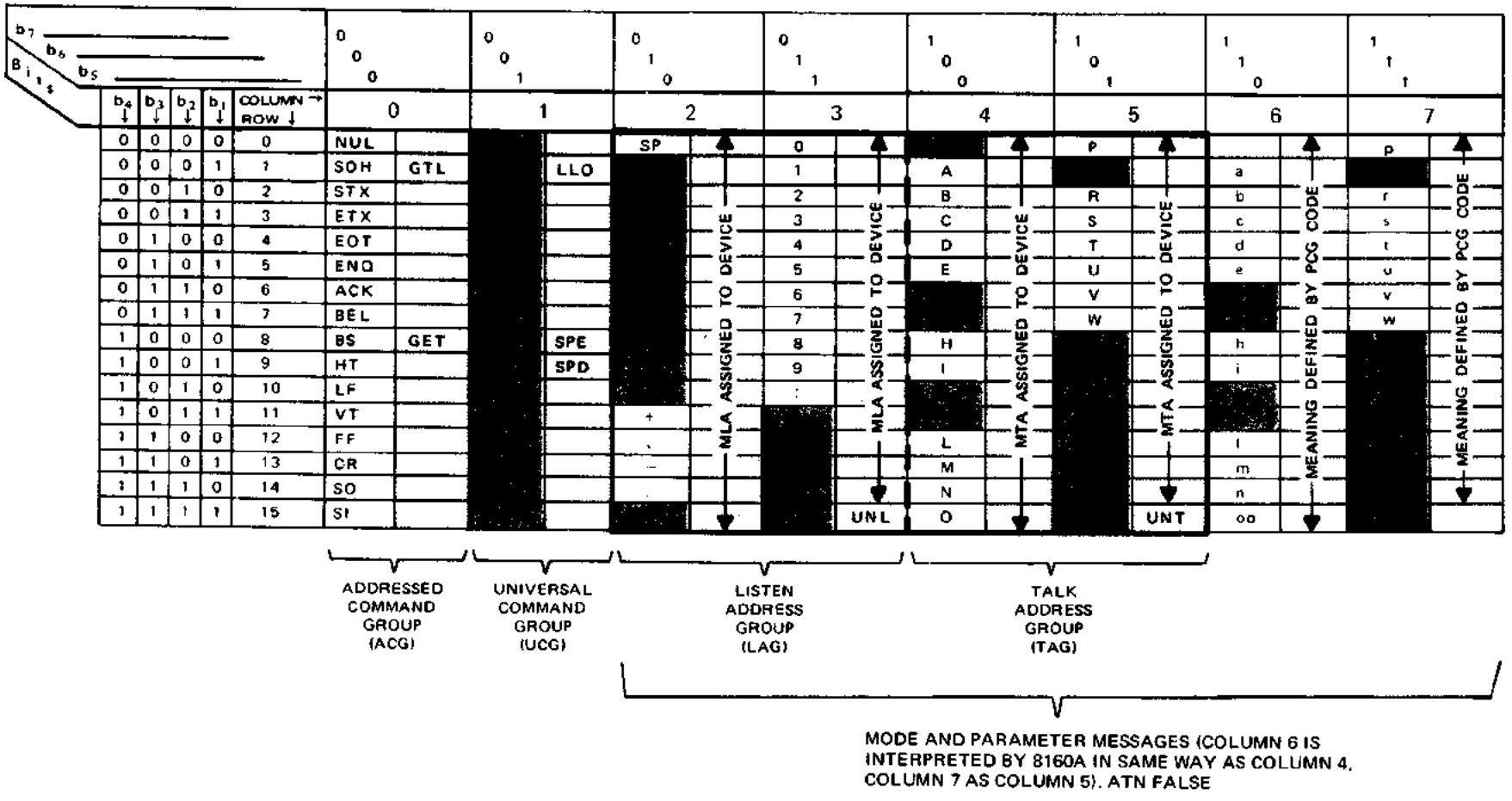
Table 3–5. Code Assignments (ASCII) for the 8160A

APPLIES ONLY IN COMMAND MODE (ATN TRUE)

DATA MODE (ATN FALSE)

THESE CHARACTERS CAUSE SRQ

THESE CHARACTERS ARE IGNORED



3–90 Programming Examples

3–91 A simple programming example is given first using the Hewlett-Packard Model 9825A Desktop Computer as system controller and the Model 98034A HP-IB Interface. The 98034A's address is assumed to be 7; thus the address of an instrument on the HP-IB is 7XX where XX is the decimal equivalent of the five least significant bits of the bus address. The 8160A address switch is assumed to be set to 10001 (table 3–1), the decimal equivalent of which is 17. Therefore the 8160A's address when programming with the 9825A is 717. Talk or listen addresses (defined by bits 6 and 7 of the HP-IB address-table 3–1) are automatically specified by the 9825A depending on the kind of command being used e.g. the statement red 717 tells the 9825A to read from the bus and tells the 8160A to talk (talk address 17, ASCII Q); the statement wrt 717 tells the 9825A to output to the bus and tells the 8160A to listen (listen address 17, ASCII 1). Stop statements (stp) are included in the program so that you can check the steps just executed. To carry on with the program, press the CONTINUE key each time.

Program

Program steps	Comments
0:rem 717; stp	sets the 8160A to remote control (REMOTE LED is lit)
1:wrt 717, "RCLOEN"; stp	recalls and outputs the standard parameter set
2:wrt 717, "PER1.5MS";stp	chanes the pulse period to 1.5 ms. All other paramgers remain unchanged.
3:wrt 717, "I4BUR512BT"	changes the input mode to burst (see Table 3–2) and specifies the length of the burst.
4:trg 717; stp	triggers the burst (9825A, version of GET – see Table 3–3).
5:jmp–1	jumps back to, and executes, the 'trg 717' statement thus triggering the pulse burst each time CONTINUE is pressed.

3–92 The following example is more complex and can be used to change 8160A parameters and also to obtain 8160A parameter sets. Error interpretation is also included in the program to enable you to identify any errors that occur (in conjunction with Table 3–4).

Program steps	Comments
1: dim A$[80]; B$[4]; fxd 0; "SET:"→B$	dimension string for storage of 8160A parameters
2: ent "DEVICE-ADDRESS?",A;A+700→A	enables you to enter correct 8160A address (two decimal digits eg. 17).
3: cfg ;ent "Data?",A$	allows you to enter data (new parameters, modes etc.) to be written to the 8160A or
4: if flg13;gto 16	if you want the 8160A to report any of its parameter sets, just press CONTINUE without enetering data (see line 16).
5: wrt A;A$;if rds(7)<128;gto 3	the 9825A writes your data (stored in A$) to the 8160A. It then reads and checks the HP-IB status byte for Service Request (most signficant bit – decimal 128) which, f set =1, would indicate that an error has occurred and the 8160A has requested service. If no service request has occurred, the program loops back to line 3 for further data entry.
	Status Calculator

```
6: rds(A)-64→P
7: prt "err.
 message:",P
8: prt A$
9: if P=34;prt
 "TIMING ERROR";
 spc 3;sto 3
10: if P=35;prt
 "SLOPE ERROR";
 spc 3;sto 3
11: if P=36;prt
 "LEVEL ERROR";
 spc 3;sto 3
12: if P=0;prt
 "SYNTAX ERROR";
 spc 3;sto 3
13: if P=1;prt
 "PARAM. ERROR";
 spc 3;sto 3
14: if P=3;prt
 "SLOPE ERROR",
 "AMPLITUDE LOSS
 ";spc 3;sto 3
15: end
16: ent "which
 SET?",B$[4];if
 fls13;":"→B$[4]
17: prt B$;spc ;
 wrt A,B$
18: red A,A$;
 prt A$[1,16];
 if A$[1,3]#"BUR
 ";jmp 0
19: spc 2;sto 3
20: end
SET:
I1 E1 DI AS
AN A5 BN B5
PER     1.00 MS
DEL A   100 US
DBL*A   200 US
WID A   100 US
LEE A   10.0 US
TRE A   10.0 US
HIL A  +1.00 V
LOL A  +0.00 V
DEL B   100 US
DBL*B   200 US
WID B   100 US
LEE B   10.0 US
TRE B   10.0 US
HIL B  +1.00 V
LOL B  +0.00 V
BUR     0010 BT
```

Status 8160A

Lines 6 to 14 determine and print the error that has occurred.

the program reads the 8160A status byte and subtracts 64 (service request bit). The remaining lines 7 to 14 check the least signficant five bits of the status byte and print the appropriate error statement (see table 3–4).

programs asks which parameter set you want. Enter 0–9 and press CONTINUE, or just press CONTINUE if you wan, the current operating parameters.

9825A tells 8160A to be ready to output the appropriate parameter set on receipt of its talk address.

the red A, A$ statement causes the 8160A to output 16 bytes of data into A$. This is then examined for 'BUR' which, if present, indicates that all parameter information has been transmitted and the program finishes. If 'BUR' is not present, the program loops back to the beginning of line 18 to read the next 16 bytes.

This is a sample printout of the current 8160A parameter set that would be produced by the 9825A at program step 18.

The * indicates that DBL is not active.

SECTION IV
PERFORMANCE TESTS

4–1 INTRODUCTION

4–2 The procedures in this section test the electrical performance of the instrument using the specifications of Table 1–2 as performance standards. All tests can be performed without access to the interior of the instrument.

4–3 EQUIPMENT REQUIRED

4–4 Equipment required for the performance tests is listed in Table 1–1, Recommended Test Equipment. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model(s).

4–5 TEST RECORD

4–6 Results of the performance tests may be tabulated on the Test Record at the end of the test procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance, troubleshooting, and after repairs or adjustments.

4–7 PERFORMANCE TESTS

4–8 The performance tests given in this section are suitable for incoming inspection, troubleshooting, or preventive maintenance. During any performance test, all shields and connecting hardware must be in place. The tests are designed to verify the published instrument specifications, perform the tests in the order given and record the data on the test card and/or in the data spaces provided at the end of each procedure.

4–9 Each test is arranged so that the specification is written as it appears in Table 1–2. Next, when necessary, a description of the test and any special instructions or problem areas are included. Each test that requires test equipment has a setup drawing and a list of the required equipment. The initial steps of each procedure give control settings required for that particular test.

PERFORMANCE TESTS

4–10 PERIOD

SPECIFICATION

Range: 20.0 ns to 999 ms.
Resolution: 3 digits, 0.1 ns min.
Accuracy: 3 % of programmed value ±0.3 ns (PER < 100 ns).
2 % of programmed value (PER ⩾ 100 ns)
Max. Jitter: 0.1 % of programmed value + 50 ps.
Repeatability: 50 % of accuracy.

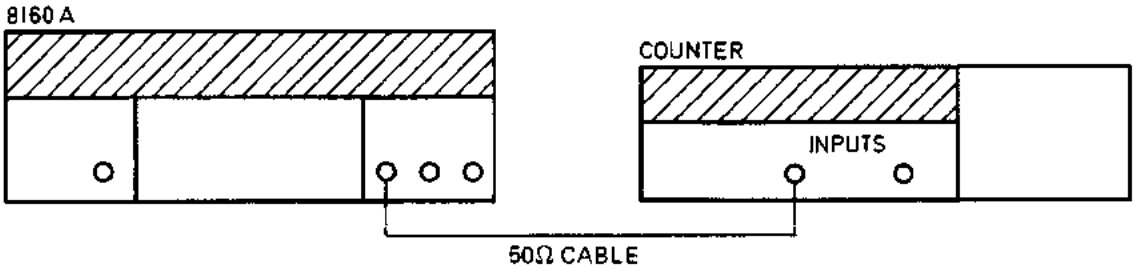


Figure 4–1. Frequency Test Set-up.

EQUIPMENT

Counter, 50 ohm BNC to BNC coaxial cable.

PROCEDURE

1. Connect equipment as shown in fig. 4–1.

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	see below
DOUBLE PULSE	20 ns
DELAY	0 ns
WIDTH	10 ns
LEE	6 ns
TRE	6 ns
BURST	0
HIL	1.0 V
LOL	−1.0 V
OUTPUT MODE	Enable, A sep B
CHANNEL A	NORM, 50Ω
CHANNEL B	NORM, 50Ω

PERFORMANCE TESTS

3. Set 8160A and Counter as necessary and check period as per table 4–1.

8160A Display PER	Counter Reading Min.	Max.
20.0 ns	19.1 ns	20.9 ns
99.9 ns	96.7 ns	103.2 ns
100 ns	98.1 ns	102 ns
999 ns	980.4 ns	1.02 μs
1 μs	980 ns	1.02 μs
1 ms	980 μs	1.02 ms
999 ms	980 ms	1.02 s

Table 4–1 Period Limits

PERFORMANCE TESTS

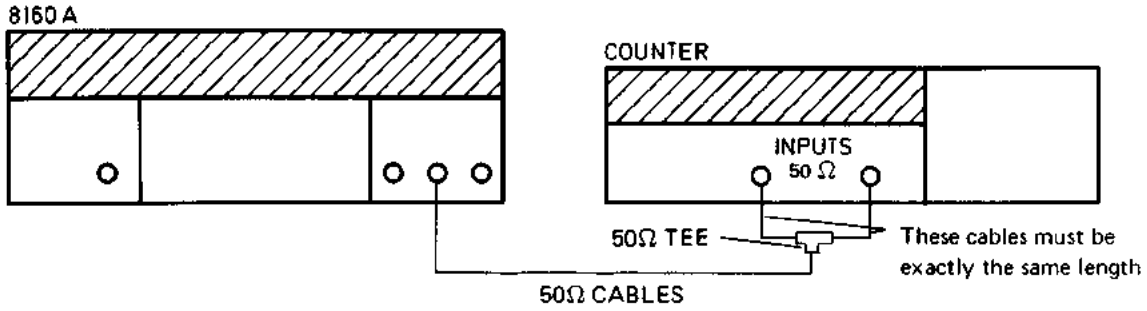


Figure 4–13. Width Test Set-up – High Ranges

EQUIPMENT

Counter, 50Ω BNC/BNC coaxial cables, 50Ω tee connector.

PROCEDURE

1. Connect the equipment as shown in figure 4–13.

2. Set counter:

   Function: time int A to B
   Channel A: DC, 50 Ω, slope +
   Channel B: DC, 50 Ω, slope –
   Gate time: adjust as necessary

   Set 8160A INPUT MODE to NORM

3. The width limits are 1% ± 1 ns (see table 4–3). Change to 8160A to each setting in turn and measure the width.

8160A Period Display	8160A Width Display	Counter Reading* min.		max.
1.00 ms	500 ns	494 ns	–	506 ns
1.00 ms	1.00 µs	989 ns	–	1.01 µs
1.00 ms	50.0 µs	49.5 µs	–	50.5 µs
500 ms	1.00 ms	990 µs	–	1.01 ms
999 ms	500 ms	495 ms	–	505 ms
999 ms	900 ms	891 ms	–	909 ms

*± Counter error

Table 4–3. Width Limits – High Ranges

4. If 8160A option 020 is fitted, repeat the complete Width Test for output B.

PERFORMANCE TESTS

4–11 BURST GATE MODES

Burst: provides pulse bursts containing a predetermined number of pulses.
Burst length programmable from 1 to 9999.
Gate: Gate signal turns rate generator on and off synchronously, i.e. first and last pulses are always completed.

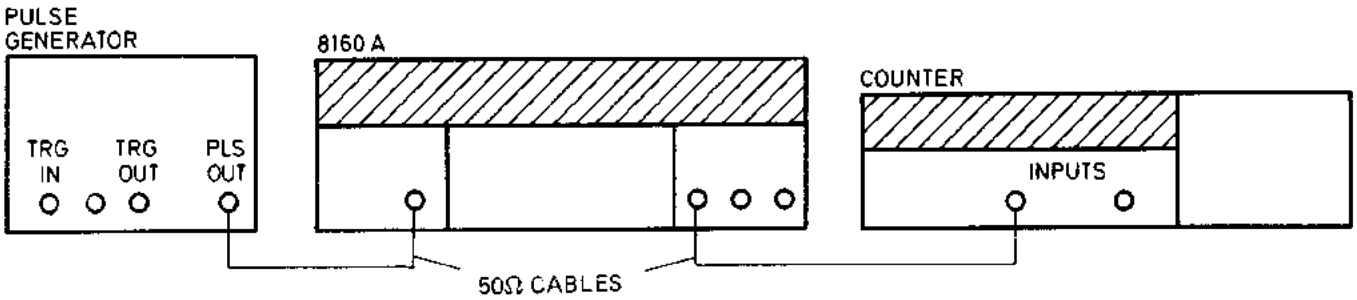


Figure 4–2. Burst, Gate Test Set-up

EQUIPMENT

Counter, Pulse Generator, 50 ohm BNC/BNC coaxial cable.

PROCEDURE

1. Connect equipment shown in fig. 4–2. Set counter to count single events.

2. Set 8160A as follows (all channels):

INPUT MODE	BURST
EXT. SLOPE	POS
TRIG LEVEL trimpot	mid pos
EXT INPUT impedance	OFF
PERIOD	100μs
DELAY	0 ns
WIDTH	50 μs
LEE	6 ns
TRE	6 ns
BURST	8160
HIL	1 V
LOL	– 1 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

PERFORMANCE TESTS

3. Press counter reset

4. Press 8160A MAN button

5. Counter display should be 8160 *

6. Set Pulse Generator:
   Period 1 ms and width 450 μs, min. delay.
   Set input mode to external triggering on a positive slope (EXT+) and set the amplitude to 2 V, sym

7. Reset counter.

8. Press Pulse Generator MAN button once and check counter display. It should read 8160.

9. Set 8160A to GATE, EXT INPUT impedance to 50 Ω, trig. level to mid position, reset Counter.

10. Press pulse generator MAN button once and check counter display. It should read 5. *

* (5345A reading will be 8159 or 4, since first pulse arms the counter)

PERFORMANCE TESTS

4–12 DELAY / DOUBLE PULSE

SPECIFICATION (for 3 ns transition setting)

DELAY (DEL)

Range: 0.00 ns to 999 ms (measured from 50% point of leading edge of trigger output to 50% of LEE of signal output).

Resolution: 3 digits, 0.1 ns min.

Accuracy: 1 % of programmed value ± 1 ns.

Max. Jitter: 0.1 % + 50 ps (DEL ≤ 999 ns)
0.05 % (999 ns < DEL ≤ 9.99μs)
0.005 % (DEL > 9.99μs)

Repeatability: 50 % of accuracy

DOUBLE PULSE (DBL)

Range: 20.0 ns to 999 ms. (Spacing between leading edges of double pulse).

Resolution: 3 digits, 0.1 ns min.

Accuracy: 1 % of programmed value ± 1 ns

Max. Jitter: 0.1 % + 50 ps (DBL ≤ 999 ns)
0.05 % (999 ns < DBL ≤ 9.99μs)
0.005 % (DBL > 999μs)

Repeatability: 50 % of accuracy

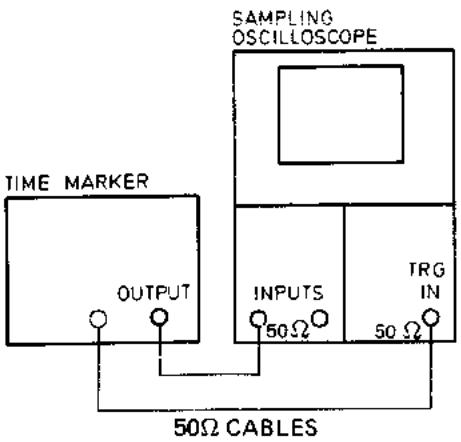


Figure 4–3. Oscilloscope Test Set-up

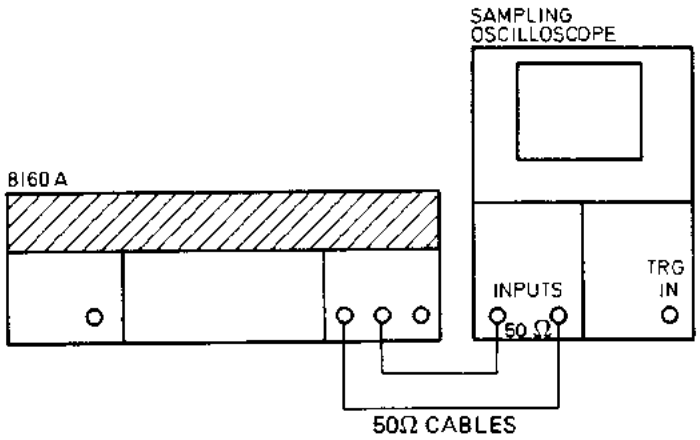


Figure 4–4. Minimum Delay Test Set-up

EQUIPMENT

Sampling oscilloscope, time marker, pulse generator, 50Ω BNC/BNC coaxial cable.

PROCEDURE

1. Connect equipment as shown in fig. 4–3,set time marker to 2 ns and oscilloscope to 1 ns/div. Check oscilloscope for horizontal accuracy
Connect equipment as shown in fig. 4–4. Use exactly the same cable lengths.

PERFORMANCE TESTS

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	100 ns
DOUBLE PULSE	20 ns
DELAY	0 μs
WIDTH	10 ns
LEE	3 ns
TRE	3 ns
HIL	1 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

3. With oscilloscope set to 1 ns/div, measure distance between trigger output and output pulse at the 50% line. The minimum delay should be as shown in figure 4–5. Take into account delay differences of Channel A and Channel B of Scope.

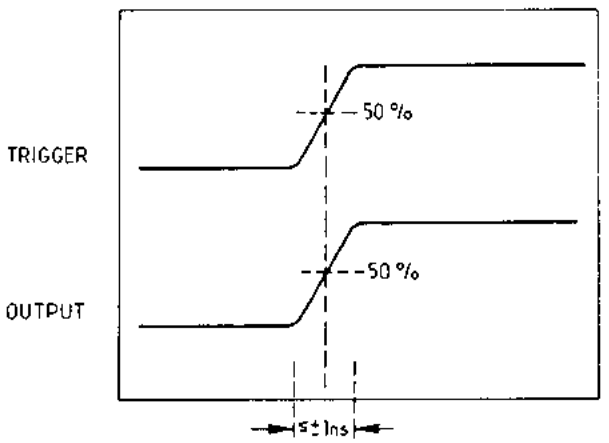


Figure 4–5. Min. Delay Limits.

PERFORMANCE TESTS

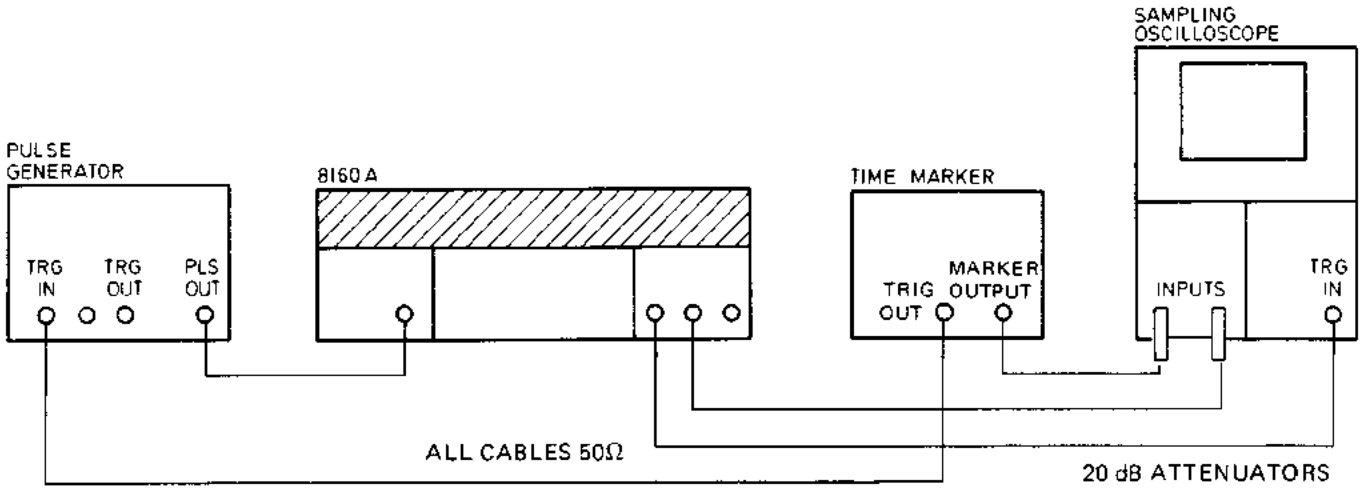


Figure 4–6. Delay/Double Pulse Test Set-up

EQUIPMENT

Pulse generator, time marker, sampling oscilloscope, 50Ω BNC/BNC coaxial cables, 20 dB attenuators.

PROCEDURE

1. Set up equipment as shown in figure 4–6. Set controls as follows:

pulse generator:	time marker:	sampling oscilloscope:
Input mode . . EXT +	Range . . . 2 ns	direct . . . . . 20 ns
Delay . . . . . see below		expanded . . 2 ns
Width . . . . . 10 ns		

8160A (all channels):

INPUT MODE	TRIG
EXT SLOPE	POS
PERIOD	< period of marker
DOUBLE PULSE	20 ns
DELAY	0 ns
WIDTH	10 ns
LEE	3 ns
TRE	3 ns
BURST	0
HIL	4 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

PERFORMANCE TESTS

2. Set pulse generator delay and oscilloscope position so that the 50% line of amplitude and horizontal crossing of sinewave are coincident.

3. Set 8160A delay to 2 ns, 10 ns, 20 ns and measure delay by comparing it to the reference signal.

Range	min	–	max
2 ns	0.98 ns	–	3.02 ns
10 ns	8.9 ns	–	11.1 ns
20 ns	18.8 ns	–	21.2 ns

4. Set time marker to 10 ns. Set 8160A delay to 0 ns. Set scope expand to 10 ns/div, direct to 50 ns/div and repeat step 2.

5. Set 8160A delay to 50 ns and 90 ns and again measure delay by comparing it to the reference signal.

Range	min	–	max
50 ns	48.5 ns	–	51.5 ns
90 ns	88.1 ns	–	91.9 ns

6. Set DBL pulse to 20 ns and observe display. Leading edge of the second pulse should appear 20 ns after the leading edge of the first pulse.

7. Set DBL Pulse to 80 ns. Leading edge of the second pulse should appear 80 ns after the leading edge of the first pulse.

Range	min	–	max
20 ns	18.8 ns	–	21.2 ns
80 ns	78.2 ns	–	81.8 ns

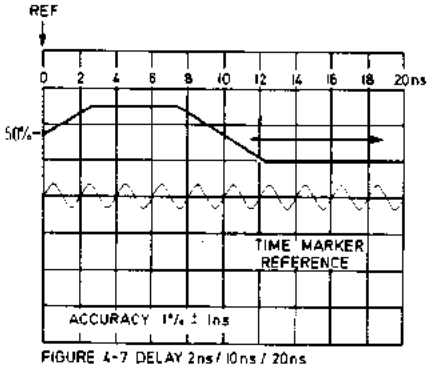


FIGURE 4-7 DELAY 2ns / 10ns / 20ns

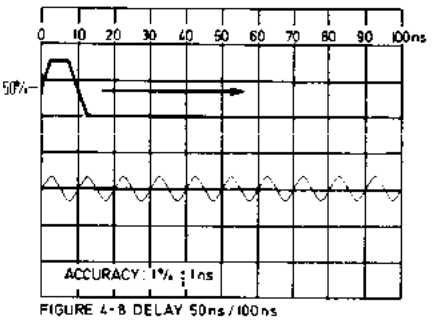


FIGURE 4-8 DELAY 50ns / 100ns

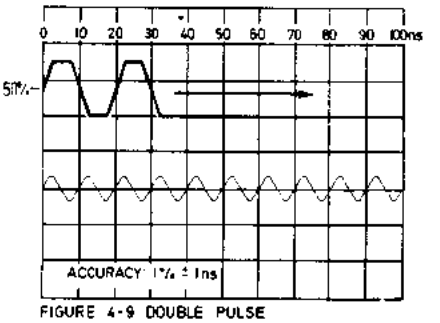


FIGURE 4-9 DOUBLE PULSE

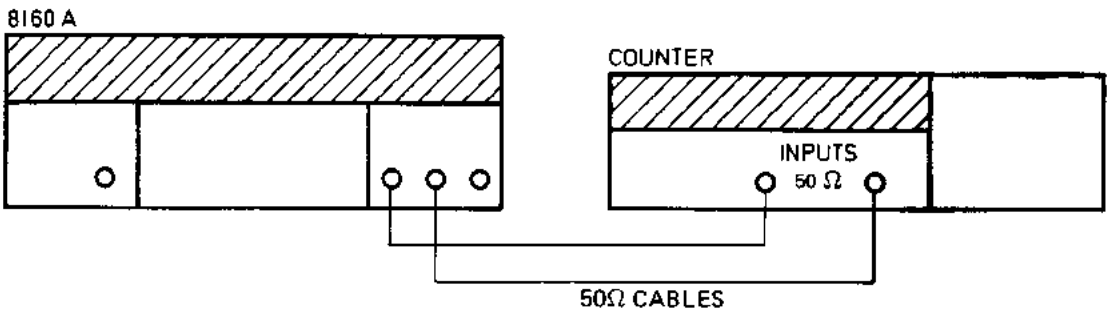


Figure 4–10. Delay Test Set-up High Ranges

PERFORMANCE TESTS

EQUIPMENT

Counter, 50Ω BNC/BNC coaxial cables

PROCEDURE

1. Connect the equipment as shown in Figure 4–10. The 50Ω cables must be exactly the same length.

2. Set the counter as follows:

   Function: time int A to B
   Channel A: DC, 50 Ω slope +
   Channel B: DC, 50 Ω slope +
   Gate time: adjust as necessary

   Set 8160A INPUT MODE to NORM.

3. The delay limits are 1% ± 1 ns (see table 4–2). Change the 8160A to each setting in turn and measure the delay.

8160A Period Display	8160A Delay Display	Counter Reading* min.			max.	
10 µs	500 ns	494	ns	–	506	ns
100 µs	1.00 µs	998	ns	–	1.01	µs
1.00 ms	50.0 µs	49.5	µs	–	50.5	µs
500 ms	1.00 ms	990	µs	–	1.01	ms
999 ms	500 ms	495	ms	–	505	ms
999 ms	900 ms	891	ms	–	909	ms

*± counter error

Table 4–2. Delay Limits – High Ranges

4. If 8160A option 020 is fitted, repeat the complete Delay/Double pulse test for output B.

PERFORMANCE TESTS

4–13 WIDTH

SPECIFICATION (for 3 ns transition times)

Range: 10.0 ns to 999 ms.
Resolution: 3 digits, 0.1 ns min.
Accuracy: 1 % of programmed value ± 1 ns.
Max. Jitter: 0.1 % + 50 ps (WID ≤ 999 ns)
0.05 % (999 ns < WID ≤ 9.99μs)
0.005 % (WID > 9.99μs)
Repeatability: 50 % of accuracy

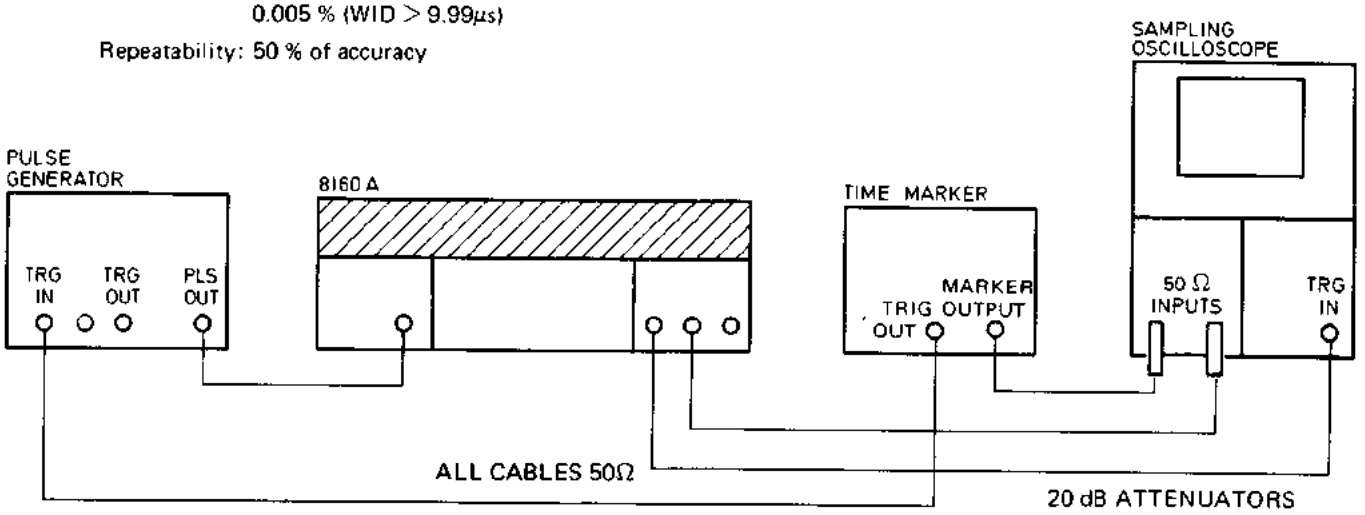


Figure 4–11. Width Test Set-up

EQUIPMENT

Pulse generator, time marker, sampling oscilloscope, 50Ω BNC/BNC coaxial cables, 20 dB attenuators.

PERFORMANCE TESTS

PROCEDURE

1. Connect equipment as shown in fig. 4–11.

2. Set 8160A as follows (all channels):

INPUT MODE	TRIG
EXT. SLOPE	POS
PERIOD	200 ns
DELAY	0 ns
WIDTH	10 ns
LEE	3 ns
TRE	3 ns
HIL	4 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

3. Set pulse generator:

Function: ext +
Delay: min
Width: 10 ns

set time marker:

Range: 10 ns

set sampling oscilloscope:

direct: 20 ns
expanded: 10 ns
time: expanded

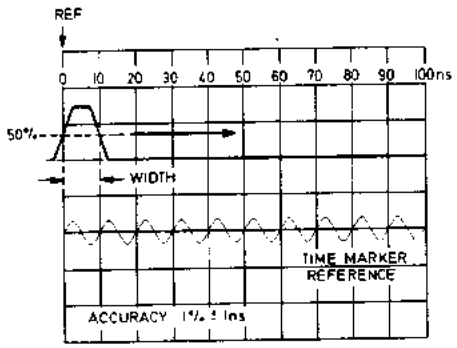


FIGURE 4-12 WIDTH MEASUREMENTS

4. Set pulse generator delay and oscilloscope position so that the 50% line of amplitude and horizontal crossing of sinewave are coincident (figure 4–12).

5. Set 8160A width to 10 ns, 50 ns, 80 ns and measure width by comparing it to the reference signal.

Range	min	–	max
10 ns	8.9 ns	–	11.1 ns
50 ns	48.5 ns	–	51.5 ns
80 ns	78.2 ns	–	81.8 ns

PERFORMANCE TESTS

4–14 TRANSITION TIME – FAST

SPECIFICATION (50Ω source and load impedance)

Leading/trailing edge range: 6 ns to 9.99 ms independently programmable within 6 ranges (see specifications).
Resolution: 3 digits, 100 ps min.
Accuracy: 3 % of programmed value ± 1 ns.
Repeatability: 50 % of accuracy.
Linearity: 3% for transition times ⩾ 30 ns.
Leading edge is programmable to at least 70% of width without loss of amplitude.
Trailing edge is programmable to 0.7 (0.94 of period – width) without loss of amplitude.

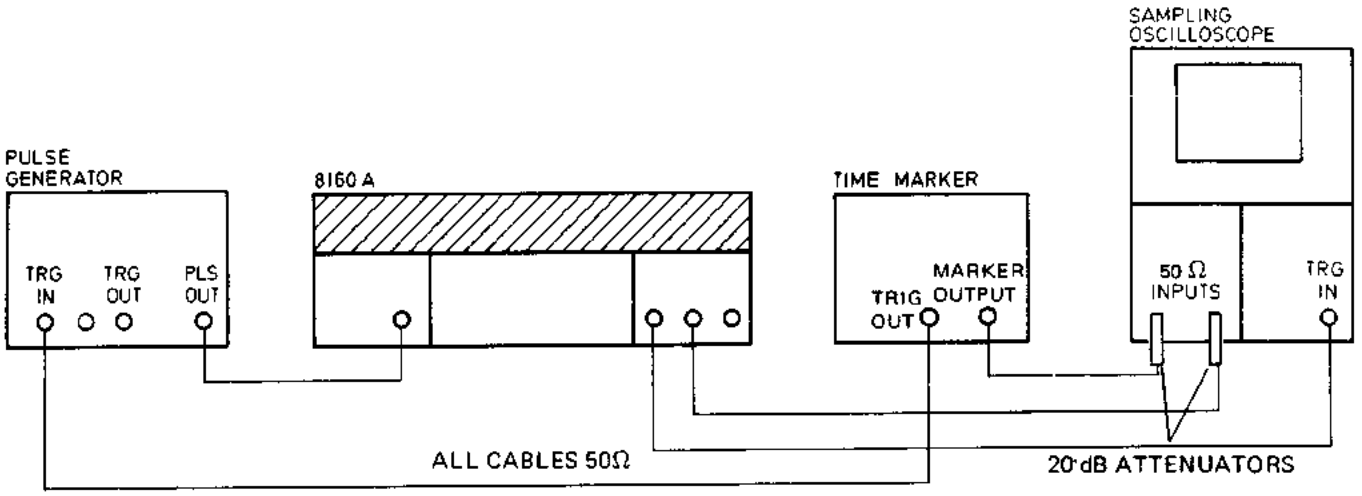


Figure 4–14. Transition Time – Fast Test Set-up

EQUIPMENT

Pulse generator, time marker, sampling oscilloscope, 50Ω BNC/BNC coaxial cables, 20 dB attenuators.

SECTION III
OPERATING AND PROGRAMMING

3–1 INTRODUCTION

3–2 This section explains the functions of controls, connectors and indicators, and provides operating and programming information.

3–3 SPECIAL OPERATING CONSIDERATIONS

3–4 The following steps must be taken before applying power to the Model 8160A.

a) Read the safety summary at the front of this manual.

b) Be sure the power selector switches are set properly for the power source being used to avoid instrument damage.

WARNING

The power supply cover on the rear panel may be hot and could cause burns.

CAUTION

Do not change the LINE SELECTOR switch setting with the instrument on or with power connected to the rear panel.

3–5 CONTROLS, CONNECTORS AND INDICATORS

3–6 Refer to Figure 3–1 for a brief explanation of all controls, connectors and indicators. Use figure 3–1 also for reference in the following operating instructions. Figure 3–2 shows an 8160A output pulse with all the parameters that are variable. The front panel mnemonics are given with each parameter to enable you to associate each control with the parameter it varies.

3–7 OPERATORS CHECKS

3–8 Use the performance checks in section IV to verify proper operation of the 8160A. You can also perform a rapid operational check by recalling the standard parameter set and checking the output.

3–9 OPERATING INSTRUCTIONS

3–10 Operating modes and parameters can be set using the front panel controls (local operations) or programmed using the HP-IB (remote operation). Local operation is explained in the following paragraphs. For remote operation refer to paragraph 3–67.

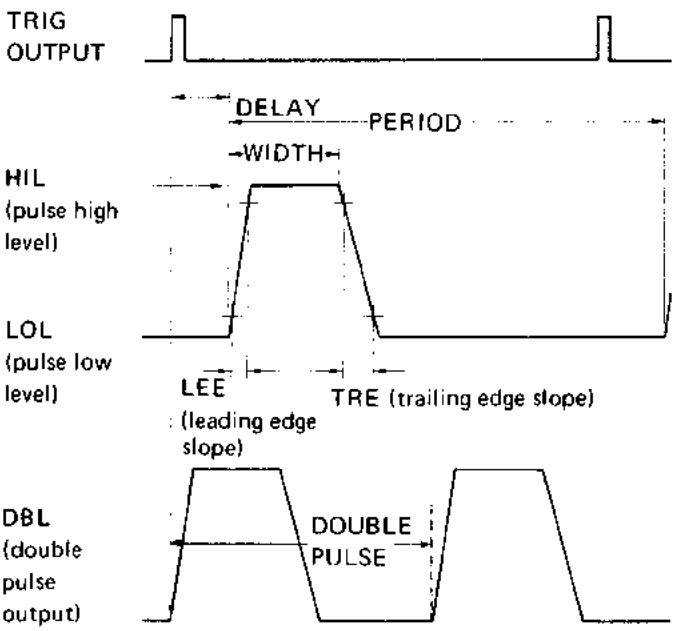


Figure 3–2. 8160A Variable Pulse Parameters

3–11 Commence by setting the LINE switch on and pressing the DISABLE/ENABLE pushbutton. The pushbutton lamp should go out, indicating that the output is enabled. The lamp for output A and, if channel B is fitted, output B will also light.

3–12 The 8160A will automatically assume the operating state prevailing when it was switched off.

PERFORMANCE TESTS

PROCEDURE

1. Connect equipment as shown in fig. 4–14.

2. Set 8160A as follows (all channels):

INPUT MODE	TRIG
EXT. SLOPE	POS
PERIOD	200 ns
DELAY	0 ns
WIDTH	50 ns
LEE	3 ns
TRE	3 ns
HIL	4 V
LOL	−4 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

3. Before measuring transition times, check the oscilloscope amplitude accuracy using an a.c. calibrator.

4. Set the time marker to the 2 ns range.

5. Adjust set-up to obtain a full amplitude signal on oscilloscope (figure 4–15).

6. Set pulse generator delay and oscilloscope setting so that the 10% line and 8160A pulse edge are coincident at fourth graticule line as shown in Figure 4–15.

7. By using the time marker signal as reference, compare the 90% line of pulse against the marker signal. The 10% to 90% time should be 6 ns ± 1.18 ns.

8. Set 8160A LEE to 20 ns and repeat steps 4 and 5. The 10% to 90% time should be 20 ns ± 1.6 ns.

9. Repeat steps 3 to 6 for the pulse TRE.

10. Set the 8160A LEE to 30 ns. Set time marker to 10 ns and readjust oscilloscope and pulse generator to obtain a full amplitude signal positioned on the oscilloscope as in Figure 4–15.

11. Measure transition at the 90% line by comparing it to the marker ref. signal. The 10% to 90% time should be 30 ns ± 1.9 ns. Repeat steps 9 and 10 for TRE.

12. If 8160A option 020 is fitted, repeat the complete Transition Time-Fast test for output B.

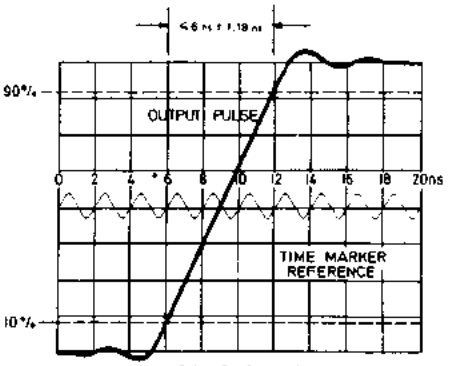


FIGURE 4-15 TRANSITION TIME-FAST MEASUREMENTS

PERFORMANCE TESTS

4–15 TRANSITION TIME – SLOW

SPECIFICATION

See 4–14 Transition Time-Fast

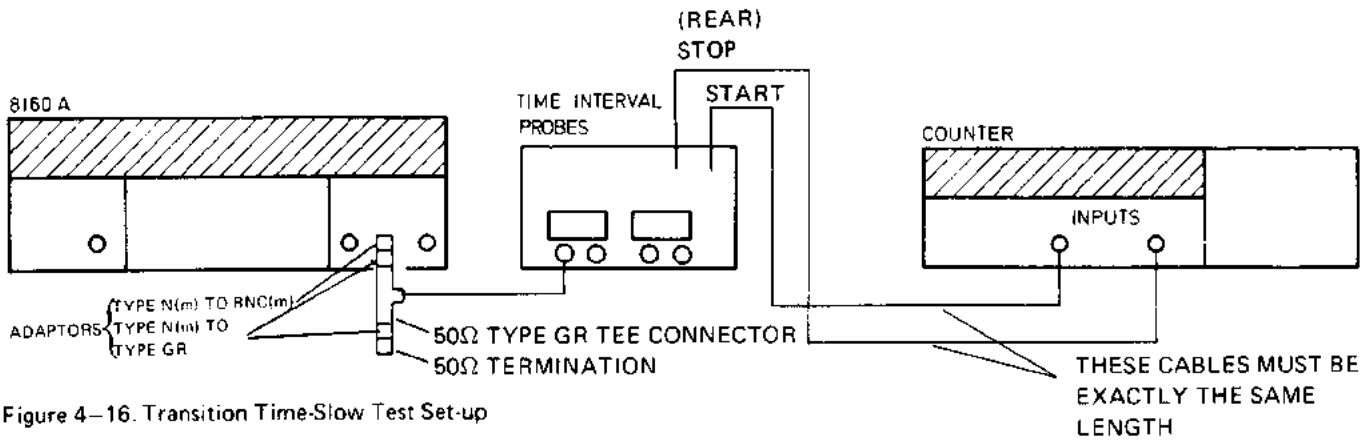


Figure 4–16. Transition Time-Slow Test Set-up

EQUIPMENT

Counter, time internal probes, 50Ω BNC/BNC coaxial cables.

PROCEDURE

1. Connect equipment as shown in fig. 4–16.

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	10 μs
DELAY	0 ns
WIDTH	500 ns
TRE	200 ns
HIL	9.99 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

3. Before measuring transition times, verify exact amplitude (top and bottom levels) using an oscilloscope. The oscilloscope accuracy must first be checked using an a.c. calibrator and any deviation taken into account.

PERFORMANCE TESTS

4. Set time interval probe switches to A ⨍ (or B ⨍) 1.00 V and A ⨍ (or B ⨍) 9.00 V. Set counter to TIME INT. A to B, SEP

5. Set 8160A to settings as given in table 4–4. Measure LEE first.

Period	Width	LEE	TRE	min. – max.
10 µs	500 ns	200 ns	200 ns	193 ms – 207 ns
1 ms	500 µs	1 µs	1 µs	969 ns – 1.031 µs
1 ms	500 µs	100 µs	100 µs	97 µs – 103 µs
10 ms	5 ms	1 ms	1 ms	970 ms – 1.03 ms
100 ms	50 ms	9.9 ms	9.9 ms	9.61 ms – 10.2 ms

Table 4–4. Transition Time Slow Limits

6. Set time interval probes to opposite transitions and voltages. Repeat step 5 for TRE.

7. If 8160A option 020 is installed, repeat the complete Transition Time-Slow Test for output B.

PERFORMANCE TESTS

4–16 HIGH LEVEL (HIL), LOW LEVEL (LOL)

SPECIFICATION (50Ω source and load impedance)

High level (HIL) range: –9.89 V to 9.99 V.
Low level (LOL): –9.99 V to 9.89 V.
Resolution: 3 digits, 10 mV.
Min amplitude: 0.1 V.
Max amplitude: 9.99 V (using either high impedance source or load doubles available amplitude and levels – see specifications).
Accuracy: 1 % of programmed value ± 1 % of pulse amplitude, ± 50 mV pulse shift.
Repeatability: 50 % of specified accuracy.
Settling time: 40 ns to specified accuracy.

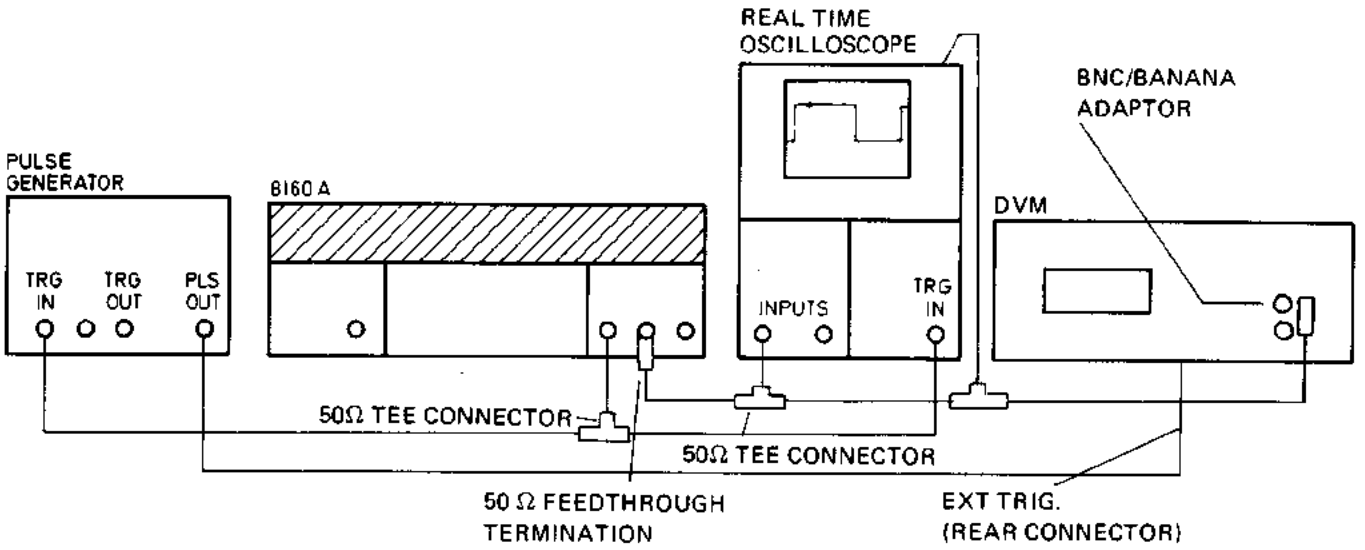


Figure 4–17. HIL, LOL Test Set-up

EQUIPMENT

DVM, pulse generator, 50Ω BNC/BNC coaxial cables, 50Ω feedthrough termination, real time oscilloscope. Total attenuation to be within 0.5 % of nominal.

PROCEDURE

1. Connect equipment as shown in fig. 4–17.

PERFORMANCE TESTS

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	100 ms
DELAY	0 ns
WIDTH	50 ms
LEE	3 ns
TRE	3 ns
HIL	0.1 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

3. Set pulse generator:

Input mode:	EXT TRIGGER
Vernier:	CCW
Width:	0.1m–10m
Vernier:	CCW
Amplitude:	2 V
Delay:	ca. 25 ms to measure HIL

4. Set DVM:

Function:	V
Trigger:	EXT
Range:	100

5. Set 8160A to settings as listed in table 4–5 and measure HIL first.

8160A HIL (LOL = 0 V)	min.		–	max.	
0.10 V	48	mV	–	152	mV
0.49 V	430	mV	–	550	mV
0.99 V	920	mV	–	1.06	V
1.99 V	1.902	V	–	2.08	V
2.99 V	2.88	V	–	3.1	V
3.99 V	3.86	V	–	4.12	V
7.99 V	7.78	V	–	8.2	V*
9.99 V	9.74	V	–	10.24	V*

Set 8160A impedance to 1 k and measure:

10 V	9.7	V	–	10.3 V
13 V	12.64	V	–	13.36 V
17 V	16.56	V	–	17.44 V
19.9 V	19.5	V	–	20.4 V

Table 4–5. HIL, LOL Limits

PERFORMANCE TESTS

6. For measuring LOL set pulse delay vernier cw till the trigger is in the low level area (see figure 4–18). Set 8160A LOL to –0.1 V and HIL to 0 V. Set EXT INPUT IMP. back to 50Ω. Repeat table 5–5 for same values but LOL.

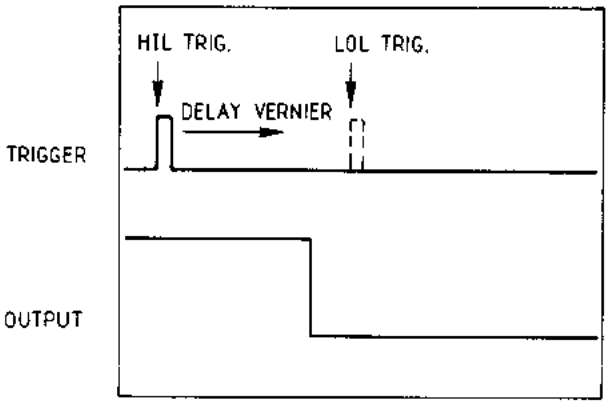


Figure 4–18. HIL, LOL Measurements

7. Disable 8160A output and check that DVM reads 0.0V.

8. If 8160A option 020 is fitted, repeat the complete HIL, LOL test for output B. Set HIL A to 0.1 V, LOL A to –0.1 V.

PERFORMANCE TESTS

4–17 AMPLITUDE A + B (option 020 only)

SPECIFICATION

The difference between the highest upper level and the lowest lower level must not exceed 20 V.

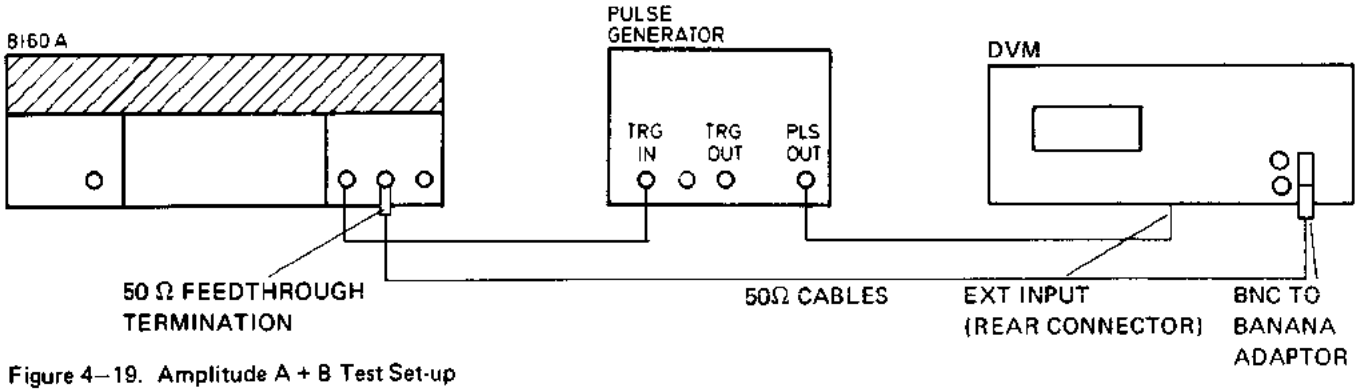


Figure 4–19. Amplitude A + B Test Set-up

EQUIPMENT

DVM, pulse generator, 50Ω BNC/BNC coaxial cables, 50Ω feedthrough termination.
(Total attenuation to be within 0.5 % of nominal.

PROCEDURE

1. Connect equipment as shown in fig. 4–19. The DVM takes samples from pulse top and bottom depending on trigger.

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	100 ms
DELAY	0 ns
WIDTH	50 ms
LEE	3 ns
TRE	3 ns
HIL	2.5 V
LOL	–2.5 V
OUTPUT MODE	enable, A + B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

PERFORMANCE TESTS

3. Ensure that channel B is set to the same settings as channel A.

4. Set pulse generator:

Input mode:	ext. trig. on pos. slope
Delay:	10m–1
Vernier:	CCW
Width:	0.1m–10m
Vernier:	CCW
Amplitude:	2 V

5. Set DVM:

Function:	V
Range:	100
Trigger:	EXT

6. Measure pulse top and bottom levels by changing pulse generator delay vernier (see fig. 4–18). Levels should be within limits of table 4–6.

7. Set 8160A HIL (both chan) to 3.75 V and LOL to –3.75 V. Repeat step 6.

8. Set 8160A HIL (both chan) to 4.99 V and LOL to –4.99 V. Repeat step 6.

HIL	LOL	min. – max.
2.5 V	–2.5 V	4.63 V – 5.12 V
3.75 V	–3.75 V	7.0 V – 7.63 V
4.99 V	–4.99 V	9.35 V – 10.1 V

Table 4–6. A + B Levels

PERFORMANCE TESTS

4–18 PULSE ABERRATION

SPECIFICATION

Max. pulse pre-shoot, overshoot, ringing and baseline distortion:
⩽5 % of pulse amplitude ± 10 mV.

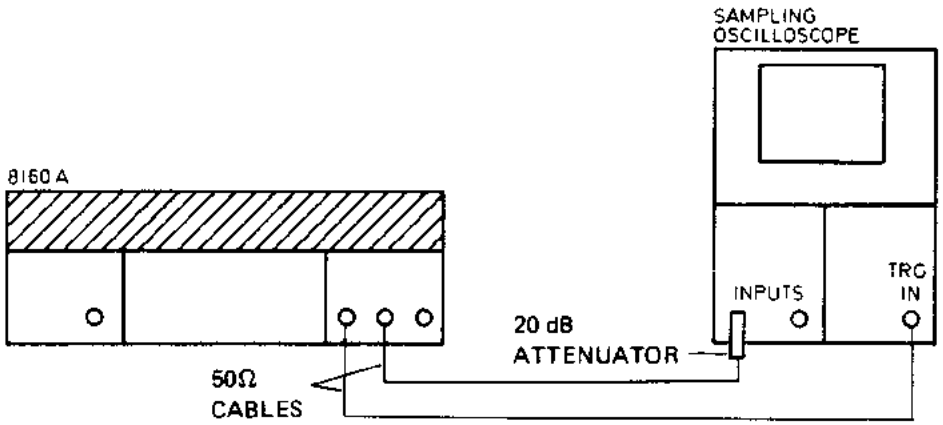


Figure 4–20. Pulse Aberration Test Set-up

EQUIPMENT

Sampling oscilloscope, 50Ω BNC/BNC coaxial cables, 20 dB attenuator.

PROCEDURE

1. Connect equipment as shown in fig. 4–20.

2. Set 8160A as follows (all channels):

INPUT MODE	NORM
EXT. SLOPE	POS
PERIOD	1 µs
DELAY	0 ns
WIDTH	500 ns
LEE	5 ns
TRE	5 ns
HIL	9.99 V
LOL	0 V
OUTPUT MODE	enable, A sep B
CHANNEL A	50Ω, NORM
CHANNEL B	50Ω, NORM

PERFORMANCE TESTS

3. Set scope to fill the display with one cycle.
   Measure preshoot, overshoot, ringing and baseline distortion.
   It should be better $\leq \pm 5\%$ of pulse amplitude $\pm$ 10 mV.

PERFORMANCE TESTS

Performance Test Record

Hewlett-Packard Company Model 8160A/8160A Option 020 Programmable Pulse Generator Serial No.		Tested by Date		
Para. No.	Test Description	Result		
				Actual
		Min	Max	Standard Opt. 020
4–10	Period			
	20.0 ns	19.1 ns	20.9 ns	....
	99.9 ns	96.7 ns	103.2 ns	....
	100 ns	98.1 ns	102 ns	....
	999 ns	980.4 ns	1.02 µs	....
	1.00 µs	980 ns	1.02 µs	....
	1.00 ms	980 µs	1.02 ms	....
	999 ms	980 ms		....
4–11	Burst, Gate			
	Number of pulses (8160)			yes ☐ no ☐
	Number of pulses (8160)			yes ☐ no ☐
	Number of pulses (5)			yes ☐ no ☐
4–12	Delay			
	Scope accuracy test			yes ☐ no ☐
	Coincidence of trigger and Outp.		⩽ ± 1 ns	....
	2 ns	0.98 ns	3.02 ns	....
	10 ns	8.9 ns	11.1 ns	....
	20 ns	18.8 ns	21.2 ns	....
	50 ns	48.5 ns	51.5 ns	....
	90 ns	88.1 ns	91.9 ns	....
	DOUBLE PULSE			
	20 ns	18.8 ns	21.1 ns	....
	80 ns	78.2 ns	81.8 ns	....
	DELAY SLOW			
	500 ns	494 ns	506 ns	....
	1.00 µs	989 ns	1.01 µs	....
	50.0 µs	49.5 µs	50.5 µs	....
	1.00 ms	990 µs	1.01 ms	....
	500 ms	495 ms	505 ms	....
	900 ms	891 ms	909 ms	....

PERFORMANCE TESTS

Para. No.	Test Description	Result			
				Actual	
		Min	Max	Standard	Opt. 020
4–13	WIDTH				
	10 ns	8.9 ns	11.1 ns	.....	.....
	50 ns	48.5 ns	51.5 ns	.....	.....
	80 ns	78.2 ns	81.8 ns	.....	.....
	500 ns	494 ns	506 ns	.....	.....
	1.00 µs	989 ns	1.01 µs	.....	.....
	50.0 µs	49.5 µs	50.5 µs	.....	.....
	1.00 ms	990 µs	1.01 ms	.....	.....
	500 ms	495 µs	505 ms	.....	.....
	900 ms	891 µs	909 ms	.....	.....
4–14	TRANSITION TIME – FAST				
	LEE 6 ns	4.82 ns	7.18 ns	.....	.....
	20 ns	18.4 ns	21.6 ns	.....	.....
	TRE 6 ns	4.82 ns	7.18 ns	.....	.....
	20 ns	18.4 ns	21.6 ns	.....	.....
	LEE 30 ns	28.1 ns	31.9 ns	.....	.....
	TRE 30 ns	28.1 ns	31.9 ns	.....	.....
4–15	TRANSITION TIME – SLOW				
	LEE 200 ns	193 ns	207 ns	.....	.....
	1 µs	969 ns	1.031 µs	.....	.....
	100 µs	97 µs	103 µs	.....	.....
	1 ms	970 ms	1.03 ms	.....	.....
	9.9 ms	9.61 ms	10.2 ms	.....	.....
	TRE 200 ns	193 ns	207 ns	.....	.....
	1 µs	969 ns	1.031 µs	.....	.....
	100 µs	97 µs	103 µs	.....	.....
	1 ms	969 ms	1.03 ms	.....	.....
	9.9 ms	9.63 ms	10.2 ms	.....	.....
4–16	HIGH LEVEL, [LOW LEVEL 0 V]			HIL/LOL	HIL/LOL
	(50Ω)				
	0.10 V	48 mV	152 mV	...../.....	...../.....
	0.49 V	430 mV	550 mV	...../.....	...../.....
	0.99 V	920 mV	1.06 V	...../.....	...../.....
	1.99 V	1.90 V	2.08 V	...../.....	...../.....
	2.99 V	2.88 V	3.1 V	...../.....	...../.....
	3.99 V	3.86 V	4.12 V	...../.....	...../.....
	7.99 V	7.78 V	8.2 V	...../.....	...../.....
	9.99 V	9.74 V	10.24 V	...../.....	...../.....
	(1 kΩ)				
	10 V	9.7 V	10.3 V	...../.....	...../.....
	13 V	12.64 V	13.36 V	...../.....	...../.....
	17 V	16.56 V	17.44 V	...../.....	...../.....
	19.9 V	19.4 V	20.4 V	...../.....	...../.....

PERFORMANCE TESTS

Para. No.	Test Description	Result			
				Actual	
		Min	Max	Standard	Opt. 020
4–17	AMPLITUDE A + B				
	2.5 V/–2.5 V	4.63 V	5.12 V	..../.....	
	3.75 V/–3.75 V	7.0 V	7.63 V	..../.....	
	4.99 V/–4.99 V	9.35 V	10.1 V	..../.....	
4–18	PULSE ABERRATION pre-shoot, overshoot, ringing, baseline distortion		≤ 5 % ± 10 mV	.....	.....

SECTION V
ADJUSTMENT PROCEDURE

5–0 GENERAL

The adjustment procedure is divided into the following sections as shown:

1. Switched power supply	para 5–1
2. Power supply regulator	para 5–2
3. Shift supply	para 5–3
4. Rate generator	para 5–4
5. Rate clamp adjust	para 5–5
6. Time interval blocks	para 5–6
7. Slope generator	para 5–7
8. Roll-off recheck	para 5–8
9. Slope risetime adjust	para 5–9
10. Output amplifier	para 5–10
11. Output ampl. pulse adj.	para 5–11

All adjustments blocks can be performed independently except:

1. Min. pulse width (A128), which has to be measured at the output.
2. Slope generator A140, as its output has direct influence on the output amplifier.

An adjustment needs only to be performed when the performance test fails or a repair has been performed in a particular section.

This procedure has been written for the STANDARD instrument (one channel). Any differences to opt. 020 (two channels) are mentioned in each section.

NOTE

Allow the instrument a 10 minute warm-up time with closed cover. Keep cover closed between adjustments. Adjustment locations are shown on fold-out page at the end of this section.

5–1 SWITCHED SUPPLY ADJUST

Only necessary if the switched supply voltage is out of order, (to test this see steps 6 to 9), or after a repair in this area. (See also steps 10 to 14).

EQUIPMENT:

Galvanic separated variable AC source.
Oscilloscope, high voltage probe, DVM.

WARNING

Voltages can be dangerous to life.

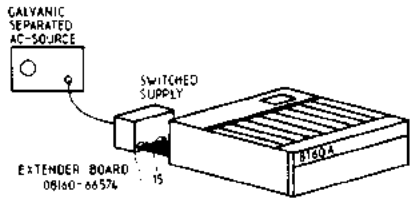


Figure 5–1

PROCEDURE:

1. Connect AC source and supply as shown in Figure 5–1.
2. Connect the scope via HV probe to collector of Q101 or Q102.
3. Reduce AC source while watching the positive going edge of the waveform (figure 5–2).

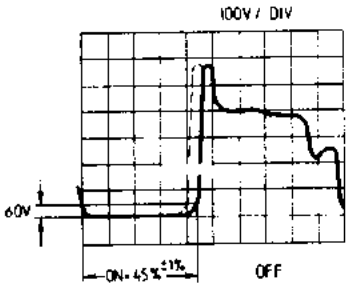


Figure 5–2

4. The maximum duty cycle is reached when jitter stops.
5. With the AC source at this point, adjust A11 R140 to a max. duty cycle of 45% ± 1%.
6. Set the variable AC source to 180 V (90 V).
7. Measure the +5 V fx and −5 V fx output with the DVM and leave the DVM connected to the output with the lower absolute value.
8. Adjust this voltage for (−) 6.36 V + 10 mV via A11 R102.
9. Check voltages in table 5–1, for A1 J1.

Table 5–1.

Voltages	J1 pin	limit	voltage without load (unplugged)
± 20 V fx	8 / 3	⩾24 V	< 32 V
± 20 V fl	14 / 11	⩾ 24 V	< 32 V
± 5 V fx	6,7 / 4,5	⩾ 6.6 V	< 10 V
± 5 V fl	13 / 12	⩾ 7.6 V	< 10 V
+ 12 V	9	⩾ 15.8 V	< 20 V
– 12 V	10	⩾ –15.4 V	< –20 V

10. Minimum duty cycle adjust

This adjustment usually needs no re-calibration except when a repair has been performed in this area. If a repair has been performed, this adjustment should be performed first before any other.

PROCEDURE

11. Use same set-up as in troubleshooting figure 8–3–7.
12. Set 6200B to +40 V, connecting the negative pole to TP8 and the positive pole to the junction of CR108/CR109 anode. Leave R137 connected, or use an external resistor with the same value. Connect scope to TP4.
13. Increase 6200B voltage to a point just before oscillation disappears.
14. Adjust A11 R101 for a positive pulse width of 1.25 µs ± .25 µs.

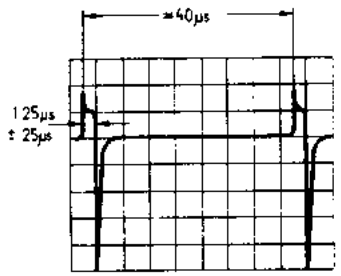


Figure 5–3

5–2 SERIES REGULATORS

EQUIPMENT:

DVM with floating input
Variable galvanic separated AC source

Test set-up:

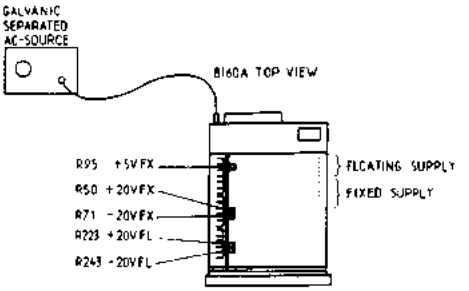


Figure 5–4

PROCEDURE:

1. Set AC source to corresponding voltage (110 V or 220 V).
2. Connect DVM low terminal to gnd ⊥ and measure fixed supply.
   Adjust +5 V fx via A18 R95 to 5.00 V ± 10 mV.
   Measure –5 V fx. It should be –5 V ± 30 mV.
   Adjust +20 V fx via A18 R50 to 20 V ± 20 mV.
   Adjust –20 V fx via A18 R71 to –20 V ± 20 mV.
3. Connect DVM low terminal to floating gnd and measure floating supply.
   Measure 5 V fl. It should be 5 V ± 30 mV.
   Measure –5 V fl. It should be –5 V ± 30 mV.
   Adjust 20 V fl via A18 R223 to 20 V ± 20 mV.
   Adjust –20 V fl via A18 R243 to –20 V ± 20 mV.

5–3 SHIFT SUPPLY ADJUST

EQUIPMENT:

DVM

Test set-up: same as figure 5–4.

PROCEDURE:

1. Connect DVM between gnd ⊥ and floating gnd ⏚ testpoints on motherboard.
2. Press RCL 0 and ENABLE.
   Set HIL A to 9.99 V and LOL A 0.00 V.
   Set HIL B to 9.99 V and LOL B 0.00 V (if opt. 020 is installed).

3. Adjust A150 R15 for 10.00 V ± 50 mV.
4. Set HIL A to 1 V and LOL A to −1 V.
   Set HIL B to 1 V and LOL B to −1 V (if opt. 020 is installed).
5. DVM should read 0 V ± 200 mV.

5–4 RATE GENERATOR

EQUIPMENT:

DVM, Counter, Cable 08160–61610

Test set-up:

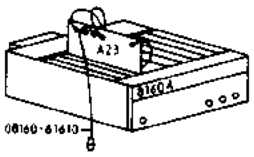


Figure 5–5

PROCEDURE:

1. Set Rate Board A23 on Extender Board 08160–66573 and connect trigger output to counter.
2. Set 8160A: DEL 0 ns
   WID 8 ns
   PER 100 ns
3. Connect DVM to TP5 (U72 pin 7) and ground. Adjust A23 R141 for −5 V ± 20 mV (D/A converter slope).
4. Set period to 99.9 ns.
5. With DVM still at TP5, adjust A23 R159 for −500 mV ± 2 mV (D/A converter offset).
6. Repeat steps 2 to 5 until the voltages are within tolerance.
7. Set Counter for period measurement.
8. Set 8160A period to 999 ns and adjust A23 R141 for 999 ns ± 3 ns.
9. Set period to 100 ns and adjust A23 R79 for 99.5 ns ± 0.3 ns.
10. Repeat steps 8 and 9 until periods are within tolerance (see Figure 5–6).
11. Adjust A23 R74, R78 and C19 to mid-range position.
12. Set 8160A period to 99.9 ns and adjust A23 C21 for 99.9 ns ± 0.3 ns.
13. Set period to 20 ns and adjust A23 R78 for 20 ns ± 0.1 ns.
14. Repeat step 12.
15. Measure 8160A period at 20 ns and 35 ns settings and calculate the relative error.
16. If error at 20 ns is higher, set period to 20 ns and adjust A23 R78 for 20 ns ± 0.2 ns.
17. If error at 35 ns is higher, set period to 35 ns and adjust A23 R74 for 35 ns ± 0.3 ns.
18. Repeat steps 15 to 17 until period at 20 ns and 35 ns settings are within ± 1.5% of setting.
19. Set period to 99.9 ns and adjust C21 for 99 ns ± 0.3 ns.
20. Remove Extender Board. Re-connect A23 and replace 8160A top cover. Allow 10 minute warm-up time.
21. Measure period accuracy by spot checks:
    range < 100 ns —— ± 2% of programmed value ± 0.2 ns
    range > 100 ns —— ± 1.5% of programmed value at 25°C
22. If necessary, re-adjust rate.

NOTE: Service hint – do not readjust C19 during calibration procedure, except in step 11 if it is out of mid-range position.

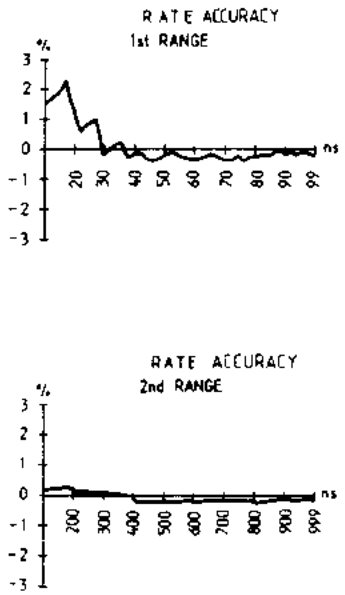


Figure 5–6

5–5 RATE CLAMP ADJUST

EQUIPMENT:

Pulse generator, sampling scope, 20 dB attenuator.

Test set-up:

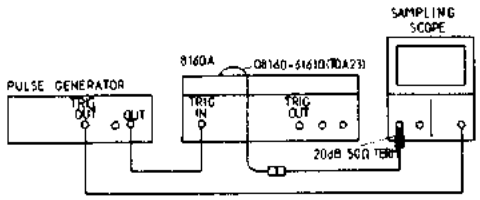


Figure 5–7

PROCEDURE:

1. Pulse generator settings: square wave, 1 ns transitions, about 300 ns period and 3 V amplitude.
2. Connect pulse generator to 8160A ext input.
   Connect sampling scope to rate output and trigger externally with external pulse generator.
   Set the 8160A as follows:
   INPUT MODE – GATE
   SLOPE – POS
   PERIOD – 30 ns
   Adjust 8160A front panel trigger level for gated pulse on rate output.
3. Adjust A23 R57 for minimum distance between first and second pulse without additional propagation delay (figure 5–8).

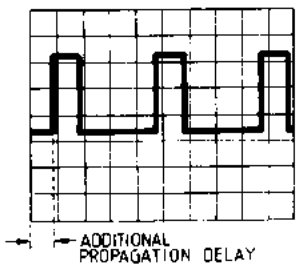


Figure 5–8

Trigger Symmetry Adjust

4. Insert 20 dB attenuator between ext. pulse generator and 8160A EXT input.
5. Set ext. pulse generator to 1 μs period, square wave, transition times to almost form a triangle, amplitude about 1 V, no offset, and 8160A input switch to 50 Ω.
6. Adjust the 8160A front panel trigger level for a gated signal at the rate output.
7. Adjust A23 R30 for same signal in EXT SLOPE pos. and neg. mode.

5–6 TIME INTERVAL BLOCK ADJUST – WIDTH TRIGGER

EQUIPMENT:

Sampling scope, 2 test cables 08160–61610, active probe.

Test set-up:

Connect 8160A trigger out to sampling scope ext. trig.

PROCEDURE:

Settings: Set delay/width switch of **all time interval blocks** A128, A228 (if opt. 020, A328, A428 as well) **to delay.** 1 2 3 4

Set channel switches [1 1 | 1] as follows:
A128 to 1, A228 to 2 (stimulates opt. 020)
(Opt. 020 A328 to 1, A428 to 2).
Turn 8160A off and on.

Set 8160A: PER 90 ns

DEL A	0 ns	DEL B	0 ns
WID A	8 ns	WID B	8 ns
LEE A	3 ns	LEE B	3 ns
TRE A	3 ns	TRE B	3 ns

1. Using a sampling probe with isolator, measure signal at 50 ohm connecting board between A126 and A127 (signal out and width trigger) as shown in Figure 5–9. With the reference signal probed, adjust the sampling scope delay control so that the leading edge of the reference pulse is in the center of the graticule.

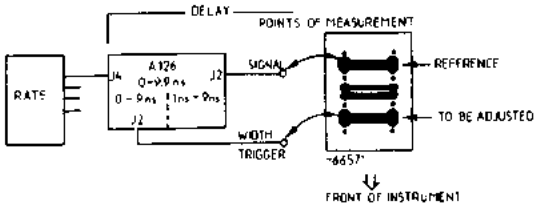
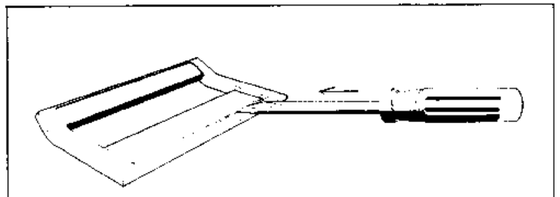


Figure 5–9

2. Change the probe connection to the width trigger and adjust A126 R138 for 0 ± 50 ps difference between width trigger and graticule center as shown in Figure 5–10.
3. Repeat for A226.



Lift a corner of the plastic trim with a screwdriver and give a sharp tap in the direction of the arrow.

Figure 2–4. Removing Plastic Trim

2–21 CLAIMS AND REPACKAGING

2–22 Claims for Damage

2–23 If physical damage is evident or if the instrument does not meet specification when received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2–24 Storage and Shipment

2–25 The instrument can be stored or shipped at temperatures between −20°C and 70°C. The instrument should be protected from temperature extremes which cause condensation within the instrument.

2–26 If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office, attach a tag showing owner, return address, model number and full serial number and the type of service required. The original shipping carton and packaging material may be re-usable but the Hewlett-Packard Sales/Service office will also provide information and recommendations on materials to be used if the orignal packing is not available or reusable. General instructions for re-packing are as follows:

1. Wrap instrument in heavy paper or plastic.

2. Use strong shipping container. A double wall carton made of 350-pound test material is adequate.

3. Use enough shock-absorbing material (3 to 4-inch layer) around all sides of instrument to provide firm cushion and prevent movement inside container. Protect control panel with cardboard.

4. Seal shipping container securely.

5. Mark shipping container FRAGILE to encourage careful handling.

6. In any correspondence, refer to instrument by model number and serial number.

4. Repeat for A326 if opt. 020 is installed.
5. Repeat for A426 if opt. 020 is installed.
6. **Delay 0 adjust, width trailing edge adjust.**
7. Set 8160A: DEL A 20 ns DEL B 20 ns
   Set delay/width switch on A128 to width.
8. Connect test cable 08160–61610 to A128 output and to sampling scope via 50 ohm termination.
9. Set leading edge of pulse to center of graticule as reference.
   (Scope resolution 200 ns). Set delay/width switch back to delay.
10. Set 8160A: DEL A 0 ns DEL B 0 ns

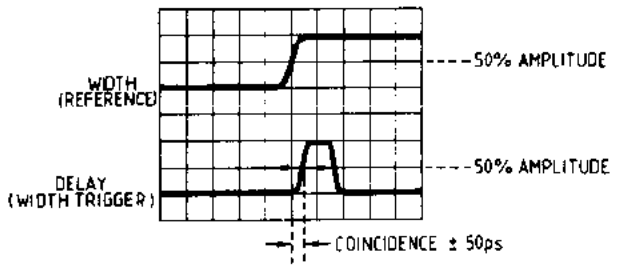


Figure 5–10

11. Adjust A128 R19 for coincidence (± 50 ps) between leading edge of delay mode pulse and leading edge of width mode pulse.
12. Repeat steps 7 to 11 for A228.
13. If Opt. 020 is installed, repeat steps 7 to 11 for A328 and A428.
14. Set delay/width switch of A128 to delay, set DEL A to 20 ns, DEL B to 20 ns.
15. Set the leading edge of the delay pulse to center of display as reference (resolution of scope 200 ns).
16. Set delay/width switch on A128 to width.
17. Adjust trailing edge of width pulse via A128 R239 to within limits of +300 ps or −50 ps (see Figure 5–11) of coincidence with leading edge of delay pulse.

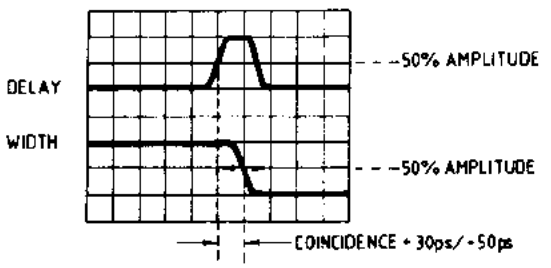


Figure 5–11

18. Repeat steps 14 to 17 for A228.
19. If opt. 020 installed, repeat steps 14 to 17 for A328 and A428.
20. Reset address switches to original position.

Reference Trigger Adjust

21. Set 8160A: DEL 0 ns.
    By using two test cables 08160–61610, connect sampling scope channel A to ref. trigger out on A127. and channel B to signal out on A128.
    NOTE: Both cables must be of exactly the same length. If necessary perform a cross check.
22. With a scope resolution of 200 ps/cm adjust A128 R112 for signal coincidence.

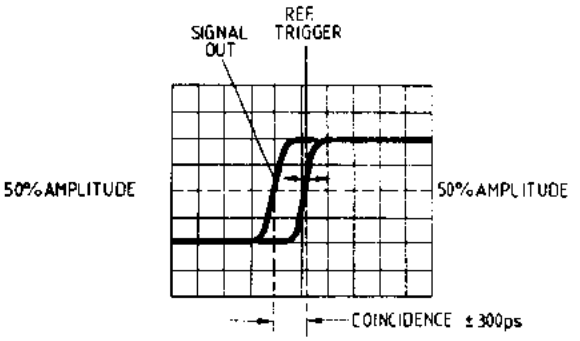


Figure 5–12

23. Repeat step 21 and 22 for A228 and adjust A228 R112.
24. If Opt. 020 installed, repeat steps 21, 22 for A328 and A428.

Long Time Delay Adjust

Test set-up

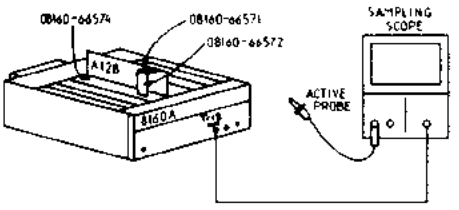


Figure 5–13

25. Put A128 on extender board 08160–66573, and connect extender board 08160–66572 as shown in Figure 5–13.

26. Set 8160A: PER 400 ns DEL A 200 ns
    DEL B 200 ns
27. Trigger the sampling scope externally, and connect the probe via isolator across A128 R26.
28. Adjust, via A128 R37, the switching spike of the "Cut-Off monostable Multivibrator" to about 13 ns after the trailing edge (see Figure 5–14).

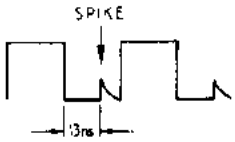


Figure 5–14

29. Set 8160A: PER 2 ms DEL A 1 ms
    DEL B 1 ms
    Set delay/width switch to width.
    Set counter trig. level A –.3 V,
    B .3 V, COM
    Connect A128 signal output to counter and check width measurement is 1 ms.
30. Adjust A128C10 for 1.0014 ms ± .0005 ms on counter.
31. Put A128 back into mainframe and set delay/width back to delay.
32. Repeat steps 25 to 31 with A228 (leave switch in width pos). If opt. 020 installed, repeat steps 25 to 31 with A328 (delay) and A428 (width).

Short Time Delay Adjust

EQUIPMENT:

Time marker, sampling scope.

Test set-up:

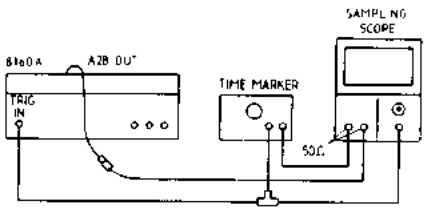


Figure 5–15

PROCEDURE:

Set time marker to 2 ns.
Set delay/width switches of all TI blocks to delay.

Set 8160A: PER 70 ns, DEL A 0 ns, DEL B 0 ns
Adjust external TRIG LEVEL for coincidence of leading edge of delay pulse and leading edge of time mark signal as shown in Figure 5–16.

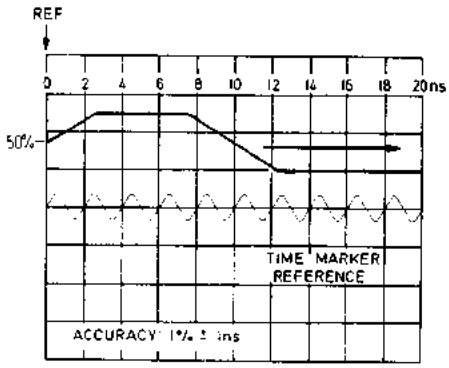
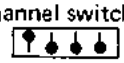
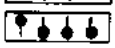
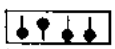
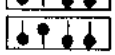


Figure 5–16

1. Check delay 0.1 to 0.9 ns. If .5 ns range is out of spec, adjust A26C8 (increasing A26C8 increases delay).
2. In the following table set 8160A to necessary range and adjust the corresponding resistor.
   1 ns adjust A126R151
   2 ns adjust A126R153
   3 ns adjust A126R155
   4 ns adjust A126R157
3. Make spot checks up to 50 ns (with time marker reference).
4. Repeat short time delay adjust for A226.
5. If opt. 020 is installed repeat for A326 and A426 respectively.
6. Set delay/width switches and channel switches:
   A128 DELAY Channel  1
   A228 WIDTH Channel  1
7. If opt. 020 installed
   A328 DELAY Channel  2
   A428 WIDTH Channel  2
   Turn 8160A off and on.
8. Connect calibrated sampling scope to 8160A output and perform para 5–11 steps 11 and 12. (Or use performance set-up Fig. 4–11/4–12 to adjust width).

5–7 SLOPE GENERATOR ADJUST

A re-adjust of the slope generator also requires the output ampl. adjust of para 5–10, steps 1 to 19.

EQUIPMENT:

Oscilloscope, DVM (with sample hold), counter, time interval probe, test cable 08160–61610, 10:1 probe.

Test set-up:

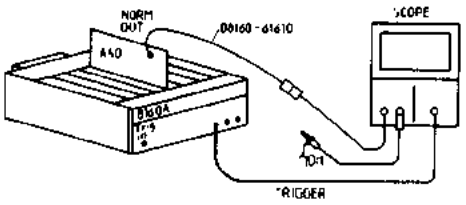


Figure 5–17

PROCEDURE:

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1. Set 8160A: RCL 0 set

PER	100 µs
DEL	0 ns
WID	50 µs
LEE	5 µs
TRE	5 µs
ENABLE	

2. Turn A140 R127 fully ccw and R142 cw, and connect scope as shown in Figure 5–17. Terminate slope output with 50 ohm, and set scope DC-coupled, ext. trigger, ALT, time base 10 µs/div.
3. Adjust scope vernier and position to get a 6 div. display.
4. Connect probe, dc-coupled, to cathode of A140 CR8.
5. Turn A140 R127 fully cw and R142 ccw. Set channel B vernier and position of scope for same pulses as channel A.
6. Adjust A140 R127 for about 3 % more amplitude on B pulse top (.18 div).
7. Adjust A140 R142 for about 3 % more amplitude on B pulse bottom (.18 div).

5–8 ROLL-OFF RECHECK

Test set-up:

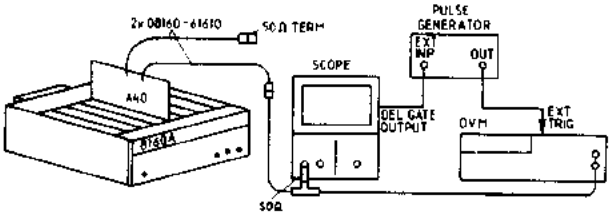


Figure 5–18

PROCEDURE:

1. Connect equipment as shown in Figure 5–18 with pulse gen. to ext. trigger. Set scope and pulse generator to produce a display as shown in figure 5–19.
   Set 8160A: PER 50 ms, WID 25 ms, TRE 50 µs.

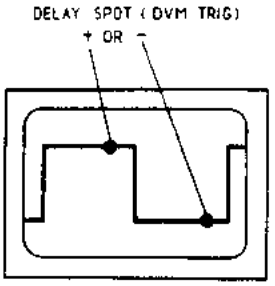


Figure 5–19

2. A change of LEE from 99.9 µs to 100 µs should give a DVM variation of less than ± 5 mV on pulse top.
3. Set 8160A: LEE 50 µs.
   Measure bottom of pulse.
4. A change of TRE from 99.9 µs to 100 µs should give a DVM variation of less than ± 5 mV on pulse bottom.
   If the roll-off re-check fails, repeat 5–7 steps 1 to 7 with 4 % more amplitude on pulse top and bottom.

Amplitude and Offset

5. With same test set-up as before (Figure 5–18), set 8160A: PER 50 ms, WIDTH 25 ms, LEE 5 µs, TRE 5 µs.
6. Trigger DVM about 20 ms after LEE 80 % (with scope delay – see figure 5–19).
   Measure top level and write down V NORM.

7. Connect slope COMP output to DVM, measure top level and write down V COMP.
8. Calculate the following formula

$$\frac{\text{Top level NORM + Top level COMP}}{2} = \quad \text{V}$$

9. Adjust top level via A140 R207 to the result of the formula ± 5 mV.
10. Change DVM trigger by scope delay (figure 5–19) and measure bottom level.

$$\frac{\text{Top level NORM + Top level COMP}}{2} - 1.25\ \text{V} = \quad \text{V}$$

11. Adjust the bottom level with A140 R251 to the result of the second formula ± 5 mV.

5–9 SLOPE RISETIME ADJUST

Test set-up:

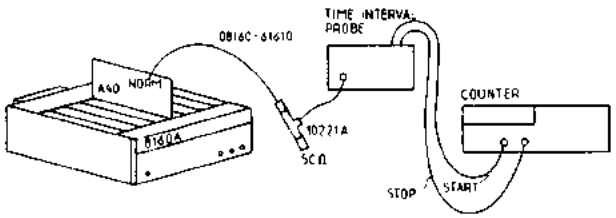


Figure 5–20

1. With a calibrated sampling scope, calibrate the Time Interval Probes at 50 ns. Put A140 on extender board 08160–66573.
2. Set 8160A: PER 600 µs, WID 300 µs, LEE 5 µs, TRE 99.9 µs.
3. To get the 10 % and 90 % level use following formulae with the voltage from previous test:

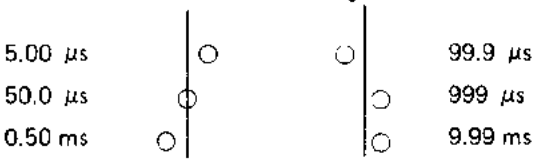
$$\frac{\text{Top level NORM + Top level COMP}}{2} - .125 = 90\ \%$$

$$\frac{\text{Bottom level NORM + Bottom level COMP}}{2} + .125 = 10\ \%$$

4. In the following 3 ranges, measure the low end and the high end of each range (LEE). Note the deviation:

LEE	TRE	LEE	TRE
5.00 µs –	99.9 µs	99.9 µs –	5.00 µs
____ µs –	____ µs	____ µs –	____ µs
50.0 µs –	999 µs	999 µs –	50.0 µs
____ µs –	____ µs	____ µs –	____ µs
0.50 ms –	9.99 ms	9.99 ms –	0.50 ms
____ ms –	____ ms	____ ms –	____ ms

absolute values (example)



5. With reference to the 3 low end deviations, select the range which corresponds to the second largest value.
6. Adjust the low end of this range to its nominal value via A140 R113 (min leading edge current).
7. With reference to the 3 high end deviations, select the range which corresponds to the second largest value.
8. Adjust the high end of this range to its nominal value via A140 R83 (max. leading edge current).
9. Set 8160A: LEE 99.9 µs, TRE 5 µs.
   Repeat steps 4 to 8 and adjust A140 R196 low end (min trailing edge current) and adjust A140 R41 for high end (max trailing edge current).
10. Set 8160A: PER 60 µs, WID 30 µs, LEE 500 ns, TRE 9.99 µs.
    Check LEE: 500 ns ± 5 ns, TRE: 9.99 µs ± 100 ns.
    Set 8160A: LEE 9.99 µs, TRE 500 ns.
    Check LEE: 9.99 µs ± 100 ns, TRE 500 ns ± 5 ns.
    If necessary change A140 C25 ≈ 30 pF per 1 %.
11. Connect slope NORM output to a calibrated sampling scope.
12. Set 8160A: PER 6 µs, WID 3 µs, LEE 100 ns, TRE 999 ns.
13. Measure LEE and adjust A140 C19 to 100 ns ± 1 ns, then set 8160A LEE 999 ns, TRE 100 ns.
14. Measure TRE edge and align both LEE and TRE for 100 ns ± 1.5 ns via A140 C19.
15. Put A140 back into mainframe, re-connect 50 ohm cables.
16. Connect calibrated sampling scope to 8160A output.
17. Perform Amplifier Pulse adj. para 5–11, steps 5 to 10.

5–10 OUTPUT AMPLIFIER ADJUST

Pre-condition for this adjustment is the correct function of roll off. Re-check 5 – 8 steps 1 to 4.

EQUIPMENT:

Oscilloscope,
DVM with sample hold, pulse generator,
sampling scope,
storage scope,
20 dB attenuator
1:1 scope probe

Vernier symmetry adjust

PROCEDURE:

Set 8160A: PER 0.5 ms, WID 0,25 ms, LEE/TRE 20 ns
HIL +4.99 V, LOL –4.99 V

1. Set oscilloscope: AC-coupled, sensitivity 5 mV/div time base .2 ms/div.
2. Connect scope via 1:1 probe to A151Q200 emitter (see figure 5–21).
3. Adjust A151R208 for min signal on screen.
4. Set 8160A: HIL +0.49 V, LOL –0.49 V.
5. Adjust A151R206 for min signal on screen.

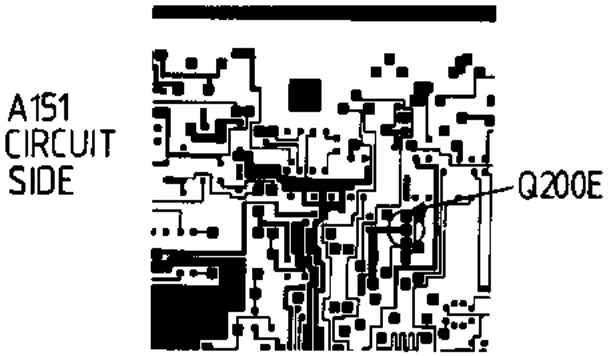


Figure 5–21

Amplifier Offset Adjustments

Test set-up:

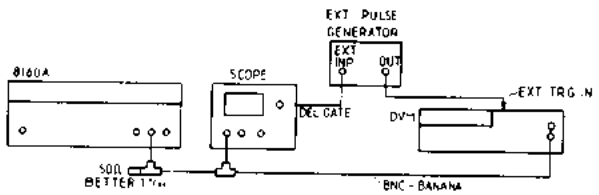


Figure 5–22

Set 8160A: PER 50 ms, WID 25 ms, HIL +4.99 V, LOL –4.99 V, LEE/TRE 20 ns, Output mode 50 ohm, NORM

PROCEDURE:

Set scope: Time base 5 ms/div
Delay time base .1 ms/div
Set delay time to 20 ms after pulse edge
Sweep Mode: NORM
Internal Trigger

NOTE: Before proceeding with this section, make sure the pulse flatness is better than 1 %. If not, then perform Amplifier AC adjustment first.

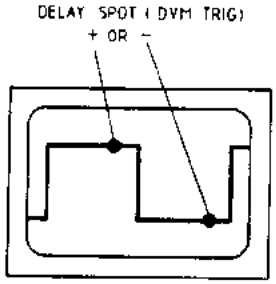


Figure 5–23

1. While switching from NORM to COMP adjust A151R107 for min difference on DVM reading (≤ 5 mV).
2. Set 8160A: HIL 0.5 V, LOL –0.5 V.
3. While switching scope trigger slope from + to – and back, adjust A151R311 for min.difference on DVM reading.
4. Set 8160A: HIL 1 V, LOL –1 V.
5. While switching scope slope trig from + to – and back, adjust A151R308 for min.difference on DVM reading.
6. Set 8160A: HIL 0.49 V, LOL –0.49 V.
7. While switching scope slope trig from + to – and back, adjust A151R289 for min. difference on DVM reading.
8. Repeat steps 3 to 7 for min. difference.

Amplifier Gain Adjustments

9. Set 8160A: HIL 3.98 V, LOL –3.98 V, output mode 1 kohm. Adjust via A151R264 for a high level of 4.014 V ± 10 mV.
   Set scope slope trig to – and measure low level: –4.014 V ± 10 mV.
10. Set 8160A: HIL 1.99 V, LOL –1.99 V, output mode 50 ohm.
    Adjust A151R275 for a high level of 2.00 V ± 7 mV.

Set scope slope trig to – and measure low level: –2.00 V ± 7 mV.

11. Set 8160A: HIL 1 V, LOL –1 V.
    Adjust A151R247 for a high level of 1.004 V ± 3 mV.
    Set scope slope trig to – and measure low level: –1.004 V ± 3 mV.
12. Set 8160A: HIL 2.99 V, LOL –2.99 V.
    Adjust A151R268 for a high level of 3.008 V ± 10 mV.
    Set scope slope trig to – and measure low level: –3.008 V ± 10 mV.
13. Set 8160A: HIL 3.99 V, LOL –3.99 V.
    Adjust A151R266 for a high level of 4.014 V ± 12 mV.
    Set scope slope trig to – and measure low level: –4.014 V ± 12 mV.
14. Set 8160A: HIL 0.99 V, LOL –0.99 V.
    Adjust A151R212 for a high level of .994 V ± 2 mV.
    Set scope slope trig to – and measure low level: – .994 V ± 2 mV.
15. Set 8160A: HIL 0.49 V, LOL –0.49 V.
    Adjust A151R224 for a high level of 0.49 V ± 2 mV.
    Set scope slope trig to – and measure low level: –0.49 V ± 2 mV.

If low level in one of the tests above is out of limit, verify Amplifier Offset Adjust.

16. Set 8160A: HIL 15.6 V, LOL 15.4 V, output mode 1 kohm.
    Adjust A151R403 for a high level of 15.6 V ± 20 mV.
    Set scope slope trig to – and measure low level: 15.4 V ± 30 mV.
17. Set 8160A: HIL –15.4 V, LOL –15.6 V.
    Adjust A151R435 for a low level of –15.6 V ± 20 mV.
    Set scope slope trig to + and measure high level: 15.4 V ± 20 mV.
18. Set 8160A: HIL 5.20 V, LOL +5.0 V.
    Adjust A150R14 for a high level of 5.2 V ± 10 mV.
    Set scope slope trig to – and measure low level: +5.0 V ± 10 mV.
19. Set 8160A: HIL 7.73 V, LOL 7.63 V, output mode 50 ohm.
    Adjust A151R401 for a high level of 7.73 V ± 5 mV.
    Set scope slope trig to – and measure low level: 7.63 V ± 5 mV.

Amplifier AC Adjustments

Test set-up:

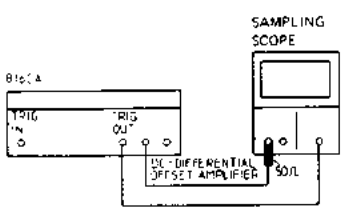


Figure 5–24

PROCEDURE:

Set 8160A:	PER	2 ms
	DEL	.1 ms
	WID	1 ms
	HIL	8 V
	LOL	0.00 V

1. Set vertical sensitivity to .2 V, turn offset and position for top level on center of screen (sensitivity 2 % / div now).
2. Check that flatness of high level between 200 μs and 400 μs after pulse step is better than .2 %.
3. Set 8160A: PER 400 μs
   DEL 20 μs
   WID 200 μs
   Scope time base: 20 μs
4. Check that flatness of pulse top between 2 μ and 200 μs after pulse step is better than 0.5 %.
5. Set 8160A: PER 6 μs
   DEL .5 μs
   WID 3 μs
   Set scope time base: 200 ns/div
6. Check that flatness of pulse is better than 1 %.
7. If one of the above limits fails, perform steps 8 to 17.
8. Using same equipment as in steps 1–7.
   Set A151 R131 – R135 to fully cw and R472 to mid position.
9. Set 8160A: PER 2 ms
   DEL .1 ms
   WID 1 ms
   HIL 8 V
   LOL 0 V
   Set vert. sensitivity .2 V so 1 div = 2 %.
10. Adjust A151 R131 for best flatness (< .2 %) between 200 μs and 400 μs after pulse step.
11. Set 8160A: PER 400 μs
    DEL 20 μs
    WID 200 μs
12. Adjust A151 R132 for best flatness (< .4 %) between 20 μs and 200 μs after pulse step.
13. Adjust A151 R133 for best flatness (< .5 %) between 2 μs and 20 μs after pulse step.
14. Set 8160A: PER 20 μs
    DEL 2 μs
    WID 10 μs
    Set scope time base to 1 μs
15. While switching 50 ohm – 1 kohm adjust alternately A151 R472 and A151 R134 for best flatness (< 1 %) in both modes.
16. Set 8160A: PER 6 μs
    DEL .5 μs
    WID 3 μs
17. Adjust A151 R135 for a flatness of better 1 %.
18. Repeat steps 9 to 17 carefully for fine adjust.

5–11 AMPLIFIER PULSE ADJUSTMENT

Test set-up: (if sampling scope is not accurate enough, use the performance test set-up in Figure 4–11).

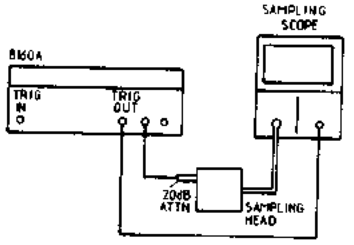


Figure 5–25

PROCEDURE:

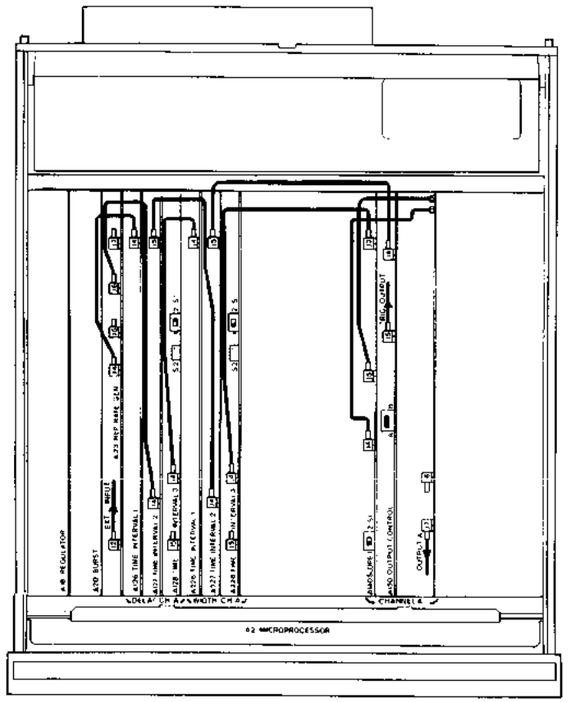
Set 8160A:	PER	100 ns	LEE	3 ns
	DEL	0 ns	TRE	3 ns
	WID	50 ns	HIL	8.00 V
			LOL	0.00 V

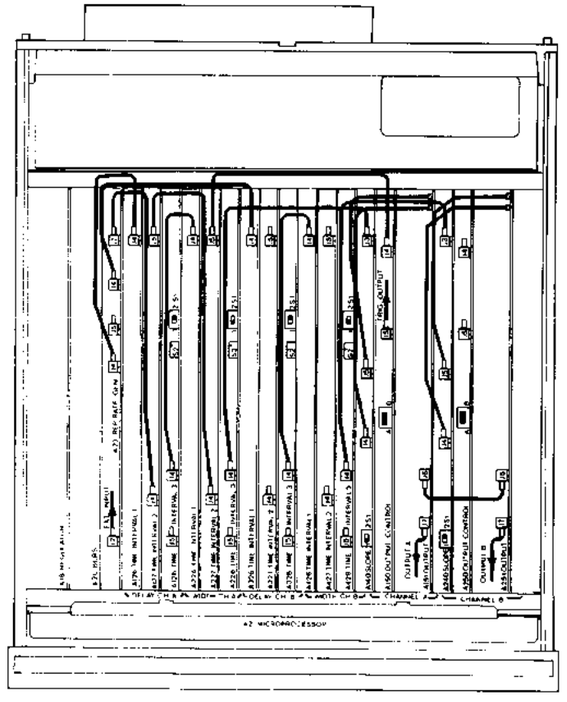
Set scope time base: norm 20 ns/div
expand 1 ns/div
set to expand
Set vertical resolution to 10 % per div.

1. Adjust A151R118 for a rise and falltime of < 6 ns while pulse perturbation is ≤ 5 %.
   If risetime does not meet spec see step 9.
2. Set 8160A: HIL 1.99 V
   LOL 0.0 V
   Remove 20 dB attenuator.
3. While switching NORM – COMP adjust A151R137 for ≤ 5 % pulse perturbation.
4. Repeat steps 1 to 3.
5. Set 8160A: RCL 0

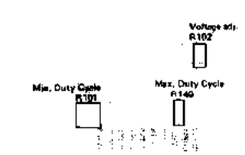
PER	100 ns	TRE	10 ns
WID	50 ns	HIL	1 V
LEE	10 ns	LOL	–1 V

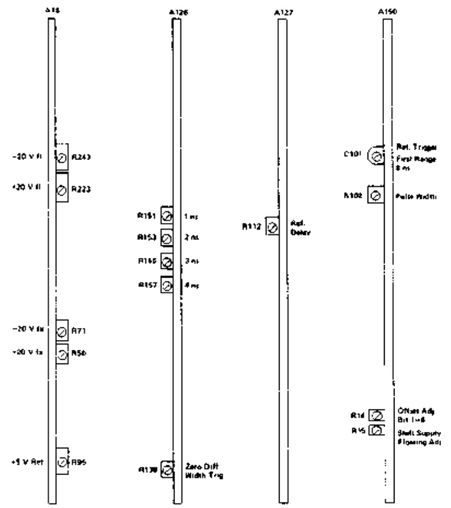
6. Measure LEE with calibrated sampling scope and adjust if necessary A140C18 for 10 ns ± .7 ns (set A140 on extender).
7. Measure TRE for same value and compromise if necessary LEE/TRE for 10 ns ± .7 ns.
8. Set 8160A: LEE 3 ns
   TRE 3 ns
9. Measure LEE and adjust A140R87 for < 6 ns.
   Measure TRE and adjust A140R90 for < 6 ns.
10. If risetime does not meet spec see step 1.
11. Set 8160A: PER 50 ns
    DEL 0 ns
    WID 10 ns
12. Measure width at 50 % of amplitude for 10 ns ± .7 ns and re-adjust if necessary A228R239 for 10 ns ± .7 ns.
13. Set 8160A: PER 100 ns
    DEL 0 ns
    WID 10 ns
14. Connect scope channel A to trigger output of 8160A and trigger scope ext. with output of 8160A.
15. Measure pulse width for 40 ns ± 4 ns. If necessary adjust A150R102 for 40 ns ± 4 ns.
16. Set 8160A: PER 1 μs
    Measure pulse width for 400 ns ± 40 ns. If necessary repeat step 15 for best compromise.
17. Set 8160A: 99.9 ns
    Measure pulse width for 8 ns ± 1 ns. If necessary adjust A150C101 for 8 ns ± 1 ns.
18. Connect scope channel A to trigger output and scope channel B to channel A of 8160A.
19. Measure delay between trigger output and pulse output: 0 ns ± 300 ps.
20. If delay is out of limit change A150C112 (asterisk value 0 to 10 pF).
21. If opt. 020 installed repeat complete output ampl. procedure for channel B.



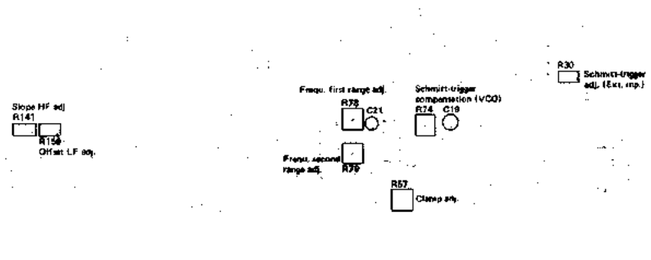


A11 BD AY SWITCHING REGULATOR

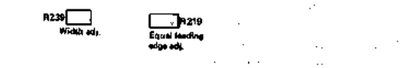


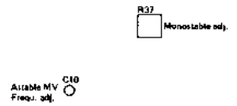


A23 BD AY REPETITION RATE GENERATOR

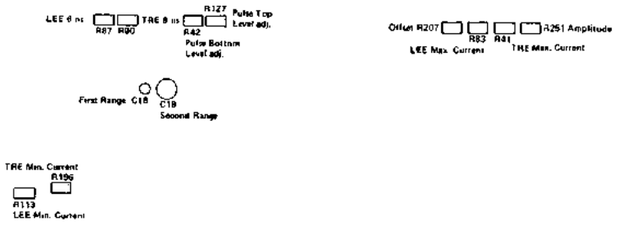


A128 BD AY TIME INTERVAL 3





A40 BD AY SLOPE GENERATOR



SECTION VI
REPLACEABLE PARTS

6–1 INTRODUCTION

6–2 This section contains information for ordering parts. Table 6–1 lists abbreviations used in the parts lists and elsewhere in the manual. Table 6–2 contains the names and address that correspond to the manufacturers code numbers. Table 6–3 list all the replaceable parts in reference designator order. Parts pertaining to Option 020 are also listed in Table 6–3 but are printed on the blue pages at the end of the table.

6–3 ABBREVIATIONS

6–4 Table 6–1 lists abbreviations used in the parts lists, schematics and elsewhere in the manual. In some cases two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts lists are always all capitals. However, in the schematics and other parts of the manual, the same abbreviations may have upper and lower case letters.

6–5 REPLACEABLE PARTS

6–6 Table 6–3 is the list of replaceable parts and is organised as follows:

a. Mainframe (chassis) parts in alphanumerical order by reference designation
b. Electrical assemblies and their components in alpha-numerical order by reference designation.

Reference designators are of the form A5R9 i. e. resistor 9 on assembly 5.

6–7 The information given for each part consists of the following:

a. The Hewlett-Packard part number.
b. The total quantity (Qty) in the instrument. This is given only once for each part – at the first appearance of the part in the list.
c. The description of the part.
d. A typical manufacturer of the part in a five-digit code.
e. The manufacturers' code number for the part.

A list relating manufacturers to their respective codes is given in Table 6–2.

6–8 ORDERING INFORMATION

6–9 To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office (list of Sales/Service offices at the rear of this manual).

6–10 To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required, address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATIONS

A . . . . . assembly
AT . . attenuator; isolator, termination
B . . . . . fan; motor
BT . . . . . battery
C . . . . . capacitor
CP . . . . . coupler
CR . . . . . diode; diode thyristor, varactor
DC . . . directional coupler
DL . . . . . delay line
DS . . . . . annunciator; signaling device (audible or visual); lamp; LED
E . . . . . miscellaneous electrical part
F . . . . . fuse
FL . . . . . filter
H . . . . . hardware
HY . . . . . circulator
J . . . . electrical connector (stationary portion); jack
K . . . . . relay
L . . . . . coil; inductor
M . . . . . meter
MP . . . . . miscellaneous mechanical part
P . . . electrical connector (movable portion); plug
Q . . . . . transistor; SCR; triode thyristor
R . . . . . resistor
RT . . . . . thermistor
S . . . . . switch
T . . . . . transformer
TB . . . . . terminal board
TC . . . . . thermocouple
TP . . . . . test point
U . . . . integrated circuit; microcircuit
V . . . . . electron tube
VR . . . . voltage regulator; breakdown diode
W . . . . cable; transmission path; wire
X . . . . . socket
Y . . . . crystal unit (piezoelectric or quartz)
Z . . . . tuned cavity; tuned circuit

ABBREVIATIONS

A . . . . . ampere
ac . . alternating current
ACCESS . . . . accessory
ADJ . . . . . adjustment
A/D . . . . analog-to-digital
AF . . . . audio frequency
AFC . . . . . automatic frequency control
AGC . . . . automatic gain control
AL . . . . . aluminum
ALC . . . . automatic level control
AM . . . amplitude modulation
AMPL . . . . . amplifier
APC . . . . automatic phase control
ASSY . . . . . assembly
AUX . . . . . auxiliary
avg . . . . . average
AWG . . . . American wire gauge
BAL . . . . . balance
BCD . . . . binary coded decimal
BD . . . . . board
BE CU . . . . . beryllium copper
BFO . . . beat frequency oscillator
BH . . . . . binder head
BKDN . . . . . breakdown
BP . . . . . bandpass
BPF . . . . bandpass filter
BRS . . . . . brass
BWO . . . . backward-wave oscillator
CAL . . . . . calibrate
ccw . . . counter-clockwise
CER . . . . . ceramic
CHAN . . . . . channel
cm . . . . . centimeter
CMO . . cabinet mount only
COAX . . . . . coaxial
COEF . . . . . coefficient
COM . . . . . common
COMP . . . . . composition
COMPL . . . . . complete
CONN . . . . . connector
CP . . . . . cadmium plate
CRT . . cathode-ray tube
CTL . . . . complementary transistor logic
CW . . . . continuous wave
cw . . . . . clockwise
cm . . . . . centimeter
D/A . . . . digital-to-analog
dB . . . . . decibel
dBm . . . decibel referred to 1 mW
dc . . . . . direct current
deg degree (temperature interval or difference)
. . ° . . . degree (plane angle)
°C . . . . . degree Celsius (centigrade)
°F . . . . degree Fahrenheit
°K . . . . . degree Kelvin
DEPC . . deposited carbon
DET . . . . . detector
diam . . . . . diameter
DIA . diameter (used in parts list)
DIFF AMPL . . . differential amplifier
div . . . . . division
DPDT . . . . . double-pole, double throw
DR . . . . . drive
DSB . . . . double sideband
DTL . . . diode transistor logic
DVM . . . . digital voltmeter
ECL . . . emitter coupled logic
EMF . . electromotive force
EDP . . . . electronic data processing
ELECT . . . . . electrolytic
ENCAP . . . . encapsulated
EXT . . . . . external
F . . . . . farad
FET . . . . . field effect transistor
F/F . . . . . flip-flop
FH . . . . . flatt head
FIL H . . . . . fillister head
FM . frequency modulation
FP . . . . . front panel
FREQ . . . . frequency
FXD . . . . . fixed
g . . . . . gram
GE . . . . . germanium
GHz . . . . . gigahertz
GL . . . . . glass
GRD . . . . . grounded)
H . . . . . henry
h . . . . . hour
HET . . . . heterodyne
HEX . . . . hexagonal
HD . . . . . head
HDW . . . . . hardware
HF . . . high frequency
HG . . . . . mercury
HI . . . . . high
HP . . . Hewlett-Packard
HPF . . . . high pass filter
HR . . . . . hour (used in parts list)
HV . . . . . high voltage
Hz . . . . . Hertz
IC . . . integrated circuit
ID . . . . . inside diameter
IF . . . . . intermediate frequency
IMPG . . . . . impregnated
in . . . . . inch
INCD . . . . . incandescent
INCL . . . . . include(s)
INP . . . . . input
INS . . . . . insulation
INT . . . . . internal
kg . . . . . kilogram
kHz . . . . . kilohertz
kΩ . . . . . kilohm
kV . . . . . kilovolt
lb . . . . . pound
LC . . . . . inductance-capacitance
LED . . light-emitting diode
LF . . . . . low frequency
LG . . . . . long
LH . . . . . left hand
LIM . . . . . limit
LIN . . . . linear taper (used in parts list)
lin . . . . . linear
LK WASH . . . lock washer
LO . . . low; local oscillator
LOG . . . logarithmic 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 . . . metallic oxide
MF . . . medium frequency; microfarad (used in parts list)
MFR . . . . . manufacturer
mg . . . . . milligram
MHz . . . . . megahertz
mH . . . . . millihenry
mho . . . . . mho
MIN . . . . . minimum
min . . . . . minute (time)
' . . . . . minute (plane angle)
MINAT . . . . . miniature
mm . . . . . millimeter
MOD . . . . . modulator
MOM . . . . . momentary
MOS . . . metal-oxide semiconductor
ms . . . . . millisecond
MTG . . . . . mounting
MTR . . . meter (indicating device)
mV . . . . . millivolt
mVac . . . . . millivolt, ac
mVdc . . . . . millivolt, dc
mVpk . . . . millivolt, peak
mVp-p . . . millivolt, peak-to-peak
mVrms . . . . millivolt, rms
mW . . . . . milliwatt
MUX . . . . . multiplex
MY . . . . . mylar
μA . . . . . microampere
μF . . . . . microfarad
μH . . . . . microhenry
μmho . . . . . micromho
μs . . . . . microsecond
μV . . . . . microvolt
μVac . . . . microvolt, ac
μVdc . . . . microvolt, dc
μVp-p . . . microvolt, peak-to-peak
μVrms . . . microvolt, rms
μW . . . . . microwatt
nA . . . . . nanoampere
NC . . . . no connection
N/C . . . . normally closed
NE . . . . . neon
NEG . . . . . negative
nF . . . . . nanofarad
NI PL . . . . nickel plate
N/O . . . . normally open
NOM . . . . . nominal

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6–1. Reference Designators and Abbreviations (cont'd)

NORM . . . normal
NPN . . . negative positive negative
NPO . . . negative positive zero (zero tempera ture coefficient)
NRFR . . . not recommended for field replacement
NSR . . . not separately replaceable
ns . . . . . nanosecond
nW . . . . . nanowatt
OBD . . . order by description
OD . . . outside diameter
OH . . . oval head
OP AMPL . . . operational amplifier
OPT . . . . . option
OSC . . . . oscillator
OX . . . . . oxide
oz . . . . . ounce
Ω . . . . . ohm
P . . . . peak (used in parts list)
PAM . . . pulse amplitude modulation
PC . . . . printed circuit
PCM . . . pulse code modulation, pulse count modulation
PDM . . . . . pulse duration modulation
pF . . . . . picofarad
PH BRZ . . . phosphor bronze
PHL . . . Phillips
PIN . . . positive intrinsic negative
PIV . . . . peak inverse voltage
pk . . . . . peak
PL . . . . phase lock
PLO . . . . phase lock oscillator
PM . . . . phase modulation
PNP . . . positive negative positive
P/O . . . . . part of
POLY . . . . polystyrene
PORC . . . . porcelain
POS . . . positive, position(s) (used in parts list)
POSN . . . . position
POT . . . . potentiometer
p-p . . . . peak to peak
PP . . . peak to peak (used in parts list)
PPM . . . . pulse position modulation
PREAMPL . . . preamplifier
PRF . . . pulse repetition frequency
PRR . . . . pulse repetition rate
ps . . . . . picosecond
PT . . . . . point
PTM . . . . pulse time modulation
PWM . . . pulse-width modulation
PWV . . . . peak working voltage
RC . . . resistance-capacitance
RECT . . . . . rectifier
REF . . . . . reference
REG . . . . regulated
REPL . . . replaceable
RF . . . . . radio frequency
RFI . . . . . radio frequency interference
RH . . . round head; right hand
RLC . . . . resistance inductance capacitance
RMO . . . rack mount only
rms . . . root mean square
RND . . . . round
ROM . . . read only memory
R&P . . . . . rack and panel
RWV . . . . reverse working voltage
S . . . scattering parameter
s . . . . . second (time)
" . . . second (plane angle)
S B . . . . . slow-blow (fuse) (used in parts list)
SCR . . . silicon controlled rectifier; screw
SE . . . . . selenium
SECT . . . . sections
SEMICON . . . semiconductor
SHF . . . superhigh frequency
SI . . . . . silicon
SIL . . . . . silver
SL . . . . . slide
SNR . . . signal-to-noise ratio
SPDT . . . . single pole, double throw
SPG . . . . . spring
SR . . . . . split ring
SPST . . . . single-pole, single-throw
SSB . . . . single sideband
SST . . . . stainless steel
STL . . . . . steel
SQ . . . . . square
SWR . . . standing-wave ratio
SYNC . . . synchronize
T . . . timed (slow-blow fuse)
TA . . . . . tantalum
TC . . . temperature compensating
TD . . . . . time delay
TERM . . . . . terminal
TFT . . . thin film transistor
TGL . . . . . toggle
THD . . . . . thread
THRU . . . . through
TI . . . . . titanium
TOL . . . . . tolerance
TRIM . . . . trimmer
TSTR . . . . . transistor
TTL . . . transistor transistor logic
TV . . . . . television
TVI . . . television interference
TWT . . . traveling wave tube
U . . . micro (10^{6}) (used in parts list)
UF . . . microfarad (used in parts list)
UHF . . . ultrahigh frequency
UNREG . . . unregulated
V . . . . . volt
VA . . . . . voltampere
Vac . . . volts, ac
VAR . . . . variable
VCO . . . voltage controlled oscillator
Vdc . . . . . volts, dc
VDCW . . . volts, dc, working (used in parts list)
V(F) . . . . . volts, filtered
VFO . . . variable frequency oscillator
VHF . . . very high frequency
Vpk . . . . . volts, peak
Vp-p . . . volts, peak-to peak
Vrms . . . . volts, rms
VSWR . . . voltage standing wave ratio
VTO . . . voltage tuned oscillator
VTVM . . . Vacuum tube voltmeter
V(X) . . . . volts, switched
W . . . . . watt
W . . . . . with
WIV . . . . working inverse voltage
WW . . . . . wirewound
W/O . . . . . without
YIG . . . yttrium iron-garnet
Z_o . . . . . characteristic impedance

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

NOTE

All abbreviations in the parts list will be in upper case.

