

SECTION V ADJUSTMENT

5-1. INTRODUCTION.

5-2. This section provides the information needed to adjust the 4140B to the specifications listed in Table 1-1. Prime purpose of adjustment is to return the instrument to its peak operating capabilities after repairs have been made. The instrument should be tested and adjusted when a part or component has been replaced. Adjustments sometime restore the instrument to its normal operating conditions without the necessity of repairs. Adjustment procedures can also be performed periodically to maintain top operating performance. Recommended adjustment schedule for the 4140B is every six months. All adjustable components referred to individual tests are summarized in Table 5-1 and adjustment locations are identified pictorially on the foldout sheets in Section VIII. If proper performance cannot be achieved after adjustment procedures have been performed, refer to troubleshooting in Section VIII.

Note

Before performing any adjustments, allow a 60 minute warm up period to stabilize operating conditions.

5-3. SAFETY REQUIREMENTS.

5-4. Although the instrument has been designed in accordance with international safety standards, this manual contains information, cautions, and warnings which must be followed to ensure safe operation and to keep the instrument in safe condition (see Sections II and III). Adjustments described in this section should be performed only by qualified service personnel.

WARNING

ANY INTERRUPTION OF THE PROTECTIVE (GROUNDED) CONDUCTOR (INSIDE OR OUTSIDE THE INSTRUMENT), OR DISCONNECTION OF THE PROTECTIVE EARTH TERMINAL IS LIKELY TO MAKE THE INSTRUMENT DANGEROUS. INTENTIONAL INTERRUPTION IS PROHIBITED.

5-5. The opening of covers for removal of parts, except those to which access can be gained by hand, is likely to expose live parts. Accessible terminals may also be live.

5-6. Capacitors in the instrument may still be charged even if the instrument has been disconnected from power source.

WARNING

ADJUSTMENTS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT AND PROTECTIVE COVERS REMOVED. ENERGY EXISTING AT MANY POINTS MAY, IF CONTACTED, RESULT IN PERSONAL INJURY.

5-7. EQUIPMENT REQUIRED.

5-8. Equipment needed to adjust the Model 4140B is listed in Table 4-1. This equipment should always be calibrated to satisfy its own specifications and those of the required characteristics. If the recommended model is not available, any instrument whose specifications equal or surpass the required specifications may be substituted.

5-9. ADJUSTMENT RELATIONSHIPS.

5-10. The adjustment procedures described in this section, starting with paragraph 5-15, are interactive and should be performed in the order they are presented, e.g., DC Power Supply Adjustment should be performed before pA Meter Amplifier Offset Adjustment. Ignoring or changing procedures may make it impossible to achieve optimum instrument performance. Table 5-2 lists the required adjustment after a given repair or board replacement. The adjustments listed in Table 5-2 assume that no other adjustments were attempted prior to board or component replacement.

5-11. ADJUSTMENT LOCATIONS.

5-12. For reference, overall adjustment location illustrations are given in Section VIII. The locations of individual board assemblies are denoted in board assembly component location illustrations included on each foldout service sheet.

Table 5-1. Adjustable Components.

Reference Designator	Name of Control	Purpose
A1R5 (Para. 5-17)	SWS R ADJ	To eliminate any dc voltage offset in integrator circuit of DC amplifier.
A1R24 (Para. 5-17)	OFFSET ADJ	To eliminate any dc voltage offset in DC amplifier of I-V Converter.
A2R29 (Para. 5-21)	pA GAIN	To adjust total gain of I-V Converter for pA Meter
A2R82 (Para. 5-19)	pA ZERO	To eliminate any dc voltage offset in filter amplifier of I-V Converter.
A5R19 (Para. 5-23)	x10 ZERO	To eliminate any dc voltage offset in V _A power amplifier on x10 range.
A5R24 (Para. 5-23)	x1 ZERO	To eliminate any dc voltage offset in V _A power amplifier.
A5R31 (Para. 5-23)	x10 GAIN	To adjust V _A power amplifier gain on x10 range.
A5R64 (Para. 5-23)	x10 ZERO	To eliminate any dc voltage offset in V _B power amplifier on x10 range.
A5R69 (Para. 5-23)	x1 ZERO	To eliminate any dc voltage offset in V _B power amplifier.
A5R76 (Para. 5-23)	x10 GAIN	To adjust V _B power amplifier gain on x10 range.
A5R91 (Para. 5-23)	DA ZERO	To eliminate any dc voltage offset in DAC (D-A Converter) for DC voltage source.
A5R94 (Para. 5-23)	DA GAIN	To adjust gain of DAC for DC voltage source.
A6R11 (Para. 5-25)	COMP ZERO	To eliminate any dc voltage offset in comparator.
A6R12 (Para. 5-25)	dV/dt BUF ZERO	To eliminate any dc voltage offset in dV/dt buffer amplifier.
A6R13 (Para. 5-27)	dV/dt ADJ	To adjust ramp rate (dV/dt) of ramp wave in V _A ramp generator.
A7R1 (Para. 5-15)	-15VF	To set output of regulated, floated -15V dc power supply.
A7R2 (Para. 5-15)	+15VF	To set output of regulated, floated +15V dc power supply.
A31R4 (Para. 5-29)	ZERO	To eliminate any dc voltage offset in DAC for analog output (Option 001 only).
A31R5 (Para. 5-29)	GAIN	To adjust gain of DAC for analog output (Option 001 only).
A32R5 (Para. 5-29)	x1/10 ZERO	To eliminate any dc voltage offset in 1/10 amplifier (Option 001 only).

5-13. TOP COVER REMOVAL.

5-14. Remove top cover to locate and to gain access to the adjustment controls as follows:

- (1) Fully loosen the retaining screw located at rear of top cover.
- (2) Slide top cover towards the rear and lift off.

WARNING

WHEN TOP COVER IS REMOVED, LIVE PARTS ARE EXPOSED.

WARNING

TO INSURE PERSONAL SAFETY FROM POSSIBLE ELECTRICAL SHOCK HAZARDS AND RESULTANT INJURY, USE INSULATED ADJUSTMENT TOOL.

Table 5-2. Adjustment Requirements.

