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**OPERATING AND SERVICE MANUAL
DELAY GENERATOR/FREQUENCY DIVIDER
8092A**

**PART OF THE 8080 HIGH FREQUENCY
PULSE/WORD GENERATOR SYSTEM**

SERIAL NUMBERS

This manual applies directly to instrument serial number

2007G00306

For instruments with lower serial numbers, refer to the backdating information in Section 8 of this module manual.

For instruments with higher serial numbers, refer to the Manual Change sheets at the end of this module manual.

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CONTENTS

	Page		Page
Section 1	General Information	Section 5	Internal Tests and Adjustments
			5-1
1-1	Introduction	5-1	Introduction
	1-1		5-1
1-4	Specifications	5-3	Safety Considerations
	1-1		5-1
1-6	Safety Considerations	5-9	Test Equipment Required
	1-1		5-1
1-9	Instruments Covered By Manual	5-11	Alignment Tool
	1-1		5-1
1-11	Description	5-13	Performance Tests
	1-1		5-1
1-14	Options	5-15	Related Adjustments
	1-2		5-1
1-16	Equipment Required But Not Supplied	5-18	Initial Preparation
	1-2		5-1
1-18	Equipment Available		Basic Adjustment Procedure
	1-2		5-2
1-20	Recommended Test Equipment		Adjustment Procedure
	1-2		5-3
Section 2	Installation	Section 6	Replaceable Parts
	2-1		6-1
2-1	Introduction	6-1	Introduction
	2-1		6-1
2-3	Initial Inspection	6-3	Abbreviations
	2-1		6-1
2-5	Preparation For Use	6-5	Replaceable Parts
	2-1		6-1
2-6	Installation in 8080 Mainframe	6-8	Ordering Information
	2-1		6-1
2-8	Operating Environment		
	2-1		
2-10	Storage And Shipment		
	2-1		
Section 3	Operation	Section 7	Service
	3-1		7-1
3-1	Introduction	7-1	Introduction
	3-1		7-1
3-3	Front Panel Features	7-3	Recommended Test Equipment
	3-1		7-1
3-5	Operating Instructions		Troubleshooting
	3-1		7-1
Section 4	Performance Tests	Section 8	Backdating
	4-1		8-1
4-3	Equipment Required	8-1	Introduction
	4-1		8-1
4-5	Test Record	8-3	Change Sequence
	4-1		8-1
	Performance Test		
	4-2		

TABLES

Table	Page	Table	Page
1-1	Recommended Test Equipment	6-2	Replaceable Parts
	1-2		6-5
1-2	Specifications	7-1	Reference Designators
	1-3		7-1
6-1	Abbreviations for Replaceable Parts List	7-2	Schematic Diagram Symbols
	6-2		7-2

ILLUSTRATIONS

Figure		Page	Figure		Page
1-1	8092A Delay Generator/Frequency Divider Module and Supplied Accessories . .	1-0	3-1	8092A Controls and Indicators	3-0
1-2	Serial Number Plate	1-1	6-1	8092A Replaceable Parts	6-4

SCHEMATIC DIAGRAMS

Diagram		Diagram	
	8092A Block Diagram		
1	Control Board A1	4	Part of Digital Board A3 & Part of Control Board A1
2	Analog Board A2		
3	Part of Digital Board A3 & Part of Control Board A1	5	Mother Board A4

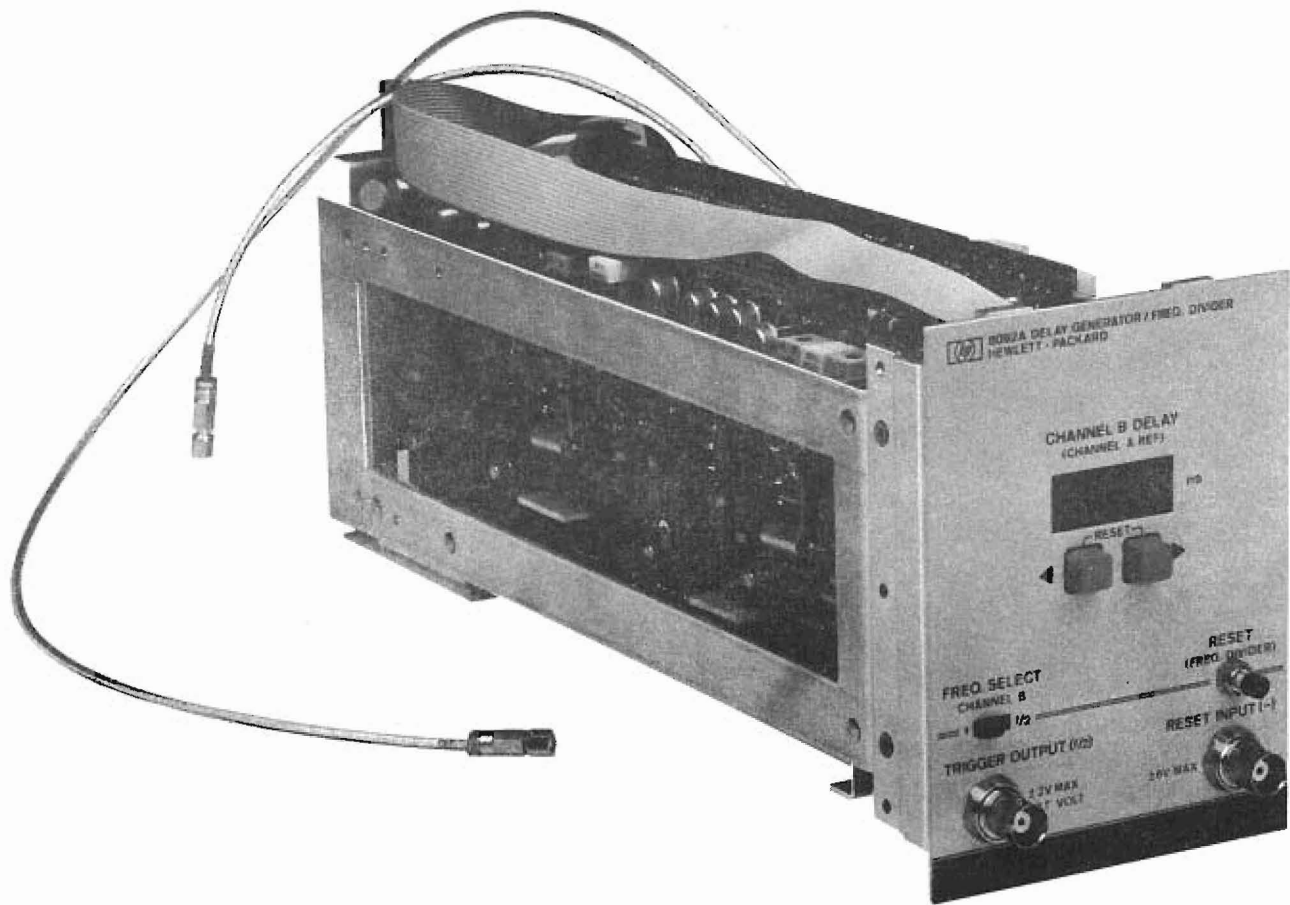


Figure 1-1. 8092A Delay Generator/Frequency Divider Module and Supplied Accessories

1-1 INTRODUCTION

1-2 This operating and Service manual contains information required to install, operate, test, adjust and service the Hewlett-Packard Model 8092A Delay Generator/Frequency Divider module.

Figure 1-1 shows the module and accessories supplied. This selection 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 microfiche contains up to 60 photo-duplicates 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 standard or limits against which the instrument is tested.

1-6 SAFETY CONSIDERATIONS

1-7 The Model 8092A is a Safety Class 1 instrument (it has an exposed metal chassis that is connected to earth via the 8080 system mainframe). This instrument has been designed according to international safety standards and has been supplied in a safe condition.

1-8 This operating and service manual contains information, cautions and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

1-9 INSTRUMENTS COVERED BY MANUAL

1-10 Attached to the inside of the instrument side frame is a serial number plate (figure 1-2). 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 8 of this module manual. For instruments with higher serial numbers, refer to the Manual Change sheets at the end of this module 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 module manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.



Figure 1-2. Serial Number Plate

1-11 DESCRIPTION

1-12 The Model 8092A is a Delay Generator/Frequency Divider module for the 8080 system. It has two output channels (A and B) which can be delayed or advanced with respect to each other in 100 ps increments up to ± 9.9 ns. In addition, the repetition rate of the channel B output can be halved with respect to channel A. Thus, for example, channel A can be used as a clock and channel B as a data channel for testing setup and hold times of high speed flip-flops and other clocked devices.

1-13 The input and both outputs of the 8092A are connected internally to other 8080 system modules. The 8080A Mainframe provides all the necessary power supplies for the 8092A.

1-14 OPTIONS

1-15 The only option for the Model 8092A is a second copy of the operating and service manual which can be obtained by ordering option 910. See HP publication no. 5952-9545 for details on optional factory-systemized configurations.

1-16 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-17 To operate the Model 8092A module, an 8080A Mainframe is required. The 8080A provides housing and power supplies for the 8092A. A rep. rate source is also required. The clock input specifications are given in Table 1-2.

1-18 EQUIPMENT AVAILABLE

1-19 The 8092A is one of a complete range of rep. rate, timing and output modules that form the 8080 high frequency pulse/word generator system. Modules are available for either 300 MHz or 1 GHz operation and include facilities for word generation and multichannel operation in addition to the capabilities of the 8092A. The modules are interchangeable to enable you to purchase a system exactly tailored to your requirements.

1-20 RECOMMENDED TEST EQUIPMENT

1-21 Equipment required to maintain the 8092A is listed in table 1-1. Other equipment can be substituted if it meets or exceeds the critical specifications listed in the table.

A = Adjustment Procedure
P = Performance Test
T = Troubleshooting

Table 1-1. Recommended Test Equipment

Instrument Type	Recommended Model	Required Characteristics	Required for
Mainframe	8080A		A P T
1 GHz Rate Gen. Module	8091A		A P T
Pulse Generator	8082A	Risetime Ins. positive and negative output selectable	A P T
Oscilloscope Mainframe	180C/182C		A T
Vertical Plug-In	1801A	Good Pulse Performance (min overshoot)	A T
Time Base Plug-In	1821A		A T
10:1 Probe	10004D		A T
2xFeedthrough Termination	10100C	50 Ω	A P T
Sampling Oscilloscope with Accessories		4 GHz Bandwidth	A P T
BNC Cable Assembly	10501A (2x)	50 Ω coax. 112 cm	A P T
BNC Cable Assembly	10502 A (1x)	50 Ω coax. 23 cm	A P T
6 dB Attenuator	8491 Opt. 006		A P T
SMC to BNC adaptor	1250-0831 (2x)		A P T
BNC (f) to BNC (f) adaptor	1250-0080 (2x)		A P T

Table 1-2. Specifications

Information about internal inputs and outputs, and further information useful when devising configurations are contained in the 8080A Systemizing Guide, HP Publication 5952-9546.

Specifications describe the module's warranted performance over the temperature range from 0°C to 55°C. Specifications and supplemental characteristics apply with a load and source of 50 ohms or a single 8080A Series module.

Supplemental characteristics provide information useful in applying the instrument by giving typical or nominal, but non-warranted, performance parameters.

8092A DELAY GENERATOR

Specifications

OPERATING MODES

f-Mode: The Drive Signal is split into two channels. The interchannel delay is variable and is displayed digitally.

f/2-Mode: Channel B frequency is halved so that the output represents a NRZ data stream of alternate 0's and 1's. (Channel A frequency is unchanged and thus provides an appropriate clock signal). Full interchannel delay capability is retained.

Variable Width: Can be used as variable width generator with 8093A H01.

TIMING

Frequency: dc to 1 GHz

Delay (relative to Channel A)

Range: 0.0 to 9.9 ns (Channel B delayed),
-0.0 to -9.9 ns (Channel B advanced).

Resolution: 100 ps

Step accuracy: $\pm 2\% \pm 80$ ps (f-mode, 15-55°C),
 $\pm 2\% \pm 180$ ps (f-mode, 0-15°C),
 $\pm 2\% \pm 150$ ps (f/2-mode, 15-55°C),
 $\pm 2\% \pm 250$ ps (f/2-mode, 0-15°C).

Change-over error (difference between 0.0 ns and -0.0 ns settings):

≤ 60 ps (15-55°C),
 ≤ 80 ps (0-15°C).

OUTPUT AMPLITUDE: ≥ 500 mVpp.

Supplemental Characteristics

TIMING

Fixed Delay Error (actual delay at 0.0 ns/-0.0 ns settings):
 ≤ 50 ps. Can be compensated by adjusting relative lengths of cables to the device.

Output Width: Input width ± 300 ps.

Variable Width (Variable width operation with Output Amplifier 8093A H01) measured at Amplifier Output:

Min Width: 0.5 ns

Useable range (positive 8092A display settings):

f < 100 MHz: 0.5 ns to 40 % of period (max. 9.9 ns),
100 MHz-250 MHz: 0.5 ns to 1.5 ns,
250 MHz-500 MHz: 0.5 ns to 0.7 ns,
500 MHz-1 GHz: 0.5 ns fixed.

Note: Width indication is approximate. Some pulse degradation may occur at a setting in the range 0.7 to 1.4 ns.

RESET INPUT

For use in f/2-Mode so that, when Rate Generator module is in Ext Gate mode, Channel B returns to low level on the trailing edge of the Rate Generator module's Ext Input signal. This ensures a defined start to each gated burst.

Min Amplitude: 500 mVpp.

Threshold: -300 mV, fixed.

Max Levels: ± 6 V.

Leading Edge: Negative edge resets Channel B to low level (f/2-Mode, low 8092A Drive Input).

Max Transition Time: 10 ns.

Min Off Time between negative and positive edge: 20 ns.

Min On Time between positive and negative edge: 0.5 μ s.

Input Impedance: 1 kohm

Manual Reset: Push button resets Channel B to low level when 8092A Drive Input is low, independent of Reset Input.

f/2 TRIGGER OUTPUT

Amplitude: ≥ 500 mVpp.

High Level: More positive than -100 mV.

Low Level: More negative than -500 mV.

Max External Levels: ± 2 V.

Leading Edge: Negative.

Transition Time: ≤ 10 ns.

Timing: Leads Channel B output by 3.8 ns (applies to 8093A Output in factory-systemized configurations).

Output Impedance: 50 ohm.

Max Load: One 8080A module.

General

ENVIRONMENTAL: As 8080A Mainframe.

WEIGHT:

Net 1 kg (2.2 lbs)

Shipping 1.5 kg (3.2 lbs)

DIMENSIONS: 1/4 mainframe.

ACCESSORIES DELIVERED:

SMC (f)/SMC (f) Cable (Ch A) 63 cm 08092-61640

SMC (f)/SMC (f) Cable (Ch B) 28 cm 08092-61641

Manual 08092-90002

2-1 INTRODUCTION

2-2 This section provides installation instructions for the Model 8092A Delay Generator/Frequency Divider module. 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. Procedures for checking the electrical operation are given in Section 3. If the contents are incomplete, if there is mechanical damage or defect, or if the 8092A does not pass the operator's checks, notify the nearest Hewlett-Packard Sales/Service office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5 PREPARATION FOR USE

2-6 Installation in 8080A Mainframe

CAUTION

The following installation procedure must only be carried out by qualified service personnel.

2-7 To operate the 8092A, it must first be installed in an 8080A Mainframe as follows:

1. Switch the mainframe LINE OFF/ON switch to OFF. Disconnect the power supply cable from the rear of the 8080A mainframe.

2. Remove the upper two feet from the rear of the 8080A mainframe.

3. Remove the 8080A mainframe top cover.

4. Remove the 8080A mainframe top bracket that holds the pc boards in position.

5. Insert the 8092A in the required position in the 8080A mainframe (there are no electrical limitations on the position).

6. Secure the 8092A to the 8080A mainframe using the two screws provided.

7. Connect the internal coaxial cable from the 8092A to the rep. rate source, word generator, output amplifier modules or to remote equipment as required. Connections are Clock Input and Channel A and B Outputs. Connecting cables for the Channel A and B Outputs are provided.

8. Replace the 8080A mainframe top bracket.

9. Replace the 8080A mainframe top cover.

10. Replace the two feet on the rear of the 8080A mainframe.

11. The trigger level of the modules to which the 8092A outputs are connected must now be checked and, if necessary, adjusted.

2-8 Operating Environment

2-9 The 8092A will operate within specifications when the ambient temperature is between 0°C (32°F) and 55°C (131°F).

2-10 Storage and Shipment.

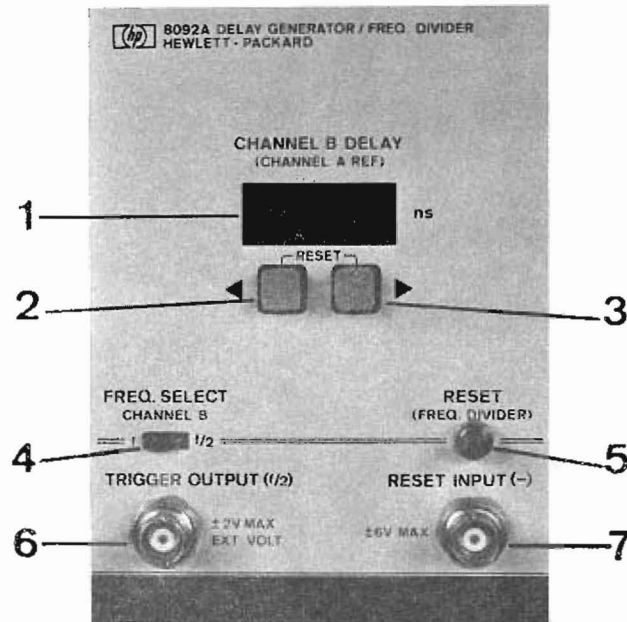
2-11 The 8092A can be stored or shipped at temperatures between -40°C (-40°F) and 75°C (167°F). The instrument should be protected from temperature extremes which cause condensation within the instrument.

2-12 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 original packing is not available or re-usable. General instructions for repacking 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 full serial number.



- ① Delay/Advance Indicator: indicates the time by which channel B is delayed (+9.9 ns max.) or advanced (-9.9 ns max.) with respect to channel A. 7-segment numerical LEDs are used for the display.
- ② Advance pushbutton: when this button is pressed, channel B is advanced on channel A in 0.1 ns steps. If the button is held down, the rate of advance increases after the first 0.1 ns step to enable large advance periods to be stepped through quickly if required.
- ③ Delay pushbutton: when this button is pressed, channel B is delayed on channel A in 0.1 ns steps. If the button is held down, the rate of delay increases after the first 0.1 ns step to enable large delay periods to be stepped through quickly if required.

If both the Advance and Delay pushbuttons are pressed at the same time, the advance/delay is immediately reset to zero.

Note: output data invalid during switching.

- ④ FREQ. SELECT switch: Selects channel B frequency as either the same as channel A (f) or f channel A.
2
- ⑤ RESET (FREQ. DIVIDER) pushbutton. Pressing this pushbutton resets channel B to low (only in $f/2$ mode with low drive input). Independent of RESET input.
- ⑥ $f/2$ TRIGGER OUTPUT connector. BNC connector for $f/2$ trigger output signal (opposite phase to channel B).
- ⑦ RESET (-) connector. BNC connector for use in $f/2$ mode. Applying a negative-going signal resets channel B to low when the drive input is low.

Figure 3-1. 8092A Controls and Indicators

3-1 INTRODUCTION

3-2 This operating section explains the function of the controls and indicators of the 8092A Delay

Generator/Frequency Divider module.

3-3 Frontpanel Features

3-5 Frontpanel controls, indicators and connectors are shown in Figure 3-1. Description numbers match the numbers on the photograph.

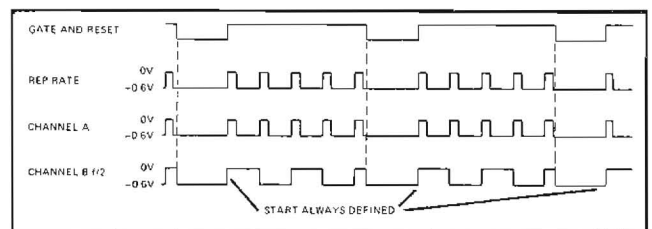
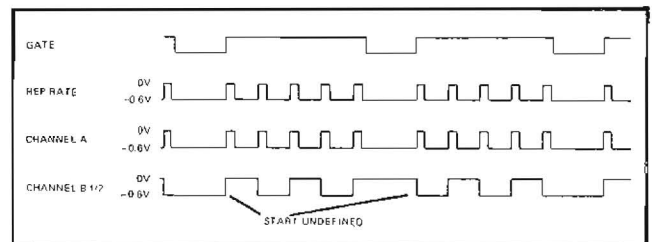
3-5 Operating Instructions

3-6 The 8092A has basically two operating modes:

- f-mode
- f/2-mode

In f-mode, the drive signal from the repetition rate generator is split into two channels, channel A and channel B. Channel B can then be delayed/advanced with respect to channel A using the frontpanel delay pushbuttons ② and ③. The selected delay/advance is displayed digitally at ①.

3-7 In f/2 mode, channel B frequency is halved so that the output represents an NRZ datastream of alternate 0's and 1's. Channel A frequency is unchanged, and the complement signal of channel B is routed to the f/2 TRIGGER OUTPUT connector. Also available in f/2-mode is a reset facility to ensure a defined start state (low) in the gated burst mode of the repetition rate generator. Resetting is accomplished either by pressing the RESET pushbutton ⑤, or applying a negative-going edge to the RESET (-) connector. The following timing diagrams illustrate the different outputs (for an odd number of drive pulses from the repetition rate generator) with and without use of the reset facility.



4-1 INTRODUCTION

4-2 The procedures in this section test the instrument's electrical performance using the specifications of Table 1-2 as the 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 the Recommended Test Equipment table in

section 1. Any equipment that satisfies the critical specifications given in the table can be substituted for the recommended model.

4-5 TEST RECORD

4-6 The results of the performance can be tabulated on the Test Record at the end of the 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 troubleshooting and after repairs or adjustments.

PERFORMANCE TEST

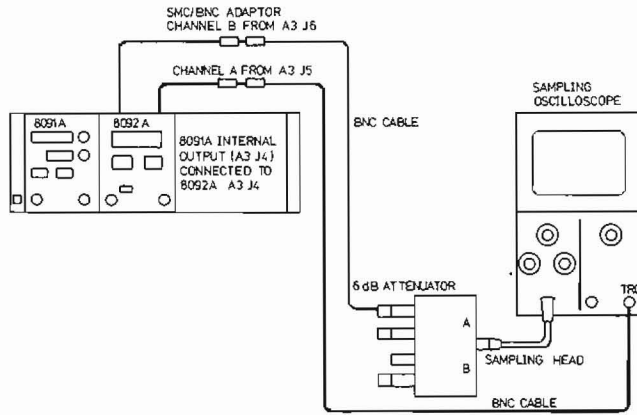


Figure 4-1

EQUIPMENT:

- 8080A Mainframe
- 8091A Rate Module
- Pulse Generator
- Sampling Oscilloscope with Adaptors, Sampling Head and Terminations
- Two BNC cables
- Two SMC to BNC adaptors
- Two BNC (f) to BNC (f) adaptors
- One 6 dB attenuator

SETTINGS:

8091A

Mode Switch NORM
 RATE Range 1GHz - 300MHz
 RATE VERNIER CCW

OSCILLOSCOPE

Channel A
 Vertical sensitivity 100mV / DIV
 Trigger NORMAL
 Timebase Setting DIRECT 10ns/DIV
 EXPANDED 1ns/DIV

DISPLAY NORM/FILTERED NORMAL
 TIMEBASE EXPANDED

8092A

FREQ. SELECT f

2. Check amplitude for 500 mVpp when stepping through all delay ranges (-9.9ns to + 9.9ns).
3. Set 8091A CHANNEL B DEL to -0.0ns and RATE range to 10MHz-1MHz.
4. Position the leading edge of the pulse exactly on the right vertical graticule line, and check following advance settings for specifications ($\pm 2\% \pm 100ps$).

- 0.0ns Reference	0.0ns Reference
- 1.0ns	1.0ns
- 2.0ns	2.0ns
- 3.0ns	3.0ns
- 4.0ns	4.0ns
- 5.0ns	5.0ns
- 6.0ns	6.0ns
- 7.0ns	7.0ns
- 8.0ns	8.0ns
- 9.0ns	9.0ns
- 9.9ns	9.9ns
5. Check delay settings referenced to 0.0ns for specifications as listed above.
6. Set oscilloscope to 0.2ns / DIV, set reference at delay -0.0 and check advance steps to -2.0ns for $\pm 2\% \pm 100ps$.
7. Set reference at 0.0ns and check delay steps to 2.0ns for $\pm 2\% \pm 100ps$.
8. Remove CHA.A cable from oscilloscope trigger input and trigger oscilloscope with trigger output signal from 8091A.
9. Ensure that time difference (polarity change delay) is less than 50ps when switching the 8092A delay from -0.0ns to +0.0ns.

1. Position baseline on scope 1.5 divisions (+ 300mV) above center graticule without input signal and connect equipment as shown in Figure 4-1.

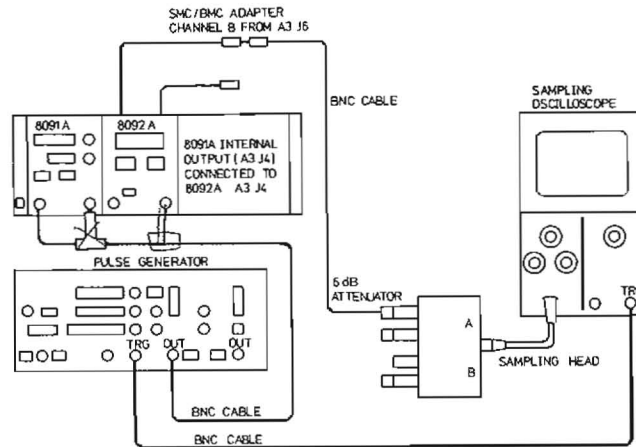


Figure 4-2.

