SPECIFICATION OPTION 01-1908A
PROGRAM RECEIVER ASSEMBLY
MODEL 1908A

OPERATING AND SERVICE MANUAL

HEWLETT hp PACKARD

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MODIFICATIONS

SPECIFICATION OPTION 01-1908A
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MODEL 1908A

1. DESCRIPTION

The Option 01 Program Receiver Assembly (Figure 1) provides the interface circuitry necessary for adapting the Model 1908A Delay Generator for use in programable 1900-series Pulse Generator Systems. With the Option 01 installed, the time interval between pulses and the relation between trigger and drive outputs can be automatically controlled by an external program source. The Option 01 may be ordered as a standard model modification installed at the factory or may be field installed at the nearest local Hewlett-Packard Sales/Service Office.

This operating note applies directly to the Model 1908A instruments with the Option 01 Program Receiver Assembly installed. The serial prefix will vary with the different models (the serial prefix is the first three digits of the eight-digit serial number.) Always include the complete serial number in any correspondence with the Hewlett-Packard Sales/Service Office.

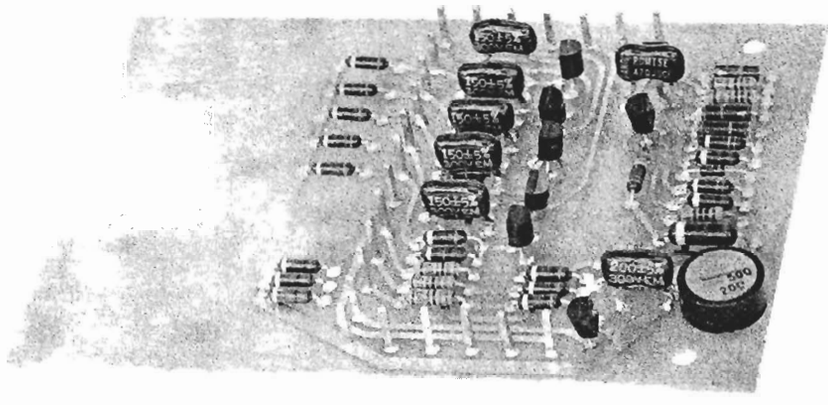

Figure 1

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Table 1 Programing Specifications

1908A Delay Generator

DRIVE SELECTION:

Delay: 1 control line
Advance: 1 control line
DBL. PL: 1 control line

No input give no pulses out.

True: -1 V (7.1 mA) to +1.3 V (4.2 mA)
(I out = 5.8 mA at 0 V.)

False: +3.5 V to +7.0 V. Open circuit typically +4.7 V.

Response Time: 4 μsec*

RANGE SELECTION:

6 Ranges: .015 to 10 K μsec

5 control lines required.

No input activates the .015 - 0.1 μsec range

True: -1 V (3.9 mA) to +1 V (0.9 mA)
(I out = 2.4 mA at 0 V)

False: +2.0 to +7.0 V. Open circuit typically +4.4 V

Response Time: 4 μsec*

TIME INTERVAL VERNIER:

0 to 10 mA gives continuous time interval variation on all ranges.

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TIME INTERVAL VERNIER: (Cont'd)

Sustaining Voltage: 0.6 V

Response Time: 3 μsec*

*If the generator is operating when a program is changed, the time to assure a properly positioned output pulse is the sum of the response time plus one output pulse period.

TOTAL PROGRAM CONTROL LINES:

8 Digital

1 Analog

---

2. INITIAL INSPECTION AND CLAIMS

Upon receipt of the instrument, check for physical damage. If no physical damage is evident, check the electrical performance of the instrument with the performance check procedures in Paragraphs 6 through 10 of this note.

3. INSTALLATION

Installation of the Model 1908A Delay Generator equipped with an Option 01 Receiver Assembly is the same as described in the Operating

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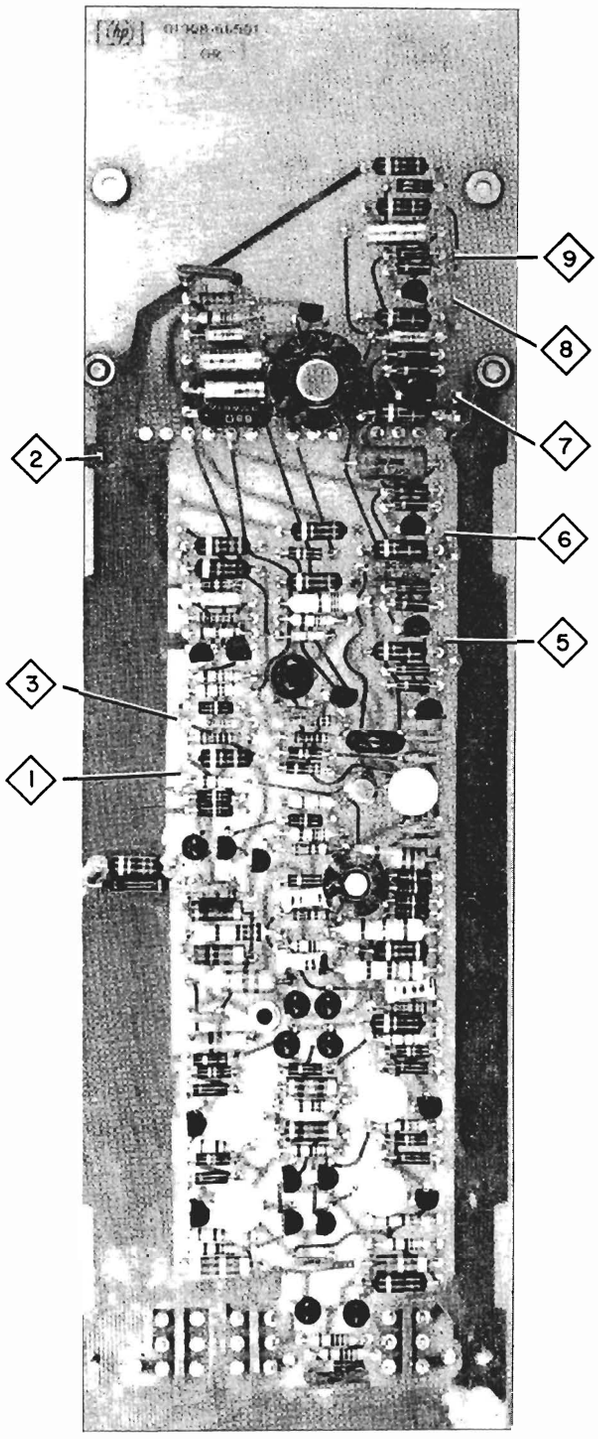

Figure 2. A1 Assembly PGM Connections

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3. INSTALLATION (cont'd)

and Service Manual for the standard Model 1908A. If the Option 01 Assembly is to be installed in the field, proceed as follows:

a. Remove the Model 1908A from the 1900-series mainframe.

b. Refer to Figure 2, A1 Assembly Component Identification for the Model 1908A. Pin connections are designated by the symbol◇ with a numeral enclosed. Using the following color code instructions, connect (through the top of the Model 1908A) the wire leads from the Option 01 assembly board to the A1 assembly board of the Model 1908A as indicated:

Note

All wire leads except five that come from the Option 01 assembly board have pin connectors installed at the factory. These connectors slip onto pins mounted on the A1 assembly board of the standard Model 1908A.