Assembly Repaired or Replaced	Required Adjustment
A1 I-V Converter (HP Part No.: 04140-66601)	Paragraph 5-17. pA Meter Amplifier Offset Adjustment.
A2 A-D Converter (HP Part No.: 04140-66602)	Paragraph 5-19. pA Meter Filter Offset Adjustment. Paragraph 5-21. pA Meter Gain Adjustment.
A3 MPU (HP Part No.: 04140-66613)	None.
A4 I/O Control (HP Part No.: 04140-66504)	
A5 VS Output (HP Part No.: 04140-66505)	Paragraph 5-23. VS (Voltage Source) DC Adjustment.
A6 Ramp Generator (HP Part No.: 04140-66506)	Paragraph 5-25. VS Ramp Generator Adjustment. Paragraph 5-27. VS Ramp Rate Adjustment.
A7 Power Supply (HP Part No.: 04140-66607)	Paragraph 5-15. DC Power Supply Adjustment.
A8 Display (HP Part No.: 04140-66508)	None.
A9 Mother board (HP Part No.: 04140-66609)	
A21 HP-iB Interface (HP Part No.: 04140-66521)	
A31 Analog Output Control (HP Part No.: 04140-66531)	Paragraph 5-29. Analog Output Adjustment.
A32 Analog Output Distributor (HP Part No.: 04140-66532)	

ADJUSTMENTS

5-15. DC POWER SUPPLY ADJUSTMENT.

5-16. This procedure adjusts the regulated, floated $\pm 15V$ DC Supply (A7).

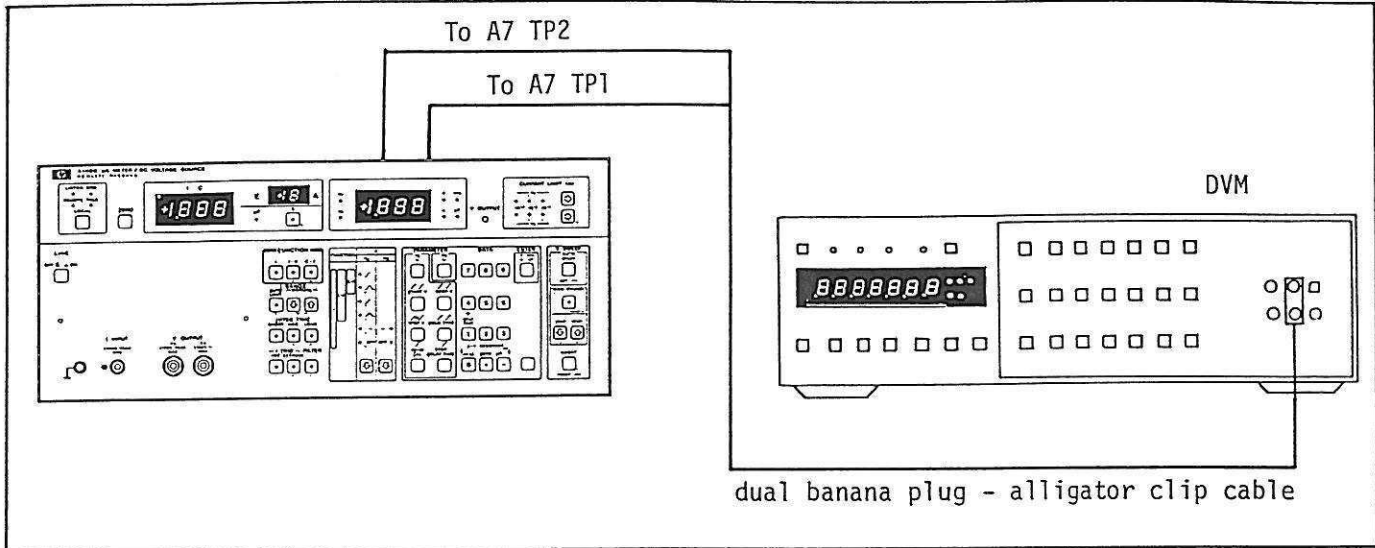


Figure 5-1. Power Supply Voltage Adjustment Setup.

EQUIPMENT:

- DVM HP 3455A
- Dual Banan Plug - Alligator Clip Cable HP 11002A

PROCEDURE:

1. Connect the positive input of the DVM to A7TP2 ($-15V$) and the negative input to A7TP1 (F COMM) with the dual banana plug - alligator clip cable. See Figure 5-1.
2. Set the DVM as follows:
 - FUNCTION DCV
 - RANGE AUTO
 - HIGH RESOLUTION OFF
 - AUTO CAL ON
 - GUARD ON
 - TRIGGER INTERNAL
3. Adjust " $-15V$ " potentiometer A7R1 for -15 volts ± 0.1 volts (see Figure 8-22 for location).
4. Connect the positive input of the DVM to A7TP3 ($+15V$) and the negative input to A7TP1 (F COMM).
5. Adjust " $+15V$ " potentiometer A7R2 for $+15$ volts ± 0.1 volts (see Figure 8-22 for location).
6. Connect the positive input of the DVM to the test points listed in Table 5-3 and the negative input to 4140B chassis.
7. Verify that the dc voltages at the test points listed in Table 5-3 are within the test limits given in the table.

ADJUSTMENTS

Table 5-3. DC Voltage Check at Test Points.

Test Points	Voltage Limits
A7TP6 (+5V)	+4.85V ~ +5.20V
A7TP4 (+15V)	+14.10V ~ +15.90V
A7TP5 (-15V)	-15.90V ~ -14.10V
A7TP7 (+120V)	+115.0V ~ +127.0V
A7TP8 (-120V)	-130.7V ~ -118.3V

ADJUSTMENTS

5-17. pA METER AMPLIFIER OFFSET ADJUSTMENT.

5-18. This adjustment eliminates any DC amplifier offset in the pA Meter (A1).

Note

Allow a 60 minute warm up and stabilization period before performing this adjustment.

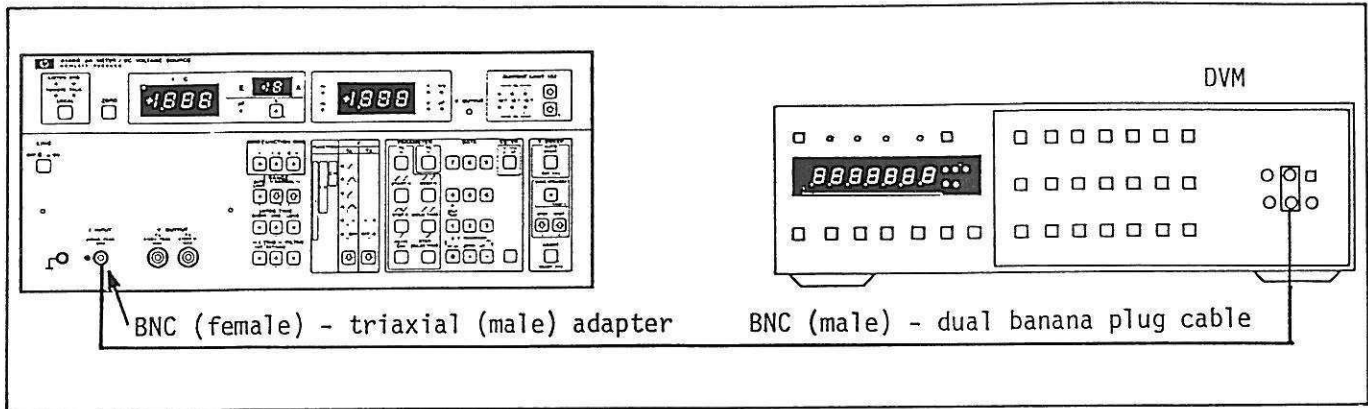


Figure 5-2. pA Meter Amplifier Offset Adjustment Setup.

