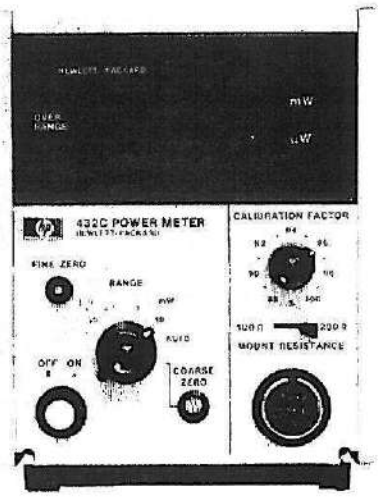
MANUAL SUPPLEMENT

HP 432C
POWER METER



USE THIS SUPPLEMENT WITH
MANUAL PART NO. 00432-90009
PRINTED JUNE 1972

HEWLETT PACKARD

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Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

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MANUAL IDENTIFICATION

Model Number: HP 432C
Date Printed: August 1984
Part Number: 00432-90056

POWER METER

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections.

Make all appropriate serial number related changes indicated in the tables below. The HP 432A changes are those changes to be made to the HP 432A Operating and Service manual from the HP 432A MANUAL CHANGES Supplement.

Serial Prefix or Number	Make Manual Changes	
	HP 432C	HP 432A
2128A	Errata only	Errata 1—4

Serial Prefix or Number	Make Manual Changes	
	HP 432C	HP 432A

▶ NEW ITEM

ERRATA

Page 25, Table 9:

A6U6. Change the part number and description for A6U6 to the following:
1820-1284 CD5 IC GATE TTL LS AND-OR-INV 4-INP.

▶Page 26, Table 9:

MP28 and MP29. Change the part number and description for MP28 and MP29 to the following:
00432-00106 BRKT-PC BD.

Page 30, paragraph 81:

At the end of paragraph 81 add the following:
In addition to the lettered changes to be made in the HP 432C Supplement, the appropriate numbered changes must be made in the HP 432A Operating and Service manual. The numbered changes are in the yellow MANUAL CHANGES supplement for the HP 432A manual.

Page 30, Table 11:

Replace Table 11 with Table 11 in this supplement.

Page 33, Figure 9:

In the Integrated Circuit part number table (left side of schematic) change the part number for **U6** to 1820-1284.

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

11 June 1986
2 Pages

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ERRATA (cont'd)

Page 59, Figure 25:
In the Integrated Circuit part number table (left side of schematic) change the part number for **U6** to 1820-1284.

Page 68:
In the Integrated Circuit part number table (left side of schematic) change the part number for **U6** to 1820-1284.

Table 11. Manual Changes by Serial Number (P/O Errata)

Serial or ID Number	Change	HP 432A Numbered Manual Change
1129A	N, M, L, K, J, I, H, G, F, E, D, C, B, A	X
1213A00140-230	N, M, L, K, J, I, H, G, F, E, D, C, B	X
1213A00231-250	N, M, L, K, J, I, H, G, F, E, D, C	X
1249A	N, M, L, K, J, I, H, G, F, E, D	X
1512A	N, M, L, K, J, I, H, G, F, E	1
1714A	N, M, L, K, J, I, H, G, F	1
1737A	N, M, L, K, J, I, H, G	1, 2
1832A	N, M, L, K, J, I, H	1—3
1835A	N, M, L, K, J, I	1—4
1845A	N, M, L, K, J, I	1—4
1906A	N, M, L, K, J	1—4
1937A	N, M, L, K	1—4
2020A	N, M, L	1—4
2035A00906-955	M	1—4
2035A00956-965	N	1—4

X = No change required.

MANUAL SUPPLEMENT

HP 432C
POWER METER

SERIAL NUMBERS

This supplement applies directly to instruments with serial numbers prefixed 2128A.

With changes described after the Replaceable Parts table, this supplement also applies to instruments with serial numbers prefixed 1129A, 1213A, 1249A, 1512A, 1714A, 1737A, 1832A, 1835A, 1845A, 1906A, 1937A, 2020A, and 2035A.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY SUPPLEMENT in paragraph 3 of this manual.

HEWLETT PACKARD

SUPPLEMENT PART NO. 00432-90056
Microfiche Part No. 00432-90057

Printed: AUGUST 1984

1. GENERAL INFORMATION

2. Instruments Covered By This Supplement

3. This supplement is intended to be used with the 432A Operating and Service Manual. It covers the changes necessary to document the 432C. This supplement applies directly to instruments with the serial number prefix of 2128A. When the instrument serial number prefix is higher than 2128A, a yellow "Manual Changes" sheet is provided to update the supplement. With the backdating changes described after the Replaceable Parts table, this supplement also applies to instruments with serial numbers prefixed lower than 2128A.

4. Description

5. The Hewlett Packard Model 432C Power Meter has a digital readout, automatic ranging, and remote programming capability. It uses the same meter circuits used in the HP 432A analog power meter: the only electrical and mechanical differences between the two instruments are those that have to do with Digital Panel Meter Assembly M1, Auto Range Assembly A6, and data input/output connector J6.

6. Accessories

7. Accessories supplied with, and available for, the 432C are the same as those for the 432A.

8. Options

9. Options for the 432C are the same as those for the 432A except that Option 001, rechargable battery, is not available.

10. INSTALLATION

11. Installation procedures for the 432C are the same as those for the 432A except for those that deal with internal battery operation.

Table 1. Specifications

Instrument Type: Automatic, self-balancing power meter for use with temperature-compensated thermistor mount.

Power Range: Four ranges with full scale readings of 10 and 100 μW, and 1 and 10 mW.

Accuracy: ±0.5% of full scale on 100 μW, and 1 and 10 mW ranges (20° to 30°C); ±1.0% on 10 μW range, ±1.5% of full scale on all ranges (±0 to +55°C).

Noise: Less than 0.25% of full scale peak.

Response Time: At Recorder Output, 35 ms time constant (typical).

Fine Zero: Automatic, operated by front panel switch or remote input.

Zero Carryover: Less than 0.50% of full scale when zeroed on most sensitive range.

Calibration Factor Control: 13-position switch normalizes meter reading to account for thermistor mount Calibration Factor. Range 100% to 88% in 1% steps.

Meter: Three digits with one digit overrange. 20% overrange capability on all ranges.

Thermistor Mount: External temperature-compensated thermistor mounts required for operation (HP 478, 8478B, and 486 series; mount resistance 100 or 200 ohms).

Recorder Output: Proportional to indicated power with 1 volt corresponding to full-scale. 1 kΩ output impedance.

BCD Output†: 8, 4, 2, 1 code: "1" positive. TTL compatible logic. Operates with HP 5055A Digital Recorder and HP 5150A Thermal Printer. "Print" and "Inhibit" lines available.

Bridge Outputs (V_{RF} and V_{COMP}): Direct connections to the thermistor bridges; used in instrument calibration and precision power measurements.

Control Lines: (Note: Instrument is referenced to +5V true. "Logical 1", refers to +5V, "Logical 0" is equivalent to 0V):

Outputs: BCD Output as described above.
Overrange: Single bit indicates meter overrange.
Underrange: Single bit indicates meter underrange.
Range: 2 Bit code indicates range selected.

†For backdating information refer to Manual Changes.

Table 1. Specifications (Cont'd)

Print: Single bit indicates data is ready.

Inputs:

Remote Enable: Single bit establishes control of instrument ranging and fine zero controls for remote programming. Remote fine zero may be accomplished in remote or local modes of operation.

Remote Range: Two bit code selects instrument range.

Auto Zero: Contact closure to ground zeros meter.

Inhibit†: Single bit holds data and stops A/D converter.

Ext. Trig†: When in inhibit mode, single bit starts new data conversion. Data Ready in 10 ms.

Power: 115 or 230V AC ±10%, 50 to 400 Hz, 16 watts.

Weight: Net, 3.2 kg (7 lb.).

Dimensions: 163 mm high, 130 mm wide, and 279 mm deep (6-9/16 x 5-1/8 x 11 in.).

Accessories Furnished: 1.5m (5 ft.) cable for HP temperature-compensated thermistor mounts, 2.25m (7-1/2 ft.) power cable.

Accessories Available:

8404A Power Meter Leveling Amplifier (for use with HP 8690B or 8620 sweepers).

8477A Power Meter Calibrator.

11076A, Carrying Case.

5060-0797 Rack Adapter Frame (holds three instruments the size of the 432C).

Combining Cases:

1051A, 286 mm (11-1/4 in.) deep.
1052A, 416 mm (16-3/8 in.) deep.

The combining cases accept the 1/3-module HP instruments for bench use or rack mounting.

Options:

002: Input connector placed on rear panel in parallel with front.

003: Input connector on rear panel only.

NOTE

Thermistor mount cable impedance is part of the 432C input bridge circuit. For cables over 10 feet long the bridge is matched to specific cable options, so the various cables should not be interchanged.

009: 3m (10 ft.) cable for 100-ohm or 200-ohm mount.

010: 6.1m (10 ft.) cable for 100-ohm or 200 ohm mount.

011: 15.25m (50 ft.) cable for 100-ohm or 200-ohm mount.

012: 30.5m (100 ft.) cable for 100-ohm or 200-ohm mount.

013: 61m (200 ft.) cable for 100-ohm or 200-ohm mount.

12. OPERATING INFORMATION

13. Introduction

14. The 432C operates the same as the 432A with the following exceptions:

a. No battery operation

b. Ranges are 10 and 100 μW, 1 and 10 mW, and Auto.

c. Unit is remotely programmable.

d. Greater meter accuracy (see Table 1).

e. Data input/output at rear panel.

15.† The digital panel meter is a self-contained unit and is not field repairable.

16. Auto Ranging

17. If Range Switch S5 is set to AUTO, the 432C power meter will automatically select the correct

†Refer to Manual Changes for backdating information.

range. When the digital panel meter reads 1200 or higher, the display will momentarily blank and the power meter will switch to the next higher range. When the digital panel meter reads 0099 or less, the power meter will switch to the next lower range. It takes the power meter 500 ms to make an analog to digital conversion and switch to the next higher or lower range.

18. Data Input/Output at J6

19. Connector J6, on the rear panel, provides data input/output capability that is TTL compatible. The 432C uses positive true logic: logical "1" refers to +2.5 to +5V, and logical "0" refers to 0 to 0.44V. Figure 1 shows J6 and lists its pin functions. The HP 1251-0086 plug (Amphenol and Cinch Part No. 57-30500-375) mates with data jack J6 on the rear panel.

20. BCD Output. Binary Coded Decimal information that duplicates the numbers shown on the digital panel meter is provided in an 8421 code (see Table 2).

Digit		Weight	Pin Number
Units	10^0 A	1	1
	10^0 B	2	2
	10^0 C	4	26
	10^0 D	8	27
Tens	10^1 A	1	3
	10^1 B	2	4
	10^1 C	4	28
	10^1 D	8	29
Hundreds	10^2 A	1	5
	10^2 B	2	6
	10^2 C	4	30
	10^2 D	8	31
Thousands	10^3 A	1	7
	10^3 B	2	8 (ground)
	10^3 C	4	32 (ground)
	10^3 D	8	33 (ground)

21. Underrange/Overrange Output. The Underrange Flag is set when the meter reads 0099 or less; the overrange Flag is set when the meter reads 1200 or more.

Condition	Pin 16	Pin 15
On Range	0	0
Underrange	0	1
Overrange	1	0

Table 2. BCD Output

Decimal	Binary			
	8	4	2	1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

22. Range Output. The current range setting of the power meter is indicated by the range outputs.

Range	Range 2 (pin 12)	Range 1 (pin 11)
10 μW	0	0
100 μW	0	1
1 mW	1	0
10 mW	1	1

23. Print Output. A transition, on pin 48, from 1 to 0 signifies that data is ready. Normally, the Print command does not appear until the power meter has auto ranged to the correct range, or is set to the correct range by the front panel switch or the remote range inputs. However, the Print command will appear, even if the power meter is overranged or underranged, if the jumper (E1) on Auto Range Assembly A6 is connected between jumper pins B and C (see Service Sheet 5).

24. Ground and +5V Outputs. Pin 50 provides a ground reference for the logic circuits in the 432C. Pin 45 provides +5V (at 100 mA max) that can be used to power an interface or print device.

25. Remote Enable Input. A logical 0 (or contact closure to ground) on pin 21 puts the 432C in remote mode. The front panel RANGE and FINE ZERO switches are disabled, and the meter is under control of the Remote 1, Remote 2 and Auto Zero inputs.

26. A logical 1 (or open circuit) on pin 21 puts the 432C in local mode. The meter is under control of the front panel RANGE and FINE ZERO switches and the Remote 1 and Remote 2 inputs

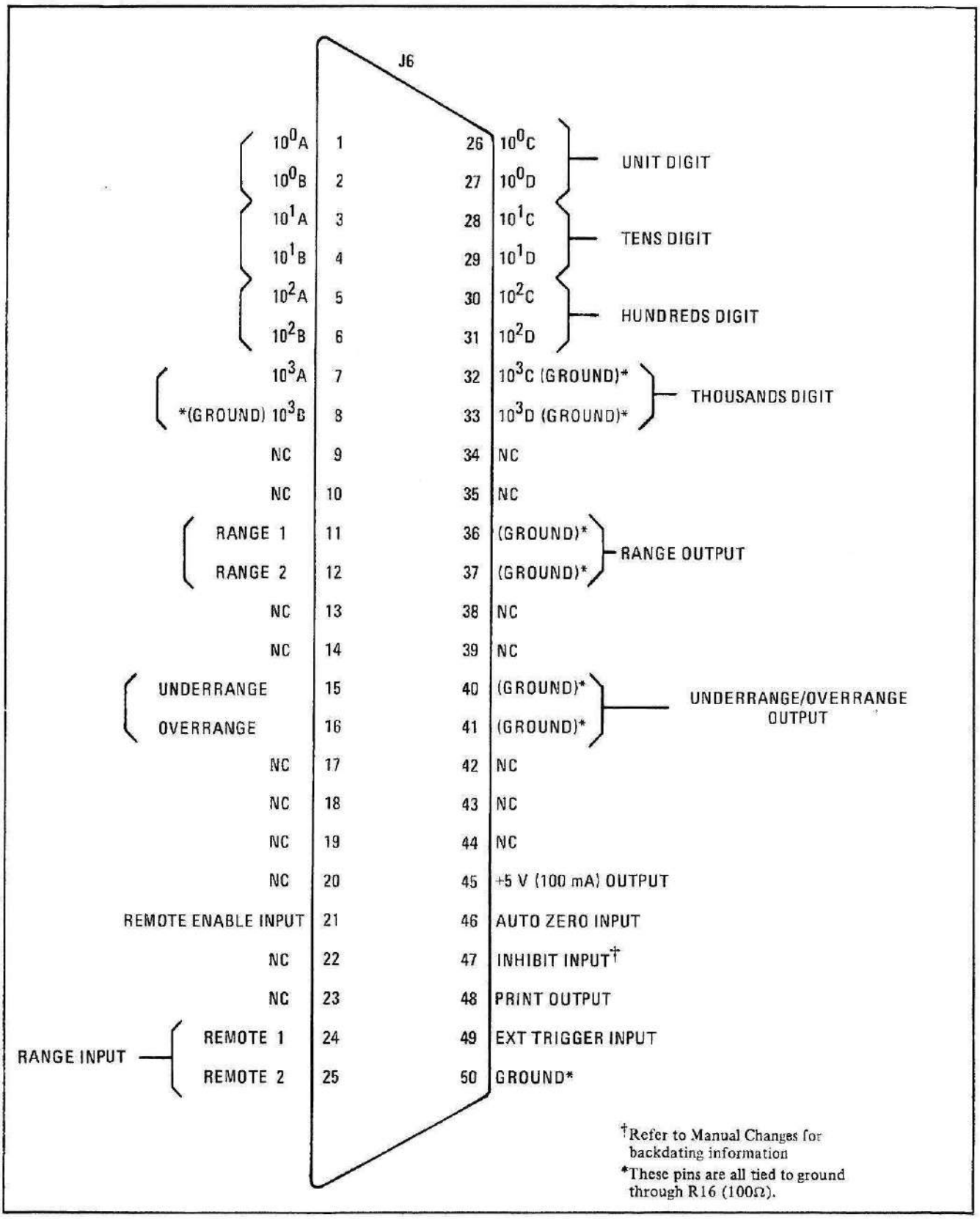


Figure 1. Data Input/Output Connector J6

are disabled. However, the meter can be zeroed using the Auto Zero input.

NOTE

Since the logic circuitry in the 432C is TTL compatible, an open circuit is equivalent to logical 1 (+5V).

27. Remote Range Inputs. The remote range inputs control range selection in remote mode (when Remote Enable is 0). They are disabled in local mode.

Range	Remote 2 (pin 25)	Remote 1 (pin 24)
10 μW	0	0
100 μW	0	1
1 mW	1	0
10 mW	1	1

28. Auto Zero Input. A logical 0 on pin 46 zeros the meter in either remote or local mode.

29. Inhibit Input†. A logical 0 on pin 47 holds data and stops the analog to digital converter. A logical 1 starts an A/D conversion on the next 500 ms.

30. External Trigger Input†. With a logical 0 on the Inhibit input, a transition from logical 1 to logical 0 on the External Trigger input starts an A/D conversion immediately. Data is ready in 10 ms.

NOTE

Normally the Print output will indicate a data ready condition only if the power meter is on the correct range; to get a Print output regardless of an underrange or overrange condition, connect the jumper (E1) on Auto Range Assembly A6 between jumper pins B and C.

31. Operation With HP Model 5055A Digital Recorder and HP Model 5150A Thermal Printer.

32. To use the 432C with the HP 5055A Digital Recorder or HP 5150A Thermal Printer, connect the recorder to the power meter with an HP 562A-16C interface cable (supplied with HP 5055A Option 002 and HP 5150A Option 005). Set the recorder for a +8421 BCD code, turn blanking on (this blanks insignificant zeros). Table 3 shows data interpretation.

†Refer to Manual Changes for backdating information.

Table 3. 432C/5055A or 5150A Data Interpretation

Column	Interpretation
1 (right)	Units Digit
2	Tens Digit
3	Hundreds Digit
4	Thousands Digit
5	Blank
6	Range Code*
7	Blank
8	Overrange/Underrange**
9	Blank
10 (left)	Blank

* Range Code: 0 = 10 μW Range
1 = 100 μW Range
2 = 1 mW Range
3 = 10 mW Range

** 0 = Correct Range, 1 = Underrange, 2 = Overrange

33. PRINCIPLES OF OPERATION

34. General

35. The 432C operation is the same as the 432A except that Digital Panel Meter M1 accepts the analog information from Meter Logic Assembly A2. Also, all range switching (manual, auto and remote) is performed by circuits on Auto Range Assembly A6. Operation of Thermistor Bridge Assembly A1 and of Meter Logic Assembly A2 is the same in both instruments.

36. Auto Range Assembly A6

37. Introduction (see Figure 2). Auto Range Assembly A6 comprises the logic circuitry and relays that set the power meter to its four basic ranges. The main control element is the up/down counter. The counter generates a range code that consists of four binary counts, or states. The range code corresponds to the meter's four ranges:

Range Code	Range
00	10 μW
01	100 μW
10	1 mW
11	10 mW

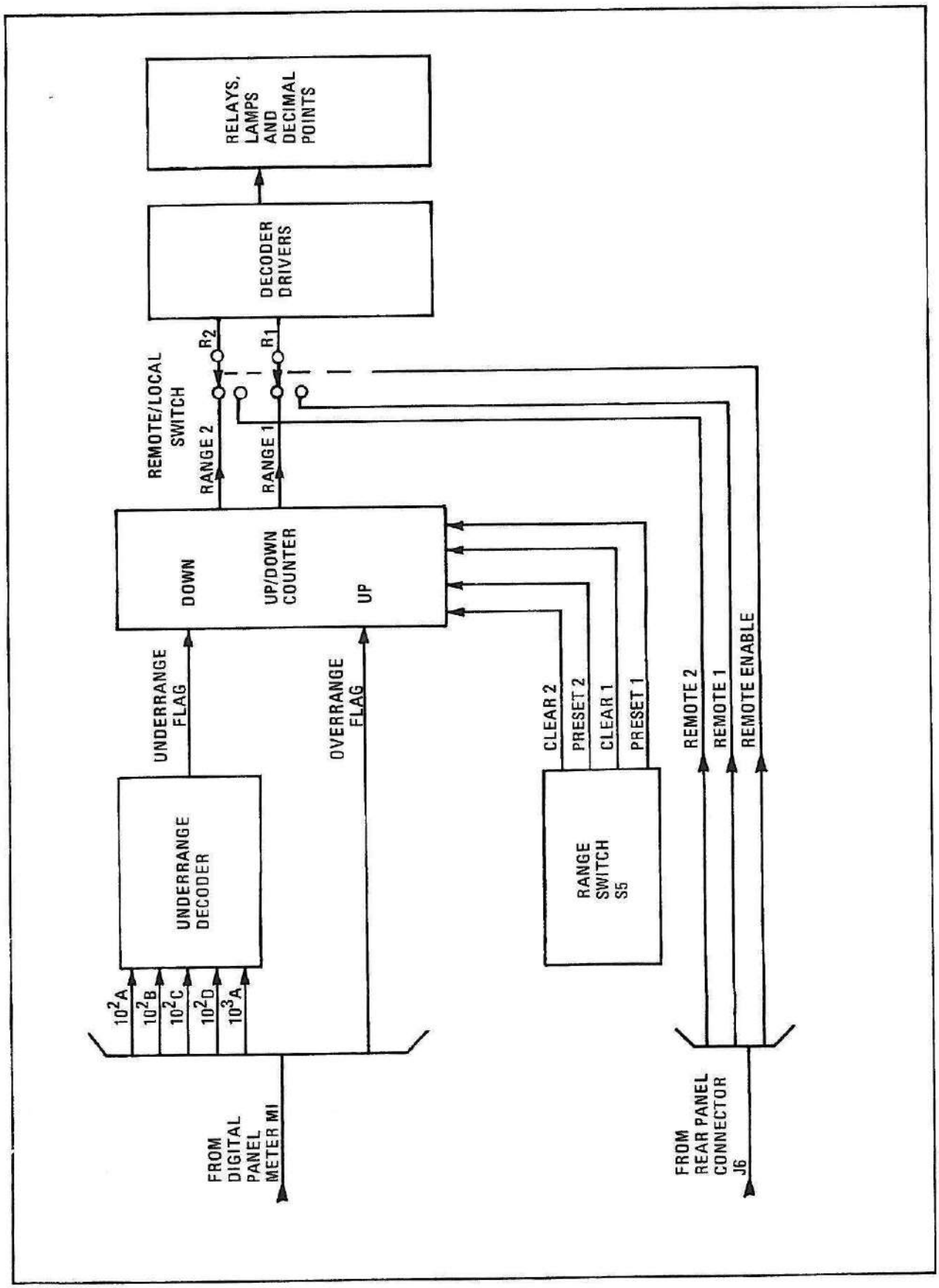


Figure 2. Auto Range Assembly A6 Block Diagram

The counter's range code is decoded by the decoder drivers. The drivers energize and de-energize the relays that set the range of the power meter (see Service Sheet 2).

38. The range code can also be supplied by external logic circuitry through the Remote Enable, Remote 1 and Remote 2 input lines. When these inputs are being used, the up/down counter still functions but is isolated from the decoder drivers by the remote/local switch.

39. The up/down counter is controlled by the Underrange and Overrange Flags. The Overrange Flag is set by circuitry in Digital Panel Meter M1 whenever the meter reads 1200 or higher. The Underrange Flag is set by the underrange decoder (located on the A6 assembly) whenever the meter reads 0099 or lower.

40. An Overrange Flag causes the up/down counter to count up, increasing the range setting of the power meter. An Underrange Flag causes the counter to count down, decreasing the range setting of the power meter. However, if the counter is at range code 11 (10 mW range) and receives an Overrange Flag, it will not cycle to range code 00 (10 μW range). Likewise, if the counter receives an Underrange Flag when it is at range code 00, it will not cycle to range code 11.

41. The Underrange and Overrange Flags control the up/down counter only when Range Switch S5 is set to AUTO. If the switch is set to COARSE ZERO or one of its four range positions, it directly sets the counter to a range code that corresponds to the switch setting. The counter is then unaffected by the flags.

42. Up/Down Counter Inputs (see Service Sheet 5). When Range Switch S5 is set to AUTO, the up/down counter is controlled by the Underrange Flag, the Overrange Flag and the End of Conversion bit.

43.† The End of Conversion bit is generated by Digital Panel Meter M1 every time the meter completes an analog to digital conversion. The bit is a transition from 1 to 0 and triggers monostable multivibrator A6U8. The multivibrator's output is a delayed positive pulse that clocks (at its trailing edge) the flip-flops in the up/down counter. The complement of the Clock pulse is used to gate A6U12A. OR gate U12B feeds a Print pulse (logical 0) to rear panel connector J6 whenever both:

a. J/K_1 and J/K_2 are 0 (i.e., whenever the counter is not counting up or down).

b. U12A gets a low Clock pulse from U8.

This prevents the Print pulse from being sent to J6 while the power meter is on an incorrect range (i.e. while it is auto ranging itself). Connecting jumper E1 between pins B and C feeds the End of Conversion bit directly to connector J6, whether the counter is on the correct range or not.

44. The Overrange Flag is generated by Digital Panel Meter M1 whenever the meter reads 1200 or higher. It is fed to the up/down counter and to rear panel connector J6 (see Service Sheet 4). The Overrange Flag is a logical 1.

45.† The underrange decoder generates an Underrange Flag whenever the Digital Panel Meter reads 0099 or lower. When the hundreds bits and thousands bit are logical 0, pin 9 of NOR gate U6U2C is low, thus generating an Underrange Flag.