EQUIPMENT:

- 8080A Mainframe
- 8091A Rate Module
- Pulse Generator
- Sampling Oscilloscope with Sampling Head, Adaptors and Terminations
- Three BNC to BNC cables
- One BNC cable
- One BNC TEE
- One SMC to BNC Adaptor
- One BNC (f) to BNC (f) Adaptor
- One 6 dB Attenuator

SETTINGS:

- 8091A
- Rate Range 100MHz - 10MHz
- Rate Vernier CW
- Mode Switch EXT. GATE
- Slope POS.

PULSE GENERATOR

- Period 1µs
- Pulse Width SQUAREWAVE
- Mode NORMAL
- Transition Time min.
- Amplitude - 600mV
- Output NEG
- Offset OFF.

SAMPLING OSCILLOSCOPE

- Sensitivity 100mV/DIV
- Time Base .2ns/DIV

8092A

- FREQ. SELECT f/2

Reset Input test.

1. Connect equipment as shown in Figure 4-2 and adjust 8091A TRIGGER LEVEL vernier to get a gated output signal.
2. Turn the 8091A RATE VERNIER slowly CCW and check that the level always goes low after the gate time and a new gated signal starts from low level. (If 8092A reset input is not connected, the level between gated signals may jump from high to low when varying the frequency).

Manual Test.

3. Remove cable from 8092A reset input and set 8091A MODE switch to EXT. WIDTH (TRIG) and SLOPE switch to MAN.
4. Press 8091A MAN pushbutton so that the baseline on scope jumps to high level.
5. When pressing the 8092A RESET pushbutton, the 8092A output level must be reset to low level.

CHANNEL A and TRIGGER OUTPUT amplitude test.

6. Set 8091A back to EXT. GATE and POS slope and check channel A output amplitude for 500mVpp.
7. With the 8092A FREQ. SELECT switch in f/2 position, check TRIGGER OUTPUT amplitude for .500 mVpp, high level more positive than -100 mV, and low level more negative than - 500 mV.

8092A PERFORMANCE TEST RECORD

	Test Description	Result	
		Specification	Actual
	Amplitude > 500 mVpp in all delay ranges	> 500 mVpp	
	Advance Accuracy ns steps referenced to		
	- 0.0 ns		
	- 1.0 ns	- .88 ns to -1.12 ns	
	- 2.0 ns	-1.86 ns to -2.14 ns	
	- 3.0 ns	-2.84 ns to -3.16 ns	
	- 4.0 ns	-3.82 ns to -4.18 ns	
	- 5.0 ns	-4.8 ns to -5.2 ns	
	- 6.0 ns	-5.78 ns to -6.22 ns	
	- 7.0 ns	-6.76 ns to -7.24 ns	
	- 8.0 ns	-7.74 ns to -8.26 ns	
	- 9.0 ns	-8.72 ns to -9.28 ns	
	Delay Accuracy ns steps referenced to		
	0.0 ns		
	1.0 ns	.88 ns to 1.12 ns	
	2.0 ns	1.86 ns to 2.14 ns	
	3.0 ns	2.84 ns to 3.16 ns	
	5.0 ns	4.8 ns to 5.2 ns	
	6.0 ns	5.78 ns to 6.22 ns	
	7.0 ns	6.76 ns to 7.24 ns	
	8.0 ns	7.74 ns to 8.26 ns	
	9.0 ns	8.72 ns to 9.28 ns	
	Advance Accuracy 100 ps steps referenced to		
	- 0.0 ns	0.0 ns to - .2 ns	
	- 0.1 ns	- .1 ns to - .3 ns	
	- 0.2 ns	- .19 ns to - .41 ns	
	- 0.3 ns	- .29 ns to - .51 ns	
	- 0.4 ns	- .39 ns to - .61 ns	
	- 0.5 ns	- .49 ns to - .71 ns	
	- 0.6 ns	- .59 ns to - .81 ns	
	- 0.7 ns	- .68 ns to - .92 ns	
	- 0.8 ns	- .78 ns to -1.02 ns	
	- 0.9 ns	- .88 ns to -1.12 ns	
	- 1.0 ns	- .98 ns to -1.22 ns	
	- 1.1 ns	-1.08 ns to -1.32 ns	
	- 1.2 ns	-1.17 ns to -1.43 ns	
	- 1.3 ns	-1.27 ns to -1.54 ns	
	- 1.4 ns	-1.37 ns to -1.63 ns	
	- 1.5 ns	-1.47 ns to -1.73 ns	
	- 1.6 ns	-1.57 ns to -1.83 ns	
	- 1.7 ns	-1.66 ns to -1.94 ns	
	- 1.8 ns	-1.76 ns to -2.04 ns	
	- 1.9 ns	-1.86 ns to -2.14 ns	
	- 2.0 ns		

8092A PERFORMANCE TEST RECORD

	Test Description	Result	
		Specification	Actual
	Delay Accuracy 100 ps steps referenced to		
	0.0 ns	0.0 ns to .2 ns	
	0.1 ns	.1 ns to .3 ns	
	0.2 ns	.19 ns to .41 ns	
	0.3 ns	.29 ns to .51 ns	
	0.4 ns	.39 ns to .61 ns	
	0.5 ns	.49 ns to .71 ns	
	0.6 ns	.59 ns to .81 ns	
	0.7 ns	.68 ns to .92 ns	
	0.8 ns	.78 ns to 1.02 ns	
	0.9 ns	.88 ns to 1.12 ns	
	1.0 ns	.98 ns to 1.22 ns	
	1.1 ns	1.08 ns to 1.32 ns	
	1.2 ns	1.17 ns to 1.43 ns	
	1.3 ns	1.27 ns to 1.53 ns	
	1.4 ns	1.37 ns to 1.63 ns	
	1.5 ns	1.47 ns to 1.73 ns	
	1.6 ns	1.57 ns to 1.83 ns	
	1.7 ns	1.66 ns to 1.94 ns	
	1.8 ns	1.76 ns to 2.04 ns	
	1.9 ns	1.86 ns to 2.14 ns	
	2.0 ns		
	Polarity Change Delay between -0.0 ns and 0.0 ns	≤ 50 ps	
	Reset Input function		
	MAN Reset function		
	Channel A output amplitude	> 500 mVpp	
	Trigger Output amplitude (f/2)	> 500 mVpp	

INTERNAL TESTS AND ADJUSTMENTS

5-1 INTRODUCTION

5-2 This section describes adjustments required to return the Model 8092A Delay Generator to peak operating condition. Included in this section are test setups, tests and adjustment. Removal and replacement procedures are given in the Disassembly/Assembly procedure in section 7. An adjustment locator diagram is included in this section.

5-3 SAFETY CONSIDERATIONS

5-4 Although this instrument has been designed in accordance with international safety standards, this manual contains information and warnings which must be followed to ensure safe operation and to retain the instrument in a safe condition (see Sections 2 and 3). Service and adjustments should be performed only by qualified service personnel.

WARNING

Any interruption of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.

5-5 Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved. The opening of covers or removal of parts, except those to which access can be gained by hand, may expose live parts, and also accessible terminals may be live.

5-6 Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

5-7 Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc) are used for replacement. The use of

repaired fuses and the short-circuiting of fuseholders must be avoided.

5-8 Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

5-9 TEST EQUIPMENT REQUIRED

5-10 Table 1-1 contains a list of test equipment and test accessories required in the adjustment procedures. In addition, the tables contain the required minimum specifications and a suggested manufacturer's model number.

5-11 ALIGNMENT TOOL

5-12 A non-metallic alignment tool must be used when making any adjustments to the Model 8092A.

5-13 PERFORMANCE TESTS

5-14 After making the adjustments, carry out the Performance Tests in Section 4.

5-15 RELATED ADJUSTMENTS

5-16 The following adjustments must be performed in the order indicated in the procedures. The adjustments cannot be performed individually because of interaction.

5-17 After making the adjustments, the following related adjustments should be checked. If the Model 8092A output is connected to an output amplifier, the output amplifier duty cycle must be checked and, if necessary adjusted.

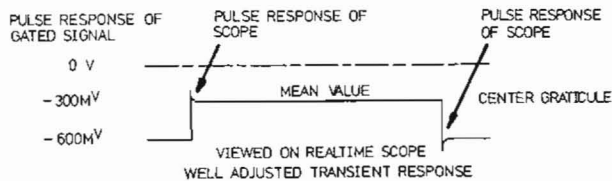
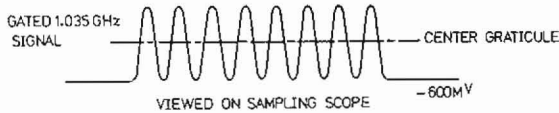
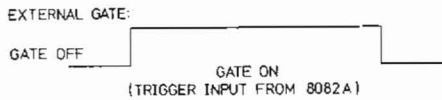
5-18 INITIAL PREPARATION

5-19 A working knowledge of amplifier calibration and measurement techniques, and the ability to interpret an output signal

displayed on an oscilloscope, are pre-requisites for carrying out adjustment procedures to obtain optimum performance.

In order to measure the amplifier output, the signal has to be displayed on an oscilloscope. The low-pass characteristics of the oscilloscope are then used to show the mean-value of the gated GHz signal which is in direct proportion to its duty cycle. The most significant characteristic displayed on the oscilloscope is the "transient response" of the 1 GHz gated signal with respect to the duty cycle variations of the input gate signal.

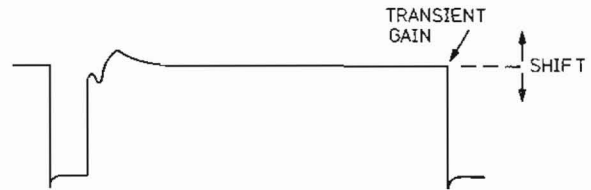
The diagrams below illustrate the areas of influence of the the various potentiometers that have to be adjusted for optimum amplifier response.



Basic Adjustment Procedure

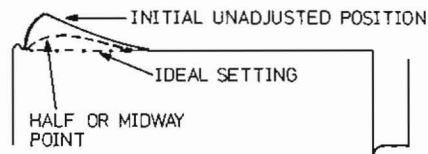
Step 1.

Increase or decrease the transient GAIN of the amplifier so that the 10% to 90% variation of the input gate signal duty cycle does not cause the high level of the waveform to shift in either direction. See diagram below.



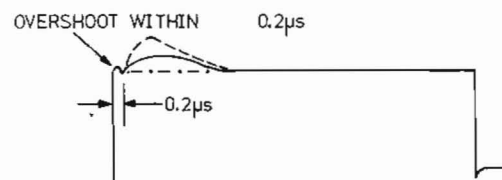
Step 2.

Increase or decrease the transient OFFSET so that the overshoot (or undershoot) is decreased to half of its initial value. That is to say, decrease the overshoot to a point midway between the initial, unadjusted position and the ideal setting as illustrated below.



Step 3.

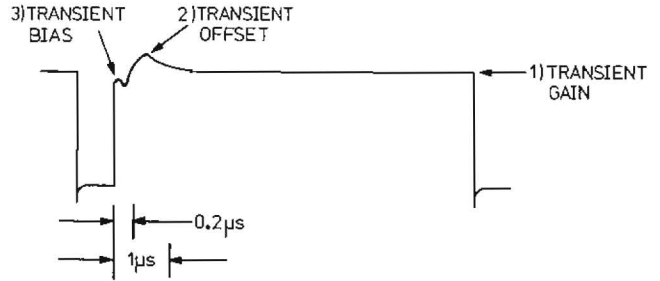
Increase or decrease the transient BIAS so that the overshoot, within the first 2 μs of the waveform, is decreased to obtain as flat a pulse response as possible.



The criteria for optimizing the amplifier transient response is based on a sequential adjustment of three parameters:

- 1) Transient GAIN
- 2) Transient OFFSET
- 3) Transient BIAS

The following diagram illustrates the effect that each adjustment has upon the waveform. At this point, it must also be noted that transient OFFSET and transient BIAS adjustments are interactive with the transient GAIN. It must be remembered, therefore, that the transient gain has to be re-adjusted after each adjustment sequence.



Step 4.

Due to the fact that transient OFFSET and BIAS adjustments are interactive with the transient GAIN, repeat step 1 and, if necessary, the whole sequence until optimum flatness and minimum high level shift is obtained.

ADJUSTMENT PROCEDURE

**INPUT AMPLIFIER (A3U1)
LINEAR AMPLIFIER ADJUSTMENT**

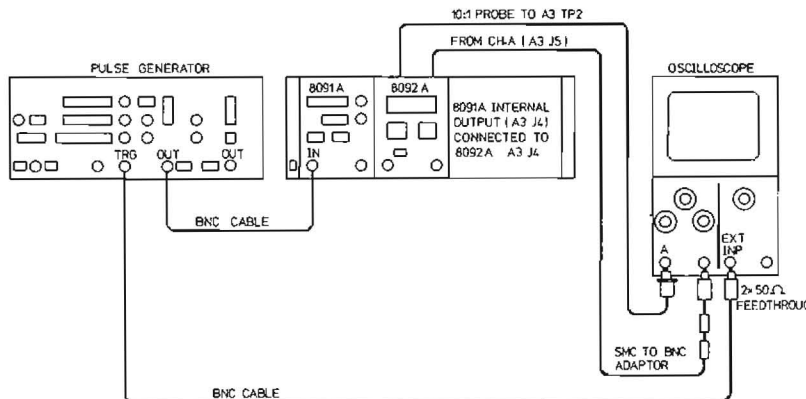


Figure 5-1. Amplifier Adjustment Setup

EQUIPMENT:

- 8080A Mainframe
- 8091A Rate Module
- Pulse generator
- Realtime oscilloscope
- 10:1 divider probe
- Two BNC cables
- Two 50 Ohm feedthroughs
- SMC to BNC adaptor

Pulse generator

- Repetition rate 50 ms
- Width 25 ms
- Delay Minimum
- Transition time Minimum
- Amplitude 600 mV into 50 Ohms
- Offset Off
- Polarity POS

Oscilloscope

- Chan. A selected DC
- Vertical sensitivity CHA 10 mV/div;
CHB 100 mV/div
- Time base 5 ms/div
- Trigger EXT.

SETTINGS:

8091A Rate module

- Mode switch EXT. WIDTH (TRIG)
- RATE range 1 GHz - 300 MHz
- Rate VERNIER CCW
- SLOPE NEG

8092A

- CHANNEL B DELAY (+) 0.0 ns
- FREQ SELECT f

INPUT AMPLIFIER (A3U1) ADJUSTMENT

PROCEDURE

1. Connect the test equipment as shown in Figure 5-1 and adjust the 8091A TRIGGER LEVEL VERNIER to obtain the gate signal at A3TP2 (8092A).
2. Connect the 10:1 probe to A3TP1 and adjust A3R16 for max. amplitude (600mV).
3. Set the oscilloscope so that the signal is symmetrical about the center graticule.
4. Switch the 8091A to EXT. GATE mode and set the signal low level onto the center graticule via A3R16.
5. While varying the duty cycle of the gate signal between 10% and 90%, observe and reduce the low level shift at the end of the displayed pulse to a minimum by means of A3R1.
6. Set the waveform low level onto the center graticule by means of A3R16.
7. With a duty cycle of 90%, decrease the over- or undershoot to half of its initial, unadjusted value by means of A3R8 and A3R73.
8. Vary the duty cycle between 10% and 90% and adjust A3R1 for minimum shift.
9. Set the waveform high level onto the center graticule by means of A3R16.
10. Repeat steps 7 to 9 until optimum flatness and minimum low level shift is maintained when the duty cycle is varied between 10% and 90%.
11. Disconnect the 10:1 divider probe, select CH. B on scope, and set 8091A back to EXT. WIDTH (TRIG).

LINEAR AMPLIFIER (A3Q5/Q6) ADJUSTMENT

12. Set the oscilloscope input to GND, adjust baseline to 3 divisions (300 mV) above the center graticule and then select DC mode.
13. Adjust the transient offset potentiometer A3R40 so that the signal is symmetrical about the center graticule.
14. Reduce the pulse-top tilt to a minimum by means of the transient gain potentiometer A3R37.
15. Ensure that the signal is symmetrical about the center graticule and, if necessary, repeat steps 13 and 14.
16. Set the 8091A mode switch to EXT GATE.
17. Observe the displayed waveform and ensure that the pulse-top tilt is at a mini-

mum and the signal high level is at center graticule. If necessary, repeat steps 13 to 15.

LINEAR AMPLIFIER (A2Q15) ADJUSTMENT

PROCEDURE

1. Connect 10:1 probe to A2 TP1, select channel A on scope and set 8092A delay to -0.0
2. Set the 8091A to EXT.WIDTH (TRIG) and adjust the transient offset potentiometer A2R86 until the max. positive shift is just reached.
NOTE: this setting on the oscilloscope screen.
3. Now adjust A2R86 so that the high level is at a point 300 mV below the setting obtained in step 2.
4. Set the oscilloscope so that the signal is symmetrical about the center graticule.
5. Set the 8091A mode switch to EXT GATE.
6. Adjust A2R103 for an optimum flat response at the negative part of the displayed signal.
7. Using A2R86 set signal low level to center graticule.
8. Repeat steps 6 and 7 until optimum flatness is reached.
9. Disconnect the 10:1 divider probe, select CH.B on oscilloscope (200 mV/div) and set 8091A to EXT. WIDTH (TRIG).
10. With CH.B input on oscilloscope set to GND position the baseline 1.5 divisions (300mV) above the center graticule and then select DC mode.
11. Set A2R105 to mid-range.
12. Adjust the transient gain A2R104 and the transient offset A2R84 potentiometers for an optimum squarewave.
13. Set 8091A to EXT. GATE and set the high level of the displayed signal to center graticule by means of A2R84.
14. Switch 8091A DELAY from -0.0ns to 0.0ns to ensure that the high level of the displayed signal is on center graticule.
NOTE: If there is a difference at 0.0ns delay, re-adjust a A3R40, and at -0.0ns delay, adjust A2R84.

FREQUENCY DIVIDER (LINEAR AMPLIFIER) ADJUSTMENT

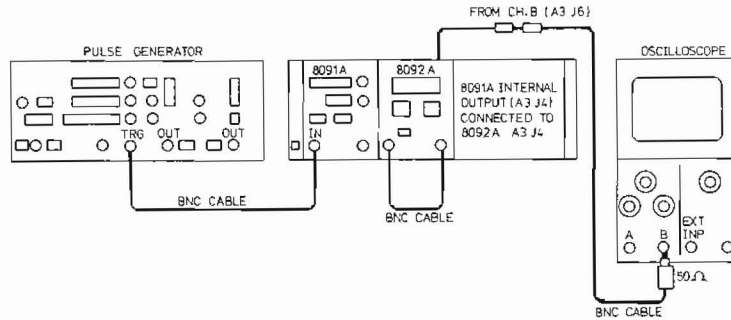


Figure 5-2. Amplifier Adjustment Setup

EQUIPMENT:

- 8080A Mainframe
- 8091A Rate Module
- Pulse generator
- One SMC to BNC Adaptor
- Three BNC cables
- One 50 Ohm feedthrough
- One BNC(f) to BNC(f) adapter

SETTINGS:

8091A Rate module

- Mode switch EXT. WIDTH (TRIG)
- RATE range 1 GHz - 300 MHz
- Rate VERNIER CCW
- SLOPE NEG

Pulse generator

- Repetition rate 50 ms
- Width 25 ms
- Delay Minimum
- Transition time Minimum
- Amplitude 600 mV into 50 Ohms
- Offset Off
- Polarity POS

Oscilloscope

- Chan. B selected DC
- Vertical sensitivity 10 mV/div
- Time base 10 μ s/div
- Trigger Internal

8092A

- CHANNEL B DELAY (-) 0.0 ns
- FREQ SELECT f/2

PROCEDURE

1. Connect the test equipment as shown in Figure 5-2.
2. With the oscilloscope input grounded, set the trace 1.5 divisions above the center graticule. Set to DC mode.
3. Adjust the threshold potentiometer, A3R105, and A3R141 for maximum signal.
4. Adjust the transient offset potentiometer A3R141 so that the signal is symmetrical about the center graticule.
5. Reduce the pulse-top tilt to a minimum by means of the transient gain potentiometer A3R80.
6. Repeat steps 4 and 5 until optimum pulse form is reached with signal symmetrical about center graticule.
7. Set the 8091A mode switch to EXT GATE.
8. Observe the displayed waveform and ensure that the pulse-top tilt is at a minimum and the signal high level is at center graticule. If necessary, readjust A3R141 slightly.
9. Vary the 8091A frequency in the 1GHz-300MHz and 300MHz-100MHz range. If oscillations appear, readjust A3R105.

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 lists all replaceable parts in reference designator order.

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 6-2 is the list of replaceable parts and is organised as follows:

- a. Illustrated parts breakdowns for chassis mounted parts.
- b. Chassis mounted parts in alphanumerical order by reference designator.
- c. Electrical assemblies and their components in alphanumerical order by reference designator.

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

- a. The Hewlett-Packard part number.
- b. A check digit.
- c. The description of the part.

6-8 ORDERING INFORMATION

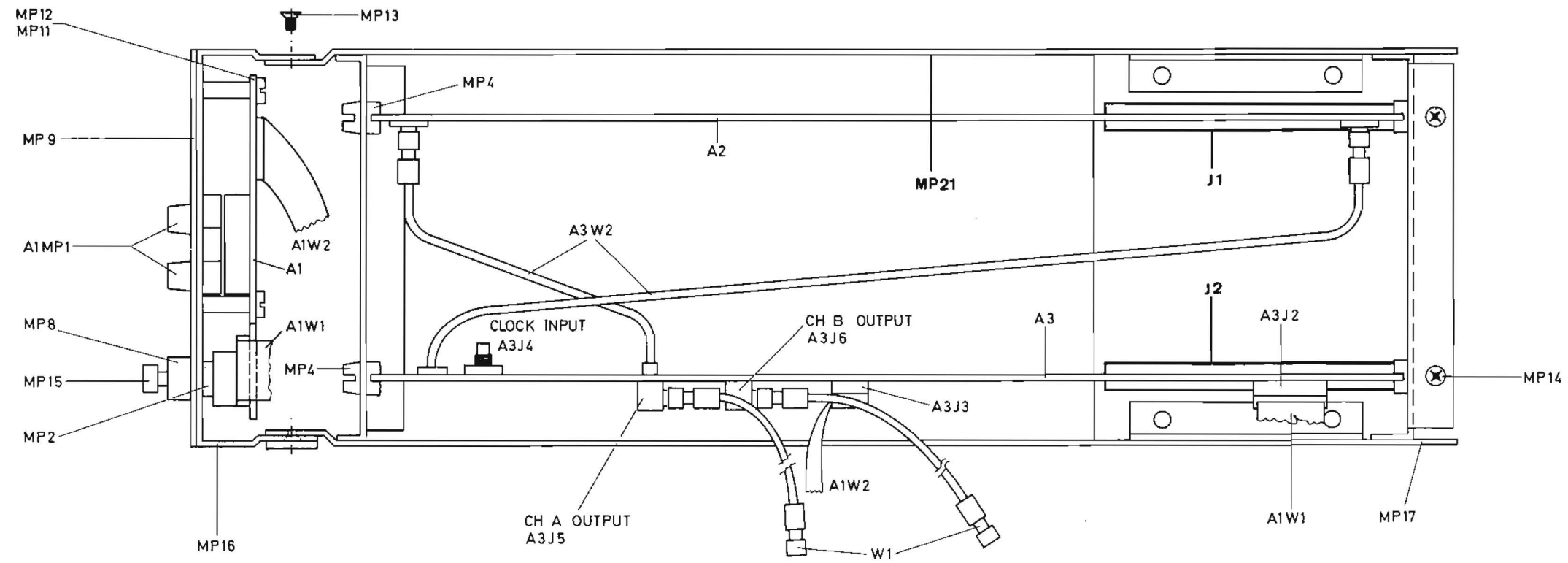
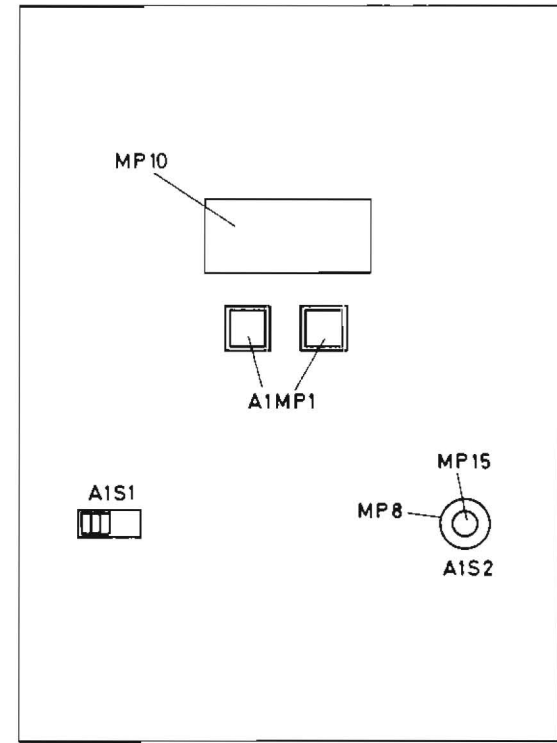
6-9 To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office (list of Sales/Service offices at the rear of the 8080A Mainframe manual). The check digit will ensure accurate and timely processing of your order.