EQUIPMENT:

- DVM HP 3455A
- BNC (Female) - Triaxial (Male) Adapter ... TROMPETER AD-BJ20-E3-PL75
- BNC (Male) -Dual Banana Plug Cable HP 11001A

ADJUSTMENTS

PROCEDURE:

1. Connect the DVM input to the 4140B I INPUT connector with the BNC (female) - triaxial (male) adapter and BNC (male) - dual banana plug cable. See Figure 5-2.

2. Set DVM as follows:

FUNCTION	DCV
RANGE E	AUTO
HIGH RESOLUTION	OFF
AUTO CAL	ON
GUARD	ON
TRIGGER	INTERNAL

3. Set 4140B I RANGE to 10^{-6} A.

4. Set 4140B AIS1 and S2 to right hand position (see Figure 8-25 for location).

5. Adjust "SWS R ADJ" potentiometer A1R5 for 0 volts ± 1.0 millivolts (see Figure 8-22 for location).

6. Reset 4140B AIS1 and S2 to left hand position.

7. Adjust "OFFSET ADJ" potentiometer A1R24 for 0 volts ± 0.020 millivolts (see Figure 8-22 for location).

Note

After this adjustment, the 4140B switches AIS1 and S2 should be in their left hand positions.

ADJUSTMENTS

5-19. pA METER FILTER OFFSET ADJUSTMENT.

5-20. This adjustment eliminates any dc offset in the SAI (Sectional Average Integrator) circuit of the pA Meter Section (A2).

Note

Allow a 30 minute warm up and stabilization period before performing this adjustment.

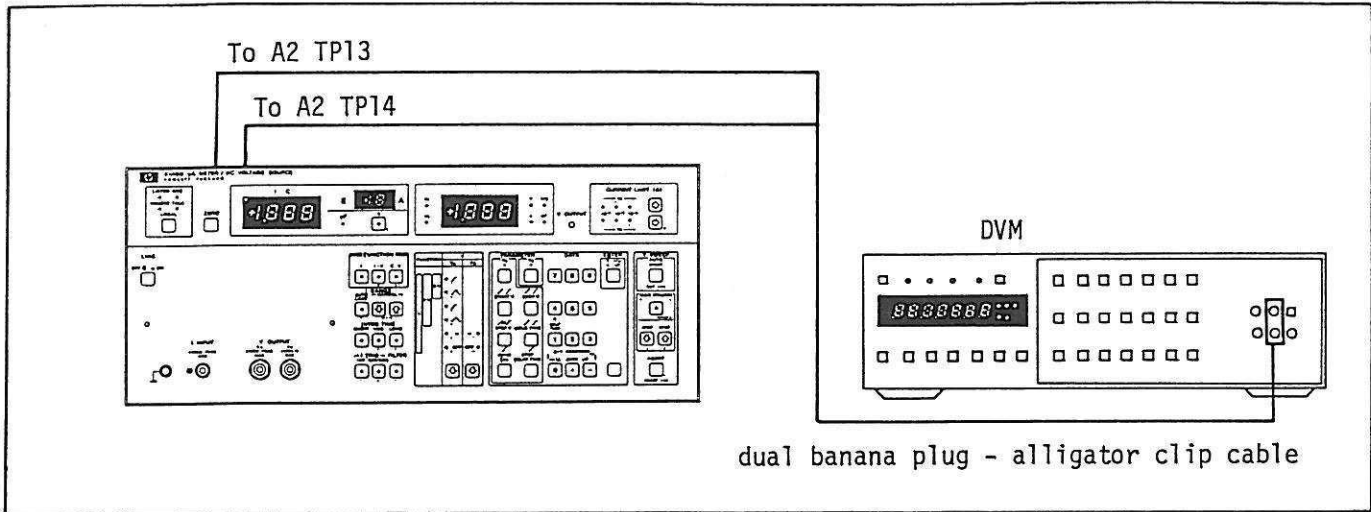


Figure 5-3. pA Meter Filter Offset Adjustment Setup.

EQUIPMENT:

- DVM HP 3455A
- Dual Banana Plug-to-Alligator Clip Cable HP 11002A

ADJUSTMENTS

PROCEDURE:

1. Connect the positive input of the DVM to A2TP3 (see Figure 3-28 location) and the negative input to A2TP14 with dual banana plug-to-alligator clip cable. See Figure 5-6.

2. Set the DVM as follows:

FUNCTION	DCV
RANGE	AUTO
HIGH RESOLUTION	OFF
AUTO CAL	DI
GUARD	DI
TRIGGER	INTERNAL

3. Set the 4140B as follows:

I RANGE	10^{-6}
FILTER	DI

4. Adjust "pA ZERO" potentiometer A2R82 (see Figure 3-22 for location) until the DVM readout is between 0V and 50µV.

ADJUSTMENTS

5-21. pA METER GAIN ADJUSTMENT.

5-22. This procedure adjusts the DC amplifier gain of the pA Meter (A2).

Note

Allow a 30 minute warm up and stabilization period before performing this adjustment.