46. Up/Down Counter (see Service Sheet 5). The up/down counter comprises dual J/K master/slave flip-flop A6U11, AND-NOR-INVERT gates A6U4 and U6, and inverters A6U7E and U7F. The counter's output is a two-bit range code, 0 to three in binary, that corresponds to the four meter ranges:

Range	Range 2	Range 1
10 μW	0	0
100 μW	0	1
1 mW	1	0
10 mW	1	1

When the counter receives an Overrange Flag, it counts up; when it receives an Underrange Flag, it counts down.

47. There are two flip-flops, one for each range bit. They are controlled (in auto mode) by their Clock and J/K inputs. If a J/K input is high (logical 1) when a Clock pulse arrives, the flip-flop toggles, and the Q output changes states (changes from 0 to 1 or from 1 to 0). If a J/K input is low when a Clock pulse arrives, the Q output does not change.

48. The J/K inputs to the flip-flops are set by A6U4, U6, U7E and U7F. When an Underrange or an Overrange Flag is set, U4 and U6 "decide"

†Refer to Manual Changes for backdating information.

whether to set J/K_1 or J/K_1 and J/K_2 high to make the counter count up or down. The "decision" depends upon both:

a. Whether an Underrange or an Overrange Flag is received.

b. The current count (range code) of the counter. Figure 3 diagrams the decision making capacity of U4 and U6.

49. The J/K flip-flops also have Preset and Clear inputs. A low (logical 0) input to Preset sets a flip-flop's Q output to 1, and a low input to Clear sets the Q output to 0. When either Preset or Clear is low, the J/K and Clock inputs are internally disabled.

50. Range Switch S5 is connected to the Preset and Clear inputs of the flip-flops. When RANGE is set to AUTO, the Preset and Clear inputs are logical 1 and the flip-flops respond to their J/K and Clock inputs. When RANGE is set to any other position, it directly controls the flip-flops:

Range	Clear 2	Preset 2	Q_2	Clear 1	Preset 1	Q_1
10 μW	0	1	0	0	1	0
100 μW	0	1	0	1	0	1
1 mW	1	0	1	0	1	0
10 mW	1	0	1	1	0	1
AUTO	1	1	–	1	1	–
COARSE ZERO	1	0	1	0	1	0

51. **Remote/Local Switch** (see Service Sheet 5). A6U9 and associated inverters, A6U7A, U7B and U7D, function as a double throw, double pole switch under control of the Remote Enable input. If Remote Enable is logical 1 (i.e. an open circuit) the range busses (R_2 and R_1, $\overline{R}_2$ and $\overline{R}_1$) are connected to the outputs of flip-flops A5U11a and U11B. If Remote Enable is logical 0 (i.e. grounded), then the range busses are connected to the Remote 2 and Remote 1 input lines. Thus, the range code can be supplied by either the up/down counter or the remote inputs.

52. **Decoder Drivers** (see Service Sheet 5). Decoding from the range code (R_2 and R_1, $\overline{R}_2$ and $\overline{R}_1$) to the logic functions required to drive the decimal points, lamps, and reed relays is done by A6U2, U3, U5 and A6Q1 through Q3. The truth table for the decoder drivers is shown below. Note that a contact closure to ground is required to energize a relay or a lamp and is signified by a logical 0; a logical 1 indicates that the lamp or relay is de-energized.

53. **Auto Zero Circuits** (see Service Sheet 4). A6Q6 and Q7 supply −13V to front panel RANGE and FINE ZERO switches when the Remote Enable line is a logical 1 (open circuit). This allows front panel control of the coarse and fine zero functions.

Range	K1	K2	K3	K4	K5	K6	DS7(μW)	DS6(mW)
10 μW	1	1	1	0	0	1	0	1
100 μW	1	0	1	1	0	1	0	1
1 mW	1	1	0	1	1	0	1	0
10 mW	0	1	1	1	1	0	1	0

54. During remote operation, when the Remote Enable line is a logical 0 ($\overline{\text{Remote Enable}}$ is a logical 1), A6Q6 turns off, turning off A6Q7. This prevents front panel control of the coarse and fine zero functions.

55. Whenever the Auto Zero input is a logical 0, A6Q4 and A6Q5 turn on, supplying −13V to the fine zero circuits on Thermistor Bridge Assembly A1. This action is independent of the Remote Enable input.

56. **Power Supply Circuits** (see Service Sheet 3). The +5V that supplies the integrated circuits on Auto Range Assembly A6 is provided by A6U1 and associated components. A6U1, a monolithic voltage regulator, controls Q1; the conduction of Q1 is regulated to provide +5V at test point 2.

Range	Decimal Point 1	Decimal Point 2	Decimal Point 3
10 μW	1	0	1
100 μW	0	1	1
1 mW	1	1	0
10 mW	1	0	1

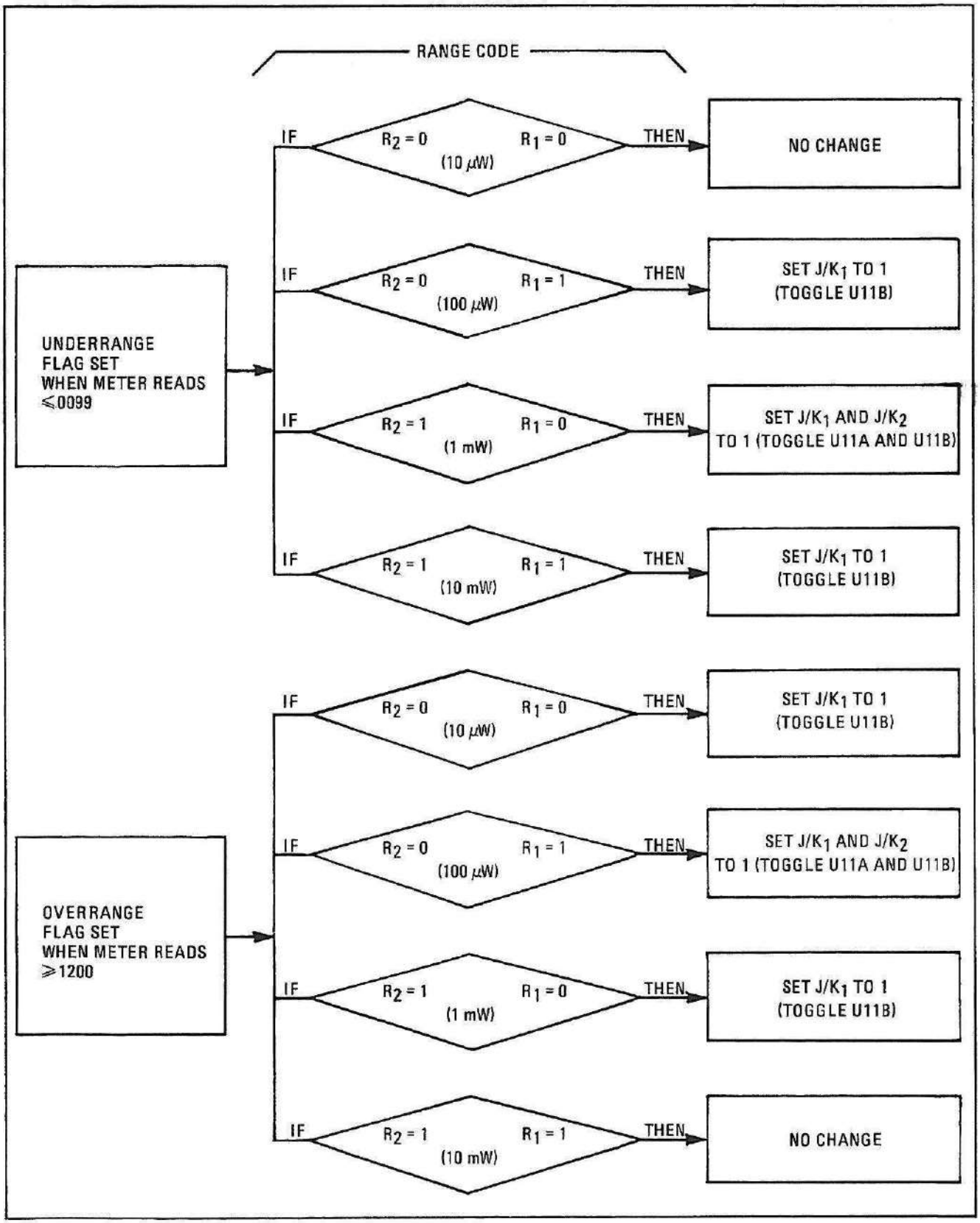


Figure 3. Up/Down Count Sequence

57. PERFORMANCE TESTS

58. The performance tests are suitable for incoming inspection, periodic evaluation, and troubleshooting. Use the recommended test equipment listed in Table 5-1 of the 432A manual with the following changes:

a. Change the filter network (see Figure 4).

b. Add a digital printer with TTL logic levels and +8421 BCD code — HP 5055A Digital Recorder or HP 5150A Thermal Printer with HP 562A-16C interface cable.

c. Add the remote control test set (see Figure 5).

59. The following performance tests replace those documented in the 432A manual.

WARNING

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

60. Meter Accuracy Test

SPECIFICATION:

Accuracy:

Instrument Uncertainty: ±0.5% on 100 μW and 1 and 10 mW ranges, ±1.0% on 10 μW range (20 to 30° C) ±1.5% max. on all ranges (0 to 55°C) ±1.0% typical.

Zero Uncertainty: ± one count on all ranges.

DESCRIPTION: Meter accuracy is checked with an 8477A Calibrator. At the same time, RECORDER output is checked with a digital voltmeter.

EQUIPMENT:

Calibrator	HP 8477A
Digital Voltmeter	HP 3435A
Cable Assembly (2)	HP 10503A
Cable Assembly	HP 11000A

PROCEDURE:

a. Connect the digital voltmeter and the calibrator to the 432C (see Figure 5-1 in the 432A manual). Set the 8477A Calibrator controls as follows:

POWER (MW)	0.01 mW
FUNCTION	200Ω
ZERO/TEST	ZERO

b. Set the 432C controls as follows:

MOUNT RESISTANCE	200Ω
RANGE	10 μW
POWER	ON
CALIBRATION FACTOR	100%
A2S1	CALIBRATE

NOTE

A2S1 is located at the top of the left hand circuit board (Meter Logic Assembly A2).

PERFORMANCE TESTS

60. Meter Accuracy Test (Cont'd)

c. Adjust 8477A ZERO knob for 0.00 μW ±0.01 μW indication on the 432C.

−0.01 _____ +0.01 μW

d. Set 8477A ZERO/TEST to TEST.

e. The digital voltmeter should indicate 1000 ±10 millivolts.

990 _____ 1010 mVdc

f. The 432C meter should indicate 10 μW ±0.1 μW.

9.90 _____ 10.10 μW

g. Repeat steps d through f for each of the other ranges. Set the power meter range selector to the position indicated in Column 1 of Table 4 and set the 8477A meter reading selector to the corresponding position indicated in Column 2 of Table 4. In each case, the meter indications should correspond to those shown in Table 4, Columns 3 and 4.

h. After completing tests, set A2S1 to OPERATE.

Table 4. Meter Accuracy Test

432C Range	8477A Range (mW)	Digital Voltmeter Indication (millivolts)	432C Meter Indication		
10 μW	.01	1000 ± 10	10 ± 0.1 μW	9.9 _____	10.1
100 μW	0.1	1000 ± 5	100 ± 0.5 μW	99.5 _____	100.5
1 μW	1	1000 ± 5	1.0 ± 0.005 mW	0.995 _____	1.005
10 μW	10	1000 ± 5	10.0 ± 0.05 mW	9.95 _____	10.05

61. Meter Linearity Test

SPECIFICATION: Same as Meter Accuracy Test.

DESCRIPTION: A calibrator is used to check meter linearity.

EQUIPMENT:

Calibrator . . . . . HP 8477A
Cable Assembly (2) . . . . . HP 10503A

PROCEDURE:

a. Connect the calibrator to the 432C. Set the 8477A POWER (MW) selector to 1 mW, FUNCTION to 200Ω and ZERO/TEST switch to TEST.

b. Set the 432C RANGE selector to 10 mW, MOUNT RESISTANCE to 200Ω. Set A2S1 to CALIBRATE.

c. The 432C meter should indicate 1 ±0.05 mW

0.95 _____ 1.05 mW

PERFORMANCE TESTS

61. Meter Linearity Test (Cont'd)

d. Set the 8477A POWER (MW) selector to 2 mW.

e. The 432C meter should indicate 2 mW ±0.05 mW

1.95 _____ 2.05 mW

f. Set the 8477A POWER (MW) selector to 3 mW.

g. The 432C meter should indicate 3 mW ±0.05 mW

2.95 _____ 3.05 mW

h. After completing tests, set A2S1 to OPERATE.

62. Calibration Factor Test

SPECIFICATION: Range 100% to 88% in 1% steps.

DESCRIPTION: A calibrator is used to check the accuracy of the calibration factor circuits.

EQUIPMENT:

Calibrator	HP 8477A
Cable Assembly (2)	HP 10503A

PROCEDURE:

a. Connect the calibrator to the 432C, and set 432C controls as follows:

RANGE	100 μW
CAL FACTOR	88%
MOUNT RESISTANCE	200Ω
A2S1	CALIBRATE

b. Set 8477A controls as follows:

FUNCTION	200Ω
ZERO/TEST Switch	TEST
POWER (mW)	0.1 mW

c. Set 8477A ZERO control so that the 432C reads 100 ±0.1 μW.

99.9 _____ 100.1 μW

d. Set the CALIBRATION FACTOR selector to 89%.

e. The 432C should indicate 98.9 ±0.5 μW.

98.4 _____ 99.4 μW

f. Repeat steps d and e for each position of the CALIBRATION FACTOR selector. In each case, the digital voltmeter should indicate the voltage shown in the second column of Table 5 for the CALIBRATION FACTOR shown in the first column.

g. After completing tests, set A2S1 to OPERATE.

PERFORMANCE TESTS

62. Calibration Factor Test (Cont'd)

Table 5. Calibration Factor Test

Calibration Factor Selector Setting (%)	432C Reading (μW)	
88	100.0 ± 0.1	99.9 _____ 100.1
89	98.9 ± 0.5	98.4 _____ 99.4
90	97.8 ± 0.5	97.3 _____ 98.3
91	96.7 ± 0.5	96.2 _____ 97.2
92	95.7 ± 0.5	95.2 _____ 96.2
93	94.6 ± 0.5	94.1 _____ 95.1
94	93.5 ± 0.5	93.0 _____ 94.0
95	92.6 ± 0.5	92.1 _____ 93.1
96	91.6 ± 0.5	91.1 _____ 92.1
97	90.7 ± 0.5	90.2 _____ 91.2
98	89.7 ± 0.5	89.2 _____ 90.2
99	88.9 ± 0.5	88.4 _____ 89.4
100	88.0 ± 0.5	87.5 _____ 88.5

63. Zero Carryover Test

SPECIFICATION: Less than 0.5% of full scale when zeroed on most sensitive range.

DESCRIPTION: 432C is zeroed with a thermistor mount and zero carryover is checked.

EQUIPMENT:

Thermistor Mount . . . . . HP 478A or 8478B

PROCEDURE:

a. Set 432C MOUNT RESISTANCE to resistance shown on the thermistor mount.

b. Connect the thermistor mount to the 432C (A2S1 should be set to OPERATE). Allow the 432C to warm up at least 5 minutes.

c. Zero the 432C as follows:

1) Set the RANGE selector maximum cw to COARSE ZERO.

2) Set the COARSE ZERO screwdriver adjustment so that the meter indicates zero.

3) Set 432C RANGE switch to 10 μW. Depress the FINE ZERO switch. The meter indication should go to zero without overshoot.

d. With the FINE ZERO switch held down, the 432C should read 0 μW ± 0.01 μW

−0.01 _____ +0.01 μW

e. Release FINE ZERO. Rotate the RANGE switch clockwise, one step at a time. On each range the 432C should read within 5 counts of zero, as shown in Table 6.

PERFORMANCE TESTS

63. Zero Carryover Test (Cont'd)

Table 6. Zero Carryover

Range	Meter Reading	
100 μW	00.0 ± 0.5 μW	−0.5 _____ +0.5
1 mW	0.000 ± 0.005 mW	−0.005 _____ +0.005
10 mW	0.00 ± 0.005 mW	−0.005 _____ +0.005

64. Fine Zero Range Test

SPECIFICATION: Automatic, operated by front panel switch.

DESCRIPTION: The fine zero circuits are checked for their ability to zero the meter.

EQUIPMENT:

Thermistor Mount . . . . . HP 478A or 8478B

PROCEDURE:

a. Connect the thermistor mount to the 432C. Set MOUNT RESISTANCE to the resistance shown on the mount. Set RANGE to 1 mW (A2S1 should be set to OPERATE).

b. Turn the COARSE ZERO screwdriver adjustment full ccw.

c. Depress FINE ZERO and hold it down five seconds. The fine zero circuit is now at one end of its range.

d. Release FINE ZERO.

e. Turn COARSE ZERO cw until the meter reads 0.3 ± 0.001 mW.

0.299 _____ 0.301 mW

f. Depress FINE ZERO. The fine zero circuit goes to the other end of its range. The meter should indicate below 0.20 mW.

_____ 0.20 mW

g. Re-adjust COARSE and FINE ZERO to zero the meter.

65. Noise Test

SPECIFICATION: Less than 0.25% of full scale peak.

DESCRIPTION: An oscilloscope is connected through a low pass filter (used to eliminate line noise) to RECORDER output. The 432C is then checked for circuit noise.

65. Noise Test (Cont'd)

EQUIPMENT:

Thermistor Mount	HP 478A or 8478B
Oscilloscope	HP 1200B
Filter	(See Figure 4)
Cable Assembly	HP 10503A

PROCEDURE:

a. Connect the thermistor mount to the 432C; connect the oscilloscope, through the filter, to RECORDER output with the BNC cable assembly.

b. Set the 432C controls as follows:

RANGE	10 μW
MOUNT RESISTANCE	200 Ω
A2S1	OPERATE

c. Set the oscilloscope controls as follows:

Vertical Deflection	1 mV/div
Horizontal Deflection	2s/div
Input	dc

d. Zero the 432C, then read the circuit noise directly on the oscilloscope; any trace deflection should be less than 5 mVp-p.

_____ 5 mVp-p

e. To assemble the line noise filter for the RECORDER output noise test, proceed as follows:

1. Obtain the following parts: BNC connectors — 1 male, 1 female; resistor — 10K ohm; capacitors — 4.7 μF and 100 μF.
2. Assemble the parts as shown in Figure 4.

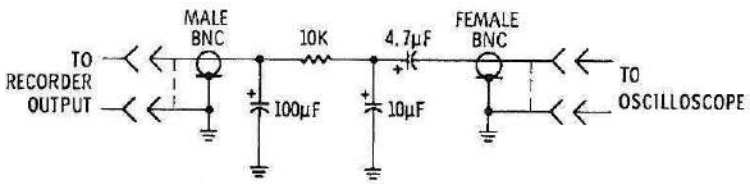


Figure 4. Noise Test Filter Schematic Diagram

66. Data Output and Digital Panel Meter Test

SPECIFICATIONS:

Meter: Three digits with one digit overrange. 20% overrange capability on all ranges.

BCD Output: 8421 code, 1 positive. TTL compatible logic.

66. Data Output and Digital Panel Meter Test (Cont'd)

Control Lines (Outputs):

BCD Output as described above.

Overrange: Single bit indicates meter overrange.

Underrange: Single bit indicates meter underrange.

Range: Two bit code indicates range selected.

Print: Single bit indicates data is ready.

DESCRIPTION: The panel meter's digits and annunciator lamps are checked for proper operation. A digital printer is used to check the data output at J6.

EQUIPMENT:

Digital Recorder	HP 5150A
Interface Cable	HP 526-16C
Thermistor Mount	HP 478A or 8478B

PROCEDURE:

a. Set 432C MOUNT RESISTANCE to resistance shown on thermistor mount.

b. Connect the thermistor mount to the 432C (A2S1 should be set to OPERATE). Connect the digital printer to J6 on rear panel of 432C.

c. Set printer for positive 8421 BCD code and turn blanking on.

d. Set 432C RANGE to 1 mW.

e. Turn COARSE ZERO Screwdriver adjustment full ccw, then slowly turn it cw, checking the following:

1. The panel meter counts in sequence from < .000 mW to 1.199 mW.

2. The printer prints the same digits that appear on the meter (see Table 3 for an explanation of the print-out).

3. When the panel meter reads < .099 mW, the printer should print a "1" in the Underrange/Overrange column.

4. As the panel meter passes 1.199 mW, the display should blank, the "OR" lamp should light, and the printer should print a "2" in the Underrange/Overrange column.

f. Turn COARSE ZERO screwdriver adjustment ccw until the panel meter reads .000 mW. Set RANGE as follows, noting decimal point placement, μW and mW lamps, and the range code column on the print-out:

Range	Panel Meter	Range Code
10 μW	0.00 μW	0
100 μW	00.0 μW	1
1 mW	.000 mW	2
10 mW	0.00 mW	3

PERFORMANCE TESTS

66. Data Output and Digital Panel Meter Test (Cont'd)

g. Set RANGE to AUTO; slowly turn COARSE ZERO to full cw. Each time the meter count passes 1199, the power meter should switch to the next higher range.

h. Slowly turn COARSE ZERO to full ccw. Each time the meter count passes 100, the power meter should switch to the next lower range.

67. Data Input Test

SPECIFICATIONS:

Control Lines (Inputs):

Remote Enable: Single bit establishes control of instrument ranging and fine zero controls for remote programming. Remote fine zero may be accomplished in remote or local modes of operation.

Remote Range: Two bit code selects instrument range.

Auto Zero: Contact closure to ground zeros meter.

Inhibit: Single bit holds data and stops A/D converter.

Ext. Trig.: When in inhibit mode, single bit starts new data conversion. Data ready in 10 ms.

DESCRIPTION: The power meter's ability to be remotely controlled is checked using a remote control test set. To assemble the remote control test set, obtain wire, SPST switches, mounting board or box, and connector or (Cinch 57-30500-375). Assemble as shown in Figure 5.

NOTE

If desired, six short wires, with test clips at each end, can be substituted for the test set. Shorting the appropriate pin (of J6) to ground provides a logical 0 input.

EQUIPMENT:

Remote Control Test Set	(See Figure 5)
Thermistor Mount	HP 478A or 8478B

PROCEDURE:

a. Set 432C MOUNT RESISTANCE to resistance shown on thermistor mount.

b. Connect the thermistor mount to the 432C (A2S1 should be set to OPERATE). Connect the test set to J6 on rear panel of 432C.

c. Set test set LOCAL/REMOTE to LOCAL and set AUTO ZERO to 1. Set 432C RANGE to COARSE ZERO and adjust COARSE ZERO screwdriver adjustment so that meter indicates zero.

d. Set 432C RANGE to AUTO and set AUTO ZERO to 0; the panel meter reading should go to zero.

e. Set test set as follows:

REMOTE/LOCAL	REMOTE
REMOTE 2	1
REMOTE 1	1
AUTO ZERO	1
HOLD	1
EXT TRIG.	1

67. Data Input Test (Cont'd)

f. Depress 432C FINE ZERO switch; the panel meter reading should *not* attempt to go to zero. In turn, set 432C RANGE to 100 μW, 1 mW and 10 mW. The meter should *not* indicate that the power meter is changing ranges.

g. Set test set as follows. The panel meter should indicate that the 432C is changing ranges. (Note decimal point placement and μW and mW lamps.)

Remote 2	Remote 1	Panel Meter
0	0	0.00 μW
0	1	00.0 μW
1	0	.000 mW
1	1	0.00 mW

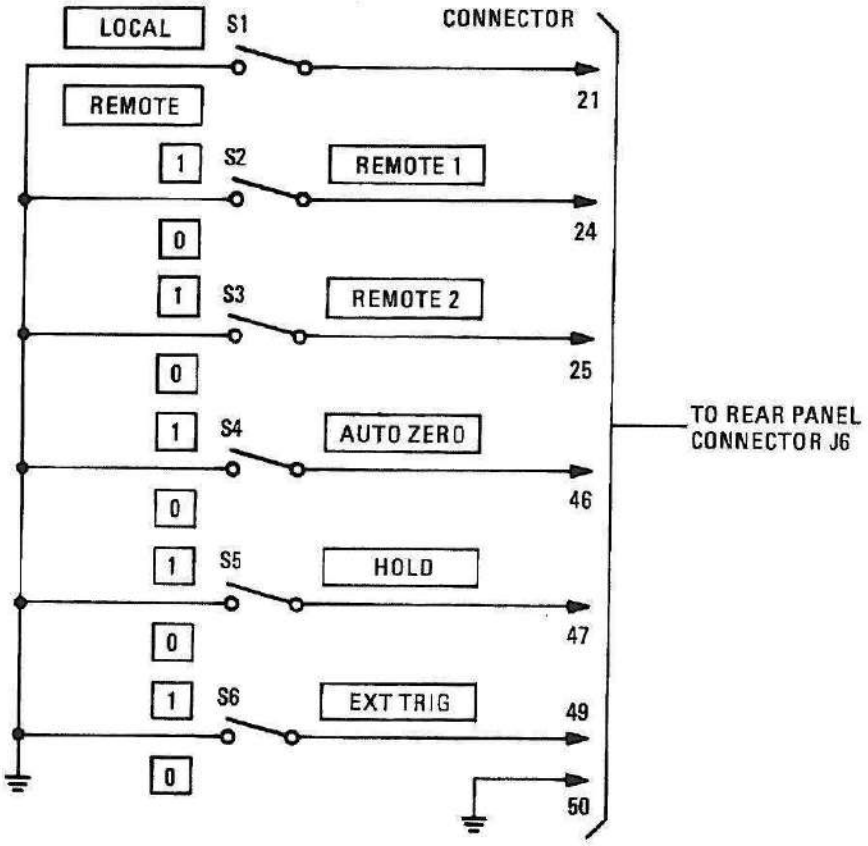


Figure 5. Remote Control Test Set

Table 7. Performance Test Record

Para. No.	Test Description	Measurement Unit	Min.	Actual	Max.
60.	**Meter Accuracy**				
c.	Adjust ZERO knob	μW	−0.01	_____	+0.01
e.	DVM indication	mVdc	990	_____	1010
f.	432C indication	μW	9.90	_____	10.10
g.	Meter Accuracy, Table 4	μW	9.9	_____	10.1
		μW	99.5	_____	100.5
		mW	0.995	_____	1.005
		mW	9.95	_____	10.05
61.	**Meter Linearity**				
c.	432C indication	mW	0.95	_____	1.05
e.	432C indication	mW	1.95	_____	2.05
g.	432C indication	mW	2.95	_____	3.05
62.	**Calibration Factor**				
c.	Set ZERO knob	μW	99.9	_____	100.1
e.	432C indication	μW	98.4	_____	99.4
f.	Calibration Factor, Table 5	μW	99.9	_____	100.1
		μW	98.4	_____	99.4
		μW	97.3	_____	98.3
		μW	96.2	_____	97.2
		μW	95.2	_____	96.2
		μW	94.1	_____	95.1
		μW	93.0	_____	94.0
		μW	92.1	_____	93.1
		μW	91.1	_____	92.1
		μW	90.2	_____	91.2
		μW	89.2	_____	90.2
		μW	88.4	_____	89.4
		μW	87.5	_____	88.5
63.	**Zero Carryover**				
d.	FINE ZERO down	μW	−0.01	_____	+0.01
e.	Zero Carryover, Table 6	μW	−0.5	_____	+0.5
		mW	−0.005	_____	+0.005
		mW	−0.05	_____	+0.05
64.	**Fine Zero Range**				
e.	Set COARSE ZERO	mW	0.299	_____	0.301
f.	FINE ZERO down	mW		_____	0.20
65.	**Noise Test**				
d.	Peak to Peak Noise	mW		_____	5

68. ADJUSTMENTS

The following procedures supplement those documented in the 432A manual. (Disregard paragraph 5-35 in the manual.)