Table 2 Programing Instructions

Wire Lead from Option 01 Board (Color)	Connect to Pin on A1 Assembly Board
2	◇1
0	◇2
7	◇3
901	◇5
902	◇6
903	◇7
904	◇8
905	◇9

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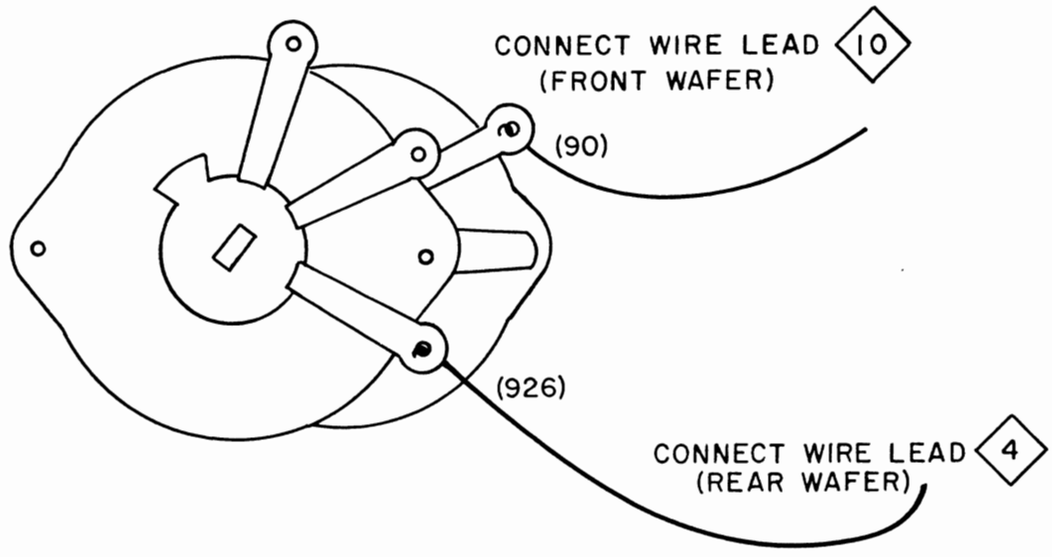
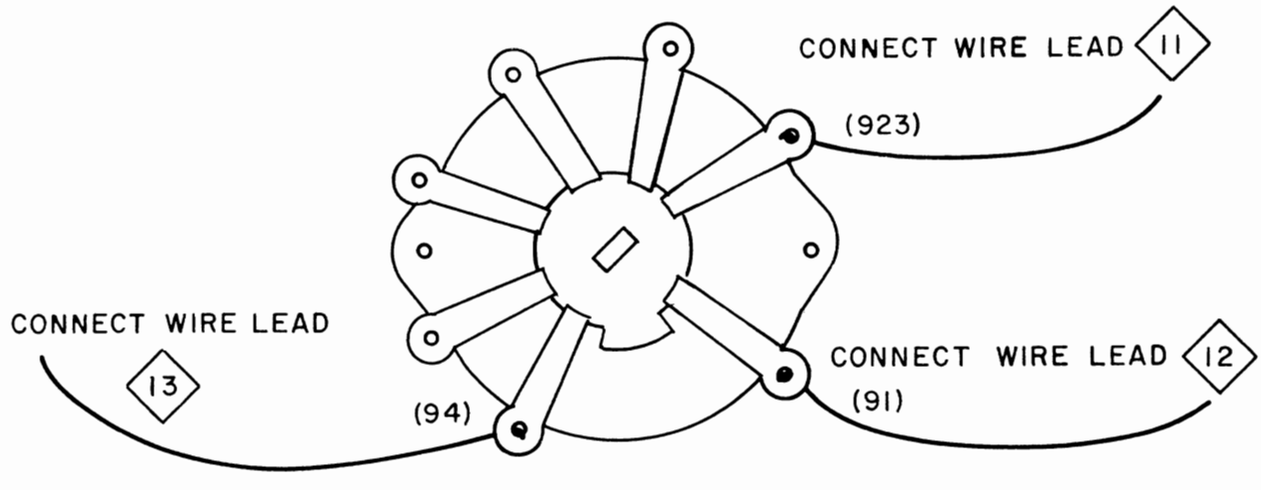


Time Interval Switch (S2)
Rear View
Figure 3.



Drive Output Switch (S1)
Rear View
Figure 4.

3. INSTALLATION (cont'd)

c. There are five wires which must be soldered to two front-panel controls. Proceed as follows:

(1) Connect wire leads (color codes 90 and 926) to TIME INTERVAL switch (S2) as indicated in Figure 3.

(2) Connect wire leads (color codes 923, 91 and 94) to the DRIVE OUTPUT switch (S1) as indicated in Figure 4.

d. Through the top of the frame of the Model 1908A, insert the Option 01 board assembly into the retaining guide slots located on each side (rear) of the Model 1908A frame. Mount the Option 01 assembly board on the mounting brackets with the two retaining screws.

e. Slip the Option 01 connector (P2) through the connector access hole on the rear panel of the Model 1908A frame. The access hole is large enough so that the connector may be slipped through at an angle. The mounting flanges of connector P2 must be mounted on the outside of the rear panel of the Model 1908A. Secure connector P2 using the two retaining screws.

f. Reinstall the Model 1908A Delay Generator into the 1900-series mainframe.

4. OPERATION

Operation of an Option 01 equipped Model 1908A is basically the same as operation of the standard instrument. The only variation is that the instrument can be operated in a program mode besides the standard mode of operation. To operate an Option 01 equipped Model 1908A in the program mode, proceed as follows:

a. Connect the appropriate external trigger signal to the RATE INPUT (front-panel connector or interface switch routing).

b. Set the DRIVE OUTPUT and TIME INTERVAL switches to the PGM positions.

4. OPERATION (cont'd)

To program the Model 1908A to specific drive mode outputs and time intervals, refer to the Option 01 Program Receiver Assembly inputs listed in Table 3. The actual drive mode output and time interval programing of the Model 1908A will depend on the 1900-series Pulse Generator System application involved. Refer to 1900-series application notes for specific information regarding programable pulse generator applications.

Table 3. Option 01 Program Inputs

PROGRAM SIGNAL REQUIRED	APPLICATION	FUNCTION INITIATED
Variable 0-10 mA	P2-2	Time Interval Vernier (10 mA=longest delay within the programed time interval range.)
None	N/A	.015 - .1 μsec Time Interval Range
GRD	P2-5	.1-1 μsec Time Interval Range
GRD	P2-6	1-10 μsec Time Interval Range
GRD	P2-7	10-100 μsec Time Interval Range
GRD	P2-8	100-1K μsec Time Interval Range
GRD	P2-9	1K-10K μsec Time Interval Range
GRD	P2-11	Delay Drive and Advance Trigger
GRD	P2-12	Delay Trigger
GRD	P2-10	Advance Drive

NOTE

a. For advanced drive and delayed trigger outputs (ADV), program inputs (GRDS) must be applied simultaneously to both P2-10 and P2-12.

b. For double pulse outputs (DBL. PL), program inputs must be applied simultaneously to both P2-10 and P2-11.

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5. THEORY OF OPERATION

The following paragraphs describe the operation of the Option 01 Program Receiver Assembly. Use the block diagram (Figure 10) and the schematic (Figure 12) as an aid in understanding the circuit descriptions.

The block diagram (Figure 10) illustrates the relationship of the circuits comprising the Option 01 Program Receiver Assembly. The assembly consists of divider networks, time-interval range gates, and a dc-amplifier, function-generator circuit. By applying program signals to the proper Option 01 Program Receiver Assembly input terminals, the drive output mode and the time interval of the Model 1908A are automatically established. When a program input (grd) is applied to a divider network, the associated change in the output voltage of the divider network is routed to the Model 1908A (A1) Delay Generator Assembly to energize the appropriate output circuit or circuits. Delay (time interval) ranges are programed in a similar manner. With a program input (grd) applied to the applicable range gate, the gate conducts and a ground path is completed to energize the associated saturating switch circuit in the Model 1908A (A1) Delay Generator Assembly. With no program input (grd) applied to the delay range gates, the .015 -. 1 μsec delay range is programed. The remote time interval vernier control is a 0-10 mA program input to the dc-amplifier, function-generator circuit. It controls the delay time within each delay range. The dc-amplifier, function-generator circuit amplifies and converts the time interval vernier input to a charging current output. The charging current output is coupled to the ramp generator circuit in the Model 1908A (A1) Delay Generator Assembly. A change in the amplitude of the time interval vernier program input produces a corresponding change in the current output of the dc-amplifier, function-generator circuit and the delay time is varied accordingly within the limits of the programed delay range.

The resistance divider networks control the drive output mode of the Model 1908A. Because the functions of the divider networks are identical, only the delay drive and advance trigger divider network (consisting of A2R32 through A2R34) will be explained.