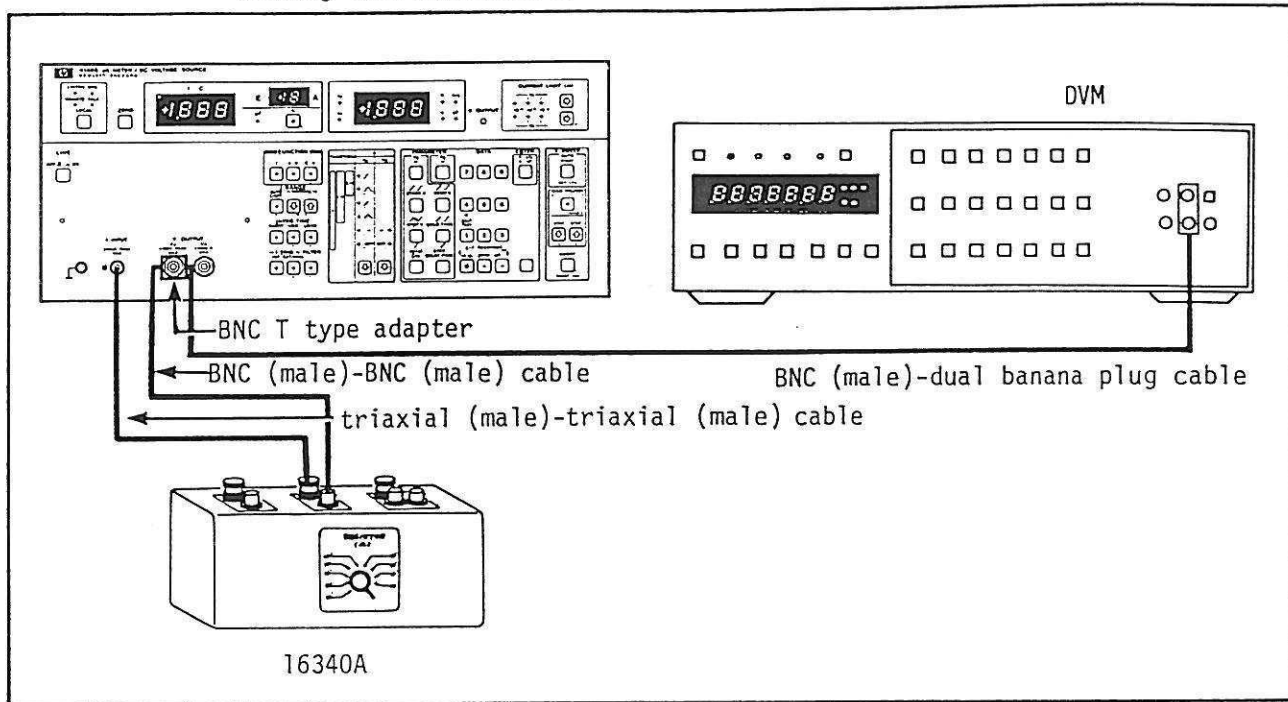


Figure 5-4. pA Meter Gain Adjustment Setup.

EQUIPMENT:

DVM	HP 3455A
RC Box	HP 16340A
BNC T Type Adapter	Part of HP 16340A (HP Part No.: 1250-0781)
Triaxial (Male) - Triaxial (Male) Cable	Part of HP 16340A (HP Part No.: 16053-61002)
BNC (Male) - BNC (Male) Cable	Part of HP 16340A (HP Part No.: 16053-61003)
BNC (Male) - Dual Banana Plug Cable	HP 11001A

ADJUSTMENTS

PROCEDURE:

1. Connect 4140B, DVM and Decade Resistor as shown in Figure 5-4.
2. Set the DVM as follows:

```

FUNCTION ..... DCV
RANGE ..... AUTO
HIGH RESOLUTION ..... OFF
AUTO CAL ..... ON
GUARD ..... ON
TRIGGER ..... INTERNAL