WARNING

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

69. Thermistor Bridge Assembly A1, Zero Adjustment

a. Remove the right side panel (see 432A manual, paragraph 5-27).

b. Connect a mount to the 432C and adjust COARSE ZERO.

c. Switch RANGE to 10 μW, push FINE ZERO down and adjust A1R43 for a zero indication on digital panel meter (adjust A1R43 until the "minus" lights — then back off until it just goes out).

d. Release FINE ZERO and replace the right side panel.

e. Perform the Zero Carryover Test in the Performance Tests section of this supplement. If zero carryover is out of specification, perform the Digital Panel Meter Zero Adjustment, and repeat steps a through d.

70. Digital Panel Meter Zero Adjustment†

a. Remove the Digital Panel Meter and meter cover by following steps a through g of the Digital Panel Meter M1 Removal procedure below.

b. Temporarily reinstall the meter in the chassis, leaving its readout exposed. Use two or more screws to hold the meter in place.

c. Check that connectors P1 and XM1B are not reversed, that the meter is right side up, and that P1 and XM1B are not shorting to the chassis.

d. Short XM1B pins E and H together.

e. Apply line power to the 432C.

WARNING

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

f. Using a non-metallic screwdriver, adjust the meter zeroing potentiometer for a zero indication on the meter. The zero adjustment is the potentiometer nearest the center at the top of the meter face.

g. Remove the short at XM1B and reassemble the 432C.

†Refer to Manual Changes for backdating information.

71. Auto Range Assembly A6 Power Supply Adjustment

a. Remove the top cover (see 432A manual paragraph 5-27).

b. Connect the DC digital voltmeter across A6 test points 2 and 3.

c. Apply line power to the 432C and adjust +5V ADJ A6R13 for 5.00 ±0.01 V.

d. Remove the digital voltmeter and replace the top cover.

72. Digital Panel Meter M1 Removal†

a. Remove all power from the 432C; remove the top and side covers (see 432A manual, paragraph 5-27).

b. Disconnect the connectors from the back of the meter (P1 and XM1B).

c. Remove the four top-front chassis screws that secure the digital panel meter bracket.

d. Slide the digital panel meter up and back, exposing the two screws under the meter that secure the meter cover to the meter bracket; remove the screws.

e. Slide the top guide, securing the meter cover to the meter bracket, to the side and off.

f. Lift the meter cover and the filter and the mask from the front of the meter.

g. The meter can now be removed or adjusted.

h. For reassembly, reverse the above procedures.

CAUTION

Be sure that Digital Panel Meter M1 is not installed upside-down. If power is applied to the 432C while the meter is installed upside-down, the meter will be damaged.

†Refer to Manual Changes for backdating information.

73. REPLACEABLE PARTS S

74. Introduction

75. Table 9 is a list of replaceable parts for the 432C. The Thermistor Bridge Assembly A1, the Meter Logic Assembly A2 and the Calibration Factor Assembly A4 are the same for both the 432A and 432C; refer to the 432A manual parts list for a parts breakdown of those assemblies.

76. Table 9 lists parts in alpha-numerical order of their reference designation and provides the following information on each part:

a. HP part number.
b. Part number check digit (CD).
c. Total quantity of items documented in this supplement.
d. Description (see abbreviations, Table 8).
e. Manufacturer of the part in a five-digit code (see list of manufacturers in Table 10).
f. Manufacturers part number.

77. Ordering Information

78. To order a part listed in the Replaceable Parts Table, quote the Hewlett-Packard part number (with check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

NOTE

Within the USA, it is better to order directly from the HP Parts Center in Mountain View, California. Ask your nearest HP office for information and forms for the "Direct Mail Order System."

79. 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 8. Reference Designations

REFERENCE DESIGNATORS

A	= assembly	F	= fuse	P	= plug	V	= vacuum tube, neon bulb, photocell, etc.
B	= motor	FL	= Filter	Q	= transistor		
BT	= battery	J	= jack	R	= resistor		
C	= capacitor	K	= relay	RT	= thermistor	VR	= voltage regulator
CP	= coupler	L	= inductor	S	= switch		
CR	= diode	LS	= loud speaker	T	= transformer	W	= cable
DL	= delay line	M	= meter	TB	= terminal board	X	= socket
DS	= device signaling (lamp)	MK	= microphone	TP	= test point	Y	= crystal
E	= misc electronic part	MP	= mechanical part	U	= integrated circuit	Z	= tuned cavity, network

ABBREVIATIONS

A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
		HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
AMPL	= amplifier	HG	= mercury			S-B	= slow-blow
		HR	= hour(s)			SCR	= screw
BFO	= beat frequency oscillator	Hz	= Hertz	NPN	= negative-positive-negative	SE	= selenium
		IF	= intermediate freq			SECT	= section(s)
BE CU	= beryllium copper	IMPG	= impregnated	NRFR	= not recommended for field replacement	SEMICON	= semiconductor
BH	= binder head	INCD	= incandescent			SI	= silicon
BP	= bandpass	INCL	= include(s)			SIL	= silver
BRS	= brass	INS	= insulation(ed)	NSR	= not separately replaceable	SL	= slide
BWO	= backward wave oscillator	INT	= internal			SPG	= spring
				OBD	= order by description	SPL	= special
CCW	= counterclockwise	K	= kilo = 1000			SST	= Stainless steel
CER	= ceramic			OH	= oval head	SR	= split ring
CMO	= cabinet mount only			OX	= oxide	STL	= steel
COEF	= coefficient	LH	= left hand				
COM	= common	LIN	= linear taper	P	= peak	TA	= tantalum
COMP	= composition	LK WASH	= lock washer	PC	= printed circuit	TD	= time delay
COMPL	= complete	LOG	= logarithmic taper	PF	= picofarads = 10^{-12} farads	TGL	= toggle
CONN	= connector	LPF	= low pass filter			THD	= thread
CP	= cadmium plate			PH BRZ	= phosphor bronze	TI	= titanium
CRT	= cathode-ray tube	M	= milli = 10^{-3}	PHL	= Phillips	TOL	= tolerance
CW	= clockwise	MEG	= meg = 10^{6}	PIV	= peak inverse voltage	TRIM	= trimmer
		MET FLM	= metal film			TWT	= traveling wave tube
DEPC	= deposited carbon	MET OX	= metallic oxide	PNP	= positive-negative-positive		
DR	= drive	MFR	= manufacturer				
		MHz	= mega Hertz	P/O	= part of	μ	= micro = 10^{-6}
ELECT	= electrolytic	MINAT	= miniature	POLY	= polystrene		
ENCAP	= encapsulated	MOM	= momentary	PORC	= porcelain		
EXT	= external	MOS	= metalized substrate	POS	= position(s)	VAR	= variable
				POT	= potentiometer	VDCW	= dc working volts
F	= farads	MTG	= mounting	PP	= peak-to-peak		
FH	= flat head	MY	= "mylar"	PT	= point	W/	= with
FIL H	= Fillister head			PWV	= peak working voltage	W	= watts
FXD	= fixed	N	= nano (10^{-9})			WIV	= working inverse voltage
G	= giga (10^{9})	N/C	= normally closed	RECT	= rectifier		
GE	= germanium	NE	= neon	RF	= radio frequency	WW	= wirewound
GL	= glass	NI PL	= nickel plate	RH	= round head or right hand	W/O	= without
GRD	= ground(ed)						

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	00432-60024	2	1	THERMISTOR ASSEMBLY	28480	00432-60024
A2	00432-6015	9	1	METER ASSEMBLY	28480	00432-6015
A3				NOT ASSIGNED		
A4	00432-6004	6	1	CALIBRATION FACTOR SWITCH ASSEMBLY	28480	00432-6004
A5†	00432-60111	8	1	BCD BUFFER ASSEMBLY	28480	00432-60111
A5TP1†	1251-0600	0	6	CONNECTOR-SGL CONT PIN ' 14-MM-BSC-SZ SQ	28480	1251-0600
A5U1†	1820-1918	2	2	IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS241N
A5U2†	1820-1918	2		IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS241N
A5XM1A†	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
	1251-1115	4	3	POLARIZING KEY-PC EDGE CONN	28480	1251-1115
A6†	00432-60206	2	1	AUTO RANGE ASSEMBLY	28480	00432-60206
A6C1†	0160-3460	2	2	CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0160-3460
A6C2	0160-3460	2		CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0160-3460
A6C3	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6C4	0180-2100	7	1	CAPACITOR-FXD 1200UF+75-10% 15VDC AL	28480	0180-2100
A6C5	0160-3533	0	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-3533
A6C6	0180-2206	4	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A6C7	0160-2055	9	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A6CR1†	1901-0159	3	2	DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A6CR2†	1901-0159	3		DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A6CR3	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6E1	00432-60202	8	1	JUMPER	28480	00432-60202
A6K1	0490-0916	6	6	RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6K2	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6K3	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6K4	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6K5	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6K6	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6Q1	1854-0022	8	3	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A6Q2	1854-0022	8		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A6Q3	1854-0022	8		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A6Q4†	1854-0810	2	3	TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A6Q5	1853-0020	4	2	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q6	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q7†	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A6Q8†	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A6R1†	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6R2	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6R3	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A6R4	0757-0465	6	8	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R5	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R6	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R7	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R8	0811-2536	2	1	RESISTOR 3.167K .1% .05W PWW TC=0+-10	20940	140-1/40-D-3167R-B
A6R9	0811-2284	7	1	RESISTOR 1K .1% .05W PWW TC=0+-10	20940	140-1/40-E-1001-B
A6R10	0811-2534	0	1	RESISTOR 314.3 .1% .05W PWW TC=0+-10	20940	140-1/40-D-314R3-B
A6R11	0811-2535	1	1	RESISTOR 145 .1% .05W PWW TC=0+-10	20940	140-1/40-D-145R-B
A6R12	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A6R13†	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A6R14	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-21S1-F
A6R15	0811-2815	0	1	RESISTOR 1.5 5% .75W PW TC=0+-50	91637	RS1/2-T2-1R5-J

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6R16	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6R17	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R18	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R19	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R20	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6R21	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A6R22	0698-3160	8		RESISTOR 31.6K 1% 125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A6R23†	0698-3160	8	3	RESISTOR 31.6K 1% 125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A6R24†	0698-3160	8		RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A6R25	0698-7286	7	2	RESISTOR 121K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1213-F
A6R26	0698-7286	7		RESISTOR 121K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1213-F
A6U1†	1826-0177	5	1	IC 723 V RGLTR TO-100	15818	723BE
A6U2	1820-0328	6	1	IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A6U3	1820-0054	5	1	IC GATE TTL NAND QUAD 2-INP	01295	SN7400N
A6U4	1820-0084	1	2	IC GATE TTL AND-OR-INV	01295	SN7453N
A6U5	1820-0535	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A6U6	1820-0382	2	1	IC GATE TTL H AND-OR-INV 4-INP	01295	SN74H55N
A6U7	1820-0174	0	1	IC INV TTL HEX	01295	SN7404N
A6U8	1820-0261	6	1	IC MV TTL MONOSTBL	01295	SN74121N
A6U9	1820-1210	7	1	IC GATE TTL LS AND-OR-INV DUAL 2-INP	01295	SN74LS51N
A6U10†	1820-1208	3	2	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A6U11	1820-0076	1	1	IC FF TTL J-K PULSE PRESET/CLEAR DUAL	01295	SN7476N
A6U12†	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
C1†				NOT ASSIGNED		
C2				NOT ASSIGNED (STANDARD INSTRUMENT)		
C3	0160-2438	2	3	CAPACITOR-STDOFF 5000PF +80 -20% 200V	28480	0160-2438
C4	0160-2438	2		CAPACITOR-STDOFF 5000PF +80 -20% 200V	28480	0160-2438
C5	0160-2438	2		CAPACITOR-STDOFF 5000PF +80 -20% 200V	28480	0160-2438
C6	0160-3451	1	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
DS1	3131-0434	6	1	LENS ASSY-PUSHBUTTON TRANSLUCENT WHITE	28480	3131-0434
DS2	2140-0016	8	2	LAMP-INCAND 683 5VDC 60MA T-1-BULB	00115	683
DS3	2140-0016	8		LAMP-INCAND 683 5VDC 60MA T-1-BULB	00115	683
F1	2110-0201	0	1	FUSE .25A 250V TD 1.25X.25 UL (FOR 115V OPERATION)	28480	2110-0201
F1	2110-0318	0	1	FUSE .125A 250V TD 1.25X.25 UL (FOR 230V OPERATION)	28480	2110-0318
FL1†	9100-3142	0	1	FILTER-LINE CEE-22-TERMS	28480	9100-3142
J1	1251-1280	4	1	CONNECTOR 6-PIN F CIRC AUDIO	28480	1251-1280
	00432-2005	4	1	NUT, CONNECTOR	28480	00432-2005
J2	1250-0118	3	3	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0118
	5040-0702	0	3	INSULATOR:CONNECTOR	28480	5040-0702
	5040-0345	7	3	INSULATOR:CONNECTOR	28480	5040-0345
J3	1250-0118	3		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0118
	5040-0702	0		INSULATOR:CONNECTOR	28480	5040-0702
	5040-0345	7		INSULATOR:CONNECTOR	28480	5040-0345
J4	1250-0118	3		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0118
	5040-0702	0		INSULATOR:CONNECTOR	28480	5040-0702
	5040-0345	7		INSULATOR:CONNECTOR	28480	5040-0345
J5†				NOT ASSIGNED		
J6	1251-0087	7	1	CONNECTOR 50-PIN F MICRO RIBBON	28480	1251-0087
M1†	1120-1593	5		METER,DIGITAL	28480	1120-1593

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP1	0370-0077	6	1	KNOB SHRTD BAR:BLK:FOR .250SHFT:.625D (RANGE)	28480	0370-0077
MP2	0370-0193	7	1	KNOB POINTER: FOR .250:1 ARO:.625D (CAL FACTOR)	28480	0370-0193
MP3	0370-0432	7	1	KNOB LEVER SWITCH .200 X 220 X .375IN (MOUNT RESISTANCE)	28480	0370-0432
MP4	00432-00107	6	1	COVER-TRANSFORMER	28480	00432-00107
	0590-0500	6	4	NUT-CAP 6-32-THD .281-IN-THK .312-A/F	28480	0590-0500
MP5	5020-7633	8	1	METER TRIM:THIRD MODULE	28480	5020-7633
MP6				NOT ASSIGNED		
MP7				NOT ASSIGNED		
MP8†	00432-00119	0	1	DECK, LOWER	28480	00432-00119
MP9†	00432-00104	3	1	BRACKET-BOARD	28480	00432-00104
MP10	00432-00105	4	1	BRACKET-READOUT	28480	00432-00105
MP11†				NOT ASSIGNED		
MP12				NOT ASSIGNED		
MP13†	00432-00108	7	1	MASK-DPM	28480	00432-00108
MP14	00432-20102	3	1	GUIDE-EXTRUSION	28480	00432-20102
MP15†	00432-20104	5	1	FILTER-DPM	28480	00432-20104
MP16	5000-8221	0	1	METER CASE	28480	5000-8221
MP17†	0340-0008	0	1	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0008
MP18†	00432-40101	4	1	SPACER	28480	00432-40101
MP19†				NOT ASSIGNED		
MP20†				NOT ASSIGNED		
MP21†	0520-0136	7	1	SCREW-MACH 2-56 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP22†	0610-0001	6	1	NUT-HEX-DBL-CHAM 2-56-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
MP23†	2190-0005	0	1	WASHER-LK EXT T NO. 4 .116-IN-ID	28480	2190-0005
MP24†	3050-0098	6	1	WASHER-FL MTLC NO. 2 .094-IN-ID	28480	3050-0098
MP25†				NOT ASSIGNED		
MP26†	2360-0120	1	1	SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP27†	2420-0001	5	1	NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
MP28†	00432-00038	2	1	LEFT PC BOARD BRACKET	28480	00432-00038
MP29†	00432-00039	3	1	RIGHT PC BOARD BRACKET	28480	00432-00039
MP30†	0380-0838	8	1	SPACER-RND .188-IN-LG .128-IN-ID	28480	0380-0838

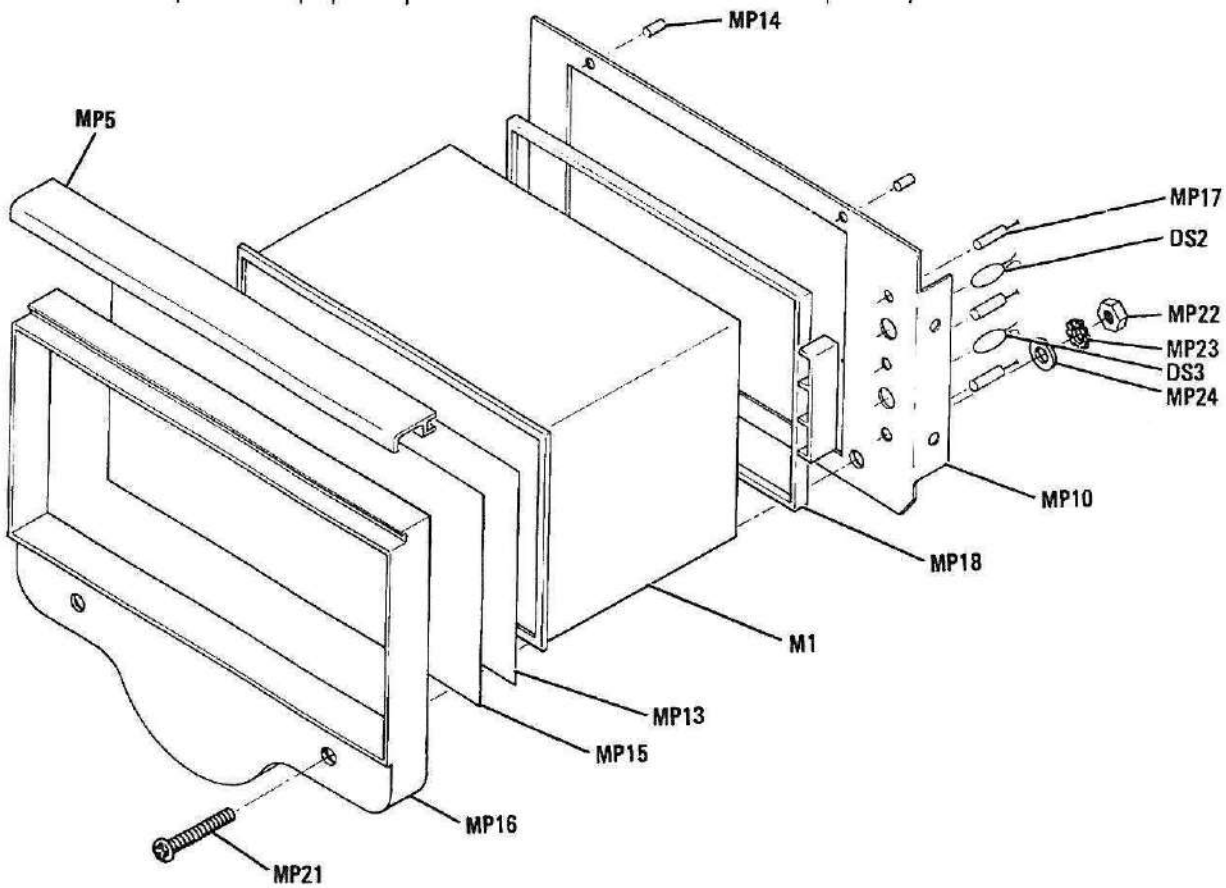


Figure 6. Panel Meter Components, Exploded View

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
P1†	1251-0159	4	2	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-0159
Q1	1854-0072	8	1	TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	3L585	2N3054
R1	2100-2849	5	1	RESISTOR-VAR PREC 5W 10-TRN 50K 3%	28480	2100-2849
	2950-0034	7	1	NUT-HEX-DBL-CHAM 3/8-32-THD .81-IN-THK	00000	ORDER BY DESCRIPTION
	00432-2004	2	1	BUSHING-PANEL	28480	00432-2004
R2	0811-2538	4	4	RESISTOR 100 .1% .2W PWW TC=0+-10	54294	VA10-1/10-D-101-B
R3	0811-2538	4		RESISTOR 100 .1% .2W PWW TC=0+-10	54294	VA10-1/10-D-101-B
R4	0811-2538	4		RESISTOR 100 .1% .2W PWW TC=0+-10	54294	VA10-1/10-D-101-B
R5	0811-2538	4		RESISTOR 100 .1% .2W PWW TC=0+-10	54294	VA10-1/10-D-101-B
R6†	0757-0984	4	2	RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
R7†	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
R8	0757-0198	2	2	RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
R9	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100 (PART OF W3)	24546	C4-1/8-T0-5112-F
R10				NOT ASSIGNED (STANDARD INSTRUMENT)		
R11				NOT ASSIGNED (STANDARD INSTRUMENT)		
R12				NOT ASSIGNED (STANDARD INSTRUMENT)		
R13				NOT ASSIGNED (STANDARD INSTRUMENT)		
R14	0811-2277	8	1	RESISTOR 10K .1% .05W PWW TC=0+-10	20940	140-1/40-E-1002-B
R15	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
R16	0757-0198	2		RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
S1†	3101-2139	9	1	SWITCH-PB DPDT ALTNG 4A 250VAC (PART OF W3)	28480	3101-2139
S2	3101-1234	3	1	SWITCH-SL DPDT STD 1.5A 250VAC SLDR-LUG (PART OF REAR PANEL)	28480	3101-1234
S3	3100-2485	6	1	SWITCH-ROTARY LEVER 1.250 MTG CTR SPCG (MOUNT RESISTANCE)	28480	3100-2485
	00432-00031	5	1	SWITCH PLATE	28480	00432-00031
S4	3101-1357	1	1	SWITCH-TGL SUBMIN SPDT 5A 115VAC (FINE ZERO)	28480	3101-1357
	00432-2003	0	1	NUT-DRESS	28480	00432-2003
S5	3100-3029	6	1	SWITCH-ROTARY 1.250 STRUT CTR SPCG; 6	28480	3100-3029
T1†	9100-4187	5	1	TRANSFORMER-POWER 115/230V 50-60HZ	28480	9100-4187
U1†				NOT ASSIGNED		
W1	8120-1082	4	1	CABLE ASSY 24AWG 4-CNDCT JGK-JKT	28480	8120-1082
W2	8120-1348	5	1	CABLE ASSY 18AWG 3-CNDCT BLK-JKT	28480	8120-1348
W3	00432-60033	3	1	CABLE ASSEMBLY-POWER SWITCH (INCLUDES S1 AND R9)	28480	00432-60033
W4	00432-60102	7	1	CABLE ASSEMBLY-BCD	28480	00432-60102
XA1	1251-0172	1	2	CONNECTOR-PC EDGE 22-CONT/ROW 1-ROW (PART OF LOWER DECK)	28480	1251-0172
XA2	1251-0172	1		CONNECTOR-PC EDGE 22-CONT/ROW 1-ROW (PART OF LOWER DECK)	28480	1251-0172
XA6	1251-0233	5	1	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS (BODY)	28480	1251-0233
XF1†	2110-0546	6	1	FUSE 5A 125V .281X.093	75915	275005
	2110-0565	9	1	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
	2110-0569	3	1	FUSEHOLDER COMPONENT NUT; THREAD M12.7	28480	2110-0569
XM1A2†				NOT ASSIGNED		
XM1A3†				NOT ASSIGNED		
XM1B†	1251-0159	4		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-0159
	1251-1115	4		POLARIZING KEY-PC EDGE CONN	28480	1251-1115
XQ1	0340-0162	7	1	INSULATOR-XSTR ALUMINUM	28480	0340-0162
	1200-0168	8	1	SOCKET-XSTR 2-CONT TO-66 SLDR-EYE	28480	1200-0168
Z2	9170-0016	8	5	CORE-SHIELDING BEAD	28480	9170-0016
Z3	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
Z4	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
Z5	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016
Z6	9170-0016	8		CORE-SHIELDING BEAD	28480	9170-0016