With the Model 1908A DRIVE OUTPUT Switch (S1) set to the PGM position, the output of the delay drive and advance trigger divider network is connected through the applicable program receiver assembly interconnection to the delay drive and advance trigger circuits in the (A1) Delay Generator Assembly. In the quiescent state, with no program input applied, the voltage developed at the junction of A2R32 and A2R33 prevents energizing the delay drive and advance trigger circuits. When a program input (grd)

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5. THEORY OF OPERATION (cont'd)

is applied to the junction of A2R33 and A2R34, the decreased voltage level at the output of the network (junction of A2R32 and A2R33) forward biases the delay drive and advance trigger circuits and the delay drive operating mode is programed. To program advance drive and delay trigger and double pulse drive modes, program inputs must be applied simultaneously and in specific combinations to the applicable divider networks. Refer to Table 3 for information covering specific drive mode programing.

The range gate circuits program the delay range of the Model 1908A. As the operation of range gates A2Q4 through A2Q8 is identical, only the operation of the 0.1 to 1 μsec delay range gate A2Q4 will be explained.

When the Model 1908A TIME INTERVAL switch (S2) is set to the PGM position, the emitter of A2Q4 is connected to ground, and the voltage divider network, consisting of A2R13, A2R12 and A2R11, biases A2Q4 to cutoff. When a program input (grd) is applied through connector P2-5 to the junction of A2R12 and A2R11, the voltage applied to the base of A2Q4 becomes negative and A2Q4 conducts. With A2Q4 conducting, a ground path is completed through the applicable Option 01 Program Receiver Assembly interconnection to the Delay Generator Assembly to energize the 0.1 to 1 μsec time-interval saturating switch.

A variable (0-10 mA) time-interval vernier program input is applied through connector P2-2 to the emitter of common-base dc-amplifier A2Q1. The output of A2Q1 is connected directly to the collector circuit of current source A2Q2. Transistor A2Q2 uses fixed base bias to establish a steady state conduction. Diode A2CR1 provides temperature stabilization. SENS ADJ potentiometer A2R6 sets the proper operating level of current source A2Q2. The conduction of current source A2Q2 establishes the dc voltage applied to the base of function generator A2Q3. With a 0-mA time-interval vernier program input, the dc voltage applied to the base of function generator A2Q3 is approximately +9 volts. Any increase in the vernier program input causes dc amplifier A2Q1 to conduct. With A2Q1 conducting, the current flowing through A2Q2 decreases and the dc voltage applied to the base of A2Q3 is increased. Further increases in the vernier program input will cause corresponding increases in the dc voltage applied to the base of A2Q3.

Function Generator A2Q3 produces a current output that is nonlinear relative to linear changes in the dc voltage applied to the base (i.e. The time interval (period) is inversely proportional to current and therefore

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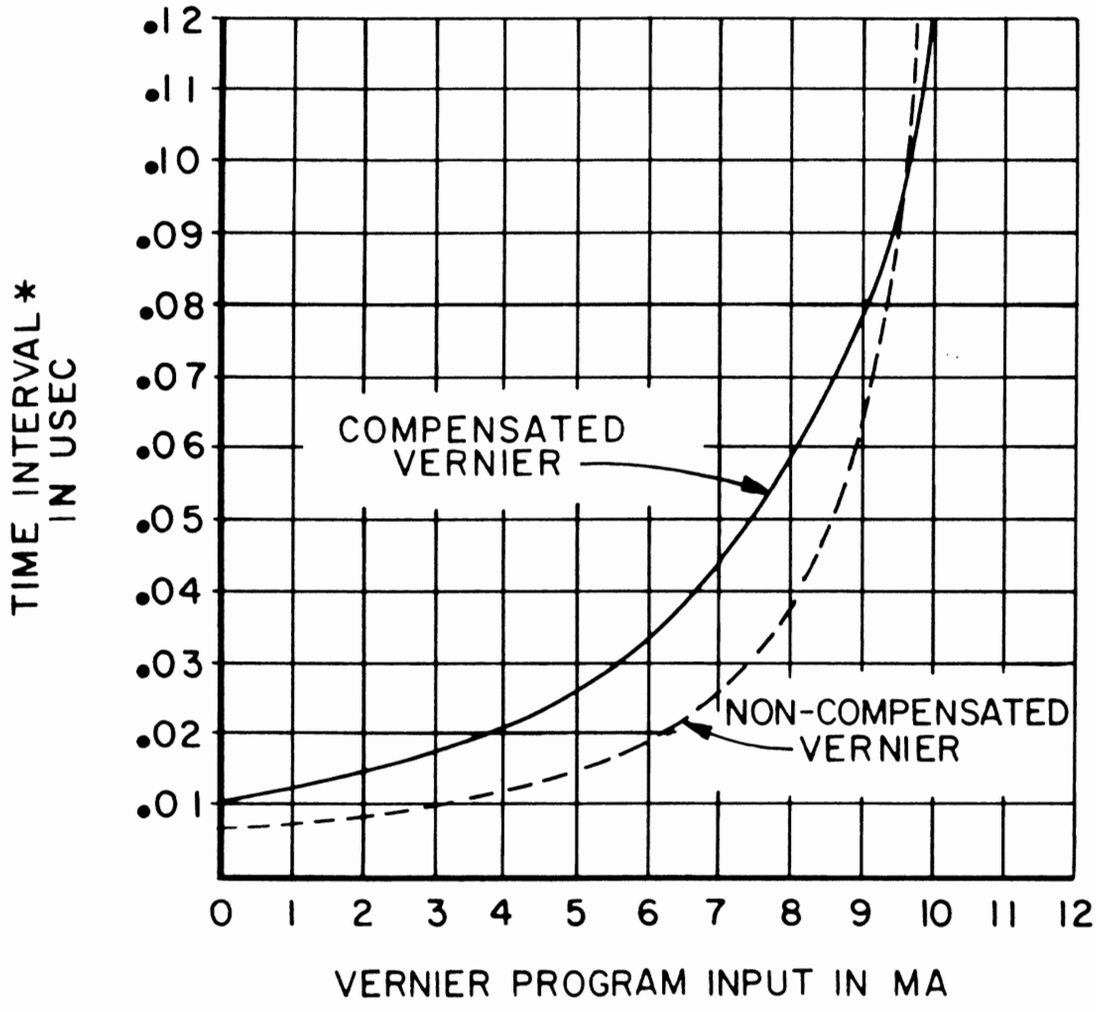

*NOTE
X10 FOR .1 USEC TO 1 USEC DELAY RANGE
X100 FOR 1 USEC TO 10 USEC DELAY RANGE
X1000 FOR 10 USEC TO 100 USEC DELAY RANGE
X10,000 FOR 100 USEC TO 1K USEC DELAY RANGE
X100,000 FOR 1K USEC TO 10K USEC DELAY RANGE

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Figure 5. Relationship of Pulse Width and Vernier Input

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5. THEORY OF OPERATION (cont'd)

nonlinear relative to current changes). See Figure 5. A variable impedance network in the emitter circuit A2Q3 provides the non-linear circuit characteristic required to improve the linearity of the delay output. When the applied time-interval vernier program input is 0 mA, the conduction of A2Q3 is maximum and the impedance of the emitter network is minimum (approximately 130 ohms). If the vernier program input is increased, the conduction of A2Q3 is decreased. This decrease in conduction causes a decrease in the voltage drop across the emitter network of A2Q3. When the voltage across A2R8 drops below 5. 1 volts breakdown diode A2VR1 stops conducting and the impedance of the network is increased. Further increases in the vernier program input will cause further decreases in the current through A2Q3. When the voltage across A2R9 drops below 5. 1 volts, breakdown diode A2VR2 stops conducting and a further increase in the impedance of the emitter network results. Additional decreases in the conduction of A2Q3 will cause A2VR3 to stop conducting. With A2VR3 cut off, the impedance of the emitter network is maximum (approximately 11 K ohms) and the current through A2Q3 is minimum. In this manner, linear changes in the vernier program input produce the nonlinear current output required for a more linear control of the time interval across the programed time interval range.

With an 01 Option Receiver Assembly installed in the Model 1908A, +25 volts dc is available at connector P2-25. This voltage source may be used for external PGM logic circuitry. The current drain by external logic circuitry should be limited to 100 mA.