```

3. Set the 4140B as follows:

```

FUNCTION ..... I
I RANGE ..... AUTO
INTEG TIME ..... LONG
I DATA OUTPUT TRIGGER ..... INT
VA ..... == (DC)
FILTER ..... ON

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4. Set the RC Box to the $10^4\Omega$ range.
5. Set PARAMETER (==) to 1.8 volts.
6. Push SET (==) key and observe the DVM and I-C DISPLAY readouts.
7. Adjust "pA GAIN" potentiometer A2R29 for *S.C.V. ± 1 count (See Figure 8-22 for location) on I-C DISPLAY.
 *S.C.V. (Supplied Current Value) = (Measured Voltage Value of DVM)/
 Decade Resistor Value).
8. Set the RC Box to the $10^5\Omega$ range.
9. Read display outputs and verify that the I-C DISPLAY displays S.C.V. ± 1 count.
10. If not, adjust "pA GAIN" potentiometer A2R29 for S.C.V. ± 1 count and repeat steps 7 thru 9.

ADJUSTMENTS

5-23. VS (VOLTAGE SOURCE) DC ADJUSTMENT.

5-24. This procedure adjusts the DC voltage sources (V_A and V_B) (A5). The adjustment is divided into five parts.

- (1) V_A Amplifier Offset Zero Adjustment.
- (2) V_B Amplifier Offset Zero Adjustment.
- (3) DAC Adjustment.
- (4) V_A Amplifier Gain Adjustment.
- (5) V_B Amplifier Gain Adjustment.

Note

Allow a 15 minute warm up and stabilization period before performing these adjustments.

Note

This adjustment should be performed under vibration free conditions. A slight breeze or accidental movement of the instrument or bench while a board is extended can affect the adjustment.

WARNING

THE A5 BOARD IS EXTENDED WITH AN EXTENDER BOARD FOR THIS ADJUSTMENT THUS EXPOSING DANGEROUS AC VOLTAGES. TO AVOID ELECTRIC SHOCK, DO NOT TOUCH ANY COMPONENTS EXCEPT THOSE TO BE ADJUSTED!

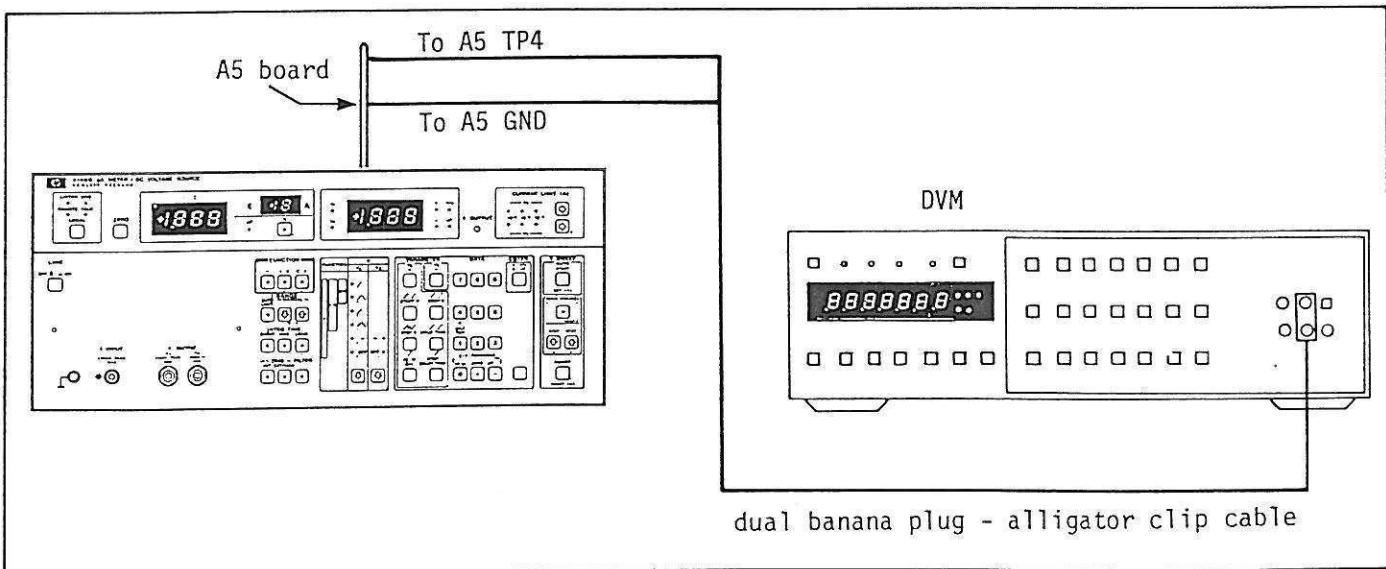


Figure 5-5. VS (Voltage Source) DC Adjustment Setup.

ADJUSTMENTS

EQUIPMENT:







DVM HP 3455A
 Dual Banana Plug - Alligator Clip Cable HP 11002A
 Extender Board (22pin x 2) HP Part No.: 5060-4025
 Clip - Clip Cable

PROCEDURE:

(1) V_A Amplifier Offset Zero Adjustment

1. Turn the 4140B OFF.
2. Remove the A5 board and reinstall with extender board.
3. Turn the instrument ON.
4. Connect the positive input of the DVM to A5TP4 (see Figure 8-42 for location) and the negative input to A5GND with dual banana plug - alligator clip cable. See Figure 5-5.
5. Set the DVM as follows:

FUNCTION DCV
 RANGE AUTO
 HIGH RESOLUTION OFF
 AUTO CAL ON
 GUARD ON
 TRIGGER INTERNAL

6. Short leads of the 1 μ F capacitor A5C13 with a clip-to-clip cable (see Figure 8-42 for location).
7. This adjustment is made using the auto setting mode of 4140B (refer to paragraph 4-9).
8. Press "  ,  " to set 4140B to Self Test mode.
9. Press "  ,  " to set 4140B to " S-1 " mode.
10. Adjust "x1ZERO" potentiometer A5R24 for a DVM reading of 0 volts \pm 0.1mV (see Figure 8-42 for location).
11. Press "  ,  " to set 4140B to " S-5 " mode.
12. Adjust "x10ZERO" potentiometer A5R19 for a DVM reading of 0 volts \pm 1mV (see Figure 8-42 for location).
13. Remove clip-to-clip cable from A5C13.

ADJUSTMENTS

(2) V_B Amplifier Offset Zero Adjustment



14. Connect the positive input of the DVM to A5TP9 (see Figure 8-42 for location) and the negative input to A5GND with dual banana plug-to-alligator clip cable.
15. Short leads of the 1 μ F capacitor A5C27 with clip-to-clip cable (see Figure 8-42 for location).
16. Press "Blue", \square " to set 4140B to " S-1 " mode.
17. Adjust "x1ZERO" potentiometer A5R69 for a DVM reading of 0 volts ± 0.1 mV (see Figure 8-42 for location).
18. Press "Blue", \square " to set 4140B to " S-5 " mode.
19. Adjust "x10ZERO" potentiometer A5R64 for a DVM reading of 0 volts ± 1 mV (see Figure 8-42 for location).
20. Remove clip-to-clip cable.

(3) DAC Adjustment

21. Connect the positive input of the DVM to "VA IN" A5TP3 (see Figure 8-42 for location) and the negative input to A5GND with dual banana plug-to-alligator clip cable.
22. Press "Blue", \square " to set 4140B to " S-1 " mode.
23. Adjust "DA ZERO" potentiometer A5R91 for a DVM reading of 0 volts ± 0.2 mV (see Figure 8-42 for location).
24. Press "Blue", \square " to set 4140B to " S-2 " mode.
25. Adjust "DA ZERO" potentiometer A5R91 for a DVM reading of -10 millivolts ± 1 mV.