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CABINET PARTS		
1	5060-0703	3	2	FRAME ASSY:6 X 11 SM	28480	5060-0703
2	1490-0031	7	1	TILT STAND 2.236-IN-W 4.498-IN-OA-LG SST	28480	1490-0031
3	5040-0700	8	2	HINGE	28480	5040-0700
4	5060-0727	1	2	FOOT ASSY	28480	5060-0727
5				NOT ASSIGNED		
6	5000-8565	5	2	COVER-SIDE	28480	5000-8565
7	5060-8555	9	1	COVER ASSEMBLY-TOP 5 X 11	28480	5060-8555
8	5000-8571	3	1	COVER-BOTTOM 5 X 11	28480	5000-8571
9†	00432-00117	8	1	PANEL-REAR	28480	00432-00117
10†	00432-00121	4	1	PANEL-FRONT	28480	00432-00121
11	00432-0011	5	1	BRACKET-FRAME	28480	00432-0011

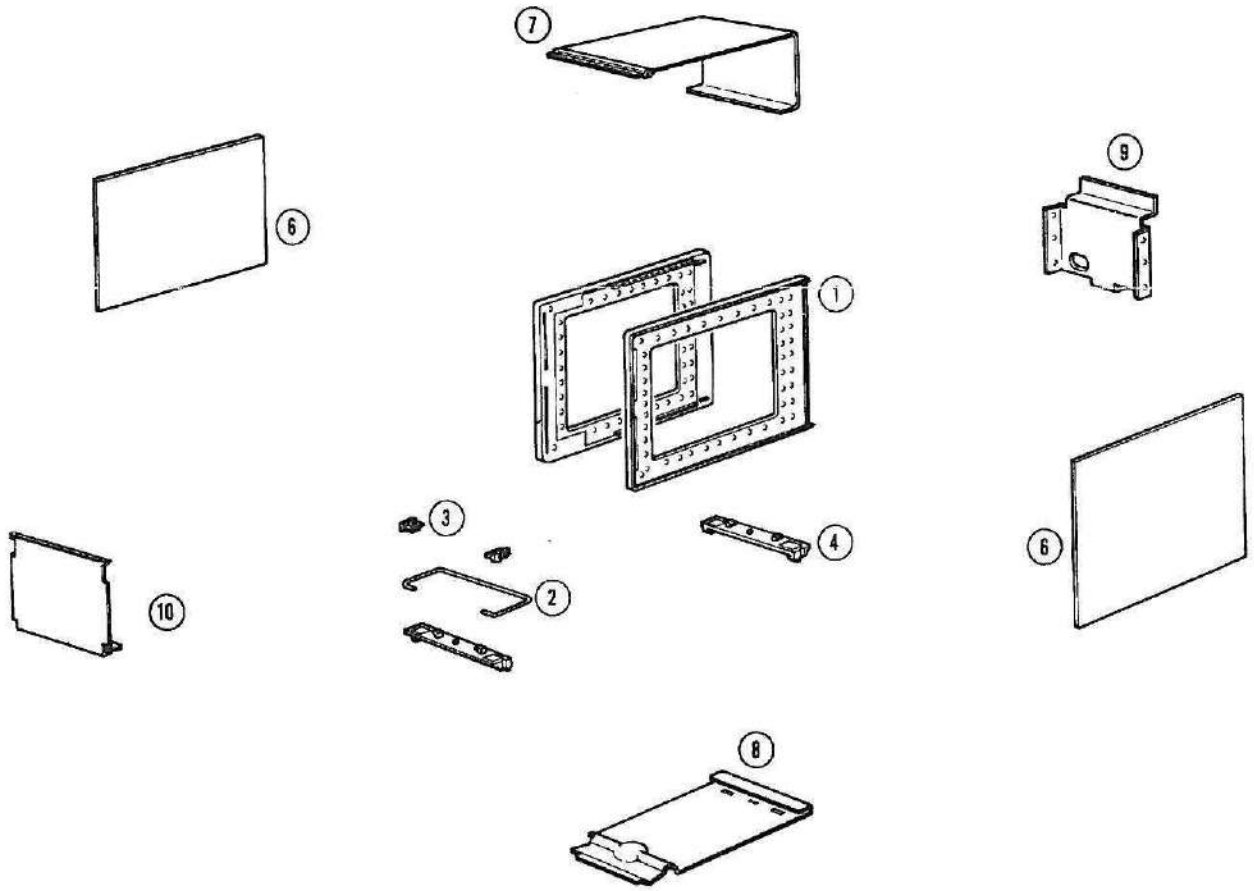


Figure 7. Cabinet Parts, Exploded View

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information

Table 10. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address		Zip Code
00000	ANY SATISFACTORY SUPPLIER			
00115	ACE GLASS INC	VINELAND	NJ	08360
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
02111	SPECTROL ELECTRONICS CORP	CITY OF IND	CA	91745
03508	GE CO SEMICONDUCTOR PROD DEPT	AUBURN	NY	13201
03888	K D I PYROFILM CORP	WHIPPANY	NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85008
06665	PRECISION MONOLITHICS INC	SANTA CLARA	CA	95050
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	94042
13606	SPRAGUE ELECT CO SEMICONDUCTOR DIV	CONCORD	NH	03301
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW	CA	94043
20940	MICRO-OHM CORP	EL MONTE	CA	91731
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
30983	MEPCO/ELECTRA CORP	SAN DIEGO	CA	92121
54294	SHALLCROSS INC	SELMA	NC	27576
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247
72136	ELECTRO MOTIVE CORP	FLORENCE	SC	06226
75915	LITTELFUSE INC	DES PLAINES	IL	60016
91637	DALE ELECTRONICS INC	COLUMBUS	NE	68601

80. MANUAL CHANGES

81. This section contains manual change instructions for backdating this supplement for HP Model 432C Digital Power Meters that have serial number prefixes lower than 2128A. To adapt this supplement to your instrument, refer to Table 11 and make all of the manual changes listed opposite your instrument's serial number or prefix. The supplement changes are listed in serial number sequence and should be made in the sequence listed. For example, Change A should be made after Change B; Change B should be made after Change C, etc.

82. If your instrument's serial number or prefix is not listed on the title page of this supplement or in Table 11, it may be documented in a yellow Manual Changes supplement. The supplement to this Manual Supplement is keyed to this manual's print date and part number, both of which appear on the title page. Complementary copies of the supplement are available from Hewlett-Packard.

83. For information concerning a serial number prefix not listed on the title page of this supplement or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

Table 11. Manual Changes By Serial Number

Serial or I.D. Number	Change
1129A	N, M, L, K, J, I, H, G, F, E, D, C, B, A
1213A00140-230	N, M, L, K, J, I, H, G, F, E, D, C, B
1213A00231-250	N, M, L, K, J, I, H, G, F, E, D, C
1249A	N, M, L, K, J, I, H, G, F, E, D
1512A	N, M, L, K, J, I, H, G, F, E
1714A	N, M, L, K, J, I, H, G, F
1737A	N, M, L, K, J, I, H, G
1832A	N, M, L, K, J, I, H
1835A	N, M, L, K, J, I
1845A	
1906A	N, M, L, K, J
1937A	N, M, L, K
2020A	N, M, L
2035A00906-955	M
2035A00956-965	N

CHANGE A

Table 9:
Delete C6, 0160-3451, CAPACITOR, FIXED CER 0.01MF +80 −20% 100 VDCW

Service Sheet 4 (schematic):
Replace with attached schematic, Figure 8.

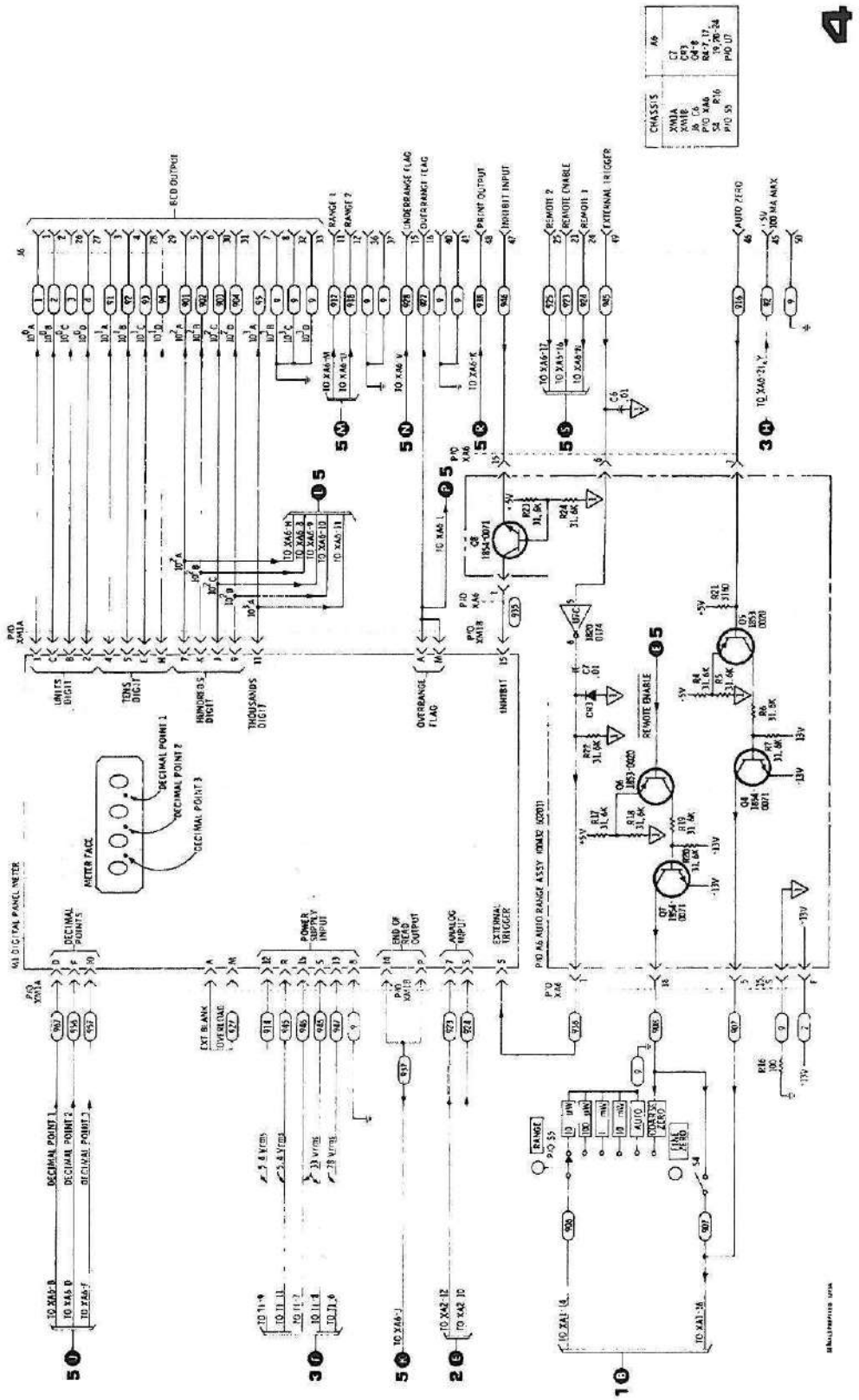


Figure 8. Digital Panel Meter M1 and Connector J6 Interconnections Backdating (Change A)

CHANGE B

Service Sheet 5 (schematic):
Replace with attached schematic, Figure 9.

CHANGE C

Service Sheet 2 (schematic):
Change A2R21 & A2R28 to 14.7K ohm.
Change A2R89 to A2CR16.
Change the value of A2R41 and A2R46 to 1 KΩ.

432A Manual (0432-90009), Table 6-1:
Change A2R21 and A2R28 to 0698-3156, RESISTOR, FIXED, METAL FILM, 14.7K OHM, 1%, 0.125W, 28480, 0698-3156.
Delete A2R89.
Add A2CR16, 1901-0026, DIODE, SILICON, 0.75A, 200 PIV. 04713, SR1358-8.
Change A2R41 and A2R46 to 0757-0465, RESISTOR, FIXED METAL FILM 100K OHM 1% 0.125W 28480 0757-0465.

CHANGE D

Table 9:
Delete A6R25 and A6R26.
Change: A6R4, R5, R6, R7, R17, R18, R19, and R20 to 0698-3160, RESISTOR, FIXED, METAL FILM, 31.6K OHMS, 1%, 1/8W, 28480, 0698-3160.

Service Sheet 4 (schematic):
Delete A6R25 and A6R16, 121K ohm.
Change A6R4, R5, R6, R7, R17, R18, R19, and R20 to 31.6K ohm.

CHANGE E

Table 9:
Change the first M1 to 1120-0594 METER, DIGITAL. However, this meter is not repairable and is no longer available. The replacement is Digital Meter Kit 00432-60113.

CHANGE F

Service Sheet 2 (schematic):
Delete R90 and R91.
Change the value of R56 to 464K.

CHANGE G

Table 9:
Replace the XF1 listing with the following:
XF1 2110-0470 FUSEHOLDER-EXTR POST 15A 250V
2100-0465 FUSEHOLDER-EXTR POST UL/IEC .25 x 1.25 FUSE
2100-0467 NUT, HEX

CHANGE H

Table 9:
Delete A5 00432-60111 BD ASSY-BCD BUFFER.
Change P1 to XM1A.
Service Sheet 4 (schematic):
Replace with the attached schematic, Figure 10.

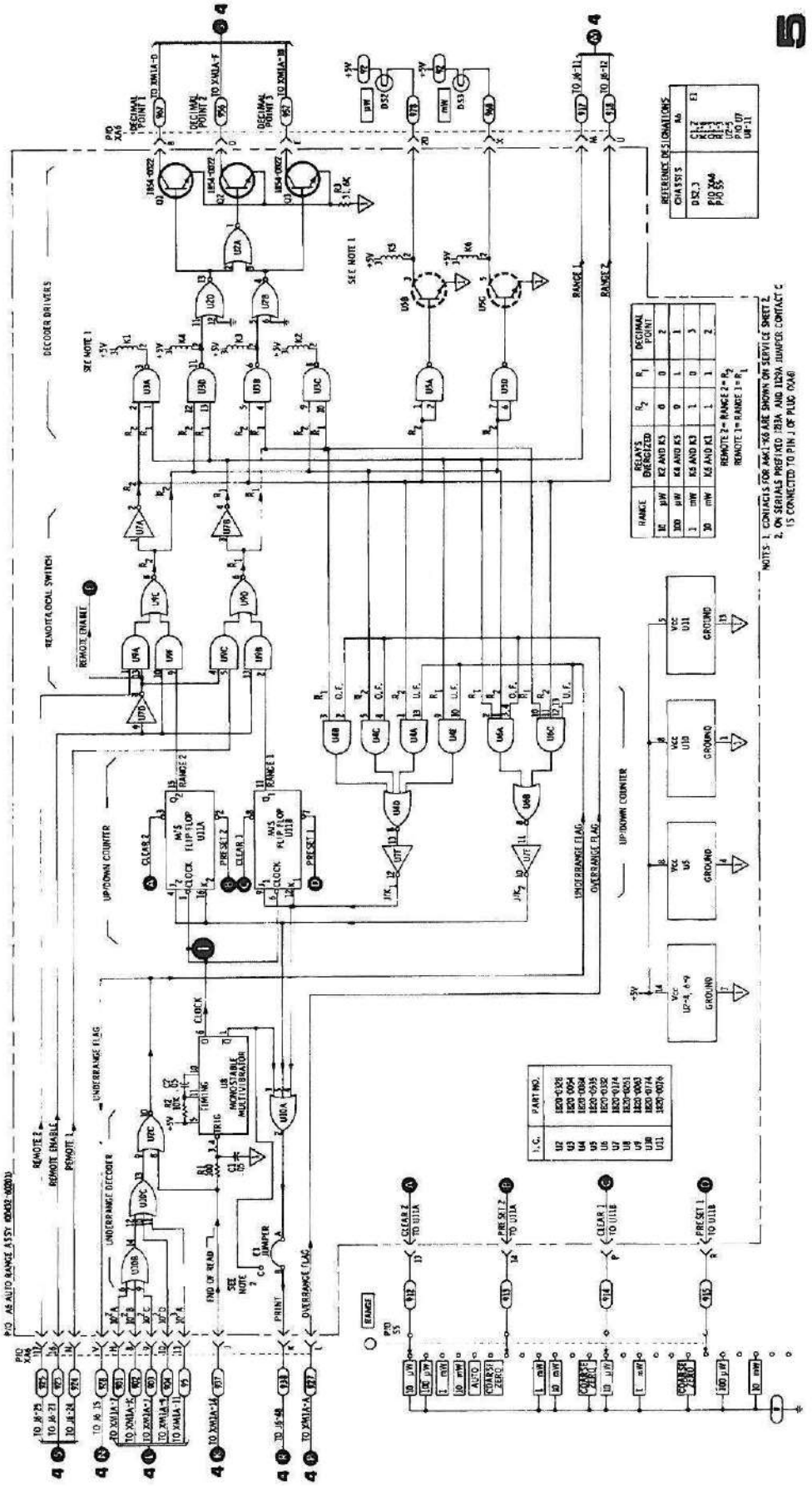


Figure 9. Auto Range Circuits Backdating (Change B)

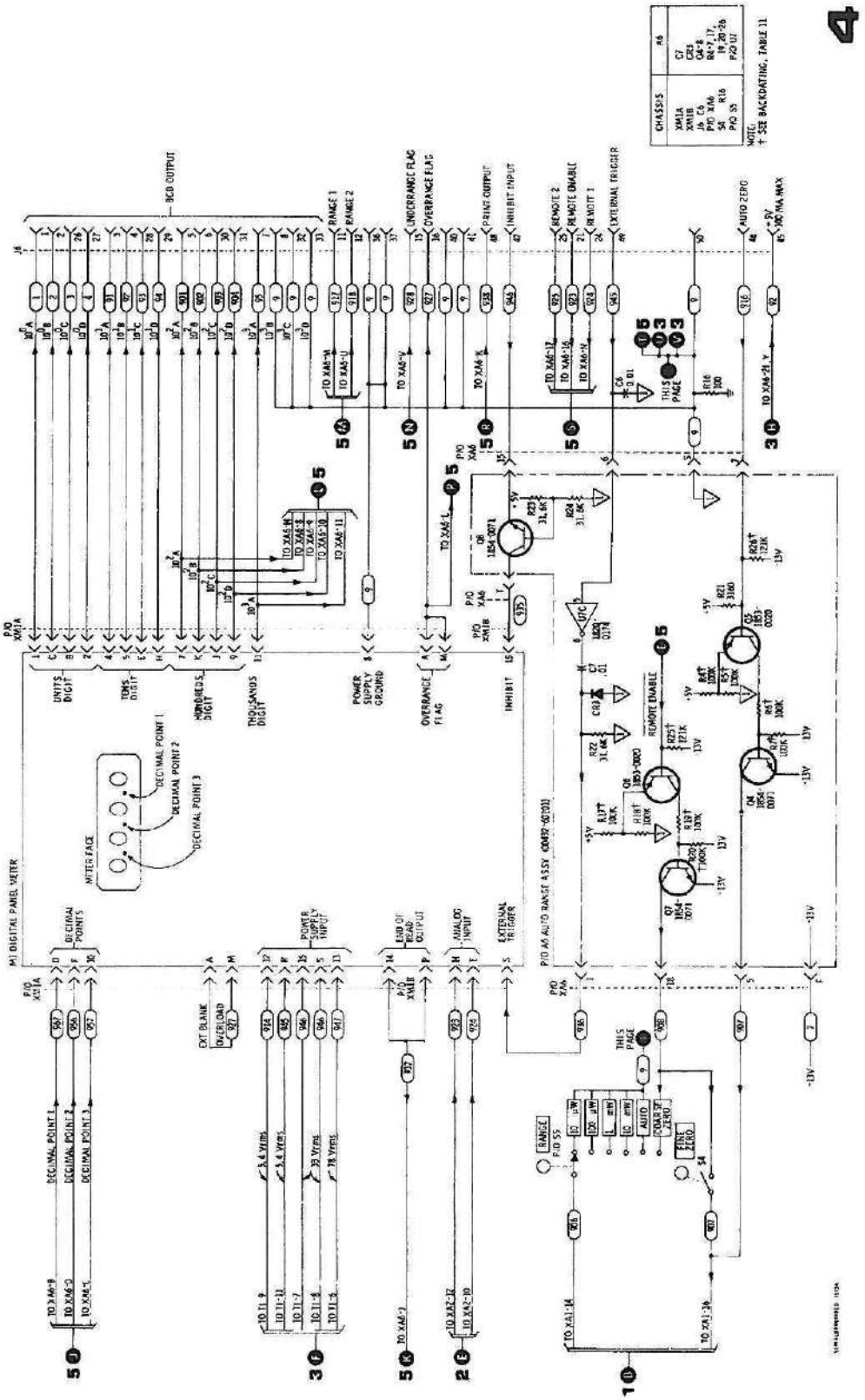


Figure 10. Digital Panel Meter M1 and Connector J6 Interconnections Backdating (P/O Change H)

CHANGE I

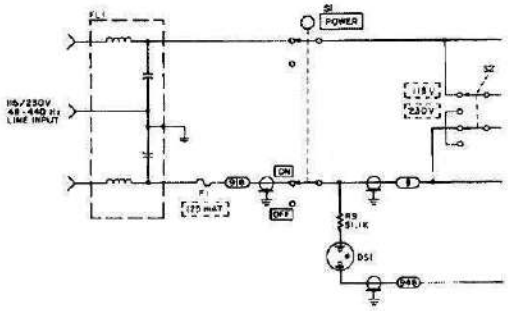
Table 9:

Add: C1 0160-3043 CAPACITOR-FXD 500 PF/5000 P5 ±20%.
J5 1251-2357 CONNECTOR, AC POWER HP-9 MALE FLANGE (PART OF REAR PANEL).
R6 0757-0984 RESISTOR 10 1% .5W F TC=±100.
R7 0757-0984 RESISTOR 10 1% .5W F TC=±100.

Delete FL1.
Change MP8 to 00432-00112 DECK-LOWER.
Change S1 to 3101-1248 SWITCH-PB SPDT DB ALTNG 10.5A 250 VAC.
Change item 9 (cabinet part) to 00432-00109.
Change item 10 (cabinet part) to 00432-00201.

Service Sheet 3 (schematic):

Replace the power line input portion of the power supply with the following partial schematic.



P/O Service Sheet 3 (Part of Change I)

CHANGE J

All references to the "Hold" line should be changed to "Inhibit".

Add the following Adjustment Procedures:

Thermistor Bridge Assembly A1, Zero Adjustment

a. Remove the right side panel (see 432A manual, paragraph 5-27).

b. Connect a mount to the 432C and adjust COARSE ZERO.

c. Switch RANGE to 10 μW, push FINE ZERO down and adjust A1R43 for a zero indication on digital panel meter (adjust A1R43 until the "minus" lights — then back off until it just goes out).

d. Release FINE ZERO and replace the right side panel.

e. Perform the Zero Carryover Test in the Performance Tests section of this supplement. If zero carryover is out of specification, perform the Digital Panel Meter Zero Adjustment, and repeat steps a through d.

Digital Panel Meter M1 Removal

a. Remove all power from the 432C; remove the top and side covers (see 432A manual, paragraph 5-27).

b. Disconnect the connectors from the back of the meter (P1 and XM1B).

c. Remove the four top-front chassis screws that secure the digital panel meter bracket.

CHANGE J (Cont'd)

d. Slide the digital panel meter up and back, exposing the two screws under the meter that secure the meter cover to the meter bracket; remove the screws.

e. Slide the top guide, securing the meter cover to the meter bracket, to the side and off.

f. Lift the meter cover and the filter and the mask from the front of the meter.

g. The meter can now be removed or adjusted.

h. For reassembly, reverse the above procedures.

CAUTION

Be sure that Digital Panel Meter M1 is not installed upside-down. If power is applied to the 432C while the meter is installed upside-down, the meter will be damaged.

Digital Panel Meter Zero Adjustment

a. Remove the Digital Panel Meter and meter cover by following steps a through g of the Digital Panel Meter M1 Removal procedure above.

b. Temporarily reinstall the meter in the chassis, leaving its readout exposed. Use two or more screws to hold the meter in place.

c. Check that connectors P1 and XM1B are not reversed, that the meter is right side up, and that P1 and XM1B are not shorting to the chassis.

d. Short XM1B pins E and H together.

e. Apply line power to the 432C.

WARNING

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

f. Using a non-metallic screwdriver, adjust the meter zeroing potentiometer for a zero indication on the meter. The zero adjustment is one of two potentiometer adjustments located on the face of each meter behind the nixie tubes. The exact location of these pots varies with different HP part numbers and may be found as indicated below (the HP part number appears on the top surface of each meter):

HP 1120-1526 (new) or HP 1120-1542 (exchange): adjust top potentiometer at upper right corner of meter face.

HP 1120-0594 (new) or HP 1120-0595 (exchange) and HP 1120-0621 (new) or HP 1120-0622 (exchange): adjust the potentiometer nearest the center at top of meter face.

Self-contained meters are not field repairable and are no longer available. The replacement is Digital Panel Meter Kit 00432-60113.

g. Remove the short at XM1B and reassemble the 432C.

Table 9:
Add A5 00432-60111 BD ASSY-BCD BUFFER.
Delete A6C1.
Change A6R3 to 0757-0442 RESISTOR 10K 1% .125W.

