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# Service Manual

Type 2553
DC VOLTAGE/CURRENT
STANDARD

TUCKER MASTER




YEW
YOKOGAWA ELECTRIC WORKS

SM 2553-1E

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**OPTION**

**Type 2578-25 TEMPERATURE PROBE**


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# 1. OPERATING PRINCIPLE AND CONFIGURATION

## 1.1 Introduction

The Type 2553 DC Voltage/Current Standard has been developed with a new concept as a sister model of the portable instrument now popular on the market. Its output is exact and stable by adoption of a D-A conversion based on a correct time instead of a conventional resistive division.

All settings by logic signals reduce influence by contact resistance of switches and provide the high precision and multi-function instrument with an expandability to a programmable instrument in keeping with present trends. The instrument features:

- **Temperature setting—mV generating function incorporated**

A dc mV equal to the thermo-emf centered on 0 °C and corresponding to any of five thermocouples (PR, CA, CRC, CC, IC) specified in JIS C 1602 and selected on the switch is automatically obtained just by setting a desired temperature with three controls. The incorporated ROM which memorizes the thermo-emf table for all the above thermocouples permits to deliver accurate outputs.

When calibrating a recorder, converter or measuring instrument for thermocouples, therefore, a thermo-emf table is no longer necessary. The Type 2578-25 Temperature Probe which is practical for calibrating the instrument itself and reference junction compensation circuit is optionally available.

- **Output dividing function incorporated**

The output divider dials have a function of obtaining n/m ths of a set output ($m = 1 \sim 15$, $n = 0 \sim 15$, $n/m \leqq 1$). When the output of the instrument is set at the full scale value of the measuring instrument or industrial instrument under test, therefore, inspection of its master graduations or linearity can quickly be effected just by turning the dial. Repeated settings at every master graduation is no longer necessary.

Because this output dividing function is also applicable to the temperature range, a mV output for each divided temperature of a set temperature indicated can be obtained.

- **No-contact output setting by photocouplers**

The output setting dials are of a no-contact mechanism using two photoelectric elements. The microprocessor discerns the rotating direction and counts the number of displacement steps according to two phase rotation detecting outputs. Range setting, output divider setting and other information are also treated in the form of logic signals for processing by the microprocessor. Influence by change of contact resistance of the switch or thermo-emf is eliminated, whereby the instrument operation remains unaffected.

Thus the repeatability and stability are excellent, and the high reliability is maintained.

- **Automatic carry and borrow function adopted on output setting dial**

While on the classic instruments a carry from 9999 to 10000 or a borrow from 10000 to 9999 entailed troublesome manipulations, this instrument is provided with an automatic carry and borrow function which permits such an operation just by the LSD dial. On this instrument, troublesome operation is not only unnecessary at carry or borrow but also the output can be changed continuously. Such features make the instrument suited for alarm setting inspection and hysteresis measurement.

- **GP-IB system adopted**

The Type 2553-01 incorporates GP-IB (General Purpose Interface Bus) which conforms to IEEE Std. 488-1975 both electrically and structurally. It permits to externally set the range, output level, polarity and output ON/OFF and also to externally output the setting information. These features make the instrument useful as a component of an automatic testing system.

- **Self-calibration adopted**

On this instrument, compensation corresponding to zero and span adjustments for each range is made digitally by a self-calibration according to memorization in the incorporated memory elements.

## 1.2 Operating Principle

Figure 1-1 shows the block diagram and signal waveforms of this instrument.

In the figure, the reference voltage $V_S$ enters the integrator, where it is integrated for the pulse duration corresponding to a value set on the front panel. The integrator output $V_I$ enters the sample hold circuit, where the final value is held. Its output $V_H$ enters the amplifier, where it is amplified to a final output $V_O$ according to the range setting.

The pulse width which determines an integration period is obtained by dividing the oscillation frequency of the crystal oscillator and, therefore, is excellent in linearity and stability against temperature change.