CAUTION

Whenever power is supplied to the 1900-series mainframe, which has an instrument with the 01 Option Receiver Assembly installed, +25 volts dc at 2. 5A is applied to the PGM connector (pin 25) on the mainframe. Care should be taken when handling the mainframe with these connectors exposed.

6. PERFORMANCE CHECK

The procedures presented in the following paragraphs verify that the Option 01 Program Receiver Assembly is operating properly. Before attempting the Option 01 performance checks, ensure that operation of the Model 1908A is in accordance with the performance checks given in the Operating and Service Manual for the Model 1908A.

7. TEST EQUIPMENT

The test equipment required for checking the performance of the Option 01 Program receiver Assembly is basically the same as listed in the manual for the standard instrument. The only additional equipment required is a vernier program input test circuit. See Figure 6 for the details covering fabrication of the test circuit.

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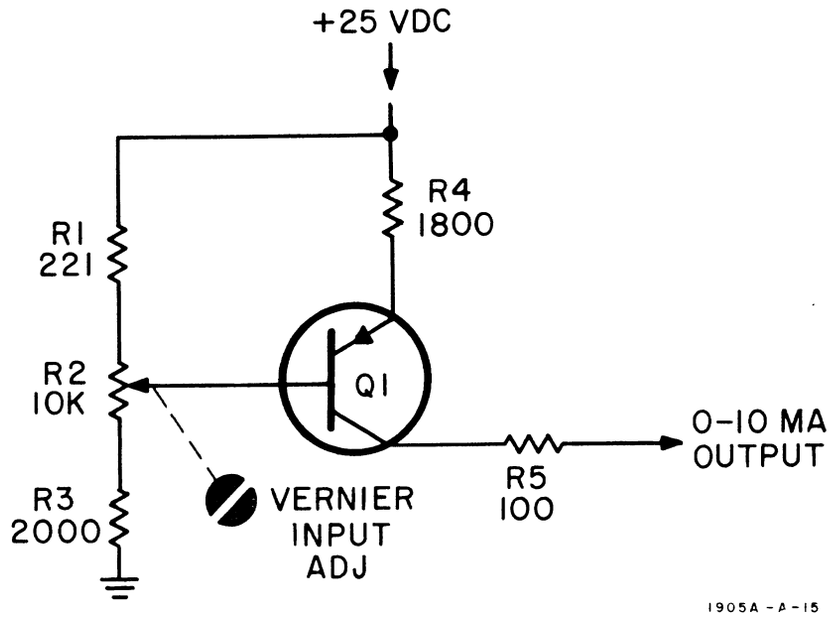

Figure 6. Vernier Program Input Test Setup

PARTS LIST

REF DESIG	DESCRIPTION	QTY	PART NUMBER
Q1	Q: Si pnp	1	HP 1853-0020(2N 3702)
R1	R: fxd metflm, 221 ohms, 1%, 1/8 W	1	HP 0757-0282
R2	R: var comp. 10 K ohms	1	HP 2100-0167
R3	R: fxd metflm, 2000 ohms, 1%, 1/8 W	1	HP 0757-0283
R4	R: fxd gl, 1800 ohms, 5%, 1/2 W	1	HP 0758-0043
R5	R: fxd car, 100 ohms, 10%, 1/4 W	1	HP 0684-1011

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8. PRELIMINARY TEST SETUP

To accomplish the Option 01 performance checks, set up the Model 1908A as follows:

a. Remove the Model 1908A from the 1900-series mainframe.

b. Connect HP extender (HP 10484A) between the Model 1908A plug-in connector and the applicable 1900-series mainframe compartment connector.

c. Set the Model 1908A front-panel controls as follows:

TIME INTERVAL	PGM
DRIVE OUTPUT	PGM

d. Set the three interface switches located on the underside of the Model 1908A to the forward position.

e. Set the 1900-series mainframe power switch on and allow 10 minutes for instrument warmup.

9. DRIVE OUTPUT PROGRAMING

Connect the equipment as shown in Figure 7. Perform the following procedure:

a. Set the Model 1905A controls as follows:

RATE SOURCE	INT
RATE (Hz)	2.5M-25M
INC	mid-range
NORMAL/GATED	NORMAL

b. Set the Model 1410A/1425A controls as follows:

CHANNEL A MILLIVOLTS/CM	50
CHANNEL B MILLIVOLTS/CM	50
Channel Selector	A & B
TRIGGER	B
SMOOTHING	NORM
TIME/CM	100 nSEC
MAIN SWEEP MAGNIFIER	20

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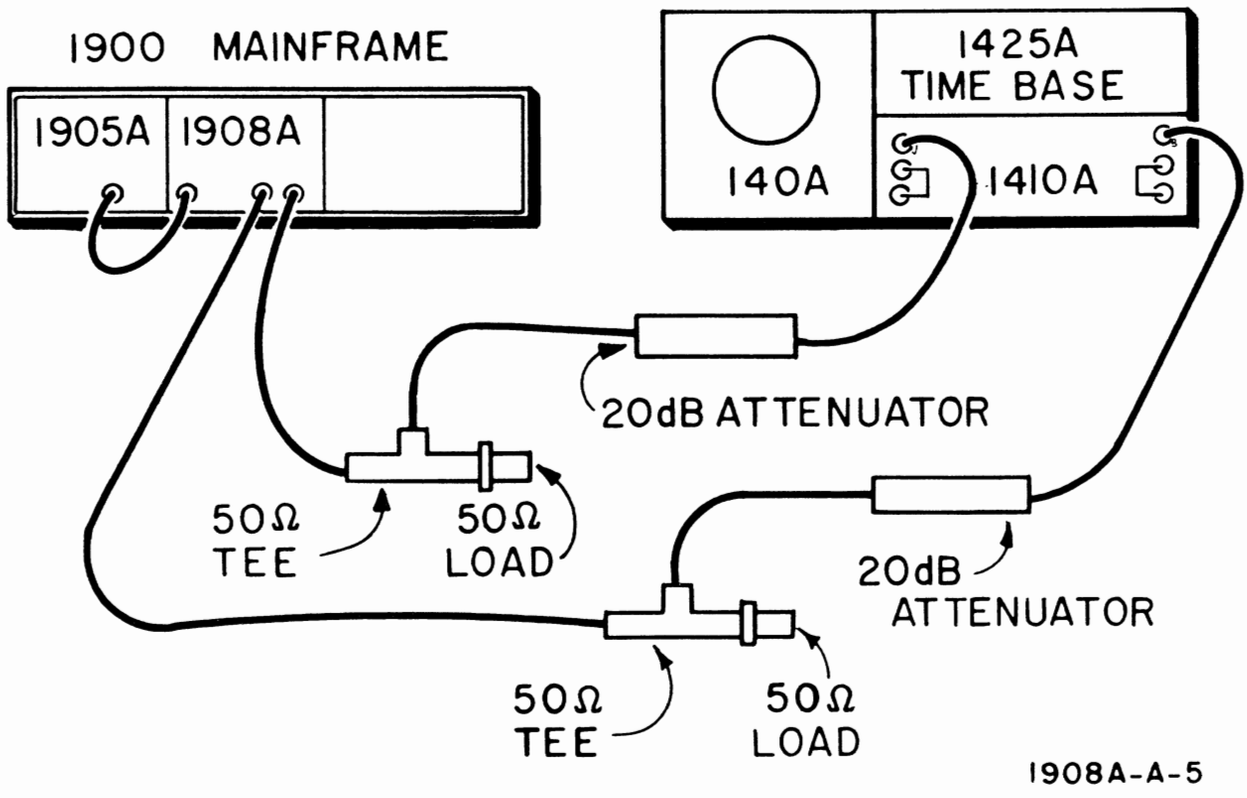

Figure 7. Output Pulse Test Setup

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9. DRIVE OUTPUT PROGRAMING (cont'd)

MAIN SWEEP TRIGGER	+, INT, NORM
LEVEL/MODE	AUTO
SCANNING	NORMAL
SWEEP	MAIN

c. Assemble the vernier program input test circuit (see Figure 6) and connect to a +25 volt source.

d. Connect the output of the vernier program input test circuit to P2-2 of the Option 01 Program Receiver Assembly.

e. Connect the HP Model 412A to the output of the test circuit. Adjust test circuit potentiometer R2 for a 0-mA output indication on the HP 412A.

f. Apply ground to P2-11 (delay drive and advanced trigger) of the Option 01 Program Receiver Assembly.

g. The Model 140A should display a drive output pulse delayed approximately .015 μsec (15 ns) in relation to the trigger output.

h. Connect ground to P2-11 and P2-10 of the Option 01 Program Receiver Assembly.

i. A double pulse drive output with a pulse spacing of approximately .015 μsec (15 ns) should be observed on the Model 140A CRT. The trigger pulse output should occur at the same time as the first pulse of the double pulse drive output.

j. Disconnect the ground from P2-11 and connect ground to P2-12. Do not disconnect the ground applied to P2-10.

k. A drive output pulse that is advanced approximately .015 μsec (15 ns) in relation to the trigger output should be observed on the Model 140A CRT.