CHANGE J (Cont'd)

Table 9 (Cont'd):
Add DS2,3 2140-0016 LAMP-INCAD T-1 BULB 5V.
Change M1 to 1120-0621 METER DIGITAL. However, this meter is not repairable and no longer available. The replacement is Digital Meter Kit 00432-60017.
Delete M1A1, M1A2, and M1A3.
Add MP9 00432-00104 BRACKET, BOARD.
Change MP13 to 00432-00108 MASK DPM.
Change MP15 to 00432-20104 FILTER, DPM.
Add MP17 0340-0008 TERMINAL-STUD DBL-TUR PRESS-MTG.
Add MP18 SPACER.
Delete MP19—25.
Add P1 1251-0159 CONNECTOR-PC EDGE 15-CONT/ROW 2 ROWS.
Change T1 to 9100-3155 TRANSFORMER: POWER
Delete U1.
Delete XM1A2 and XM1A3.
Add XM1B 1251-0159 CONNECTOR-PC EDGE
Replace the Panel Meter Components, Exploded View figure with Figure 11.

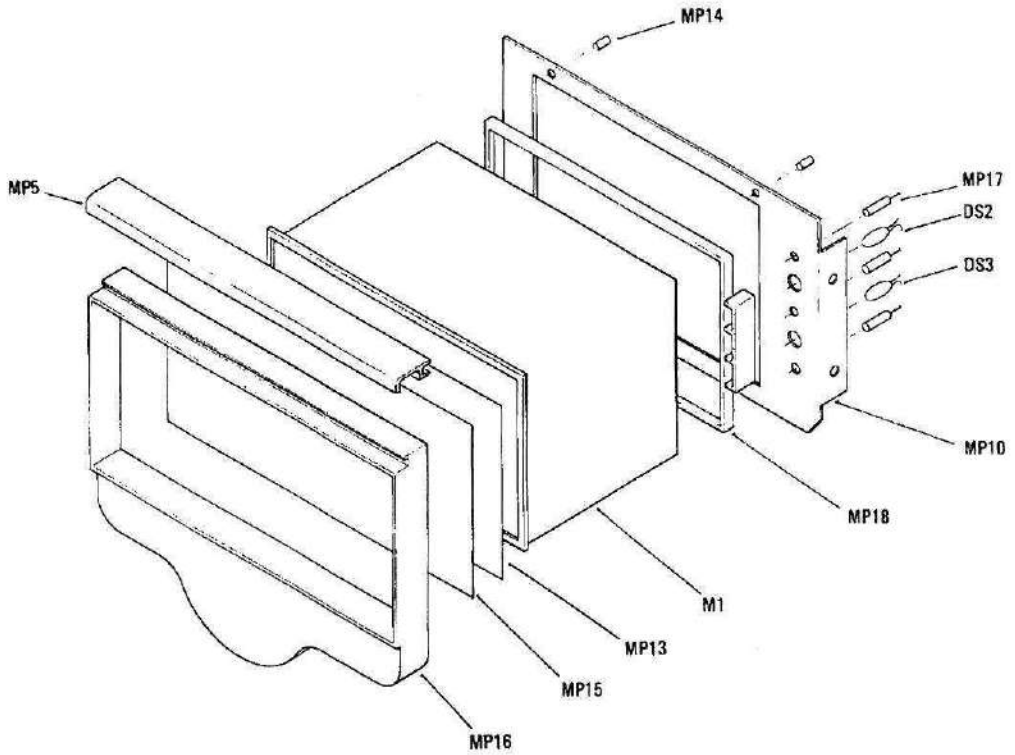


Figure 11. Panel Meter Components, Exploded View, Backdating (P/O Change J)

Add the following paragraphs regarding troubleshooting for self-contained Digital Panel Meters:

Digital Panel Meter M1. If the panel meter will not zero, or if zero carryover is out of specification, the trouble can be isolated as follows:

a. Remove Meter Logic Assembly A2.

b. Short together XA2 pins 10 and 12 (or XM1B pins E and H).

c. The panel meter should read zero ± one digit.

CHANGE J (Cont'd)

d. If the meter is out of specification, perform the Digital Panel Meter Zero Adjustment procedure in Change J of the Backdating section.

e. If the meter is found to be defective, do not attempt to open the meter's case or otherwise repair it. To do so would void the meter's warranty.

Replace the Assembly and Component Locations photographs with Figure 12.

Service Sheet 4 (schematic):
Replace with the attached schematic, Figure 13.

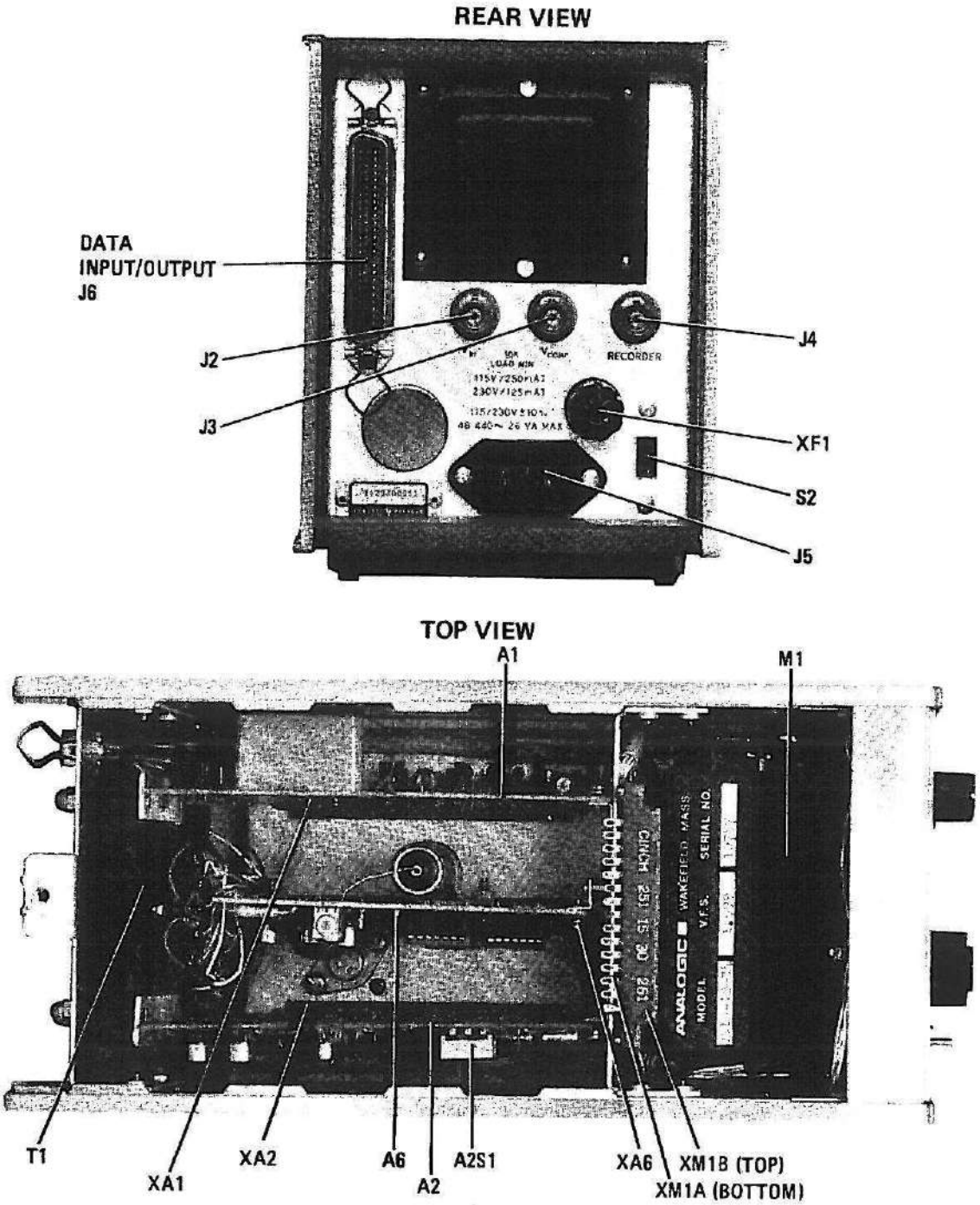


Figure 12. Assembly and Component Locations, Backdating (P/O Change J)

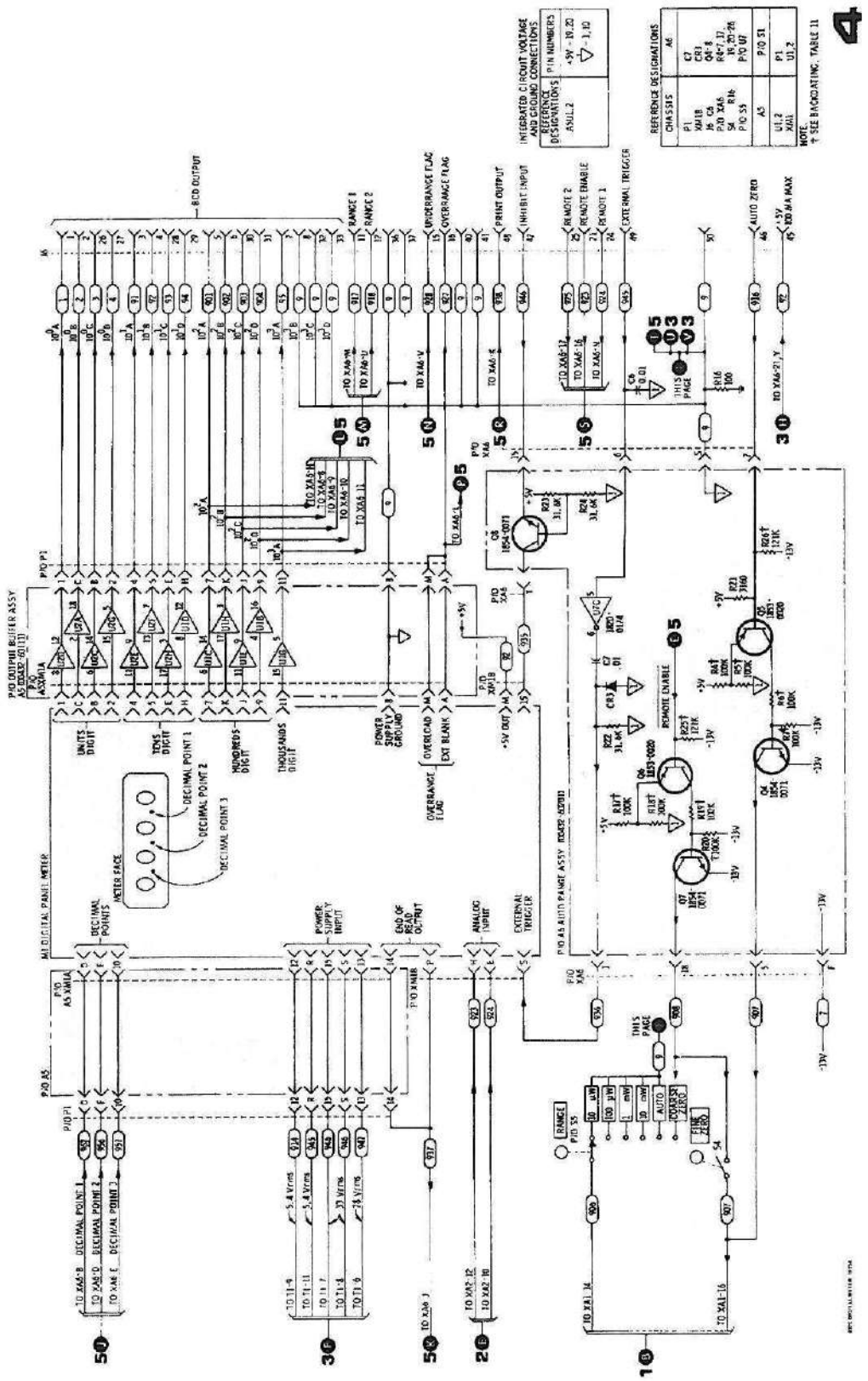


Figure 13. Digital Panel Meter M1 and Connector J6 Interconnections Backdating (P/O Change J)

CHANGE K

Table 1:

Under BCD Output, change the last sentence to " 'Print' and 'Hold' lines available."

Under Control Lines, change the Print specification to "Single bit indicates data is ready."

Under Control Line Inputs:

1. Add "Hold: Single bit holds data in output register."
2. Change Ext. Trig specification to "When in hold mode, single bit allows next conversion to enter output register."

Figure 1:

Change J6 pin 47 to "Hold Input."

Operating Information:

Add the following paragraph (after the paragraph titled "Auto Zero Input"):

Hold Input. A logical 0 on pin 47 holds data in the output register. A logical 1 allows data to enter the output register after completion of the next A/D conversion.

Change the paragraph titled "External Trigger Input" to read as follows:

External Trigger Input. With a logical 0 on the Hold input, a transition from logical 1 to logical 0 on the External Trigger input allows data to enter the output register after completion of the next A/D conversion.

Principles of Operation:

Under "Digital Panel Meter Assembly M1 (See Service Sheet 4)," replace the sixth, seventh, and eighth paragraphs with the following:

An A/D conversion is completed in approximately 250 ms. An End of Conversion (EOC) pulse is generated at the completion of each conversion and applied to M1A2U7D and M1A2U1 pin 9. The EOC output of the A/D Converter (pin 14) is gated with the output of M1A2U4B at NAND gate M1 A2U7D. In local and remote operation, the External Trigger and Hold inputs to the Power Meter are both high. Therefore, the Set input to M1A2U4B (pin 7) is high and the pin 1 output is also high. When a high EOC pulse is combined with the high output of pin 1, the output of NAND gate M1A2-U7D is pulsed low for the time the EOC pulse is high. This pulse is inverted by M1A2U7C and applied to CMOS-TTL Buffer M1A2U10. The output of the buffer is a TTL positive pulse that clocks the new power level reading into Output Registers M1A3U8 and U9. The high output of Inverter M1A2U7C is also connected to the Reset of the J/K Flip Flop but has no effect since the Set input remains high, until set low by an external input to pin 47 of J6. When the EOC pulse to the NAND gate goes low, the output of the NAND gate goes high. This output is inverted to low by Inverter M1A2U7C until the next A/D conversion is completed. Therefore, each time the A/D Converter generates an EOC pulse, the power measurement data is clocked into the Output Registers on the low-to-high transition of the pulse.

The A/D Converter continues to make analog to digital conversions every 250 ms, and to update the display when the Hold input (J6 pin 47) is low. However, when the Hold input is low the power measurement data displayed at the end of each conversion is not clocked into the Output Registers. The data information available at connector J6 is the data clocked into the Output Registers on the first conversion after the Hold input was set low.

A low Hold input pulls the Set input to M1-A2U4B low. When both the Set and Reset inputs are low the output on pin 1 remains high. When a high EOC pulse is gated with pin 1, the output of NAND gate M1A2U7D is low. M1A2U7C inverts the low level to a high level. The Reset input to the J/K Flip Flop is then high. With the Set input low, the output on pin 1 is switched low. Also, the Reset input is switched back to low. With both the Set and Reset inputs low, the output on pin 1 remains low until the input to the NAND gate changes from a low level to a high level. This transition is accomplished when a high-to-low pulse is applied to the External Trigger (J6 pin 49). The External Trigger pulse pulls the input to Inverter M1A2U7B low; the output of the inverter then goes high. This low-to-high transition gates J/K Flip Flop pin 1 high, enabling the NAND gate on

MANUAL CHANGES

CHANGE K (Cont'd)

the next EOC pulse from the A/D Converter. At this time, the NAND gate output goes low and is inverted by M1A2U7C. The high output of Inverter M1A2U7C resets the output of the J/K Flip Flop until the next pulse on the External Trigger. Data is clocked into the Output Registers on the low-to-high transition of the pulse. The truth table for M1A2U4B is shown below.

J	K	S	R	Clock(G)	Pin 1
x	x	1	0	x	1
x	x	0	1	x	0
1	x	0	0	↑	1
x	0	0	0	↑	1
x	x	1	1	x	1

Under "Digital Panel Meter Assembly M1 (See Service Sheet 4)," in the last sentence of the ninth paragraph, change A6U12A to A6U10A.

Under "Auto Range Assembly A6, Up/Down Counter Inputs,"

1. Change the fourth and fifth sentences in the second paragraph to read "The complement of the Clock pulse is used to gate A6U10A. OR gate U10A . . ."
2. Change step b in the second paragraph to "U10A gets a low clock pulse from U8."
3. Change the fourth paragraph to read as follows:
   The underrange decoder generates an Underrange Flag whenever the Digital Panel Meter reads 0099 or lower. When the hundreds bits and thousands bit are logical 0, pin 9 of NOR gate U6U2C is low. When the End of Conversion bit (negative-going transition) arrives at U2C pin 8, a positive (logical 1) Underrange Flag is generated.

Performance Tests:

Under "Data Output and Digital Panel Meter Test," change the Print specification to "Single bit indicates data is ready."

Under "Data Input Test,"

1. Add "Hold: Single bit holds data in output register."
2. Change Ext. Trig specification to "When in hold mode, single bit allows next conversion to enter output register."

Table 9:

Change A6 to 00432-60201 CD7 AUTO RANGE ASSEMBLY.
Delete A6L1.
Add A6Q8. A6Q8 was originally 1854-0071. However, the new part listed in Table 9 is the recommended replacement. Therefore, no manual change is recommended.
Add A6R1 0757-0401 CD0 RESISTOR 100 1% .125W F TC=0+/-100 24546 C4-1/8-TO-101-F.
Add A6R23 and A6R24 0698-3160 CD8 RESISTOR 31.6K 1% .125W F TC=0+/-100 24546 C4-1/8-TO-3162-F.
Change A6U10 to 1820-0774 CD6 IC GATE TTL OR TPL 3-INP 18324 SP374N.
Delete A6U12.

Service Sheet 4 (schematic):
Replace the appropriate portion of the schematic with the following partial schematic.

Service Sheet 5 (component locations):
Replace Figure 31 with the attached figure.

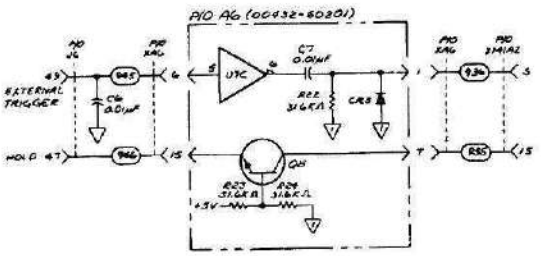


Figure 14. P/O Digital Panel Meter Schematic (P/O Change K)

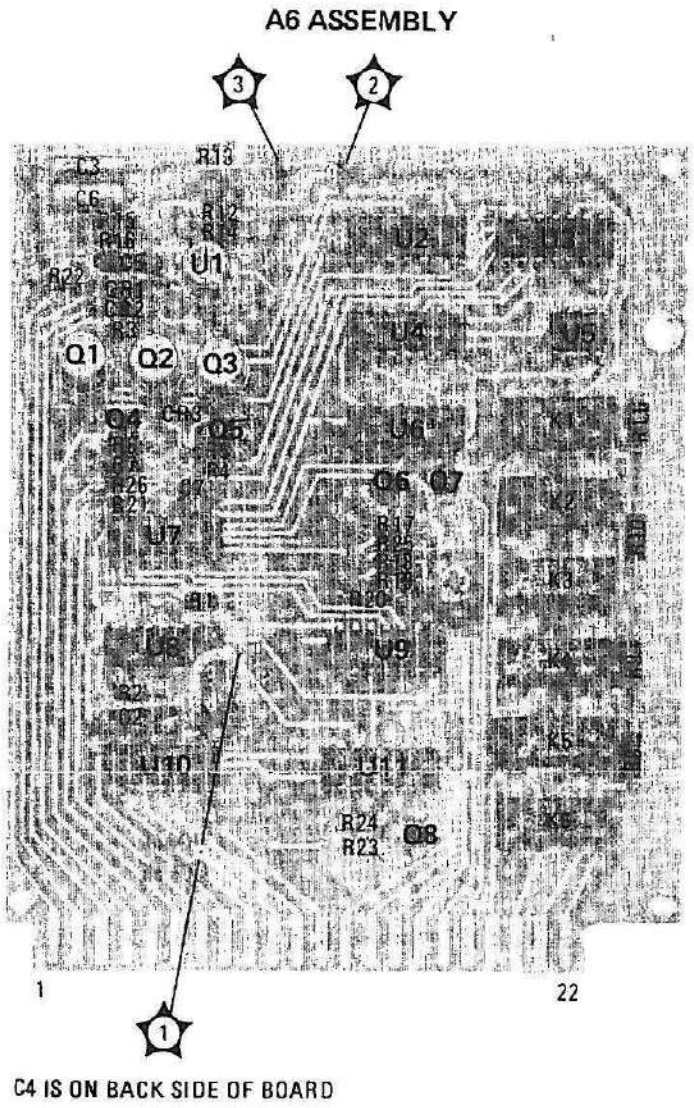


Figure 15. Auto Range Assembly A6 Component Locations (P/O Change K)

MANUAL CHANGES

CHANGE K (Cont'd)

Service Sheet 5 (schematic):
Replace the underrange decoder circuit with the following partial schematic.

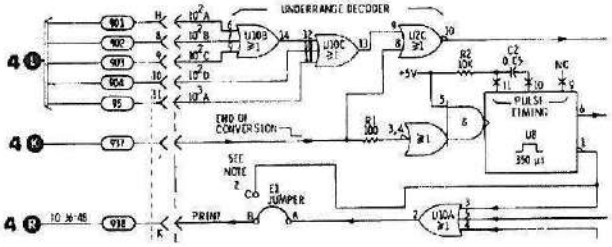


Figure 16. P/O Auto Range Circuits (P/O Change K)

CHANGE L

Table 1:
Under Control Lines, change the Print specification to "A single bit indicates either data is ready or external trigger received. (Note: With jumper A6E1 in the A-B position, a single bit indicates that the range is valid and either data is ready or an external trigger received. With jumper A6E1 in the B-C position, a single bit indicates new data is ready or external trigger received — may be over- or under-range.)"

Performance Tests:
Under "Data Output and Digital Panel Meter Test," change the Print specification to "A single bit indicates either data is ready or external trigger received. (Note: With jumper A6E1 in the A-B position, a single bit indicates that the range is valid and either data is ready or an external trigger received. With jumper A6E1 in the B-C position, a single bit indicates new data is ready or external trigger received — may be over- or under-range.)"

Table 9:
Change A6 to 00432-60204 CD0 AUTO RANGE ASSEMBLY.
Delete A6C8.
Change A6CR1 and A6CR2 to 1901-0159 CD3 DIODE-PWR RECT 400V 750MA D0-41.
Add A6L1 9140-0118 CD8 INDUCTOR RF-CH MLD 500uH 5% .2DX.45LG.
Delete A6Q8.
Change A6R13 to 2100-2574 CD3 RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN 30983 ET50X501.
Delete A6R27, A6R28, and A6R29.

Service Sheet 5 (component locations):
Replace Figure 31 with the attached figure.

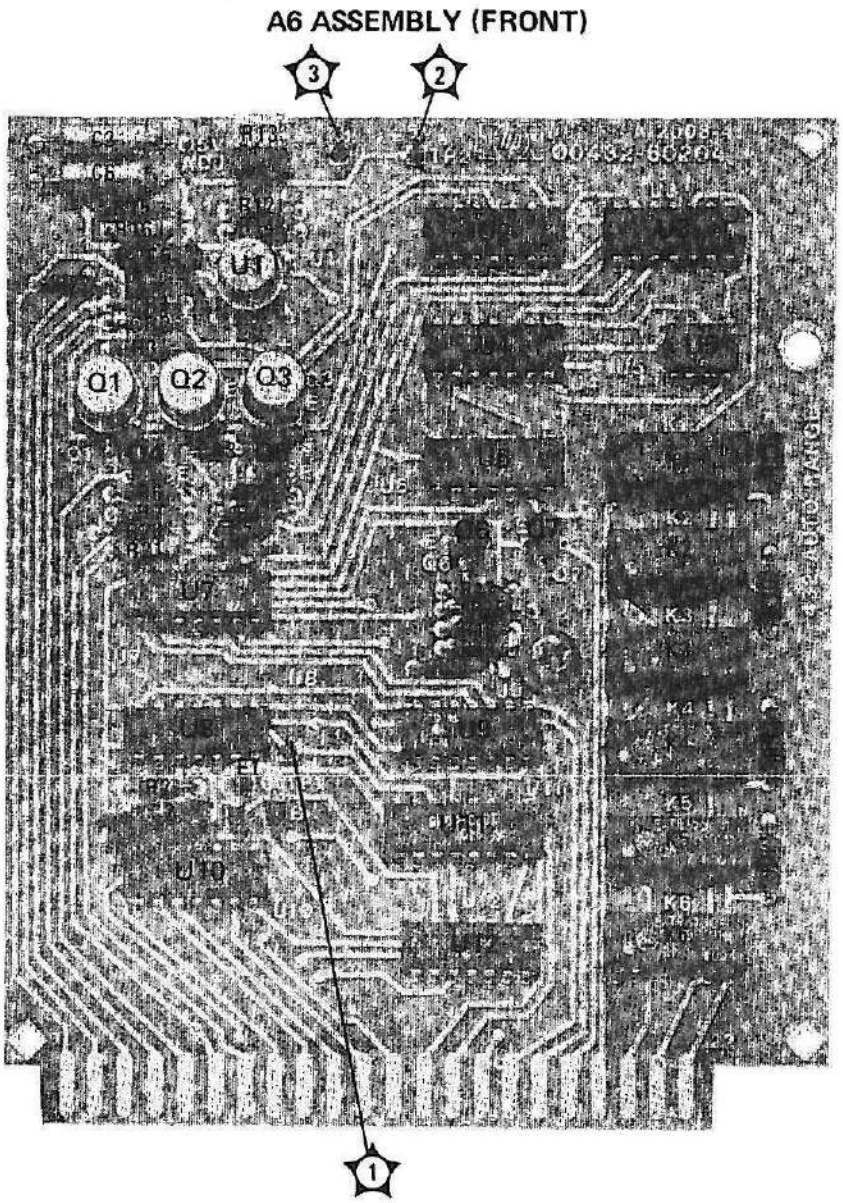


Figure 17. Auto Range Assembly A6 Component Locations (P/O Change L)

CHANGE L (Cont'd)

Service Sheet 5 (schematic):
Replace the underrange decoder circuit with the attached partial schematic.