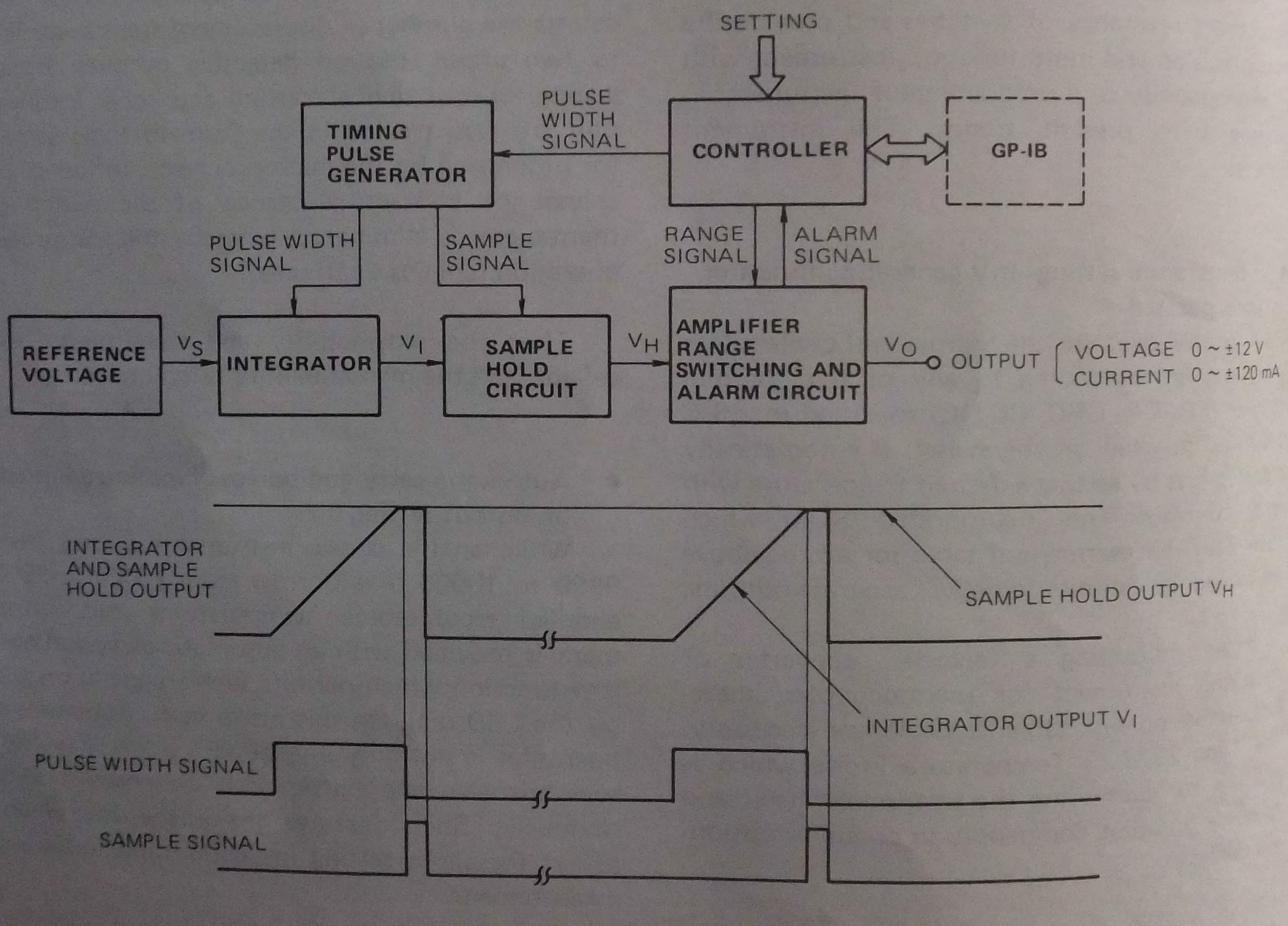



**Figure 1-1. Operating Principle.**

## 1.3 Configuration

### 1.3.1 Power Supply Assembly

The assembly consists of fuse, main switch, power transformer, noise filter and battery for protecting calibration constant memory. The OUT GUARD output appears on the connector on the mother board parts side, and the IN GUARD output on screwed compression terminal on the mother board pattern side.

### 1.3.2 Display Assembly

The assembly consists of display PCB assembly and photoelectric switch mechanism.

**A. Output Setting Dials**

All the three output setting dials consist of no-contact photoelectric switches. All the switches for three digits are of an incremental type. The rotating direction and number of clicks in rotation are detected by two-phase output signals.

**B. Range and Output Divider Dials**

Because the information from the range and output divider dials is also digital signals to be inputted to the microprocessor, the configuration is so arranged that increase of the contact resistance of the switches up to about 500 Ω does not cause setting errors.

They are designed in such a manner that their operation is toward a safer side when erroneously handled as described below:

- When changing the range, output is automatically turned off.
- When setting beyond the output setting span of the range, the set value does not change even by rotating the dial.
- When setting has become beyond the output span after changing the range, the output is not turned on. (For example, if the range is changed to 10 V after 1600 °C is set at the PR range, the output setting becomes 16 V but output is not turned on. Output is turned on by reducing the output setting to 12 V or lower.)
- The output divider dials are of an auto lock mechanism so that the coefficient does not surpass 1.

### 1.3.3 Mother Board Assembly

Comprises two stabilized power supplies, one for logics (+5 V) and the other for relays (+6.2 V), and an unregulated power supply of ±28 V for analog circuits.

The mother board assembly also includes LED driver for connecting the display control assembly and display assembly, and relay driver for actuating relays on the A-D/D-A assembly.

### 1.3.4 CPU Card Assembly

This is a CPU (Central Processing Unit) card provided with μPD8085A whose operating clock is at 2.5 MHz.

It also includes 4 k byte MASK ROM: μPD 2332C as program memory, 256 byte RAM: μPD8156C having I/O port as data memory, 256 × 4 bit FUSE ROM: μPB403C as calibration constant memory, and 256 × 4 bit CMOS RAM: μPD5101 LC.

### 1.3.5 A-D/D-A Card Assembly

Consists of all the analog section and the output circuit of the Type 2553.

As shown in the A-D/D-A Card Assembly block diagram in Figure 1-2, analog conversion is made by sample hold of the integrator output at a timing corresponding to digital setting, and its output is changed according to the range setting to obtain an instrument output.

By the comparator for the A-D conversion which compares the integrator output with the temperature probe output voltage, an output of a pulse width corresponding to the probe output voltage (A-D conversion output) is obtained.

The A-D and D-A conversion has a resolution of 16 bits (65536 counts/rating).