10. TIME INTERVAL PROGRAMING

Set up the equipment as shown in Figure 8. Perform the following procedure:

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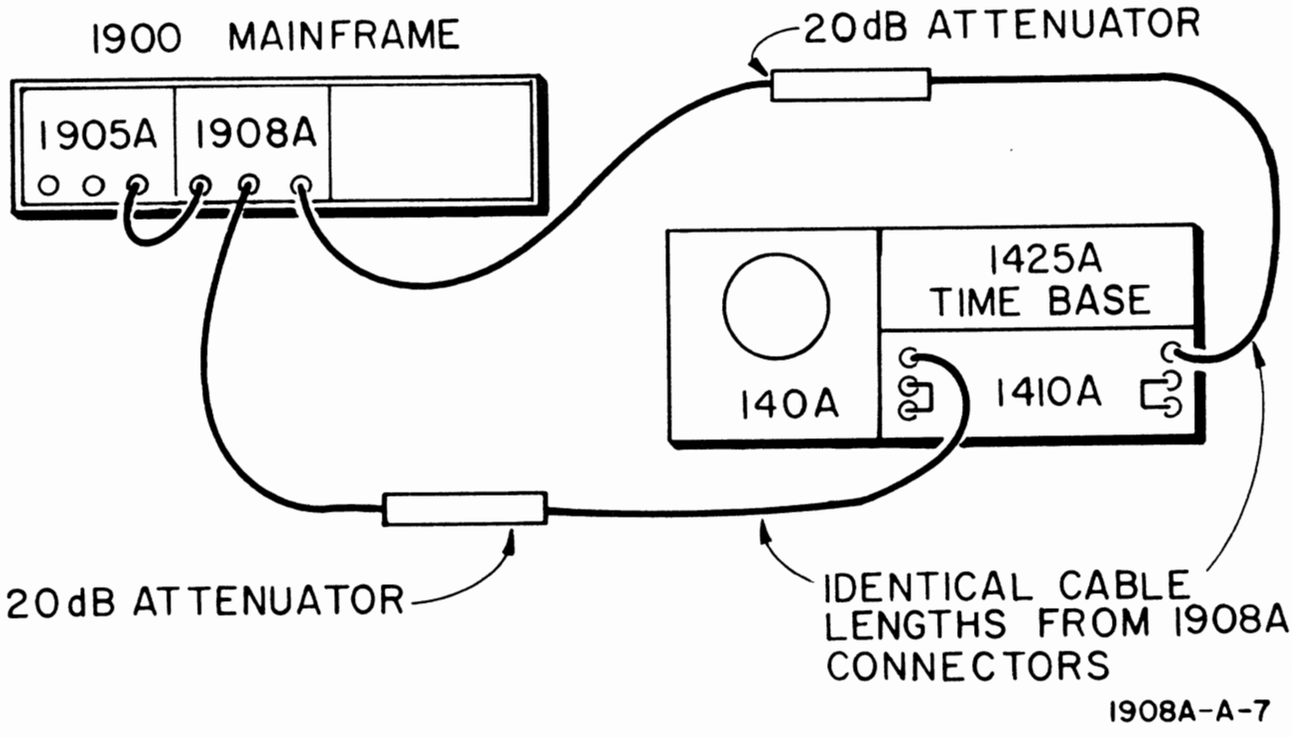

Figure 8. Delay Measure Part I

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10. TIME INTERVAL PROGRAMING (cont'd)

a. Set the Model 1905A controls as follows:

RATE SOURCE	INT
RATE (Hz)	(Refer to Table 4)
INC	ccw
NORMAL/GATED	NORMAL

b. Set the Model 1410A/1425A controls as follows:

CHANNEL A MILLIVOLTS/CM	50
CHANNEL B MILLIVOLTS/CM	50
Channel Selector	A & B
TRIGGER	A
SMOOTHING	NORM
TIME/CM	(Refer to Table 4)
MAIN SWEEP MAGNIFIER	X1
MAIN SWEEP TRIGGER	+, INT, NORM
LEVEL MODE	AUTO
SCANNING	NORMAL
SWEEP	MAIN

c. Connect the output of the vernier program input test circuit to P2-2 of the Option 01 Program Receiver Assembly.

d. Apply ground to P2-11 (delay drive and advance trigger) of the Option 01 Program Receiver Assembly.

e. Perform the tests indicated in Table 4.

Table 4. Time Interval Programing Tests (Part I)

Option 01 Program Input		Model 1905A	Model 1425A	Model 140A CRT Display	
Range Input	Vernier Input	RATE (Hz)	TIME/CM	Pulse Spacing (Min)	Pulse Spacing (Max)
None	0 mA	2.5M-25M	5 nSEC	12.5 ns	15 ns
None	10 mA	2.5M-25M	20 nSEC	110 ns	180 ns
GRD P2-5	0 mA	2.5M-25M	10 nSEC	50 ns	95 ns

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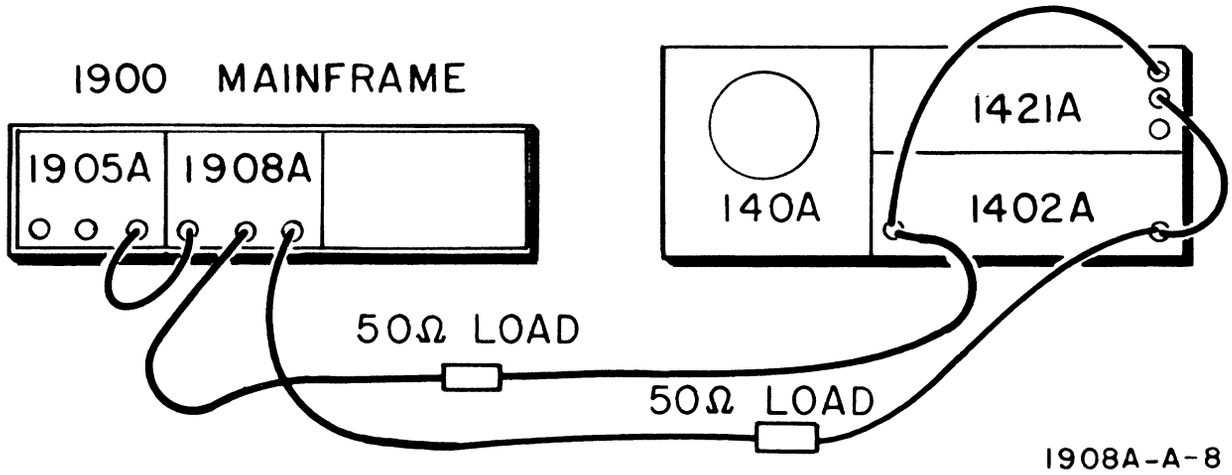

Figure 9. Delay Measure Part II

10. TIME INTERVAL PROGRAMING (cont'd)

f. Remove the Model 1410A and 1425A plug-ins from the Model 140A Mainframe and install the Model 1421A and 1402A plug-ins.

g. Connect the equipment as shown in Figure 9.

h. Set the controls of the Model 1421A and 1402A as follows:

FUNCTION	ALT
CHANNEL A SENSITIVITY	.5 V/CM
CHANNEL B SENSITIVITY	.5 V/CM
TIME/CM	(Refer to Table 5)
MAIN SWEEP TRIGGER	EXT, AC, +
DELAY SWEEP TRIGGER	EXT, AC, +
DELAY (CM)	.55
SWEEP	MAIN

i. Set the Model 1905A RATE control as indicated in Table 5.

j. Adjust the Model 1421A LEVEL control for a stable display and perform the tests indicated in Table 5.