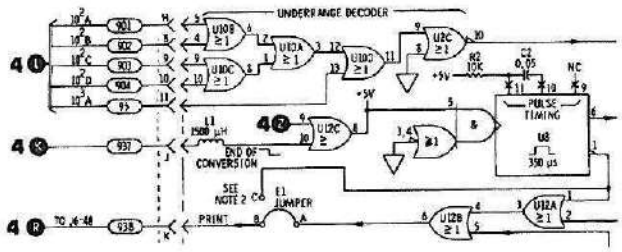


Figure 18. P/O Auto Range Circuits (P/O Change L)

CHANGE M

Table 9, Replaceable Parts:
For M1A1DS5, M1A1DS6, and M1A1DS7, delete the spacer (part number 0380-1231) listed under the part.

CHANGE N

Table 1:
Before Fine Zero, add "Analog-to-Digital Conversion Time: ⩽ 250 ms asynchronous with EXT TRIG signal."

Change the last sentence under BCD Output to "'Print' line available."

Under Control Lines, change Print specification to "With jumber A6E1 in the A-B position, a single bit indicates that the range is valid and data is ready. With jumper A6E1 in the B-C position, a single bit indicates that data is ready or external trigger received (may be over- or under-range)."

Under Control Line Inputs:
1. Delete the Inhibit specification.
2. Change the Ext. Trig specification to "A single bit generates a Print signal as described under Print above."

Operating Information:
Replace the second paragraph under "Introduction" with the following:
The digital panel meter, consisting of three separate circuit boards, contains an analog-to-digital converter and a solid state display. Digital panel meters in instruments with serial numbers prefixed 1937A and below are self-contained units and are not field repairable.

Change the last sentence in the paragraph titled "Auto Ranging" to
"It takes the power meter 250 ms to make an analog to digital conversion and 500 ms to switch to the next higher or lower range."

MANUAL CHANGES

CHANGE N (Cont'd)

Figure 1:
Change J6 pin 47 to "NC."

Delete the paragraph titled "Inhibit Input."

Change the paragraph titled "External Trigger Input" to read:
"A transition from logical 1 to logical 0 on the External Trigger input produces a Print signal at rear panel connector J6 pin 48."

Principles of Operation
After the paragraph titled "General," add the following paragraphs.

Digital Panel Meter Assembly M1 (See Service Sheet 4)

The Digital Panel Meter Assembly M1 consists of three circuit boards: a Display Assembly (M1A1), an A/D Converter Assembly (M1A2), and a Demultiplexer Assembly (M1A3). The A/D Converter Assembly accepts analog data from the Meter Logic Assembly A2 and converts it to BCD. The Display Assembly provides a visual representation of the BCD digits.

A/D Converter M1A2U1 samples the analog output from the Meter Logic Assembly A2 and converts it to digital data in a Binary Coded Decimal (BCD) format. BCD data bits from the A/D Converter are applied to the 7-Segment Decoder M1A2U2. U2 decodes the BCD data to a 7-segment code. The 7-segment code lights the correct LED of the display for decimal digits 0 through 9. The Decoder will not decode binary values greater than 9.

Digit Select lines DS1 to 4 from the A/D Converter enable the appropriate display to accept the 7-segment code, lighting the correct LEDs to display the digit. The Digit Select lines also go to the four Demultiplexer Latches M1A3U1 through U4 to clock the BCD bits into the correct D flip-flop for the units, tens, hundreds, and thousands digit. The BCD data then goes through CMOS-TTL buffers to Output Registers M1A3U8 and U9. The digital data output of the Output Registers is available at rear panel connector J6.

A/D Converter M1A2U1 compares the unknown analog voltage V_X to the reference voltage V_{REF}. A full scale meter reading occurs when the ratio is one (that is, when the two voltages are equal). When the analog voltage is less than the voltage reference the meter reads less than full scale.

Clock M1A2U3 enables the A/D Converter. The Clock functions as a free running, astable multivibrator. The frequency, which is approximately 80 kHz, is set by R1 and C1.

An A/D conversion is completed in approximately 250 ms. An End of Conversion (EOC) pulse is generated at the completion of each conversion and applied to M1A2U7D and M1A2U1 pin 9. The EOC output of the A/D Converter (pin 14) is gated with the output of M1A2U4B at NAND gate M1A2U7D. In local and remote operation, the M1A2U4B pin 1 output is high. When a high EOC pulse is combined with the high output of pin 1, the output of NAND gate M1A2U7D is pulsed low for the time the EOC pulse is high. This pulse is inverted by M1A2U7C and applied to CMOS-TTL Buffer M1A2U10. The output of the buffer is a TTL positive pulse that clocks the new power level reading into Output Registers M1A3U8 and U9. The high output of Inverter M1A2U7C is also connected to the Reset of the J/K Flip Flop but has no effect since the Set input remains high. When the EOC pulse to the NAND gate goes low, the output of the NAND gate goes high. This output is inverted to low by Inverter M1A2U7C until the next A/D conversion is completed. Therefore, each time the A/D Converter generates an EOC pulse, the power measurement data is clocked into the Output Registers on the low-to-high transition of the pulse. The A/D Converter continues to make analog to digital conversions every 250 ms and to update the display.

The A/D Converter continues to make analog to digital conversions every 250 ms, and to update the display when the Hold input (J6 pin 47) is low. However, when the Hold input is low the power measurement data displayed at the end of each conversion is not clocked into the Output Regis-

CHANGE N (Cont'd)

ters. The data information available at connector J6 is the data clocked into the Output Registers on the first conversion after the Hold input was set low.

A low Hold input pulls the Set input to M1A2U4B low. When both the Set and Reset inputs are low the output on pin 1 remains high. When a high EOC pulse is gated with pin 1, the output of NAND gate M1A2U7D is low. M1A2U7C inverts the low level to a high level. The Reset input to the J/K Flip Flop is then high. With the Set input low, the output on pin 1 is switched low. Also, the Reset input is switched back to low. With both the Set and Reset inputs low, the output on pin 1 remains low until the input to the NAND gate changes from a low level to a high level. This transition is accomplished when a high-to-low pulse is applied to the External Trigger (J6 pin 49). The External Trigger pulse pulls the input to Inverter M1A2U7B low; the output of the inverter then goes high. This low-to-high transition gates J/K Flip Flop pin 1 high, enabling the NAND gate on the next EOC pulse from the A/D Converter. At this time, the NAND gate output goes low and is inverted by M1A2U7C. The high output of Inverter M1A2U7C resets the output of the J/K Flip Flop until the next pulse on the External Trigger. Data is clocked into the Output Registers on the low-to-high transition of the pulse. The truth table for M1A2U4B is shown below.

J	K	S	R	Clock(G)	Pin 1
x	x	1	0	x	1
x	x	0	1	x	0
1	x	0	0	↑	1
x	0	0	0	↑	1
x	x	1	1	x	1

When the EOC pulse is terminated and makes the transition from high to low, it triggers Monostable Multivibrator A6U8. The output of the multivibrator is a delayed positive pulse that clocks, on its trailing edge (high to low), the flip-flops in the up/down counter. The complement of the clock pulse from the multivibrator goes to OR gate A6U12A, which provides a logical low Print, data ready, to rear panel connector J6 pin 48.

The Overrange Logic M1A3U10 decodes the thousands data bit (10^3) and three of the hundreds data bits (10^2 B, 10^2 C, and 10^2 D). These data bits are the thousand bit 1 and the hundred bits 2, 4, and 8 from Output Register M1A3U8. The thousands bit is ANDed with each of the three hundreds bits to provide a low output on M1A3U10 pin 8. This low output blanks the units, tens, and hundreds digits in the overrange condition. The meter overranges when the value in the Output Registers is 1200 or greater. The meter remains in the overrange condition until the reading is less than 1200. The low output on M1A3U10 pin 8 is gated with the DS1 output from the A/D Converter at NOR gate M1A2U5C. The DS1 output of the A/D Converter clocks the thousand digit into display DS1 and Demultiplexer Latch M1A3U1. When both the overrange bit and the DS1 input to the Blanking Logic NOR gate M1A2U5C are low, the output of the NOR gate is high. The high output is inverted by M1A2U5B for a low G3 input to the 7-Segment Decoder M1A2U2, thus disabling the decoder. The decoder will remain disabled while DS1 is low and blank the display because the units, tens, and hundreds digits will not be decoded. When DS1 goes high for the thousands digit, the 7-Segment Decoder is enabled and the digit is decoded and displayed.

The low output from M1A3U10 pin 8 is also connected to the base of M1A3Q1 and the Overrange Driver on the M1A2 Assembly. The collector of M1A3Q1 is tied to +5V (through R5) and connected to rear panel connector J6 pin 16 and to Auto Range Assembly A6 pin L (the Overrange Flag). Therefore, in the overrange condition a logical low to the transistor's base turns off the transistor and produces a logical high, setting the Overrange Flag on both J6 pin 16 and A6 pin L. The low output of M1A3U10 pin 8 is inverted high by M1A2U5D to illuminate Overrange Light DS5.

The minus sign, located on DS1 of the Display Assembly, lights only when both M1A2U1 pin 19 (DS1) is high and pin 22 (Q2) is low. The DS1 line from the A/D Converter must be high to enable display DS1. The logic level on the Q2 line from the A/D Converter determines the polarity of the digits in the display. The Q2 line goes to Inverters M1A2U5A and U9H. A low Q2 input to M1A1DS1 pin 4 illuminates the minus sign. A high

MANUAL CHANGES

CHANGE N (Cont'd)

Q2 input to M1A1DS1 pin 4 indicates a positive polarity, but the plus sign does not illuminate.

Recorder Output Buffer M1A2U6 prevents a load on Recorder rear panel connector J4 from interferring with the operation of the Meter Assembly.

The power supply for M1, located on the M1A3 circuit board, consists of a full-wave bridge rectifier (CR1—4). The +5V supply is filtered by capacitors 2 through 7 and regulated by series regulator U1. The —5V supply is filtered by C1 and regulated by CR5. The power supply is used throughout the meter assembly.

Under "Auto Range Assembly A6, Up/Down Counter Inputs," change U12B in the fifth sentence of the last paragraph to U12A.

Performance Tests:

Under "Data Output and Digital Panel Meter Test," change the Print control line specification to read "With jumper wire A6E1 in the A–B position, a single bit indicates that the range is valid and data is ready. With jumper A6E1 in the B–C position, a single bit indicates that data is ready or external trigger received (may be over- or under-range)."

Under "Data Input Test," delete the entry for Inhibit in the Control Lines specifications.

Under "Data Input Test," change the Ext. Trig. control line specification to "A single bit generates a Print signal."

Adjustments:

Under "Digital Panel Meter Zero Adjustment," replace this adjustment with the following Meter and Recorder Output Calibration procedure.

Meter and Recorder Output Calibration

a. Remove the side panels (see 432A manual, paragraph 5-28).

b. Connect the DVM positive input to the 432C connector XM1A2 pin 7 and the negative input to XM1A2 pin E.

c. Set the 8477A controls as follows:

FUNCTION	200Ω
ZERO/TEST	ZERO
POWER	1 mW

d. Set the 432C controls as follows:

A2S1 (on Meter Logic Assembly)	CALIBRATE
MOUNT RES	200Ω
RANGE	1 mW
CAL FACTOR	100%

e. Adjust the Zero control on the 8477A Power Meter Calibrator for a DMV indication of 0.000 ±.001V.

f. Set ZERO/TEST on the 8477A to TEST.

g. Adjust M1A2R4 for a Digital Panel Meter reading equal to the DVM reading ±.001.

h. Set the ZERO/TEST switch on the 8477A to ZERO and connect the DVM to the 432C RECORDER output.

CHANGE N (Cont'd)

i. Short XM1A2 connector pin 7 to pin E. Adjust M1A2R6 for a DVM reading of 0.000 ±.001V.

j. Set the ZERO/TEST switch on the 8477A to TEST and remove the short from XM1A2 pin 7 and pin E.

k. Adjust A2R74 for a DVM reading of 1.000 ±.001V.

l. Change the following settings:

432C RANGE to 10 mW
8477A Power (mW) to 10 mW and ZERO/TEST to ZERO.

m. Check zero and adjust as necessary.

n. Set ZERO/TEST to TEST and adjust A2R86 for a DVM reading of 1.000 ±.001V.

o. Return 432C RANGE and 8477A POWER switches to 1 mW and ZERO as before.

p. Adjust A2R6 for a DVM reading of 1.000 ±.001V.

q. Perform the adjustments of steps m through p again until the 432C reads 1 ±.010V (at RECORDER output) on both 1 mW and 10 mW ranges.

r. Set A2S1 to OPERATE.

s. Verify that the instrument meets its specification by completing the Performance Tests.

Replace "Digital Panel Meter Assembly M1 Removal" with the following procedure:

Digital Panel Meter Assembly M1 Removal

a. Remove all power from the 432C; remove top and side covers (see 432A manual, paragraph 5-27).

b. Facing the front of the instrument, remove the left side frame.

c. Remove printed circuit boards A1, A2 and A6.

d. Slide off the meter trim, MP5 (see Figure 6).

e. Remove the screws in the right side frame that secure the readout bracket (MP10) to the meter bracket (MP19).

f. Slide the meter assembly back and remove the readout bracket (MP10), mask (MP13), filter (MP15) and meter case (MP16) by sliding them forward. These three parts are held together by screws MP21 and 22 and nuts MP23 and 24.

g. Disconnect the three wires that attach U1 to M1A3.

h. Remove M1A2 and M1A3 from the connectors.

i. For reassembly, reverse the procedures.

MANUAL CHANGES

CHANGE N (Cont'd)

Table 9:

Delete A5 BCD Buffer Assembly and all parts structured under it (A5TP1, A5U1, A5U2, and A5XM1A).

Change A6 to 00432-60205 CDI AUTO RANGE ASSEMBLY.

Delete A6C1.

Add A6C8 0160-3458 CD8 CAPACITOR-FXD .005UF.

Change A6CR1 and A6CR2 to 1901-0328 CD8 DIODE-PWR RECT 400V 1A 6US.

A6Q4, A6Q7 and A6Q8 were originally 1854-0071. However, the recommended replacement is listed in Table 9. Therefore, no manual change is recommended.

Delete A6R1.

Change A6R13 to 2100-3351 CD6 RESISTOR-TRMR 500 10% C-SIDE ADJ 1-TRN.

Delete A6R23 and A6R24.

Add A6R27 0757-0394 CD0 RESISTOR 51.1 1% .125W.

Add A6R28 0698-0084 CD9 RESISTOR 2.15K 1% .125W.

Add A6R29 0757-1094 CD9 RESISTOR 1.47K 1% .125W.

A6U1 was originally 1820-0196. However, the recommended replacement is listed in Table 9. Therefore, no manual change is recommended.

Delete DS2 and DS3.

Change M1 to NSR, METER DIGITAL COMPOSED OF M1A1, M1A2 and M1A3 ASSEMBLIES.

Add the following parts to Table 9:

Table 9. Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
M1A1	00432-60106	1	1	DISPLAY ASSEMBLY	28480	00432-60106
M1A1DS1	1990-0713	2	1	DISPLAY-AN-SEG 1-CHAR .408-H RED	28480	HDSP-3736
M1A1DS2	1990-0714	3	3	DISPLAY-NUM-SEG 1-CHAR .43-H RED	28480	HDSP-3731
M1A1DS3	1990-0714	3		DISPLAY-NUM-SEG 1-CHAR .43-H RED	28480	HDSP-3731
M1A1DS4	1990-0714	3		DISPLAY-NUM-SEG 1-CHAR .43-H RED	28480	HDSP-3731
M1A1DS5	1990-0450	4	3	LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
	0380-1231	7	3	SPACER-RND .365-IN-LG .12-IN-ID	00000	ORDER BY DESCRIPTION
M1A1DS6	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
	0380-1231	7		SPACER-RND .365-IN-LG .12-IN-ID	00000	ORDER BY DESCRIPTION
M1A1DS7	1990-0450	4		LED-LAMP LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
	0380-1231	7		SPACER-RND .365-IN-LG .12-IN-ID	00000	ORDER BY DESCRIPTION
M1A1P1	1251-5770	5	1	CONNECTOR 18-PIN F POST TYPE	28480	1251-5770
M1A1P2	1251-5769	2	1	CONNECTOR 30-PIN F POST TYPE	28480	1251-5769
M1A1R1	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
M1A1XDS1	1200-0803	8	4	SOCKET-IC 14-CONT DIP DIP-SLDR	28480	1200-0803
M1A1XDS2	1200-0803	8		SOCKET-IC 14-CONT DIP DIP-SLDR	28480	1200-0803
M1A1XDS3	1200-0803	8		SOCKET-IC 14-CONT DIP DIP-SLDR	28480	1200-0803
M1A1XDS4	1200-0803	8		SOCKET-IC 14-CONT DIP DIP-SLDR	28480	1200-0803
M1A2	00432-60105	0	1	A/D CONVERTER ASSEMBLY	28480	00432-60105
M1A2C1	0140-0193	0	1	CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
M1A2C2	0160-0168	1	1	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
M1A2C3	0160-4084	8	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
M1A2C4	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
M1A2C5	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
M1A2C6	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
M1A2C7	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
M1A2R1	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
M1A2R2	0757-0462	3	2	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
M1A2R3	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
M1A2R4	2100-3103	6	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
M1A2R5	0698-3260	9	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
M1A2R6	2100-2522	1	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
M1A2R7	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

MANUAL CHANGES

CHANGE N (Cont'd)

Table 9. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
M1A2R8	0698-3430	5	8	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R9	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R10	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R11	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R12	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R13	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R14	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2R15	0698-3430	5		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
M1A2TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
M1A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
M1A2U1	1826-0431	4	1	IC CONV 24-DIP-C PKG	04713	MC14433L
M1A2U2	1820-1413	2	1	IC DCDR CMOS BCD-TO-7-SEG 4-TO-7-LINE	3L585	CD4511BE
M1A2U3	1820-1317	5	1	IC MV CMOS MONO/ASTBL	3L585	CD4047AE
M1A2U4	1820-1964	8	1	IC FF CMOS J-K POS-EDGE-TRIG DUAL	3L585	CD4027BE
M1A2U5	1820-1657	6	1	IC GATE CMOS HEX	04713	MC14572UBCP
M1A2U6	1826-0013	8	1	IC OP AMP LOW-NOISE TO-99 PKG	06665	SSS741CJ
M1A2U7	1820-1747	5	1	IC GATE CMOS NAND QUAD 2-INP	04713	MC14011BCP
M1A2U8	1820-2273	4	1	IC DRVR TTL OCTL	13606	UDN2981A
M1A2U9	1858-0069	1	1	TRANSISTOR ARRAY 18-PIN PLSTC DIP	13606	ULN-2803A
M1A2U10	1820-1146	8	4	IC BFR CMOS NON-INV HEX	3L585	CD4050BE
M1A2U11	1826-0544	0	1	V REF 8-DIP-C	04713	MC1403U
M1A2XM1A1P2	1251-5771	6	1	CONNECTOR 30-PIN M POST TYPE	28480	1251-5771
M1A3	00432-60107	2	1	DEMULTIPLEXER ASSEMBLY	28480	00432-60107
M1A3C1	0180-0094	4	1	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
M1A3C2	0180-2154	1	1	CAPACITOR-FXD 1900UF+75-10% 15VDC AL	28480	0180-2154
M1A3C3	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
M1A3C4	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
M1A3C5	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
M1A3C6	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
M1A3C7	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
M1A3CR1	1901-0328	8	4	DIODE-PWR RECT 400V 1A 6US	03508	A14D
M1A3CR2	1901-0328	8		DIODE-PWR RECT 400V 1A 6US	03508	A14D
M1A3CR3	1901-0328	8		DIODE-PWR RECT 400V 1A 6US	03508	A14D
M1A3CR4	1901-0328	8		DIODE-PWR RECT 400V 1A 6US	03508	A14D
M1A3CR5	1902-0579	3	1	DIODE-ZNR 5.1V 5% PD=1W IR=10UA	28480	1902-0579
M1A3MP1	1400-0016	9	1	CLAMP-CABLE .75-DIA .5-WD NYL	28480	1400-0016
M1A3MP2	2200-0147	4	1	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0147
M1A3MP3	2260-0009	3	1	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
M1A3MP4	3050-0105	6	1	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
M1A3Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
M1A3R1	0698-3411	2	1	RESISTOR 3.48K 1% .5W F TC=0+-100	28480	0698-3411
M1A3R2				NOT ASSIGNED		
M1A3R3	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
M1A3R4	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
M1A3R5	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
M1A3TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
M1A3TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
M1A3TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
M1A3U1	1820-1956	8	4	IC LCH CMOS COM CLOCK QUAD	3L585	CD4042BE
M1A3U2	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	3L585	CD4042BE
M1A3U3	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	3L585	CD4042BE
M1A3U4	1820-1956	8		IC LCH CMOS COM CLOCK QUAD	3L585	CD4042BE
M1A3U5	1820-1146	8		IC BFR CMOS NON-INV HEX	3L585	CD4050BE
M1A3U6	1820-1146	8		IC BFR CMOS NON-INV HEX	3L585	CD4050BE
M1A3U7	1820-1146	8		IC BFR CMOS NON-INV HEX	3L585	CD4050BE
M1A3U8	1820-1461	0	2	IC FF TTL D-TYPE POS-EDGE-TRIG CLEAR	01295	SN74273
M1A3U9	1820-1461	0		IC FF TTL D-TYPE POS-EDGE-TRIG CLEAR	01295	SN74273
M1A3U10	1820-0084	1		IC GATE TTL AND-OR-INV	01295	SN7453N
M1A3XM1A1P1	1251-5772	7	1	CONNECTOR 18-PIN M POST TYPE	28480	1251-5772

See introduction to this section for ordering information
†Refer to Manual Changes for backdating information.

CHANGE N (Cont'd)

Delete MP9.
Add MP11 00432-00106 CD5 GUIDE-BOARD.
Change MP13 to 00432-20108 CD 7 MASK-DPM.
Change MP15 to 00432-20109 CD0 FILTER-DPM.
Delete MP17 and MP18.
Add MP19 00432-00115 CD6 BRACKET-DPM (INCLUDES XM1A2, XM1A3).
Add MP20 0360-0036 CD6 TERMINAL-SLDR LUG PL-MTG FOR -#6-SCR.
Change MP21 and MP22 to 2360-0193 CD8 SCREW-MACH 6-32 .25-IN-LG PAN-HD POZI.
Change MP23 and MP24 to 2420-0001 CD5 NUT-HEX-W/LKWR 6-32-THD .109-IN-THK.
Add MP25 4320-0002 CD6 MOLDING COMPOUND POLYC GRA 72799 LEXAN101-7081.
Delete MP26 through MP30.
Replace Figure 6 with the following:

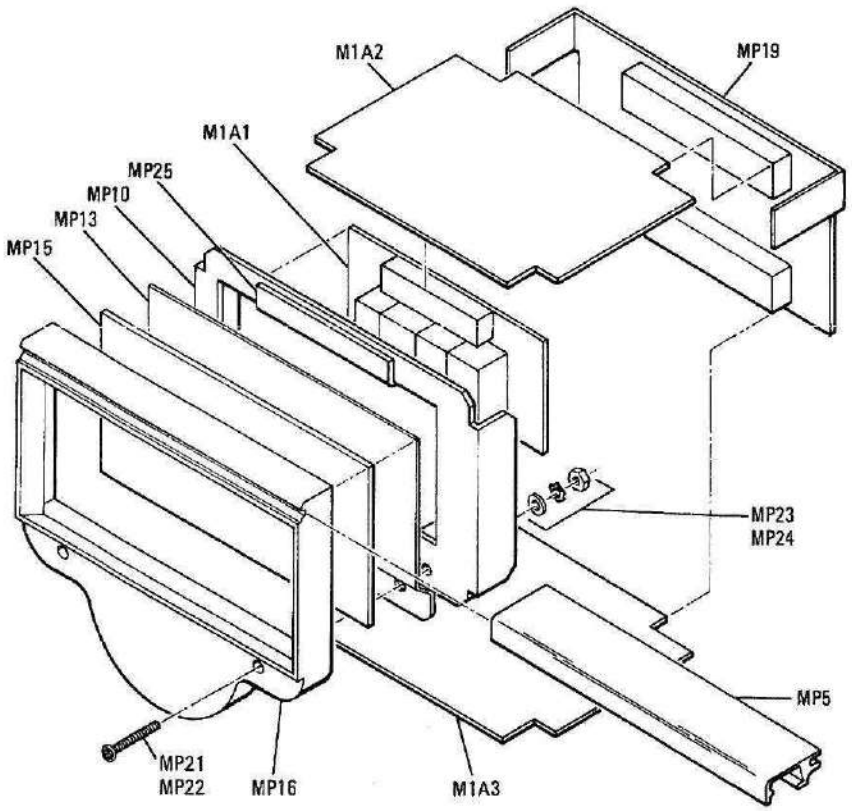


Figure 19. Panel Meter Components, Exploded View (P/O Change N)

CHANGE N (Cont'd)

Delete P1.

Delete R6 and R7.

Change T1 to 9100-0431 CD4 TRANSFORMER-POWER.

Add U1 1826-0181 CD1 IC V RGLTR TO-3.

Add XM1A2 and XM1A3 1251-0159 CD4 CONNECTOR-PC EDGE 15-CONT/ROW 2 ROWS.

Delete XM1B.

Troubleshooting, Schematics, and Component Locations:

Under Troubleshooting, change the paragraph titled "Digital Panel Meter M1" to read as follows: "If the panel meter display will not coarse or fine zero, or if zero carryover is out of specification, perform steps a through g of the Meter and Recorder Output Calibration adjustment."

Under Troubleshooting, in the paragraph titled "Auto Range Assembly A6," delete the portion of the last sentence that reads "trouble with the Inhibit input would be caused by the panel meter."