26. Press "Blue", \square " to set 4140B to " S-3 " mode.
27. Adjust "DA GAIN" potentiometer A5R94 for a DVM reading of -10 volts ± 1 mV.

ADJUSTMENTS

(4) V_A Amplifier Gain Adjustment.

28. Connect the positive input of the DVM to A5TP4 (see Figure 8-42 for location) and the negative input to A5GND with dual banana plug-to-alligator clip cable.
29. Press "  ,  " to set 4140B to " S-6 " mode.
30. Adjust "x10 GAIN" potentiometer A5R31 for a DVM reading of -100 volts $\pm 10\text{mV}$ (see Figure 8-42 for location).

(5) V_B Amplifier Gain Adjustment.

31. Connect the positive input of the DVM to A5TP9 (see Figure 8-42 for location) and the negative input to A5GND with dual banana plug-to-alligator clip cable.
32. Adjust "x10 GAIN" potentiometer A5R76 for a DVM reading of -100 volts $\pm 10\text{mV}$ (see Figure 8-42 for location).

ADJUSTMENTS

5-25. VS (VOLTAGE SOURCE) RAMP GENERATOR ADJUSTMENT

5-26. This procedure adjusts the ramp generator of V_A (A6). The adjustment is divided into two parts:

- (1) dV/dt Buffer Zero Adjustment.
- (2) Comparator Zero Adjustment.

Note

Allow a 15 minute warm up and stabilization period before performing this adjustment.

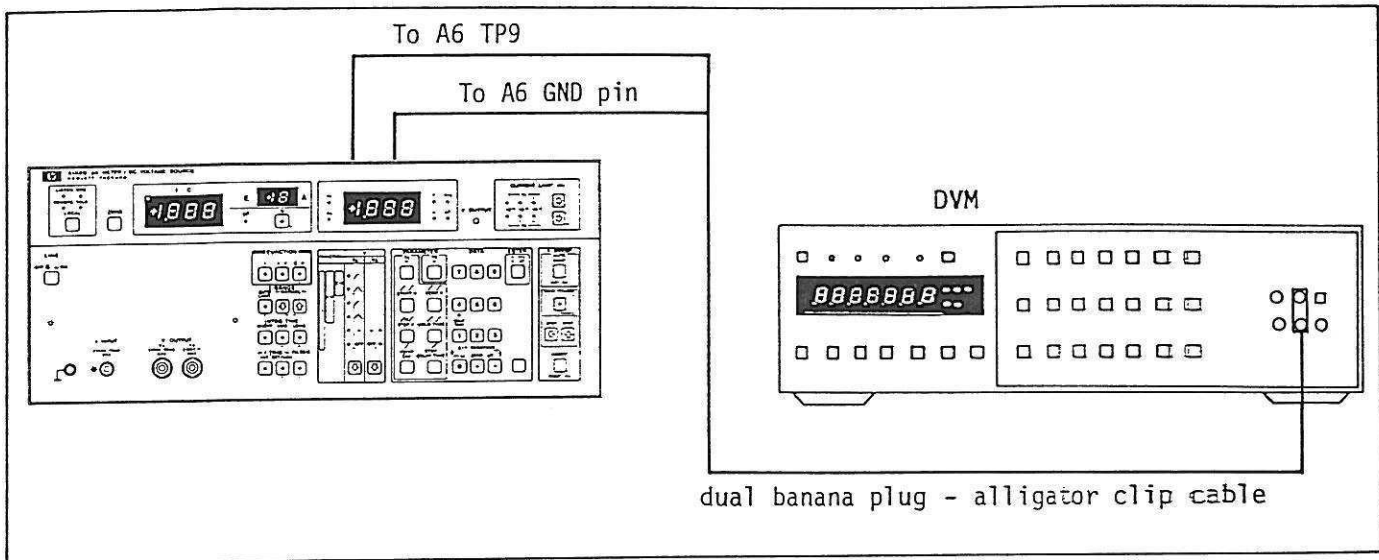


Figure 5-6. VS (Voltage Source) Ramp Generator Adjustment Setup.

EQUIPMENT:

- DVM HP 3455A
- Dual Banana Plug-to-Alligator Clip Cable HP 11002A
- Clip-to-Clip Cable (2ea)

ADJUSTMENTS

PROCEDURE:

(1) dV/dt Buffer Zero Adjustment.

1. Turn the 4140B OFF, and remove the A5 board.
2. Connect A5TP5, A5TP7 and A5GND with clip-to-clip cables.
3. Reinstall A5 board, and turn the instrument ON.
4. Connect the positive input of the DVM to "dV/dt BUF. OUT" A6TP9 (see Figure 8-45 for location) and the negative input to A6GND with dual banana plug-to-alligator clip cable. See Figure 5-6.
5. Set the DVM as follows:

FUNCTION	DCV
RANGE	AUTO
HIGH RESOLUTION	OFF
AUTO CAL	ON
GUARD	ON
TRIGGER	INTERNAL

6. Adjust "dV/dt BUF ZERO" potentiometer A6R12 for a DVM reading of 0 volts $\pm 0.2\text{mV}$ (see Figure 8-22 for location).

(2) Comparator Zero Adjustment

7. Connect the positive input of the DVM to "RAMP OUT" A6TP7 (see Figure 8-45 for location) and the negative input to A6GND with dual banana plug-to-alligator clip cable.
8. Press "".
9. Adjust "COMP ZERO" potentiometer A6R11 for a DVM reading of 0 volts $\pm 0.2\text{mV}$ (see Figure 8-22 for location).
10. Turn the instrument OFF, and remove the A5 board.
11. Remove clip-to-clip cables, and reinstall the A5 board.

ADJUSTMENTS

5-27. VS (VOLTAGE SOURCE) RAMP RATE ADJUSTMENT.

5-28. This procedure adjusts the ramp rate for a ramp wave (/ , \) in the V_A ramp generator (A6).

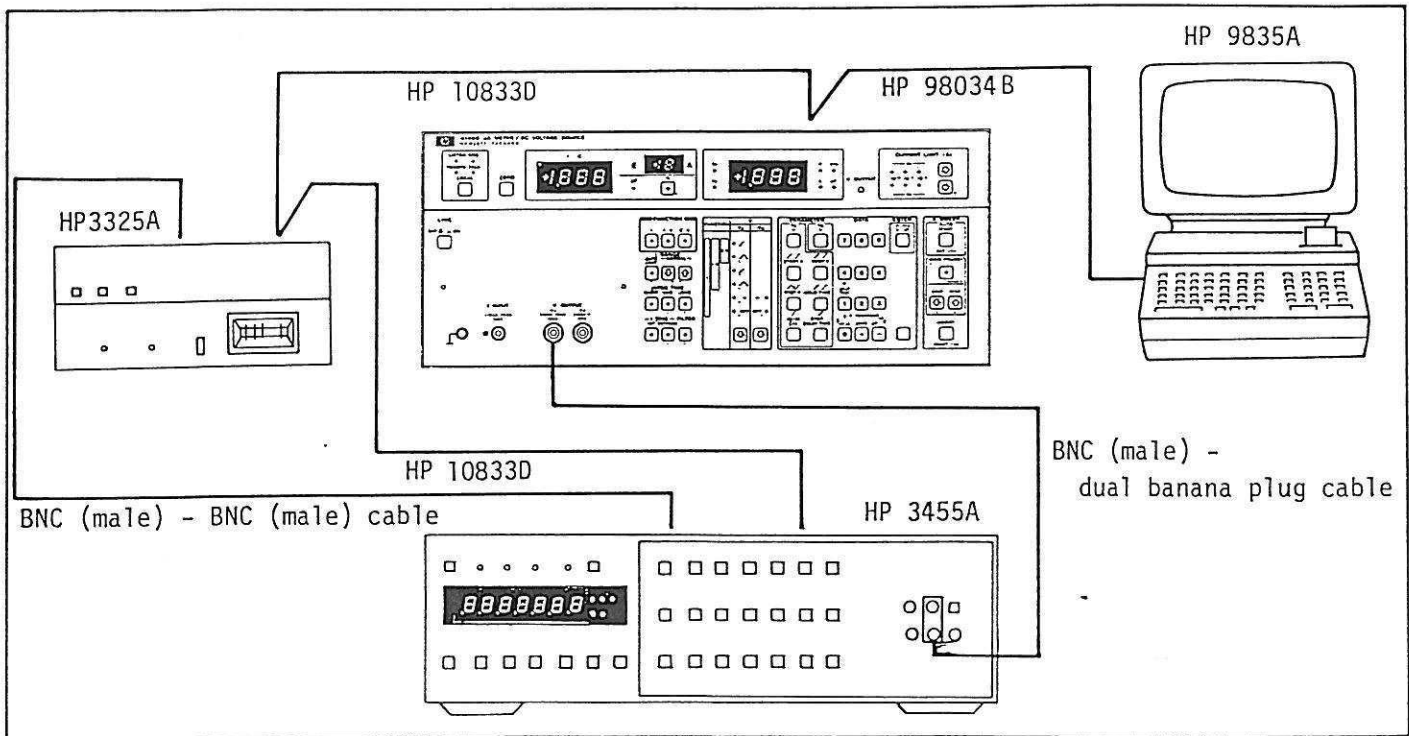


Figure 5-7. VS (Voltage Source) Ramp Rate Adjustment Setup.

EQUIPMENT:

Desktop Computer	HP 9835A
General I/O ROM	HP 98332A
HP-IB Interface Card with Cable	HP 98034B
HP-IB Cable	HP 10833D (2ea)
DVM (with HP-IB Interface capability)	HP 3455A
Synthesizer/Function Generator (with HP-IB Interface capability)	HP3325A
BNC (Male)-to-BNC (Male) Cable	Part of HP 16053A (HP Part No.: 16053-61003)
BNC (Male)-to-Dual Banana Plug Cable	HP 11001A

ADJUSTMENTS

PROCEDURE:

1. Turn all instruments OFF.
2. Insert the 98034B HP-IB Interface Card into the 9835A I/O slot, and connect the attached cable to the 4140B rear panel HP-IB connector, as shown in Figure 5-7.
3. Install 98332A ROM in 9835A ROM slot.
4. Set 98034A Select Code switch dial to select code 7 (using a screwdriver).
5. Set HP-IB addresses of instruments as follows:
 - 4140B: 10001 (17 in binary code).
 - 3455A: 00110 (6 in binary code).
 - 3325A: 10000 (16 in binary code).
6. Connect 4140B, 3455A, 3325A with 10833D HP-IB cables as shown in Figure 5-7.
7. Connect BNC (male) to BNC (male) cable between 3325A SIGNAL OUTPUT connector and 3455A EXT TRIGGER INPUT connector, as shown in Figure 5-7.
8. Turn all instruments ON.
9. Load test program (as shown in Figure 5-8) in controller.
10. Execute the program.
11. Respond to the instructions displayed on the 9835A CRT-refer to Table 5-4.

ADJUSTMENTS

[PROGRAMMING]