Table 5. Time Interval Programing Tests (Part II)

Option 01 Program Input		Model 1905A	Model 1421A		Model 140A CRT
Range Input	Vernier Input	RATE (Hz)	TIME/CM MAIN	TIME/CM DELAYED	Test Specification
GRD P2-5	10 mA	250K-2.5M	.2 μSEC	OFF	5 cm Between Pulses
GRD P2-6	0 mA	250K-2.5M	.2 μSEC	OFF	5 cm Between Pulses
GRD P2-6	10 mA	25K-250K	2 μSEC	.2 μSEC	5 cm Between Pulses*
GRD P2-7	0 mA	25K-250K	2 μSEC	.2 μSEC	5 cm Between Pulses*
GRD P2-7	10 mA	2.5K-25K	20 μSEC	2 μSEC	5 cm Between Pulses*
GRD P2-8	0 mA	2.5K-25K	20 μSEC	2 μSEC	5 cm Between Pulses*
GRD P2-8	10 mA	250-2.5K	.2 MS	20 μSEC	5 cm Between Pulses*
GRD P2-9	0 mA	250-2.5K	.2 MS	20 μSEC	5 cm Between Pulses*
GRD P2-9	10 mA	25-250	2 MS	.2 MS	5 cm Between Pulses*

* NOTE

Adjust the delay trigger level of the Model 1421A for an intensified portion on the sweep base indicating the pulse location. Pulses on the indicated checks are not visible due to the speed of occurrence. Measure the distance

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10. TIME INTERVAL PROGRAMING (cont'd)

between the start of the sweep and the intensified portion of the sweep base.

11. ADJUSTMENTS

The only Option 01 Program Receiver Assembly adjustment that may be required is SENS ADJ potentiometer A2R6. Before performing this adjustment, ensure that the time interval ranges of the standard instrument are in calibration (refer to Operating and Service Manual, Model 1908A). If SENS ADJ potentiometer A2R6 cannot be adjusted to meet the required specification, refer to the troubleshooting information in Section 12.

a. Perform the preliminary test setup instructions given in Section 8.

b. Connect the equipment as shown in Figure 8.

c. Set the Model 1410A and 1425A controls as follows:

CHANNEL A MILLIVOLTS/CM	50
CHANNEL B MILLIVOLTS/CM	50
Channel Selector	A & B
TRIGGER	A
SMOOTHING	NORM
TIME/CM	5 nSEC
MAIN SWEEP MAGNIFIER	X1
MAIN SWEEP TRIGGER	+, INT, NORM
SWEEP	MAIN
LEVEL MODE	AUTO
SCANNING	NORMAL

d. Set the Model 1905A controls as follows:

RATE SOURCE	INT
RATE (Hz)	2.5M-25M
INC	ccw
NORMAL/GATED	NORMAL

e. Assemble the vernier input test circuit (Figure 7) and connect the output to P2-2 of the Option 01 Program Receiver Assembly.

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11. ADJUSTMENTS (cont'd)

f. Connect the HP Model 412A to the output of the test circuit. Adjust test circuit potentiometer R2 for an output of 0 mA as indicated on the Model 412A.

g. Apply ground to P2-11 (delay drive and advance trigger) of the Option 01 Program Receiver Assembly.

h. Adjust the Model 1425A LEVEL/MODE control for a stable display on the Model 140A CRT.

i. Adjust SENS ADJ potentiometer A2R6 for a pulse spacing between 12.5 ns (2.5 cm) and 15 ns (3 cm) on the Model 140A CRT.

j. Adjust test circuit potentiometer R2 for an output of 10 mA as indicated on the Model 412A.

k. Set the Model 1425A TIME/CM control to 20 ns.

l. Adjust SENS ADJ potentiometer A2R6 for a pulse spacing between 110 ns (5.5 cm) and 180 ns (9.0 cm).

m. Repeat steps f. through l. to correct for any interaction between adjustments.

12. TROUBLESHOOTING

Troubleshooting procedures for the Option 01 Program Receiver Assembly are given in the following paragraphs.

NOTE

Before attempting to troubleshoot the Option 01 Assembly, make sure that the trouble is not in the circuits of the standard Model 1908A. Refer to the Operating and Service Manual for standard Model 1908A troubleshooting procedures.

13. TEST EQUIPMENT

Troubleshooting of the Option 01 Program Receiver Assembly may be accomplished using the test equipment and accessories listed for the Model 1908A. No additional test equipment is required.

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TABLE 6. Option 01, Trouble Isolation

TROUBLE	PROBABLE CAUSE	REMEDY
Drive output, time interval range, and vernier programing inoperative.	Loss of dc source voltages	Check dc voltage inputs; replace defective interconnection wiring.
Time interval range programing inoperative on all ranges.	Defective switch	Check PGM position of TIME INTERVAL switch S2; repair or replace switch as necessary.
	Shorted or open program interconnection.	Check program receiver assembly interconnection ◇10◇ ; replace defective wiring.
Time interval range programing inoperative on a specific range.	Defective range gate	Check applicable range gate circuit A2Q4-A2Q8; Replace defective component(s) as necessary.
	Shorted or open program interconnection.	Check applicable program receiver assembly interconnection ◇5◇ to ◇9◇ replace defective wiring.
Time interval vernier programing inoperative.	Defective dc-amplifier, function generator circuit.	Check dc amplifier A2Q1 and current source A2Q2; replace defective components as necessary.
		Check function generator A2Q3; replace defective components as necessary.
	Shorted or open program interconnection.	Check program receiver assembly interconnection ◇4◇ ; replace defective wiring.

TABLE 6. CONTINUED

TROUBLE	PROBABLE CAUSE	REMEDY
Drive output programing inoperative for one specific mode.	Defective DRIVE OUTPUT switch.	Check PGM position of DRIVE OUTPUT switch S1; repair or replace switch as necessary.
	Shorted or open program interconnection.	Check applicable program receiver assembly interconnection ◇11◇ to ◇13◇ .

14. TEST SETUP

To troubleshoot the Option 01 Program Receiver Assembly, set up the instrument as follows:

a. Remove the Model 1908A from the 1900-series mainframe.

b. Connect HP extender (HP 10484A) between the Model 1908A plug-in connectors and the applicable 1900-series compartment connectors.

c. Set the 1900-series mainframe power switch on.

NOTE

Checkout of the electrical circuits of the Option 01 Assembly can be performed with the assembly installed in the Model 1908A.

15. TROUBLE ISOLATION

Table 6 lists possible troubles, probable causes and possible corrective action. The table also provides the information necessary to isolate a malfunction to a circuit stage. The dc voltages of the defective circuit can then be checked to determine the faulty component. Refer to the schematic (Figure 12) and the component identification illustration (Figure 11) for the location of test points. Refer to the Theory of Operation, Paragraph 5, as and aid in diagnosing troubles. Before performing any dc voltage measurements, ensure that the operating controls of the Model 1908A are set to the positions specified in Table 8.

16. REPAIR AND REPLACEMENT

Repair and replacement procedures for the Option 01 Assembly are the same as for the standard instrument (refer to Operating and Service Manual, Model 1908A).

17. REPLACEABLE PARTS

Replaceable parts for the Option 01 Program Receiver Assembly are listed in Table 7. Organization of the table and information for ordering parts is the same as described in the Operating and Service Manual for the standard instrument.