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. Abbreviations for Replaceable Parts List

A	AMPERE(S)	K	KILO (10^3)	RECT	RECTIFIER(S)
ASSY	ASSEMBLY	KG	KILOGRAM	RF	RADIO FREQUENCY
				RFI	RADIO FREQUENCY INTERFERENCE
BD	BOARD(S)	LB	POUND(S)	RH	ROUND HEAD
BH	BINDER HEAD	LH	LEFT HAND		OR
BP	BANDPASS	LIN	LINEAR TAPER		RIGHT HAND
		LOG	LOGARITHMIC TAPER	RMO	RACK MOUNT ONLY
C	CENTI (10^{-2})	LPF	LOW-PASS FILTER(S)	RMS	ROOT MEAN SQUARE
	CERMET	LVR	LEVER	RWV	REVERSE WORKING VOLTAGE
CAR	CARBON				
CC	CARBON COMPOSITION				
CCW	COUNTERCLOCKWISE	M	MILLI (10^{-3})		
CER	CERAMIC	MEG	MEGA (10^6)		
CMO	CABINET MOUNT ONLY	MET FILM	METAL FILM	S-B	SLOW-BLOW
COAX	COAXIAL	MET OX	METAL OXIDE	SCR	SILICON CONTROLLED RECTIFIER
COEF	COEFFICIENT	MFR	MANUFACTURER		
COMP	COMPOSITION	MINAT	MINIATURE	SE	SELENIUM
CONN	CONNECTOR(S)	MOM	MOMENTARY	SEC	SECOND(S)
CRT	CATHODE-RAY TUBE	MTG	MOUNTING	SECT	SECTION(S)
CW	CLOCKWISE	MY	MYLAR	SI	SILICON
				SIL	SILVER
				SL	SLIDE
D	DECI (10^{-1})	N	NANO (10^{-9})	SP	SINGLE POLE
DEPC	DEPOSITED CARBON	N/C	NORMALLY CLOSED	SPL	SPECIAL
DP	DOUBLE POLE	NE	NEON	ST	SINGLE THROW
DT	DOUBLE THROW	N/O	NORMALLY OPEN	STD	STANDARD
		NOF	NEGATIVE POSITIVE ZERO (ZERO TEMPERATURE COEFFICIENT)		
ELECT	ELECTROLYTIC				
ENCAP	ENCAPSULATED				
EXT	EXTERNAL	NPN	NEGATIVE-POSITIVE-NEGATIVE	TA	TANTALUM
				TC	TEMPERATURE COEFFICIENT
		NSR	NOT SEPARATELY REPLACEABLE	TD	TIME DELAY
F	FARAD(S), METAL FILM (FOR RESISTORS)			TFL	TEFLON
FC	CARBON FILM/COMPOSITION			TGL	TOGGLE
FET	FIELD-EFFECT TRANSISTOR(S)	OBD	ORDER BY DESCRIPTION	THYR	THYRISTOR
FT	TRANSIT FREQUENCY	OH	OVAL HEAD	TI	TITANIUM
		OX	OXIDE	TNLDIO	TUNNEL DIODE(S)
FH	FLAT HEAD			TOL	TOLERANCE
FIL H	FILLISTER HEAD			TRIM	TRIMMER
FXD	FIXED				
		P	PEAK		
		PC	PRINTED (ETCHED) CIRCUIT(S)	U	MICRO (10^{-6})
G	GIGA (10^9)				
GE	GERMANIUM	PD	POWER DISSIPATION		
GL	GLASS	PF	PICOFARADS		
GRD	GROUNDED	PHL	PHILLIPS	V	VOLTS
		PIV	PEAK INVERSE VOLTAGE(S)	VAR	VARIABLE
				VDCW	DC WORKING VOLT(S)
H	HENRY(IES)	PNP	POSITIVE-NEGATIVE-POSITIVE		
HG	MERCURY				
HP	HEWLETT-PACKARD	P/O	PART OF		
HZ	HERTZ	PORC	PORCELAIN	W	WATT(S)
		POS	POSITION(S)	W/	WITH
IF	INTERMEDIATE FREQ.	POT	POTENTIOMETER(S)	WIV	WORKING INVERSE VOLTAGE
IMPG	IMPREGNATED	P-P	PEAK-TO-PEAK		
INCD	INCANDESCENT	PRGM	PROGRAM	W/O	WITHOUT
INCL	INCLUDE(S)	PS	POLYSTYRENE	WVDC	WORKING VOLTAGE DIRECT CURRENT
INS	INSULATION(ED)	PWV	PEAK WORKING VOLTAGE		
INT	INTERNAL			WW	WIREWOUND

FRONT PANEL (MP9)



MODEL 8092A
 INSTRUMENT SERIAL PREFIX

FRAME

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A1	08092-66511	BD AY-CONTROL	A1	R9	8 0698-3441	A2	C18	5 0180-2207
A2	08092-66502	BD AY ANALOG	A1	R10	8 0698-3441	A2	*C19	0 0160-4383
A3	08092-66513	BD AY-DIGITAL	A1	R11	8 0698-3441	A2	C20	9 0160-2055
J1	9 1251-2035	CONN PC2X15.156D	A1	R12	8 0698-3441			
MP1	5 5041-0309	CAP KEY QUARTER	A1	R13	8 0698-3441	A2	C21	9 0160-2055
MP2	5 5041-0309	CAP KEY QUARTER	A1	R14	8 0698-3441	A2	C22	9 0160-2055
MP8	1 0590-0836	NUT 1/4-40	A1	R15	8 0698-3441	A2	C23	9 0160-2055
MP9	08092-00201	PANEL FRONT	A1	R16	8 0698-3441	A2	C24	7 0160-3879
MP10	08092-28101	WINDOW	A1	R21	3 0757-0280	A2	C25	7 0160-3879
MP11	4 2190-0108	WASH-LOCK .115ID	A1	R22	3 0757-0280	A2	C26	7 0160-3879
MP12	8 2200-0141	SCR MCH 4-40X.31	A1	R23	9 0757-0278	A2	C27	7 0160-3879
MP13	9 2200-0770	SCR MCH 4-40	A1	R24	3 0698-4428	A2	C28	9 0160-2055
MP14	7 2360-0332	SCR 6-32X.312	A1	R25	1 0757-0288	A2	C29	9 0160-2055
MP15	8 3101-0851	CAP PUSH BUTTON	A1	R26	1 0698-4020	A2	C30	9 0160-2055
MP16	5000-8922	PANEL-SUB	A1	R27	1 0757-0410	A2	C31	9 0160-2055
MP21	5061-2113	CHASSIS ASSEMBLY	A1	R28	0 0757-0419	A2	C32	9 0160-2055
S1	7 3101-1311	SW SLIDE DPDT	A1	R29	9 0757-0434	A2	C33	9 0160-2055
S2	8 3101-1221	SW PBTN SPDT	A1	R30	9 0757-1094	A2	C34	3 0180-0374
W1	08092-61604	CBL AY-SHLD #4	A1	R31	4 0698-3132	A2	C35	7 0180-0229
			A1	R32	9 0757-0278	A2	C36	3 0180-0374
			A1	R33	8 0757-0417	A2	C37	9 0160-2055
			A1	R34	1 0698-4020	A2	C38	9 0160-2055
			A1	S3	7 5060-9436	A2	C39	9 0160-0174
			A1	S4	7 5060-9436	A2	C40	5 0180-2207
			A1	U1	4 1990-0434	A2	C41	1 0160-3568
			A1	U2	4 1990-0434	A2	C43	3 0160-4386
			A1	U3	4 1990-0434	A2	C45	1 0160-3568
			A1	W1	9 5081-1993	A2	C49	9 0160-0174
			A1	W2	5081-1967	A2	C50	5 0180-2207
						A2	C51	5 0180-2207
						A2	C52	9 0160-0174
						A2	C-19	1 0160-3873
						A2	C-19	2 0160-3874
						A2	CR6	4 1901-0639
						A2	CR7	4 1901-0639
						A2	CR8	4 1901-0639
						A2	CR9	4 1901-0639
						A2	CR10	4 1901-0639
						A2	CR11	4 1901-0639
						A2	CR12	4 1901-0639
						A2	CR13	4 1901-0639
						A2	CR14	4 1901-0639
						A2	CR15	4 1901-0639
						A2	CR16	4 1901-0639
						A2	CR17	4 1901-0639
						A2	CR18	4 1901-0639
						A2	CR19	4 1901-0639
						A2	CR20	4 1901-0639
						A2	CR21	4 1901-0639
						A2	CR36	4 1901-0639
						A2	CR37	4 1901-0639
						A2	CR38	4 1901-0639
						A2	CR39	4 1901-0639
						A2	CR40	4 1901-0639
						A2	CR41	4 1901-0639
						A2	CR42	4 1901-0639
						A2	CR43	4 1901-0639
						A2	CR44	4 1901-0639

 MODEL 8092A
 INSTRUMENT SERIAL PREFIX

A1 08092-66511 BD AY-CONTROL

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A1	C1	9 0160-0174
A1	C2	6 0160-4040
A1	C3	7 0160-3879
A1	C4	9 0160-0174
A1	C5	9 0160-0174
A1	J4	9 1200-0474
A1	J5	9 1200-0474
A1	J6	9 1200-0474
A1	L1	9 9100-2276
A1	Q1	1 1854-0215
A1	Q2	1 1854-0215
A1	Q3	1 1854-0215
A1	Q4	1 1854-0215
A1	Q5	1 1854-0215
A1	Q6	1 1854-0215
A1	Q7	1 1854-0215
A1	R1	8 0698-3441
A1	R2	8 0698-3441
A1	R3	8 0698-3441
A1	R4	8 0698-3441
A1	R5	8 0698-3441
A1	R6	8 0698-3441
A1	R7	8 0698-3441
A1	R8	8 0698-3441

 MODEL 8092A
 INSTRUMENT SERIAL PREFIX

A2 08092-66502 BD AY ANALOG

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A2	C1	4 0160-3470
A2	C2	4 0160-3785
A2	C3	4 0160-3785
A2	C4	8 0180-0197
A2	C5	6 0160-3878
A2	C6	3 0180-0374
A2	C7	3 0160-4386
A2	C8	1 0160-3568
A2	C9	2 0160-3874
A2	C10	1 0160-3568
A2	C11	4 0160-3470
A2	C12	4 0160-3785
A2	C13	4 0160-3785
A2	C14	8 0180-0197
A2	C15	6 0160-3878
A2	C16	3 0180-0374
A2	C17	1 0160-3568

REFERENCE DESIGNATOR	C	H-P PART NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C	H-P PART NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C	H-P PART NUMBER	DESCRIPTION
A2	CR45	4 1901-0639	DIO PIN 110V	A2	Q18	9 1853-0314	XSTR 2N2905A PNP	A2	R46	6 0757-0465	R-F 100K1% .125W
A2	CR46	4 1901-0639	DIO PIN 110V	A2	Q19	2 1854-0472	XSTR SI MPS A14	A2	R47	6 0757-0465	R-F 100K1% .125W
A2	CR47	4 1901-0639	DIO PIN 110V	A2	Q20	2 1854-0472	XSTR SI MPS A14	A2	R48	6 0757-0465	R-F 100K1% .125W
A2	J2	1 1250-0835	JACK RECEP STRAI	A2	Q21	2 1854-0472	XSTR SI MPS A14	A2	R49	6 0757-0465	R-F 100K1% .125W
A2	J3	1 1250-0835	JACK RECEP STRAI	A2	Q22	2 1854-0472	XSTR SI MPS A14	A2	R50	6 0757-0465	R-F 100K1% .125W
A2	L1	1 9140-0137	COIL-FXD 1000 UH	A2	Q23	2 1854-0472	XSTR SI MPS A14	A2	R51	6 0757-0465	R-F 100K1% .125W
A2	L2	1 9140-0137	COIL-FXD 1000 UH	A2	Q24	2 1854-0472	XSTR SI MPS A14	A2	R52	6 0757-0465	R-F 100K1% .125W
A2	L3	1 9140-0137	COIL-FXD 1000 UH	A2	Q25	7 1854-0477	XSTR NPN 2N2222A	A2	R53	6 0757-0465	R-F 100K1% .125W
A2	L4	1 9140-0137	COIL-FXD 1000 UH	A2	Q26	7 1854-0477	XSTR NPN 2N2222A	A2	R54	6 0698-7219	R-F 196 1% .05W
A2	L5	1 9140-0137	COIL-FXD 1000 UH	A2	Q27	6 1854-0632	XSTR SI NPN	A2	R55	4 0698-7209	R-F 75 1% .05W
A2	L6	1 9140-0137	COIL-FXD 1000 UH	A2	Q28	5 1854-0897	XSTR NPN 2/02	A2	R58	7 0698-7236	R-F 1K 1% .05W
A2	L7	1 9140-0137	COIL-FXD 1000 UH	A2	Q29	1 1854-0215	XSTR SI 2N3904	A2	R59	7 0698-7236	R-F 1K 1% .05W
A2	L8	1 9140-0137	COIL-FXD 1000 UH	A2	Q30	9 1853-0314	XSTR 2N2905A PNP	A2	R60	7 0698-7236	R-F 1K 1% .05W
A2	L9	1 9140-0137	COIL-FXD 1000 UH	A2	Q31	2 1853-0036	XSTR SI 2N3906	A2	R61	3 0757-0438	R-F 5.11K1%
A2	L10	1 9140-0137	COIL-FXD 1000 UH	A2	Q32	9 1853-0314	XSTR 2N2905A PNP	A2	R62	6 0698-7277	R-F 51.1K 1% .05
A2	L11	1 9140-0137	COIL-FXD 1000 UH	A2	Q33	5 1854-0392	XSTR ST 2N 5088	A2	R63	9 0698-7212	R-F 100 1% .05W
A2	L16	1 9140-0137	COIL-FXD 1000 UH	A2	Q34	2 1853-0036	XSTR SI 2N3906	A2	*R64	0 0698-7205	R-F 51.1 1% .05W
A2	L17	1 9140-0137	COIL-FXD 1000 UH	A2	Q35	5 1854-0392	XSTR ST 2N 5088	A2	R65	8 0698-7253	R-F 5.11K 1% .05
A2	L18	1 9140-0137	COIL-FXD 1000 UH	A2	Q36	2 1853-0036	XSTR SI 2N3906	A2	R66	8 0698-7203	R-F 42.2 1% .05W
A2	L19	1 9140-0137	COIL-FXD 1000 UH	A2	R1	0 0757-0401	R-F 100 1% .125W	A2	R67	8 0698-7203	R-F 42.2 1% .05W
A2	L20	1 9140-0137	COIL-FXD 1000 UH	A2	R3	8 0698-3178	R-F 487 1% .125W	A2	R68	1 0698-7206	R-F 56.2 1% .05W
A2	L21	1 9140-0137	COIL-FXD 1000 UH	A2	R4	2 0698-4469	R-F 1.15K1%	A2	R69	0 0757-0401	R-F 100 1% .125W
A2	L22	1 9140-0137	COIL-FXD 1000 UH	A2	R5	3 0698-4428	R-F 1.69K1%	A2	R70	8 0698-3178	R-F 487 1% .125W
A2	L23	1 9140-0137	COIL-FXD 1000 UH	A2	R6	5 0698-4404	R-F 105 1% .125W	A2	R71	8 0698-3441	R-F 215 1% .125W
A2	L24	1 9140-0137	COIL-FXD 1000 UH	A2	R7	1 0757-0402	R-F 110 1% .125W	A2	R72	8 0698-7253	R-F 5.11K 1% .05
A2	L25	5 5081-1973	INDUCTANCE 3BEAD	A2	R8	6 0757-0407	R-F 200 1% .125W	A2	R73	9 0698-7197	R-F 23.7 1% .05W
A2	L26	5 5081-1973	INDUCTANCE 3BEAD	A2	R9	0 0757-0401	R-F 100 1% .125W	A2	R74	7 0698-7260	R-F 10K 1% .05W
A2	L27	5 5081-1973	INDUCTANCE 3BEAD	A2	R10	5 0698-4404	R-F 105 1% .125W	A2	R75	7 0698-7202	R-F 38.3 1% .05W
A2	L28	5 5081-1973	INDUCTANCE 3BEAD	A2	R11	1 0757-0402	R-F 110 1% .125W	A2	R76	7 0698-7202	R-F 38.3 1% .05W
A2	L29	5 5081-1973	INDUCTANCE 3BEAD	A2	R12	6 0757-0407	R-F 200 1% .125W	A2	R77	0 0698-7205	R-F 51.1 1% .05W
A2	L30	5 5081-1973	INDUCTANCE 3BEAD	A2	R13	3 0698-4428	R-F 1.69K1%	A2	R78	4 0698-7267	R-F 19.6K 1% .05
A2	L31	5 5081-1973	INDUCTANCE 3BEAD	A2	R14	2 0698-4469	R-F 1.15K1%	A2	R79	6 0757-0449	R-F 20K1% .125W
A2	L32	5 5081-1973	INDUCTANCE 3BEAD	A2	R15	8 0698-3178	R-F 487 1% .125W	A2	R80	3 0698-4428	R-F 1.69K1%
A2	L33	5 5081-1973	INDUCTANCE 3BEAD	A2	R16	9 0698-4383	R-F 53.6 1/8W 1%	A2	R81	4 0757-0421	R-F 825 1% .125W
A2	L34	5 5081-1973	INDUCTANCE 3BEAD	A2	R17	9 0698-4383	R-F 53.6 1/8W 1%	A2	R82	8 0698-3136	R-F 17.8K1%
A2	L35	5 5081-1973	INDUCTANCE 3BEAD	A2	R18	9 0698-4383	R-F 53.6 1/8W 1%	A2	R83	9 0757-1094	R-F 1.47K1%
A2	L36	5 5081-1973	INDUCTANCE 3BEAD	A2	R19	9 0698-4383	R-F 53.6 1/8W 1%	A2	R84	6 2100-3351	RES TRMR 500 10%
A2	L37	5 5081-1973	INDUCTANCE 3BEAD	A2	R20	7 0757-0317	R-F 1.33K1%	A2	R85	9 0757-1094	R-F 1.47K1%
A2	L38	5 5081-1973	INDUCTANCE 3BEAD	A2	R21	7 0757-0317	R-F 1.33K1%	A2	R86	6 2100-3351	RES TRMR 500 10%
A2	L39	5 5081-1973	INDUCTANCE 3BEAD	A2	R22	7 0757-0317	R-F 1.33K1%	A2	R88	5 0698-7200	R-F 31.6 1% .05W
A2	L40	5 5081-1973	INDUCTANCE 3BEAD	A2	R23	0 0698-7239	R-F 1.33K 1% .05	A2	R90	7 0698-7236	R-F 1K 1% .05W
A2	L41	5 5081-1973	INDUCTANCE 3BEAD	A2	R24	7 0757-0317	R-F 1.33K1%	A2	R91	3 0757-0438	R-F 5.11K1%
A2	L42	5 5081-1973	INDUCTANCE 3BEAD	A2	R25	7 0757-0317	R-F 1.33K1%	A2	R92	6 0698-7277	R-F 51.1K 1% .05
A2	L43	5 5081-1973	INDUCTANCE 3BEAD	A2	R26	7 0757-0317	R-F 1.33K1%	A2	*R93	9 0698-7212	R-F 100 1% .05W
A2	L44	5 5081-1973	INDUCTANCE 3BEAD	A2	R27	7 0757-0317	R-F 1.33K1%	A2	R94	9 0698-7212	R-F 100 1% .05W
A2	Q1	9 1853-0314	XSTR 2N2905A PNP	A2	R28	7 0757-0317	R-F 1.33K1%	A2	R95	8 0698-7253	R-F 5.11K 1% .05
A2	Q2	9 1853-0314	XSTR 2N2905A PNP	A2	R29	7 0757-0317	R-F 1.33K1%	A2	R96	0 0757-0401	R-F 100 1% .125W
A2	Q3	9 1853-0314	XSTR 2N2905A PNP	A2	R30	7 0757-0317	R-F 1.33K1%	A2	R97	1 0698-7206	R-F 56.2 1% .05W
A2	Q4	2 1854-0472	XSTR SI MPS A14	A2	R31	7 0757-0317	R-F 1.33K1%	A2	R98	8 0698-7203	R-F 42.2 1% .05W
A2	Q5	2 1854-0472	XSTR SI MPS A14	A2	R32	7 0757-0317	R-F 1.33K1%	A2	R99	8 0698-7203	R-F 42.2 1% .05W
A2	Q6	2 1854-0472	XSTR SI MPS A14	A2	R33	7 0757-0317	R-F 1.33K1%	A2	R100	8 0698-3178	R-F 487 1% .125W
A2	Q7	2 1854-0472	XSTR SI MPS A14	A2	R34	7 0757-0317	R-F 1.33K1%	A2	R101	8 0698-3441	R-F 215 1% .125W
A2	Q8	2 1854-0472	XSTR SI MPS A14	A2	R35	7 0757-0317	R-F 1.33K1%	A2	R102	9 0757-1094	R-F 1.47K1%
A2	Q9	2 1854-0472	XSTR SI MPS A14	A2	R36	0 0698-7239	R-F 1.33K 1% .05	A2	R103	2 2100-3274	R-VAR 10K 10%
A2	Q10	2 1854-0472	XSTR SI MPS A14	A2	R37	7 0757-0317	R-F 1.33K1%	A2	R104	2 2100-3274	R-VAR 10K 10%
A2	Q11	2 1854-0472	XSTR SI MPS A14	A2	R38	7 0757-0317	R-F 1.33K1%	A2	R105	1 2100-3273	R-VAR 2K 10%
A2	Q12	7 1854-0477	XSTR NPN 2N2222A	A2	R39	7 0757-0317	R-F 1.33K1%	A2	R106	0 0698-4467	R-F 1.05K1%
A2	Q13	7 1854-0477	XSTR NPN 2N2222A	A2	R40	6 0757-0465	R-F 100K1% .125W	A2	R107	8 0698-7253	R-F 5.11K 1% .05
A2	Q14	6 1854-0632	XSTR SI NPN	A2	R41	6 0757-0465	R-F 100K1% .125W	A2	R108	8 0698-3136	R-F 17.8K1%
A2	Q15	5 1854-0897	XSTR NPN 2/02	A2	R42	6 0757-0465	R-F 100K1% .125W	A2	R109	6 0757-0449	R-F 20K1% .125W
A2	Q16	9 1853-0314	XSTR 2N2905A PNP	A2	R43	6 0757-0465	R-F 100K1% .125W	A2	R110	6 0757-0449	R-F 20K1% .125W
A2	Q17	9 1853-0314	XSTR 2N2905A PNP	A2	R44	6 0757-0465	R-F 100K1% .125W	A2	R111	9 0698-7197	R-F 23.7 1% .05W
				A2	R45	6 0757-0465	R-F 100K1% .125W	A2	R112	8 0698-7229	R-F 511 1% .05W
								A2	R113	0 0698-7263	R-F 13.3K 1%

7-1 INTRODUCTION

7-2 This section contains the component layouts and schematic diagrams for the Model 8092A Delay Generator. Tables listing the reference designators and schematic symbols used are also given. Refer to section 6 for the replaceable parts information.

7-3 RECOMMENDED TEST EQUIPMENT

7-4 Test equipment and test equipment accessories required to maintain the Model 8092A are listed in table 7-1. Equipment other than that listed can be used if it meets the listed critical specifications.

Table 7-1. Reference Designators

A	= assembly	U	= micro-circuit
B	= motor	P	= plug
BT	= battery	Q	= transistor
C	= capacitor	R	= resistor
CP	= coupler	RT	= thermistor
CR	= diode	S	= switch
DL	= delay line	T	= transformer
DS	= lamp	TB	= terminal board
F	= fuse	V	= vacuum, tube, neon bulb, photocell, etc.
FL	= filter	VR	= voltage regulator
HR	= heater	W	= cable
J	= jack	X	= socket
K	= relay	Y	= crystal
L	= inductor	TP	= test point
M	= meter		






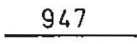






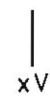


TROUBLESHOOTING

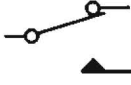


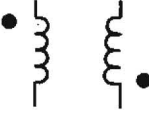












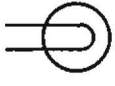
The adjustment procedure for this module has been written such that any defective circuits can easily be localized when performing the procedure. For this reason, it is suggested that the adjustment procedure given in SECTION 5 of this manual be used as a troubleshooting aid.

Table 7-2 Schematic Diagram Symbols

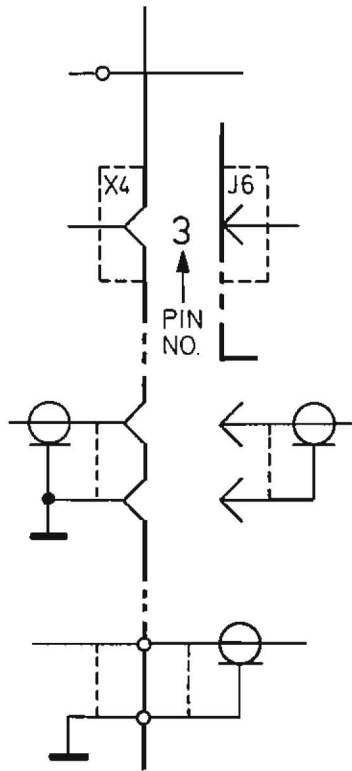
The following symbols conform, as far as possible, with ANSI Y32.2, IEEE No. 315 and ANSI Y32.14 (for the logic symbols). These standards should be consulted when further information is required.

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
	Wire colour code. Same as resistor colour code. First number is wire body colour.
	Wire our 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.
	Specific potential difference with respect to a potential reference level, eg.
	
	Normally open toggle switch. Circles (O) are used for the contacts to indicate a locking type switch.

	Spring return, 2-position transfer switch. Triangles (\blacktriangle) 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 (\bullet) is used, when necessary, to indicate instantaneous polarity.
	Iron core
	Ferrite core
	Ferrite bead
	Varactor diode
	Multi-junction diode
	Diode
	Zener diode
	Schottky diode
	Light Emitting Diode (LED)
	Photodiode
	Fuse
	Neon
	Filament lamp

Terminals and Connectors



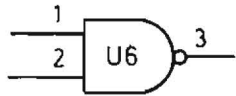
Soldered connection.