Table 6–2. Manufacturers Code List

8160 MANUFACTURERS CODE LIST AS OF 01/11/79 PAGE 2

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
C0633	ARTIEBOLAGET RIFA	BROMMA	SE	
02540	VALVO GMBH	HAMBURG	GM	
02624	ABSMANN F W UND SOEHNE	LUEDENSCHEID	GM	
0000J	GTE SYLVANIA MINIATURE LT PROD	MILLSBORO	NH	03244
00000	ANY SATISFACTORY SUPPLIER			
0004G	UNITRODE COMPUTER PRODUCTS CORP	METHUEN	MA	
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
01928	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	08876
02111	SPECTROL ELECTRONICS CORP	CITY OF IND	CA	91745
03508	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE	NY	13201
03888	KDI PYROFILM CORP	WHIPPANY	NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85062
06001	GE CO ELEK CAP & BAT PROD DEPT	IRMO	SC	29063
0612M	MIMA	MANNHEIM	GM	6800
06665	PRECISION MONOLITHICS INC	SANTA CLARA	CA	95050
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	94042
12697	CLAROSTAT MFG CO INC	DOVER	NH	03820
14936	GENERAL INSTR CORP SEMICON PROD GP	HICKSVILLE	NY	11802
18324	SIGNETICS CORP	SUNNYVALE	CA	94086
19701	MEPCO/ELECTRA CORP	MINERAL WELLS	TX	76067
20932	EMCON DIV ITW	SAN DIEGO	CA	92129
24046	TRANSITRON ELECTRONIC CORP	WAKEFIELD	MA	01880
24506	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON	NC	28401
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE	CA	92507
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	94086
34649	INTEL CORP	MOUNTAIN VIEW	CA	95051
52763	STETTNER-TRUSH INC	CAZENOVIA	NY	13035
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC	CT	06226
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON	CA	92634
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA	PA	19108
75915	LITTELFUSE INC	DES PLAINES	IL	60016
83186	VICTORY ENGINEERING CORP	SPRINGFIELD	NJ	07081
91637	DALE ELECTRONICS INC	COLUMBUS	NE	68601

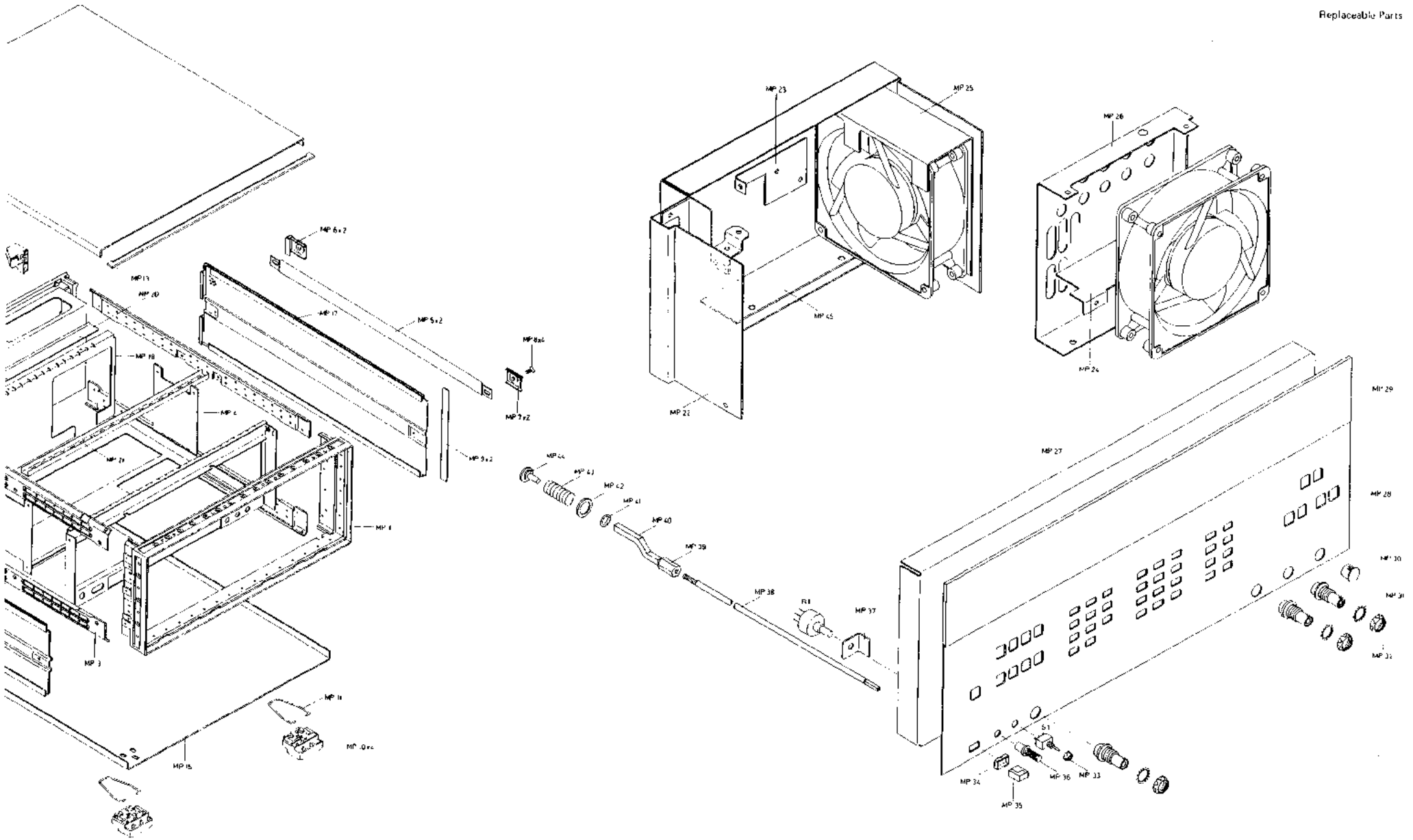
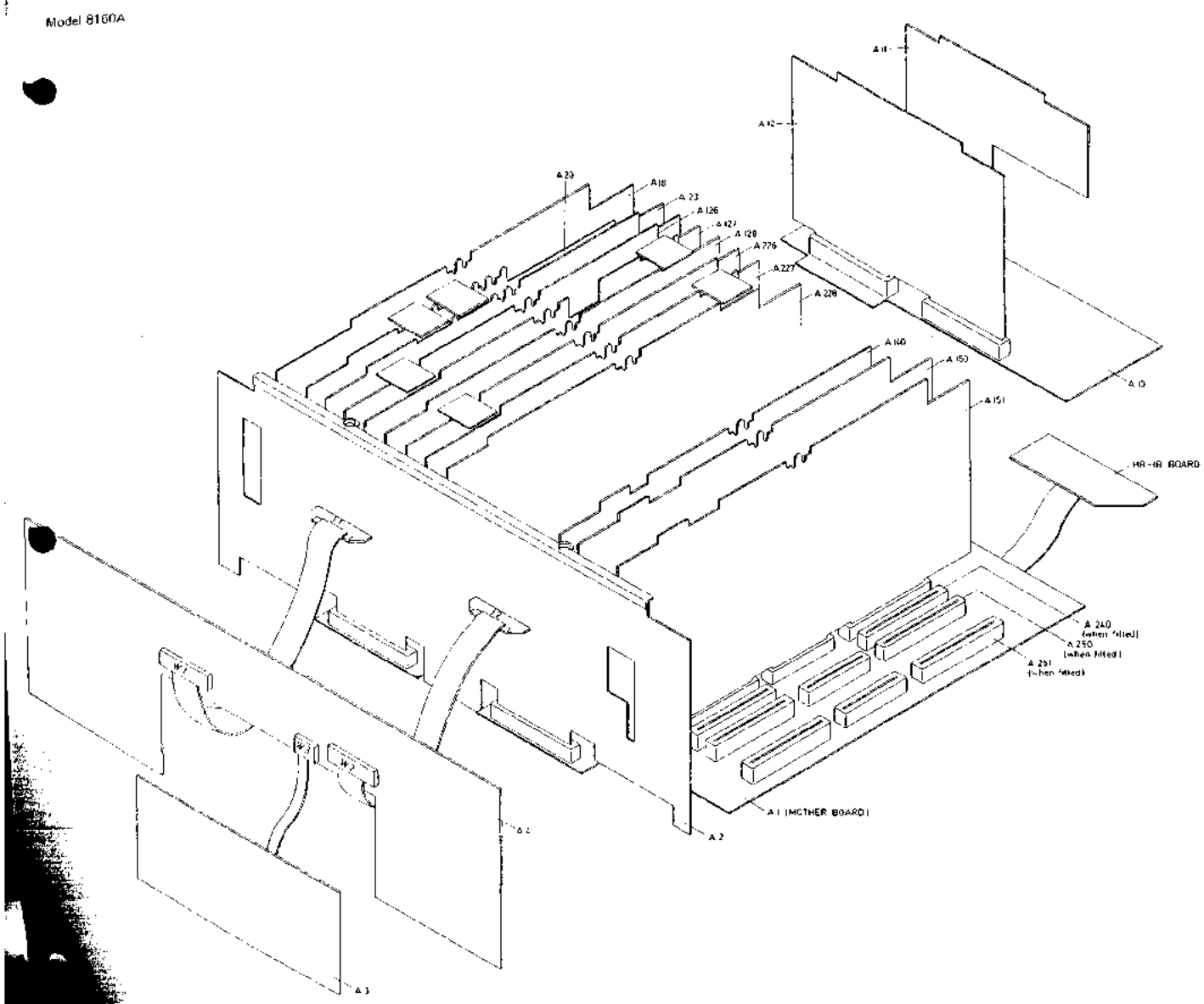


Figure 6–1. Frame Parts Diagram (instrument shown with Option 020 fitted)


A 11
A 12
A 20
A 18
A 23
A 126
A 127
A 128
A 776
A 227
A 228
A 160
A 150
A 151
A 10
HR-IB BOARD
A 240
(when fitted)
A 250
(when fitted)
A 251
(when fitted)
A 1 (MOTHER BOARD)
A 2
A 3

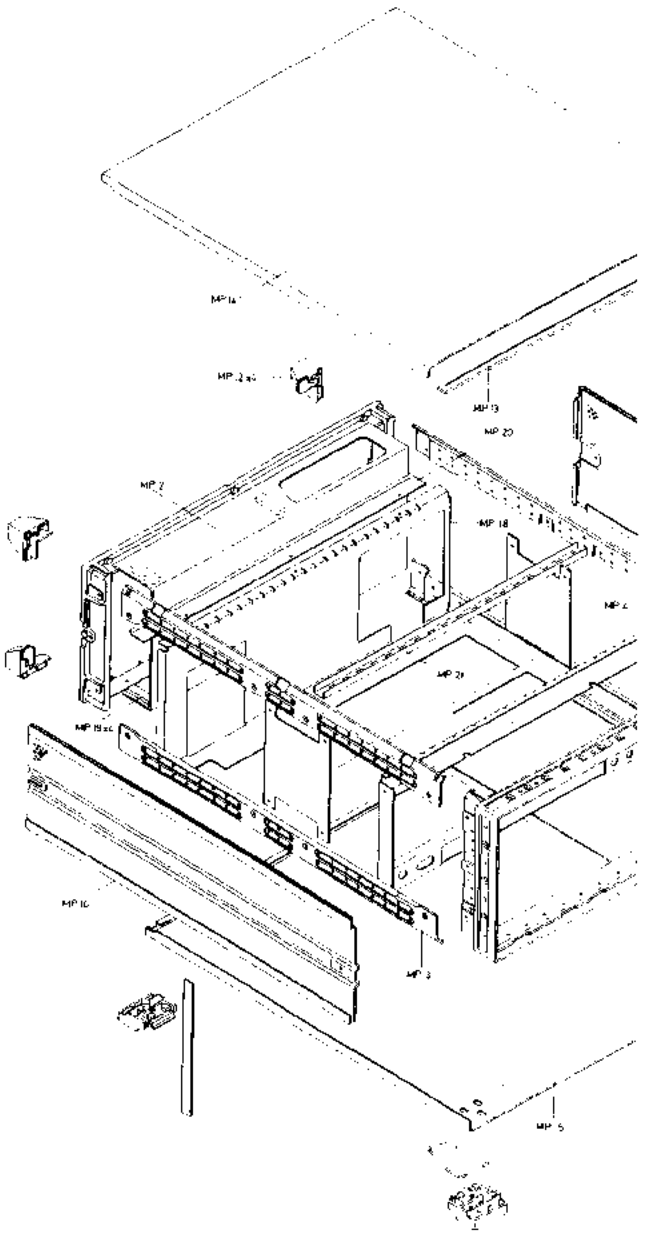

MP 14
MP 13
MP 20
MP 2
MP 18
MP 4
MP 19
MP 16
MP 3
MP 5

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	08160-60501	9		BOARD ASSEMBLY, MOTHER	28480	08160-60501
A2	08160-60502	0		BOARD ASSEMBLY, MICROPROCESSOR	28480	08160-60502
A3	08160-60503	1		BOARD ASSEMBLY, KEYBOARD	28480	08160-60503
A4	08160-60504	2		BOARD ASSEMBLY, DISPLAY	28480	08160-60504
A6	08160-60506	4		BOARD ASSEMBLY, CONNECTOR	28480	08160-60506
A10	08160-60510	0		BOARD ASSEMBLY, POWER SUPPLY MOTHER	28480	08160-60510
A11	08160-60511	1		BOARD ASSEMBLY, POWER SUPPLY REGULATOR	28480	08160-60511
A12	08160-60512	2		BOARD ASSEMBLY, POWER SUPPLY RECTIFIER	28480	08160-60512
A13	08160-60513	3		BOARD ASSEMBLY, POWER SUPPLY INPT-LIN	28480	08160-60513
A18	08160-60518	8		BOARD ASSEMBLY, REGULATOR	28480	08160-60518
A20	08160-60520	8		BOARD ASSEMBLY, BURST	28480	08160-60520
A23	08160-60523	5		BOARD ASSEMBLY, REP RATE	28480	08160-60523
A126	08160-60526	8		BOARD ASSEMBLY, TIME INT 1	28480	08160-60526
A127	08160-60527	9		BOARD ASSEMBLY, TIME INT 2	28480	08160-60527
A128	08160-60528	0		BOARD ASSEMBLY, TIME INT 3	28480	08160-60528
A140	08160-60540	6		BOARD ASSEMBLY, SLOPE	28480	08160-60540
A150	08160-60550	8		BOARD ASSEMBLY, DIGITAL OUTPUT	28480	08160-60550
A151	08160-60551	9		BOARD ASSEMBLY, ANALOG OUTPUT	28480	08160-60551
A226	08160-60526	8		BOARD ASSEMBLY, TIME INT 1	28480	08160-60526
A227	08160-60527	9		BOARD ASSEMBLY, TIME INT 2	28480	08160-60527
A228	08160-60528	0		BOARD ASSEMBLY, TIME INT 3	28480	08160-60528
	08160-64103	3	1	COVER ASSEMBLY, POWER	28480	08160-64103
F1	2110-0036	9	1	FUSE 8A 125V FAST-BLO 1.25X.25	75915	312008
F1	2110-0055	2	1	FUSE 4A 250V FAST-BLO 1.25X.25 UL IEC	75915	312004
L1	9140-0322	6	1		28480	9140-0322
MP1	5020-8805	8	1		28480	5020-8805
MP2	08160-60501	7	1	FRAME, REAR	28480	08160-60501
MP3	5020-8837	6	1	CORNER, STRUT	28480	5020-8837
MP4	5001-0433	2	1	SIDE GUSSET	28480	5001-0433
MP5	5060-9804	3	1		28480	5060-9804
MP6	5040-7220	1	1	STRAP, HANDLE, CAP-REAR	28480	5040-7220
MP7	5040-7219	8	1	STRAP, HANDLE, CAP-FRONT	28480	5040-7219
MP8	2680-0172	1	1	SCREW-MACH 10-32 .375-IN-LG 100 DEG	28480	2680-0172
MP9	5001-0440	1	1	TRIM, SIDE	28480	5001-0440
MP10	5040-7201	8	1	FOOT(STANDARD)	28480	5040-7201
MP11	1460-1345	5	1	TILT STAND SST	28480	1460-1345
MP12	5040-7221	2	1		28480	5040-7221
MP13	5040-7202	9	1	TRIM, TOP	28480	5040-7202
MP14	08160-64107	1	1	COVER, TOP	28480	08160-64107
MP15	5060-9847	4	1	COVER, BOTTOM	28480	5060-9847
MP16	08160-64101	5	1	COVER, SIDE, PERFORATED	28480	08160-64101
MP17	08160-64105	9	1	COVER, SIDE W/MAY	28480	08160-64105
MP18	08160-60101	3	1	DECK ASSY, MAIN	28480	08160-60101
MP19	0403-0101	8	1	GUIDE-PC BD NMY NYL .062-BD-THKNS 2.5-LG	28480	0403-0101
MP20	08160-64102	6	1	COVER, PC BOARD	28480	08160-64102
MP21	08160-02302	4	1	HOLDER, DISTANCE	28480	08160-02302
MP22	08160-64103	3		COVER ASSEMBLY, POWER	28480	08160-64103
MP23	08160-01102	0	1	HEAT SINK RES.	28480	08160-01102
MP24	08160-64104	8	1	COVER, FAN	28480	08160-64104
MP25	08160-01201	0	1	BRACKET, FAN	28480	08160-01201
MP26	08160-00203	0	1	PANEL, REAR	28480	08160-00203
MP27	08160-00202	9	1	PANEL, SUB	28480	08160-00202
MP28	08160-00201	8	1	PANEL, FRONT	28480	08160-00201
MP29	08160-28101	5	1	WINDOW	28480	08160-28101
MP30	6960-0041	1	1	PLUG-HOLE FL-MD FOR .5-D-HOLE NYL	28480	6960-0041
MP31	2190-0054	9	1	WASHER-LK INTL T 1/2 IN .505-IN-ID	28480	2190-0054
MP32	2950-0145	1	1	NUT-SPCLY 15/32-32-THD .15-IN-THK	28480	2950-0145
MP33	0590-0856	1	1	NUT-HEX-SGL CHAM 1/4-40-THD .15-IN-THK	00000	ORDER BY DESCRIPTION
MP34	0370-0914	0	1	BEZEL-PB KNOB,.490LG,.330W,.165HI,JADE	28480	0370-0914
MP35	5040-1124	2	1	KNOB, PUSHBUTTON POWER	28480	5040-1124
MP36	5040-1136	6	1	KNOB, LONG	28480	5040-1136
MP37	08160-01206	5	1	BRACKET, POT	28480	08160-01206
MP38	5040-7756	8	1	EXTENDER ROD, POT	28480	5040-7756
MP39	01830-23201	3	1	COUPLER, SWITCH 10-24	28480	01830-23201
MP40	08030-43701	6	1	SHAFT, SHORT	28480	08030-43701
MP41	3050-0755	2	1	WASHER	28480	3050-0755
MP42	2190-0200	7	1	WASHER-FL NM 3/8 IN .378-IN-ID	28480	2190-0200
MP43	1460-0254	3	1	SPRING-CPRSN .438-IN-OD .5-IN-OA-LG SST	28480	1460-0254
MP44	08160-27201	4	1	INSERT ROD	28480	08160-27201
MP45	08160-05401	9	1	INSULATOR PLATE	28480	08160-05401
R1	2100-3436			R-VAR 10K 10%		

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
R103	0811-3479	4	1	RESISTOR 3.1K 1% 50M PW TC=0+-20	28480	0811-3479
R137	0819-0019	8	1	RESISTOR 100 5% 20W PW TC=0+-260	91637	CW25L-20M-101-J
S1	3101-0432			SWITCH TOGGLE		
W1	08160-61613			CABLE SWITCH		

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	08160-60501	9	1	BOARD ASSEMBLY, MOTHER	28480	08160-60501
A1C1	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C2	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C3	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C4	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C5	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C6	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C7	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C8	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C9	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C10	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C11	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C12	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C13	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C14	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C15	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C16	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C17	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C18	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C19	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C20	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C21	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C22	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C23	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C24	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C25	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C26	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C27	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C28	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C29	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1C30	0180-2276	8	2	CAPACITOR-FXD 270UF+-20% 15VDC TA	06001	699336G7
A1C31	0180-2276	8		CAPACITOR-FXD 270UF+-20% 15VDC TA	06001	699336G7
A1J2	1251-1365	6	1	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A1J3	1251-2035	9	45	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J4	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J5	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J6	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J7	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J8	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J9	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J10	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J11	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J12	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J13	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J14	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J15	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J16	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J17	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J18	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J19	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J20	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J21	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J22	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J23	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J24	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J25	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J26	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J27	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J28	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J29	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J30	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J31	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J32	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J33	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J34	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J35	1251-2034	8	5	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A1J36	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J37	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J38	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A1J41	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J42	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J43	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035

See introductory text to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1J48	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J45	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A1J46	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J49	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J50	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A1J51	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J53	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J54	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1J57	1251-4868	4	1	CONNECTOR 7-PIN F F POST TYPE	28480	1251-4868
A1MP1	08160-67601	2	1	CONNECTOR ASSEMBLY	28480	08160-67601
A2	08160-66502	0	1	BOARD ASSEMBLY, MICROPROCESSOR	28480	08160-66502
A2BT1	1420-0574	6	2	BATTERY	28480	1420-0574
A2BT2	1420-0574	6		BATTERY	28480	1420-0574
A2C1	0180-2635	3	1	CAPACITOR-FXD 1000UF+50-10% 35VDC AL	28480	0180-2635
A2C2	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A2C3	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A2C4	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C5	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C6	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A2C7	0160-2218	6	1	CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218
A2C8	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C9	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C10	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C11	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C12	0160-4211	3	3	CAPACITOR-FXD .047UF +-20% 50VDC POLYE	28480	0160-4211
A2C13	0140-0200	0	1	CAPACITOR-FXD 300PF +-5% 300VDC MICA	72136	DM15F391J0300WV1CR
A2C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C15	0180-1704	5	1	CAPACITOR-FXD 47UF+-10% 6VDC TA	56289	150D476X9006B2
A2C16	0160-4297	5	1	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101M223Z922-CDM
A2C17	0160-4040	6	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4040
A2C18	0180-1743	2	1	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A2C19	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A2C20	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C26	0140-0145	2	2	CAPACITOR-FXD 22PF +-5% 500VDC MICA	72136	DM15C220J0500WV1CR
A2C27	0140-0145	2		CAPACITOR-FXD 22PF +-5% 500VDC MICA	72136	DM15C220J0500WV1CR
A2C28	0160-2150	5		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A2C29	0140-0192	9	2	CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E680J0300WV1CR
A2C30	0160-2150	5		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A2C31	0140-0192	9		CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E680J0300WV1CR
A2C36	0180-1701	2	1	CAPACITOR-FXD 6.8UF+-20% 6VDC TA	56289	150D685X0006A2
A2CR1	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR14	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR15	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2J1	1251-3024	8	2	CONNECTOR 24-PIN M RECTANGULAR	28480	1251-3024
A2J2	1251-3024	8		CONNECTOR 24-PIN M RECTANGULAR	28480	1251-3024
A2J5	1200-0659	2	1	SOCKET-IC 40-CONT DIP-SLDR	28480	1200-0659
A2MP1	4040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
A2MP2	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A2Q1	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2Q2	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2Q3	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2Q4	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2Q5	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2Q6	1854-0368	5		TRANSISTOR NPN 2N5191 SI PD=40W FT=2MHZ	04713	2N5191
A2Q7	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A2Q8	1854-0368	5		TRANSISTOR NPN 2N5191 SI PD=40W FT=2MHZ	04713	2N5191
A2Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A2Q10	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2Q11	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2Q12	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A2R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R2	0811-1832	9	1	RESISTOR 5 1% 3W PW TC=0+-50	28480	0811-1832
A2R3	0757-0716	0	1	RESISTOR 162 1% .25W F TC=0+-100	24546	C5-1/4-T0-162R-F
A2R4	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2R5	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2R6	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2R7	0757-0284	7	5	RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A2R8	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A2R9	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A2R10	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A2R11	0757-0284	7		RESISTOR 150 1% .125W F TC=0+-100	24546	C4-1/8-T0-151-F
A2R12	0698-4399	7	5	RESISTOR 88.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-88R7-F
A2R13	0698-4399	7		RESISTOR 88.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-88R7-F
A2R14	0698-4399	7		RESISTOR 88.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-88R7-F
A2R15	0698-4399	7		RESISTOR 88.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-88R7-F
A2R16	0698-4399	7		RESISTOR 88.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-88R7-F
A2R17	0757-0409	8	4	RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A2R18	0698-7260			RESISTOR 10K		
A2R19	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A2R20	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2R25	0698-4471	6	2	RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A2R30	0757-0706	8	1	RESISTOR 51.1 1% .25W F TC=0+-100	24546	C5-1/4-T0-51R1-F
A2R31	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-5620-F
A2R37	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A2R40	1810-0055	5	2	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0055
A2R41	1810-0055	5		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0055
A2R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R48	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2R50	0757-0283	9		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A2R51	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A2R52	0757-0455	4	3	RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A2R54	0757-0455	4		RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A2R55	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A2R56	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A2R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R58	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R59	0698-4086	9		RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A2R60	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2R61	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A2R62	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A2R63	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R64	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R65	0698-4086	9		RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A2R66	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2R67	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R68	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2R69	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A2R70	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A2R71	0698-4458	9	2	RESISTOR 590 1% .125W F TC=0+-100	24546	C4-1/8-T0-590R-F
A2R72	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2R73	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A2R74	0757-0123	3	6	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A2R75	0698-3260	9	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2R77	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2R78	0757-0291	6	3	RESISTOR 24.9 1% .125W F TC=0+-100	19701	MFQC1/8-T0-2492-F
A2R79	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R80	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R81	0757-0123	3		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A2R82	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A2R83	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R84	0813-0029	8	3	RESISTOR 1 3% 3A PW TC=0+-50	28480	0813-0029
A2R85	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A2R86	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2RT1	0837-0050	5	1	THERMISTOR DISC 1K-OHM TC=-4.4%/C-DEG	28480	0837-0050
A2U1	1820-1480	3	1	IC MICPROC NMOS 8-BIT	04713	MC68000L
A2U2	1818-0786	5	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U3	1818-0787	6	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U4	1818-0788	7	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U5	1818-0789	8	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U6	1818-0790	1	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U7	1818-0792	3	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM68332L MASKED
A2U8	1820-1216	3	4	IC OCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A2U9	1820-1216	3		IC OCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A2U10	1820-1216	3		IC OCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A2U11	1818-0320	3	2	IC NMOS 1K RAM STAT 650-NS 3-S	34335	P2101-2
A2U12	1818-0320	3		IC NMOS 1K RAM STAT 650-NS 3-S	34335	P2101-2
A2U13	1818-0319	0	6	IC CMOS 1K RAM STAT 650-NS 3-S	34649	P5101L-3
A2U14	1818-0319	0		IC CMOS 1K RAM STAT 650-NS 3-S	34649	P5101L-3
A2U15	1818-0319	0		IC CMOS 1K RAM STAT 650-NS 3-S	34649	P5101L-3

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2U16	1818-0319	0		IC CMOS 1K RAM STAT 450-NS 3-S	34649	P5101L-3
A2U17	1818-0319	0		IC CMOS 1K RAM STAT 450-NS 3-S	34649	P5101L-3
A2U18	1818-0319	0		IC CMOS 1K RAM STAT 450-NS 3-S	34649	P5101L-3
A2U19	1820-1730	6	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A2U20	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A2U21	1820-1195	7	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A2U22	1820-1195	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A2U23	1820-1201	6	2	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A2U24	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A2U25	1820-1196	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A2U26	1820-1491	6	1	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A2U27	1820-1624	7	5	IC BFR TTL S OCTL 1-INP	01295	SN74S241N
A2U28	1820-1624	7		IC BFR TTL S OCTL 1-INP	01295	SN74S241N
A2U29	1820-1624	7		IC BFR TTL S OCTL 1-INP	01295	SN74S241N
A2U30	1820-1624	7		IC BFR TTL S OCTL 1-INP	01295	SN74S241N
A2U31	1820-1423	4	4	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A2U32	1820-1808	5	1	IC BFR NMOS CLOCK DRVR	04713	MPQ6842
A2U33	1816-0902	3	1	IC ECL 256-BIT RAM 35-NS 3-S	28480	1816-0902
A2U34	1820-1194	6	2	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A2U35	1820-1194	6		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A2U36	1820-1042	3	1	IC SHF-RGTR TTL R-S PRL-IN SERIAL-OUT	01295	SN74165N
A2U37	1820-1199	1	7	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A2U38	1820-0716	6	1	IC CNTR TTL BIN SYNCHRO POS-EDGE-TRIG	01295	SN74161N
A2U39	1818-0791	2	1	IC NMOS 16384-BIT ROM STAT 500-NS 3-S	04713	MCM6832L MASKED
A2U40	1820-1278	7	4	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS191N
A2U41	1820-1443	8	1	IC CNTR TTL LS BIN ASYNCHRO	01295	SN74LS293N
A2U42	1820-1197	9	4	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A2U43	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A2U44	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A2U45	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A2U50	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A2U51	1820-1442	7	7	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS390N
A2U52	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A2U53	1820-1204	9	1	IC GATE TTL LS NAND DUAL 4-INP	01295	SN74LS20N
A2U54	1820-0491	4	3	IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN74145N
A2U55	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A2U56	1820-0904	4	1	IC COMPTR TTL L MAGTD 5-BIT	07263	93L24PC
A2U57	1820-1481	4	1	IC PIA NMOS	04713	MC6821L
A2U58	1820-1918	2	1	IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS241N
A2U59	1820-1624	7		IC BFR TTL S OCTL 1-INP	01295	SN74S241N
A2U60	1820-1451	8	11	IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A2U61	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A2U62	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A2U63	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A2U64	1820-1641	8	1	IC DRVR TTL LS BUS DRVR HEX 1-INP	01295	SN74LS365AN
A2U65	1826-0147	9	1	IC 7812 V REGLTR TO-220	04713	MC7812CP
A2VR1	1902-0048	1		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	28480	1902-0048
A3	08160-60503	1	1	BOARD ASSEMBLY, KEYBOARD	28480	08160-60503
A3J1	1200-0547	7	1	LOCK-DUAL INLINE PKG IC FOR 14 PIN	28480	1200-0547
A3J1	1200-0548	8	1	SOCKET-IC 14-CONT DIP DIP-SLDR	28480	1200-0548
A3MP2	5021-0504	0	1	TAPE, DISTANCE	28480	5021-0504
A3MP3	5040-9304	6	5	FRAME, KEY	28480	5040-9304
A3MP4	5040-9304	6		FRAME, KEY	28480	5040-9304
A3MP5	5040-9304	6		FRAME, KEY	28480	5040-9304
A3MP6	5040-9304	6		FRAME, KEY	28480	5040-9304
A3MP7	5040-9304	6		FRAME, KEY	28480	5040-9304
A3MP8	02108-00014	5	10	SPRING, CONTACT	28480	02108-00014
A3MP9	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP10	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP11	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP12	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP13	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP14	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP15	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP16	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A3MP17	02108-00014	5		SPRING, CONTACT	28480	02108-00014
A4	08160-60504	2	1	BOARD ASSEMBLY, DISPLAY	28480	08160-60504
A4C1	0180-1714	7	3	CAPACITOR-FXD 330UF+-10% 6VDC T4	56289	150D337X9006S2
A4C2	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C3	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C4	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C5	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4C7	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C8	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C9	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4C10	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4DS1	1990-0617	5	5	DISPLAY-AN-DOT MAT 1-CHAR .3-H	28480	1990-0617
A4DS2	1990-0617	5		DISPLAY-AN-DOT MAT 1-CHAR .3-H	28480	1990-0617
A4DS3	1990-0617	5		DISPLAY-AN-DOT MAT 1-CHAR .3-H	28480	1990-0617
A4DS4	1990-0695	9	1	DISPLAY-AN-DOT MAT 1-CHAR .29-H RED	28480	5082-7340, CAT L & F
A4DS5	1990-0505	0	4	DISPLAY-NUM-DOT MAT 1-CHAR .29-H	28480	5082-7302, CAT E
A4DS6	1990-0505	0		DISPLAY-NUM-DOT MAT 1-CHAR .29-H	28480	5082-7302, CAT E
A4DS7	1990-0505	0		DISPLAY-NUM-DOT MAT 1-CHAR .29-H	28480	5082-7302, CAT E
A4DS8	1990-0505	0		DISPLAY-NUM-DOT MAT 1-CHAR .29-H	28480	5082-7302, CAT E
A4DS9	1990-0617	5		DISPLAY-AN-DOT MAT 1-CHAR .3-H	28480	1990-0617
A4DS10	1990-0617	5		DISPLAY-AN-DOT MAT 1-CHAR .3-H	28480	1990-0617
A4DS11	1990-0487	7	16	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS12	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS13	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS14	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS15	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS16	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS17	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS18	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS19	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS20	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS21	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS22	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS23	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS24	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS25	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS27	1990-0485	5	1	LED-VISIBLE LUM-INT=800UCD IF=30MA-MAX	28480	5082-4484
A4DS28	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A4DS28	2140-0016	8	4	LAMP-INCAND 683 5VDC 60MA T-1-3/4LB	0000J	683
A4DS29	2140-0016	8		LAMP-INCAND 683 5VDC 60MA T-1-3/4LB	0000J	683
A4DS30	2140-0016	8		LAMP-INCAND 683 5VDC 60MA T-1-3/4LB	0000J	683
A4DS31	2140-0016	8		LAMP-INCAND 683 5VDC 60MA T-1-3/4LB	0000J	683
A4MP1	08160-21101	1	1	HEAT SINK	28480	08160-21101
A4MP2	08160-23701	1	1	BAR	28480	08160-23701
A4MP3	08160-45201	2	4	HOUSING, LAMP	28480	08160-45201
A4MP4	08160-45201	2		HOUSING, LAMP	28480	08160-45201
A4MP5	08160-45201	2		HOUSING, LAMP	28480	08160-45201
A4MP6	08160-45201	2		HOUSING, LAMP	28480	08160-45201
A4Q1	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A4Q2	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A4Q3	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A4Q4	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q5	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q6	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q7	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q8	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q9	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4Q10	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4R1	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A4R2	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A4R3	1810-0203	5	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A471
A4R4	0757-0992	4	2	RESISTOR 22.1 1% .5W F TC=0+-100	28480	0757-0992
A4R5	0757-0992	4		RESISTOR 22.1 1% .5W F TC=0+-100	28480	0757-0992
A4R6	1810-0209	1	5	NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	01121	314B910
A4R9	1810-0209	1		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	01121	314B910
A4R10	1810-0209	1		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	01121	314B910
A4R11	1810-0209	1		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	01121	314B910
A4R12	1810-0209	1		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	01121	314B910
A4R13	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A4R14	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A4R15	1810-0041	9	1	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0041
A4R16	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A4R17	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A4R18	0698-4456	9		RESISTOR 590 1% .125W F TC=0+-100	24546	C4-1/8-T0-590R-F
A4R19	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A4R20	0683-1555	0	1	RESISTOR 1.5M 5% .25W FC TC=-900/+1100	01121	CB1555
A4R21	0757-0270	1	1	RESISTOR 249K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2493-F
A4R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

See introductory to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4S1	5060-9436	7	15	SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S2	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S3	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S4	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S5	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S6	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S7	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S8	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S9	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S10	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S11	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S12	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S13	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S14	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4S15	5060-9436	7		SWITCH-PUSHBUTTON, SINGLE	28480	5060-9436
A4U1	1820-1453	6	5	IC SHF-RGTR TTL LS R=8 SERIAL-IN PRL-OUT	01295	SN74LS164N
A4U2	1820-1453	6		IC SHF-RGTR TTL LS R=8 SERIAL-IN PRL-OUT	01295	SN74LS164N
A4U3	1820-1453	6		IC SHF-RGTR TTL LS R=8 SERIAL-IN PRL-OUT	01295	SN74LS164N
A4U4	1820-1453	6		IC SHF-RGTR TTL LS R=8 SERIAL-IN PRL-OUT	01295	SN74LS164N
A4U5	1820-1453	6		IC SHF-RGTR TTL LS R=8 SERIAL-IN PRL-OUT	01295	SN74LS164N
A4U6	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U7	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U8	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U9	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U10	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U11	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U12	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U13	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U14	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U15	1820-1451	8		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S38N
A4U16	1820-0491	4		IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN74145N
A4U17	1820-0628	9	1	IC TTL 64-BIT RAM 60-NS O-C	01295	SN7489N
A4U18	1820-1217	4	1	IC MUXR/DATA-SEL TTL LS 8-TO-1-LINE	01295	SN74LS151N
A4U19	1820-0491	4		IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN74145N
A4U20	1820-1210	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A4U21	1820-2014	1	1	IC INV CMOS HEX	04713	MC14069UBCP
A4U22	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A4W1	5081-1980	4	2	CABLE, RIBBON 1LC 279MM	28480	5081-1980
A4W2	5081-1980	4		CABLE, RIBBON 1LC 279MM	28480	5081-1980
A4W3	0816-061608	1	1	CABLE ASSEMBLY, DISPLAY KEY	28480	0816-061608
A6	08160-66506	4	1	BOARD ASSEMBLY, CONNECTOR	28480	08160-66506
A6J1	1251-3283	1	1	CONNECTOR 24-PIN F MICRORIBBON	28480	1251-3283
A6J2	1251-4017	1	1	CONNECTOR 26-PIN M	28480	1251-4017
A6J3	1200-0485	2	1	SKT-IC,14 PIN; PC MTG; RT ANGL; CONT	28480	1200-0485
A6R1	1810-0136	3	2	NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0136
A6R2	1810-0136	3		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0136
A6R3	1810-0155	6	1	NETWORK-RES 6-PIN-SIP .15-PIN-SPCG	28480	1810-0155
A6S1	3101-1860	1	1	SWITCH-SL 5-1ADIP-SLIDE-ASSY .1A 50VDC	28480	3101-1860
A10	08160-66510	0	1	BOARD ASSEMBLY, POWER SUPPLY MOTHER	28480	08160-66510
A10C1	0160-2734	3	2	CAPACITOR-FXD 7400UF+50-10% 250VDC AL	56289	36DX7415F250AC2B
A10C2	0160-2734	3		CAPACITOR-FXD 7400UF+50-10% 250VDC AL	56289	36DX7415F250AC2B
A10C3	0160-4323	8	4	CAPACITOR-FXD .047UF +-20% 250VAC(RMS)	C0633	PME271M547
A10C4	0160-4323	8		CAPACITOR-FXD .047UF +-20% 250VAC(RMS)	C0633	PME271M547
A10C5	0160-4323	8		CAPACITOR-FXD .047UF +-20% 250VAC(RMS)	C0633	PME271M547
A10C6	0160-4323	8		CAPACITOR-FXD .047UF +-20% 250VAC(RMS)	C0633	PME271M547
A10CR1	1901-0787	3	4	DIODE-PWR RECT 600V 6A	04713	MR756
A10CR2	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A10CR3	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A10CR4	1901-0787	3		DIODE-PWR RECT 600V 6A	04713	MR756
A10E1	08160-87301	1	1	SPARK, GAP	28480	08160-87301
A10F2	2110-0007	0	1	FUSE 1A 250V SLO-BLO 1.25X.25 UL IEC	75915	313001
A10F3	2110-0343	1	1	FUSE .25A 125V FAST-BLO .281X.093	28480	2110-0343
A10J101	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A10J102	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A10J103	1251-2030	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2030
A10K1	0490-1155	7	1	RELAY, 1A 24VDC	28480	0490-1155

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10HP1	08160-21107	7	1	HEAT, BUFFER	28480	08160-21107
A10HP2	1205-0284	9	1	HEAT SINK	28480	1205-0284
A10Q1	1854-0806	6	2	TRANSISTOR NPN SI PD=3.5W	01295	TIP51
A10Q2	1854-0806	6		TRANSISTOR NPN SI PD=3.5W	01295	TIP51
A10Q3	1854-0079	5	2	TRANSISTOR NPN 2N3439 SI TO-5 PD=1W	01928	2N3439
A10Q4	1854-0079	5		TRANSISTOR NPN 2N3439 SI TO-5 PD=1W	01928	2N3439
A10R1	0757-0854	7	2	RESISTOR 56.2K 1% .5W F TC=0+-100	28480	0757-0854
A10R2	0757-0854	7		RESISTOR 56.2K 1% .5W F TC=0+-100	28480	0757-0854
A10R3	0811-1655	0	1	RESISTOR 10 5% 20W PW TC=0+-260	12697	VPR20W20+10R+J
A10R4	0757-0838	7	1	RESISTOR 9.09K 1% .5W F TC=0+-100	28480	0757-0838
A10R5	0757-0839	8	3	RESISTOR 10K 1% .5W F TC=0+-100	28480	0757-0839
A10R6	0757-0839	8		RESISTOR 10K 1% .5W F TC=0+-100	28480	0757-0839
A10R7	0757-0839	8		RESISTOR 10K 1% .5W F TC=0+-100	28480	0757-0839
A10R8	0811-1204	9	2	RESISTOR 200 5% 5W PW TC=0+-20	28480	0811-1204
A10R9	0811-1204	9		RESISTOR 200 5% 5W PW TC=0+-20	28480	0811-1204
A10R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A10R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A10R12	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4=1/8-T0-3832-F
A10R13	0757-0816	1	1	RESISTOR 681 1% .5W F TC=0+-100	28480	0757-0816
A10S1	08160-61901	3	1	LINE SWITCH ASSEMBLY	28480	08160-61901
A10S2	3101-2299	2	1	SWITCH, SLIDE	28480	3101-2299
A10T1	08160-61101	5	1	TRANSFORMER, POWER	28480	08160-61101
A10VR1	1902-3307	1	1	DIODE-ZNR 36.5V 2% DO-7 PD=.4W TC=+.081%	28480	1902-3307
A11	08160-60511	1	1	BOARD ASSEMBLY, POWER SUPPLY REGULATOR	28480	08160-60511
A11C101	0160-4259	9	2	CAPACITOR-FXD .22UF +-10% 250VAC(RMS)	C0633	PME271M622
A11C102	0160-4689	9	1	CAPACITOR-FXD .01UF +-10% 1KVDC POLYP	06127	FKP1
A11C103	0160-4211	3		CAPACITOR-FXD .047UF +-20% 50VDC POLYE	28480	0160-4211
A11C104	0160-3456	6	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A11C105	0160-4298	0	9	CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M522-COH
A11C106	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A11C107	0160-2940	1		CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2940
A11C108	0160-2220	0	1	CAPACITOR-FXD 1200PF +-5% 300VDC MICA	28480	0160-2220
A11C109	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A11C110	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A11C111	0180-1745	4	1	CAPACITOR-FXD 1.5UF+-10% 20VDC TA	56289	150D155X9020A2
A11C112	0160-4211	3		CAPACITOR-FXD .047UF +-20% 50VDC POLYE	28480	0160-4211
A11C113	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A11C114	0160-3228	8	1	CAPACITOR-FXD .01UF +-10% 400VDC	28480	0160-3228
A11C115	0180-0230	0	1	CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
A11C116	0180-0582	5	1	CAPACITOR-FXD 270UF+100-10% 40VDC AL	56289	672D277H040DT2C
A11C117	0160-3839	9	1	CAPACITOR-FXD 2.2UF +-10% 40VDC	28480	0160-3839
A11C118	0160-4209	9	21	CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A11C119	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A11C120	0160-3097	1	1	CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3097
A11CR101	1901-1065	2	6	DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11CR102	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11CR103	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11CR104	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11CR105	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR106	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A11CR107	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A11CR108	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11CR109	1901-1065	2		DIODE-PWR RECT 1N4936 400V 1A 200NS	14936	1N4936
A11L101	9100-1618	1	3	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG-NOM	28480	9100-1618
A11L102	9100-1618	1		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG-NOM	28480	9100-1618
A11L103	9100-1618	1		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG-NOM	28480	9100-1618
A11MP2	2200-0117	8	1	SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A11MP3	2200-0111	2	1	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A11MP4	08160-01101	9	1	HEAT SINK, SWITCH	28480	08160-01101
A11MP5	08160-04106	0	1	COVER, TRANSISTOR	28480	08160-04106
A11MP6	3050-0722	3	1	WASHER-FL MTLC NO. 8 .166-IN-ID	28480	3050-0722
A11MP7	4040-0749	4		EXTR-PC BD BRK POLYC .062-BD-THKNS	28480	4040-0749
A11MP9	0360-1788	7	1	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A11Q101	1854-0775	8	2	TRANSISTOR NPN SI TO-3 PD=100W FT=4MHZ	02540	2UX80
A11Q102	1854-0775	8		TRANSISTOR NPN SI TO-3 PD=100W FT=4MHZ	02540	2UX80
A11Q103	1854-0727	0	1	TRANSISTOR NPN 2N6474 SI TO-220AB PD=40W	01928	2N6474
A11Q104	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A11Q105	1853-0400	4		TRANSISTOR PNP SI DARL TO-92 PD=500MW	28480	1853-0400
A11Q106	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A11Q107	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A11Q108	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A11Q109	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A11Q110	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11R101	2100-3210	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A11R102	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A11R104	0819-0034	7	1	RESISTOR 250 5% 20W PW TC=0+-260	28480	0819-0034
A11R105	0812-0017	2	2	RESISTOR .25 5% 3W PW TC=0+-90	28480	0812-0017
A11R106	0812-0017	2		RESISTOR .25 5% 3W PW TC=0+-90	28480	0812-0017
A11R107	0757-1000	7		RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A11R108	0757-0986	6	2	RESISTOR 12.1 1% .5W F TC=0+-100	28480	0757-0986
A11R109	0757-0986	6		RESISTOR 12.1 1% .5W F TC=0+-100	28480	0757-0986
A11R110	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R111	0698-4425	0	2	RESISTOR 1.54K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1541-F
A11R112	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R113	0757-0825	2	2	RESISTOR 2.21K 1% .5W F TC=0+-100	28480	0757-0825
A11R114	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A11R115	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A11R116	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R117	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R118	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R119	0757-0455	4		RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A11R120	0757-0467	8	1	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A11R121	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R122	0698-3453	2	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A11R123	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A11R124	0683-1065	7		RESISTOR 10M 5% .25W FC TC=-900/+1100	01121	CB1065
A11R125	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R126	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A11R127	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R128	0757-0459	3	1	RESISTOR 33.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3322-F
A11R129	0698-3258	5		RESISTOR 5.36K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5361-F
A11R130	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R131	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R132	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A11R133	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R134	0757-0825	2		RESISTOR 2.21K 1% .5W F TC=0+-100	28480	0757-0825
A11R135	0757-0830	9	1	RESISTOR 3.92K 1% .5W F TC=0+-100	28480	0757-0830
A11R136	0757-0411	2		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A11R138	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R139	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A11R140	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A11R141	0698-3540	8	1	RESISTOR 15.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1542-F
A11R142	0698-4425	0		RESISTOR 1.54K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1541-F
A11RT101	0837-0055	0	1	THERMISTOR DISC 50K-OHM TC=-3.3%/C-DEG	53180	45FN1
A11S101	3103-0067	2	1	SWITCH, THERMAL	28480	3103-0067
A11T101	0818-061102	0	1	TRANSFORMER, DRIVER	28480	0818-061102
A11U101	1826-0275	4	1	IC 78L12A V RGLTR TO-92	04713	MC78L12ACP
A11U102	1826-0335	7	1	16-DIP-P	28480	1826-0335
A11U103	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A11VR101	1902-0922	0	4	DIODE-ZNR 180V 5% PD=5W	28480	1902-0922
A11VR102	1902-0922	0		DIODE-ZNR 180V 5% PD=5W	28480	1902-0922
A11VR103	1902-0922	0		DIODE-ZNR 180V 5% PD=5W	28480	1902-0922
A11VR104	1902-0922	0		DIODE-ZNR 180V 5% PD=5W	28480	1902-0922
A11VR105	1902-0931	1	1	DIODE-ZNR 120V 5% PD=1W TC=+.088% IR=5UA	04713	1N120ZB5
A11VR106	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A11VR107	1902-0783	1	1	DIODE-ZNR 10.2V 5% DO-15 PD=1W TC=+.066%	28480	1902-0783
A11VR108	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A11VR109	1902-3140	0	1	DIODE-ZNR 8.25V 2% DO-7 PD=.4W TC=+.053%	28480	1902-3140
A11XG101	1205-0208	7	2	THERMAL LINK 3GL TO-3-PKG	28480	1205-0208
A11XG102	1205-0208	7		THERMAL LINK 3GL TO-3-PKG	28480	1205-0208
A12	08160-60512	2	1	BOARD ASSEMBLY, POWER SUPPLY RECTIFIER	28480	08160-60512
A12C201	0180-2733	2	8	CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C202	0180-2733	2		CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C203	0180-2733	2		CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C204	0180-2733	2		CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C205	0180-2636	4	12	CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C206	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C207	0180-2733	2		CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C208	0180-2733	2		CAPACITOR-FXD 470UF+100-10% 25VDC AL	28480	0180-2733
A12C209	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C210	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C211	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C212	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C213	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C214	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C215	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636

See introduction to this section for ordering information
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Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12C216	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C217	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C218	0180-2636	4		CAPACITOR-FXD 560UF+100-10% 20VDC AL	28480	0180-2636
A12C219	0180-0407	3	8	CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C220	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C221	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C222	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C223	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C224	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C225	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C226	0180-0407	3		CAPACITOR-FXD 180UF+-20% 30VDC TA	06001	69F252G7
A12C227	0180-2338	3		CAPACITOR-FXD 650UF+-20% 15VDC TA	06001	69F233QG7
A12C228	0180-2338	3		CAPACITOR-FXD 650UF+-20% 15VDC TA	06001	69F233QG7
A12C229	0160-0128	3	1	CAPACITOR-FXD 2.2UF +-20% 50VDC CER	28480	0160-0128
A12C230	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C231	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C232	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C233	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C234	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C235	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C236	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12C237	0180-4298	6		CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251M472M822-CDM
A12CR201	1901-0692	9	8	DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR202	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR203	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR204	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR205	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR206	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR207	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR208	1901-0692	9		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A12CR209	1901-1095	8	2	DIODE-PWR RECT 40V 15A DO-4	04713	MBR1540
A12CR210	1901-1095	8		DIODE-PWR RECT 40V 15A DO-4	04713	MBR1540
A12F201	2110-0456	7	2	FUSE 10A 125V FAST-BLO .281X.093	28480	2110-0456
A12F202	2110-0456	7		FUSE 10A 125V FAST-BLO .281X.093	28480	2110-0456
A12L201	9100-3139	5	16	COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L202	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L203	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L204	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L205	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L206	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L207	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L208	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L209	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L210	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L211	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12L212	9100-3139	5		COIL 75UH 15% .50X.875LG-NOM	28480	9100-3139
A12MP1	08160-21105	5	1	HEAT DISSIPATOR	28480	08160-21105
A12R201	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R202	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R203	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A12R204	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A12R205	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R206	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R207	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A12R208	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A12R209	0757-0805	8	2	RESISTOR 221 1% .5W F TC=0+-100	28480	0757-0805
A12R210	0757-0805	8		RESISTOR 221 1% .5W F TC=0+-100	28480	0757-0805
A12R211	0698-3428	1	6	RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A12R212	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A12R213	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A12R214	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A12R215	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A12R216	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A12R217	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A12R218	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A13	08160-60513	3	1	BOARD ASSEMBLY, POWER SUPPLY INPT-LIN	28480	08160-60513
A13C301	0160-3968	5	1	CAPACITOR-FXD .47UF +-10PF 250VAC(RMS)	28480	0160-3968
A13C302	0160-4259	9		CAPACITOR-FXD .22UF +-10% 250VAC(RMS)	00853	PME271M622
A13C303	0160-3969	6	2	CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969
A13C304	0160-3969	6		CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969

See introduction to this section for ordering information
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Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A13L301	9100-3139	5		COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A13L302	9100-3139	5		COIL 75UH 15% .5DX.875LG-NOM	28480	9100-3139
A13R301	0757-0374	6	1	RESISTOR 475K 1% .5W F TC=0+-100	28480	0757-0374
A13R302	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A13R303	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A13R304	0757-0789	7	1	RESISTOR 475K 1% .25W F TC=0+-100	24546	C5-1/4-T0-4753-F
A18	08160-66518	8	1	BOARD ASSEMBLY, REGULATOR	28480	08160-66518
A18C1	0180-2506	7	4	CAPACITOR-FXD 470UF+50-10% 25VDC AL	28480	0180-2506
A18C2	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C3	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C4	0180-1714	7		CAPACITOR-FXD 330UF+-10% 6VDC TA	56289	150D337X9006B2
A18C5	0180-2506	7		CAPACITOR-FXD 470UF+50-10% 25VDC AL	28480	0180-2506
A18C6	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C7	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C8	0180-1714	7		CAPACITOR-FXD 330UF+-10% 6VDC TA	56289	150D337X9006B2
A18C9	0180-1819	3	4	CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DM2
A18C10	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C11	0180-0094	4	6	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A18C12	0180-1819	3		CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DM2
A18C13	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C14	0180-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A18C15	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C16	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C17	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A18C18	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A18C19	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C20	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C24	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C25	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C26	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C27	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C29	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C30	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C31	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C32	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C33	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C34	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C35	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C40	0160-3572	7	2	CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
A18C41	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
A18C44	0160-4210	2	2	CAPACITOR-FXD .022UF +-20% 50VDC POLYE	28480	0160-4210
A18C45	0160-4210	2		CAPACITOR-FXD .022UF +-20% 50VDC POLYE	28480	0160-4210
A18C46	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C201	0180-2506	7		CAPACITOR-FXD 470UF+50-10% 25VDC AL	28480	0180-2506
A18C202	0180-2506	7		CAPACITOR-FXD 470UF+50-10% 25VDC AL	28480	0180-2506
A18C203	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C204	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C205	0170-1714	6	2		28480	0170-1714
A18C206	0170-1714	6			28480	0170-1714
A18C207	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C208	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C209	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C210	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C212	0180-1819	3		CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DM2
A18C213	0180-1819	3		CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DM2
A18C214	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C215	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C216	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C217	0180-2144	9	2	CAPACITOR-FXD 200UF+75-10% 25VDC AL	56289	30D207G025DM9
A18C218	0180-2144	9		CAPACITOR-FXD 200UF+75-10% 25VDC AL	56289	30D207G025DM9
A18C219	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C220	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C221	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C222	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A18C223	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A18C224	[illegible]-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C225	[illegible]-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C226	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C227	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C228	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C230	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18C231	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C232	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C233	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C234	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C235	0160-4209	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	28480	0160-4209
A18C301	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A18C302	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A18C303	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C304	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A18C305	0180-0375	4	2	CAPACITOR-FXD 68UF+-10% 20VDC TA	56289	150D686X9020B2
A18C306	0180-0375	4		CAPACITOR-FXD 68UF+-10% 20VDC TA	56289	150D686X9020B2
A18C307	0160-3878	8		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A18C308	0180-2207	5		CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A18C309	0180-2207	5		CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A18CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR20	1901-0673	6	12	DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR21	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR22	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR23	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR201	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR202	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR203	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR204	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR205	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR206	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR207	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR208	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR209	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR210	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR211	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR213	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR221	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR222	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR223	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR224	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR302	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR303	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR304	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR305	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR309	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR310	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR311	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18CR312	1901-0673	6		DIODE-PWR RECT 100V 5A SUS	03508	A15A
A18DS1	1990-0325	2	1	LED-VISIBLE LUM-INT@800UCD IF@50MA-MAX	28480	5082-4003
A18L1	9100-3139	5		COIL FXD 15% .50X.875LG-NOM	28480	9100-3139
A18L2	9100-3139	5		COIL FXD 15% .50X.875LG-NOM	28480	9100-3139
A18MP1	08160-21104	4	1	HEAT SINK	28480	08160-21104
A18MP2	08160-21102	2	1	HEAT SINK	28480	08160-21102
A18MP3	08160-21103	3	1	HEAT SINK	28480	08160-21103
A18MP4	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A18MP5	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A18MP6	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A18MP7	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A18MP8	4040-0747	2		EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0747
A18MP9	4040-0749	4		EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0749
A18Q1	1853-0425	3	1	TRANSISTOR PNP 2N5883 SI TO-3 PD=200W	04713	2N5883
A18Q2	1853-0347	8	1	TRANSISTOR PNP SI DARL PD=40W FT=1MHZ	04713	MJE700
A18Q3	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A18Q4	1854-0679	1	1	TRANSISTOR NPN 2N5885 SI TO-3 PD=200W	04713	2N5885
A18Q5	1854-0633	7	1	TRANSISTOR NPN SI DARL PD=40W	04713	MJE800
A18Q6	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A18Q7	1853-0251	3	3	TRANSISTOR PNP SI PD=40W FT=2MHZ	28480	1853-0251
A18Q8	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A18Q9	1854-0433	5	3	TRANSISTOR NPN SI PD=40W FT=2MHZ	28480	1854-0433
A18Q10	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A

See introduction to this section for ordering information
*Indicates factory-selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A18Q201	1853-0334	3	1	TRANSISTOR PNP SI DARL PD=70W FT=1MHZ	04713	MJE1090
A18Q202	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A18Q203	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A18Q204	1854-0558	5	1	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
A18Q205	1853-0251	3		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A18Q206	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A18Q207	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A18Q208	1854-0433	5		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
A18Q209	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A18Q210	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A18Q301	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A18Q302	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A18Q303	1854-0587	2	1	TRANSISTOR NPN 2N3725 SI TO-5 PD=800MW	01295	2N3725
A18Q304	1854-0433	5		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
A18Q305	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A18Q306	1853-0251	3		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A18Q307	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A18Q308	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A18R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R2	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R3	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R4	0698-3444	1		RESISTOR 31.6 1% .125W F TC=0+-100	24546	C4-1/8-T0-31R6-F
A18R5	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A18R6	0813-0029	8		RESISTOR 1 3% 3W PW TC=0+-50	28480	0813-0029
A18R7	0757-0390	5	2	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A18R8	0811-1831	8	2	RESISTOR 2 5% 3W PW TC=0+-50	28480	0811-1831
A18R9	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A18R10	0811-3290	7	8	RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R11	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R12	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R14	0757-0349	5		RESISTOR 22.0K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2262-F
A18R15	0757-0349	5		RESISTOR 22.0K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2262-F
A18R16	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A18R17	0698-3491	8	4	RESISTOR 1K .1% .125W F TC=0+-50	28480	0698-3491
A18R18	0757-0291	6		RESISTOR 24.9 1% .125W F TC=0+-100	19701	MFMC1/8-T0-2492-F
A18R19	0757-0291	6		RESISTOR 24.9 1% .125W F TC=0+-100	19701	MFMC1/8-T0-2492-F
A18R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R21	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A18R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R23	0757-0390	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A18R24	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A18R25	0811-1831	8		RESISTOR 2 5% 3W PW TC=0+-50	28480	0811-1831
A18R26	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A18R27	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A18R28	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A18R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R30	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R31	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R33	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A18R34	0813-0029	8		RESISTOR 1 3% 3W PW TC=0+-50	28480	0813-0029
A18R35	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A18R36	0698-3491	8		RESISTOR 1K .1% .125W F TC=0+-50	28480	0698-3491
A18R40	0698-4491	0	2	RESISTOR 3.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3741-F
A18R41	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A18R42	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R44	0757-0801	4	2	RESISTOR 150 1% .5W F TC=0+-100	28480	0757-0801
A18R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R46	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R48	0757-0123	3		RESISTOR 30.8K 1% .125W F TC=0+-100	28480	0757-0123
A18R49	0757-0123	3		RESISTOR 30.8K 1% .125W F TC=0+-100	28480	0757-0123
A18R50	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A18R51	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R52	0698-3156	2	4	RESISTOR 10.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1072-F
A18R53	0757-0338	2	4	RESISTOR 1K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1001-F
A18R60	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R61	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A18R62	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R63	0757-0198	2	2	RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A18R64	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18R65	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R66	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R67	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R68	0698-4498	7	4	RESISTOR 53.6K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-53G2-F
A18R69	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R70	0698-3156	2		RESISTOR 14.7K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1472-F
A18R71	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A18R72	0698-4498	7		RESISTOR 53.6K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-53G2-F
A18R73	0757-0413	4	2	RESISTOR 392 1% ,125W F TC=0+-100	24546	C4=1/8-T0-392R-F
A18R74	0757-0338	2		RESISTOR 1K 1% ,25W F TC=0+-100	24546	C5=1/4-T0-1001-F
A18R79	0757-0283	6		RESISTOR 2K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-2001-F
A18R80	0698-4502	4	2	RESISTOR 64.9K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-6492-F
A18R81	0698-3245	0		RESISTOR 20.5K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-2052-F
A18R82	0757-0442	9		RESISTOR 10K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1002-F
A18R83	0698-3450	9	1	RESISTOR 42.2K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-4222-F
A18R85	0757-0458	7		RESISTOR 51.1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-5112-F
A18R86	0757-0465	0		RESISTOR 100K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1003-F
A18R87	0698-4521	7		RESISTOR 154K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1543-F
A18R88	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R89	0757-1094	9		RESISTOR 1.47K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1471-F
A18R90	0698-4543	3	1	RESISTOR 887K 1% ,125W F TC=0+-100	28480	0698-4543
A18R91	0757-0419	0	1	RESISTOR 681 1% ,125W F TC=0+-100	24546	C4=1/8-T0-681R-F
A18R93	0757-0428	1		RESISTOR 1.62K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1621-F
A18R94	0698-4469	2	1	RESISTOR 1.15K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1151-F
A18R95	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A18R96	0757-0438	3		RESISTOR 5.11K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-5111-F
A18R97	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R98	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R99	0757-0796	6	1	RESISTOR 82.5 1% ,5W F TC=0+-100	28480	0757-0796
A18R201	0698-3491	8		RESISTOR 1K ,1% ,125W F TC=0+-50	28480	0698-3491
A18R202	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R203	0757-0001	0		RESISTOR 100 1% ,125W F TC=0+-100	24546	C4=1/8-T0-101-F
A18R204	0757-0178	8	2	RESISTOR 100 1% ,25W F TC=0+-100	24546	C5=1/4-T0-101-F
A18R205	0811-1681	2	2	RESISTOR .39 5% 2W PW TC=0+-800	75042	BWN2-39/100-J
A18R206	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R207	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R208	0698-4482	9	4	RESISTOR 17.4K 1% ,125W F TC=0+-100	03888	PME55-1/8-T0-1742-F
A18R209	0698-4482	9		RESISTOR 17.4K 1% ,125W F TC=0+-100	03888	PME55-1/8-T0-1742-F
A18R210	0698-3491	8		RESISTOR 1K ,1% ,125W F TC=0+-50	28480	0698-3491
A18R211	0757-0401	0		RESISTOR 100 1% ,125W F TC=0+-100	24546	C4=1/8-T0-101-F
A18R212	0757-0178	8		RESISTOR 100 1% ,25W F TC=0+-100	24546	C5=1/4-T0-101-F
A18R213	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R214	0698-4482	9		RESISTOR 17.4K 1% ,125W F TC=0+-100	03888	PME55-1/8-T0-1742-F
A18R215	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R216	0811-1681	2		RESISTOR .39 5% 2W PW TC=0+-800	75042	BWN2-39/100-J
A18R217	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R218	0698-4482	9		RESISTOR 17.4K 1% ,125W F TC=0+-100	03888	PME55-1/8-T0-1742-F
A18R219	0757-0416	7		RESISTOR 511 1% ,125W F TC=0+-100	24546	C4=1/8-T0-511R-F
A18R220	0757-0407	6		RESISTOR 200 1% ,125W F TC=0+-100	24546	C4=1/8-T0-201-F
A18R221	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R222	0698-4441	0		RESISTOR 3.74K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-3741-F
A18R223	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A18R224	0757-0421	4	1	RESISTOR 825 1% ,125W F TC=0+-100	24546	C4=1/8-T0-825R-F
A18R225	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R226	0757-0401	0		RESISTOR 100 1% ,125W F TC=0+-100	24546	C4=1/8-T0-101-F
A18R227	0757-0801	4		RESISTOR 150 1% ,5W F TC=0+-100	28480	0757-0801
A18R228	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R229	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R230	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R231	0757-0123	3		RESISTOR 34.8K 1% ,125W F TC=0+-100	28480	0757-0123
A18R232	0757-0123	3		RESISTOR 34.8K 1% ,125W F TC=0+-100	28480	0757-0123
A18R233	0757-0403	2		RESISTOR 121 1% ,125W F TC=0+-100	24546	C4=1/8-T0-121R-F
A18R234	0757-0403	2		RESISTOR 121 1% ,125W F TC=0+-100	24546	C4=1/8-T0-121R-F
A18R235	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R236	0757-0281	4		RESISTOR 2.74K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-2741-F
A18R237	0757-0198	2		RESISTOR 100 1% ,5W F TC=0+-100	28480	0757-0198
A18R238	0757-0280	3		RESISTOR 1K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A18R239	0698-4498	7		RESISTOR 53.6K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-53G2-F
A18R240	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R241	0698-6624	5		RESISTOR 2K ,1% ,125W F TC=0+-25	28480	0698-6624
A18R242	0698-4498	7		RESISTOR 53.6K 1% ,125W F TC=0+-100	24546	C4=1/8-T0-53G2-F
A18R243	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A18R244	0811-3290	7		RESISTOR .1 5% 2W PW TC=0+-800	28480	0811-3290
A18R245	0757-0407	6		RESISTOR 200 1% ,125W F TC=0+-100	24546	C4=1/8-T0-201-F
A18R247	0757-0420	3		RESISTOR 750 1% ,125W F TC=0+-100	24546	C4=1/8-T0-751-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18R249	0757-0338	2		RESISTOR 1K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1001-F
A18R250	0757-0338	2		RESISTOR 1K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1001-F
A18R251	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A18R252	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A18R253	0757-0413	4		RESISTOR 392 1% .125W F TC=0+-100	24546	C4-1/8-T0-392R-F
A18R260	0698-4502	4		RESISTOR 64.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6492-F
A18R261	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R262	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A18R263	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A18R264	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R265	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A18R266	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R267	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A18R268	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A18R269	0698-3268	7	1	RESISTOR 11.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1152-F
A18R275	0698-4157	5	4	RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A18R276	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A18R277	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A18R278	0698-4157	5		RESISTOR 10K .1% .125W F TC=0+-50	28480	0698-4157
A18R279	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A18R280	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A18R281	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A18R282	0757-0803	6	1	RESISTOR 1R2 1% .5W F TC=0+-100	28480	0757-0803
A18R283	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A18R284	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A18R285	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R301	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A18R302	0698-8958	2		RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A18R303	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A18R304	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R305	0698-4125	7	2	RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-953R-F
A18R306	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A18R307	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A18R308	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R309	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A18R310	0698-4125	7		RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-953R-F
A18R311	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A18R312	0811-1672	5	2	RESISTOR 3.3 5% 2W PW TC=0+-400	75042	BWW2-3R3-J
A18R313	0811-1672	5		RESISTOR 3.3 5% 2W PW TC=0+-400	75042	BWW2-3R3-J
A18R314	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A18R315	0811-3294	1	2	RESISTOR .22 5% 2W PW TC=0+-800	28480	0811-3294
A18R316	0811-3294	1		RESISTOR .22 5% 2W PW TC=0+-800	28480	0811-3294
A18R317	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R318	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18U1	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U2	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U3	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U4	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A18U5	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A18U6	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A18U7	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	04713	MC1455P1
A18U8	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A18U9	1826-0300	6	2	IC V RGLTR TO-39	07263	79M12MC
A18U10	1826-0226	5	2	IC V RGLTR TO-39	07263	78M12MC
A18U201	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U202	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U203	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A18U204	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A18U205	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A18U206	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A18U207	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A18U208	1826-0226	5		IC V RGLTR TO-39	07263	78M12MC
A18U209	1826-0300	6		IC V RGLTR TO-39	07263	79M12MC
A18U301	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A18VR1	1902-0126	6	2	DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.072%	28480	1902-0126
A18VR2	1902-0126	6		DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.072%	28480	1902-0126
A18VR3	1902-0660	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A18VR4	1902-3279	6	2	DIODE-ZNR 28.7V 5% DO-7 PD=.4W TC=+.076%	28480	1902-3279
A18VR201	1902-3279	6		DIODE-ZNR 28.7V 5% DO-7 PD=.4W TC=+.076%	28480	1902-3279
A18VR301	1902-3139	7	3	DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	28480	1902-3139
A18V[illegible]	1902-3139	7		DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	28480	1902-3139
420	0818--66520	8	1	BOARD ASSEMBLY, BURST	28480	0818--66520

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A20C1	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A20C2	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A20C3	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A20C4	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A20J8	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A20J9	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A20MP1	0360-0535	0	4	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A20MP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A20MP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A20MP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A20MP5	0040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	0040-0748
A20MP6	0040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	0040-0750
A20Q1	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A20R1	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A20R2	1810-0332	1	6	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A8B1
A20R3	1810-0332	1		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A8B1
A20R4	0698-3401	8	8	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A20R5	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A20R6	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A20R7	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A20U1	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A20U2	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A20U3	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A20U4	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A20U5	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A20U6	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A20U7	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A20U8	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A20U9	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A20U10	1820-1278	7		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS191N
A20U11	1820-1278	7		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS191N
A20U12	1820-1278	7		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS191N
A20U13	1820-1144	6		IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A20U14	1820-1203	8	1	IC GATE TTL LS AND TPL 3-INP	01295	SN74LS11N
A20U15	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A20U16	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A20U17	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A20U18	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A20U19	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A20U20	5081-1984	8	2	IC	28480	5081-1984
A20U20	5081-1984	8		MC 10136L WITH HEAT SINK	28480	5081-1984
A20U21	1820-0796	2	2	IC GATE ECL NOR QUAD 2-INP	04713	MC1002L
A20U22	1820-0806	5	1	IC GATE ECL OR-NOR DUAL 4-5-INP	04713	MC10109P
A20U23	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A23	08160-60523	5	1	BOARD ASSEMBLY, REP RATE	28480	08160-60523
A23C1	0160-4521	8	1	CAPACITOR-FXD 12PF +-5% 200VDC CER 0+-30	28480	0160-4521
A23C2	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C3	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C4	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C5	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A23C6	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C7	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C8	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C9	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C10	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A23C19	0121-0475	1	1	CAPACITOR-V TRMR-POLYP 2-22PF 100V	D2540	2222 808 11229
A23C20	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A23C21	0121-0467	1		CAPACITOR-V TRMR-CER 2.5-9PF 100V PC-MTG	28480	0121-0467
A23C22	0160-4494	4		CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4494
A23C23	0160-4675	3	1	CAPACITOR-FXD 680PF +-1% 50VDC CER	28480	0160-4675
A23C24	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A23C25	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A23C26	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A23C27	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A23C28	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A23C29	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A23C30	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A23C31	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C32	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23C51	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C52	0160-4389	6		CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A23C53	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A23C54	0160-4389	6		CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A23C55	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A23C56	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A23C57	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C58	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C59	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A23C61	0180-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A23C62	0180-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A23C63	0180-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A23C64	0180-0094	4		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A23C65	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C66	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A23C67	0180-2690	0	1	CAPACITOR-FXD 3.3UF+-10% 15VDC TA	56289	150D335X9015A2
A23CR1	1901-0539	3	2	DIODE-SCHOTTKY	28480	1901-0539
A23CR2	1901-0539	3		DIODE-SCHOTTKY	28480	1901-0539
A23CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR4	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A23CR5	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A23CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR20	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A23CR21	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A23CR22	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR23	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR24	1901-1097	0	1	DIODE-PIN	28480	1901-1097
A23CR25	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR26	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR27	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR28	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR29	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR30	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR31	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR32	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR33	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR34	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR35	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR51	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A23CR52	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A23CR53	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A23CR54	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A23J1	1250-0583	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0583
A23J2	1250-0583	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0583
A23J3	1250-0583	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0583
A23J4	1250-0583	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0583
A23J5	1250-0583	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0583
A23J6	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A23J7	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A23K1	0490-1079	0		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A23L1	9100-3109	7		COIL 220UH 10% Q=40 .312DX.375LG-NOM	28480	9100-3109
A23L3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23L4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23L5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23L6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23L7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23L8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A23MP1	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A23MP2	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
A23MP3	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A23Q1	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A23Q2	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A23Q3	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q4	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q5	1854-0385	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A23Q6	1854-0385	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A23Q20	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A23Q21	1853-0218	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0218
A23Q22	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q23	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087

See introduction to this section for ordering information
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Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23Q24	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A23Q25	1854-0085	7		TRANSISTOR NPN SI TO-104 PD=175MW	28480	1854-0085
A23Q51	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q52	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q53	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q54	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q55	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q56	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q57	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q58	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q59	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q60	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q61	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q62	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q63	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q64	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q65	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q66	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q67	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q68	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q69	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q70	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q71	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q72	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q73	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q74	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A23Q75	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A23Q76	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A23Q77	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q78	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A23Q79	1855-0241	5	1	TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	18324	SD215
A23Q80	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A23Q81	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A23Q82	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A23Q83	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A23R1	0698-3610	3	1	RESISTOR 24 5% 2W MO TC=0+-200	27167	FP42-2-T00-24R0-J
A23R2	0698-3611	4	1	RESISTOR 27 5% 2W MO TC=0+-200	27167	FP42-2-T00-27R0-J
A23R3	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A23R4	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A23R5	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R7	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R12	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R13	0757-0476	9	1	RESISTOR 301K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3013-F
A23R14	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R15	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A23R16	0698-4471	6		RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A23R17	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A23R18	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A23R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R20	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A23R21	0757-0728	4	1	RESISTOR 619 1% .25W F TC=0+-100	24546	C5-1/4-T0-619R-F
A23R22	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A23R23	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A23R24	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A23R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R26	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A23R27	0757-0726	2	1	RESISTOR 511 1% .25W F TC=0+-100	24546	C5-1/4-T0-511R-F
A23R28	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A23R29	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A23R30	2100-3349	2	1	RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A23R31	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R32	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R33	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R36	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R37	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R38	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R39	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A23R40	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G

See introduction to this section for ordering information
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Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23R41	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A23R49	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R50	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R51	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R52	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R53	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R54	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R55	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A23R56	0698-3700	2		RESISTOR 715 1% .125W F TC=0+-100	24546	C4-1/8-T0-715R-F
A23R57	2100-0554	5	1	RESISTOR-TRMR 500 10% C TOP-ADJ 1-TRN	28480	2100-0554
A23R58	0683-0515	0	1	RESISTOR 5.1 5% .25W FC TC=-400/+500	01121	CB5165
A23R59	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A23R60	0698-4464	7	1	RESISTOR 887 1% .125W F TC=0+-100	24546	C4-1/8-T0-887R-F
A23R61	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A23R62	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A23R63	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A23R64	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R65	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R66	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R67	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A23R68	0698-7186	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A23R69	0757-0725	1	1	RESISTOR 475 1% .25W F TC=0+-100	24546	C5-1/4-T0-475R-F
A23R70	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R71	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R72	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A23R73	0698-7200	5	3	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A23R74	2100-0567	0	1	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	28480	2100-0567
A23R75	0698-7200	5		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A23R78	2100-0568	1	1	RESISTOR-TRMR 100 10% C TOP-ADJ 1-TRN	28480	2100-0568
A23R79	2100-3409	5	1	RESISTOR-TRMR 20 10% C TOP-ADJ 1-TRN	28480	2100-3409
A23R80	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A23R81	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A23R82	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A23R83	0698-7277	6	1	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A23R84	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R85	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R86	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A23R87	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A23R88	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R89	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R90	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R91	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R92	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R93	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R94	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R95	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R96	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A23R97	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A23R101	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R102	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R103	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R104	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R105	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R106	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R107	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R108	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R109	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R110	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R111	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R112	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R113	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R114	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R115	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R116	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R117	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R118	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R119	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R120	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R121	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R122	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R123	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R124	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A23R125	0699-0243	4		RESISTOR 199 .1% .125W F TC=0+-25	28480	0699-0243
A23R126	0698-6355	9	1	RESISTOR 400 .1% .125W F TC=0+-25	28480	0698-6355
A23R127	0698-6366	2	1	RESISTOR 800 .1% .125W F TC=0+-25	28480	0698-6366

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23R128	0698-6103	5		RESISTOR 1.6K .1% .125W F TC=0+-50	28480	0698-6103
A23R129	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A23R130	0698-6322	0		RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A23R131	0698-6361	7		RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A23R132	0698-8046	9		RESISTOR 16K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-1602-B
A23R133	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A23R134	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A23R135	0698-4509	1	1	RESISTOR 80.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8062-F
A23R136	0757-0470	3		RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A23R137	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A23R138	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A23R139	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A23R140	0698-3495	2	1	RESISTOR 866 1% .125W F TC=0+-100	24546	C4-1/8-T0-866R-F
A23R141	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A23R142	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R143	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R144	0757-0410	1		RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
A23R145	0757-0410	1		RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
A23R146	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R147	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A23R148	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R149	0683-1055	5		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A23R150	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A23R151	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R152	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R153	0683-2255	9		RESISTOR 2.2M 5% .25W FC TC=-900/+1100	01121	CB2255
A23R154	0683-1055	5		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A23R155	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A23R156	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R157	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R158	0757-0453	2	2	RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
A23R159	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A23R160	0757-0453	2		RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
A23R161	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R162	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R163	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R164	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A23R170	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R171	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R172	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R173	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R174	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R175	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R176	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R177	0698-3279	0	2	RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A23R178	0698-6447	0	3	RESISTOR 681.8 .1% .125W F TC=0+-25	28480	0698-6447
A23R179	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A23R180	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R181	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R182	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A23R183	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R184	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R185	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A23R186	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R187	0698-3279	0		RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A23R188	0698-6447	0		RESISTOR 681.8 .1% .125W F TC=0+-25	28480	0698-6447
A23R189	0698-6447	0		RESISTOR 681.8 .1% .125W F TC=0+-25	28480	0698-6447
A23R190	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A23R191	0698-7242	5	1	RESISTOR 1.78K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1781-G
A23R192	0698-7249	2	1	RESISTOR 3.48K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3481-G
A23R193	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A23R194	0698-7200	5		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A23R195	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A23R201	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A23R202	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A23R203	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A23R204	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A23R205	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A23R206	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A23R207	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A23R208	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A23R209	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R210	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R211	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A23R212	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23R213	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A23R219	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R221	1810-0332	1		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A681
A23R222	1810-0332	1		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A681
A23R223	1810-0332	1		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A681
A23R224	1810-0332	1		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	01121	208A681
A23R250	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R251	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A23R252	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A23R253	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A23R254	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A23R255	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A23RT76	0837-0085	8	2	THERMISTOR ROD 680-OHM TC=-.7%/C-DEG	28480	0837-0085
A23RT77	0837-0085	8		THERMISTOR ROD 680-OHM TC=-.7%/C-DEG	28480	0837-0085
A23U1	1826-0346	0	1	OP AMP GP DUAL 8-DIP-P	27014	LM358N
A23U2	1826-0363	1		DIFF AMPL DUAL	28480	1826-0363
A23U21	1820-0798	2		IC GATE ECL NOR QUAD 2-INP	04713	MC1662L
A23U22	1820-0790	0	3	IC GATE ECL OR-NOR DUAL 4-INP	04713	MC1660L
A23U23	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A23U24	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A23U25	1820-0795	1	1	IC GATE ECL OR QUAD 2-INP	04713	MC1664L
A23U26	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A23U27	1826-0043	4		1C AMP GP TO-99	01928	CA1077T
A23U28	1820-0790	0		IC GATE ECL OR-NOR DUAL 4-INP	04713	MC1660L
A23U29	1820-0790	0		IC GATE ECL OR-NOR DUAL 4-INP	04713	MC1660L
A23U30	1826-0363	1		DIFF AMPL DUAL	28480	1826-0363
A23U31	1858-0015	7		IC MISC	28480	1858-0015
A23U32	1858-0015	7		IC MISC	28480	1858-0015
A23U33	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A23U34	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A23U35	1820-1205	0	2	IC GATE TTL LS AND DUAL 4-INP	01295	SN74LS21N
A23U36	1820-1205	0		IC GATE TTL LS AND DUAL 4-INP	01295	SN74LS21N
A23U37	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U38	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U39	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U40	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U41	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U42	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A23U51	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A23U52	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A23U53	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A23U54	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U55	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U56	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U57	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U58	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U59	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U60	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A23U61	1820-1601	0	1	IC GATE CMOS EXCL-OR QUAD 2-INP	01928	CD4070BE
A23U62	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A23U63	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A23U64	1820-1418	7		IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	01295	SN74LS42N
A23U65	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A23U66	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A23U67	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A23U68	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A23U70	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A23U71	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A23U72	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A23U73	1826-0556	4	2	OP AMP GP DUAL TO-99	04713	MC1458NG
A23U74	1826-0106	0	1	IC 7815 V RGLTR TO-220	04713	MC7815CP
A23U75	1826-0214	1	1	IC V RGLTR TO-220	04713	MC7915CT
A23U76	1826-0179	7	1	IC V RGLTR TO-39	27014	LM320H-5.2
A23U77	1826-0556	4		OP AMP GP DUAL TO-99	04713	MC1458NG
A23VR1	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.08%	28480	1902-0025
A23VR2	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	28480	1902-0041
A23VR3	1902-3048	7	1	DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=+.058%	28480	1902-3048
A23VR4	1902-3139	7		DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	28480	1902-3139
A23VR51	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A23VR52	1902-3104	6	3	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	28480	1902-3104
A23VR53	1902-3104	6		DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	28480	1902-3104
A23VR55	1902-3104	6		DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	28480	1902-3104

See 2011 for Code To This section for ordering information.
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A126	08160-60526	8	2	BOARD ASSEMBLY, TIME INT I	28480	08160-60526
A126C1	0160-4386	3	18	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A126C2	0160-3873	1	28	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C3	0160-3879	7	45	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A126C4	0160-0174	9	62	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A126C5	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A126C7	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A126C8	0160-3872	0	2	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A126C10	0160-3874	2	20	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A126C11	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C12	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A126C13	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C20	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A126C23	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A126C24	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C25	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A126C30	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A126C31	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A126C32	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A126CR5	1901-0040	1	213	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR20	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR21	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR22	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR23	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR25	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR26	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR27	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR28	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR29	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126CR30	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A126DL1	08160-61615	6	2	CABLE ASSEMBLY, SHIELDED	28480	08160-61615
A126J2	1251-3718	7	12	CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A126J4	1250-0543	8	29	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A126L1	5081-1973	5	12	INDUCTANCE, 3-BEAD	28480	5081-1973
A126L2	9100-1641	0	2	COIL-MLD 240UH 5% Q=35 .155Dx.375LG-NOM	28480	9100-1641
A126L3	9100-2247	4	8	COIL-MLD 100NH 10% Q=34 .095Dx.25LG-NOM	28480	9100-2247
A126L4	9170-0894	0	86	CORE-SHIELDING BEAD	28480	9170-0894
A126L6	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L7	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L10	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L13	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L14	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126MP3	4040-0750	7	9	EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A126MP4	4040-0750	7	2	EXTR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0750
A126Q1	1853-0075	0	14	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A126Q2	1854-0342	5	63	TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q3	1853-0086	2	58	TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A126Q5	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A126Q11	1854-0583	6	92	TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18

See introduction to this section for ordering information
*Indicates factory-selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A126Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q13	1854-0215	1	79	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q15	1853-0036	2	147	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q17	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q18	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q19	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q20	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q21	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q22	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q23	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q24	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q25	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q26	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q27	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q28	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q29	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q30	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q35	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q36	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q37	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q38	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q39	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q40	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q41	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q42	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q43	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q44	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q45	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q46	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q47	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q48	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q49	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q50	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q51	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q52	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q53	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q54	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q55	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q56	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q57	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q58	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q59	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q60	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q61	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q62	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q63	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q64	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q65	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q66	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q67	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q68	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A126R1	0757-0394	0	99	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R2	0698-3447	4	24	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A126R3	0757-039A	4	19	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A126R4	0757-0389	3	25	RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A126R5	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A126R6	0698-3446	3	12	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A126R7	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A126R8	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A126R9	0757-0818	3	14	RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A126R10	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R11	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A126R12	0757-0417	8	3	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A126R13	0698-4044	3	4	RESISTOR 4.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4R87-F
A126R14	0698-4044	3		RESISTOR 4.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4R87-F
A126R15	0698-3178	8	2	RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A126R16	0757-0438	3	83	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R17	0757-0439	4	7	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A126R18	0757-0433	8	7	RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A126R19	0757-0407	6	73	RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R20	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A126R21	0757-0159	5	2	RESISTOR 1K 1% .5W F TC=0+-100	28480	0757-0159
A126R22	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R24	0757-0442	9	147	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1002-F
A126R25	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4=1/8-T0-6811-F
A126R26	0698-3455	8	2	RESISTOR 261K 1% .125W F TC=0+-100	24546	C4=1/8-T0-2613-F
A126R30	0698-4479	8	90	RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R31	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R32	0698-4020	1	118	RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R33	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R34	0757-0280	3	175	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R36	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R37	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4=1/8-T0-51R1-F
A126R38	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R39	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R40	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R41	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R42	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R43	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R44	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R45	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R46	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R48	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R49	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R50	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R51	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R52	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R53	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R54	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R55	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R56	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R57	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R58	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R59	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R60	0757-0401	0	52	RESISTOR 100 1% .125W F TC=0+-100	24546	C4=1/8-T0-101-F
A126R62	0757-0434	9	6	RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4=1/8-T0-3651-F
A126R63	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R65	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R66	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R67	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R68	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R70	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R71	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R72	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R73	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R74	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R75	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R76	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R77	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R78	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R79	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R80	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R81	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4=1/8-T0-201-F
A126R82	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R83	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R84	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R85	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R86	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R87	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R88	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R89	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R90	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R91	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F
A126R92	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R93	0757-0416	7	45	RESISTOR 511 1% .125W F TC=0+-100	24546	C4=1/8-T0-511R-F
A126R94	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R95	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R96	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R97	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1402-F
A126R98	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R99	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R100	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R101	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4=1/8-T0-9531-F
A126R102	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4=1/8-T0-1001-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A126R103	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R104	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R105	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A126R106	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A126R107	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A126R108	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A126R109	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A126R110	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R111	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R112	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R113	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R114	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R115	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R116	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R117	0757-0434	9		RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3651-F
A126R118	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R119	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R120	0683-9145	0	2	RESISTOR 910K 5% .25W FC TC=-800/+900	01121	CB9145
A126R121	0683-6245	5	2	RESISTOR 620K 5% .25W FC TC=-800/+900	01121	CB6245
A126R122	0683-7545	0	2	RESISTOR 750K 5% .25W FC TC=-800/+900	01121	CB7545
A126R123	0698-3454	3	2	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A126R124	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R125	0757-0434	9		RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3651-F
A126R126	0757-0443	0	4	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A126R127	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R128	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R130	0698-3431	6	8	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A126R131	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A126R132	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A126R133	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A126R134	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A126R135	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A126R136	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A126R137	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R138	2100-3351	6	14	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A126R139	0698-0082	7	7	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A126R140	0757-0392	8	2	RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
A126R141	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A126R142	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A126R143	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R144	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R145	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R146	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R147	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R148	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A126R150	0757-0472	5	10	RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A126R151	2100-3274	2	18	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A126R152	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A126R153	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A126R154	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A126R155	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A126R156	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A126R157	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A126R160	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R161	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R162	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R163	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126RT1	0837-0040	3	2	THERMISTOR DISC 10K-OHM TC=4.4%/C-DEG	28480	0837-0040
A126U1	1858-0015	7	16	IC MISC	28480	1858-0015
A126U2	1820-1958	0	4	SWITCH ANLG QUAD 14-DIP-P	01928	CD4016BE
A126U3	1858-0015	7		IC MISC	28480	1858-0015
A126U4	1826-0043	4	15	OP AMP GP TO-99	01928	CA3077
A126U5	1820-1958	0		SWITCH ANLG QUAD 14-DIP-P	01928	CD4016BE
A126U6	1820-1956	8	73	IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A126U7	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A127	08160-60527	9	2	BOARD ASSEMBLY, TIME INT 2	28480	08160-60527
A127C1	0160-2940	1	5	CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2940
A127C2	0160-2940	1		CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2940
A127C3	0160-0598	1	2	CAPACITOR-FXD 2200PF +-10% 250VDC	28480	0160-0598
A127C4	0140-0141	8	2	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WVICR
A127C5	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A127C5	0160-3875	3	8	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A127C5	0160-0585	2	11	CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-0585
A127C5	0160-0586	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-0586
A127C5	0160-0587	4	12	CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-0587
A127C5	0160-0496	4	3	CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-0496

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A127C8	0160-0576	5	103	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A127C7	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A127C8	0160-4350	1	6	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A127C9	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A127C10	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A127C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A127C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A127C13	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A127C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A127CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A127DL1	08160-61601	0	2	CABLE ASSEMBLY, DELAY 1	28480	08160-61601
A127DL3	08160-61602	1	2	CABLE ASSEMBLY, DELAY 2	28480	08160-61602
A127DL4	08160-61616	7	2	CABLE ASSEMBLY, SHIELDED	28480	08160-61616
A127DL5	08160-61603	2	2	CABLE ASSEMBLY, DELAY 3	28480	08160-61603
A127J2	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A127J4	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A127J5	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A127J6	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A127L1	9100-2262	3	6	COIL-MLD 3.9UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2262
A127L2	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127L3	9100-2262	3		COIL-MLD 3.9UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2262
A127L4	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127L5	9100-0368	4	2	COIL-MLD 330NH 10% Q=28 .095DX.25LG-NOM	28480	9100-0368
A127L6	9100-2265	6	2	COIL-MLD 10UH 10% Q=60 .095DX.25LG-NOM	28480	9100-2265
A127L7	9100-2251	0	6	COIL-MLD 220NH 10% Q=32 .095DX.25LG-NOM	28480	9100-2251
A127L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127L12	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A127MP3	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A127MP4	4040-0755	2	2	EXTR-PC BD VIO POLYC .062-BD-THKNS	28480	4040-0755
A127Q1	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q2	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q3	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q4	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q5	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q6	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q9	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q10	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q11	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q13	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q14	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q15	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q16	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q17	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q18	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q19	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q20	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A127Q21	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A127Q22	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q23	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q24	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A127Q25	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A127Q26	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q27	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q28	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q29	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q30	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A127Q46	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A127R1	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R2	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R3	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R4	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R7	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R8	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R9	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R10	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R11	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R12	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A127R13	0683-0275	9	12	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R14	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R15	0698-3132	4	10	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A127R16	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R17	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R18	0757-0412	3	9	RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A127R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R21	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R22	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R23	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R24	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R25	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A127R26	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R27	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R28	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R29	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R30	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R31	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R32	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R33	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R34	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R35	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R36	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A127R37	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R38	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A127R39	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A127R40	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R41	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R42	0757-0279	0	11	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A127R43	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R44	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R45	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R46	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R48	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A127R49	0698-4356	6	4	RESISTOR 12.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-12R7-F
A127R50	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A127R51	0698-4356	6		RESISTOR 12.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-12R7-F
A127R52	0698-4358	8	2	RESISTOR 14 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R0-F
A127R53	0757-0411	2	5	RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A127R54	0698-0416	9	6	RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A127R55	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A127R56	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A127R57	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A127R58	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A127R59	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A127R60	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A127R61	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A127R62	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A127R63	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A127R64	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A127R65	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A127R66	0698-4453	4	2	RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A127R67	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A127R68	0698-3937	2	10	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A127R69	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R70	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R71	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R72	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R73	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A127R74	0698-3245	0	18	RESISTOR 20,5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A127R75	0698-3245	0		RESISTOR 20,5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A127R76	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R77	0757-0438	3		RESISTOR 5,11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A127R78	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R79	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R80	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R81	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A127R82	0757-0405	4	10	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A127R83	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A127R84	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R85	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A127R86	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R87	0698-4020	1		RESISTOR 9,53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A127R88	0698-4431	8	52	RESISTOR 2,05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A127R89	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A127R90	0757-0288	1	2	RESISTOR 9,09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A127R91	0757-0283	8	29	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A127R100	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A127R101	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A127R102	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A127R103	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A127R104	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A127R105	0757-0348	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A127R106	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A127R107	0757-0348	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A127R108	0757-0736	4	8	RESISTOR 1,5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A127R109	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A127R110	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A127R111	0698-4459	0	2	RESISTOR 634 1% .125W F TC=0+-100	24546	C4-1/8-T0-634R-F
A127R112	2100-3352	7	17	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A127R113	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A127R114	0757-0736	4		RESISTOR 1,5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A127R115	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A127U1	1858-0015	7		IC MISC	28480	1858-0015
A127U2	1858-0015	7		IC MISC	28480	1858-0015
A127U3	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128	08160-66528	0	2	BOARD ASSEMBLY, TIME INT S	28480	08160-66528
A128C1	0160-3873	1		CAPACITOR-FXD 4,7PF +-.5PF 200VDC CER	28480	0160-3873
A128C3	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A128C4	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A128C7	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A128C8	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A128C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A128C10	0121-0467	1	5	CAPACITOR-V TRMR-CER 2.5-9PF 100V PC-MTG	28480	0121-0467
A128C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A128C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A128C13	0160-0387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-0387
A128C14	0160-0387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-0387
A128C15	0160-0387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-0387
A128C16	0160-3873	1		CAPACITOR-FXD 4,7PF +-.5PF 200VDC CER	28480	0160-3873
A128C17	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A128C18	0160-3873	1		CAPACITOR-FXD 4,7PF +-.5PF 200VDC CER	28480	0160-3873
A128C19	0160-3873	1		CAPACITOR-FXD 4,7PF +-.5PF 200VDC CER	28480	0160-3873
A128CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A128DL1	08160-61604	3	2	CABLE ASSEMBLY, DELAY	28480	08160-61604
A128DL2	08160-61617	8	4	CABLE ASSEMBLY, SHIELDED, SET OF 2	28480	08160-61617
A128DL3	08160-61617	8		CABLE ASSEMBLY, SHIELDED, SET OF 2	28480	08160-61617

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A126J2	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A126J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A126J5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A126L1	9100-2262	3		COIL-MLD 3.9UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2262
A126L2	9100-2264	5	2	COIL-MLD 6.8UH 10% Q=50 .095DX.25LG-NOM	28480	9100-2264
A126L3	9100-2259	8	2	COIL-MLD 1.5UH 10% Q=32 .095DX.25LG-NOM	28480	9100-2259
A126L4	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L5	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L6	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L7	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L10	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L12	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L13	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L14	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L15	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126L16	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A126MP1	1400-0824	7	2	STRAP-CABLE	28480	1400-0824
A126MP3	01801-22301	7	6	HEAT SINK	28480	01801-22301
A126MP4	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A126MP5	4040-0747	2	3	EXTR-PC BD GRA POLYC .062-BD-THKNS	28480	4040-0747
A126Q1	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q2	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q4	1854-0485	7	18	TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A126Q6	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A126Q7	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A126Q8	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A126Q9	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A126Q10	1853-0218	2	5	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0218
A126Q11	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A126Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q15	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q16	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q18	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q30	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q31	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q32	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q33	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q50	1855-0061	1	15	TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A126Q52	1855-0061	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A126Q54	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A126Q57	1855-0061	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A126Q59	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A126Q60	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126Q61	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A126R1	0698-4479	4		RESISTOR 18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1802-F
A126R2	0698-4479	4		RESISTOR 18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1802-F
A126R3	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R4	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R7	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A126R8	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A126R10	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R11	0698-4389	5	8	RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A126R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R14	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A126R15	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A126R16	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A126R17	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A126R18	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R19	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A126R20	0698-3440	1	6	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A126R21	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A126R22	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R25	0757-0384	8	4	RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A126R26	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A126R27	0698-4460	3	34	RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A126R28	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12BR29	0698-4418	1	8	RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A12BR30	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A12BR31	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR33	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A12BR34	0757-1096	9	11	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A12BR35	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12BR36	0757-0273	4	9	RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A12BR37	2100-3252	6	2	RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TRN	28480	2100-3252
A12BR38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A12BR39	0698-4433	0	2	RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A12BR40	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR41	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR45	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A12BR46	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A12BR47	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A12BR48	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A12BR49	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A12BR50	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A12BR51	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A12BR52	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12BR53	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A12BR54	0757-0290	5	5	RESISTOR 4.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-4191-F
A12BR58	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A12BR100	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A12BR101	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A12BR102	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A12BR103	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A12BR104	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR105	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR106	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR107	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR108	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR109	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR110	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR111	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A12BR112	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR113	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR114	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR115	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR116	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR117	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR118	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR119	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR120	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR125	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR126	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A12BR127	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A12BR128	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12BR150	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A12BR151	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12BR200	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR201	0757-0458	7	34	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR202	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR203	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A12BR204	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR205	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR206	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR207	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR208	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR209	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR210	0698-4442	1	6	RESISTOR 4.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4421-F
A12BR211	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR212	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR213	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12BR214	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A12BR215	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR216	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A12BR217	0757-0821	8	4	RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A12BR218	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12BR219	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A12BR220	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A12BR221	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A12BR222	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12BR223	0757-0428	1	7	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A12BR224	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A128R225	0757-0388	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A128R226	0757-0388	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A128R227	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A128R228	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A128R229	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A128R230	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A128R231	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A128R232	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A128R233	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A128R234	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A128R235	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A128R236	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A128R237	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A128R238	0698-4022	7	4	RESISTOR 1.27K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1271-F
A128R239	2100-3207	1	10	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A128R240	0698-7205	0	41	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A128R241	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A128R250	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A128S1	3101-0569	5	4	SWITCH-SL DPDT MINTR 1A 125VAC PC	28480	3101-0569
A128S2	3101-2063	6	2	SWITCH, TOGGLE .5A	28480	3101-2063
A128U1	1820-0753	1	8	IC GATE ECL DUAL 3-INP	28480	1820-0753
A128U2	1858-0015	7		IC MISC	28480	1858-0015
A128U3	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A128U4	1820-1225	4	8	IC FF ECL D-M/S DUAL	04713	MC10231P
A128U5	1820-0802	1	5	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A128U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A128U7	1820-1482	5	2	IC GATE ECL NOR DUAL 3-INP	04713	MC10211P
A128U8	5081-1976	8	2	IC, 10137L WITH HEAT SINK	28480	5081-1976
A128U9	1820-0817	6	3	IC FF ECL D-M/S DUAL	04713	MC10131P
A128U10	1820-1173	1	8	IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A128U11	1820-1052	5	5	IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A128U12	1820-1144	6	3	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A128U13	1820-1207	2	2	IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
A128U14	1820-1279	8	12	IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U15	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U16	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U17	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U18	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U19	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A128U20	1820-1112	8	5	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A128U21	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U22	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U23	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U24	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U25	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U26	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U27	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U28	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A128U29	1820-1970	4	10	IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A128U30	1820-1963	7	18	IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013AE
A128U31	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013AE
A128U32	1820-1747	5	6	IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A128U33	1820-1745	3	9	IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A128U40	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A128U41	1826-0363	3	4	DIFF AMPL DUAL	28480	1826-0363
A128U42	1858-0015	7		IC MISC	28480	1858-0015
A128VR1	1902-3002	3	4	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=+.07%	28480	1902-3002
A128VR2	1902-3002	3		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=+.07%	28480	1902-3002
A140	08160-66540	6	2	BOARD ASSEMBLY, SLOPE	28480	08160-66540
A140C1	0160-2150	5	6	CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A140C2	0160-2150	5		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A140C3	0160-3878	6	23	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C7	0180-0116	1	20	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A140C8	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A140C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A140C10	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A140C11	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A140C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A140C13	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C15	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A140C17	0160-3873	3		CAPACITOR-FXD 8.7PF +-.5PF 200VDC CER	28480	0160-3873
A140C18	0121-0467	1		CAPACITOR-V TRMR-CER 2.5-9PF 100V PC-MTG	28480	0121-0467
A140C19	0121-0046	2	2	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N=50
A140C20	0160-3916	3	2	CAPACITOR-FXD 220PF +-2% 100VDC CER	28480	0160-3916
A140C21	0140-0174	7	2	CAPACITOR-FXD 3050PF +-1% 100VDC MICA	72136	DM19F3050RF0100MV1CR
A140C22	0160-4582	1	2	CAPACITOR-FXD .033UF +-1% 100VDC	28480	0160-4582
A140C24	0140-3656	8	2	CAPACITOR-FXD .33UF +-1% 200VDC	28480	0160-3656
A140C25	0140-0217	9	2	CAPACITOR-FXD 140PF +-2% 300VDC MICA	72136	DM15F141G0300MV1CR
A140C26	0160-3376	9	2	CAPACITOR-FXD 3.3UF +-1% 50VDC MET-POLYC	28480	0160-3376
A140C27	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A140C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A140C29	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A140C30	0160-4698	0	2	CAPACITOR-FXD 56PF +-1% 200VDC CER	28480	0160-4698
A140C31	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A140C32	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A140C33	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A140C34	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A140C35	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A140C37	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A140C39	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A140C40	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A140C41	0180-2597	6	*	CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A140C42	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A140C43	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A140C44	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A140C45	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A140CR2	1901-0701	1	4	DIODE-STABISTOR 12V 10MA	28480	1901-0701
A140CR3	1901-0701	1		DIODE-STABISTOR 12V 10MA	28480	1901-0701
A140CR4	1901-0050	3	14	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A140CR5	1901-1068	5	16	DIODE-SCHOTTKY	28480	1901-1068
A140CR6	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A140CR7	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A140CR8	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A140CR9	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A140CR10	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A140CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR20	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR21	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A140J3	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A140J4	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A140J5	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A140K1	0490-1079	4	7	RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A140L1	9100-2247	4		COIL-MLD 100NH 10% Q=30 .095DX.25LG-NOM	28480	9100-2247
A140L3	9100-0346	0	4	COIL-MLD 50NH 20% Q=40 .095DX.25LG-NOM	28480	9100-0346
A140L4	9100-2251	0		COIL-MLD 220NH 10% Q=32 .095DX.25LG-NOM	28480	9100-2251
A140L5	9170-0029	3	38	CORE-SHIELDING BEAD	28480	9170-0029
A140L6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L9	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L17	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L18	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L19	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L20	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A140L21	9100-3149	7	9	COIL 220UH 10% Q=90 .312DX.375LG-NOM	28480	9100-3149

See introduction to this section for ordering information
*Indicates factory selected value

Table 6—3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140L22	9100-3149	7		COIL 220UH 10% Q=90 .312DX.375LG-NOM	28480	9100-3149
A140L23	9100-3149	7		COIL 220UH 10% Q=90 .312DX.375LG-NOM	28480	9100-3149
A140L24	9100-3149	7		COIL 220UH 10% Q=90 .312DX.375LG-NOM	28480	9100-3149
A140L25	5081-1973	5		INDUCTANCE 3-BEAD	28480	5081-1973
A140L26	5081-1973	5		INDUCTANCE 3-BEAD	28480	5081-1973
A140MP1	4040-0752	9	2	EXTR-PC 80 YEL POLYC .062-BD-THKNS	28480	4040-0752
A140MP2	4040-0748	3	6	EXTR-PC 80 BLK POLYC .062-BD-THKNS	28480	4040-0748
A140MP3	1205-0012	1	2	HEAT SINK TO-18-PKG	28480	1205-0012
A140Q1	1854-0637	1	16	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A140Q2	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q3	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q4	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q8	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q10	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q11	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q12	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q14	1854-0409	5	60	TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q15	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q16	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q17	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q18	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q19	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q20	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q21	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q22	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q23	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q24	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q25	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q26	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A140Q27	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A140Q28	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q29	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q30	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q35	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q36	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q37	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q38	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q39	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q40	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q41	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q42	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q43	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q44	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q45	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q46	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q47	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q48	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q49	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q50	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q51	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A140Q52	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A140Q53	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A140Q55	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A140Q56	1855-0052	6	2	TRANSISTOR J-FET P-CHAN D-MODE TO-92 SI	07263	2N4360
A140Q57	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A140Q58	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A140Q60	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A140Q61	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q62	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A140Q63	1854-0485	7		TRANSISTOR NPN SI TO-18* PD=175MW	28480	1854-0485
A140Q64	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A140Q65	1854-0345	8	17	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A140Q66	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A140Q68	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A140Q69	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A140Q70	1853-0018	0	8	TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A140Q71	1853-0018	0		TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A140Q72	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A140Q73	1853-0218	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0218

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A0Q74	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q75	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A1A0Q76	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5086
A1A0Q77	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q78	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q79	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q80	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q81	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q82	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q83	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q84	1855-0082	2	8	TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A1A0Q85	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q86	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A1A0Q87	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q88	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q89	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A1A0Q90	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q91	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q92	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A1A0Q93	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q94	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q95	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0Q96	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q97	1855-0062	8	4	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A1A0Q98	1855-0062	8		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A1A0Q99	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q100	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1A0Q101	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A1A0Q102	1854-0085	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0085
A1A0Q103	1854-0085	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0085
A1A0Q104	5081-1977	9	2	FET, SELECTED	28480	5081-1977
A1A0Q105	1853-0075	9		TRANSISTOR-DUAL PNP PD=600MW	28480	1853-0075
A1A0Q106	1853-0018	0		TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A1A0Q107	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1A0R1	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1A0R2	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1A0R3	0698-3432	7	5	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A1A0R4	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R5	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R13	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R15	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A0R16	0698-3439	4	66	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R17	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R18	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R19	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R20	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R21	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R22	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R23	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R24	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R25	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R26	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R27	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A1A0R28	0699-0243	4	5	RESISTOR 199 .1% .125W F TC=0+-25	28480	0699-0243
A1A0R29	0698-6989	5	4	RESISTOR 400 .1% .125W F TC=0+-50	28480	0698-6989
A1A0R30	0698-6104	6	4	RESISTOR 800 .1% .125W F TC=0+-50	28480	0698-6104
A1A0R31	0698-6103	5	5	RESISTOR 1.6K .1% .125W F TC=0+-50	28480	0698-6103
A1A0R32	0698-6624	5	13	RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A1A0R33	0698-6322	0	5	RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A1A0R34	0698-6361	7	5	RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A1A0R35	0698-8046	9	5	RESISTOR 16K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-1602-B
A1A0R36	0757-0449	0	21	RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1A0R37	0698-3499	0	17	RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A1A0R38	0757-0463	4	8	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A1A0R39	0757-0470	3	5	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A1A0R40	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140R41	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A140R42	0698-4429	4	17	RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-187L-F
A140R43	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A140R44	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A140R45	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A140R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R50	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R53	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R54	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R55	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R56	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R58	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R59	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R60	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R61	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R62	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R63	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R64	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R65	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R66	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R67	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R68	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R69	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A140R70	0757-0470	3		RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A140R71	0757-0463	4		RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A140R72	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A140R73	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A140R74	0698-8046	9		RESISTOR 16K .1% .125W F TC=0+-25	19701	MF4C1/8-T9-1602-B
A140R75	0698-6361	7		RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A140R76	0698-6322	0		RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A140R77	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A140R78	0698-6103	5		RESISTOR 1.6K .1% .125W F TC=0+-50	28480	0698-6103
A140R79	0698-6104	6		RESISTOR 800 .1% .125W F TC=0+-50	28480	0698-6104
A140R80	0698-6989	5		RESISTOR 400 .1% .125W F TC=0+-50	28480	0698-6989
A140R81	0699-0243	4		RESISTOR 199 .1% .125W F TC=0+-25	28480	0699-0243
A140R82	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A140R83	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A140R84	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R86	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A140R87	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A140R88	0683-1055	5	6	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A140R89	0683-1055	5		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A140R90	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A140R91	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A140R93	0698-4367	9	12	RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R94	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R95	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R96	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R97	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A140R98	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A140R100	0698-6360	6	40	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R101	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R102	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R103	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R104	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R105	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R106	0757-0811	6	4	RESISTOR 392 1% .5W F TC=0+-100	28480	0757-0811
A140R107	0757-0815	0	10	RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A140R108	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R109	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R110	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R111	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R112	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R113	2100-3358	9	10	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3358
A140R114	0683-5655	9	4	RESISTOR 5.6M 5% .25W FC TC=-900/+1100	01121	CB5655
A140R115	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R116	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R117	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R118	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140R119	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R120	0757-0276	7	8	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A140R121	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A140R122	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A140R123	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A140R124	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R125	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R126	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A140R127	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A140R128	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R129	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R130	0757-0197	1	6	RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A140R131	0698-4422	7		RESISTOR 1.27K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1271-F
A140R132	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A140R133	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A140R134	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R135	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A140R136	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A140R137	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A140R138	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R139	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R140	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R141	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R142	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A140R143	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A140R144	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A140R145	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A140R147	0698-4527	3	2	RESISTOR 205K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2053-F
A140R148	0698-7229	8	2	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A140R149	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A140R150	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R151	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R152	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R153	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R154	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A140R155	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R156	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A140R157	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R158	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A140R159	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R160	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A140R161	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R162	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R163	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R164	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A140R165	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R166	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A140R167	0683-2255	9	5	RESISTOR 2.2M 5% .25W FC TC=-900/+1100	01121	CB2255
A140R168	0683-2255	9		RESISTOR 2.2M 5% .25W FC TC=-900/+1100	01121	CB2255
A140R170	0757-0349	5	6	RESISTOR 22.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-22e2-F
A140R171	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R172	0757-0369	5		RESISTOR 22.0K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2202-F
A140R173	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A140R174	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R175	0757-0200	7	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A140R176	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R177	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A140R178	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R179	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R180	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R181	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R182	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R183	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R184	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R185	0757-0811	6		RESISTOR 392 1% .5W F TC=0+-100	28480	0757-0811
A140R186	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A140R187	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R188	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R189	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R190	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R191	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R192	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R193	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R194	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A140R195	0683-5655	9		RESISTOR 5.6M 5% .25W FC TC=-900/+1100	01121	CB5655

See introduction to this section for ordering information
*Indicates factory selected value

Table 6—3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140R196	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A140R197	0698-7188	8	3	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A140R198	0698-7195	7	2	RESISTOR 14.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-14R6-G
A140R199	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R200	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A140R201	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A140R202	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R203	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A140R204	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R205	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A140R206	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A140R207	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A140R208	0698-4409	0	6	RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A140R209	0757-0821	8		RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A140R210	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R211	0757-0403	2	11	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A140R213	0698-4416	9		RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A140R214	0698-4416	9		RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A140R215	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R216	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R217	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A140R218	0757-0931	1	6	RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A140R219	0757-0718	2	4	RESISTOR 200 1% .25W F TC=0+-100	24546	C5-1/4-T0-201-F
A140R220	0757-0709	1	4	RESISTOR 68.1 1% .25W F TC=0+-100	24546	C5-1/4-T0-68R1-F
A140R221	0757-0718	2		RESISTOR 200 1% .25W F TC=0+-100	24546	C5-1/4-T0-201-F
A140R222	0757-0709	1		RESISTOR 68.1 1% .25W F TC=0+-100	24546	C5-1/4-T0-68R1-F
A140R223	0698-7199	1	16	RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A140R224	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A140R225	0757-0388	2	4	RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A140R226	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R227	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A140R228	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A140R229	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R230	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R231	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A140R232	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R233	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A140R234	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A140R235	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R236	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R237	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A140R238	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A140R239	0698-4486	9	2	RESISTOR 976 1% .125W F TC=0+-100	24546	C4-1/8-T0-976R-F
A140R240	0698-7253	8	8	RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A140R241	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A140R242	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A140R243	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A140R244	0683-3355	2	8	RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A140R245	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A140R246	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A140R247	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A140R250	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R251	2100-3350	5	4	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A140R252	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R253	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A140R254	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A140R255	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A140R294	0698-4477	2	9	RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A140R295	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A140R296	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A140R297	0757-0465	6	21	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A140R298	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A140R299	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A140R300	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R301	0757-0396	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A140R310	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R311	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A140R400	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A140S1	3101-0569	5		SWITCH-SL DPDT MINTR 1A 125VAC PC	28480	3101-0569
A140U1	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A140U2	1820-1416	7	3	IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	01295	SN74LS42N
A140U3	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A140U4	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A140U5	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE

See introduction to this section for ordering information
*Indicates factory selected value

Table 6--3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A140U6	1820-1956	8		IC LCN CMOS COM CLOCK QUAD	01928	CD4042BE
A140U7	1820-1956	8		IC LCN CMOS COM CLOCK QUAD	01928	CD4042BE
A140U8	1820-1956	8		IC LCN CMOS COM CLOCK QUAD	01928	CD4042BE
A140U9	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A140U10	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A140U11	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A140U12	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A140U13	1820-1747	5		IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A140U20	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A140U21	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A140U22	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A140U23	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A140U24	1826-0111	7	2	OP AMP GP DUAL TO-99	04713	MC1458G
A140U27	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A140U28	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A140U29	1858-0015	7		IC MISC	28480	1858-0015
A140U30	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A140U32	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A140U34	1858-0029	3	2		28480	1858-0029
A140VR1	1902-0680	7	10	DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A140VR2	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A140VR3	1902-0049	2	25	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR4	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR5	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR6	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR7	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR8	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR9	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR10	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR11	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR12	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A140VR22	1902-0025	4	7	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A150	08160-60550	8	2	BOARD ASSEMBLY, DIGITAL OUTPUT	28480	08160-60550
A150C1	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A150C2	0160-4389	6	4	CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A150C3	0160-4389	6		CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A150C4	0180-2207	5	4	CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010M2
A150C5	0160-3508	9	43	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A150C6	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A150C7	0180-0291	3	7	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A150C8	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A150C101	0121-0059	7	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304328 2/8PF NPO
A150C103	0160-2205	1	2	CAPACITOR-FXD 120PF +-5% 300VDC MICA	28480	0160-2205
A150C104	0160-0597	0	2	CAPACITOR-FXD 1500PF +-10% 250VDC	28480	0160-0597
A150C105	0160-2197	0	4	CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
A150C106	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A150C107	0160-2249	3	2	CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A150C108	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A150C109	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A150C110	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A150C111	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A150C112	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A150C113	0160-4383	0	2	CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	28480	0160-4383
A150CR1	1901-0376	9	8	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A150CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A150CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A150CR4	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A150CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A150CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A150CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A150CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A150CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A150CR101	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A150CR102	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A150CR103	1901-1098	1	4	DIODE-SWITCHING 1N4150 50V 200MA 4NS	0004G	1N4150
A150CR104	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	0004G	1N4150
A150DL1	08160-61605	4	2	CABLE ASSEMBLY, DELAY	28480	08160-61605
A150J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A150J5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A150L1	9100-1645	4	2	COIL-MLD 390UH 5% Q=65 .190DX.44LG-NOM	28480	9100-1645
A150L101	9140-0105	3	2	COIL-MLD 8.2UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0105
A150L102	9100-2251	0		COIL-MLD 220NH 10% Q=32 .095DX.25LG-NOM	28480	9100-2251
A150L103	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150L104	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A150L105	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150L106	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150L107	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150L108	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150L109	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A150MP1	4040-0753	0	4	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
A150MP2	4040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
A150MP109	1205-0037	0	2	HEAT SINK TO-18-PKG	28480	1205-0037
A150MP110	1205-0011	0	7	HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A150Q1	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A150Q2	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A150Q3	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A150Q4	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A150Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A150Q6	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A150Q7	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A150Q8	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A150Q9	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A150Q10	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A150Q11	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A150Q12	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A150Q101	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A150Q102	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A150Q103	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A150Q104	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A150Q105	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A150Q106	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A150Q107	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A150Q108	1854-0305	0	2	TRANSISTOR NPN SI TO-18 PD=400MW	28480	1854-0305
A150Q109	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A150Q110	1854-0498	2	10	TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A150R1	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R2	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R3	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A150R4	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A150R5	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A150R6	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A150R7	0698-3155	1	7	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A150R8	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A150R9	0757-0281	4	7	RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A150R10	0757-0422	5	2	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A150R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A150R14	2100-3350	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A150R15	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A150R16	0698-3515	7	2	RESISTOR 5.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5901-F
A150R17	0698-0035	2	8	RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A150R18	0698-0035	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A150R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A150R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A150R21	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A150R22	0698-0084	9	6	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A150R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A150R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A150R30	0698-3157	3	12	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R31	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A150R32	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A150R33	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R34	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R36	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R37	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A150R38	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R39	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A150R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A150R41	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A150R101	0757-0459	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A150R102	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A150R103	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A150R104	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A150R105	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A150R106	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R107	0757-0738	6	2	RESISTOR 1.82K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1821-F
A150R108	0757-0420	3	12	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A150R109	0757-0346	2	33	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A150R110	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R111	0757-0379	1	A	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A150R112	0757-0379	1		RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A150R113	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A150R114	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R115	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R116	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A150R117	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R118	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R119	0757-0406	5	2	RESISTOR 182 1% .125W F TC=0+-100	24546	C4-1/8-T0-182R-F
A150R120	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A150R121	0757-0722	8	2	RESISTOR 332 1% .25W F TC=0+-100	24546	C5-1/4-T0-332-F
A150R122	0757-0705	7	2	RESISTOR 97.5 1% .25W F TC=0+-100	28480	0757-0705
A150R123	0757-0794	4	2	RESISTOR 68.1 1% .5W F TC=0+-100	28480	0757-0794
A150R124	0698-4421	6	2	RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F
A150R125	0757-0815	0		RESISTOR 3k2 1% .5W F TC=0+-100	28480	0757-0815
A150S1	3101-1871	4	2	SWITCH-SL 4POT SUBMIN .3A 125VAC PC	28480	3101-1871
A150U1	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A150U2	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A150U3	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A150U4	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A150U5	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U6	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U7	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U8	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U9	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U10	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U11	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U12	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U13	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U14	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U15	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U16	1820-1747	5		IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A150U17	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U18	1820-1976	2	B	IC BFR CMOS NON-INV HEX	01928	CD4050BE
A150U19	1826-0188	8	6	CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A150U20	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A150U21	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A150U22	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A150U23	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A150U24	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A150U25	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A150U26	1826-0161	7	4	OP AMP GP QUAD 14-DIP-P	04713	MLM324P
A150U27	1826-0059	2	15	OP AMP GP TO-99	01295	LM201AL
A150U101	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A150U102	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A150U103	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A150U104	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A150VR1	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A150VR2	1902-0041	4	10	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A150VR3	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A150VR4	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A150VR5	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A151	08160-66551	9	2	BOARD ASSEMBLY, ANALOG OUTPUT	28480	08160-66551
A151C101	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A151C102	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A151C103	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A151C104	0160-3719	4	2	CAPACITOR-FXD .068UF +-10% 250VDC	28480	0160-3719
A151C105	0160-3715	0	2	CAPACITOR-FXD .015UF +-10% 250VDC	28480	0160-3715
A151C106	0160-0596	9	2	CAPACITOR-FXD 1000PF +-10% 250VDC	28480	0160-0596
A151C107	0160-0130	1	2	CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0130
A151C108	0160-0190	7	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A151C109	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A151C110	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A151C111	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A151C112	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A151C113	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A151C114	0160-2338	3	*	CAPACITOR-FXD 650UF+-20% 13VDC TA	56001	69F233DG7
A151C115	0180-2338	3		CAPACITOR-FXD 650UF+-20% 13VDC TA	56001	69F233DG7
A151C116	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A151C117	0160-2197	0		CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
A151C201	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A151C202	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A151C203	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1C204	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C205	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C206	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C207	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C208	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C211	0160-0576			CAPACITOR 0.1UF		
A1S1C209	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C210	0160-2257	3	5	CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A1S1C212	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C213	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C214	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C215	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C216	0180-2141	6	2	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A1S1C217	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C218	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C219	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C220	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C221	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C222	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C223	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C224	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C225	0140-0197	4	2	CAPACITOR-FXD 180PF +-5% 300VDC MICA	72136	DM15F181J0300WV1CM
A1S1C226	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C227	0160-4381	8	2	CAPACITOR-FXD 1.5PF +-.25PF 200VDC CER	28480	0160-4381
A1S1C301	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C302	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C303	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C304	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C307	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C308	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A1S1C309	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C310	0180-0229	7	20	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1S1C311	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1S1C312	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C313	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C315	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A1S1C316	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C317	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C318	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A1S1C319	0160-0570	9	8	CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	502UEM100RD221M
A1S1C320	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C321	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C322	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C323	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C324	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C325	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C326	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	502UEM100RD221M
A1S1C327	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1S1C328	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C329	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C330	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C331	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	502UEM100RD221M
A1S1C332	0160-0571	0	2	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A1S1C333	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C334	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C335	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C336	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C337	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C338	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C339	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C340	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C341	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C342	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A1S1C343	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C401	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C402	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C403	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C404	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C405	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C406	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	502UEM100RD221M
A1S1C408	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C409	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C410	0160-0574	3	6	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A1S1C411	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C412	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C413	0160-0575	4	6	CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1C414	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C415	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1S1C416	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A1S1C417	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A1S1C41A	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A1S1C419	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A1S1C420	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A1S1C421	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C422	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1C423	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1S1CR201	1902-0040	3	6	DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A1S1CR202	1902-0040	3		DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A1S1CR203	1902-0040	3		DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A1S1CR204	1902-0040	3		DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A1S1CR207	1901-0033	2	6	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1S1CR209	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1S1CR210	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1S1CR301	1901-0620	3	16	DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR302	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR305	1901-0460	9	4	DIODE-STABISTOR 30V 150MA DO-7	28480	1901-0460
A1S1CR306	1901-0460	9		DIODE-STABISTOR 30V 150MA DO-7	28480	1901-0460
A1S1CR307	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR30A	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR309	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR310	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR311	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR312	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00046	NDP250
A1S1CR313	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR315	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR316	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR317	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR318	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR319	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR324	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR325	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1CR402	1901-0731	7	13	DIODE-PWR RECT 400V 1A	28480	1901-0731
A1S1CR403	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A1S1CR404	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A1S1CR405	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A1S1CR406	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1S1J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A1S1J5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A1S1K200	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A1S1K201	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A1S1K202	0490-1034	1	6	RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A1S1K203	0490-1034	1		RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A1S1K301	0490-1034	1		RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A1S1K302	0490-1192	2	4	RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A1S1K303	0490-1192	2		RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A1S1K401	0490-1192	2		RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A1S1L101	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L102	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L201	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L202	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L210	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A1S1L211	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A1S1L212	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A1S1L301	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L302	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L303	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L304	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A1S1L306	9100-0346	0		COIL-MLD 50NH 20% 3MM .095DX.25LG-NOM	28480	9100-0346
A1S1L401	08160-60001	4	2	COIL, FXD	28480	08160-60001
A1S1MP1	1205-0236	1	32	ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP2	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP3	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP4	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP5	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP6	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP7	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP8	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP9	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP10	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1MP11	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP12	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP13	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP14	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP15	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP16	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A1S1MP17	01801-22301	7		HEAT SINK	28480	01801-22301
A1S1MP18	01801-22301	7		HEAT SINK	28480	01801-22301
A1S1MP19	08160-01103	1	2	HEAT SINK, ANALOG OUTPUT	28480	08160-01103
A1S1MP20	0380-0160	9	6	STANDOFF-RVT-ON ,S-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A1S1MP21	0380-0160	9		STANDOFF-RVT-ON ,S-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A1S1MP22	0380-0160	9		STANDOFF-RVT-ON ,S-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A1S1MP23	08160-01205	4	2	BRACKET, TRANSISTOR	28480	08160-01205
A1S1MP24	4040-0749	4	4	EXTR-PC BD BRN POLYC ,062-BD-THKNS	28480	4040-0749
A1S1MP25	4040-0753	0		EXTR-PC BD GRN POLYC ,062-BD-THKNS	28480	4040-0753
A1S1MP26	0515-0149	1	32	SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP27	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP27	1205-0368	0	2	HEAT SINK SGL TO-18-PKG	D2624	104648/5
A1S1MP28	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP29	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP30	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP31	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP32	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP33	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP34	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP35	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP36	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP37	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP40	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP41	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP42	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1MP43	0515-0149	1		SCREW-MACHINE 6 BA THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A1S1Q101	1853-0315	0	16	TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q102	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q103	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q104	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q200	1854-0368	5	6	TRANSISTOR NPN 2N5191 SI PD=40W FT=2MHZ	04713	2N5191
A1S1Q201	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A1S1Q202	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q203	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q204	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q205	1854-0477	7	18	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q206	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q207	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q208	1853-0281	9	16	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1S1Q209	1850-0872	2	7	TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A1S1Q210	1853-0314	9	16	TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q211	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A1S1Q212	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q213	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q214	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q215	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q216	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q217	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q218	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q300	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A1S1Q301	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q302	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q303	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A1S1Q304	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q305	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q306	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A1S1Q307	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A1S1Q308	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1S1Q309	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q311	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q312	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q313	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q314	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A1S1Q315	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A1S1Q316	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A1S1Q317	1854-0474	4	2	TRANSISTOR NPN SI PD=310MW FT=100MHZ	04713	2N5551
A1S1Q318	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q319	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A1S1Q321	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A1S1Q327	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A1S1Q329	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1Q529	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A1S1Q901	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A1S1Q907	1853-0400	4	3	TRANSISTOR PNP SI DARL TO-92 PD=500MW	28480	1853-0400
A1S1Q908	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1Q909	1853-0096	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q910	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1S1Q911	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q912	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1S1Q913	1854-0368	5		TRANSISTOR NPN 2N5191 SI PD=400W FT=2MHZ	04713	2N5191
A1S1Q914	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q915	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q917	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1S1Q918	1853-0212	6	8	TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A1S1Q919	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A1S1Q920	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A1S1Q942	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A1S1R100	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A1S1R101	0757-0442	9	2	RESISTOR 13 1% .25W F TC=0+-100	19701	MF52C1/4-T0-13R0-F
A1S1R102	0757-0999	1	12	RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A1S1R103	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A1S1R104	0698-4086	9	6	RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A1S1R105	0698-4086	9		RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A1S1R106	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R107	2100-3141	6	4	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A1S1R108	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R109	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R110	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R111	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1S1R112	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R113	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1S1R114	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R115	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1S1R116	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A1S1R117	0757-0411	2		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A1S1R118	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A1S1R119	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A1S1R120	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R121	0757-0997	9	18	RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R122	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A1S1R123	0757-0995	7	6	RESISTOR 33.2 1% .5W F TC=0+-100	28480	0757-0995
A1S1R124	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R125	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R126	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1S1R127	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1S1R128	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R129	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R130	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1S1R131	2100-3354	0		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A1S1R132	2100-3354	0		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A1S1R133	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A1S1R134	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A1S1R135	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A1S1R136	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R137	2100-2497	9	2	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A1S1R140	0698-3258	5	3	RESISTOR 5.36K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5361-F
A1S1R200	0698-7267	4	22	RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R202	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R203	0757-0720	6	6	RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A1S1R204	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R205	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R206	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A1S1R207	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R208	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A1S1R209	0757-0799	9	4	RESISTOR 121 1% .5W F TC=0+-100	28480	0757-0799
A1S1R210	0757-0799	9		RESISTOR 121 1% .5W F TC=0+-100	28480	0757-0799
A1S1R211	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1S1R212	2100-3353	8	2	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	32997	3386X-Y06-203
A1S1R213	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A1S1R214	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A1S1R215	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1S1R216	0757-0442	1	4	RESISTOR 27.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2742-F
A1S1R217	0757-0442	1		RESISTOR 27.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2742-F
A1S1R218	0757-0447	4	4	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A1S1R219	0757-0720	6		RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A1S1R220	0757-0415	6	2	RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A1S1R221	0698-7284	5	14	RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1R222	0757-0395	1	2	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A1S1R223	0757-0410	1	4	RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
A1S1R224	2100-3273	1	3	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A1S1R225	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R226	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1S1R227	0698-3154	0	4	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A1S1R228	0698-4401	2	4	RESISTOR 95.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-95R3-F
A1S1R229	0698-4401	2		RESISTOR 95.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-95R3-F
A1S1R230	0698-4381	7	8	RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A1S1R231	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A1S1R232	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A1S1R233	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A1S1R234	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A1S1R236	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A1S1R237	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R238	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1S1R239	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R240	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R241	0698-3433	8	*	RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A1S1R242	0698-3433	8		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A1S1R243	0757-0813	8	2	RESISTOR 475 1% .5W F TC=0+-100	28480	0757-0813
A1S1R244	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R245	0757-0402	1	3	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A1S1R246	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R247	2100-3150	7	6	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A1S1R248	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A1S1R249	0683-1045	7	3	RESISTOR 10M 5% .25W FC TC=-900/+1100	01121	CB1065
A1S1R250	0757-0724	0	2	RESISTOR 392 1% .25W F TC=0+-100	24546	C5-1/4W-T0-392R-F
A1S1R251	0757-0424	7	2	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A1S1R252	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1S1R253	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R254	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R255	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A1S1R256	0698-6324	2	6	RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A1S1R257	0698-4521	7	5	RESISTOR 154K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1543-F
A1S1R258	0698-6324	2		RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A1S1R259	0698-4521	7		RESISTOR 154K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1543-F
A1S1R260	0698-3136	8	6	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A1S1R261	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A1S1R262	0757-0449	0		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1S1R263	0757-0449	0		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A151R264	2100-3109			RESISTOR 2K		
A151R265	0757-0416		3	RESISTOR 511 1% .125W	24546	C4-1/8-TO-511 R-F
A151R266	2100-3109			RESISTOR 2K		
A151R267	0757-0416			RESISTOR 511 1% .125W	24546	C4-1/8-TO-511 R F
A1S1R268	2100-3058	8	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A1S1R269	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1S1R270	0698-7212	9	12	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A1S1R271	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A1S1R272	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A1S1R273	0698-7236	7	17	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R274	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A1S1R275	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A1S1R276	0698-6324	2		RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A1S1R277	0698-3558	8	6	RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A1S1R278	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A1S1R280	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R281	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R282	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R283	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R284	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R285	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R286	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R287	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R288	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1S1R289	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A1S1R290	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A1S1R292	0698-7244	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A1S1R293	0698-7244	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A1S1R294	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R295	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A151R296*	0757-0200	8	*	RESISTOR 5.62K 1% .125W F-TC-0+-100	24546	C4-1/8-TO-5621-F
A1S1R300	0698-4442	1		RESISTOR 4.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4421-F
A1S1R301	0698-3700	2	5	RESISTOR 715 1% .125W F TC=0+-100	24546	C4-1/8-T0-715R-F
A1S1R302	0698-4465	8	4	RESISTOR 931 1% .125W F TC=0+-100	24546	C4-1/8-T0-931R-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1S1R303	0698-3512	4	8	RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A1S1R304	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A1S1R305	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R306	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R307	0698-4413	6	0	RESISTOR 154 1% .125W F TC=0+-100	24546	C4-1/8-T0-154R-F
A1S1R308	2100-3095	5	0	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A1S1R309	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R310	0698-4413	6		RESISTOR 154 1% .125W F TC=0+-100	24546	C4-1/8-T0-154R-F
A1S1R311	2100-3095	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A1S1R312	0761-0042	4	8	RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A1S1R313	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A1S1R314	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A1S1R315	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A1S1R316	0683-0475	1	8	RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB4705
A1S1R317	0757-0418	9	8	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1S1R318	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R319	0698-5965	5	0	RESISTOR 50 1% .5W F TC=0+-100	28480	0698-5965
A1S1R320	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1S1R321	0698-5965	5		RESISTOR 50 1% .5W F TC=0+-100	28480	0698-5965
A1S1R322	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB4705
A1S1R323	0757-1000	7	5	RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A1S1R324	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1S1R325	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1S1R326	0757-1000	7		RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A1S1R327	0698-4465	8		RESISTOR 931 1% .125W F TC=0+-100	24546	C4-1/8-T0-931R-F
A1S1R328	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R329	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A1S1R330	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A1S1R331	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A1S1R332	0757-0995	7		RESISTOR 33.2 1% .5W F TC=0+-100	28480	0757-0995
A1S1R333	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A1S1R334	0757-0995	7		RESISTOR 33.2 1% .5W F TC=0+-100	28480	0757-0995
A1S1R335	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R336	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A1S1R337	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R338	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB4705
A1S1R339	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A1S1R340	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB4705
A1S1R341	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1S1R342	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1S1R343	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1S1R344	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R345	0698-7260	7	5	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A1S1R346	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R347	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A1S1R348	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R349	0698-7243	6	6	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A1S1R350	0757-0721	7	0	RESISTOR 274 1% .25W F TC=0+-100	24546	C5-1/4-T0-274R-F
A1S1R351	0698-3700	2		RESISTOR 715 1% .125W F TC=0+-100	24546	C4-1/8-T0-715R-F
A1S1R352	0698-4421	1		RESISTOR 6.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6421-F
A1S1R353	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R354	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R355	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R356	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R357	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A1S1R358	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R359	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R360	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R361	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R362	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R363	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R364	0757-0821	8		RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A1S1R365	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R366	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1S1R367	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R368	0757-0721	7		RESISTOR 274 1% .25W F TC=0+-100	24546	C5-1/4-T0-274R-F
A1S1R369	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A1S1R370	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1S1R371	0757-0720	6		RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A1S1R372	0699-0146	6	2	RESISTOR 53.6 1% 1W F TC=0+-50	28480	0699-0146
A1S1R373	0698-0063	4	2	RESISTOR 5.23K 1% .125W F TC=0+-100	91637	CMF-1/8-T1-5231-F
A1S1R373	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A1S1R373	0698-3496	3	2	RESISTOR 3.57K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3571-F
A1S1R373	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A1S1R373	0698-4470	5	2	RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1R374	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R375	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1S1R376	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R377	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A1S1R378	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A1S1R379	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R380	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A1S1R381	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A1S1R3A2	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A1S1R383	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R384	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R385	0757-0486	4	4	RESISTOR 10 1% .25W F TC=0+-100	19701	MF52C1/4-T0-10R0-F
A1S1R386	0757-0489	4		RESISTOR 10 1% .25W F TC=0+-100	19701	MF52C1/4-T0-10R0-F
A1S1R387	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A1S1R388	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1S1R389	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R390	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R391	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R392	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1S1R393	0698-8958	2	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A1S1R394	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1S1R395	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A1S1R396	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R397	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R398	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R399	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1R401	2100-3161	6		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A1S1R402	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1S1R403	2100-3122	9	4	RESISTOR-TRMR 100 10% C SIDE-ADJ 17-TRN	02111	43P101
A1S1R404	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A1S1R407	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R408	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R409	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1S1R410	0698-4407	6	2	RESISTOR 280 1% .125W F TC=0+-100	24546	C4-1/8-T0-280R-F
A1S1R411	0757-0282	5	2	RESISTOR 221 1% .125W F TC=0+-100	24546	C4-1/8-T0-221R-F
A1S1R412	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A1S1R413	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R414	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R427	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R428	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1S1R429	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R430	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A1S1R431	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R432	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R433	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R434	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A1S1R435	2100-3122	9		RESISTOR-TRMR 100 10% C SIDE-ADJ 17-TRN	02111	43P101
A1S1R436	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1S1R437	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R438	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A1S1R439	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A1S1R440	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R441	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1S1R442	0757-0441	8	4	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1S1R443	0698-4409	0		RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A1S1R444	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R445	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R446	0698-3443	0	4	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A1S1R447	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A1S1R448	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R449	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R451	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A1S1R452	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1S1R453	0698-4409	0		RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A1S1R454	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R455	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A1S1R456	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A1S1R457	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R458	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R459	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R460	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1S1R463	0698-3435	0	4	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A1S1R464	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R465	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A1S1R466	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1R471	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1S1R472	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A1S1R473	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1S1R474	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A1S1R475	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1S1R476	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A1S1R477	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A1S1R478	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A1S1R479	0698-7263	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A1S1R480	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A1S1R481	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A1S1R2091	0757-0031	2	4	RESISTOR 105 1% .5W F TC=0+-100	28480	0757-0031
A1S1R2101	0757-0031	2		RESISTOR 105 1% .5W F TC=0+-100	28480	0757-0031
A1S1U201	1826-0161	7		OP AMP GP QUAD 14-DIP-P	04713	MLM324P
A1S1U202	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A1S1U203	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A1S1U204	5081-1963	7	2	IC ASSEMBLY, VERNIER	28480	5081-1963
A1S1U305	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A1S1U306	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A1S1U307	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A1S1U402	1826-0009	2	6	TO-99	06665	883725CJ
A1S1U404	1826-0009	2		TO-99	06665	883725CJ
A1S1U405	1826-0009	2		TO-99	06665	883725CJ
A1S1VR201	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A1S1VR204	1902-0522	6	4	DIODE-ZNR 1N5340B 6V 5% PD=5W IR=1UA	04713	1N5340B
A1S1VR205	1902-0522	6		DIODE-ZNR 1N5340B 6V 5% PD=5W IR=1UA	04713	1N5340B
A1S1VR208	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A1S1VR209	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A1S1VR301	1902-3094	3	4	DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A1S1VR302	1902-3094	3		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A1S1VR303	1902-1285	0	4	DIODE-ZNR 12V 5% PD=5W IR=50UA	28480	1902-1285
A1S1VR304	1902-1285	0		DIODE-ZNR 12V 5% PD=5W IR=50UA	28480	1902-1285
A1S1VR305	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A1S1VR306	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A1S1VR321	1902-0935	5	2	DIODE-ZNR 9.1V 5% PD=5W IR=100UA	28480	1902-0935
A1S1VR322	1902-0935	5		DIODE-ZNR 9.1V 5% PD=5W IR=100UA	28480	1902-0935
A1S1VR401	1902-0048	1	5	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	28480	1902-0048
A1S1VR402	1902-0048	1		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	28480	1902-0048
A1S1W101	08160-61614	5	4	CABLE ASSEMBLY, SHIELDED AMPLIFIER	28480	08160-61614
A1S1W102	08160-61614	5		CABLE ASSEMBLY, SHIELDED AMPLIFIER	28480	08160-61614

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				FRAME, OPTION 020		
A240	08160-66540	6		BOARD ASSEMBLY, SLOPE	28480	08160-66540
A250	08160-66550	8		BOARD ASSEMBLY, DIGITAL OUTPUT	28480	08160-66550
A251	08160-66551	9		BOARD ASSEMBLY, ANALOG OUTPUT	28480	08160-66551
A326	08160-66526	6		BOARD ASSEMBLY, TIME INT 1	28480	08160-66526
A327	08160-66527	9		BOARD ASSEMBLY, TIME INT 2	28480	08160-66527
A328	08160-66528	0		BOARD ASSEMBLY, TIME INT 3	28480	08160-66528
A426	08160-66526	6		BOARD ASSEMBLY, TIME INT 1	28480	08160-66526
A427	08160-66527	9		BOARD ASSEMBLY, TIME INT 2	28480	08160-66527
A428	08160-66528	0		BOARD ASSEMBLY, TIME INT 3	28480	08160-66528
				OPTION 020		
A240	08160-66540	6		BOARD ASSEMBLY, SLOPE	28480	08160-66540
A240C1	0160-2150	5		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A240C2	0160-2150	5		CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A240C3	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C7	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A240C8	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A240C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A240C10	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A240C11	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A240C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A240C13	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C15	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A240C17	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A240C18	0121-0047	1		CAPACITOR-V TRMR-CER 2.5-9PF 100V PC-MTG	28480	0121-0047
A240C19	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304122 9/35PF N650
A240C20	0160-3916	3		CAPACITOR-FXD 220PF +-2% 100VDC CER	28480	0160-3916
A240C21	0140-0174	7		CAPACITOR-FXD 3650PF +-1% 100VDC MICA	72136	DM19F365F0100MV1CR
A240C22	0160-0582	1		CAPACITOR-FXD .033UF +-1% 100VDC	28480	0160-0582
A240C24	0160-3656	8		CAPACITOR-FXD .33UF +-1% 200VDC	28480	0160-3656
A240C25	0140-0217	9		CAPACITOR-FXD 140PF +-2% 300VDC MICA	72136	DM15F141G0300MV1CR
A240C26	0160-3376	9		CAPACITOR-FXD 3.3UF +-1% 50VDC MET-POLYC	28480	0160-3376
A240C27	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A240C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A240C29	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A240C30	0160-4698	0		CAPACITOR-FXD 56PF +-1% 200VDC CER	28480	0160-4698
A240C31	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875

See introduction to this section for ordering information
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Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240C32	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A240C33	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A240C34	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A240C35	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A240C37	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A240C39	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A240C40	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A240C41	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A240C42	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A240C43	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A240C44	0180-2597	6		CAPACITOR-FXD 270UF+-10% 25VDC TA	28480	0180-2597
A240C45	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A240CR2	1901-0701	1		DIODE-STABISTOR 12V 10MA	28480	1901-0701
A240CR3	1901-0701	1		DIODE-STABISTOR 12V 10MA	28480	1901-0701
A240CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A240CR5	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR6	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR7	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR8	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR9	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR10	1901-1068	5		DIODE-SCHOTTKY	28480	1901-1068
A240CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR20	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR21	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A240J3	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A240J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A240J5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A240K1	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A240L1	9100-2247	4		COIL-MLD 100NH 10% Q@34 .095DX.25LG-NOM	28480	9100-2247
A240L3	9100-0346	0		COIL-MLD 50NH 20% Q@40 .095DX.25LG-NOM	28480	9100-0346
A240L4	9100-2251	0		COIL-MLD 220NH 10% Q@32 .095DX.25LG-NOM	28480	9100-2251
A240L5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L9	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L17	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L18	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L19	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L20	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A240L21	9100-3149	7		COIL 220UH 10% Q@90 .3120X.375LG-NOM	28480	9100-3149
A240L22	9100-3149	7		COIL 220UH 10% Q@90 .3120X.375LG-NOM	28480	9100-3149
A240L23	9100-3149	7		COIL 220UH 10% Q@90 .3120X.375LG-NOM	28480	9100-3149
A240L24	9100-3149	7		COIL 220UH 10% Q@90 .3120X.375LG-NOM	28480	9100-3149
A240L25	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A240L26	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A240MP1	4040-0752	9		EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
A240MP2	4040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
A240MP3	1205-0012	1		HEAT SINK TO-18-PKG	28480	1205-0012
A240Q1	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A240Q2	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q3	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q4	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q8	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q10	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240Q11	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q12	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q14	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q15	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q16	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q17	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q18	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q19	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q20	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q21	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q22	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q23	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q24	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q25	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q26	1854-0492	6	*	TRANSISTOR NPN SI PD=350MW FT=250MHZ	04713	MPS5643
A240Q27	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A240Q28	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q29	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q30	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q35	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q36	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q37	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q38	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q39	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q40	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q41	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q42	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q43	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q44	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q45	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q46	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q47	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q48	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q49	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q50	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q51	1854-0409	5		TRANSISTOR NPN 2N5210 SI PD=310MW	04713	2N5210
A240Q52	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q53	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q55	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A240Q56	1855-0052	6		TRANSISTOR J-FET P-CHAN D-MODE TO-92 SI	07263	2N4360
A240Q57	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q58	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A240Q60	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A240Q61	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q62	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A240Q63	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A240Q64	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A240Q65	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A240Q66	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A240Q68	1853-0075	9		TRANSISTOR=DUAL PNP PD=400MW	28480	1853-0075
A240Q69	1853-0075	9		TRANSISTOR=DUAL PNP PD=400MW	28480	1853-0075
A240Q70	1853-0018	0		TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A240Q71	1853-0018	0		TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A240Q72	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q73	1853-0218	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0218
A240Q74	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q75	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A240Q76	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q77	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q78	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q79	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5086
A240Q80	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q81	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q82	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q83	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q84	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A240Q85	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q86	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A240Q87	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q88	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5086

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240Q89	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A240Q90	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q91	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q92	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A240Q93	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q94	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q95	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240Q96	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q97	1855-0062	8		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A240Q98	1855-0062	8		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A240Q99	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q100	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A240Q101	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N5904
A240Q102	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A240Q103	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A240Q104	5081-1977	9		FET, SELECTED	28480	5081-1977
A240Q105	1853-0075	9		TRANSISTOR=DUAL PNP PD=400MW	28480	1853-0075
A240Q106	1853-0018	0		TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ	28480	1853-0018
A240Q107	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A240R1	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R2	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R3	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A240R4	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R5	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R13	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R15	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R16	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R17	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R18	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R19	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R20	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R21	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R22	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R23	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R24	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R25	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R26	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R27	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R28	0699-0243	4		RESISTOR 100 .1% .125W F TC=0+-25	28480	0699-0243
A240R29	0698-6989	5		RESISTOR 400 .1% .125W F TC=0+-50	28480	0698-6989
A240R30	0698-6104	6		RESISTOR 800 .1% .125W F TC=0+-50	28480	0698-6104
A240R31	0698-6103	5		RESISTOR 1.6K .1% .125W F TC=0+-50	28480	0698-6103
A240R32	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A240R33	0698-6322	0		RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A240R34	0698-6361	7		RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A240R35	0698-8046	9		RESISTOR 16K .1% .125W F TC=0+-25	19701	MFAC1/8-T9-1602-B
A240R36	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A240R37	0698-3449	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A240R38	0757-0463	4		RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A240R39	0757-0470	3		RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A240R40	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R41	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A240R42	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A240R43	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R44	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R45	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A240R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R50	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R53	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R54	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R55	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240R56	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R58	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R59	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R60	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R61	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R62	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R63	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R64	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R65	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R66	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R67	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R68	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R69	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A240R70	0757-0470	3		RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A240R71	0757-0463	4		RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A240R72	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A240R73	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A240R74	0698-8046	9		RESISTOR 16K .1% .125W F TC=0+-25	19701	MFAC1/8-T9-1602-B
A240R75	0698-6361	7		RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A240R76	0698-6322	0		RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A240R77	0698-6624	5		RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A240R78	0698-6103	5		RESISTOR 1.6K .1% .125W F TC=0+-50	28480	0698-6103
A240R79	0698-6104	6		RESISTOR 800 .1% .125W F TC=0+-50	28480	0698-6104
A240R80	0698-6989	5		RESISTOR 400 .1% .125W F TC=0+-50	28480	0698-6989
A240R81	0699-0243	4		RESISTOR 199 .1% .125W F TC=0+-25	28480	0699-0243
A240R82	0698-4429	8		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A240R83	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A240R84	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R86	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R87	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A240R88	0683-1055	5		RESISTOR 1M 5% .25W FC TC=800/+900	01121	CB1055
A240R89	0683-1055	5		RESISTOR 1M 5% .25W FC TC=800/+900	01121	CB1055
A240R90	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A240R91	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R93	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R94	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R95	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R96	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R97	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A240R98	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A240R100	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R101	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R102	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R103	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R104	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R105	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R106	0757-0811	6		RESISTOR 192 1% .5W F TC=0+-100	28480	0757-0811
A240R107	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A240R108	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R109	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R110	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R111	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R112	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R113	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A240R114	0683-5655	9		RESISTOR 5.6M 5% .25W FC TC=+900/+1100	01121	CB5655
A240R115	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R116	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R117	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R118	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R119	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R120	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A240R121	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A240R122	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A240R123	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A240R124	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R125	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R126	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A240R127	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A240R128	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R129	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R130	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A240R131	0698-4422	7		RESISTOR 1.27K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1271-F
A240R132	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A240R133	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A240R134	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R135	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A240R136	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A240R137	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A240R138	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R139	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R140	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R141	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R142	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A240R143	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A240R144	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A240R145	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A240R147	0698-4527	3		RESISTOR 205K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2053-F
A240R148	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A240R149	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A240R150	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R151	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R152	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R153	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R154	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A240R155	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R156	0757-0197	1		RESISTOR 1.5K 1% .5W F TC=0+-100	28480	0757-0197
A240R157	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R158	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A240R159	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R160	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A240R161	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R162	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R163	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R164	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A240R165	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R166	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A240R167	0683-2255	9		RESISTOR 2.2M 5% .25W FC TC=-900/+1100	01121	CB2255
A240R168	0683-2255	9		RESISTOR 2.2M 5% .25W FC TC=-900/+1100	01121	CB2255
A240R170	0757-0349	5		RESISTOR 22.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2262-F
A240R171	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R172	0757-0349	5		RESISTOR 22.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2262-F
A240R173	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A240R174	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R175	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A240R176	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R177	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A240R178	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R179	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R180	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R181	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R182	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R183	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R184	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R185	0757-0811	6		RESISTOR 392 1% .5W F TC=0+-100	28480	0757-0811
A240R186	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A240R187	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R188	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R189	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R190	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R191	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R192	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R193	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R194	0698-6360	6		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A240R195	0683-5655	9		RESISTOR 5.6M 5% .25W FC TC=-900/+1100	01121	CB5655
A240R196	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A240R197	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A240R198	0698-7195	7		RESISTOR 19.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-19R6-G
A240R199	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R200	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A240R201	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A240R202	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R203	0698-4367	9		RESISTOR 20.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-20R5-F
A240R204	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R205	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A240R206	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A240R207	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A240R208	0698-4409	0		RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A240R209	0757-0821	8		RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A240R210	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240R211	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A240R213	0698-4416	9		RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A240R214	0698-4416	9		RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A240R215	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R216	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R217	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A240R218	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A240R219	0757-0718	2		RESISTOR 200 1% .25W F TC=0+-100	24546	C5-1/4-T0-201-F
A240R220	0757-0709	1		RESISTOR 66.1 1% .25W F TC=0+-100	24546	C5-1/4-T0-66R1-F
A240R221	0757-0718	2		RESISTOR 200 1% .25W F TC=0+-100	24546	C5-1/4-T0-201-F
A240R222	0757-0709	1		RESISTOR 68.1 1% .25W F TC=0+-100	24546	C5-1/4-T0-68R1-F
A240R223	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A240R224	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A240R225	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A240R226	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R227	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A240R228	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A240R229	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R230	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R231	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A240R232	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R233	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A240R234	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A240R235	0757-0439	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R236	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R237	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A240R238	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A240R239	0698-4466	9		RESISTOR 976 1% .125W F TC=0+-100	24546	C4-1/8-T0-976R-F
A240R240	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A240R241	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A240R242	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A240R243	0698-7253	8		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A240R244	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A240R245	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A240R246	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A240R247	0683-3355	2		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A240R250	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R251	2100-3350	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A240R252	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R253	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A240R254	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A240R255	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A240R294	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A240R295	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A240R296	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A240R297	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A240R298	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A240R299	0698-4477	2		RESISTOR 10.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1052-F
A240R300	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R301	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A240R310	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R311	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A240R400	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A240S1	3101-0569	5		SWITCH-SL DPDT MINTR 1A 125VAC PC	28480	3101-0569
A240U1	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U2	1820-1418	7		IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	01295	SN74LS42N
A240U3	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U4	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U5	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U6	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U7	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U8	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A240U9	1820-1970	6		IC GATE CMOS OP QUAD 2-INP	04713	MC14071BCP
A240U10	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A240U11	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A240U12	1820-1745	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A240U13	1820-1747	5		IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A240U20	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A240U21	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A240U22	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A240U23	1826-0043	4		OP AMP GP TO-99	01928	CA3077
A240U24	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A240U27	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A240U28	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A240U29	1858-0015	7		IC MISC	28480	1858-0015
A240U30	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1456G
A240U32	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1456G
A240U34	1858-0029	3			28480	1858-0029
A240VR1	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A240VR2	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A240VR3	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR4	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR5	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR6	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR7	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR8	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR9	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR10	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR11	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR12	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A240VR22	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A250	08160-60550	8		BOARD ASSEMBLY, DIGITAL OUTPUT	28480	08160-60550
A250C1	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A250C2	0160-4389	6		CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A250C3	0160-4389	6		CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A250C4	0180-2207	5		CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A250C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A250C6	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A250C7	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A250C8	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A250C101	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A250C103	0160-2205	1		CAPACITOR-FXD 120PF +-5% 300VDC MICA	28480	0160-2205
A250C104	0160-0597	0		CAPACITOR-FXD 1500PF +-10% 250VDC	28480	0160-0597
A250C105	0160-2197	0		CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
A250C106	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A250C107	0160-2249	3		CAPACITOR-FXD 8.7PF +-.25PF 500VDC CER	28480	0160-2249
A250C108	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A250C109	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A250C110	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A250C111	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A250C112	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A250C113	0160-4383	0		CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	28480	0160-4383
A250CR1	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A250CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A250CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A250CR4	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A250CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A250CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A250CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A250CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A250CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A250CR101	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A250CR102	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A250CR103	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	00000	1N4150
A250CR104	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	00000	1N4150
A250DL1	08160-61605	4		CABLE ASSEMBLY, DELAY	28480	08160-61605
A250J4	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A250J5	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A250L1	9100-1645	4		COIL-MLD 390UH 5% Q=65 .190X.44LG-NOM	28480	9100-1645
A250L101	9140-0105	3		COIL-MLD 6.2UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0105
A250L102	9100-2251	0		COIL-MLD 220NH 10% Q=32 .095DX.25LG-NOM	28480	9100-2251
A250L103	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L104	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L105	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L106	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L107	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L108	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250L109	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A250MP1	4040-0753	0		EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
A250MP2	4040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
A250MP109	1205-0037	0		HEAT SINK TO-18-PKG	28480	1205-0037
A250MP110	1205-0011	0		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A250Q1	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A250Q2	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A250Q3	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
[illegible]	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
[illegible]	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2S0Q6	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S0Q7	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S0Q8	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S0Q9	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S0Q10	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S0Q11	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A2S0Q12	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A2S0Q101	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S0Q102	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S0Q103	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S0Q104	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2S0Q105	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2S0Q106	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2S0Q107	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2S0Q108	1854-0305	0		TRANSISTOR NPN SI TO-18 PD=400MW	28480	1854-0305
A2S0Q109	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2S0Q110	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A2S0R1	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R2	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R3	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2S0R4	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2S0R5	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2S0R6	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2S0R7	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A2S0R8	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A2S0R9	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A2S0R10	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A2S0R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S0R14	2100-3350	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A2S0R15	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A2S0R16	0698-3515	7		RESISTOR 5.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5901-F
A2S0R17	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A2S0R18	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A2S0R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S0R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S0R21	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A2S0R22	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A2S0R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S0R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S0R30	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R31	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2S0R32	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A2S0R33	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R34	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R36	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R37	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2S0R38	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R39	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A2S0R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2S0R41	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A2S0R101	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A2S0R102	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A2S0R103	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A2S0R104	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A2S0R105	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A2S0R106	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R107	0757-0738	6		RESISTOR 1.82K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1821-F
A2S0R108	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A2S0R109	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2S0R110	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R111	0757-0379	1		RESISTOR 12.1 1% .125W F TC=0+-100	19701	MFAC1/8-T0-12R1-F
A2S0R112	0757-0379	1		RESISTOR 12.1 1% .125W F TC=0+-100	19701	MFAC1/8-T0-12R1-F
A2S0R113	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A2S0R114	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R115	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R116	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2S0R117	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R118	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R119	0757-0406	5		RESISTOR 182 1% .125W F TC=0+-100	24546	C4-1/8-T0-182R-F
A2S0R120	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S0R121	0757-0722	8		RESISTOR 332 1% .25W F TC=0+-100	24546	C5-1/4-T0-332R-F
A2S0R122	0757-0705	7		RESISTOR 47.5 1% .25W F TC=0+-100	28480	0757-0705
A2S0R123	0757-0794	4		RESISTOR 68.1 1% .5W F TC=0+-100	28480	0757-0794
A2S0R124	0698-4421	6		RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A250R125	0757-0815	0		RESISTOR 562 1% .5W F TC=0+-100	28480	0757-0815
A250S1	3101-1871	4		SWITCH-SL 4PDT SUBMIN .3A 125VAC PC	28480	3101-1871
A250U1	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A250U2	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A250U3	1820-1705	5		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A250U4	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A250U5	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U6	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U7	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U8	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U9	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U10	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U11	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U12	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U13	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U14	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U15	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U16	1820-1707	5		IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A250U17	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U18	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A250U19	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A250U20	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A250U21	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A250U22	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A250U23	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A250U24	1820-1976	2		IC BFR CMOS NON-INV HEX	01928	CD4050BE
A250U25	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A250U26	1826-0181	7		OP AMP GP QUAD 14-DIP-P	04713	MLM324P
A250U27	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A250U101	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A250U102	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A250U103	1820-1956	8		IC LCM CMOS COM CLOCK QUAD	01928	CD4042BE
A250U104	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A250VR1	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A250VR2	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A250VR3	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A250VR4	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A250VR5	1902-0049	2		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A251	08160-66551	9		BOARD ASSEMBLY, ANALOG OUTPUT	28480	08160-66551
A251C101	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C102	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A251C103	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A251C104	0160-3719	4		CAPACITOR-FXD .068UF +-10% 250VDC	28480	0160-3719
A251C105	0160-3715	0		CAPACITOR-FXD .015UF +-10% 250VDC	28480	0160-3715
A251C106	0160-0596	9		CAPACITOR-FXD 1000PF +-10% 250VDC	28480	0160-0596
A251C107	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A251C108	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A251C109	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A251C110	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C111	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C112	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C113	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C114	0180-2338	3		CAPACITOR-FXD 650UF+-20% 13VDC TA	06001	69F233G7
A251C115	0180-2338	3		CAPACITOR-FXD 650UF+-20% 13VDC TA	06001	69F233G7
A251C116	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A251C117	0160-2197	0		CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
A251C201	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C202	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C203	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A251C204	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C205	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C206	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C207	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C208	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C209	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C210	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A251C211	0160-0576	5		CAPACITOR 0.1UF		
A251C212	0160-0576	7		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C213	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C214	0160-3879	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C215	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C216	0180-2141	5		CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A251C217	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C218	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C219	0160-0576			CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A251C220	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C221	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C222	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C223	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C224	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C225	0140-0197	4		CAPACITOR-FXD 180PF +-5% 300VDC MICA	72136	DM15F181J0300WV1CR
A251C226	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C227	0160-4381	8		CAPACITOR-FXD 1.5PF +-.25PF 200VDC CER	28480	0160-4381
A251C301	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C302	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C303	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C304	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C307	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C308	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A251C309	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C310	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A251C311	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A251C312	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C313	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C315	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A251C316	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C317	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C318	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A251C319	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A251C320	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C321	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C322	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C323	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C324	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C325	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C326	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A251C327	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A251C328	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C329	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C330	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C331	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A251C332	0160-0571	0		CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A251C333	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C334	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C335	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C336	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C337	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C338	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C339	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C340	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C341	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C342	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A251C343	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C401	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C402	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C403	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C404	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C405	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C406	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A251C408	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C409	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C410	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A251C411	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C412	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C413	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A251C414	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C415	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A251C416	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A251C417	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A251C418	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A251C419	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A251C420	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A251C421	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C422	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251C423	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A251CR201	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A251CR202	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A251CR203	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A251CR204	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A251CR207	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033