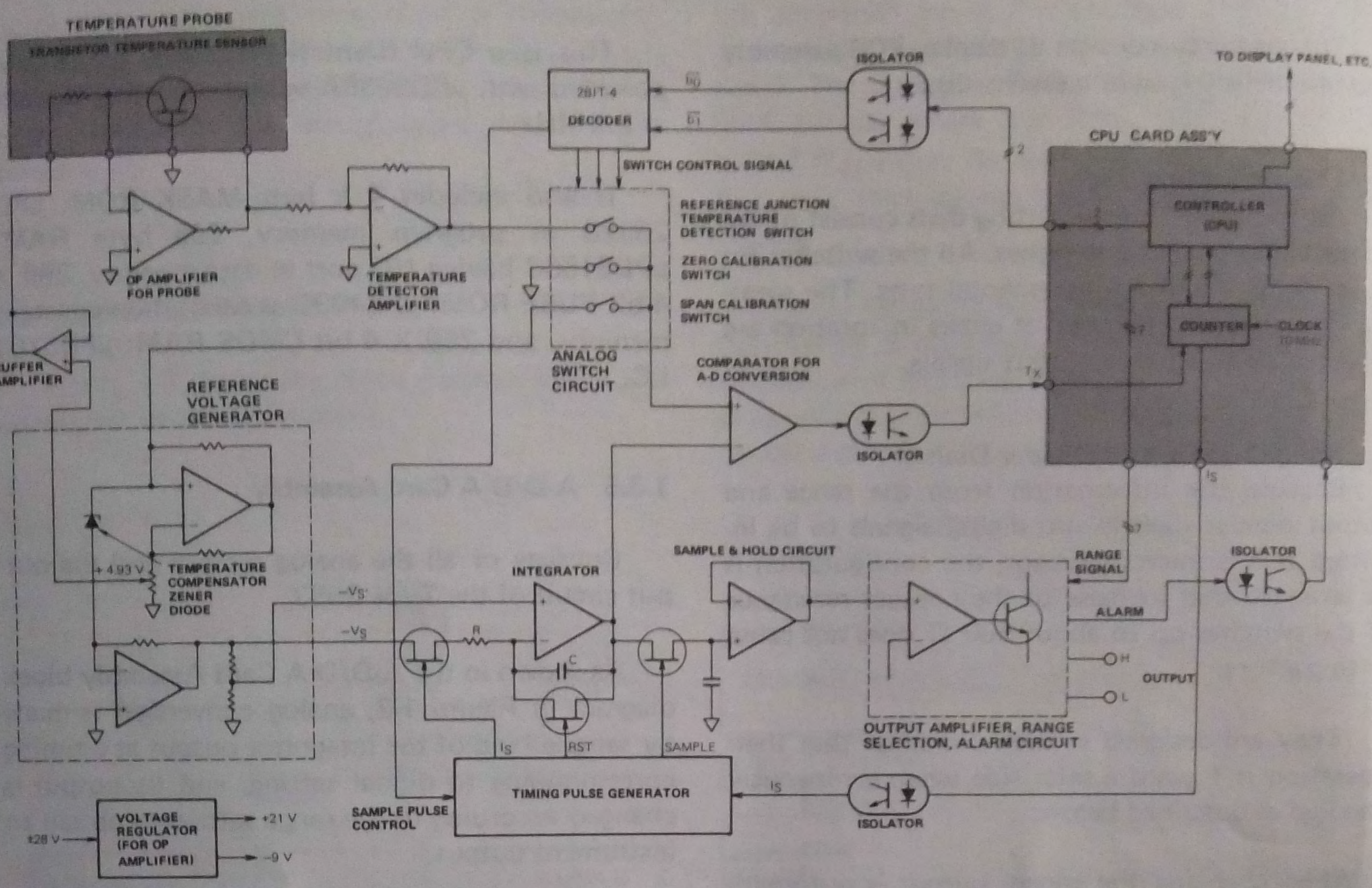



**Figure 1-2. A-D/D-A Card Ass'y Block Diagram.**

# 2. INSPECTION

## 2.1 Introduction

This chapter concerns the inspection of the Type 2553.

Although the Type 2553 is factory-adjusted to satisfy all the specifications described in 2.2 and delivered after strict intracompany inspection, periodical inspection and readjustment are necessary in order to maintain the accuracy for an extended length of time and operate the instrument usefully.

For the inspection, refer to 2.4 and 2.5. If adjustment is necessary incidental to the inspection or when parts are replaced for repair, refer to "4. ADJUSTMENT" and "5. CALIBRATION".

For general handling of the instrument at the time of inspection or adjustment, refer to the separate **instruction manual for the Type 2553 DC Voltage/Current Standard.**

## 2.2 Specifications

| Range | Span | Accuracy (at 23 ± 3 °C) | Max. Output | Inner Resistance | Output Resolution |
|---|---|---|---|---|---|
| 10V | 0 ~ ±12.000 V | ±0.02 % of range | Approx. 120 mA | 10 mΩ max. | 1 mV |
| 1 V | 0 ~ ±1.2000 V | ±0.02 % of range | Approx. 120 mA | 10 mΩ max. | 100 μV |
| 100 mV | 0 ~ ±120.00 mV | ±0.02 % of range | *1) Approx. 1 kΩ | Approx. 1 Ω | 10 μV |
| 10 mV | 0 ~ ±12.000 mV | ±(0.02 % of range +4 μV) | *1) Approx. 1 kΩ | Approx. 1 Ω | 1 μV |
| 100 mA | 0 ~ ±120.00 mA | ±0.02 % of range | *2) Approx. 9 V | Approx. 1 MΩ | 10 μA |
| 10 mA | 0 ~ ±12.000 mA | ±0.02 % of range | Approx. 15 V | Approx. 10 MΩ | 1 μA |
| 1 mA | 0 ~ ±1.2000 mA | ±0.02 % of range | Approx. 15 V | Approx. 10 MΩ | 0.1 μA |

| DC voltage (mV) according to thermo-emf table in JIS C 1602-1974 is generated for following temperatures | | | At 25 °C step settings centered on 0 °C | At settings other than left | | | |
|---|---|---|---|---|---|---|---|
| *4) Thermocouple type | PR | 0 ~ 1600.0 °C | ± 2.7 °C | ± 3.0 °C | | Approx. 1 Ω | Approx. 1 °C |
| | CA | 0 ~ 1200.0 °C | ± 0.40 °C | ± 0.47 °C | | Approx. 1 Ω | Approx. 0.1 °C |
| | CRC | 0 ~ 700.0 °C | ± 0.25 °C | ± 0.31 °C | | Approx. 1 Ω | Approx. 0.1 °C |
| | IC | −200.0 ~ 600.0 °C | *3) ± 0.37 °C (± 0.68 °C) | *3) ± 0.44 °C (± 0.90 °C) | | Approx. 1 Ω | Approx. 0.1 °C |
| | CC | −200.0 ~ 200.0 °C | *3) ± 0.2 °C (± 0.35 °C) | *3) ± 0.25 °C (± 0.50 °C) | | Approx. 1 Ω | Equivalent to 1 μV |

*1) Minimum load resistance at which −0.1 % of error occurs
*2) Approx. 15 V up to 50 mA
*3) Value in parentheses is for setting below 0 °C
*4) When transistor prove is used, accuracy of reference junction compensation is ±0.38 °C (±0.66 °C for PR) at measurement range comprised between 0 and +50 °C

Output setting :
By 3 dials (no-contact type with photo-couplers)
Dials 1, 2 . . . . . 16 steps/rev
Dial 3 . . . . . 32 steps/rev
Setting display : 5 digit LEDs
Units display : mV/V/mA/°C
Divided output :

$$= \text{setting} \times \frac{n}{m}$$

m; 1, 2, . . . . . , 15 (equally divided by 15)
n; 0, 1, . . . . . , 15
where $n \leqq m$
Divider accuracy : Within ±1 LSD
Output ripple :
100 mV/1/10 V/10/100 mA ranges
±0.01 % of range (dc to 60 Hz component)
1 mA range
±0.05 % of range
Temperature coefficient :
50 ppm/°C at 5 to 40 °C
Warmup : 30 min minimum
CMRR : For dc to 60 Hz
voltage output . . . Approx. 120 dB
current output . . . Approx. 0.1 μA/V
Line regulation :
±0.02 % of range at 100 V ac ±10 %
Calibration cycle : 3 months
Current limiter :
Approx. 200 mA (manual reset)
Voltage limiter :
Approx. 15 V (manual reset)
Operating temperature range :
5 to 40 °C
Operating humidity range :
5 to 95 % RH
Insulation resistance :
100 MΩ min./500 V dc between power supply and case
100 MΩ min./500 V dc between case and guard
Dielectric strength :
1500 V ac for 1 min between power supply and case
100 V ac for 1 min between case and guard
Power source :
100 V ac ±10 %, 50/60 Hz
(120, 200, 220, 240 V ac available upon request)
Power consumption : 50 VA

External dimensions :
Approx. 149 × 228 × 365 mm
Weight : Approx. 8 kg
Accessories :

| | |
|---|---|
| 1 pc | power cord |
| 2 pcs | fuses |
| 1 copy | instruction manual |
| 2 pcs | dry cells (SUM-3N) |

**Type 2589-01 GP-IB Block (incorporated in Type 2553-01 only)**

Electrical specifications :
Conform to IEEE Std. 488-1975
Structural specifications :
Conform to IEEE Std. 488-1975
Functional specifications :
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Employed code : ISO code
Address designation :
Select switch sets talker/listener address out of 0 to 15
Remote status reset :
Remote status is reset by throwing selector to LOCAL mode unless LOCAL LOCK-OUT is made by controller