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

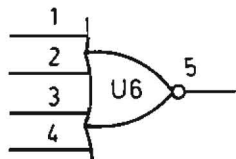
example of bulkhead mounted coaxial socket with free coaxial plug and cable.

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

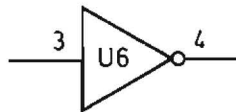
Analog/Digital logic symbols



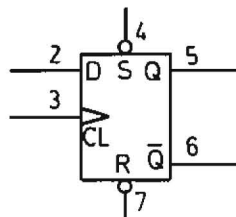
2-input NAND gate



4-input NOR gate



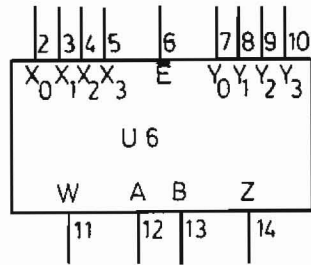
Inverter



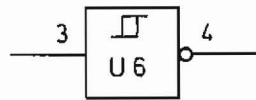
Flip-flop.



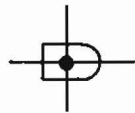
The dynamic indicator denotes that this is a dynamic input and operates on a transition, not a level.



Complex functions represented by rectangular box. Letters can be used inside the rectangle to clarify the function. A truth table should be included, as close as possible to the circuit.



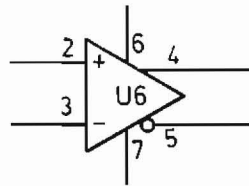
Schmitt trigger



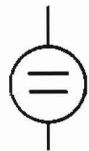
Wired AND connection



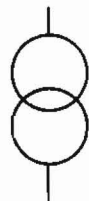
Wired OR connection



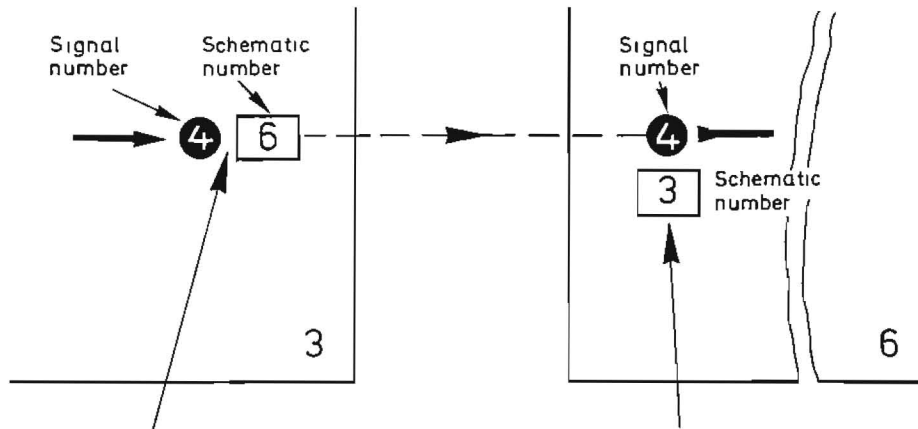
Operational amplifier



Voltage source

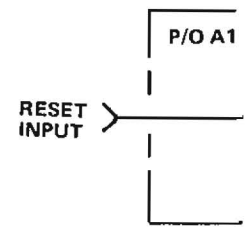
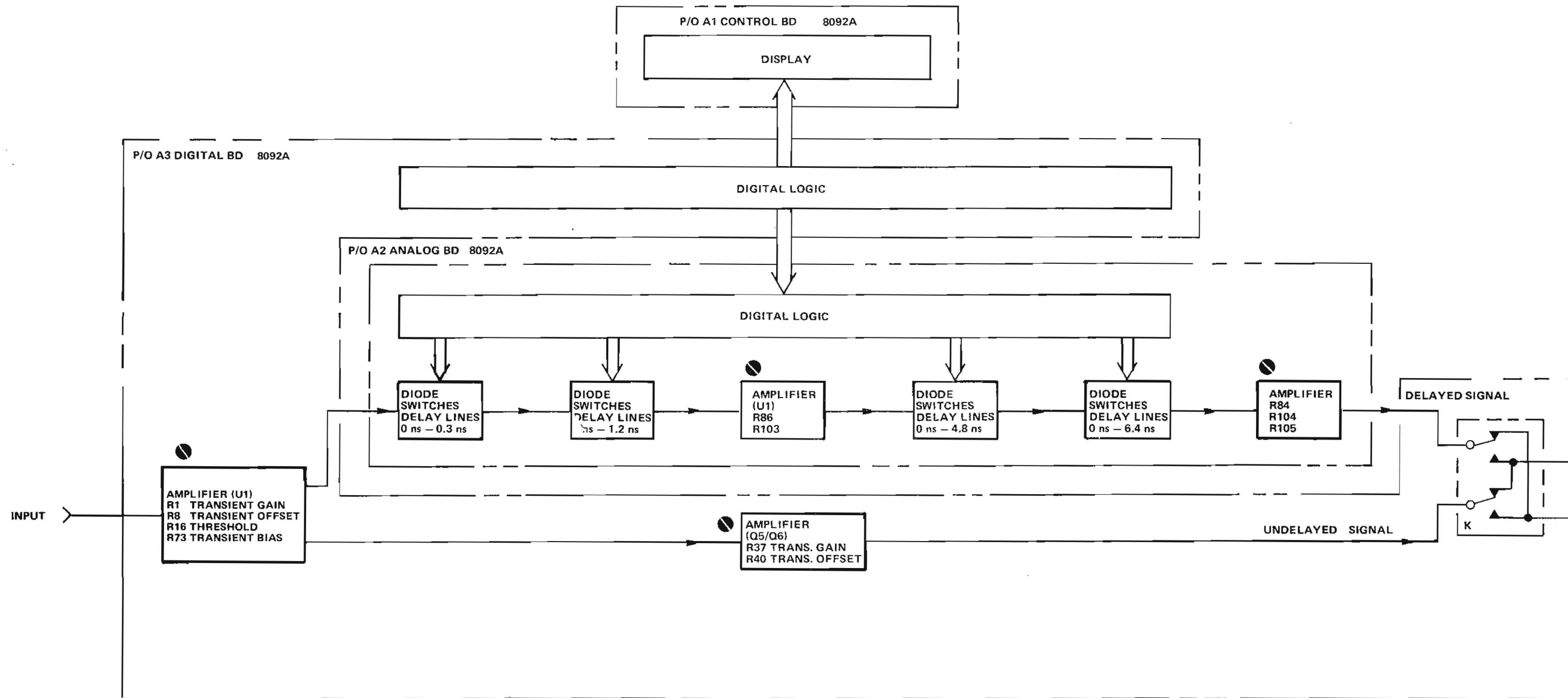


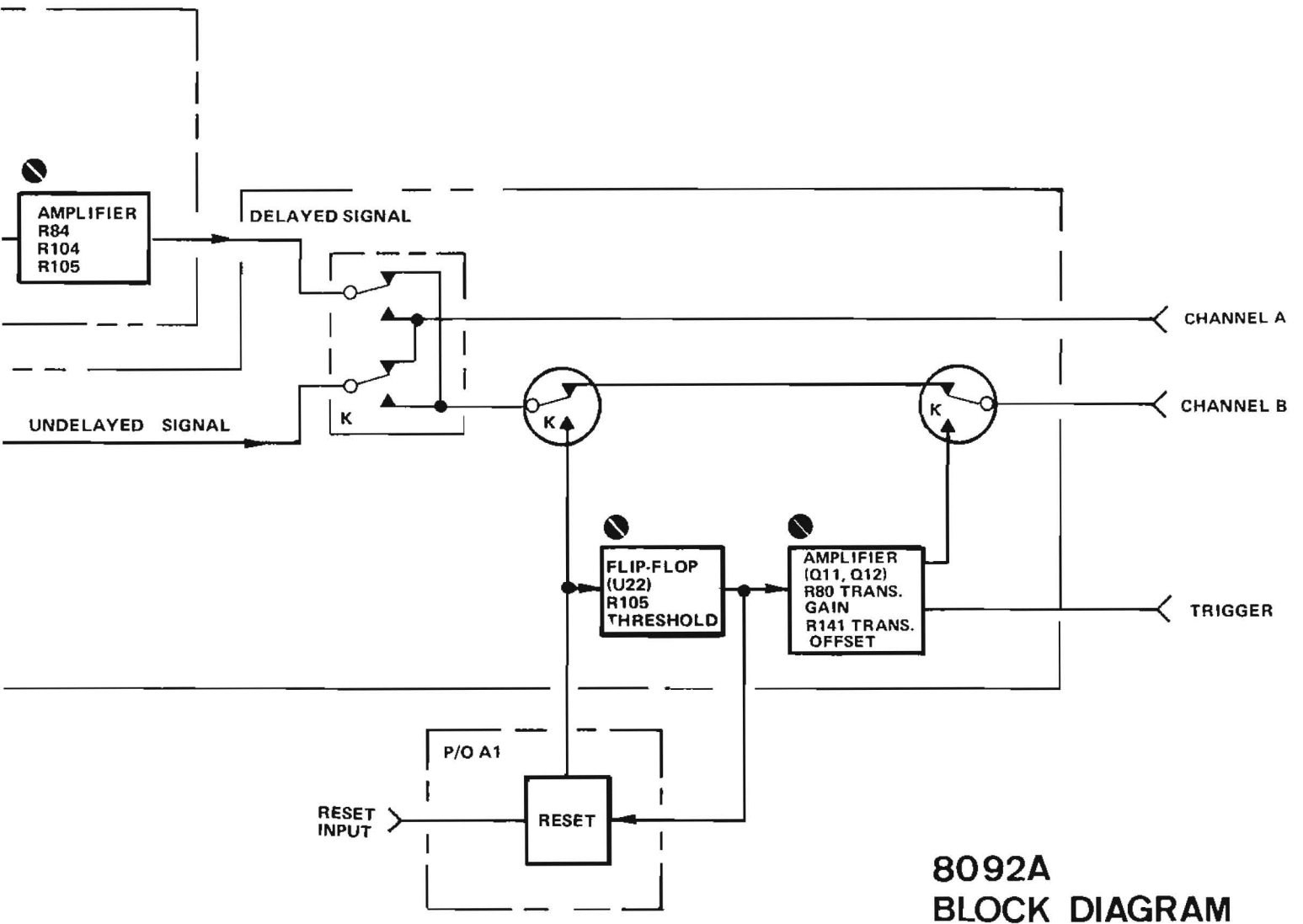
Current source



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.

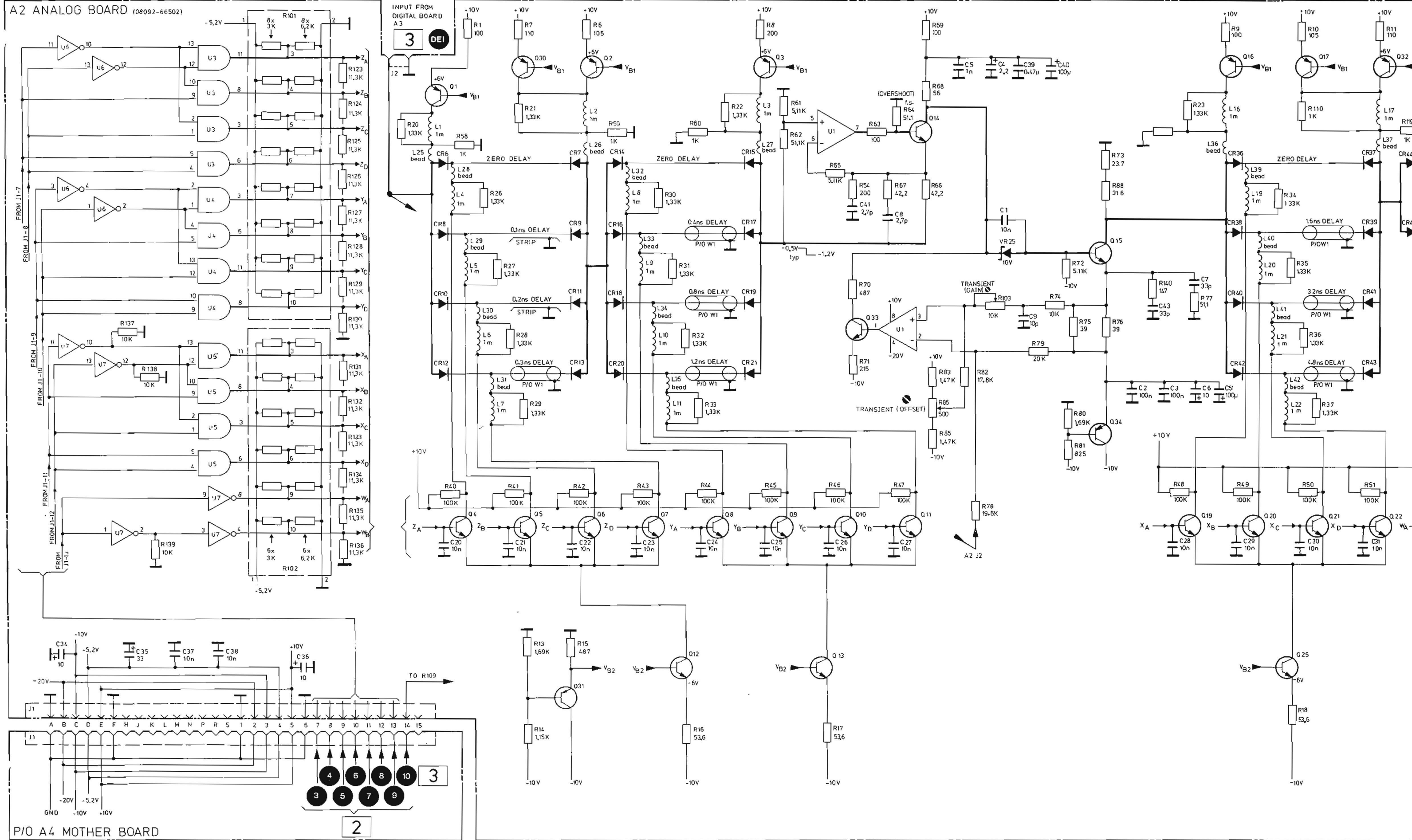
These references on a signal entering a schematic diagram indicate the signal origin. The circle contains the signal number and the square contains the number of the schematic on which that signal originates.



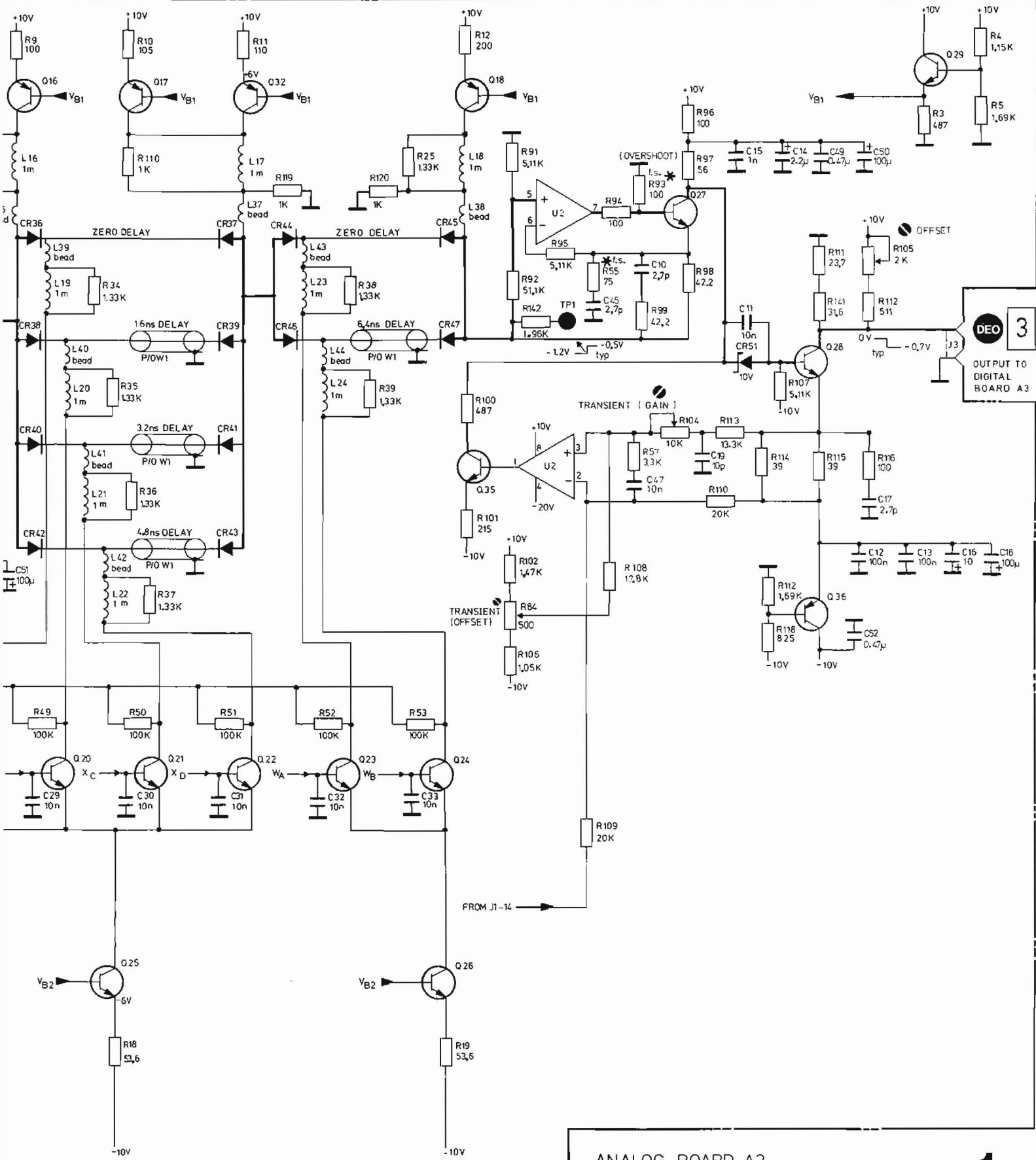


Model 8092A

A2 ANALOG BOARD (08092-66502)

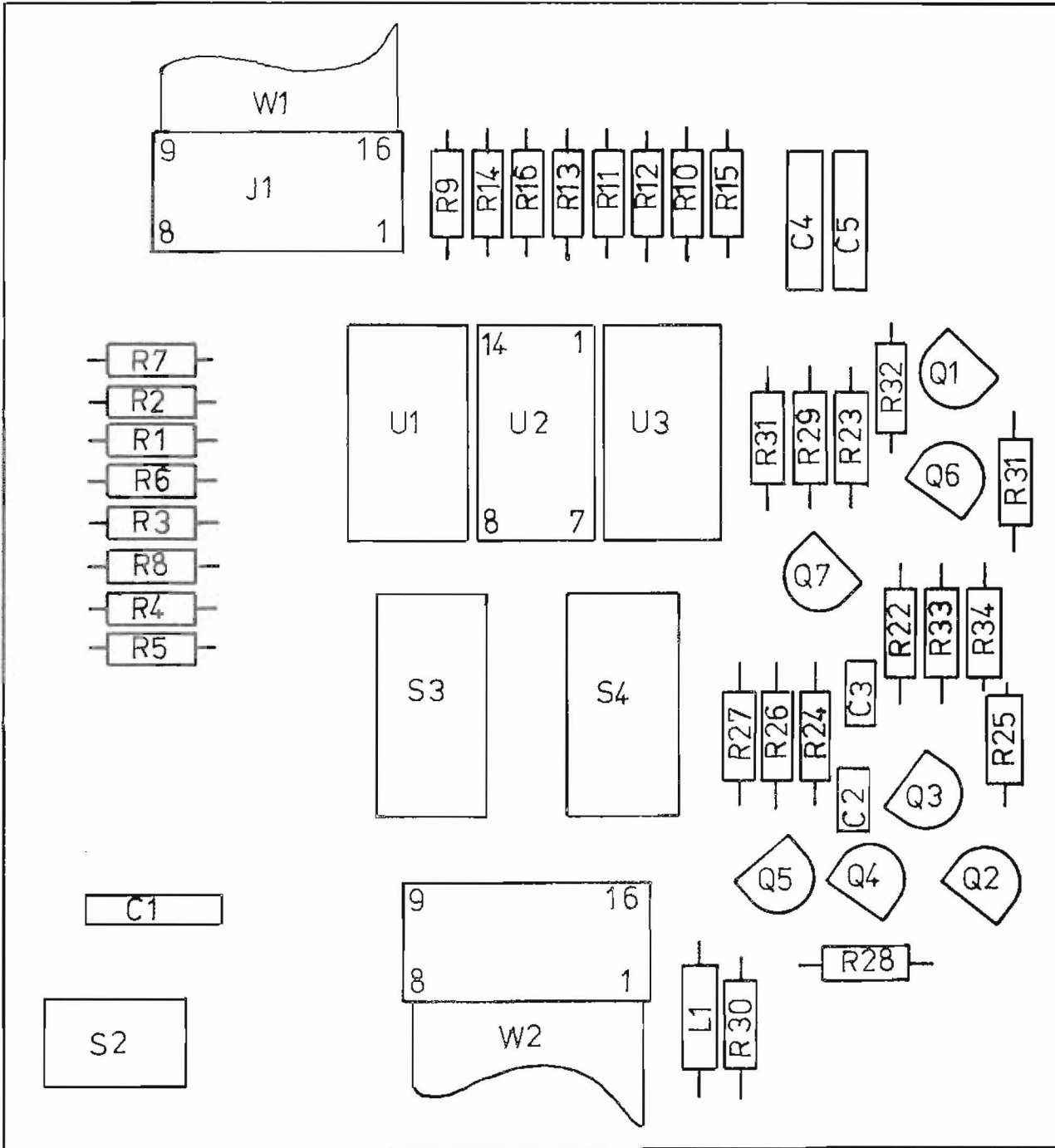


P/O A4 MOTHER BOARD

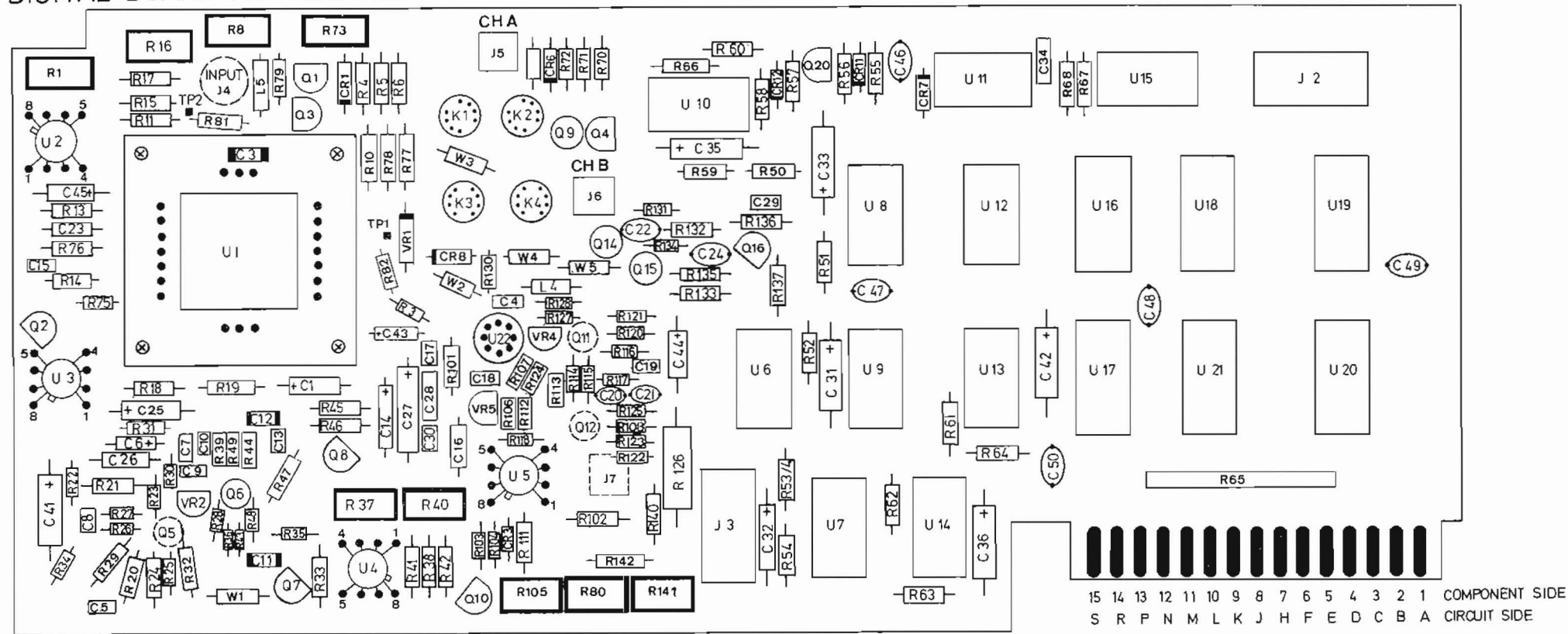


ANALOG BOARD A2

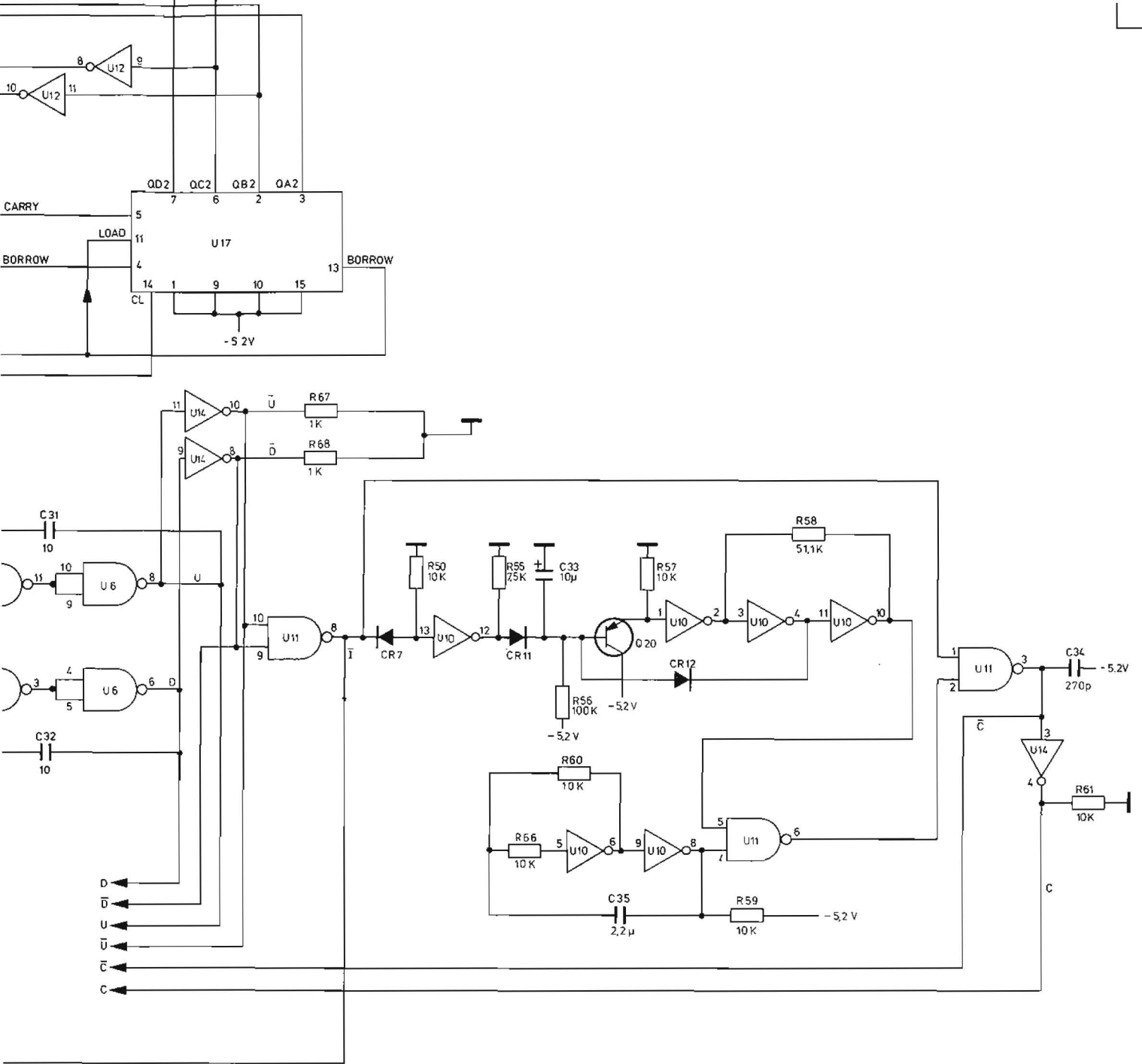
CONTROL BOARD A1 08092-66511



DIGITAL BOARD A3 08092-66513



P/O A3 DIGITAL BOARD (08092 - 66513)