Figure 26, Assembly and Component Locations:

Replace the bottom half of the figure with the attached figure.

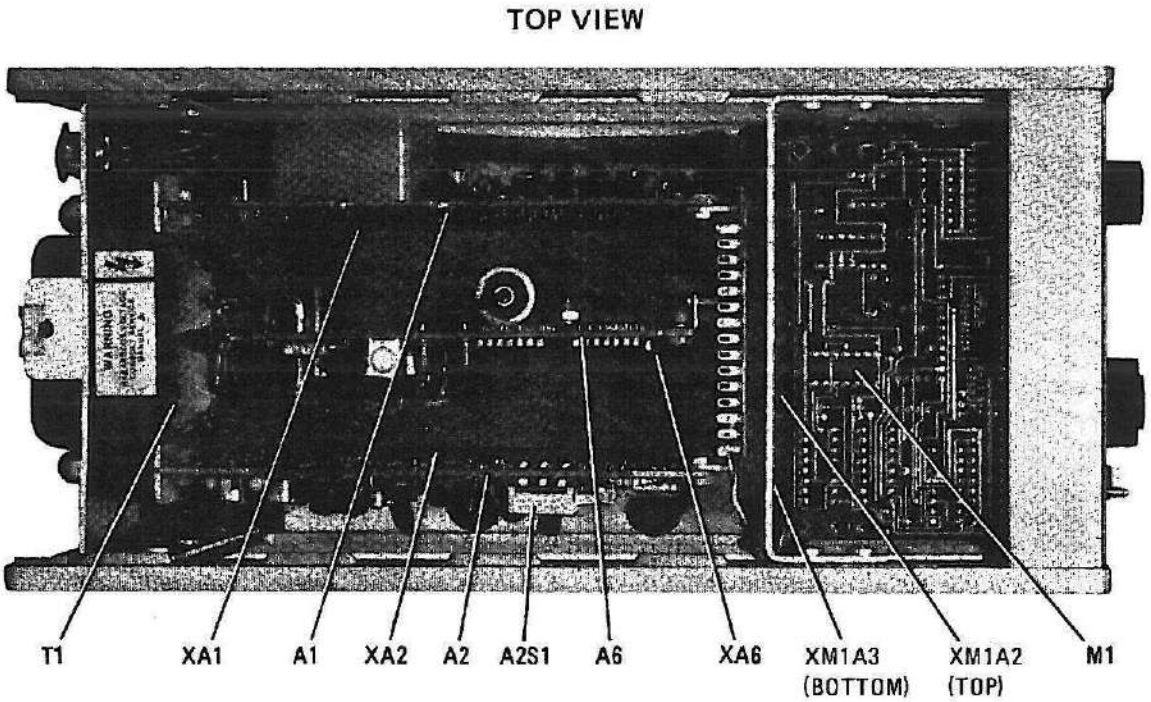


Figure 20. P/O Assembly and Component Locations (P/O Change N)

MANUAL CHANGES

CHANGE N (Cont'd)

Service Sheet 2 (schematic):
On the Auto Range Assembly (at the bottom of the schematic), change "00432-60206" to 00432-60205."

Service Sheet 3 (schematic):
Replace the power line input portion of the schematic with the following partial schematic.

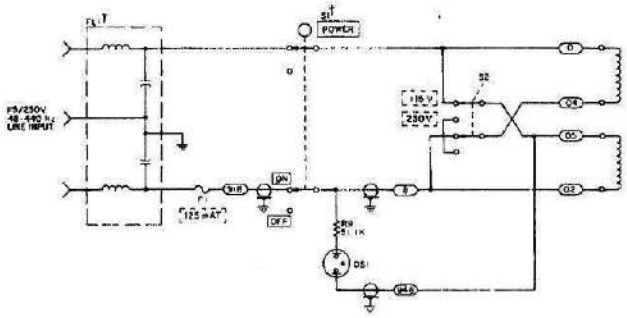


Figure 21. P/O Power Supply Schematic (P/O Change N)

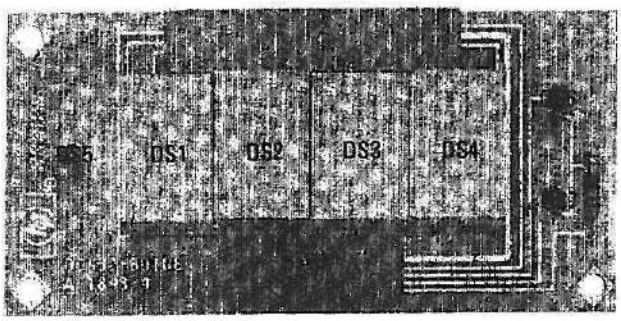
CHANGE N (Cont'd)

Service Sheet 4 (component locations):
Add the attached Digital Panel Meter Assembly M1 Component Locations.

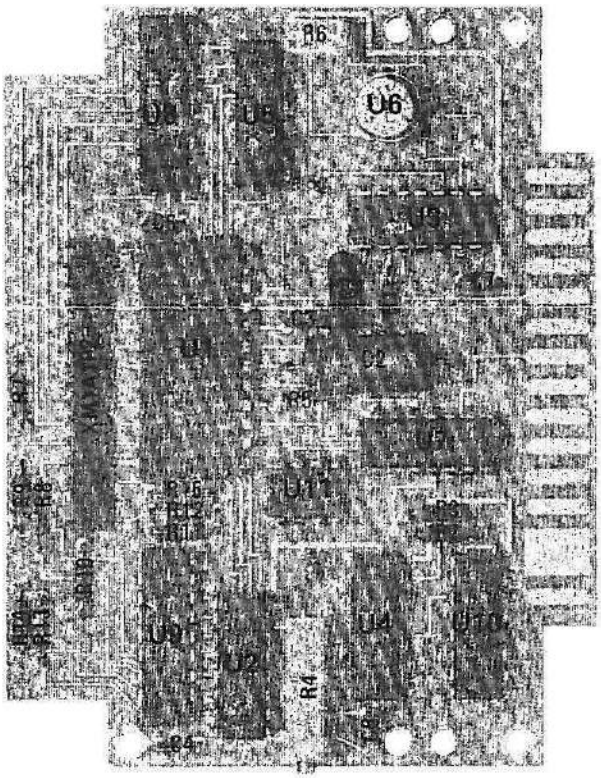
Service Sheet 4 (schematic):
Replace with the following schematic.

MANUAL CHANGES

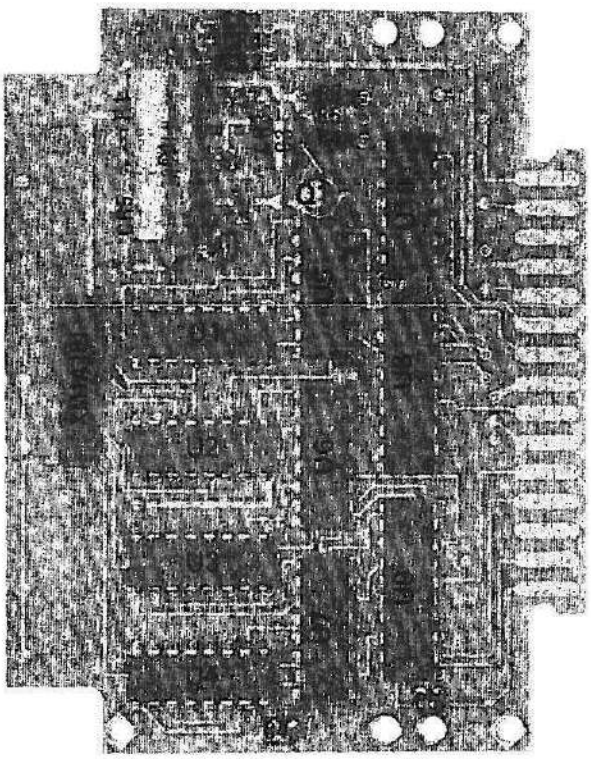
M1A1 DISPLAY ASSEMBLY



M1A2 A/D CONVERTER ASSEMBLY

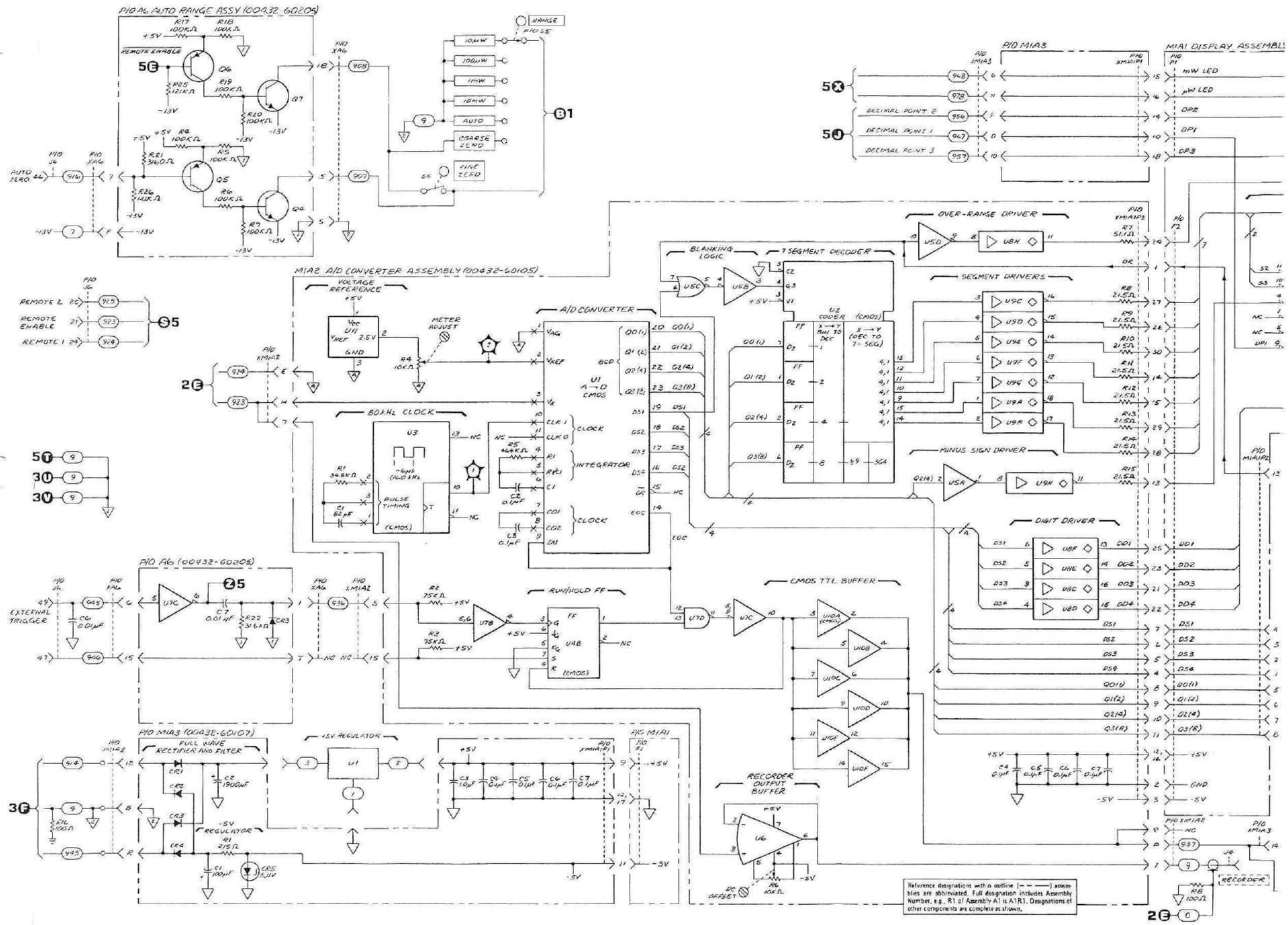


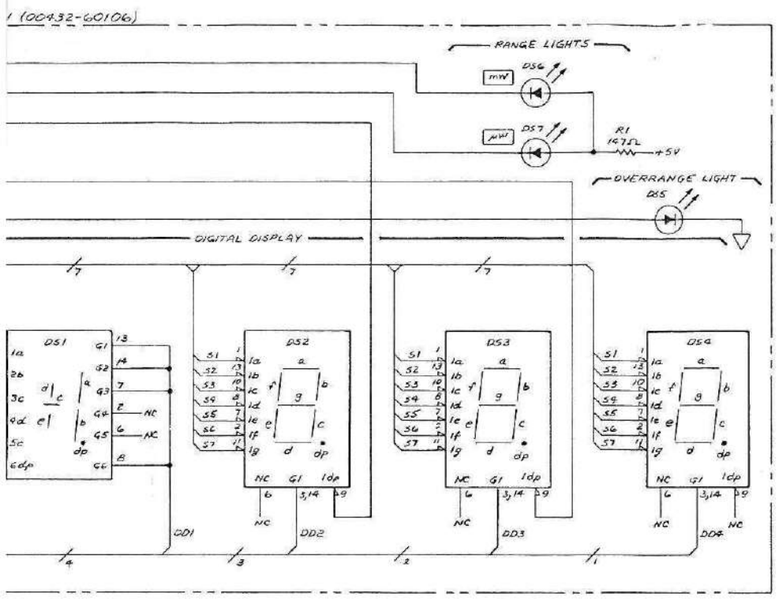
M1A3 DEMULTIPLEXER ASSEMBLY



C2 IS CONNECTED TO THE BACK SIDE OF THE CIRCUIT BOARD.

Figure 22. Digital Panel Meter Assembly M1 Component Locations (P/O Change N)





REFERENCE DESIGNATIONS

NO PREFIX	MIA1
J8 R8,16 S4,5 T1 U1 W4 X26 XMIA1,2,3	DS1-7 R1,2 R1
A6	MIA2
C** CR3 Q12-7 R7-22,25,26 U7	C1-7 CR1-5 R1,3-5 Q1 U1-10 XMIA1P2
	MIA3
	C1-7 CR1-5 R1,3-5 Q1 U1-10 XMIA1P2

INTEGRATED CIRCUIT VOLTAGE AND GROUND CONNECTIONS

REFERENCE DESIGNATIONS	PIN NUMBERS
MIA2	
U1	+5V – 14 – 13
U2,4,5	+5V – 16 – 8
U3	+5V – 4,5,6,14 -5V – 1,9,12
U6	+5V – 7
U7	+5V – 14 – 1
U8	+5V – 9 – 10
U9	– 4
U10	+5V – 1 – 8 NC – 13 +5V – 5
U11	– 3
MIA3	
U1-4	+5V – 16 – 8
U5-7	+5V – 1 – 8
U8,9	+5V – 20 – 10
U10	+5V – 14 – 7 NC – 6,11,12

TRANSISTOR AND INTEGRATED CIRCUIT PART NUMBERS

REFERENCE DESIGNATIONS	PART NUMBERS
A6	
Q4,7,8	1854-0071
Q5,6	1853-0020
U7	1820-0179
MIA2	
U1	1826-0431
U2	1820-1413
U3	1820-1317
U4	1820-1564
U5	1820-1657
U6	1826-0018
U7	1820-1747
U8	1820-2272
U9	1858-0049
U10	1820-1146
U11	1826-0568
MIA3	
Q1	1854-0477
U1-4	1820-1956
U5-7	1820-1146
U8,9	1820-1461
U10	1820-6084

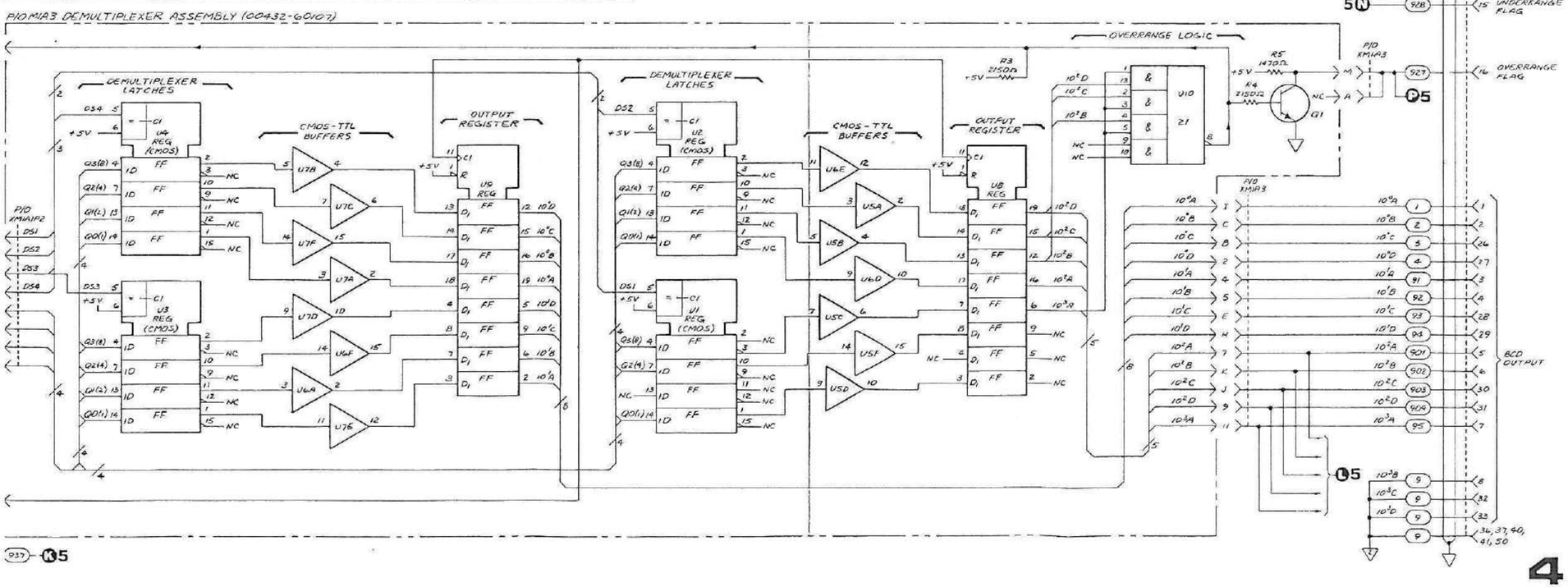


Figure 23. Digital Panel Meter Schematic (P/O Change N)

MANUAL CHANGES

CHANGE N (Cont'd)

Service Sheet 5 (component locations):
Replace with the attached component locations.

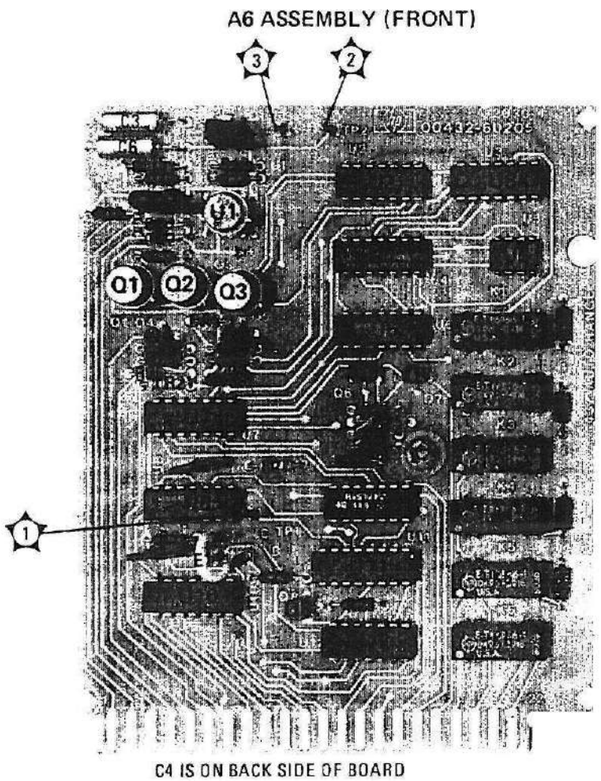


Figure 24. Auto Range Assembly A6 Component Locations (P/O Change N)

Service Sheet 5 (schematic):
Replace with the attached schematic.

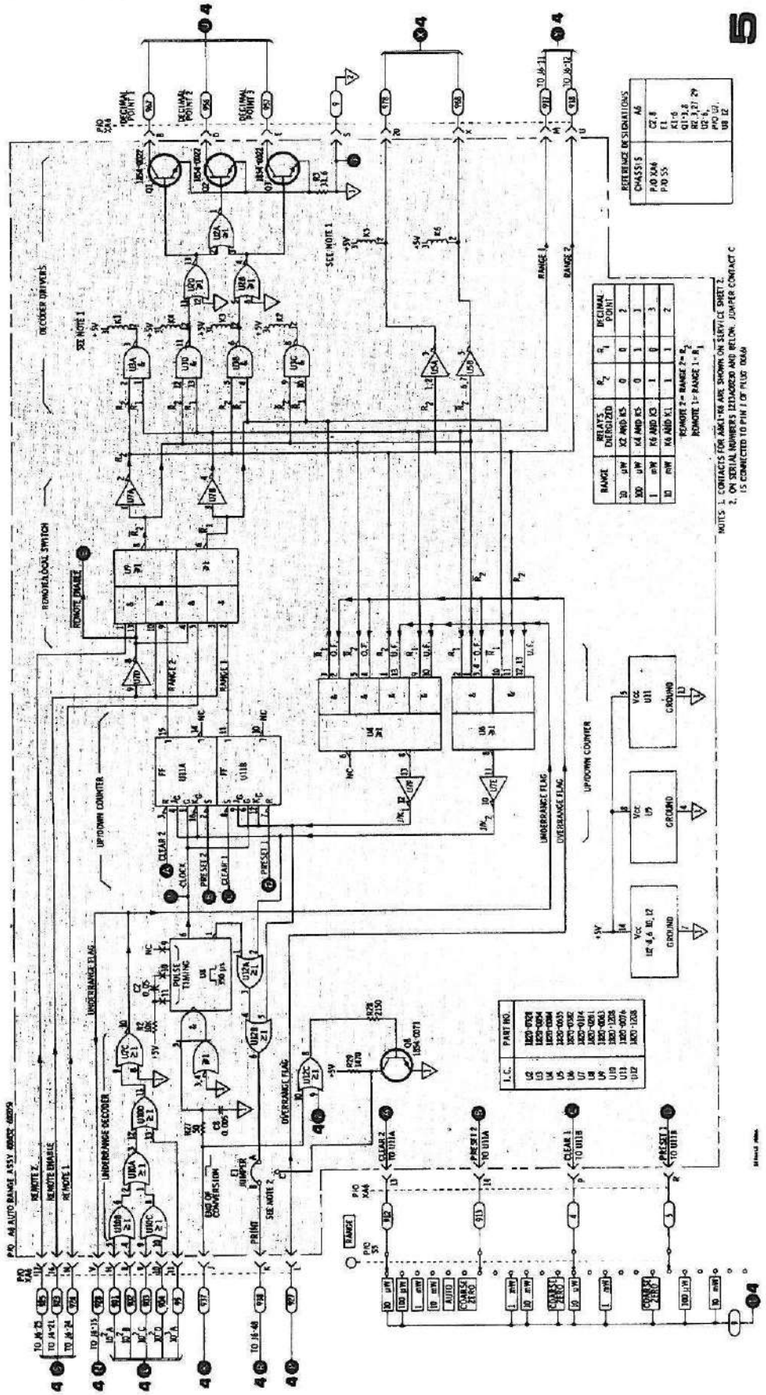


Figure 25. Auto Range Circuits (P/O Change N)

84. TROUBLESHOOTING, SCHEMATICS, AND COMPONENT LOCATIONS

85. Introduction

86. All of the troubleshooting information and component locations for the Thermistor Bridge Assembly A1, Meter Logic Assembly A2, and Calibration Factor Switch Assembly A4 is the same in both the 432A and 432C; this information is contained in the 432A manual.

NOTE

A 22 pin extender board (HP 5060-0630) is required to perform component level troubleshooting and repair on Auto Range Assembly A6.

87. Troubleshooting

88. Digital Panel Meter M1†. If the panel meter display will not coarse or fine zero, or if zero carryover is out of specification, perform steps a through g of the Digital Panel Meter Zero Adjustment.

89. The Meter Accuracy Test in the Performance Tests section will isolate trouble to the panel meter. Correct RECORDER output readings and incorrect panel meter readings would indicate that the trouble is in the panel meter.

90. Some of the data inputs and outputs at connector J6 connect directly to the panel meter. If either the Data Output and Digital Panel Meter Test or the Data Input Test (located in the Performance Tests section) indicate trouble, examine Service Sheets 4 and 5 to isolate trouble to the meter or Auto Range Assembly A6.

91. Auto Range Assembly A6. Isolate trouble to the A6 assembly using the Data Output and Digital Panel Meter Test and the Data Input Test (located in the Performance Tests section). Note the specific trouble, then examine Service Sheets 4 and 5 to isolate the trouble to the A6 assembly or the panel meter. For example, an inability to auto range would probably be caused by the A6 assembly; trouble with the Inhibit input would be caused by the panel meter.

92. When trouble has been isolated to the A6 assembly, remove the top cover from the 432C (see 432A manual paragraph 5-27). Remove the A6 Assembly and reinstall it on an extender board (HP 5060-0630).

93. To check the +5V power supply (A6U1 and associated components), connect a digital voltmeter across A6 test points 2 and 3. The voltmeter should read +5.00 ±0.01V. If the voltage is high, adjust A6R13. If the voltage is low, check that the voltage drop across A6R15 does not exceed 600 mV. If it does, some component external to the power supply is probably drawing too much current. If the voltage drop is less than 600 mV, check Q1, the 10 Vrms input, and the +7V reference voltage at A6U1 pin 4.

94. To check the range code from the up/down counter, the decoder drivers, the relays, and the lamps on the front panel, set RANGE as shown in Table 12 and use a digital voltmeter to check the designated points (see Service Sheet 5).

NOTE

A logical 1 equals +2.5V to +5V and a logical 0 equals 0V to +0.4V.