See introduction to this section for ordering information
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Table 6--3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A25ICR209	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A25ICR210	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A25ICR301	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR302	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR305	1901-0460	9		DIODE-STABISTOR 30V 150MA DO-7	28480	1901-0460
A25ICR306	1901-0460	9		DIODE-STABISTOR 30V 150MA DO-7	28480	1901-0460
A25ICR307	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR308	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR309	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR310	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR311	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR312	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	00040	NDP250
A25ICR313	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR315	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR316	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR317	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR318	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR319	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR324	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR325	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25ICR402	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A25ICR403	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A25ICR404	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A25ICR405	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A25ICR406	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A25IJ4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A25IJ5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A25IK200	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A25IK201	0490-1079	4		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-1079
A25IK202	0490-1034	1		RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A25IK203	0490-1034	1		RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A25IK301	0490-1034	1		RELAY 2C 12VDC-COIL .5A 350VDC	28480	0490-1034
A25IK302	0490-1192	2		RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A25IK303	0490-1192	2		RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A25IK401	0490-1192	2		RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-1192
A25IL101	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL102	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL201	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL202	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL210	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A25IL211	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A25IL212	5081-1973	5		INDUCTANCE, 3-BEAD	28480	5081-1973
A25IL301	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL302	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL303	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL304	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A25IL306	9100-0346	0		COIL-MLD 50NH 20% Q=40 .095DX.25LG-NOM	28480	9100-0346
A25IL401	08160-66001	4		COIL, FXD	28480	08160-66001
A25IMP1	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP2	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP3	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP4	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP5	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP6	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP7	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP8	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP9	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP10	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP11	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP12	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP13	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP14	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP15	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP16	1205-0236	1		ADPTR SEMICON,XSTR CASE TO-5	28480	1205-0236
A25IMP17	01801-22301	7		HEAT SINK	28480	01801-22301
A25IMP18	01801-22301	7		HEAT SINK	28480	01801-22301
A25IMP19	08160-01103	1		HEAT SINK, ANALOG OUTPUT	28480	08160-01103
A25IMP20	0380-0160	9		STANDOFF-RVT-ON ,5-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A25IMP21	0380-0160	9		STANDOFF-RVT-ON ,5-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A25IMP22	0380-0160	9		STANDOFF-RVT-ON ,5-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
A25IMP23	08160-01205	4		BRACKET, TRANSISTOR	28480	08160-01205
A25IMP24	4040-0749	4		EXTR-PC 80 BRN POLYC ,062-BD-THKNS	28480	4040-0749
A25IMP25	4040-0753	0		EXTR-PC 80 GRN POLYC ,062-BD-THKNS	28480	4040-0753

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2S1MP26	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP27	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP27	1205-0368	0		HEAT SINK SGL TO-18-PKG	D2624	104648/5
A2S1MP28	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP29	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP30	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP31	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP32	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP33	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP34	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP35	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP36	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP37	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP40	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP41	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP42	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1MP43	0515-0149	1		SCREW-MACHINE 6-8A THD; 2.80 MM DIA X	00000	ORDER BY DESCRIPTION
A2S1Q101	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q102	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q103	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q104	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q200	1854-0568	5		TRANSISTOR NPN 2N5191 SI PD=40W FT=2MHZ	04713	2N5191
A2S1Q201	1854-0215	3		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A2S1Q202	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q203	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q204	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q205	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q206	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q207	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q208	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2S1Q209	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A2S1Q210	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q211	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2S1Q212	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q213	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q214	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q215	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q216	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q217	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q218	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q300	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A2S1Q301	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q302	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q303	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A2S1Q304	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q305	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q306	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2S1Q307	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2S1Q308	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2S1Q309	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q311	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q312	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q313	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q314	1853-0315	0		TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ	28480	1853-0315
A2S1Q315	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A2S1Q316	1854-0498	2		TRANSISTOR NPN SI TO-39 PD=1W	28480	1854-0498
A2S1Q317	1854-0474	4		TRANSISTOR NPN SI PD=310MW FT=100MHZ	04713	2N5551
A2S1Q318	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q319	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A2S1Q321	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A2S1Q327	1854-0637	1		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A2S1Q328	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A2S1Q329	1853-0314	9		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A2S1Q401	1854-0472	2		TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A2S1Q407	1853-0400	4		TRANSISTOR PNP SI DARL TO-92 PD=500MW	28480	1853-0400
A2S1Q408	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1Q409	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q410	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2S1Q411	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q412	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2S1Q413	1854-0368	5		TRANSISTOR NPN 2N5191 SI PD=40W FT=2MHZ	04713	2N5191
A2S1Q414	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q415	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q417	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A2S1Q418	1853-0212	6		TRANSISTOR PNP 2N5194 SI PD=40W FT=2MHZ	04713	2N5194
A2S1Q419	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A2S1Q420	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A2S1Q421	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A2S1R100	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A2S1R101	0757-0492	9		RESISTOR 13 1% .25W F TC=0+-100	19701	MF52C1/4-T0-13R0-F
A2S1R102	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A2S1R103	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A2S1R104	0698-4086	9		RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A2S1R105	0698-4086	9		RESISTOR 22.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-22R6-F
A2S1R106	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2S1R107	2100-3161	6		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A2S1R108	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2S1R109	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S1R110	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S1R111	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A2S1R112	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2S1R113	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S1R114	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2S1R115	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S1R116	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A2S1R117	0757-0411	2		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332W-F
A2S1R118	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A2S1R119	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A2S1R120	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-G
A2S1R121	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A2S1R122	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A2S1R123	0757-0995	7		RESISTOR 33.2 1% .5W F TC=0+-100	28480	0757-0995
A2S1R124	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S1R125	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2S1R126	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A2S1R127	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2S1R128	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A2S1R129	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A2S1R130	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2S1R131	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A2S1R132	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A2S1R133	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A2S1R134	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A2S1R135	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A2S1R136	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-G
A2S1R137	2100-2497	9		RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A2S1R140	0698-3258	5		RESISTOR 5.36K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5361-F
A2S1R200	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A2S1R202	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A2S1R203	0757-0720	6		RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A2S1R204	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A2S1R205	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A2S1R206	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A2S1R207	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A2S1R208	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A2S1R209	0757-0799	9		RESISTOR 121 1% .5W F TC=0+-100	28480	0757-0799
A2S1R210	0757-0799	9		RESISTOR 121 1% .5W F TC=0+-100	28480	0757-0799
A2S1R211	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A2S1R212	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	32997	3386X-T46-203
A2S1R213	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A2S1R214	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A2S1R215	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2S1R216	0757-0452	1		RESISTOR 27.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2742-F
A2S1R217	0757-0452	1		RESISTOR 27.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2742-F
A2S1R218	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A2S1R219	0757-0720	6		RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A2S1R220	0757-0415	6		RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A2S1R221	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A2S1R222	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A2S1R223	0757-0410	1		RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
A2S1R224	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A2S1R225	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A2S1R226	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A2S1R227	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A2S1R228	0698-4401	2		RESISTOR 95.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-95R3-F
A2S1R229	0698-4401	2		RESISTOR 95.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-95R3-F
A2S1R230	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A2S1R231	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A2S1R232	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A2S1R233	0698-4381	7		RESISTOR 48.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-48R7-F
A2S1R234	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A2S1R236	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A2S1R237	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A25R238	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A25R239	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R240	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R241	0698-3933	8		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A25R242	0698-3933	8		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A25R243	0757-0813	8		RESISTOR 475 1% .5W F TC=0+-100	28480	0757-0813
A25R244	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R245	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A25R246	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A25R247	2100-3154	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A25R248	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A25R249	0683-1065	7		RESISTOR 10M 5% .25W FC TC=+900/+1100	01121	CB1065
A25R250	0757-0724	0		RESISTOR 392 1% .25W F TC=0+-100	24546	C3-1/4-T0-392R-F
A25R251	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A25R252	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A25R253	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R254	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-[illegible]-F
A25R255	0757-0999	1		RESISTOR 47.5 1% .5W F TC=0+-100	28480	0757-0999
A25R256	0698-6324	2		RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A25R257	0698-4521	7		RESISTOR 154K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1543-F
A25R258	0698-6324	2		RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A25R259	0698-4521	7		RESISTOR 154K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1543-F
A25R260	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A25R261	0698-3136	6		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A25R262	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A25R263	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100		
A25R264	2100-3109			RESISTOR 2K		
A25R265	0757-0416	2		RESISTOR 511 1% .125W	24546	C4-1/8-T0-511 R-F
A25R266	2100-3109	7		RESISTOR 2K		
A25R267	0757-0416	3		RESISTOR 511 1% .125W	24546	C4-1/8-T0-511 R-F
A25R268	2100-3056	8		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A25R269	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A25R270	0698-7212	8		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A25R271	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A25R272	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A25R273	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R274	0698-4429	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A25R275	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A25R276	0698-6324	2		RESISTOR 187 1% .125W F TC=0+-100	24546	C4-1/8-T0-187R-F
A25R277	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A25R278	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A25R280	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R281	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R282	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R283	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R284	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A25R285	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R286	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R287	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R288	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A25R289	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A25R290	0757-0281	4		RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A25R292	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A25R293	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A25R294	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R295	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R296*	0757-0200			RESISTOR 5.62K 1% .125W	24546	C4-1/8-T0-5621-F
A25R300	0698-4442	1		RESISTOR 4.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4421-F
A25R301	0698-3700	2		RESISTOR 715 1% .125W F TC=0+-100	24546	C4-1/8-T0-715R-F
A25R302	0698-4465	8		RESISTOR 931 1% .125W F TC=0+-100	24546	C4-1/8-T0-931R-F
A25R303	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A25R304	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A25R305	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A25R306	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R307	0698-4413	6		RESISTOR 154 1% .125W F TC=0+-100	24546	C4-1/8-T0-154R-F
A25R308	2100-3095	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A25R309	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R310	0698-4413	6		RESISTOR 154 1% .125W F TC=0+-100	24546	C4-1/8-T0-154R-F
A25R311	2100-3095	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A25R312	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A25R313	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A25R314	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A25R315	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A25R316	0683-4075	1		RESISTOR 4.7 5% .25W FC TC=+400/+500	01121	CB4765
A25R317	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3 Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A25R318	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25U317	0698-5965	5		RESISTOR 50 1% .5W F TC=0+-100	28480	0698-5965
A25R320	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A25R321	0698-5965	5		RESISTOR 50 1% .5W F TC=0+-100	28480	0698-5965
A25U322	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB47G5
A25R323	0757-1000	7		RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A25R324	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A25R325	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A25R326	0757-1000	7		RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A25R327	0698-4485	8		RESISTOR 931 1% .125W F TC=0+-100	24546	C4-1/8-T0-931R-F
A25R328	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R329	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A25R330	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A25R331	0698-3512	4		RESISTOR 1.18K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1181-F
A25R332	0757-0995	7		RESISTOR 53.2 1% .5W F TC=0+-100	28480	0757-0995
A25R333	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A25R334	0757-0995	7		RESISTOR 53.2 1% .5W F TC=0+-100	28480	0757-0995
A25R335	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R336	0761-0042	4		RESISTOR 68 5% 1W MO TC=0+-200	28480	0761-0042
A25R337	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R338	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB47G5
A25R339	0698-7244	5		RESISTOR 1.03K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A25R340	0683-0475	1		RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB47G5
A25R341	0757-1084	0		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A25R342	0757-1084	0		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A25R343	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A25R344	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R345	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A25R346	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R347	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A25R348	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R349	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A25R350	0757-0721	7		RESISTOR 274 1% .25W F TC=0+-100	24546	C5-1/4-T0-274R-F
A25R351	0698-3700	2		RESISTOR 715 1% .125W F TC=0+-100	24546	C4-1/8-T0-715R-F
A25R352	0698-4482	1		RESISTOR 4.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4421-F
A25R353	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R354	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R355	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R356	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R357	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A25R358	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R359	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R360	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R361	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R362	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R363	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R364	0757-0821	8		RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A25R365	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R366	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A25R367	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R368	0757-0721	7		RESISTOR 274 1% .25W F TC=0+-100	24546	C5-1/4-T0-274R-F
A25R369	0698-3490	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A25R370	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A25R371	0757-0720	6		RESISTOR 243 1% .25W F TC=0+-100	24546	C5-1/4-T0-243R-F
A25R372	0698-0146	8		RESISTOR 53.6 1% 10W F TC=0+-50	28480	0698-0146
A25R373	0698-0063	4		RESISTOR 5.23K 1% .125W F TC=0+-100	91637	CMF-1/8-T1-5231-F
A25R374	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A25R375	0698-3496	3		RESISTOR 3.57K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3571-F
A25R376	0698-4029	4		RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A25R377	0698-4470	5		RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F
A25R378	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R379	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A25R380	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R381	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A25R382	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A25R383	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R384	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A25R385	0698-7199	1		RESISTOR 28.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-28R7-G
A25R386	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A25R387	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R388	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A25R389	0757-0489	4		RESISTOR 10 1% .25W F TC=0+-100	19701	MF52C1/4-T0-10R0-F
A25R390	0757-0489	4		RESISTOR 10 1% .25W F TC=0+-100	19701	MF52C1/4-T0-10R0-F
A25R391	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A25R392	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G

See Introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A25R389	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R390	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R391	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R392	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A25R393	0698-8958	2		RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A25R394	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A25R395	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A25R396	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R397	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R398	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A25R399	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A25R401	2100-3161	6		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A25R402	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A25R403	2100-3122	9		RESISTOR-TRMR 100 10% C SIDE-ADJ 17-TRN	02111	43P101
A25R404	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A25R407	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R408	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R409	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A25R410	0698-4447	6		RESISTOR 280 1% .125W F TC=0+-100	24546	C4-1/8-T0-280R-F
A25R411	0757-0282	5		RESISTOR 221 1% .125W F TC=0+-100	24546	C4-1/8-T0-221R-F
A25R412	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A25R413	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R414	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R427	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R428	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A25R429	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R430	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A25R431	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A25R432	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R433	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R434	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A25R435	2100-3122	9		RESISTOR-TRMR 100 10% C SIDE-ADJ 17-TRN	02111	43P101
A25R436	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A25R437	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R438	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A25R439	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A25R440	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R441	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A25R442	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A25R443	0698-4409	0		RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A25R444	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R445	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R446	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A25R447	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A25R448	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R449	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R451	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A25R452	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A25R453	0698-4409	0		RESISTOR 127 1% .125W F TC=0+-100	24546	C4-1/8-T0-127R-F
A25R454	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R455	0757-0997	9		RESISTOR 39.2 1% .5W F TC=0+-100	28480	0757-0997
A25R456	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A25R457	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R458	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R459	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R460	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A25R463	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A25R464	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R465	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A25R466	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R471	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A25R472	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A25R473	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A25R474	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A25R475	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A25R476	0698-7284	5		RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A25R477	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A25R478	0698-7267	4		RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A25R479	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A25R480	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A25R481	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A25R2091	0757-0031	2		RESISTOR 105 1% .5W F TC=0+-100	28480	0757-0031
A25R2101	0757-0031	2		RESISTOR 105 1% .5W F TC=0+-100	28480	0757-0031
A25U201	1826-0161	7		OP AMP GP QUAD 14-DIP-P	04713	MLM324P
A25U202	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A25U203	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A25U204	5081-1983	7		IC ASSEMBLY, VERNIER	28480	5081-1983
A25U305	1826-0059	2		OP AMP GP TO-99	01295	LM201AL

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A251U306	1826-0059	2		OP AMP GP TO-99	01295	LM201AL
A251U307	1826-0111	7		OP AMP GP DUAL TO-99	04713	MC1458G
A251U402	1826-0009	2		TO-99	06665	SG3725CJ
A251U404	1826-0009	2		TO-99	06665	SG3725CJ
A251U405	1826-0009	2		TO-99	06665	SG3725CJ
A251VR201	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A251VR204	1902-0522	6		DIODE-ZNR 1N5340B 6V 5% PD=5W IR=1UA	04713	1N5340B
A251VR205	1902-0522	6		DIODE-ZNR 1N5340B 6V 5% PD=5W IR=1UA	04713	1N5340B
A251VR208	1902-0041	4		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	28480	1902-0041
A251VR209	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	24046	1N827
A251VR301	1902-3094	3		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A251VR302	1902-3094	3		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009%	28480	1902-3094
A251VR303	1902-1285	0		DIODE-ZNR 12V 5% PD=5W IR=50UA	28480	1902-1285
A251VR304	1902-1285	0		DIODE-ZNR 12V 5% PD=5W IR=50UA	28480	1902-1285
A251VR305	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A251VR306	1902-0025	4		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A251VR321	1902-0835	4	2		28480	1902-0835
A251VR322	1902-0835	4			28480	1902-0835
A251VR401	1902-0048	1		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.003%	28480	1902-0048
A251VR402	1902-0048	1		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.003%	28480	1902-0048
A251W101	08160-61614	5		CABLE ASSEMBLY, SHIELDED AMPLIFIER	28480	08160-61614
A251W102	08160-61614	5		CABLE ASSEMBLY, SHIELDED AMPLIFIER	28480	08160-61614
A326	08160-66526	8		BOARD ASSEMBLY, TIME INT L	28480	08160-66526
A326C1	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A326C2	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C3	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A326C4	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A326C5	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A326C7	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A326C8	0160-3872	0		CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A326C10	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A326C11	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C12	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A326C13	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C20	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A326C23	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A326C24	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C25	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A326C30	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A326C31	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A326C32	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A326CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR20	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR21	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR22	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR23	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR25	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR26	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR27	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR28	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR29	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326CR30	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A326DL1	08160-61615	6		CABLE ASSEMBLY, SHIELDED	28480	08160-61615
A326J2	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A326J4	1250-0543	8		CONNECTOR-RF SMB,SNP M PC 50-OHM	28480	1250-0543

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A326L1	5081-1971	5		INDUCTANCE, 3-BEAD	28480	5081-1971
A326L2	9100-1641	0		COIL-MLD 240UH 5% Q=65 .155DX.375LG-NOM	28480	9100-1641
A326L3	9100-2247	4		COIL-MLD 100MH 10% Q=30 .095DX.25LG-NOM	28480	9100-2247
A326L4	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L6	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L7	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L10	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L13	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326L14	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A326MP3	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-TMKNS	28480	4040-0750
A326MP4	4040-0754	1		EXTR-PC BD BLU POLYC .062-BD-TMKNS	28480	4040-0754
A326Q1	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A326Q2	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A326Q3	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A326Q5	1853-0086	2		TRANSISTOR PNP SI PD=310MW FT=40MHZ	27014	2N5087
A326Q11	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q17	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q18	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q19	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q20	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q21	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q22	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q23	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q24	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q25	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q26	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q27	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q28	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q29	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q30	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q35	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q36	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q37	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q38	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q39	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q40	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q41	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q42	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q43	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q44	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q45	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q46	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q47	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q48	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q49	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q50	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q51	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q52	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q53	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q54	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q55	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q56	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q57	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q58	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q59	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q60	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q61	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q62	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A326Q63	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q64	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A326Q65	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q66	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A326Q67	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A326Q68	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A326R1	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A326R2	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A326R3	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A326R4	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A326R5	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-10-	24546	C4-1/8-T0-33R2-F
A326R6	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A326R7	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A326R8	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A326R9	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A326R10	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A326R11	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A326R12	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A326R13	0698-4444	3		RESISTOR 4.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4871-F
A326R14	0698-4444	3		RESISTOR 4.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4871-F
A326R15	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A326R16	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R17	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A326R18	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A326R19	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R20	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R21	0757-0159	5		RESISTOR 1K 1% .5W F TC=0+-100	28480	0757-0159
A326R22	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R24	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A326R25	0757-0439	8		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A326R26	0698-3455	4		RESISTOR 261K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2613-F
A326R30	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R31	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R32	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R33	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R34	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R36	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R37	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A326R38	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R39	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R40	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R41	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R42	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R43	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R44	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R45	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R46	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R48	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R49	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R50	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R51	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R52	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R53	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R54	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R55	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R56	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R57	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R58	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R59	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R60	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A326R62	0757-0434	9		RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3651-F
A326R63	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R65	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R66	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R67	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R68	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R70	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R71	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R72	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R73	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R74	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R75	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R76	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R77	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R78	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R79	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R80	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R81	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R82	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A326R83	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R84	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R85	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R86	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R87	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R88	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R89	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R90	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R91	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R92	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R93	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A326R94	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R95	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R96	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R97	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R98	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R99	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R100	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R101	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R102	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R103	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R104	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R105	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A326R106	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R107	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R108	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R109	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A326R110	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R111	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R112	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R113	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R114	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R115	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R116	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R117	0757-0434	9		RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3651-F
A326R118	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A326R119	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A326R120	0683-9145	0		RESISTOR 910K 5% .25W FC TC=-800/+900	01121	CB9145
A326R121	0683-6245	5		RESISTOR 620K 5% .25W FC TC=-800/+900	01121	CB6245
A326R122	0683-7545	0		RESISTOR 750K 5% .25W FC TC=-800/+900	01121	CB7545
A326R123	0698-3454	3		RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A326R124	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R125	0757-0434	9		RESISTOR 3.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3651-F
A326R126	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A326R127	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A326R128	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R130	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A326R131	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A326R132	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A326R133	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A326R134	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A326R135	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A326R136	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A326R137	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R138	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A326R139	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A326R140	0757-0392	8		RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
A326R141	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A326R142	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A326R143	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R144	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R145	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R146	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R147	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R148	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A326R150	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A326R151	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A326R152	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A326R153	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A326R154	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A326R155	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A326R156	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A326R157	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A326R160	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R161	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A326R162	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326R163	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A326RT1	0837-0040	3		THERMISTOR DISC 10K-OHM TC=-4.4%/C-DEG	28480	0837-0040
A326U1	1858-0015	7		IC MISC	28480	1858-0015
A326U2	1820-1958	0		SWITCH ANLG QUAD 14-DIP-P	01928	CD4016BE
A326U3	1858-0015	7		IC MISC	28480	1858-0015
A326U4	1826-0043	4		OP AMP GP TO-99	01928	CA3078
A326U5	1820-1958	0		SWITCH ANLG QUAD 14-DIP-P	01928	CD4016BE
A326U6	1820-1956	6		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A326U7	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A327	08160-66527	9		BOARD ASSEMBLY, TIME INT 2	28480	08160-66527
A327C1	0160-2940	1		CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2940
A327C2	0160-2940	1		CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2940
A327C3	0160-0598	1		CAPACITOR-FXD 2200PF +-10% 250VDC	28480	0160-0598
A327C4	0140-0191	8		CAPACITOR-FXD 5PF +-5% 300VDC MICA	72136	DM15E5R0J0300WV1CR
A327C5	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A327C6	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A327C5	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A327C5	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A327C5	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A327C5	0160-4404	4		CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4404
A327C6	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A327C7	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A327C8	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A327C9	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A327C10	0160-43A6	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A327C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A327C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A327C13	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A327C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A327CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327CR19	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A327DL1	08160-61601	0		CABLE ASSEMBLY, DELAY 1	28480	08160-61601
A327DL3	08160-61602	1		CABLE ASSEMBLY, DELAY 2	28480	08160-61602
A327DL4	08160-61616	7		CABLE ASSEMBLY, SHIELDED	28480	08160-61616
A327DL5	08160-61603	2		CABLE ASSEMBLY, DELAY 3	28480	08160-61603
A327J2	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A327J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A327J5	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A327J6	1251-3718	7		CONNECTOR 10-PIN F F POST TYPE	28480	1251-3718
A327L1	9100-2262	3		COIL-MLD 3.9UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2262
A327L2	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327L3	9100-2262	3		COIL-MLD 3.9UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2262
A327L4	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327L5	9100-0368	4		COIL-MLD 330NH 10% Q=28 .095DX.25LG-NOM	28480	9100-0368
A327L6	9100-2265	6		COIL-MLD 10UH 10% Q=60 .095DX.25LG-NOM	28480	9100-2265
A327L7	9100-2251	0		COIL-MLD 220NH 10% Q=32 .095DX.25LG-NOM	28480	9100-2251
A327L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327L12	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A327MP3	4040-0750	7		EXTR-PC BD RED PDLYC .062-BD-THKNS	28480	4040-0750
A327MP4	4040-0755	2		EXTR-PC BD VIO PDLYC .062-BD-THKNS	28480	4040-0755
A327Q1	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q2	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q3	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q4	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q5	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A327Q6	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q9	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q10	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q11	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q13	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q14	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q15	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q16	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q17	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q18	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q19	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q20	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A327Q21	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A327Q22	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q23	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q24	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q25	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A327Q26	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q27	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q28	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q29	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q30	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q31	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q32	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q33	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q34	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A327Q40	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A327R1	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R2	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R3	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R4	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R7	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R8	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R9	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R10	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R11	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R12	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A327R13	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R14	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R15	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A327R16	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R17	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R18	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A327R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R21	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R22	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R23	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R24	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R25	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A327R26	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R27	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R28	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R29	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R30	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R31	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R32	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R33	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R34	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R35	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R36	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A327R37	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R38	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A327R39	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A327R40	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R41	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R42	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A327R43	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R44	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R45	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A327R46	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R48	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A327R49	0698-4356	6		RESISTOR 12.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-12R7-F
A327R50	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A327R51	0698-4356	6		RESISTOR 12.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-12R7-F
A327R52	0698-4358	8		RESISTOR 14 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R0-F
A327R53	0757-0411	2		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A327R54	0698-4416	4		RESISTOR 169 1% .125W F TC=0+-100	24546	C4-1/8-T0-169R-F
A327R55	0757-0304	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A327R56	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A327R57	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A327R58	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A327R59	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A327R60	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A327R61	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A327R62	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A327R63	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A327R64	0757-0433	8		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
A327R65	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A327R66	0698-4453	4		RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A327R67	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A327R68	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A327R69	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R70	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R71	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R72	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R73	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A327R74	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A327R75	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A327R76	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R77	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A327R78	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R79	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R80	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R81	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A327R82	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A327R83	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A327R84	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R85	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A327R86	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R87	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A327R88	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A327R89	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A327R90	0757-0288	1		RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A327R91	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A327R100	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A327R101	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A327R102	0757-0389	3		RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
A327R103	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A327R104	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A327R105	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A327R106	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A327R107	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A327R108	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A327R109	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A327R110	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A327R111	0698-4459	0		RESISTOR 634 1% .125W F TC=0+-100	24546	C4-1/8-T0-634R-F
A327R112	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A327R113	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A327R114	0757-0736	4		RESISTOR 1.5K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1501-F
A327R115	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A327U1	1858-0015	7		IC MISC	28480	1858-0015
A327U2	1858-0015	7		IC MISC	28480	1858-0015
A327U3	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328	08160-66528	0		BOARD ASSEMBLY, TIME INT 3	28480	08160-66528
A328C1	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A328C3	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A328C4	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A328C7	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A328C8	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A328C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A328C10	0121-0467	1		CAPACITOR-V TRMR-CER 2.5-8PF 100V PC-MTG	28480	0121-0467
A328C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A328C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A328C13	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387

See introduction to this section for ordering information
*Indicates factory selected value

Table 6—3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A328C14	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A328C15	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A328C16	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A328C17	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A328C18	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A328C19	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A328CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A328DL1	08160-61404	3		CABLE ASSEMBLY, DELAY	28480	08160-61404
A328DL2	08160-61617	8		CABLE ASSEMBLY, SHIELDED SET OF 2	28480	08160-61617
A328DL3	08160-61617	8		CABLE ASSEMBLY, SHIELDED SET OF 2	28480	08160-61617
A328J2	1251-3718	7		CONNECTOR 10-PIN F F PDST TYPE	28480	1251-3718
A328J4	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A328J5	1250-0543	8		CONNECTOR-RF SM-BNP M PC 50-OHM	28480	1250-0543
A328L1	9100-2262	3		COIL-MLD 3.9UH 10% Q@45 .095DX.25LG-NOM	28480	9100-2262
A328L2	9100-2264	5		COIL-MLD 8.8UH 10% Q@50 .095DX.25LG-NOM	28480	9100-2264
A328L3	9100-2259	8		COIL-MLD 1.5UH 10% Q@32 .095DX.25LG-NOM	28480	9100-2259
A328L4	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L5	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L6	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L7	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L8	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L9	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L10	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L11	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L12	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L13	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L14	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L15	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328L16	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A328MP1	1400-0824	7		STRAP-CABLE	28480	1400-0824
A328MP3	01801-22301	7		HEAT SINK	28480	01801-22301
A328MP4	4040-0750	7		EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
A328MP5	4040-0747	2		EXTR-PC BD GRA POLYC .062-BD-THKNS	28480	4040-0747
A328Q1	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A328Q2	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A328Q4	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A328Q6	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A328Q7	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A328Q8	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A328Q9	1854-0485	7		TRANSISTOR NPN SI TO-106 PD=175MW	28480	1854-0485
A328Q10	1853-0216	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0216
A328Q11	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A328Q12	1854-0583	6		TRANSISTOR NPN SI TO-92 PD=310MW	04713	MPS-A18
A328Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A328Q15	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A328Q16	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A328Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A328Q18	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A328Q30	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328Q31	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328Q32	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328Q33	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328Q50	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A328Q52	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A328Q54	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A328Q57	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A328Q59	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A328Q60	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328Q61	1854-0392	5		TRANSISTOR NPN SI PD=310MW FT=50MHZ	04713	2N5088
A328R1	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A328R2	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A328R3	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A328R4	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A328R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

See introductory to this section for ordering information
*Indicates factory selected value

Table 6–3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A328R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A328R7	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A328R8	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A328R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A328R10	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R11	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A328R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R14	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A328R15	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A328R16	0757-0412	3		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A328R17	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R18	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R19	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A328R20	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A328R21	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A328R22	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R25	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A328R26	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R27	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R28	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A328R29	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A328R30	0698-4418	1		RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A328R31	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R33	0698-4389	5		RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A328R34	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A328R35	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A328R36	0757-0273	4		RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A328R37	2100-3252	6		RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TRN	28480	2100-3252
A328R38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A328R39	0698-4433	0		RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A328R40	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R41	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R45	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A328R46	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A328R47	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A328R48	0698-4479	9		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A328R49	0698-4479	9		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A328R50	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A328R51	0698-4020	1		RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A328R52	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A328R53	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A328R54	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A328R58	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R100	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A328R101	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A328R102	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A328R103	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A328R104	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R105	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R106	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R107	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R108	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R109	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R110	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R111	0698-4431	8		RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A328R112	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R113	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R114	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R115	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R116	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R117	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R118	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R119	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R120	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R125	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R126	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R127	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A328R128	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A328R150	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A328R151	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A328R200	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R201	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R202	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R203	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A328R204	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A328R205	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R206	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R207	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R208	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R209	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R210	0698-4482	1		RESISTOR 4.42K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4421-F
A328R211	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R212	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R213	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A328R214	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A328R215	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R216	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A328R217	0757-0821	5		RESISTOR 1.21K 1% .5W F TC=0+-100	28480	0757-0821
A328R218	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A328R219	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A328R220	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R221	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R222	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A328R223	0757-0426	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A328R224	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A328R225	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R226	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A328R227	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A328R228	0698-3245	0		RESISTOR 20.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2052-F
A328R229	0757-0407	6		RESISTOR 200 1% .125W F TC=0+-100	24546	C4-1/8-T0-201-F
A328R230	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R231	0698-4460	3		RESISTOR 649 1% .125W F TC=0+-100	24546	C4-1/8-T0-649R-F
A328R232	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A328R233	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R234	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R235	0757-0818	3		RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A328R236	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R237	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A328R238	0698-4422	7		RESISTOR 1.27K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1271-F
A328R239	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A328R240	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A328R241	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A328R250	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A32881	3101-0569	5		SWITCH-SL DPDTMINTR 1A 125VAC PC	28480	3101-0569
A32882	3101-2063	8		SWITCH-RKR DIP-RKR-ASSY 4-1A .05A 30VDC	28480	3101-2063
A328U1	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A328U2	1858-0015	7		IC MISC	28480	1858-0015
A328U3	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A328U4	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A328U5	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A328U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A328U7	1820-1402	5		IC GATE ECL NOR DUAL 3-INP	04713	MC10211P
A328U8	5081-1976	8		IC, 10137L WITH HEAT SINK	28480	5081-1976
A328U9	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A328U10	1820-1173	1		IC XLTR ECL TTL-TO-ECL QUAD 2-INP	04713	MC10124L
A328U11	1820-1052	5		IC XLTR ECL ECL-TO-TTL QUAD 2-INP	04713	MC10125L
A328U12	1820-1144	6		IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A328U13	1820-1207	2		IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
A328U14	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U15	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U16	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U17	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U18	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U19	1820-1279	8		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS190N
A328U20	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74N
A328U21	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U22	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U23	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U24	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U25	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U26	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U27	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U28	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	01928	CD4042BE
A328U29	1820-1970	6		IC GATE CMOS OR QUAD 2-INP	04713	MC14071BCP
A328U30	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A328U31	1820-1963	7		IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01928	CD4013BAE
A328U32	1820-1707	5		IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
A328U33	1820-1705	3		IC GATE CMOS NOR QUAD 2-INP	04713	MC14001BCP
A328U40	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A328U41	1826-0363	1		DIFF AMPL DUAL	28480	1826-0363
A328U42	1858-0015	7		IC MISC	28480	1858-0015
A328VR1	1902-3002	3		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
A328VR2	1902-3002	3		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002

See introduction to this section for ordering information
*Indicates factory selected value

SECTION VII
BACKDATING

7–1 INTRODUCTION

7–2 This section contains backdating information which adapts this manual to instruments with serial numbers lower than that shown on the title page.

NOTE: Earlier instruments have PROM's located on a separate board which is in turn fastened to board A2. Should a fault in these earlier instruments be isolated to the microprocessor section, the board A2 (together with the PROM board) should be returned to Hewlett-Packard on the blue stripe exchange program which has been setup for all A2 boards produced for the 8160A instrument series.

7–3 CHANGE 1 (for serial number 1804G 00160 and lower, with the exception of 1804G00149, 1804G00151 and 1804G00158)

Delete R235 and C228 on the A151 Parts List, Schematic 26 and A151 Component Layout.

On Assembly A18 Parts List, change Q12 part no. to 1854–0215.

SECTION VIII
SERVICE

8–1 INTRODUCTION

8–2 This section contains the information to service the HP Model 8160A. The information includes theory of operation, troubleshooting, schematics, component layouts and block diagram.

8–3 The schematics and component layouts are organized as 'Service Sheets' which are identified by a large number within a square in the lower corners. A table relating these Service Sheets to board assemblies is given in Table 8–1. Schematic Diagram symbols are given in Table 8–3.

Table 8–1. Index to Assemblies

Assembly	Service Sheet
A1 Mother Board	5
A2 Microprocessor Board	8,9,10,11
A3 Keyboard	6
A4 Display Board	6,7
A10 Power Supply Motherboard	1
A11 Switching Regular Board	1
A12 Rectifier Board	1
A13 Filter Board	1
A18 Regulator Board	2,3,4
A20 Burst Board	12
A23 Rate Generator Board	13,14,15
A126 (A226, A326, A426) Time Interval 1	16,17
A127 (A227, A327, A427) Time Interval 2	18
A128 (A228, A328, A428) Time Interval 3	19,20
A140 (A240) Slope Generator Board	22,23
A150 (A250) Output Amplifier Control Board	24,25
A151 (A251) Output Amplifier Board	26,27,28

NOTE: In Table 8–1, the 3 Time Interval Boards A126, A127 and A128 comprise a Time Interval Block. For each channel in the 8160A, there are two such blocks – one for DELAY and one for WIDTH, the parameter being determined by switch S1A on the 'Time Interval 3' board in each block (e.g. A128). Hence the 2XX, 3XX and 4XX series numbers given in brackets in Table 8–1. Series 1XX and 2XX are allocated to OUTPUT A; series 3XX and 4XX are allocated to OUTPUT B when fitted.
Whether 1XX, 2XX, 3XX or 4XX series, the schematics and component layouts for each Time Interval Block are identical, hence only one set are given in this manual.
Similarly for A140, A150 and A151, the numbers in brackets indicated the OUTPUT B board when fitted. In each case, the schematic and component layout are identical to the OUTPUT A board.

8–4 SAFETY CONSIDERATIONS

8–5 This section contains warnings and cautions that must be followed for your protection and to avoid damage to the equipment:

WARNING

Maintenance described herein is performed with power supplied to the instrument, and protective covers removed. Such maintenance should be performed only by service-trained personnel who are aware of the hazards involved (for example, fire and electrical shock). Where maintenance can be performed without power applied, the power should be removed.

When servicing is completed, the After Service Safety Check must be performed.

8–6 AFTER SERVICE SAFETY CHECK

8–7 Execute the following checks when servicing is completed.

8–8 Disconnect power cord from line. Visually inspect interior of instrument for any sign of abnormal internally generated heat, such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. Determine cause and remedy.

8–9 Check cabinet/ground pin continuity in accordance with IEC/VDE. Flex the power cord while making the measurement to detect any intermittent discontinuity. Check internal ground connections on boards and frame. Also check resistance of any front or rjar panel ground terminals marked ⏚ .

8–10 Check cabinet/line isolation in accordance with IEC/VDE. Replace any component which results in a failure or refer to production Memo or Service Note issued by product division for alternate action.

8–11 Check line fuse to verify that the proper value is installed.

8–12 Check that safety covers are installed.

8–13 Check that all coaxial and flat cables inside are properly connected. Check that all boards and the heatsink on the chassis are properly connected. Verify that the board clamp is fitted.

8–14 Inform Hewlett-Packard (internally, the responsible product division) of any repeated failures in the above tests or any other safety features.

8–15 SERVICE BLOCKS (THEORY/TROUBLESHOOTING)

8–16 The theory of operation and troubleshooting is divided into Service Blocks, each Service Block, with the exception of Service Block 1, corresponding to a complete function within the HP 8160A. Service Block 1 deals with overall instrument troubleshooting (including a detailed block diagram of all analog functions in the HP 8160A) and is intended to provide a fast means of isolating a fault down to a function. The serviceman should then proceed to the Service Block providing detailed theory of operation and troubleshooting hints for that function. A table relating function to Service Block is given in Table 8–2.

Table 8–2. Index to Service Blocks

Service Block	Function
1	Troubleshooting Tree
2	Internal Device Bus Data Transfer
3	Switched Supply
4	Power Supply Serial Regulator
5	Shift Supply
6	Display
7	Microprocessor
8	Burst Generator
9	Rate Generator
10	Time Interval Block
11	Slope Generator
12	Reference Trigger
13	Output Amplifier Control
14	Output Amplifier
15	Offset Generator

8–17 Tables and Figures within each Service Block are given three-digit codes e.g. Figure 8–3–1. The first digit refers to the Manual Section (8), the second digit to the Service Block and the third to the Figure number. e.g. Figure 8–3–1 means Section 8, Service Block 3, Figure 1.

8–18 IC INFORMATION

8–19 IC information is given following Table 8–3. This information is in HP Part Number sequence and provides such details as pin assignments, thruth tables and timing diagrams for individual IC's.

8–20 BOARD EXCHANGE PROGRAM

8–21 Hewlett-Packard operates a blue stripe exchange program for the microprocessor board A2 (08160–69502).

8–22 Handling procedure: Using the troubleshooting information in this section, the fault can be localized down to board level. If the faulty board is A2, it should be returned on the blue exchange program together with a description of the operating fault(s) caused by the board.

8–23 PREVENTIVE MAINTENANCE

8–24 A forced air cooling system is used to maintain the operating temperature required by the instrument. The cooling fan is located on the right side of the instrument drawing air through the left filtered side panel. To ensure good airflow, and hence instrument reliability, this side panel should be removed and cleaned at least once a year. Cleaning can be done with soapy water or via a vacuum cleaner.

Table 8–3. Schematic Diagram Notes (1 of 2)

The following symbols conform, as far as possible, with ANSI Y 32.2, IEEE No. 315 and ANSI Y32.14 (for the logic symbols). These standards should be consulted when further informations is required.

General

Units — Resistance values are in ohms, capacitance values in microfarads and inductance values in microhenries unless otherwise noted.

P/O — Part of

Asterisk denotes a factory selected value. The value shown is the nominal value.

Encloses front panel nomenclature.

Encloses rear panel nomenclature.

Heavy line indicates signal path.

Heavy dashed line indicates primary feedback path.

947 — Wire colour code. Same as resistor colour code. First number is wire body colour.

Wire or plug used as link.

Test point in a circuit. Point may/may not be identified on P.C. board

Used with trimmer potentiometers or capacitors to indicate screwdriver adjustment.

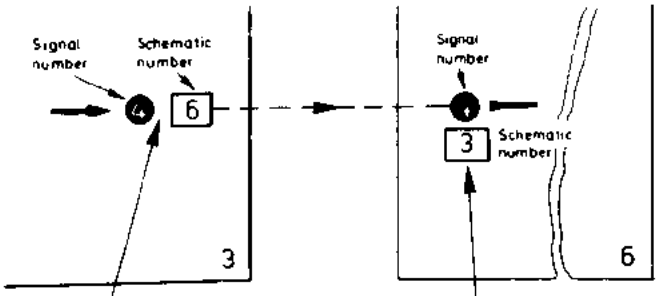
Direct connection to earth.

Ground connection to instrument chassis or frame.

Used when a number of common-return connections are at the same potential. If there is more than one such system in the same circuit, numbers are written in the triangles so that all connections with the same potential have the same number.

xV — Specific potential difference with respect to a potential reference level, eg. +10 V

Schematic Referencing



These references on a signal leaving a schematic diagram indicate the signal destination. The circle contains the signal number and the square contains the number of the schematic to which that signal goes.

These references on a signal entering a schematic diagram indicate the signal origin. The circle contains the signal number and the square contains the number of the schematic to which that signal originates.

Components

Normally open toggle switch. Circles (O) are used for the contacts to indicate a locking type switch.

Spring return, 2-position transfer switch. Triangle (▲) are used for the contacts to indicate a non-locking type switch.

2-position, 2-pole slide switch

Air cored inductor.

Air cored transformer. The dot (●) is used, when necessary, to indicate instantaneous polarity.

Iron core

Ferrite core

bead — Ferrite bead

Varactor diode

Multi-junction diode

Diode

Zener diode

Schottky diode

Light Emitting Diode (LED)

Photodiode

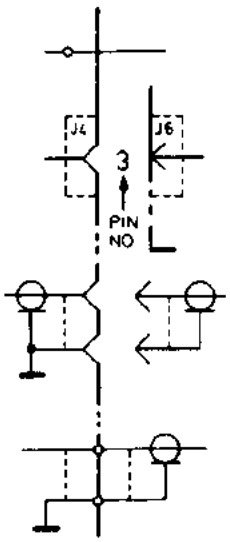
Fuse

Neon

Filament lamp

Table 8–3. Schematic Diagram Notes (2 of 2)

Terminals and Connectors



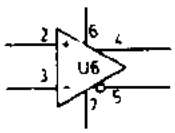
Soldered connection.

Example of fixed male and female connectors with plug and socket and contact designators, eg. P.C. board edge connector and socket.

example of bulkhead mounted coaxial socket with free coaxial plug and cable.

example of coaxial cable with termination soldered to P.C. board.

Analog Symbols



Operational amplifier



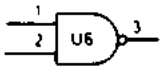
Voltage source



Current source

Logic Symbols

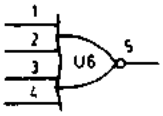
Positive logic is used unless otherwise specified



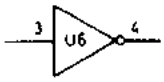
2-input NAND gate



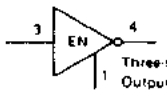
open collector



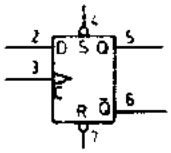
4-input NOR gate



Inverter

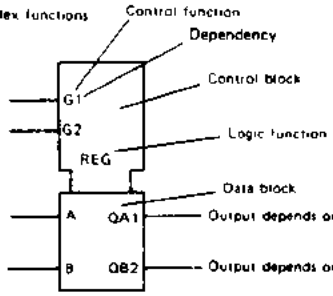


Three-state device
Output is high-impedance when EN is false (irrespective of input). Normal operation when EN is true.



Flip-flop

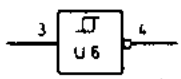
Complex functions



Output depends on A and G1

Output depends on B and G2

Control functions:
G-gate, C-clock EN-3-state, R-reset (Q low) S-set (Q high), ↑ (↓)-count up (down) → shift > edge-triggered.
Logic functions
REG-register, SEL-selector CNTR-counter, (DE)MUX-(de)multiplexer



Schmitt trigger



Wired AND connection



Wired OR connection

1820–0491

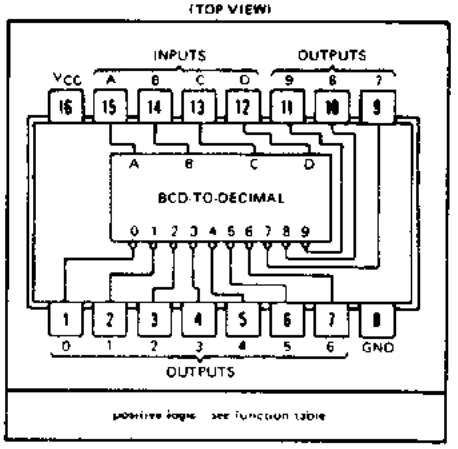
BCD-TO-DECIMAL DECODERS/DRIVERS

FUNCTION TABLE

NO.	INPUTS				OUTPUTS									
	D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H
1	L	L	L	H	H	L	H	H	H	H	H	H	H	H
2	L	L	H	L	H	H	L	H	H	H	H	H	H	H
3	L	L	H	H	H	H	H	L	H	H	H	H	H	H
4	L	H	L	L	H	H	H	H	L	H	H	H	H	H
5	L	H	L	H	H	H	H	H	H	L	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H
7	L	H	H	H	H	H	H	H	H	H	H	L	H	H
8	H	L	L	L	H	H	H	H	H	H	H	H	L	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L
INVALID	H	L	H	L	H	H	H	H	H	H	H	H	H	H
	H	L	H	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	L	H	H	H	H	H	H	H	H	H	H
	H	H	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	H	L	H	H	H	H	H	H	H	H	H	H
	H	H	H	H	H	H	H	H	H	H	H	H	H	H

H = high level (off), L = low level (on)

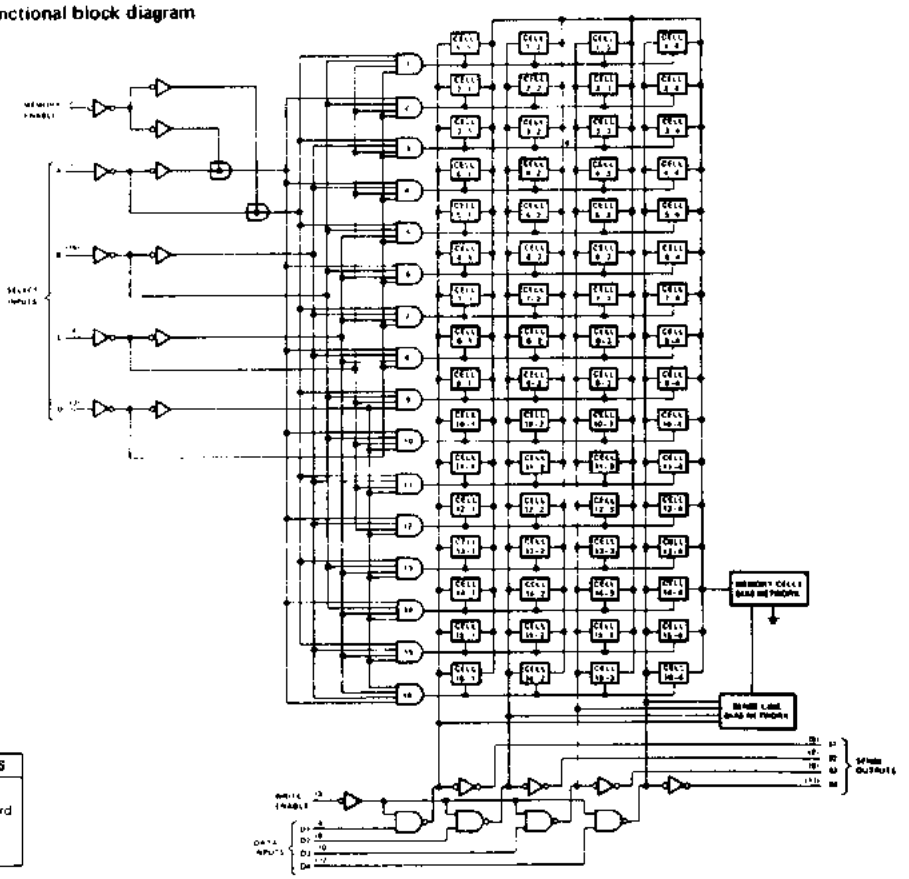
(TOP VIEW)



1820–0628

64-BIT READ/WRITE MEMORY

functional block diagram

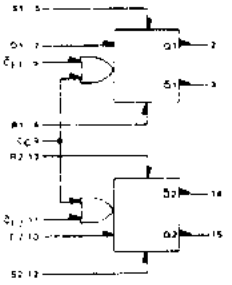


FUNCTION TABLE

ME	WE	OPERATION	CONDITION OF OUTPUTS
L	L	Write	Complement of Data Inputs
L	H	Read	Complement of Selected Word
H	L	Inhibit Storage	Complement of Data Inputs
H	H	Do Nothing	High

1820–0817

Dual Type D Master-Slave Flip-Flop



CLOCKED TRUTH TABLE

C	D	Q_{n+1}
L	↑	Q_n
H	L	L
H	H	H

↑ = Don't Care
↑ = C_E + C_C
▲ clock H to L clock transition
logic level to a high level

RS TRUTH TABLE

R	S	Q_{n+1}
-	-	Q_n
-	↑	H
↑	-	L
L	L	L
H	H	N D

N D = Not Defined

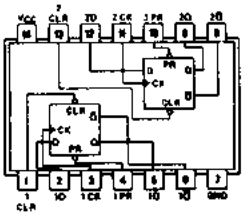
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

1820–1112

DUAL D-TYPE POSITIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET AND CLEAR

FUNCTION TABLE

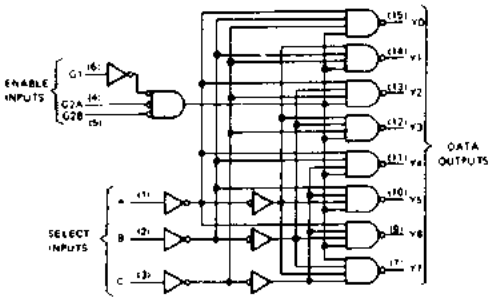
INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\bar{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\bar{Q}_0$



1820–1216

DECODERS/DEMULTIPLEXERS

'LS138, 'S138



'LS138, 'S138
FUNCTION TABLE

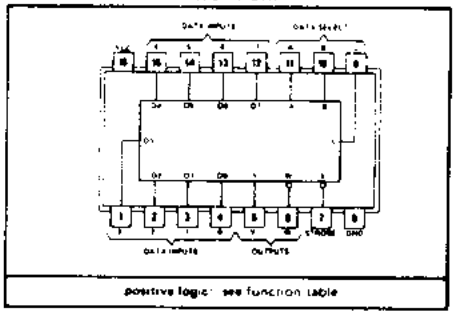
ENABLE		SELECT			OUTPUTS							
G1	G2*	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

*G2 = G2A + G2B
H = high level, L = low level, X = irrelevant

1820–1217

DATA SELECTORS/MULTIPLEXERS

(TOP VIEW)



positive logic: see function table

'151A, 'LS151, 'S151
FUNCTION TABLE

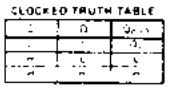
INPUTS				OUTPUTS	
SELECT			STROBE		
C	B	A	S	Y	W
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

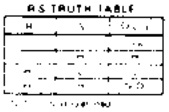
H = high level, L = low level, X = irrelevant
E0, E1 ... E15 = the complement of the level of the respective E input
D0, D1 ... D7 = the level of the D respective input

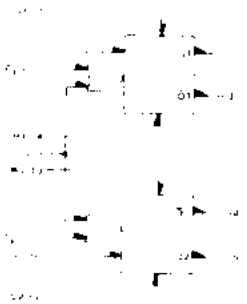
1820–1225

High Speed Dual Type D Master-Slave Flip-Flop

CLOCKED TRUTH TABLE





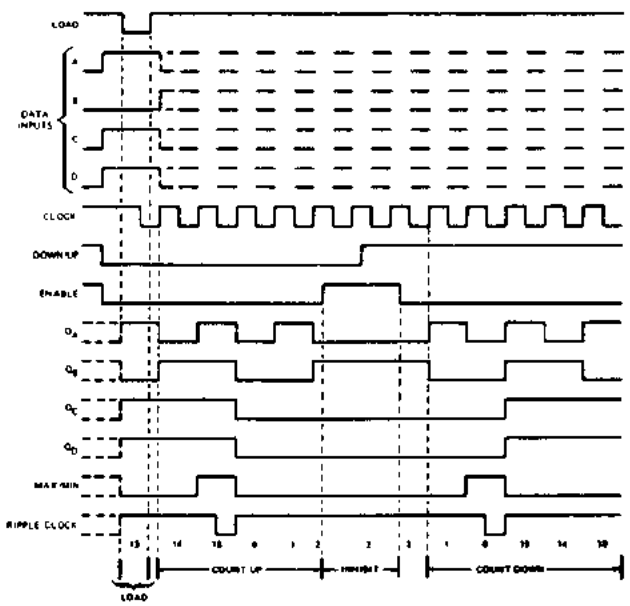


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

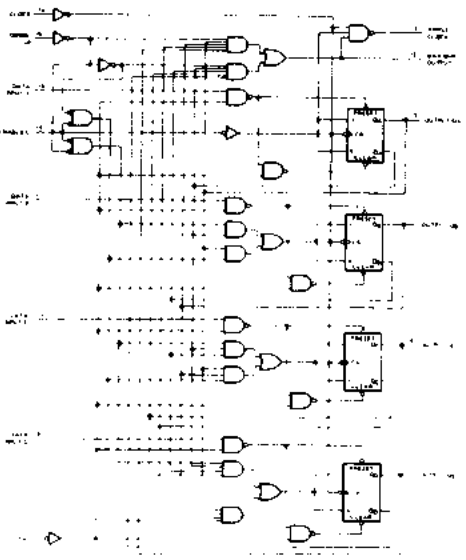
P_D = 270 mW typ/pkg (No Load)
f_{Tog} = 225 MHz typ

1820–1278

SYNCHRONOUS UP/DOWN COUNTERS WITH DOWN/UP MODE CONTROL



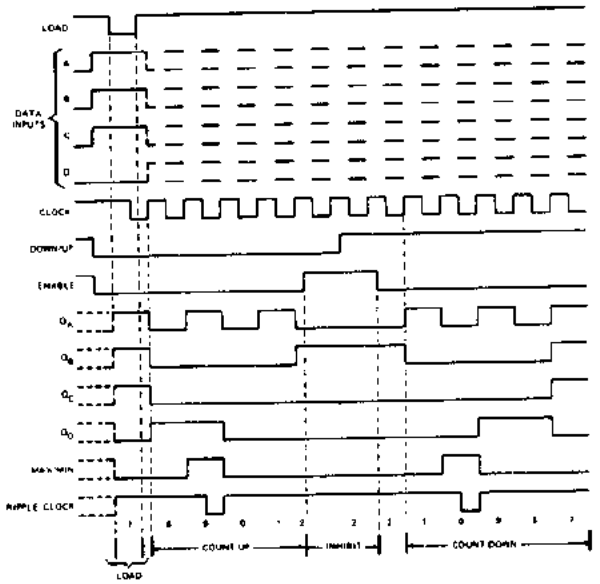
'191, 'LS191 BINARY COUNTERS

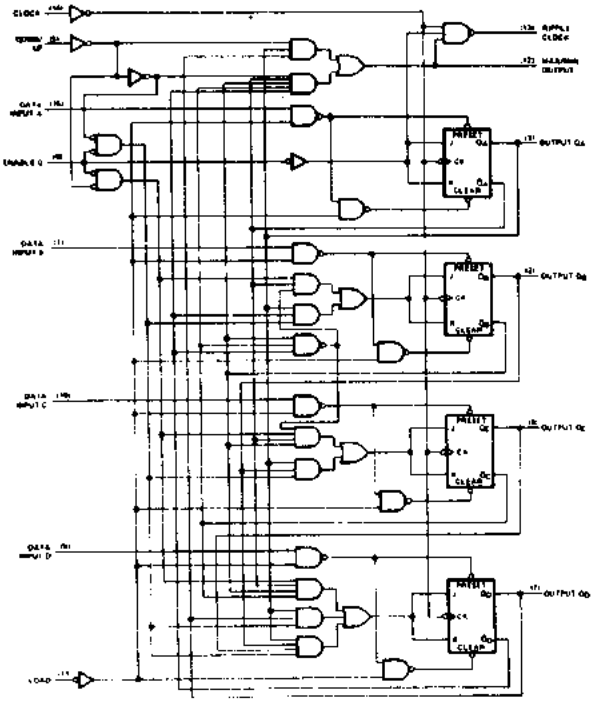


1820–1279

SYNCHRONOUS UP/DOWN COUNTERS WITH DOWN/UP MODE CONT.

'190, 'LS190 DECADE COUNTERS



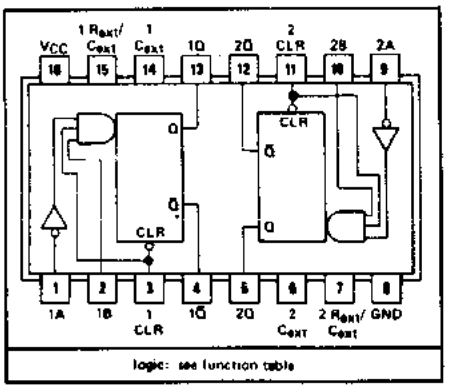


1820–1423

RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

'123, 'L123, 'LS123
FUNCTION TABLE

INPUTS			OUTPUTS	
CLEAR	A	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⎍	⎍
H	↓	H	⎍	⎍
↑	L	H	⎍	⎍



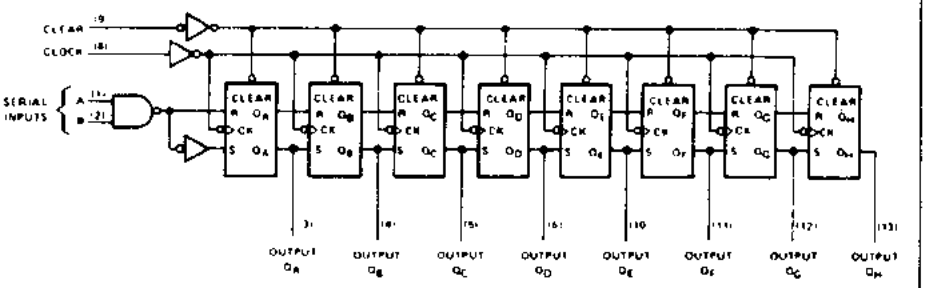
1820–1433

8-BIT PARALLEL-OUT SERIAL SHIFT REGISTERS

FUNCTION TABLE

INPUTS				OUTPUTS		
CLEAR	CLOCK	A	B	Q_A	Q_B . .	Q_H
L	X	X	X	L	L	L
H	L	X	X	Q_{A0}	Q_{B0}	Q_{H0}
H	↑	H	H	H	Q_{An}	Q_{Gn}
H	↑	L	X	L	Q_{An}	Q_{Gn}
H	↑	X	L	L	Q_{An}	Q_{Gn}

functional block diagram



1820–1442

DECADE AND 4-BIT BINARY COUNTERS

'290, 'LS290
BCD COUNT SEQUENCE
(See Note A)

COUNT	OUTPUT			
	Q_D	Q_C	Q_B	Q_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

'290, 'LS290
BI-QUINARY (5-2)
(See Note B)

COUNT	OUTPUT			
	Q_A	Q_D	Q_C	Q_B
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	H	L	L	L
6	H	L	L	H
7	H	L	H	L
8	H	L	H	H
9	H	H	L	L

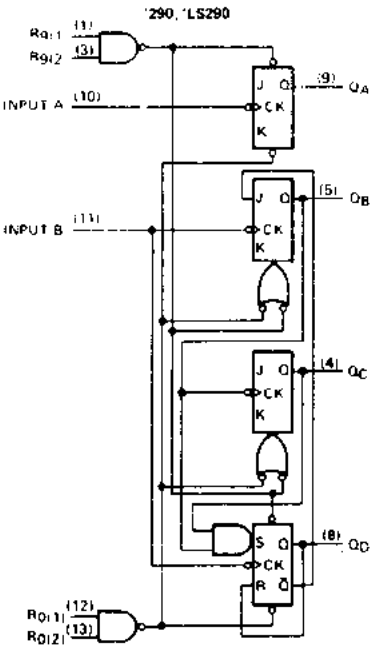
'290, 'LS290
RESET/COUNT FUNCTION TABLE

RESET INPUTS				OUTPUT			
$R_{0(1)}$	$R_{0(2)}$	$R_{9(1)}$	$R_{9(2)}$	Q_D	Q_C	Q_B	Q_A
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L	COUNT			
L	X	L	X	COUNT			
L	X	X	L	COUNT			
X	L	L	X	COUNT			

NOTES
A. Output Q_A is connected to input B for BCD count.
B. Output Q_D is connected to input A for bi-quinary count.
C. Output Q_A is connected to input B.
D. H = high level, L = low level, X = irrelevant

functional block diagrams

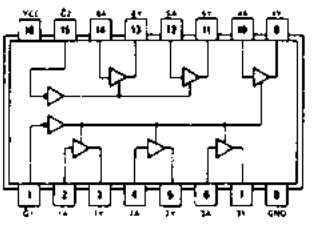
'290, 'LS290



1820–1491

HEX BUS DRIVERS

NONINVERTED DATA OUTPUT
4-LINE AND 2-LINE ENABLE INPUTS
3-STATE OUTPUTS



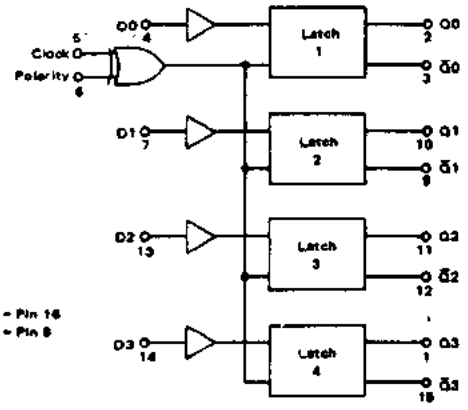
SN54367A (J, W)
SN54LS367 (J, W)

SN74367A (J, N)
SN74LS367 (J, N)

1820–1956

QUAD LATCH

LOGIC DIAGRAM



V_{DD} = Pin 16
V_{SS} = Pin 8

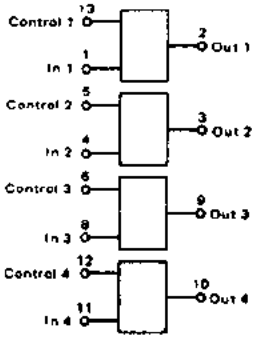
TRUTH TABLE

CLOCK	POLARITY	Q
0	0	Data
↑	0	Latch
1	1	Data
↓	1	Latch

1820–1958

QUAD ANALOG SWITCH
QUAD MULTIPLEXER

BLOCK DIAGRAM

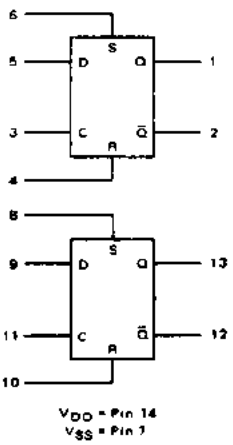


V_{DD} = Pin 14
V_{SS} = Pin 7

1820–1963

DUAL TYPE D FLIP-FLOP

BLOCK DIAGRAM



V_{DD} = Pin 14
V_{SS} = Pin 7

TRUTH TABLE

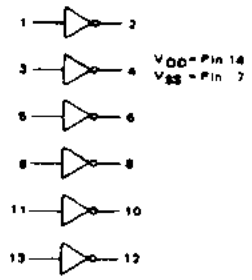
INPUTS				OUTPUTS	
CLOCK†	DATA	RESET	SET	Q	Q̄
↑	0	0	0	0	1
↑	1	0	0	1	0
↓	X	0	0	Q	Q̄
X	X	1	0	0	1
X	X	0	1	1	0
X	X	1	1	1	1

No Change

X = Don't Care
† = Level Change

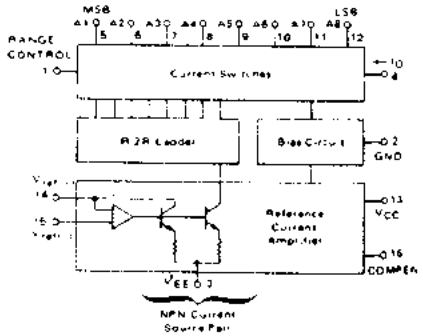
1820–2014

LOGIC DIAGRAM



1826–0188

EIGHT-BIT MULTIPLYING DIGITAL TO ANALOG CONVERTER



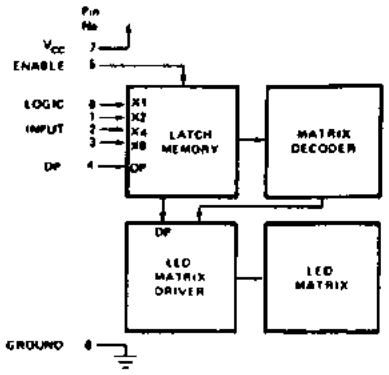
1990–0505

PIN	FUNCTION
1	INPUT 2
2	INPUT 4
3	INPUT 8
4	DECIMAL POINT
5	LATCH ENABLE
6	GROUND
7	V_{CC}
8	INPUT 1

TRUTH TABLE

BCD DATA[1]				
X_8	X_4	X_2	X_1	
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	L	L	L	8
H	L	L	H	9
H	L	H	L	(BLANK)
H	L	H	H	(BLANK)
H	H	L	L	(BLANK)
H	H	L	H	....
H	H	H	L	(BLANK)
H	H	H	H	(BLANK)

DECIMAL PT	ON	V_{DP} = L
	OFF	V_{DP} = H
ENABLE[1]	LOAD DATA	V_E = L
	LATCH DATA	V_E = H



NOTES:

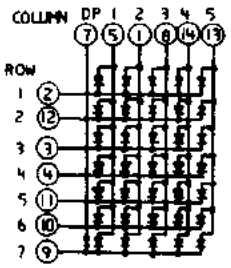
1. H = Logic High; L = Logic Low. With the enable input at logic high changes in BCD input logic levels or D.P. input have no effect upon display memory, displayed character, or D.P.

1990–0617

PIN	FUNCTION	PIN	FUNCTION
1	COLUMN 2	9	ROW 7 AND DECIMAL CATHODE
2	ROW 1	10	ROW 6
3	ROW 3	11	ROW 5
4	ROW 4	12	ROW 2
5	COLUMN 1	13	COLUMN 5
6	OMITTED	14	COLUMN 4
7	DECIMAL ANODE		
8	COLUMN 3		

TABLE 1

PIN DETAIL



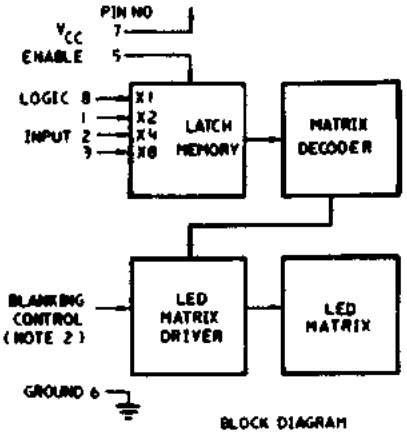
SCHEMATIC
(TOP VIEW ORIENTATION)

NOTES:
1. ALL DIMENSIONS ARE IN INCHES; TOLERANCES AS SHOWN
2. TRUE POSITION PIN SPACING IS .100 BETWEEN ℄, EACH PIN ℄ IS LOCATED WITHIN ±.010 OF ITS TRUE LONGITUDINAL POSITION RELATIVE TO PINS 4 AND 11
3. LEAD DIMENSIONS ARE NOT CONTROLLED ABOVE SEATING PLANE
4. VERTICAL AND HORIZONTAL SPACING BETWEEN ℄ OF ROWS AND COLUMNS IS NOMINALLY .050

1990–0695

TRUTH TABLE				
BCD DATA (NOTE 1)				
X_8	X_4	X_2	X_1	
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	L	L	L	8
H	L	L	H	9
H	L	H	L	A
H	L	H	H	B
H	H	L	L	C
H	H	L	H	D
H	H	H	L	E
H	H	H	H	F

BLANKING (NOTE 2)	DISPLAY-ON	V_B = L
	DISPLAY-OFF	V_B = H
ENABLE (NOTE 1)	LOAD DATA	V_E = L
	LATCH DATA	V_E = H



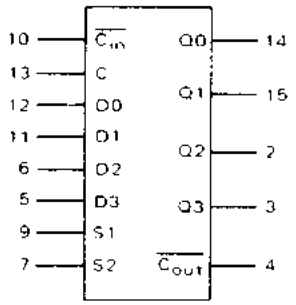
BLOCK DIAGRAM
FIGURE 2

NOTES:
1. H = Logic High; L = Logic Low. With the enable input at logic high changes in BCD input logic levels have no effect upon display memory, displayed character.
2. Blanking input has no effect upon display memory.

PIN	FUNCTION
1	INPUT 2
2	INPUT 4
3	INPUT 8
4	BLANKING CONTROL
5	LATCH ENABLE
6	GROUND
7	V_{CC}
8	INPUT 1

5081–1976

UNIVERSAL DECADE COUNTER



SEQUENTIAL TRUTH TABLE*

INPUTS								OUTPUTS				
S1	S2	D0	D1	D2	D3	$\overline{\text{Carry In}}$	Clock **	Q0	Q1	Q2	Q3	$\overline{\text{Carry Out}}$
L	L	H	H	H	L	↓	↑	H	H	H	L	H
L	H	↓	↓	↓	↓	↓	↑	L	L	L	H	H
H	H	↓	↓	↓	↓	L	↑	L	L	L	H	L
H	L	↓	↓	↓	↓	L	↑	L	L	L	L	H
L	H	↓	↓	↓	↓	L	↑	H	L	L	L	H
L	H	↓	↓	↓	↓	H	↑	H	L	L	L	H
L	H	↓	↓	↓	↓	L	↑	H	H	L	L	H
L	H	↓	↓	↓	↓	H	↑	H	H	L	L	H
L	L	↓	↓	↓	↓	L	↑	H	H	H	L	H
L	L	↓	↓	↓	↓	H	↑	H	H	H	L	H
H	L	↓	↓	↓	↓	L	↑	L	H	L	L	H
H	L	↓	↓	↓	↓	H	↑	L	H	L	L	H
H	H	↓	↓	↓	↓	L	↑	H	L	L	L	H
H	H	↓	↓	↓	↓	H	↑	L	L	L	L	L

↓ = Don't care

* Truth table shows logic states assuming inputs vary in sequence shown from top to bottom.

** A clock H is defined as a low to high transition followed by a high logic level.

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

P_D = 625 mW typ/pkg (No Load)
f_{count} = 150 Mhz typ

FUNCTION SELECT TABLE

S1	S2	Operating Mode
L	L	Preset (Programs)
L	H	Increment (Count Up)
H	L	Decrement (Count Down)
H	H	Hold (Stop Count)

SERVICE BLOCK 1
TROUBLESHOOTING TREE

GENERAL

The purpose of this Service Block is to provide a fast fault-locating procedure. Having located the function at fault, detailed circuit operating theory and down-to-component troubleshooting hints are given for the function in one of the following Service Blocks. Details of which Service Block relates to which function are given in the following. Basically any 8160A malfunction can be categorized as follows: (see also Figure 8–1–1).

1. Control-microprocessor with the device bus and related circuits. Service Blocks dealing with this category are the Service Block 2 (device bus) and Service Block 6 (microprocessor).

2. Display/Keyboard – Service Block 7.

3. Any analog functional block with its related digital device bus receiver. A fast troubleshooting aid in this category is Figure 8–1–3 (standard instrument) and Figure 8–1–4 (option 020 fitted). Service Blocks belonging to this category are: Service Block 8 (burst), Service Block 9 (rep. rate), Service Block 10 (time interval), Service Block 11 (slope), Service Block 12 (reference trigger), Service Block 13 (output control), Service Block 14 (output amplifier), Service Block 15 (offset).

4. Power Supply – Service Block 3, Service Block 4.

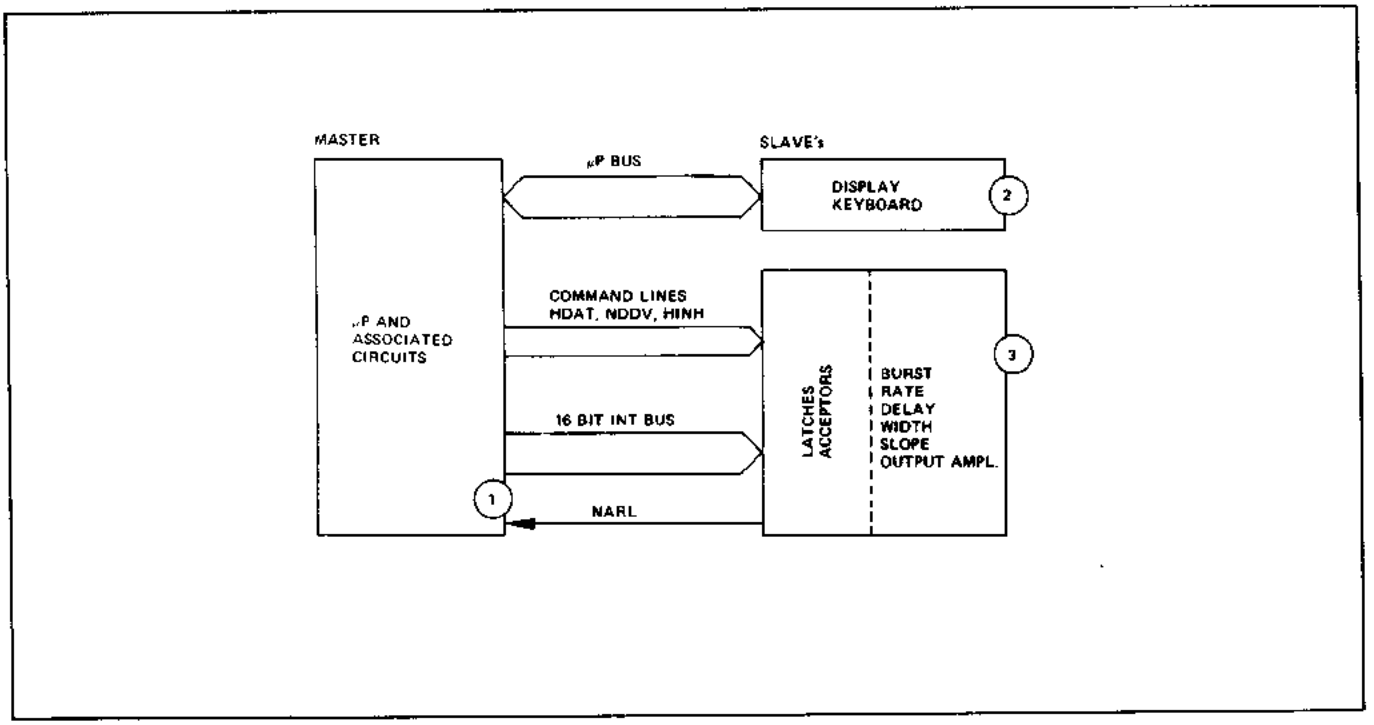


Figure 8–1–1. Categories of 8160A Malfunctions

TROUBLESHOOTING

In order to locate the trouble, operate the 8160A via front panel or remotely together with the corresponding test equipment – see Figure 8–1–2. The fault can then be traced to one of the categories given in Figure 8–1–2.

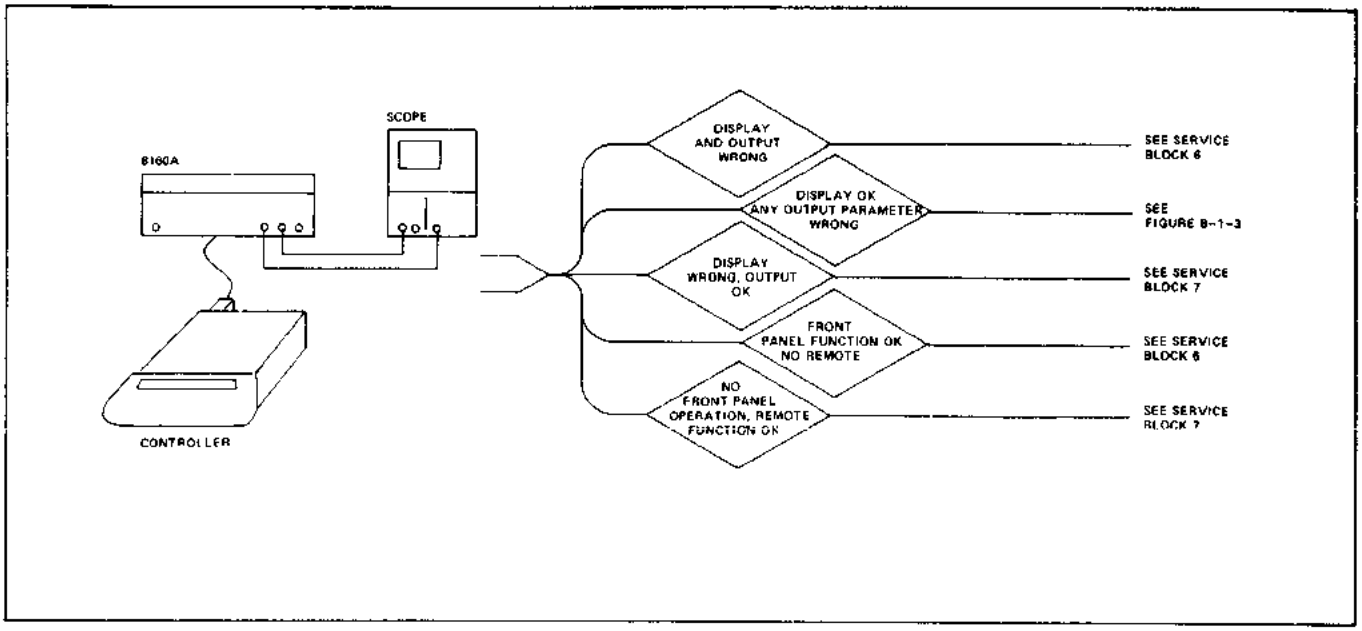


Figure 8–1–2. Troubleshooting Tree

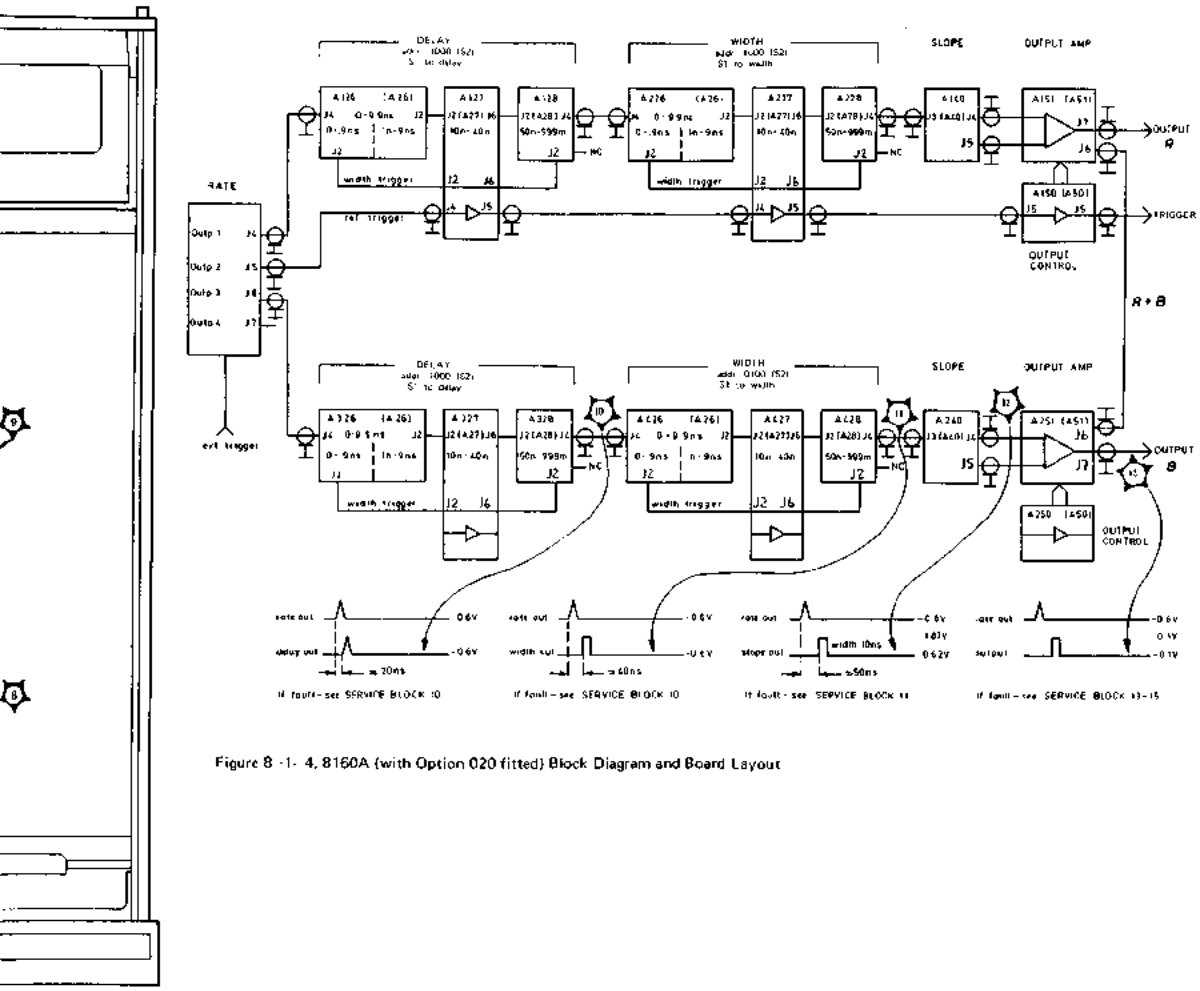
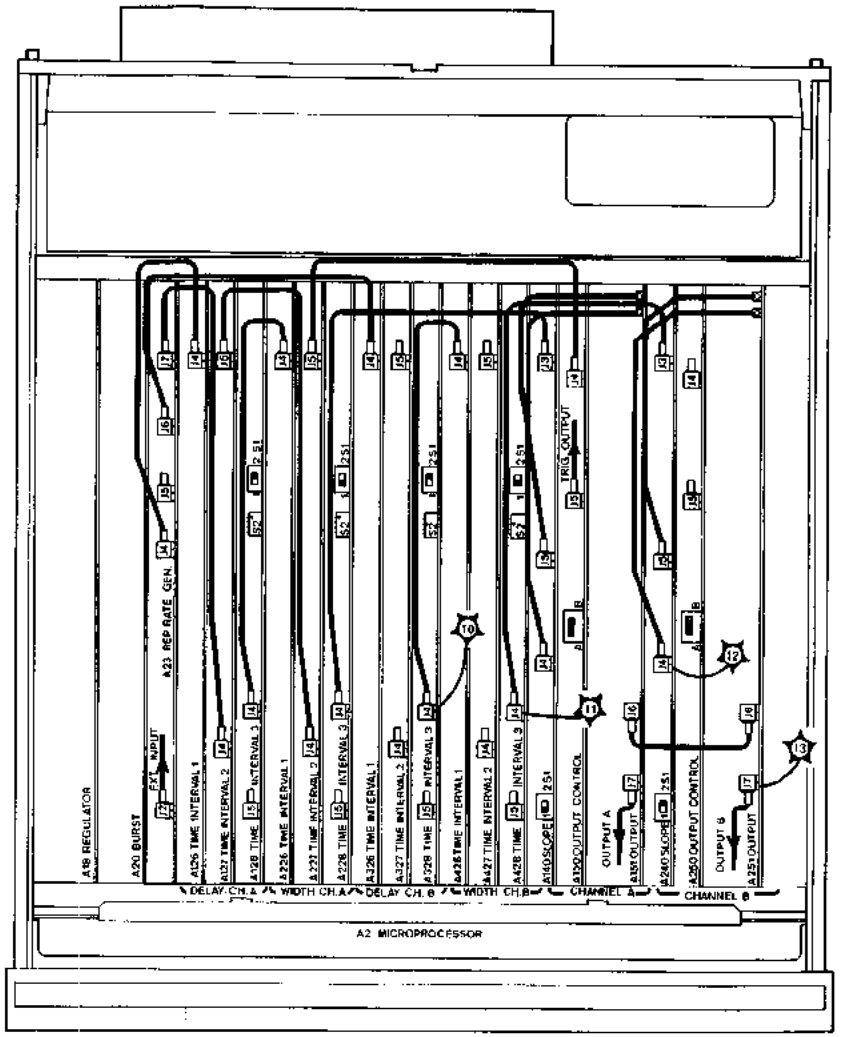
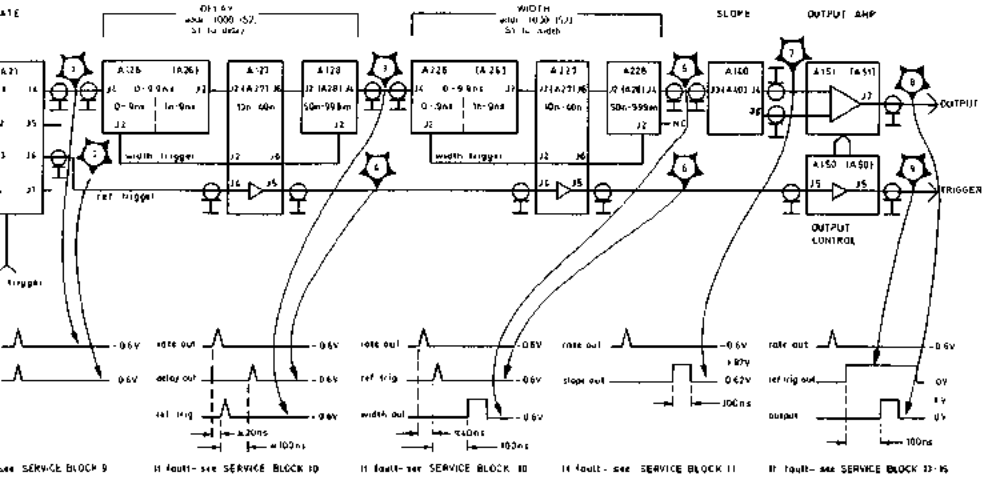


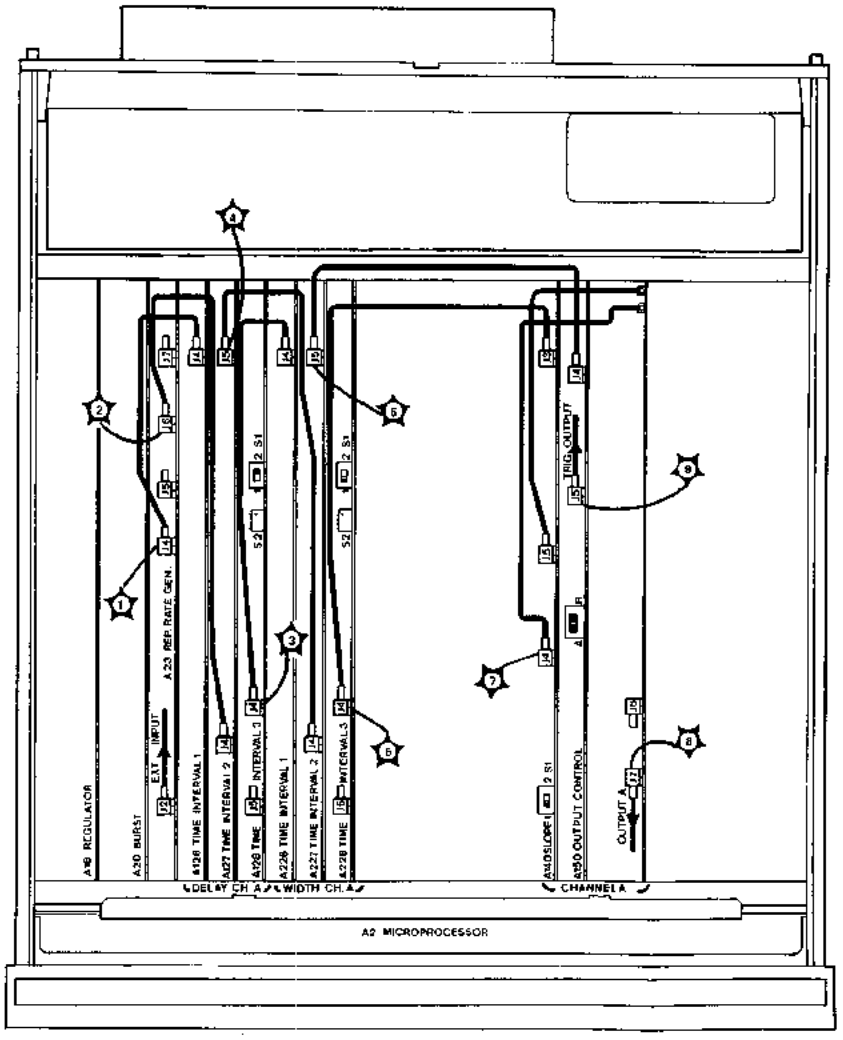
Figure 8 -1- 4, 8160A (with Option 020 fitted) Block Diagram and Board Layout



d a faulty analog output exist, press RCL 0 to obtain some signals. In order to trace the problem down
corresponding function block, use a scope (together with probe or test cable 08160-61610) to measure
gnals between the function blocks as shown in Figure 8-1-3 (Standard 8160A) and Figure 8-1-4 (Option
tted). NOTE. If test cable is used, terminate it with 50 Ω.



8-1-3. Standard 8160A Block Diagram and Board Layout



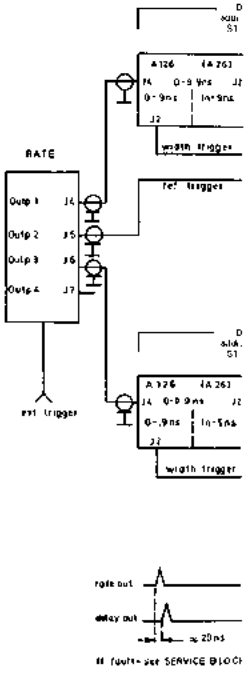
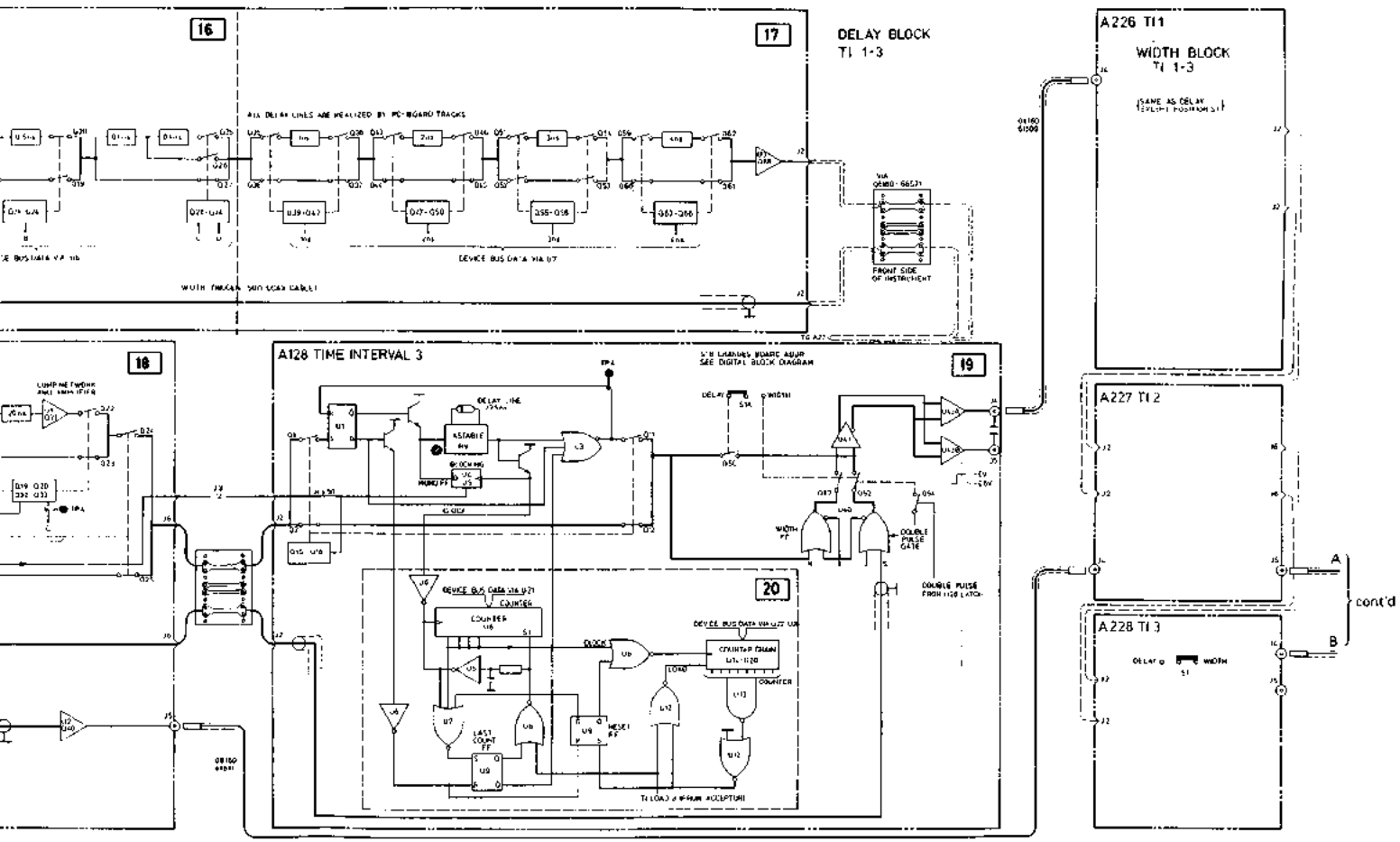


Figure 8-1-4. 8160A (with


16
17
DELAY BLOCK
TI 1-3
A226 TI1
WIDTH BLOCK
TI 1-3
A227 TI 2
A228 TI 3
A128 TIME INTERVAL 3
18
19
20
FRONT SIDE OF INSTRUMENT
DEVICE BUS DATA VIA U7
WITH FLAT 50P SCAN CABLE
TO A21
DELAY LINE
ASTABLE
COUNTER
LAST COUNT FF
RESET FF
WIDTH FF
DOUBLE PULSE GATE
cont'd
A
B

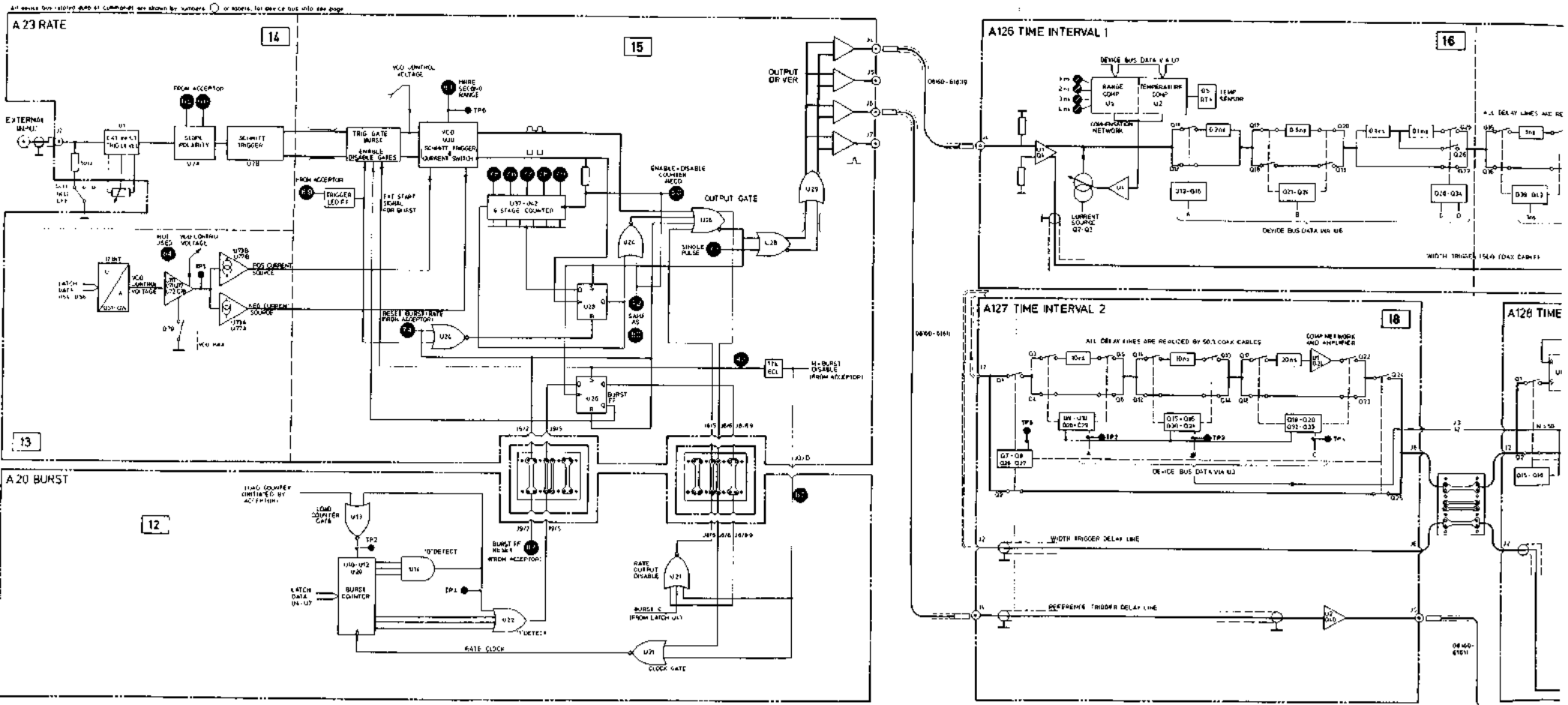


Figure 8-1-5 Analog Block Diagram

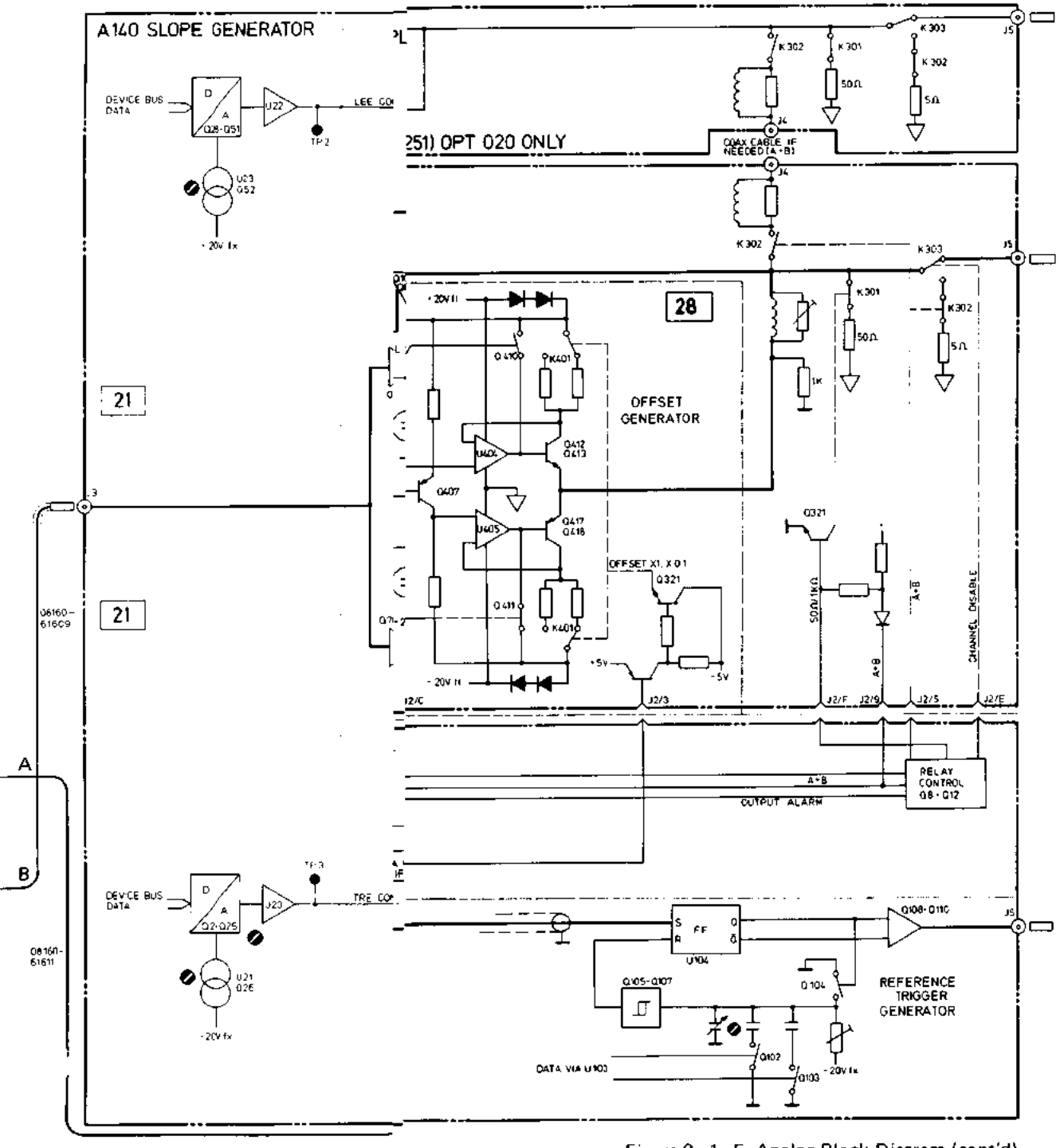


Figure 8–1–5. Analog Block Diagram (cont'd)

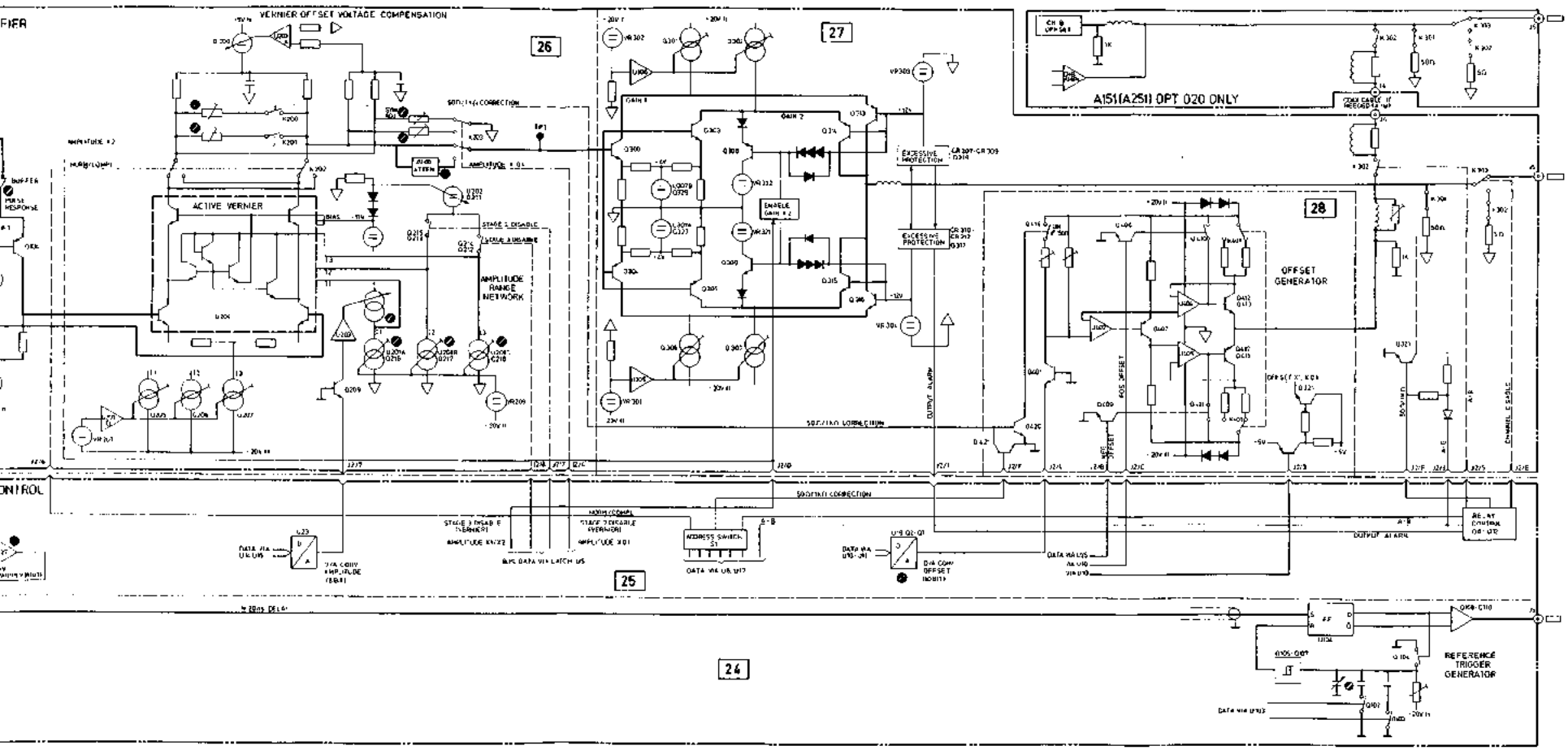
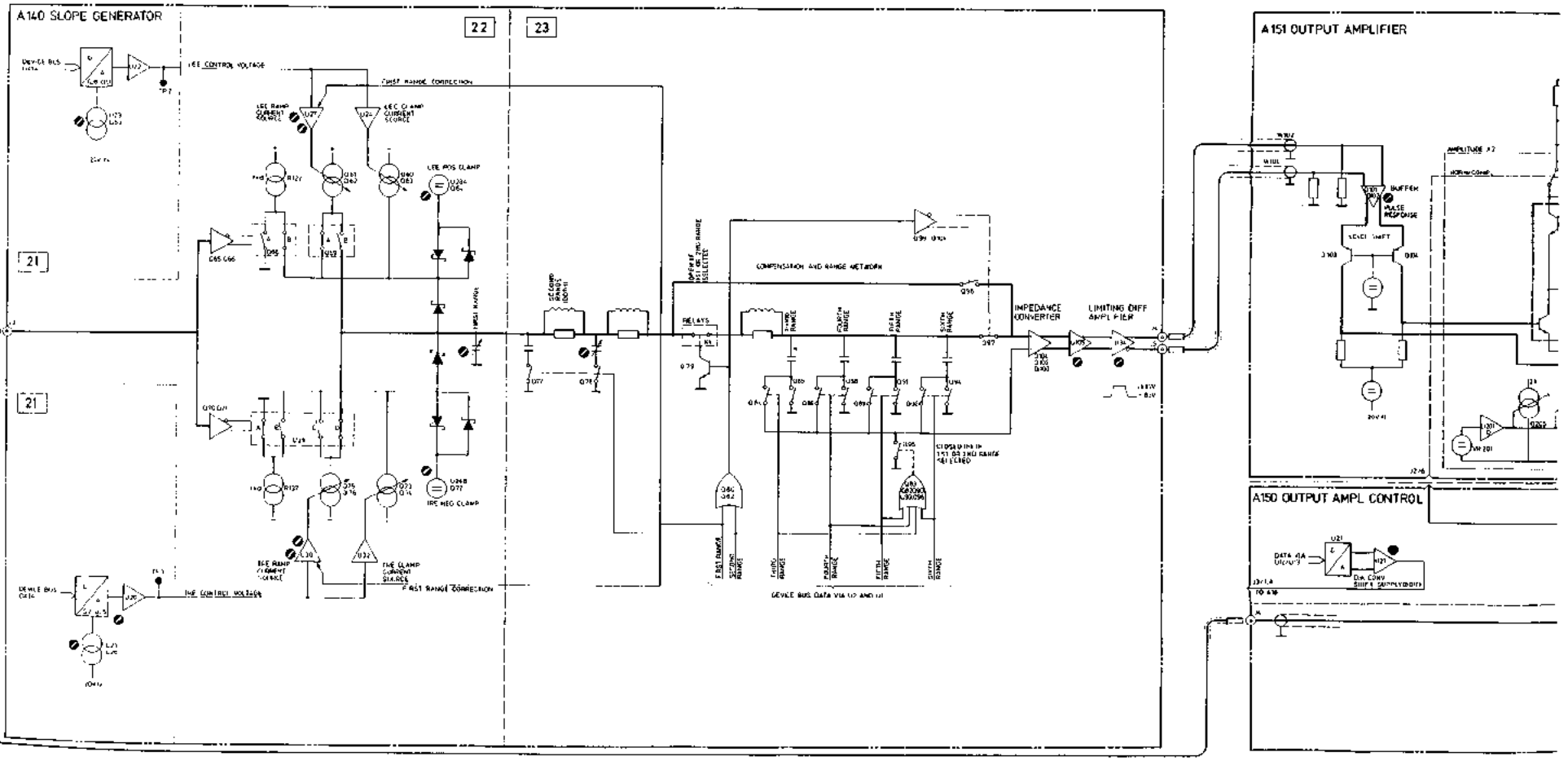
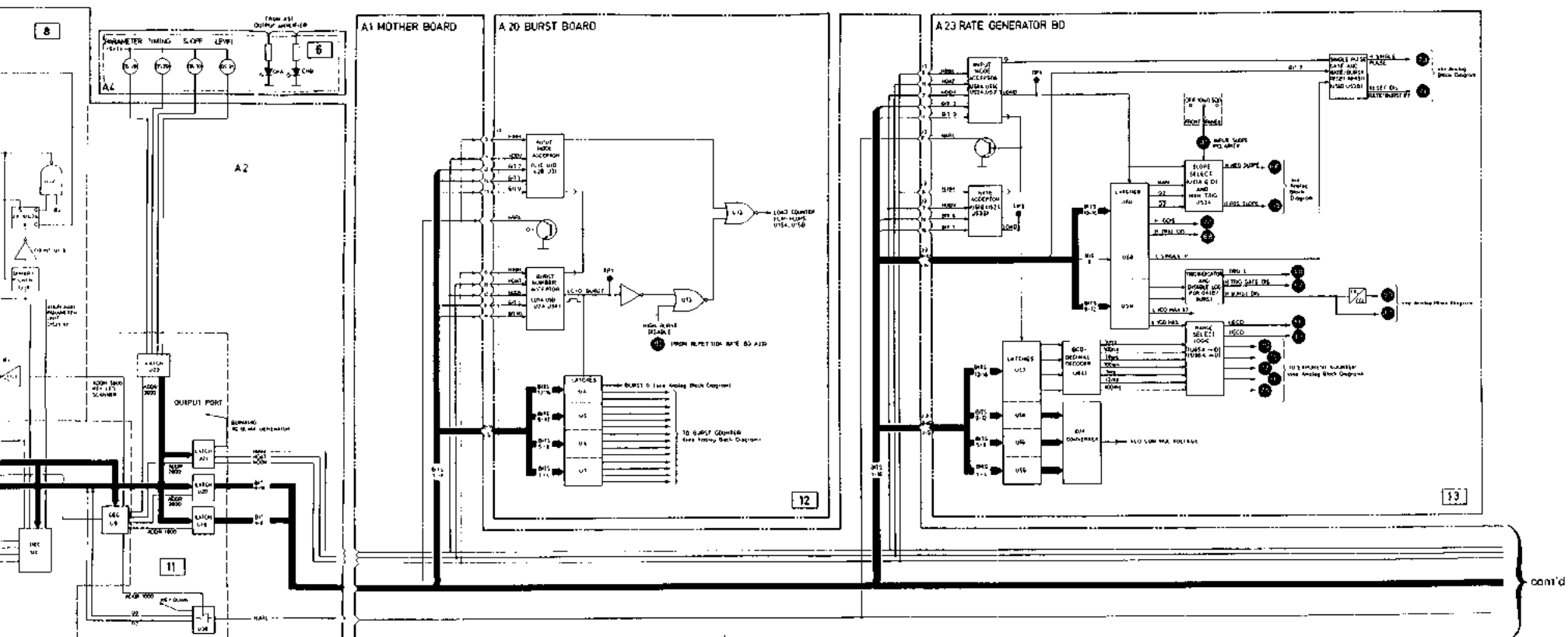


Figure 8–1–5. Analog Block Diagram (cont'd)


A140 SLOPE GENERATOR
22
23
21
21
A151 OUTPUT AMPLIFIER
A150 OUTPUT AMPL CONTROL
LEE CONTROL VOLTAGE
COMPENSATION AND RANGE NETWORK
IMPEDANCE CONVERTER
LIMITING OFF AMPLIFIER
BUFFER
LEVEL SHIFT
AMPLITUDE X2
DEVICE BUS DATA VIA U2 AND U1


A1 MOTHER BOARD
A 20 BURST BOARD
A 23 RATE GENERATOR BD
A2
OUTPUT PORT
LATCHES
10 BURST COUNTER
cont'd

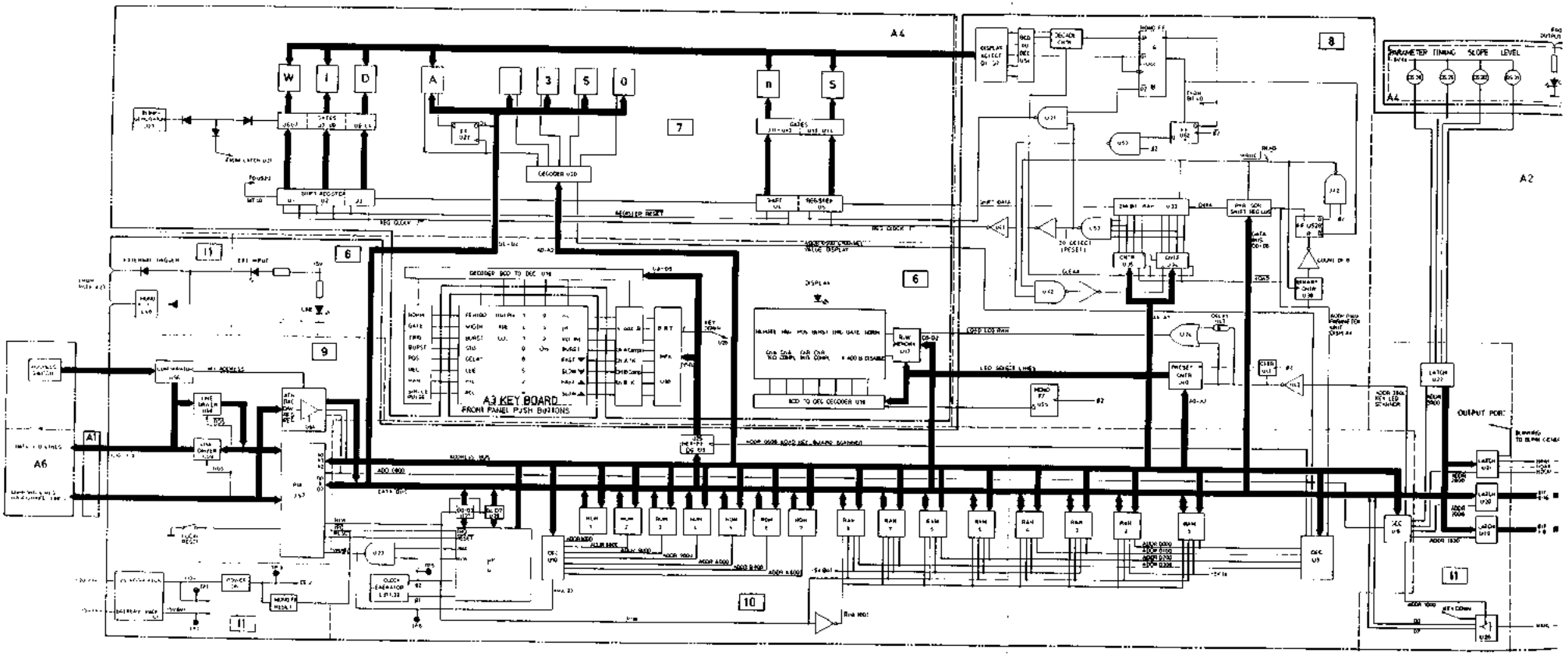


Figure 8--2--1 Microprocessor/Device Bus Block Diagram

SERVICE BLOCK 2
INTERNAL DEVICE BUS DATA TRANSFER A2 11

GENERAL

The Microprocessor and Device Bus Block Diagram, Figure 8–2–1, shows the relationship between microprocessor and slaves (display and analog section).

This Service Block provides all the necessary information regarding the internal device bus in order to understand its function, and thus trace any trouble to the microprocessor or one of the related function blocks.

THEORY OF OPERATION

Microprocessor

The microprocessor is the data and instruction center of the 8160A Programmable Pulse Generator. It generates the control information required by the instrument dependent on inputs from one of two sources:

a) Keyboard inputs when in manual control
b) HP-IB inputs when in remote control.

During operation, inputs from one of these sources program the desired output parameters. These parameters are burst, period, delay, double pulse, width, leading edge, trailing edge, high level, low level, the inputs modes and the output modes. When the instrument is in the remote control mode, the keyboard switches are disabled and output parameters can be entered only through the HP-IB.

For detailed troubleshooting information on the microprocessor itself – see SERVICE BLOCK 7.

Device Bus Acceptors

The receiver end of the 16-bit device bus comprises latches and address acceptors for each block (burst, rate etc.). The acceptor circuit recognizes its own address and generates the necessary load pulse(s) for loading data into the latches.

There are three control lines which handle the DATA/ADDRESS transfer and reset the acceptor circuits. These are as follows:

NDDV = NOT DATA VALID
HDAT = HIGH DATA
HINH = HIGH INHIBIT

A fourth line, NARL (NOT ADDRESS RESPONSE LINE) informs the microprocessor of the instrument configuration i.e. whether Standard or Option 020.

Before any data transfer can take place, the HINH is pulled high so that all acceptor flip-flops are set, thus no address can be recognized nor data loaded. At this point, the HDAT line is low and the NDDV line is high (i.e. no valid data or addresses on the device bus).

Should the microprocessor now need to address a particular function block, it first pulls HINH and NDDV low, enabling each acceptor to recognize its unique address, and then sends the address on the device bus. The NDDV then goes high again while the acceptor flip-flop Q output goes low. The function block is now addressed.

With the address accepted, the HDAT line will go high to indicate that the next device bus transfer is data, which will be loaded by pulling NDDV low and then high again.

Typical examples of how device bus acceptors function are given in Figure 8–2–2 and Figure 8–2–3. Figure 8–2–2 illustrates the generation of a single load pulse, while Figure 8–2–3 illustrates the generation of 3 load pulses.

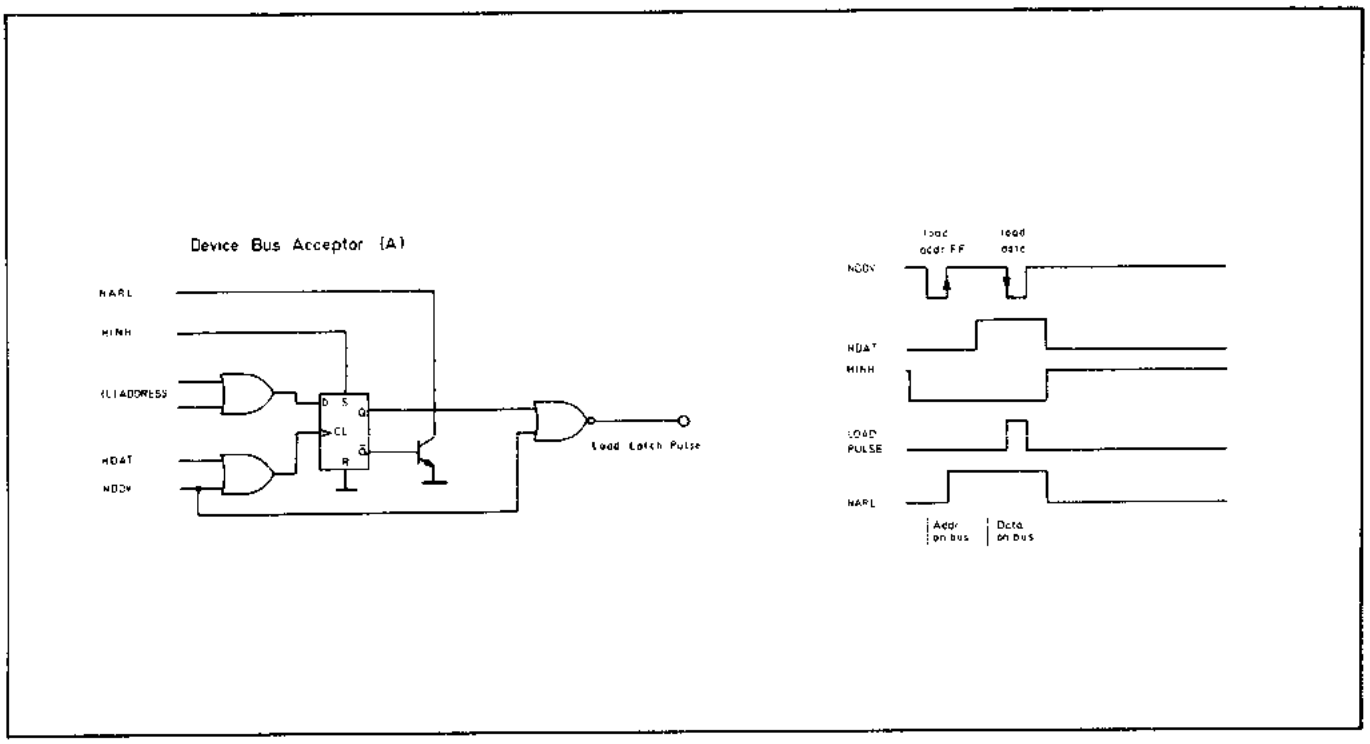


Figure 8–2–2. Device bus acceptor circuit (1 load pulse)

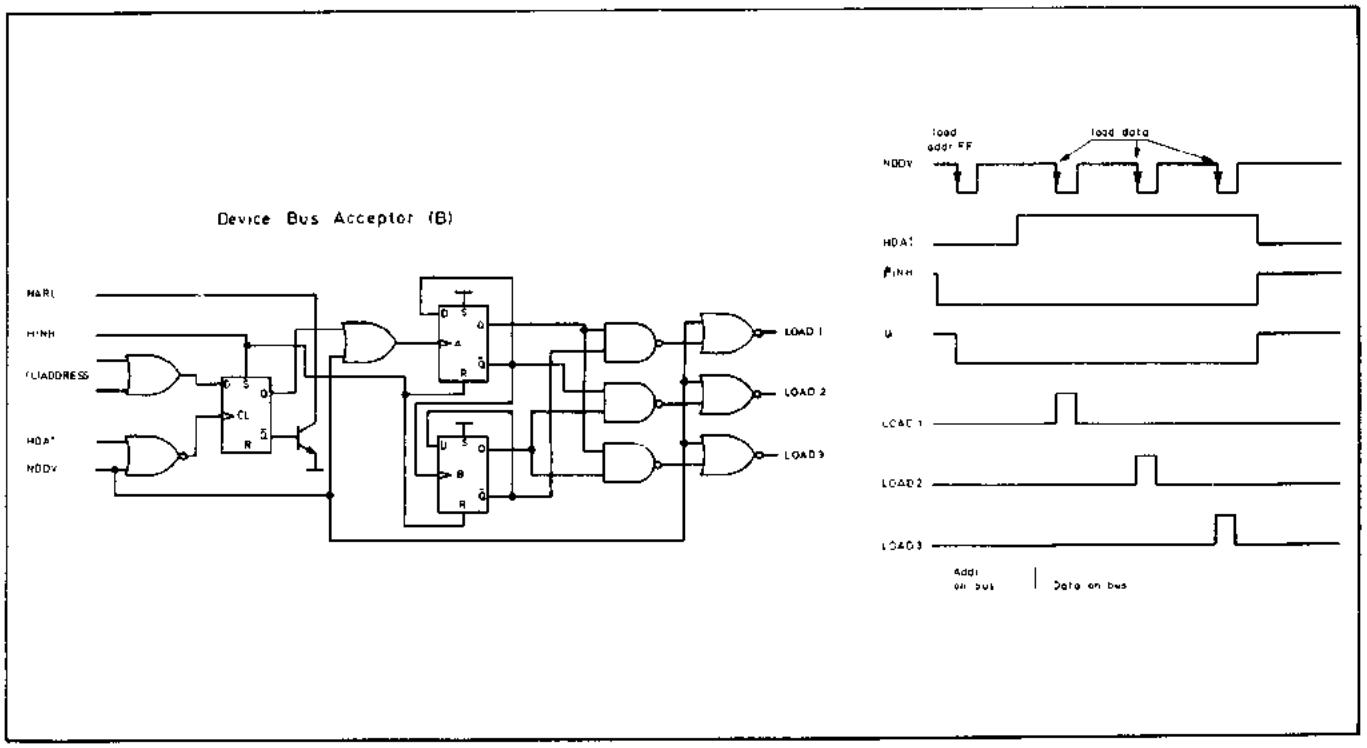


Figure 8–2–3. Device bus acceptor circuit (3 load pulses)

TROUBLESHOOTING

The following relates only to Device Bus troubleshooting. For troubleshooting information on the microprocessor – see SERVICE BLOCK 7. For troubleshooting information on the display – see SERVICE BLOCK 6.

By using a Logic Analyzer, the complete data transfer from the microprocessor can be tested. First connect the Logic Analyzer via an extender board to any device bus connector. Data transfer then takes place as soon as a MODE (INPUT/OUTPUT) or ENTRY button has been pressed, the transfer comprising 2–4 steps always beginning with device address.

Table 8–2–1. Device Bus Addresses

	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
F D F 7	1 1 1 1	1 1 0 1	1 1 1 1	0 1 1 1	BURST
F F 7 E	1 1 1 1	1 1 1 1	0 1 1 1	1 1 1 0	PERIOD
F B F E	1 1 1 1	1 0 1 1	1 1 1 1	1 1 1 0	DELAY A
F 7 F E	1 1 1 1	0 1 1 1	1 1 1 1	1 1 1 0	DELAY B
F B F D	1 1 1 1	1 0 1 1	1 1 1 1	1 1 0 1	WIDTH A
F 7 F D	1 1 1 1	0 1 1 1	1 1 1 1	1 1 0 1	WIDTH B
E F F E	1 1 1 0	1 1 1 1	1 1 1 1	1 1 1 0	SLOPE A
E F F D	1 1 1 0	1 1 1 1	1 1 1 1	1 1 0 1	SLOPE B
D F F E	1 1 0 1	1 1 1 1	1 1 1 1	1 1 1 0	OUTPUT A
D F F D	1 1 0 1	1 1 1 1	1 1 1 1	1 1 0 1	OUTPUT B
F E F B	1 1 1 1	1 1 1 0	1 1 1 1	1 0 1 1	INPUT MODE
B F F E	1 0 1 1	1 1 1 1	1 1 1 1	1 1 1 0	OUTPUT MODE
B F F D	1 0 1 1	1 1 1 1	1 1 1 1	1 1 0 1	REF TRIG WIDTH

Table 8–2–2. Input Mode Data Transfer (two step transfer)
(Followed by REF TRIG)

16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
1 1 1 1	1 1 1 0	1 1 1 1	1 0 1 1	Input mode addr.
X X X X	X X X X	X X X X	X X X X	Input mode data
0 X 1 1	1 1 0 0	0 0 0 0	0 0 0 0	NORM
0 X 0 1	1 0 0 0	X X X X	X X X X	GATE
0 X 1 0	1 0 1 0	X X X X	X X X X	EXT TRIG
0 X 1 1	0 1 0 0	X X X X	X X X X	BURST
0 1 0 0	0 0 0 0	X X X X	X X X X	POS SLOPE
0 0 0 0	0 0 0 0	X X X X	X X X X	NEG SLOPE
X X X X	X X X X	0 1 0 0	0 0 0 0	SINGLE PULSE
1 X X X	X X X X	X X X X	X X X X	MANUAL

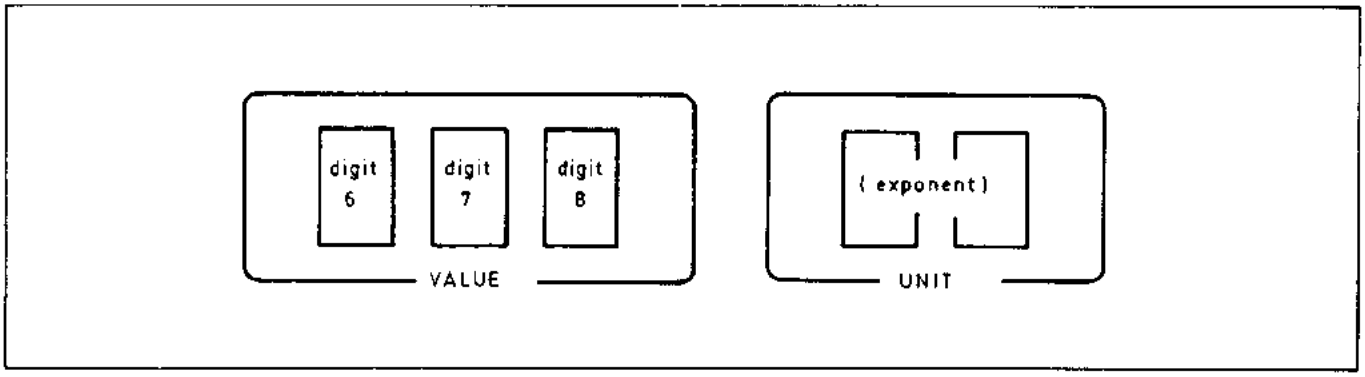


Figure 8–2–4. Period Display

Table 8–2–3. Pulse Period Data Transfer (two step transfer) 10 ns – 999 ms
(After period transfer, Ref Trig is transferred)

	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
	1 1 1 1	1 1 1 1	0 1 1 1	1 1 1 0	address period
	X X X X	X X X X	X X X X	X X X X	period data
	Exponent	digit 6	digit 7	digit 8	
10.0 ns to 99.9 ns	0 0 0 1 0 0 0 1	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 1
100 ns to 999 ns	0 0 1 0 0 0 1 0	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 2
1 μs to 9.99 μs	0 0 1 1 0 0 1 1	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 3
10.0 μs to 99.9 μs	0 1 0 0 0 1 0 0	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 4
100 μs to 999 μs	0 1 0 1 0 1 0 1	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 5
1 ms to 9.99 ms	0 1 1 0 0 1 1 0	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 6
10.0 ms to 99.9 ms	0 1 1 1 0 1 1 1	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 7
100 ms to 999 ms	1 0 0 0 1 0 0 0	0 0 0 1 1 0 0 1	0 0 0 0 1 0 0 1	0 0 0 0 1 0 0 1	Range 8

Table 8–2–4. Time Interval Data Transfer (0 to 999 ms for delay) (10 ns to 999 ms for width)

NOTE: This table should be used in conjunction with Tables 8–2–5 to 8–2–8. Time interval data transfer requires 4 steps starting with the address step (selected from the first 4 lines in the following table) followed by 3 data steps. The first data step transfers data (T1, T2, T3) for time values under 50 ns – the binary equivalent for individual values being given in Tables 8–2–6 to 8–2–8. The second data step transfers time values up to 499.9 μs and the third step up to 999 ms. For these last 2 steps, the sign 'x' is entered for individual lines e.g. N71 to N74. The decimal value of 'x' is given in Table 8–2–5. e.g. delay 99.9 ms selected, lines N61 to N64 are set to decimal 9 (1 0 0 1).