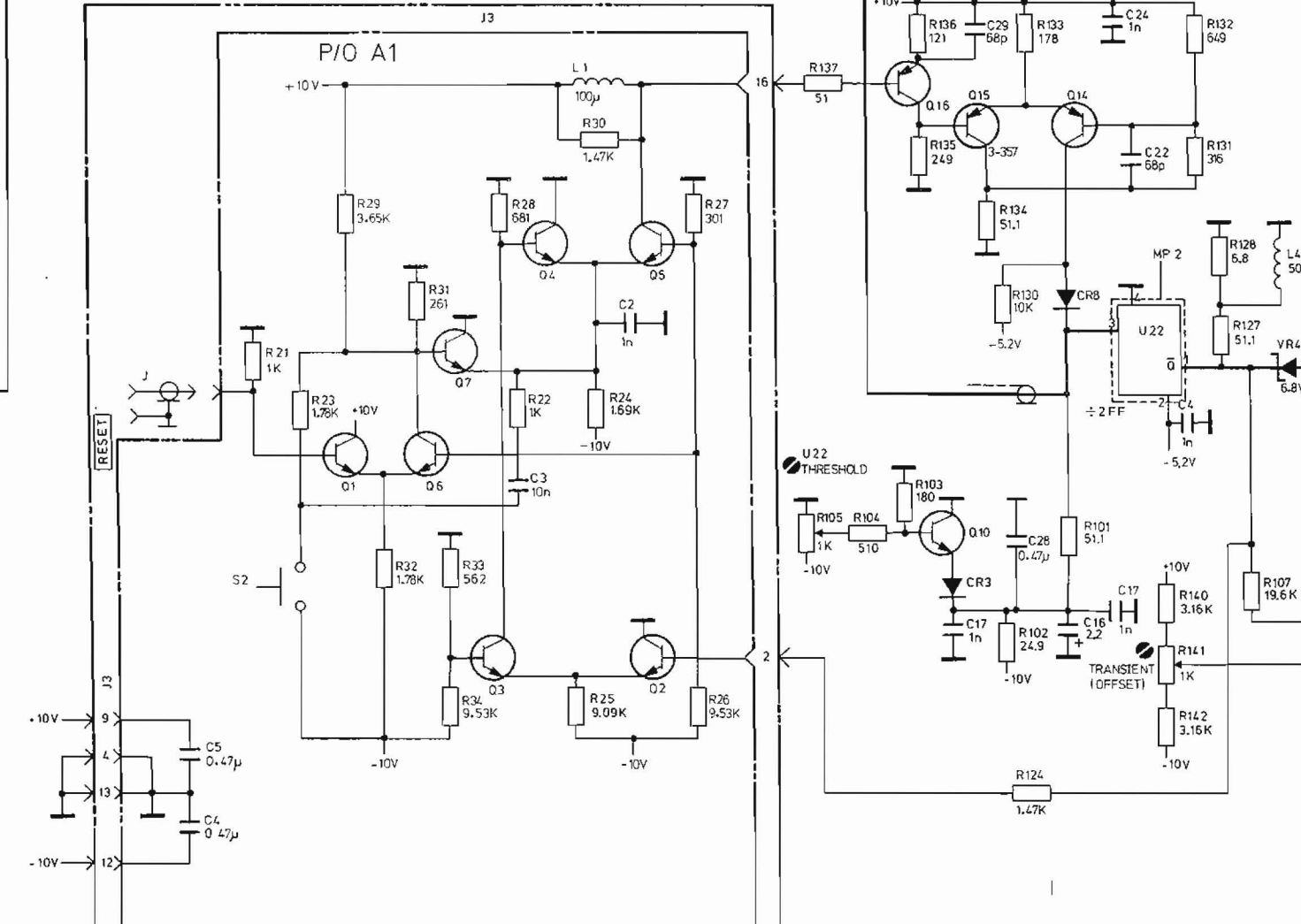
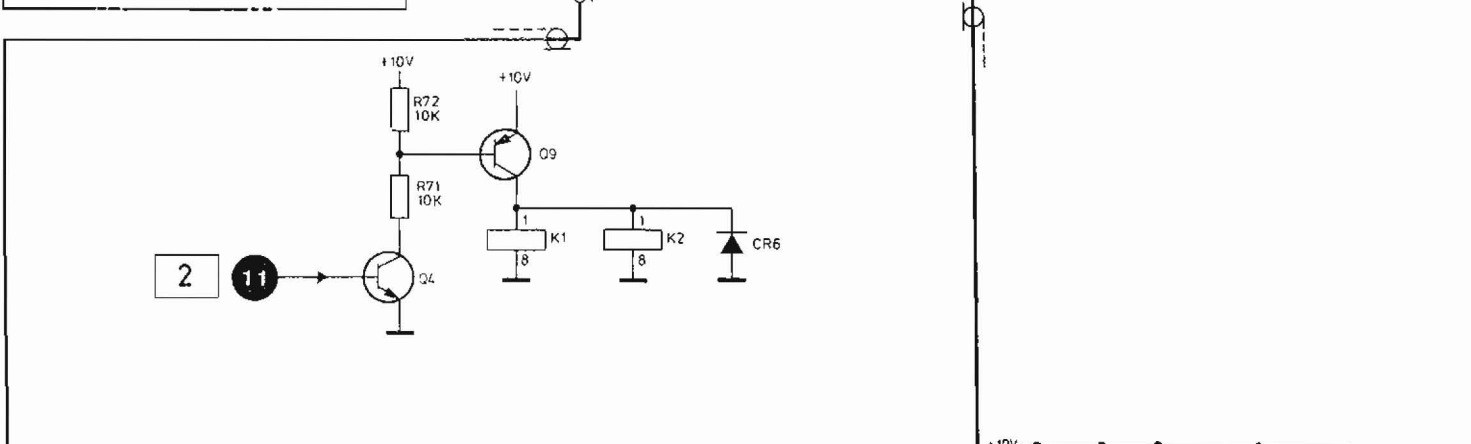
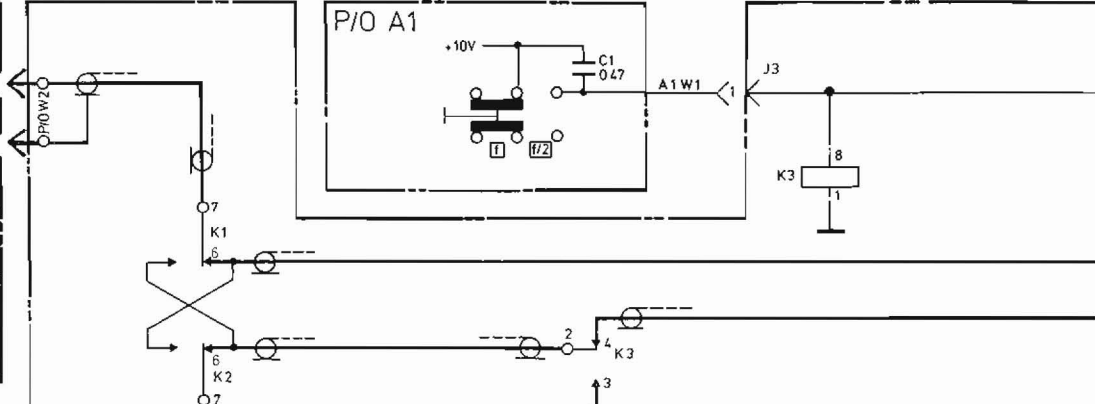
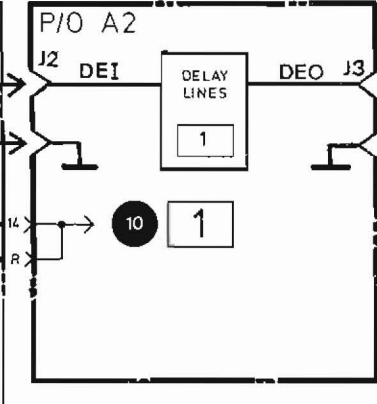
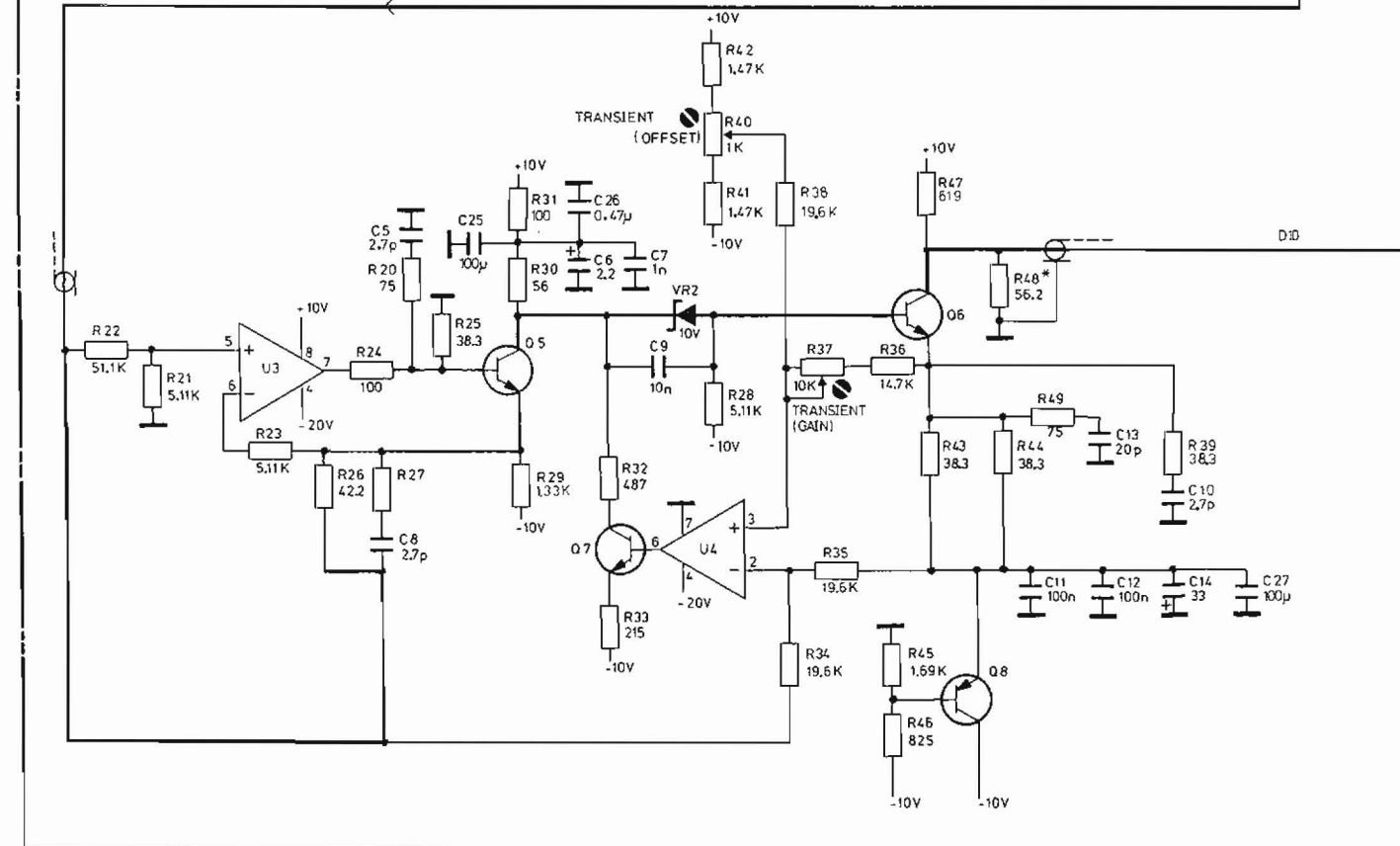
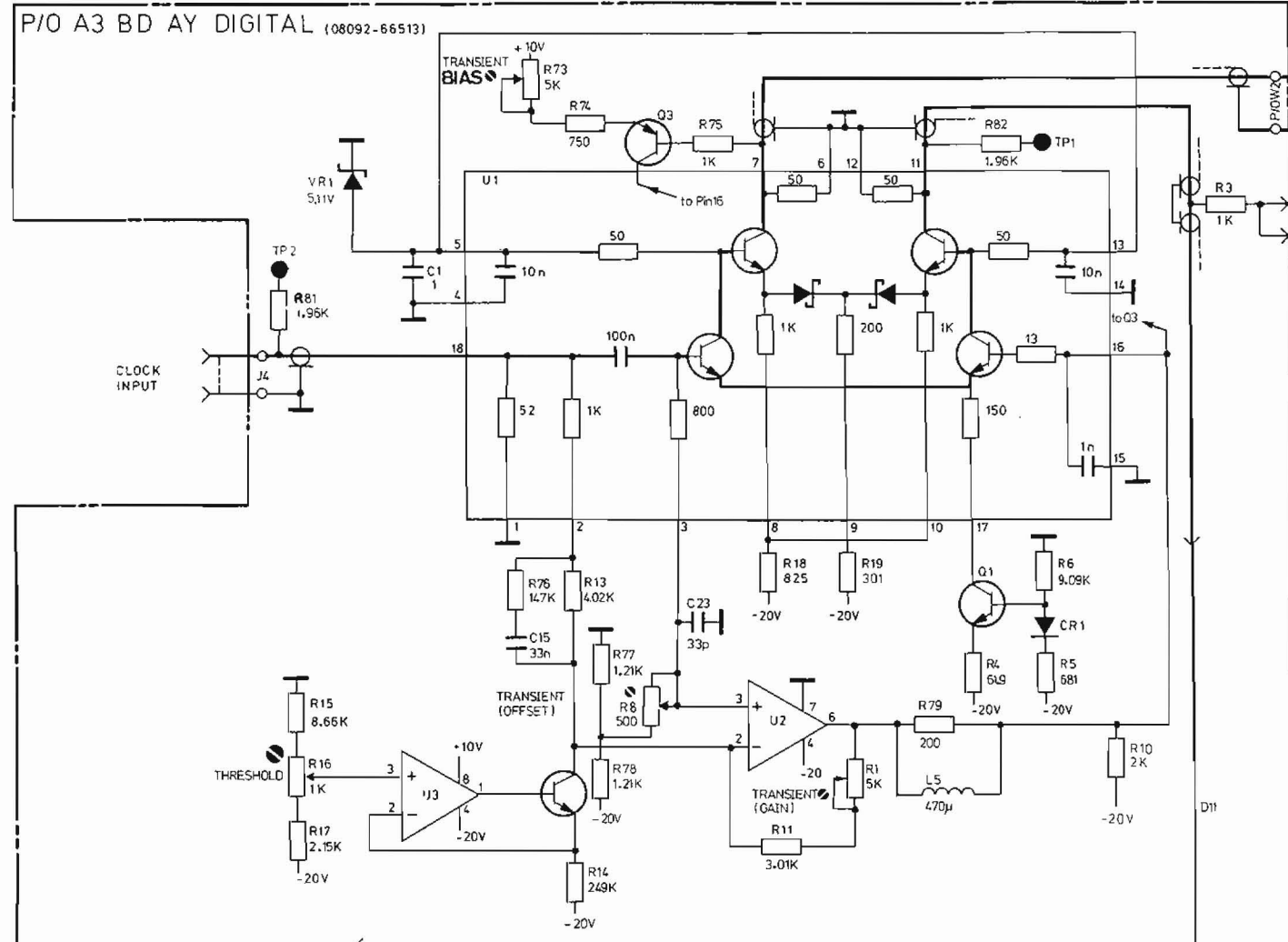


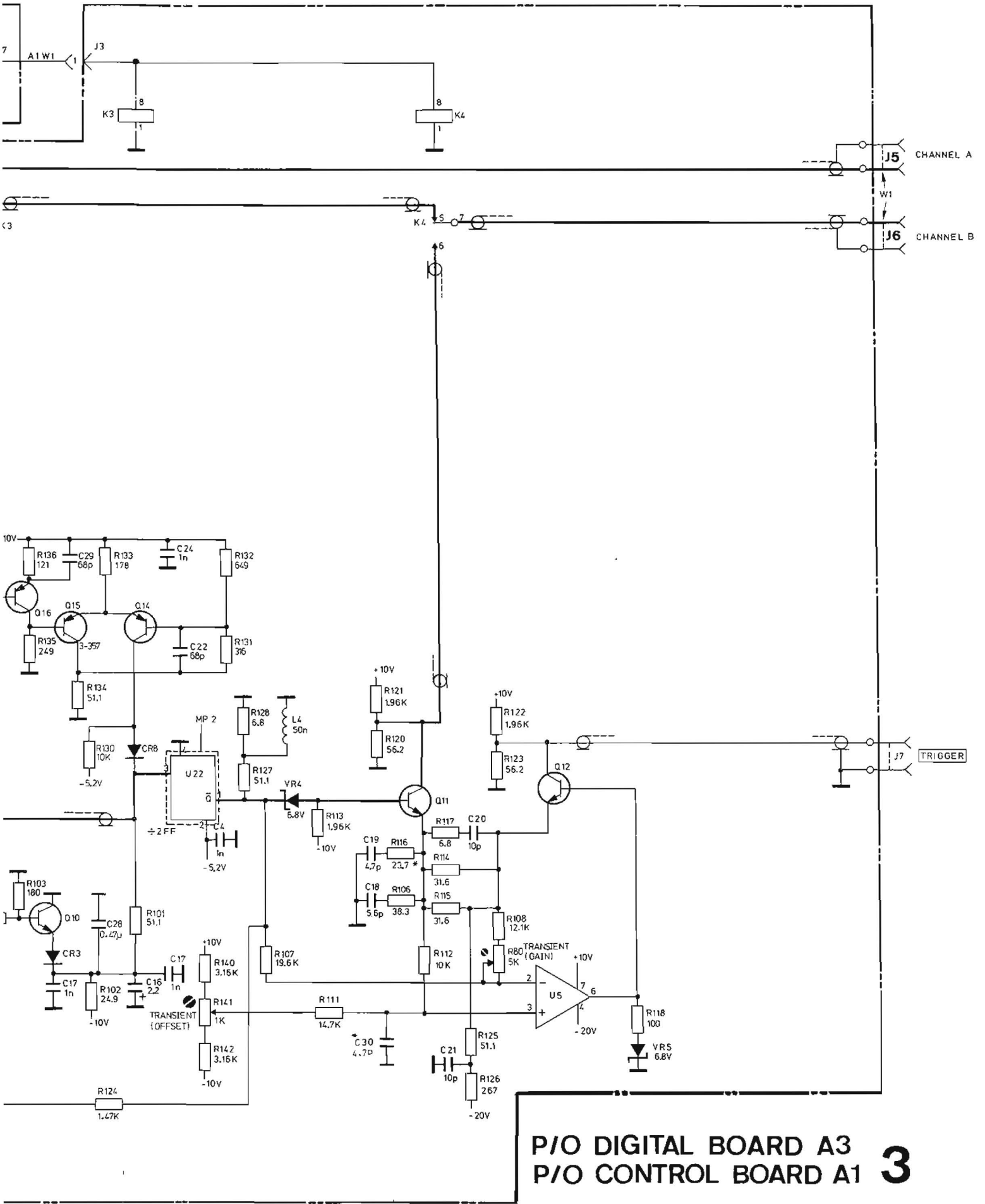
11 3

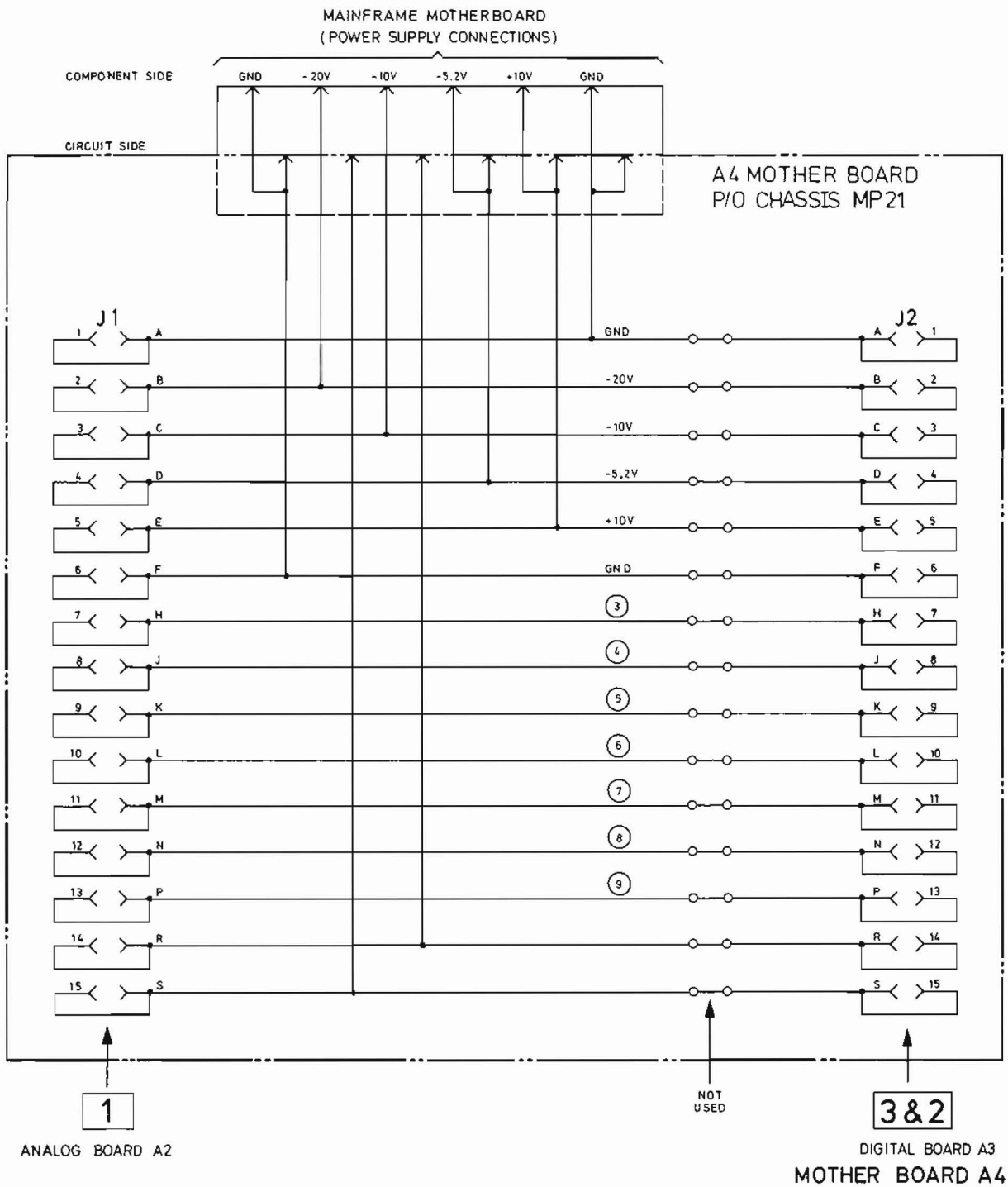
PART OF DIGITAL BOARD A3
PART OF CONTROL BOARD A1 **2**

Model 8092A

P/O A3 BD AY DIGITAL (08092-66513)







8-1 INTRODUCTION

8-2 The purpose of this section is to provide supplementary information for instruments with serial numbers lower than shown on the title page of this manual.