**Type 2578-25 Temperature Probe (option)**

Measurement range : −20 to 60 °C
Accuracy :
±0.3 °C combined with Type 2553 (in temperature measurement at R.J. TEMP range)
Insulation resistance :
100 MΩ min./500 V dc between terminal tip and Type 2553 ⏚ terminal
Dielectric strength :
100 V ac, 50/60 Hz for 1 min between terminal tip and Type 2553 ⏚ terminal
Cord length : Approx. 2 m
Terminals : Material . . . copper
: Shape . . . . round
Accessories : 5 pcs round tips

**REFERENCE**

For the Type 2553-01 individually, GP-IB Block functions are as shown in the table below:

| Function | Contents |
|---|---|
| SH1 | With all transmission handshake functions |
| AH1 | With all reception handshake functions |
| T6 | Basic talker function |
| | Serial polling |
| | Talker cancel function by MLA |
| L4 | Basic listener function |
| | Listener cancel function by MTA |
| SR1 | With all service request functions |
| RL1 | With all remote local functions |
| PP0 | Without parallel polling function |
| DC1 | With all device clear functions |
| DT1 | With all device trigger functions |
| C0 | Without control function |

The Type 2553-01 itself has functions of T5 (T6 and talk only mode) as a talker but, when used individually, the talk only mode cannot be used.

The talk only mode can be used only when the instrument is incorporated in the Type 2560-03, 04 DC Calibration System.

## 2.3 Rewiring of Power Transformer Primary and Change of Fuse Incidental to Change of Line Voltage

The power transformer primary is wired as illustrated in Figure 2-1 according to the particular line voltage. When using the instrument in a district where the line voltage is different, therefore, rewire the primary windings of the power transformer mounted on the Power Supply Assembly: B9268DA.

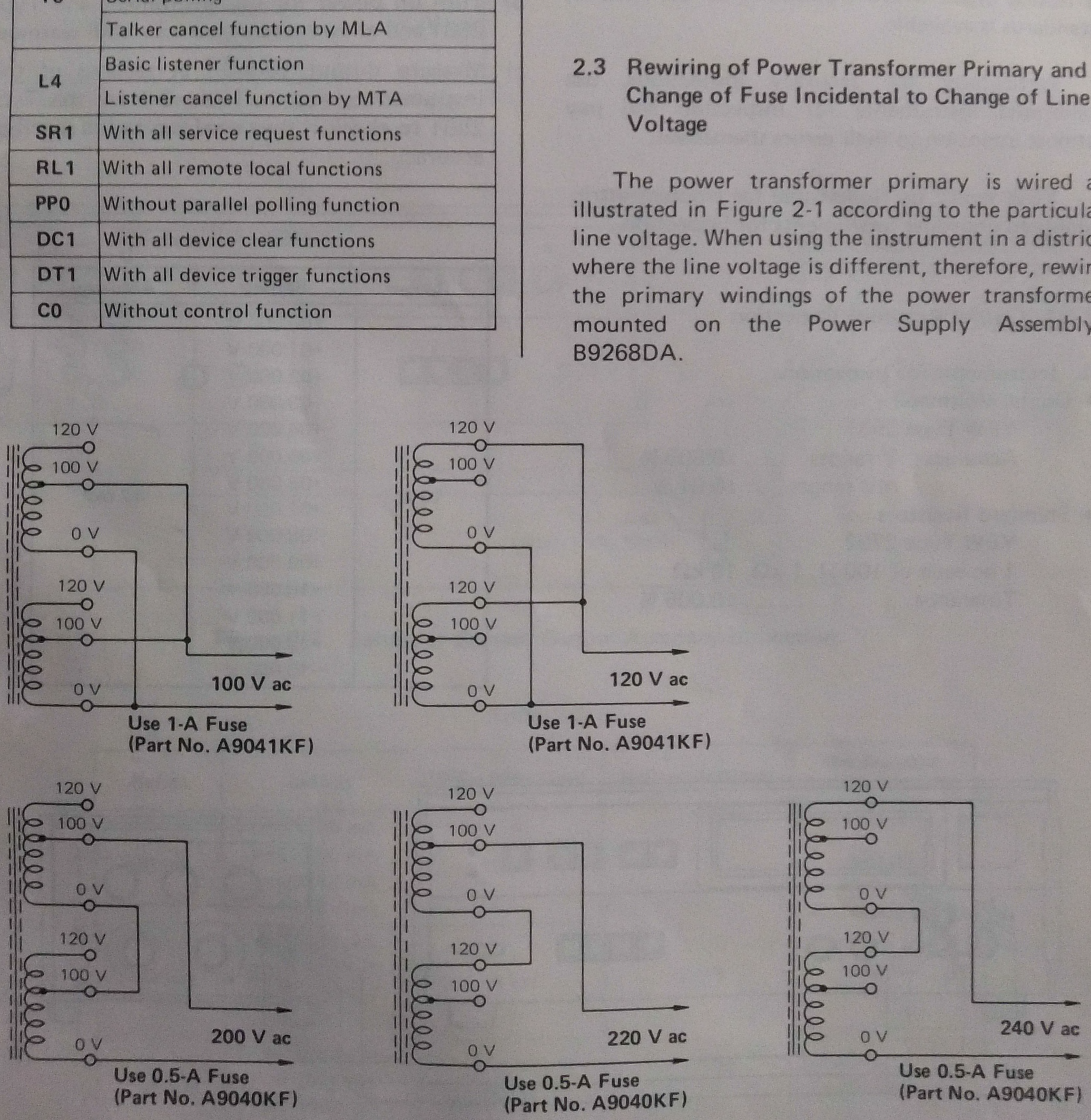



Figure 2-1. Tap Connection of Power Transformer.

Use a 1-A fuse (P/N: A9041KF) for a line voltage 100/120 V or a 0.5-A fuse (P/N: A9040KF) for 200/220/240 V.

## 2.4 Inspection (general)

Inspect this instrument using the following instruments or equivalent instruments the accuracy of which is warranted by periodical inspections at a testing organ where traceability to the national standards is available.

Particularly for accuracy inspections, use calibrated instruments for inspection and pay utmost attention to their errors themselves.

YEW won't be responsible for troubles attributable to improper instruments for inspection.

### 2.4.1 Output Accuracy Inspection

**A. Instruments for Inspection**

- Digital Voltmeter :
  YEW Type 2501
  Accuracy; V ranges . . . ±0.005 %
  mV ranges . . . ±0.01 %
- Standard Resistors :
  YEW Type 2792
  1 pc each of 100 Ω, 1 kΩ, 10 kΩ
  Tolerance . . . . . ±0.005 %

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 3 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz
- Inspection setup : As specified below

**C. Voltage Output Accuracy Inspection**

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 1 V.

b) Turn on power for this instrument and Type 2501 and allow more than a four hour warmup.

c) Measure output voltages at settings of this instrument given in Table 2-1 by the Type 2501 to check if they conform to the specified accuracy.