Addresses 16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
1 1 1 1	1 0 1 1	1 1 1 1	1 1 1 0	addr. delay A
1 1 1 1	0 1 1 1	1 1 1 1	1 1 1 0	addr. width A
1 1 1 1	1 0 1 1	1 1 1 1	1 1 0 1	addr. delay B
1 1 1 1	0 1 1 1	1 1 1 1	1 1 0 1	addr. width B
Transfer				
1 1 1 1	1 0 1 1	1 1 1 1	1 1 1 0	addr. delay A
T3 X X X X N ⩾ 50n	T2 X X X X 10 ns - 40 ns	T1 X X X X 1 ns - 9 ns	X X X X 0 - 0.9 ns	delay A data (0 to 49.9 ns)
N44 to N41 X X X X 50 μs – 450 μs	N34 to N31 X X X X 5 μs – 45 μs	N24 to N21 X X X X 0.5 μs – 4.5 μs	N14 to N11 X X X X 50 ns – 450 ns	delay A data (50 ns to 450 μs)
N81 X X X X double pulse	N74 to N71 X X X X 500 ms 50 ms - 450 ms	N64 to N61 X X X X 5 ms - 45 ms	N54 to N51 X X X X 0.5 ms - 4.5 ms	delay A data (0.5 ms to 999 ms)
Example of last two lines when 99.9 ms and double pulse selected				
1 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
0 1 0 0	0 0 0 1	1 0 0 1	1 0 0 1	

Table 8–2–5. List of Data

	step 3 bit 13-1				step 4 bit 16-1				step 2 bit 15-5		
Display	N81	N71 to N74	N61 to N64	N51 to N54	N41 to N44	N31 to N34	N21 to N24	N11 to N14	T3	T2	T1
999 ms	1	9	9	8	0	0	0	0	0	0	0
99.9 ms	0	1	9	9	8	0	0	0	0	0	0
10.1 ms	0	0	2	0	2	0	0	0	0	0	0
10.0 ms	0	0	2	0	0	0	0	0	0	0	0
9.99 ms	0	0	1	9	9	8	0	0	0	0	0
1.01 ms	0	0	0	2	0	2	0	0	0	0	0
1.00 ms	0	0	0	2	0	0	0	0	0	0	0
999 μs	0	0	0	1	9	9	8	0	0	0	0
10.1 μs	0	0	0	0	0	2	0	2	0	0	0
10.0 μs	0	0	0	0	0	2	0	0	0	0	0
9.99 μs	0	0	0	0	0	1	9	9	4	0	0
9.98 μs	0	0	0	0	0	1	9	9	3	0	0
1.00 μs	0	0	0	0	0	0	2	0	0	0	0
999 ns	0	0	0	0	0	0	1	9	4	9	0
998 ns	0	0	0	0	0	0	1	9	4	8	0
100 ns	0	0	0	0	0	0	0	2	0	0	0
99.0 ns	0	0	0	0	0	0	0	1	4	9	9
01.0 ns	0	0	0	0	0	0	0	0	0	1	0
00.9 ns	0	0	0	0	0	0	0	0	0	0	9
000 ns	0	0	0	0	0	0	0	0	0	0	0

Table 8–2–6. T1 0 ns – 0.9 ns

bit / dec	0.5 ns 8	0.2 ns 7	0.2 ns* 6	0.1 ns 5
0	0	0	0	0
0.1 ns	0	0	0	1
0.2 ns	0	0	1	0
0.3 ns	0	0	1	1
0.4 ns	0	1	1	0
0.5 ns	1	0	0	0
0.6 ns	1	0	0	1
0.7 ns	1	0	1	0
0.8 ns	1	0	1	1
0.9 ns	1	1	1	0

Table 8–2–7. T2 1 ns – 9 ns

bit / dec	4 ns 12	3 ns 11	2 ns 10	1 ns 9
< 1 ns	0	0	0	0
1 ns	0	0	0	1
2 ns	0	0	1	0
3 ns	0	1	0	0
4 ns	1	0	0	0
5 ns	1	0	0	1
6 ns	1	0	1	0
7 ns	1	1	0	0
8 ns	1	1	0	1
9 ns	1	1	1	0

Table 8–2–8. T3 10 ns – 40 ns

bit / dec	20 ns 15	10 ns* 14	10 ns 13
< 10 ns	0	0	0
10 ns	0	0	1
20 ns	0	1	1
30 ns	1	0	1
40 ns	1	1	1

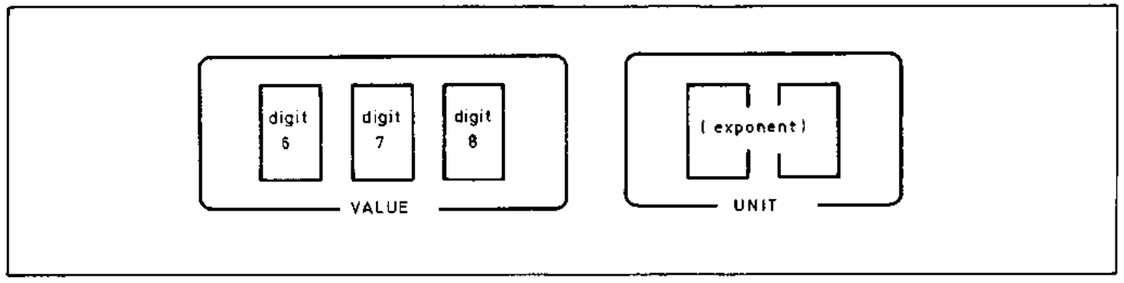


Table 8–2–9. Slope Data Transfer (three step transfer) 6 ns (3 ns) – 9.99 ms

NOTE: Binary data for the last two steps is given in Table 8–2–**11.**

16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
1 1 1 0	1 1 1 1	1 1 1 1	1 1 1 0	Slope addr. A
				or
1 1 1 0	1 1 1 1	1 1 1 1	1 1 0 1	Slope addr. B
X X X X	X X X X	X X X X	X X X X	Slope LEE data
X X X X	X X X X	X X X X	X X X X	Slope TRE data
exponent	digit 6	digit 7	digit 8	

Table 8–2–10. LEE/TRE Ranges

NOTE: LEE value and TRE value must be in one range.

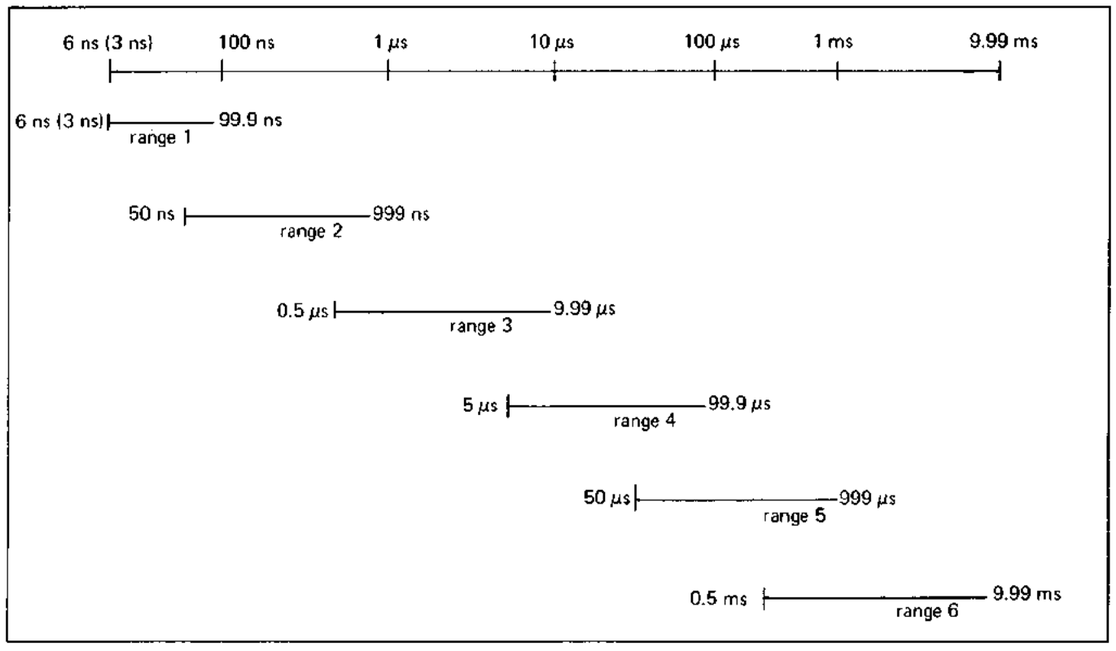


Table 8–2–11. List of Slope Data
(Exponent will be transferred with LEE only)

	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
6.0 ns	0 0 0 1	0 0 0 0	0 1 1 0	0 0 0 0	Range 1
to					
99.9 ns	0 0 0 1	1 0 0 1	1 0 0 1	1 0 0 1	
50 ns	0 0 1 0	0 0 0 0	0 1 0 1	0 0 0 0	Range 2
to					
999 ns	0 0 1 0	1 0 0 1	1 0 0 1	1 0 0 1	
0 .50 µs	0 0 1 1	0 0 0 0	0 1 0 1	0 0 0 0	Range 3
to					
9.99 µs	0 0 1 1	1 0 0 1	1 0 0 1	1 0 0 1	
5 .0 µs	0 1 0 0	0 0 0 0	0 1 0 1	0 0 0 0	Range 4
to					
99.9 µs	0 1 0 0	1 0 0 1	1 0 0 1	1 0 0 1	
50 µs	0 1 0 1	0 0 0 0	0 1 0 1	0 0 0 0	Range 5
to					
999 µs	0 1 0 1	1 0 0 1	1 0 0 1	1 0 0 1	
0.5 ms	0 1 1 0	0 0 0 0	0 1 0 1	0 0 0 0	Range 6
to					
9.99 ms	0 1 1 0	1 0 0 1	1 0 0 1	1 0 0 1	

Table 8–2–12. Output level data transfer (Three-step transfer followed by OUTPUT MODE. If amplitude is ≥ 2 V, the amplitude is transferred twice, whereby the first set will set the amplifier to X1, and the second set transfers the actual data, followed again by OUTPUT MODE).

NOTE: 1. OUTPUT DISABLE causes different data.
2. Amplitude = HIL – LOL
3. Step size below 10 V from 50 Ω into 50 Ω is 10 mV
4. Step size below 10 V from 1 KΩ into 50 Ω is 20 mV
5. Step size below 10 V from 1 KΩ into 50 Ω is 100 mV

16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
1 1 0 1	1 1 1 1	1 1 1 1	1 1 1 0	Addr. output A
				or
1 1 0 1	1 1 1 1	1 1 1 1	1 1 0 1	Addr. output B
X X X X	X X X X	X X X X	X X X X	Output data
		offset	gain	
X X X X	X X X X	X X X X	X X X X	Output data
amplitude D/A conv. data		offset D/A conv. data + bit 7, 8 of second step		

Table 8–2–13. Amplitude Data

NOTE: Digital step size between 1 V (100 mV) and 1.99 V (199 mV) is 2; this means LSB (9) is not used. (99 steps only, output gain X1).

Display (LOL 0 V)	D/A Conv. data 16 15 14 13	D/A Conv. data 12 11 10 9	Gain 4 3 2 1	TP1 Vernier Output
HIL 1 V or 100 mV	1 1 0 0	1 0 0 0	1 0 1 1	1 V swing (100 mV)
HIL 1.1 V or 110 mV	1 0 1 1	0 1 0 0	1 0 1 1	1.1 V swing (110 mV)
HIL 1.34 V	1 0 0 0	0 1 0 0	1 0 1 1	1.34 V swing
HIL 1.35 V	1 0 0 0	0 0 1 0	1 0 1 1	1.35 V swing
HIL 1.98 V	0 0 0 0	0 1 0 0	1 0 1 1	1.98 V swing
HIL 1.99 V	0 0 0 0	0 0 1 0	1 0 1 1	1.99 V swing

Table 8–2–14. Amplitude Data

NOTE: Digital step size between 2 V (200 mV) and 3.99 V (399 mV) is 1; this means LSB (9) is used. (199 steps now, output gain X2). Valid for all ampl. ⩾ 2 V.

Display (LOL 0 V)	16 15 14 13	12 10 11 9	4 3 2 1	TP1 Vernier Output
HIL 2.0 V (200mV)	1 1 0 0	1 0 0 0	0 0 1 1	1 V swing (100 mV)
HIL 2.2 V (220 mV)	1 0 1 1	0 1 0 0	0 0 1 1	1.1 V swing (110 mV)
HIL 3.98 V	0 0 0 0	0 0 1 0	0 0 1 1	1.98 V swing
HIL 3.99 V	0 0 0 0	0 0 0 1	0 0 1 1	1.99 V swing
HIL 4.00 V (400 mV)	1 1 0 0	1 0 0 0	0 0 1 0	2.00 V swing
HIL 5.99	0 0 0 0	0 0 0 1	0 0 1 0	2.99 V swing
HIL 6.00 V (600 mV)	1 1 0 0	1 0 0 0	0 0 0 1	3.00 V swing
HIL 8.00 V (800 mV)	1 1 0 0	1 0 0 0	0 0 0 0	4.00 V swing (400 mV)
HIL 9.99 V	0 0 0 0	0 0 0 1	0 0 0 0	4.99 V swing (500 mV)

Table 8–2–15. Amplitude Data

NOTE: Digital step size between 10 V and 19.9 V is 5; this means 100 mV amplitude change.

Display (LOL 0 V)	16 15 14 13	12 10 11 9	4 3 2 1	TP1 Vernier Output
HIL 10.0 V	0 1 1 0	0 1 0 0	0 0 1 0	2.5 V swing
HIL 15.0 V	0 0 1 1	0 0 1 0	0 0 0 1	3.75 V swing
HIL 19.8 V	0 0 0 0	1 0 1 0	0 0 0 0	4.95 V swing
HIL 19.9 V	0 0 0 0	0 1 0 1	0 0 0 0	4.98 V swing

Table 8–2–16. Offset Data Transfer

NOTES: 1. The offset vernier consists of a 10 Bit D/A converter (bit 7, 8 of second step and bit 1–8 of third step).

2. Offset $\frac{\text{HIL} + \text{LOL}}{2}$, max. 10 V into 50 Ω

3. Between 0 V and 995 mV offset generator output, the smallest digital step size is 5 (offset gen. set X0.1).

third data step								second step				
8	7	6	5	4	3	2	1	8	7	dec	HIL	LOL
0	0	0	0	0	0	0	0	0	0	0	0.1 V	–0.1 V
0	0	0	0	0	0	0	1	0	1	5	0.11 V	–0.1 V
0	0	0	0	0	0	1	0	1	0	10	0.12 V	–0.1 V
1	1	1	1	0	1	1	1	1	0	990	1.98 V	0 V
1	1	1	1	1	0	0	0	1	1	995	1.99 V	0 V

Table 8–2–17. Offset Data Transfer

NOTE: Between 1.00 V and 10 V offset generator output, the digital step size per 100 mV ampl. change is 5 (offset generator set to X1).

third data step								second step					
8	7	6	5	4	3	2	1	8	7	dec	HIL	LOL
0	1	1	1	1	0	1	0	1	0	490	9.80 V	0 V
0	1	1	1	1	0	0	1	0	1	485	9.70 V	0 V
0	0	1	1	1	1	1	0	1	0	250	5.00 V	0 V
0	0	0	1	1	0	1	1	1	0	110	2.20 V	0 V
0	0	0	1	1	0	1	0	0	1	105	2.10 V	0 V

Table 8–2–18. Offset Data Transfer

NOTE: In the amplitude range of 10 V to 19.9 V (1 KΩ) the smallest digital ste is 2 or 3 depending on even or odd number.

third data step								second step				
8	7	6	5	4	3	2	1	8	7	dec	HIL	LOL
0	0	1	1	1	1	1	0	1	0	230	10.0 V	0 V
0	1	0	1	0	1	0	1	1	1	343	15.0 V	0 V
0	1	1	1	1	1	0	0	0	1	497	19.9 V	0 V
0	1	0	0	1	0	0	0	0	0	288	10.5 V	10.0 V
1	1	1	1	0	1	1	1	1	0	990	19.9 V	19.7 V

Table 8–2–19. Offset Gain / Polarity

bit	9	6	5
pos	0	0	X
neg	1	1	X
zero	0	1	X
X0.1	X	X	1
X1	X	X	0

bit 5 will be low when offset is ≥ 1 V

Table 8–2–20. Output Mode Data Transfer (two step transfer)
(If 50 Ω or 1 KΩ is selected, amplitude transfer follows)

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	Output mode address
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Output mode data
shift supply data see Table 8–2–22								output mode data see Table 8–2–21								

Table 8–2–21. Output Mode Data

	0	1
bit 1	A sep B	A add B
bit 2	NORM (A)	COMP (A)
bit 3	50 Ohm (A)	1 Kohm (A)
bit 4	DIS (A)	EN (A)
bit 5	NORM (B)	COMP (B)
bit 6	50 Ohm (B)	1 Kohm (B)
bit 7	DIS (B)	EN (B)

Table 8–2–22. Shift Supply Data

16 15 14 13	12 11 10 9	decimal value	shift out
0 0 0 0	0 0 0 1	1	–10 V
0 1 1 0	0 1 0 0	100	0 V
1 1 0 0	0 1 1 0	198	+10 V

Table 8–2–23. Reference Trigger Transfer (two step transfer)
(Headed by INPUT MODE or PERIOD transfer)

16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1	
1 0 1 1	1 1 1 1	1 1 1 1	1 1 0 1	Reference trigger address
X X X X	X X X X	X X X X	X X X X	Reference trigger data (see Table 8–2–24)

Table 8–2–24. Reference Trigger Data

	min. 8 ns	40 ns	0.4 μs
bit 1	0	1	0
bit 2	0	0	1
Rate VCO frequency	10M-50M	1M-9.9M	0.9 Hz - 0.99 MHz
		NORM, GATE, BURST	
	EXT. TRIG.		

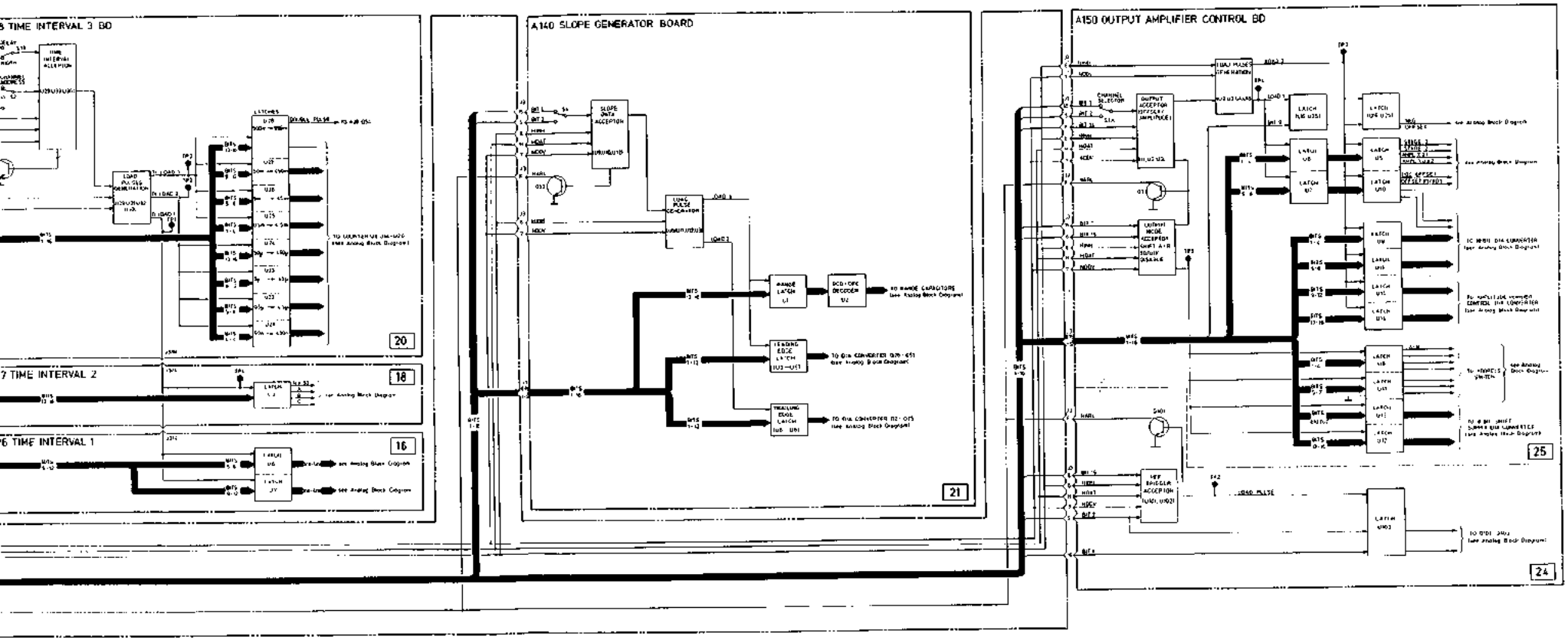
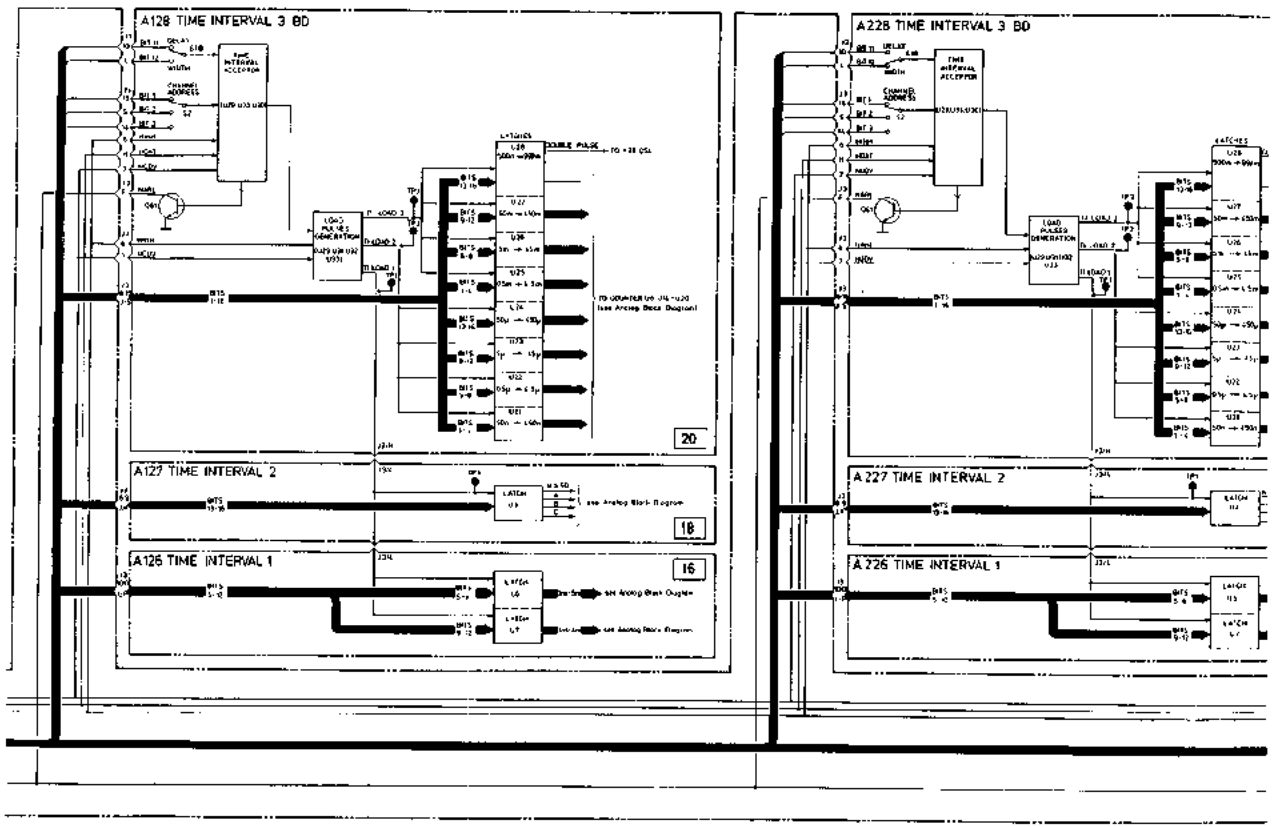
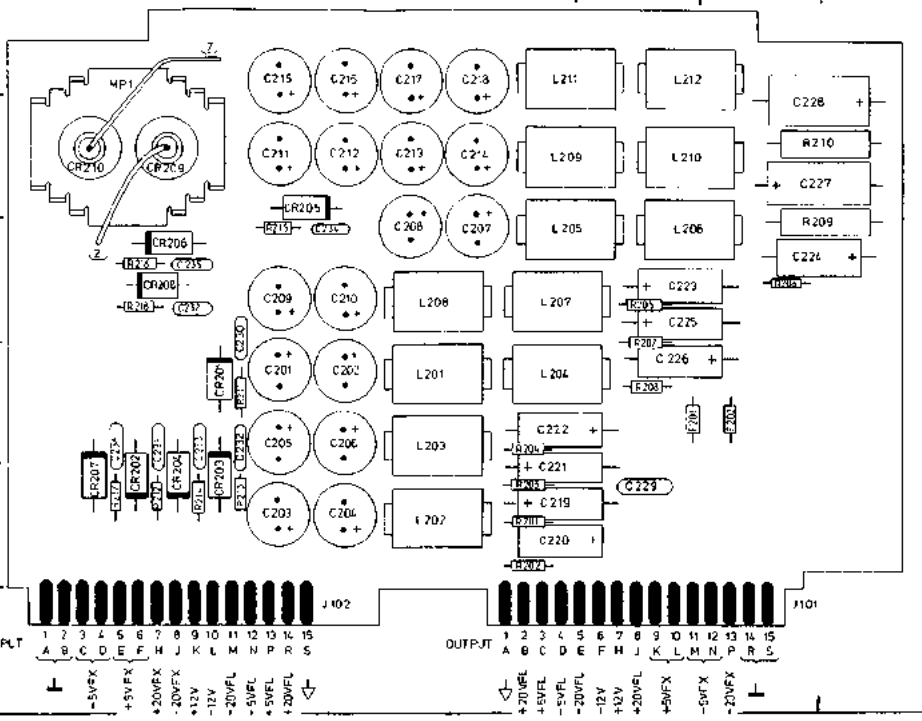


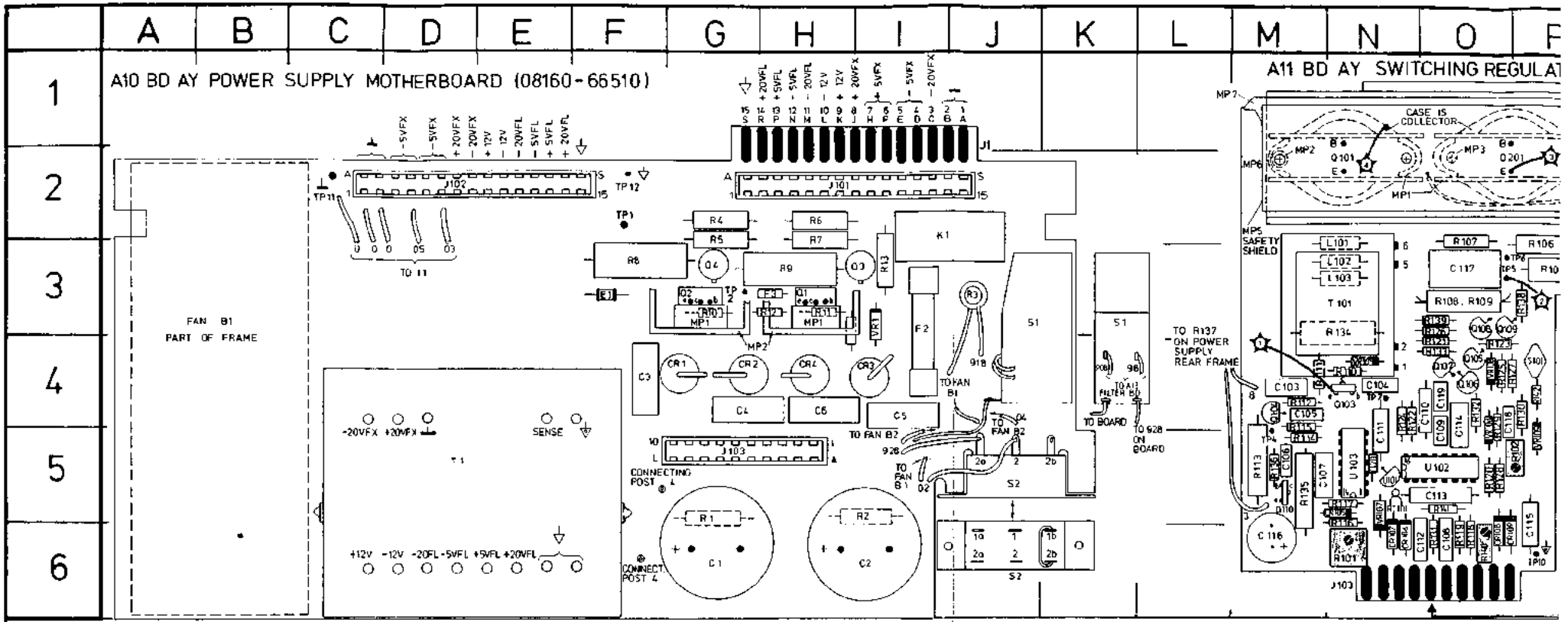
Figure 8–2–1. Microprocessor/Device Bus Block Diagram (cont'd)


A128 TIME INTERVAL 3 BD
A228 TIME INTERVAL 3 BD
A127 TIME INTERVAL 2
A227 TIME INTERVAL 2
A126 TIME INTERVAL 1
A226 TIME INTERVAL 1
20
18
16

A12 BD AY RECTIFIER (08160-66512)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C201	C4	C217	D1	C233	C4	F202	G4	R203	E5
C202	D4	C218	E1	C234	D3	L201	E4	R204	E4
C203	C5	C219	F5	C235	B3	L202	E5	R205	F3
C204	D5	C220	F5	C236	B4	L203	E4	R206	G3
C205	C4	C221	F5	C237	B3	L204	F4	R207	F4
C206	D4	C222	F4	CR201	C4	L205	F5	R208	F4
C207	F3	C223	G3	CR202	B5	L206	G3	R209	H3
C208	D3	C224	H3	CR203	C5	L207	F3	R210	H2
C209	C3	C225	G3	CR204	B5	L208	E3	R211	G4
C210	D3	C226	G4	CR205	C2	L209	F2	R212	B5
C211	C2	C227	H2	CR206	B3	L210	G2	R213	C5
C212	D2	C228	H2	CR207	B5	L211	F1	R214	C6
C213	D2	C229	F5	CR208	B3	L212	G1	R215	C3
C214	E2	C230	C3	CR209	B2	MP1	B1	R216	B3
C215	C1	C231	B4	CR210	B2	R201	E5	R217	B5
C216	D1	C232	C4	F201	G4	R202	E5	R218	B3



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	G6	K1	I2	R10	G3
C2	I6	MP1	G3	R11	H3
C3	F4	MP2	G3	R12	H3
C4	G4	O1	H3	R13	I3
C5	I4	O2	G3	S1	J3
C6	H4	O3	I3	S2	J5
CR1	G4	O4	G3	T1	D5
CR2	G4	R1	G5	TP1	F2
CR3	I4	R2	I5	TP2	G3
CR4	H4	R3	J3	TP8	F3
E1	F3	R4	G2	TP11	C2
F2	I3	R5	G2	TP12	F2
F3	H3	R6	H2	VR1	I3
J101	H2	R7	H2		
J102	D2	R8	F3		
J103	G5	R9	H3		

A10

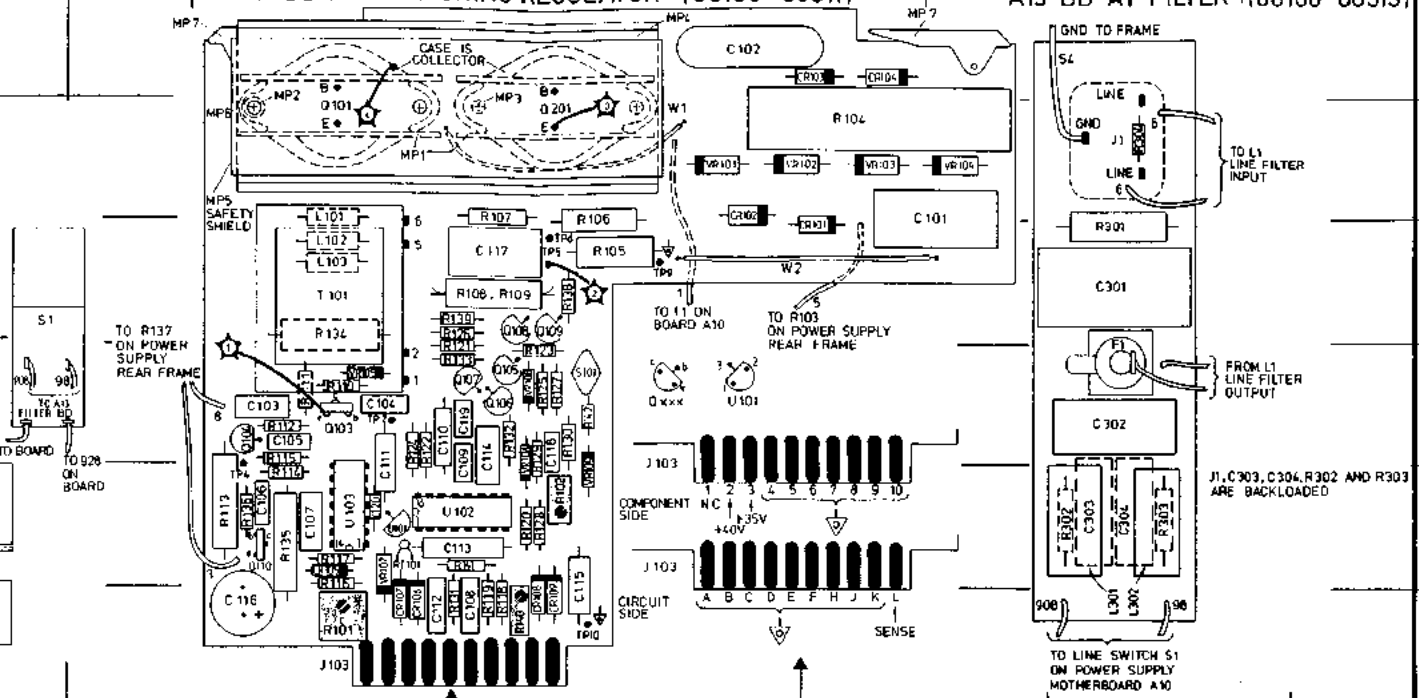
A11

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
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C102	Q1	C118	O4	MP2	M2	Q110	M5	R117	P
C103	M4	C119	O4	MP3	O2	R101	N6	R118	O
C104	N4	C120	N5	MP4	P1	R102	O5	R119	O
C105	M4	CR101	Q2	MP5	M2	R104	R2	R120	O
C106	M5	CR102	Q2	MP6	M2	R105	P3	R121	O
C107	M5	CR103	R1	MP7	M1	R106	P3	R122	P
C108	O6	CR104	R1			R107	O3	R123	O
C109	O4	CR105	N5	Q101	N2	R108	O3	R124	P
C110	N4	CR106	N6	Q102	O7	R109	O3	R125	O
C111	N4	CR107	N6	Q103	N4	R110	N4	R126	O
C112	N6	CR108	O6	Q104	M4	R111	M4	R127	O
C113	O5	CR109	O6	Q105	O4	R112	M4	R128	O
C114	O4	L101	N3	Q106	O4	R113	M5	R129	O
C115	P5	L102	N3	Q107	O4	R114	M5	R130	P
C116	M6	L103	N3	Q108	O3	R115	M4	R131	O

K L M N O P Q R S T U V

A11 BD AY SWITCHING REGULATOR (08160-66511)

A13 BD AY FILTER (08160-66513)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C101	H3	C117	O3	MP1	N2	Q109	O3	R116	N5	R132	O4	TP6	P3	W1	P2
C102	Q1	C118	O4	MP2	M2	Q110	M5	R117	N5	R133	O4	TP7	N4	W2	Q3
C103	M4	C119	O4	MP3	O2	R101	N6	R118	O6	R134	N3	TP9	P3	XQ101	
C104	N4	CR20	N5	MP4	P1	R102	O5	R119	O6	R135	M5	TP10	P6		
C105	M4	CR101	Q2	MP5	M2	R104	R2	R120	O5	R136	M5	U101	N5		
C106	M5	CR102	Q2	MP6	M2	R105	P3	R121	O4	R138	P5	U102	O6		
C107	M5	CR103	R1	MP7	M1	R106	P3	R122	N4	R139	O3	U103	N5		
C108	O6	CR104	R1			R107	O3	R123	O4	R140	O6	VR101	O2		
C109	O4	CR105	N5	Q101	N2	R108	O3	R124	N4	R141	O5	VR102	O2		
C110	N4	CR106	N6	Q102	O2	R109	O3	R125	O4	R142	P4	VR103	R2		
C111	N4	CR107	N6	Q103	N4	R110	N4	R126	O3	RT101	N5	VR104	R2		
C112	N6	CR108	O6	Q104	M4	R111	M4	R127	O4	S101	P4	VR105	N4		
C113	O5	CR109	O6	Q105	O4	R112	M4	R128	O5	T101	N3	VR106	O4		
C114	O4	L101	N3	Q106	O4	R113	M5	R129	O4	TP3	N5	VR107	N5		
C115	P5	L102	N3	Q107	O4	R114	M5	R130	P4	TP4	P3/M4	VR108	O4		
C116	M6	L103	N3	Q108	O3	R115	M4	R131	O6	TP5	O3	VR109	P4		

A13

REF DESIG	GRID LOC
C301	T3
C302	T4
C303	T5
C304	T5
L301	T5
L302	T5
R301	T3
R302	T5
R303	T5
R304	T2

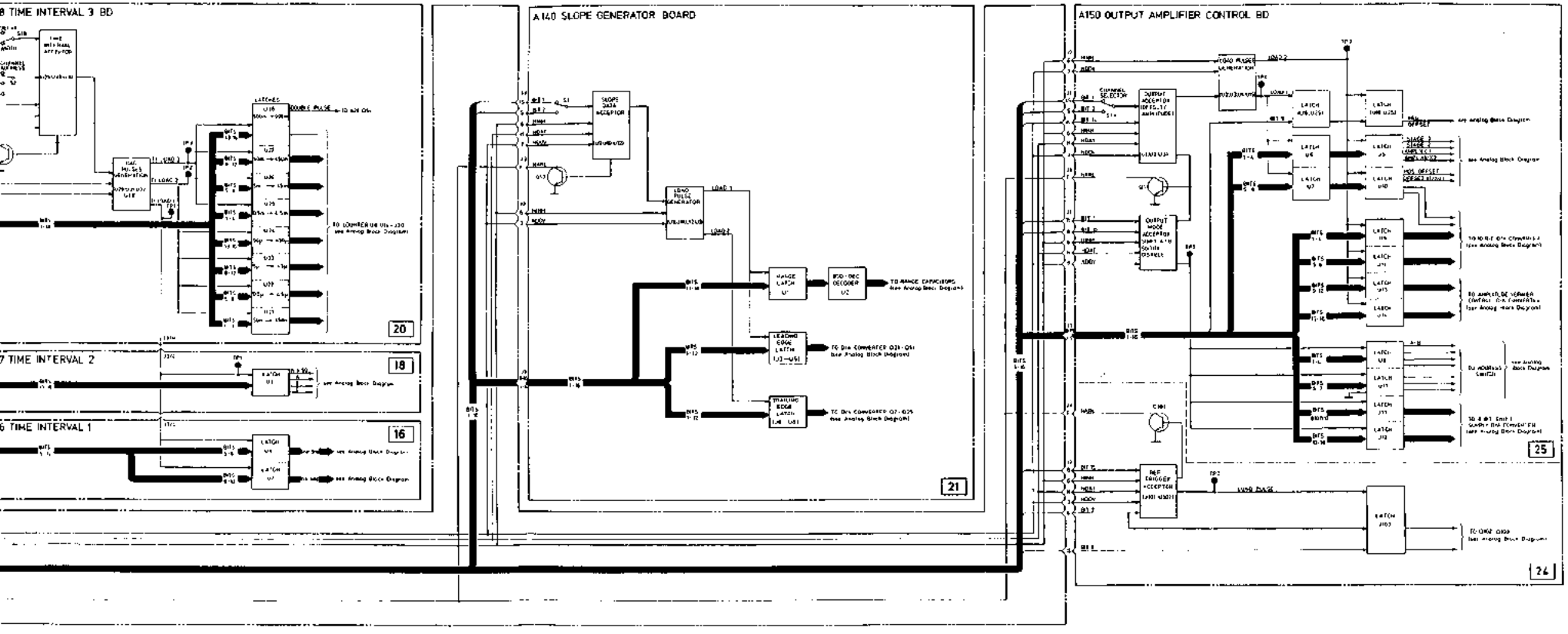
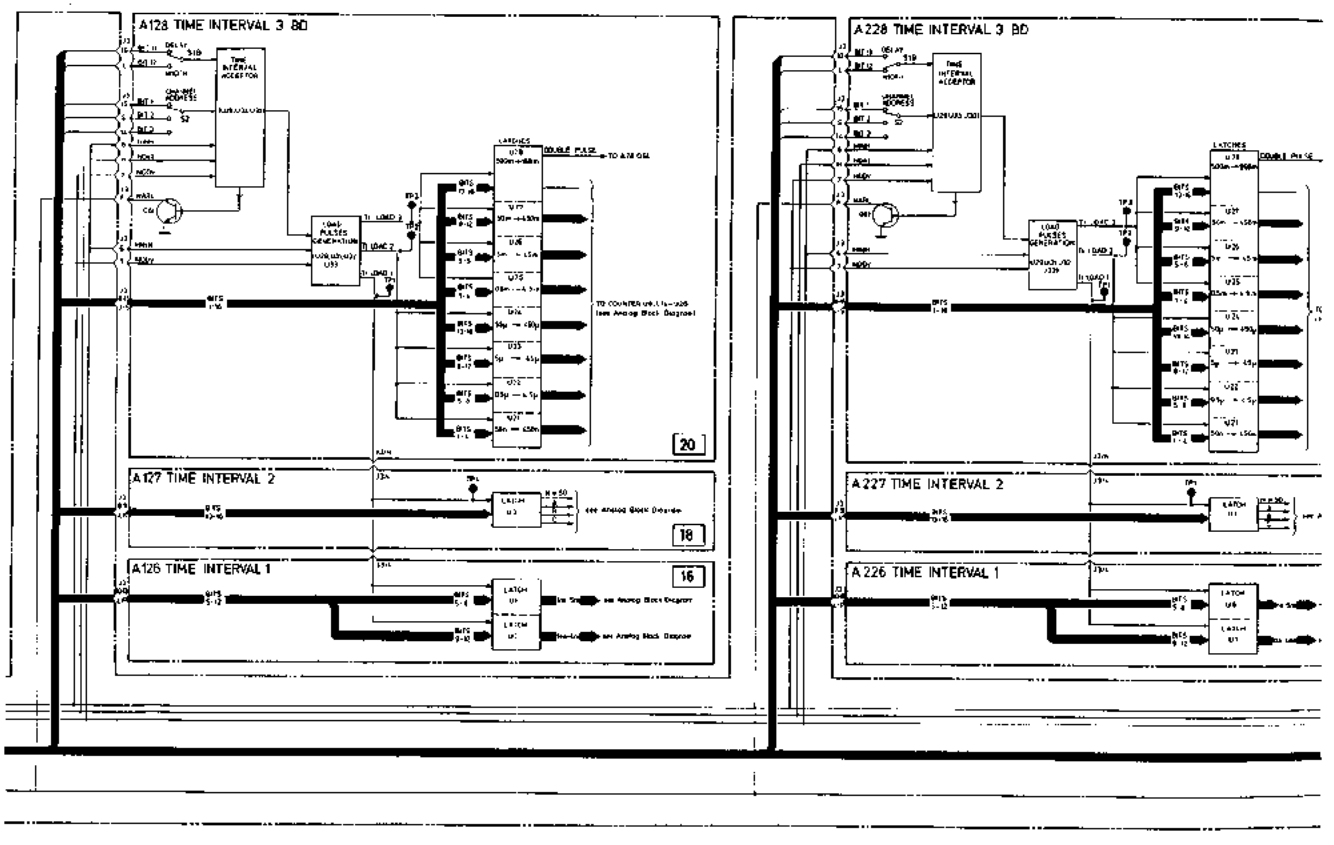
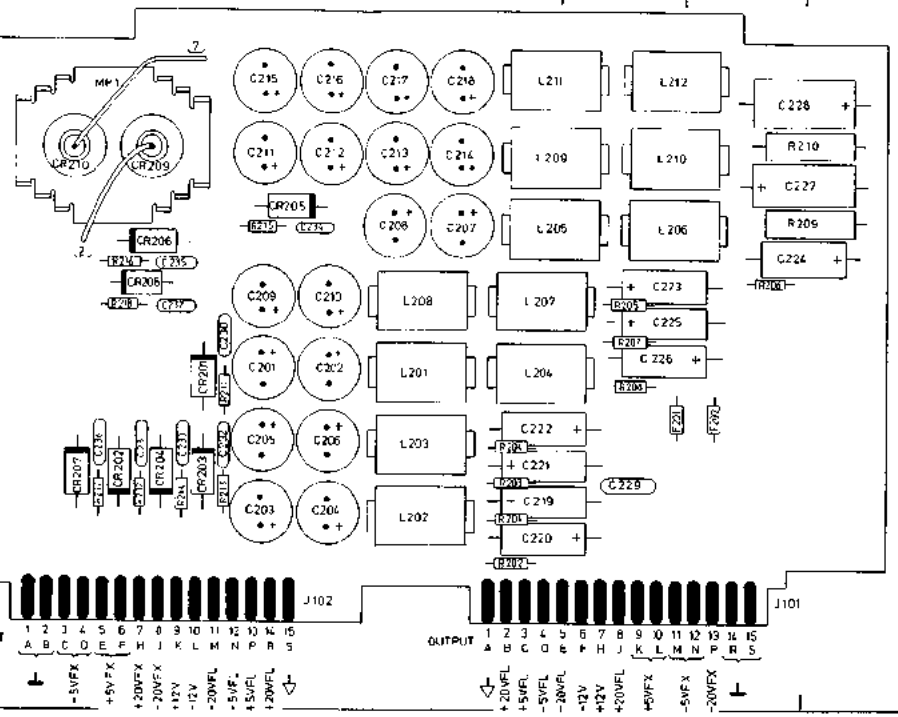


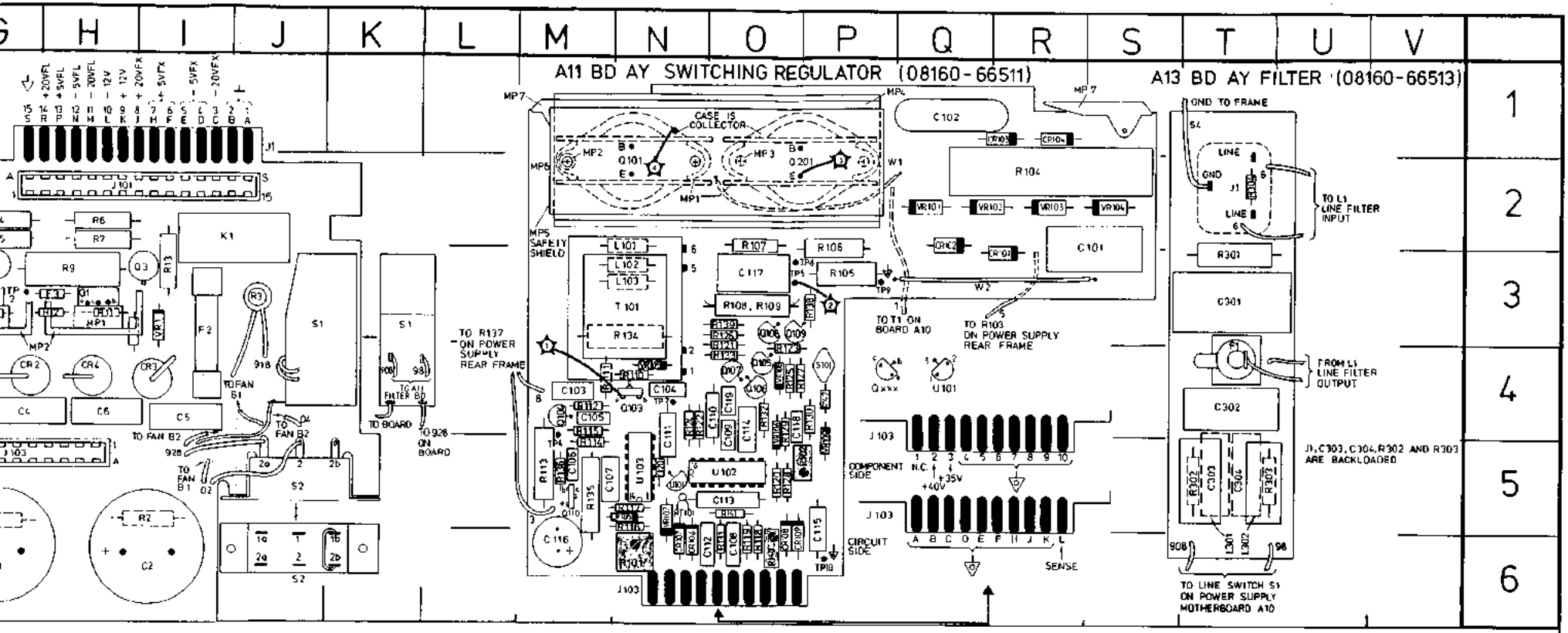
Figure 8–2–1. Microprocessor/Device Bus Block Diagram (cont'd)


A128 TIME INTERVAL 3 BD
A127 TIME INTERVAL 2
A126 TIME INTERVAL 1
A228 TIME INTERVAL 3 BD
A227 TIME INTERVAL 2
A226 TIME INTERVAL 1
20
18
16

A12 BD AY RECTIFIER (08160-66512)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C201	C4	C217	D1	C233	C4	F202	G4	R203	E5
C202	C4	C218	E1	C234	D3	L201	E4	R204	E4
C203	C5	C219	F5	C235	B3	L202	E5	R205	F4
C204	D5	C220	F5	C236	B4	L203	E4	R206	G3
C205	C4	C221	F5	C237	B3	L204	F4	R207	F4
C206	D4	C222	F4	CR201	C4	L205	F3	R208	F4
C207	E3	C223	G3	CR202	B5	L206	G3	R209	F3
C208	D3	C224	H3	CR203	C5	L207	F3	R210	H2
C209	C3	C225	G3	CR204	B5	L208	E3	R211	C4
C210	D3	C226	G4	CR205	C2	L209	F2	R212	B5
C211	C2	C227	H2	CR206	B3	L210	G2	R213	C5
C212	D2	C228	H2	CR207	B5	L211	F1	R214	C5
C213	D2	C229	F5	CR208	B3	L212	G1	R215	C3
C214	E2	C230	C3	CR209	B2	MP1	B1	R216	B3
C215	C1	C231	B4	CR210	B2	R201	E5	R217	B5
C216	D1	C232	C4	F201	G4	R202	E5	R218	B3

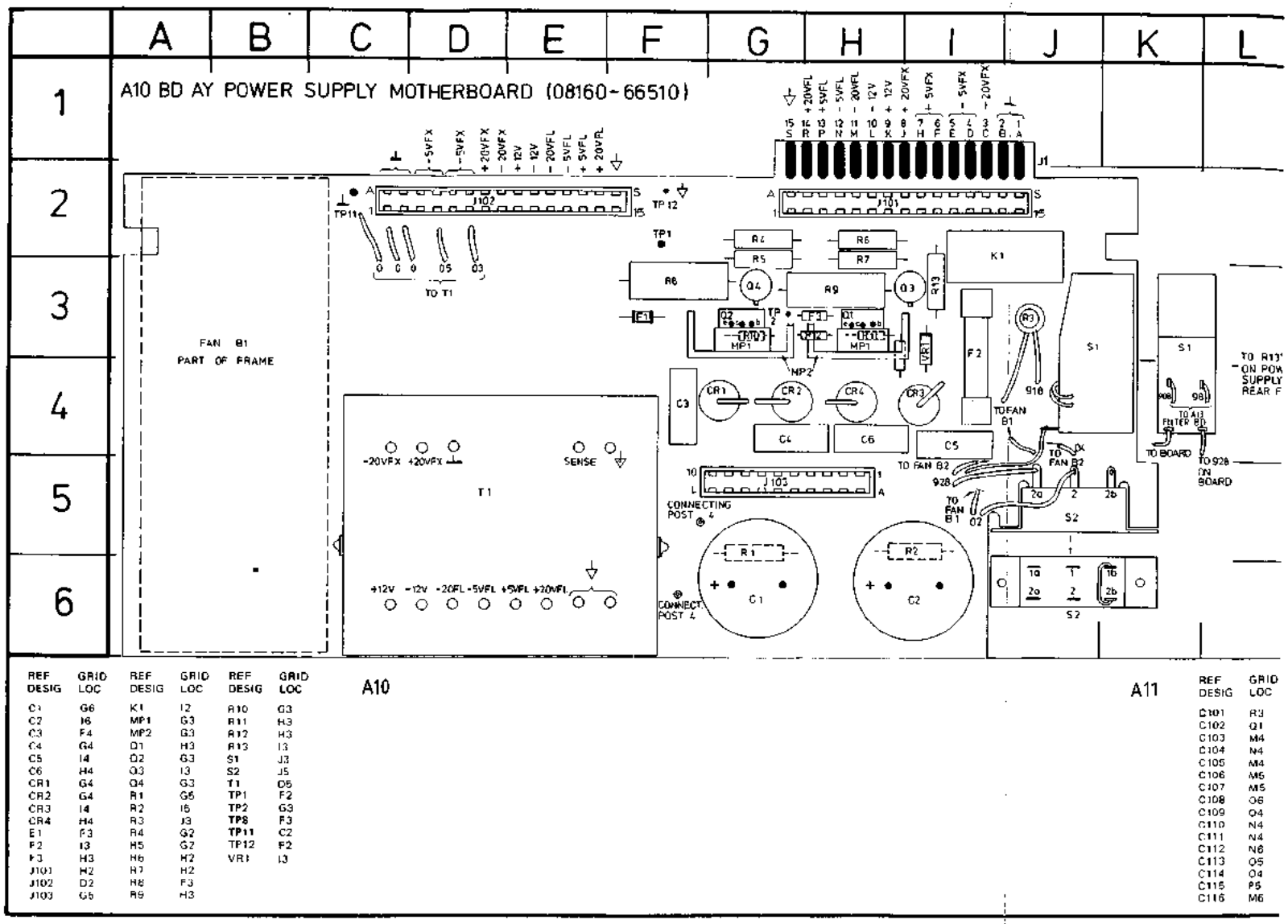


A11

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C101	R3	C117	O3	MP1	N2	Q109	O3	R116	N6	R132	O4	**TP6**	**P3**	W1	P2
C102	Q1	C118	O4	MP2	M2	Q110	M5	R117	N5	R133	O4	**TP7**	**N4**	W2	O3
C103	M4	C119	O4	MP3	O2	R101	N6	R118	O6	R134	N3	**TP9**	**P3**	XQ101	
C104	N4	C120	N5	MP4	**P1**	R102	O5	R119	O6	R135	M5	**TP10**	**P6**		
C105	M4	CR101	Q2	MP5	M2	R104	R2	R120	O5	R136	M5	U101	N5		
C106	M5	CR102	Q2	MP6	M2	R105	P3	R121	O4	R138	P3	U102	O5		
C107	M5	CR103	**R1**	MP7	M1	R106	P3	R122	**N4**	R139	O3	U103	N5		
C108	O6	CR104	**R1**			R107	O3	R123	O4	R140	O6	VR101	Q2		
C109	O4	CR105	N5	Q101	N2	R108	O3	R124	N4	R141	O5	VR102	Q2		
C110	N4	CR106	N6	Q102	O2	R109	O3	R125	O4	R142	P4	VR103	R2		
C111	N4	CR107	N6	Q103	N4	R110	N4	R126	O3	RT101	N5	VR104	R2		
C112	N6	CR108	O6	Q104	M4	R111	M4	R127	O4	S101	P4	VR105	N4		
C113	O5	CR109	O6	Q105	O4	R112	M4	R128	O6	T101	N3	VR106	O4		
C114	O4	L101	N3	Q106	O4	R113	M5	R129	O4	**TP3**	**N5**	VR107	N5		
C115	P5	L102	N3	Q107	O4	R114	M5	R130	P4	**TP4**	**P3/M4**	VR108	O4		
C116	M6	L103	N3	Q108	O3	R115	M4	R131	O6	**TP5**	**O3**	VR109	P4		

A13

REF DESIG	GRID LOC
C301	T3
C302	T4
C303	T6
C304	T5
L301	T5
L302	T5
R301	T3
R302	T5
R303	T5
R304	T2



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	G6	K1	I2	R10	G3
C2	I6	MP1	G3	R11	H3
C3	F4	MP2	G3	R12	H3
C4	G4	Q1	H3	R13	I3
C5	I4	Q2	G3	S1	J3
C6	H4	Q3	I3	S2	J5
CR1	G4	Q4	G3	T1	D5
CR2	G4	R1	G5	TP1	F2
CR3	I4	R2	I5	TP2	G3
CR4	H4	R3	J3	TP8	F3
E1	F3	R4	G2	TP11	C2
F2	I3	R5	H5	TP12	F2
F3	H3	R6	H2	VR1	I3
J101	H2	R7	H2		
J102	D2	R8	F3		
J103	G5	R9	H3		

A10

A11

REF DESIG	GRID LOC
C101	R3
C102	Q1
C103	M4
C104	N4
C105	M4
C106	M5
C107	M5
C108	O6
C109	O4
C110	N4
C111	N4
C112	N6
C113	O5
C114	O4
C115	P5
C116	M6

SERVICE BLOCK 3
SWITCHED SUPPLY A10, A11, A12, A13 [1]

THEORY OF OPERATION

The primary supply operates as a switched mode DC-DC converter of the flyback type, which pre-regulates all outgoing secondary dc voltages according to the following equation:

$$V_{sec} = \frac{\delta}{1-\delta} \quad V_{C1,\,2} \cdot \frac{n_{sec}}{n_{prim}}$$

where $\delta = \frac{t_{on}}{T}$

t_{on} = switch-on time of Q101, Q102

T = period of switching frequency (~ 25 kHz)

n_{prim} = primary turns

n_{sec} = secondary turns

$V_{C1,\,C2}$ = voltage at capacitors C1, C2.

The rectified line voltage is switched to the flyback transformer T1 via the switching transistors Q101, Q102. Feedback voltage is then routed to the switching control circuit which controls the operation of these switching transistors by pulse width variance.

A summary of the functions fulfilled by the flyback transformer is therefore as follows:

a) transformation of primary voltage to multiple secondary voltages.
b) separation of primary and secondary sections for safety purposes.
c) inductive storage of energy during the 'off-state' of switching.
d) generation of feedback voltage dependent on primary voltage and load changes.

Secondary circuits associated with the transformer only perform half-wave rectification and filtering.

The following descriptions correspond to the circuit blocks shown in the power supply block diagram, Figure 8–3–9.

Line Input Filter (A13)

The line input filter can be divided into the following functional areas:

a) C301 to C304, L1, L301 and L302 form an RFI filter to reduce RFI voltages generated by switch mode down to a tolerable level.
b) R302 and R303 damp resonance together with L301, L302.
c) R301, R304 discharge C301, C302 after separating the line input from the power line.
d) Fuse F1 protects the instrument from overloads and short circuits.

Voltage selector, current limiter, rectifier and fans (A10)

Instrument operation is activated via the front panel LINE switch S1, the line voltage range being selected via the LINE VOLTAGE SELECTOR switch S2. In the 115 V-position of S2, rectifier CR1, CR4 is connected to charging capacitors C1, C2 to form a voltage doubler. Also in this position, fans B1 and B2 are connected in parallel, and CR2, CR3 are reverse biased (thus having no function). When S2 is in the 230 V position, diodes CR1, CR2, CR3 and CR4 are arranged as a bridge, and the fans B1 and B2 are connected in series. Both fans blow out of the case, B1 operating in the switched mode supply and B2 in the mainframe.

At instrument switch-on, the charging current of C1, C2 is limited by R3 to protect S1, CR1, CR3 and CR4 from current spikes. R3 is itself protected during switch-on by fuse F2, this limitation being shorted in normal operation via relay K1, which is activated by a sufficiently high feedback voltage from CR108 and C116.

The rectified line voltage across C1, C2 lies between 200 V and 358 V depending on line voltage, load conditions and operating status (start, alarm, etc.). To prevent this rectified ac voltage from damaging the start supply during incorrect operation (S2 positioned to 115 V for 230 V line voltage), overvoltage protector E1 ignites at a safe voltage level-thus shorting the input circuit and blowing fuse F1 or F2.

CAUTION

Switch-on under incorrect line voltage selection can blow either fuse F1 or F2. Only after correct line voltage selection should both fuses be checked and replaced if necessary.

Start circuit (A10)

The start circuit delivers power for the control circuits during the following three phases of supply operation:

a) start phase.
b) after alarm until the next soft start. (For definition of soft start and final alarm – see theory for 'switching control and alarm circuits').
c) after final alarm blocking until switch-off of the supply.

The cascaded Darlington emitter-followers deliver the 35 V dc generated by VR1. When normal supply operation is reached, the start circuit is decoupled by the 'or' arrangement of CR106 and CR107, the operating feedback voltage from CR108, C116 being more positive (approx. 40 V). Fuse F3 protects the start circuit from overload.

Feedback rectifier (A11)

The sense winding on the flyback transformer senses rectified line voltage and load conditions thus supplying two paths of feedback rectification:

a) In normal operation CR108, C116 produce the supply voltage for the drive stage, the 12 V-IC U101 and the relay K1. (This supply is selected, as opposed to the start supply, via the 'or' arrangement of CR106 and CR107 which selects the more positive voltage).
b) CR109 and C115 generate the feedback sensing voltage which is then divided by R128, R129 and R102 before comparison with the reference voltage of VR6. This comparison is accomplished via the switching control circuit U102 which then provides voltage regulation. Potentiometer R102 therefore determines the feedback voltage level and hence all output voltages.

+12 V Supply (A11)

Zener diode VR107 steps down the incoming voltage/power at U101 pin 1 to within the U101 operating range. U101 then stabilizes this voltage to supply +12 V to the switching control circuit U102, the associated alarm circuits and the duty cycle mono-flop U103.

Switching control and alarm circuits (A11)

Figure 8–3–1 provides a functional block diagram of the switching control IC U102. Individual IC functions, together with a brief description, are given as follows:

a) the Miller integrator generates a sawtooth voltage at pin 3 with a frequency determined by R119 and C108.
b) the comparator compares the feedback sensing voltage (from divider R128, R129 and R102) with the reference voltage from VR106. R130, C118, C114 and the source resistance of the voltage divider serve to reduce loop gain.
c) the pulse width modulator compares the Miller sawtooth with the comparator output signal to provide pulse width variation.

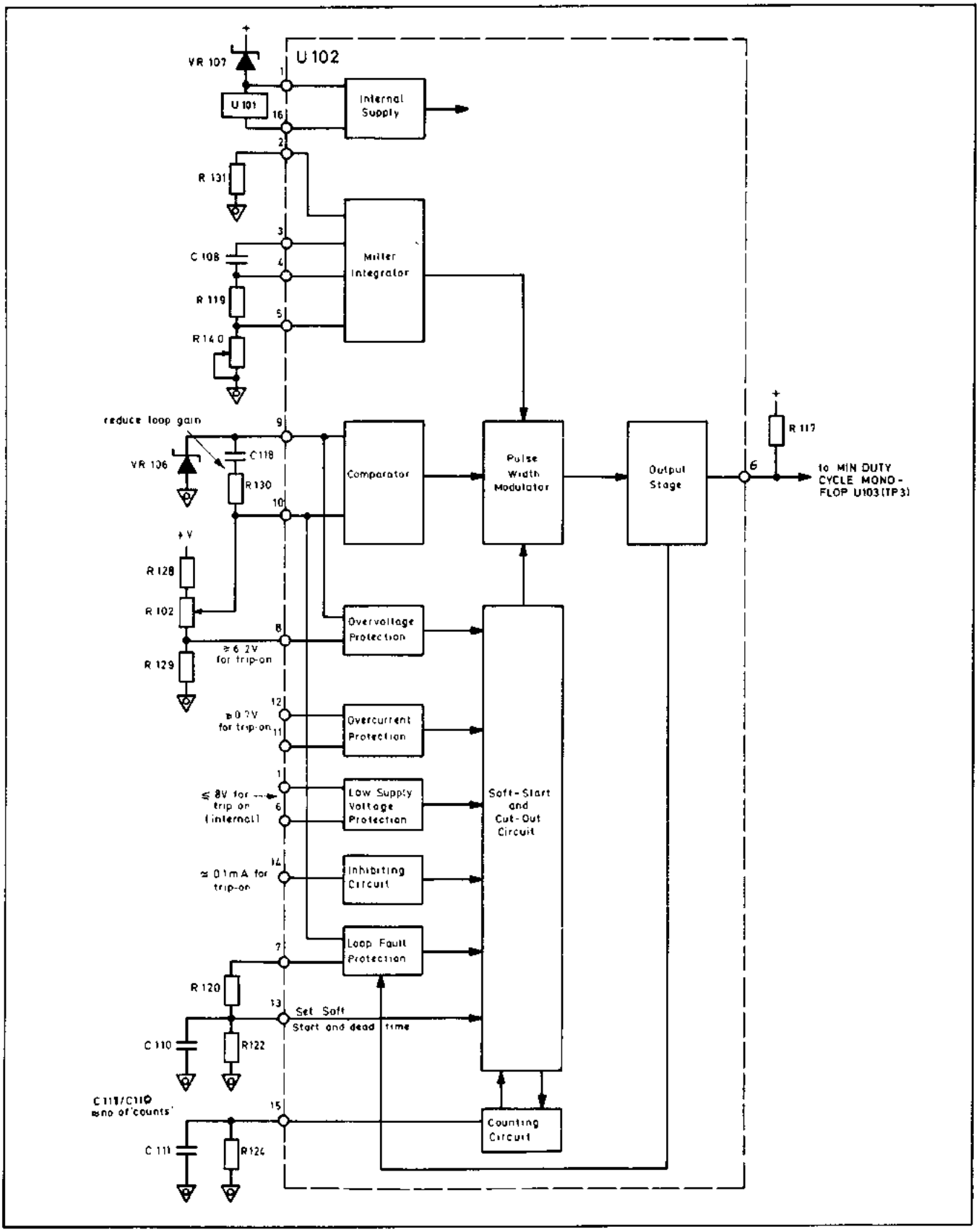


Figure 8–3–1. IC Block Diagram

d) the soft-start and cutout circuit receives the alarm signals from the protection circuits (overvoltage, overcurrent etc.), and subsequently controls the pulse width modulator to achieve soft-start (slowly increasing width) or cutout. R122 and C110 determine the dead time and soft-start time, which both occur after supply start-on or after alarm. During dead time, the operating duty cycle is held to zero and is then slowly increased during soft-start to achieve the required value for normal operation.

e) the number of alarms is limited by the voltage of C111 (TP7). In normal operation this voltage is approximately 1.6 to 1.8 V. After each alarm, this voltage steps up by an amount determined by the ratio C111/C110. When the trip level, 5 V, is reached, a final step to 6.2 V occurs which blocks further operation. This state is called 'final alarm' and to remove this blocking action, the instrument must be switched off for 5 seconds to discharge C111.

f) overcurrent alarm occurs when a voltage of 0.65 → 0.75 V exists between pins 11 and 12 of U102. Overvoltage alarm occurs when ≥ 6.2 V (VR106) is at pin 8. Low supply voltage alarm occurs when ≤ 8 V is at pin 1.
Loop fault protection occurs when the feedback loop is open- or short-circuited. Duty cycle (δ) is then cut to zero, but after the dead time rises to δ_{open} which is determined by R120. It is held at this value until the loop is restored, and then rises with a soft-start up to the operating value. To prevent loop fault during start-on under heavy load, VR109 shifts the feedback voltage on pin 10 to 3.75 V.

g) the output stage consists of a common emitter stage with an open collector end diode-clamped to +12 V. R117 serves as a pull-up resistor.

Alarm circuits

Overcurrent: Current through the switching transistors Q101, Q102 is sensed by R105, R106. The differential stage Q108, Q109 then compares this signal with the voltage determined by voltage divider R126, R139. Overcurrent alarm is sensed by U102 pin 12 at Q108 collector.

Overtemperature: Thermal switch S101 closes when the air temperature reaches 71°C ± 2.5°C and starts an alarm on the overcurrent alarm line.

Overvoltage: The low end of the voltage adjust potentiometer R102 is connected to U102 pin 8 (overvoltage alarm). The slider of R102 must therefore be set slightly above the low end to avoid alarms occuring during normal operation.

Drive current reduction on final alarm: To ensure an infinite final alarm blocking state without damage to the starting circuit (which is supplying the necessary current in this state), it is necessary to reduce the load current drawn by the drive stage (Q101, Q102, → OFF = Q103 → ON). The differential stage Q105, Q106 therefore senses the alarm counting voltage at TP7 (C111, U102 pin 15) and compares it with the reference voltage from VR106, U102 pin 9. Now in normal operation, Darlington transistor Q105 conducts, in which case Q107 and Q110 also conduct to provide the normal drive current, thereby shorting R135. Should final alarm occur, the voltage at TP7 becomes equal to that of VR106 therefore Q105, Q107 and Q110 are cut off. R135 then reduces the steady-state drive current and VR108 enables oscillation-free clipping.

Duty cycle correction

Because U102 delivers a duty cycle from 20 % – 90 % compared with the required 2 % – 45 % for the switching transistors, a correction must be done.

a) **Minimum duty cycle:** the switching signal from U102 pin 6 (TP3) is fed through the minimum duty cycle monostable formed by NOR gates U103 (pins 1, 2, 3) and U103 (pins 11, 12, 13). The unstable on-time is adjustable via R101. In NOR gate U103 (pin 8,9, 10), this time is then subtracted from the original switching signal from U102 to obtain a signal at U103 pin 10 with a duty cycle down to 2 %.

b) **Maximum duty cycle:** the maximum duty cycle is limited by R118, R140, R141, RT101 and adjustable via R140.

Driver stage

The signal at TP4 is inverted by Q104 to control the drive transistor Q103. Q103 then switches the operating feedback voltage of approx. 40 V to the flyback drive transformer T101, whose secondary winding is connected to the base network of switching transistors Q101, Q102. Under this inductive loading, Q103 is protected by C104, R110 and VR105. R134 limits the steady drive current while C103 lowers the impedance to obtain the required current pulses.

The winding polarity of T101 is such that a rising Q103 collector voltage gives a positive base voltage at Q101, Q102, i.e. Q103 is off when Q101, Q102 are on. The winding ratio of primary to secondary at T101 is 10:1.

Switching circuit

Transistors Q101, Q102 are connected in parallel and switch the primary winding of the main flyback transformer T1 to the rectified line voltage of C1, C2. For Q101, Q102, the base network is of special importance in that it provides the base current-pulses essential for such triple-diffused, high voltage transistors. During the transistor on-time, current rises linearly up to 10A so that charging energy in the transformer T1 is given by the equation:

$$E_1 = 1/2\ L_{prim} \times I^2_{peak}$$

where E_1 = energy
L_{prim} = primary inductance
I_{peak} = peak current in T1 primary

and $P_1 = E_1 \times f$

where P_1 = power
f = frequency

(At this point the secondary rectifiers are reverse-biased). With the transistors (Q101, Q102) on, the positive base current I_B charges C117 to $V = I_B \times R_P$ (R_P = parallel resistance of R108, R109) and saturates Q101, Q102 – including the intrinsic collector region. (This region is required to provide the high voltage capability, but must be saturated to give a low saturation voltage).

After switch-on of Q103, the secondary stray inductance of T101, L101, L102 and L103 provides a controlled slow decrease of the base current in Q101, Q102, during storage time. This continues until a negative base current I_B – is achieved which is approximately $-2I_B+$. Meanwhile the intrinsic collector region is fully discharged to ensure that the transistor's breakdown voltage can be achieved and thus reduce power losses. Only when fully discharged, can Q101 and Q102 be cutoff. Because cutoff energy is supplied by the base inductances $L_{S(T101)}$, L101, L102 and L103, a high dI_B / dt down to zero generates a high negative voltage spike which is added to the voltage at C117 and the transformer T101 reverse bias voltage. This brings the Q101, Q102 base-emitter junctions in reverse breakdown to provide the fastest possible cutoff time ($< 0.8\ \mu s$) and so minimize switching losses.

With Q101, Q102 cutoff, the T101 secondary windings become forward biased. Energy is then discharged from the transformer, beginning with a high current (respective to the high primary current at cutoff) and decreasing to zero before the next primary switch-on occurs.

This also explains the high voltage stress of a flyback converter during cutoff – the switching transistors are not only stressed by the rectified line voltage and the back-transformed sum of the secondary voltages, but also by the voltage spike due to the primary stray inductance ($L_S \times dI/dt$). To stay within the safe operating area of Q101, Q102, a collector protection network is required. As the Q101, Q102 collector current decreases, the voltage rise is slowed down by charging capacitor C102 via diodes CR103, CR104. Power switching losses are thus held to a minimum (C102 then discharges through R104; and CR103, CR104 become reverse biased until transistors Q101, Q102 switch on again). The maximum value of this voltage spike at the Q101, Q102 collector is limited by the peak charging of C101 via CR101, CR102. This charging takes place only for the duration of the spike, then C101 is discharged during the rest of the switching period via R103. Should the maximum voltage of this spike exceed 720 V, the zener diodes VR101 to VR104 conduct to provide further clamping.

WARNING

Voltages in the collector network of Q101, Q102 can rise to 750 V, while rectified line can reach 360 V with low impedance. The whole primary area is on floating rectified line ground. Service only with an isolating transformer to avoid danger to life and equipment.

Secondary

The secondary of transformer T1 is well isolated from the primary and contains all windings for the secondary voltages. There is a fixed voltage group referenced to ground, and a floating voltage group referenced to a voltage shifted from ground.

All secondary voltage configurations are identical-consisting of a one-way rectifier with RFI suppression, a charging capacitor, an LC circuit to reduce ripple, and a discharge bleed resistor. As already mentioned, the secondary diodes become forward biased during cutoff of the primary switching transistors. Due to the 25 kHz switching frequency, fast recovery diodes are employed. For the high current handling required in the ± 5 V FX supplies, power Schottky diodes are used to save losses. The charging capacitors are also specially developed for switched mode power supplies – exhibiting low equivalent series resistance.

TROUBLESHOOTING

The power supply is divided into two functional areas:

a) switched supply – the troubleshooting for which is given in this service block.
b) power supply regulator – see Service Block 4.

In case of a power supply fault, measure the voltages at the supply test points and at A10 J1 (switched supply outputs) as given in Table 8–3–1. The fault can thus be traced to the switched supply or the regulator section.

Table 8–3–1. Supply voltages

Voltage TP	A10 J1 pin	A10 J1 voltage
± 20 V fx	8/3	⩾ 24 V
± 20 V fl	14/11	⩾ 24 V
± 5 V fx	6,7/4,5	⩾ 6.6 V
± 5 V fl	13/12	⩾ 7.6 V

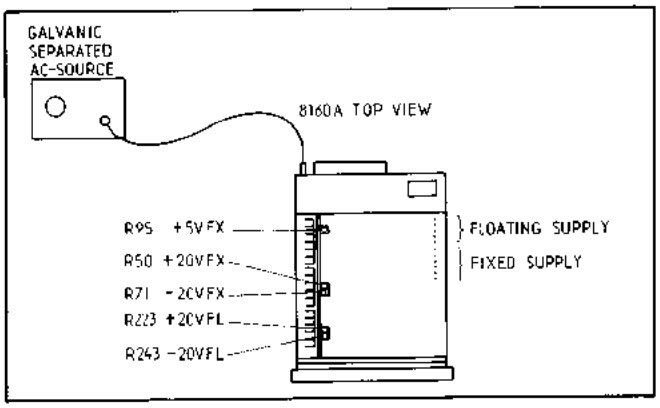


Figure 8–3–2. Test Setup

Should a fault be isolated to the switched supply, the theory of operation should be read and understood before proceeding with troubleshooting in this area.

WARNING

Troubleshooting and adjustments within the switched supply area MUST ONLY be undertaken with a variable ac source with galvanic separation. Depending on the power plug connection (either line or neutral can be connected to floating ground ⏚), voltages can be dangerous to life, therefore operate with extreme care in this area.

The switched supply consists of 3 main blocks:

a) power input (filter board A13 and mother board A10)
b) switching regulator A11
c) rectifier board A12

If only +5 V fx or −5 V fx is at fault, check fuses F201/F202 on board A12.

A10 TROUBLESHOOTING

If one or all voltages, as given in Table 8−3−1, are at fault, use the following procedure to troubleshoot board A10.

PROCEDURE

1. After ensuring that no power is applied, remove the 3 chassis screws above the switched supply and pull the supply out of the frame as shown in Figure 8−3−3.
2. Remove rectifier board A12 as shown in Figure 8−3−4
3. Apply power to the switched supply.
4. Using a DVM with floating inputs, measure voltages between TP12 (floating ground of switched supply) and corresponding A10 test points, as shown in Figure 8−3−5.

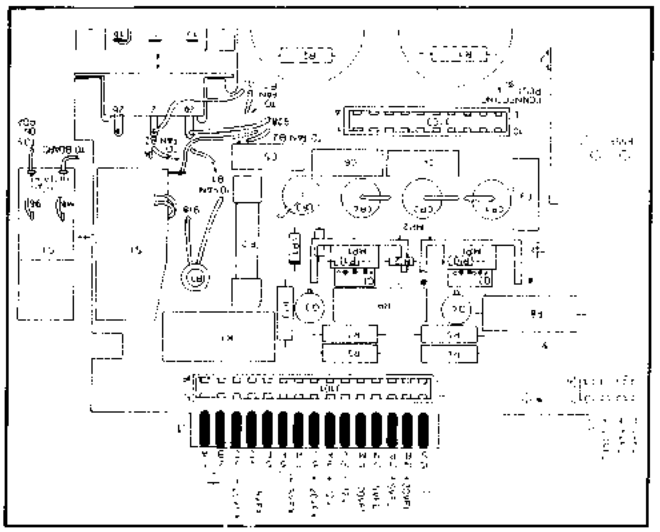


Figure 8−3−5. A10 Checkpoints

5. 'Power input' test at A10 TP1 should lie between 245 V and 335 V depending on line voltage. If faulty check fuse F2, rectifier and spark-gap.
6. 'Start voltage' test at A10 TP2 should lie between 35.5 V and 36.8 V depending on line voltage. If fault check fuse F3 and Q1−Q4.

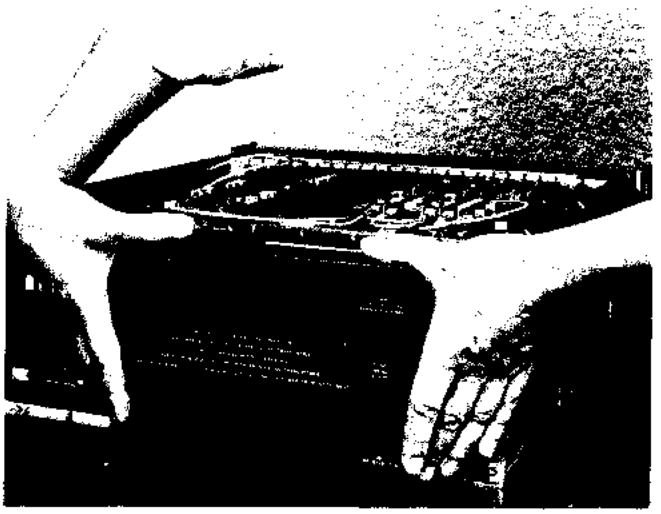


Figure 8−3−3. Power Supply Removal

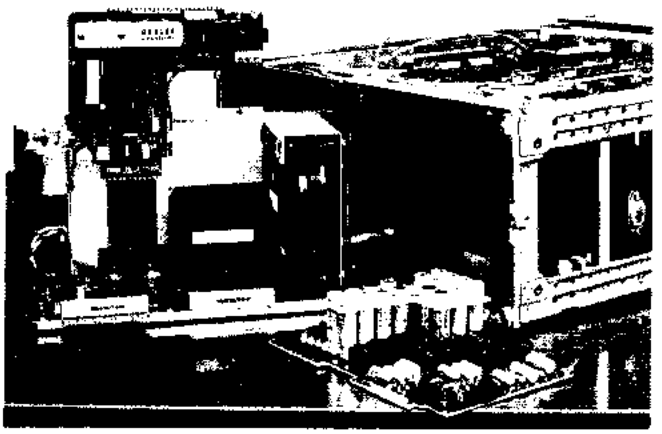


Figure 8−3−4. A12 Removal

A11 TROUBLESHOOTING

Should the fault be definitely isolated to board A11 or if a min duty cycle adjust has to be performed, use the following procedure.

NOTE: Troubleshooting on board A11 can be carried out using a normal 15-pin extender board, or with the special extender board 08160–66577.

1. Using a 6200B power supply, set its voltage to +40 V, connecting the negative pole to TP8 and the positive pole to the junction of CR108/CR109 anode (see Figure 8–3–8). Leave R137 connected via the cable or connect an external resistor with the same value.
2. Using a scope and 10:1 probe, measure following signals given in Figures 8–3–6 and 8–3–7.
3. Check the voltage at TP7. During normal operation it will be +1.6 V to +1.8 V dc. With probe left connected at TP7, reduce 6200B voltage to 27 V – 30 V. Voltage should rise up to +6.2 V (low–voltage alarm).
4. Set 6200B voltage back to 40 V. Turn it off and on again. TP7 voltage should be back to normal (+1.6 V to +1.8 V).
5. Increase 6200B voltage to 45 V – 50 V. TP7 voltage must increase to 6.2 V (overvoltage alarm).
6. Repeat step 4.
7. To test overcurrent alarm, apply a voltage of .5 V to TP6. Increase voltage until overcurrent alarm occurs.
8. Repeat step 4.
9. To test overheat function of S101, heat up housing of S101 to 75°C → 120°C. Overtemperature alarm must occur.
10. When temperature of S101 is back to normal, repeat step 4.
11. Voltage across R135 is less than .2 V in normal operating mode, and in any alarm mode it will increase to 2 V less than the supply voltage.

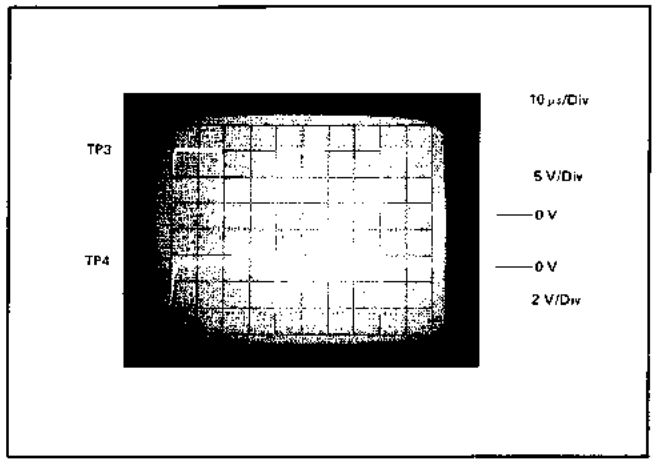


Figure 8–3–6. Waveforms

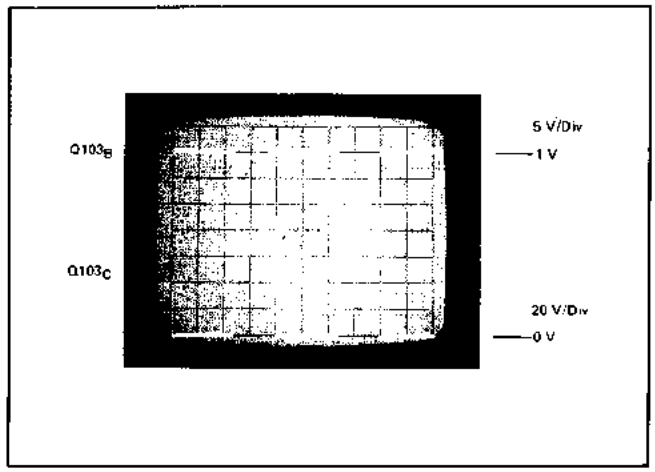


Figure 8–3–7. Waveforms

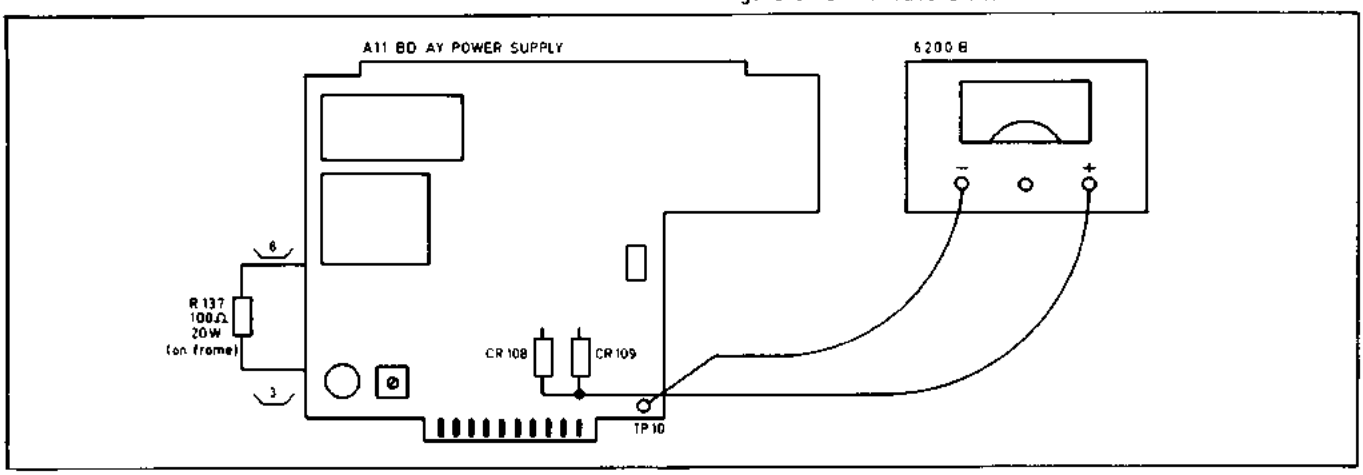


Figure 8–3–8. A11 Troubleshooting Setup

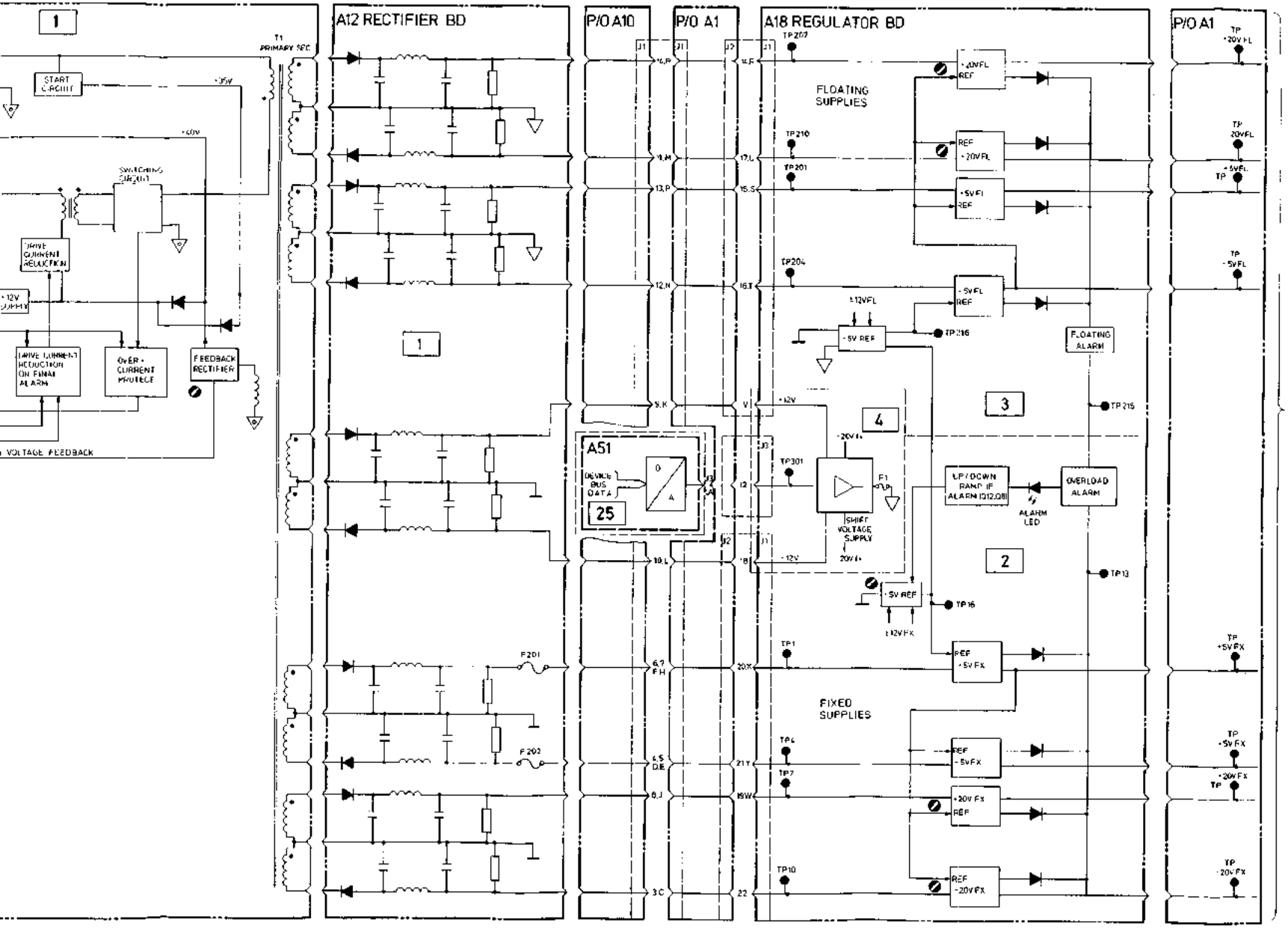
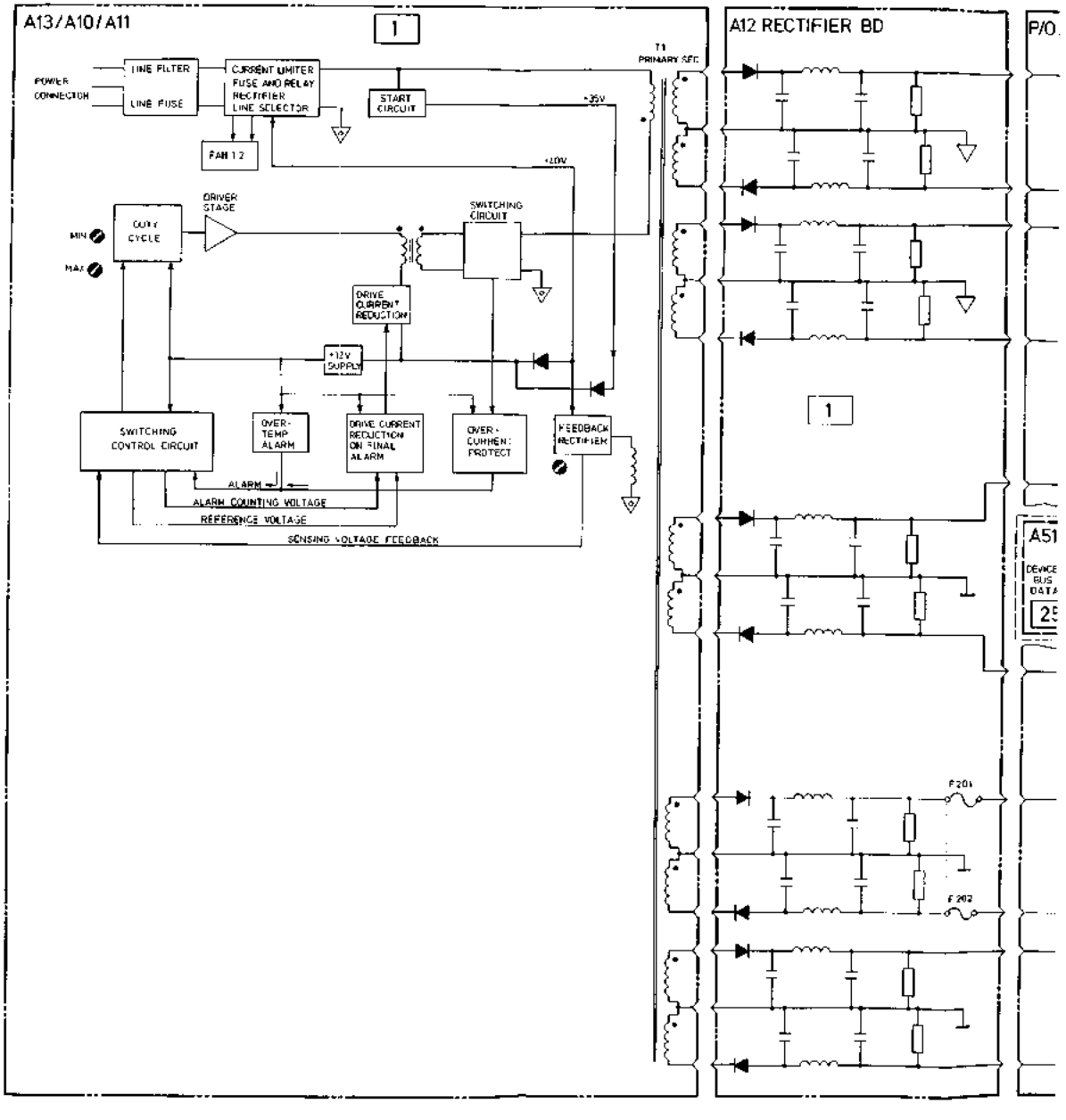
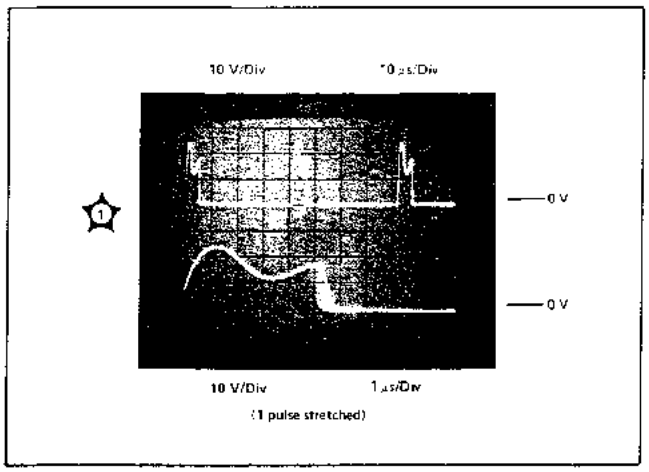
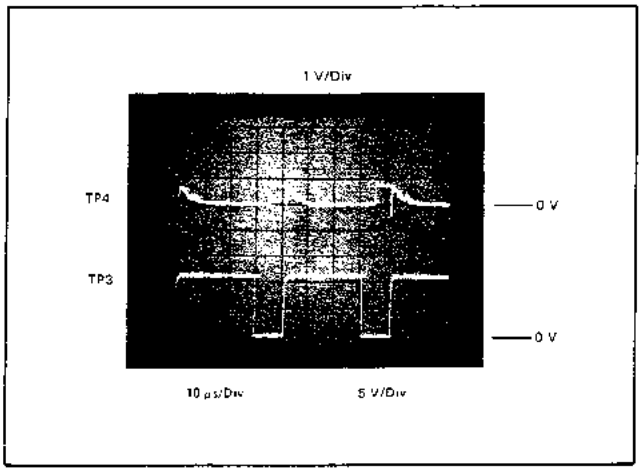
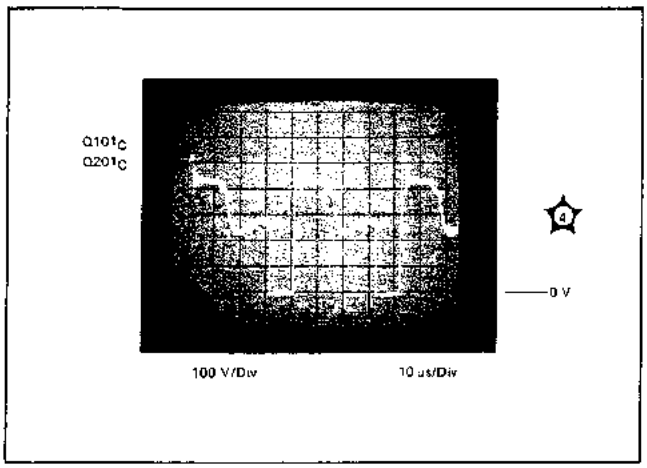


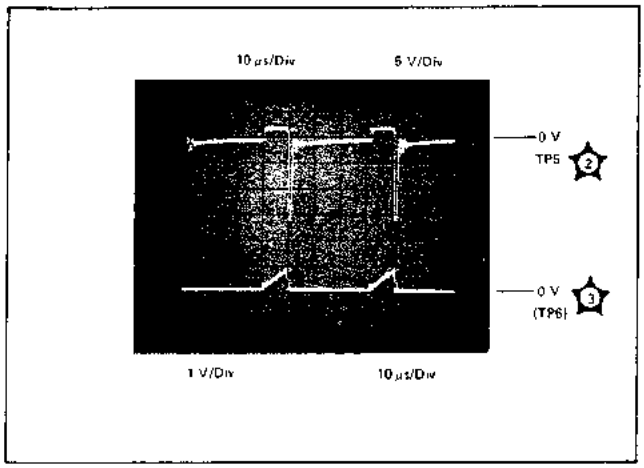
Figure 8-3 9. Power Supply Block Diagram

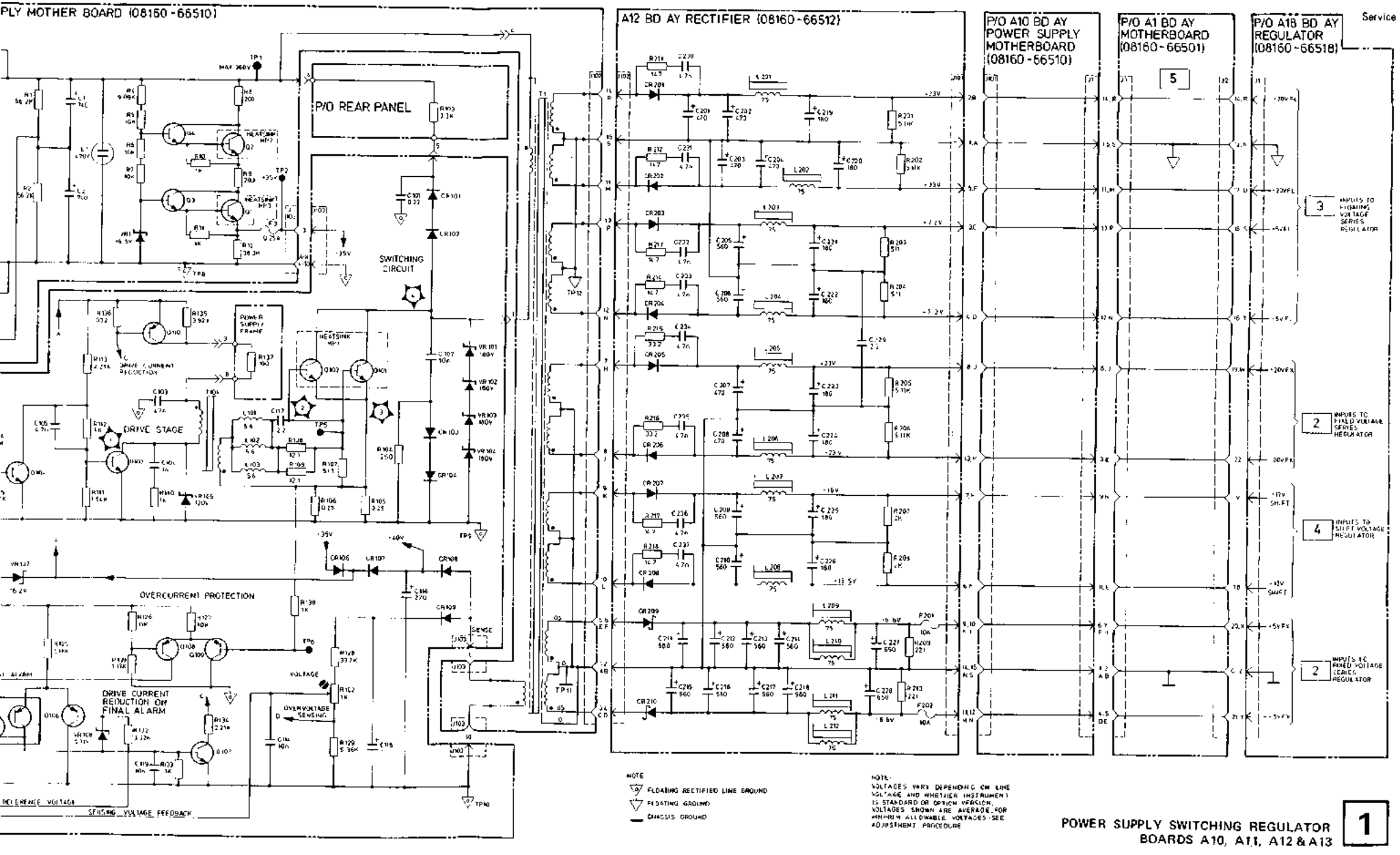

A13/A10/A11
1
POWER CONNECTION
LINE FILTER
LINE FUSE
CURRENT LIMITER FUSE AND RELAY RECTIFIER LINE SELECTOR
START CIRCUIT
+35V
+20V
FAN 12
T1 PRIMARY SEC
DRIVER STAGE
DUTY CYCLE
MIN
MAX
SWITCHING CIRCUIT
DRIVE CURRENT REDUCTION
+12V SUPPLY
SWITCHING CONTROL CIRCUIT
OVER-TEMP ALARM
DRIVE CURRENT REDUCTION ON FINAL ALARM
OVER-CURRENT PROTECT
FEEDBACK RECTIFIER
ALARM
ALARM COUNTING VOLTAGE
REFERENCE VOLTAGE
SENSING VOLTAGE FEEDBACK
A12 RECTIFIER BD
1
F201
F202
P/O
A51


10 V/Div
1 µs/Div
1
0 V
0 V
10 V/Div
1 µs/Div
(1 pulse stretched)

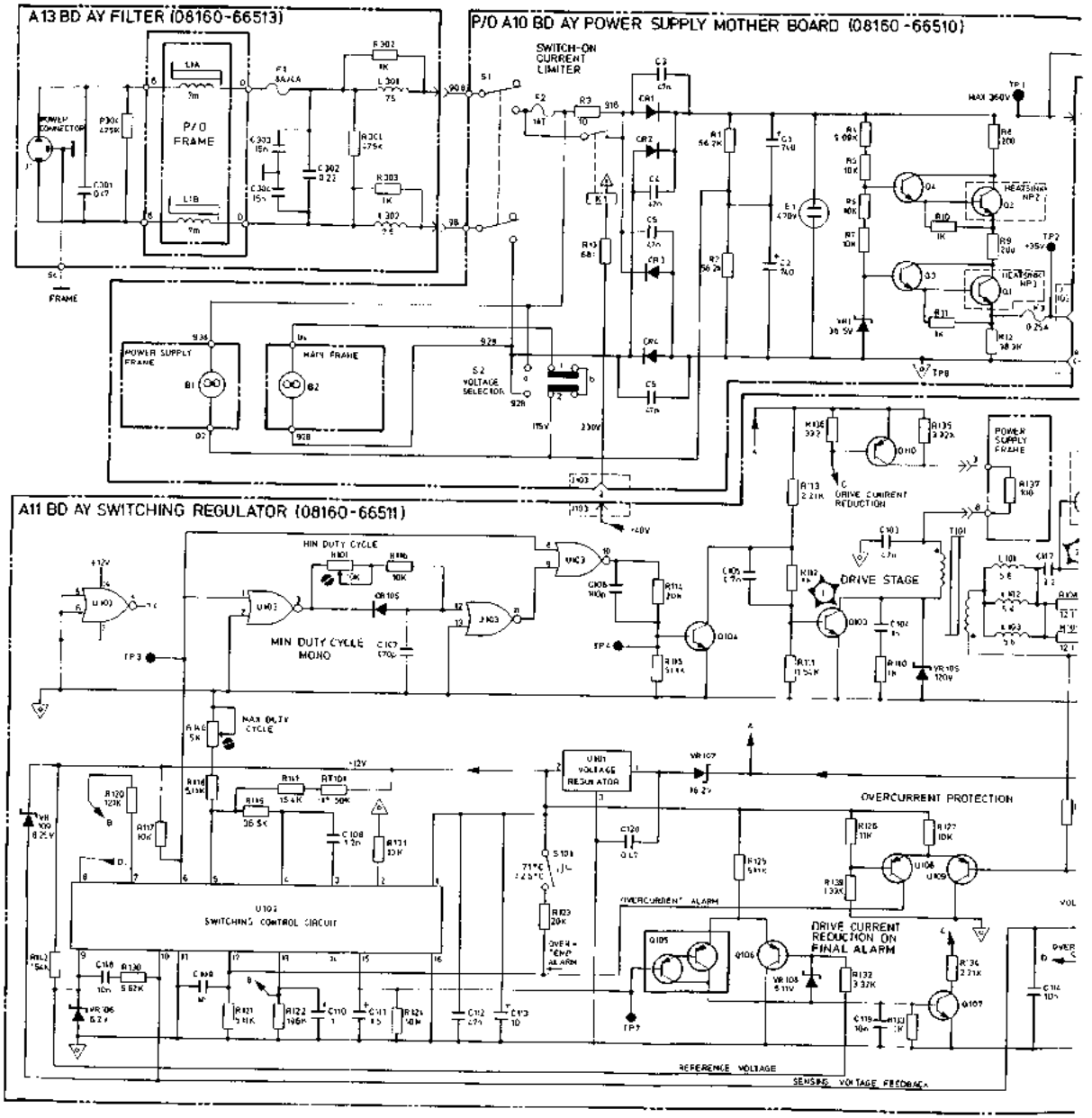

1 V/Div
TP4
TP3
0 V
0 V
10 µs/Div
5 V/Div

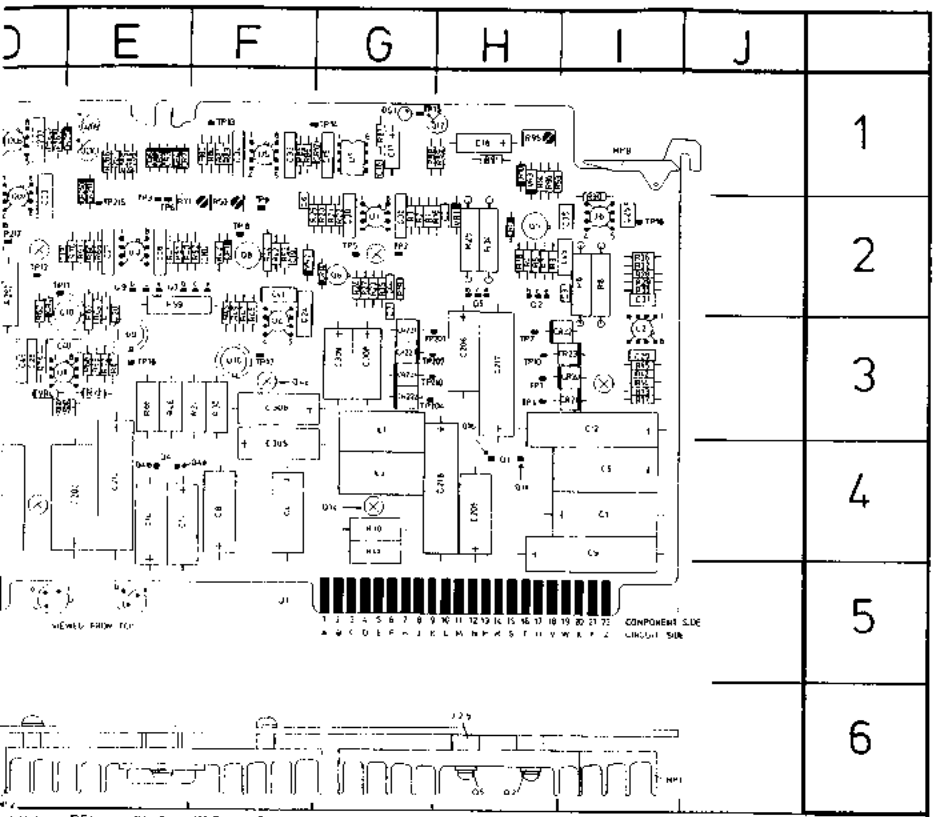

Q101C
Q201C
4
0 V
100 V/Div
10 µs/Div


10 µs/Div
5 V/Div
0 V
TP5
2
0 V
(TP6)
3
1 V/Div
10 µs/Div



POWER SUPPLY SWITCHING REGULATOR BOARDS A10, A11, A12 & A13 **1**

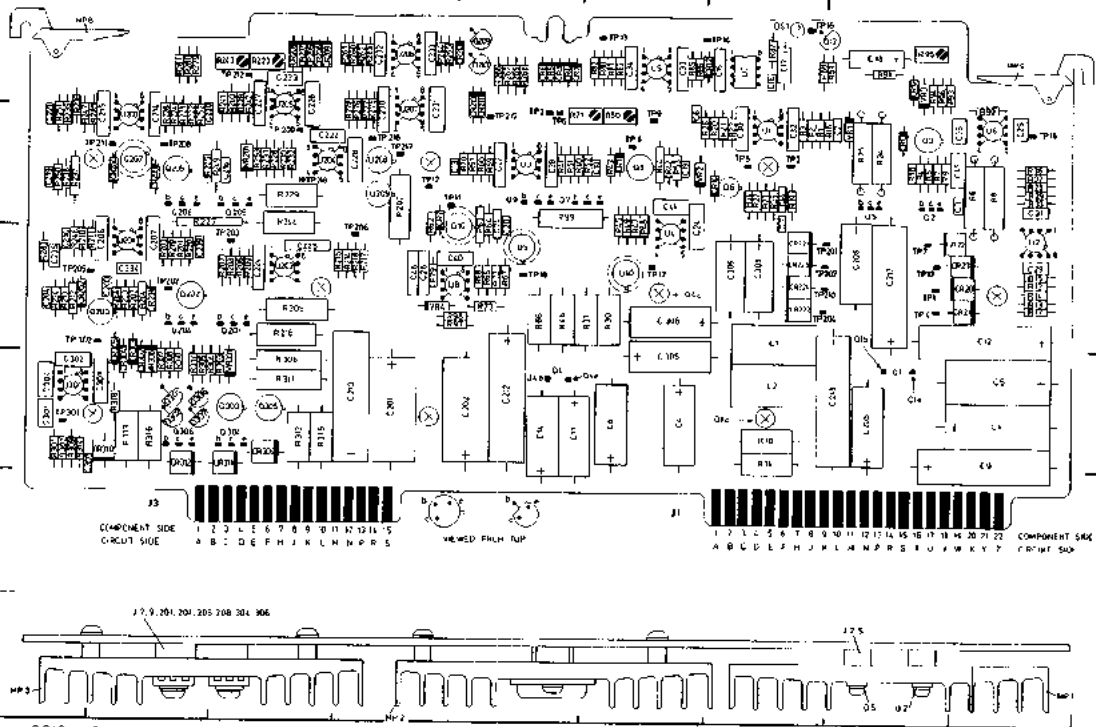

A13 BD AY FILTER (08160-66513)
P/O A10 BD AY POWER SUPPLY MOTHER BOARD (08160-66510)
SWITCH-ON CURRENT LIMITER
P/O FRAME
FRAME
POWER SUPPLY FRAME
MAIN FRAME
S2 VOLTAGE SELECTOR
115V
230V
HEATSINK NP1
HEATSINK NP2
A11 BD AY SWITCHING REGULATOR (08160-66511)
MIN DUTY CYCLE
MIN DUTY CYCLE MONO
MAX DUTY CYCLE
DRIVE STAGE
DRIVE CURRENT REDUCTION
U101 VOLTAGE REGULATOR
U102 SWITCHING CONTROL CIRCUIT
OVERCURRENT PROTECTION
OVERCURRENT ALARM
OVER-TEMP ALARM
DRIVE CURRENT REDUCTION FINAL ALARM
REFERENCE VOLTAGE
SENSING VOLTAGE FEEDBACK



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
R62	D3	R238	A2	TP18	E3
R63	E3	R239	C2	TP201	H3
R64	E3	R240	C2	TP202	B3
R65	E3	R241	C2	TP203	C3
R66	E3	R242	C2	TP204	H3
R67	E3	R243	C1	TP205	A3
R68	E3	R244	C3	TP206	D3
R69	E2	R246	A3	TP207	H3
R70	E2	R247	B2	TP208	B2
R71	F2	R249	C2	TP209	C2
R72	E3	R250	A2	TP210	H3
R73	E3	R251	A2	TP211	B2
R74	E3	R252	B2	TP212	C1
R79	D3	R253	C2	TP215	E2
R80	F1	R260	D1	TP216	D2
R81	F1	R261	D1	TP217	D2
R82	F1	R262	D1	TP218	C2
R83	F1	R263	D1	TP302	A3
R84	F1	R264	D1	U1	G2
R85	F1	R265	D1	U2	I3
R86	G1	R266	E1	U3	E2
R87	H1	R267	E1	U4	F3
R88	H1	R268	E1	U5	F1
R89	I1	R269	E1	U6	I2
R90	H1	R275	D2	U7	G1
R91	H1	R276	D2	U8	E3
R93	H1	R277	D2	U9	E3
R94	H1	R278	D2	U10	F3
R95	H1	R279	B1	U201	B3
R96	E3	R280	B1	U202	C3
R97	E3	R281	B1	U203	B2
R98	E2	R282	D2	U204	C2
R99	B3	R283	D3	U205	C2
R201	B3	R284	B3	U206	D1
R202	B3	R285	B2	U207	D2
R203	B3	R301	A4	U208	D2
R204	C3	R302	A4	U209	D2
R205	C3	R303	C4	U301	A4
R206	C3	R304	C4	VR1	H2
R207	C3	R305	B4	VR2	F2
R208	C3	R306	C4	VR3	H1
R209	A3	R307	B4	VR4	D3
R210	B3	R308	B4	VR201	C2
R211	A3	R309	A4	VR301	C4
R212	A3	R310	B4	VR306	B4
R213	D3	R311	C4		
R214	D3	R312	C4		
R215	C3	R313	B4		
R216	D3	R314	A4		
R217	D3	R315	C4		
R218	B3	R316	B4		
R219	B3	R317	B4		
R220	B2	R318	B4		
R221	B2	TP1	H3		
R222	C1	TP2	G2		
R223	B2	TP3	E2		
R224	C2	TP4	H3		
R225	B2	TP5	G2		
R226	C3	TP6	E2		
R227	C2	TP7	H3		
R228	C2	TP8	F2		
R229	C2	TP9	F2		
R230	C2	TP10	H3		
R231	C2	TP11	D2		
R232	C2	TP12	D2		
R233	B3	TP13	F1		
R234	A3	TP14	G1		
R235	A2	TP15	G1		
R236	A2	TP16	I2		
R237	A2	TP17	F3		

GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
B3	CR7	E1	CR209	C1	L1	G3	Q203	B3	R2	G2	R19	G2	R36	I2
A3	CR10	I1	CR210	E2	I2	G4	Q204	B3	R3	G2	R20	G2	R40	E2
A4	CR12	G2	CR211	E2	MP8	A1	Q205	C2	R4	H2	R21	G2	R41	F2
A4	CR13	H2	CR213	G3	MP9	I1	Q206	B2	R5	H2	R22	G2	R42	F2
B4	CR14	G2	CR221	G3	Q1	H4	Q207	B2	R6	I2	R23	G2	R43	F2
A4	CR20	I3	CR222	G3	Q2	H2	Q208	B2	R7	H2	R24	G2	R44	F2
F4	CR21	I3	CR223	G3	Q3	H2	Q209	E1	R8	I2	R25	H2	R45	F2
F3	CR22	I3	CR224	G3	Q4	E4	Q210	E1	R9	H2	R26	G2	R46	E3
B4	CR23	I3	CR302	B4	Q5	H2	Q301	B4	R10	G4	R27	G2	R47	F2
G3	CR201	B3	CR303	B4	Q6	G2	Q302	B4	R11	G4	R28	I2	R48	F2
G3	CR202	B3	CR304	B4	Q7	F2	Q303	C4	R12	I3	R29	I2	R49	F2
F2	CR203	B2	CR305	B4	Q8	F2	Q304	C4	R13	I3	R30	F3	R50	F2
E2	CR204	B2	CR309	C4	Q9	E2	Q305	C4	R14	I3	R31	F3	R51	E2
E1	CR205	C1	CR310	B4	Q10	E3	Q306	B4	R15	I3	R32	I2	R52	F2
E1	CR206	C1	CR311	C4	Q12	G1	Q307	B4	R16	H2	R33	I2	R53	F2
E1	CR207	C1	CR312	B4	Q201	C3	Q308	B4	R17	I3	R34	H2	R60	E2
E1	CR208	C1	DS1	G1	Q202	B3	R1	G2	R18	H2	R35	G2	R61	E2

A18 BD AY REGULATOR (08160-66518)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	I4	C18	H1	C44	G2	C216	C2	C234	B3	CR7	E1	CR209	C1	L1	G3	Q203	B3	R2	G2	R19	G2	R36	I2
C2	H2	C19	F2	C46	I2	C217	H3	C235	A3	CR10	H1	CR210	E2	L2	G4	Q204	B3	R3	G2	R20	G2	R40	E2
C3	I2	C20	E3	C46	D3	C218	H4	C301	A4	CR12	G2	CR211	E2	MP8	A1	Q205	C2	R4	H2	R21	G2	R41	E2
C4	F4	C24	F2	C201	D4	C219	A2	C302	A4	CR13	I2	CR213	G3	MP9	I1	Q206	B2	R5	H2	R22	G2	R42	F2
C5	I4	C25	I2	C202	F4	C220	C2	C303	B4	CR14	G2	CR221	G3	Q1	H4	Q207	B2	R6	I2	R23	G2	R43	F2
C6	F2	C26	D3	C203	B3	C221	A2	C304	A4	CR20	I3	CR222	G3	Q2	H2	Q208	B2	R7	H2	R24	G2	R44	F2
C7	G2	C27	E2	C204	A3	C222	C2	C305	F4	CR21	I3	CR223	G3	Q3	H2	Q209	D1	R8	I2	R25	H2	R45	F2
C8	F4	C28	E2	C205	H4	C223	C1	C306	F3	CR22	I3	CR224	G3	Q4	E4	Q210	E1	R9	H2	R26	G2	R46	E3
C9	I4	C29	I3	C206	F3	C224	C3	C307	B4	CR23	I3	CR302	B4	Q5	J12	Q301	D4	R10	G4	R27	G2	R47	F2
C10	F2	C30	G2	C207	B3	C225	C3	C308	G3	CR201	B3	CR303	B4	Q6	G2	Q302	B4	R11	G4	R28	I2	R48	F2
C11	F4	C31	I2	C208	B3	C226	C2	C309	G3	CR202	B3	CR304	B4	Q7	F2	Q303	C4	R12	I3	R29	I2	R49	F2
C12	I1	C32	G2	C209	B3	C227	C2	CR1	F2	CR203	B2	CR305	B4	Q8	F2	Q304	C4	R13	I3	R30	F3	R50	F2
C13	E2	C33	F1	C210	A3	C228	D2	CR2	E2	CR204	B2	CR309	C4	Q9	E2	Q305	C1	R14	I3	R31	F3	R51	E2
C14	E4	C34	F1	C212	E4	C230	D2	CR3	E1	CR205	C1	CR310	B4	Q10	F3	Q306	B4	R15	I3	R32	I2	R52	F2
C15	G1	C35	I2	C213	D4	C231	D2	CR4	E1	CR206	C1	CR311	C4	D12	G1	Q307	B4	R16	H2	R33	I2	R53	F2
C16	G1	C40	E3	C214	B2	C232	D1	CR5	E1	CR207	C1	CR312	B4	Q201	C3	Q308	B4	R17	I3	R34	H2	R60	E2
C17	G1	C41	F2	C215	B2	C233	D1	CR6	E1	CR208	C1	DS1	G1	Q202	B3	R1	G2	R18	H2	R35	G2	R61	E2

SERVICE BLOCK 4
POWER SUPPLY SERIAL REGULATOR A18 2 3

THEORY OF OPERATION

The serial regulator comprises 3 regulator blocks, whereby 2 consist of 4 different voltage regulators.

The blocks are:
1. Fixed voltage supply
2. Floating voltage supply
3. Shift voltage supply (see SERVICE BLOCK 5)

(A complete functional block diagram is given in Figure 8–3–9).

Fixed voltage supply

This block provides 4 regulated votlages related to fixed ground. All 4 regulators are based on the same principle, a functional diagram of which is given in Figure 8–4–1.

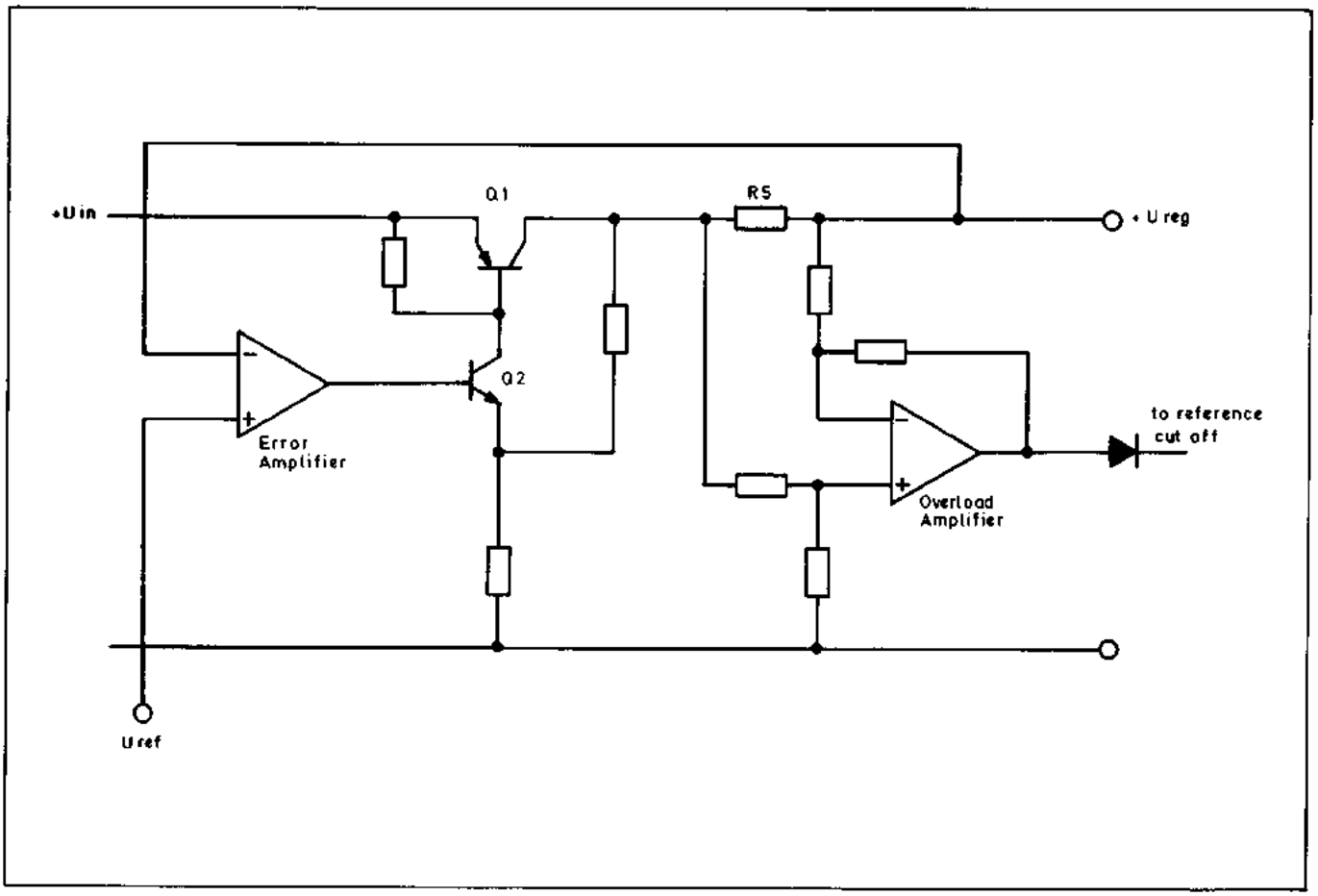


Figure 8–4–1. Principle of fixed voltage regulator

The error amplifier compares Ureg with Uref and drives the regulator transistor Q1 to zero difference. Excessive output current is then detected by Rs and the overload amplifier, the output of which goes high if an overload occurs.

Reference voltage circuit

Reference voltage for the +5 V fixed supply is derived from temperature compensating Zener diode A18 VR3. The Zener voltage is divided via A18 R94, R95 and R96 to exactly +5 V for reference, and then converted via A18 U6 to low output impedance.

To obtain good tracking, the +5 V fixed regulator output is used as reference input for the −5 V fixed supply, the −5 V fixed regulator output then being used as reference input for the ± 20 V fixed supplies.

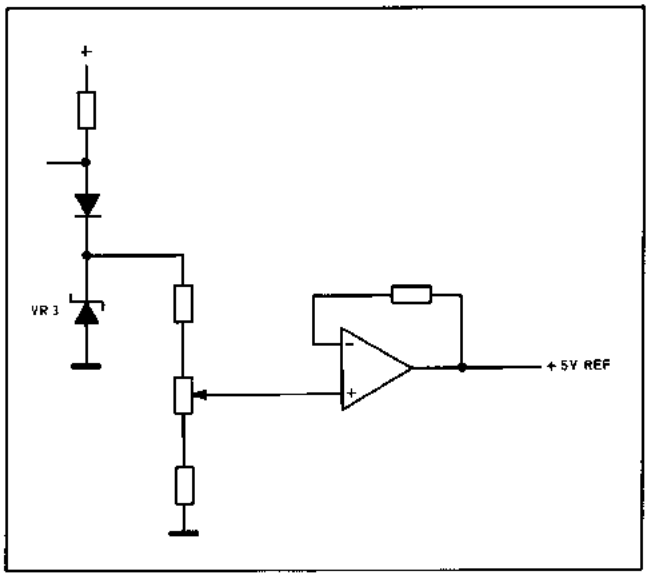


Figure 8−4−2. +5 V Reference

Reference shutdown circuit

An overload signal from an overload amplifier cuts off diode A18 CR7 and the inverting input of U5 goes high. The output of U5 goes down and triggers the Timer. The Timer then drives Q12, which shorts the reference voltage, causing all regulated voltages to go down. This status is indicated by the illuminated LED DS1. After a run-down time determined by the time constant of R87 and C17, the timer output goes down and cuts off Q12. If the overload still exists, the whole procedure starts again.

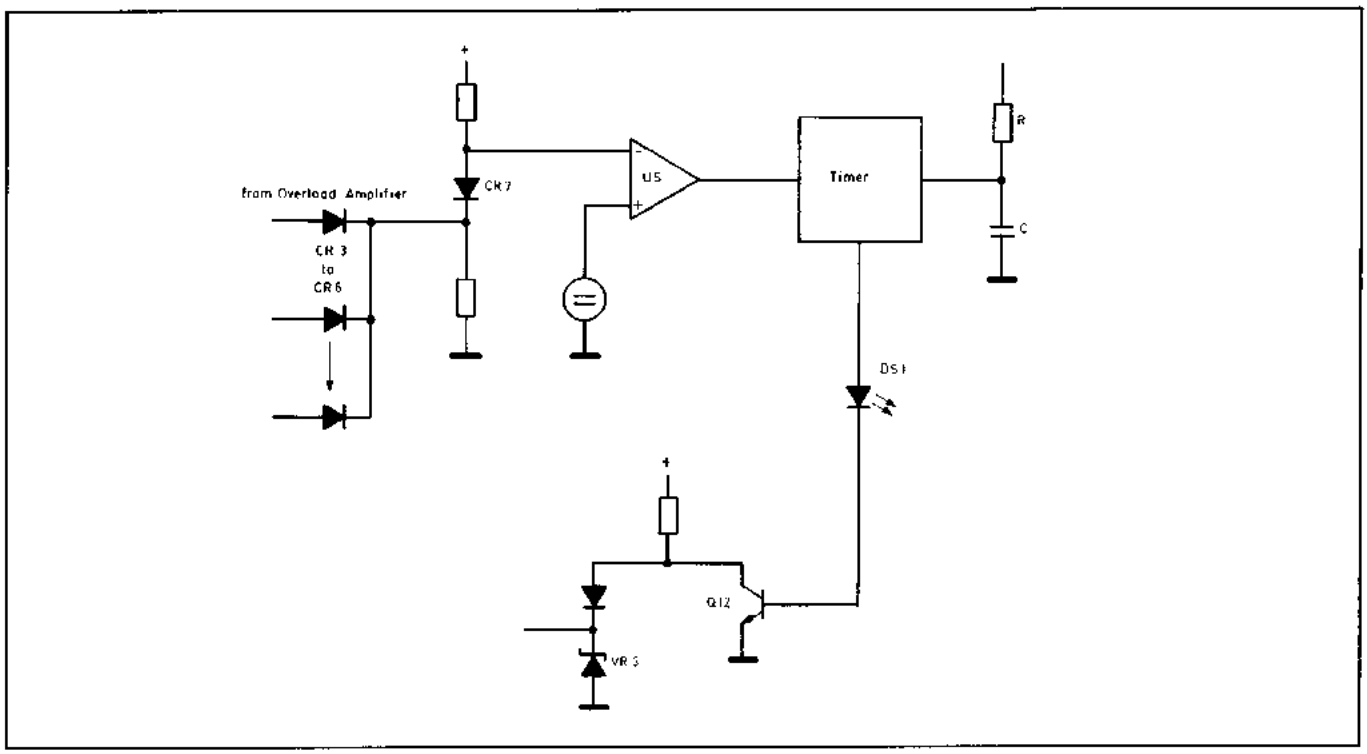


Figure 8−4−3. Reference shutdown circuit.

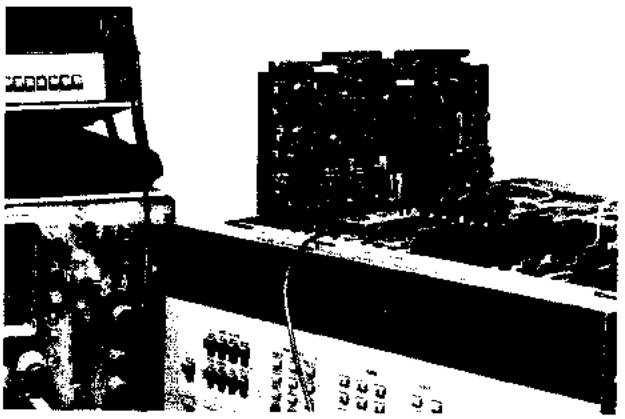
Floating voltage supply

All 4 floating voltage circuits are based on the same principle as the fixed voltage circuits, with the difference that the floating voltages are related to floating ground.

TROUBLESHOOTING

Two basic faults can appear in this section:

a) no voltage or overvoltage caused by a faulty supply.
b) excessive current caused by one of the power consuming boards.



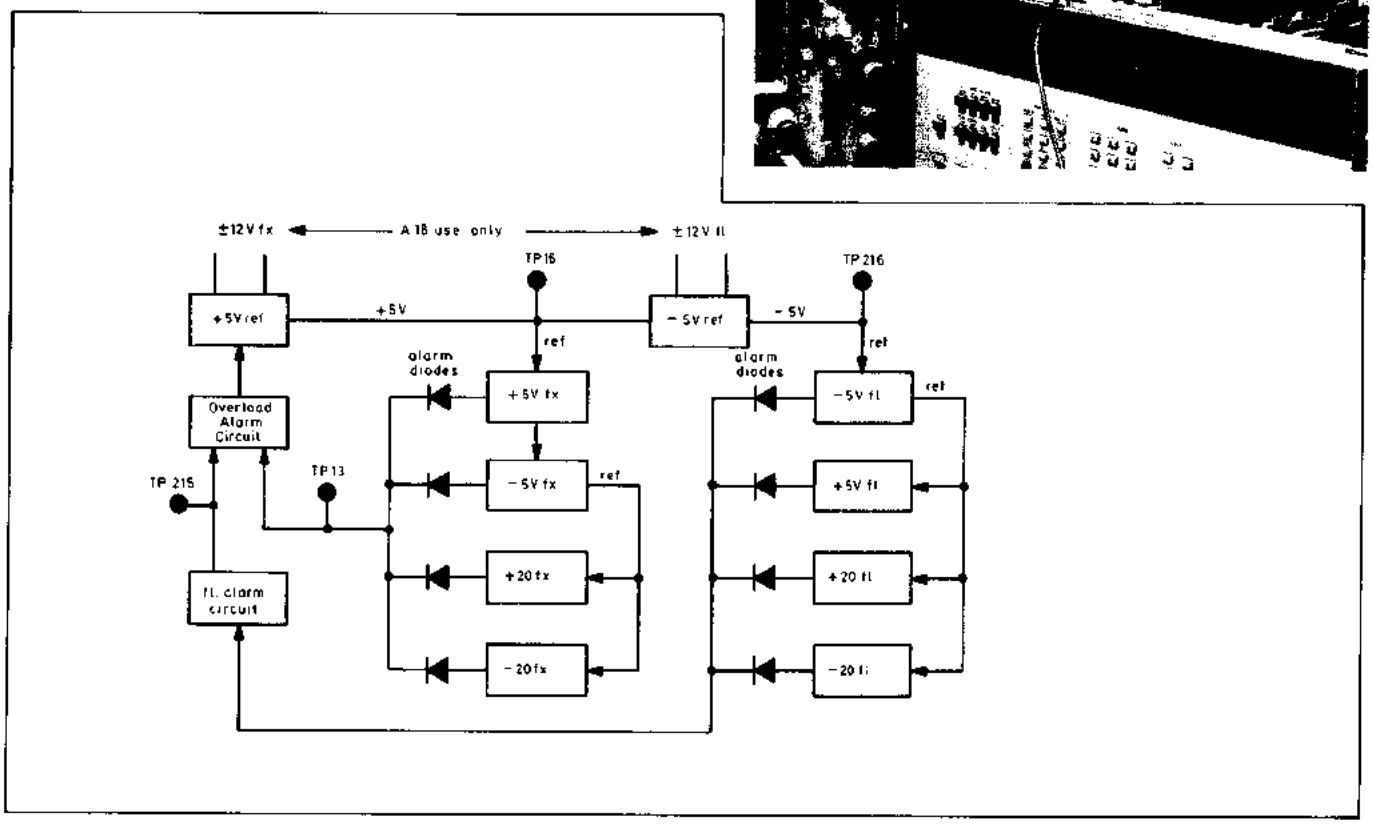


Figure 8–4–4. Supply reference voltages

If the ALARM LED (DS1) on A18 is not flashing, but one of the supplies is at fault, simply troubleshoot the respective supply. (**NOTE:** each supply has a reference voltage – see Figure 8–4–4).

If the ALARM LED is flashing, this indicates excessive current caused by a supply overvoltage or a short in one of the power consuming boards. First trace the fault to the fx supplies or fl supplies by measuring at TP13 and TP215 (see Figure 8–4–4). Then measure which of the alarm diodes has transferred the alarm (see Figure 8–4–4).

Having determined the faulty supply, locate the fault source by pulling out each board in turn starting with the output amplifier.

NOTES:
1. A short in one of the supplies generates narrow pulses, thus the 8160A display remains dark. Excessive current causes wider pulses and the display may blink.
2. Should a stable reference be required for troubleshooting, remove transistor Q12 from its socket, and isolate the faulty supply output pin to avoid damage.

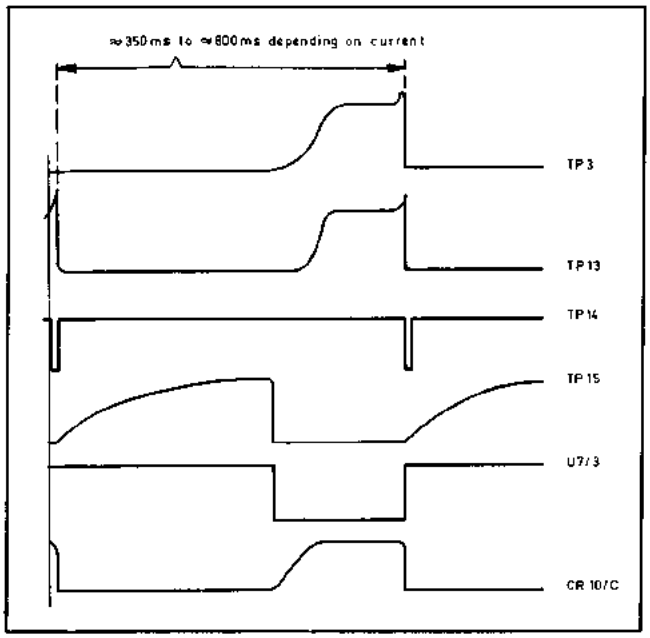


Figure 8–4–5. Excessive current of +5 V fx supply

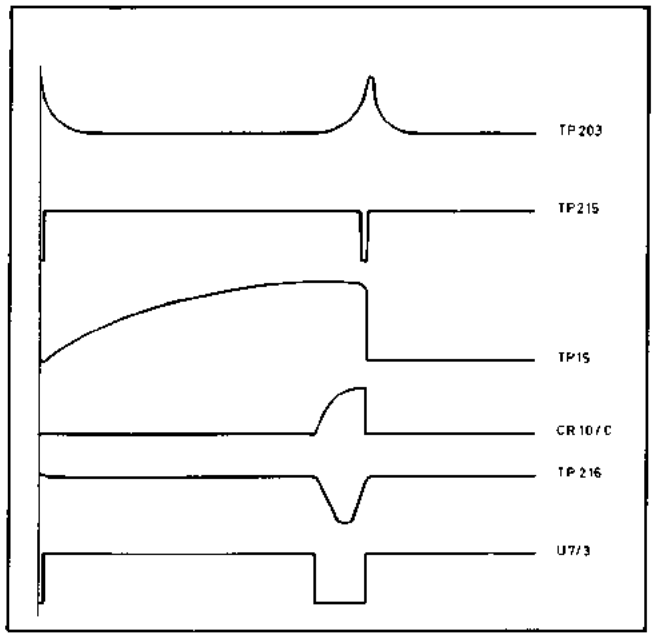


Figure 8–4–6. Excessive current of +5 V fl supply

Using the Model 3465B DVM with low terminal connected to ground, the approximate resistance and current of individual boards can be measured as given in Table 8–4–1. (The values given in Table 8–4–1 for board A2 are when PROM's are installed in the 8160A. Should ROM's be installed, the current will be slightly decreased).