8-3 The table of replaceable parts, the schematic and component layout diagrams contained in this section are applicable to instruments with serial numbers: 2007G00262 to 2007G00305.

NOTE

Following changes are to be made to the table of replaceable parts, schematics and layout diagrams contained in this section only (not to Section 7).

8-4 Changes are listed in the serial number order that they occurred in the manufacture of the instrument. However, in adapting this backdating information to an instrument with a particular serial number, apply the changes in the reverse order. That is, begin with the latest change and progress to the earliest change that applies to the serial number in question. Table 8-1 lists the serial numbers to which each change applies.

CHANGE 1

On Table 8-2, change the Table of Replaceable Parts to read:

A2R104	2100-3207	R-VAR 5K 10 %
A2R106	0757-1094	R-F 1.47K 1 %
A3R47	0757-0428	R-F 1.62K 1%

Delete:

A3C5	0160-3568	C-F 2.7PF 100 V
A3C10	0160-3568	C-F 2.7PF 100 V
A3C23	0160-3779	C-F 1NF 20 % 100 V
A3R20	0698-7209	R-F 75 1 % .05 W
A3R39	0698-7202	R-F 38.3 2 % .125 W

Make the appropriate changes to the schematic and layout diagrams located at the end of this section.

Table 8-1 Backdating Changes

Instrument Serial Number	Make changes
1614G00101-105	1 to 8
1614G00106-110	2 to 8
1614G00111-115	3 to 8
1614G00116-117	2 to 8
1614G00118-119	3 to 8
1614G00120	2 to 8
1614G00121-130	3 to 8
1721G00131-150	4 to 8
1721G00151-160	5 to 8
1721G00161-175	6 to 8
1721G00176-225	7 to 8
2007G00226-261	8
2007G00262-305	See Para. 8-3.

CHANGE 2

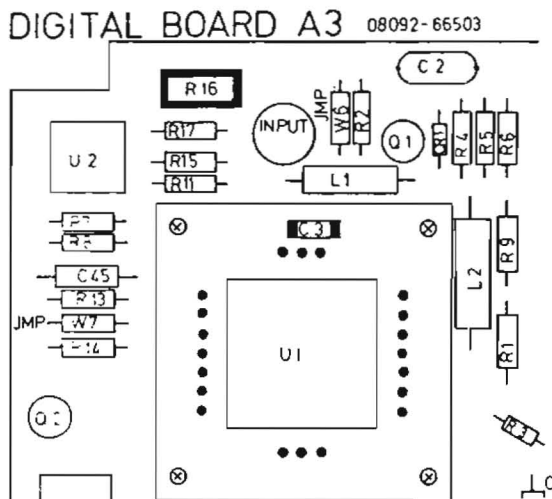
On Table 8-2, change the Table of Replaceable Parts to read:

A3C3	0160-3779	C-F 1000PF 20 %
A3R1	0698-3445	R-F 348 1 % .125 W
A3R7	0698-4428	R-F 1.69K 1 %
A3R8	0698-4428	R-F 1.69K 1 %
A3R11	0698-4428	R-F 1.69K 1 %
A3R121	0698-7243	R-F 1.96K 2 % .125 W

Delete:

A3R10	0698-5180	R-F 2 K 5 % .125 W
A3VR1	1902-0041	DIO BKDN 5.11 V

On schematic 3 replace A3VR1 with R1 and make the appropriate changes to the layout diagram as shown below:

**CHANGE 3**

On Table 8-2, change the Table of Replaceable Parts to read:

A3C3	0160-4386	C-F 33PF 5% 200 V	
A3C23	0160-3876	C-F 47PF 20 % 200 V	
A3R7	0757-1094	R-F 1.47 K 1 %	(*range: 1.44K - 1.6 K)
A3R8	0757-1094	R-F 1.47 K 1 %	(*range: 1.44 K - 1.6 K)
A3R11	0698-3155	R-F 4.64 K 1 % .125 W	(*range: 4 K - 5 K)

Delete:

A3R1	2100-3273	R-VAR 2 K
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Make the appropriate changes to the schematic and layout diagrams located at the end of this section.

CHANGE 4

On Table 8-2, change the Table of Replaceable Parts to read:

A1W1	5081-1967	CABLE AY RIBBON
A1W2	5081-1967	CABLE AY RIBBON

Delete:

A2TP1	0360-0535	TERMINAL TEST POINT
A3TP1	0360-0535	TERMINAL TEST POINT

CHANGE 5

On Table 8-2, change the Table of Replaceable Parts to read:

A4	08092-66504	BD AY MOTHER
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Delete:

MP20	5020-9021	BD PC
J1	1251-2035	CONN PC 30 CONT.

CHANGE 6

On Table 8-2, change the Table of Replaceable Parts to read:

MP4	0403-0164	GUIDE PC BD BLK
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CHANGE 7

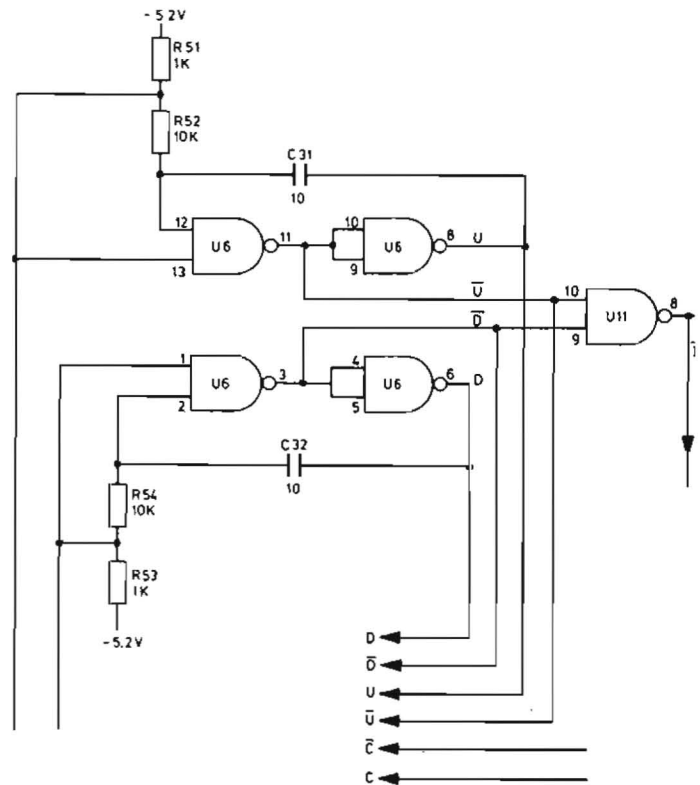
On Table 8-2, change the Table of Replaceable Parts to read:

MP4	0403-0132	GUIDE PC
MP6	0510-0002	INS-THRDED 6-32
MP7	0510-0137	INS-THRDED 4-40
MP17	5000-8923	PLATE SIDE
MP18	5000-8924	ANGLE
MP19	5000-8926	BRACKET 1/4 MOD
MP20	5020-9021	BD PC

Delete:

MP21	5061-2113	CHASSIS AY
A3R66	0757-0280	R-F 1 K 1 % .125 W
A3R67	0757-0280	R-F 1 K 1 % .125 W

Make the appropriate changes to the layout diagram _____ and to the schematic diagram as shown below.

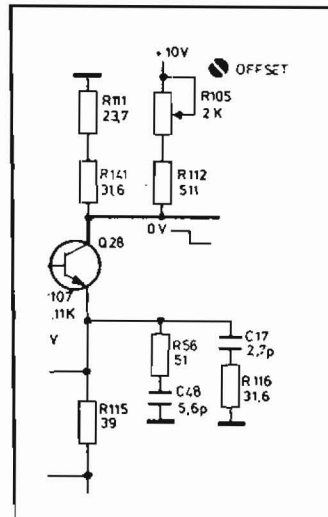
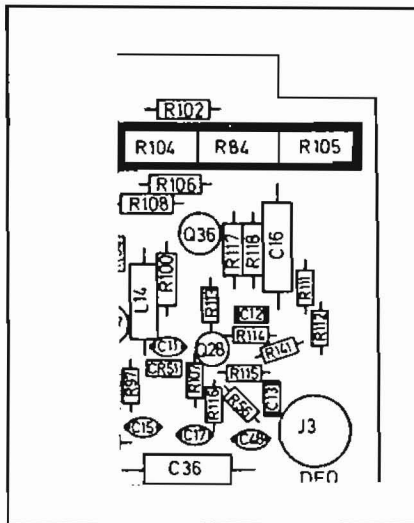


CHANGE 8

On Table 8-2, change the Table of Replaceable Parts to read:

A2C17	0160-3568	C-F 2.7 PF 100 V
A2C48	0160-3566	C-F 5.6 PF 100 V
A2R56	0698-7205	R-F 51.1 2 % .125 W
A2R116	0698-7200	R-F 31.6 2 % .05 W

Make the appropriate changes to the schematic and layout diagrams for A2 as shown below:



FRAME

REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION
A1	08092-66501	BD AY CONTROL
A2	08092-66502	BD AY ANALOG
A3	08092-66503	BD AY DIGITAL
J1	1251-2035	CONN PC 2 x 15
MP1	5041-0309	CAP KEY QUATER
MP2	5041-0309	CAP KEY QUATER
MP8	0509-0836	NUT 1/4-40
MP9	08092-00201	PANEL FRONT
MP10	08092-28101	WINDOW
MP11	2190-0108	WASH-LOCK .115 ID
MP12	2200-0141	SCR MACH 4-40
MP13	2200-0770	SCR MACH 4-40
MP14	2360-0332	SCR 6-32 x .312
MP15	3101-0851	CAP PUSH BUTTON
MP16	5000-8923	PANEL-SUB
MP21	5061-2113	CHASSIS AY
S1	3101-1311	SW SLIDE DPDT
S2	3101-1221	SW PBTN SPDT
W1	08092-61604	CBL AY SHLD No.4

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A1	08092-66501	BD AY-CONTROL
A1	C1	9 0160-0174 C-F .47UF 25V
A1	C2	0 0160-2204 C-F 100PF 300V
A1	J4	9 1200-0474 SOCKET IC 14CONT
A1	J5	9 1200-0474 SOCKET IC 14CONT
A1	J6	9 1200-0474 SOCKET IC 14CONT
A1	Q1	1 1854-0215 XSTR SI 2N3904
A1	Q2	1 1854-0215 XSTR SI 2N3904
A1	Q3	1 1854-0215 XSTR SI 2N3904
A1	Q4	1 1854-0215 XSTR SI 2N3904
A1	Q5	1 1854-0215 XSTR SI 2N3904

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A1	Q6	1 1854-0215 XSTR SI 2N3904
A1	Q7	1 1854-0215 XSTR SI 2N3904
A1	R1	8 0698-3441 R-F 215 1% .125W
A1	R2	8 0698-3441 R-F 215 1% .125W
A1	R3	8 0698-3441 R-F 215 1% .125W
A1	R4	8 0698-3441 R-F 215 1% .125W
A1	R5	8 0698-3441 R-F 215 1% .125W
A1	R6	8 0698-3441 R-F 215 1% .125W
A1	R7	8 0698-3441 R-F 215 1% .125W
A1	R8	8 0698-3441 R-F 215 1% .125W
A1	R9	8 0698-3441 R-F 215 1% .125W
A1	R10	8 0698-3441 R-F 215 1% .125W
A1	R11	8 0698-3441 R-F 215 1% .125W
A1	R12	8 0698-3441 R-F 215 1% .125W
A1	R13	8 0698-3441 R-F 215 1% .125W
A1	R14	8 0698-3441 R-F 215 1% .125W
A1	R15	8 0698-3441 R-F 215 1% .125W
A1	R16	8 0698-3441 R-F 215 1% .125W
A1	R21	3 0757-0280 R-F 1K1% .125W F
A1	R22	3 0757-0280 R-F 1K1% .125W F
A1	R23	6 0757-0449 R-F 20K1% .125W
A1	R24	3 0698-4428 R-F 1.69K1%
A1	R25	1 0757-0288 RES 9.09K 1% .125
A1	R26	1 0698-4020 R-F 9.53K1%
A1	R27	2 0757-0411 R-F 332 1% .125W
A1	R28	7 0698-0082 R-F 464 1% .125W
A1	R29	4 0757-0421 R-F 825 1% .125W
A1	R30	7 0698-0082 R-F 464 1% .125W
A1	R31	7 0698-0082 R-F 464 1% .125W
A1	R32	1 0757-0288 RES 9.09K 1% .125
A1	S3	7 5060-9436 SW P-BTN SINGLE
A1	S4	7 5060-9436 SW P-BTN SINGLE
A1	U1	4 1990-0434 LED DISPLAY NUM
A1	U2	4 1990-0434 LED DISPLAY NUM
A1	U3	4 1990-0434 LED DISPLAY NUM
A1	W1	0 5081-1994 CBL RB 16C 368MM
A1	W2	4 5081-1964 CBL RB 16C 305MM

A2 08092-66502 BD AY ANALOG

REFERENCE DESIGNATOR	C	H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C	H-P PART D NUMBER	DESCRIPTION
A2	C1	4 0160-3470	C-F .01UF 50V	A2	CR6	4 1901-0639	DIO PIN 110V
A2	C2	4 0160-3785	C-F .1UF 20% 50V	A2	CR7	4 1901-0639	DIO PIN 110V
A2	C3	4 0160-3785	C-F .1UF 20% 50V	A2	CR8	4 1901-0639	DIO PIN 110V
A2	C4	8 0180-0197	C-F 2.2UF 20V	A2	CR9	4 1901-0639	DIO PIN 110V
A2	C5	6 0160-3878	C-F .001UF 100V	A2	CR10	4 1901-0639	DIO PIN 110V
A2	C6	3 0180-0374	C-F 10UF 20V	A2	CR11	4 1901-0639	DIO PIN 110V
A2	C7	2 0160-3874	C-F 10PF 200V	A2	CR12	4 1901-0639	DIO PIN 110V
A2	C8	1 0160-3568	C-F 2.7PF 200V	A2	CR13	4 1901-0639	DIO PIN 110V
A2	C10	1 0160-3568	C-F 2.7PF 200V	A2	CR14	4 1901-0639	DIO PIN 110V
A2	C11	4 0160-3470	C-F .01UF 50V	A2	CR15	4 1901-0639	DIO PIN 110V
A2	C12	4 0160-3785	C-F .1UF 20% 50V	A2	CR16	4 1901-0639	DIO PIN 110V
A2	C13	4 0160-3785	C-F .1UF 20% 50V	A2	CR17	4 1901-0639	DIO PIN 110V
A2	C15	6 0160-3878	C-F .001UF 100V	A2	CR18	4 1901-0639	DIO PIN 110V
A2	C16	3 0180-0374	C-F 10UF 20V	A2	CR19	4 1901-0639	DIO PIN 110V
A2	C19	8 0180-0197	C-F 2.2UF 20V	A2	CR20	4 1901-0639	DIO PIN 110V
A2	C20	9 0160-2055	C-F .01UF 100V	A2	CR21	4 1901-0639	DIO PIN 110V
A2	C21	9 0160-2055	C-F .01UF 100V	A2	CR36	4 1901-0639	DIO PIN 110V
A2	C22	9 0160-2055	C-F .01UF 100V	A2	CR37	4 1901-0639	DIO PIN 110V
A2	C23	9 0160-2055	C-F .01UF 100V	A2	CR38	4 1901-0639	DIO PIN 110V
A2	C24	9 0160-2055	C-F .01UF 100V	A2	CR39	4 1901-0639	DIO PIN 110V
A2	C25	9 0160-2055	C-F .01UF 100V	A2	CR40	4 1901-0639	DIO PIN 110V
A2	C26	9 0160-2055	C-F .01UF 100V	A2	CR41	4 1901-0639	DIO PIN 110V
A2	C27	9 0160-2055	C-F .01UF 100V	A2	CR42	4 1901-0639	DIO PIN 110V
A2	C28	9 0160-2055	C-F .01UF 100V	A2	CR43	4 1901-0639	DIO PIN 110V
A2	C29	9 0160-2055	C-F .01UF 100V	A2	CR44	4 1901-0639	DIO PIN 110V
A2	C30	9 0160-2055	C-F .01UF 100V	A2	CR45	4 1901-0639	DIO PIN 110V
A2	C31	9 0160-2055	C-F .01UF 100V	A2	CR46	4 1901-0639	DIO PIN 110V
A2	C32	9 0160-2055	C-F .01UF 100V	A2	CR47	4 1901-0639	DIO PIN 110V
A2	C33	9 0160-2055	C-F .01UF 100V	A2	J2	1 1250-0835	JACK RECEP STRAI
A2	C34	3 0180-0374	C-F 10UF 20V	A2	J3	1 1250-0835	JACK RECEP STRAI
A2	C35	7 0180-0229	C-F 33UF 10V	A2	L1	1 9140-0137	COIL-FXD 1000 UH
A2	C36	3 0180-0374	C-F 10UF 20V	A2	L2	1 9140-0137	COIL-FXD 1000 UH
A2	C37	9 0160-2055	C-F .01UF 100V	A2	L3	1 9140-0137	COIL-FXD 1000 UH
A2	C38	9 0160-2055	C-F .01UF 100V	A2	L4	1 9140-0137	COIL-FXD 1000 UH
A2	C41	1 0160-3568	C-F 2.7PF 200V	A2	L5	1 9140-0137	COIL-FXD 1000 UH
A2	C42	6 0160-3456	C-F 1000PF 1000V	A2	L6	1 9140-0137	COIL-FXD 1000 UH
A2	C43	3 0160-4386	C-F 33PF 5% 200V	A2	L7	1 9140-0137	COIL-FXD 1000 UH
A2	C44	4 0160-3652	C-F 4.7 PF 200V	A2	L8	1 9140-0137	COIL-FXD 1000 UH
A2	C45	1 0160-3568	C-F 2.7PF 200V	A2	L9	1 9140-0137	COIL-FXD 1000 UH
A2	C46	1 0160-0134	C-F 220PF 300V	A2	L9	1 9140-0137	COIL-FXD 1000 UH
A2	C47	4 0160-3470	C-F .01UF 50V	A2	L10	1 9140-0137	COIL-FXD 1000 UH

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A2	L11	1 9140-0137	A2	Q11	2 1854-0472
A2	L13	5 5081-1973	A2	Q12	7 1854-0477
A2	L14	5 5081-1973	A2	Q13	7 1854-0477
A2	L16	1 9140-0137	A2	Q14	6 1854-0632
A2	L17	1 9140-0137	A2	Q15	5 1854-0897
A2	L18	1 9140-0137	A2	Q16	9 1853-0314
A2	L19	1 9140-0137	A2	Q17	9 1853-0314
A2	L20	1 9140-0137	A2	Q18	9 1853-0314
A2	L21	1 9140-0137	A2	Q19	2 1854-0472
A2	L22	1 9140-0137	A2	Q20	2 1854-0472
A2	L23	1 9140-0137	A2	Q21	2 1854-0472
A2	L24	1 9140-0137	A2	Q22	2 1854-0472
A2	L25	5 5081-1973	A2	Q23	2 1854-0472
A2	L26	5 5081-1973	A2	Q24	2 1854-0472
A2	L27	5 5081-1973	A2	Q25	7 1854-0477
A2	L28	5 5081-1973	A2	Q26	7 1854-0477
A2	L29	5 5081-1973	A2	Q27	6 1854-0632
A2	L30	5 5081-1973	A2	Q28	5 1854-0897
A2	L31	5 5081-1973	A2	Q29	1 1854-0215
A2	L32	5 5081-1973	A2	Q30	9 1853-0314
A2	L33	5 5081-1973	A2	Q31	2 1853-0036
A2	L34	5 5081-1973	A2	Q32	9 1853-0314
A2	L35	5 5081-1973	A2	Q33	5 1854-0392
A2	L36	5 5081-1973	A2	Q34	2 1853-0036
A2	L37	5 5081-1973	A2	Q35	5 1854-0392
A2	L38	5 5081-1973	A2	Q36	2 1853-0036
A2	L39	5 5081-1973	A2	R1	0 0757-0401
A2	L40	5 5081-1973	A2	R3	8 0698-3178
A2	L41	5 5081-1973	A2	R4	2 0698-4469
A2	L42	5 5081-1973	A2	R5	3 0698-4428
A2	L43	5 5081-1973	A2	R6	5 0698-4404
A2	L44	5 5081-1973	A2	R7	1 0757-0402
A2	Q1	9 1853-0314	A2	R8	6 0757-0407
A2	Q2	9 1853-0314	A2	R9	0 0757-0401
A2	Q3	9 1853-0314	A2	R10	5 0698-4404
A2	Q4	2 1854-0472	A2	R11	1 0757-0402
A2	Q5	2 1854-0472	A2	R12	6 0757-0407
A2	Q6	2 1854-0472	A2	R13	3 0698-4428
A2	Q7	2 1854-0472	A2	R14	2 0698-4469
A2	Q8	2 1854-0472	A2	R15	8 0698-3178
A2	Q9	2 1854-0472	A2	R16	9 0698-4383
A2	Q10	2 1854-0472			

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION		
A2	R17	9 0698-4383	R-F 53.6 1/8W 1%	A2	R64	9 0698-7212	R-F 100 1% .05W
A2	R18	9 0698-4383	R-F 53.6 1/8W 1%	A2	R65	8 0698-7253	R-F 5.11K 1%.05
A2	R19	9 0698-4383	R-F 53.6 1/8W 1%	A2	R66	8 0698-7203	R-F 42.2 1%.05W
A2	R20	7 0757-0317	R-F 1.33K1%	A2	R67	8 0698-7203	R-F 42.2 1%.05W
A2	R21	7 0757-0317	R-F 1.33K1%	A2	R68	1 0698-7206	R-F 56.2 1%.05W
A2	R22	7 0757-0317	R-F 1.33K1%	A2	R69	2 0757-0403	R-F 121 1% .125W
A2	R23	7 0757-0317	R-F 1.33K1%	A2	R70	8 0698-3178	R-F 487 1% .125W
A2	R24	7 0757-0317	R-F 1.33K1%	A2	R71	4 0757-0398	R-F 75 1% .125W
A2	R25	7 0757-0317	R-F 1.33K1%	A2	R72	8 0698-7253	R-F 5.11K 1%.05
A2	R26	7 0757-0317	R-F 1.33K1%	A2	R73	9 0698-7197	R-F 23.7 1%.05W
A2	R27	7 0757-0317	R-F 1.33K1%	A2	R74	1 0698-7264	R-F 14.7K 1%.05
A2	R28	7 0757-0317	R-F 1.33K1%	A2	R75	7 0698-7202	R-F 38.3 1%.05W
A2	R29	7 0757-0317	R-F 1.33K1%	A2	R76	7 0698-7202	R-F 38.3 1%.05W
A2	R30	7 0757-0317	R-F 1.33k1%	A2	R77	0 0698-7205	R-F 51.1 1%.05W
A2	R31	7 0757-0317	R-F 1.33k1%	A2	R78	6 0757-0449	R-F 20K1% .125W
A2	R32	7 0757-0317	R-F 1.33k1%	A2	R79	6 0757-0449	R-F 20K1% .125W
A2	R33	7 0757-0317	R-F 1.33k1%	A2	R80	3 0698-4428	R-F 1.69K1%
A2	R34	7 0757-0317	R-F 1.33k1%	A2	R81	4 0757-0421	R-F 825 1% .125W
A2	R35	7 0757-0317	R-F 1.33k1%	A2	R82	8 0698-3136	R-F 17.8K1%
A2	R36	7 0757-0317	R-F 1.33k1%	A2	R83	9 0757-1094	R-F 1.47K1%
A2	R37	7 0757-0317	R-F 1.33k1%	A2	R84	6 2100-3351	RES TRMP 500 10%
A2	R38	7 0757-0317	R-F 1.33k1%	A2	R85	9 0757-1094	R-F 1.47K1%
A2	R39	7 0757-0317	R-F 1.33k1%	A2	R86	6 2100-3351	RES TRMP 500 10%
A2	R40	6 0757-0465	R-F 100k1% .125W	A2	R87	9 0757-0442	R-F 10K1% .125W
A2	R41	6 0757-0465	R-F 100k1% .125W	A2	R88	5 0698-7200	R-F 31.6 1%.05W
A2	R42	6 0757-0465	R-F 100k1% .125W	A2	R89	7 0698-7202	R-F 38.3 1%.05W
A2	R43	6 0757-0465	R-F 100k1% .125W	A2	R91	3 0757-0438	R-F 5.11K1%
A2	R44	6 0757-0465	R-F 100k1% .125W	A2	R92	6 0698-7277	R-F 51.1K 1%.05
A2	R45	6 0757-0465	R-F 100k1% .125W	A2	R93	9 0698-7212	R-F 100 1% .05W
A2	R46	6 0757-0465	R-F 100k1% .125W	A2	R94	9 0698-7212	R-F 100 1% .05W
A2	R47	6 0757-0465	R-F 100k1% .125W	A2	R95	8 0698-7253	R-F 5.11K 1%.05
A2	R48	6 0757-0465	R-F 100k1% .125W	A2	R96	3 0698-4395	R-F 78.7
A2	R49	6 0757-0465	R-F 100k1% .125W	A2	R97	1 0698-7206	R-F 56.2 1%.05W
A2	R50	6 0757-0465	R-F 100k1% .125W	A2	R98	8 0698-7203	R-F 42.2 1%.05W
A2	R51	6 0757-0465	R-F 100k1% .125W	A2	R99	8 0698-7203	R-F 42.2 1%.05W
A2	R52	6 0757-0465	R-F 100k1% .125W	A2	R100	8 0698-3178	R-F 487 1% .125W
A2	R53	6 0757-0465	R-F 100k1% .125W	A2	R101	4 0757-0398	R-F 75 1% .125W
A2	R54	6 0698-7219	R-F 196 1% .05W	A2	R102	9 0757-1094	R-F 1.47K1%
A2	R55	4 0698-7209	R-F 75 1% .05W	A2	R103	2 2100-3274	R-VAR 10K 10%
A2	R57	8 0757-0433	R-F 3.32k1%	A2	R104	2 2100-3274	R-VAR 10K 10%
A2	R61	3 0757-0438	R-F 5.11k1%	A2	R105	1 2100-3273	R-VAR 2K 10%
A2	R62	6 0698-7277	R-F 51.1k1% .05W	A2	R106	0 0698-4467	R-F 1.05K1%
A2	R63	9 0698-7212	R-F 100k1% .05W	A2	R107	8 0698-7253	R-F 5.11K 1%.05
				A2	R108	8 0698-3136	R-F 17.8K1%