**Table 2-1.**

| Range | Setting | Accuracy |
|---|---|---|
| 10 V | +00.000 V<br>+01.000 V<br>+02.000 V<br>+03.000 V<br>+04.000 V<br>+05.000 V<br>+06.000 V<br>+07.000 V<br>+08.000 V<br>+09.000 V<br>+10.000 V<br>+11.000 V<br>+12.000 V<br>−10.000 V | ±2 mV |

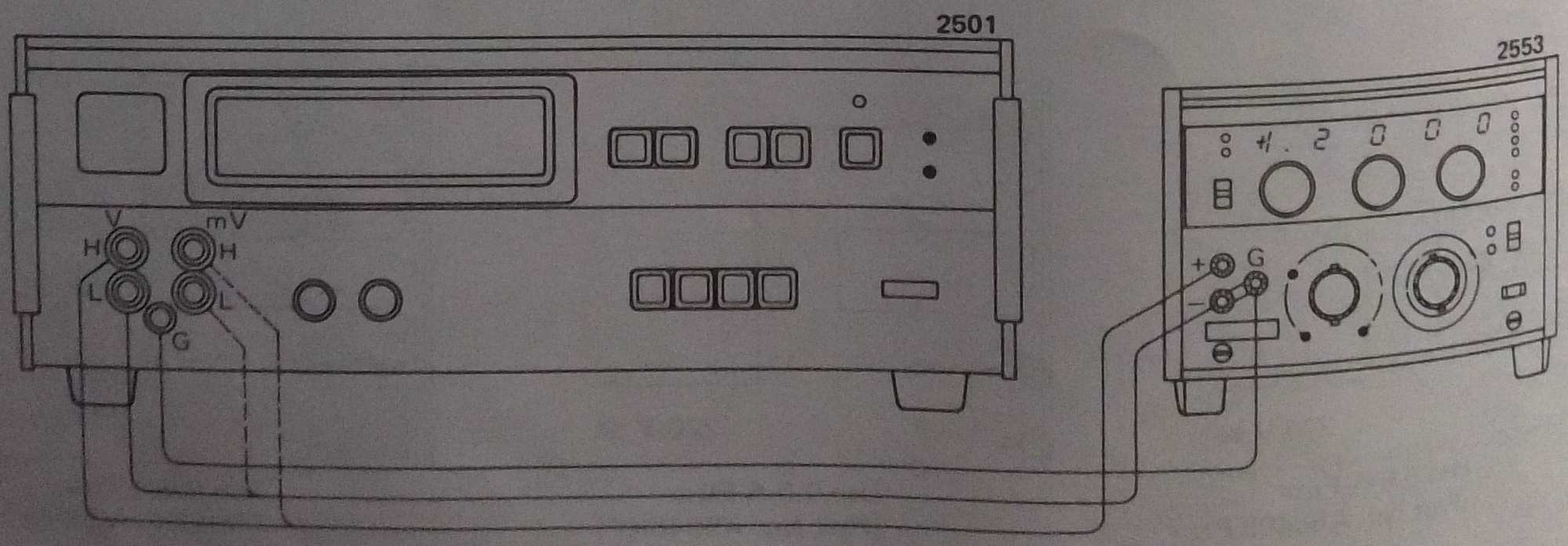



Figure 2-2. Setup for Voltage Output Accuracy Inspection.

Table 2-1. (continued)

| Range | Setting | Accuracy |
|---|---|---|
| 1 V | +0.0000 V<br>+0.1000 V<br>+1.0000 V<br>−1.0000 V | ±0.2 mV |
| 100 mV | +000.00 mV<br>+010.00 mV<br>+100.00 mV<br>−100.00 mV | ±20 μV |
| 10 mV | +00.000 mV<br>+01.000 mV<br>+10.000 mV<br>−10.000 mV | ±6 μV |

Accuracy: 10 V, 1 V, 100 mV ranges; ±0.02 % of range
10 mV range; ±(0.02 % of range +4 μV)

## D. Current Output Accuracy Inspection

a) Connect this instrument, Type 2501 and Type 2792 as shown in Figure 2-3 and measure voltage drops across the voltage terminals of the Type 2792 at each setting given in Table 2-2 by the Type 2501.

b) Recalculate the values into currents to check if the output currents at each of the inspection points conform to the specified accuracy.