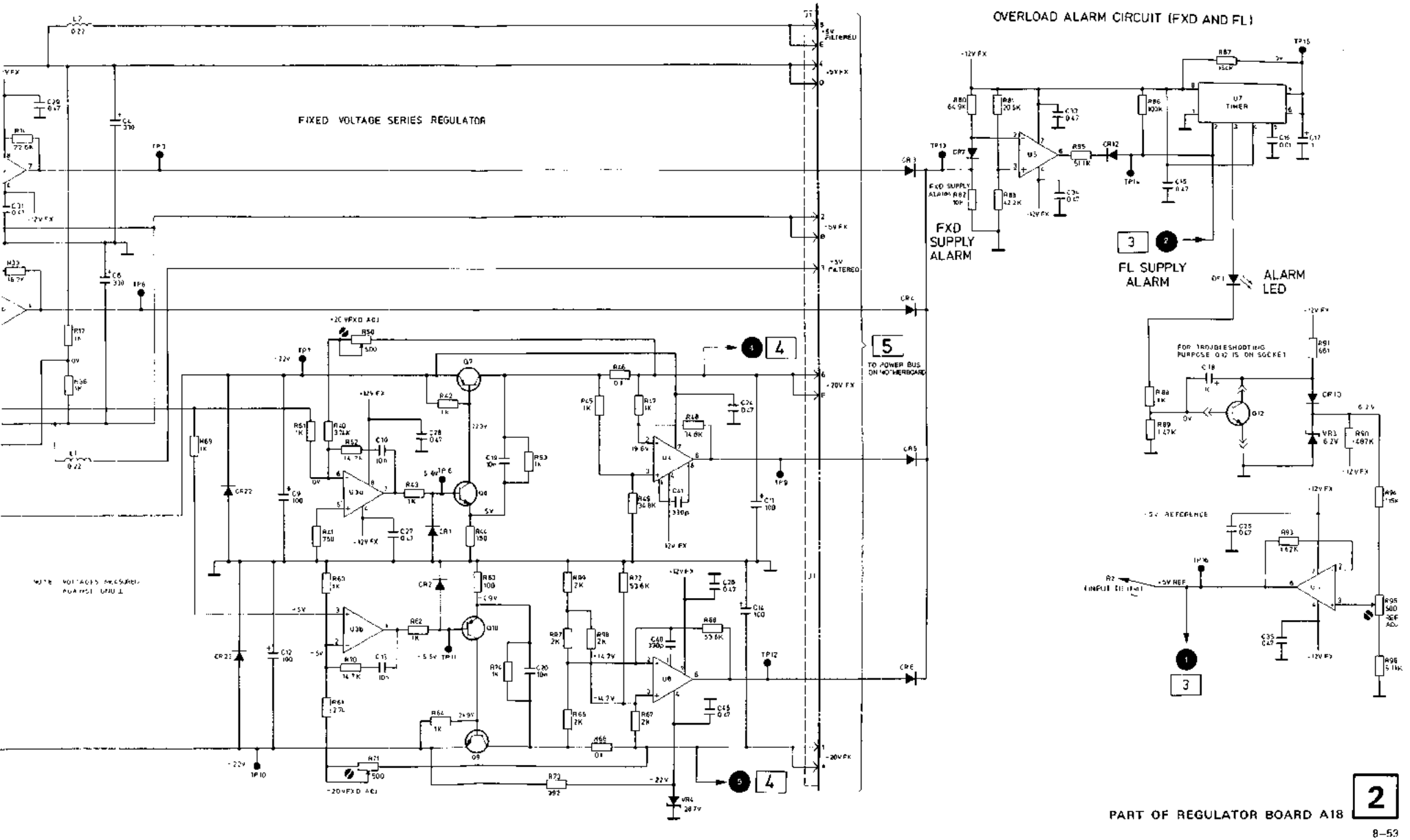
Table 8–4–1. Board Resistance / Current

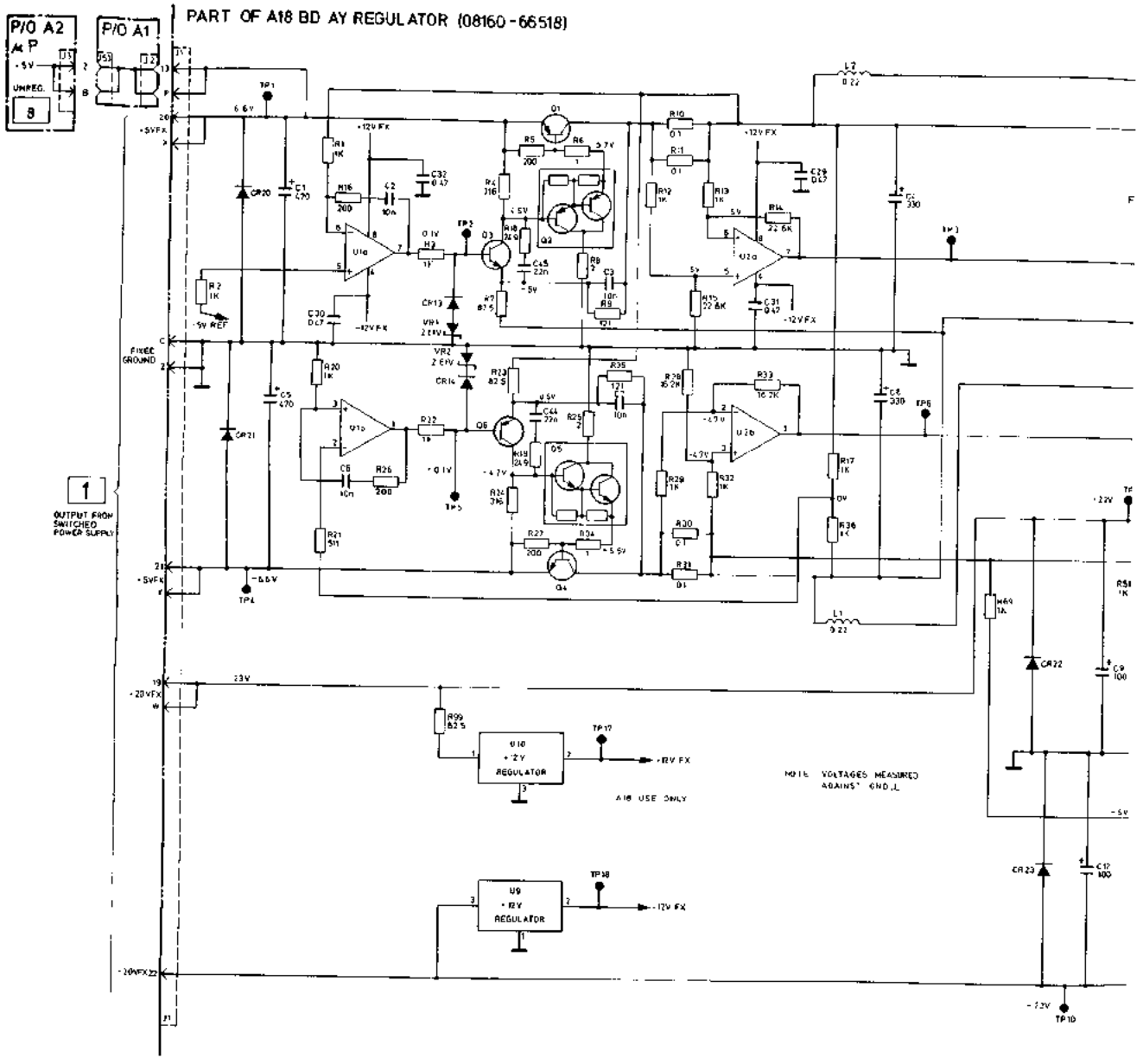
Board	+5 V fx	–5 V fx	+20 V fx	–20 V fx	+5 V fl	–5 V fl	+20 V fl	–20 V fl
A2	⩾670 Ω	–	⩾8 K	–				
A2, A3, A4	⩾240 Ω 2.4 A	240 mA	380 mA					
A20	⩾1 MΩ 150 mA	⩾1 MΩ 450 mA						
A23	⩾13 KΩ 13 KΩ 185 mA	⩾470 Ω/ 59 Ω 680 mA	⩾74 KΩ 75 mA	⩾35 KΩ 260 mA				
A126	⩾2.1 KΩ 35 mA	⩾99 Ω 75 mA	⩾20 KΩ 60 mA	⩾1.9 KΩ 120 mA				
A127	⩾54 KΩ 25 mA	⩾12 KΩ/ 100 Ω 70 mA	⩾42 KΩ 35 mA	⩾50 KΩ 85 mA				
A128	⩾1.6 KΩ 200 mA	⩾250 Ω 640 mA	⩾52 KΩ 10 mA	⩾6.4 KΩ 85 mA				
A140	⩾47 Ω 180 mA	⩾990 Ω 75 mA	⩾12 KΩ 165 mA	⩾12 KΩ 200 mA				
A150	⩾1.92 KΩ 80 mA	⩾6.2 KΩ 96 mA	⩾56 KΩ 65 mA	⩾4.2 KΩ 75 mA				
A151	⩾50 KΩ 37 mA	⩾530 Ω 10 mA	⩾50 KΩ 116 mA	⩾130 KΩ 35 mA	⩾390 KΩ 290 mA	⩾390 KΩ 130 mA	⩾2.8 KΩ 350 mA	⩾1.1 KΩ 700 mA

Table 8–4–2 indicates the instrument's total current and resistance for individual supplies. The resistances are measured at the motherboard test points (low terminal to ground).

Table 8–4–2. Instrument Resistance / Current

	+5 V fx	–5 V fx	+20 V fx	–20 V fx	+5 V fl	–5 V fl	+20 V fl	–20 V fl
Standard Instrument	≥21 Ω 3.5 A	≥6.7 Ω 2.9 A	≥449 Ω 1 A	≥220 Ω 1.2 A	≥200 Ω 160 mA	≥193 Ω 170 mA	≥640 Ω 450 mA	≥426 Ω 750 mA
Opt. 020	≥17 Ω 4.4 A	≥6.6 Ω 4.6 A	≥379 Ω 1.6 A	≥205 Ω 2.3 A	≥200 Ω 470 mA	≥193 Ω 410 mA	≥263 Ω 950 mA	≥313 Ω 1.5 A


FIXED VOLTAGE SERIES REGULATOR
OVERLOAD ALARM CIRCUIT (FXD AND FL)
FXD SUPPLY ALARM
FL SUPPLY ALARM
ALARM LED
TO POWER BUS ON MOTHERBOARD
+5V REFERENCE
FOR TROUBLESHOOTING PURPOSE Q12 IS ON SOCKET
PART OF REGULATOR BOARD A18


PART OF A18 BD AY REGULATOR (08160-66518)
P/O A2
A P
P/O A1
UNREG.
8
1
OUTPUT FROM SWITCHED POWER SUPPLY
FREE GROUND
+5VFX
+12VFX
-12VFX
-20VFX
-5V REF
23V
-5.6V
+12V FX
-12V FX
-5V
U8 +12V REGULATOR
U9 -12V REGULATOR
A18 USE ONLY
NOTE VOLTAGES MEASURED AGAINST GND.L
TP1
TP2
TP3
TP4
TP5
TP6
TP10
TP17
TP18
Q1
Q2
Q3
Q4
Q5
Q6
U1a
U1b
U2a
U2b
CR13
CR14
CR20
CR21
CR22
CR23
VR1 2.49V
VR2 2.49V
L1 9.22
L2 0.22

SERVICE BLOCK 5
SHIFT SUPPLY A18 3 , A150 25

THEORY OF OPERATION

The shift voltage supply delivers the voltage difference between fixed and floating ground. This voltage difference is dependent on the output pulse voltage levels according to the formulae:

$$U_{shift} = HIL_{max} + LOL_{max} \text{ (50 ohm termination)}$$

$$U_{shift} = \frac{HIL\ max + LOL\ max}{2} \text{ (1 K ohm termination)}$$

(max includes also CH B value (standard set value) if standard instrument and resolution is 100 mV per digital step).

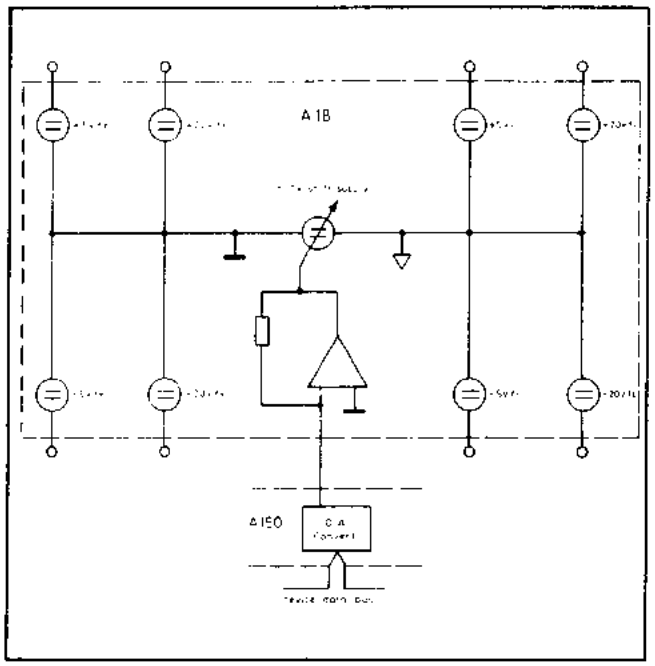


Figure 8–5–1. Block diagram of shift, fixed and floating supplies.

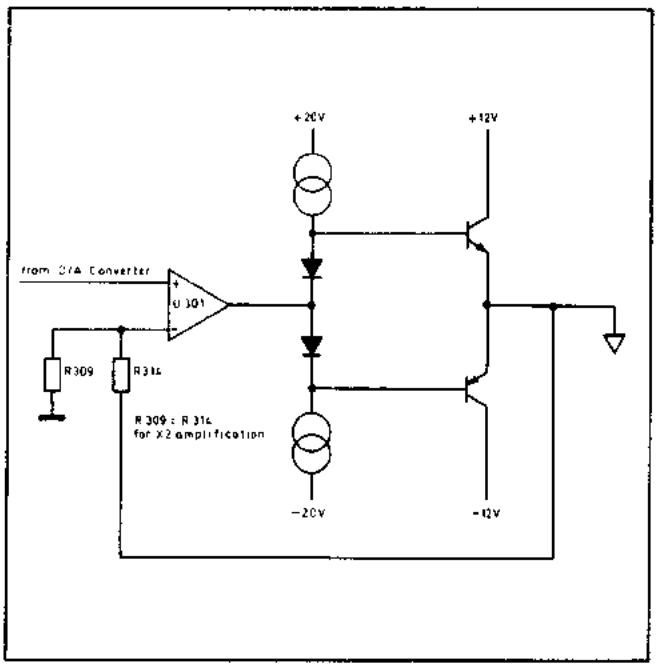


Figure 8–5–2. Shift supply operating principle.

The maximum shift voltage is limited to ± 10 V by the microprocessor which delivers the digital value of the required shift voltage to an 8-bit D/A converter on A150. The analog output of the D/A converter then controls the shift voltage supply.

To get a shift voltage of –10 V, for example, the digital signal to the D/A converter is 00000001. Zero shift voltage is derived from the digital word 01100100 (equal to decimal 100), and +10 V shift voltage is derived from 11000110 (equal to decimal 198).

The polarity of the control voltage determines whether the upper or lower part of the amplifier is on. The output voltage at floating ground is then fed back and divided to control the gain of the amplifier (see Figure 8–5–2).

TROUBLESHOOTING

Connect a DVM between the fixed ground (⊥) and floating ground (⏚) and use the following tables to check dc shift output voltages for different output settings of the 8160A.

If measuring the shift output voltages cannot isolate the fault, check the TP301 and TP302 voltages against fixed ground (⊥).

Table 8–5–1. Shift voltages for Standard 8160A (one channel)

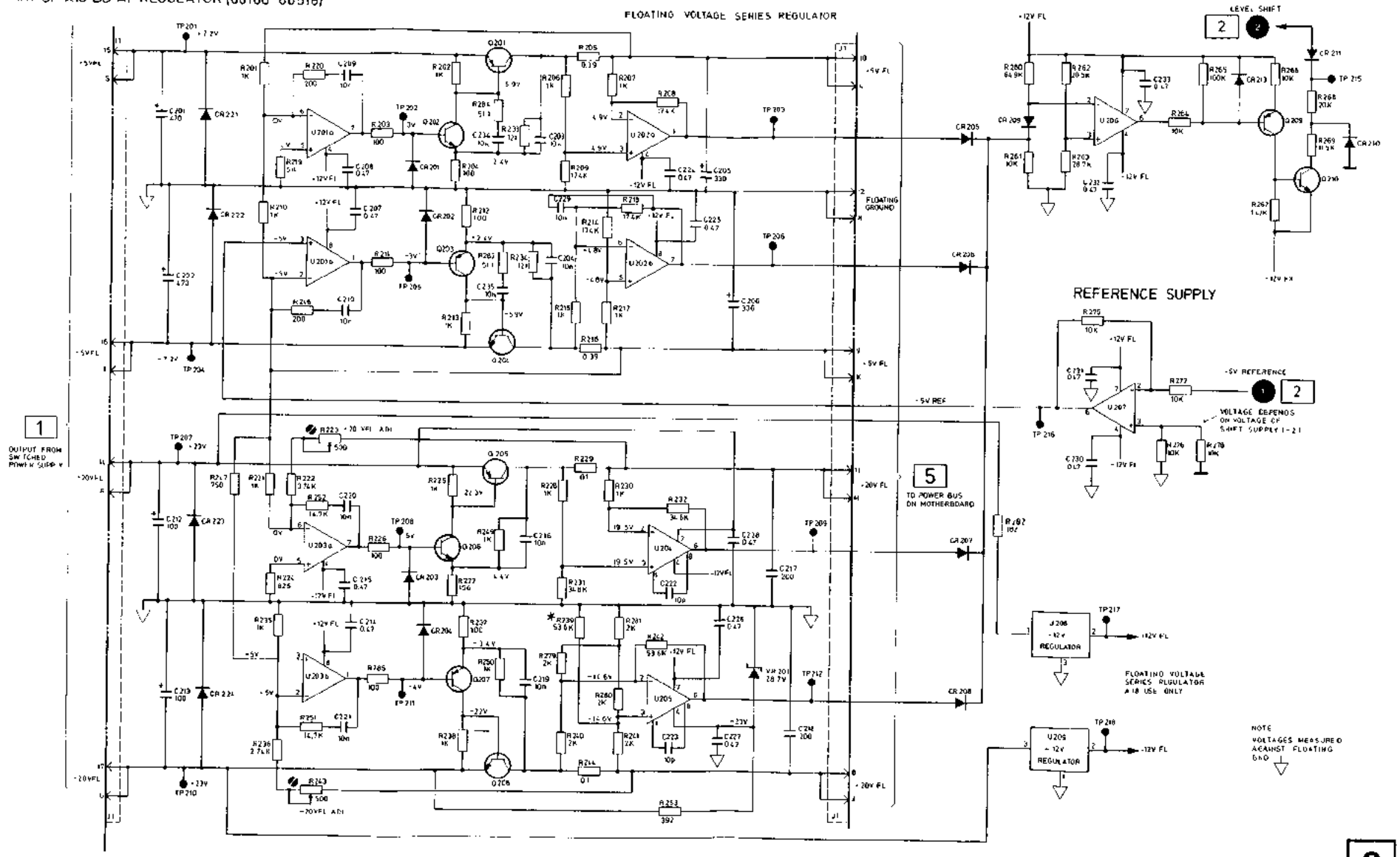
8160A Source Impedance	Shift Supply Output (⏚)	HIL	/ LOL	TP301	TP302
50 Ω	0 V	0.1 V	0 V	0 V	0 V
50 Ω	+2.5 V	2.5 V	0 V	−1.3 V	2.1 V
50 Ω	+5.0 V	5.0 V	0 V	2.6 V	4.7 V
50 Ω	+7.5 V	7.5 V	0 V	3.8 V	7.2 V
50 Ω	+10 V	9.99 V	0 V	5.0 V	9.6 V
1 k Ω	+2.5 V	5.0 V	0 V	1.3 V	2.1 V
1 k Ω	+5.0 V	10.0 V	0 V	2.6 V	4.7 V
1 k Ω	+7.5 V	15.0 V	0 V	3.8 V	7.2 V
1 k Ω	+10 V	19.9 V	0 V	5.0 V	9.6 V
50 Ω	−2.5 V	0 V	−2.5 V	−1.1 V	−2.9 V
50 Ω	−5.0 V	0 V	−5.0 V	−2.3 V	−5.5 V
50 Ω	−7.5V	0 V	−7.5 V	−3.6 V	−8.0 V
50 Ω	−10 V	0 V	−9.9 V	−4.8 V	−10.4 V
50 Ω	0 V	2.5 V	−2.5 V	0 V	−0.2 V
50 Ω	0 V	4.9 V	−4.9 V	0 V	−0.2 V
50 Ω	4 V	5.0 V	−1.0 V	2.0 V	3.5 V
50 Ω	− 6 V	−2.0 V	−6.0 V	2.8 V	−6.4 V
50 Ω	8 V	8.0 V	4.0 V	4.0 V	8.1 V

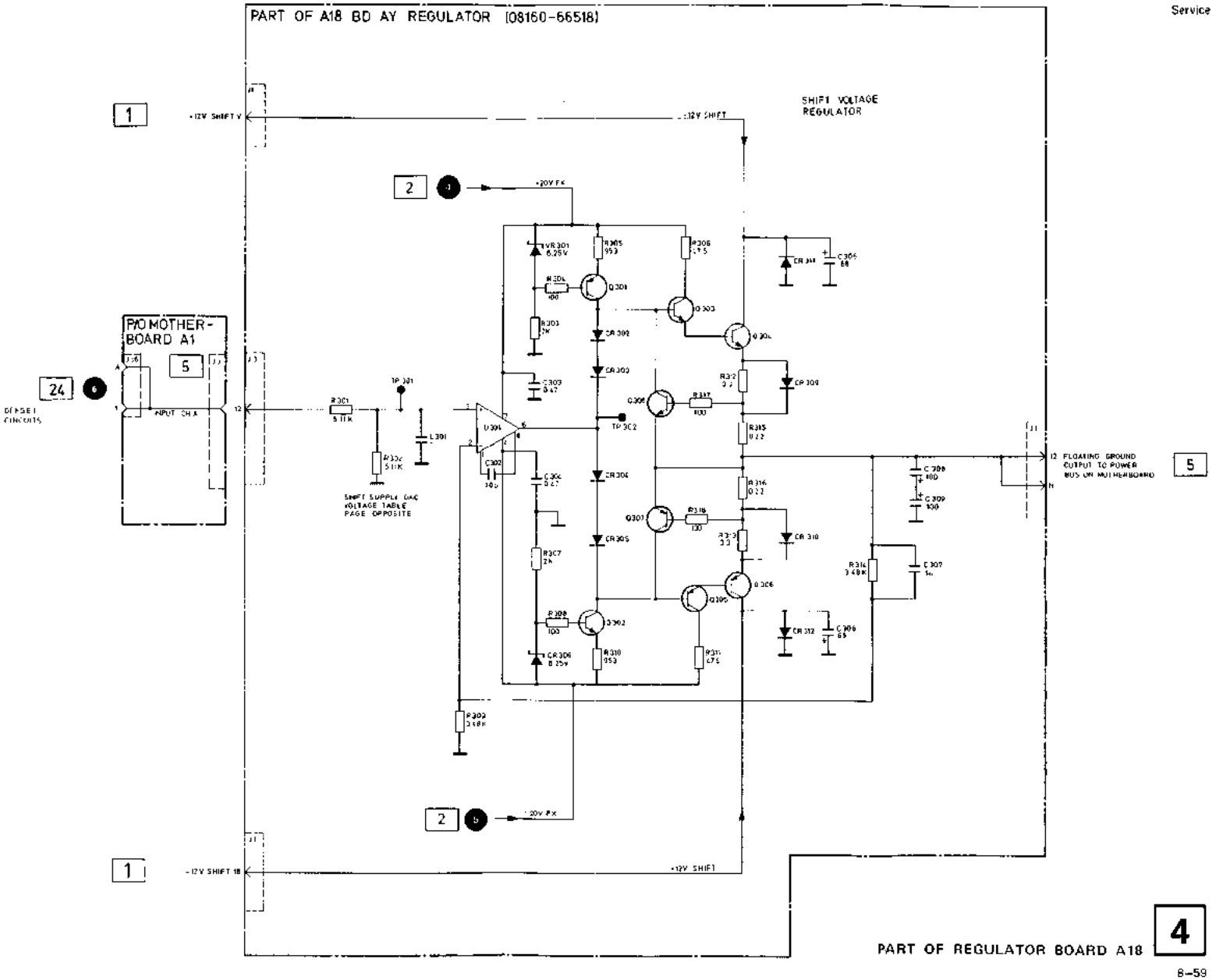
Table 8–5–2. Shift voltages for 8160A Option 020 (two channels)

Accuracy: ± 0.2 V

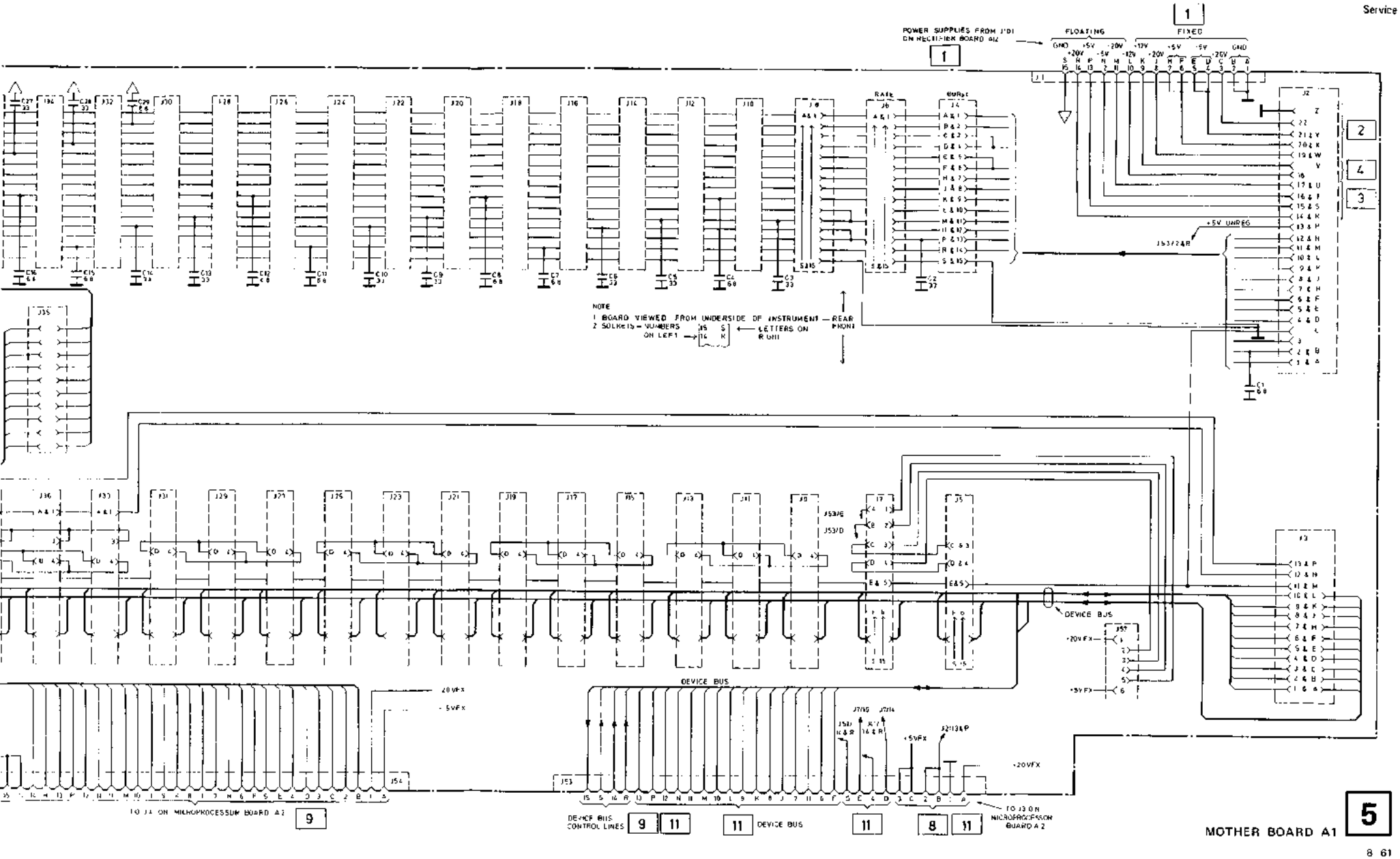
NOTE: D/A converter adjust of channel B disabled via software

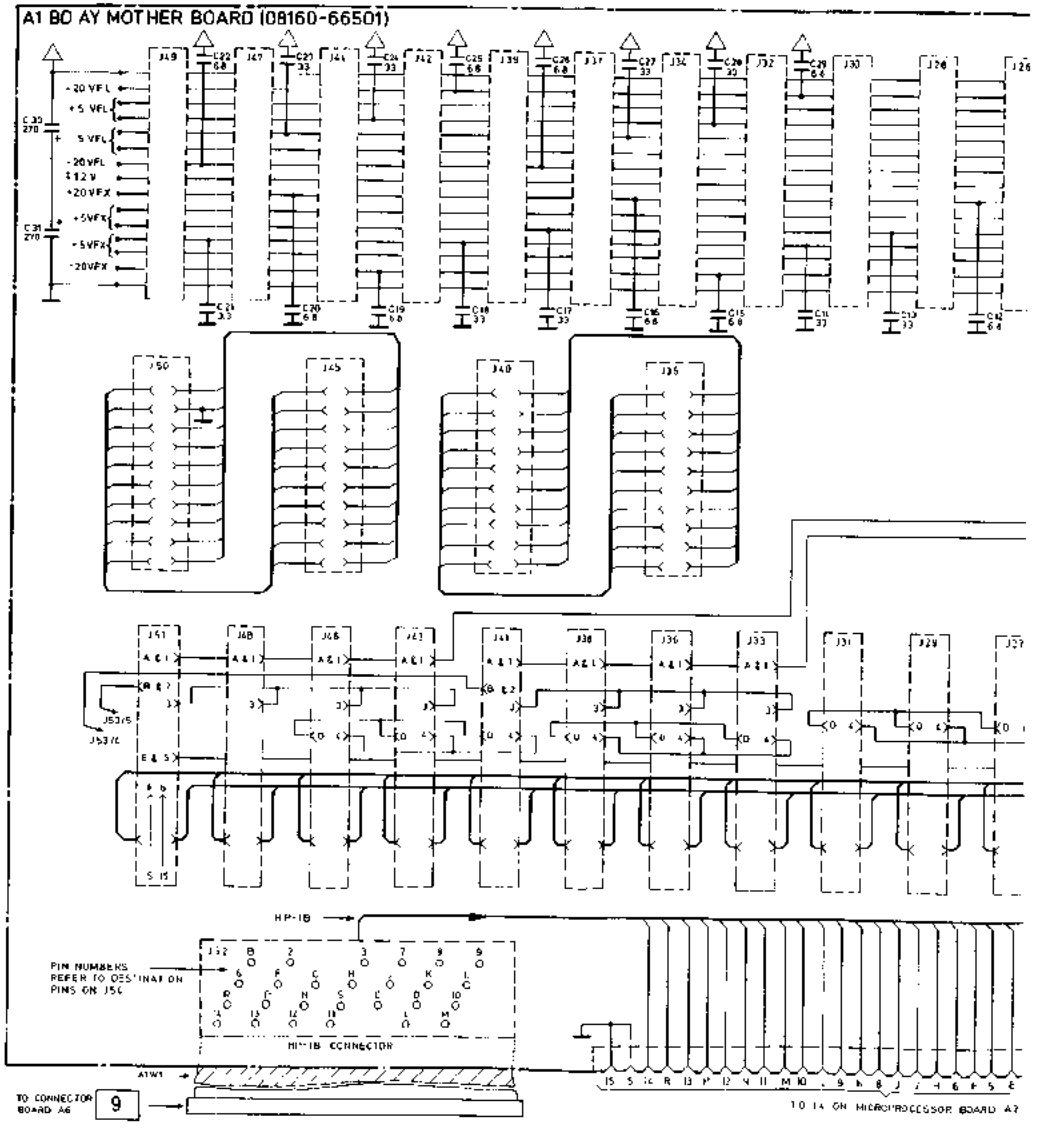
8160A Source Impedance	Shift Supply Output (⏚)	OUTPUT A HIL	OUTPUT A LOL	OUTPUT B HIL	OUTPUT B LOL	TP301	TP302
50 Ω	0 V	0.1 V	0 V	0.1 V	0 V	0 V	−0.2 V
50 Ω	2.5 V	2.5 V	0 V	2.5 V	0 V	1.3 V	2.1 V
50 Ω	5.0 V	5.0 V	0 V	5.0 V	0 V	2.6 V	4.6 V
50 Ω	10 V	9.99 V	0 V	9.99 V	0 V	5.0 V	9.7 V
50 Ω	0 V	2.5 V	0 V	0 V	−2.5 V	0 V	−0.4 V
50 Ω	0 V	5.0 V	0 V	0 V	−5.0 V	0 V	−0.5 V
50 Ω	0 V	9.99 V	0 V	0 V	−9.99 V	0 V	−0.6 V
50 Ω	0 V	9.99 V	8 V	−8 V	−9.99 V	0 V	−0.4 V
50 Ω	−1 V	8 V	4 V	−6 V	−9.0 V	−0.4 V	−1.5 V

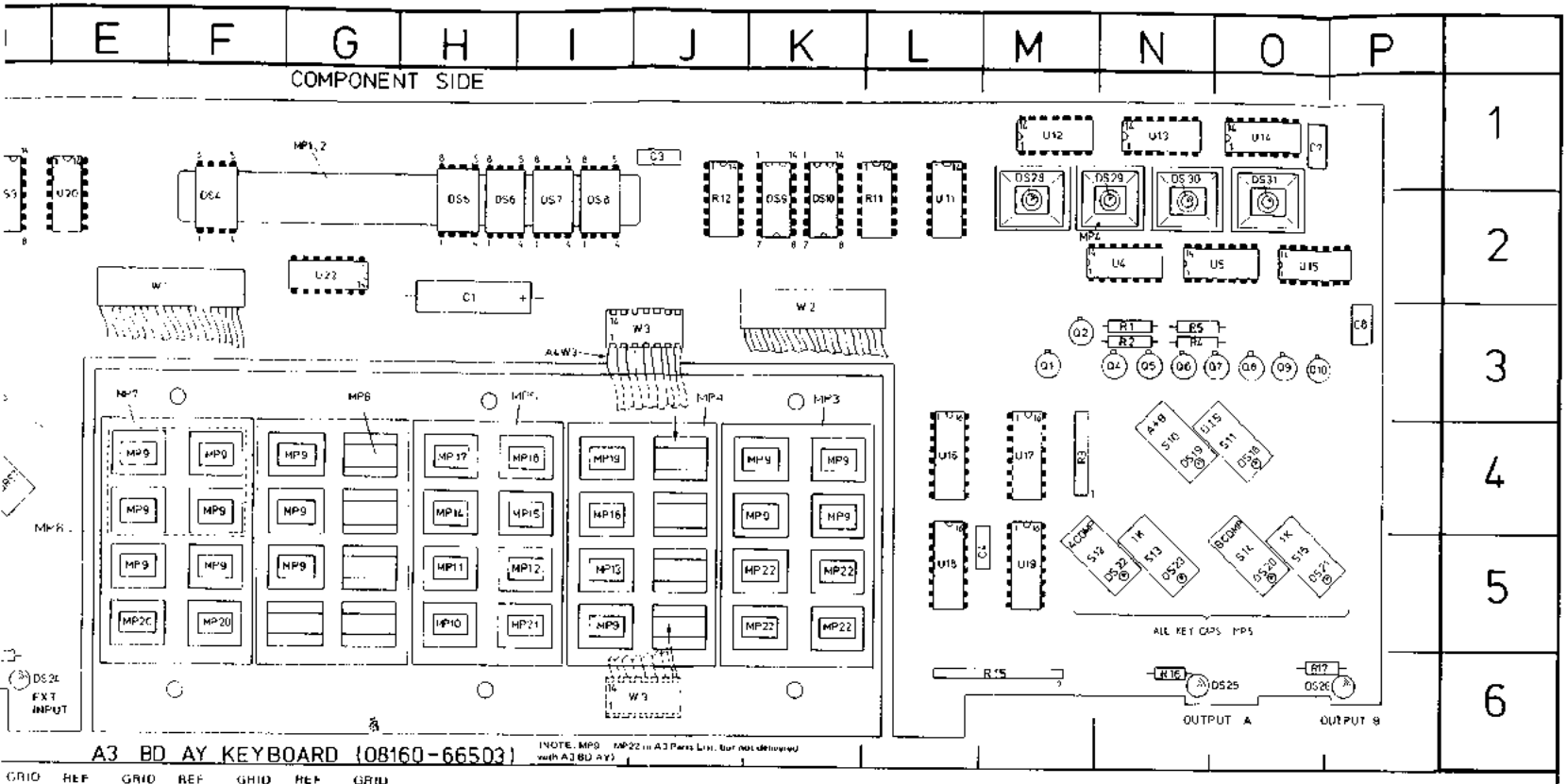

FLOATING VOLTAGE SERIES REGULATOR
FLOATING SUPPLY ALARM CIRCUIT
REFERENCE SUPPLY
1
OUTPUT FROM SWITCHED POWER SUPPLY
5
TO POWER BUS ON MOTHERBOARD
FLOATING GROUND
-5V REF
-5V REFERENCE
VOLTAGE DEPENDS ON VOLTAGE OF SHIFT SUPPLY (-21)
FLOATING VOLTAGE SERIES REGULATOR A18 USE ONLY
NOTE
VOLTAGES MEASURED AGAINST FLOATING GND



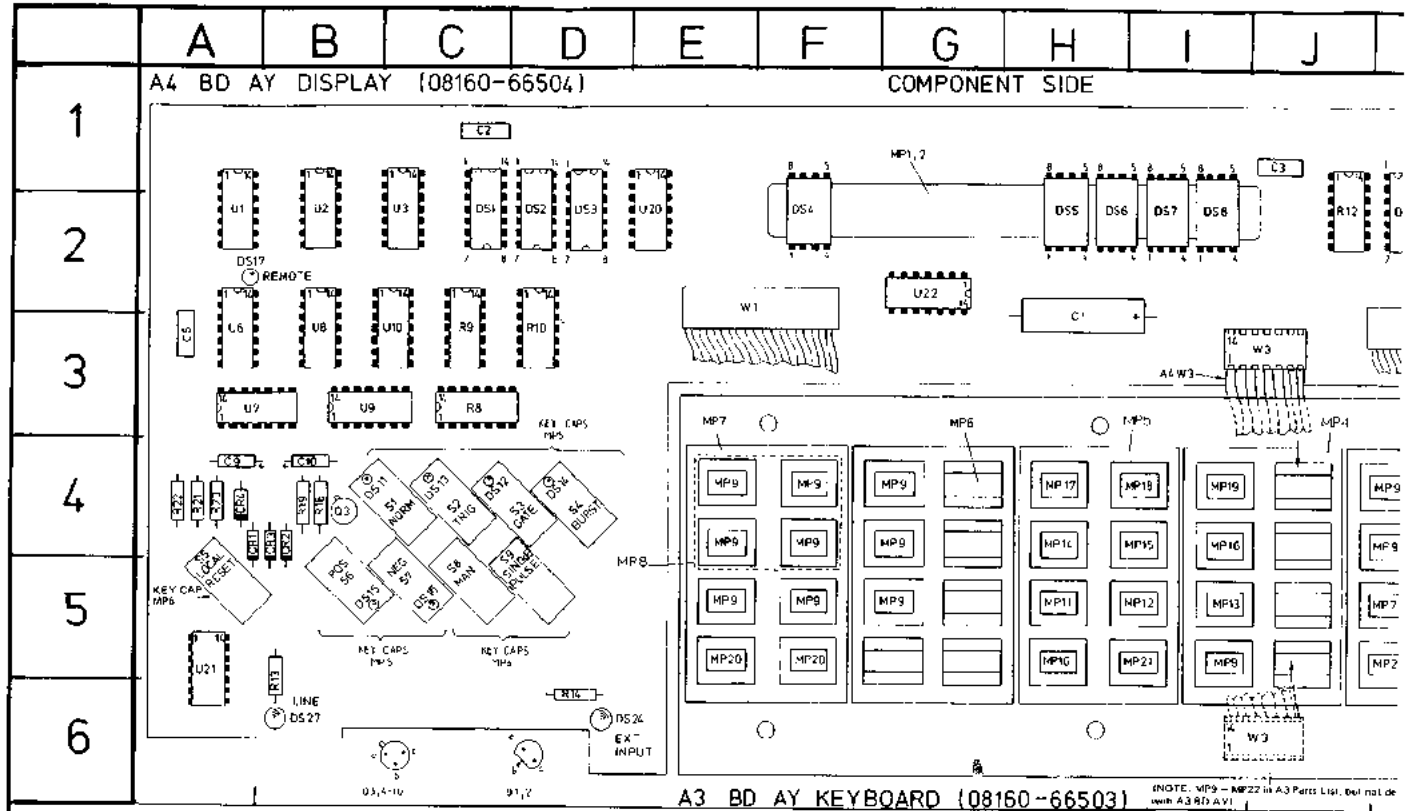
PART OF REGULATOR BOARD A18 **4**


POWER SUPPLIES FROM J101 ON RECTIFIER BOARD A12
FLOATING
FIXED
GND +5V -20V +12V +20V -5V -12V GND
+5V UNREG
NOTE
1 BOARD VIEWED FROM UNDERSIDE OF INSTRUMENT — REAR PANEL
2 SOCKETS — NUMBERS ON LEFT → 15 S 16 R ← LETTERS ON RIGHT
RATE
BURST
DEVICE BUS
+20VFX
-5VFX
+5VFX
TO J4 ON MICROPROCESSUM BOARD A3
DEVICE BUS CONTROL LINES
TO J3 ON MICROPROCESSOR BOARD A2
MOTHER BOARD A1


A1 BD AY MOTHER BOARD (08160-66501)
HP-IB
PIN NUMBERS REFER TO DESTINATION PINS ON J56
HP-IB CONNECTOR
A1W1
TO CONNECTOR BOARD A6
9
TO J4 ON MICROPROCESSOR BOARD A7



GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
L2	S6	B5	U8	B3	W3	J3
J2	S7	C5	U9	B3		
B5	S8	C5	U10	C2		
D6	S9	D6	U11	L2		
M6	S10	N4	U12	M1		
M6	S11	O4	U13	N1		
P6	S12	N5	U14	O1		
B4	S13	N5	U15	O2		
B4	S14	O5	U16	L4		
A4	S15	O5	U17	M4		
A4	U1	A2	U18	L5		
A4	U2	B2	U19	M5		
C4	U3	C2	U20	E2		
C4	U4	N2	U21	A5		
D4	U5	O2	U22	G2		
D4	U6	A3	W1	E2		
A5	U7	A3	W2	K3		



(NOTE. MP9 – MP22 in A3 Parts List, Del not de with A3 BD AY)

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	K2	DS5	H2	DS22	N5	Q2	M3	R11	L2	S6	B5	U8	B3	W3	J3
C2	C1	DS6	H2	DS23	N5	Q3	B4	R12	D7	S7	C5	U9	B3		
C3	J1	DS7	I2	DS24	O6	Q4	N3	R13	B6	S8	C5	U10	C3		
C4	M5	DS8	I2	DS25	O6	Q5	N3	R14	D6	S9	D5	U11	L2		
C5	A3	DS9	K2	DS26	P6	Q6	N3	R15	M6	S10	N4	U12	M1		
C7	O1	DS10	K2	DS27	B6	Q7	O3	R16	M6	S11	O4	U13	N1		
C8	P3	DS11	B4	DS28	M2	Q8	O3	R17	P6	S12	N5	U14	O1		
C9	A4	DS12	D4	DS29	N2	Q9	O3	R18	B4	S13	N5	U15	O2		
C10	B4	DS13	C4	DS30	N2	Q10	O3	R19	B4	S14	O5	U16	L4		
CR1	A4	DS14	D4	DS31	O2	R1	N3	R20	A4	S15	O5	U17	M4		
CR2	B4	DS15	B5	MP1	G2	R2	N3	R21	A4	U1	A2	U18	L5		
CR3	B4	DS16	C5	MP2	G2	R3	N4	R22	A4	U2	B2	U19	M5		
CR4	A4	DS17	A2	MP4	N2	R4	N3	S1	C4	U3	C2	U20	E2		
DS1	C2	DS18	O4	MP5	C5	R5	N3	S2	C4	U4	N2	U21	A5		
DS2	D2	DS19	N4	MP6	D6	R8	C3	S3	D4	U5	O2	U22	G2		
DS3	D2	DS20	O5	MP7	O2	R9	C3	S4	D4	U6	A3	W1	E2		
DS4	F2	DS21	O6	Q1	M3	R10	D3	S5	A5	U7	A3	W2	K3		

SERVICE BLOCK 6
DISPLAY BOARD A4 6 7

THEORY OF OPERATION

Display section comprises the following sections:

a) PARAMETER and UNIT
b) CHANNEL and VALUE
c) Key LED's
d) Error Annunciator

PARAMETER and UNIT

First there is the PARAMETER and UNIT display, which consists of five 5 x 7 dot matrix displays.

Data for each row is loaded in a parallel IN serial OUT shift register. Seven bits contain the row information and the eighth bit is always high. The data is then transferred to a 1 x 256 bit RAM. Corresponding to the five displays, the RAM now has 200 bits of information.

A counter then counts to 200 shifting the information to shift registers. At every 40th cycle, a power transistor is switched on causing a single row from each of the five displays to be simultaneously illuminated. After 200 cycles, therefore, all five rows in each display have been in turn illuminated. A general reset then occurs and the whole scanning cycle begins again.

CHANNEL and VALUE

The CHANNEL and the VALUE display are commercial integrated 5 x 7 DOT LED displays with built-in decoder/driver/memory. The Data Bus provides the display with the correct information. An address select, in conjunction with three other ADDRESS LINES and a ADDRESS DECODER, determines which value in the display has to be changed. The CHANNEL display is a HEXADECIMAL display type which can display the characters A, B and C.

Key LED's

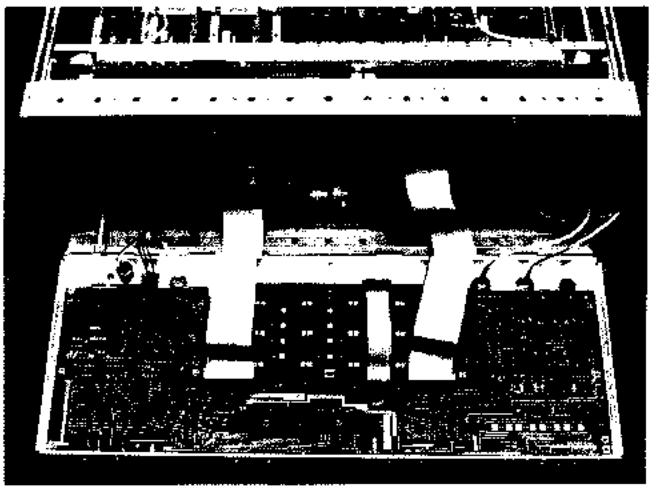
The key LED's including the REMOTE LED are arranged in an 2 x 7 MATRIX. Data is loaded in a Read/Write memory, which is scanned by a counter to multiplex the LED's.

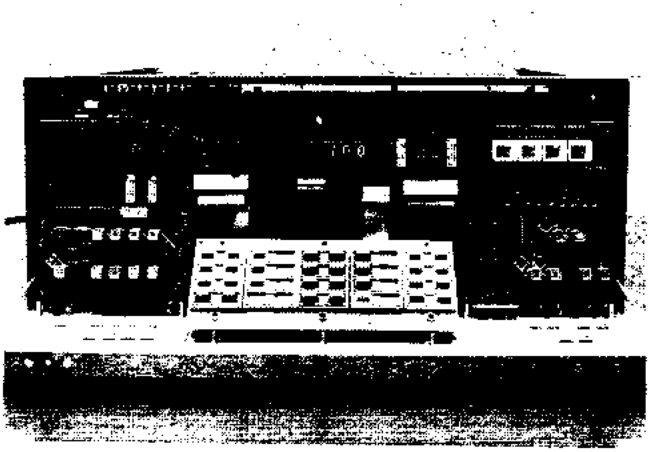
Error Annunciator

The Error Indicators are normal lamps. Data is latched and using high current drivers the desired lamps are switched on.

TROUBLESHOOTING

To troubleshoot the display, the front panel should be removed, and board A4 setup as shown in the photographs.





Display troubleshooting can be divided into the following sections:

a. PARAMETER and UNIT
b. CHANNEL and VALUE
c. Key LED's
d. Error Annunciator
e. Keyboard Scanner

PARAMETER and UNIT display

An aid to understanding this section is the block diagram, Figure 8–2–1 and the timing diagram Figure 8–6–1. During normal operation, one complete illumination-cycle of the PARAMETER and UNIT displays requires 200 clock pulses. These 200 pulses are divided into 5 groups (corresponding to the 5 dot columns of each display) each group, in turn, loading 40 bits into the shift register A4 U1 → U5. (This shift register is therefore loaded and reset 5 times for one complete illumination-cycle). The division into 5 groups is accomplished via a 'bit 40 detect' which interrupts the shift register clock (via A2U52A and A2U53), and then enables the required power transistor (A201 → Q5) to illuminate the display dot column whose data is at that moment loaded into the shift register. Power to the displays is controlled via mono-flop U44A, counter U51 and decoder U54.

After the time constant of mono-flop U44A, mono-flop U44B is started and will reset the shift register, so the next 40 bits can be loaded.

Similarly, when the display is changed, a complete 200 step cycle must be performed. The 8-bit parallel data from the microprocessor is serialized, via A2U36, and then shifted into RAM U2U33 in sync with the counter A2U34, U35. A '201 detect' counter circuit resets the counter after the loading cycle.

CHANNEL and VALUE display

The function of U20 can best be tested by using a TTL-logic probe. At a change in the display characters (microprocessor address 0500), up to 5 negative pulses at U20 pin 4 (1 negative pulse per display character) will enable outputs Y0 to Y4 according to the addresses applied to inputs A, B and C of U20. The data on outputs Y0 to Y4 will therefore be displayed.

Key LED's

Using a normal scope, check that the signals shown in Figure 8–6–2 are true.

Error Annunciator

Using a TTL logic probe, check the function of A4U15 (schematic 6), and if necessary, check the error transfer at A2U22 (schematic 11 – microprocessor transfer at address 3000).

Keyboard Scanner

Using a normal scope, check the following signals as given in Figure 8–6–3.

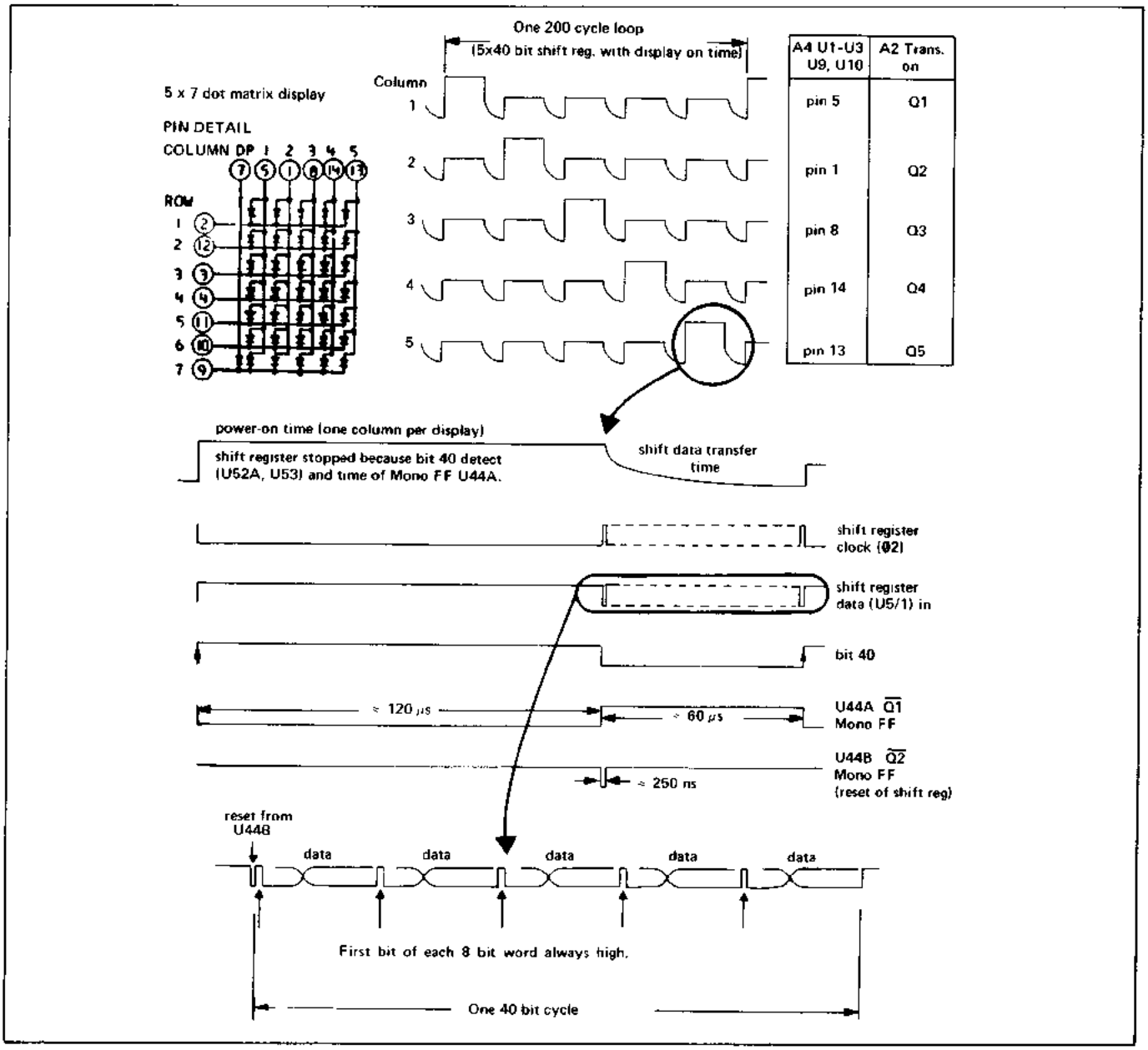


Figure 8–6–1. PARAMETER/UNIT Display Timing Cycle

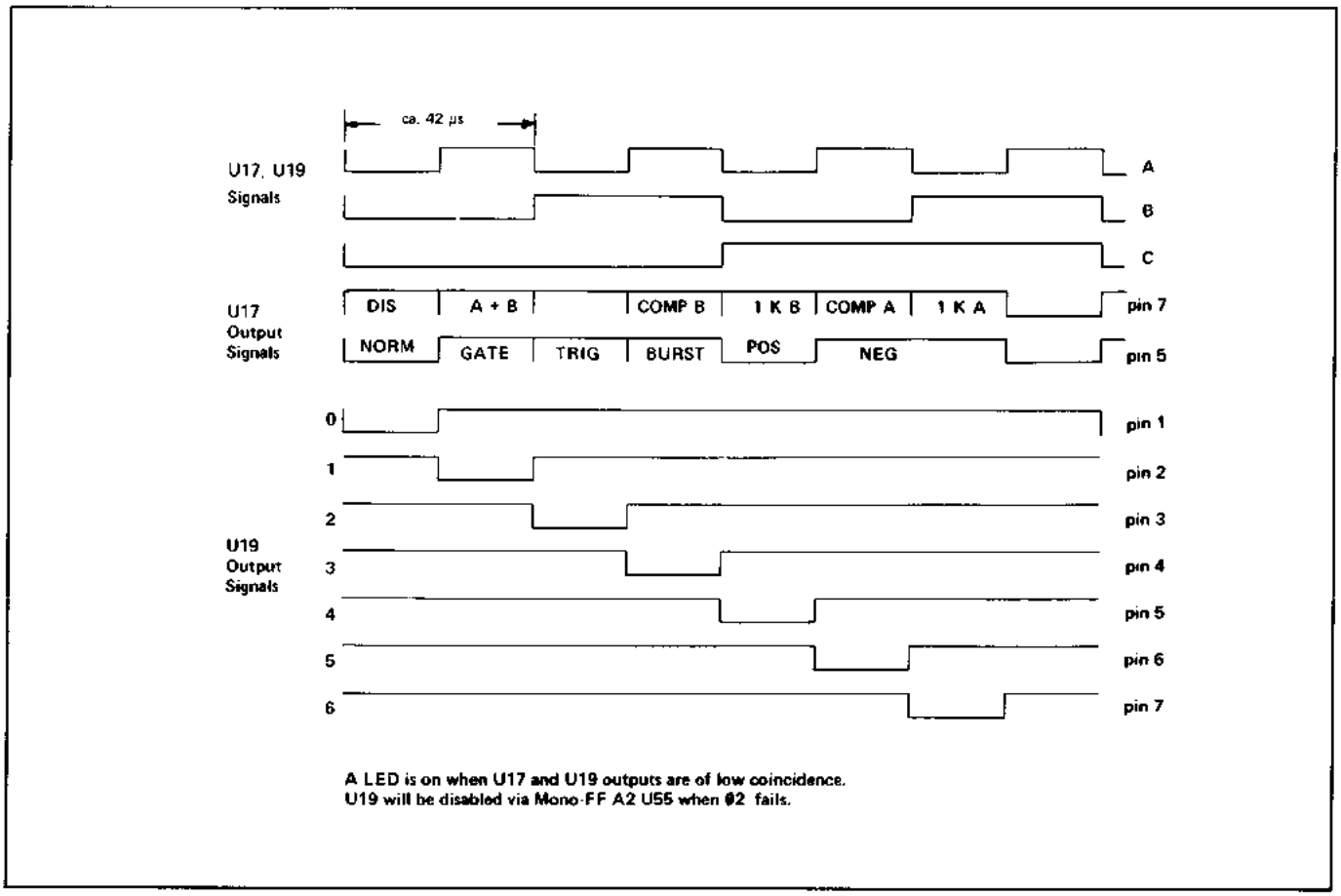


Figure 8–6–2. Key LED's Timing Cycle

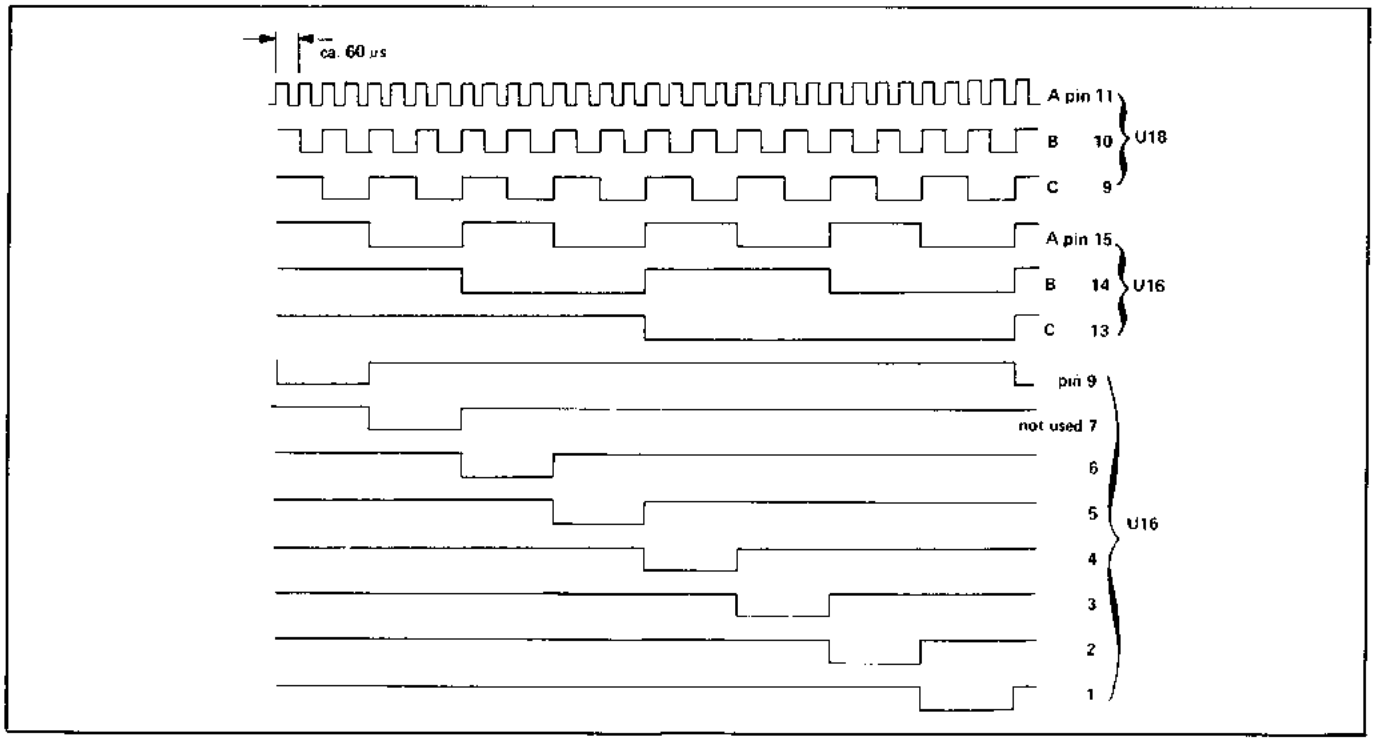
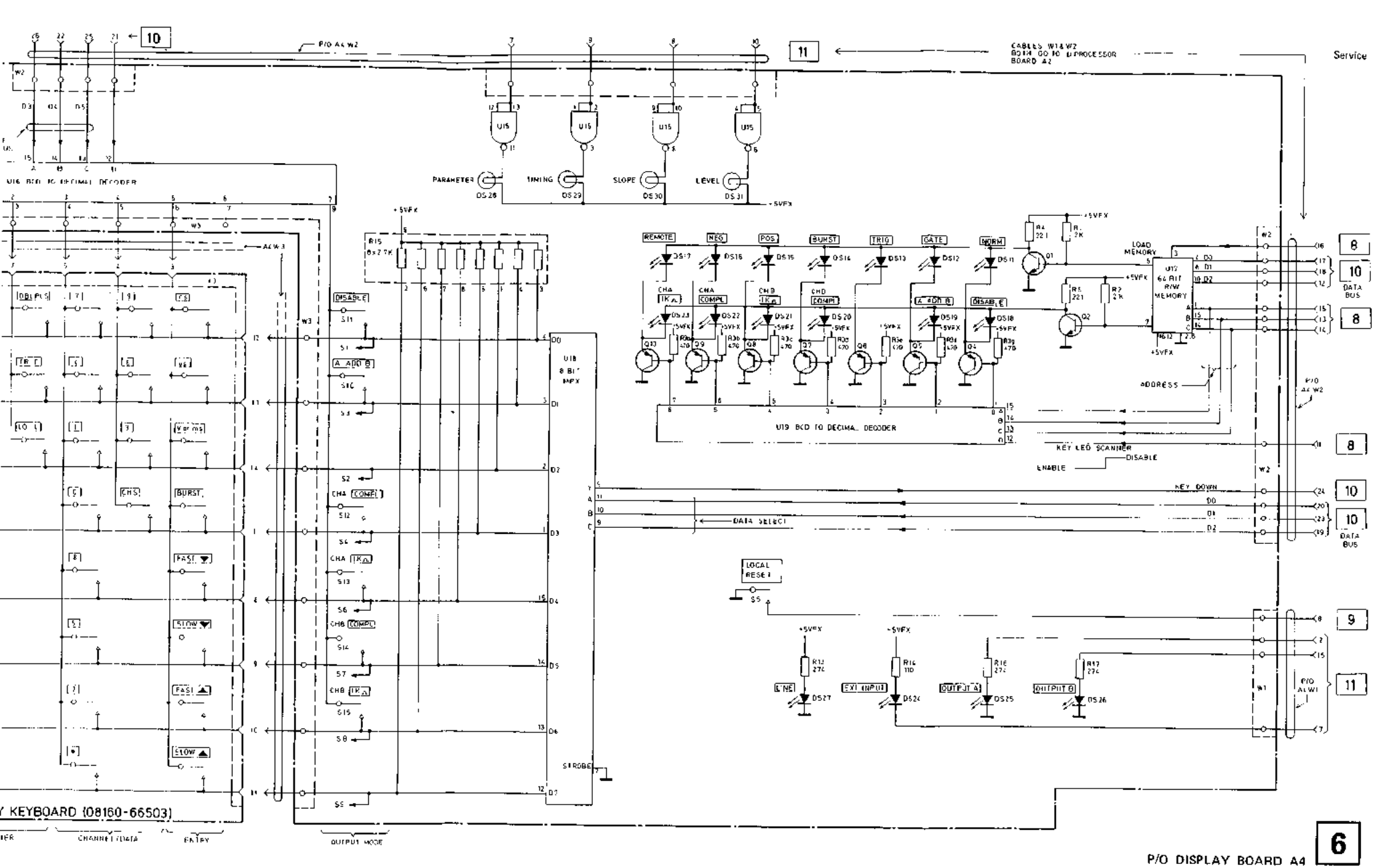
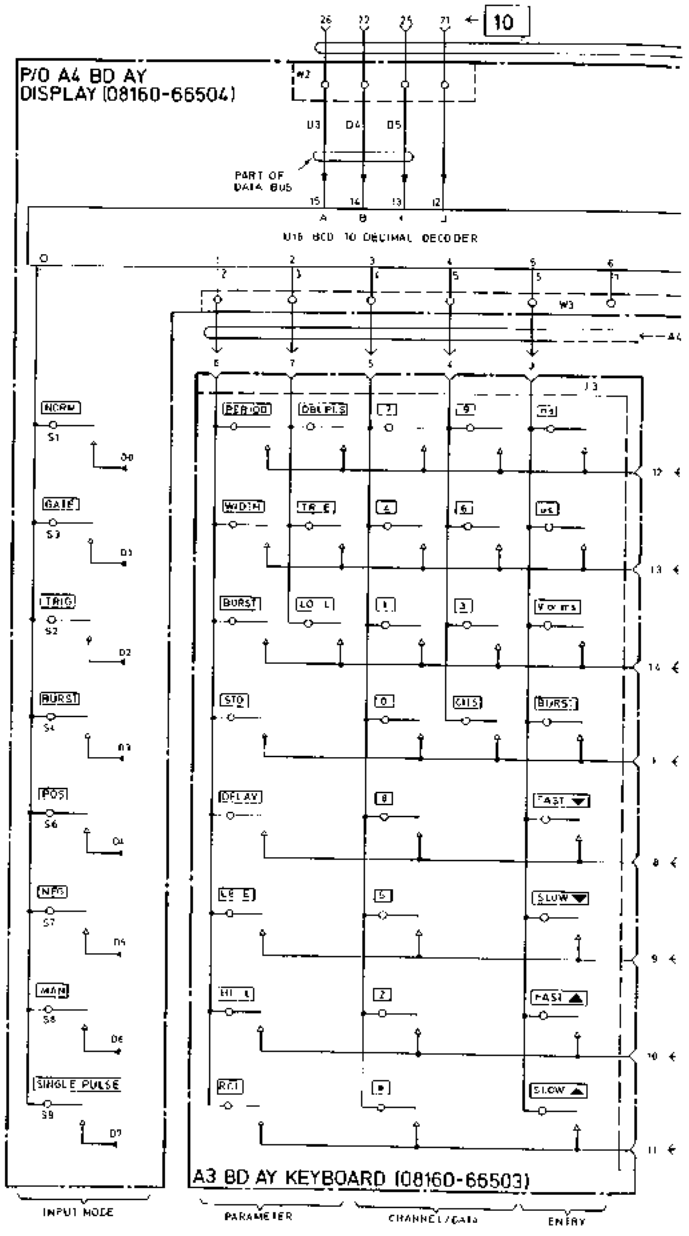
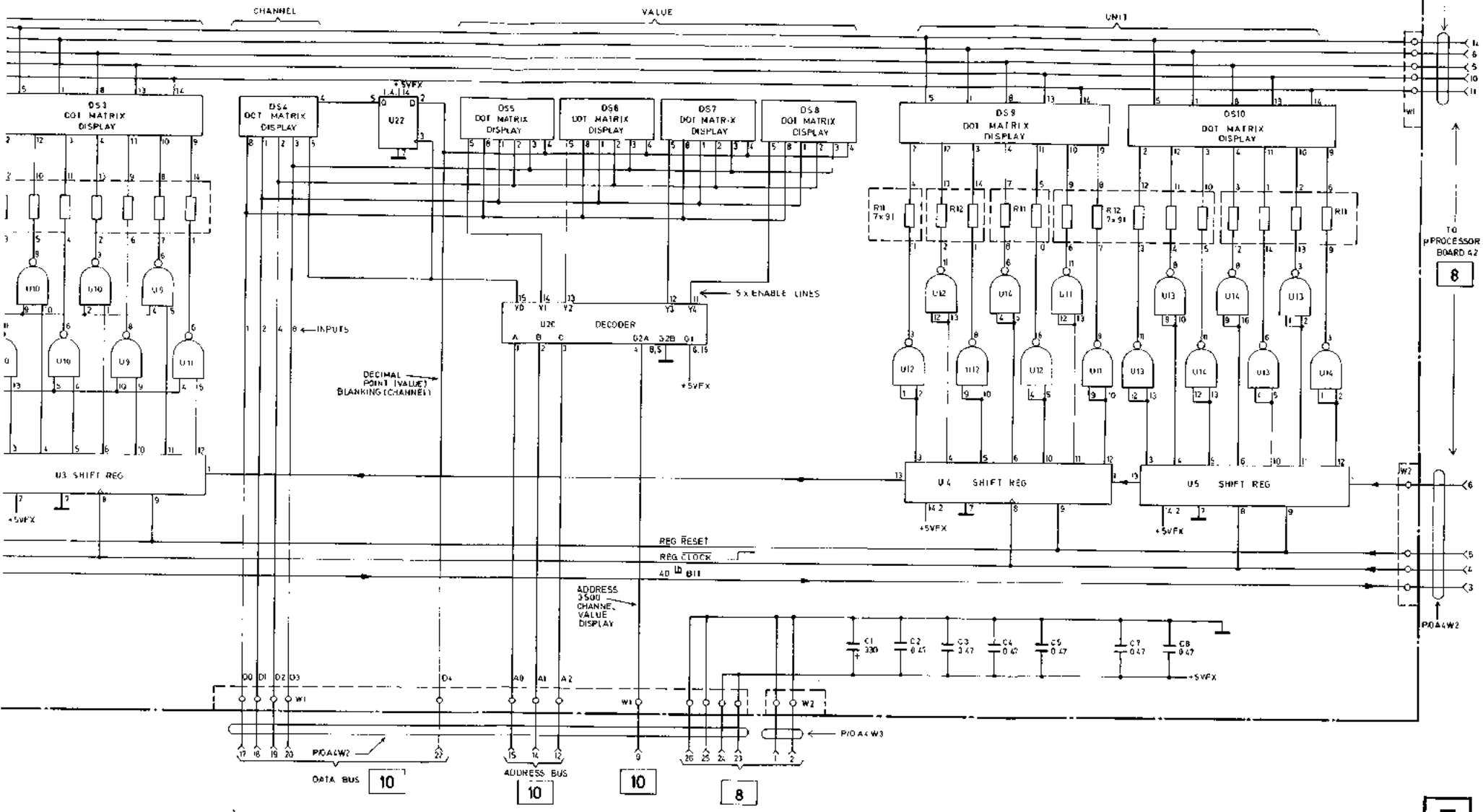


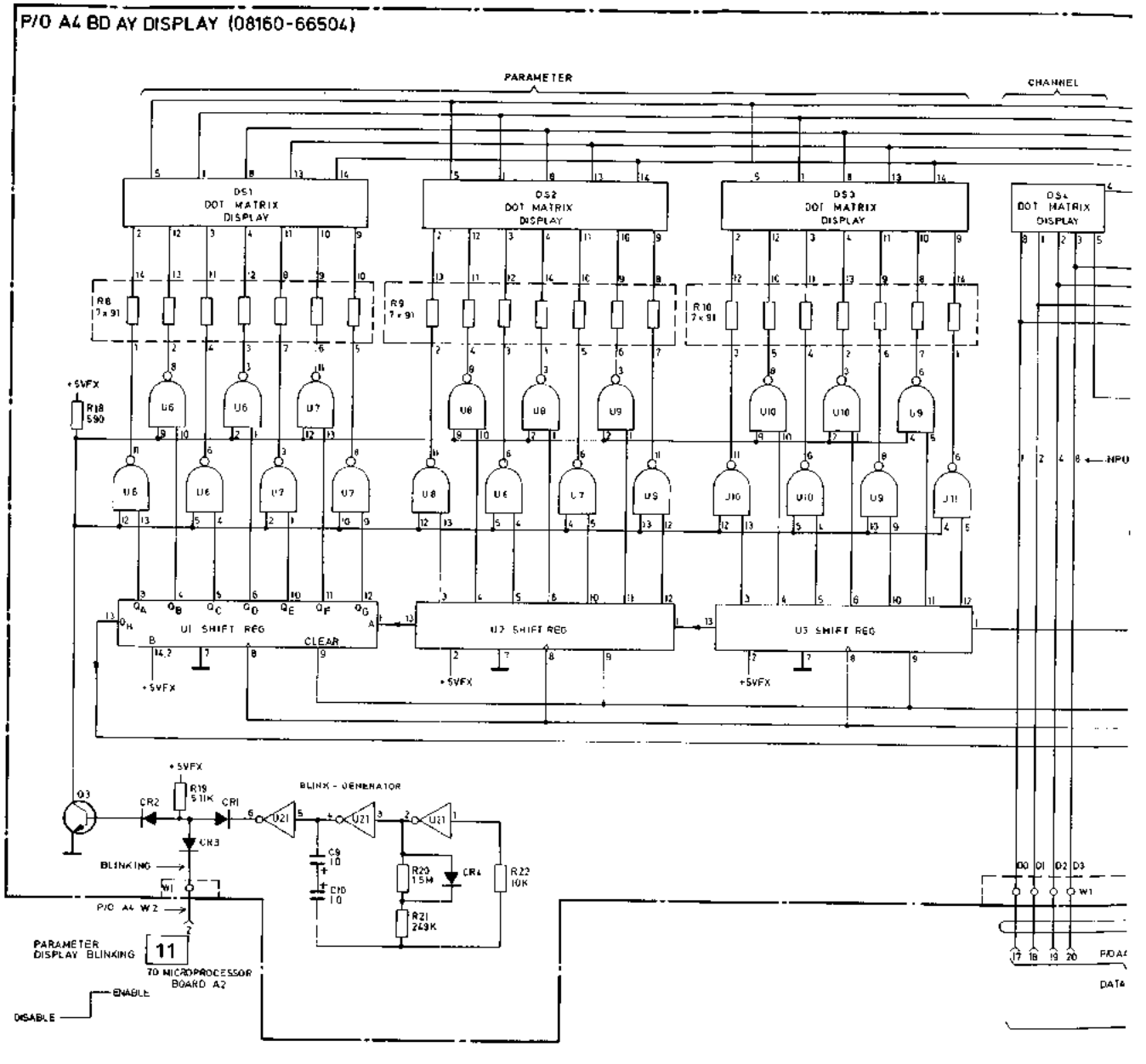
Figure 8–6–3. Keyboard Scanner Timing Cycle

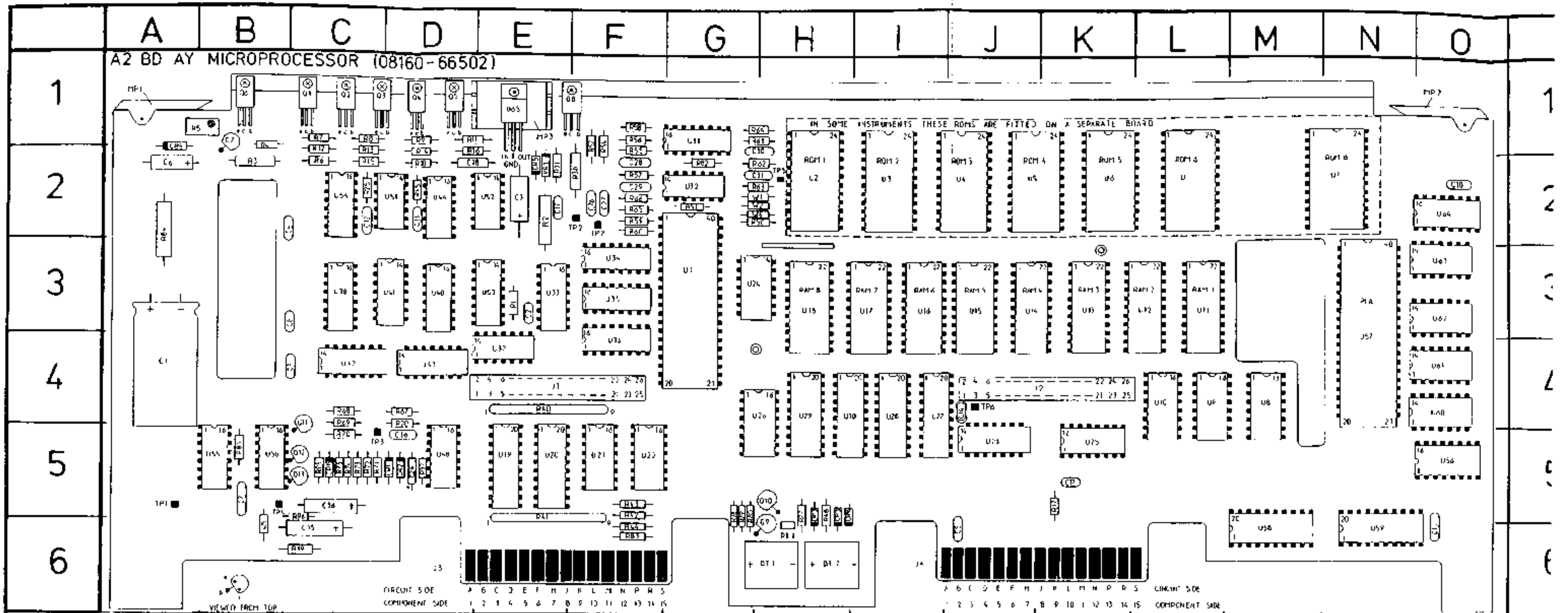

P/O A4 W2
CABLES W1 & W2 BOTH GO TO µPROCESSOR BOARD A2
Service
U16 BCD TO DECIMAL DECODER
PARAMETER
TIMING
SLOPE
LEVEL
DS28
DS29
DS30
DS31
+5VFX
REMOTE
NEG
POS
BURST
TRIG
GATE
NORM
DS17
DS16
DS15
DS14
DS13
DS12
DS11
LOAD MEMORY
U12 64 BIT R/W MEMORY
ADDRESS
U19 BCD TO DECIMAL DECODER
KEY LED SCANNER
ENABLE
DISABLE
KEY DOWN
DATA SELECT
DISABLE
U18 8 BIT MPX
STROBE
LOCAL RESET
S5
LINE
EXT INPUT
OUTPUT A
OUTPUT B
DS27
DS24
DS25
DS26
DATA BUS
P/O A4 W1
P/O DISPLAY BOARD A4
6
8-67


P/O A4 BD AY
DISPLAY (08160-66504)
PART OF DATA BUS
U16 BCD TO DECIMAL DECODER
A3 BD AY KEYBOARD (08160-66503)
INPUT MODE
PARAMETER
CHANNEL/Data
ENTRY



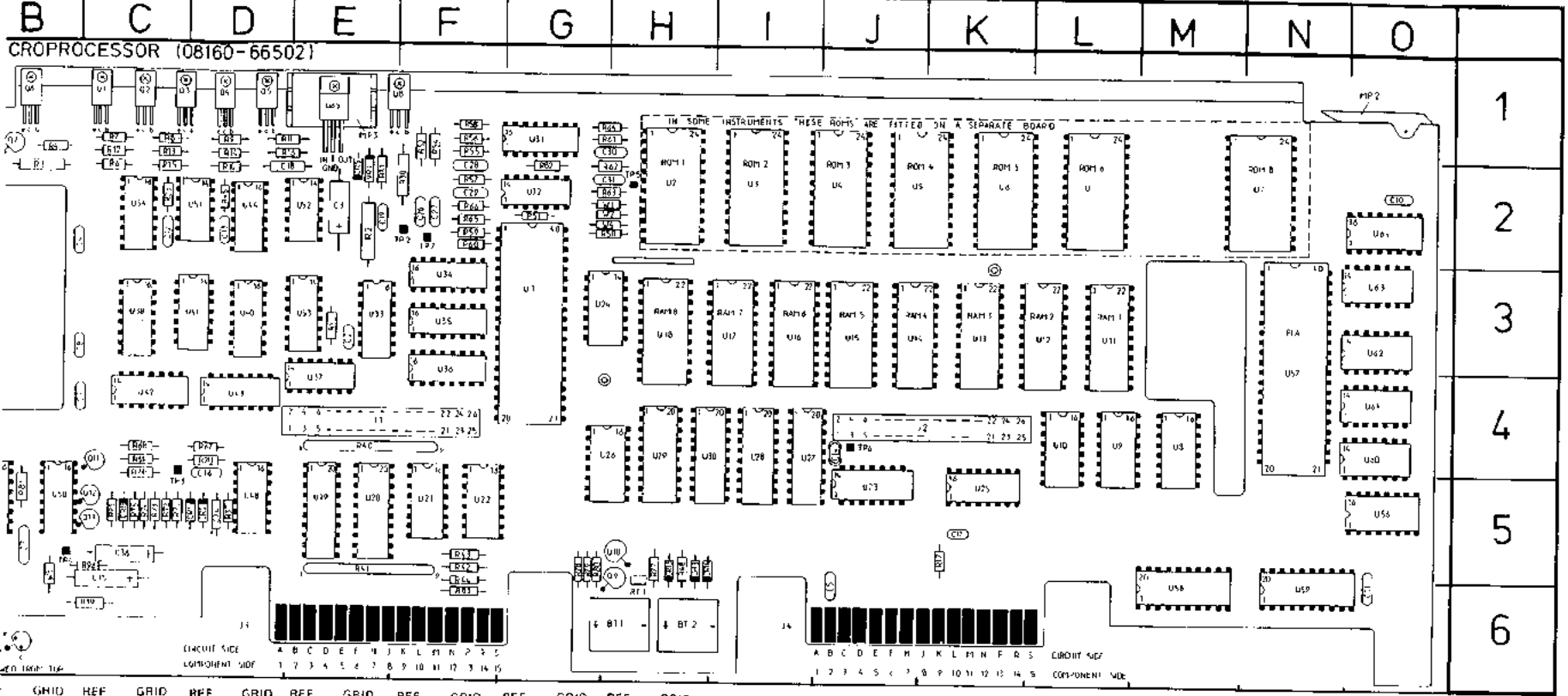
P/O A4 DISPLAY BOARD **7**


P/O A4 BD AY DISPLAY (08160-66504)
PARAMETER
CHANNEL
DS1 DOT MATRIX DISPLAY
DS2 DOT MATRIX DISPLAY
DS3 DOT MATRIX DISPLAY
DS4 DOT MATRIX DISPLAY
R8 7 x 91
R9 7 x 91
R10 7 x 91
+5VFX
R18 590
U1 SHIFT REG
U2 SHIFT REG
U3 SHIFT REG
CLEAR
BLINK - GENERATOR
R19 5.11K
CR1
CR2
CR3
CR4
C9 10
C10 10
R20 1.5M
R21 249K
R22 10K
BLINKING
W1
P/O A4 W2
PARAMETER DISPLAY BLINKING
11
TO MICROPROCESSOR BOARD A2
ENABLE
DISABLE
D0 D1 D2 D3
W1
DATA



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
BT1	H6	C16	D5	CR13	H5	Q9	H5	R13	C2	R48	H5	R67	D4	R95	C5	U8	M4	U25	J5	U42	C4	U63	O3
BT2	H6	C17	K5	CR14	H5	Q10	H5	R14	D2	R50	G2	R68	C4	R96	C5	U9	L4	U26	H4	U43	D4	U64	O2
C1	A4	C18	D2	CR15	C5	Q11	C4	R15	C2	R51	G2	R69	C4	RT1	H6	U10	L4	U27	I4	U44	D2	U65	E1
C2	E3	C19	E2	J1	E4	Q12	C5	R16	D2	R52	F1	R70	C5	TP1	A6	U11	L3	U28	I4	U48	D5	VR1	E2
C3	E2	C24	D5	J2	K4	Q13	C5	R17	K1	R54	F1	R71	C5	TP2	F2	U12	L3	U29	I4	U50	B5	W1	G2
C4	C2	C26	F2	J5 (U1)	G3	R1	E3	R19	C6	R55	F1	R72	C5	TP3	C5	U13	K3	U30	H4	U51	D2	W2	G2
C5	J6	C27	F2	MP1	A1	R2	E2	R20	D4	R56	F1	R73	C5	TP4	B5	U14	J3	U31	G1	U52	E2	W4	G2
C6	A2	C28	F2	MP2	O1	R3	B2	R25	C2	R57	F2	R74	C5	TP5	H2	U15	J3	U32	G2	U53	E3	W5	B6
C7	B5	C29	F2	MP3	E1	R4	B1	R30	F2	R58	F1	R75	C5	TP6	J4	U16	I3	U33	E3	U54	C2		
C8	B3	C30	G1	Q1	C1	R5	B1	R31	E2	R59	F2	R77	H5	TP7	F2	U17	I3	U34	F3	U55	B5		
C9	C4	C31	G2	Q2	C1	R6	C2	R37	D5	R60	F2	R78	G5	U1	G3	U18	H3	U35	F3	U56	O5		
C10	O2	C36	C5	Q3	C1	R7	C1	R40	E4	R61	G1	R79	G5	U2	H2	U19	E5	U36	F4	U57	N3		
C11	C5	CR1	D5	Q4	D1	R8	C1	R41	E5	R62	G2	R80	G5	U3	I2	U20	E5	U37	E4	U58	M5		
C12	C2	CR2	D5	Q5	D1	R9	D1	R42	F5	R63	G2	R81	B5	U4	J2	U21	F5	U38	C3	U59	N5		
C13	O2	CR3	H5	Q6	B1	R10	D2	R43	F5	R64	G1	R82	G2	U5	J/K2	U22	F5	U39	L1/2	U60	O4		
C14	J4	CR4	A2	Q7	B1	R11	D1	R44	F6	R65	F2	R83	F6	U6	K2	U23	J5	U40	D3	U61	O4		
C15	C6	CR5	E2	Q8	E1	R12	C2	R45	D2	R66	F2	R84	A2	U7	N2	U24	G3	U41	D3	U62	O3		

CROPROCESSOR (08160-66502)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
Q9	H5	H5	R13	C2	R48	H5	R67	D4	R95	C5	U8	M4	U25	J5	U47	C4	U63	O3
Q10	H5	R14	D2	R50	G2	H68	C4	R96	C5	U9	L4	U26	H4	U43	D4	U64	O2
Q11	C4	R15	C2	R51	G2	H69	C4	RT1	H6	U10	L4	U27	I4	U44	D2	U65	B1
Q12	C5	R16	D2	R52	F1	R70	C5	TP1	A1	U11	L3	U28	I4	U48	D5	VR1	E2
Q13	C5	R17	K1	R54	F1	R71	C5	TP2	F2	U12	L3	U29	H4	U50	B5	W1	G2
R1	E3	R19	C6	R55	F1	R72	C5	TP3	C5	U13	K3	U30	H4	U51	D2	W2	G2
R2	F2	R20	D4	R56	C1	R73	C5	TP4	B5	U14	J3	U31	G1	U52	E2	W4	G2
R3	B2	R25	C2	R57	F2	R74	C5	TP5	H2	U15	J3	U32	G2	U53	E3	W5	B6
R4	B1	R30	F2	R58	F1	R75	C5	TP6	J4	U16	I3	U33	E3	U54	C2		
R5	B1	R31	F2	R59	F2	R77	H5	TP7	F2	U17	I3	U34	F3	U55	B5		
R6	C2	R37	D5	R60	F2	R78	G5	U1	G3	U18	H3	U35	F3	U56	O5		
R7	C1	R40	E4	R61	G1	R79	G5	U2	H2	U19	E5	U36	F4	U57	N3		
R8	C1	R41	E5	R62	G2	R80	G5	U3	I2	U20	D5	U37	B4	U58	M5		
R9	D1	R42	F5	R63	G2	RR1	B5	U4	J2	U21	F5	U38	C3	U59	N5		
R10	D2	R43	F5	R64	G1	R82	G2	U5	J/K2	U22	F5	U39	L1/2	U60	O4		
R11	D1	R44	F6	R65	F2	R83	F6	U6	K2	U23	J5	U40	D3	U61	O4		
R12	C2	R45	D2	R66	F2	R84	A2	U7	N2	U24	G3	U41	D3	U62	O3		

SERVICE BLOCK 7
MICROPROCESSOR BOARD A2 8 9 10 11

THEORY OF OPERATION

Controller

The controller is the data and instruction center of the 8160A Programmable Pulse Generator. It generates the control information required by the instrument dependent on inputs from one of two sources: (See Figure 8–7–1).

a) Keyboard inputs when in manual control.
b) HP-IB inputs when in remote control.

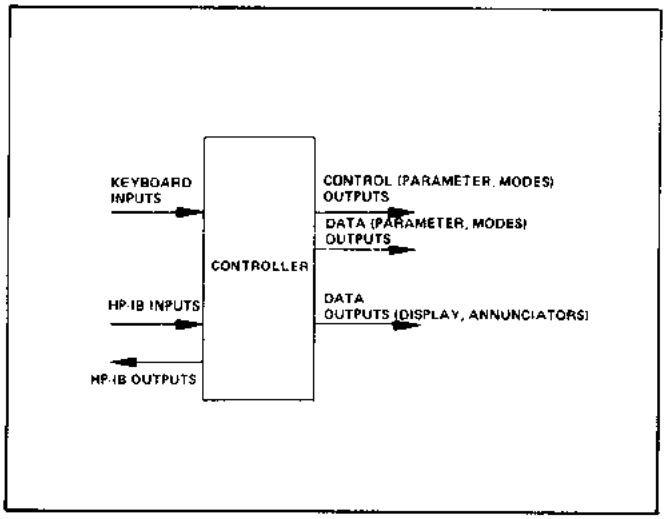


Figure 8–7–1. Controller Inputs and Outputs

During operation, inputs from one of these sources program the desired output parameters. These parameters are burst, period, delay, double pulse, width, leading edge, trailing edge, high level, low level, the inputs modes and the output modes. When the instrument is in the remote control mode, the keyboard switches are disabled and output parameters can be entered only through the HP-IB interface.

Output signals from the controller can be divided into three groups-control, data and address (the control determines whether data or address, load data or address, inhibit/reset receiver circuit).

The controller is comprised of the following major segments:
(See Figure 8–7–2, Basic Controller Structure)

a) Microprocessor Unit (MPU)
b) Read Only Memory (ROM)
c) Random Access Memory (RAM)
d) HP-IB Interface Section (Peripheral Interface Adapter, PIA)
e) Address Decoder
f) Control Line and Data Interface
g) Display
h) Keyboard Interface

The operation of the controller is based on the "intelligence" designed into the controller. Hence "intelligence" refers to the control program which is a sequence of instructions that will guide the MPU through the various operations it must perform. The program is usually referred to as "software" or "firmware" and it is common to find the terms used interchangeably. The software or firmware is what is contained in the ROM's for access by the MPU.

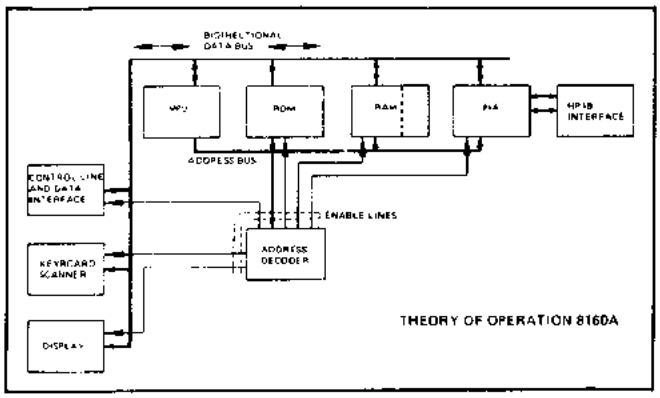


Figure 8–7–2. Basic Controller Structure

Microprocessor Unit (MPU)

The purpose of the MPU is to perform the functions (routines) programmed into the ROM. Figure 8–7–3 indicates the input and output signals of the MPU. The MPU is driven by a two-phase clock (two clock signals which are non-overlapping). It contains two buses, an eight-bit data bus and a sixteen-bit address bus. The function of the address bus is to address a particular location in memory, either ROM, RAM or the PIA. The address decoder, also connected to the address bus, enables one of these elements. In the case of a RAM or the PIA (Peripheral Interface Adapter), the MPU also controls whether it is in the read or write mode. Data can then be transmitted in either direction over the eight-bit bi-directional data bus connected to the MPU.

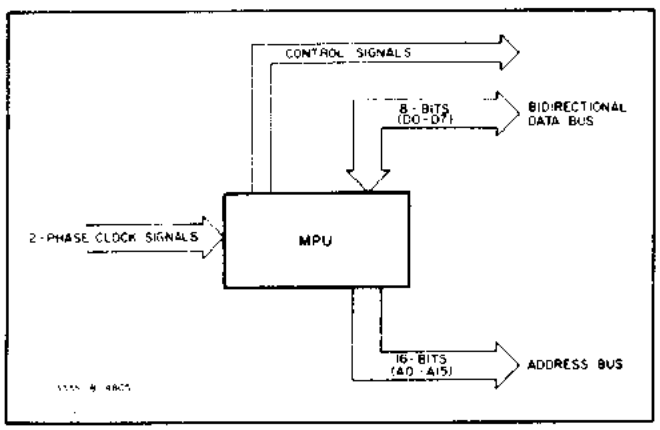


Figure 8–7–3. Microprocessor Unit Input and Output Symbols

Read Only Memory (ROM)

The Read Only Memory (ROM) is a type of memory that cannot be written into but only read from. The data pattern of the ROM is fixed at the time of manufacture according to the design specifications of its application. Data from a particular memory location can be read by addressing the memory location and enabling the ROM. Addressing and reading data take place on the two separate buses of the ROM, the address bus and the data bus.

This instrument uses ROM's which require an eleven-bit address. With eleven address lines, there are 2^{11} or 2048 different binary combinations that can be applied to the input. Each binary combination represents an "address" and the programmed ROM provides the 8-bit output from the addressed memory location. For all practical purposes, the ROM can be considered to be a decoder that transforms input addresses into specific output instructions. Instructions for particular routines are located in various ROM locations. To perform a routine, the MPU addresses the first memory location of the routine and responds to the instructions it reads. When the instruction has been performed, the MPU addresses the next memory location of the routine, reads the instruction and performs the instruction. Some instructions may branch the controller to another routine, others provide instructions to the instrument based on the information programmed in the ROM's.

Random Access Memory (RAM)

Random Access Memory (RAM) is the "scratchpad" element of the controller. The memory locations of a RAM do not normally contain permanent data. Data can be written into a memory location and then read out again at a later time. Data written into a memory location destroys the data previously stored in that location which is no longer needed, thus the term "scratchpad". Data stored in a RAM is also normally destroyed any time power is switched off or removed from the instrument. However, with the 8160A there is a non-volatile RAM section (due to battery back-up) which stores the current operating data and the 9 parameter sets.

RAM's contain two buses - an address bus for the addressing of a particular memory location, and a bi-directional data bus for transmitting data in the read mode or receiving data in the write mode. Both RAM buses are connected to the address and data buses of the MPU. The address decoder is also connected to lines of the address bus and controls the enabling of each RAM. Read or write functions are controlled by a single line from the MPU. With this configuration, the MPU can enable a particular RAM and address a particular memory location for either a read or write function.

Peripheral Interface Adapter (PIA)

The peripheral interface adapter (PIA) is a part of the HP-IB section and provides the communication link between the MPU and the outside world.

Figure 8–7–4 is a block diagram of the PIA showing internal registers and input/output lines. The PIA contains the following:

a) An 8-bit bi-directional data bus for communication with the MPU (DØ – D7).
b) Control lines to enable the PIA and establish the read or write mode of operation.
c) Two independent bi-directional 8-bit peripheral data buses "A" and "B" (PAØ – PA7 and PBØ – PB7), used enter data and generate instrument control and data signals.
d) Six internal registers, three associated with the Peripheral Data Bus "A" and three with Peripheral Data Bus "B". The three registers of each half are:

   1. A programmable control register to control activation of the peripheral data bus.
   2. A programmable data direction register to establish each individual peripheral bus line as either input or output.
   3. Data registers for holding the data to be transmitted.

e) Address lines for enabling one of the six internal registers.
f) Peripheral control outputs, of which a single line (CB2) is used.

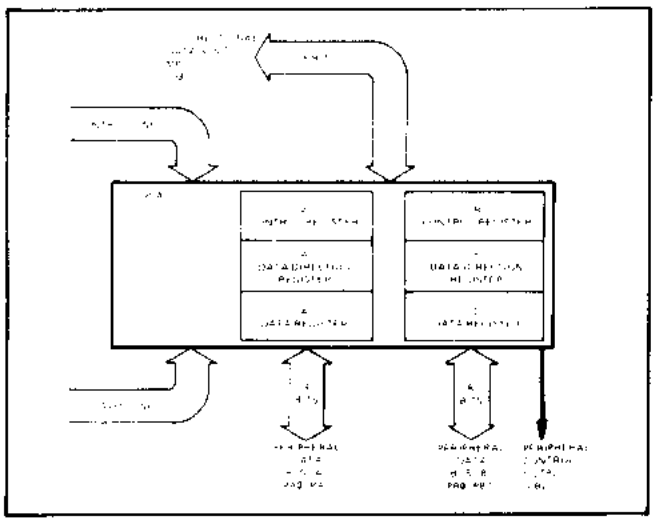


Figure 8–7–4. PIA Registers and Input/Output Lines

From the MPU's viewpoint, the PIA is simply memory locations that are treated in the same manner as any other read/write memory. The read/write function is controlled by a single line (R/W) from the MPU. This is the same line used to control the read/write function of the RAM's.

Address Decoder

The address decoder is an enabling device. See Figure 8–7–2, Basic Controller Structure. It enables a ROM, a RAM pair, the HP-IB data interface, the Control Line and Data Interface, the Keyboard Scanner or the Display, dependent on the address applied to the address bus by the MPU. The address performs a two-fold function; not only does it indicate the memory location within the ROM, RAM or PIA desired, but when applied through the address decoder, it identifies the element to be enabled.

Control Line and Data Interface (Schematic 11)

The instrument uses an internal 16-bit parallel Device Bus. The function of this bus is controlled by 3 Device Bus management lines. The control line latches and the data latches, which terminate the Data-Bus, are selected through Address Enable Lines over the Address Decoder.

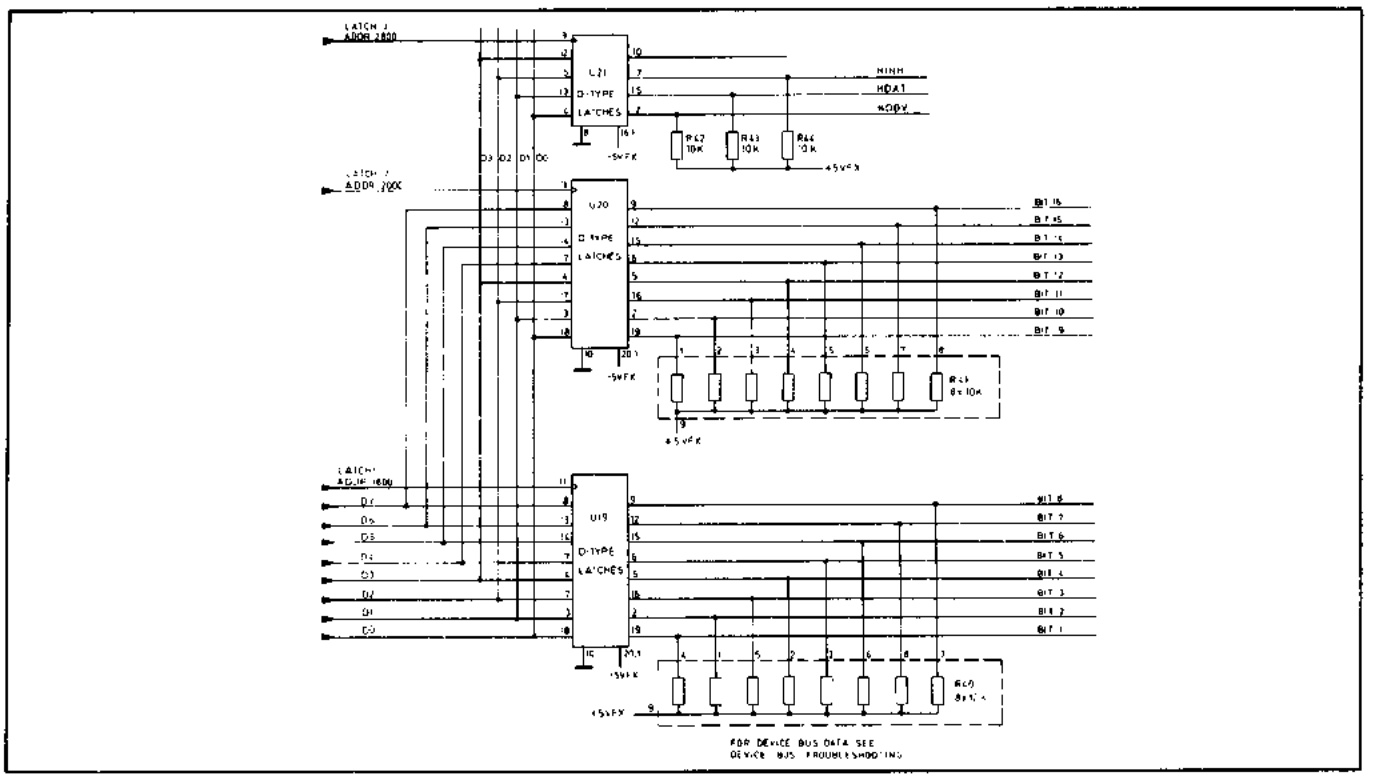


Figure 8–7–5. Control Line and Data Interface

Controller, Detailed Theory

In the previous simplified theory of the controller, a basic description of the major elements was presented. Here the detailed block diagram and schematic diagram of the controller are used to provide a detailed description of the interaction of the major elements.

The major elements of the controller are restated here.

a) Microprocessor Unit (MPU)
b) Read Only Memory (ROM)
c) Random Access Memory (RAM)
d) HP-IB Interface Section
e) Address Decoder
f) Control Line and Data Interface
g) Display Interface
h) Keyboard Interface

MPU (Schematic 10)

The MPU is the principle element of the controller. It is an eight-bit parallel microprocessor with a maximum addressing capability of 65,536 words. It is TTL compatible and requires a single 5 V supply. Several memory devices (ROM's and RAM's) and an input/output interface device (PIA) are used to support the MPU. Before describing the major elements in detail, an explanation of the MPU inputs and outputs will be presented. The inputs and outputs can be divided into four groups – Data, Address, Control and Supervisory. Figure 8–7–6 indicates the MPU lines in each of the four groups. This explanation will help to relate the other elements to the MPU.

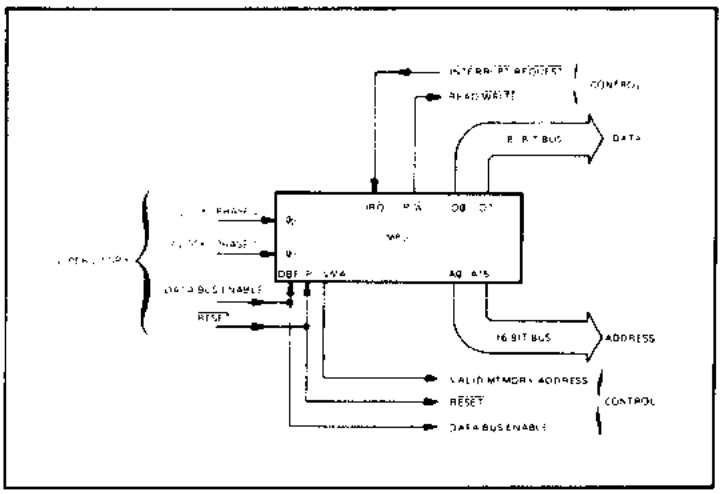


Figure 8–7–6. MPU I/O; Data, Address, Supervisory and Control

Data Bus

The MPU data bus is an 8-bit bi-directional bus. It is the communication link between the MPU and the memory and interface elements.

Address Bus

The address bus contains 16-bits. Some lines of the bus are used to address a memory location and additionally are decoded to enable a particular memory or I/O device.

Control Signals

The control signals include $\overline{\text{Interrupt Request (IRQ)}}$, Read/$\overline{\text{Write}}$ (R/$\overline{\text{W}}$), $\overline{\text{Reset}}$ ($\overline{\text{R}}$), Valid Memory Address (VMA) and Data Bus Enable (DBE). The $\overline{\text{IRQ}}$ line is connected to the HP-IB interface. When it goes to a logic zero it initiates an interrupt sequence which is the HP-IB data input routine. R/$\overline{\text{W}}$ and VMA characterize the data bus and address bus respectively. R/$\overline{\text{W}}$ designates whether the MPU is in the read or write mode for each cycle, thus it indicates the direction of data transfer on the data bus. VMA indicates to the memory and I/O device that the MPU is performing a read or write operation in a given cycle. DBE controls the data bus; it is the bus enable signal indicating when data is to be placed on or taken from the bus. $\overline{\text{Reset}}$, $\overline{\text{R}}$, actually originates as a supervisory signal. It is used following power-on or a power down condition to go an intializing routine to set up the controller starting conditions.

Supervisory Signals

These signals include the two-phase clock signals ($\emptyset_1$ and $\emptyset_2$), Data Bus Enable (DBE) and $\overline{\text{Reset}}$ ($\overline{\text{R}}$). The two-phase clock signals and DBE are generated by the clock circuit. The clock signals drive the microprocessor and DBE enables the data bus. The start-up circuit provides the $\overline{\text{R}}$ line which initiates the start-up routine and resets the controller.

Clock Circuit (Schematic 10)

The monostable flip-flops provide the non-overlapping clock signals $\emptyset_1$ and $\emptyset_2$. The $\emptyset_2$ (TTL) signal is employed in the microprocessor system, while the microprocessor itself uses a clock derived from a buffered $\emptyset_1$ (TTL) and $\emptyset_2$ (TTL).

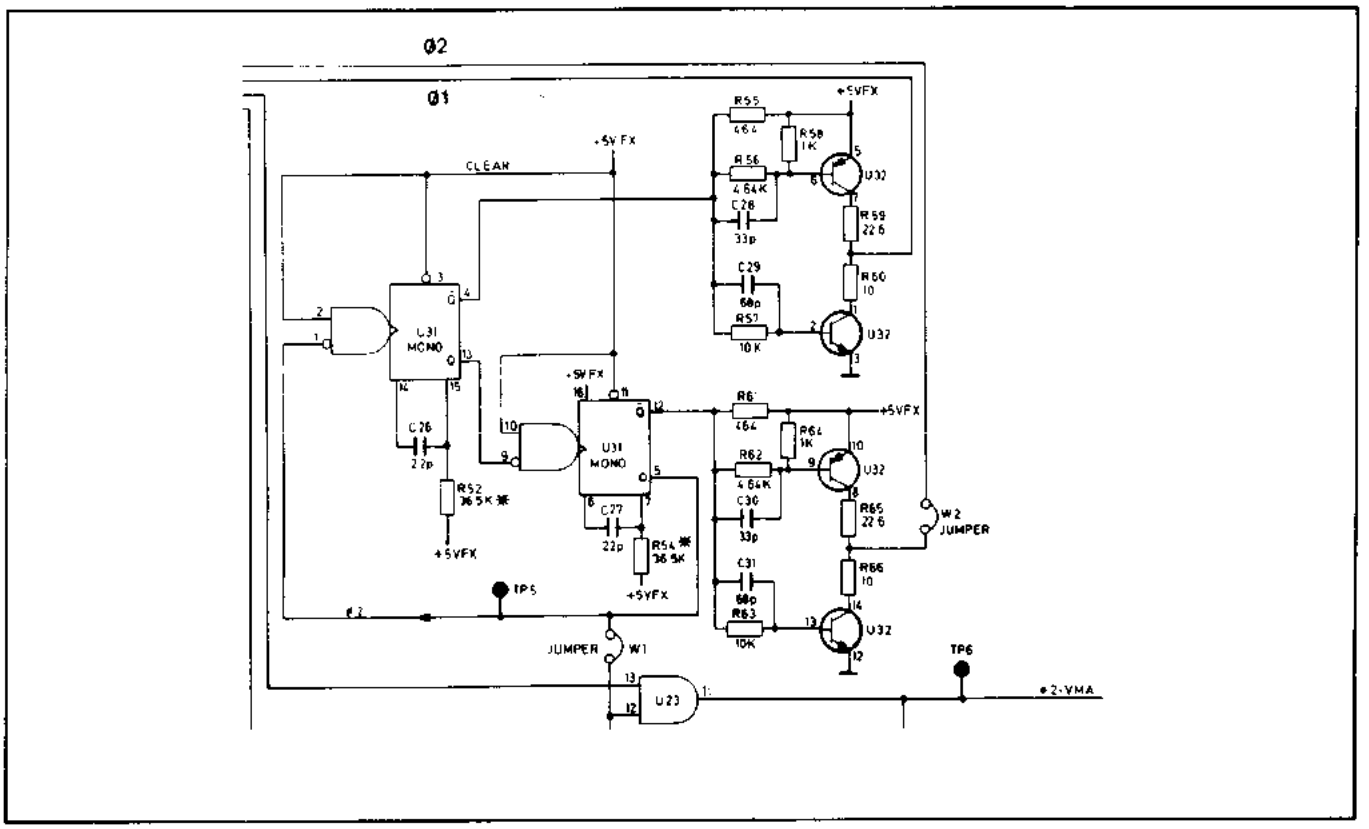


Figure 8–7–7. Clock Circuit

Restart and Battery Back-up Circuit (Schematic 11)

The restart circuit provides the microprocessor with the required $\overline{\text{RESTART}}$ signal at power switch-on. This signal is a pulse with approximately 80 ms width and is fed to both the microprocessor and Peripheral Interface Adapter (PIA).

The battery back-up circuit provides battery charging during instrument power-on, and power to the non-volatile RAM section during instrument power-off. During instrument power-on, battery charging is done via the Q9 circuit (**schematic 11**). The resistor RT1, which has a negative temperature coefficient, disables the battery charge function at low temperatures ($< 0^{\circ}C$). In the instrument power-on state, the $+5_{BATT}$ voltage is derived from the +12 V via Q8. Diode DR5 then enables current flow to the RAMs, and diode CR3 turns Q10 off so that no battery discharge can occur.

When the power is switched off from the instrument, the battery voltage is connected via Q10 to the RAMs. Then diode CR13 prevent current flow over the +5 V line to other devices.

During normal operation, the RAMs require a high RAM ENABLE (CE2) signal. In the event of the +5 V_{BATT} supply going down, the RAM ENABLE must go low prior to the +5 V_{BATT} line falling below +4.75 V. This action ensures RAM data retention, and the RAM's then only require +2.5 V to supply the non-volatile section.

The RAM ENABLE signal is generated via Q13 and the differential amplifier Q11, Q12. During power switch-on, this signal (at TP3) also triggers the monostable flip-flop U48 to generate the RESET pulse.

Control Signal Generation

Control signals include signals that are generated by the MPU, signals input to the MPU and signals both input to the MPU and transmitted to other parts of the controller. The control signals include Read/$\overline{\text{Write}}$ (R/$\overline{\text{W}}$) and VALID MEMORY ADDRESS (VMA) generated by the MPU. $\overline{\text{Interrupt Request}}$ ($\overline{\text{IRQ}}$) which is input to the MPU and DATA BUS ENABLE (DBE) and $\overline{\text{Reset}}$ ($\overline{\text{R}}$) which are input to the MPU and also transmitted to other parts of the controller. DBE and $\overline{\text{R}}$ are generated as supervisory signals.

The R/$\overline{\text{W}}$ is a signal from the MPU to RAM's or the PIA to indicate when it is in the read or write mode. VMA is generated by the MPU and combined with $\emptyset_2$, via AND gate U23, to be transmitted to the address decoder to indicate when data on the address bus is valid. $\overline{\text{IRQ}}$ is transmitted to the MPU from the HP-IB interface over the PIA. When $\overline{\text{IRQ}}$ is low, the MPU accesses the HP-IB data input routine in memory and through the routine, receives and acts according to the HP-IB data under remote control.

Keyboard

The keyboard provides the interface between the user and the instrument during manual operation. Through the keyboard, the user can program the various operating parameters. Four vernier keys are also contained in the keyboard, to allow the user to alter all parameters.

The keys of the keyboard can be divided into seven groups plus a reset to local key which sets the 8160A back to local operation. The groups are as follows: INPUT MODE Group; the PARAMETER keys including STORE, RECALL; the CHANNEL/DATA Keys; the ENTRY Keys; the VERNIER Keys; and last the OUTPUT MODE Keys.

The keyboard scanner operates in the following manner. Six bits of the Data Bus are latched in and then fed to a Multiplexer and BCD-Decimal Decoder which form a key matrix. Pressing a key results in a low-going KEY DOWN Line. This line is routed over U26 to the Data Bus, and detected by the Microprocessor (software debouncing routine ensures the validity of the key-depress action).

HP-IB Interface (Schematic 9)

The HP-IB Interface circuit comprises the Peripheral Interface Adapter (PIA), which is described earlier, together with some additional circuits.
In order to recognize MLA or MTA (MY ADDRESS), a 5-bit comparator is used to compare the 5 selectable addresses (set on the rear panel address select switch) with the DIO lines 1–5. The B section of the PIA handles the incoming and outgoing data over the Data Bus Buffer and HP-IB terminating resistors. The ATN signal disables the TALK BUFFER, and sets RFD, DAC and DAV so that the instrument is in Data Receive Mode. In the Command Mode, ATN in conjunction with DAV (Gate U62 pin 9/10/8) causes an $\overline{\text{IRQ}}$ to occur, so that the instrument will respond to the HP-IB message.
The three leftover interrupt inputs of the PIA have the following functions:

a) IFC at the CB2 input sets the instrument to LIDS and TIDS.
b) REN enables the instrument to go to the remote state, while $\overline{\text{REN}}$ forces the instrument from REMOTE to LOCAL (CA1 input).
c) the third interrupt line is from the LOCAL key (only functional if no LLO) which also forces the instrument from REMOTE to LOCAL (CA2 input).

The SRQ line is controlled by the PIA port A, PA1. During initialization, PA1 is an input but pulls U61 pins 12 and 13 high so $\overline{\text{SRQ}}$ will be high and no service request can be initiated.

The acceptor handshake in the Listener Mode is controlled by the MPU via the RDY line.
In the Talker Mode, $\overline{\text{ATN}}$ and LIDS disable DAC and RFD outputs. With $\overline{\text{ATN}}$ and $\overline{\text{TIDS}}$ data can be sent over the bus. After data transmission to the data output buffer, DAV will be sent by the MPU. Then the instrument waits for DAC. On receiving DAC, the 8160A sets $\overline{\text{DAV}}$, thus preparing new data. This status remains until RFD is set, at which point the 8160A can send new data and the complete handshake is repeated.

TROUBLESHOOTING

Due to the complexity of the microprocessor, board A2 is on a blue-stripe exchange board program. Troubleshooting is therefore limited to a few tests which determine whether the microprocessor is functioning. Perform the following tests:

1. Check that the clock generator waveforms are as shown in Figure 8–7–8.
2. Check voltage at TP1 → 12 V
3. Check voltage at TP2 → 5 V
4. Check voltage at TP3 → approximately 5 V (RAM ENABLE)
5. Check signal at TP4 is as shown in Figure 8–7–9.

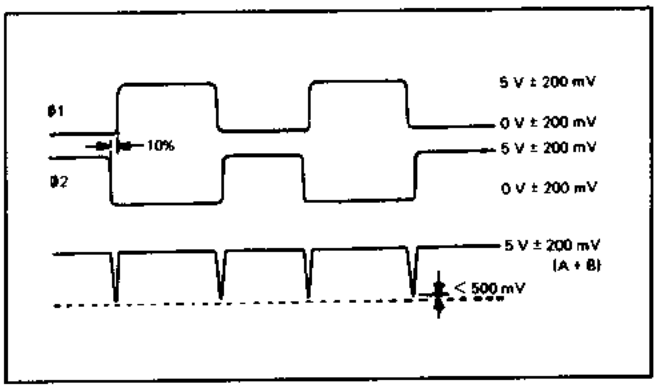


Figure 8–7–8. Clock generator waveforms

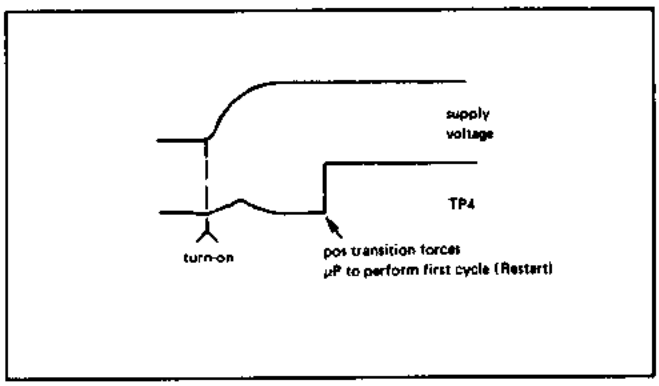
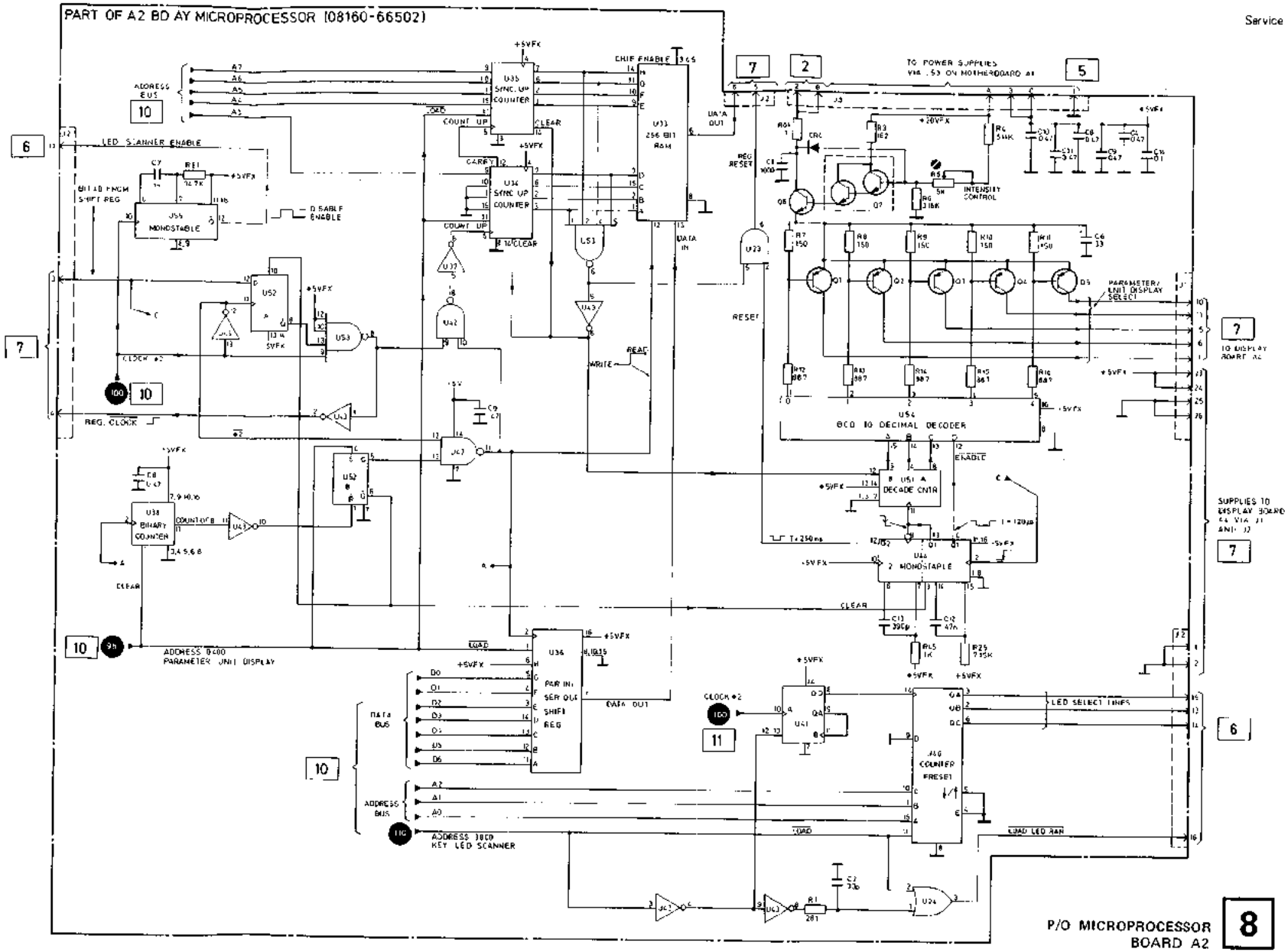
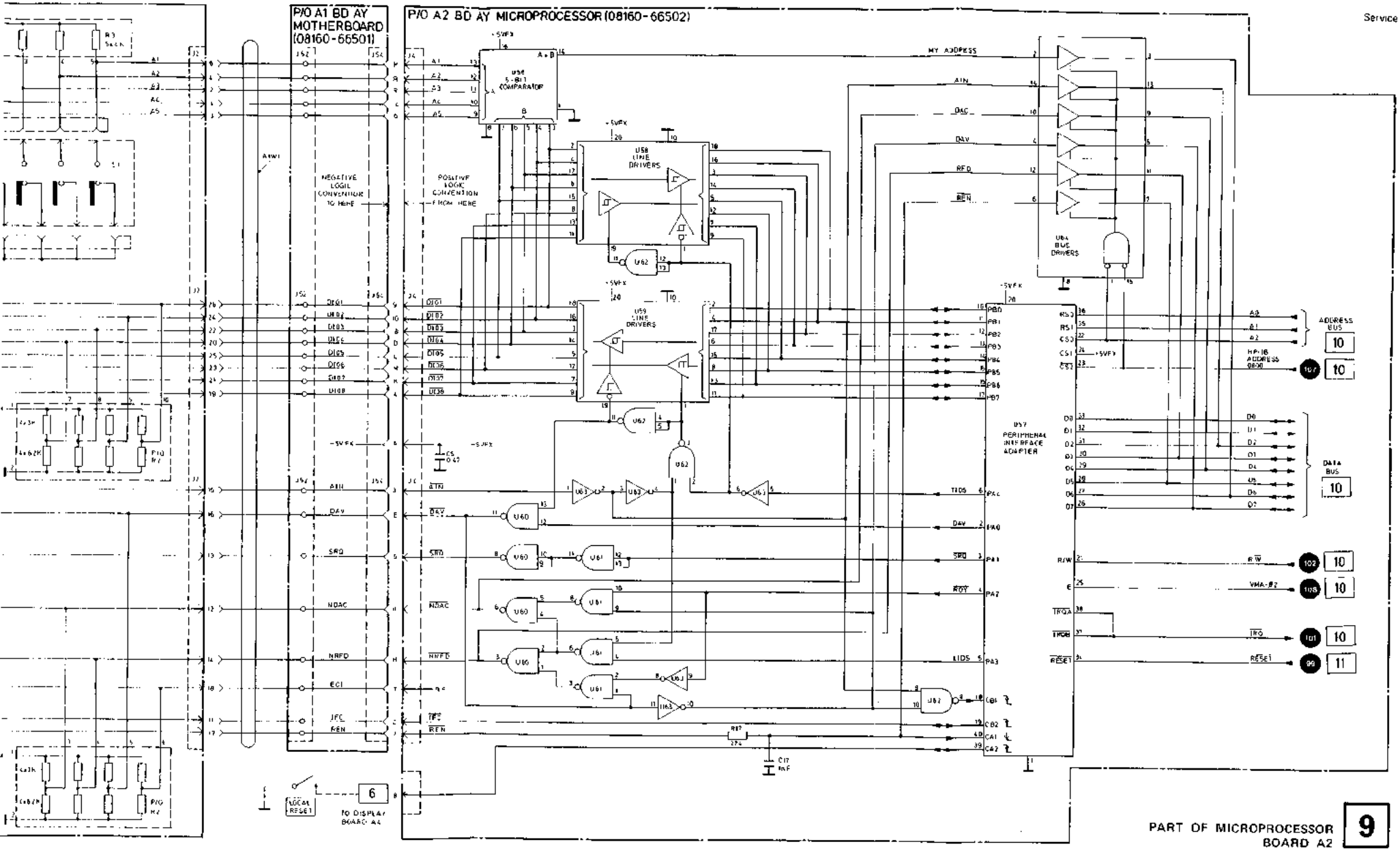
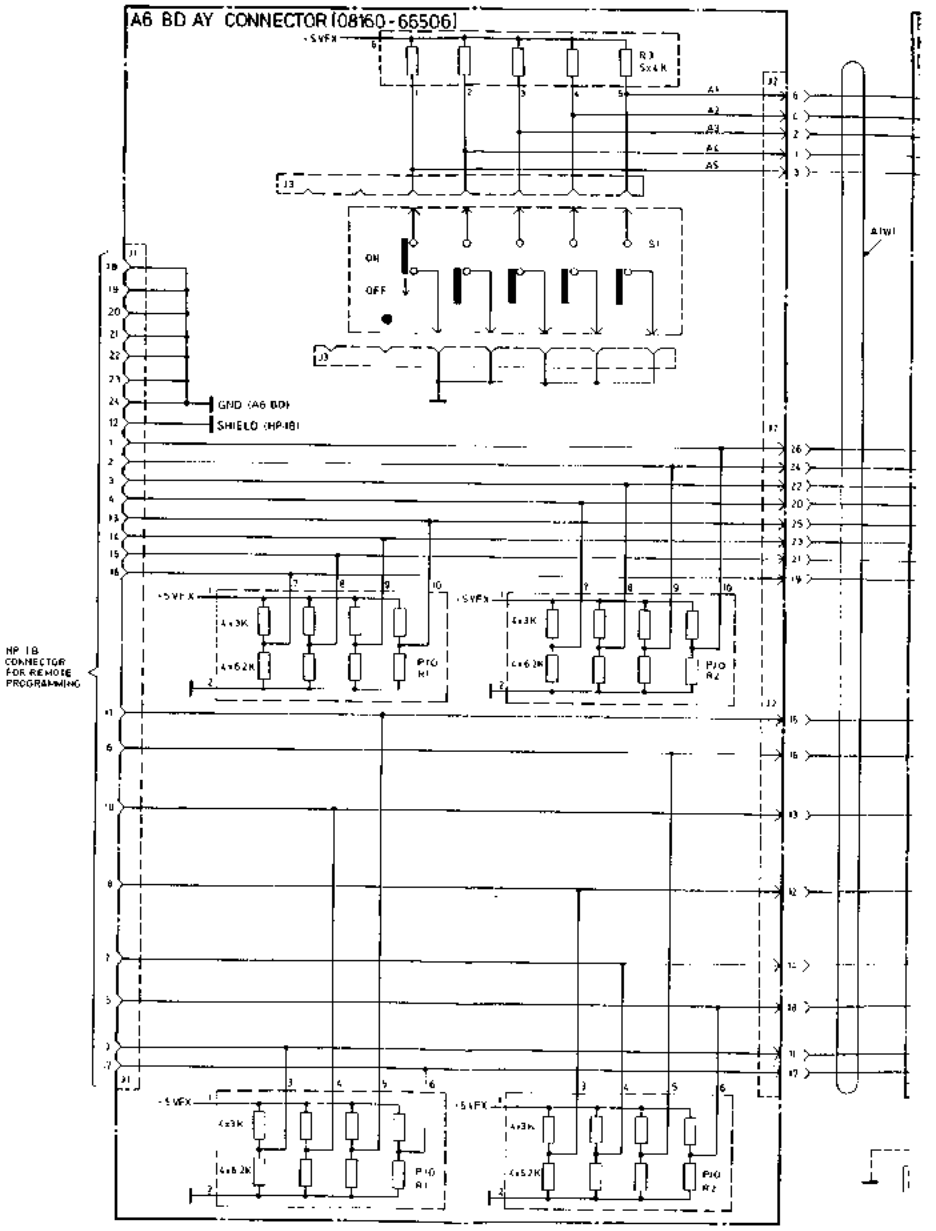
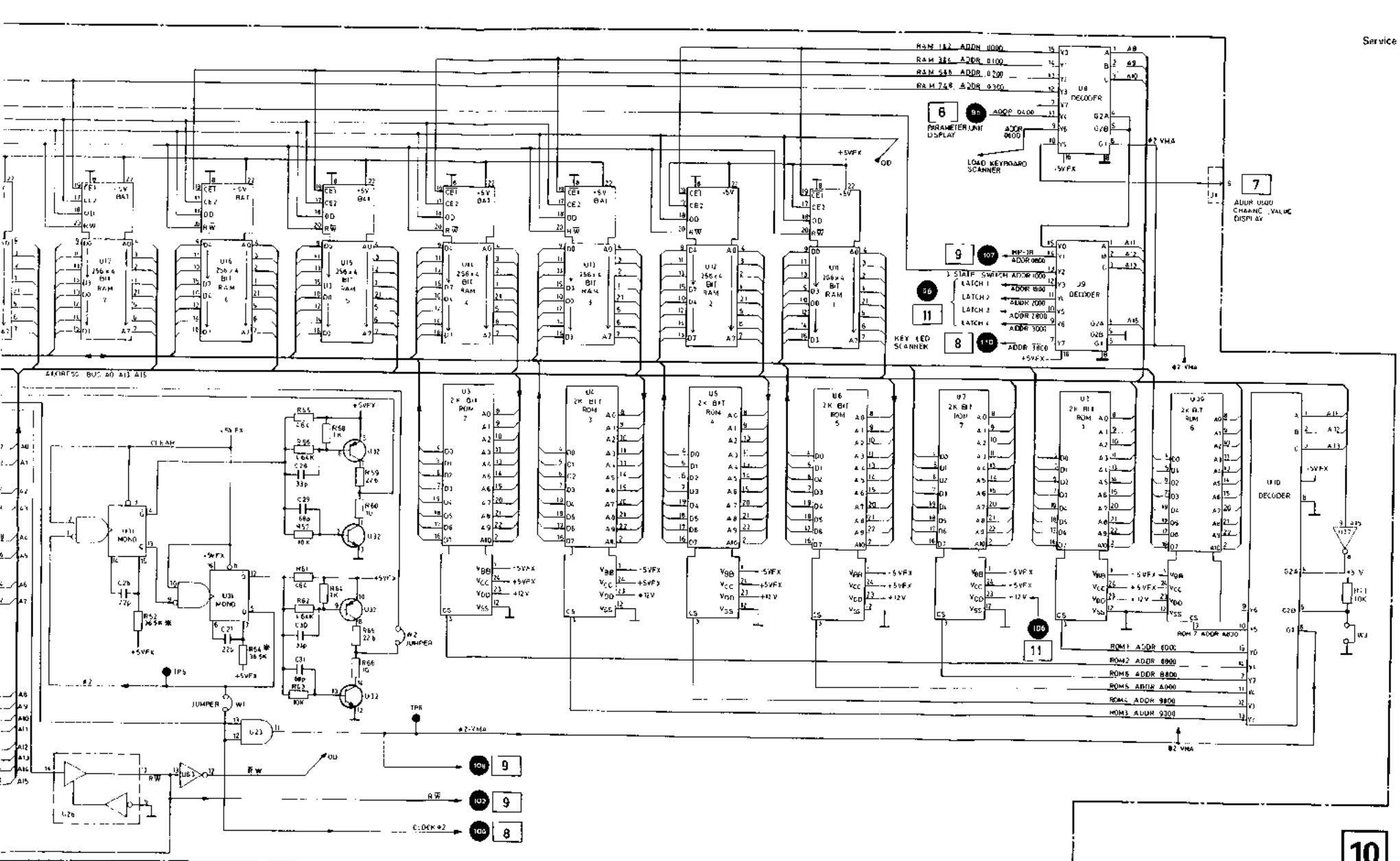


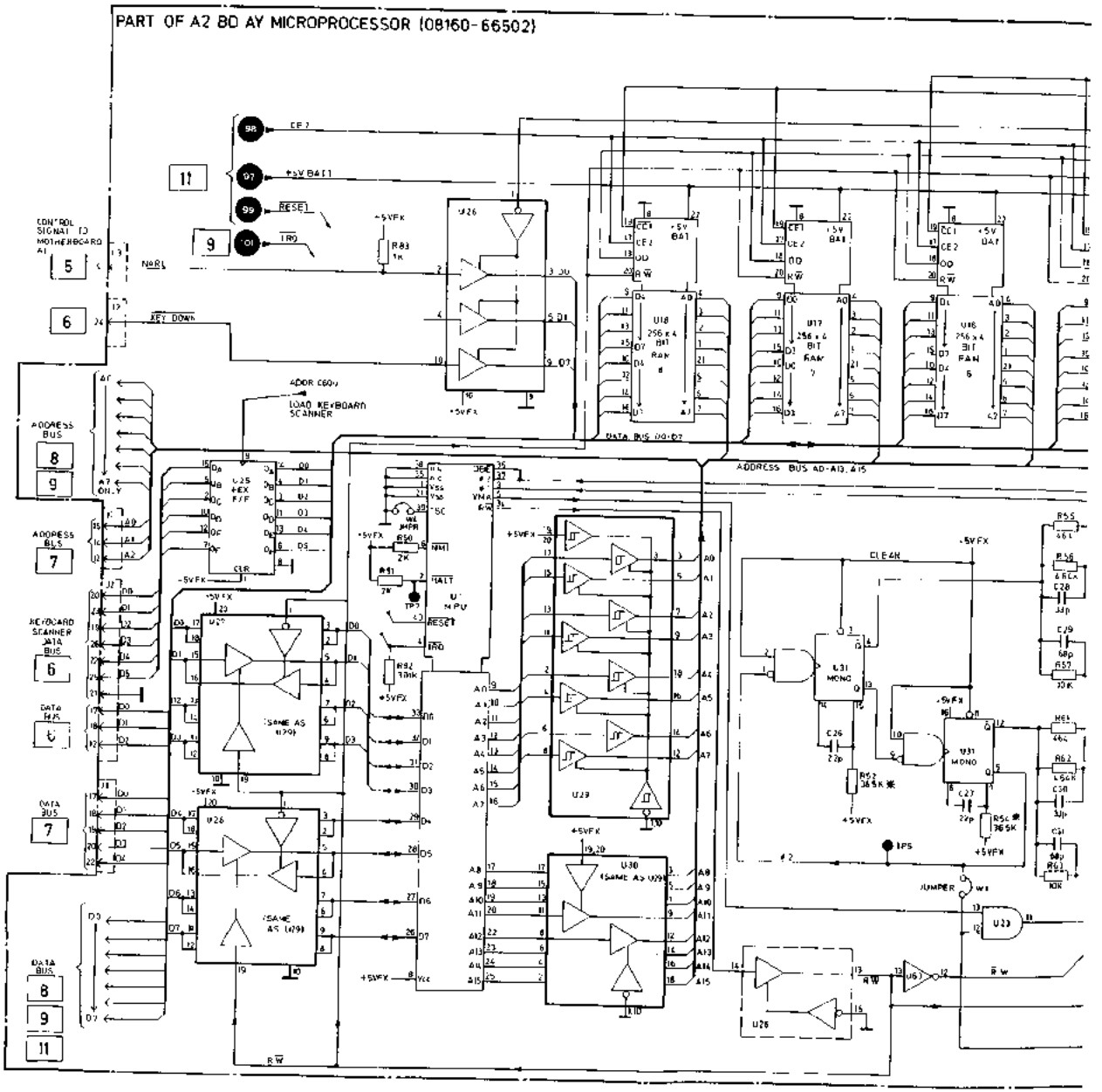
Figure 8–7–9. TP4 Waveform


PART OF A2 BD AY MICROPROCESSOR (08160-66502)
ADDRESS BUS
LED SCANNER ENABLE
BIT LED FROM SHIFT REG
DISABLE ENABLE
CLOCK ø2
REG. CLOCK
ADDRESS 0400 PARAMETER UNIT DISPLAY
DATA BUS
ADDRESS BUS
ADDRESS 38C0 KEY LED SCANNER
CHIP ENABLE
DATA IN
DATA OUT
COUNT UP
CLEAR
CARRY
LOAD
READ
WRITE
RESET
REG RESET
INTENSITY CONTROL
TO POWER SUPPLIES VIA J53 ON MOTHERBOARD A1
PARAMETER/ UNIT DISPLAY SELECT
BCD TO DECIMAL DECODER
ENABLE
LED SELECT LINES
LOAD LED RAM
TO DISPLAY BOARD A2
SUPPLIES TO DISPLAY BOARD VIA J1 AND J2
P/O MICROPROCESSOR BOARD A2
8
8-79

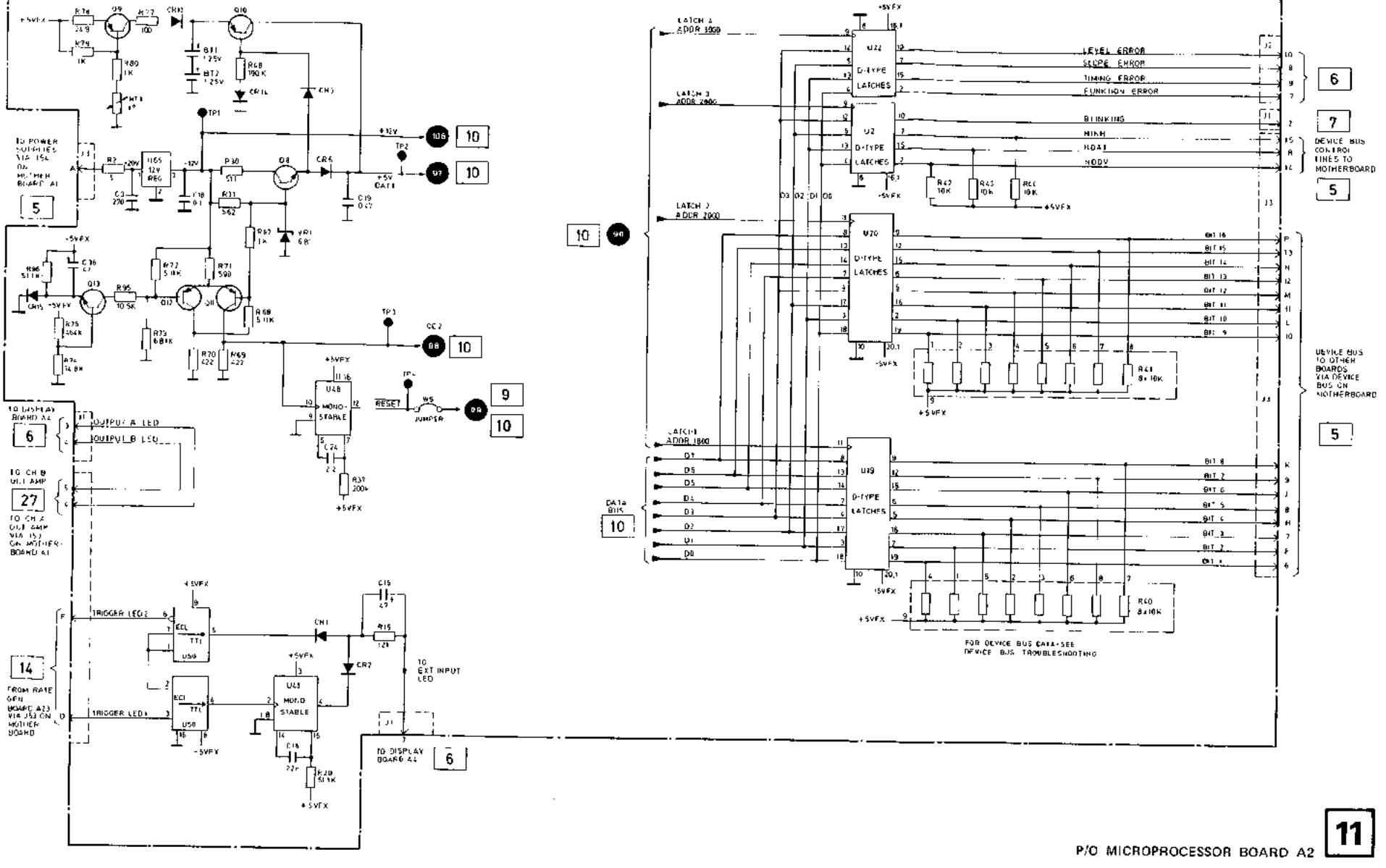

P/O A1 BD AY
MOTHERBOARD
(08160-66501)
P/O A2 BD AY MICROPROCESSOR (08160-66502)
MY ADDRESS
ATN
DAC
DAV
RFD
EOI
REN
SRQ
IFC
NRFD
NDAC
U58
LINE
DRIVERS
U59
LINE
DRIVERS
U64
BUS
DRIVERS
U56
6-BIT
COMPARATOR
U57
PERIPHERAL
INTERFACE
ADAPTER
NEGATIVE
LOGIC
CONVENTION
TO HERE
POSITIVE
LOGIC
CONVENTION
FROM HERE
+5VFX
ADDRESS
BUS
10
HP-IB
ADDRESS
0800
DATA
BUS
10
R/W
VMA-Ø2
IRQ
RESET
LOCAL
RESET
6
TO DISPLAY
BOARD A4
PART OF MICROPROCESSOR
BOARD A2
9


A6 BD AY CONNECTOR (08160-66506)
+5VFX
R3
5x4K
A1
A2
A3
A4
A5
J3
S1
ON
OFF
J2
ATN1
J1
GND (A6 BD)
SHIELD (HP-IB)
HP IB
CONNECTOR
FOR REMOTE
PROGRAMMING
4x3K
4x6.2K
P10
R1
P10
R2

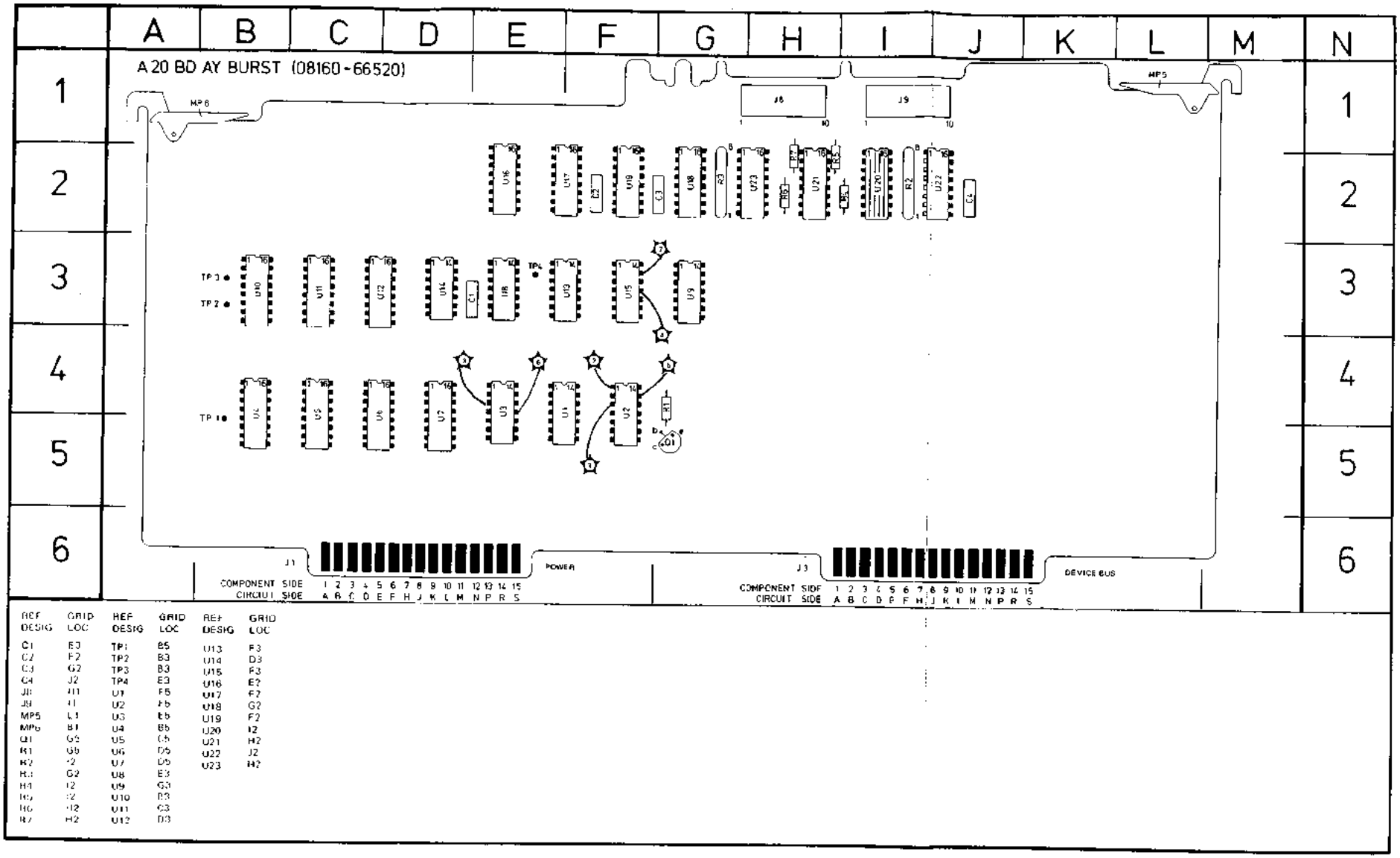

P/O A2 MICROPROCESSOR BOARD
10
8-83


PART OF A2 BD AY MICROPROCESSOR (08160-66502)
CONTROL SIGNAL TO MOTHERBOARD A1
ADDRESS BUS
KEYBOARD SCANNER DATA BUS
DATA BUS
LOAD KEYBOARD SCANNER
ADDR C600
DATA BUS D0-D7
ADDRESS BUS A0-A13, A15
CLEAN
JUMPER
U25 HEX F/F
U26
U29
U30
U31 MONO
U33
U6
U18 256 x 4 BIT RAM
U17 256 x 4 BIT RAM
U16 256 x 4 BIT RAM
U μP
SAME AS U29
SAME AS U30
SAME AS U26
SAME AS U29
R/W

PART OF A2 BD AY MICROPROCESSOR (08160-66502)



P/O MICROPROCESSOR BOARD A2 **11**



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	E3	TP1	B5	U13	F3
C2	F2	TP2	B3	U14	D3
C3	G2	TP3	B3	U15	F3
C4	J2	TP4	E3	U16	E?
J8	J1	U1	F5	U17	F?
J9	J1	U2	F5	U18	G2
MP5	L3	U3	E5	U19	F2
MP6	B1	U4	B5	U20	I2
Q1	G5	U5	C5	U21	H2
R1	G5	U6	D5	U22	J2
R2	I2	U7	D5	U23	H2
R3	G2	U8	E3		
R4	I2	U9	G3		
R5	I2	U10	B3		
R6	H2	U11	C3		
R7	H2	U12	D3		

SERVICE BLOCK 8
BURST GENERATOR A20 12

THEORY OF OPERATION

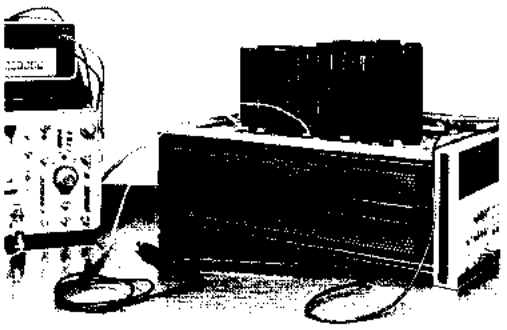
To obtain a counted burst, a counter is necessary to stop the VCO after the required number of pulses has been generated. (The burst generator of the 8160A operates for any given burst number between 0 and 9999 at all period settings). Should the burst number be re-programmed during the burst, the burst is interrupted, and the burst counter reset. The counter must then be re-triggered for the new burst.