Table 12. Up/Down Counter and Decoder Driver Troubleshooting

Range	Range Code R_2 (U3-2)	R_1 (U3-1)	$\overline{R_2}$ (U3-9)	$\overline{R_1}$ (U3-10)	Decimal Point 1 (right)	2 (cent.)	3 (left)	Lamp μW	mW	Relays Energized*
10 μW	0	0	1	1	OFF	ON	OFF	ON	OFF	K2 and K5
100 μW	0	1	1	0	ON	OFF	OFF	ON	OFF	K4 and K5
1 mW	1	0	0	1	OFF	OFF	ON	OFF	ON	K6 and K3
10 mW	1	1	0	0	OFF	ON	OFF	OFF	ON	K6 and K1

*All Others De-energized

95. If the Data Output and Digital Panel Meter Performance Test indicates that the 432C will not auto range up and/or down (and the Underrange and Overrange Flags are correct) check A6U4, U6, U11 and U7. Use the procedures in the test (steps a through e) to set the conditions shown in Table 13; check J/K_1 and J/K_2.

NOTE

If J/K_1 and J/K_2 are correct and the meter will not auto range up or down, check for the positive Clock pulses (one about every 500 msec) at A6U11 pins 1 and 6. If the clock pulses are correct, U11 is probably defective.

Table 13. Auto Range Troubleshooting

Range	Condition	J/K_2*	J/K_1*
10 μW	Underrange	0	0
	Overrange	0	1
100 μW	Underrange	0	1
	Overrange	1	1
1 mW	Underrange	1	1
	Overrange	0	1
10 mW	Underrange	0	1
	Overrange	0	0

*Check J/K_2 at U7—10, check J/K_1 at U7—12.

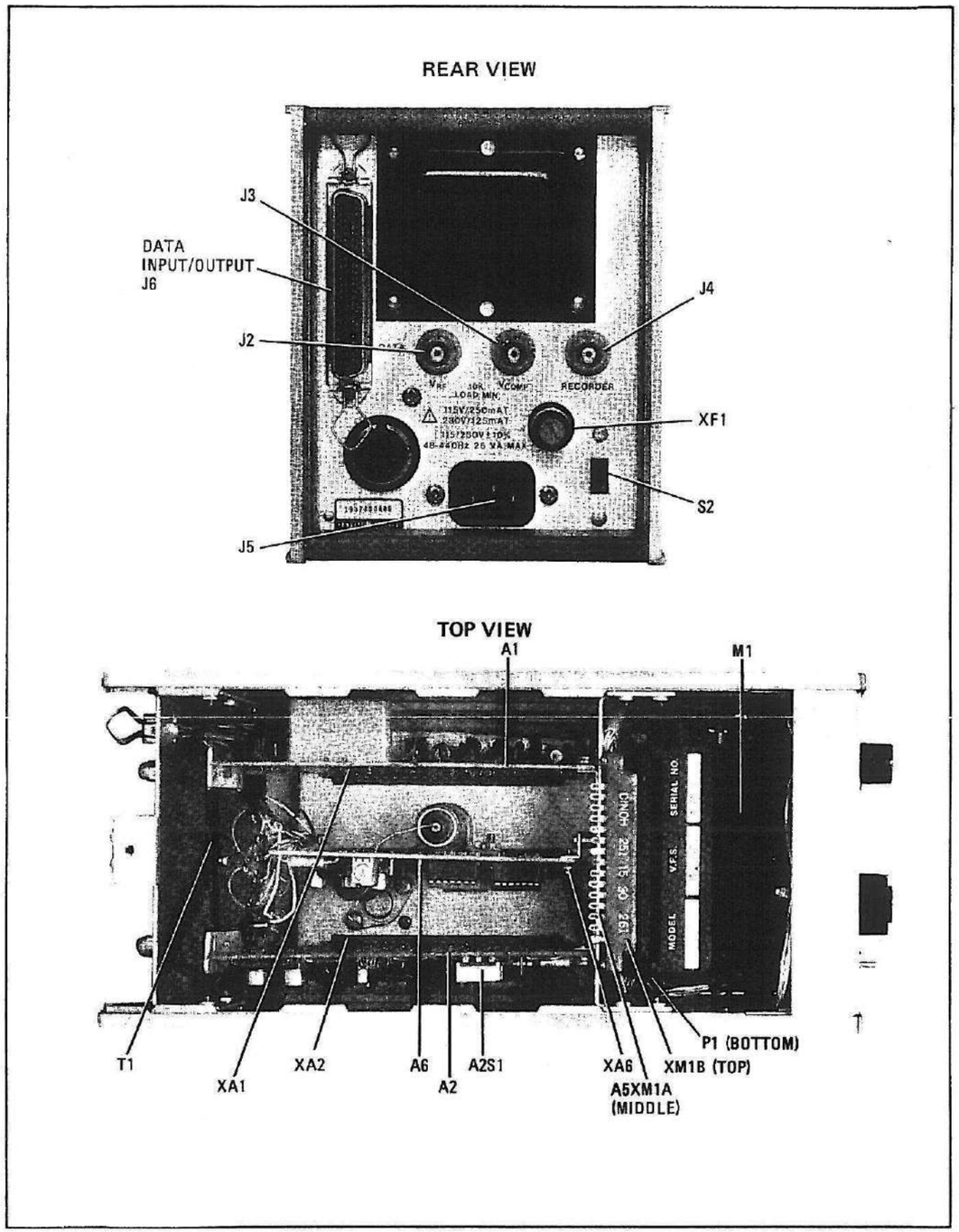


Figure 26. Assembly and Component Locations

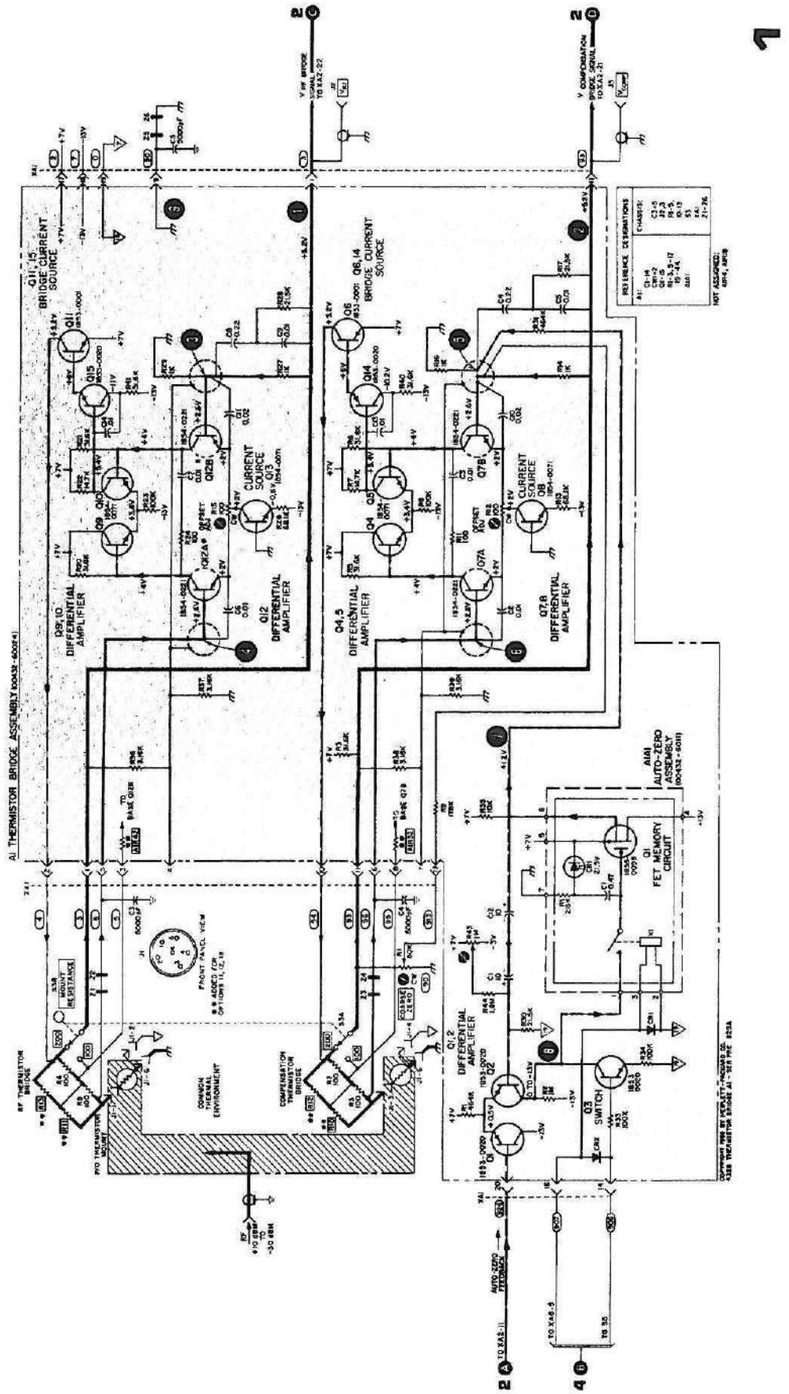


Figure 27. RF and Compensation Bridge Schematic

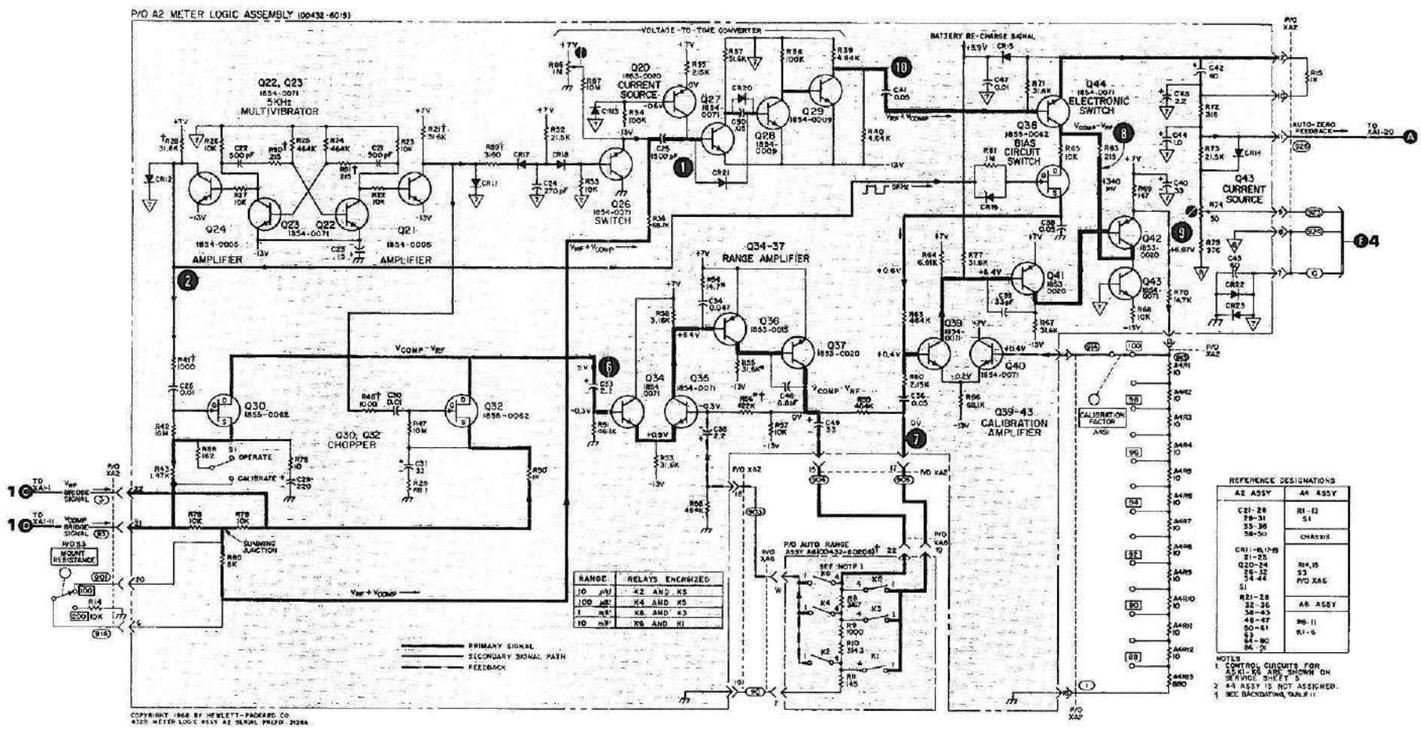


Figure 28. Meter Logic Schematic

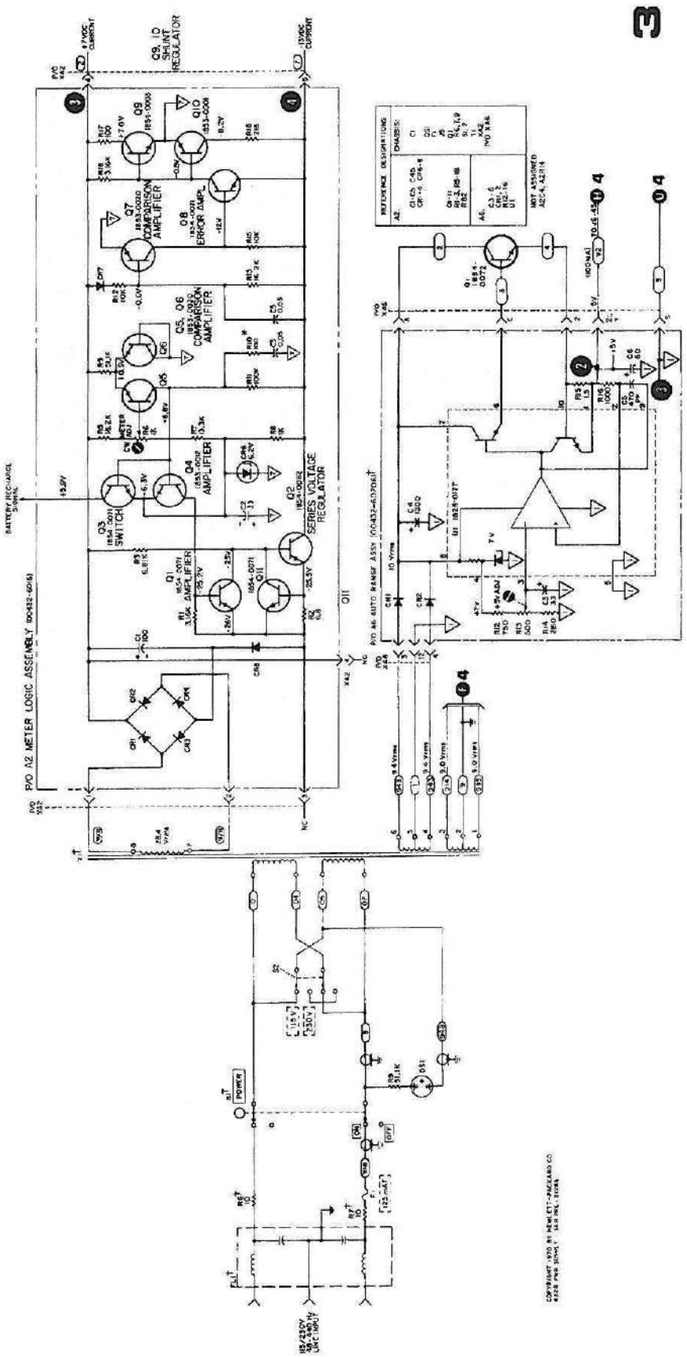


Figure 29. Power Supply Schematic

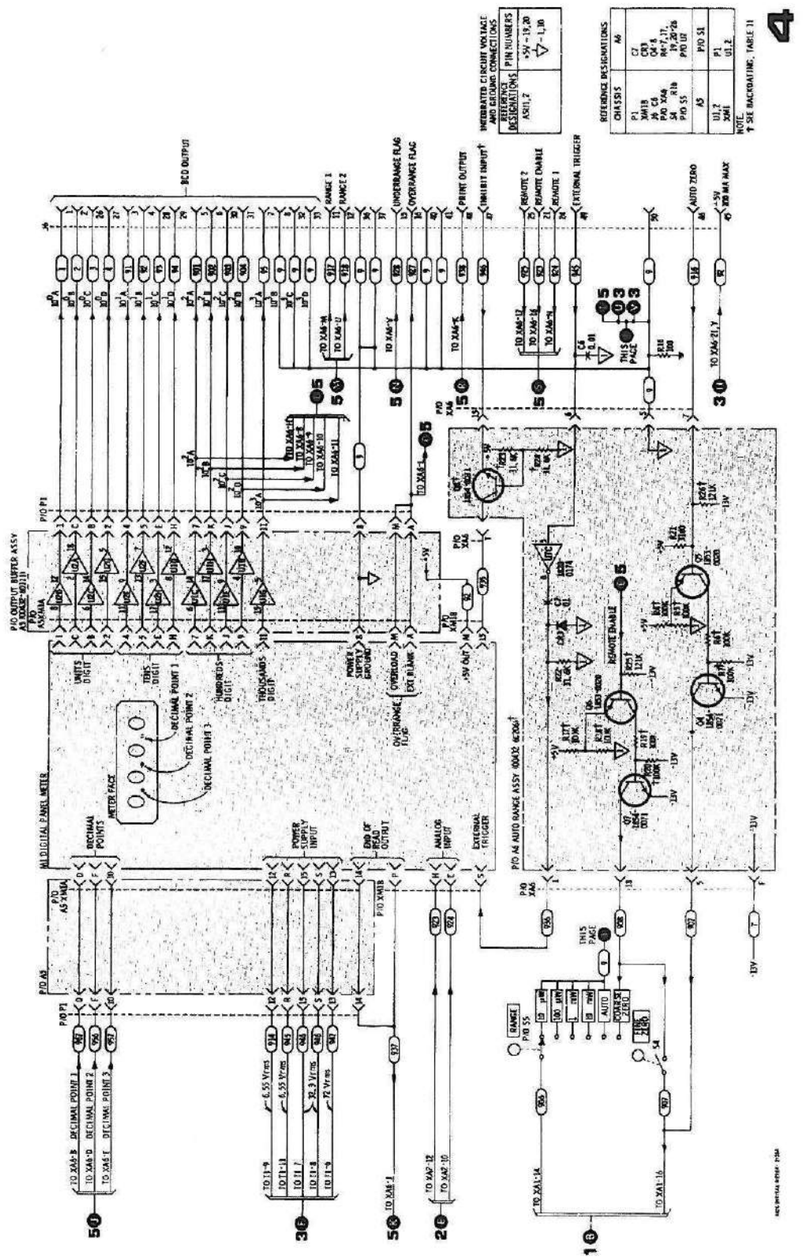


Figure 30. Digital Panel Meter Schematic

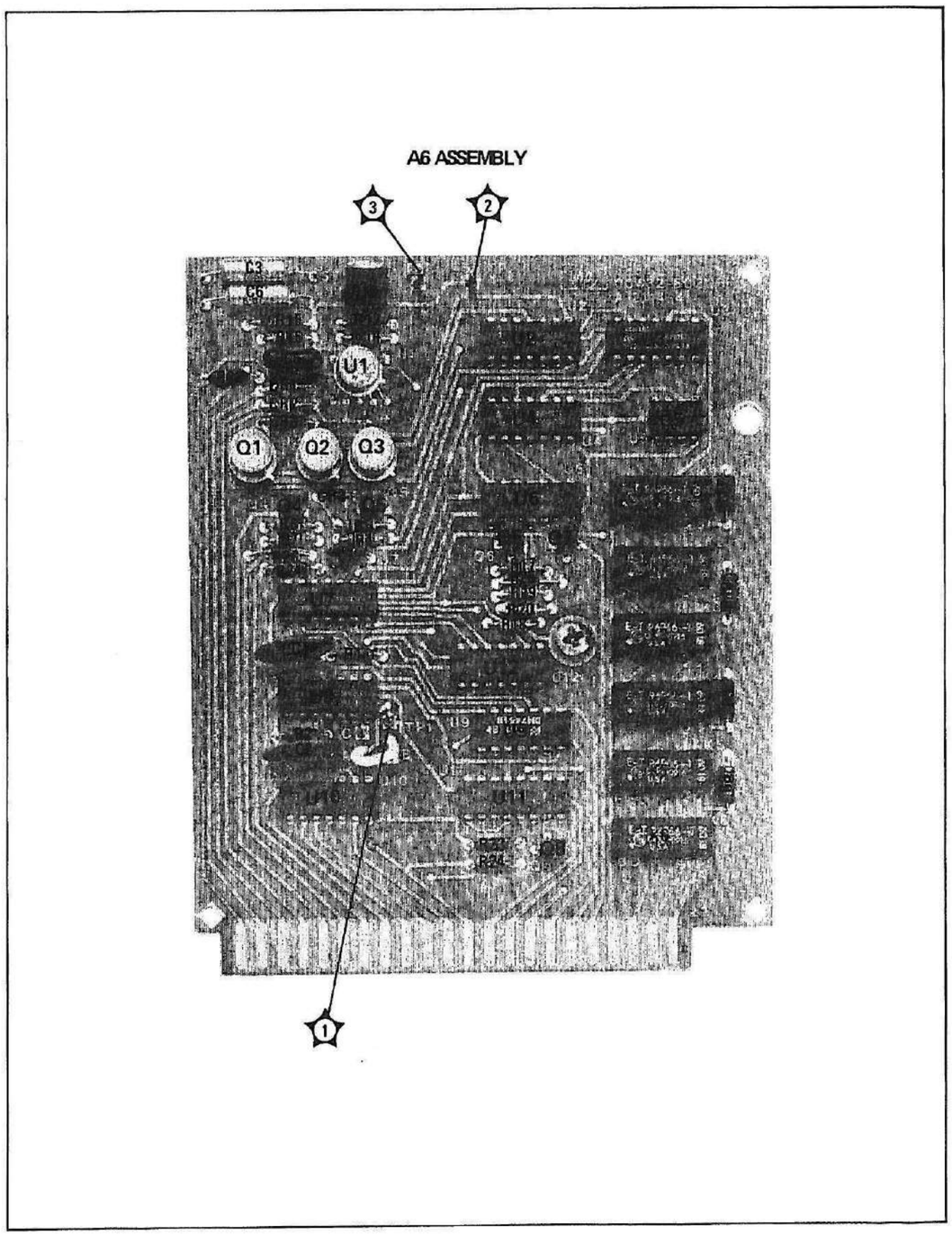
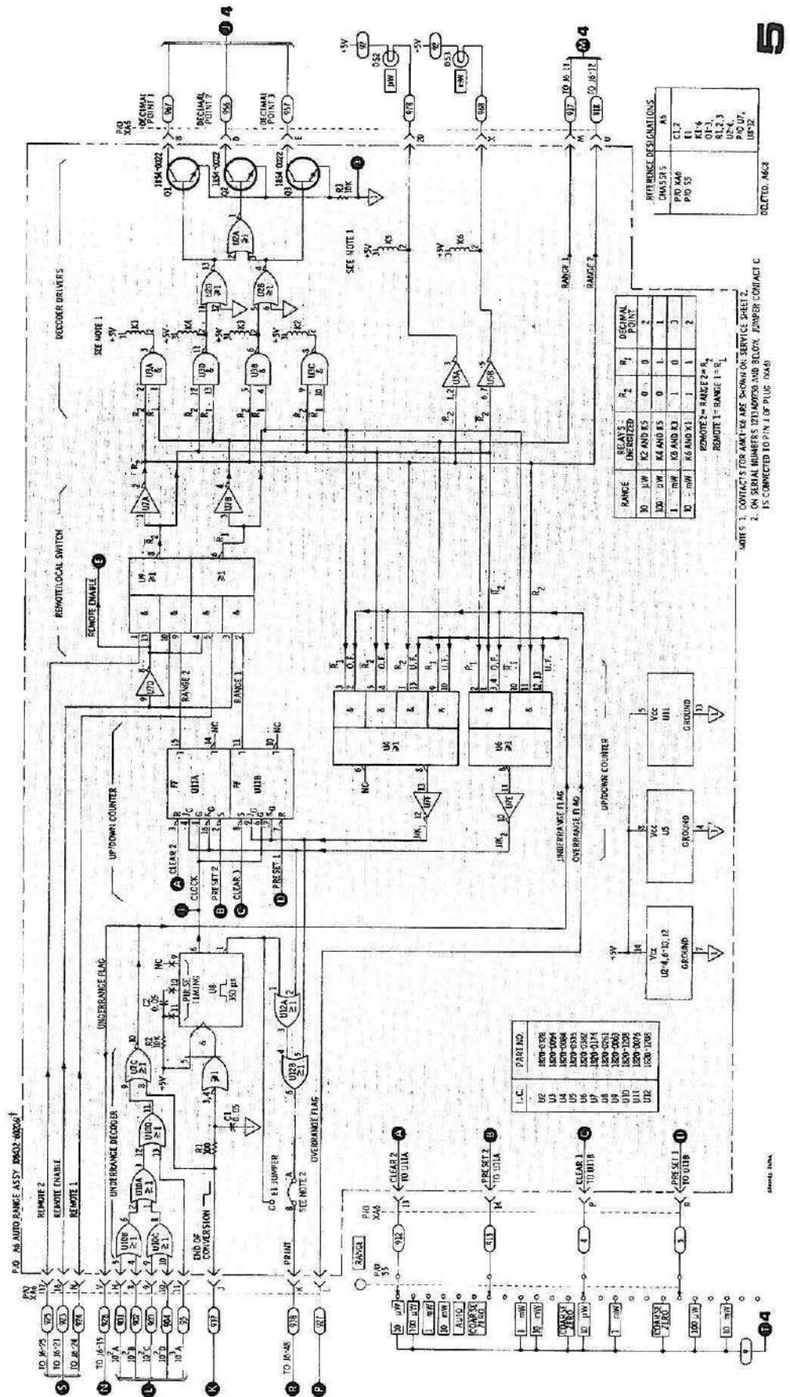


Figure 31. Auto Range Assembly A6 Component Locations†



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