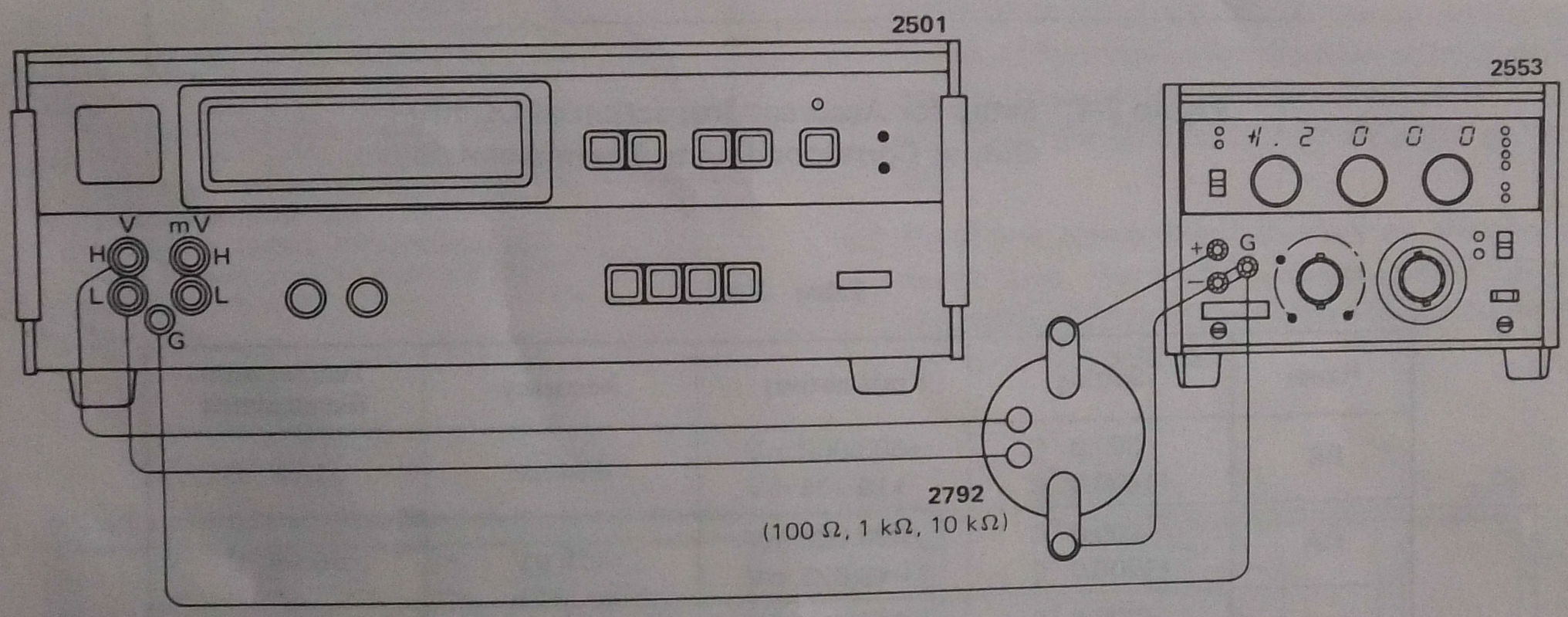



Figure 2-3. Setup for Current Output Accuracy Inspection.

Table 2-2.

| Range | Setting | Type 2792 Used | Voltage Accuracy | Recalculated Current Accuracy |
|---|---|---|---|---|
| 100 mA | +000.00 mA<br>+010.00 mA<br>+100.00 mA<br>−100.00 mA | 100 Ω | ±2 mV | ±20 μA |
| 10 mA | +00.000 mA<br>+01.000 mA<br>+10.000 mA<br>−10.000 mA | 1 kΩ | | ±2 μA |
| 1 mA | +0.0000 mA<br>+0.1000 mA<br>+1.0000 mA<br>−1.0000 mA | 10 kΩ | | ±0.2 μA |

Accuracy: ±0.02 % of range

### E. Accuracy Inspection of DC mV Output Corresponding to Thermo-emf

a) Connect this instrument and Type 2501 as shown in Figure 2-4, and measure mV output voltages of this instrument at each setting given in Table 2-3 by the Type 2501.

b) Check if the dc mV outputs conform to the specified accuracy.

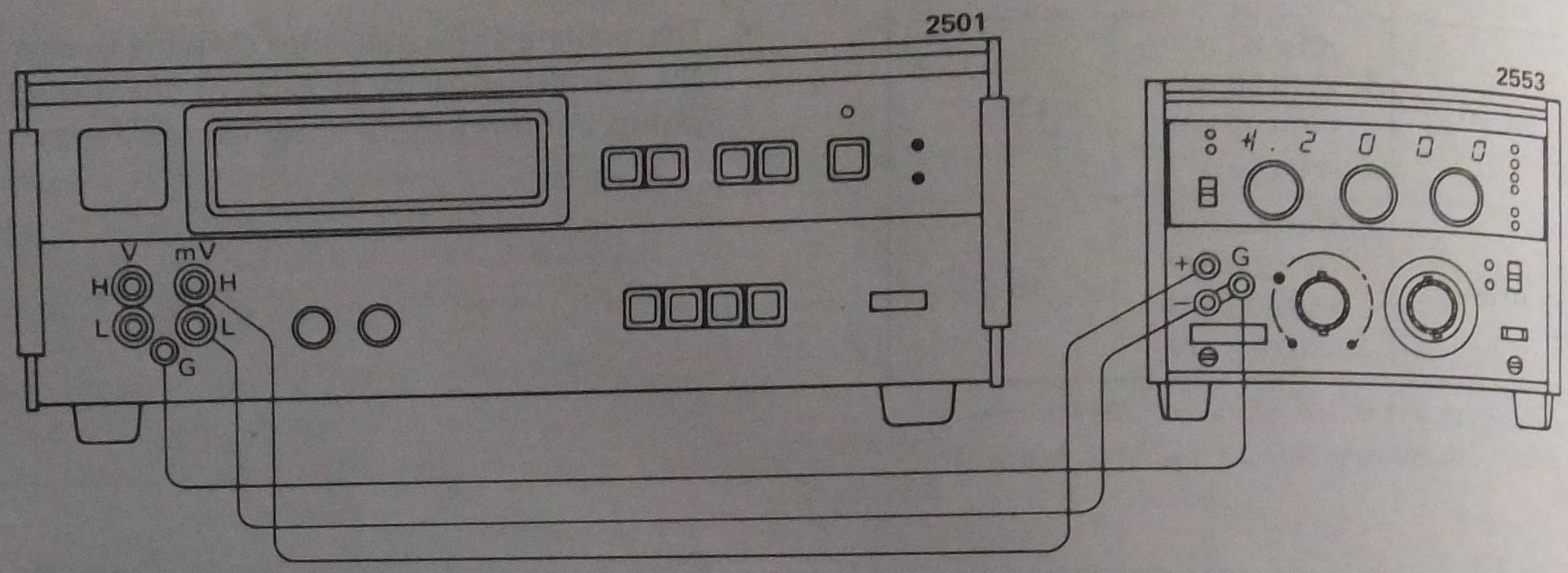



**Figure 2-4. Setup for Accuracy Inspection of DC mV Output Corresponding to Thermo-emf.**

**Table 2-3.**

| Range | Setting | mV output | Accuracy | Temperature Recalculated |
|---|---|---|---|---|
| PR | +000.0 °C<br>+1600.0 °C | +000.000 mV<br>+18.735 mV | ±14 μV | ±2.68 °C |
| CA | +000.0 °C<br>+1200.0 °C | +000.000 mV<br>+48.828 mV | ±15 μV | ±0.40 °C |
| CRC | +000.0 °C<br>+700.0 °C | +000.000 mV<br>+53.110 mV | ±15 μV | ±0.25 °C |
| IC | –200.0 °C<br>+000.0 °C<br>+600.0 °C | –7.8905 mV<br>+000.000 mV<br>+33.096 mV | ±15.5 μV<br>±18 μV | ±0.69 °C<br>±0.37 °C |
| CC | –200.0 °C<br>+000.0 °C<br>+200.0 °C | –5.603 mV<br>+000.000 mV<br>+9.286 mV | ±6 μV<br>±7.8 μV | ±0.35 °C<br>±0.16 °C |

### F. Divided Output Accuracy Inspection

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 10 V and 12 V, respectively.

b) Set the m- and n-dials of the output divider to 15.

c) According to Table 2-4, successively change n-dial settings, and take readings on the Type 2501 at each setting. From the readings, check if the accuracy of the divided output conforms to the specification.