A block diagram of the burst generator is shown in Figure 8–8–4. The burst generator consists of an acceptor circuit, a number of latches for the device data, a reset circuit and a binary down counter.

When the burst generator is programmed, the counter is set to the desired burst number. After a trigger pulse sets the burst flip-flop U26, the VCO is turned on and the burst generator starts to count down. The D-input of the burst flip-flop goes low when the counter reaches 1. The positive transition of the next pulse then clocks the burst flip-flop thus shutting off the VCO and resetting the ECL counter in the burst generator.

To enable a very short recycle time, the TTL counters in the burst generator set a flip-flop when the count reaches 16 and are themselves then reset. The flip-flop is next reset when 1 is detected.To eliminate propagation delays in the rep. rate generator, the Q output of the burst flip-flop U26 is connected to U28 pin 13 via U21 on the burst generator assy. At very short period settings, this blocks any pulse that is already under way when the VCO is shut off. It also disables the VCO output for burst number 0.

TROUBLESHOOTING



To effectively troubleshoot the Burst section of the 8160A, the following equipment is needed:

1) Extender Board 08160–66573
2) Extender Board 08160–66572 (2)
3) Extender Cable 08160–61610 (2)
4. Logic Probe ECL
5) Logic Probe TTL
6) Oscilloscope

Using the listed equipment, check that the conditions at the following test points (see also Figure 8–8–4 for precise location) are true as indicated in timing diagrams, Figure 8–8–2 and Figure 8–8–3:

① — Load pulse from acceptor to load latches [via BURST (PARAMETER), NUMBER (DATA), and BURST (ENTRY)]

② — Load pulse from acceptor to load counter [via BURST (INPUT MODE) or BURST (PARAMETER), NUMBER (DATA), and BURST (ENTRY)]

③ — Burst enable/disable (from rate acceptor)

④ — Accepted data are correct (as given in Table 8–8–1 for the respective burst number).

Burst flip-flop U26 is ok. To test this, use the following procedure:

1. Set burst number to 0.
2. Press BURST input mode (reset pulse) and MAN (set pulse) alternately, checking that the flip-flop functions correctly as shown in Figure 8–8–1.
3. Open J8/5 and rate path A23/U28, A20/U21 can also be tested.

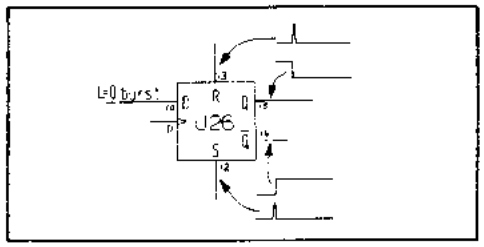


Figure 8–8–1. Burst Flip-Flop

NOTE: some pulses are very narrow and may not be detected by the logic probe.

Table 8–8–1. Latch Truth Table

Burst Number	U7 pin 2 10 11 1	U6 pin 2 10 11 1	U5 pin 2 10 11 1	U4 pin 2 10 11 1
0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1
1	1 0 0 0	0 0 0 0	0 0 0 0	0 0 0
2	0 1 0 0	0 0 0 0	0 0 0 0	0 0 0
4	0 0 1 0	0 0 0 0	0 0 0 0	0 0 0
8	0 0 0 1	0 0 0 0	0 0 0 0	0 0 0
16	0 0 0 0	1 0 0 0	0 0 0 0	0 0 0
32	0 0 0 0	0 1 0 0	0 0 0 0	0 0 0
64	0 0 0 0	0 0 1 0	0 0 0 0	0 0 0
128	0 0 0 0	0 0 0 1	0 0 0 0	0 0 0
256	0 0 0 0	0 0 0 0	1 0 0 0	0 0 0
512	0 0 0 0	0 0 0 0	0 1 0 0	0 0 0
1024	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0
2048	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0
4096	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0
8192	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0
8191	1 1 1 1	1 1 1 1	1 1 1 1	1 1 0

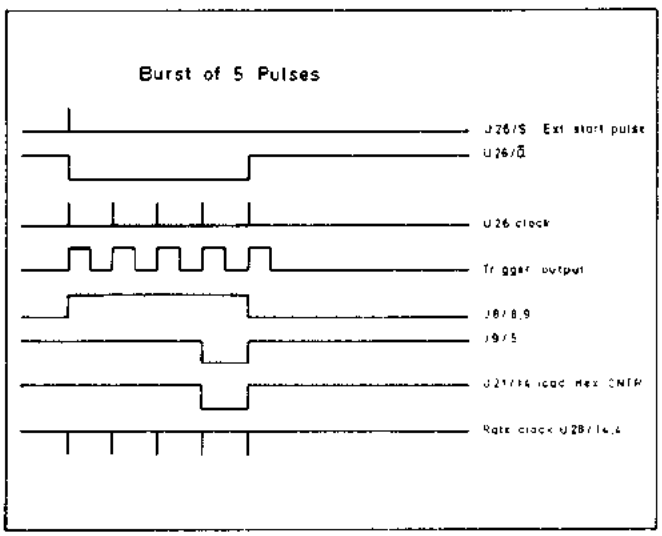


Figure 8–8–2. Timing Diagram

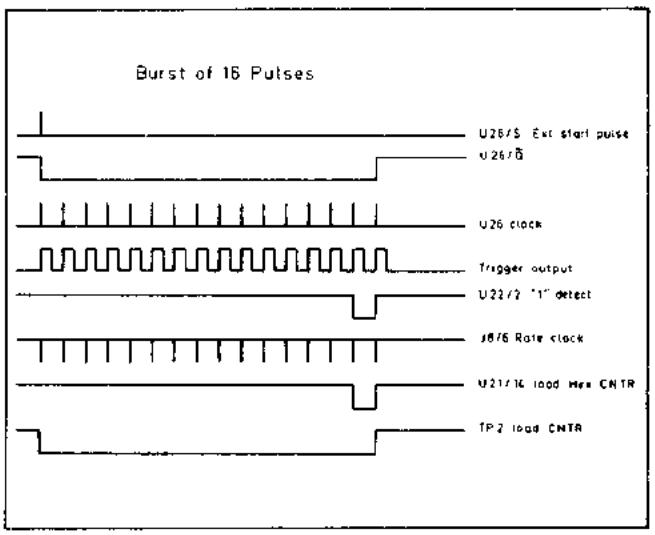


Figure 8- 8- 3. Timing Diagram

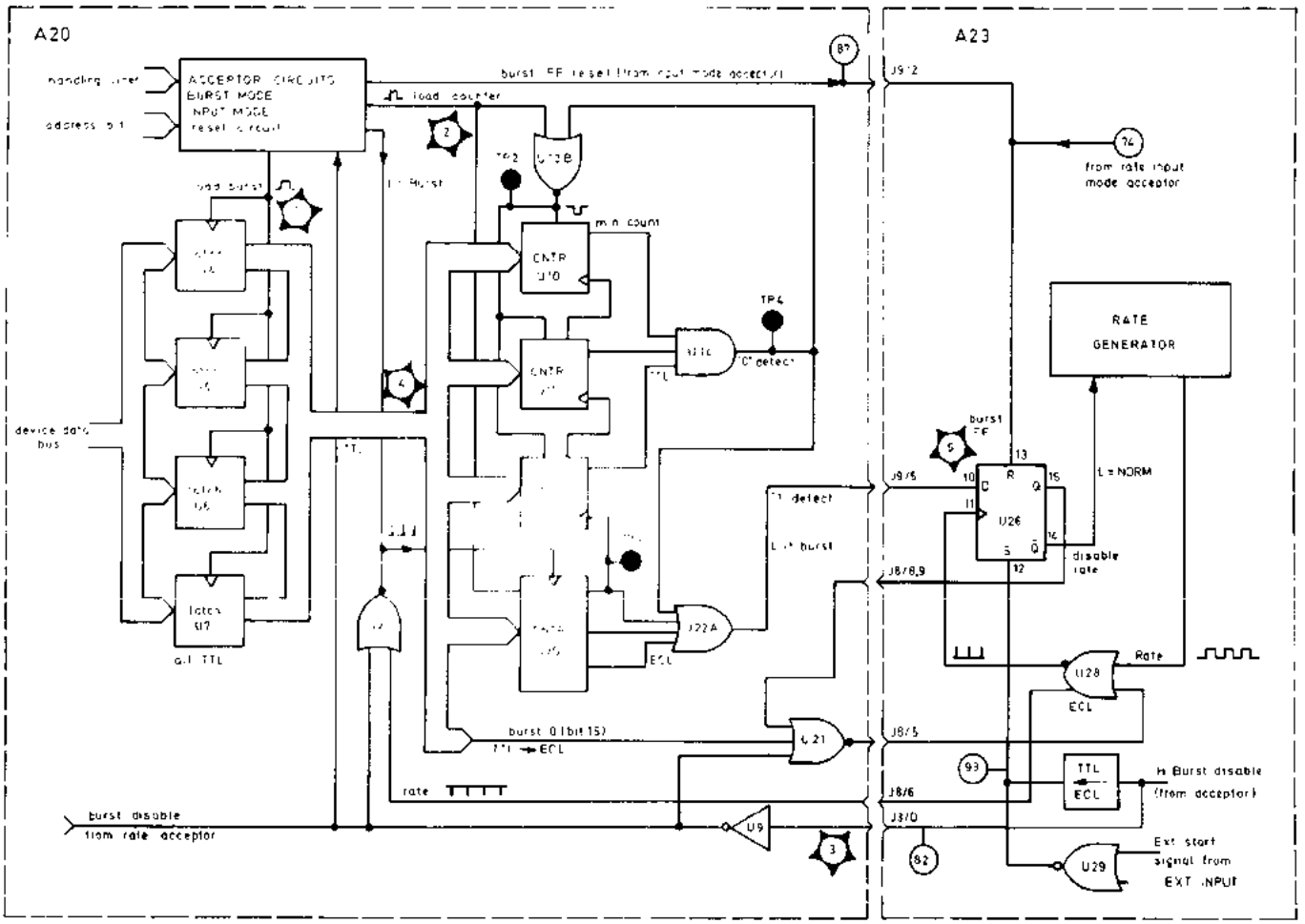
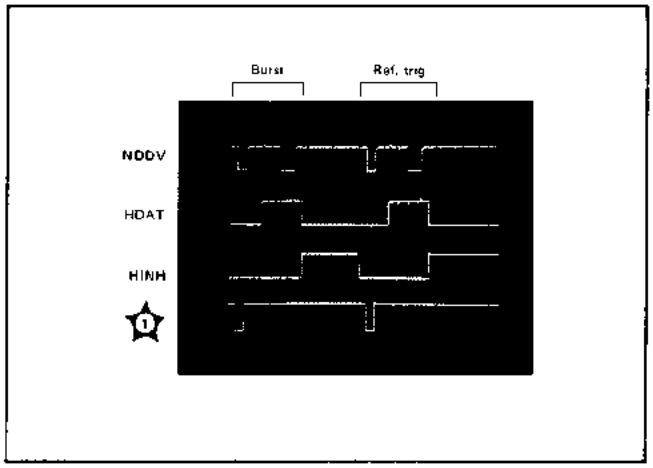
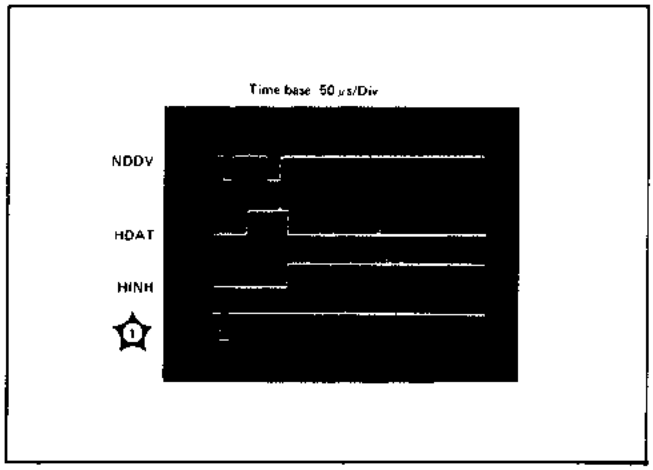


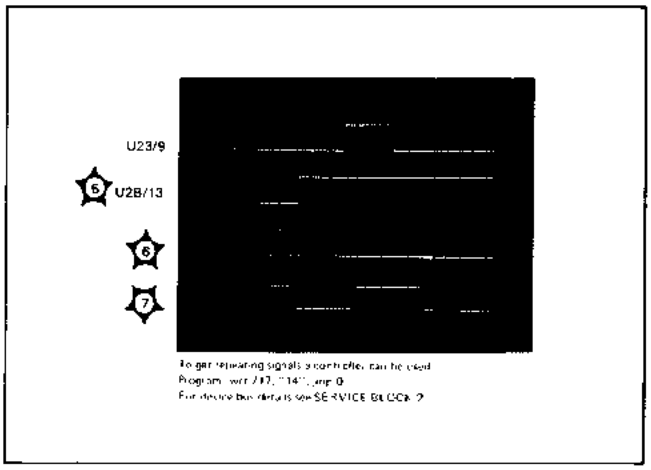
Figure 8 -8–4. Burst Block Diagram

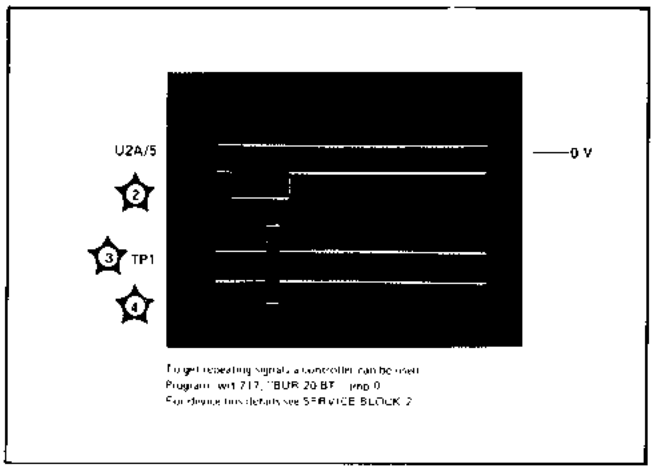
Burst Number Acceptor
(all signals are TTL level)

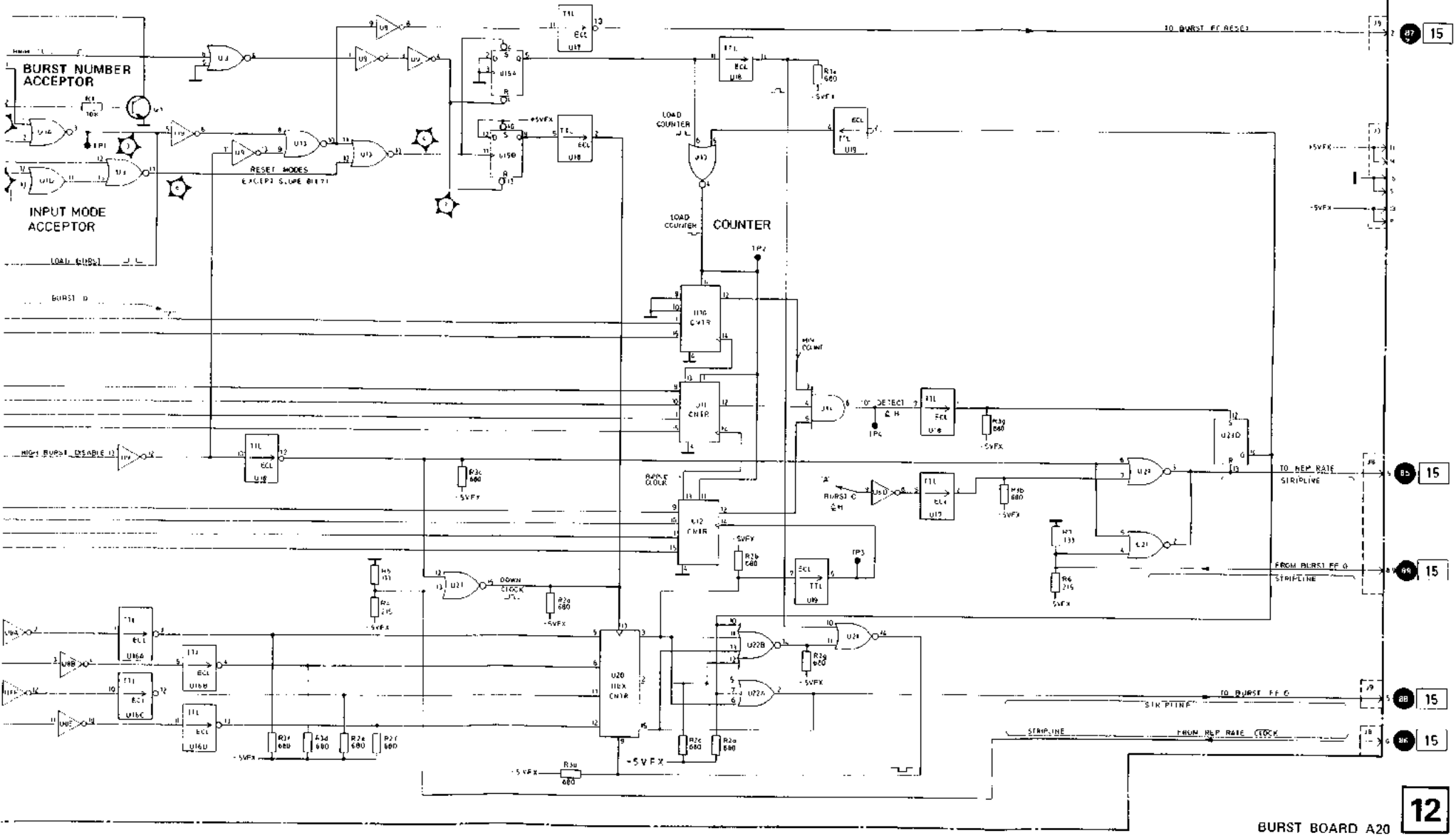


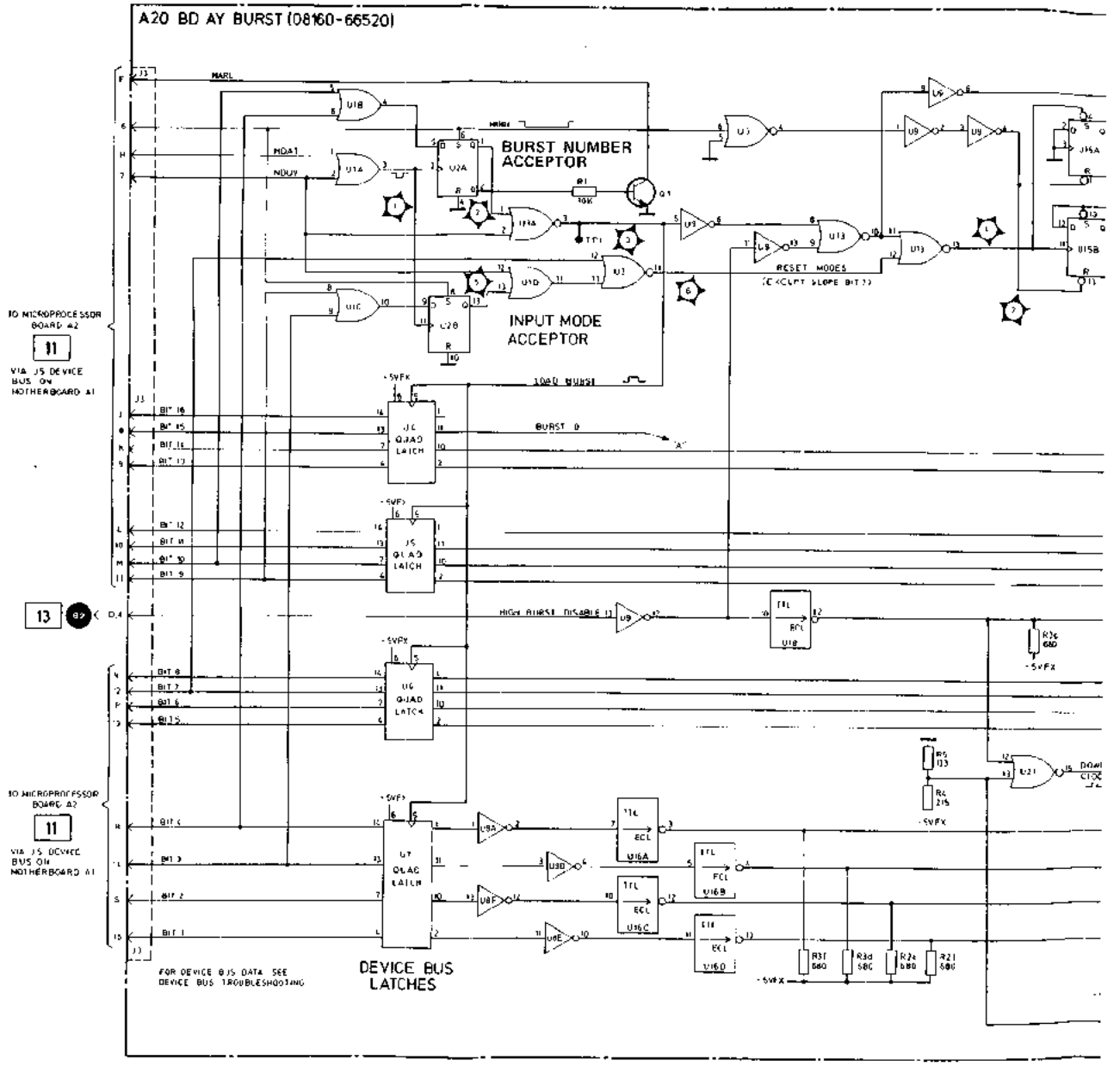
Burst Input Mode Acceptor
(all signals are TTL level)
Time base 50 µs/Div

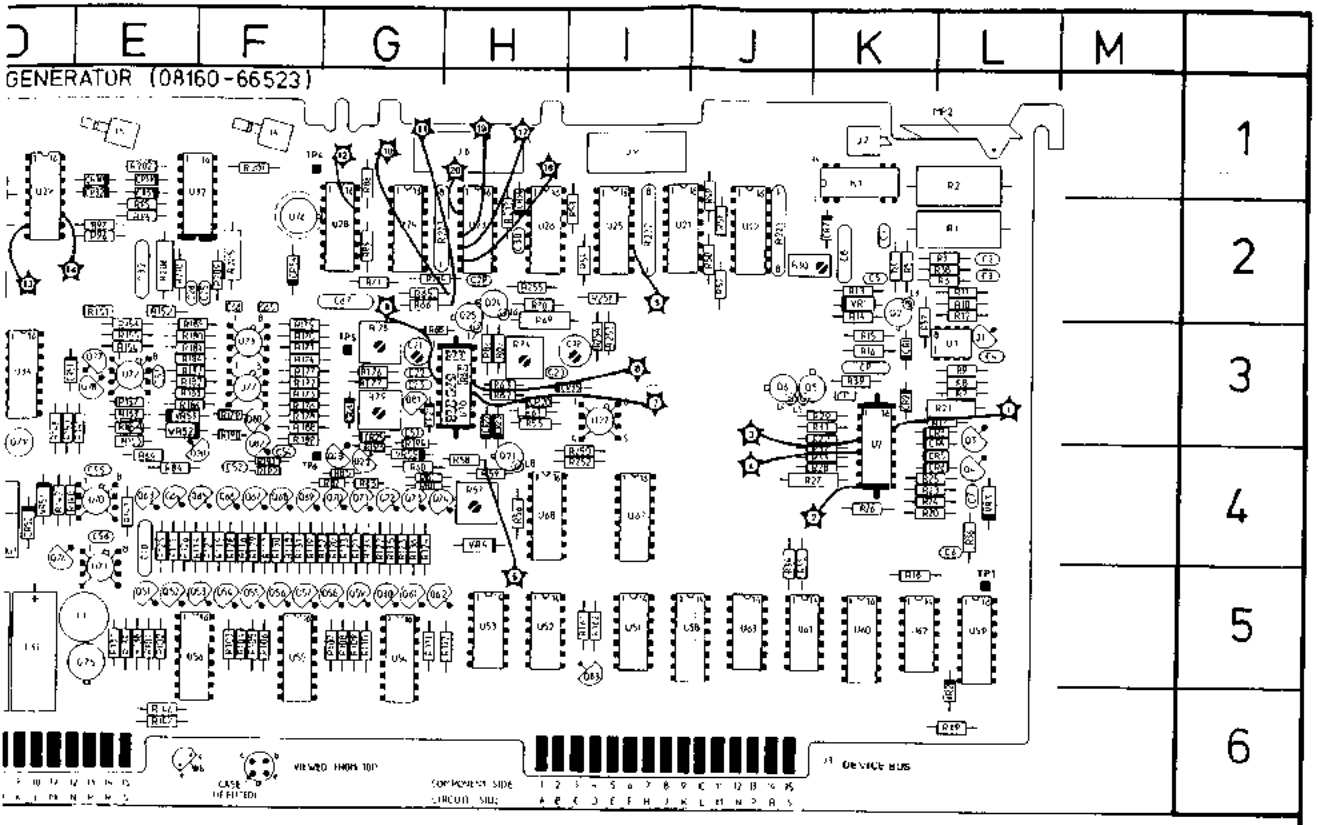







BURST NUMBER ACCEPTOR
INPUT MODE ACCEPTOR
RESET MODES EXCEPT SLOPE BIT
LOAD COUNTER
COUNTER
BURST ID
HIGH BURST DISABLE
BURST CLOCK
DOWN CLOCK
TO BURST FF RESET
TO MEM RATE STRIPLINE
FROM BURST FF Q STRIPLINE
TO BURST FF Q STRIPLINE
FROM MEM RATE CLOCK
-5VFX
+5VFX

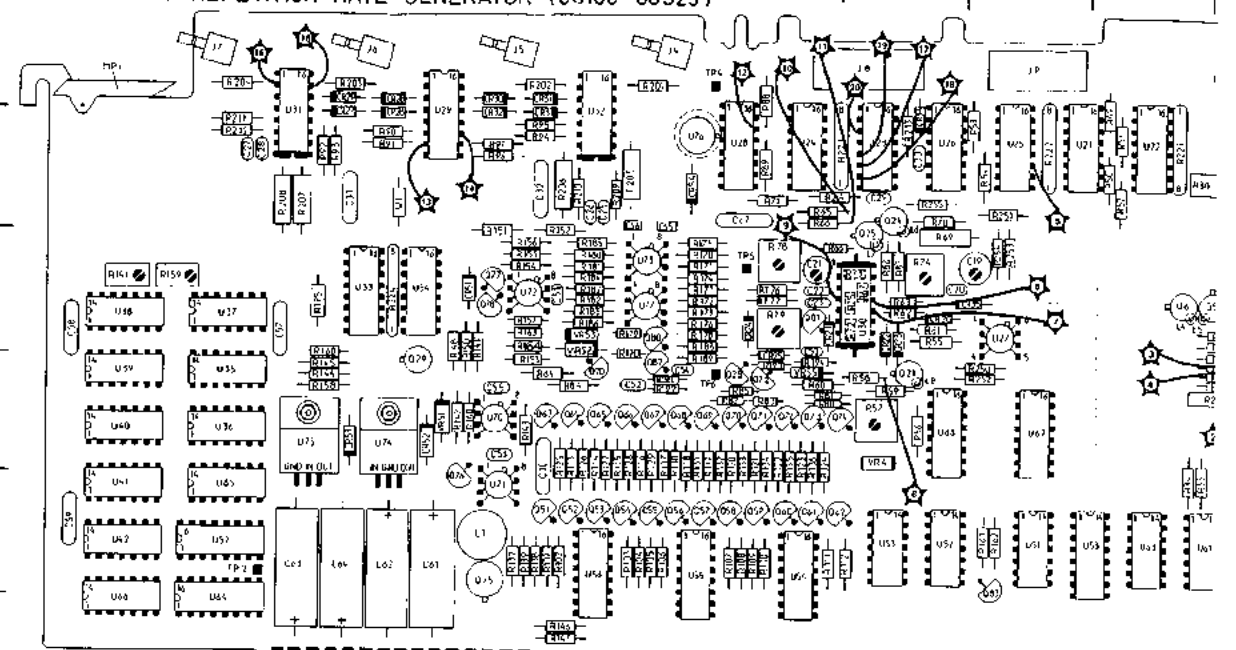

A20 BD AY BURST (08160-66520)
BURST NUMBER ACCEPTOR
INPUT MODE ACCEPTOR
RESET MODES
DEVICE BUS LATCHES
TO MICROPROCESSOR BOARD A2
VIA J5 DEVICE BUS ON MOTHERBOARD A1
FOR DEVICE BUS DATA SEE DEVICE BUS TROUBLESHOOTING
BURST 0
HIGH BURST DISABLE
MARL
MDA1
NDUV
LOAD BURST
-5VFX



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
IG																					
2	D4	L5	J3	Q24	H2	Q65	F4	Q81	G3	R14	K2	R30	J2	R55	H3	R71	G2	R89	G2	R108	G5
3	D4	L6	H2	Q25	H2	Q66	F4	Q82	F4	R15	K3	R31	K3	R56	H4	R72	H3	R90	D2	R109	G5
4	F2	L7	H3	Q51	F5	Q67	F4	Q83	I6	R16	K3	R32	K3	R57	H4	R73	H3	R91	D2	R110	G5
	C6	L8	H4	Q52	E5	Q68	F4	R1	L2	R17	L3	R33	K4	R58	H4	R74	H3	R92	C2	R111	G5
	K1	MP1	I1	Q53	F5	Q69	F4	R2	L1	R18	K5	R34	J4	R59	H4	R75	H3	R93	C2	R112	H5
	K6	MP2	L1	Q54	F5	Q70	G4	R3	L2	R19	L6	R35	K4	R60	G4	R78	G3	R94	E2	R113	E4
	F1	Q1	L3	Q55	F5	Q71	G4	R4	K2	R20	L4	R36	L4	R61	H3	R79	G3	R95	E2	R114	F4
	E1	Q2	K2	Q56	F5	Q72	G4	R5	K2	R21	L3	R37	L2	R62	H3	R80	G4	R96	E2	R115	F4
	D1	Q3	L3	Q57	F5	Q73	G4	R6	L2	R22	K3	R38	L2	R63	H2	R81	G4	R97	E2	R116	F4
	B1	Q4	L4	Q58	G5	Q74	H4	R7	L3	R23	L4	R39	K3	R64	E4	R82	G4	R101	E5	R117	F4
	H1	Q5	K3	Q59	G5	Q75	E5	R8	L3	R24	L4	R49	J2	R65	G2	R83	G4	R102	E5	R118	F4
	I1	Q6	J3	Q60	G5	Q76	D4	R9	L3	R25	L4	R50	J2	R66	G2	R84	E4	R103	F5	R119	F4
	K1	Q20	F4	Q61	G5	Q77	E3	R10	L2	R26	K4	R51	J4	R67	H3	R85	G4	R104	F5	R120	G4
	E5	Q21	H4	Q62	H5	Q78	E3	R11	L2	R27	K4	R52	J2	R68	H3	R86	H3	R105	F5	R121	G4
	K2	Q22	G4	Q63	E4	Q79	D4	R12	L2	R28	K4	R53	I2	R69	H2	R87	H3	R106	F5	R122	G4
	J4	Q23	G4	Q64	E4	Q80	F3	R13	K2	R29	K3	R54	I2	R70	H2	R88	G1	R107	G5	R123	G4

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
R124	G4	R204	C1	U71	E5
R125	E4	R205	F2	U72	E3
R126	E4	R206	E2	U73	F3
R127	F4	R207	C2	U74	D4
R128	F4	R208	C2	U75	C4
R129	F4	R209	F2	U76	F2
R130	F4	R210	E2	U77	F3
R131	F4	R211	C2	VR1	K2
R132	G4	R212	C2	VR2	L5
R133	G4	R213	H2	VR3	L4
R134	G4	R214	G2	VR4	H4
R135	G4	R221	J2	VR51	D4
R136	G4	R222	I2	VR52	F3
R137	E5	R223	H2	VR53	F3
R138	E5	R224	D3	VR55	G4
R139	E5	R250	I4	W1	D2
R140	E4	R251	I7		
R141	B3	R252	I4		
R142	D4	R253	I3		
R143	E4	R254	I3		
R144	C4	R255	H2		
R145	C4	RT76	G3		
R146	E6	RT77	G3		
R147	E6	TP1	L5		
R148	D3	TP4	G1		
R149	E3	TP5	G3		
R150	E3	TP6	G4		
R151	B2	U1	L3		
R152	E2	U2	K3		
R153	E3	U21	I2		
R154	E3	U22	J2		
R155	E3	U23	H2		
R156	C3	U24	G2		
R157	E3	U26	I2		
R158	C4	U26	H2		
R159	B3	U27	I3		
R160	C3	U28	G2		
R161	I5	U29	D1		
R162	I5	U30	H3		
R163	E5	U31	C1		
R164	E3	U32	F1		
R170	F3	U33	D3		
R171	F3	U34	D3		
R172	F3	U35	C4		
R173	F3	U36	C4		
R174	F3	U37	C3		
R175	F3	U38	B3		
R176	F3	U39	B4		
R177	F3	U40	B4		
R178	F3	U41	B5		
R179	F3	U42	B5		
R180	F3	U51	I5		
R181	F3	U52	H5		
R182	F3	U53	H5		
R183	F3	U54	G5		
R184	F3	U55	F5		
R185	F3	U56	F5		
R186	F3	U57	C5		
R187	F3	U58	J5		
R188	F3	U59	L5		
R189	F3	U60	K5		
R190	F3	U61	K5		
R191	F4	U62	K6		
R192	F4	U63	J5		
R193	G4	U64	C5		
R194	G4	U65	C5		
R195	C3	U66	B6		
R201	F1	U67	I4		
R202	E1	U68	H4		
R203	D1	U70	E4		

A23 BD AY REPETITION RATE GENERATOR (08160-66523)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	K2	C25	F2	C59	A5	CR21	G3	CR52	D4	L5	J3	Q24	H2	Q65	F4	Q81	G3	R14	K2	R30	J2
C2	J2	C26	F2	C61	D5	CR22	H3	CR53	D4	L6	H2	Q25	H2	Q66	F4	Q82	F4	R15	K3	R31	K3
C3	J2	C27	C2	C62	D6	CR23	H3	CR54	F2	L7	H3	Q51	E5	Q67	F4	Q83	I5	R16	K3	R32	K3
C4	L3	C28	C2	C63	C5	CR24	G3	J1	C6	L8	H4	Q52	E5	Q68	F4	R1	L2	R17	L3	R33	K4
C5	K2	C29	H2	C64	D5	CR25	G3	J2	K1	MP1	D1	Q53	F5	Q69	F4	R2	L1	R18	K5	R34	J4
C6	L4	C30	H2	C65	F2	CR26	D1	J3	K6	MP2	L1	Q54	F5	Q70	G4	R3	L2	R19	L6	R35	K4
C7	L4	C31	D2	C66	F2	CR27	C1	J4	F1	Q1	L3	Q55	F5	Q71	G4	R4	K2	R20	L4	R36	L4
C8	K2	C32	E2	C67	G2	CR28	D1	J5	E1	Q2	K2	Q56	F5	Q72	G4	R5	K2	R21	L3	R37	L2
C9	K3	C51	E3	CR1	K3	CR29	C1	J6	D1	Q3	L3	Q57	F5	Q73	G4	R6	L2	R22	K3	R38	L2
C10	E4	C52	F4	CR2	K3	CR30	E1	J7	B1	Q4	L4	Q58	G5	Q74	H4	R7	L3	R23	L4	R39	K3
C11	K3	C53	G3	CR3	L3	CR31	E1	J8	H1	Q5	K3	Q59	G5	Q75	E5	R8	L3	R24	L4	R49	J2
C19	I3	C54	F4	CR4	L3	CR32	E1	J9	I1	Q6	J3	Q60	G5	Q76	D4	R9	L3	R25	L4	R50	J2
C20	H3	C55	E4	CR5	L4	CR33	E1	K1	K1	Q20	F4	Q61	G5	Q77	E3	R10	L2	R26	K4	R51	J2
C21	G3	C56	E4	CR6	L4	CR34	H2	L1	E5	Q21	H4	Q62	H5	Q78	E3	R11	L2	R27	K4	R52	J2
C22	G3	C57	C3	CR7	K2	CR35	H3	L3	K2	Q22	G4	Q63	E4	Q79	D4	R12	L2	R28	K4	R53	I2
C23	G3	C58	A3	CR20	H3	CR51	E3	L4	L3	Q23	G4	Q64	E4	Q80	F3	R13	K2	R29	K3	R54	I2

SERVICE BLOCK 9
REPETITION RATE GENERATOR A23 13 14 15

THEORY OF OPERATION

GENERAL

The repetition rate generator has to provide a train of pulses approximately 3 ns wide for the delay generators and the reference trigger. A block diagram is given in Figure 8–1–5.

Ext. Input Amplifier (Service Sheets 14, 15)

In all input modes except Normal mode, the repetition rate generator is controlled (either gated or triggered) via the external input amplifier, the input impedance of which is selectable (50 ohm or 10 k ohm). The incoming signal enters a limiting level-shift circuit, the middle limiting value being approximately −1.3 V and the shifted level being determined by the setting of the trigger level potentiometer. The next stage is a differential amplifier that incorporates the trigger slope switching, followed by a differential amplifier wired as a Schmitt trigger. This amplifier drives a pair of striplines, one of them causing a signal delay of approx. 3 ns. The signals are then fed to a gate configuration (U21, U22). In NORM mode, these gates are disabled, thus effectively blocking both signals. In GATE mode, only the delayed signal is blocked. In TRIG or BURST mode the non-delayed and the delayed inverted signal pass through a NOR gate to generate a 3 ns spike. This spike is wire-OR'ed with the BURST disable signal, so that only if BURST mode is selected, can the spike set the BURST flip-flop U26.

The gates are connected to the control input of the VCO IC. At low level (−2 V) the VCO oscillates, and at high level (−1.1 V) it is stopped.

Control Circuit (Service Sheet 13)

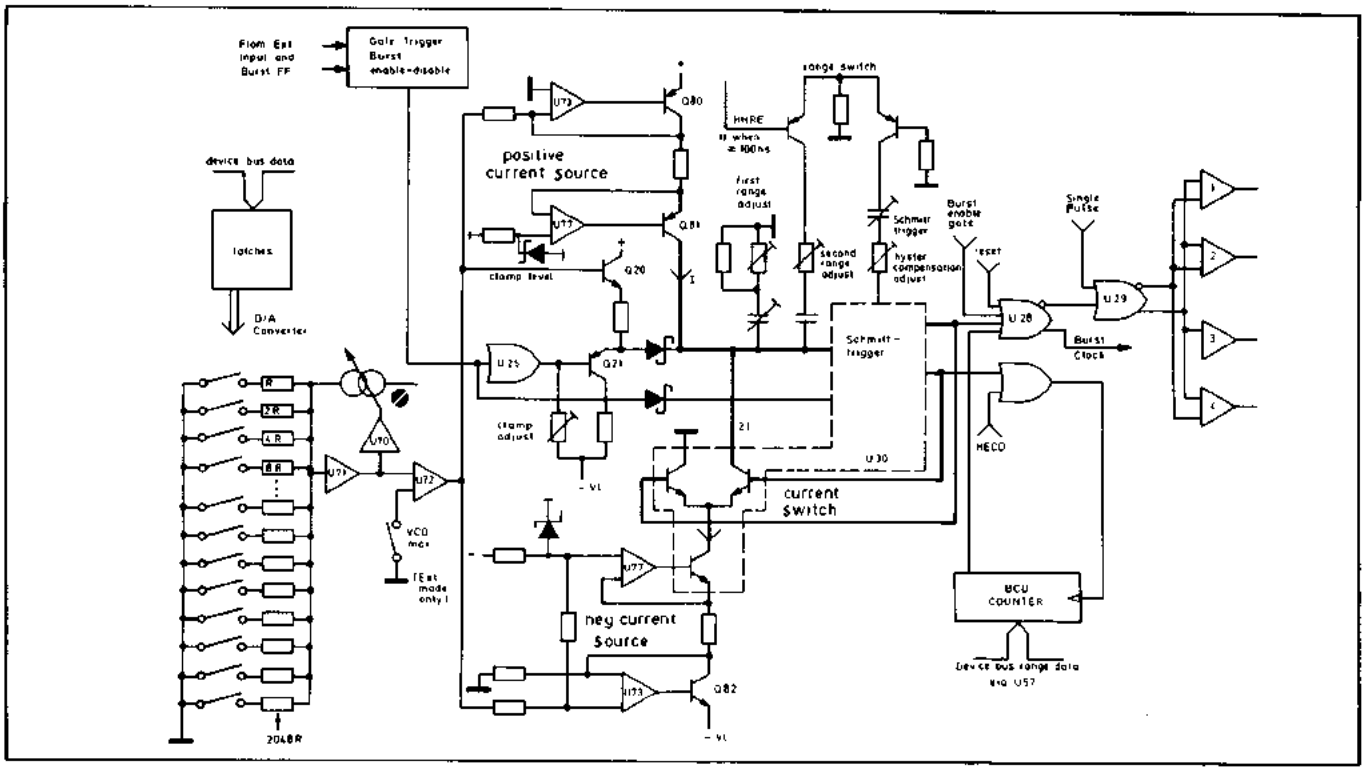


Figure 8–9–1. Rate control

The control portion of the repetition rate assembly consists of:

- a number of gates and latches which constitute the receiving end of the device bus
- a D/A converter for the VCO control voltage
- two voltage-controlled current sources
- and a range switching circuit

The operation of the 12-bit D/A converter can be explained by considering a single bit. As can be seen in Figure 8–9–1, a PNP transistor shifts the output level of a CMOS latch and delivers the base current for an NPN transistor that operates as a switch. The voltage at the output of the D/A then depends on the settings of the switching transistors, since a constant current flows through the resistors that are switched on.

The output voltage is directly proportional to the resulting resistance and makes an inverted D/A converter (D/A^{-1}) possible. A (D/A^{-1}) is necessary because the programming of a long period makes a low VCO current necessary and vice-versa. The voltage controlled current sources deliver a source current I into the ramp node and sink a current 2I out of the VCO IC.

The Voltage Controlled Oscillator (Service Sheet 15)

A block diagram of the VCO is shown in Figure 8–9–2. The negative current source is switched on and off the ramp node via a differential amplifier (U30) wired as a current switch. The resulting current into the ramp node is therefore ± I depending on the state of the current switch. This current charges the ramp capacitor (C21/C22). For periods ⩾ 100 ns an additional ramp capacitor C23, is switched in via the pin diode, CR24, therefore providing two VCO ranges: 20–99.9 ns and 100–999 ns. (By using an exponent counter periods as long as 999 ms are possible without the need for additional ramp capacitors).

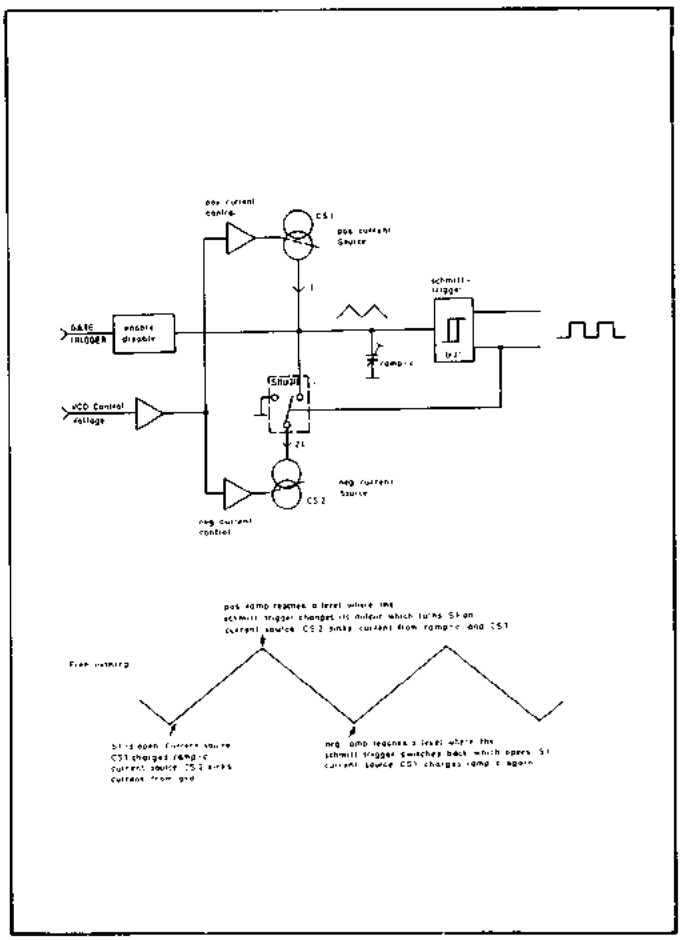


Figure 8–9–2. VCO-Rate generator

For a more detailed explanation of the VCO principle, assume that the current switch is on, in which case a current (–I) is drawn from the ramp node. The voltage at the ramp node drops until it reaches the lower threshold level of the Schmitt trigger. The Schmitt trigger then changes its state and turns the current switch off , i.e. the resulting current is now +I. The voltage at the capacitor rises until it reaches the upper threshold level of the Schmitt trigger which causes the current switch to turn on again.

When the VCO is switched off, the level at the ramp node remains stable at the lower threshold level due to the action of the clamp circuit. In this VCO off-state, the current switch is on and draws 2I, hence the clamp circuit must supply I. Should I change (by period change), the clamp level must be adjusted to compensate the changing volt-drop at the Schottky diode (CR21) – thus a constant level at the ramp node is maintained.

When the VCO is switched on, the clamp level is pulled down causing the Schottky diode to cutoff – thus ensuring that waveform at the ramp node is not distorted by an additional clamp current.

The Exponent Counter (Service Sheet 15)

The exponent counter (a block diagram of which is given in Figure 8–9–3) is designed so as to avoid the use of high capacitance and to minimize jitter. An explanation of the exponent counter operation is perhaps best given by first assuming that the VCO is off, input mode selected as GATE, and the exponent counter set to divide by 100.

Under these conditions, the R input of the exponent counter flip-flop U23 is high, $\overline{Q}$ is high, therefore U28 pin 12 is low, U37 and U38 are set to 0, and U39 to U42 are set to 9. When the VCO is turned on, the first pulse passes through gate U28 and sets flip-flop U23; therefore $\overline{Q}$ is now low, U28 pin 12 is high, and no further pulses can pass gate U28. Counters U37 and U38 then count the pulses up to 99 at which point they are set to 0 again. The negative transition of the 99th pulse clocks flip-flop U23 to set $\overline{Q}$ high. U28 pin 12 is now low and the 100th pulse can pass gate U28 again to restart the whole cycle.

When the GATE pulse ends, the VCO input goes high, the pulse train is interrupted, and the exponent counter reset ready for the next pulse that turns the VCO on again.

The exponent counter divides the VCO output frequency by 10^n (n = 1, 2, 3 ... 6). Because flip-flop U23 is clocked when all counter outputs are 9, the counters involved in counting must be set to 0 at the end of every count-cycle, while all non-used counters are set to 9.

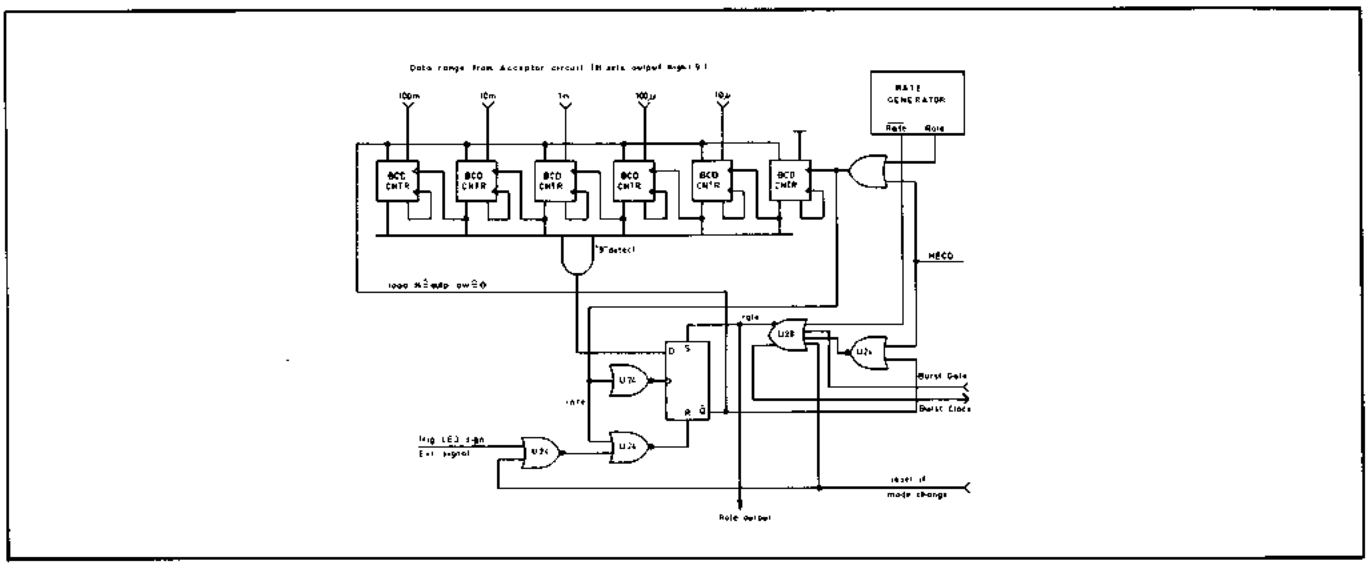


Figure 8–9–3. Exponent counter

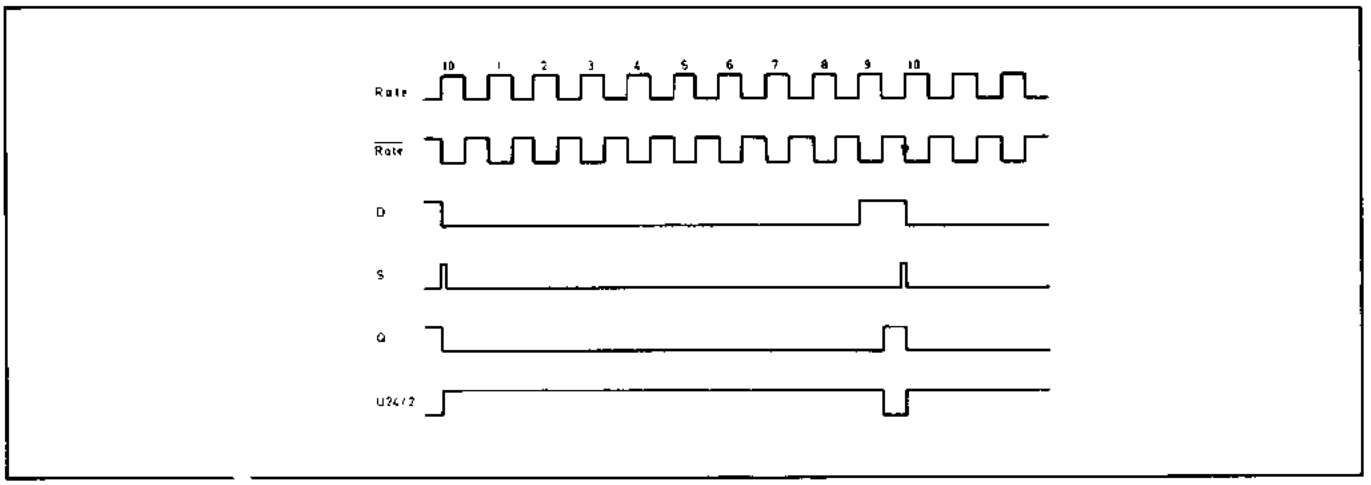


Figure 8–9–4. Timing Diagram

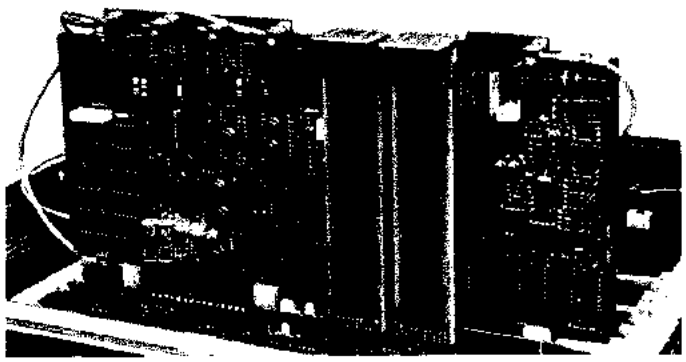
The Output Buffer Amplifier (Service Sheet 15)

For periods ≤ 999 ns the exponent counter is turned off and the VCO output (square wave) goes directly into the output buffer circuitry. For periods > 999 ns, the waveform is derived from the VCO and exponent counter, the duty cycle of this waveform being dependent on the period.

In order to function properly, the delay generators need an input pulse 3 ns wide. To generate this pulse U28 drives two striplines, the stripline connected to the non-inverting output having a 3 ns delay. U29 then generates a pulse of the required width from the inverted and non-inverted delayed signals, which is in turn level shifted via 2 diodes to drive the output buffer amplifiers U31 and U32.
(There are four identical output channels available for the different configurations of the instrument).

TROUBLESHOOTING

Before troubleshooting the repetition rate generator, place board A23 on an extender board as shown in the photograph.



An important part of the repetition rate generator is the VCO and its corresponding current sources. A convenient way to check the VCO is in EXT TRIG mode as both current sources are then set for maximum current. Voltages can be measured as indicated in Figure 8–9–5. (See also EXT TRIG mode waveforms at the end of this Service Block).

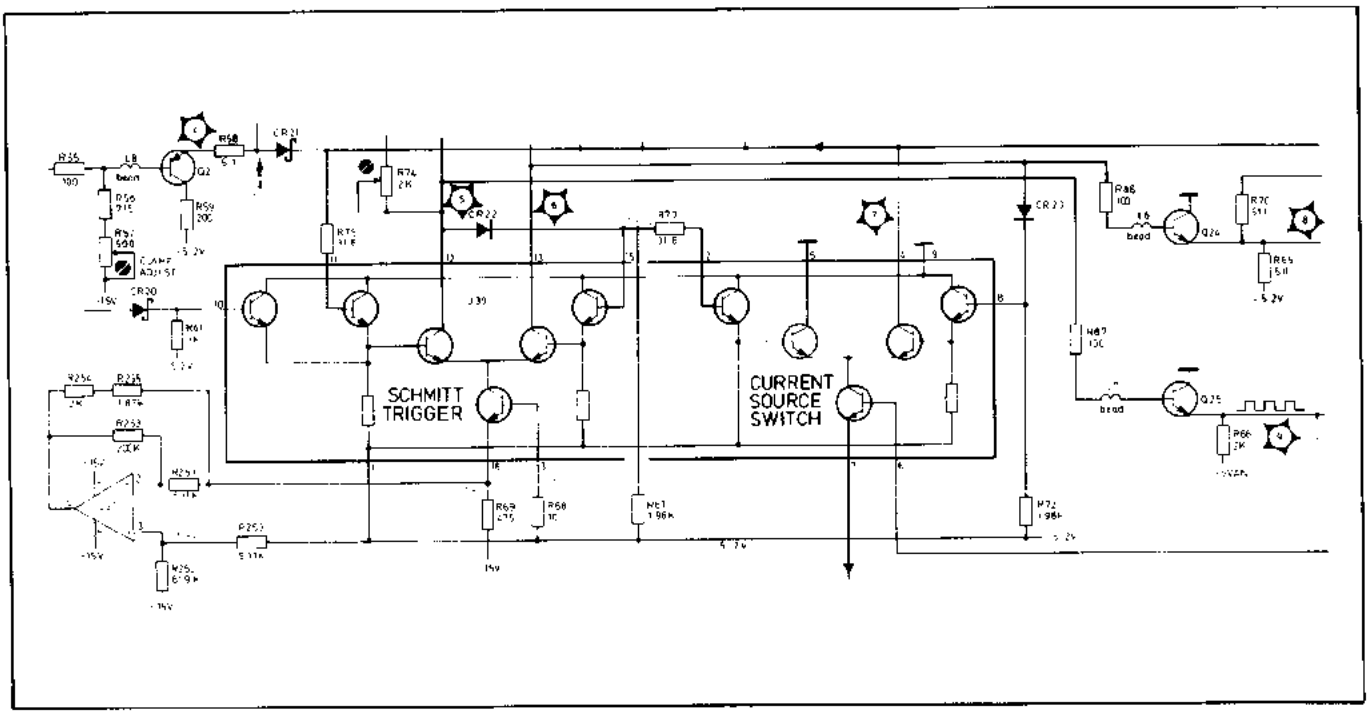


Figure 8–9–5. VCO voltages

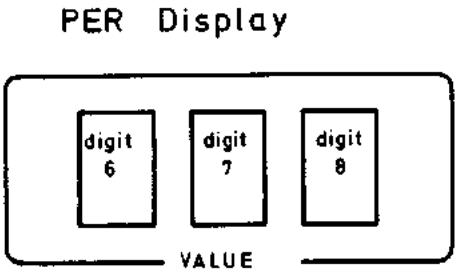
The following tables can be used for checking the different functions associated with the repetition rate generator.

Table 8–9–1. TRIG LEVEL Voltages

TRIG LEVEL	U1/1	U1/7	Q2 base	Q2 Ωmm.	U2/15
CCW	12.4 V	–12.6 V	–5.9 V	–6.6 V	–2.5 V
9 o'clock	7.6 V	– 7.7 V	–3.6 V	–4.3 V	–2.5 V
12 o'clock	1.5 V	– 1.5 V	– .7 V	–1.5 V	–1.3 V
3 o'clock	–5.4 V	5.4 V	2.4 V	1.7 V	0 V
CW	–9.1 V	9.2 V	4.1 V	3.4 V	0 V

Table 8–9–2. D/A Converter Truth Table

NOTE: Digit 6 in the following display corresponds to A23 U56, digit 7 to A23 U55 and digit 8 to A23 U54. The following truth-table is valid for all three IC's. .



Display No.	Q3 pin 15	Q2 pin 12	Q1 pin 9	Q0 pin 3
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

Table 8–9–3. Period Ranges

Range	Period
1	20 ns – 99.9 ns
2	100 ns – 999 ns
3	1 μs – 9.99 μs
4	10 μs – 99.9 μs
5	100 μs – 999 μs
6	1 ms – 9.99 ms
7	10 ms – 99.9 ms
8	100 ms – 999 ms

Table 8–9–4. Voltage Controlled Current Sources

NOTE: The following voltage patterns relate to the 'ns' period range, but are identical for the 'ms' and 'μs' ranges. e.g. 18 ns corresponds to 18 ms and 18 μs.

	Period	U71/6,3	U72/1	TP 5	U73/7	U73/1
first range	18 ns	– 5.9 V	5.9 V	–2.9 V	8 V	– 7.1 V
	25 ns	– 4.2 V	4.2 V	–2.1 V	9 V	– 8.1 V
	50 ns	– 2.1 V	2.1 V	–1.1 V	10.2 V	– 9.4 V
	75 ns	– 1.4 V	1.4 V	– .7 V	10.6 V	– 9.9 V
	99.9 ns	– 1.1 V	1.1 V	– .5 V	10.8 V	–10 V
second range	100 ns	–10.6 V	10.6 V	–5.2 V	5.5 V	– 4.4 V
	500 ns	– 2.1 V	2.1 V	–1.1 V	10.2 V	– 9.4 V
	999 ns	– 1.1 V	1.1 V	– .5 V	10.8 V	–10 V
third range	1 μs	–10.6 V	10.6 V	–5.2 V	5.5 V	– 4.4 V
	EXT TRIG Mode			–7.2 V	+3.3 V	– 2 V

Table 8–9–5. Input Mode Logic Signal Truth Table

NOTE: The circled numbers refer to the signal numbers in the Schematic.

	(70) H G DIS	(68) H TRIG DIS	(69) TRIG LED 2	(67) H GATE DIS H TRIG DIS	(93) H BURST DIS	(73) H SINGLE PULSE	(66) H NEG SLOPE	(65) H POS SLOPE	(74)
NORM	1	1	1	1	1				
TRIG	1	0	0	0	1	Positive pulse when SINGLE PULSE push-button pressed.			Positive pulse when Input Mode change
GATE	0	1	0	0	1				
BURST	1	1	0	1	0				
POS							1	0	
NEG							0	1	

Table 8–9–6. Period Ranges Truth Table

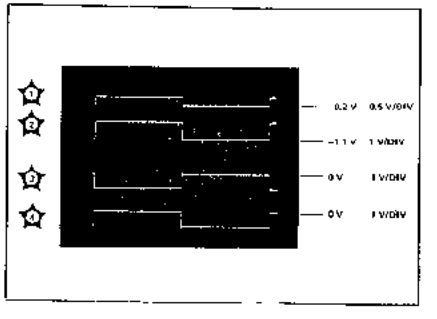
NOTE: The circled numbers refer to the signal numbers in the schematic

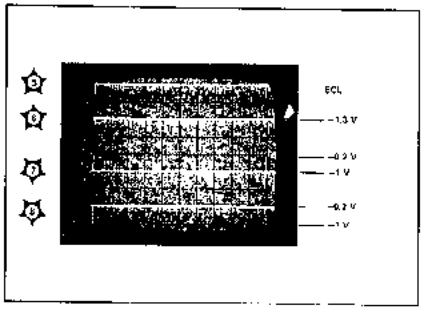
Range	(81)	(80)	(92)	(79)	(78)	(77)	(76)	(75)
EXT TRIG	1	1		1	1		1	1
10 ns – 99.9 ns	1	1		1	1		1	1
100 ns – 999 ns	0	1		1	1		1	1
1 µs – 9.99 µs	First counter automatically enabled.							
10 µs – 99.9 µs	0	0		0	1	1	1	1
100 µs – 999 µs	0	0		0	0	1	1	1
1 ms – 9.99 ms	0	0		0	0	0	1	1
10 ms – 99.9 ms	0	0		0	0	0	0	1
100 ms – 999 ms	0	0		0	0	0	0	0

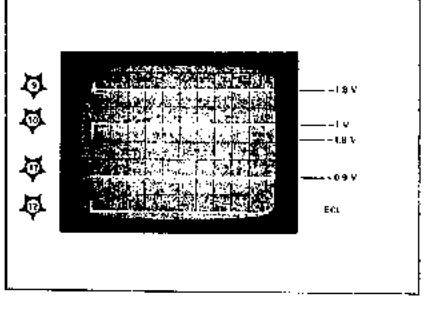
Rate Generator A23

For a fast signal, test pictures are taken with a 100 MHz scope. The levels are true for a sampling scope which should be used to measure width, transition or amplitude.
Waveform conditions:
8160A – press RCL 0
Scope timebase – 1 µs/div
External pulse generator – frequency 100 kHz; 50% duty cycle

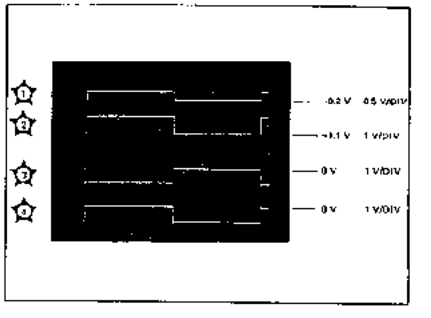
Input Mode – TRIG

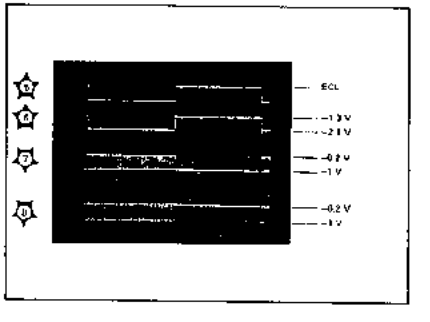


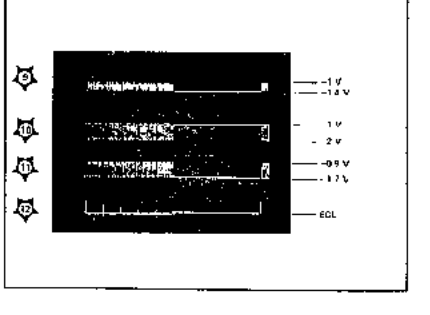




Input Mode – GATE



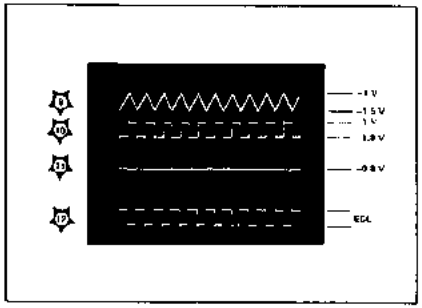




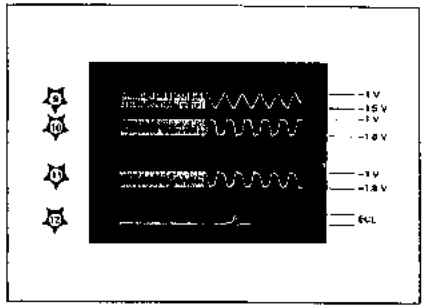
Rate Generator A23

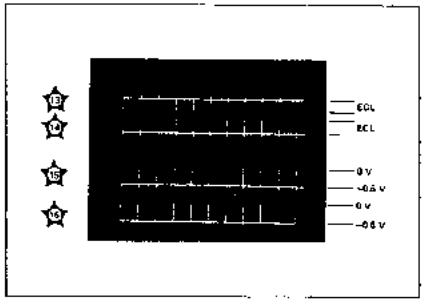
For a fast signal, test pictures are taken with a 100 MHz scope. The levels are true for a sampling scope which should be used when measuring width, transition or amplitude.
Waveform conditions:
8160A – press RCL 0.
Scope timebase – 1 µs/div.

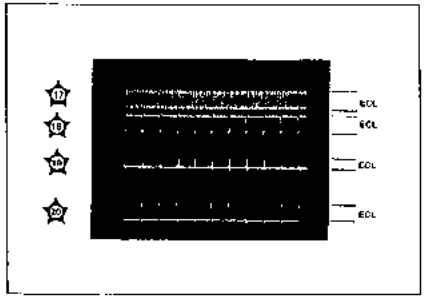
8160A set to 999 ns period.



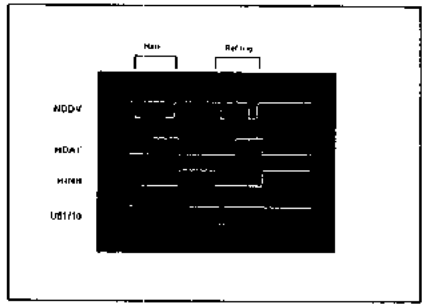
8160A set to 1 µs period

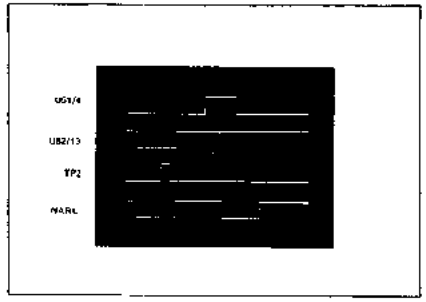






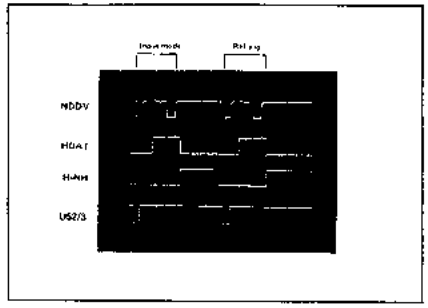
Rate Acceptor
(All signals are TTL level)
Waveform conditions:
Scope timebase – 50 µs/div
Controller programmed to obtain repeating signal
wrt 717, "PER 1 µs"; jmp 0.

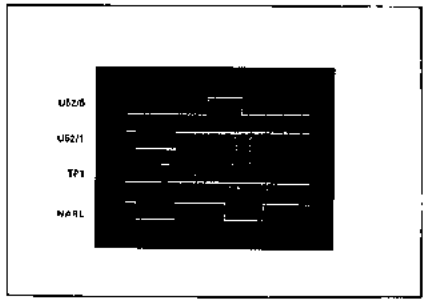




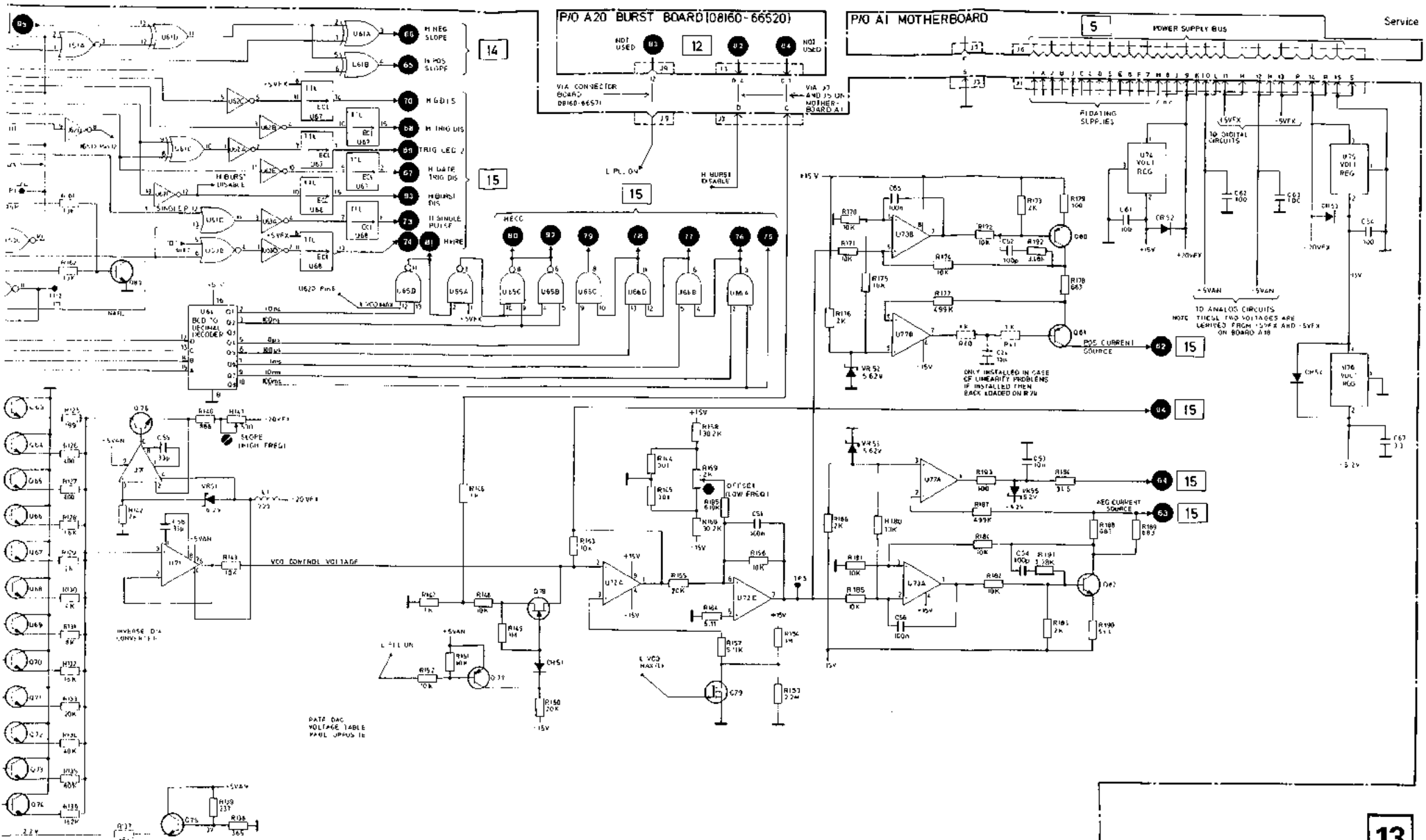
For device bus details see SERVICE BLOCK 2.

Rate Input Mode Acceptor
(All levels are TTL level)
Waveform conditions:
Scope timebase – 50 µs/div
Controlled programmed to obtain repeating signal
wrt 717 "17", jmp 0.



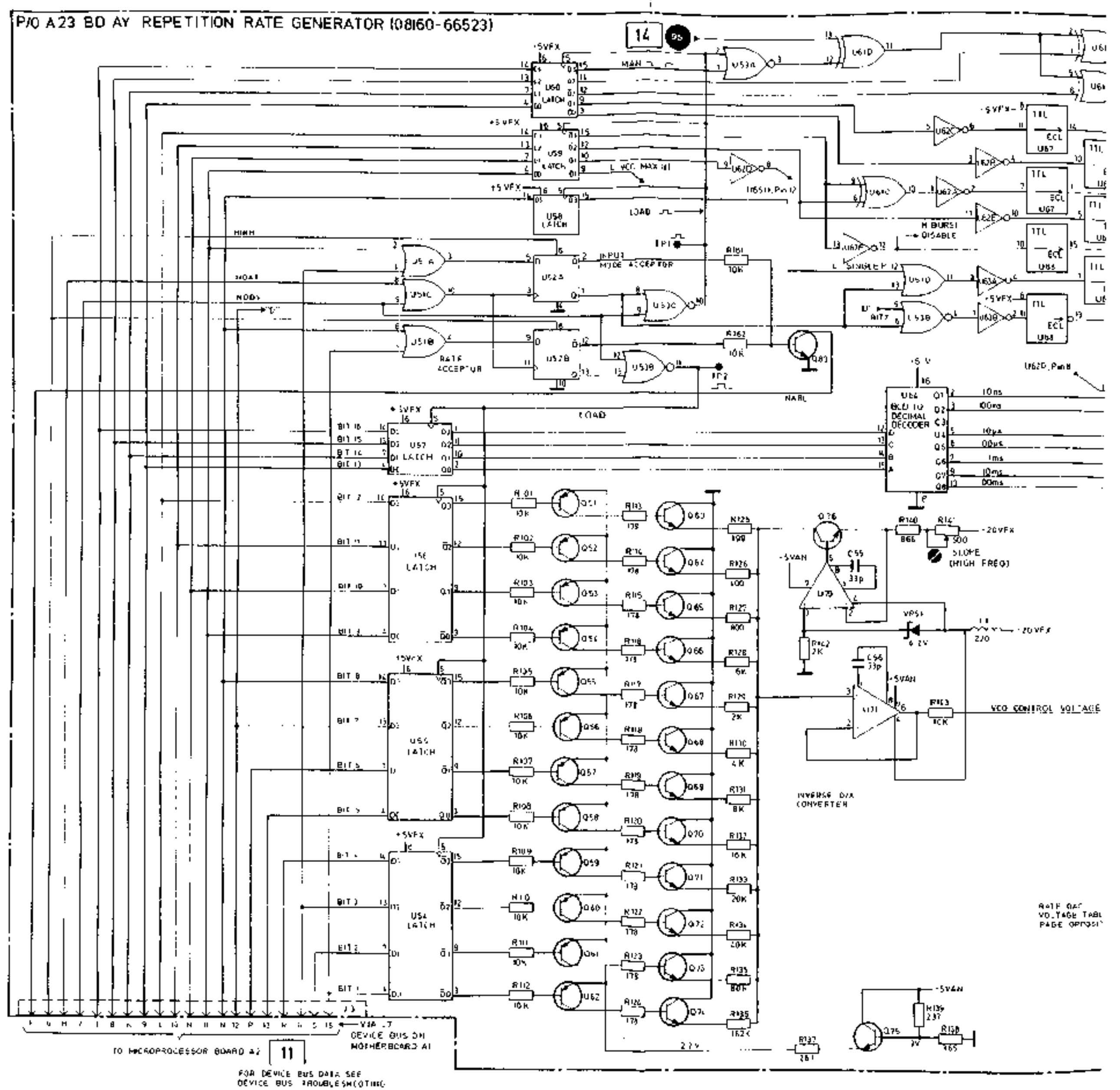


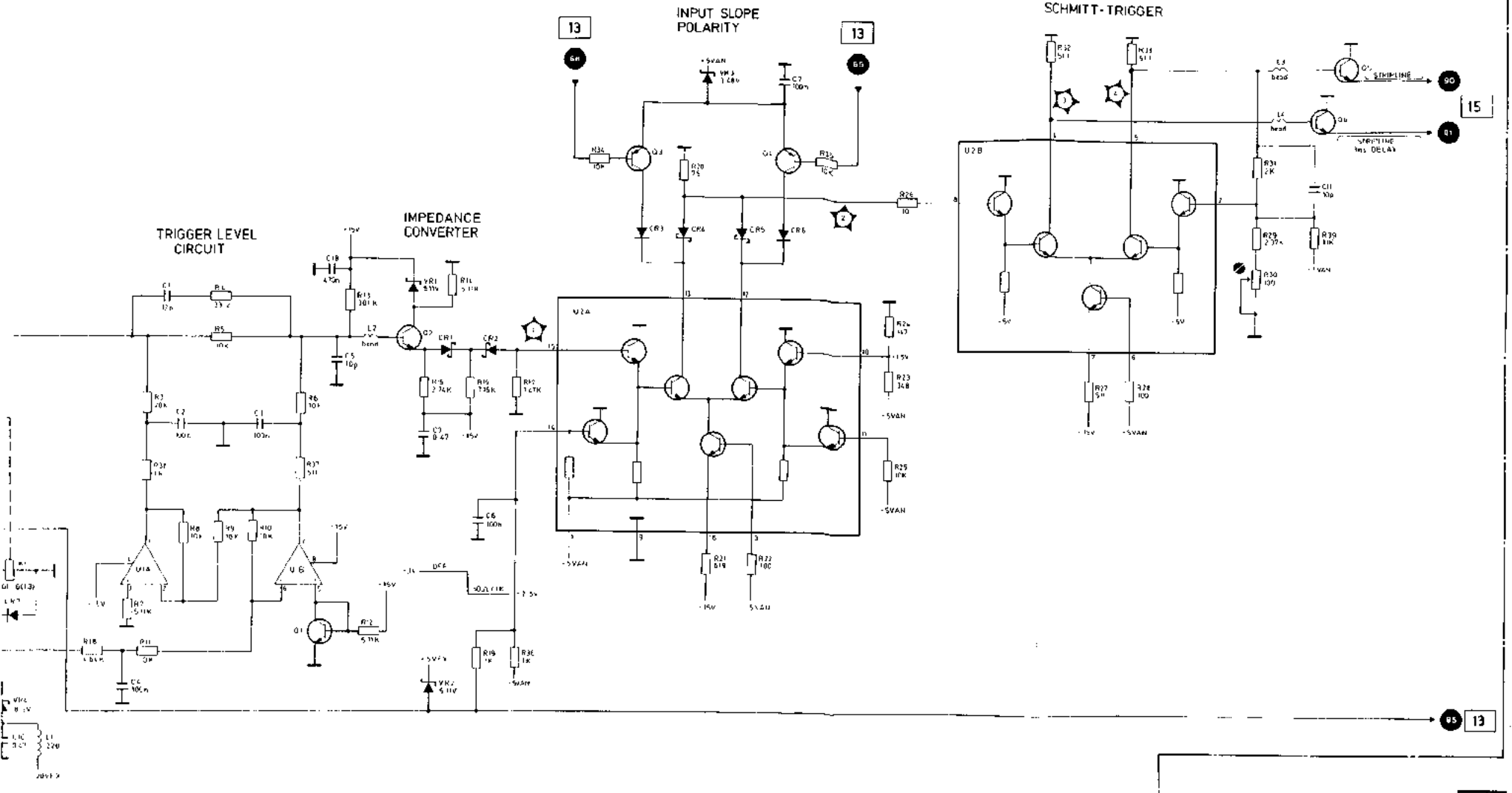
For device bus details see SERVICE BLOCK 2.

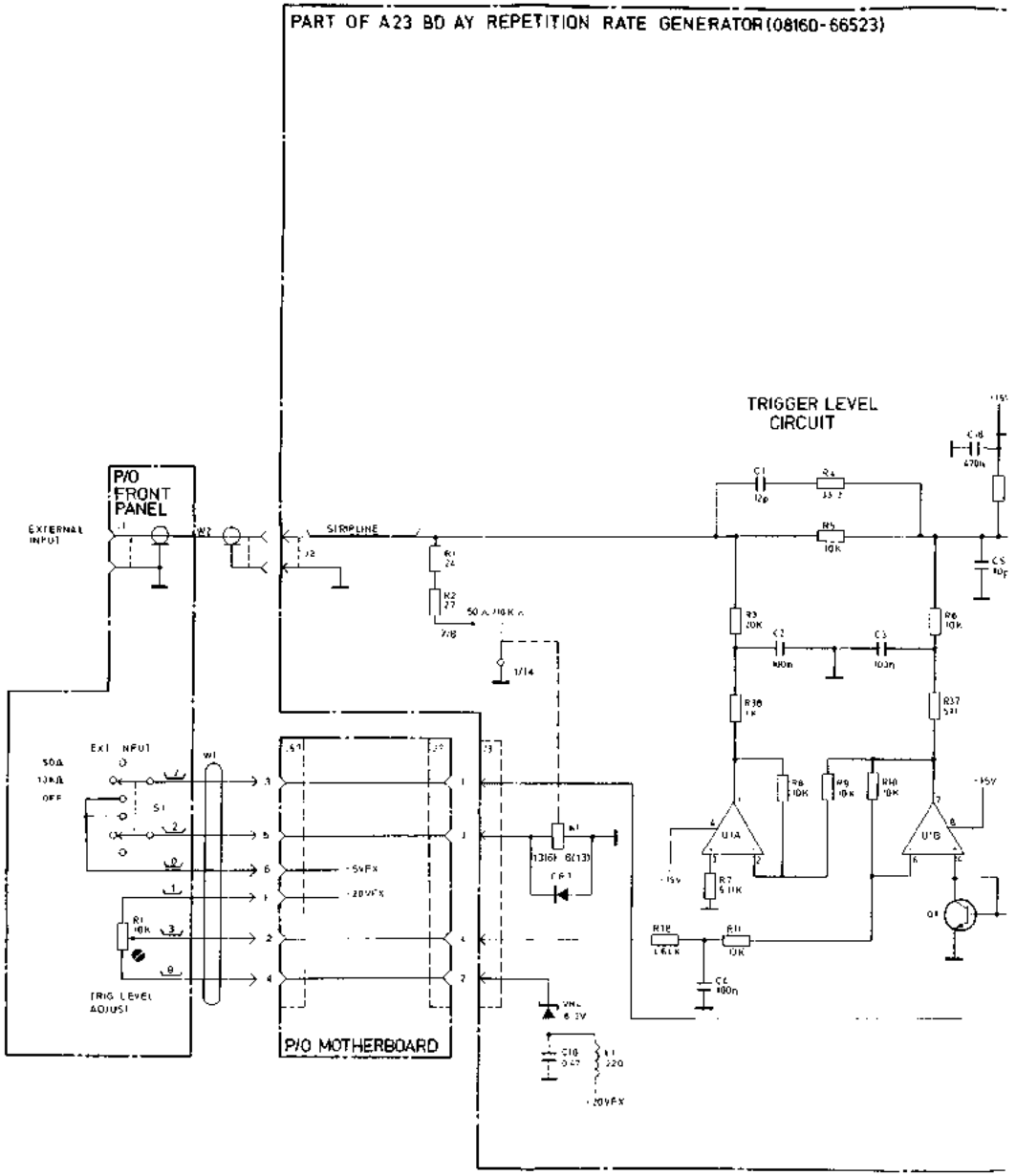


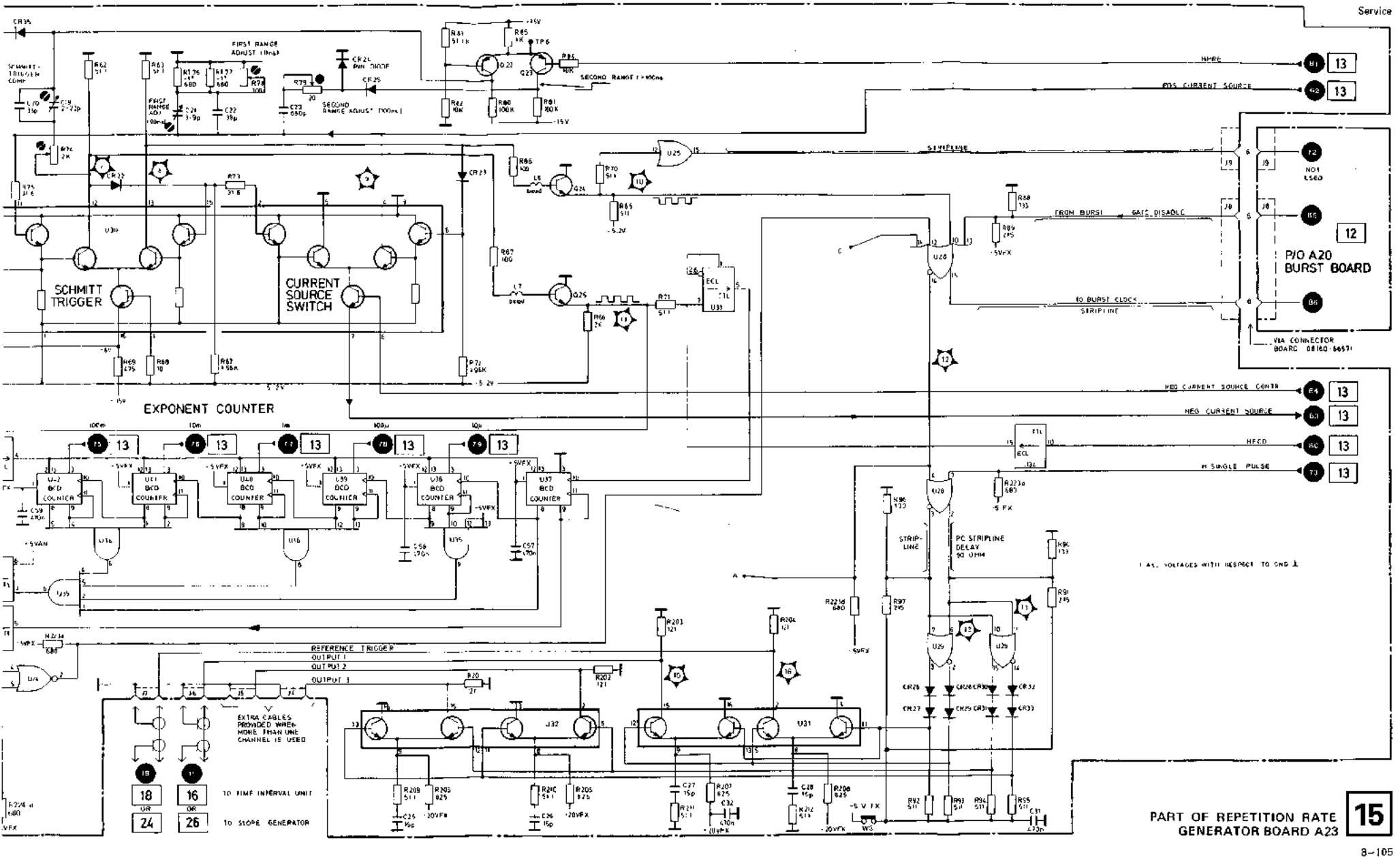
P/O RATE GENERATOR A23

13

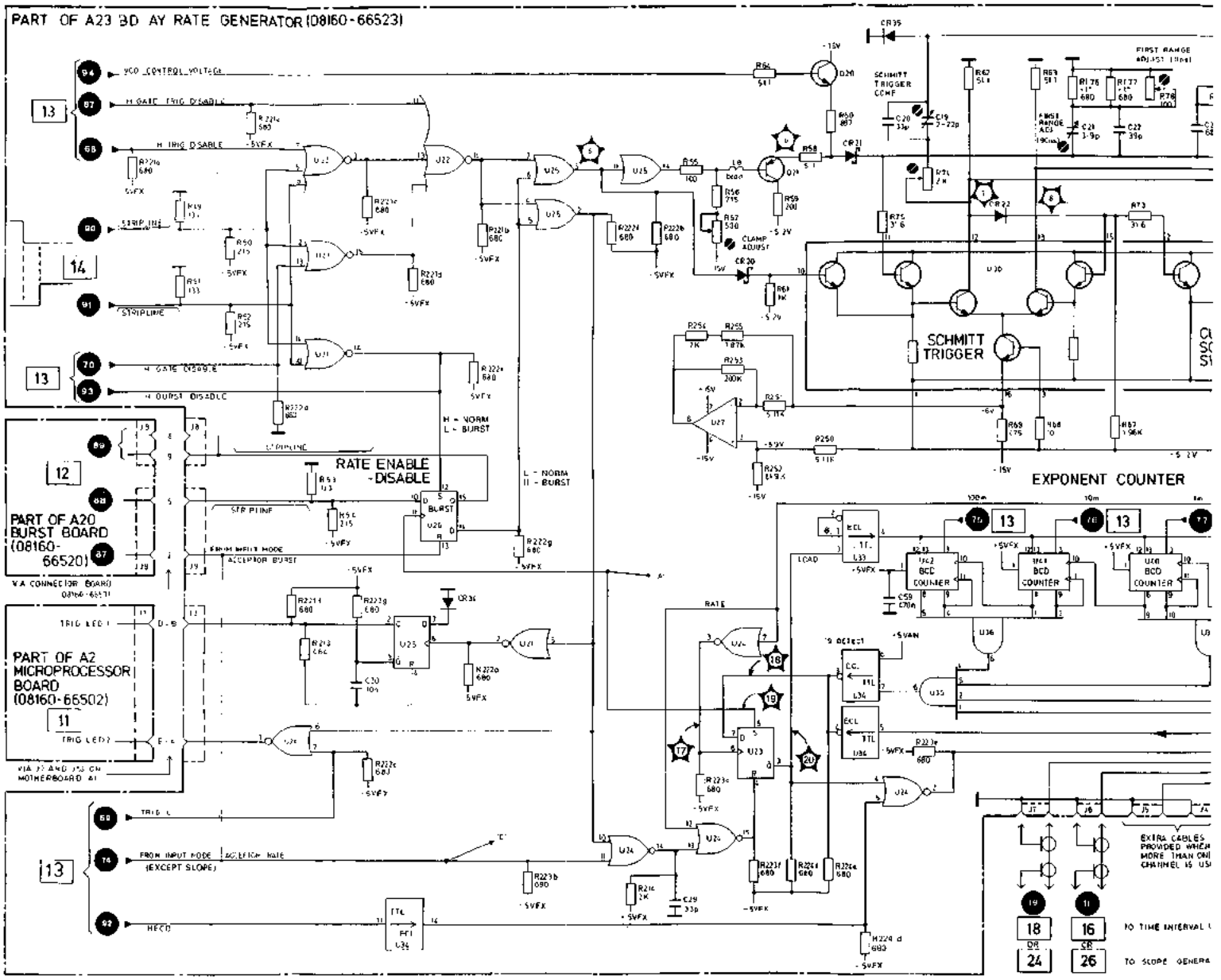

P/O A23 BD AY REPETITION RATE GENERATOR (08160-66523)
14
11
TO MICROPROCESSOR BOARD A2
VIA J7 DEVICE BUS ON MOTHERBOARD A1
FOR DEVICE BUS DATA SEE DEVICE BUS TROUBLESHOOTING
INVERSE D/A CONVERTER
VCO CONTROL VOLTAGE
SLOPE (HIGH FREQ)
BCD TO DECIMAL DECODER
INPUT MODE ACCEPTOR
RATE ACCEPTOR
LOAD
H BURST DISABLE
L SINGLE P
L VCO MAX HI
RATE DAC VOLTAGE TABL PAGE OPPOSI


TRIGGER LEVEL CIRCUIT
IMPEDANCE CONVERTER
INPUT SLOPE POLARITY
SCHMITT-TRIGGER
13
13
15
U2A
U2B
U1A
U1B
Q1
Q2
Q3
Q4
Q5
Q6
CR1
CR2
CR3
CR4
CR5
CR6
VR1
VR2
VR3
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
R1
R2
R3
R4
R5
R6
R7
R8
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R10
R11
R12
R13
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R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
L1
L2
L3
L4
+15V
-15V
-5VAN
DCS
50Ω SYNC
STRIPLINE
SPRINTIME
DELAY

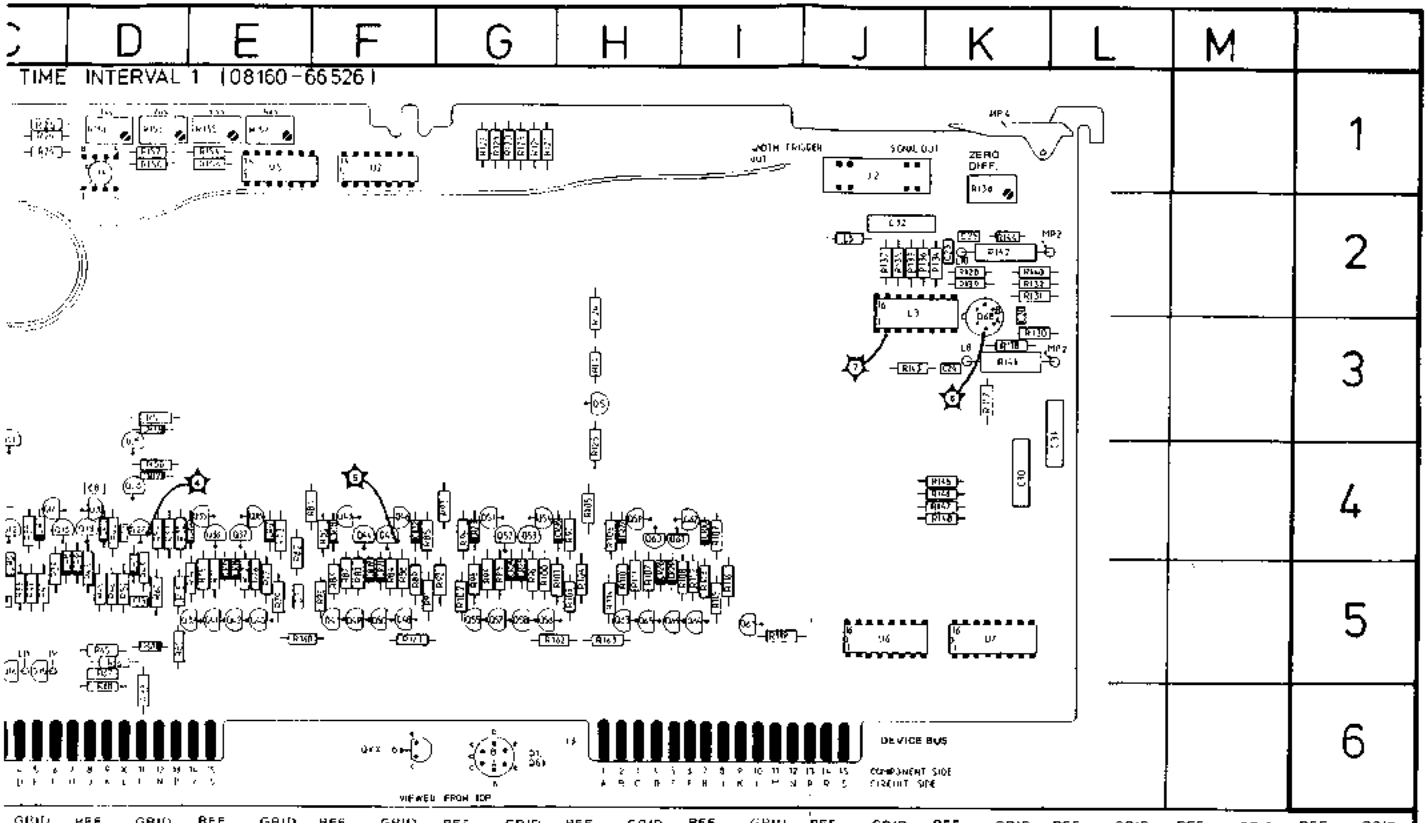

PART OF A23 BD AY REPETITION RATE GENERATOR (08160-66523)
TRIGGER LEVEL CIRCUIT
P/O FRONT PANEL
EXTERNAL INPUT
SIRPLINE
EXT INPUT
50Ω
1MΩ
OFF
TRIG LEVEL ADJUST
P/O MOTHERBOARD
-5VFX
-20VFX
+15V
-15V
U1A
U1B
Q1



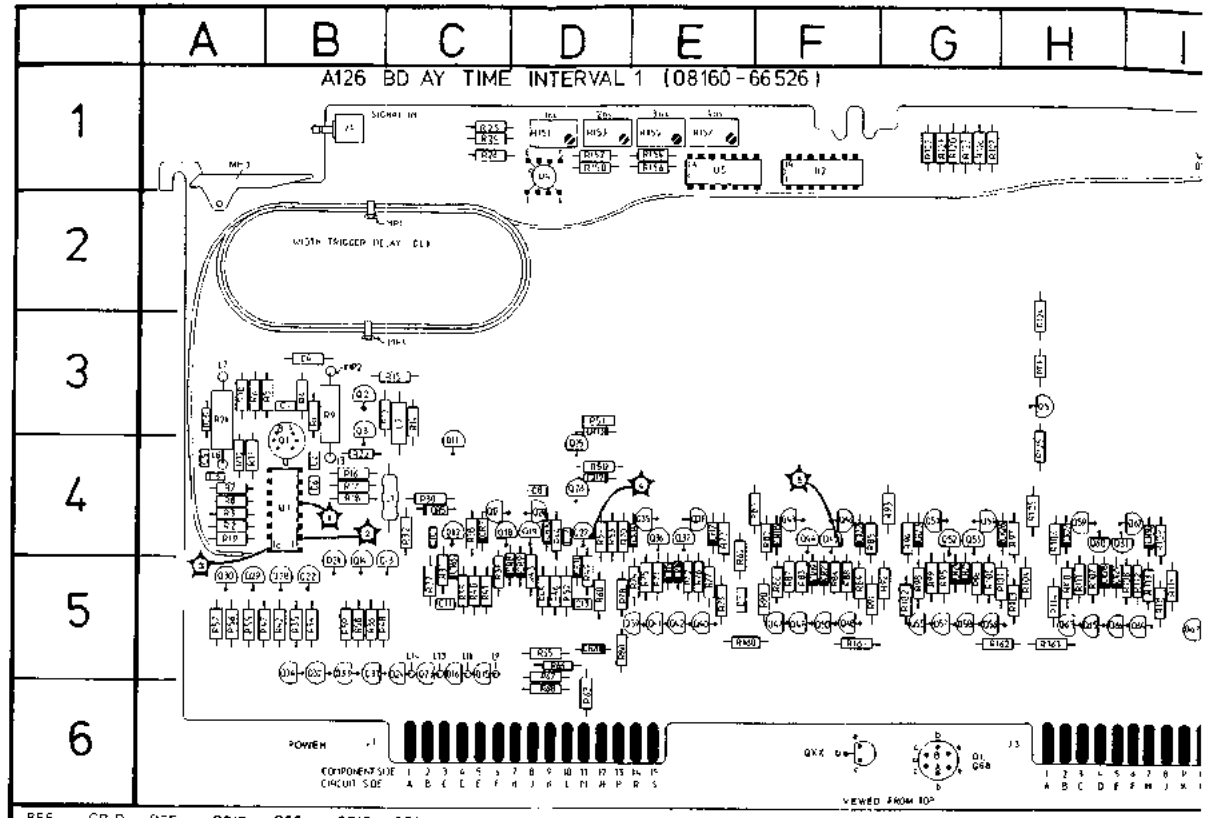
PART OF REPETITION RATE GENERATOR BOARD A23 **15**


PART OF A23 BD AY RATE GENERATOR (08160-66523)
SCHMITT TRIGGER
EXPONENT COUNTER
RATE ENABLE -DISABLE
PART OF A20 BURST BOARD (08160-66520)
PART OF A2 MICROPROCESSOR BOARD (08160-66502)
SCHMITT TRIGGER COMP
FIRST RANGE ADJUST
CLAMP ADJUST
BURST
BCD COUNTER
H = NORM L = BURST
L = NORM H = BURST
EXTRA CABLES PROVIDED WHEN MORE THAN ONE CHANNEL IS USE
NO TIME INTERVAL
TO SLOPE GENERA

TIME INTERVAL 1 (08160-66526)



GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
A4	Q12	C4	Q29	A5	Q46	F4	Q63	H5	R12	A4	R33	C5	R50	D4	R70	D4	R87	F5	R104	H5	R121	G1	H139	K2	R157	E1
A3	Q13	C5	Q30	A5	Q47	F5	Q64	I6	R13	C3	R34	B5	R51	D3	R71	E5	R88	F5	R105	H4	R122	G1	R140	K2	R160	F5
K3	Q14	B5	Q31	B5	Q48	F5	Q65	H5	R14	C3	R35	B5	R52	D5	R72	E5	R89	G5	R106	H4	R123	G1	R141	K3	R161	F5
C5	Q15	C5	Q32	B5	Q49	F5	Q66	H5	R15	C3	R36	B5	R53	D4	R73	E4	R90	F5	R107	H5	R124	H2	R142	K2	R162	H5
K2	Q16	C5	Q33	B5	Q50	F5	Q67	I5	R16	B4	R37	C5	R54	D4	R74	E5	R91	G5	R108	I5	R125	H4	R143	J5	R163	H5
C5	Q17	C4	Q34	B5	Q51	G4	Q68	K2	R17	B4	R38	C4	R55	A5	R75	E5	R92	G5	R109	L4	R126	G1	R144	K2	RT1	H3
C5	Q18	D4	Q35	E4	Q52	G4	R1	B3	R18	B4	R39	C5	R56	A5	R76	E5	R93	G4	R110	H5	R127	G1	R145	K4	U1	B4
C5	Q19	D4	Q36	E4	Q53	G4	R2	A4	R19	A4	R40	C5	R57	A5	R77	E5	R94	G4	R111	H5	R128	K2	R146	K4	U2	F1
H2	Q20	D4	Q37	F4	Q54	G4	R3	A4	R20	A3	R41	C5	R58	B5	R78	E5	R95	G5	R112	I5	R130	K3	R147	K4	U3	J2
L2,B3	Q21	B5	Q38	E4	Q55	G5	R4	B3	R21	A3	R42	B5	R59	B5	R79	E5	R96	G5	R113	I5	R131	K2	R148	K4	U4	D1
A1	Q22	B5	Q39	E5	Q56	G5	R5	B3	R22	B4	R43	D5	R60	D5	R80	E5	R97	H4	R114	H5	R132	K2	H150	D1	U5	E1
K1	Q23	C5	Q40	E5	Q57	G5	R6	A3	R24	C1	R44	D4	R62	E5	R81	F4	R98	G5	R115	I5	R133	J2	R151	D1	U6	J5
B4	Q24	C5	Q41	E5	Q58	G5	R7	A4	R25	C1	R45	D5	R63	D6	R82	F4	R99	G5	R116	I5	R134	K2	R152	D1	U7	K5
B3	Q25	D4	Q42	E5	Q59	H4	R8	A4	R26	C1	R46	D5	R65	D5	R83	F5	R100	G5	R117	K3	R135	J2	R153	D1		
B3	Q26	D4	Q43	F4	Q60	H4	R9	B3	R30	C4	R47	B5	R66	D5	R84	F5	R101	H5	R118	K3	R136	K2	R154	E1		
H3	Q27	D4	Q44	F4	Q61	I4	R10	A3	R31	C5	R48	C5	R67	D5	R85	F4	R102	G5	R119	I5	R137	J2	R155	E1		
C4	Q28	B5	Q45	F4	Q62	I4	R11	A4	R32	C4	R49	D5	R68	D6	R86	F5	R103	H5	R120	G1	R138	K1	R156	E1		



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B3	CR4	J2	CR21	F5	L6	A4	Q12	C4	Q29	A5	Q48	F4	Q63	H5	R12	A4	R33	C		
C2	B4	CR5	C4	CR22	F4	L7	A3	Q13	C6	Q30	A5	Q47	F5	Q64	I5	R13	C3	R34	B		
C3	A4	CR6	C5	CR23	G4	L8	K3	Q14	B5	Q31	B5	Q48	F5	Q65	H6	R14	C3	R35	B		
C4	B3	CR7	C4	CR24	G5	L9	C5	Q15	C5	Q32	B5	Q49	F5	Q66	H5	R15	C3	R36	B		
C5	A4	CR8	D5	CR25	G5	L10	K7	Q16	C5	Q33	B5	Q50	F5	Q67	I5	R16	B4	R37	C		
C6	B4	CR9	D5	CR26	H4	L11	C5	Q17	C4	Q34	B5	Q51	G4	Q68	K2	R17	B4	R38	C		
C7	E5	CR10	D4	CR27	H4	L13	C5	Q18	D4	Q35	F4	Q52	G4	R1	B3	R18	B4	R39	C		
C10	C4	CR11	D5	CR28	H5	L14	C5	Q19	D4	Q36	E4	Q53	G4	R2	A4	R19	A4	R40	C		
C11	C5	CR12	D4	CR29	H5	MP1	B2	Q20	D4	Q37	E4	Q54	G4	R3	A4	R20	A3	R41	C		
C12	B4	CR13	D3	CR30	I4	MP2	L2/B3	Q21	B5	Q38	E4	Q55	G5	R4	B3	R21	A3	R42	B		
C13	D5	CR14	E4	DL1	C2	MP3	A1	Q22	B5	Q39	E5	Q56	G5	R5	B3	R22	B4	R43	D		
C20	K2	CR15	E5	J2	J1	MP4	K1	Q23	C5	Q40	E5	Q57	G5	R6	A3	R24	C1	R44	D		
C23	K2	CR16	E5	J4	B1	Q1	B4	Q24	C5	Q41	E5	Q58	G5	R7	A4	R25	C1	R45	D		
C24	K3	CR17	E4	L1	C4	Q2	B3	Q25	D4	Q42	E5	Q59	H4	R8	A4	R26	C1	R46	D		
C25	K2	CR18	F4	L2	C3	Q3	B3	Q26	D4	Q43	F4	Q60	H4	R9	B3	R30	C4	R47	B		
C30	K4	CR19	F5	L3	J2	Q5	H3	Q27	D4	Q44	F4	Q61	I4	R10	A3	R31	C5	R48	C		
C31	L3	CR20	D5	L4	B4	Q11	C4	Q28	B5	Q45	F4	Q62	I4	R11	A4	R32	C4	R49	D		

SERVICE BLOCK 10
TIME INTERVAL A126, A127, A128

THEORY OF OPERATION

A simplified diagram of the time interval section (TI) is shown in Figure 8–10–1. This section can provide a delay or width function depending on the position of the DELAY/WIDTH switch on A128.

The delay is generated in two different ways. Delays from 0 ns up to 49.9 ns are achieved by switching 50 ohm lines, which have fixed propagation delays. Delays ⩾ 50 ns (multiples of 50 ns) are generated by a counted delay generator, which is described later on in this Service Block.

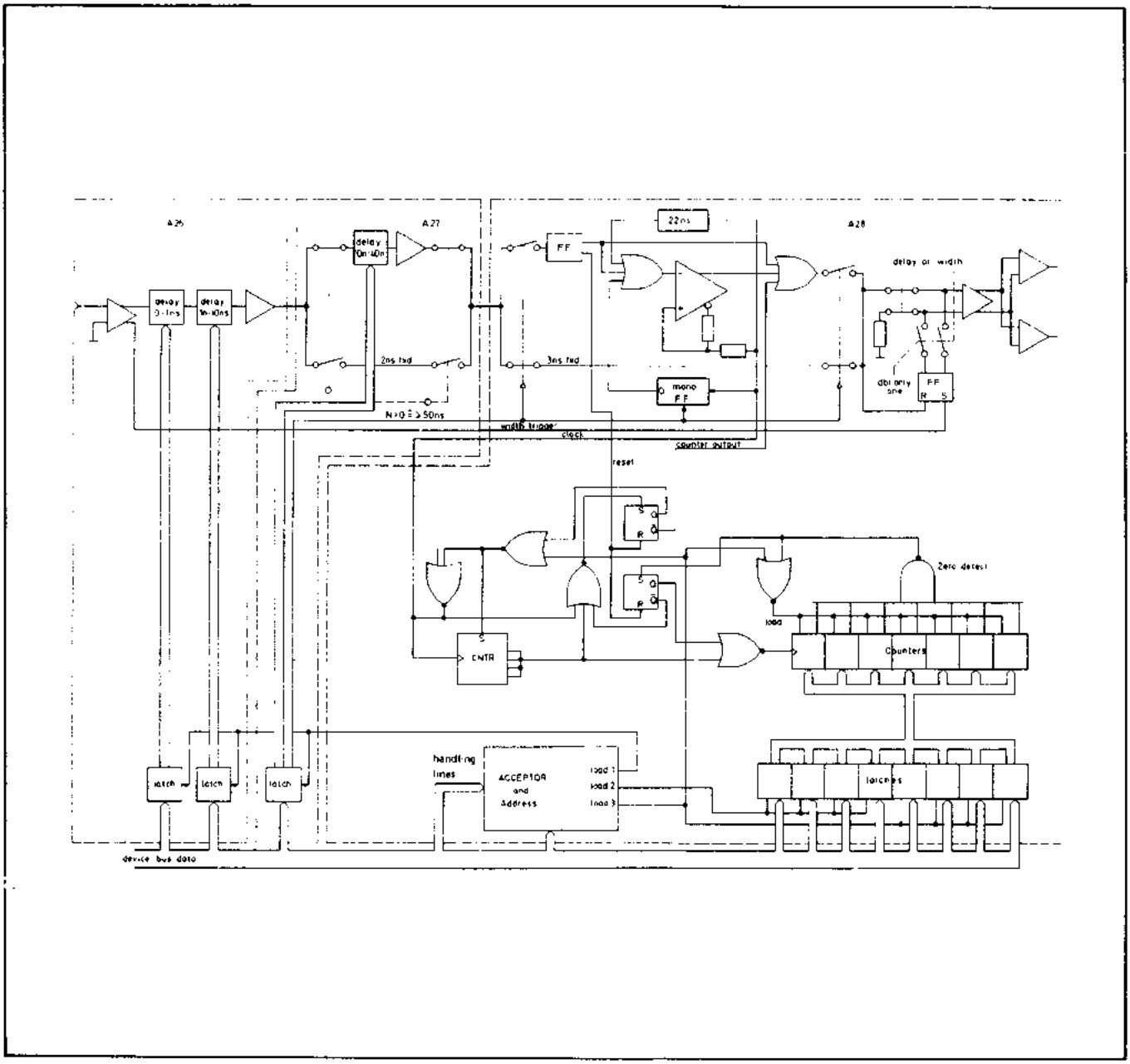


Figure 8–10–1. Simplified block diagram of time interval section.

Delay 0 – 9.9 ns

The delay of this section is achieved by printed circuit 50 ohm microstrip lines in the following steps.

Table 8–10–1. Delay steps

0 ns – 0.9 ns	1 ns – 9 ns
0.1 ns	1 ns
0.2 ns	2 ns
0.2 ns	3 ns
(2 x 0.1 ns)	
0.5 ns	4 ns

An example of how these microstrip lines are switched for a particular delay value in this range is given in Figure 8–10–2.

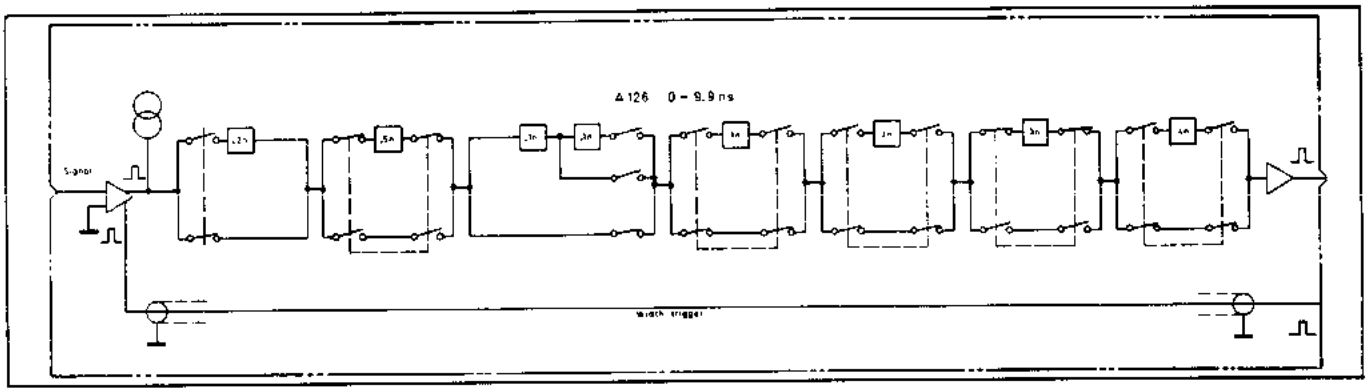


Figure 8–10–2. Delay 0 – 9.9 ns (switched to 3.5 ns)

A truth-table providing the device bus bit pattern for each value in this delay range is given in the troubleshooting part of this service block. (Tables 8–10–3, 8–10–4, 8–10–5).

Input Shaper (Schematic 16)

The input pulse coming from the rate generator or the previous TI unit transitions between –0.6 V and 0 V with a pulse width of approximately 3 ns. The input shaper comprising a pnp differential amplifier (Q1A, Q1B) followed by an npn differential amplifier with current source outputs (U1A, U1B) then directs this input signal to two different routes. One route is the delay route, while the other is the width trigger route (see Figure 8–10–3).

This shaper circuit is also used for pulse restoration in the TI section.

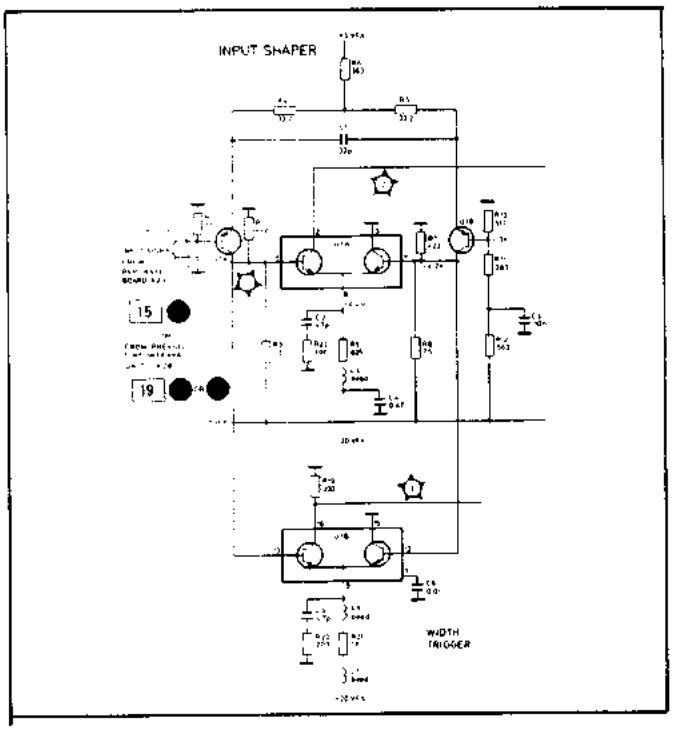


Figure 8–10–3. Shaper circuit of TI section.

Delay Line Switch (Schematic 16)

To avoid reflections, a delay line > 0.2 ns is switched on and off at both ends of the line – See Figure 8–10–4. In this Figure, which illustrates the 0.5 ns line, transistors Q17 to Q20 are high beta types with low resistance. A high (> 0.9 V) at Q23 base turns Q23 off and Q24 on. This causes Q21 to cut off, and Q17, Q20 both saturate thus switching the signal pulse through the 0.5 ns delay line. Simultaneously, the saturated Q22 pulls the base potential of Q18, Q19 down to approximately –4 V and switches Q18, Q19 off (since the signal pulse is only slightly negative). Diodes CR7 to CR10 are used to decouple the collector-base capacitance of Q21 and Q22. This same principle is repeated for all delay lines > 0.2 ns.

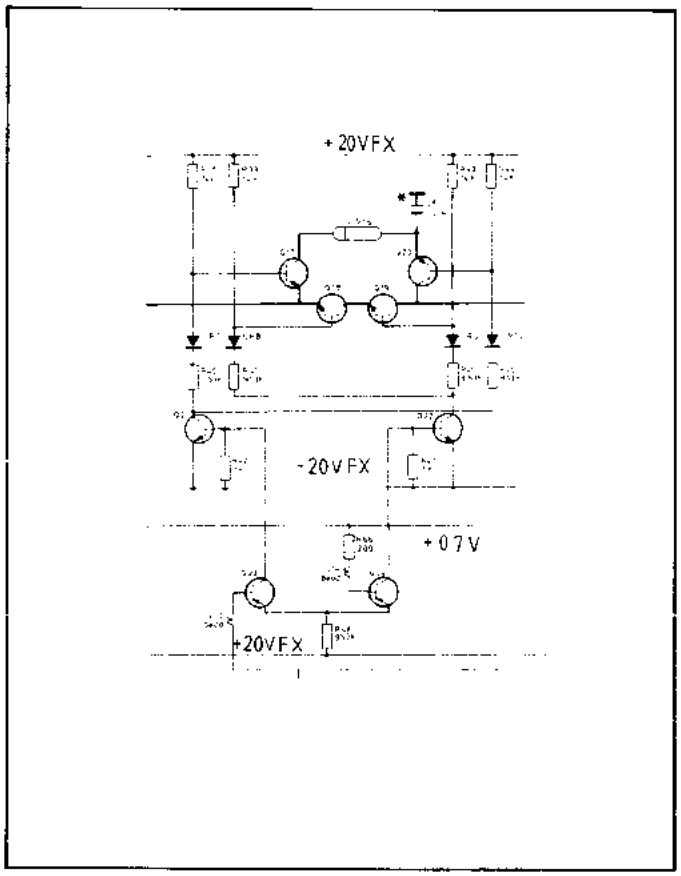


Figure 8–10–4. Delay line switch

Compensation Network (Schematic 17)

Since the dielectric constant of the printed circuit board varies with temperature, this effect has to be compensated for the delays 1 ns to 9 ns. The temperature voltage U_T is generated by the NTC (negative temperature coefficient) resistor A126 RT1 together with transistor A126 Q5.

As can be seen from Figure 8–10–5, voltage U_T, CMOS switches U2, and resistors R120 to R123 determine the current from current source I_C – which in turn shifts the pulse relative to the fixed trigger level of the output buffer (Q68, U3). By shifting the pulse, the trigger point on the leading edge is altered by a time, ΔT, which is the delay compensation time.

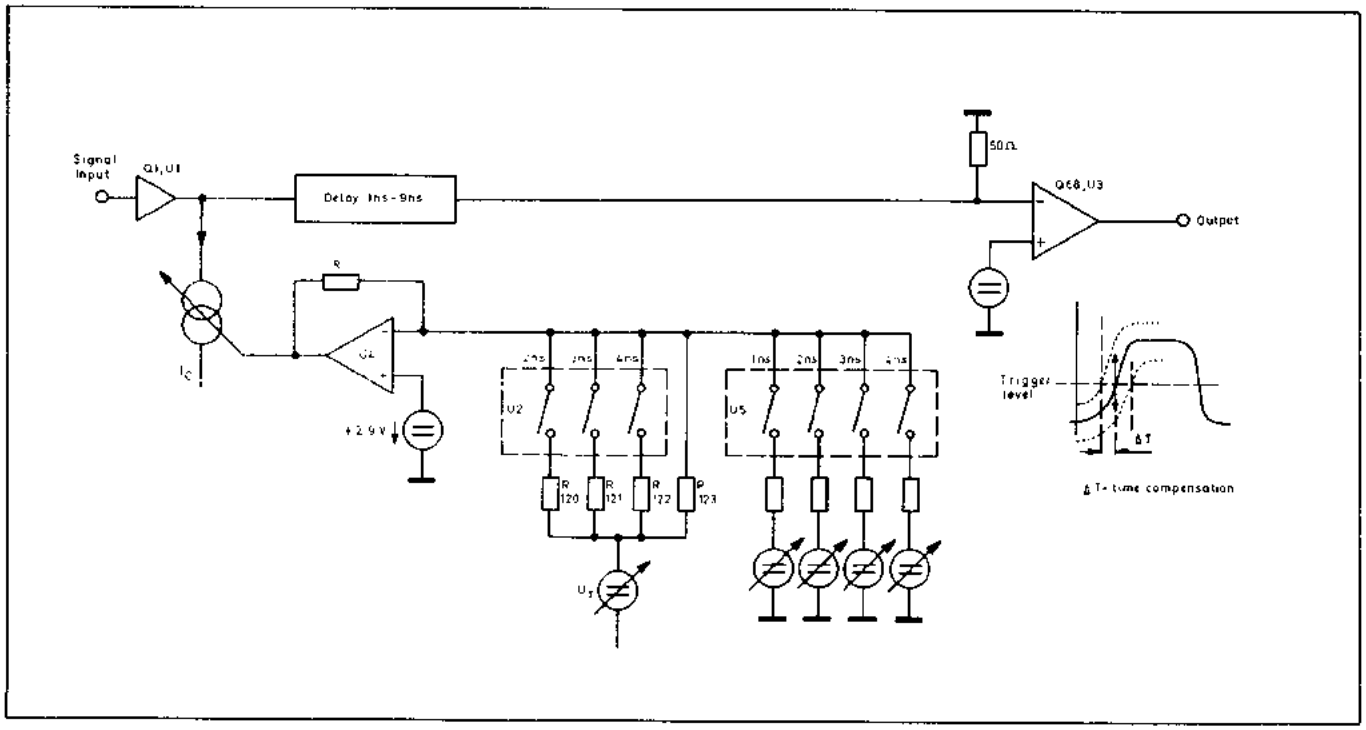


Figure 8–10–5. Compensation network (see also schematic 17)

In addition to compensation of temperature effects, an adjustment of the delay lines 1 ns, 2 ns, 3 ns and 4 ns is necessary. This is accomplished via CMOS switches U5 and resistors R150 to R157, which also affect current source I_C. A third function of I_C is to compensate the base current of the delay line switches. For this reason a minimum current (the base compensation current) is continually flowing into I_C.

Delays 10 ns to 40 ns (Schematic 18)

This delay range operates via 50 ohm coaxial cable which can be switched in 3 steps – 10 ns, 10 ns and 20 ns (see Figure 8–10–6 for a functional block diagram of this section). The RC/RL network at the end of each line is necessary to compensate the step response of the cable. Also, the resistive T-network in the non-delayed path compensates the cable attenuation.

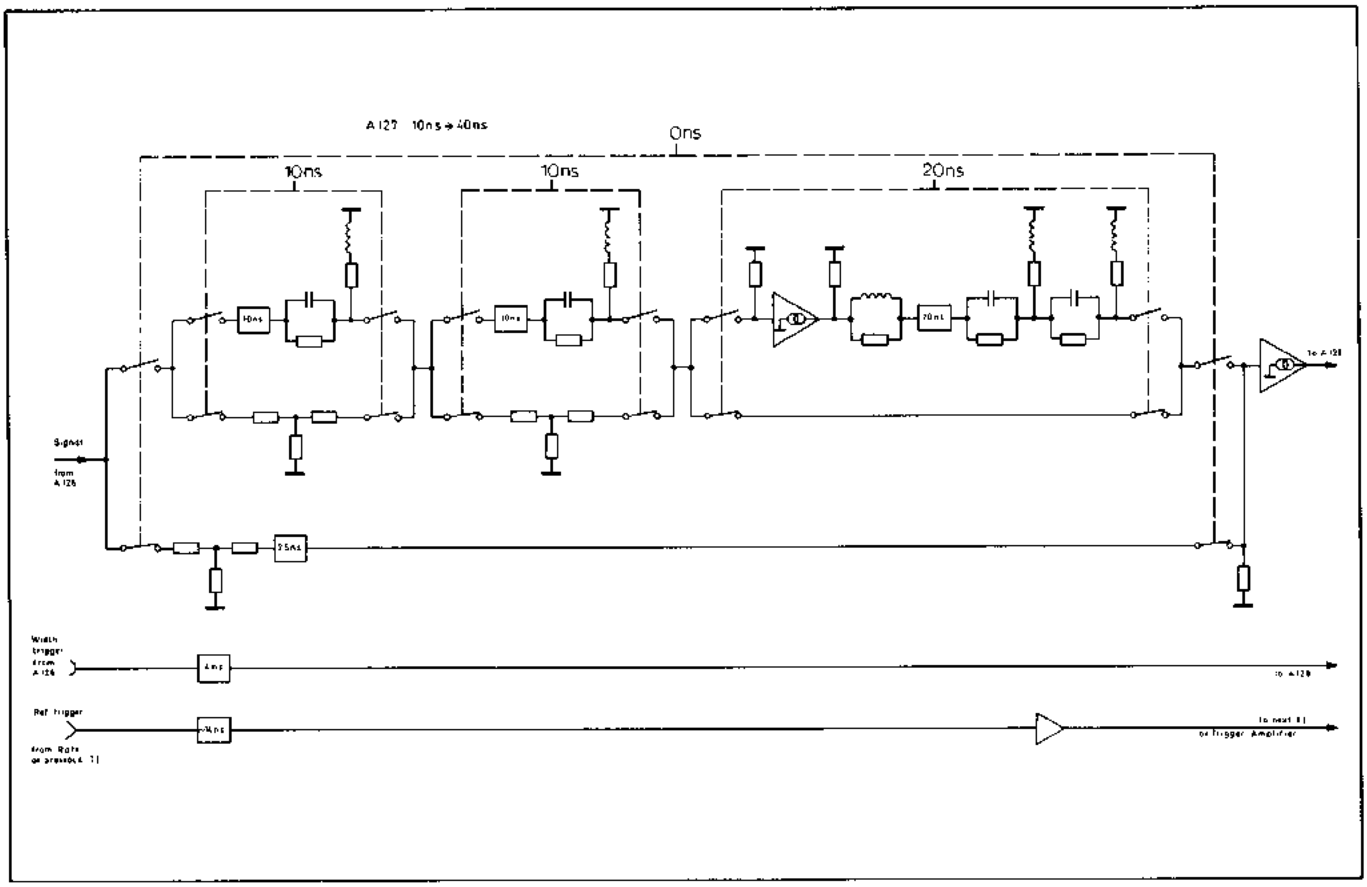


Figure 8–10–6. Delay 10 ns – 40 ns (switched to 0 ns)

As can be seen from Figure 8–10–6, the reference trigger is also routed via board A127, this route having the same propagation delay as a 0 ns selected delay. The result at the output of the time interval section is coincidence between the 'delay' pulse and the reference trigger when 0 ns delay is selected.

Delay ⩾ 50 ns (Schematics 19, 20)

For a better understanding of the circuits involved in this delay range, a general description is given first followed by detailed descriptions of individual circuit functions.

The timebase of the counted delay is an astable multivibrator with 50 ns period, which can be synchronously started and stopped.

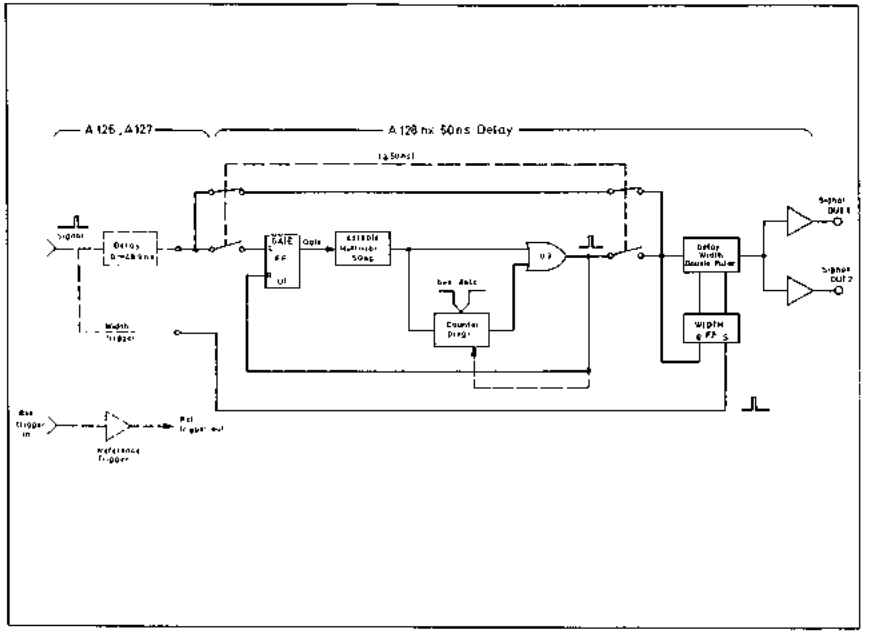


Figure 8–10 7. Counted delay and output of time interval section.