```
10  I 4140B RAMP RATE ADJUSTMENT "40BA0J"  
20  OIM A(-4,400)  
30  PRINT PAGE  
40  PRINT "RAMP RATE ADJUSTMENT":LIN(1)  
50  REMOTE 7  
60  ABORTIO 7  
70  CLEAR 717  
80  IMAGE 30X,20.40,"V/s"  
90  WAIT 2000  
100 OUTPUT 706;"F1R3T2M3A0H0"  
110 OUTPUT 716;"FU2FR5HZAMSVORF1"  
120 OUTPUT 717;"F1R1I3T2A2B2L3M3"  
130 OUTPUT 717;"PS-10;PT10;PE.5;PV.5;PH3"  
140 OUTPUT 717;"W1"  
150 B=0  
160 FOR J=-4 TO 400  
170 ENTER 706;A(J)  
180 IF J<1 THEN 250  
190 IF J=50 THEN DISP "Adjust ramp rate to .4999 - .5001V/s with A6R13 (dv/dt  
    ADJ)"  
200 IF J<201 THEN PRINT USING 80;J,A(J)-A(J-5)  
210 IF (J=200) AND ((A(J)-A(J-5))<.4999) OR (A(J)-A(J-5))>.5001) THEN B=1  
220 IF J=201 THEN DISP "Wait"  
230 IF (J>250) AND ((A(J)-A(J-5))>.4995) OR (A(J)-A(J-5))<-.5005) THEN B=1  
240 IF B=1 THEN 260  
250 NEXT J  
260 OUTPUT 717;"W7"  
270 IF B=1 THEN DISP "Adjust again!!"  
280 IF B=1 THEN 30  
290 PRINT PAGE  
300 DISP "END"  
310 END
```

Figure 5-8. Ramp Rate Adjustment Program Using 9835A

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10 ! 4140B RAMP RATE ADJUSTMENT "40BADJ"
20 DIM A(202)
30 PRINT "RAMP RATE ADJUSTMENT"
40 REMOTE 7
50 ABORT 7
60 CLEAR 7
70 IMAGE 30,20.40,"V/s"
80 WAIT 2000
90 OUTPUT 706;"F1R3T2M3A0H0"
100 OUTPUT 716;"FU2FRSHZAMSVORF1"
110 OUTPUT 717;"F1RA113T2A2B2L3M3"
120 OUTPUT 717;"PS-10;PT10;PE.S;PV.S;PH3"
130 WAIT 2000
140 OUTPUT 717;"W1"
150 WAIT 3000
160 B=0
170 FOR J=0 TO 202
180 ENTER 706:A(J)
190 IF J<3 THEN 270
200 IF J=27 THEN DISP "Adjust Ramp rate to .4999 - .5001V/s with A6R13 (dV/dt Ad
J)"
210 IF J<103 THEN PRINT USING 70:J,A(J)-A(J-2)
220 IF J<27 THEN 270
230 IF J=52 OR A(J)-A(J-2)<.4999 OR A(J)-A(J-2)>.5001 THEN B=1
240 IF J=103 THEN DISP "WAIT"
250 IF J=152 AND A(J)-A(J-2)>-.4999 OR A(J)-A(J-2)<-.5001 THEN B=1
260 IF B=1 THEN 280
270 NEXT J
280 OUTPUT 717;"W7"
290 IF B=1 THEN DISP "Adjust again"
300 IF B=1 THEN 30
310 PRINT "END"
320 END