Table 2-4.

| m | n | Divided Output | Accuracy |
|---|---|---|---|
| 15 | 15 | 12.000 V | ±3 mV* |
| | 14 | 11.2000 V | |
| | 13 | 10.4000 V | |
| | 12 | 9.6000 V | |
| | 11 | 8.8000 V | |
| | 10 | 8.0000 V | |
| | 9 | 7.2000 V | |
| | 8 | 6.4000 V | |
| | 7 | 5.6000 V | |
| | 6 | 4.8000 V | |
| | 5 | 4.0000 V | |
| | 4 | 3.2000 V | |
| | 3 | 2.4000 V | |
| | 2 | 1.6000 V | |
| | 1 | 0.8000 V | |
| | 0 | 0.0000 V | |

* Divided output accuracy
= ± (output accuracy + divider accuracy)
= ± (0.02 % of range + 1 displayed LSD)
= ± ( 2 mV + 1 mV)
= ±3 mV

### 2.4.2 Accuracy Inspection of Reference Junction Temperature Detection

**A. Instruments for Inspection**

- DC Voltage Standard :
  YEW Type 2552
  Accuracy; ±0.005 % of setting

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 3 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz
- Inspection setup : As specified below

**C. Inspection Procedure**

a) See Figure 2-5. Using the Type 2552, apply between the pins A (COM side) and F (– side) of the R.J. INPUT connector on the rear panel of this instrument voltages corresponding to the base-emitter voltages $V_{BE}$ at 0 °C and 50 °C of the temperature probe given in Table 2-5.

b) Read the temperature displays on this instrument and, from the readings, check if the reference junction compensation conforms to the specified accuracy.

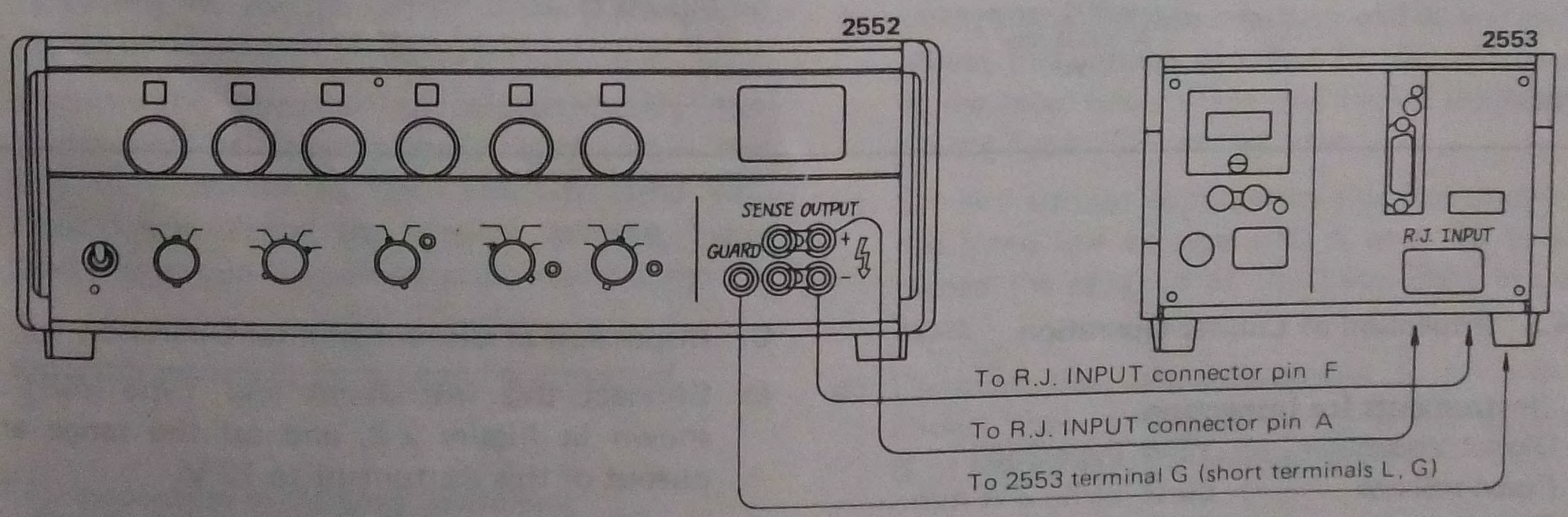



Figure 2-5. Setup for Accuracy Inspection of Reference Junction Temperature Detection.

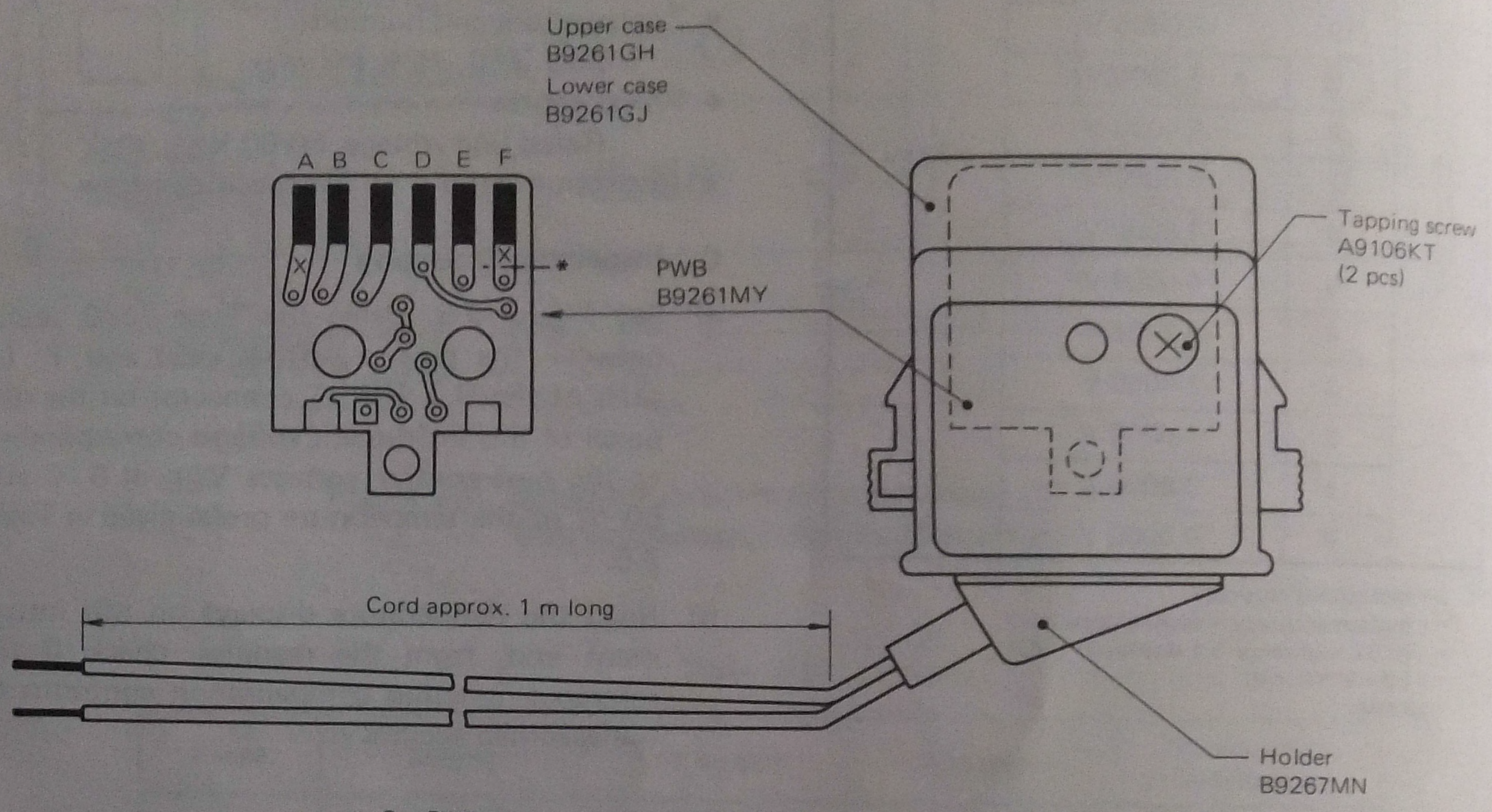
Table 2-5.