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Table 7. Option 01 Replaceable Parts

Ref Desig	HP Part No.	TQ	Description
A2	01908-66504	1	A: board assembly, program receiver
C1	0180-0291	2	C: fxd Ta 1 μF 10% 35 wVdc
C2	0180-0291		C: fxd Ta 1 μF 10% 35 wVdc
C3	0140-0198	1	C: fxd mica 200 pF 5% 300 wVdc
C4	0140-0204	1	C: fxd mica 47 pF 5% 500 wVdc
C5	0140-0196	5	C: fxd mica 150 pF 5% 300 wVdc
C6	0140-0196		C: fxd mica 150 pF 5% 300 wVdc
C7	0140-0196		C: fxd mica 150 pF 5% 300 wVdc
C8	0140-0196		C: fxd mica 150 pF 5% 300 wVdc
C9	0140-0196		C: fxd mica 150 pF 5% 300 wVdc
CR1	1901-0040	1	CR: Si
Q1	1853-0020	8	Q: Si pnp
Q2	1853-0020		Q: Si pnp
Q3	1853-0020		Q: Si pnp
Q4	1853-0020		Q: Si pnp
Q5	1853-0020		Q: Si pnp
Q6	1853-0020		Q: Si pnp
Q7	1853-0020		Q: Si pnp
Q8	1853-0020		Q: Si pnp
R1	0757-0936	2	R: fxd metflm 3300 ohms 2% 1/4 W
R2	0757-0955	1	R: fxd metflm 20 K ohms 2% 1/4 W
R3	0757-0924	4	R: fxd metflm 1000 ohms 2% 1/4 W
R4	0757-0936		R: fxd metflm 3300 ohms 2% 1/4 W
R5	0757-0089	1	R: fxd metflm 1000 ohms 2% 1/2 W
R6	2100-1771	1	R: var ww 200 ohms 10% 1/2 W
R7	0757-0900	1	R: fxd metflm 100 ohms 2% 1/4 W
R8	0757-0920	1	R: fxd metflm 680 ohms 2% 1/4 W
R9	0757-0932	1	R: fxd metflm 2200 ohms 2% 1/4 W
R10	0757-0946	1	R: fxd metflm 8200 ohms 2% 1/4 W
R11	0757-0945	5	R: fxd metflm 7500 ohms 2% 1/4 W
R12	0757-0921	5	R: fxd metflm 750 ohms 2% 1/4 W
R13	0757-0948	5	R: fxd metflm 10 K ohms 2% 1/4 W
R14	0757-0945		R: fxd metflm 7500 ohms 2% 1/4 W
R15	0757-0921		R: fxd metflm 750 ohms 2% 1/4 W

Table 7. Option 01 Replaceable Parts (Cont'd)

Ref Desig	HP Part No.	TQ	Description
R16	0757-0948		R: fxd metflm 10 K ohms 2% 1/4 W
R17	0757-0945		R: fxd metflm 7500 ohms 2% 1/4 W
R18	0757-0921		R: fxd metflm 750 ohms 2% 1/4 W
R19	0757-0948		R: fxd metflm 10 K ohms 2% 1/4 W
R20	0757-0945		R: fxd metflm 7500 ohms 2% 1/4 W
R21	0757-0921		R: fxd metflm 750 ohms 2% 1/4 W
R22	0757-0948		R: fxd metflm 10 K ohms 2% 1/4 W
R23	0757-0945		R: fxd metflm 7500 ohms 2% 1/4 W
R24	0757-0921		R: fxd metflm 750 ohms 2% 1/4 W
R25	0757-0948		R: fxd metflm 10 K ohms 2% 1/4 W
R26	0757-0935	3	R: fxd metflm 3000 ohms 2% 1/4 W
R27	0757-0927	3	R: fxd metflm 1300 ohms 2% 1/4 W
R28	0757-0924		R: fxd metflm 1000 ohms 2% 1/4 W
R29	0757-0935		R: fxd metflm 3000 ohms 2% 1/4 W
R30	0757-0927		R: fxd metflm 1300 ohms 2% 1/4 W
R31	0757-0924		R: fxd metflm 1000 ohms 2% 1/4 W
R32	0757-0935		R: fxd metflm 3000 ohms 2% 1/4 W
R33	0757-0927		R: fxd metflm 1300 ohms 2% 1/4 W
R34	0757-0924		R: fxd metflm 1000 ohms 2% 1/4 W
VR1	1902-0041	3	VR: breakdown 5.11 V 5% 400 mW
VR2	1902-0041		VR: breakdown 5.11 V 5% 400 mW
VR3	1902-0041		VR: breakdown 5.11 V 5% 400 mW
			A2 MISCELLANEOUS
	01908-61602	1	Cable Assembly, interconnection
	5020-0495	22	Pin: P. C. board
			CHASSIS PART
P2	1251-0483	1	Conn: 36 pin
	01905-61603	1	Cable Assembly, PGM Input

Table 8. Option 01, DC Voltage Test Conditions.

Set the Model 1908A controls as follows:

DRIVE OUTPUT . . . . . PGM
TIME INTERVAL . . . . . PGM

Note

Voltages may vary slightly from one program receiver assembly to another. Normal variations up to 15% are permissible. Unless otherwise indicated, all voltages are dc taken with a 20, 000 ohm-per-volt meter and measured to ground (chassis) with no signal applied.

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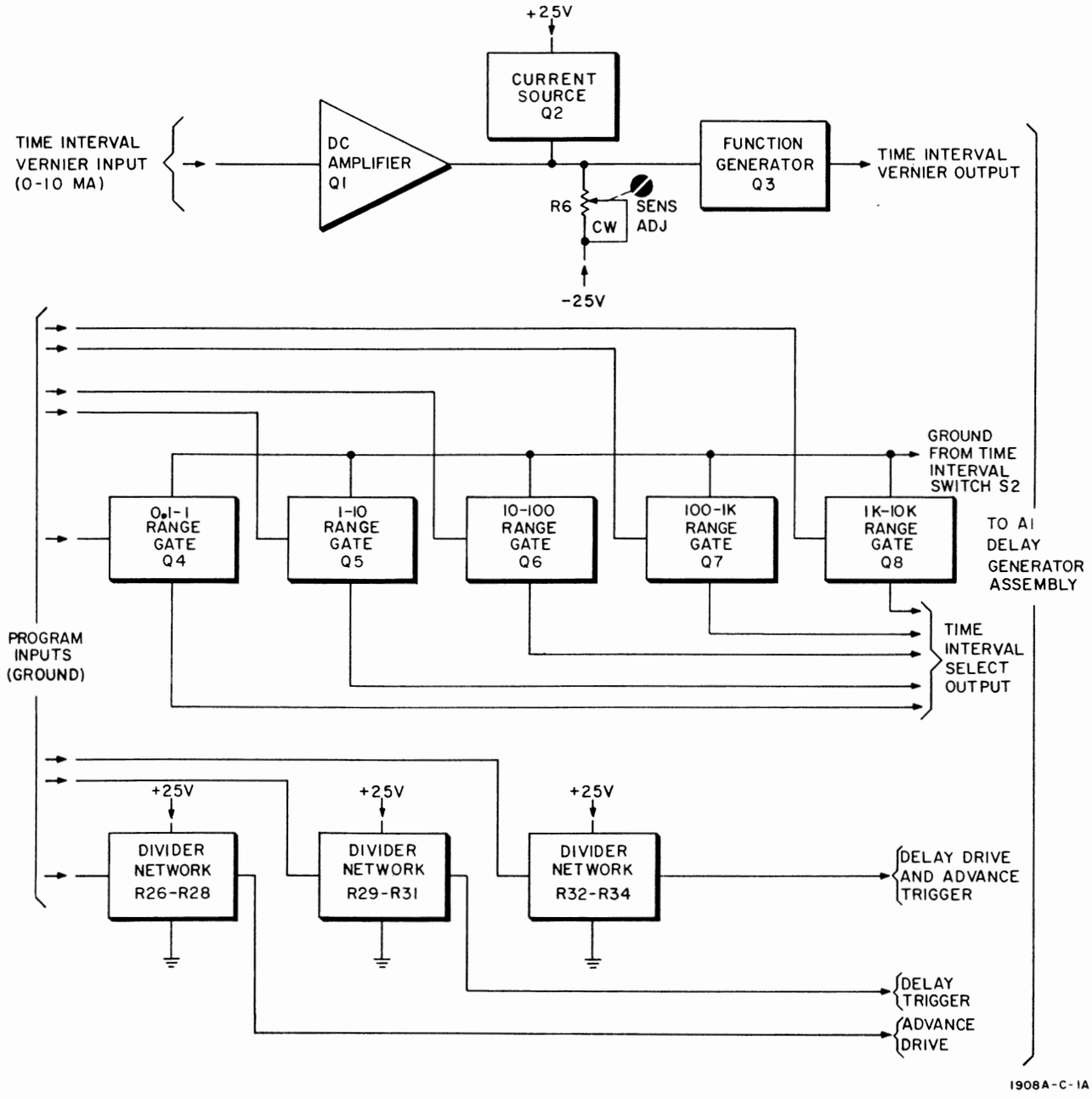
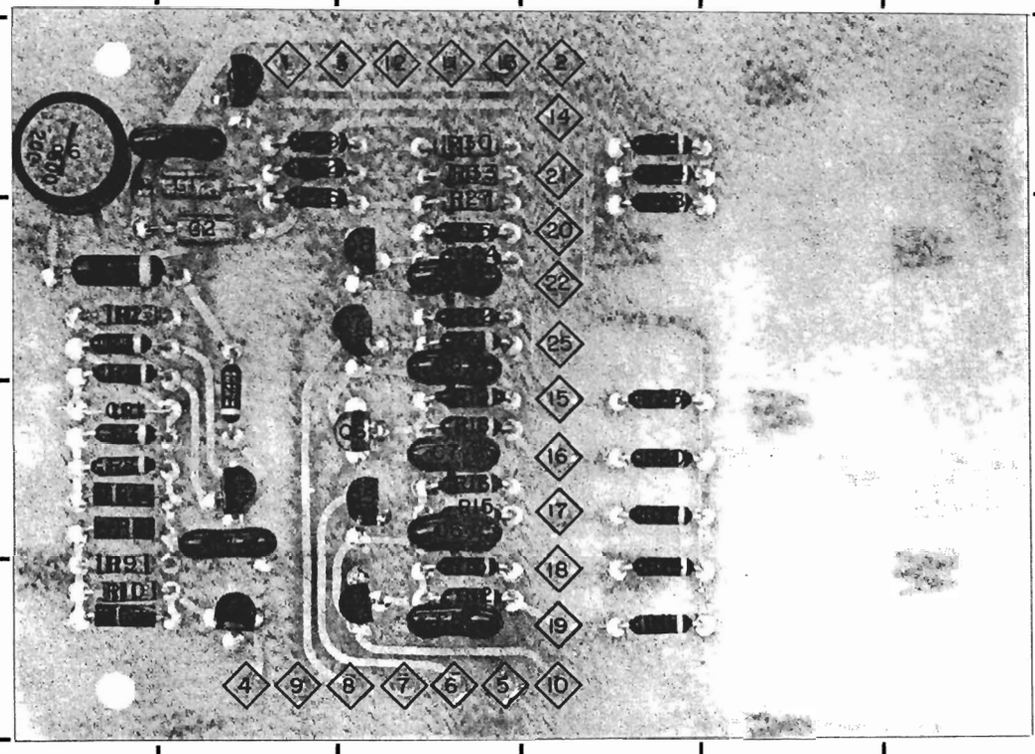