```

Figure 5-9. Ramp Rate Adjustment Program Using HP-85

```

10 ! 4140B RAMP RATE ADJUSTMENT "40BADJ"
20 DIM A(-4:400)
30 PRINT "RAMP RATE ADJUSTMENT"
40 REMOTE 7
50 ABORT 7
60 CLEAR 717
70 IMAGE 30,20.40,"V/s",20.40,"V"
80 WAIT 2
90 OUTPUT 706;"F1R3T2M3A0H0"
100 OUTPUT 716;"FU2FRSHZAMSVORF1"
110 OUTPUT 717;"F1RA113T2A2B2L3M3"
120 OUTPUT 717;"PS-10;PT10;PE.S;PV.S;PH3"
130 OUTPUT 717;"W1"
140 B=0
150 FOR J=-4 TO 400
160 ENTER 706:A(J)
170 IF J<1 THEN 240
180 IF J=50 THEN DISP "Adjust ramp rate to .4999 - .5001V/s with A6R13 (dV/d
t ADJ)"
190 IF J<201 THEN PRINT USING 70:J,A(J)-A(J-5)
200 IF (J=200) AND ((A(J)-A(J-5)<.4999) OR (A(J)-A(J-5)>.5001)) THEN B=1
210 IF J=201 THEN DISP "Wait"
220 IF (J>250) AND ((A(J)-A(J-5)>-.4999) OR (A(J)-A(J-5)<-.5005)) THEN B=1
230 IF B=1 THEN 250
240 NEXT J
250 OUTPUT 717;"W7"
260 IF B=1 THEN DISP "Adjust again !!"
270 IF B=1 THEN 30
280 PRINT "END"
290 END

```

Figure 5-10. Ramp Rate Adjustment Program Using HP 9000 Series 200/300

ADJUSTMENTS

Table 5-4. Controller Instructions and Operator Responses
for Ramp Rate Adjustment Program.

Controller Instruction	CRT Area	Operator Response
RAMP RATE ADJUSTMENT	Print	
Adjust ramp rate to .4999-.5001 V/s with A6R13 (dV/dt ADJ)	Display	Adjust ramp rate to .4999 ~ .5001V/s with A6R13 (dV/Dt ADJ) potentiometer.
NNN NN.NNNNV/s	Print	
WAIT	Display	Stop ramp rate adjustment and wait.
Adjust again!!		If ramp rate adjustment is not completed, this annunciation is displayed. In this case, try ramp rate adjustment again.
END		

ADJUSTMENTS

5-29. ANALOG OUTPUT ADJUSTMENT.

5-30. This procedure adjusts the Analog Output (A31 and A32). The adjustment is divided into three parts:

- (1) DAC (D-A Converter) Zero adjustment.
- (2) x1/10 Buffer Zero Adjustment.
- (3) DAC Gain Adjustment.

Note

Allow a 15 minute warm up and stabilization period before performing this adjustment.

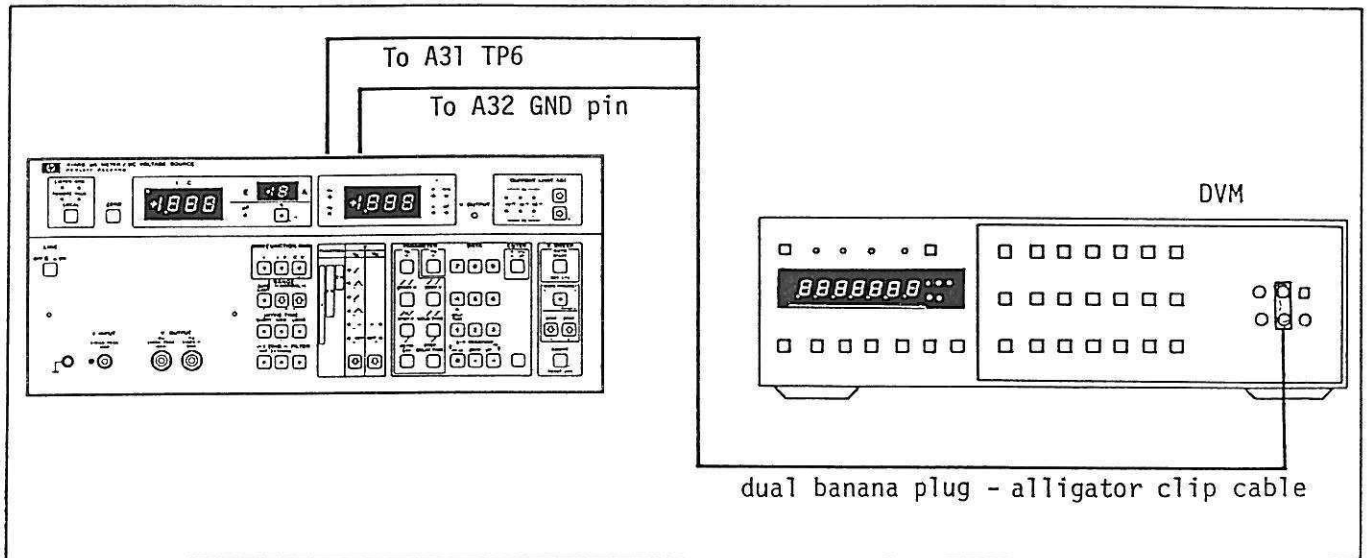


Figure 5-11. Analog Output Adjustment Setup.

EQUIPMENT:

- DVM HP 3455A
- Dual Banana Plug-to-Alligator Clip Cable HP 11002A





ADJUSTMENTS

PROCEDURE:

(1) DAC Zero Adjustment

1. Connect the positive input of the DVM to A31TP6 and the negative input to A32GND with dual banana plug-to-alligator clip cable. See Figure 5-9.
2. Set the DVM as follows:



FUNCTION	DCV
RANGE	AUTO
HIGH RESOLUTION	OFF
AUTO CAL	ON
GUARD	ON
TRIGGER	INTERNAL

3. This adjustment is made using the auto setting modes of 4140B (refer to paragraph 4-9).
4. Press ", " to set 4140B to Self Test mode.
5. Press ", " to set 4140B to "S-5" mode.
6. Adjust "ZERO" potentiometer A31R4 for a DVM reading of 0 volts $\pm 0.5\text{mV}$ (see Figure 8-22 for location).

(2) x1/10 Buffer Zero Adjustment

7. Connect the positive input of the DVM to A32TP1 and the negative input to A32GND with dual banana plug-to-alligator clip cable.
8. Adjust "x1/10 ZERO" potentiometer A32R5 for a DVM reading of 0 volts $\pm 0.5\text{mV}$ (see Figure 8-22 for location).

(3) DAC Gain Adjustment

9. Connect the positive input of the DVM to A31TP6 and the negative input to A32GND with dual banana plug-to-alligator clip cable.
10. Press ", " to set 4140B to "S-6" mode.
11. Adjust "GAIN" potentiometer A31R5 for a DVM reading of -10 volts $\pm 1\text{mV}$ (see Figure 8-22 for location).