Figure 8–10–7 shows the principle of this circuit. After the 'delay' pulse has passed the switched delay lines, it sets the gate flip-flop, U1, and starts the astable multivibrator which produces a square wave of 50 ns period. Meanwhile, the programmable down counter, which is set by bus data to "N", disables gate U3. As soon as 'N-1' pulses have passed the counter, it enables gate U3 to let the "Nth" pulse of the multivibrator pass. The resultant pulse at the output of gate U3 resets the programmable counter, disables gate U3 and resets the gate flip-flop U1. Since this output pulse appears N x 50 ns after the start pulse of the multivibrator, a delay of N x 50 ns is achieved.

Astable multivibrator N x 50 ns (Schematic 19)

As can be seen in Figure 8–10–8, together with timing diagram Figure 8–10–9, a high at the base of Q6 (~ 0 V) disables the multivibrator consisting of Q7, Q8 and U1. In this state the transistor U1A is switched on, and puts a low on the base of Q7 (which is inactive since Q6 base is still high). Also, the counter output is high to disable the gate U3 output thus putting a low on the R input of the gate flip-flop U1.

A trigger pulse at the S input of the gate flip-flop sets $\overline{Q}$ to low and switches U1A off. This causes a low/high step on the delay line, and a high/low step to the blocking monostable which disables the base of U1A for approximately 20 ns, thus avoiding oscillations with periods of less than 40 ns. The low/high step on the delay line travels for 23.5 ns until it reaches the base of Q7 and switches U1A on. The result is a high/low step at the collector of U1A approximately 1.5 ns later. In this way, the multivibrator oscillates with a period of 50 ns [2 x (23,5 + 1,5)] ns.

The clock for the programmable down counter is derived from Q9.

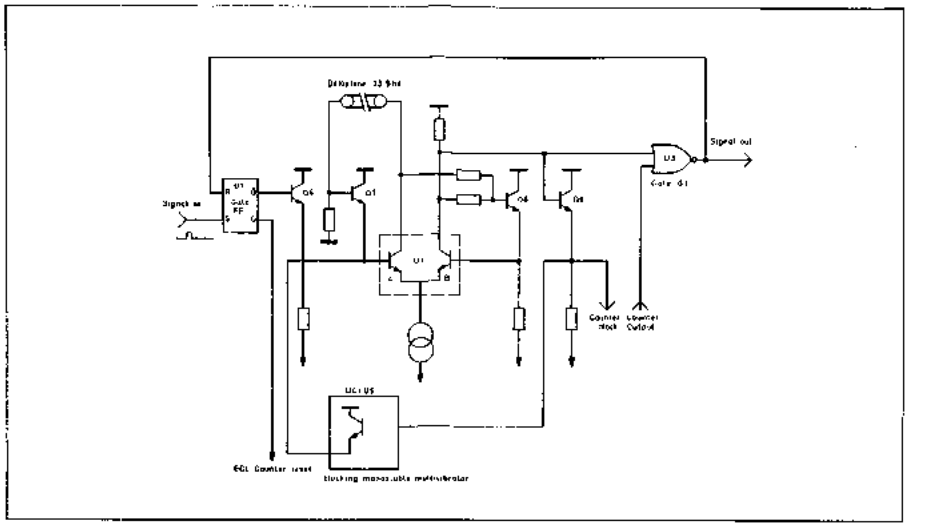


Figure 8–10–8. Astable multivibrator N x 50 ns principle (A128)

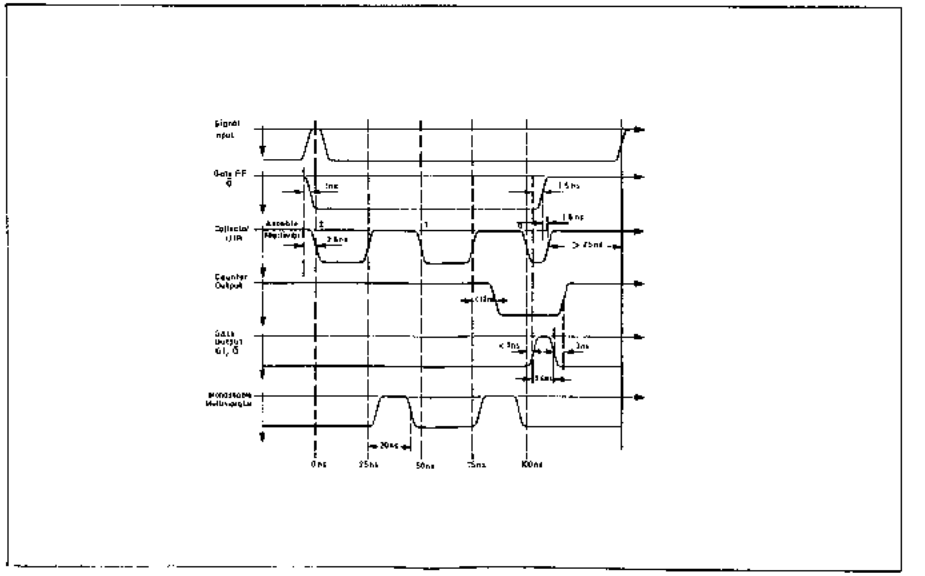


Figure 8–10–9. Pulse diagram of counted delay of TI section (A128)

Programmable TI Counter (Schematic 20)

The programmable counter comprises a fast, ECL single decade prescaler and a 6-decade, low power Schottky counter. Data from the device bus can only be loaded into the counter when the astable multivibrator is not running. Loading is then accomplished via signal TI Load 3 (delayed by U12) which loads the data stored in the device bus latches. Simultaneously, (See Figure 8–10–10) the ECL counter is preset via input S1 and the clock input (U8, pin 13). The R21/C1 network provides the necessary delay between S1 and the clock input for proper operation.

To explain the counting process assume first the counters are preset as follows: (see also timing diagram Figure 8–10–11).

Table 8–10–2. TI Counter

ECL counter	LS counters						
1	2	3	4	5	6	7	Decades
5	2	0	0	0	0	0	Preset No.

The ECL counter counts down from 5 to 0. At 0 the wired 'or' Q outputs go low and return high at 9 producing the first ripple clock for the LS counter. The first decade of the LS counter (2-dec.) counts down from 2 to 1 with the low/high transition of the ripple clock.

When the ECL counter reaches 0 again, the next ripple clock is started ... and stops with a low/high transition at 9 of the ECL counter. With this transition, the first decade of the LS counter (2-dec.) steps from 1 to 0 and gives a high on its max/min output. Since all other max/min outputs were already high, this high makes the NAND gate U13 switch to low giving the "LS counter readout". This signal presets the LS counter, sets the flip-flop U9B, disables the ripple clock gate, and enables the ECL counter readout gate U7. The max/min output of the first LS counter stage goes to low as soon as the LS counter is preset, but "LS counter readout" information is still available, since it is latched in the flip-flop U9B.

The ECL counter counts down again, and at 0, prepares the gate U7 to allow the next high/low transition of the clock input pass. This "ECL counter readout" pulse sets flip-flop U9A giving a low at the counter output (U9A, Q output). Also, the Q output of flip-flop U9A presets the ECL counter via U5, U6 as already described.

Both readout flip flops U9A, and U9B are cleared with a reset pulse from the gate flip-flop of the AMV circuit, and prepare the counter for the reset operation.

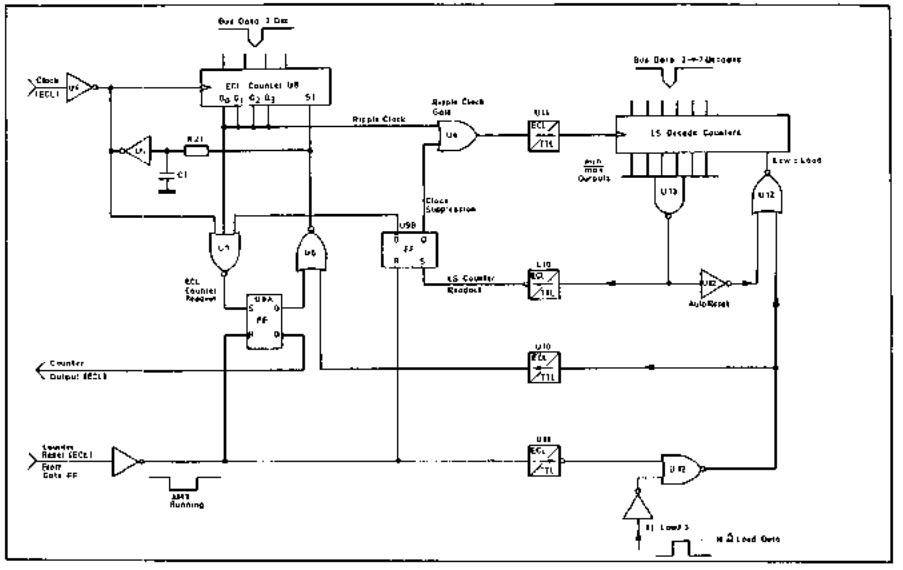


Figure 8–10–10. Programmable TI counter block diagram

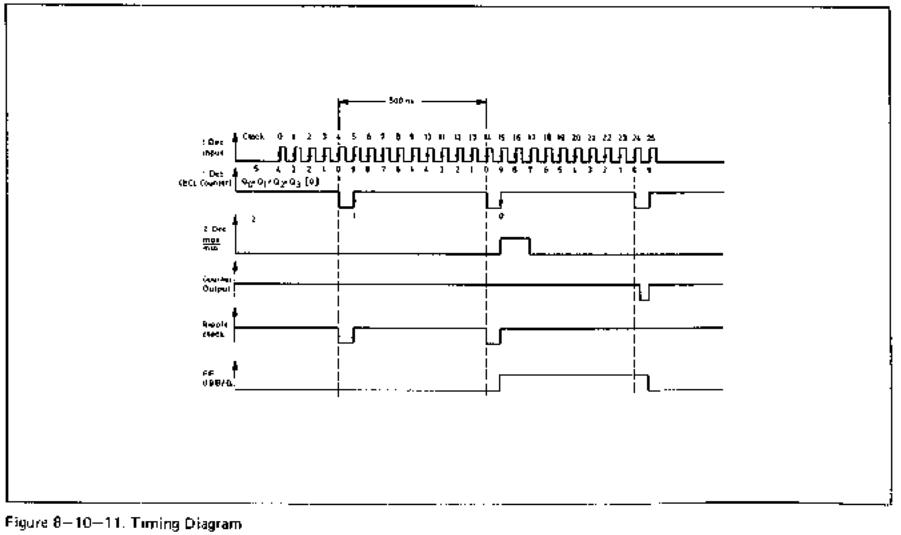


Figure 8–10–11. Timing Diagram

Delay/Double Pulse/Width Switch (General Operation)

The basic principle whereby the three functions, delay, double pulse, and width can be derived from a single input pulse is illustrated in Figure 8–10–12. A more detailed description of individual functions is given later on in this service block. In order to follow the description, fold out schematic 19

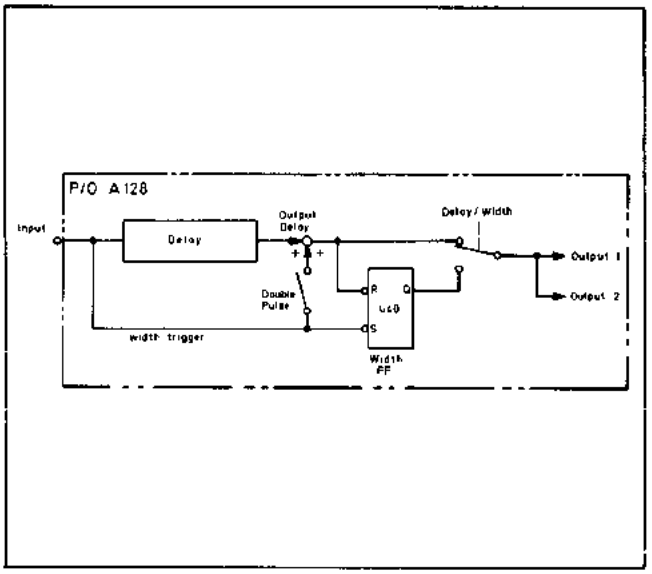


Figure 8–10–12. DELAY/WIDTH and DOUBLE PULSE mode of TI section

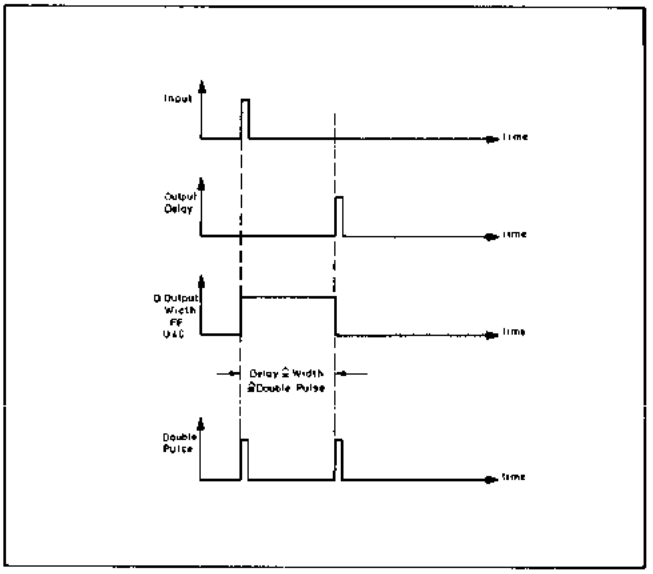


Figure 8–10–13. DELAY/WIDTH and DOUBLE PULSE mode timing

The input signal from the time interval section is directed over two routes: a delayed route and an undelayed (width trigger) route.

For DELAY OPERATION, the width trigger is not used and the output of the TI section is switched to the delay output. In this mode, the width trigger can be added to the delay output, via the double pulse switch, to achieve the DOUBLE PULSE function.

For WIDTH OPERATION, the width trigger sets the width flip-flop which is then reset by the delayed signal. The Q output provides the width function with a width that is equal to the programmed delay. In order to route width pulse to the outputs, the Delay/Width switch is set in position "Width".

The necessary signal switching to accomplish the 3 functions is done via current switch A128 U41.

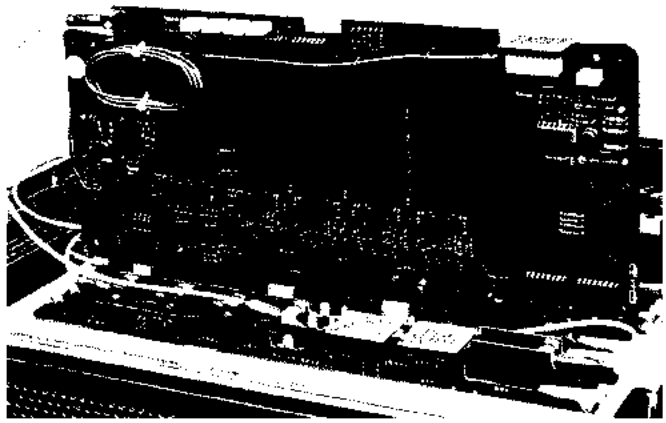
Delay: Inputs U41 pin 15, pin 11 are switched off by Q52, Q57 respectively, and U41 pin 10 is biased to approximately −0,3 V by Q59. In this mode the current switch IC works as a differential amplifier with one side biased, and the other side switched. The result is a balanced signal at the collectors derived from the single-ended input switching signal.

Double pulse: The width flip-flop U40 consists of two 3-input NOR gates wired for flip-flop function. In delay mode NOR gate U40A is switched off via pin 6, and NOR gate U40B operates as simple gate delivering the 'width trigger' pulse at output pin 11.

This width trigger pulse is then switched by Q52 (Q54) to pin 15 of the current switch IC U41. Since pins 14 and 15 of U41 are wired for OR function, the delayed signal and the width trigger pulse are combined and appear at outputs U41 pin 12 and 13.

Width: Inputs U41 and 14 and pin 10 are switched off by Q50 and Q59 respectively, and U41 pin 15 and 11 are switched on by Q52 and Q57 respectively. The NOR gate U40A is enabled and U40 operates as a flip-flop giving complementary signals at outputs U40 pin 4 and pin 11, which are driving the current switch.

TROUBLESHOOTING

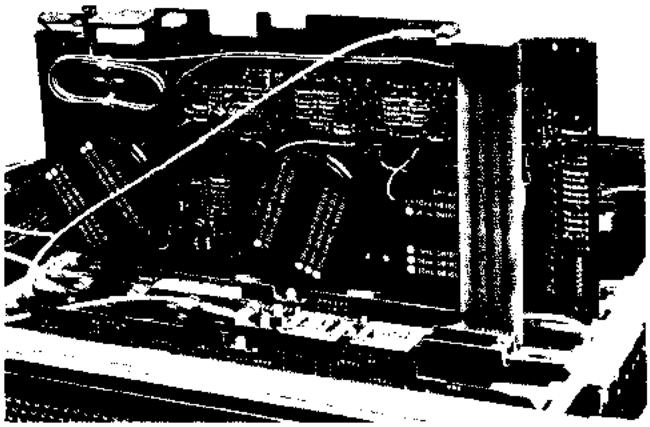


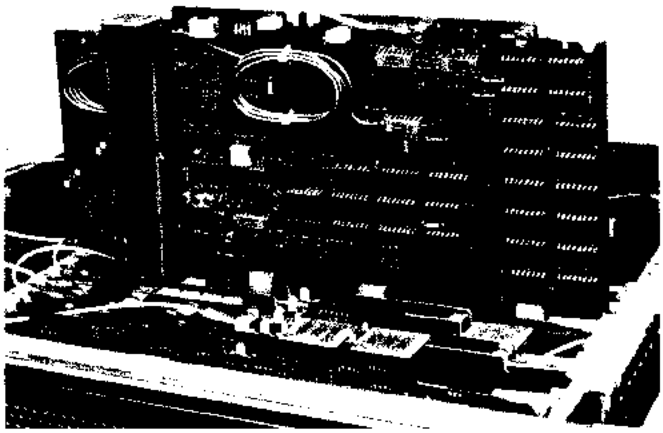
Each channel in the 8160A contains two time interval (TI) blocks, one block providing the width function and the other the delay function. The operation of both TI blocks is identical, the function (delay or width) being determined by the switch S1 on board A128. This switch changes the analog path (S1A) and the TI acceptor address (S1B). The position of switch S1B thus decides whether delay or width data is accepted.

Another switch S2 on board A128 sets the **channel** address for a particular TI block i.e. in the standard instrument, S2 is always set to 1, and when option 020 is fitted, the channel B switch S2 must be set to 2 (this is valid for both delay and width).

A TI block comprises three sections:

1. 0–9.9 ns (A126) schematics [16] [17]
2. 10 ns – 40 ns (A127) schematic [18]
3. ⩾ 50 ns (A128) schematics [19] [20]





When troubleshooting a TI block, use Figure 8–10–14 to isolate the fault to one of the above 3 boards.
Should the fault be on board A126 or A127, the control circuit, U6 and U7 on board A126 or U3 on A127 can be checked against the following truth tables.

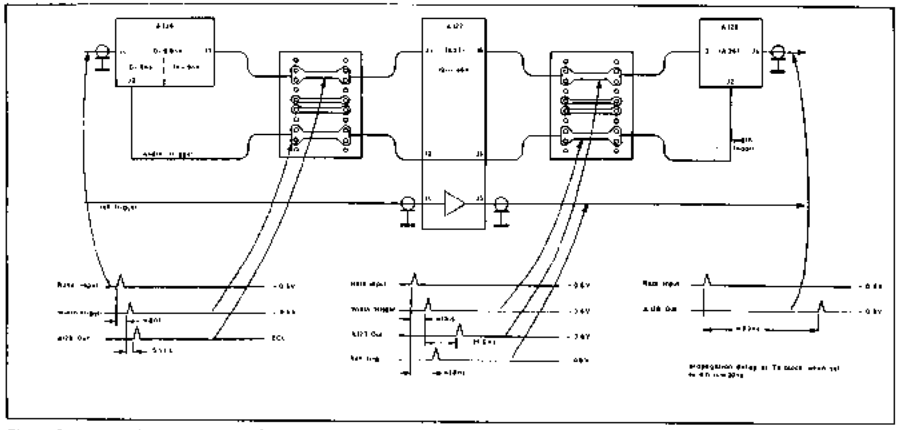


Figure 8–10–14. Fault isolation in TI block

Table 8–10–3. U6 Truth Table

Range	A *0.2 ns pin 10	B 0.5 ns pin 1	C 0.1 ns pin 2	D 0.2 ns pin 11
0 0 ns	0	0	0	0
0.1 ns	0	0	1	0
0.2 ns	1	0	0	0
0.3 ns	1	0	1	0
0 4 ns	1	0	0	1
0.5 ns	0	1	0	0
0.6 ns	0	1	1	0
0.7 ns	1	1	0	0
0.8 ns	1	1	1	0
0.9 ns	1	1	0	1

Table 8–10–4. U7 Truth Table

Range	A 1 ns pin 2	B 2 ns pin 10	C 3 ns pin 11	D 4 ns pin 1
< 1 ns	0	0	0	0
1 ns	1	0	0	0
2 ns	0	1	0	0
3 ns	0	0	1	0
4 ns	0	0	0	1
5 ns	1	0	0	1
6 ns	0	1	0	1
7 ns	0	0	1	1
8 ns	1	0	1	1
9 ns	0	1	1	1

Table 8–10–5. U3 Truth Table

Range	A 10 ns pin 2	B *10 ns pin 10	C 20 ns pin 11
< 10 ns	0	0	0
10 ns	1	0	0
20 ns	1	1	0
30 ns	1	0	1
40 ns	1	1	1

Table 8–10–6. Truth Table for Counter

	N11	N12	N13	N14
50 ns	1	0	0	0
100 ns	0	1	0	0
150 ns	1	1	0	0
200 ns	0	0	1	0
250 ns	1	0	1	0
300 ns	0	1	1	0
350 ns	1	1	1	0
400 ns	0	0	0	1
450 ns	1	0	0	1

Should the fault be isolated to board A128, a good method of checking the astable multivibrator operation is to set the TI block < 50 ns and check the static conditions as shown in Figure 8–10–15. Otherwise check the counter latch data as given in Table 8–10–6. (This table only provides a truth table for the 'ns' range, but the digital data is the same for the 'µs' and 'ms' ranges.

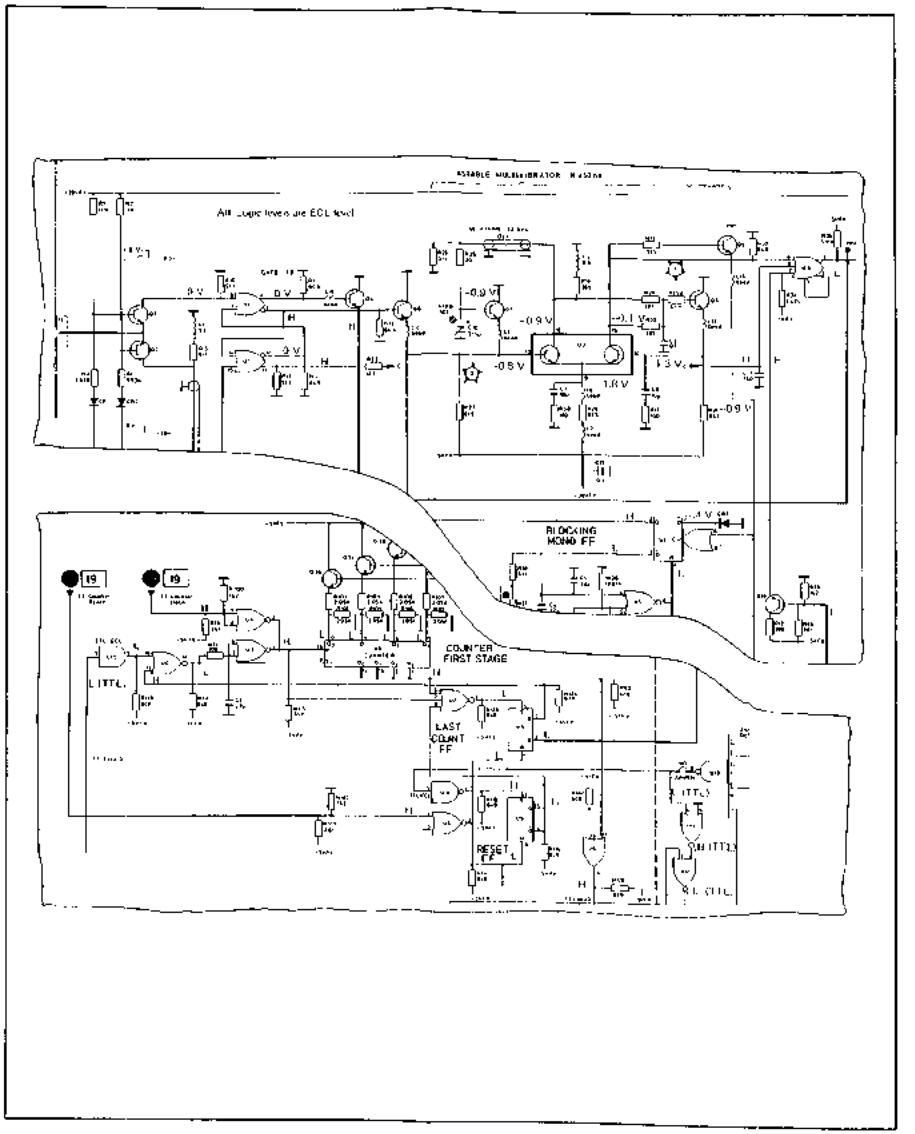
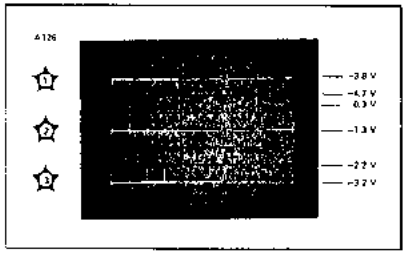
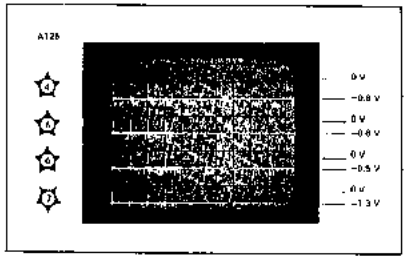


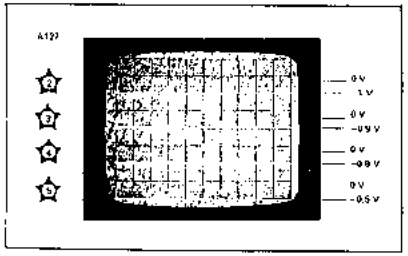
Figure 8–10–15. Astable multivibrator

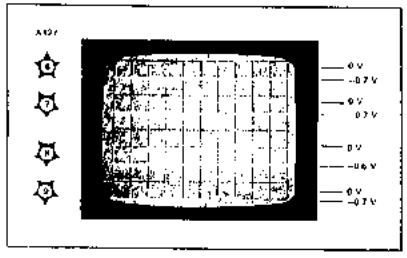
Time Interval A126 16 17 A127 18





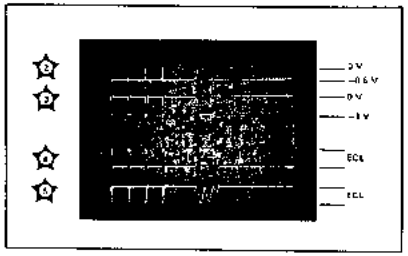
5 of A127 corresponds to 5 of A126

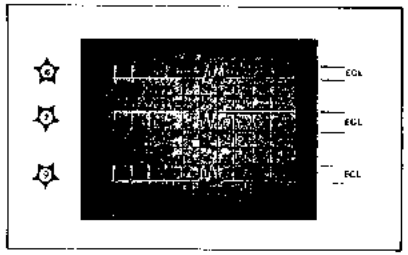


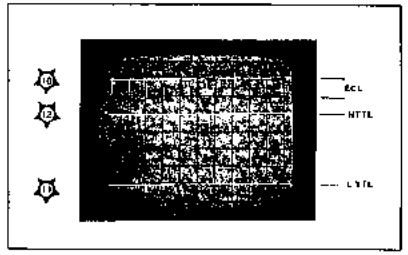


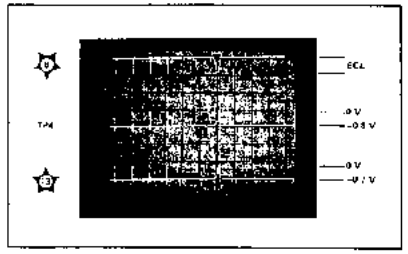
Time Interval A128 19 20

1 same as 8 of A127



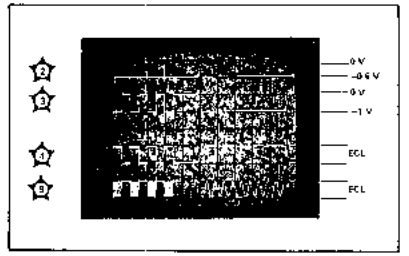


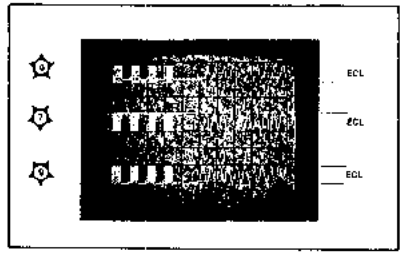


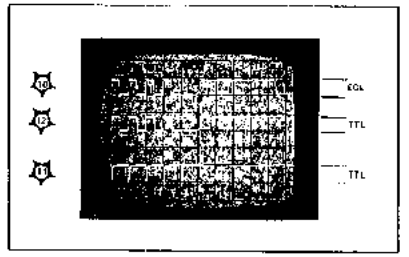


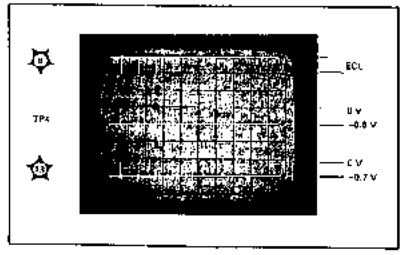
Time Interval A128 19 20

1 same as 8 of A127

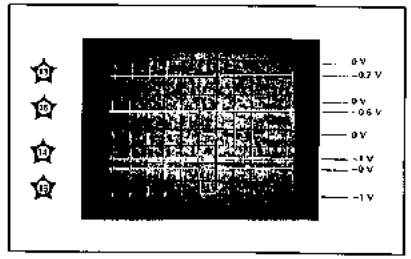


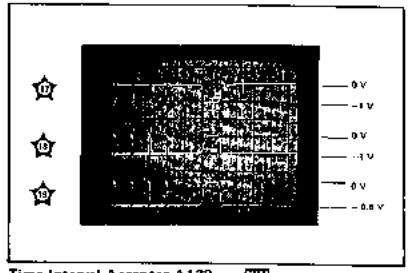




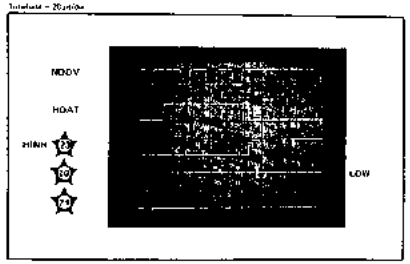


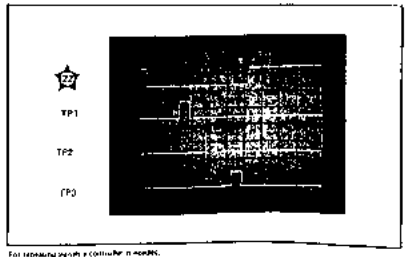
Time Interval A128 19

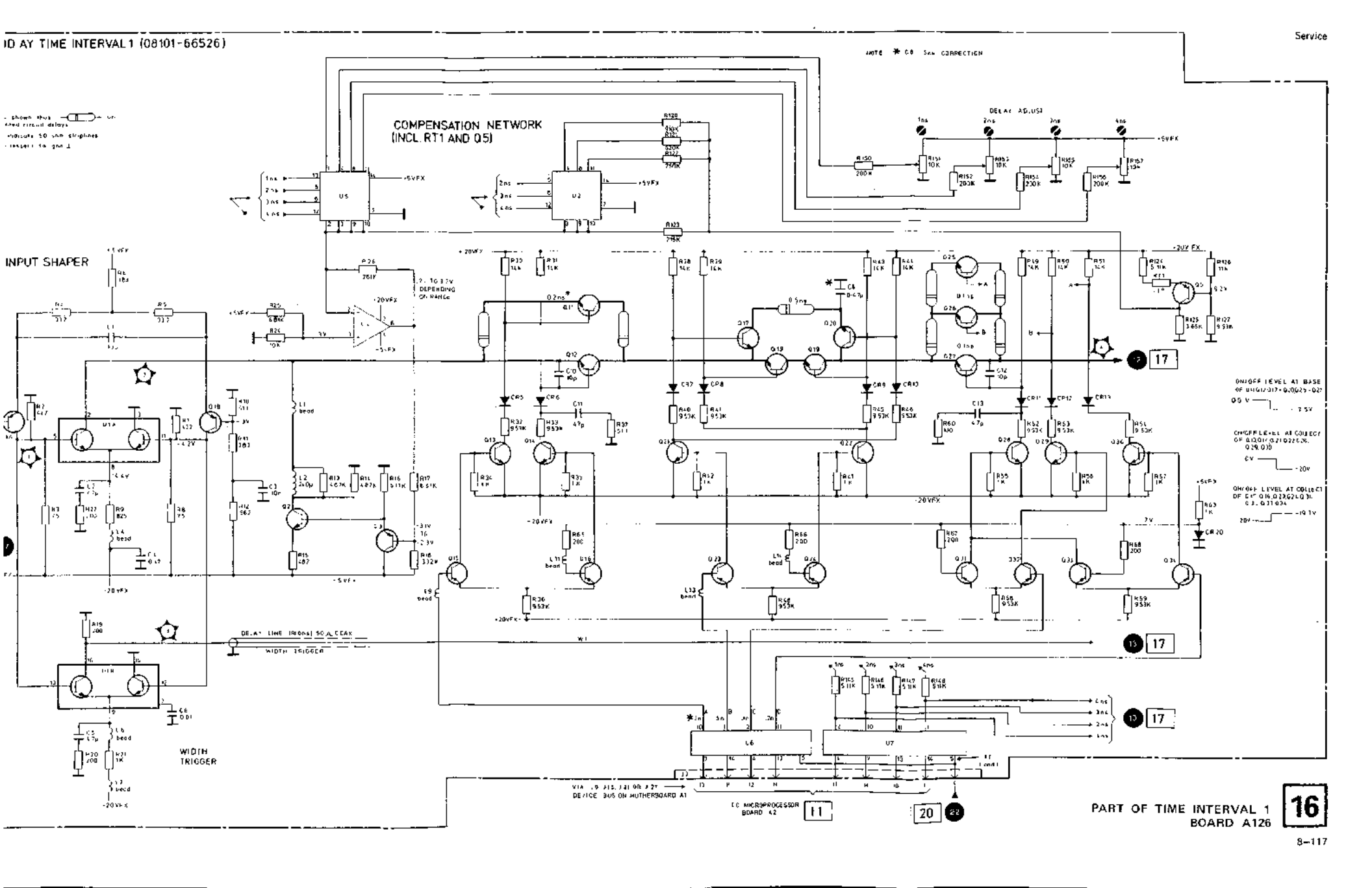


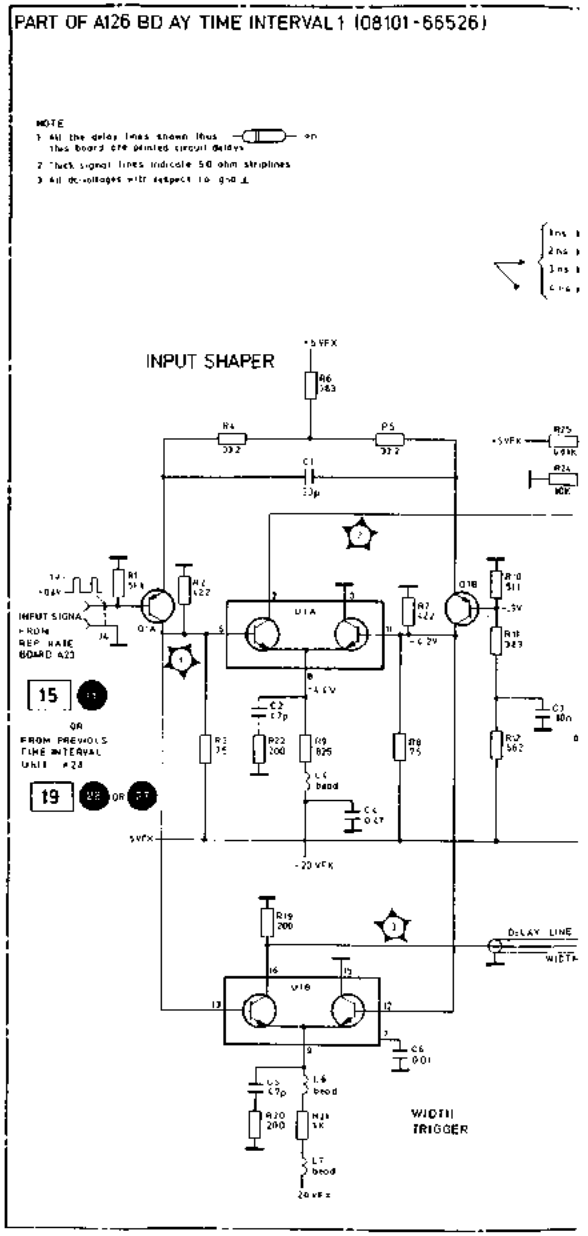


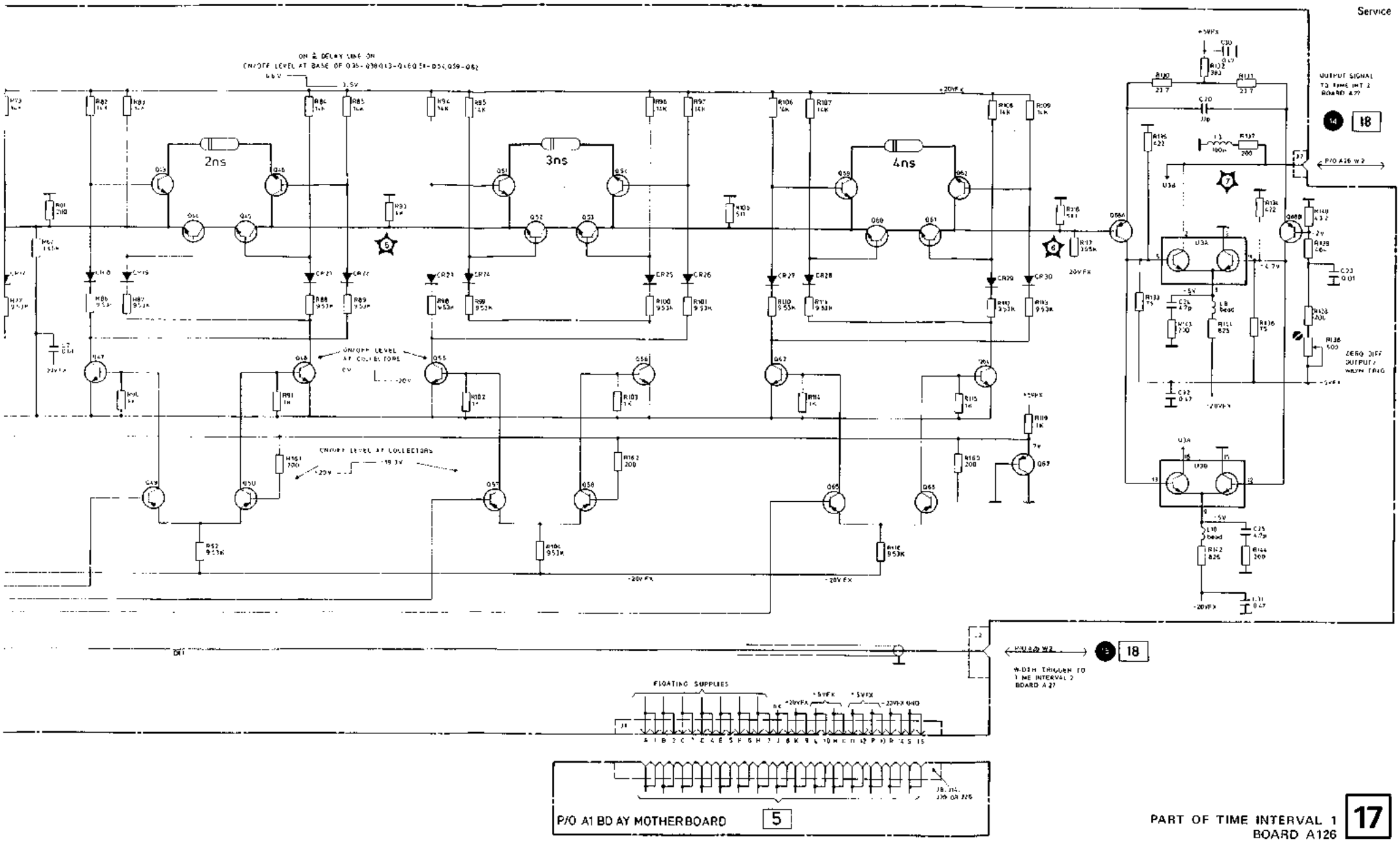
Time Interval Acceptor A128 20





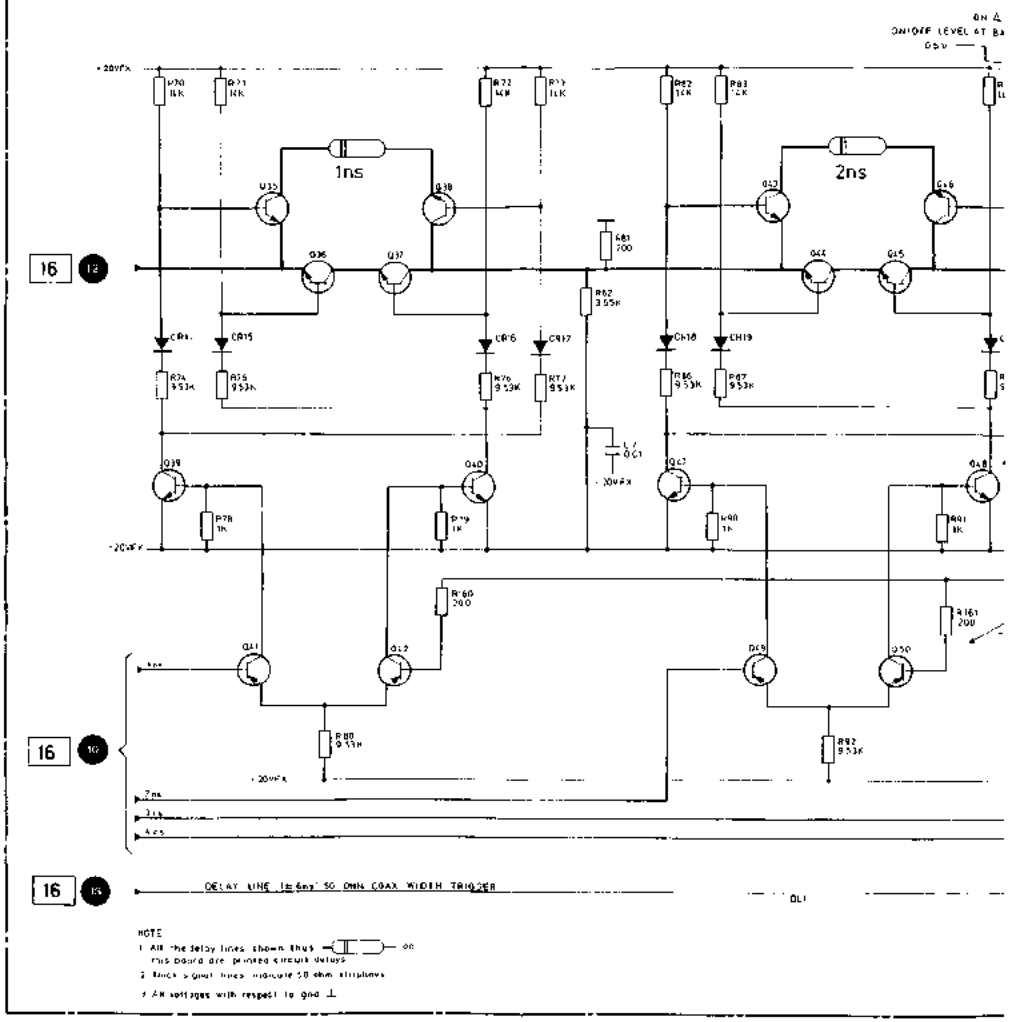

COMPENSATION NETWORK
(INCL. RT1 AND Q5)
INPUT SHAPER
WIDTH TRIGGER
DELAY LINE (RG58A/U) SCALE 0.2 X
WIDTH TRIGGER
DELAY ADJUST
PART OF TIME INTERVAL 1
BOARD A126
16
8-117


PART OF A126 BD AY TIME INTERVAL 1 (08101-66526)
NOTE
1 All the delay lines shown thus
This board are printed circuit delays
2 Thick signal lines indicate 50 ohm striplines
3 All dc voltages with respect to gnd ⊥
INPUT SHAPER
+5VFX
R6
383
R4
332
R5
332
C1
33p
R1
5K
R2
422
Q1A
D1A
R7
422
Q1B
R10
511
-5V
R11
383
-6.2V
+4.6V
C2
47p
R22
200
R9
825
L5
bead
C4
0.47
R3
75
R8
75
R12
562
C3
10n
-20 VFX
INPUT SIGNA
FROM
REP RATE
BOARD A23
15
OR
FROM PREVIOUS
TIME INTERVAL
UNIT #28
19
OR
R19
200
V1B
DELAY LINE
WIDTH
C5
47p
R20
200
R21
1K
L6
bead
L7
bead
C6
0.01
WIDTH
TRIGGER

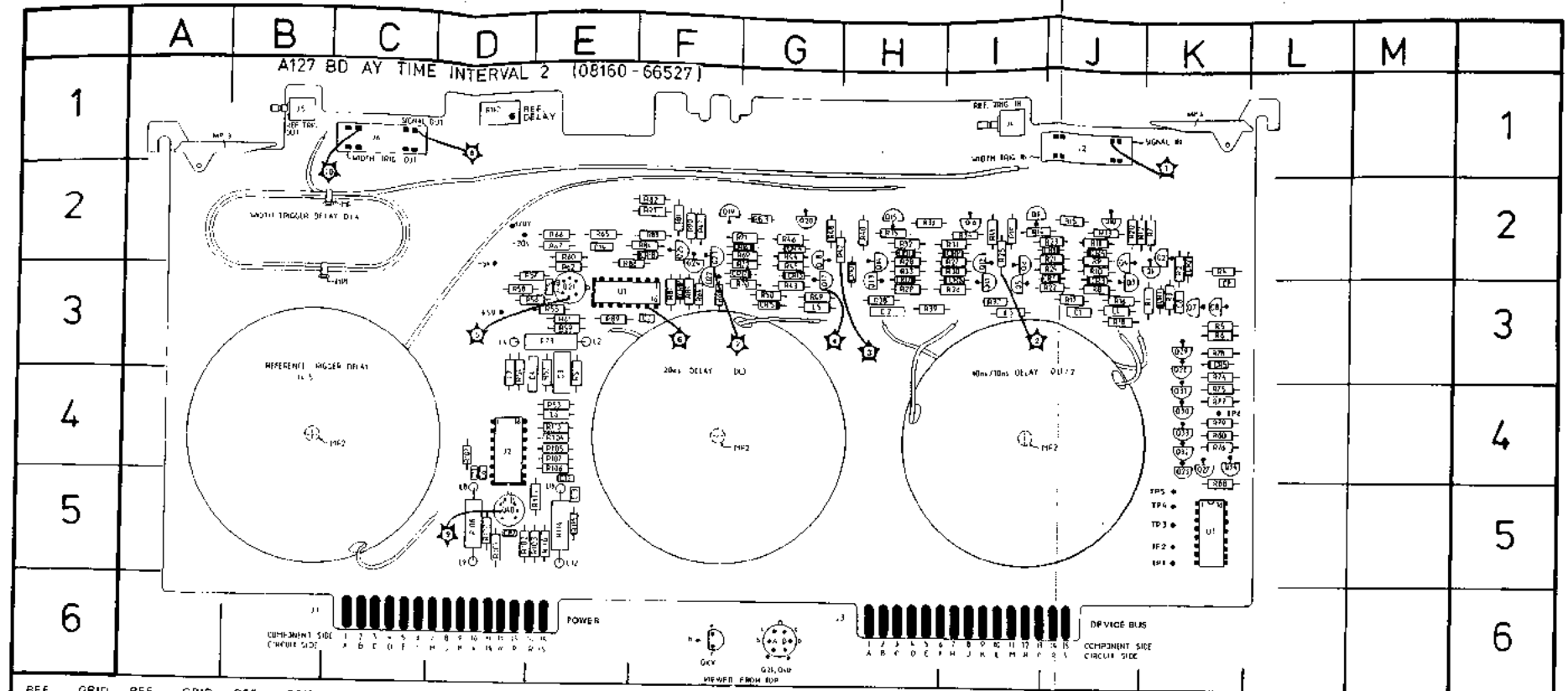

ON & DELAY LINE ON
ON/OFF LEVEL AT BASE OF Q35-Q38 Q43-Q46 Q50-Q54 Q59-Q62
2ns
3ns
4ns
ON/OFF LEVEL AT COLLECTORS
ON/OFF LEVEL AT COLLECTORS
+20VFX
-20VFX
+5VFX
-5V
OUTPUT SIGNAL TO TIME INT 2 BOARD A27
P/O A26 W2
ZERO DIFF OUTPUT WHEN TRIG
WIDTH TRIGGER TO TIME INTERVAL 2 BOARD A27
FLOATING SUPPLIES
P/O A1 BD AY MOTHERBOARD
5
PART OF TIME INTERVAL 1 BOARD A126
17

1160A

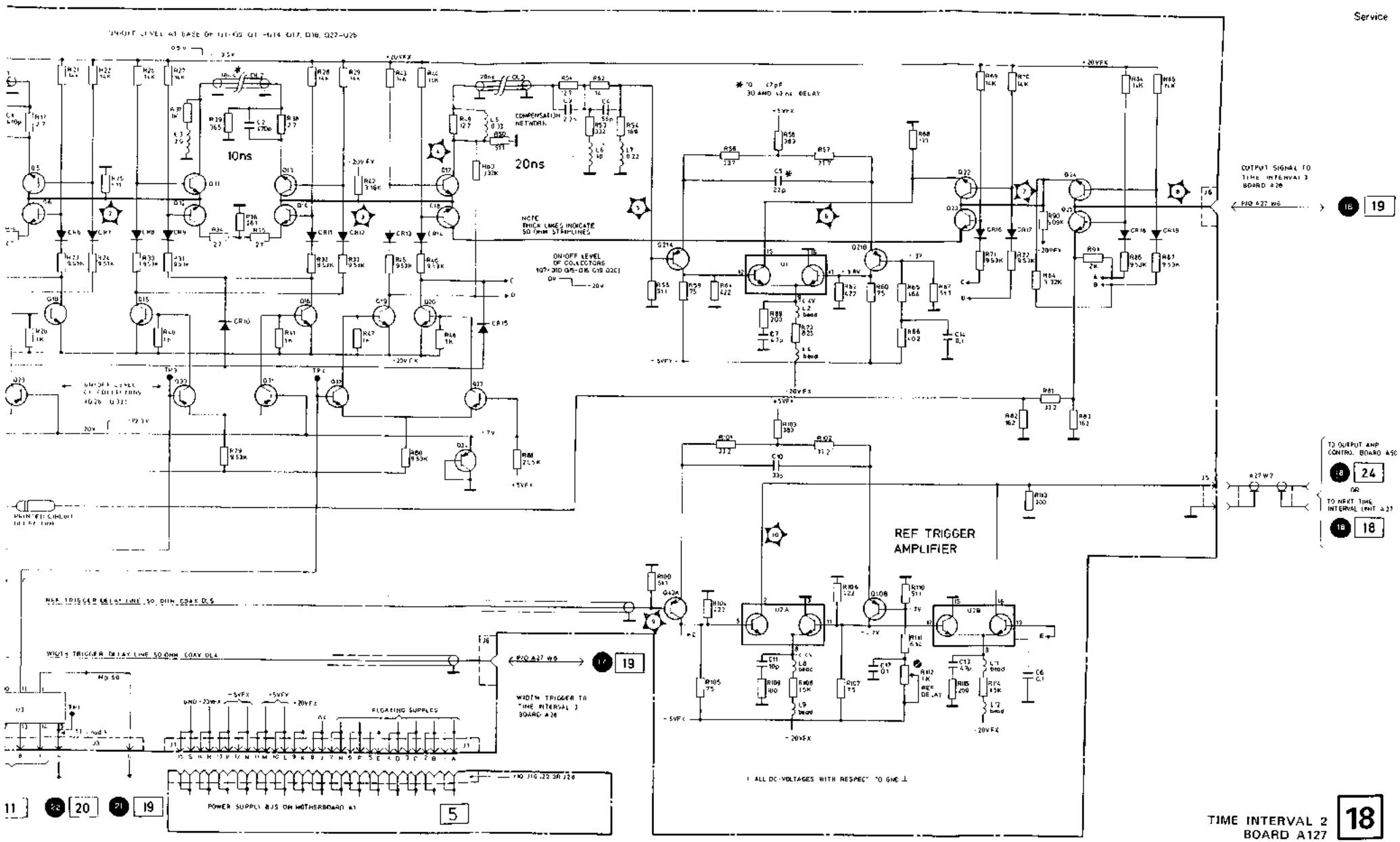
PART OF A126 BD AY TIME INTERVAL 1 (08160-66526)



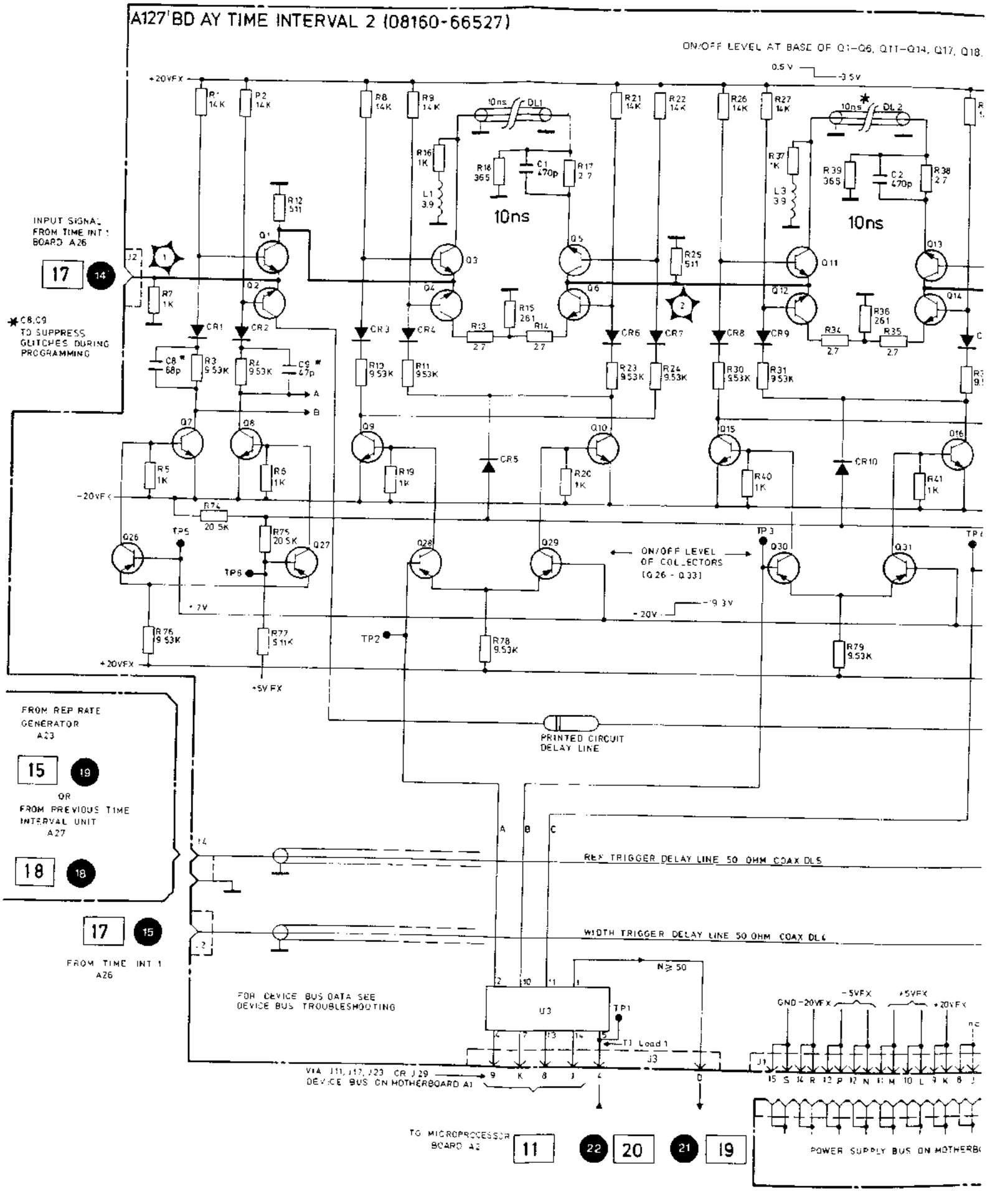
A127 BD AY TIME INTERVAL 2 (08160-66527)



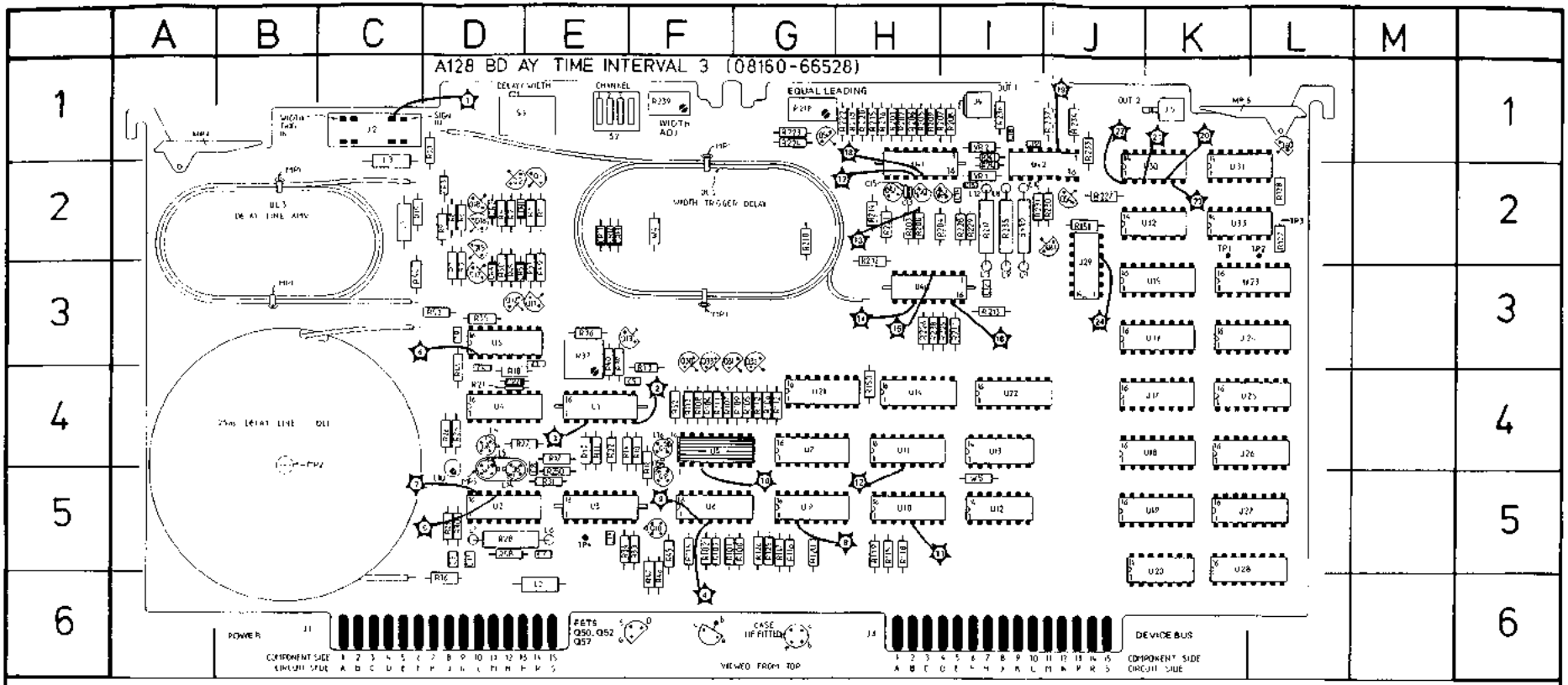
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C2	H3	CR4	J2	DL1	J3	L9	D5	Q12	I2	Q28	K3	R9	J2	R25	I2	R41	I2	R57	E3	R73	F3	R89	E3	R113	E4
C3	E3	CR5	K3	DL3	G3	L11	E3	Q13	H2	Q29	K3	R10	J2	R26	I3	R42	H2	R58	D3	R74	K3	R90	F2	R114	E5
C4	E3	CR6	J2	DL4	C2	L12	E5	Q14	H2	Q30	K4	R11	J2	R27	I2	R43	G3	R59	E3	R75	K4	R91	F2	R115	E5
C5	D4	CR7	J2	DL5	B4	MP3	A1	Q15	H2	Q31	K4	R12	K2	R28	H2	R44	G2	R60	E2	R76	K4	R100	D5	TP1	K6
C6	D4	CR8	J2	J2	J1	MP4	K1	Q16	I2	Q32	K4	R13	J2	R29	H3	R45	G2	R61	E3	R77	K4	R101	D5	TP2	K5
C7	F3	CR9	I2	J4	I1	Q1	K2	Q17	G2	Q33	K4	R14	I2	R30	I2	R46	G2	R62	E2	R78	K3	R102	D5	TP3	K5
C8	K3	CR10	H2	J5	B1	Q2	K2	Q18	G2	Q34	K4	R15	J2	R31	I2	R47	F2	R63	G2	R79	K4	R103	E5	TP4	K5
C9	K3	CR11	H2	J6	C1	Q3	J3	Q19	F2	Q40	D5	R16	J3	R32	H2	R48	G2	R64	F3	R80	K4	R104	E4	TP5	K5
C10	D5	CR12	I2	L1	J3	Q4	J2	Q20	G2	R1	K3	R17	J3	R33	H2	R49	G3	R65	E2	R81	F2	R105	E4	TP6	K4
C11	D4	CR13	G2	L2	E3	Q5	I3	Q21	E3	R2	K2	R18	J3	R34	I2	R50	G3	R66	E2	R82	F2	R106	E4	U1	E3
C12	E5	CR14	G2	L3	I3	Q6	I2	Q22	F3	R3	K3	R19	I2	R35	H2	R51	E3	R67	E2	R83	F2	R107	E4	U2	D4
C13	E5	CR15	G3	L4	D3	Q7	K3	Q23	F2	R4	K2	R20	J2	R36	H2	R52	E3	R68	F3	R84	F2	R108	D5	U3	K5
C14	E2	CR16	G2	L5	G3	Q8	K3	Q24	F2	R5	K3	R21	J2	R37	I3	R53	E4	R69	G2	R85	F3	R109	D4	DL4	C2
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CR2	K2	CR18	F2	L7	D3	Q10	J2	Q26	K4	R7	K2	R23	J2	R39	H3	R55	E3	R71	G2	R87	F3	R111	E5		


10ns
20ns
REF TRIGGER AMPLIFIER
TIME INTERVAL 2
BOARD A127
18
8-121

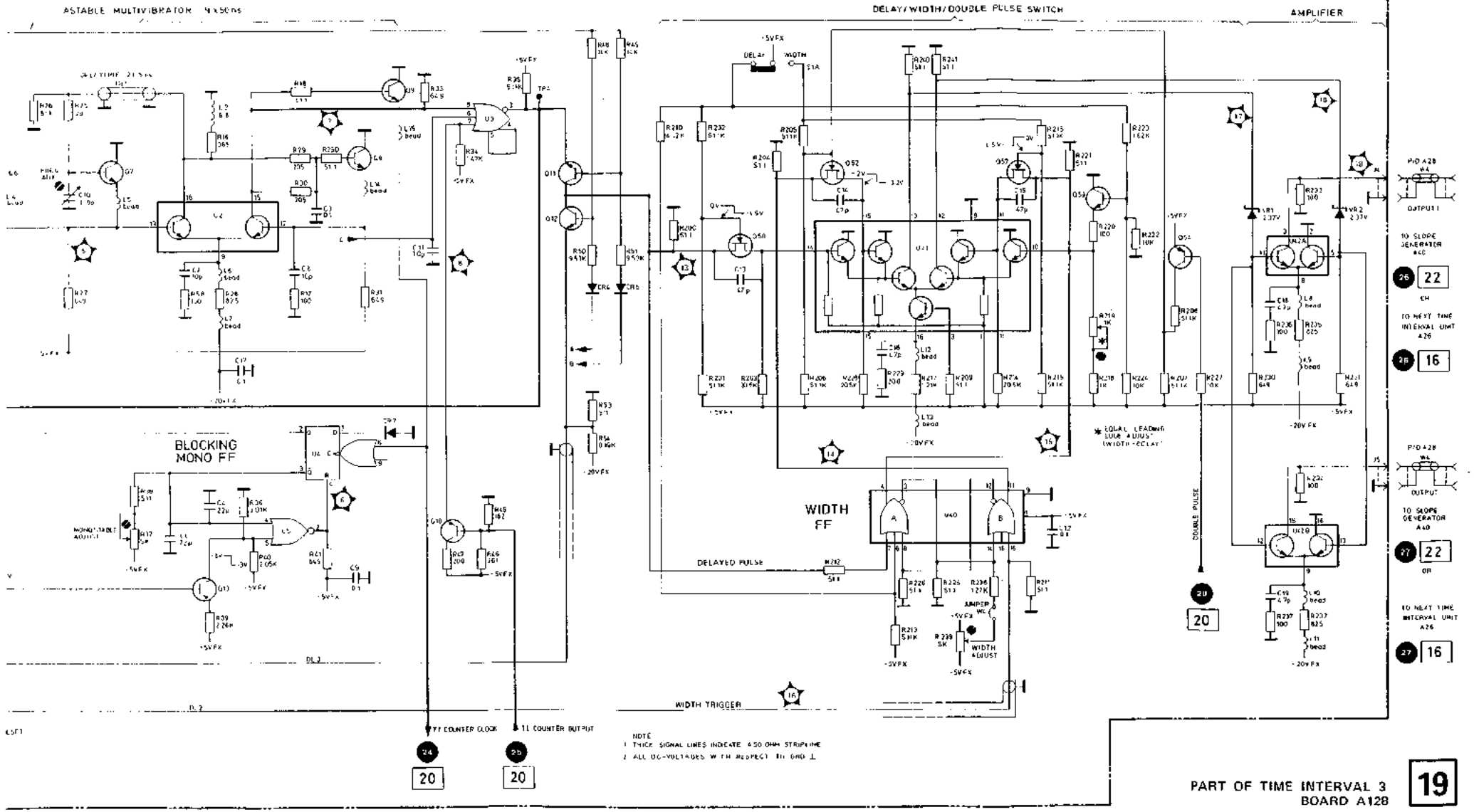
A127 BD AY TIME INTERVAL 2 (08160-66527)



A128 BD AY TIME INTERVAL 3 (08160-66528)

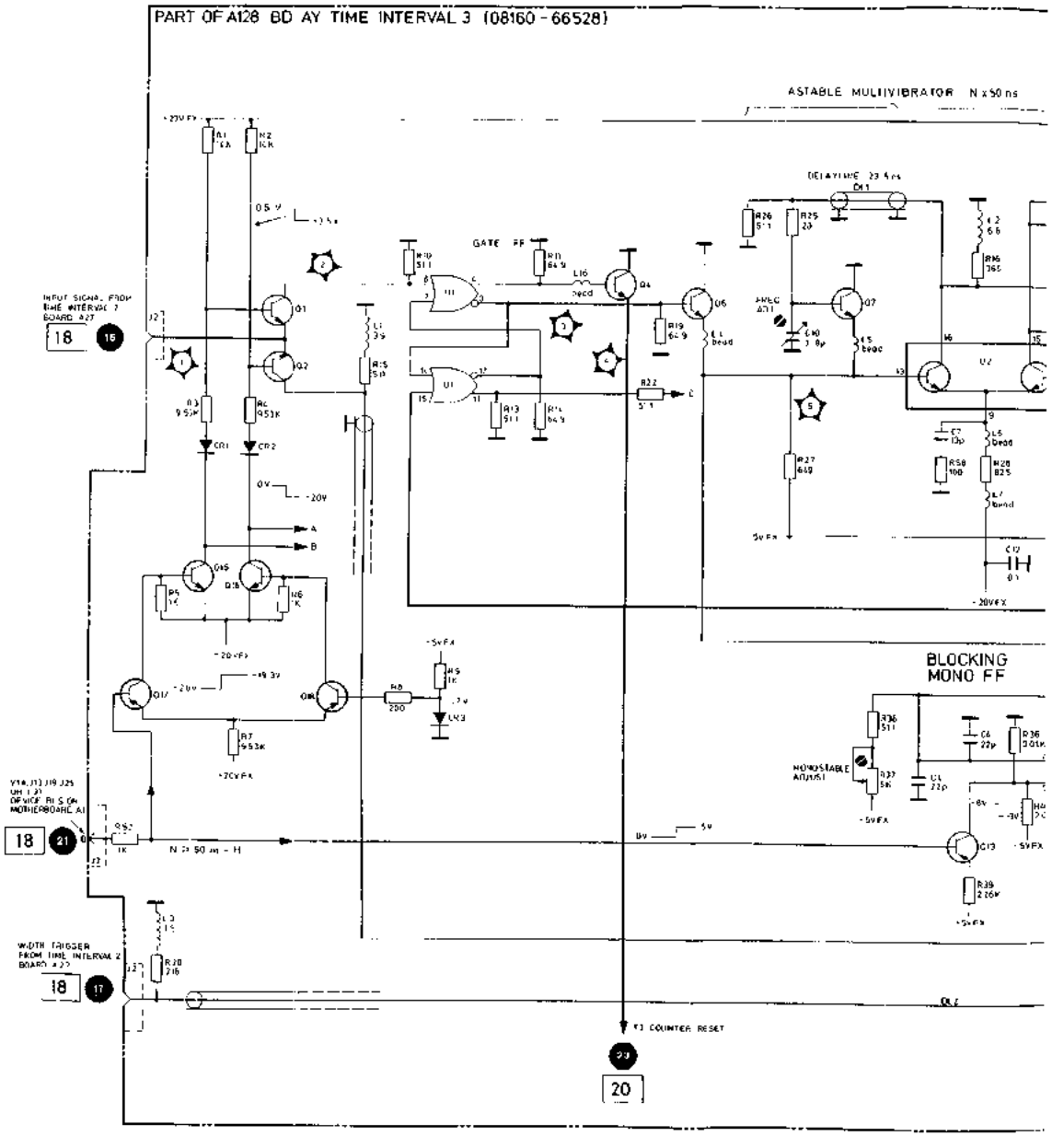


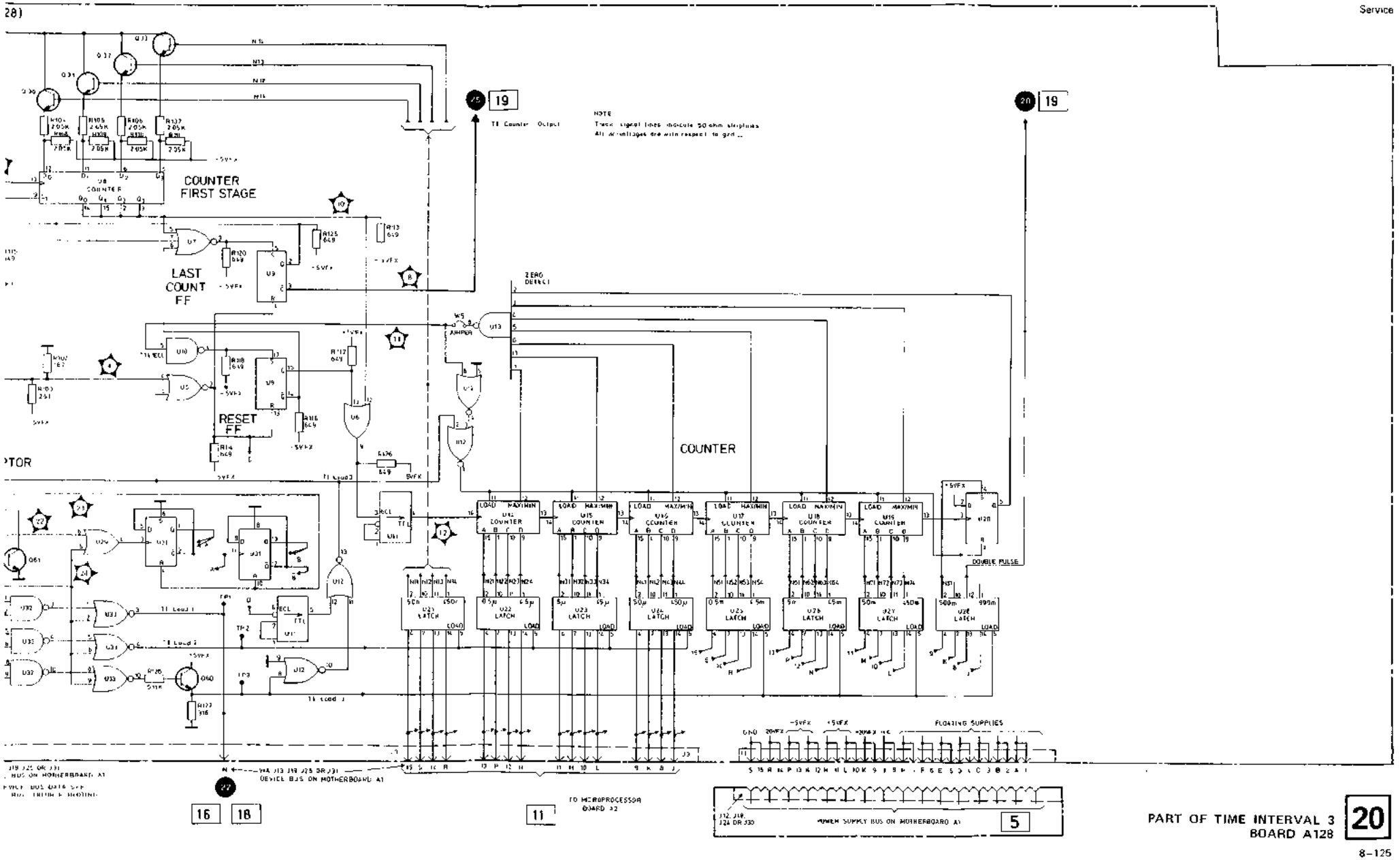
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C3	D3	CR2	D2	L3	C2	MP4	A1	Q18	D2	R5	D3	R22	E4	R41	D4	R104	F4	R120	G5	R209	H1	R225	I3	R241	I1	U9	G5	U25	L4
C4	D4	CR3	D2	L4	D4	MP5	K1	Q30	F3	R6	D2	R25	D4	R45	F5	R105	G4	R125	G5	R210	G2	R226	H3	R250	E5	U10	H5	U26	L4
C7	E5	CR4	D3	L5	D4	Q1	E2	Q31	G3	R7	D3	R26	D4	R46	F6	R106	G4	R126	G6	R211	I3	R227	J2	S1	E1	U11	H4	U27	L5
C8	E5	CR5	D3	L6	E6	Q2	D2	Q32	G3	R8	D2	R27	D4	R47	F6	R107	G4	R127	L2	R212	H2	R228	I2	S2	E1	U12	I5	U28	L5
C9	D3	CR7	D4	L7	D5	Q4	F4	Q33	F3	R9	D2	R28	D5	R48	D3	R108	F4	R128	L2	R213	I3	R229	I2	TP1	K2	U13	I4	U29	J2
C10	D6	CR11	E2	L8	I2	Q6	D4	Q50	H2	R10	F4	R29	D5	R49	E3	R109	G4	R150	H4	R214	H2	R230	J2	TP2	L2	U14	H4	U30	K1
C11	E6	CR12	E2	L9	I3	Q7	D5	Q52	I2	R11	E4	R30	D5	R50	D3	R110	G4	R151	J2	R215	H1	R231	J2	TP3	L2	U15	K3	U31	K1
C12	I3	CR13	E2	L10	I2	Q8	D5	Q54	J2	R13	F4	R31	E5	R51	E3	R111	F4	R200	H2	R216	H1	R232	I2	TP4	E5	U16	K3	U32	K2
C13	H2	DL1	C4	L11	I3	Q9	F5	Q57	J12	R14	F4	R33	F5	R52	F4	R112	G4	R201	H1	R217	I2	R233	J1	U1	E4	U17	K4	U33	L2
C14	I2	DL2	F2	L12	I2	Q10	F5	Q59	G1	R15	C2	R34	F5	R53	D3	R113	F4	R202	H1	R218	H1	R234	J1	U2	D5	U18	K4	U40	I3
C15	H2	DL3	B2	L13	I3	Q11	E3	Q60	L1	R16	D6	R35	D3	R54	C3	R114	F5	R203	H2	R219	G1	R235	I2	U3	E5	U19	K5	U41	H1
C16	I2	J2	C1	L14	D5	Q12	D3	Q61	J2	R17	E4	R36	E3	R58	D5	R115	H5	R204	J2	R220	H1	R236	I1	U4	D4	U20	K5	U42	J1
C17	D5	J4	I1	L15	F4	Q13	F3	R1	E2	R18	F5	R37	E3	R100	G5	R116	G5	R205	H1	R221	H2	R237	J1	U5	D3	U21	G4	VR1	I2
C18	I1	J5	K1	L16	F4	Q15	D2	R2	D2	R19	F4	R38	D4	R101	G5	R117	G5	R206	H1	R222	H1	R238	I3	U6	F5	U22	I4	VR2	I3
C19	I1	L1	C2	MP1	F1	Q16	D2	R3	E2	R20	D1	R39	E4	R102	F5	R118	H5	R207	I1	R223	G1	R239	F1	U7	G4	U23	L3	W4	F2
																												W5	I5



PART OF TIME INTERVAL 3
BOARD A128

19

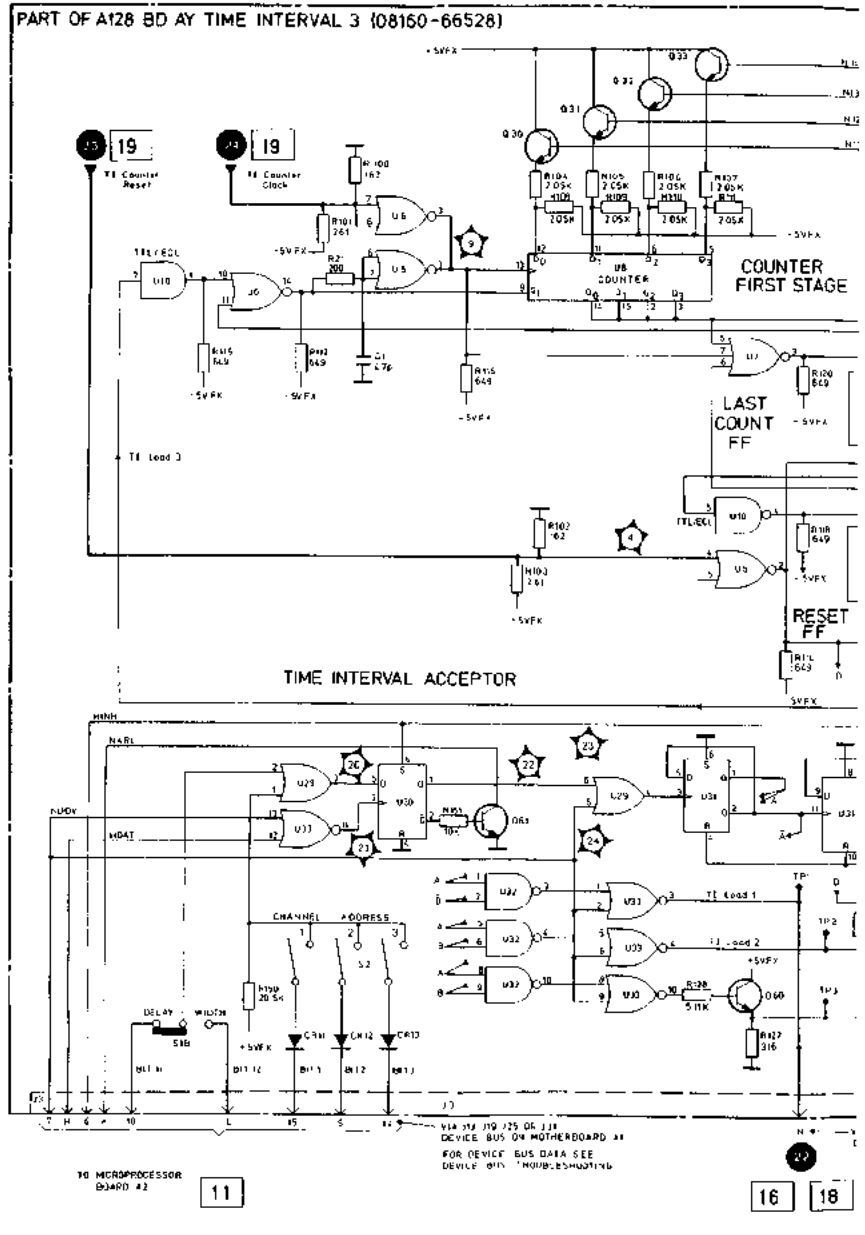

PART OF A128 BD AY TIME INTERVAL 3 (08160-66528)
ASTABLE MULTIVIBRATOR N x 50 ns
GATE FF
BLOCKING MONO FF
INPUT SIGNAL FROM TIME INTERVAL 2 BOARD A27
WIDTH TRIGGER FROM TIME INTERVAL 2 BOARD A27
N = 50 ns - H
+3 COUNTER RESET
18
20
21
22
23

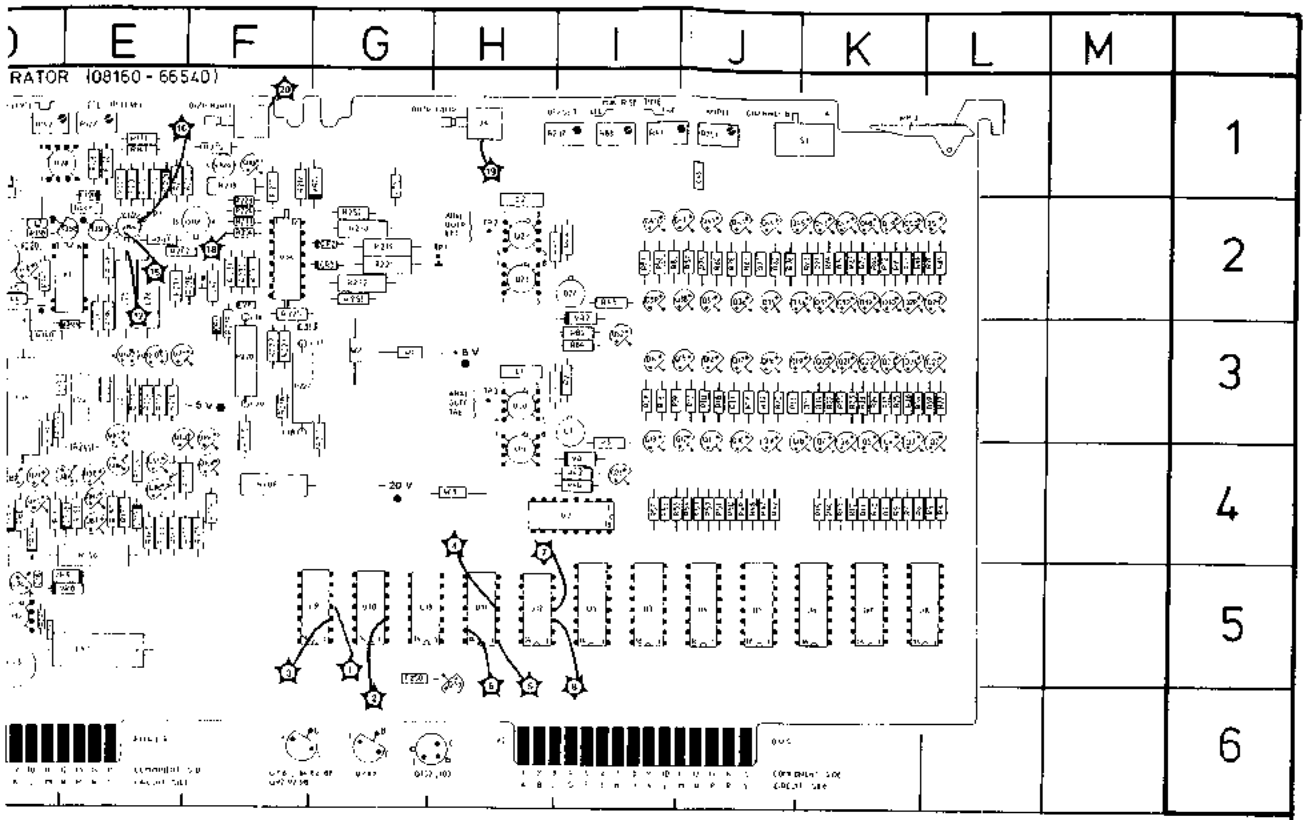


PART OF TIME INTERVAL 3
BOARD A128

20

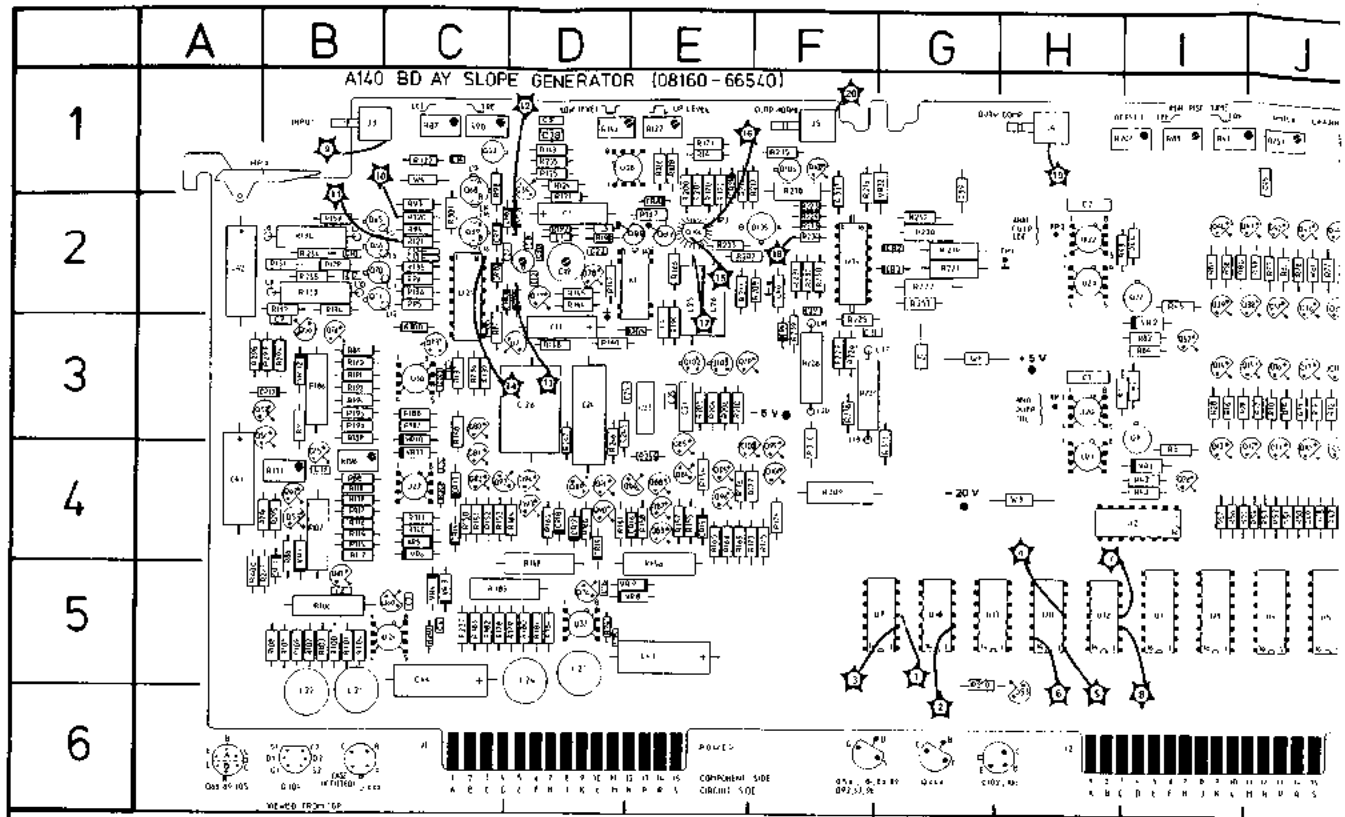
PART OF A12B BD AY TIME INTERVAL 3 (08160-66528)





REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
R28	I3	R98	C1	R168	E2	R238	F3	W1	G3
R29	I3	R100	B5	R170	E1	R239	F3	W2	G3
R30	J3	R101	B5	R171	E1	R240	C5	W3	H4
R31	J3	R102	B5	R172	E1	R241	D5	W4	C1
R32	J3	R103	B5	R173	E4	R242	C4		
R33	J3	R104	B5	R174	F4	R243	C3		
R34	K3	R105	B5	R175	F4	R244	B3		
R35	K3	R106	B5	R176	E4	R245	D3		
R36	K3	R107	B4	R177	E4	R246	D3		
R37	K3	R108	B5	R178	D5	R247	D3		
R38	K3	R109	B5	R179	D5	R250	G5		
R39	K3	R110	C4	R180	D5	R251	J1		
R40	I4	R111	C4	R181	D5	R252	G2		
R41	I1	R112	B4	R182	C5	R253	G2		
R42	I4	R113	B4	R183	C5	R254	B2		
R43	H2	R114	B4	R184	D5	R255	B2		
R44	I2	R115	B4	R185	D5	R284	B3		
R45	I2	R116	B4	R186	B3	R295	B4		
R46	J4	R117	B4	R187	C3	R296	B4		
R47	J4	R118	B4	R188	C3	R297	B5		
R48	J4	R119	B4	R189	B3	R298	A3		
R49	J4	R120	C2	R190	B3	R299	B3		
R50	J4	R121	C2	R191	B3	R300	C3		
R51	J4	R122	C1	R192	B3	R301	C2		
R52	J4	R123	D1	R193	B3	R310	F3		
R53	J4	R124	D1	R194	B3	R311	G3		
R54	J4	R125	D1	R195	B3	R400	A5		
R55	I4	R126	E1	R196	B4	S1	J1		
R56	I4	R127	E1	R197	D2	TP1	H2		
R57	I4	R128	E1	R198	D2	TP2	H2		
R58	I2	R129	B2	R199	E3	TP3	H3		
R59	J2	R130	B2	R200	E1	U1	I5		
R60	J2	R131	B2	R201	E1	U2	I4		
R61	J2	R132	B2	R202	E2	U3	I5		
R62	J2	R133	B2	R203	E2	U4	J5		
R63	K2	R134	B2	R204	E3	U5	J5		
R64	K2	R135	C2	R205	E3	U6	K5		
R65	K2	R136	C2	R206	E3	U7	K5		
R66	K2	R137	C3	R207	H1	U8	K5		
R67	K2	R138	D2	R208	F2	U9	G5		
R68	K2	R139	C3	R209	F4	U10	G5		
R69	L2	R140	D3	R210	E3	U11	H5		
R70	L2	R141	E1	R211	E2	U12	H5		
R71	K2	R142	D1	R213	E1	U13	G5		
R72	K2	R143	D1	R214	E1	U20	H3		
R73	K2	R144	D2	R215	F1	U21	H4		
R74	K2	R146	D2	R216	F1	U22	H2		
R75	K2	R147	D2	R217	F1	U23	H2		
R76	J2	R148	C3	R218	F1	U24	C5		
R77	J2	R149	D4	R219	G2	U27	C4		
R78	J2	R150	C4	R220	G2	U28	D1		
R79	J2	R151	C4	R221	G2	U29	C2		
R80	I2	R152	C4	R222	G2	U30	C3		
R81	I2	R153	C4	R223	F2	U32	D5		
R82	I3	R154	E4	R224	F2	U34	F2		
R83	I1	R155	E4	R225	F2	VR1	I4		
R84	I3	R156	F4	R226	F3	VR2	I3		
R86	B4	R157	E4	R227	F3	VR3	C5		
R87	C1	R158	E4	R228	F3	VR4	C5		
R88	B4	R159	B2	R229	F3	VR5	C4		
R89	B3	R160	D4	R230	F2	VR6	C4		
R90	C1	R161	D4	R231	F2	VR7	B4		
R91	B3	R162	D4	R232	F2	VR8	D5		
R93	C2	R163	E4	R233	F2	VR9	D5		
R94	C2	R164	D4	R234	F2	VR10	C3		
R95	C2	R165	E4	R235	D1	VR11	C4		
R96	C2	R166	E4	R236	C3	VR12	B3		
R97	C3	R167	E2	R237	C5	VR22	G1		

GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
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F2	L17	F3	Q4	K3	Q20	K3	Q36	J2	Q52	I3	Q72	D3	Q88	E4	Q104	E2	R13	K4
D2	L18	F3	Q5	K3	Q21	K3	Q37	J2	Q53	H5	Q73	C3	Q89	D4	Q105	F2	R14	K4
D2	L19	F3	Q6	K3	Q22	K3	Q38	I2	Q55	B4	Q74	D5	Q90	D4	Q106	F1	R15	K4
E3	L20	F3	Q7	K3	Q23	K3	Q39	I2	Q57	B3	Q75	B4	Q91	D4	Q107	F1	R16	I3
B2	L21	B6	Q8	J3	Q24	K3	Q40	I2	Q58	B3	Q76	B3	Q92	C4	R1	H3	R17	J3
B2	L22	B6	Q9	J3	Q25	K3	Q41	I2	Q60	C5	Q77	D2	Q93	D4	R2	I3	R18	J3
B2	L23	D5	Q10	J3	Q26	I4	Q42	J2	Q61	B5	Q78	D2	Q94	D4	R3	I3	R19	J3
B2	L24	D5	Q11	J3	Q27	I2	Q43	J2	Q62	B4	Q79	E3	Q95	E4	R4	L4	R20	J3
B2	L25	E2	Q12	J3	Q28	I2	Q44	J2	Q63	C1	Q80	C3	Q96	E4	R5	K4	R21	J3
B2	L26	E2	Q13	I3	Q29	K2	Q45	J2	Q64	D1	Q81	C4	Q97	E2	R6	K4	R22	K3
B2	MP1	A1	Q14	I3	Q30	K2	Q46	K2	Q65	B2	Q82	C4	Q98	F2	R7	K4	R23	K3
B2	MP2	K1	Q15	J3	Q31	K2	Q47	K2	Q66	B2	Q83	E4	Q99	F3	R8	K4	R24	K3
C1	MP3	E2	Q16	J3	Q32	K2	Q48	K2	Q68	C1	Q84	E4	Q100	E3	R9	K4	R25	K3
C2	Q1	I3	Q17	J3	Q33	K2	Q49	K2	Q69	C2	Q85	E3	Q101	F4	R10	K4	R26	K3
C2	Q2	K3	Q18	J3	Q34	J2	Q50	K2	Q70	B2	Q86	E4	Q102	E3	R11	K4	R27	L3



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	H3	C17	B2	C36	C3	CR8	C2	J5	F1	L16	C2	Q3	K3	Q19	J3	Q35	J2	Q51	L2	Q71	B2
C2	H2	C18	D2	C37	D1	CR9	D2	K1	E2	L17	F3	Q4	K3	Q20	K3	Q36	J2	Q52	I3	Q72	D3
C3	C5	C19	D2	C38	D1	CR10	C2	L1	D2	L18	F3	Q5	K3	Q21	K3	Q37	J2	Q53	H5	Q73	C3
C4	C6	C20	D2	C39	G1	CR11	B5	L3	D2	L19	F3	Q6	K3	Q22	K3	Q38	I2	Q55	B4	Q74	D5
C5	C4	C21	E3	C40	F2	CR12	B3	L4	F3	L20	F3	Q7	K3	Q23	K3	Q39	I2	Q57	B3	Q75	B4
C6	B6	C22	E3	C41	A4	CR13	C4	L5	B2	L21	B6	Q8	J3	Q24	K3	Q40	I2	Q58	B3	Q76	B3
C7	D2	C24	D3	C42	A2	CR14	C4	L6	B2	L22	B6	Q9	J3	Q25	K3	Q41	I2	Q60	C5	Q77	D2
C8	D2	C25	D3	C43	E5	CR15	E4	L7	B2	L23	D5	Q10	J3	Q26	I4	Q42	J2	Q61	B5	Q78	D2
C9	B3	C26	D3	C44	C5	CR16	E4	L8	B2	L24	D5	Q11	J3	Q27	I2	Q43	J2	Q62	B4	Q79	E3
C10	B2	C28	D1	C45	J1	CR17	D4	L9	B2	L25	E2	Q12	J3	Q28	L2	Q44	J2	Q63	C1	Q80	C3
C11	D3	C29	F2	CR2	G2	CR18	D4	L10	B2	L26	E2	Q13	I3	Q29	K2	Q45	J2	Q64	D1	Q81	C4
C12	D2	C30	D2	CR3	G2	CR19	D4	L11	B2	MP1	A1	Q14	I3	Q30	K2	Q46	K2	Q65	B2	Q82	C4
C13	B4	C31	F3	CR4	F3	CR20	E2	L12	B2	MP2	K1	Q15	J3	Q31	K2	Q47	K2	Q66	B2	Q83	E4
C14	C3	C32	C2	CR5	D2	CR21	E1	L13	C1	MP3	E2	Q16	J3	Q32	K2	Q48	K2	Q68	C1	Q84	E4
C15	D5	C33	C2	CR6	C2	J3	B1	L14	C2	Q1	I3	Q17	J3	Q33	K2	Q49	K2	Q69	C2	Q85	E3
C16	D5	C34	C1	CR7	C2	J4	H1	L15	C2	Q2	K3	Q18	J3	Q34	J2	Q50	K2	Q70	B2	Q86	E4

SERVICE BLOCK 11
SLOPE GENERATOR A140 21 22 23

THEORY OF OPERATION

A simplified diagram of the slope generator is given in Figure 8–11–1. It indicates 5 basic blocks: input buffer, integrator, range capacitors, output buffer and acceptor circuit.

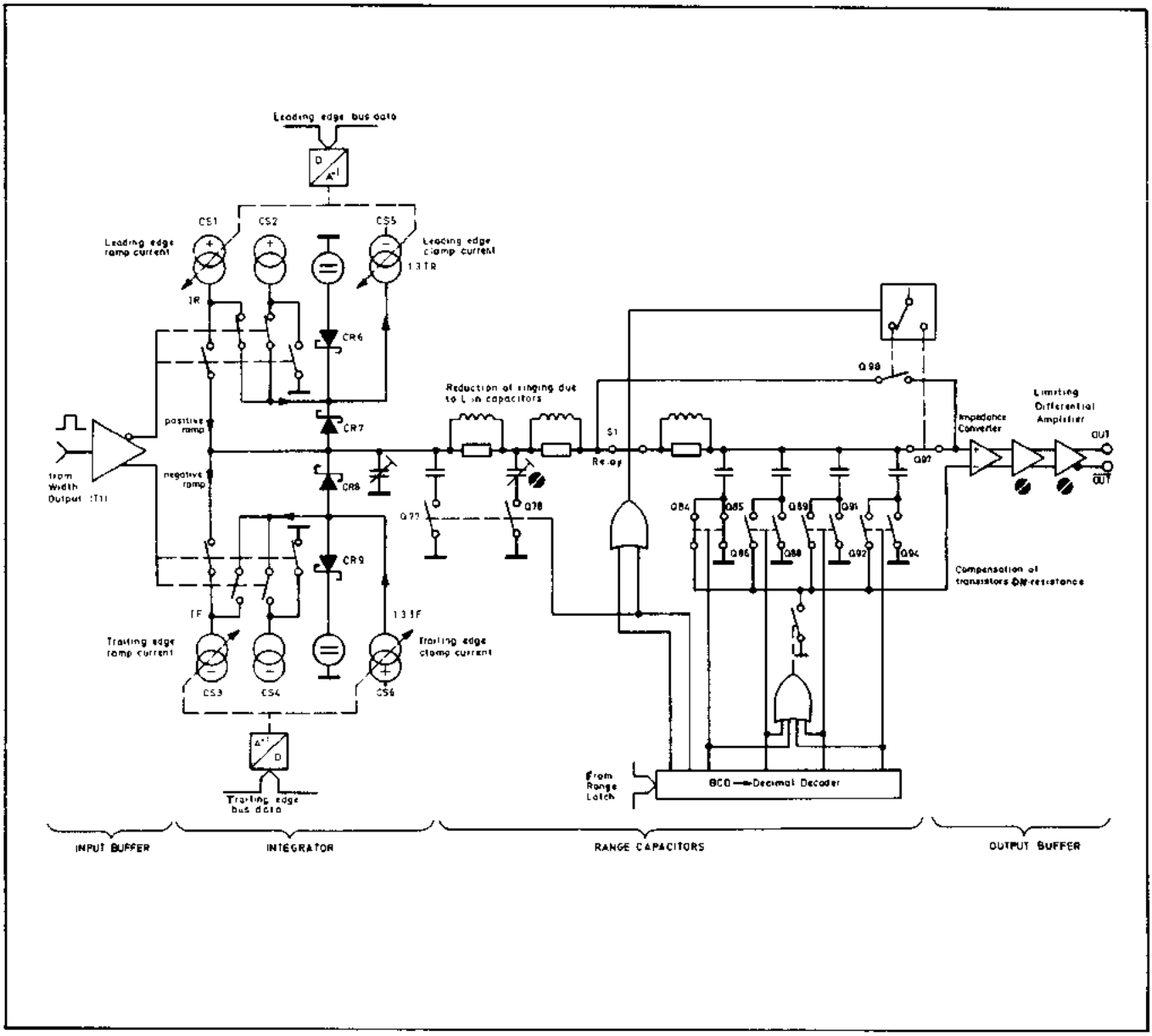


Figure 8–11–1. Slope generator block diagram

The purpose of the slope generator is to derive a signal – from the 'width' time interval block pulse – which combines stable amplitude with variable leading edge and variable trailing edge. The first stage in achieving this is the input buffer which shifts the input pulse to ± 5 volt in order to obtain the correct level for the current source switches.

Integrator Circuit (Service Sheet 22)

A functional block diagram, together with an explanatory waveform diagram for the integrator circuit is given in Figure 8–11–2. To aid explanation of the integrator operation a single reference designator is sometimes allocated in Figure 8–11–2 to a complete functional area (instead of to an individual component as in schematics) e.g. CS3 is the trailing edge ramp current source; or S1 is the combined switch of transistors Q69A and Q69B. The following operating theory is therefore references to Figure 8–11–2 for easier understanding.

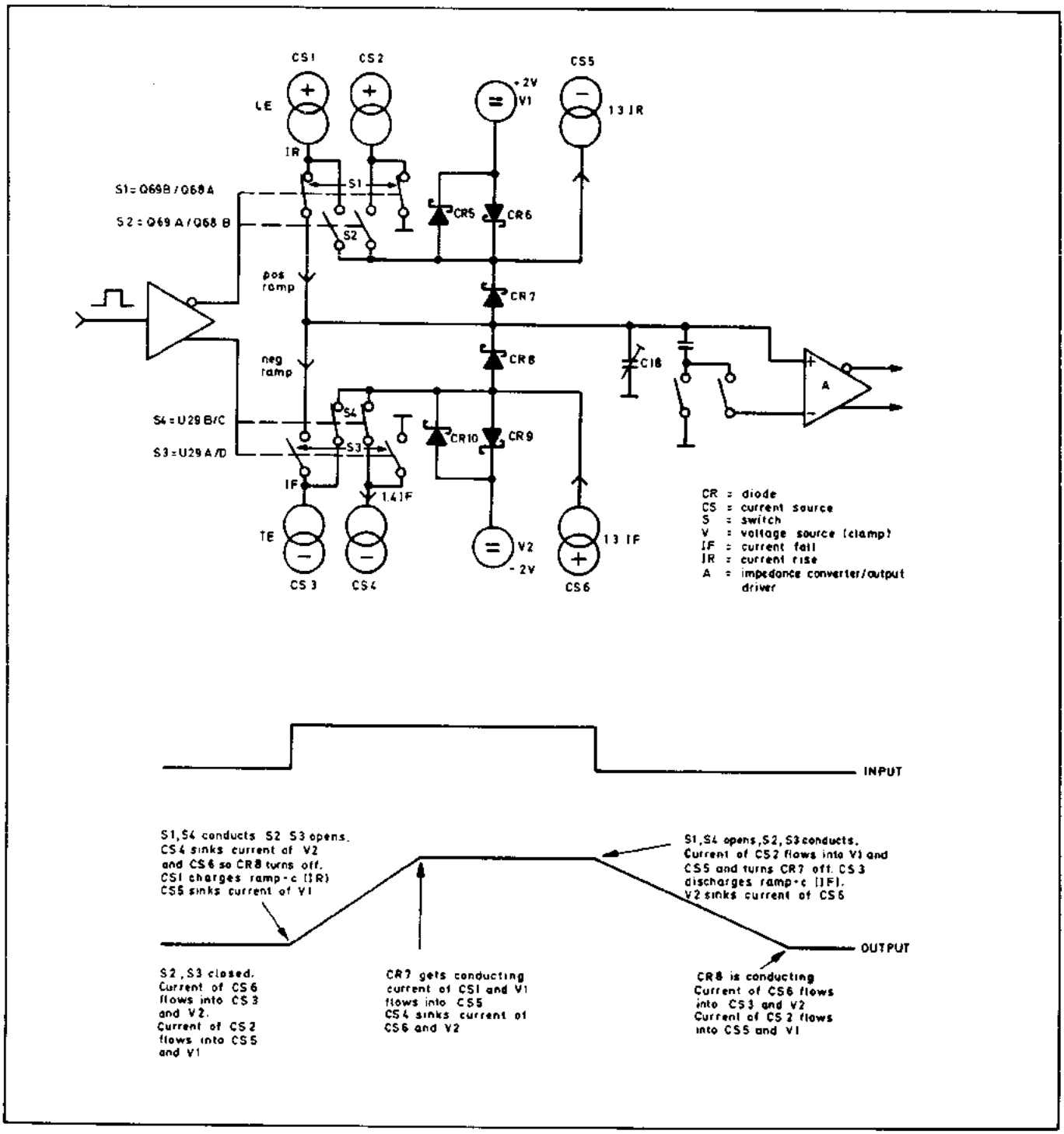


Figure 8–11–2. Integrator functional diagram

A positive step at the input buffer opens switches S3 and S2, at the same time closing switch S1 and S4. Current sources CS3 and CS4 then sink the current from CS6 thus turning CR8 and CR10 off (to avoid a discharge step from capacitor C18 voltage); also, current source CS5 sinks the V1 current, and current source CS1 supplies the leading edge ramp current which charges C18. Capacitor C18 is charged until CR7 begins to conduct. The current IR from CS1 now flows through CR7, and current 1.3 IR−IR = 0.3 IR now flows through CR6, the effect being to clamp the voltage at C18 to approximately +2 V. This state is held until the pulse at the input buffer (from the width time interval section) goes low again.

A negative step at the input buffer then opens switches S1 and S4, at the same time closing switches S2 and S3. The current of CS1/CS2 now flows into V1/CS5 turning CR7 off; also, the trailing edge clamp current 1.3 IF, from CS6 flows via CR10 into V2, thus CR8 is non-conducting, and CS3 discharges the ramp capacitor C18. The voltage at C18 drops until CR8 starts conducting again. A current IF then flows through CR8 to CS3 and a current 0.3 IF flows through CR10 into V2, the effect being to clamp the C18 voltage at approximately −2 V. This state is held until the next positive step at the input buffer.

The clamp circuits CS2, S2, CS4, S4, CS5 and CS6 serve to provide fast pulse clipping and thus minimize the 'roll-off' effects of diodes CR7, CR8 (which are still conducting immediately upon current source switching).

Range Capacitor Switching (Service Sheet 23)

The range capacitors are turned on by saturated transistors. Due to the ON-resistance of these transistors, a voltage step occurs when the capacitor current switches from charge to discharge, or vice-versa (see Figure 8−11−3). To compensate this voltage step, the step is coupled to the inverting input of the output buffer amplifier (see Figure 8−11−1) via an FET switch.

To reduce ringing due to inductance of the range capacitors, L/R components (L1, R197, L3, R198, L4, R199) form a low pass ladder network with the range capacitors thus lowering the transition times of the charge and discharge currents.

The 3rd and higher ranges are turned on by relay K1. To avoid inductive ringing due to the relay contacts in the first two ranges, the contacts are by-passed via FET switch Q98. (only the ramp voltage prior to the relay is thus selected). For the third and higher ranges FET Q97 is switched on (Q98 off), thus selecting the ramp voltage after the relay.

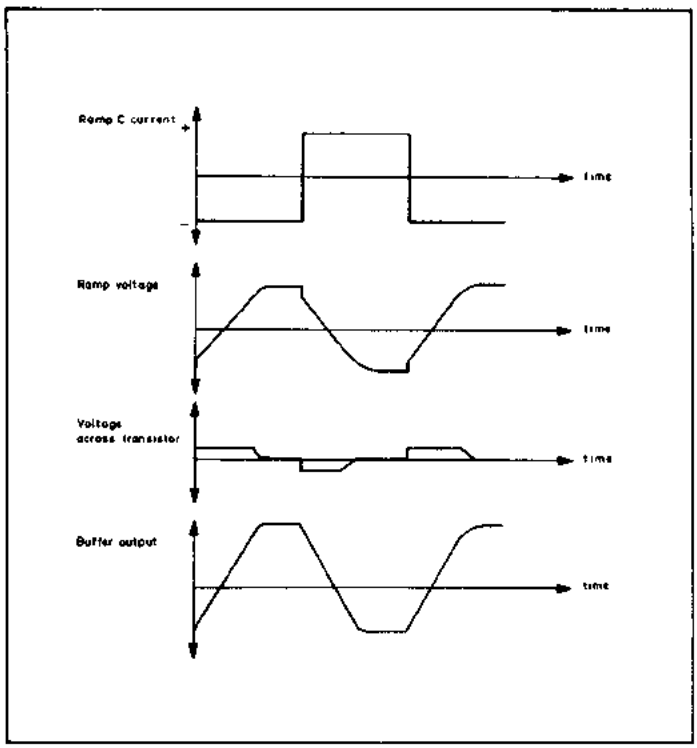


Figure 8−11−3. ON-Resistance Compensation of Range C switch

Correction of Transition Time / Control Current for First Range (Service Sheet 22)

The characteristic of the transition time versus the control voltage becomes degressive when the transition time reaches the minimum transition time of the slope buffer and output amplifier (See Figure 8−11−4).

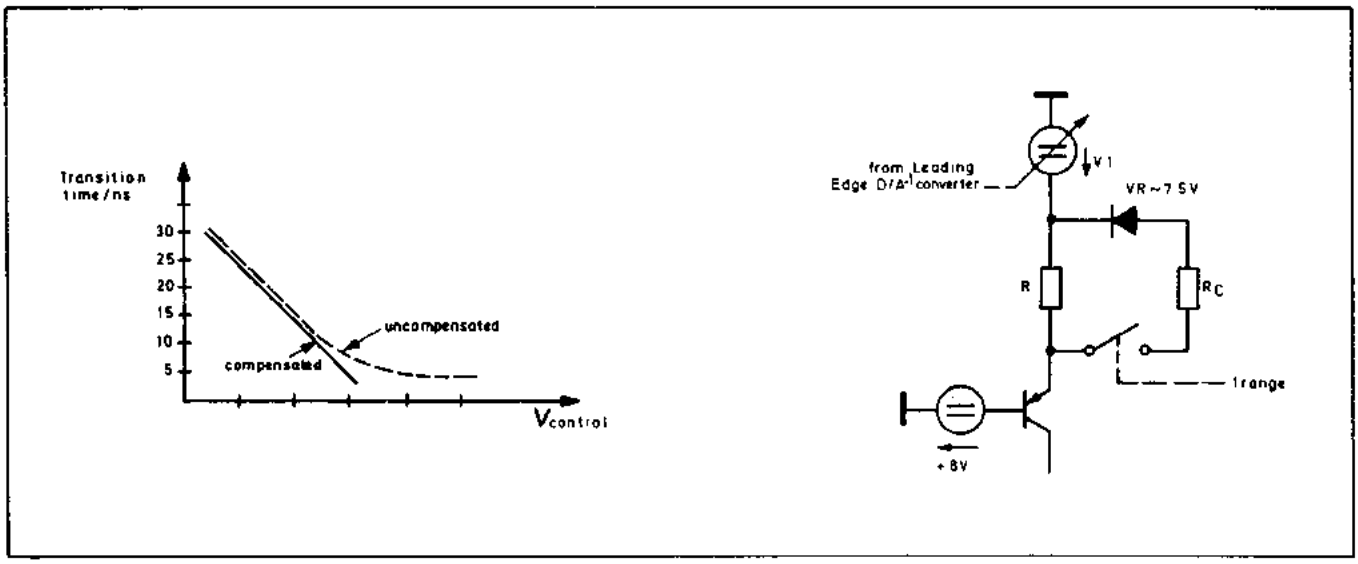


Figure 8–11–4. Compensation of transition time/control current for first range

The simplified circuit of the positive current source is also shown in Figure 8–11–4. In the first range, VR plus R_C are switched parallel to the current-determining resistor R. If the voltage drop across R is smaller than VR (7.5 V), the current from current source is porportional to V1. If the voltage drop across R increases, VR starts conducting thus increasing the current with a progressive characteristic.

For the operating theory of the D/A inverter, see the repetition rate theory, SERVICE BLOCK 9.

Output Buffer of Slope Generator (Service Sheet 23)

A simplified diagram of the buffer circuit is shown in Figure 8–11–5. A high input impedance is achieved by a dual source follower, followed by a pnp linear differential amplifier.

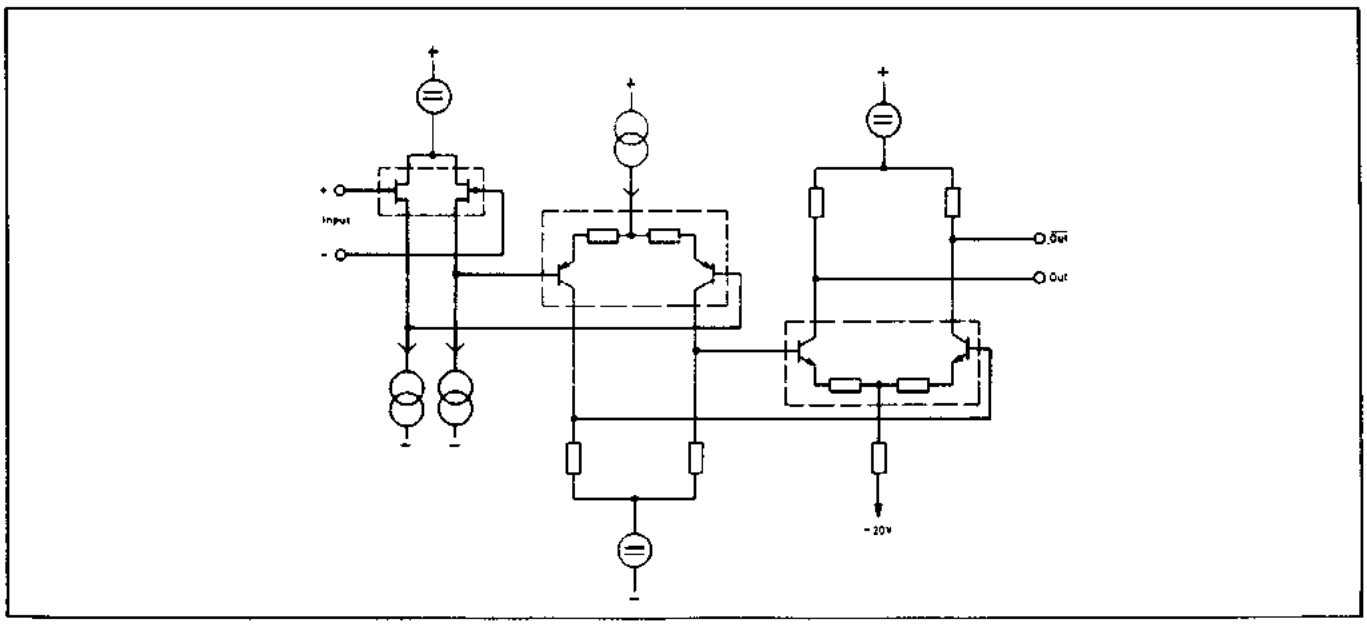


Figure 8–11–5. Simplified diagram of slope buffer

The output stage is an npn differential linear amplifier with complementary current source outputs.

TROUBLESHOOTING

The following provides details about:

a) range latch data (from the device bus)
b) LEE/TRE control voltage
c) integrator fault-finding

Before troubleshooting, board A140 should be raised on an extender board as shown in the photograph.



Range Latch Data

Figure 8–11–6 together with Table 8–11–1 relates the range latch data to individual digits within the 8160A display. The maximum ratio of LEE:TRE is 20:1 (or 1:20). Should two ranges be possible with the selected values of LEE and TRE, the microprocessor selects the range with the best resolution, e.g. LEE 60 ns, TRE 90 ns = range 1 selected.

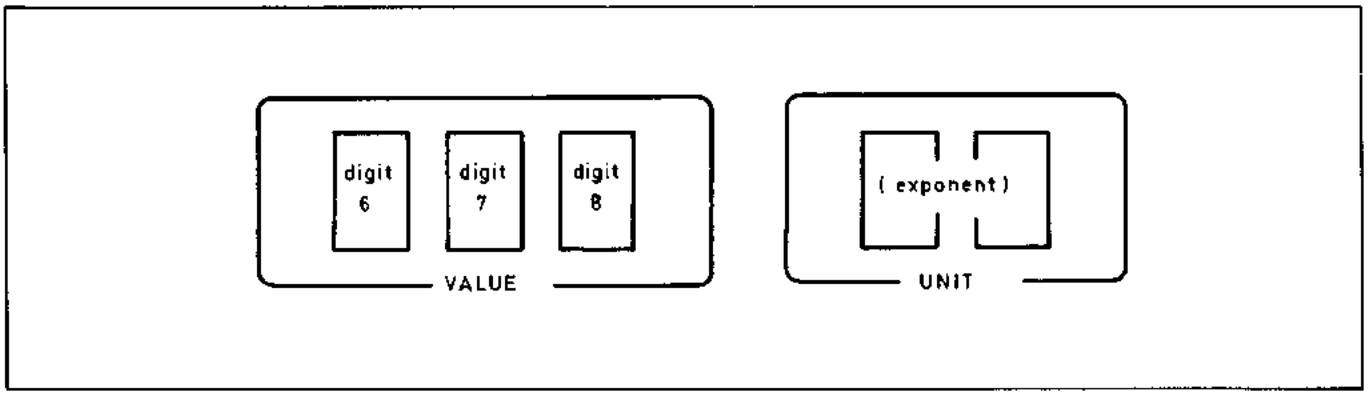


Figure 8–11–6. LEE/TRE display

Table 8–11–1. Range latch data

Slope Range		DIGIT 6 U3 (U6) pin	DIGIT 7 U4 (U7) pin	DIGIT 8 U5 (U8) pin	EXPONENT U1 pin	EXPONENT U2 pin
		15 12 9 3	15 12 9 3	15 12 9 3	1 11 10 2	2 3 4 5 6 7
1	03.0 ns	H H H H	H H O O	H H H H	O O O H	O H H H H H
	04.0 ns	H H H H	H O H H	H H H H	O O O H	O H H H H H
	05.0 ns	H H H H	H O H O	H H H H	O O O H	O H H H H H
	06.0 ns	H H H H	H O O H	H H H H	O O O H	O H H H H H
	99.9 ns	O H H O	O H H O	O H H O	O O O H	O H H H H H
2	50.0 ns	H O H O	H H H H	H H H H	O O H O	H O H H H H
	999 ns	O H H O	O H H O	O H H O	O O H O	H O H H H H
3	0.50 µs	H H H H	H O H O	H H H H	O O H H	H H O H H H
	9.99 µs	O H H O	O H H O	O H H O	O O H H	H H O H H H
4	5.00 µs	H O H O	H H H H	H H H H	O H O O	H H H O H H
	99.9 µs	O H H O	O H H O	O H H O	O H O O	H H H O H H
5	50.0 µs	H O H O	H H H H	H H H H	O H O H	H H H H O H
	999 µs	O H H O	O H H O	O H H O	O H O H	H H H H O H
6	0.50 ms	H H H H	H O H O	H H H H	O H H O	H H H H H O
	9.99 ms	O H H O	O H H O	O H H O	O H H O	H H H H H O

H = Logic 1
O = Logic 0

LEE / TRE Control Voltage

Use the following Table 8–11–2 to check control voltage for different display values.

Table 8–11–2. Display/Voltage Conversion

LEE/TRE Display Value	3.0	5.0 50.0 0.50 ↓ 0.50	10.0 100 1.00 ↓ 1.00	20.0 200 2.00 ↓ 2.00	30.0 300 3.00 ↓ 3.00	40.0 400 4.00 ↓ 4.00	50.0 500 5.00 ↓ 5.00	60.0 600 6.00 ↓ 6.00	70.0 700 7.00 ↓ 7.00	80.0 800 8.00 ↓ 8.00	90.0 900 9.00 ↓ 9.00	99.9 ns 999 ns 9.99 µs ↓ 9.99 ms
Control voltage TP2/TP3	−13.7 V	− 9.2 V	− 4.6 V	−2.3 V	−1.5 V	−1.2 V	−0.93 V	−0.78 V	−0.66 V	−0.58 V	−0.52 V	−0.47 V
LEE Clamp Q60C	−19.8 V	−16.4 V	−12.1 V	−9.9 V	−9.1 V	−8.7 V	−8.5 V	−8.3 V	−8.2 V	———	———	−8.1 V
LEE Ramp Q61C	19.7 V	16.5 V	12 V	9.8 V	9 V	8.6 V	8.4 V	8.3 V	8.2 V	———	———	8 V
TRE Clamp Q74C	19.8 V	16.6 V	12 V	9.8 V	9.0 V	8.6 V	8.4 V	8.3 V	8.2 V	- - -	- - -	8 V
TRE Ramp Q75C	−19.8 V	−16.8 V	−12.2 V	−9.9 V	−9.2 V	−8.8 V	−8.5 V	−8.4 V	−8.3 V	· · ·	· · ·	−8.1 V

Integrator Fault-Finding

A good way of checking the integrator is to measure voltages with the slope generator inactive (see Figure 8–11–7). This can be done as follows:

1. Set the 8160A to EXT TRIG and LEE/TRE to 3 ns (max. current). The slope input is now −0.6 V, which turns the TRE current source on, thus the slope output is negative (see Figure 8–11–7).
2. Remove the slope input cable. The slope input is now 0 V, which turns the LEE current source on, thus the slope output will be positive (see Figure 8–11–7).

NOTE: in Figure 8–11–7 the red line indicates current flow if input is negative.
The blue line indicates the current flow for zero input.

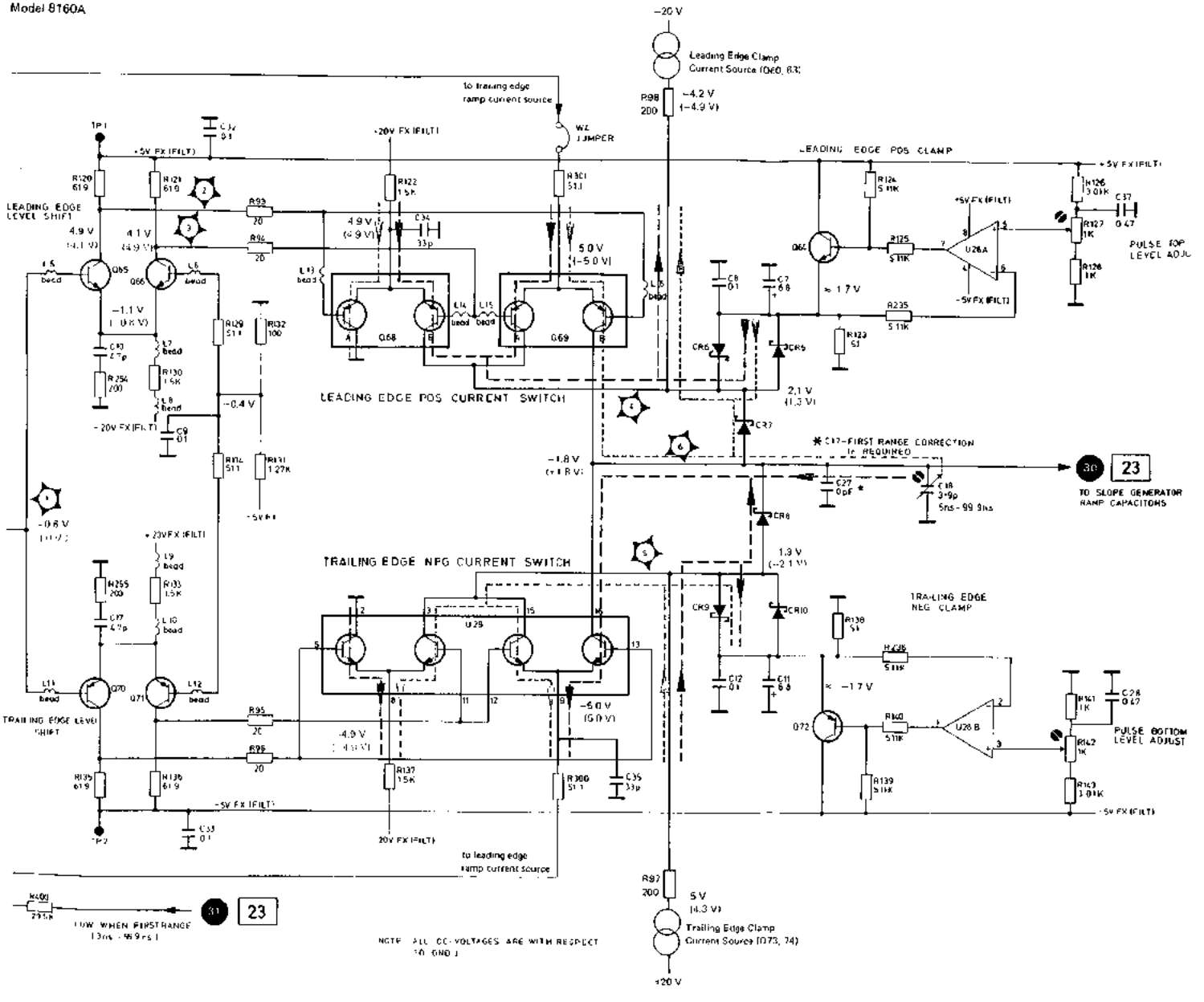
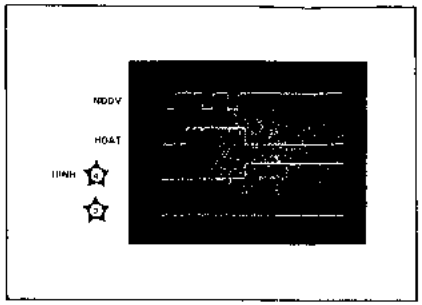
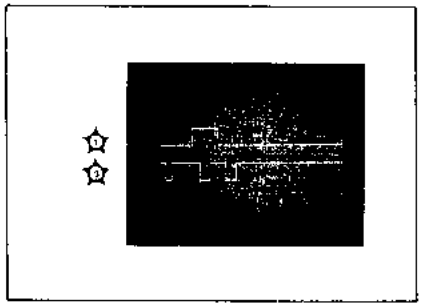
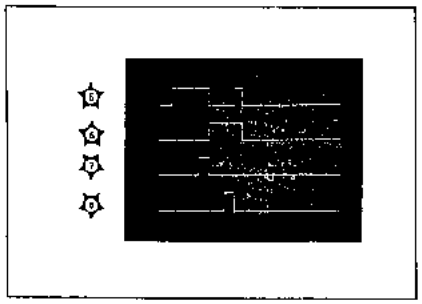


Figure 8--11--7. Integrator Voltages

Slope Data Acceptor
(All signals are TTL level)
Timebase: 50 µs/div.



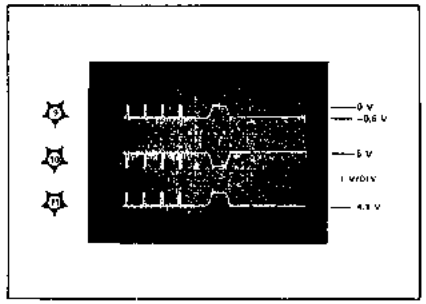


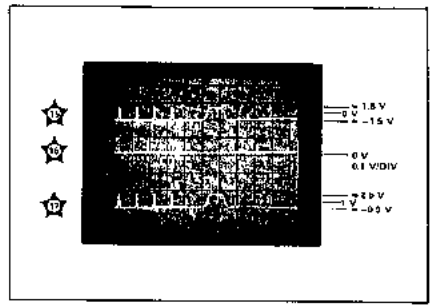


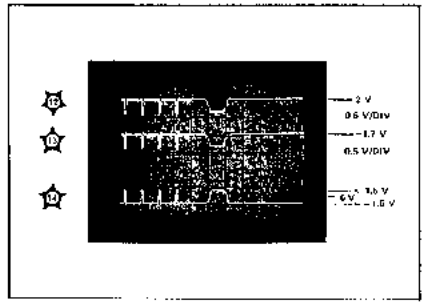
NOTE: To obtain repeating signals, a controller is needed.
Program: wrt 717, "LEE 10 ns"; jmp 0
For Device Bus details see SERVICE BLOCK 2.

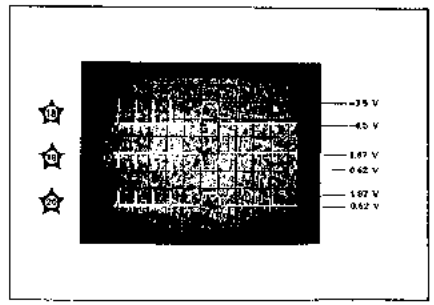
Integrator Waveforms

NOTE: Waveforms are taken with a 100 MHz scope to indicate function.
For risetime measurements, a sampling scope should be used.
Fastest integrator risetimes are typically 4–4.5 ns.
Timebase: Main 1 µs/div, Delay 0.1 µs/div.

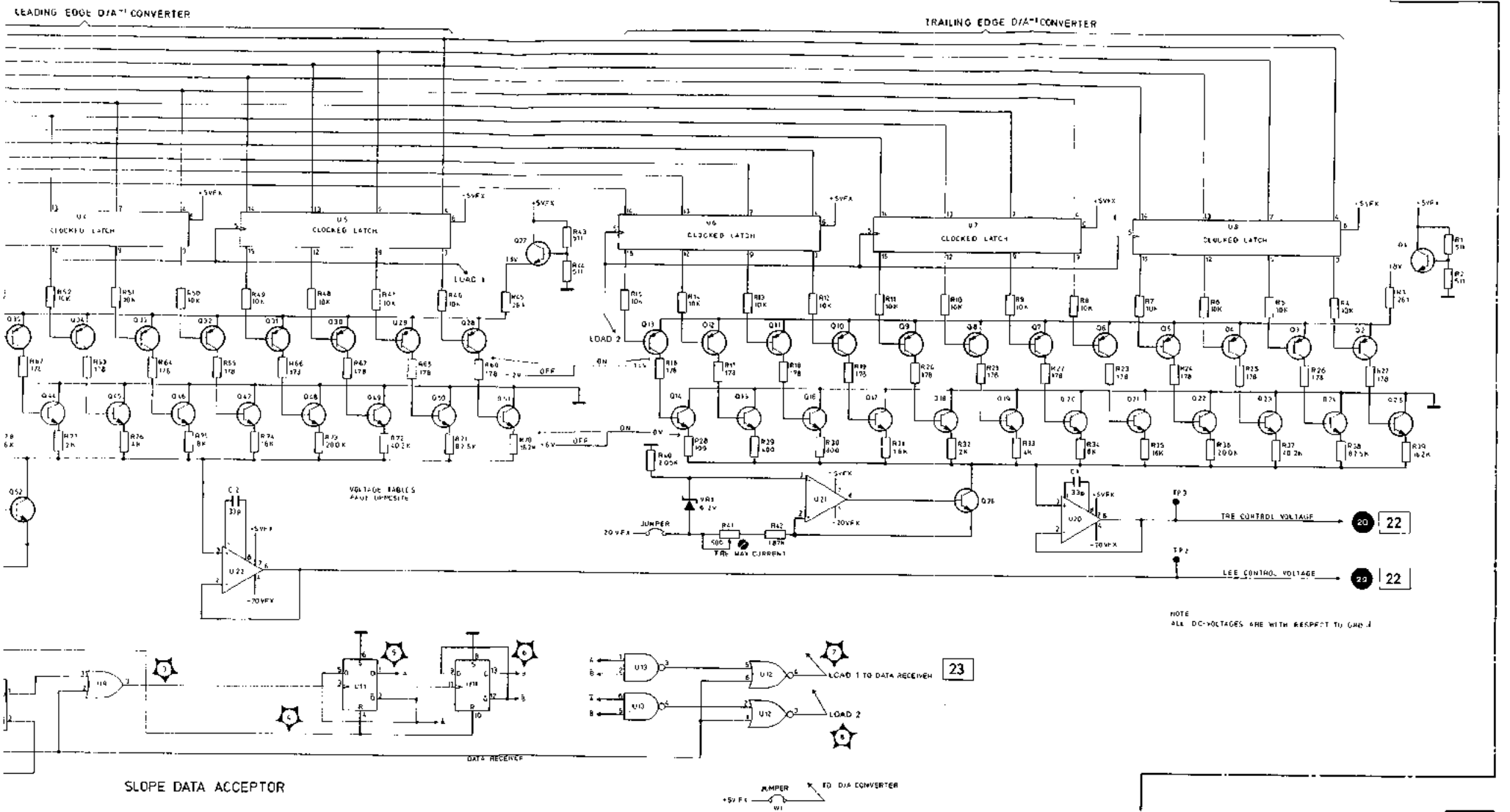






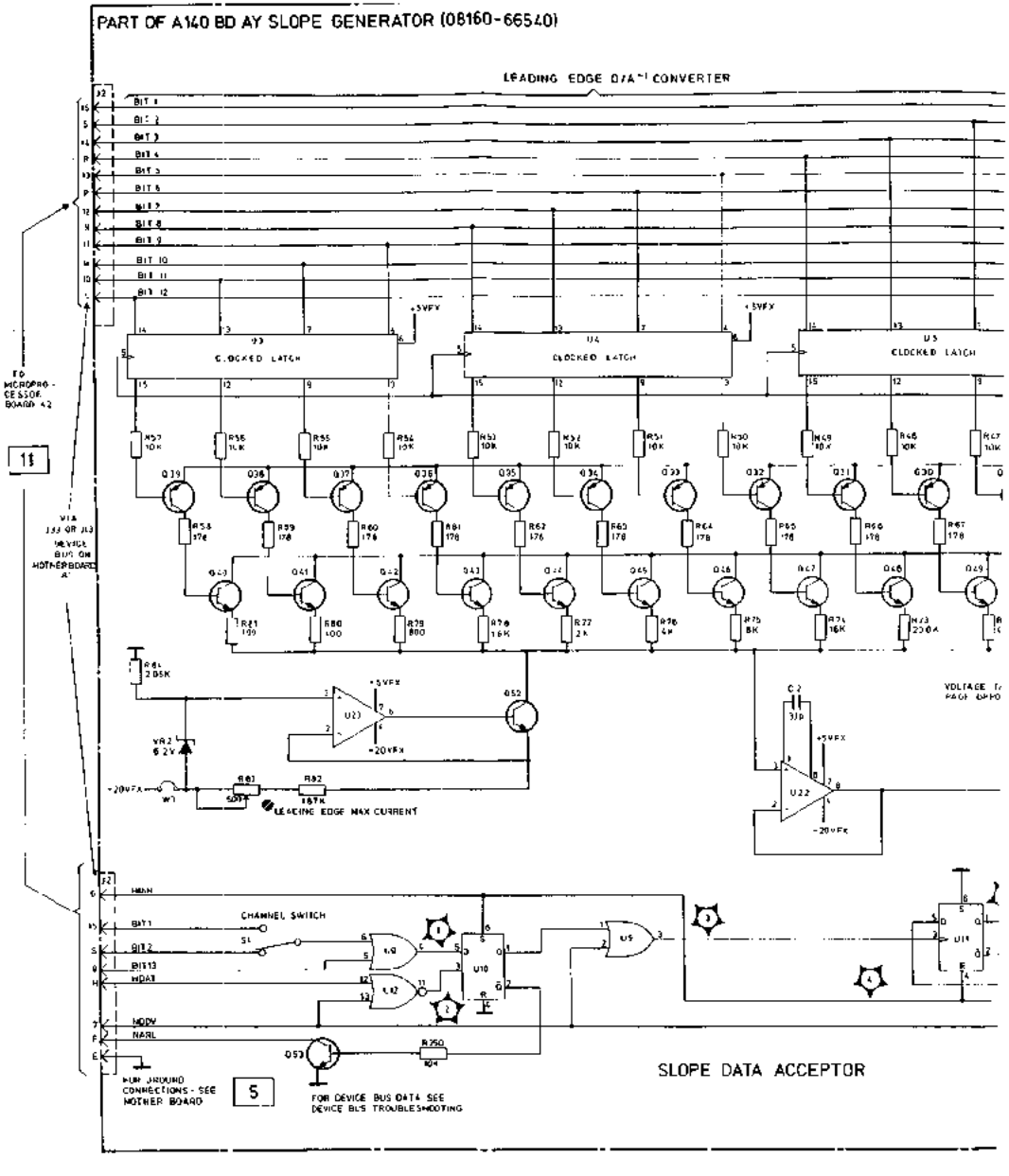


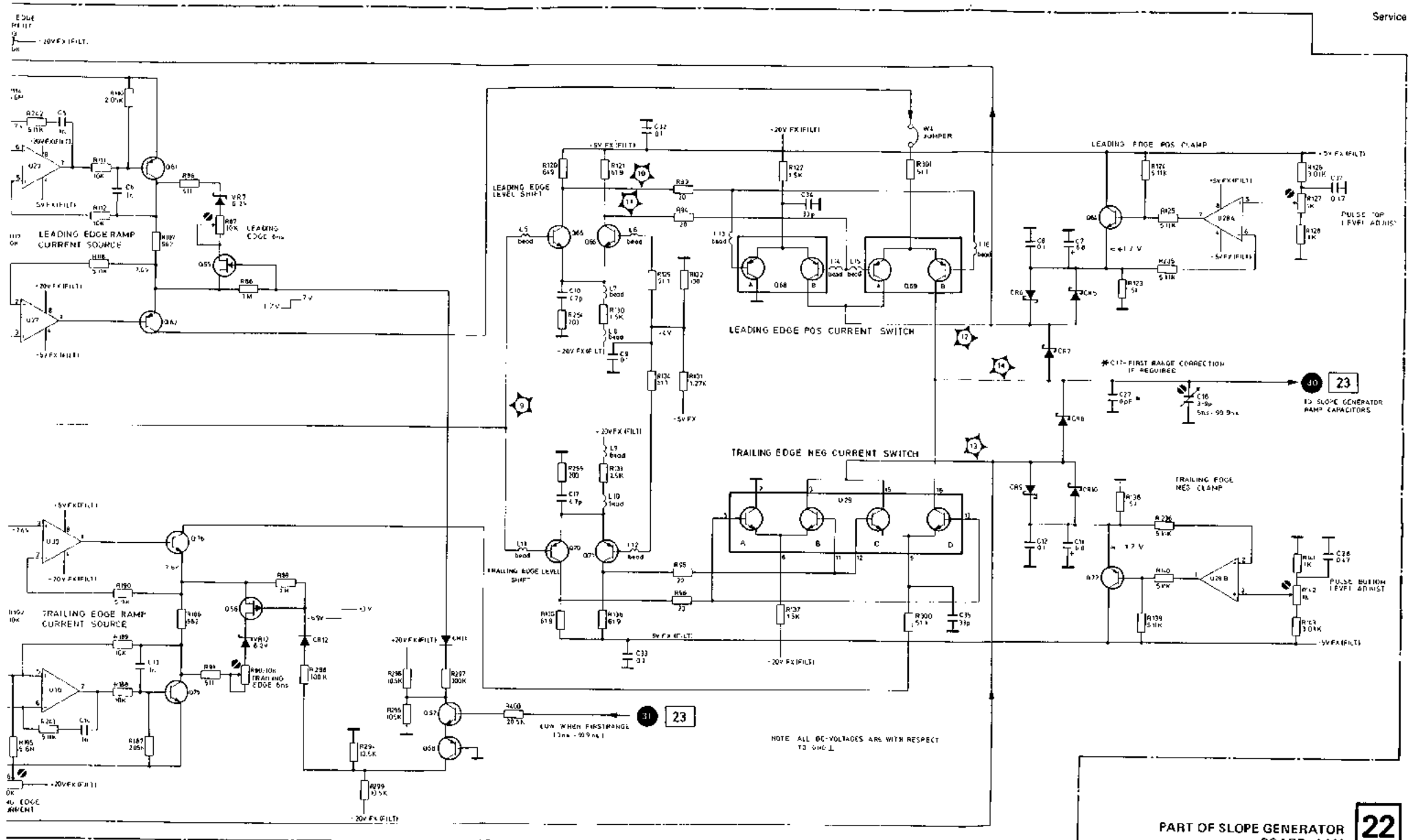
19 20 voltage may vary because adjustment to integrator affects the output amplifier and vice-versa.