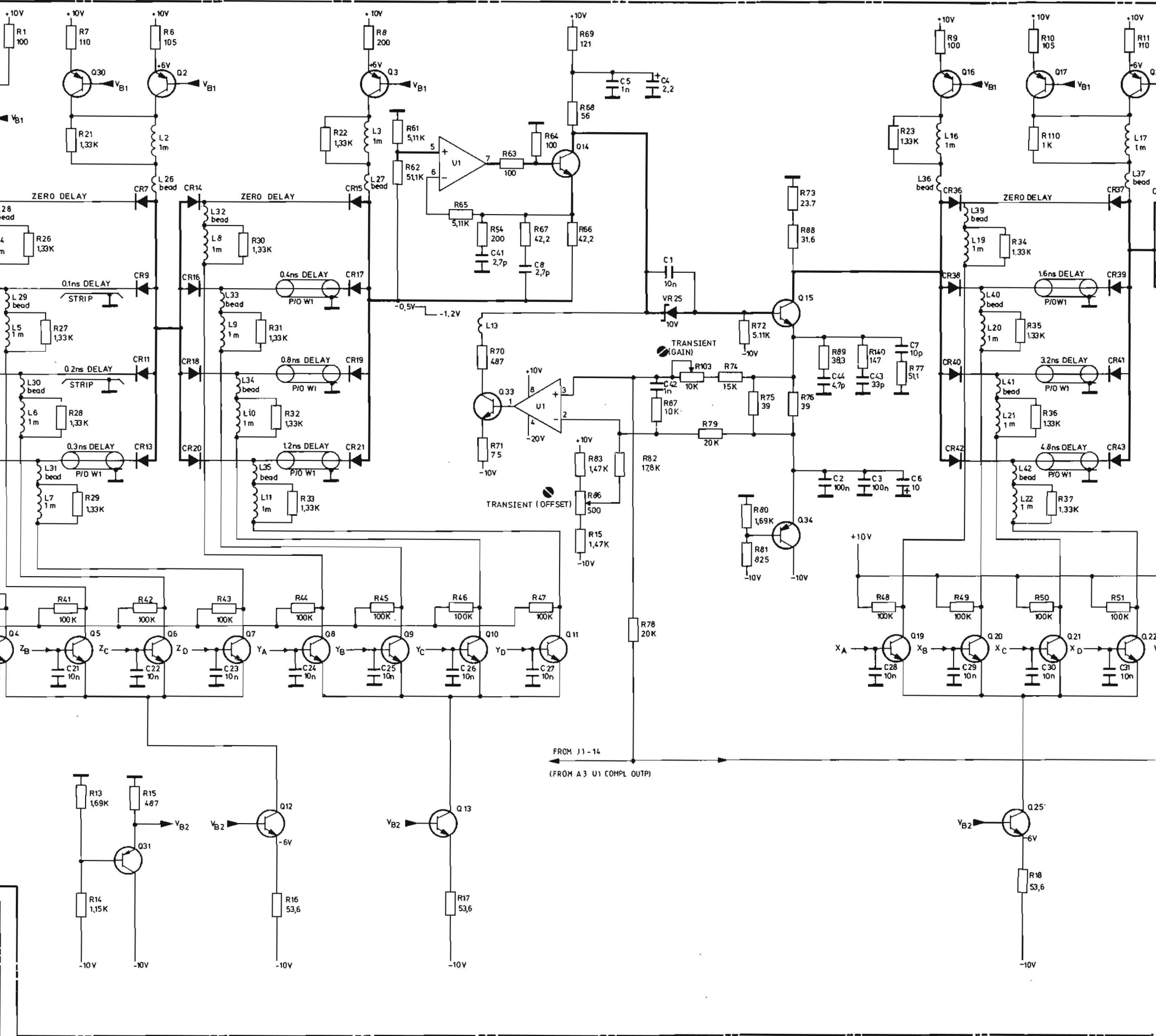
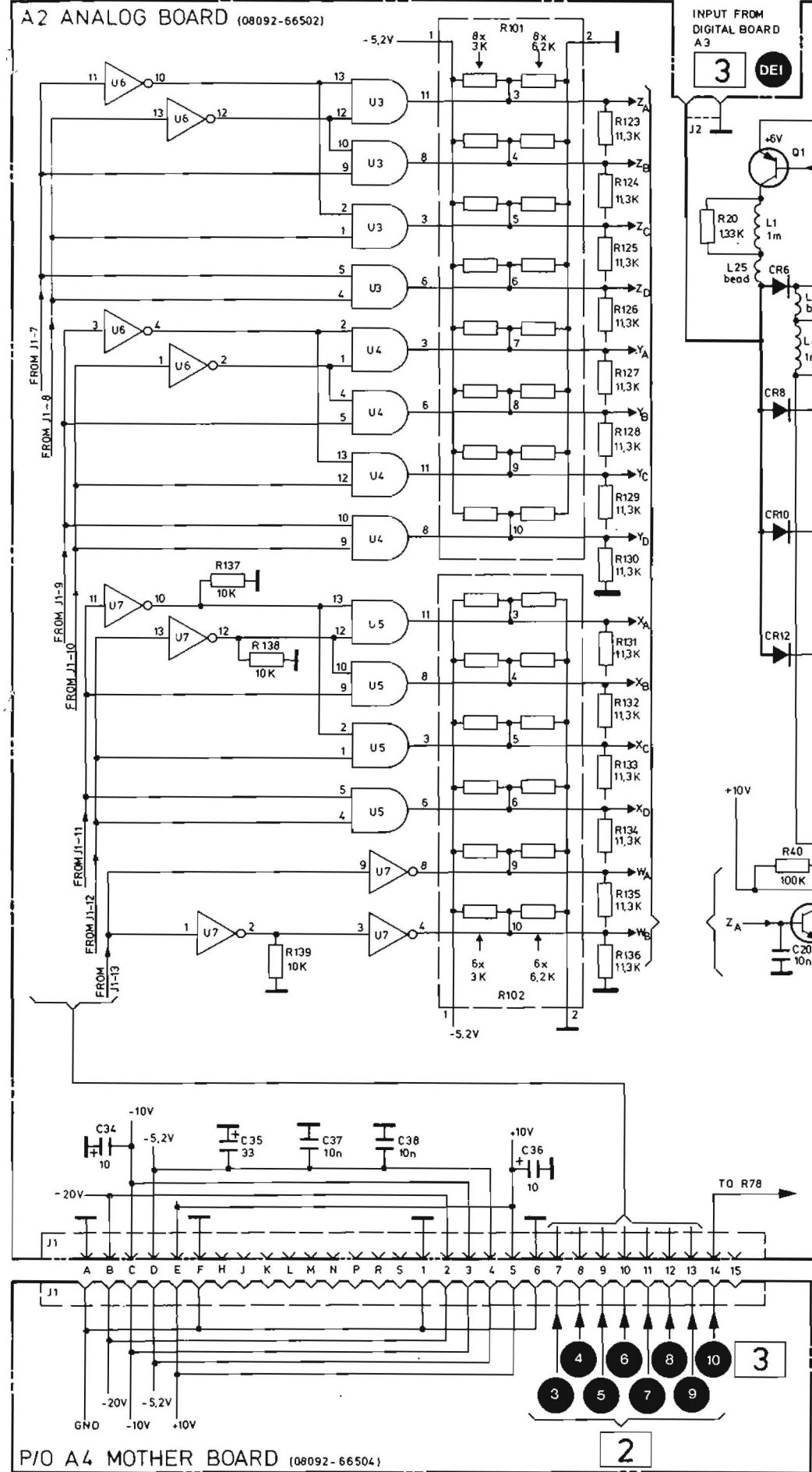
REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	A3	08092-66503	RD AY DIGITAL	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	
A2	R109	6 0757-0449	R-F	20K1%	.125W	A3	C1	3 0180-0291	C-F 1UF 35V
A2	R110	6 0757-0449	R-F	20K1%	.125W	A3	C2	4 0160-4212	C-F .068UF 20%
A2	R111	9 0698-7197	R-F	23.7 1%	.05W	A3	C3	3 0160-4386	C-F 33PF 5% 200V
A2	R112	8 0698-7229	R-F	511 1%	.05W	A3	C4	6 0160-3878	C-F .001UF 100V
A2	R113	1 0698-7264	R-F	14.7K 1%	.05	A3	C5	1 0160-3568	C-F 2.7PF 200V
A2	R114	7 0698-7202	R-F	38.3 1%	.05W	A3	C6	8 0180-0197	C-F 2.2UF 20V
A2	R115	7 0698-7202	R-F	38.3 1%	.05W	A3	C7	6 0160-3878	C-F .001UF 100V
A2	R117	3 0698-4428	R-F	1.69K1%		A3	C8	1 0160-3568	C-F 2.7PF 200V
A2	R118	4 0757-0421	R-F	825 1%	.125W	A3	C9	4 0160-3470	C-F .01UF 50V
A2	R121	3 1810-0136	R-NETWORK	8-3K		A3	C10	1 0160-3568	C-F 2.7PF 200V
A2	R122	3 1810-0136	R-NETWORK	8-3K		A3	C11	4 0160-3785	C-F .1UF 20% 50V
A2	R123	3 0698-4121	R-F	11.3K1%		A3	C12	4 0160-3785	C-F .1UF 20% 50V
A2	R124	3 0698-4121	R-F	11.3K1%		A3	C13	7 0160-3647	C-F 22PF 5% 100V
A2	R125	3 0698-4121	R-F	11.3K1%		A3	C14	7 0180-0229	C-F 33UF 10V
A2	R126	3 0698-4121	R-F	11.3K1%		A3	C16	8 0180-0197	C-F 2.2UF 20V
A2	R127	3 0698-4121	R-F	11.3K1%		A3	C17	6 0160-3878	C-F .001UF 100V
A2	R128	3 0698-4121	R-F	11.3K1%		A3	C18	9 0160-3566	C-F 5.6PF 100V
A2	R129	3 0698-4121	R-F	11.3K1%		A3	C19	4 0160-3652	C-F 4.7 PF 200V
A2	R130	3 0698-4121	R-F	11.3K1%		A3	C20	2 0160-3874	C-F 10PF 200V
A2	R131	3 0698-4121	R-F	11.3K1%		A3	C21	2 0160-3874	C-F 10PF 200V
A2	R132	3 0698-4121	R-F	11.3K1%		A3	C22	6 0160-3878	C-F .001UF 100V
A2	R133	3 0698-4121	R-F	11.3K1%		A3	C23	4 0160-4387	C-F 47PF 200V
A2	R134	3 0698-4121	R-F	11.3K1%		A3	C24	6 0160-3878	C-F .001UF 100V
A2	R135	3 0698-4121	R-F	11.3K1%		A3	C31	3 0180-0374	C-F 10UF 20V
A2	R136	3 0698-4121	R-F	11.3K1%		A3	C32	3 0180-0374	C-F 10UF 20V
A2	R137	9 0757-0442	R-F	10K1%	.125W	A3	C33	3 0180-0374	C-F 10UF 20V
A2	R138	9 0757-0442	R-F	10K1%	.125W	A3	C34	2 0140-0210	C-F 270PF 300V
A2	R139	9 0757-0442	R-F	10K1%	.125W	A3	C35	8 0180-0197	C-F 2.2UF 20V
A2	R140	3 0698-7216	R-F	147 1%	.05W	A3	C36	3 0180-0100	C-F 4.7UF 35V
A2	R141	5 0698-7200	R-F	31.6 1%	.05W	A3	C41	6 0180-0228	C-F 22UF 15V
A2	U1	7 1826-0111	IC-DUAL OP AMPL			A3	C42	7 0180-0229	C-F 33UF 10V
A2	U2	7 1826-0111	IC-DUAL OP AMPL			A3	C43	8 0180-0197	C-F 2.2UF 20V
A2	U3	9 1820-1246	IC SN74LS 09 N			A3	C44	8 0180-0197	C-F 2.2UF 20V
A2	U4	9 1820-1246	IC SN74LS 09 N			A3	C45	8 0180-0197	C-F 2.2UF 20V
A2	U5	9 1820-1246	IC SN74LS 09 N			A3	C46	9 0160-2055	C-F .01UF 100V
A2	U6	1 1820-1199	IC SN74LS 04			A3	C47	9 0160-2055	C-F .01UF 100V
A2	U7	5 1820-1200	IC SN74LS05			A3	C48	9 0160-2055	C-F .01UF 100V
A2	VR25	0 1902-0641	DIO 10V 10%	.5W		A3	C49	9 0160-2055	C-F .01UF 100V
A2	VR51	0 1902-0641	DIO 10V 10%	.5W		A3	C50	9 0160-2055	C-F .01UF 100V
A2	W1	08092-61601	CBL AY-SHLD #1			A3	CR1	1 1901-0040	DIO SI .05A 30V
A2	TP1	0360-0535	TERMINAL TEST POINT			A3	CR3	1 1901-0040	DIO SI .05A 30V
						A3	CR4	1902-1332	DIO 6.8V 5% .5W

REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C H-P PART D NUMBER	DESCRIPTION
A3	CR5	1902-1332	A3	R6	3 0698-4428
A3	CR6	3 1901-0050	A3	R7	3 0698-4460
A3	CR7	1 1901-0040	A3	R8	5 2100-3350
A3	CR11	1 1901-0040	A3	R9	0 0698-4467
A3	CR12	1 1901-0040	A3	R10	6 0757-0283
A3	J2	6 1200-0588	A3	R11	8 0698-3558
A3	J2	5040-9316	A3	R13	8 0698-3558
A3	J3	6 1200-0588	A3	R14	2 0698-4435
A3	J3	5040-9316	A3	R15	5 0698-3498
A3	J4	1 1250-0835	A3	R16	7 2100-3352
A3	J5	2 1250-0836	A3	R17	9 0698-0084
A3	J6	2 1250-0836	A3	R18	4 0757-0421
A3	J7	2 1250-0836	A3	R19	8 0757-0334
A3	K1	1 0490-1034	A3	R20	4 0698-7209
A3	K2	1 0490-1034	A3	R21	3 0757-0438
A3	K3	1 0490-1034	A3	R22	6 0698-7277
A3	K4	1 0490-1034	A3	R23	8 0698-7253
A3	L1	5 5081-1973	A3	R24	0 0757-0401
A3	L2	3 9100-1660	A3	R25	7 0698-7202
A3	L3	5 5081-1973	A3	R26	8 0698-7203
A3	L4	0 9100-0346	A3	R27	9 0698-7197
A3	MP1	7 1600-0341	A3	R28	8 0698-7253
A3	Q1	5 1854-0392	A3	R29	0 0698-7239
A3	Q2	5 1854-0392	A3	R30	1 0698-7206
A3	Q4	1 1854-0215	A3	R31	2 0757-0403
A3	Q5	6 1854-0632	A3	R32	8 0698-3178
A3	Q6	5 1854-0897	A3	R33	4 0757-0398
A3	Q7	5 1854-0392	A3	R34	4 0698-7267
A3	Q8	2 1853-0036	A3	R35	4 0698-7267
A3	Q9	9 1853-0281	A3	R36	1 0698-7264
A3	Q10	1 1854-0215	A3	R37	2 2100-3274
A3	Q11	6 1854-0632	A3	R38	3 0698-3157
A3	Q12	6 1854-0632	A3	R39	7 0698-7202
A3	Q14	2 1853-0218	A3	R40	7 2100-3352
A3	Q15	2 1853-0218	A3	R41	9 0757-1094
A3	Q16	2 1853-0086	A3	R42	9 0757-1094
A3	Q20	2 1853-0086	A3	R43	7 0698-7202
A3	R1	1 2100-3273	A3	R44	7 0698-7202
A3	R2	8 0757-0384	A3	R45	3 0698-4428
A3	R3	7 0698-7236	A3	R46	4 0757-0421
A3	R4	9 0757-0400	A3	R47	9 0757-0418
A3	R5	8 0757-0409	A3	R48	1 0698-7206
			A3	R49	4 0698-7209
			A3	R50	9 0757-0442
					R-F 1.69K1%
					R-F 649 1% .125W
					R-VAR 200 10%
					R-F 1.05K1%
					R-F 2K1% .125W F
					R-F 4.02K1%
					R-F 4.02K1%
					R-F 2.49K1%
					R-F 8.66K1%
					R-VAR 1K .5W
					R-F 2.15K 1% .125
					R-F 825 1% .125W
					R-F 301 1% .25W
					R-F 75 1% .05W
					R-F 5.11K1%
					R-F 51.1K 1% .05
					R-F 5.11K 1% .05
					R-F 100 1% .125W
					R-F 38.3 1% .05W
					R-F 42.2 1% .05W
					R-F 23.7 1% .05W
					R-F 5.11K 1% .05
					R-F 1.33K 1% .05
					R-F 56.2 1% .05W
					R-F 121 1% .125W
					R-F 487 1% .125W
					R-F 75 1% .125W
					R-F 19.6K 1% .05
					R-F 19.6K 1% .05
					R-F 14.7K 1% .05
					R-VAR 10K 10%
					R-F 19.6K 1% .125
					R-F 38.3 1% .05W
					R-VAR 1K .5W
					R-F 1.47K1%
					R-F 1.47K1%
					R-F 38.3 1% .05W
					R-F 38.3 1% .05W
					R-F 1.69K1%
					R-F 825 1% .125W
					R-F 619 1% .125W
					R-F 56.2 1% .05W
					R-F 75 1% .05W
					R-F 10K1% .125W

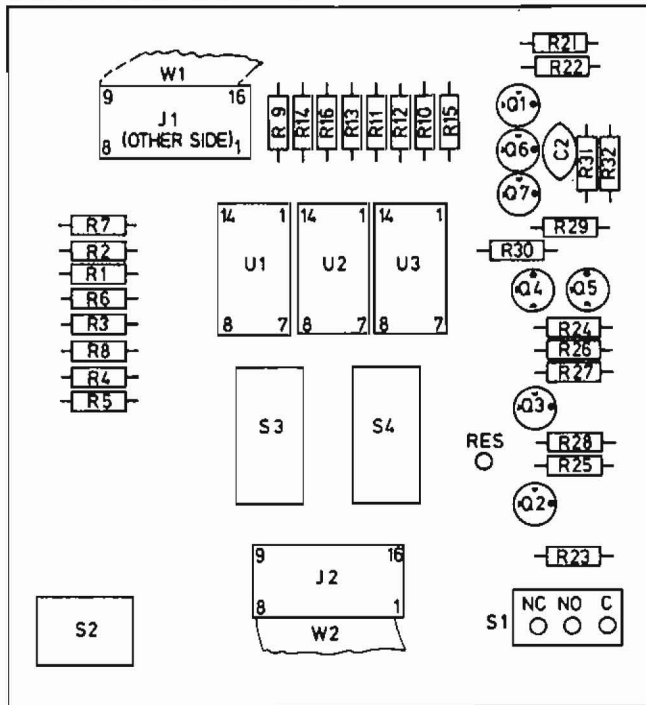
REFERENCE DESIGNATOR	C	H-P PART D NUMBER	DESCRIPTION	REFERENCE DESIGNATOR	C	H-P PART D NUMBER	DESCRIPTION
A3	R51	3 0757-0280	R-F 1K1% .125W F	A3	R127	0 0698-7205	R-F 51.1 1% .05W
A3	R52	4 0757-0273	R-F 3.01K1%	A3	R128	7 0698-5561	R-F 6.8 5% .125W
A3	R53	3 0757-0280	R-F 1K1% .125W F	A3	R129	0 0698-7205	R-F 51.1 1% .05W
A3	R54	4 0757-0273	R-F 3.01K1%	A3	R130	6 0698-3431	R-F 23.7 1%
A3	R55	7 0757-0440	R-F 7.5K 1% .125W	A3	R131	2 0698-7223	R-F 287 1% .05W
A3	R56	6 0757-0465	R-F 100K1% .125W	A3	R132	7 0757-0416	R-F 511 1% .125W
A3	R57	9 0757-0442	R-F 10K1% .125W	A3	R133	4 0698-3439	RES 178 1% .125W
A3	R58	7 0757-0458	R-F 51.1K1%	A3	R134	7 0698-7202	R-F 38.3 1% .05W
A3	R59	9 0757-0442	R-F 10K1% .125W	A3	R135	0698-4421	R-F 249 1% .125W
A3	R60	9 0757-0442	R-F 10K1% .125W	A3	R136	1 0698-4418	R-F 205 1% .125W
A3	R61	9 0757-0442	R-F 10K1% .125W	A3	R137	0 0757-0394	R-F 51.1 1%
A3	R62	9 0757-0442	R-F 10K1% .125W	A3	R140	0 0757-0279	R-F 3.16K1%
A3	R63	6 0757-0283	R-F 2K1% .125W F	A3	R141	7 2100-3352	R-VAR 1K .5W
A3	R64	9 0757-0442	R-F 10K1% .125W	A3	R142	0 0757-0279	R-F 3.16K1%
A3	R65	5 1810-0055	R-NETWORK 8X10K	A3	U2	4 1826-0043	IC LM307H
A3	R66	3 0757-0280	R-F 1K1% .125W F	A3	U3	7 1826-0111	IC-DUAL OP AMPL
A3	R66	9 0757-0442	R-F 10K1% .125W	A3	U4	4 1826-0043	IC LM307H
A3	R67	3 0757-0280	R-F 1K1% .125W F	A3	U5	4 1826-0043	IC LM307H
A3	R70	7 0698-7260	R-F 10K 1% .05W	A3	U6	9 1820-1197	IC SN74LS00
A3	R71	7 0698-7236	R-F 1K 1% .05W	A3	U7	9 1820-1197	IC SN74LS00
A3	R72	7 0698-7260	R-F 10K 1% .05W	A3	U8	6 1820-1285	IC-74LS 54
A3	R101	0 0698-7205	R-F 51.1 1% .05W	A3	U9	6 1820-1285	IC-74LS 54
A3	R102	0698-4421	R-F 249 1% .125W	A3	U10	1 1820-2014	IC DGT MC14069BC
A3	R103	5 0698-7218	R-F 178 1% .05W	A3	U11	9 1820-1197	IC SN74LS00
A3	R104	8 0698-7229	R-F 511 1% .05W	A3	U12	1 1820-1199	IC SN74LS 04
A3	R105	7 2100-3352	R-VAR 1K .5W	A3	U13	2 1820-1207	IC DGTL SN74LS30
A3	R106	7 0698-7202	R-F 38.3 1% .05W	A3	U14	5 1820-1200	IC SN74LS05
A3	R107	4 0698-7267	R-F 19.6K 1% .05	A3	U15	9 1820-1197	IC SN74LS00
A3	R108	1 0698-7264	R-F 14.7K 1% .05	A3	U16	6 1820-1277	IC SN74LS 192 N
A3	R111	2 0698-3156	R-F 14.7K1%	A3	U17	6 1820-1277	IC SN74LS 192 N
A3	R112	7 0698-7260	R-F 10K 1% .05W	A3	U18	4 1820-1580	IC DIGITAL
A3	R113	6 0698-7243	R-F 1.96K 1% .05	A3	U19	4 1820-1580	IC DIGITAL
A3	R114	5 0698-7200	R-F 31.6 1% .05W	A3	U20	4 1820-1267	IC SN74 184 N
A3	R115	5 0698-7200	R-F 31.6 1% .05W	A3	U21	4 1820-1267	IC SN74 184 N
A3	R116	9 0698-7197	R-F 23.7 1% .05W	A3	U22	4 1820-1811	IC DGTL 0-FF
A3	R117	7 0698-5561	R-F 6.8 5% .125W	A3	VR1	4 1902-0041	DIO 5.11V 5% .4W
A3	R118	9 0698-7212	R-F 100 1% .05W	A3	VR2	0 1902-0641	DIO 10V 10% .5W
A3	R120	1 0698-7206	R-F 56.2 1% .05W	A3	W1	08092-61602	CBL AY-SHLD #2
A3	R121	6 0698-7243	R-F 1.96K 1% .05	A3	W2	08092-61603	CBL AY-SHLD #3
A3	R122	6 0698-7243	R-F 1.96K 1% .05	A3	W3	08092-61606	CBL AY-SHLD #6
A3	R123	1 0698-7206	R-F 56.2 1% .05W	A3	TP1	0360 - Q535	TERMINAL TEST POINT
A3	R124	7 0698-7236	R-F 1K 1% .05W				
A3	R125	0 0698-7205	R-F 51.1 1% .05W				
A3	R126	0 0698-4855	R-F 267 1% .5W				