Figure 10. Program Circuit Block Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-2	PGM1	B-2	PGM11	C-2	PGM21	D-2	Q8	C-3	R10	A-5	R20	D-4	R29	B-2
C2	B-3	PGM2	D-2	PGM12	C-2	PGM22	D-3	R1	A-3	R11	D-5	R21	C-3	R30	C-2
C3	B-2	PGM3	C-2	PGM13	C-2	PGM25	D-3	R2	A-3	R12	C-5	R22	C-3	R31	D-2
C4	B-4	PGM4	B-5	PGM14	D-2	Q1	B-2	R3	A-3	R13	C-5	R23	D-4	R32	B-2
C5	C-5	PGM5	C-5	PGM15	D-4	Q2	B-4	R4	B-4	R14	D-5	R24	C-3	R33	C-2
C6	C-4	PGM6	C-5	PGM16	D-4	Q3	B-5	R5	A-3	R15	C-4	R25	C-3	R34	D-2
C7	C-4	PGM7	C-5	PGM17	D-4	Q4	C-5	R6	A-2	R16	C-4	R26	B-3	VR1	A-4
C8	C-3	PGM8	C-5	PGM18	D-5	Q5	C-4	R7	A-4	R17	D-4	R27	C-3	VR2	A-4
C9	C-3	PGM9	B-5	PGM19	D-5	Q6	C-4	R8	A-4	R18	C-4	R28	D-3	VR3	A-5
CR1	A-4	PGM10	D-5	PGM20	D-3	Q7	C-3	R9	A-5	R19	C-4				

Figure 11. A2 Assembly Component Identification

1908A-A-4

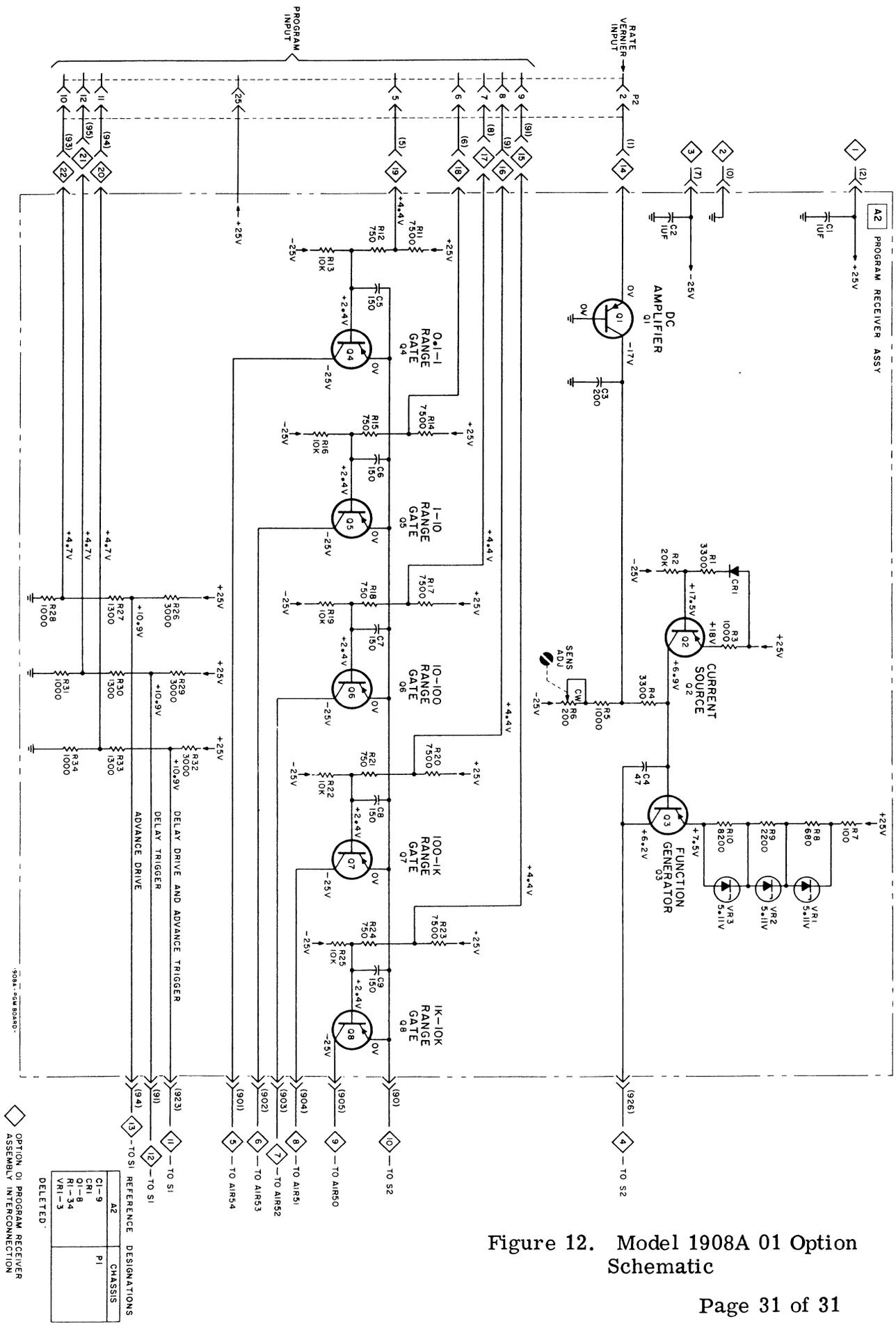


Figure 12. Model 1908A 01 Option Schematic

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