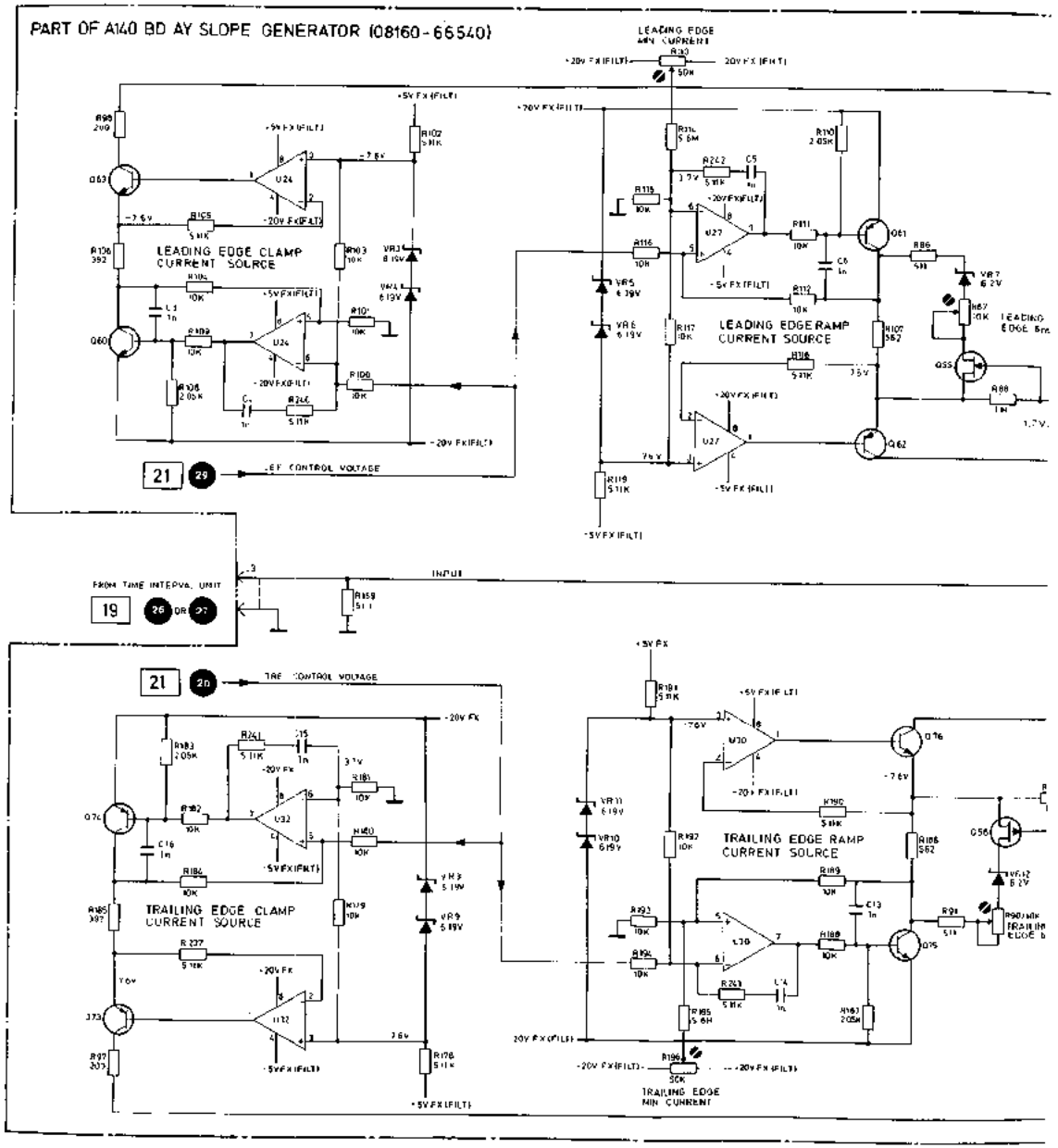
PART OF SLOPE GENERATOR
BOARD A140

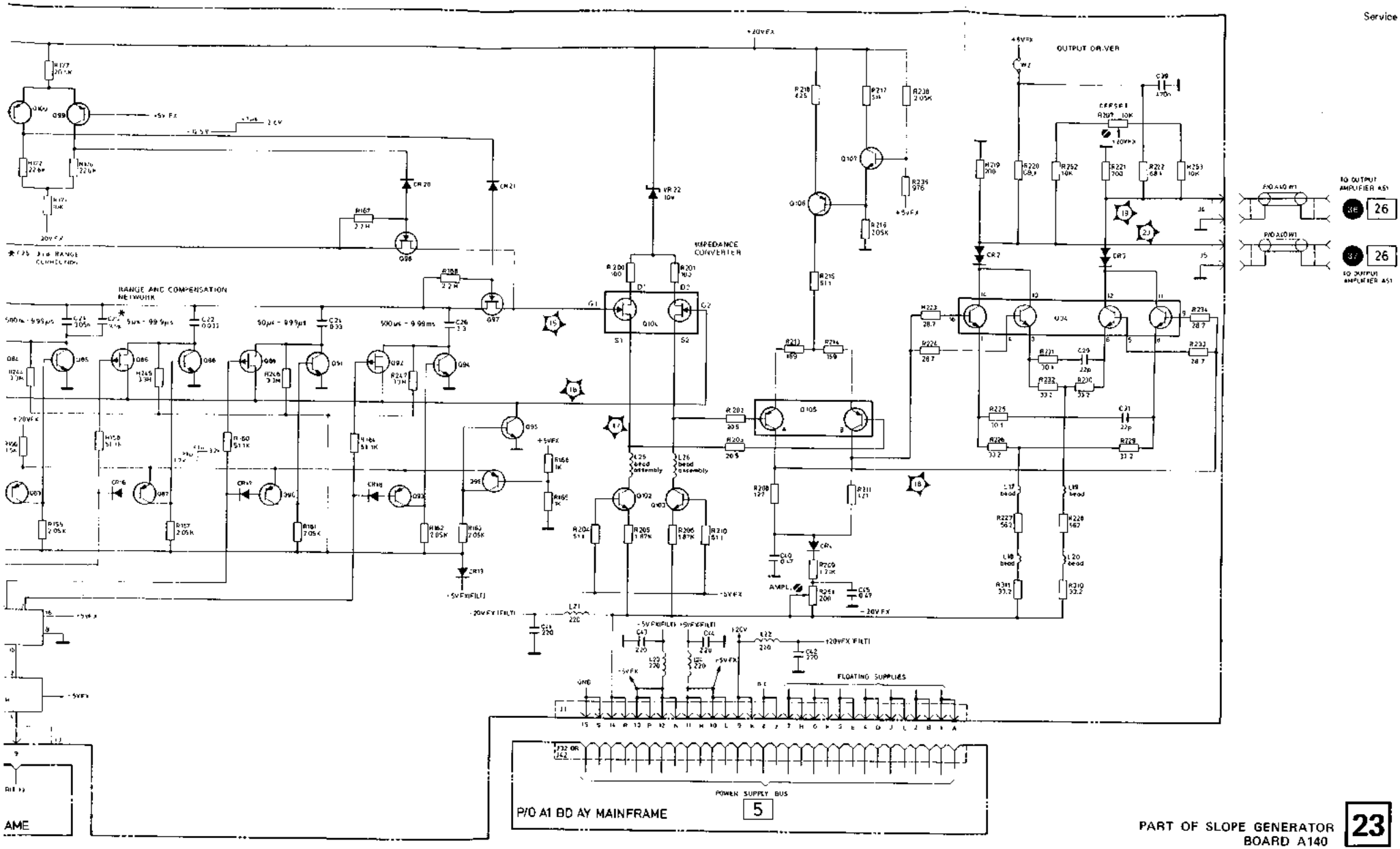
21

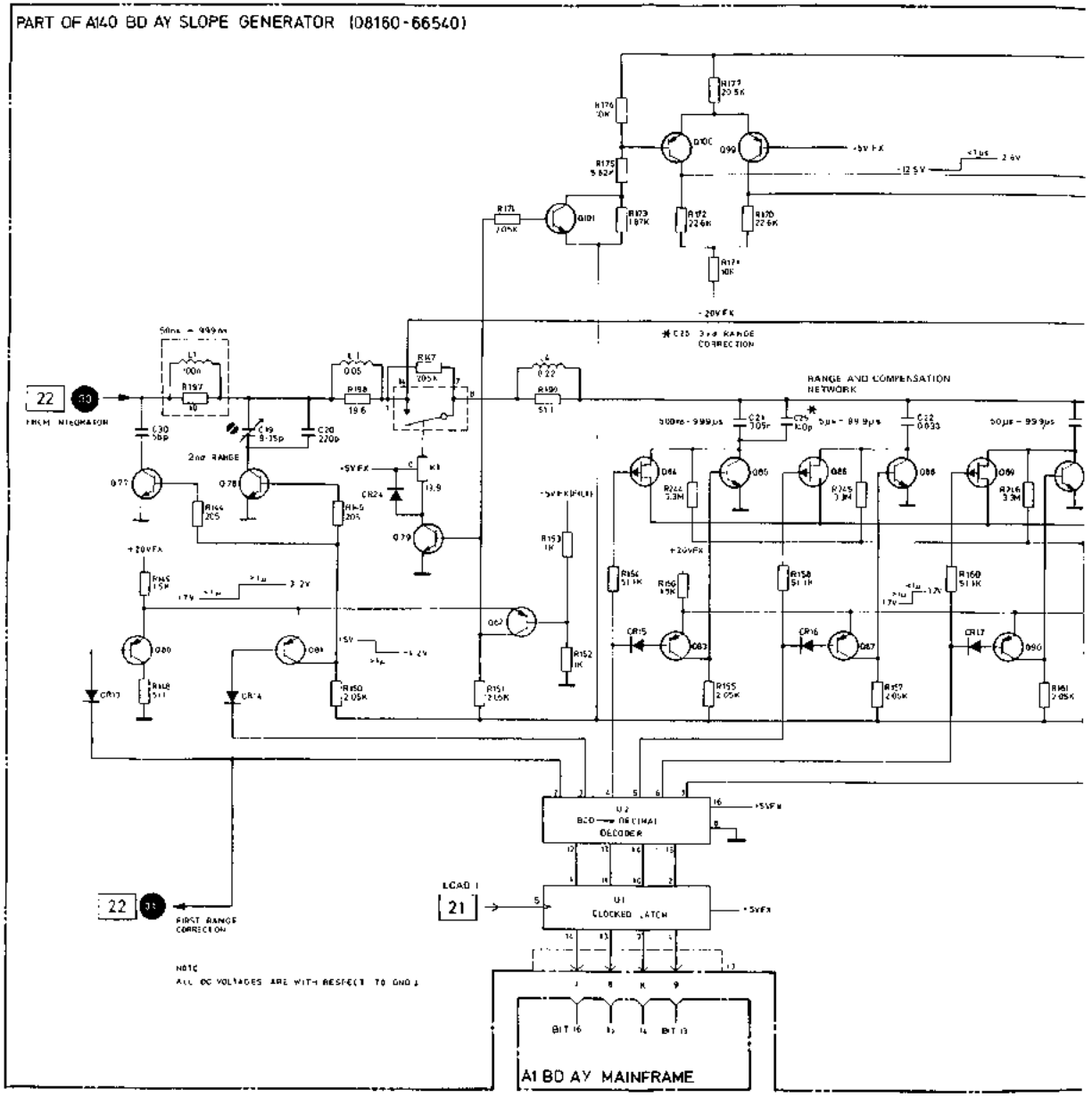

PART OF A140 BD AY SLOPE GENERATOR (08160-66540)
LEADING EDGE DATA CONVERTER
BIT 1
BIT 2
BIT 3
BIT 4
BIT 5
BIT 6
BIT 7
BIT 8
BIT 9
BIT 10
BIT 11
BIT 12
+5VFX
U3
CLOCKED LATCH
U4
CLOCKED LATCH
U5
CLOCKED LATCH
TO MICROPROCESSOR BOARD A2
11
VIA J33 OR J13 DEVICE BUS ON MOTHERBOARD A1
R57 10K
R56 10K
R55 10K
R54 10K
R53 10K
R52 10K
R51 10K
R50 10K
R49 10K
R48 10K
Q39
Q38
Q37
Q36
Q35
Q34
Q33
Q32
Q31
Q30
R58 178
R59 178
R60 178
R61 178
R62 178
R63 178
R64 178
R65 178
R66 178
R67 178
Q43
Q41
Q42
Q43
Q44
Q45
Q46
Q47
Q48
Q49
R71 100
R80 400
R79 800
R78 1.6K
R77 2K
R76 4K
R75 8K
R74 16K
R73 20.0K
R86 2.05K
U23
Q52
VR2 6.2V
-20VFX
R81 500Ω
R82 187K
LEADING EDGE MAX CURRENT
C2 33P
U22
VOLTAGE
PAGE 6
HBAN
BAT1
BIT12
BIT13
HDAT
HDAV
NARL
CHANNEL SWITCH
S1
U9
U10
U5
U11
Q53
R250 10K
FOR DEVICE BUS DATA SEE DEVICE BUS TROUBLESHOOTING
FOR GROUND CONNECTIONS - SEE MOTHER BOARD
5
SLOPE DATA ACCEPTOR

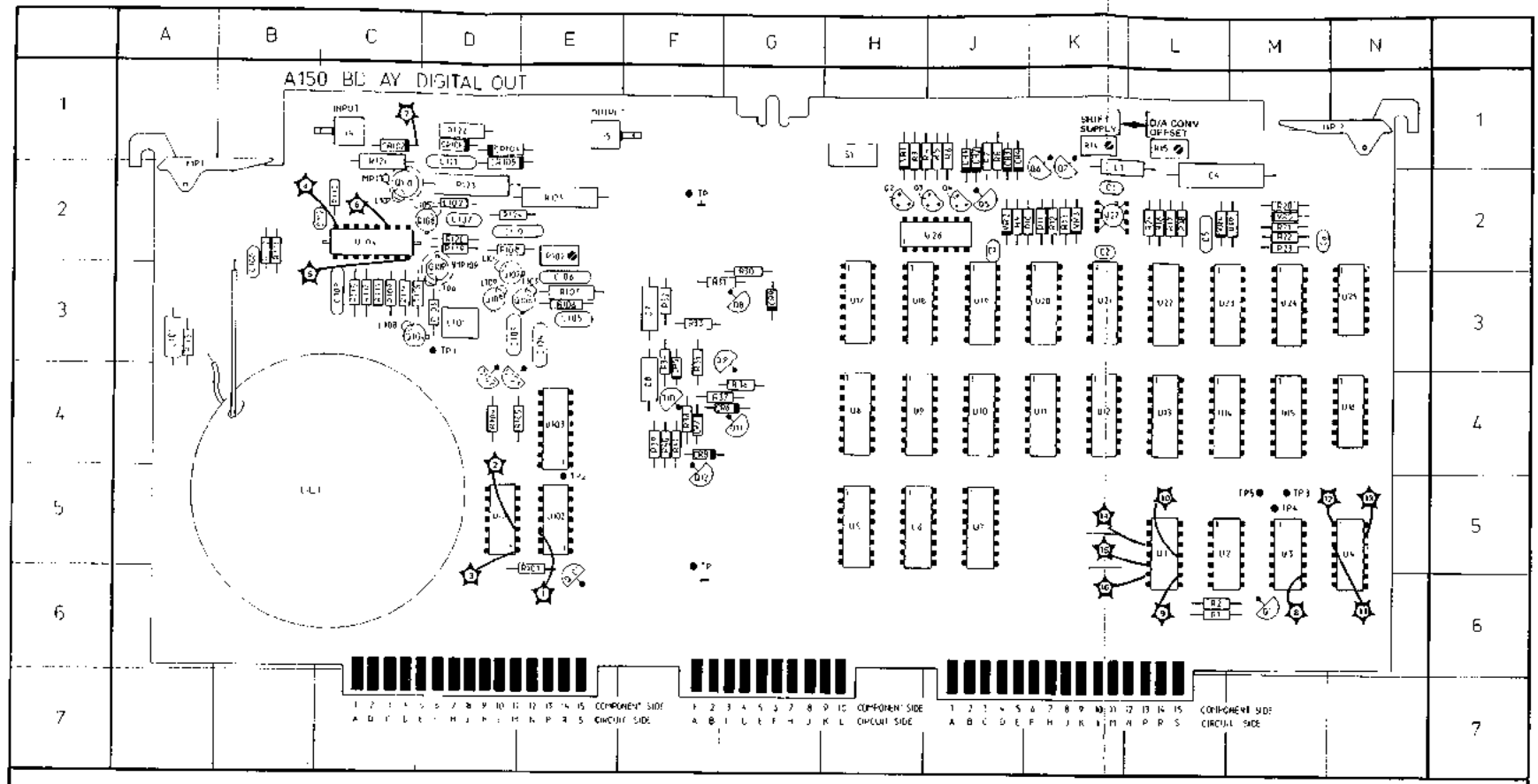


PART OF SLOPE GENERATOR BOARD A140 **22**


PART OF A140 BD AY SLOPE GENERATOR (08160-66540)
LEADING EDGE MIN CURRENT
LEADING EDGE CLAMP CURRENT SOURCE
LEADING EDGE RAMP CURRENT SOURCE
TRAILING EDGE CLAMP CURRENT SOURCE
TRAILING EDGE RAMP CURRENT SOURCE
TRAILING EDGE MIN CURRENT
LEADING EDGE
TRAILING EDGE
FROM TIME INTERVAL UNIT
INPUT
21 29 LEF CONTROL VOLTAGE
21 20 TRF CONTROL VOLTAGE
+5V FX
-20V FX
+5V FX (FILT)
-20V FX (FILT)
-5V FX (FILT)


OUTPUT DRIVER
IMPEDANCE CONVERTER
RANGE AND COMPENSATION NETWORK
FLOATING SUPPLIES
POWER SUPPLY BUS
P/O A1 BD AY MAINFRAME
5
P/O A10 W1
EQ OUTPUT AMPLIFIER A51
26
P/O A10 W1
EQ OUTPUT AMPLIFIER A51
26
PART OF SLOPE GENERATOR BOARD A140
23


PART OF A140 BD AY SLOPE GENERATOR (08160-66540)
RANGE AND COMPENSATION NETWORK
2nd RANGE
FIRST RANGE CORRECTION
HIGH MEGOHMS
U2 BCD → DECIMAL DECODER
U1 CLOCKED LATCH
LOAD 1
NOTE
ALL DC VOLTAGES ARE WITH RESPECT TO GND
BIT 16
BIT 13
A1 BD AY MAINFRAME



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	J2	C110	D2	DL1	C6	MP110	C2	Q104	D3	R10	K2	R31	F3	R106	E3	R122	D4	U6	H5	U22	L3
C2	K2	C111	D2	J4	C1	Q1	M6	Q105	D3	R11	K2	R32	F3	R107	E3	R123	D2	U7	J5	U23	L3
C3	K2	C112	B2	J5	E1	Q2	H2	Q106	E3	R12	K2	R33	F3	R108	D2	R124	D2	U8	H4	U24	M3
C4	L2	CR1	J1	L1	K2	Q3	H2	Q107	D2	R13	K2	R34	F3	R109	C3	R125	E2	U9	H4	U25	N3
C5	L2	CR2	J1	L101	A3	Q4	J2	Q108	D2	R14	K1	R35	F3	R110	C2	S1	H1	U10	J4	U26	J2
C6	M2	CR3	J1	L102	D2	Q5	J2	Q109	D2	R15	L1	R36	G4	R111	B2	TPGND	F2/F6	U11	K4	U27	K2
C7	F3	CR4	J1	L103	E3	Q6	K2	Q110	C2	R16	L2	R37	G4	R112	B2	TP1	D3	U12	K4	U101	D5
C8	F4	CR5	F3	L104	D2	Q7	K2	R1	L6	R17	L2	R38	F4	R113	A3	TP2	B5	U13	L4	U102	E5
C101	D3	CR6	G4	L105	D2	Q8	G3	R2	L6	R18	L2	R39	F4	R114	C3	TP3	M5	U14	L4	U103	E4
C103	D3	CR7	F4	L106	D3	Q9	F3	R3	H1	R19	M2	R40	F4	R115	C3	TP4	M5	U15	M4	U104	C2
C104	F3	CR8	F4	L107	C2	Q10	F4	R4	H1	R20	M2	R41	F4	R116	C3	TP5	M5	U16	N4	VR1	H1
C105	F3	CR9	G3	L108	C3	Q11	G4	R5	J1	R21	M2	R101	C6	R117	C3	U1	L5	U17	K5	VR2	J2
C106	E3	CR101	D1	L109	D3	Q12	F5	R6	J1	R22	M2	R102	E2	R118	D3	U2	L5	U18	H3	VR3	K2
C107	D2	CR102	C1	MP1	A2	Q101	F6	R7	J1	R23	M2	R103	D3	R119	D2	U3	M5	U19	J3	VR4	L2
C108	B2	CR103	D2	MP2	M1	Q102	D4	R8	J1	R24	L2	R104	D4	R120	D2	U4	N5	U20	K3	VR5	M2
C109	C3	CR104	D1	MP109	D2	Q103	D4	R9	J2	R30	G3	R105	D4	R121	C2	U5	H5	U21	K3		

SERVICE BLOCK 12
REFERENCE TRIGGER A150 24

THEORY OF OPERATION

The Reference Trigger Output is part of the digital output assembly, and consists of an acceptor circuit, a monostable multivibrator and an output stage. Depending on the repetition rate, the reference trigger pulses are 8 ns, 40 ns or 400 ns wide. The longer times are achieved by switching additional capacitances into the multivibrator. In EXT TRIGGER mode, the trigger pulses are always 8 ns long. A block diagram of the monostable and output stage are given in Figure 8–12–1.

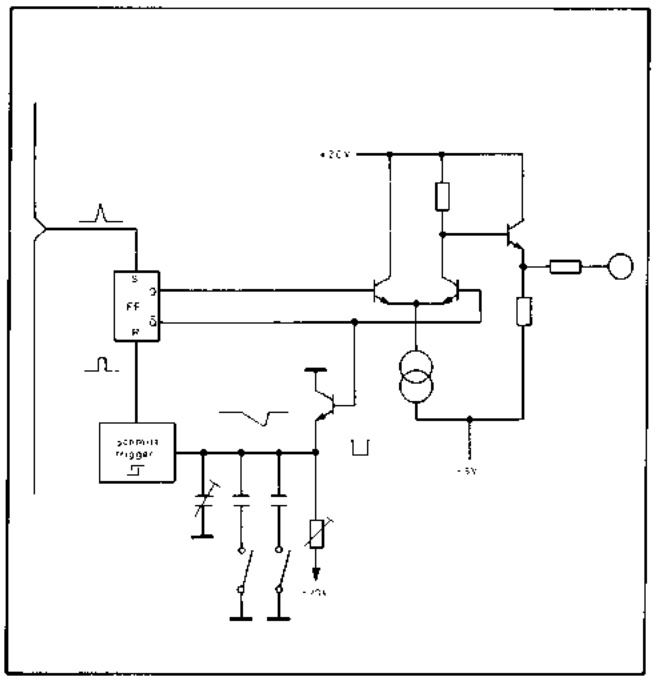


Figure 8–12–1. Schematic monostable and output stage

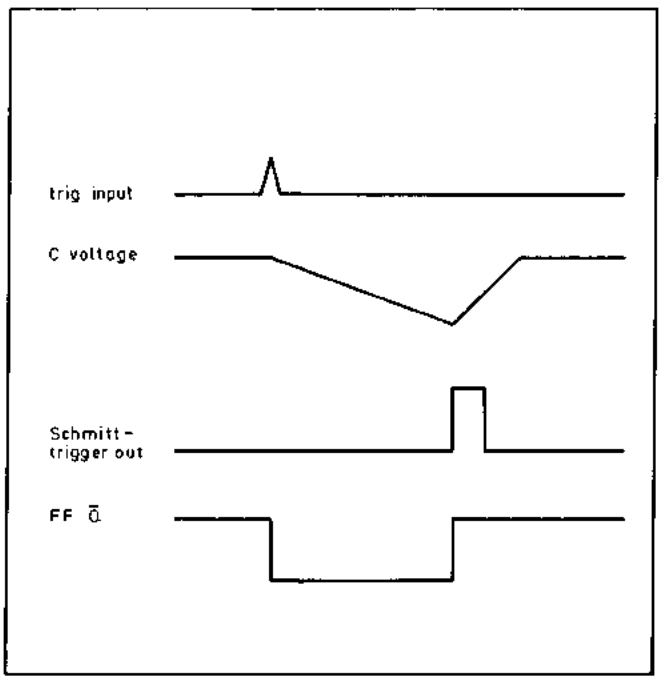


Figure 8–12–2. Timing Diagram

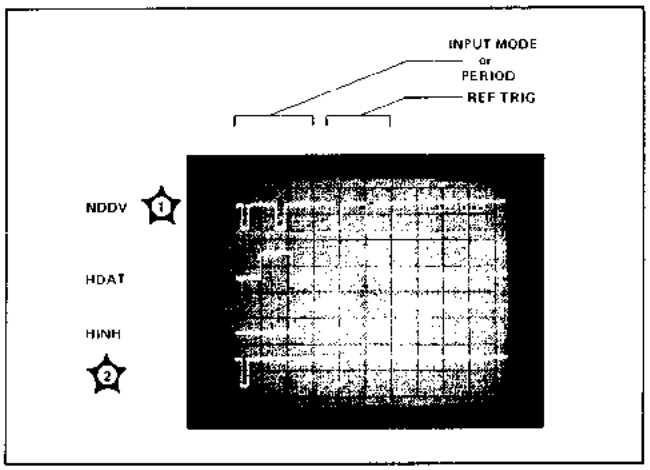
As can be seen from the waveform diagram in Figure 8–12–2, the trigger pulse sets the flip-flop U104, thus the $\overline{Q}$ output goes low. Transistor Q104 is switched off, and the range capacitor(s) begin to charge. This charging continues until the Schmitt trigger level is reached, at which point the Schmitt trigger pulse resets flip-flop U104. The $\overline{Q}$ output goes high switching Q104 on, thus causing the range capacitor(s) to discharge. The complete cycle is then repeated at the next trigger pulse.

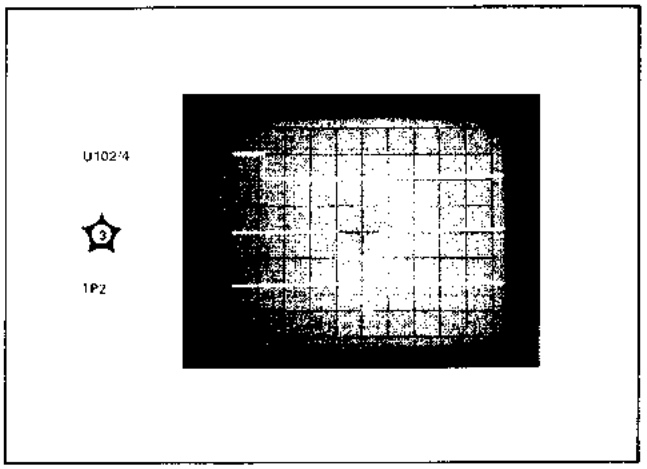
TROUBLESHOOTING

Table 8–12–1. Ref. trigger data table

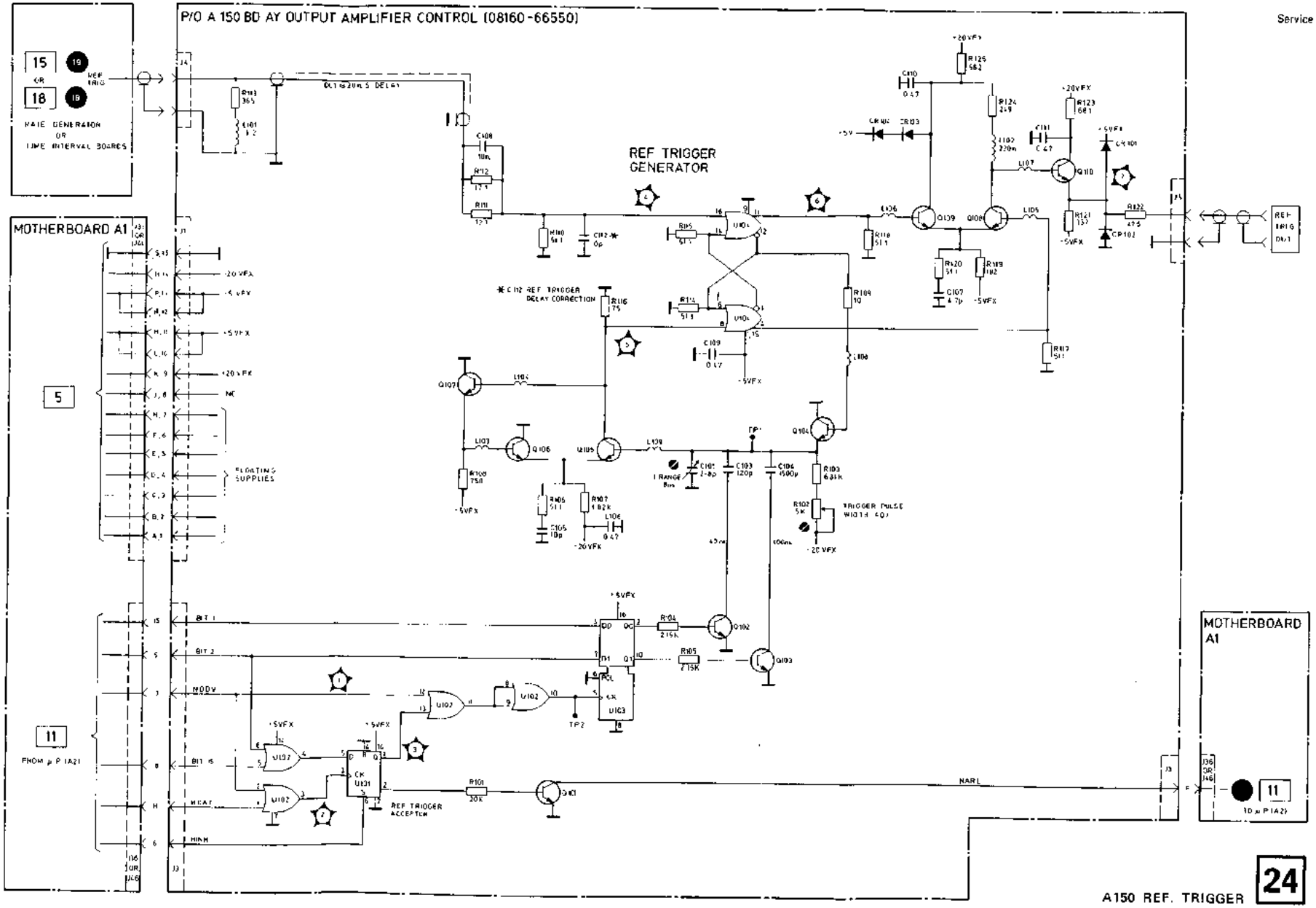
	Period	Ref. trigger width	bit 1 Q102	bit 2 Q103
Ext. trig.	20 n – 99.9 n	8 ns	0	0
Norm. Gate Burst	100 n – 999 n	40 ns	1	0
	1 µs – 999 m	.4 µs	0	1

Reference Trigger Acceptor
All signals are TTL level
Time base 50 μs/Div



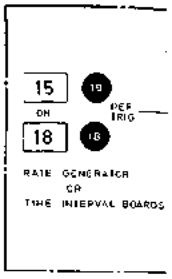


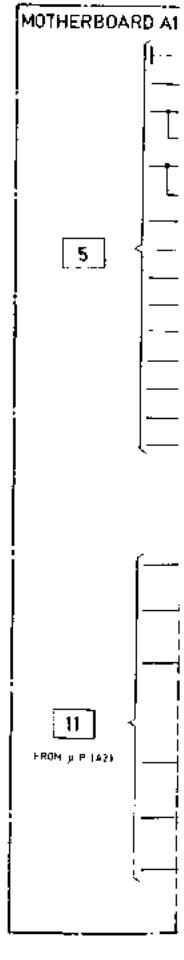
For repeating signals use controller program:
wrt 717, "PER 1 μs"; jmp 0
For device bus details see SERVICE BLOCK 2.



A150 REF. TRIGGER **24**

odel 8160A


15
OR
18
PER TRIG
RATE GENERATOR OR TIME INTERVAL BOARDS


MOTHERBOARD A1
5
11
FROM µ P (42)

SERVICE BLOCK 13
OUTPUT AMPLIFIER CONTROL A150 25

THEORY OF OPERATION

The output amplifier control comprises 4 control circuits:

a) output mode (A SEP B, A ADD B, NORM, COMP, 50 Ω, 1 kΩ, ENABLE, DISABLE)
b) output amplitude control
c) offset control
d) shift supply control

Two acceptor circuits (output acceptor for offset/amplitude data, and output mode acceptor for all other data) generate the required load pulses for the latches receiving data from the device bus. Waveform diagrams illustrating the acceptor function and tables indicating the digital control information are all given in the following troubleshooting section.

TROUBLESHOOTING

Use the following truth-tables to checkout the digital functioning of the 4 control circuits:

a) output mode control
b) output amplitude control
c) offset control
d) shift supply control



Table 8–13–1. Output Mode Truth Table (U8)

Standard Instrument (Channel A)

U8 pin	TTL LOGIC	
	0	1
2	A SEP B	A ADD B
10	NORM	COMP
11	50 OHM	1 KΩ
1	EN	DIS

Table 8–13–2. Output Mode Truth Table (U17)

Option 020 (Channel B)

U17 pin	TTL LOGIC	
	0	1
2	A SEP B	A ADD B
10	NORM	COMP
11	50 OHM	1 KΩ
1	EN	DIS

Table 8–13–3. Output Amplitude Truth Table (U5)

U5	AMPLITUDES (HIL – LOL)									
	0.10 V ↓ 0.19 V	0.20 V ↓ 0.39 V	0.40 V ↓ 0.59 V	0.60 V ↓ 0.79 V	0.80 V ↓ 0.99 V	1.00 V ↓ 1.99 V	2.00 V ↓ 3.99 V	4.00 V ↓ 5.99 V	6.00 V ↓ 7.99 V	8.00 V ↓ 9.99 V
(stage 3) pin 2	1	1	0	1	0	1	1	0	1	0
(stage 2) pin 10	1	1	1	0	0	1	1	1	0	0
(ampl. X 0.1) pin 11	1	1	1	1	1	0	0	0	0	0
(ampl. X1/X2) pin 1	1	0	0	0	0	1	0	0	0	0

Table 8–13–4. Latch Truth Table for 8-bit D/A Converter (Amplitude Vernier Control) in 1 V → 1.99 V range).

NOTE: In 1 V → 1.99 V range, U15 pin 2 is not used. Also in the 1 V → 1.99 V range, a 100 mV step corresponds to a digital step (U14, U15) with decimal equivalent 20.

Display (LOL = 0 V)	U14 1 11 10 2	U15 1 11 10 2	Decimal Equivalent	TP1 Vernier Output Amplitude
HIL 1 V or 100 mV	1 1 0 0	1 0 0 0	200	1 V (100 mV)
HIL 1.1 V or 110 mV	1 0 1 1	0 1 0 0	180	1.1 V (110 mV)
↓				↓
HIL 1.35 V	1 0 0 0	0 0 1 0	130	1.35 V
↓				↓
HIL 1.80 V or 180 mV	0 0 1 0	1 0 0 0	40	1.80 V (180 mV)
HIL 1.90 V or 190 mV	0 0 0 1	0 1 0 0	20	1.90 V (190 mV)
HIL 1.99 V	0 0 0 0	0 0 1 0	2	1.99 V

Table 8–13–5. Latch Truth Table for 8-bit D/A Converter in 2.00 V → 9.99 V Amplitude Range.

NOTE: In the 2.00 V → 9.99 V range, a 100 mV step in amplitude corresponds to a digital step (U14, U15) of decimal equivalent 10. A particular digital pattern is therefore repeated for different amplitudes in this range, the amplitude difference being determined by active vernier stages 2 and 3 – see Table 8–13–3. e.g. amplitudes 2.20 V, 4.20 V, 6.20 V and 8.20 V have the same digital pattern 10110100.

Display (LOL = 0 V)	U14 1 11 10 2	U15 1 11 10 2	Decimal Equivalent	TP1 Vernier Output Amplitude
HIL 2.00 V (200 mV)	1 1 0 0	1 0 0 0	200	1.00 V (100 mV)
HIL 2.20 V (220 mV)	1 0 1 1	0 1 0 0	180	1.10 V (110 mV)
HIL 3.98 V	0 0 0 0	0 0 1 0	2	1.98 V
HIL 3.99 V	0 0 0 0	0 0 0 1	1	1.99 V

Table 8–13–6. Latch Truth Table for 8-bit D/A Converter for Amplitudes ≥ 10 V (50 Ω/1 KΩ)

NOTE: For amplitudes ≥ 10 V, a 100 mV step in amplitude corresponds to a digital step (U14, U15) of decimal equivalent 5.A particular digital pattern is therefore repeated for different amplitudes in this range, the difference amplitudes being determined by active vernier stages 2 and 3 – see Table 8–13–3.

Display (LOL = 0 V)	U14 1 11 10 2	U15 1 11 10 2	Decimal Equivalent	TP1 Vernier Output Amplitude
HIL 10.0 V	0 1 1 0	0 1 0 0	100	2.50 V
HIL 15.0 V	0 0 1 1	0 0 1 0	50	3.75 V
HIL 19.8 V	0 0 0 0	1 0 1 0	10	4.95 V
HIL 19.9 V	0 0 0 0	0 1 0 1	5	4.98 V

Table 8–13–7. Latch Truth Table for 10-bit D/A Converter when Offset x 0.1 (U10 pin 2 low)

NOTES: 1. Offset = $\frac{\text{HIL + LOL}}{2}$ (50 Ω); HIL + LOL (1 KΩ)

2. Between 0 V and 995 mV output offset, the smallest digital step corresponds to a step of decimal equivalent 5.

3. Absolute voltages in the offset generator are given in SERVICE BLOCK 15.

U11				U9				U10		Decimal		
1	11	10	2	1	11	10	2	1	11	Equivalent	HIL	LOL
0	0	0	0	0	0	0	0	0	0	0	0.10 V	–0.10 V
0	0	0	0	0	0	0	1	0	1	5	0.11 V	–0.10 V
0	0	0	0	0	0	1	0	1	0	10	0.12 V	–0.1 V
1	1	1	1	0	1	1	1	1	0	990	1.98 V	0 V

Table 8–13–8. Latch Truth Table for 10-bit D/A Converter when Offset x 1 (U10 pin 2 high)

NOTES: 1. Offset = $\frac{\text{HIL + LOL}}{2}$ (50 Ω); HIL + LOL (1 KΩ)

2. Between 1 V and 10 V output offset, a 100 mV step corresponds to a digital step of decimal equivalent 5.

U11				U9				U10		Decimal		
1	11	10	2	1	11	10	2	1	11	Equivalent	HIL	LOL
1	1	1	1	1	0	0	0	1	0	994	9.99 V	9.89 V
1	0	0	0	0	0	0	0	0	0	512	9.99 V	0.25 V
0	0	1	1	1	1	1	0	1	0	250	5.00 V	0.0 V

Table 8–13–9. Truth Table for Offset Polartity and Gain

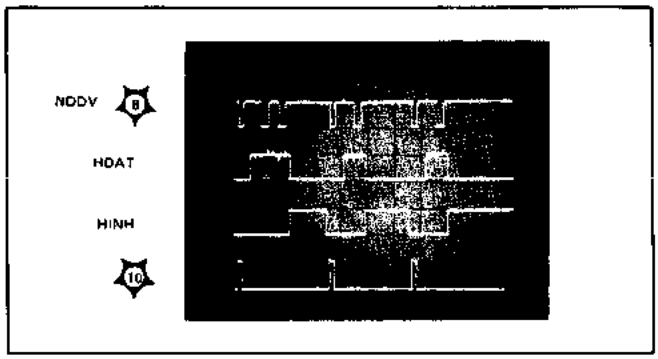
	U25/1	U10/10	U10/2
pos	0	0	X
neg	1	1	X
zero	0	1	X
X 0.1	X	X	1
X 1	X	X	0 ◀——— low when offset ≥ 1 V
X = don't care			

Table 8–13–10. Latch Truth Table for the Shift Supply 8-bit D/A Converter

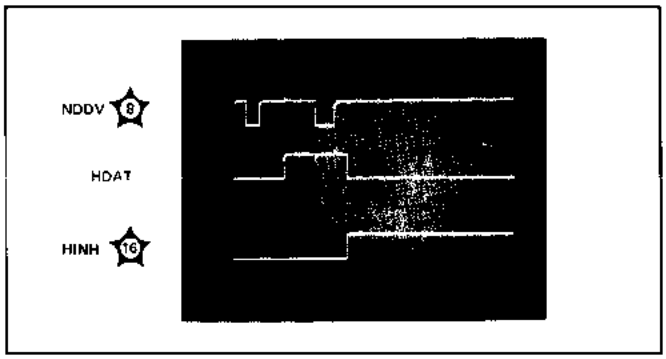
NOTE: For voltage table – see SERVICE BLOCK 5.

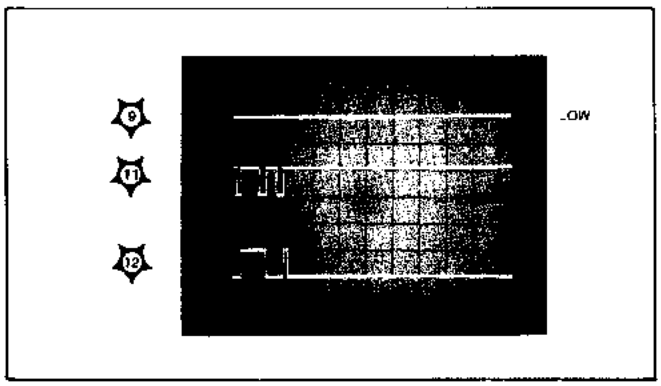
U12				U13				
1	11	10	2	1	11	10	2	Shift out
0	0	0	0	0	0	0	0	–10 V
0	1	1	0	0	1	0	0	0 V
1	1	0	0	1	0	0	0	+10 V

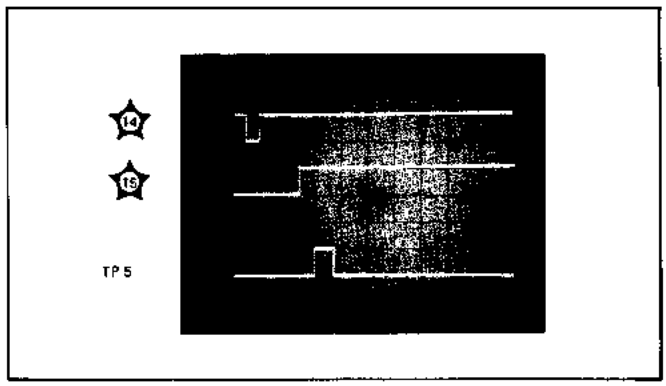
Output Mode Acceptor
(All signals are TTL level)
Time base 50 µs/Div



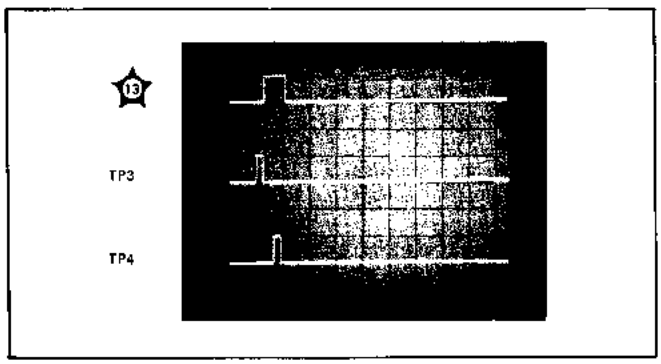
Output Mode Acceptor
(All signals are TTL level)
Time base 20 µs/div



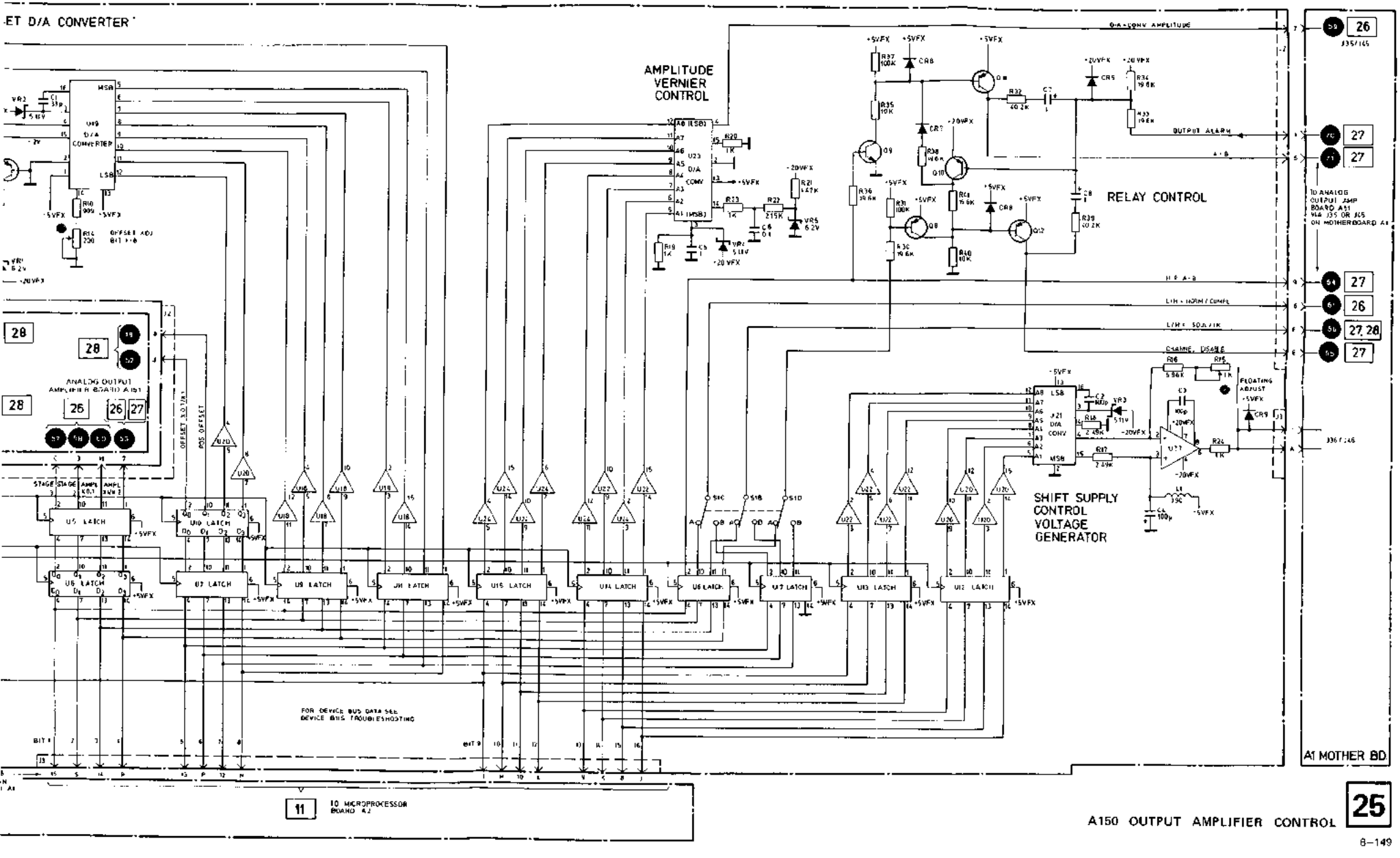




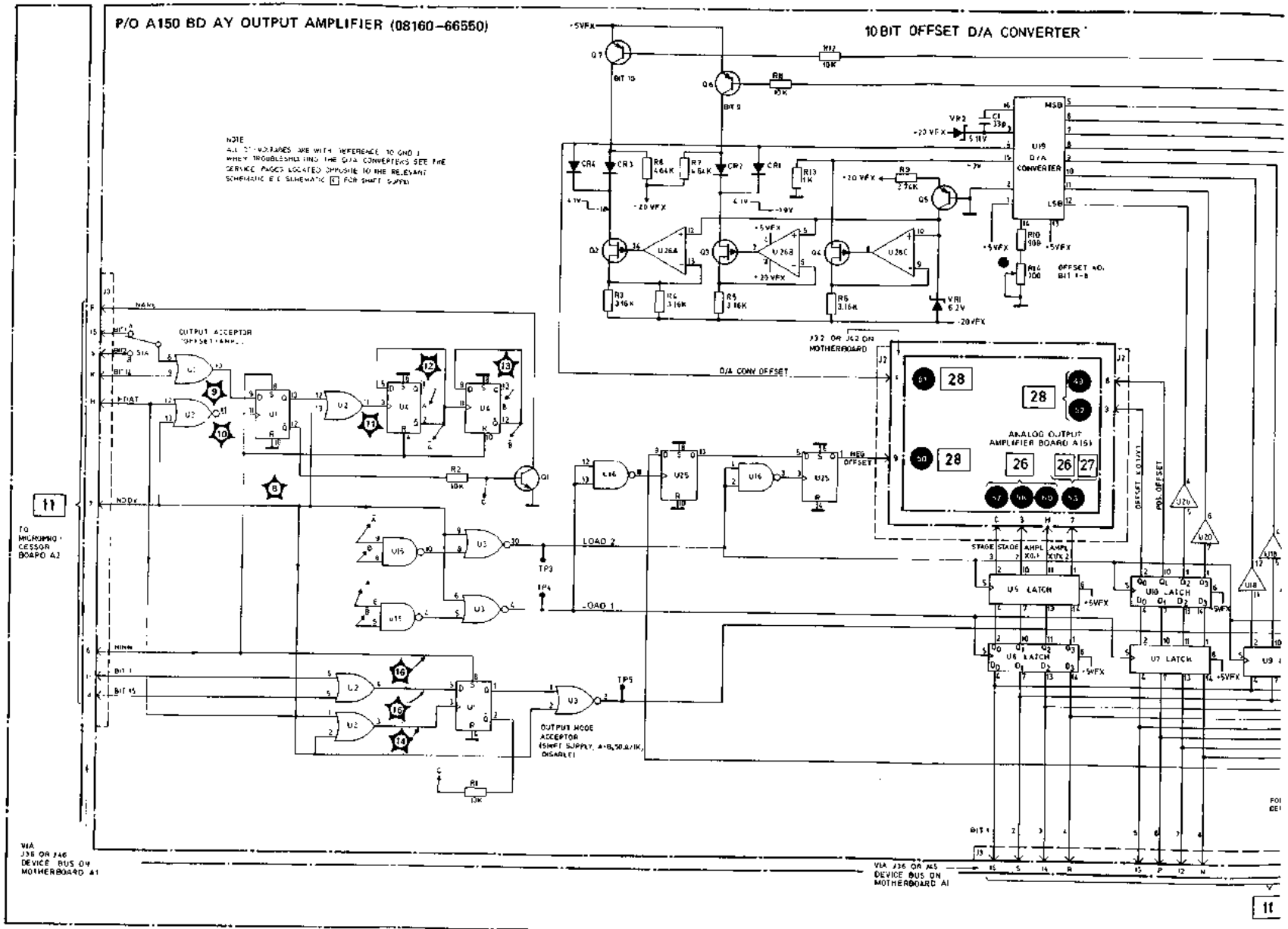
To get repeating signals a controller is needed.
Program: wrt 717, "AN"; jmp 0.
For device bus details see SERVICE BLOCK 2.

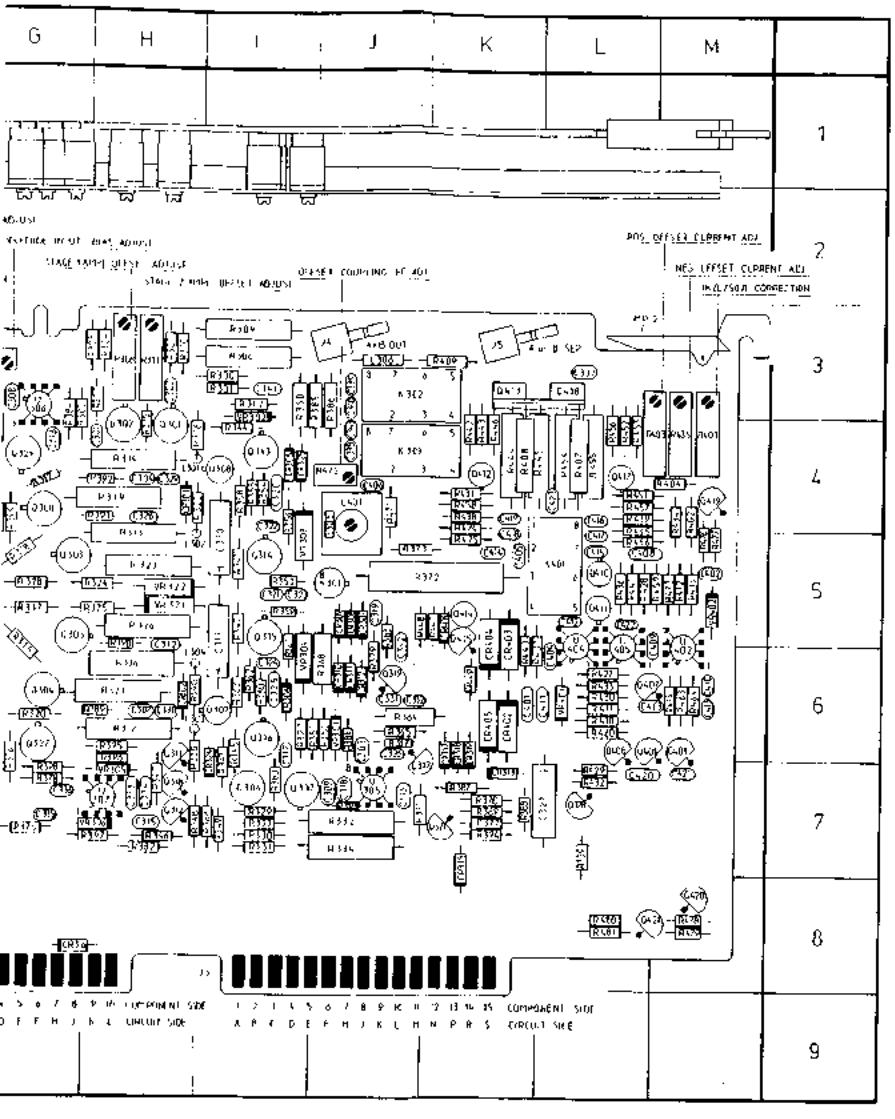


To get repeating signal a controller is needed,
Program: wrt 717, "HIL 1 V"; jmp 0
For device bus details see SERVICE BLOCK 2.

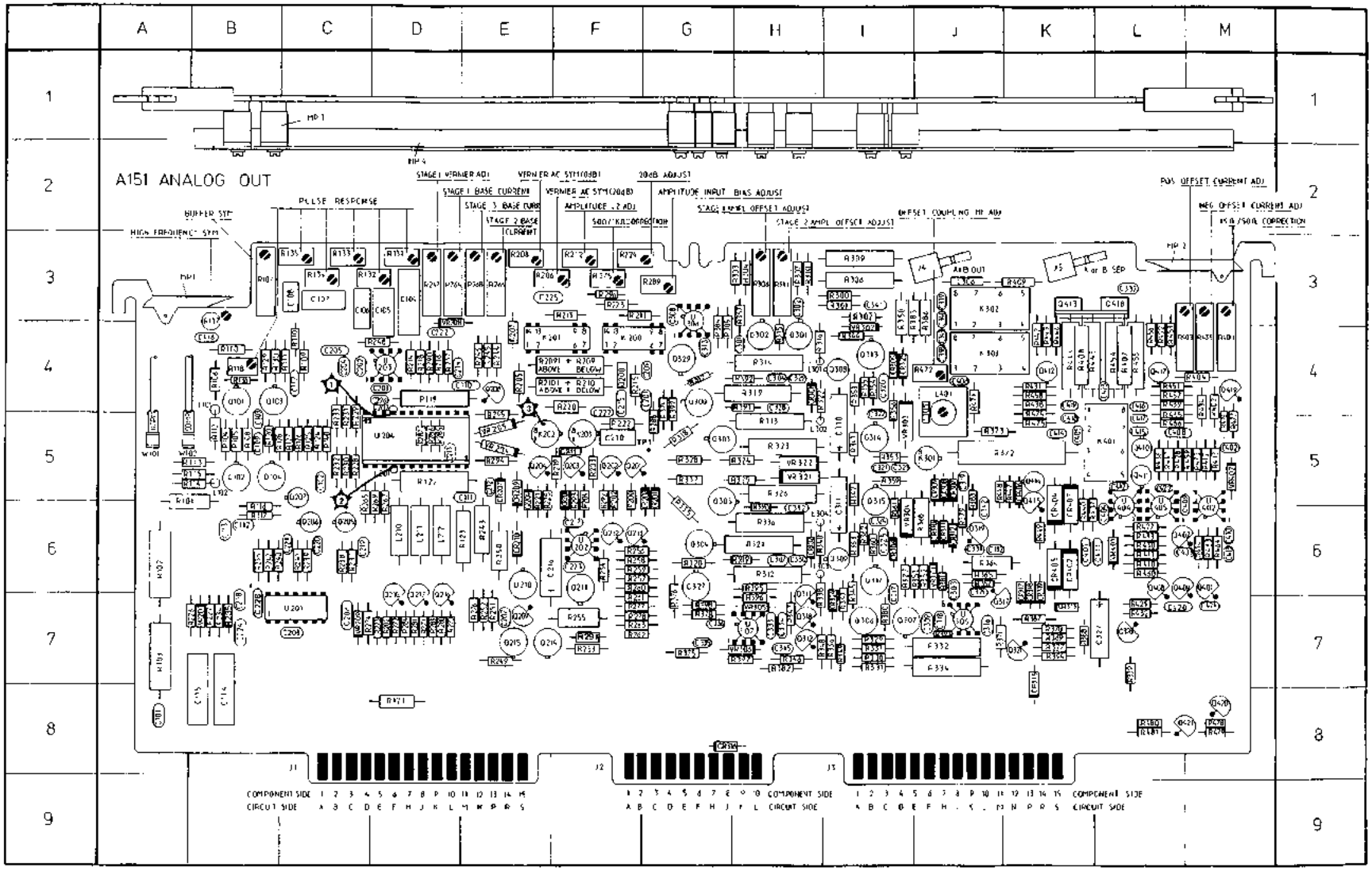


A150 OUTPUT AMPLIFIER CONTROL **25**


P/O A150 BD AY OUTPUT AMPLIFIER (08160-66550)
10 BIT OFFSET D/A CONVERTER
NOTE
ALL D/A VOLTAGES ARE WITH REFERENCE TO GND J
WHEN TROUBLESHOOTING THE D/A CONVERTERS SEE THE SERVICE PAGES LOCATED IMMEDIATELY TO THE RELEVANT SCHEMATIC E.G. SCHEMATIC 5 FOR SHAFT SUPPLY
OUTPUT ACCEPTOR (OFFSET AMPL)
D/A CONV OFFSET
J32 OR J62 ON MOTHERBOARD
ANALOG OUTPUT AMPLIFIER BOARD A150
LOAD 2
LOAD 1
NEW OFFSET
OUTPUT MODE ACCEPTOR (SHIFT SUPPLY, A+B, 50Ω/1K, DISABLE)
TO MICROPROCESSOR BOARD A2
VIA J36 OR J46 DEVICE BUS ON MOTHERBOARD A1
VIA J36 OR J45 DEVICE BUS ON MOTHERBOARD A1
U5 LATCH
U6 LATCH
U7 LATCH
U8 LATCH
STAGE
AMPL X0.5
AMPL X1/X2
OFFSET
POS OFFSET



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C101	A8	C329	H4	K201	E4	Q328	L7	R215	F4	R286	D5	R359	I5	R445	K4
C102	C5	C330	H6	K202	E5	Q329	G4	R216	D4	R287	D5	R360	I6	R446	K4
C103	B5	C331	J6	K203	F5	Q401	M6	R217	D4	R288	G5	R361	I6	R447	K5
C104	D3	C332	J6	K301	J5	Q407	L6	R218	D4	R289	G3	R362	I6	R448	J5
C105	D3	C333	H7	K302	J3	Q408	L6	R219	F5	R290	D4	R363	I6	R449	K6
C106	C3	C334	H7	K303	J4	Q409	L6	R220	F4	R291	F7	R364	J6	R451	L4
C107	C3	C335	G7	K401	I5	Q410	I5	R221	E5	R292	F5	R365	J6	R452	L4
C108	C3	C336	G7	L101	B4	Q411	L5	R222	F5	R293	F5	R366	I7	R453	L4
C109	B5	C337	L3	L102	B5	Q412	K4	R223	F3	R294	E5	R367	J6	R454	L4
C110	D4	C338	J4	L201	D5	Q413	K3	R224	F3	R295	E4	R368	J6	R455	L4
C111	E5	C339	J3	L202	D4	Q414	K5	R225	E5	R296	F3	R369	K7	R456	L4
C112	B6	C340	J3	L210	D6	Q415	K5	R226	B7	R300	I3	R370	K7	R457	L4
C113	B6	C341	I3	L211	D6	Q417	L4	R227	B7	R301	I3	R371	K7	R458	K4
C114	B8	C342	J6	L212	D6	Q418	L3	R228	C5	R302	I3	R372	J5	R459	M5
C115	B8	C343	J4	L301	H4	Q419	M4	R229	C5	R303	H3	R373	J5	R460	L6
C116	B4	C401	K6	L302	H5	Q420	M8	R230	C5	R304	H3	R374	G4	R463	M6
C117	C4	C402	M8	L303	I6	Q421	M8	R231	C5	R305	G4	R375	G7	R464	M6
C201	G4	C403	M6	L304	I6	R100	B4	R232	C5	R306	I3	R376	G6	R465	L4
C202	G4	C404	L6	L305	J4	R101	A6	R233	C5	R307	H3	R377	K7	R466	L5
C203	D4	C405	K5	L306	I3	R102	A6	R234	B7	R308	H3	R378	G7	R471	J4
C204	C4	C406	J4	L307	J4	R103	A7	R235	B7	R309	I3	R379	J6	R472	J4
C205	C4	C408	L5	MP1	B3	R104	B5	R236	B6	R310	H3	R380	I7	R473	M5
C206	C7	C409	L6	MP2	L3	R106	B5	R237	C6	R311	H3	R381	J6	R474	K4
C207	E7	C410	M6	MP3	C1	R106	B4	R238	C6	R312	H6	R382	H7	R475	K5
C208	C7	C411	L6	MP4	D2	R107	B3	R239	C6	R313	H5	R383	J5	R476	M5
C209	G4	C412	L5	MP5		R108	B5	R240	B6	R314	H4	R384	G4	R477	M5
C210	F5	C413	M6	Q101	B4	R109	C4	R241	C6	R315	H4	R385	I3	R478	M8
C211	F5	C414	K5	Q102	B6	R110	C4	R242	B6	R316	H4	R386	J4	R479	M8
C212	E5	C415	L5	Q103	B4	R111	C4	R243	C6	R317	G4	R387	K7	R480	L8
C213	D5	C416	L4	Q104	B5	R112	B5	R244	C4	R318	G5	R388	K7	R481	L8
C214	D4	C417	L5	Q200	F4	R113	B5	R245	E4	R319	H4	R389	H6	RZ091	F4
C215	F4	C418	K4	Q201	F5	R114	B5	R246	E4	R320	G6	R390	H6	R2101	F4
C216	E6	C419	K4	Q202	F5	R115	B5	R247	D3	R321	H6	R391	H4	TP1	G5
C217	F6	C420	I7	Q203	F5	R116	B6	R248	D4	R322	H4	R392	H4	U201	C7
C218	B7	C421	M7	Q204	E5	R117	B6	R249	E7	R323	H5	R393	J7	U202	F6
C219	D6	C422	I6	Q205	C6	R118	B4	R250	B6	R324	H5	R394	K7	U203	D4
C220	C6	C423	L4	Q206	C6	R119	D4	R251	E7	R325	H5	R395	H6	U204	D5
C221	C6	CR201	G5	Q207	C5	R120	B5	R252	E7	R326	H5	R396	H6	U305	J7
C222	D4	CR202	G5	Q208	E4	R121	D8	R253	F7	R327	I6	R397	H7	U306	G4
C223	F6	CR203	F6	Q209	E7	R122	D5	R254	F6	R328	G5	R398	G7	U307	H7
C224	B7	CR204	E6	Q210	E6	R123	E6	R255	F7	R329	I7	R399	G4	U402	M6
C225	E3	CR207	E5	Q211	F6	R124	C5	R256	F6	R330	I7	R401	M4	U404	L6
C226	D4	CR209	E5	Q212	F6	R125	C5	R257	F6	R331	I7	R402	M4	U405	L6
C227	F4	CR210	E6	Q213	F6	R126	C5	R258	F6	R332	J7	R403	M4	VR201	B7
C228	B7	CR301	H4	Q214	E7	R127	C5	R259	F6	R333	I7	R404	M4	VR204	E5
C301	H4	CR302	H6	Q215	E7	R128	C5	R260	F6	R334	J7	R408	K4	VR205	E5
C302	I3	CR305	I4	Q216	D7	R129	B4	R261	F6	R335	G6	R409	K3	VR208	D4
C303	J6	CR306	I6	Q217	D7	R130	B4	R262	F7	R336	H6	R410	L6	VR209	C7
C304	H4	CR307	J5	Q218	D7	R131	D3	R263	F7	R337	G5	R411	L6	VR301	J6
C307	H6	CR308	J5	Q300	G4	R132	C3	R264	D3	R338	H6	R412	M5	VR302	I4
C308	G3	CR309	J6	Q301	H4	R133	C3	R265	C6	R339	L7	R413	M5	VR303	J6
C309	J7	CR310	J6	Q302	H4	R134	C3	R266	E3	R340	H6	R414	M6	VR304	I6
C310	I5	CR311	J6	Q303	G5	R135	C3	R267	D6	R341	I5	R427	L6	VR305	H7
C311	I6	CR312	J6	Q304	G6	R136	B4	R268	E3	R342	I6	R428	L6	VR306	H7
C312	H6	CR313	K7	Q305	G6	R137	B4	R269	D6	R343	I6	R429	L7	VR321	H5
C313	G4	CR315	K7	Q306	I7	R140	C5	R270	D7	R344	I4	R430	L6	VR322	H5
C315	H7	CR316	H8	Q307	I7	R200	F5	R271	D7	R345	I6	R431	K4	VR401	L6
C316	J7	CR317	K6	Q308	I4	R202	F5	R272	D7	R346	H7	R432	L7	VR402	M5
C317	I6	CR318	K5	Q309	I6	R203	F5	R273	D7	R347	H7	R433	L6	W101	A5
C318	J7	CR319	K6	Q310	H7	R204	F6	R274	D7	R348	H7	R434	M4	W102	A5
C319	J5	CR324	I6	Q312	H7	R205	F4	R275	F3	R349	I7	R435	M4		
C320	I4	CR325	I4	Q313	I4	R206	E3	R276	F7	R350	I3	R436	L5		
C321	I5	CR402	K6	Q314	I5	R207	E4	R277	F7	R351	I6	R437	K6		
C322	I4	CR403	K5	Q315	I6	R208	E3	R278	F7	R357	J6	R438	K4		
C323	I5	CR404	K5	Q316	I6	R209	F4	R280	D7	R353	I5	R439	I4		
C324	I6	CR405	K6	Q317	J7	R210	F4	R281	D7	R354	I4	R440	K6		
C325	J6	CR406	K5	Q318	H7	R211	F3	R282	D7	R355	I4	R441	L5		
C326	J6	J4	J3	Q319	J6	R212	F3	R283	D7	R356	I4	R442	K4		
C327	L7	J5	K3	Q321	K7	R213	F3	R284	D7	R357	H4	R443	K4		
C328	H4	K200	F4	Q327	G6	R214	D4	R285	D5	R358	I4	R444	K4		


A151 ANALOG OUT
A B C D E F G H I J K L M
1 2 3 4 5 6 7 8 9
HIP 1
HIP 4
HIP 2
HIP 3
STAGE 1 VERNIER ADJ
VERNIER AC SYM(10dB)
20dB ADJUST
STAGE 1 BASE CURRENT
VERNIER AC SYM(20dB)
STAGE 3 BASE CURR
AMPLITUDE +2 ADJ
AMPLITUDE INPUT BIAS ADJUST
STAGE 2 BASE CURRENT
500Ω R&C CORRECTION
STAGE 3 AMPL OFFSET ADJUST
STAGE 2 AMPL OFFSET ADJUST
OFFSET COUPLING HF ADJ
POS OFFSET CURRENT ADJ
NEG OFFSET CURRENT ADJ
R&C/50Ω CORRECTION
BUFFER SYM
HIGH FREQUENCY SYM
PULSE RESPONSE
A or B OUT
A or B SEP
J1
J2
J3
COMPONENT SIDE
CIRCUIT SIDE

SERVICE BLOCK 14
OUTPUT AMPLIFIER A151 26 27

THEORY OF OPERATION

A functional block diagram of the output amplifier is given in Figure 8–14–1. The following description is based on the individual functions indicated in this diagram.

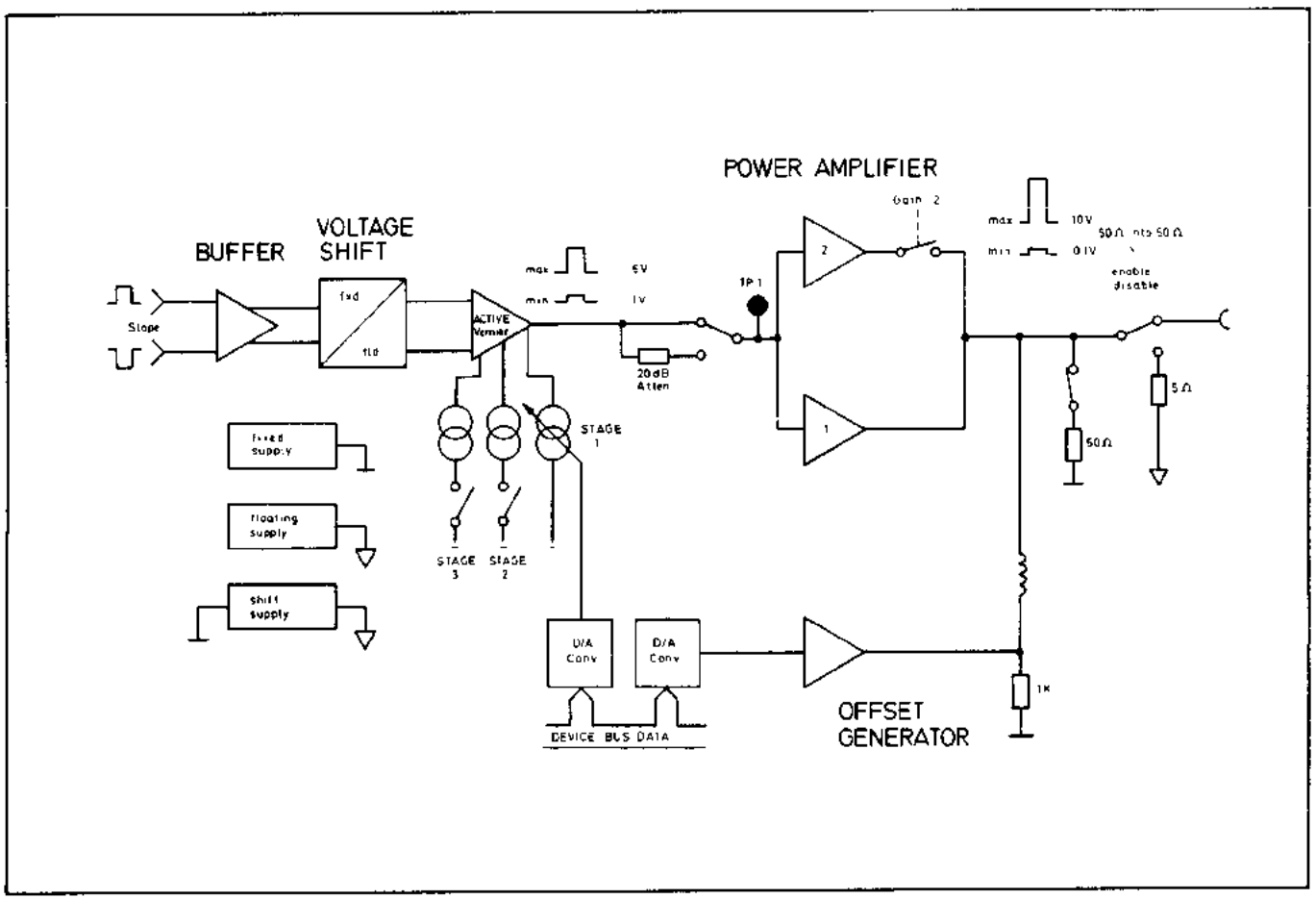


Figure 8–14–1. Output amplifier block diagram

Buffer Amplifier

The outputs of the slope generator (normal and complement) are input to the buffer amplifier (Q101 , Q102), which amplifies the input signal by factor 2 in conjunction with the voltage shift stage Q103, Q104. The input signal is referenced to fixed ground (⊥) while the output signal at R119 and R122 is referenced to floating ground. The R-C time constants in the buffer amplifier enable compensation of frequency nonlinearities in the whole output amplifier.

Active Vernier Attenuator

The active vernier circuit consists of four different sections:

a) Vernier attenuator IC
b) Current source
c) Control current source
d) Offset voltage control

A block diagram relating all 4 sections is given in Figure 8–14–2.

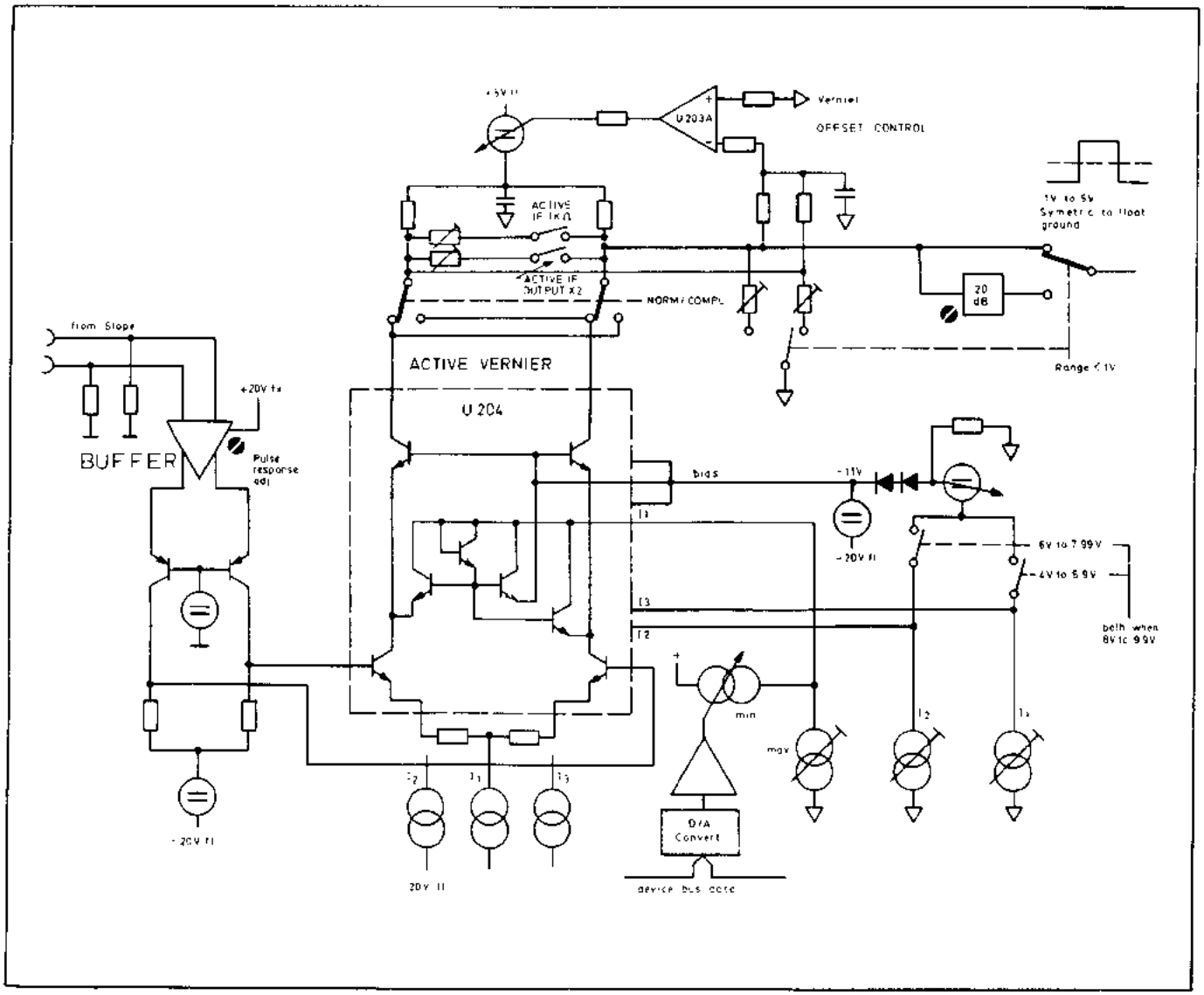


Figure 8–14–2. Block diagram for active vernier attenuator

Vernier attenuator IC: There are two attenuating elements per attenuator stage (see Figure 8–14–3), one for normal and one for complement output, and three attenuator stages in parallel to increase the dynamic range of attenuation. The attenuator uses the current-sharing principle of a differential amplifier. As Figure 8–14–3 shows, each attenuating stage is a differential amplifier connected so that the signal current flows into (or out of) the common emitters. The output current is taken from one of the collectors and fed to the external resistor, which converts output current to voltage.

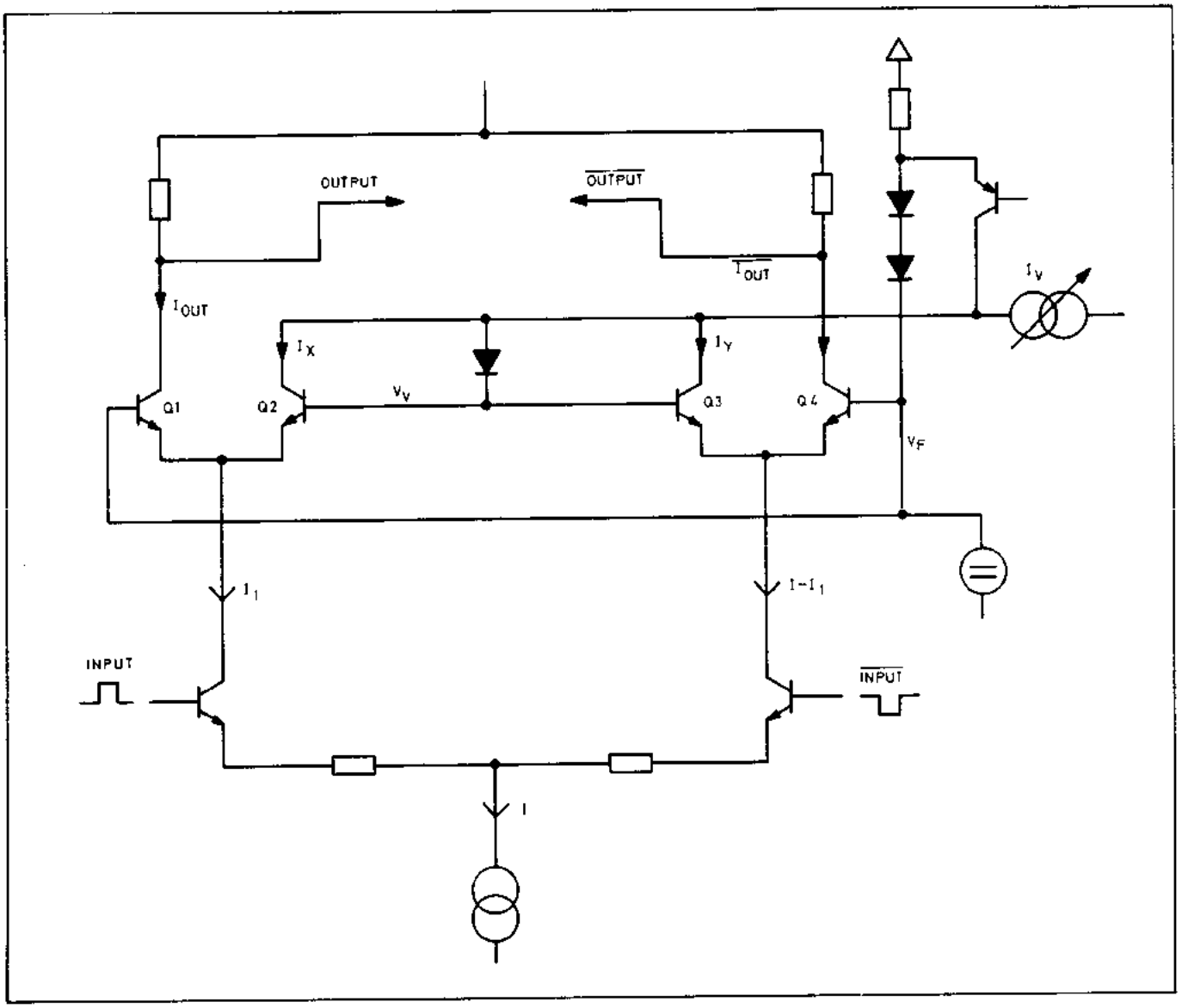


Figure 8–14–3. Operating principle for each stage of active vernier

In a differential amplifier the current flowing in each collector is proportional to the potential difference between the two bases. Thus, by varying the potential V_v (See Figure 8–14–3) on the base of one of the transistors, the current I_{out} can be controlled. However, because of the characteristic of the base-emitter voltage of each transistor, the attenuation has a logarithmic characteristic.

The input signal controls the share of current source I which flows through each input transistor. Similarly, V_v controls the current in both attenuator transistors Q1, Q2 or Q3, Q4 (Figure 8–14–3). Suppose that V_v sets an attenuation factor of 2 and, for simplicity, I = 1 mA. If the input is such that I is shared equally, then I_1 = 0.5 mA and $I - I_1$ = 0.5 mA. Also $I_x = 1/2\ I_1$ = 0,25 mA and $I_y = 1/2\ (I-I_1)$ = 0,25 mA. Now, suppose that the input changes the sharing of current I so that I_1 = 0,2 mA, and $I - I_1$ = 0,8 mA, then, I_y = 0.4 mA and I_x = 0.1 mA. In either case, the sum $I_x + I_y$ remains constant, and is in fact constant for all input signals and attenuation ratios. Therefore a constant current source (controlled by the amplitude setting) can be used to supply the current $I_y + I_x$.

If I_v = I, then I out = $\overline{\text{I out}}$ = 0

If I_v = 0, then I out = $\overline{\text{I out}}$ = 0,5 I

Current souces: The current I (see Figure 8--14--4) for each attenuator stage is provided by current sources comprising U201 d, Q205, Q206 and Q207.

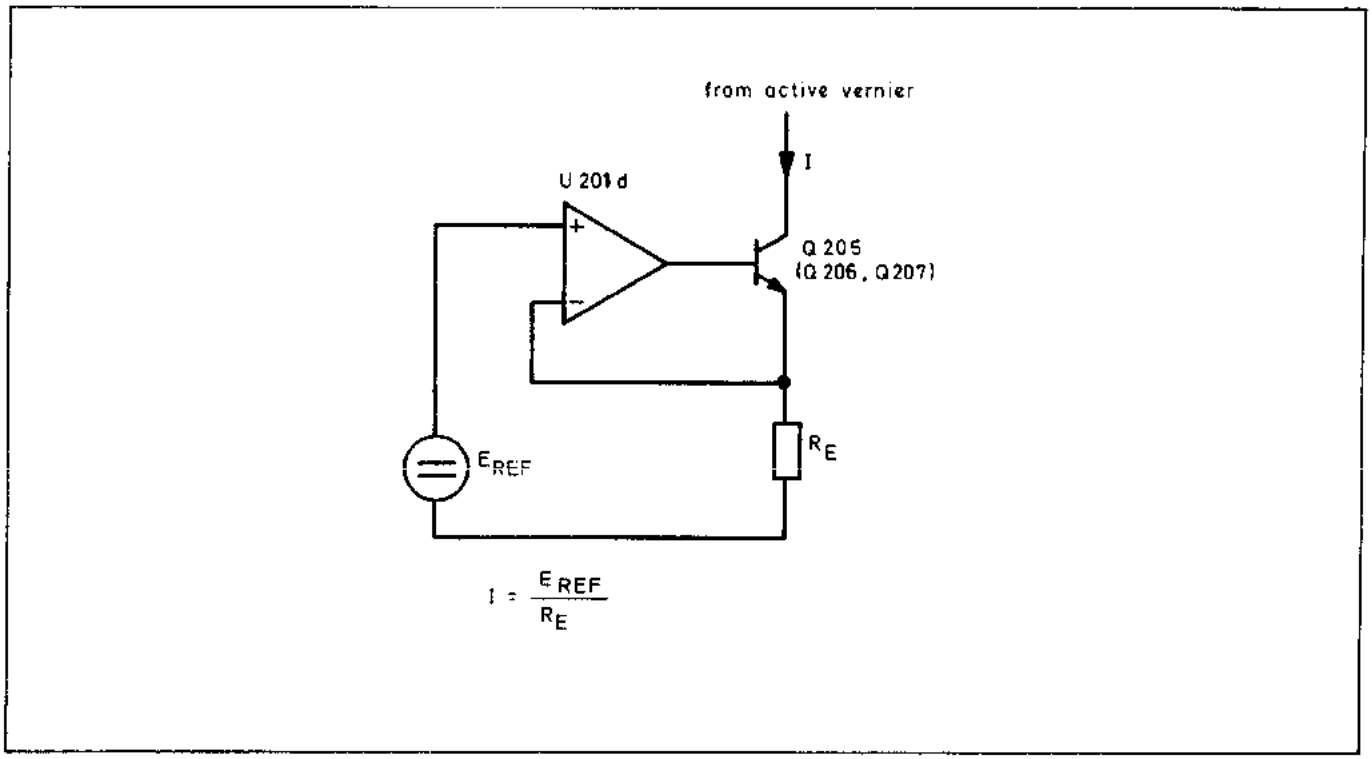


Figure 8--14--4. Functional diagram of active vernier current source

Control current sources: Each attenuator stage of the vernier IC has its own control current source (Q216 – Q201a, Q217 – U201b, Q218 – U201c) to calibrate the required attenuation of the stage.

Stage 2 and stage 3 also have transistor switches to enable a cut-off of the corresponding stage. In this case voltage V_v is set to one diode – voltage above base potential V_f (Figure 8--14--3) and I_{out} of the corresponding stage is therefore zero because $I_v = I$ (as explained above).

Figure 8--14--5 illustrates the interstage relationship of the active vernier both for the 8160A output versus programmed value and for the vernier output versus programmed value.

As can be seen from Figure 8--14--5, stage 1 acts as the variable part of the vernier attenuator, and the maximum output from the total vernier is 5 V. With stage 2, the signal is attenuated to 50 % of maximum amplitude, and stage 3 attenuates the output signal a further 20 %. Stage 1 (variable part) also provide 20 % attenuation with 8-bit resolution.

Control current source for stage 1 consists of one current source (equal to stages 3 and 2) to calibrate the lower attenuation point, and a current amplifier driven by a D/A converter on A150, to set the upper attenuation point.

Vernier Output Voltage Control

Due to the varying output current (I_{out}) of the vernier attenuator, the average voltage level (middle value between pulse top and baseline) is offset from floating ground with varying attenuation. To compensate this, both output signals, NORM and COMP, are added to obtain an average voltage which is then compared to floating ground (U203A). Any difference then controls a voltage source which compensates the vernier output, thus TP1 always sees a signal symmetrical about floating ground.

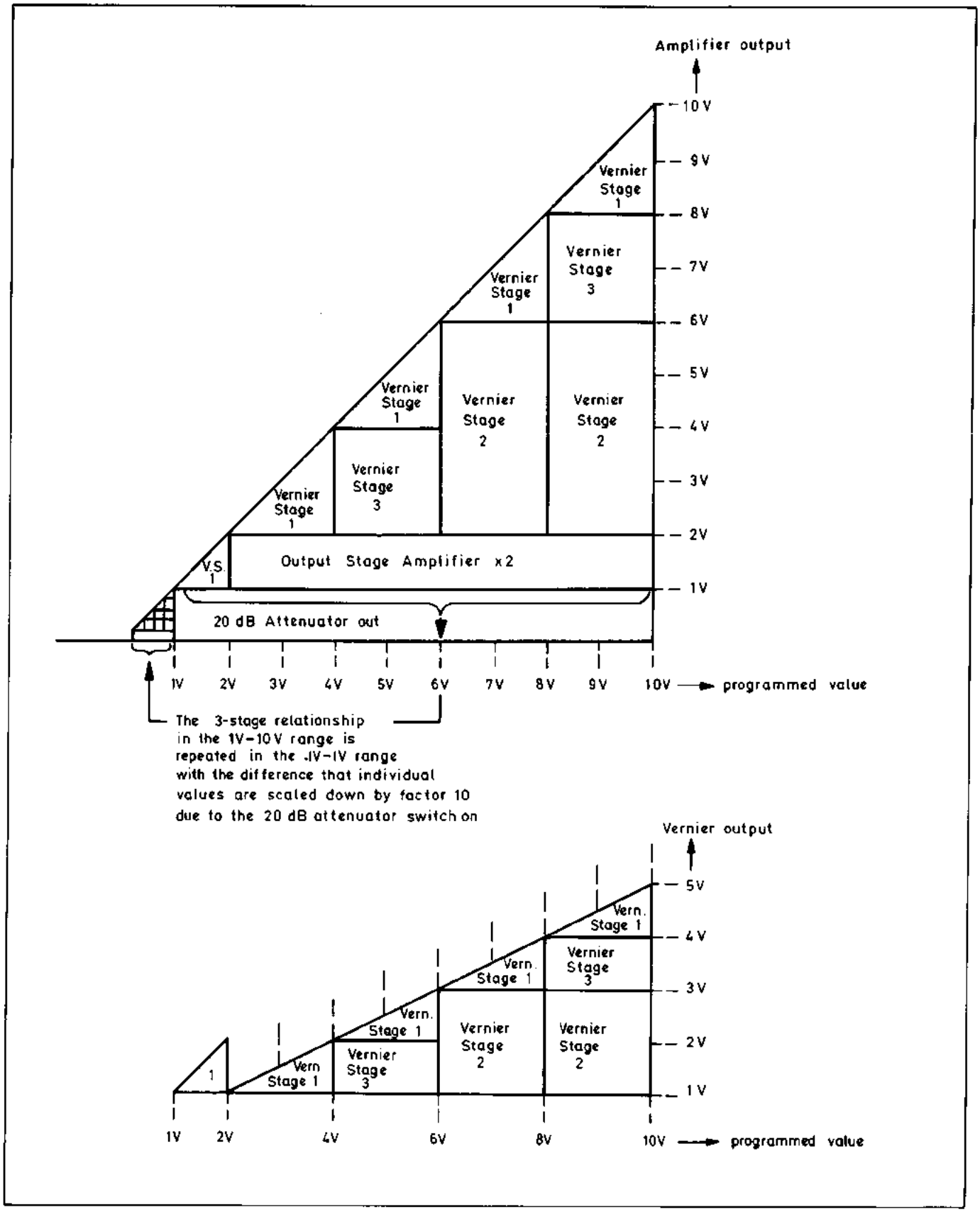


Figure 8–14–5. Inter-relationship of active vernier stages

20 dB Attenuator

A 20 dB resistive attenuator is located between the vernier attenuator and the input stage of the following power amplifier. This attenuator is only active when the amplifier is set to signal amplitudes below 1 V.

Power Amplifier

A block diagram of the output amplifier section is given in Figure 8–14–6, in which it can be seen that the power amplifier comprises two amplifiers connected in parallel, one of which can be switched off. When switched off, total amplification (input to output) is unity, while switching on provides a total gain factor of 2.

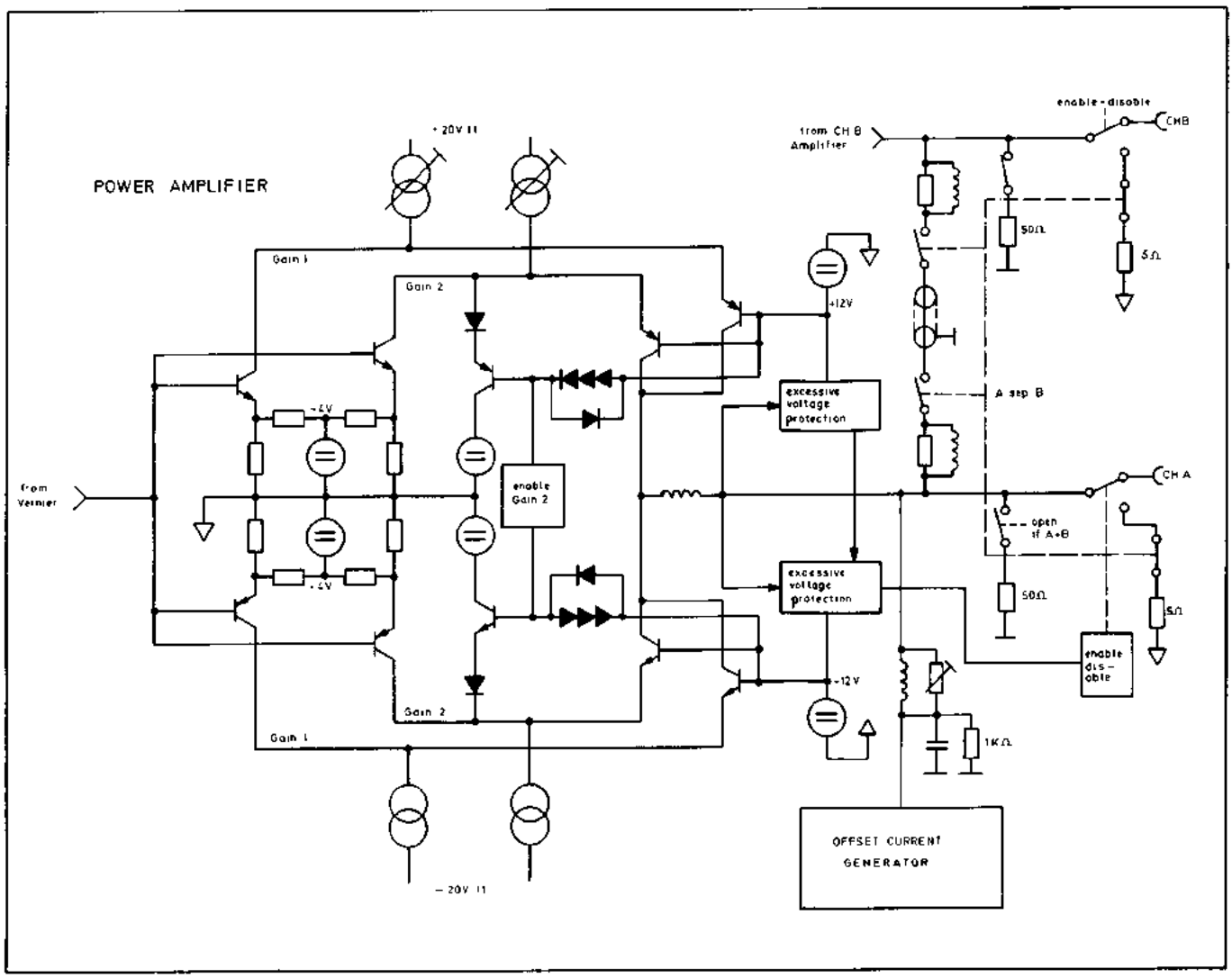


Figure 8–14–6. Power amplifier block diagram

Figure 8—14—7 illustrates the operating principle of the switchable amplifier, the only difference between this and the non-switchable being the switch function. The amplifier consists of 2 complementary cascode stages working in push – pull mode. (Complementary cascode = NPN and PNP transistor connected in common emitter/common base configuration to provide high input impedance, high output impedance and high gain). The positive cascode stage comprises common emitter transistor Q303, common base transistor Q314 and the positive current source; the negative cascode stage comprising common emitter transistor Q305, common base transistor Q315 and the negative current source. Q303 and Q305 operate as voltage-controlled current sources, the input voltage to their bases determining which is more heavily biased (the minimum bias current flows continually through all 4 transistors due to it being a linear amplifier).

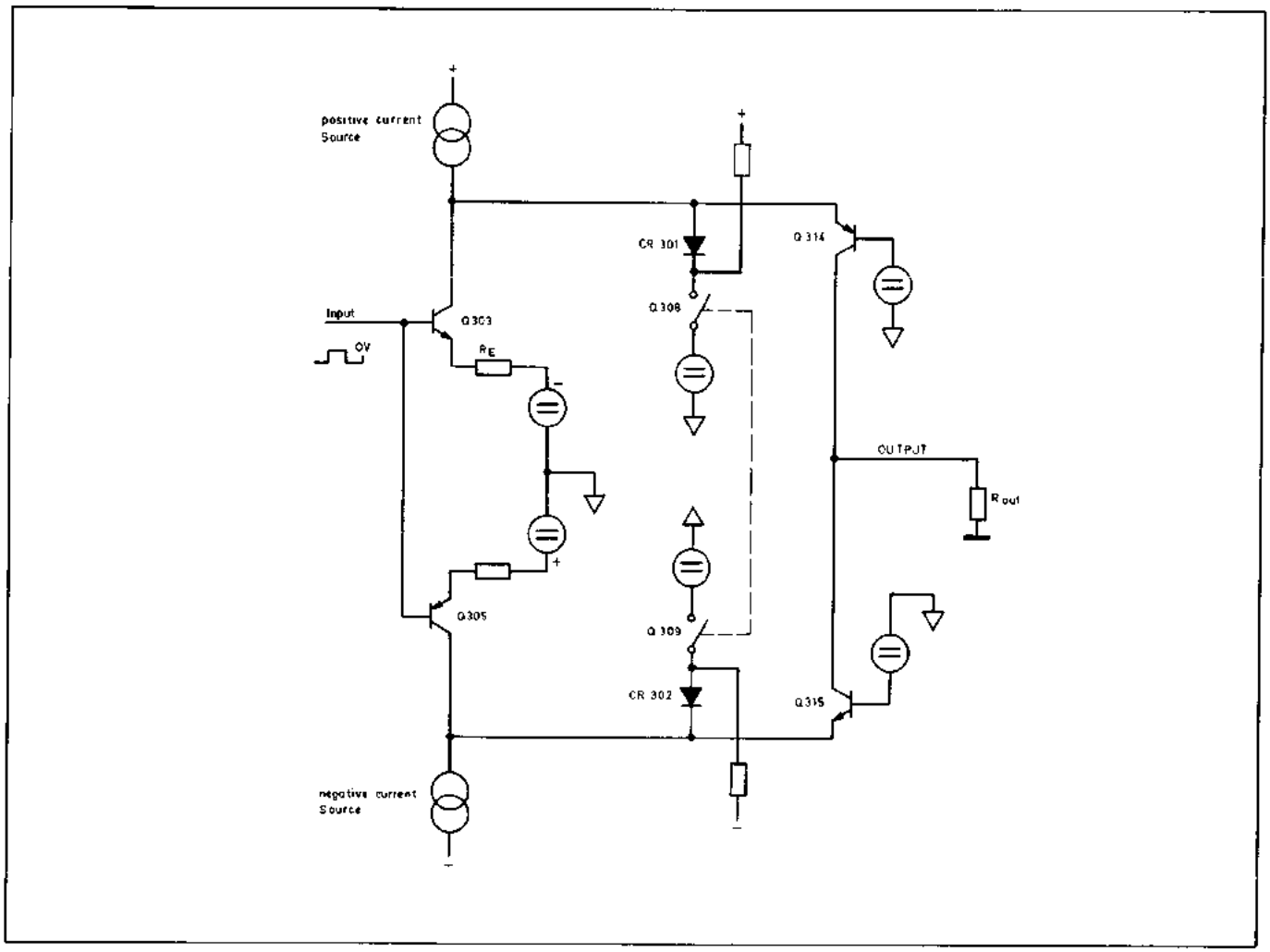


Figure 8—14—7. Switchable amplifier functional diagram

To switch the amplifier off, transistor switches Q308 and Q309 are switched on, so that all current flows through diodes CR301, CR302 into the voltage sources.

Excessive Voltage Protection

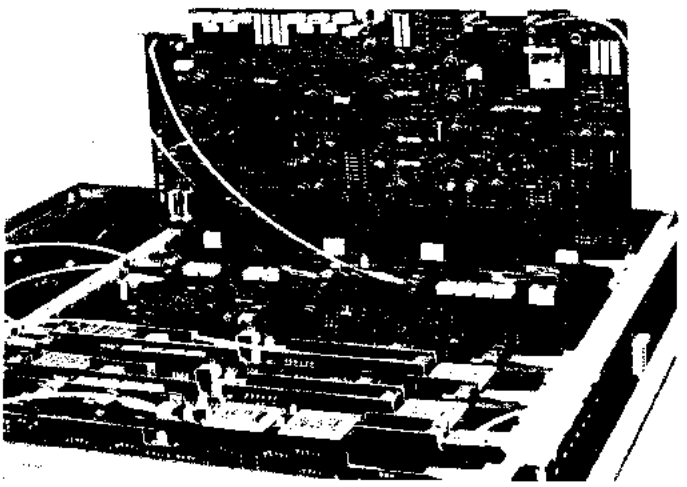
To prevent the output transistors going into saturation, a protection circuit is added. If an absolute voltage of approximately 16 V (depending on level setting) is fed to the output jack, diodes CR307 to CR309 conduct for positive voltages, CR310 to CR312 for negative voltages to cause relay K303 (via board A150) to switch to DISABLE. This diode circuit is also activated if the 8160A is set to output levels above ~ 8 V without internal or external terminating resistor.

TROUBLESHOOTING

The following hints are an aid to fault isolation should a problem arise with the 8160A output amplitude. Information given here relates to the analog sector of the output amplifier, digital troubleshooting hints being given in Service Block 13. Because amplitude and offset are generated separately, offset troubleshooting is handled in a separate Service Block – Service Block 15.

It should be remembered in the following information that amplitude as a parameter is not displayed on the 8160A front panel – it must be calculated by subtracting the programmed LOL (low level) from the HIL (high level).

AMPLITUDE = HIL – LOL



CAUTION

At higher amplitudes, do **not** work at long periods with the heat sink on board A151 removed.

Active Vernier Output

A good starting point for troubleshooting amplitude problems is the output of the active vernier, TP1. (**NOTE:** TP1 is an imaginary test point at R288 on the component side of A151. For measurements on the circuit side of A151, the right-hand printed circuit delay line can be considered as TP1). Table 8–14–1 indicates the conditions in this area for different amplitudes.

Table 8–14–1. Amplitude Conditions

Output Amplitude Range	Output Impedance	20 dB Attenuator	Relay K203
100 mV – 999 mV	50 Ω	on	on
1.00 V – 9.99 V	50 Ω	off	off
10.0 V – 19.9 V	1 k Ω	off	off

When the 20 dB attenuator is switched off (output amplitudes 1 V – 19.9 V), all signals at TP1 are within 1 V to 5 V amplitude and symmetrical about floating ground (⏚). For this reason, ensure that the measuring device is also floating. When the 20 dB attenuator is on (0.1 V – 0.999 V) all signals at TP1 are 0.1 V to 0.5 V amplitude, also symmetrical about floating ground.

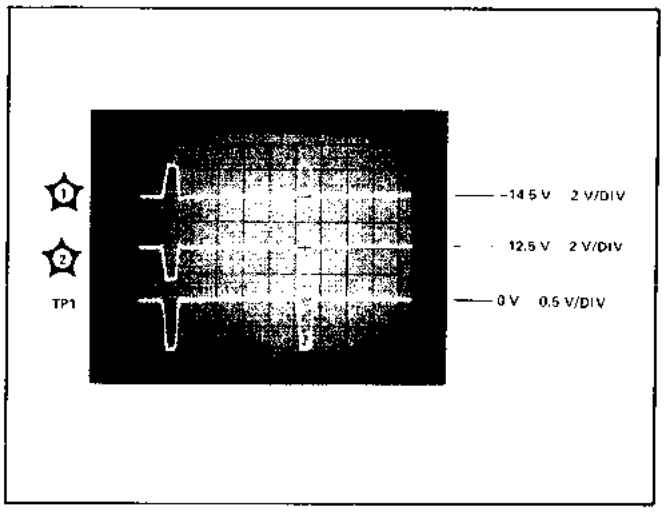
D/A Converter Output

The following table indicates the D/A converter output voltage (measured at Q209 collector — against floating ground) for different 8160A output amplitudes.

Table 8–14–2. D/A Converter Output Voltages

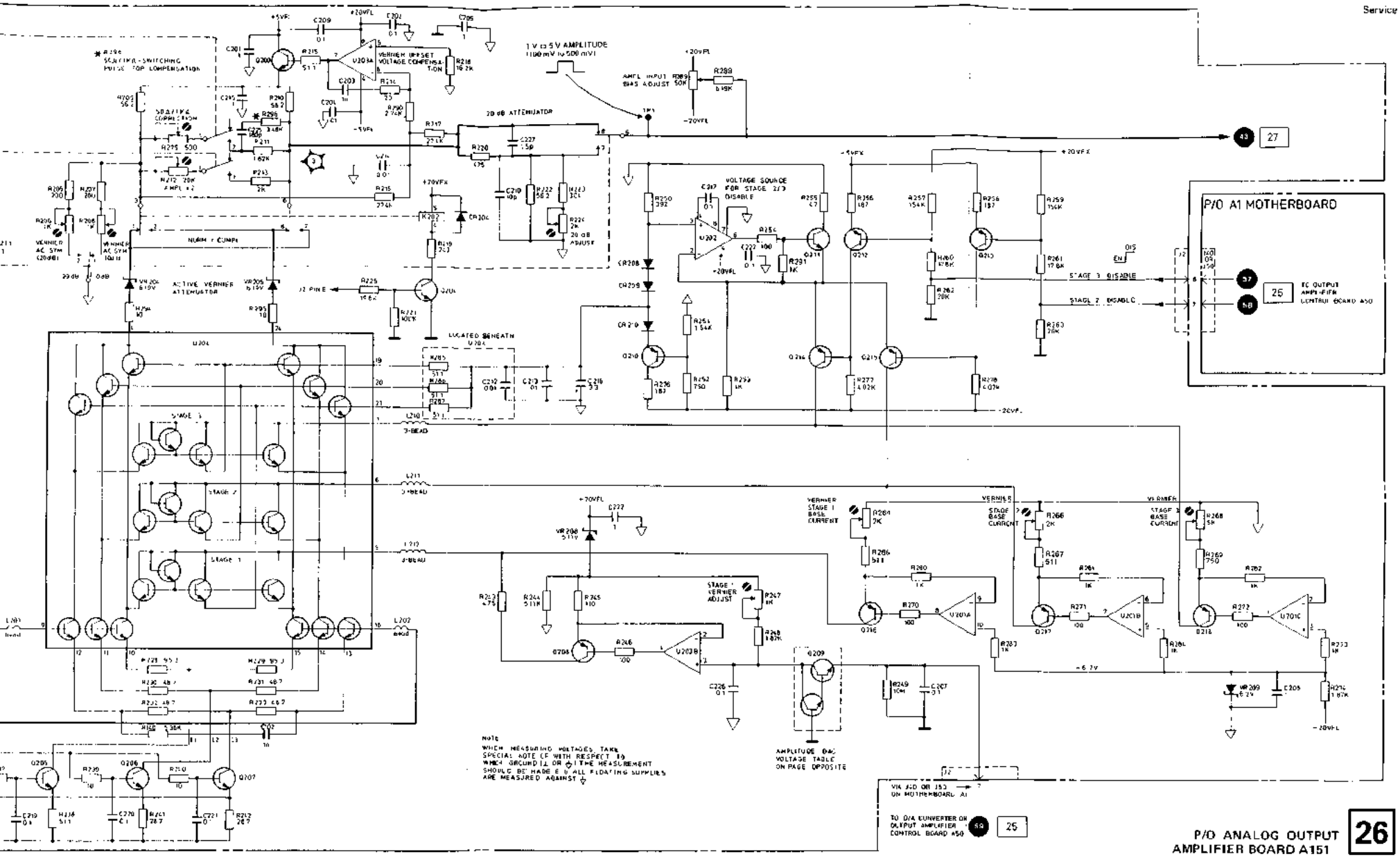
AMPLITUDE (HIL–LOL)					Active Vernier	Power Amplifier
1.00	1.30	1.60	1.99	→	Stage 1 only →	x1
2.00	2.60	3.20	3.99	→	Stage 1 only →	x2
4.00	4.60	5.20	5.99	→	Stages 1 and 3 →	x2
6.00	6.60	7.20	7.99	→	Stages 1 and 2 →	x2
8.00	8.60	9.20	9.99	→	Stages 1, 2 and 3 →	x2
Q209 coll.	11.2 V	12.2 V	13.5 V	14.9 V		

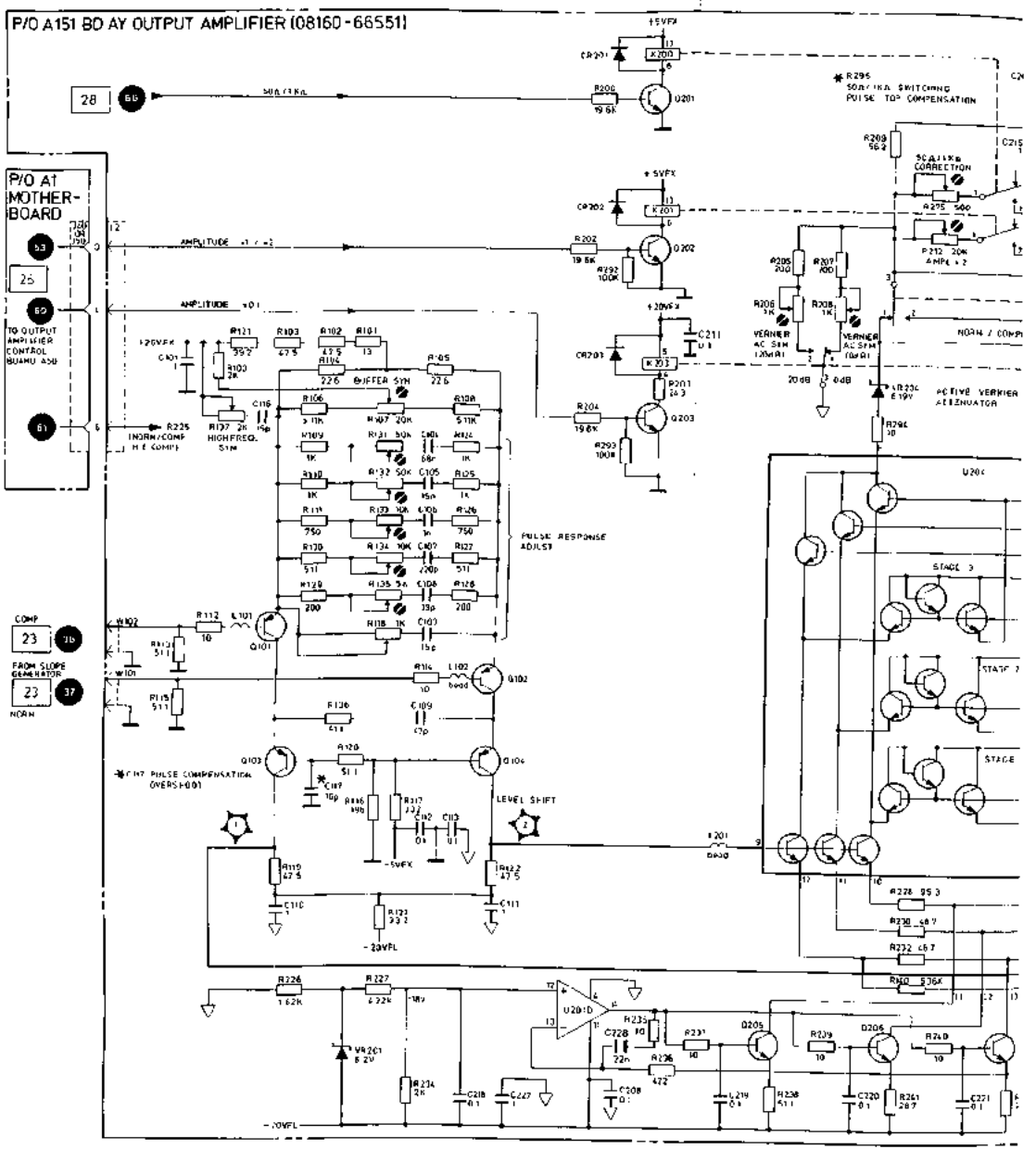
Although five different amplitude settings have the same Q209 collector voltage, the difference at the 8160A output is explained by the 'active vernier' and 'power amplifier' columns, e.g. for 4 V amplitude, stages 1 and 3 of the vernier are switched on, and the power amplifier is switched to x2.

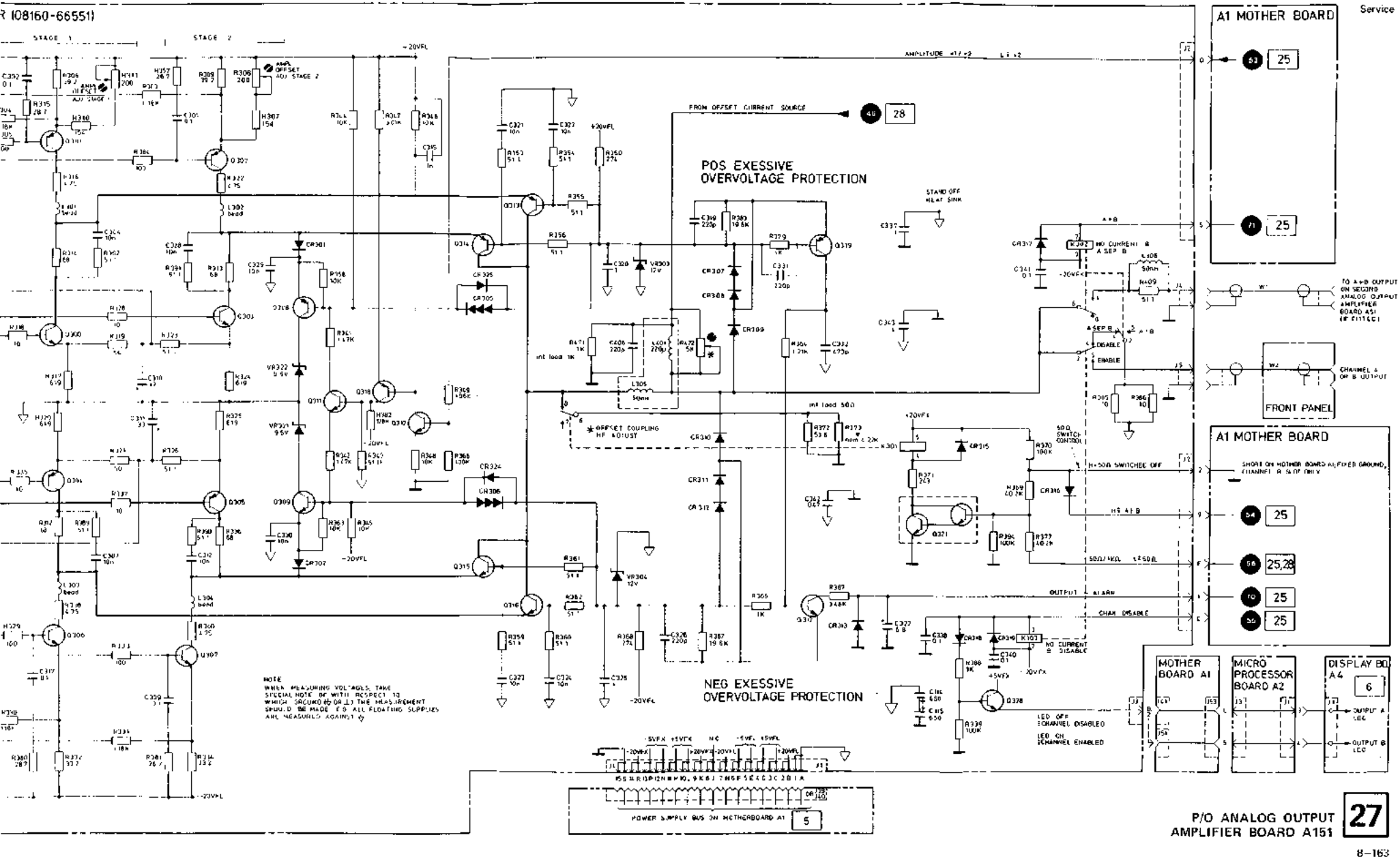


Output Amplifier A151
Fast test pictures are taken with a 100 MHz scope.
The levels are true for a sampling scope which should be used to measure width, transition or amplitude.

Waveform conditions:
8160A – press RCL 0
Scope – time base 0.2 µs/Div

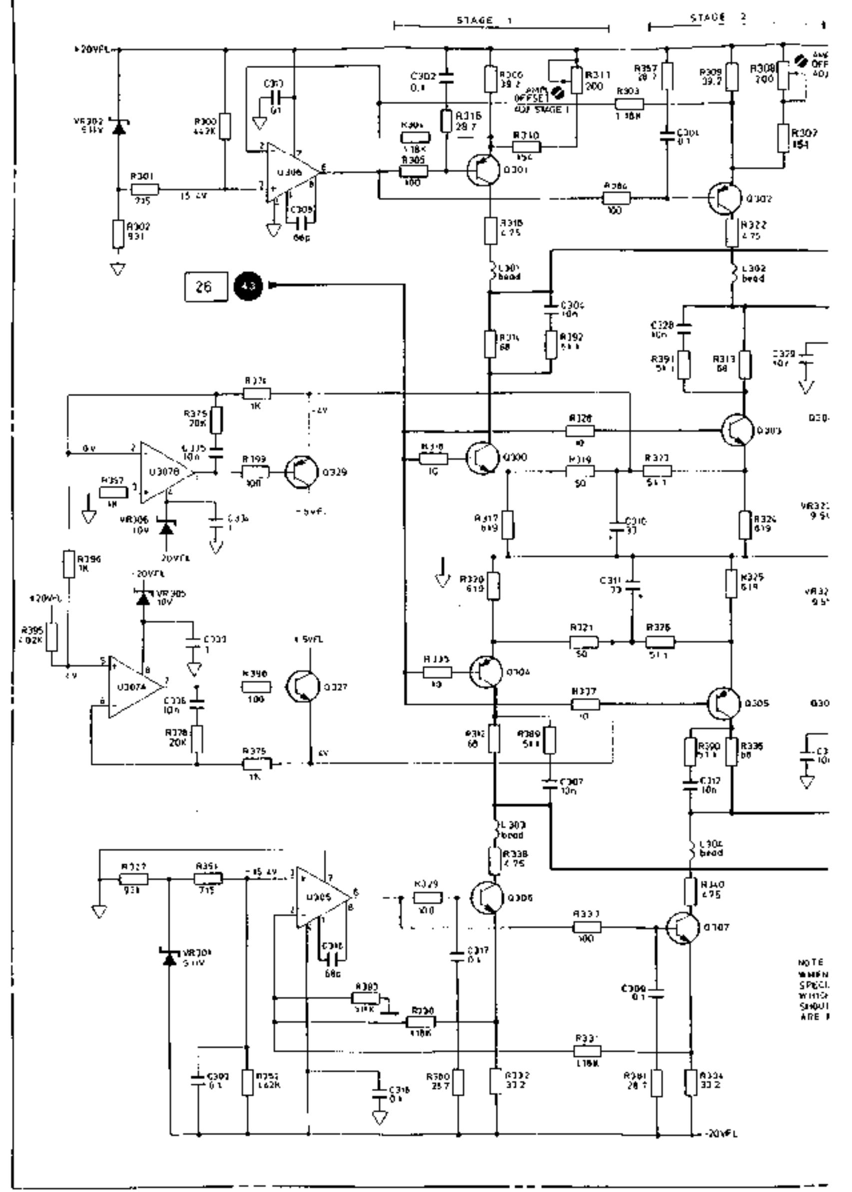

P/O A1 MOTHERBOARD
P/O ANALOG OUTPUT AMPLIFIER BOARD A151
26
8-161


P/O A151 BD AY OUTPUT AMPLIFIER (08160-66551)
P/O A1 MOTHER-BOARD
TO OUTPUT AMPLIFIER CONTROL BOARD A50
FROM SLOPE GENERATOR
NORM
COMP
AMPLITUDE ×1 / ×2
AMPLITUDE ×0.1
SCALING CORRECTION
PULSE RESPONSE ADJUST
LEVEL SHIFT
VERNIER AC SYM
VERNIER AC SYM
ACTIVE VERNIER ATTENUATOR
NORM / COMP
STAGE 3
+5VFX
-5VFX
-20VFL
+20VFX



P/O ANALOG OUTPUT AMPLIFIER BOARD A151 **27**

P/O A151 BD AY ANALOG OUTPUT AMPLIFIER (08160-66551)



SERVICE BLOCK 15
OFFSET CURRENT SOURCE A151 28

THEORY OF OPERATION

A functional diagram of the offset generator is given in Figure 8–15–1. Using the formula $\frac{HIL + LOL}{2 \times R_{OUT}}$ to determine the required offset current, the microprocessor transmits the digital information to a 10-bit D/A converter on A150. The output current of the D/A converter is then transformed to voltages V ref, V^+ ref, V^- ref, all referenced to floating ground.

V^+ ref and V^- ref control the output current sources which are relay-switched to obtain offset current x 1 (= 400 mA max.) and x 0.1 (= 40 mA max.).

Only one source can be switched on at any single point in time, this being determined by the microprocessor generated signals POS. OFFSET and NEG. OFFSET (see schematic 28).

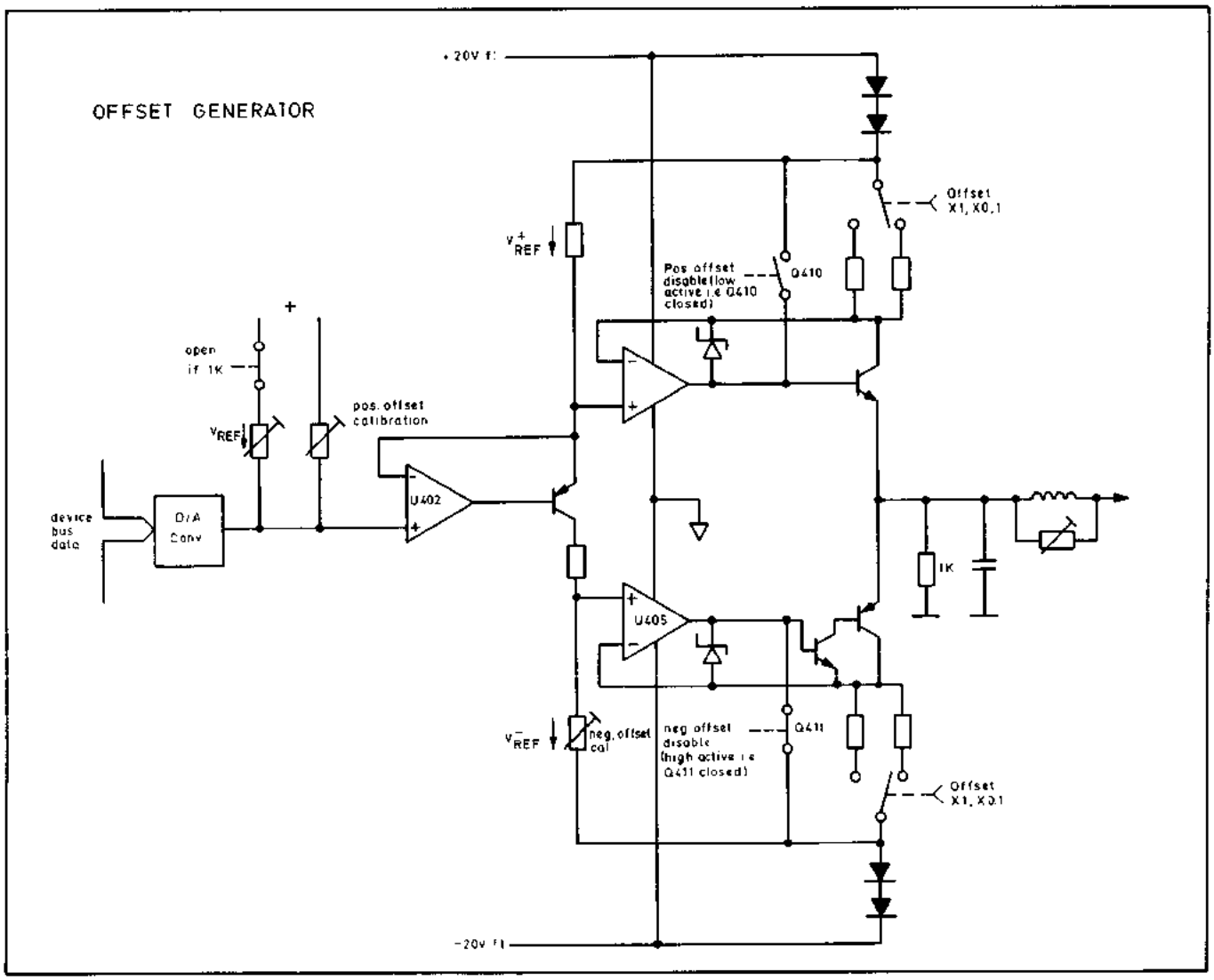


Figure 8–15–1. Offset Generator Functional Diagram

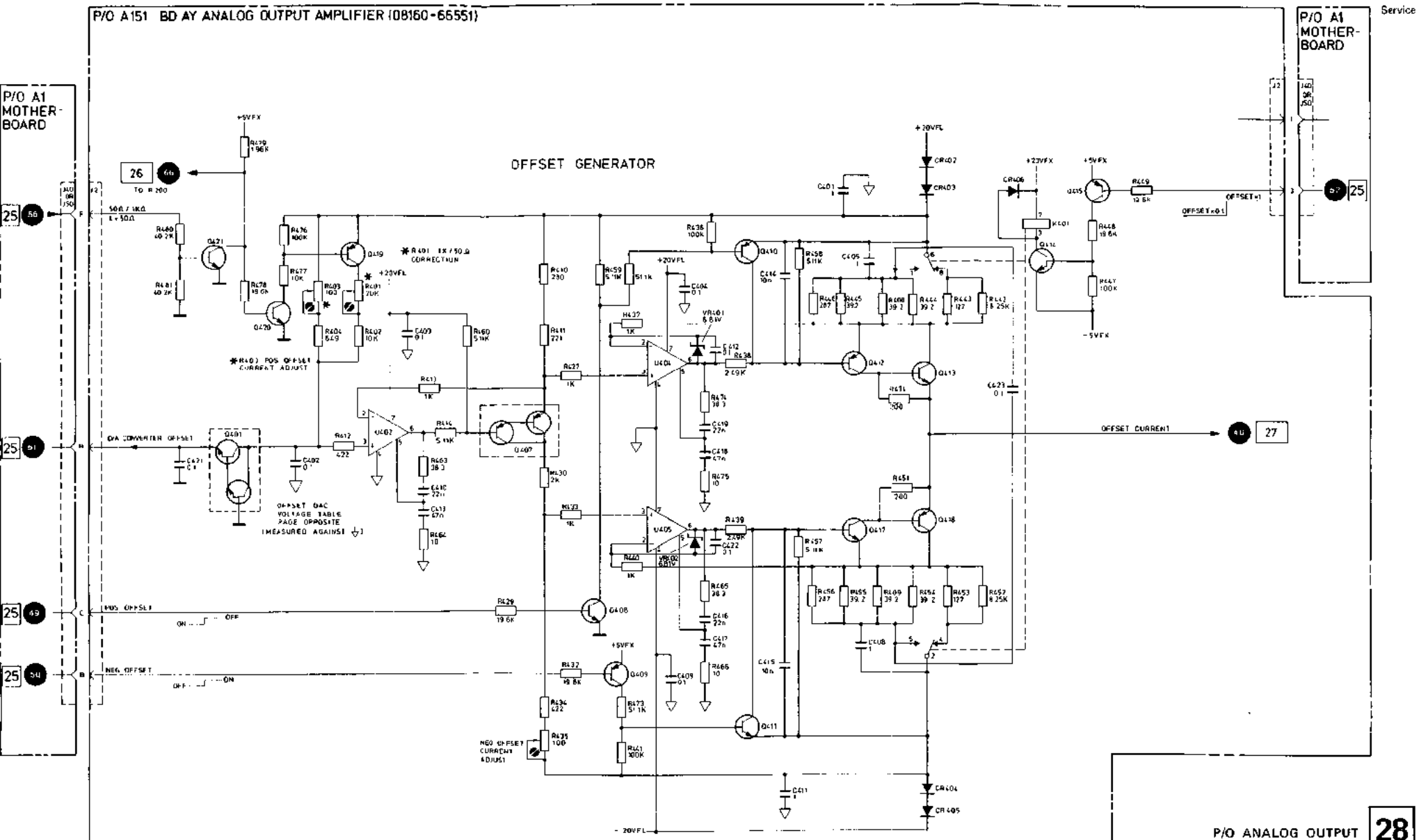
TROUBLESHOOTING

A prerequisite for measuring the offset generator output with a DVM is to set the 8160A period < 100 ns. This ensures that the ac signal (filtered by L401) from the output amplifier is low. Use the following table 8–15–1 to check offset voltages for different HIL/LOL settings.

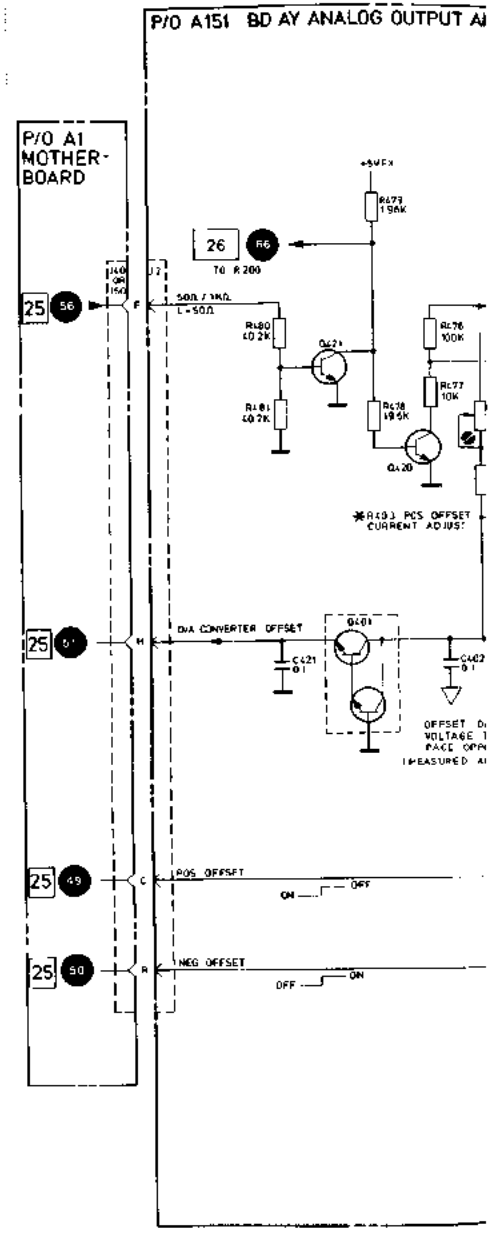
Table 8–15–1. Offset Voltages

			Measured against floating gnd.			Measured against fixed gnd
	HIL	LOL	Q401 coll.	U404 pin 3	U405 pin 3	Q413 emm. / Q418 emm.
50 Ω / 50 Ω	0.1 V	−0.1 V	18.7 V	18.7 V	−18.7 V	0 V
	1.00 V	1.00 V	18.7 V	18.7 V	−18.7 V	0.5 V
	1.99 V	0 V	13.4 V	13.4 V	−13.4 V	1.0 V
	2.00 V	0 V	18.0 V	18.0 V	−18.0 V	1.15 V
	4.00 V	0 V	17.4 V	17.4 V	−17.4 V	2.3 V
	6.00 V	0 V	16.9 V	16.9 V	−16.9 V	3.2 V
	8.00 V	0 V	16.4 V	16.4 V	−16.4 V	4.3 V
	9.99 V	0 V	15.8 V	15.8 V	−15.8 V	5.4 V
1 kΩ / 50 Ω	1.00 V	0 V	17.2 V	17.2 V	−17.2 V	0.5 V
	5.00 V	0 V	17.8 V	17.8 V	−17.8 V	2.6 V
	10.0 V	0 V	17.1 V	17.1 V	−17.1 V	5.2 V
	15.0 V	0 V	16.4 V	16.4 V	−16.4 V	7.4 V
	19.9 V	0 V	15.7 V	15.7 V	−15.7 V	10.0 V

P/O A151 BD AY ANALOG OUTPUT AMPLIFIER (08160-66551)



P/O ANALOG OUTPUT AMPLIFIER BOARD A151 **28**


P/O A151 BD AY ANALOG OUTPUT A
P/O A1 MOTHER-BOARD
25 56
25 49
25 50
26 R6
TO R200
R479 196K
R480 40.2K
R481 40.2K
Q421
R478 49.9K
R476 100K
R477 10K
Q420
*R483 POS OFFSET CURRENT ADJUST
D/A CONVERTER OFFSET
Q401
C421 0.1
C402 0.1
POS OFFSET
ON
OFF
NEG OFFSET
OFF
ON

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