Model 8092A

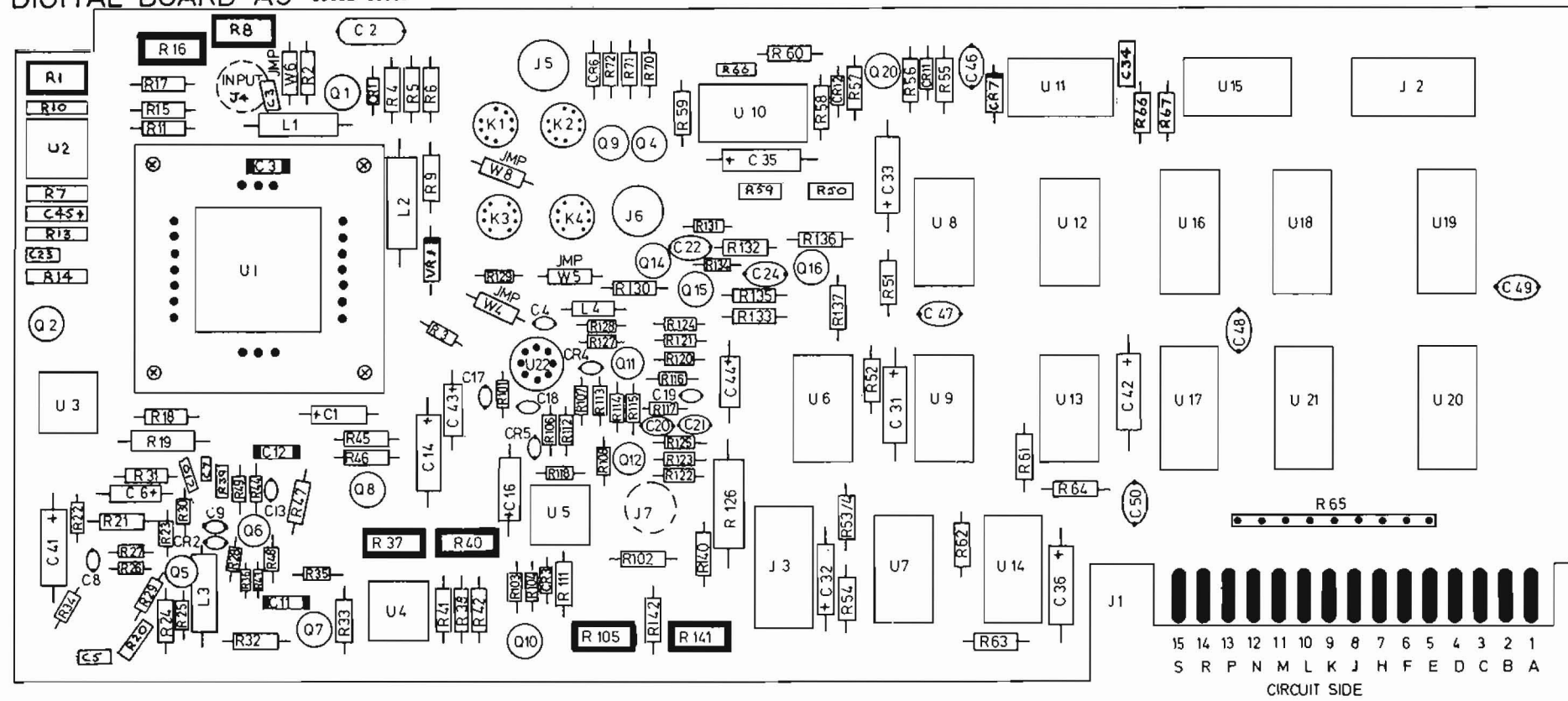
A2 ANALOG BOARD (08092-66502)

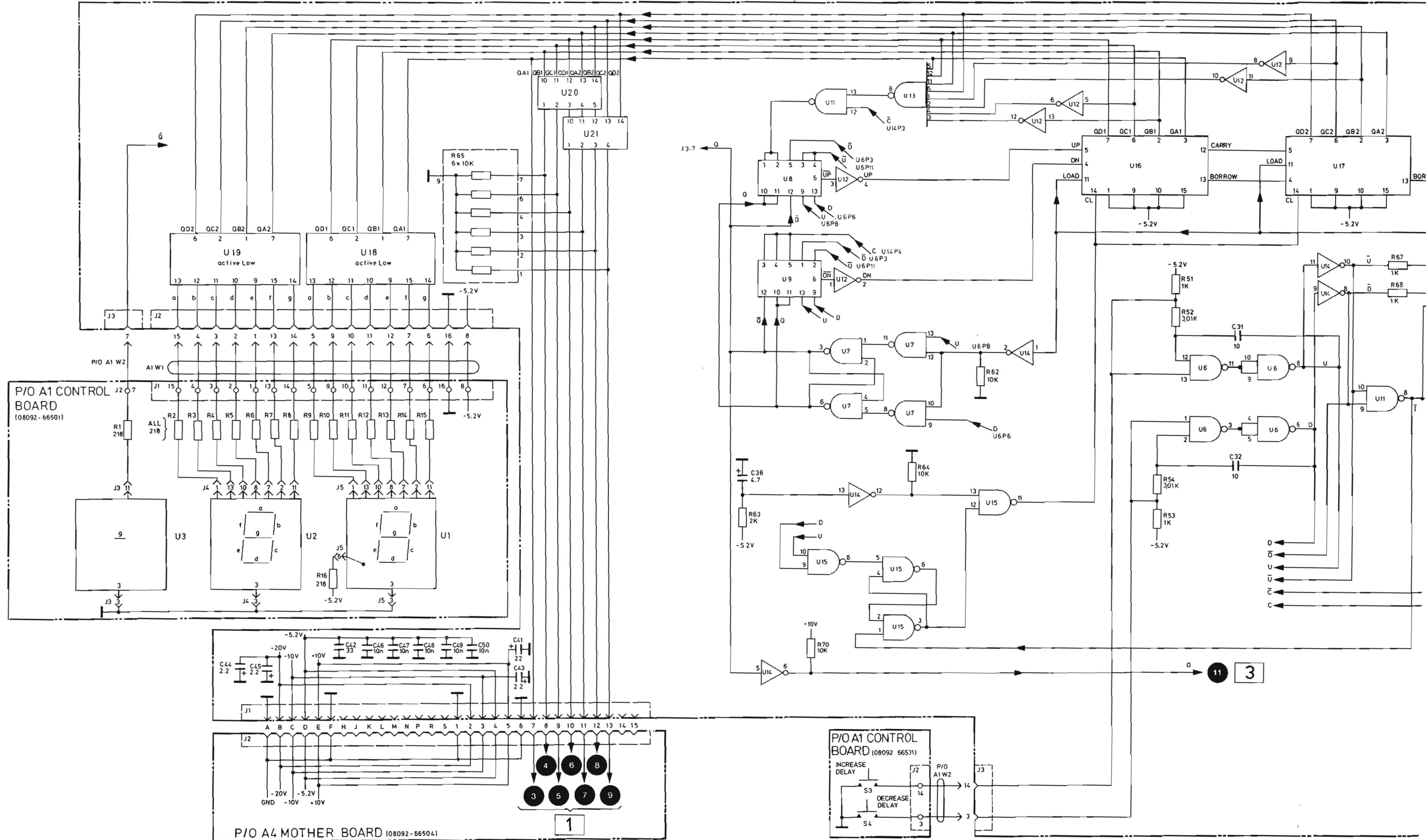


CONTROL BOARD A1 08092-66501

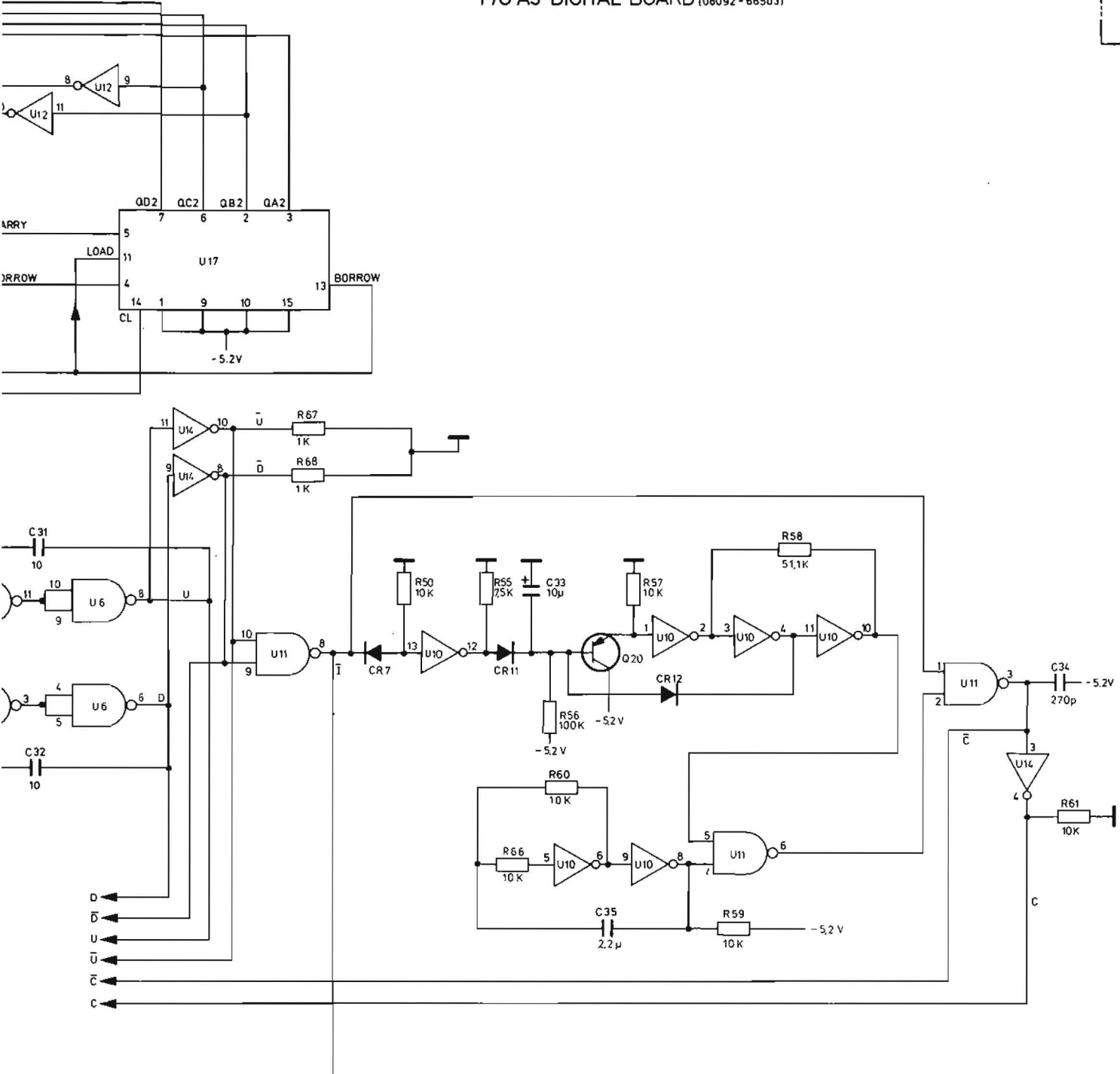


DIGITAL BOARD A3 08092-66503





P/O A3 DIGITAL BOARD (108092 - 66503)

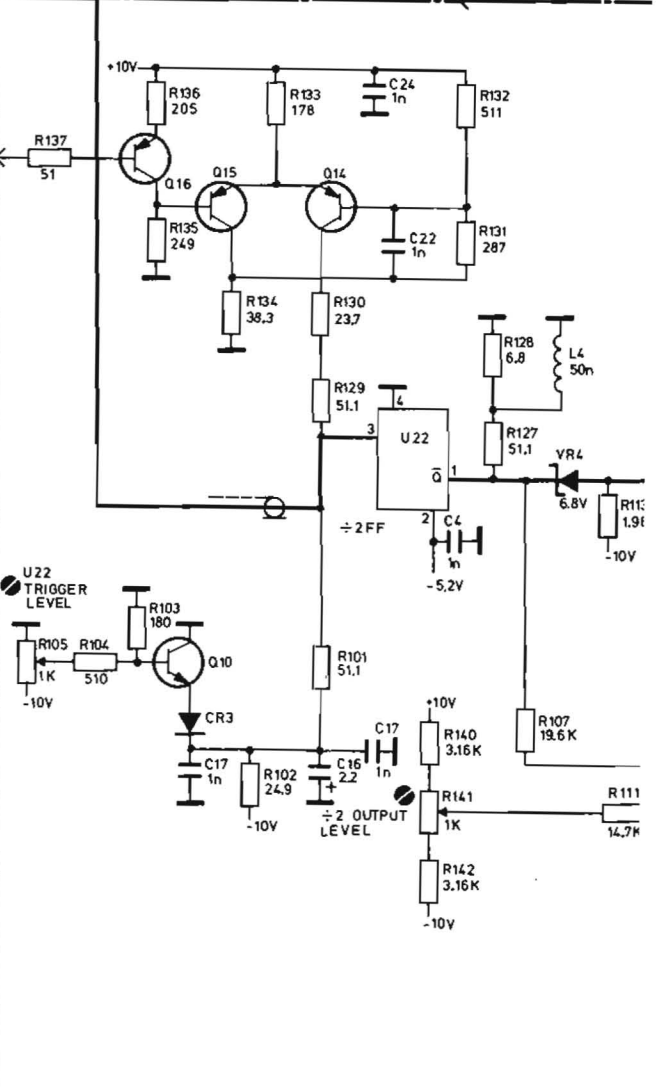
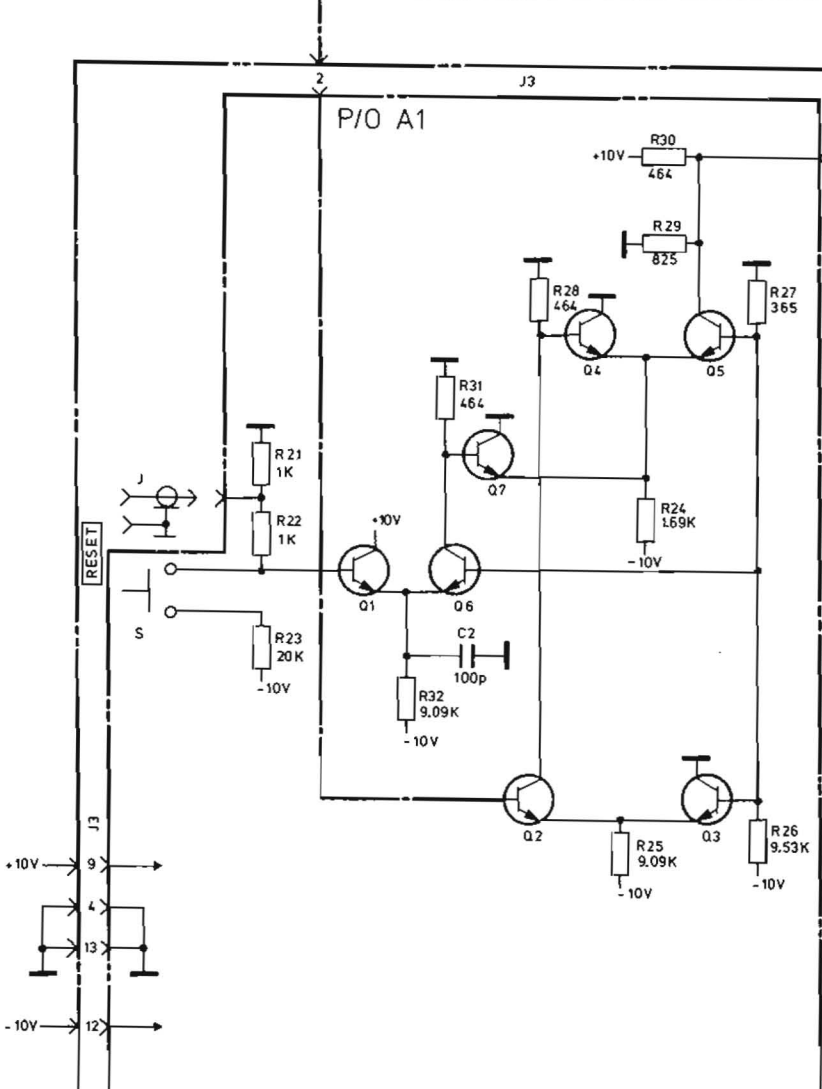
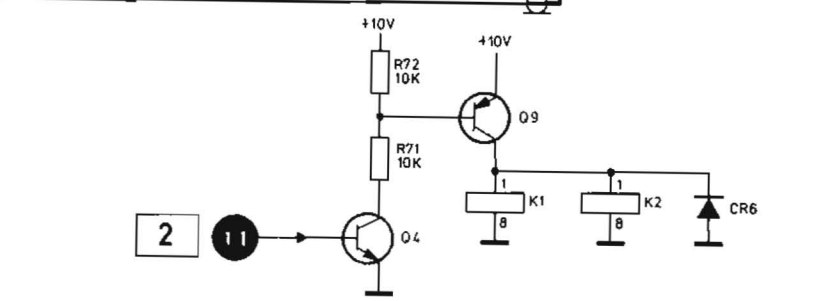
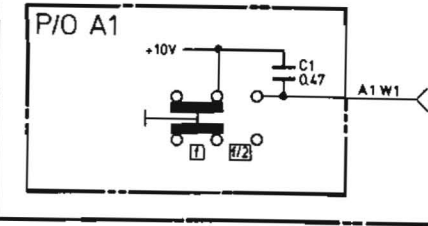
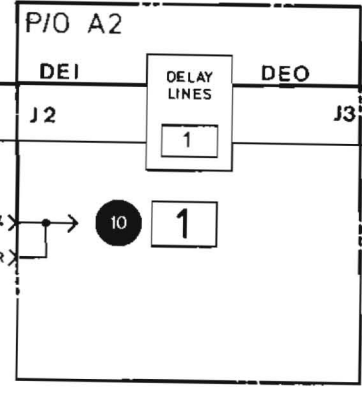
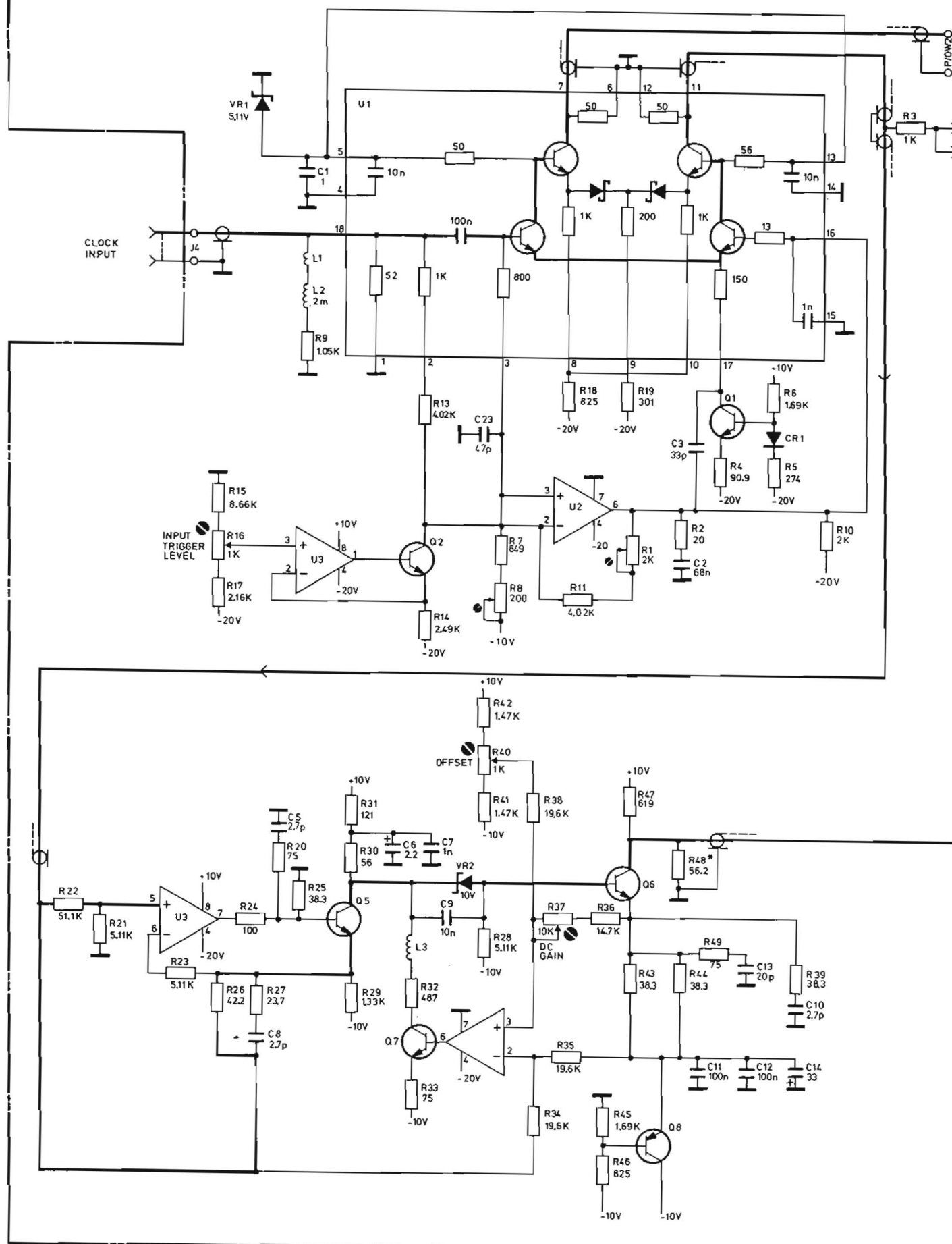


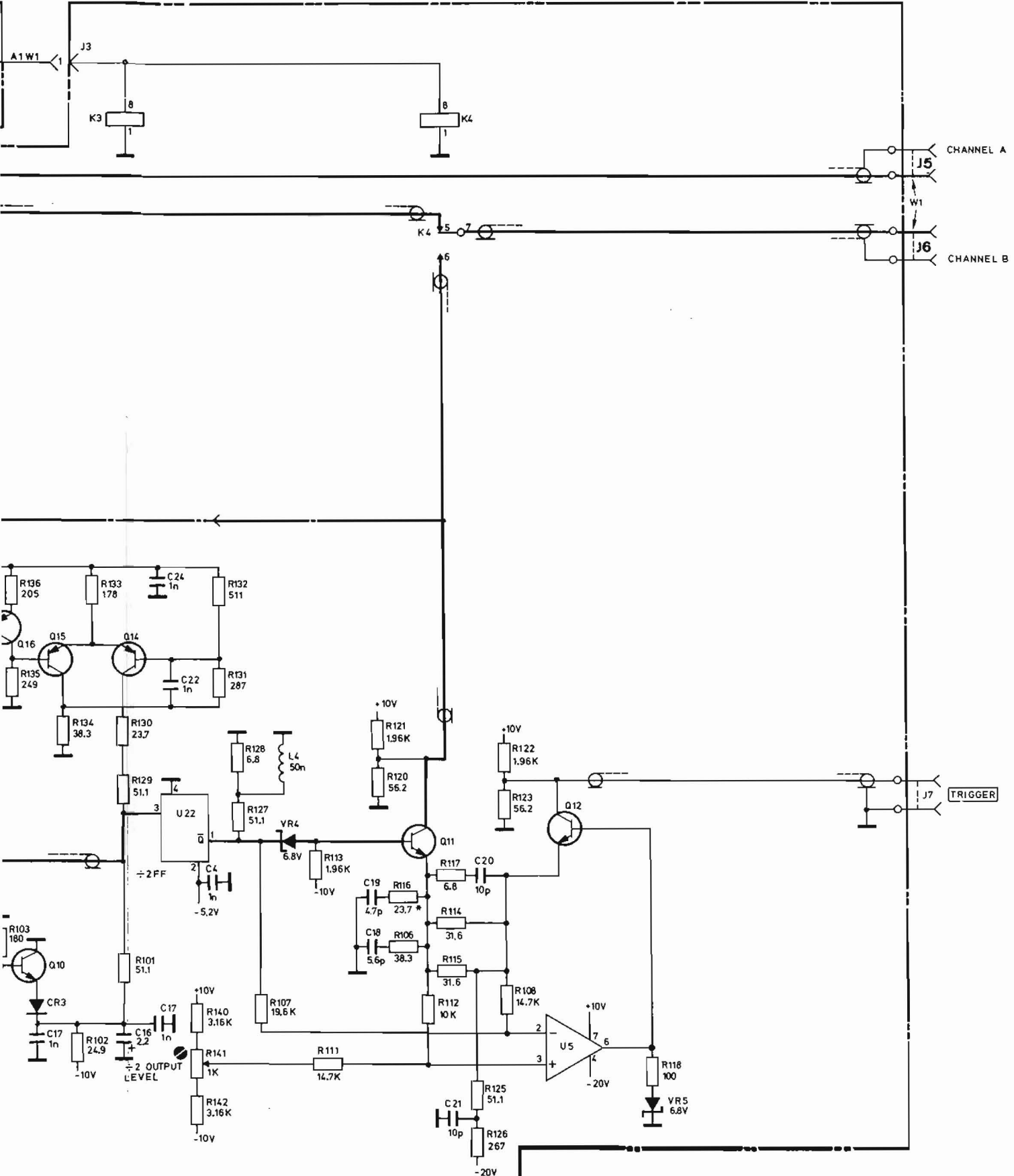
3

PART OF DIGITAL BOARD A3
PART OF CONTROL BOARD A1 **2**

Model 8092A

P/O A3 BD AY DIGITAL (08092-66503)





P/O DIGITAL BOARD A3
P/O CONTROL BOARD A1