| Range | Type 2552 Output Setting | Type 2553 Display | Accuracy |
|---|---|---|---|
| R.J. TEMP | –623.29 mV | +000.0 °C | ±0.1 °C |
| | –506.05 mV | +050.0 °C | |

## REFERENCE

For a structural reason, the R.J. INPUT connector is mounted on a position recessed from the rear panel. In this inspection, therefore, you might find difficulty in applying the output of the Type 2552 to the connector terminals.

To solve this inconvenience, it is recommended to build a jig for inspection as illustrated below using parts for temperature probe.




* Cut PWB patterns at dotted line and solder cord cores to X.
R.J. INPUT connector
A: COM side
F: – side

### 2.4.3 Inspection of Limiter Operation

**A. Instruments for Inspection**

- Digital Voltmeter : YEW Type 2501
- Fixed resistor : 50 Ω ±1 %, 2 W min.
- Rheostat : 2 kΩ, 0.2 W min.

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz
- Ranges :
  Current limiter operation; 10 V range
  Voltage limiter operation; 10 mA range

**C. Inspection of Current Limiter Operation**

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 10 V.

b) Throw the OUTPUT switch to ON. The OUTPUT ON lamp will come on. By the Type 2501, confirm that a voltage of 10 V appears on the output terminals.

c) Connect the resistor of 50 Ω between the output terminals of this instrument. Confirm that the OUTPUT OFF lamp lights this time and that the output voltage disappears.

d) Remove the resistor of 50 Ω connected between the output terminals, and throw the OUTPUT switch to ON. Confirm that the ON lamp lights and that a voltage of 10 V reappears between the output terminals.

e) From the above, it can be inspected whether the current limiter of this instrument operates normally at a current output of approximately 200 mA.

**D. Inspection of Voltage Limiter Operation**

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 10 V.

b) Set the rheostat of 2 kΩ to approximately the middle of its variable range, and connect it between the output terminals of this instrument.

c) Throw the OUTPUT switch to ON. Confirm that the ON lamp lights and that the Type 2501 reads about 10 V.

d) Gradually increase the resistance of the rheostat until the voltage limiter trips. The trip can be discerned by the fact that the OFF lamp lights and that the Type 2501 reads almost zero.

e) Note the reading on the Type 2501 immediately before the voltage limiter trips. It should be comprised between 15 and 18 V.

f) Return the rheostat to approximately the middle of its variable range, and throw the OUTPUT switch to ON. The ON lamp will light again. From the display on the Type 2501, ascertain that an output appears again.

g) By the above, whether the voltage limiter operates normally or not can be inspected.

### 2.4.4 Inspection of Polarity Switching

**A. Instrument for Inspection**

- Digital Voltmeter : YEW Type 2501

**B. Procedure**

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 10 V.

b) Throw the OUTPUT switch to ON, and change the polarity switch to (+) and (−) alternately.

c) From the polarity displays on the Type 2501 at this time, ascertain that the output polarity of this instrument changes properly.

### 2.4.5 Line Regulation Inspection

**A. Instruments for Inspection**

- Digital Voltmeter :
  YEW Type 2501
  Accuracy; V ranges . . . ±0.005 %
- Portable AC Ammeter :
  YEW Type 2013-18
  Class; 0.5
- AC voltage regulator :
  Variable beyond rated line voltage ±10 %

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Power source :
  Rated line voltage ±10 %, 50/60 Hz
- Range : 100 mV

**C. Procedure**

a) Connect this instrument and Type 2501 as shown in Figure 2-2, and set the range and output of this instrument to 100 mV and 120 mV, respectively.

b) Using the ac voltage regulator and ac voltmeter, adjust the voltage supplied to this instrument to the rated line voltage, and record the reading on the Type 2501 at this time.

c) Set the voltage supplied to this instrument to the rated line voltage −10 % and +10 %, and record the readings on the Type 2501 in both cases.

d) Compare the values measured in b) and c) above. Their difference should be within ±0.02 % of the set range or within 20 μV.

### 2.4.6 Insulation Resistance Inspection

**A. Instrument for Inspection**

- Insulation Resistance Tester :
  YEW Type 3213-13 (500 V/100 MΩ)

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Applied voltage : 500 V dc

C. Procedure

a) Disengage the power plug of this instrument from the power line, and turn on the POWER switch.

b) Ascertain that the output terminal (–) and GUARD terminal are securely short-circuited by the shorting link.

c) Ascertain that the terminal ⏚ and CIRCUIT COMMON terminal are securely short-circuited by the shorting link.

d) Using the Type 3213-13, measure the insulation resistance between a conductor of the power cord and the ⏚ terminal. The value should be higher than 100 MΩ.

e) Measure the insulation resistance between the GUARD terminal and ⏚ terminal. The value should be higher than 100 MΩ.

### 2.4.7 Dielectric Strength Inspection

A. Instrument for Inspection

- Dielectric strength tester :
  Variable between 0 and 1500 V ac, provided with current limiter

B. Inspection Conditions

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Applied voltages : See below

C. Procedure

a) Refer to 2.4.6 C. a), b) and c) above.

b) Set the current limiter of the dielectric strength tester to 10 mA.

c) Using the dielectric strength tester, apply a nearly sinusoidal wave of 1500 V, 50/60 Hz between a conductor of the power cord and the ⏚ terminal for one minute. This instrument should remain normal.

d) Apply a nearly sinusoidal wave of 100 V, 50/60 Hz between the ⏚ terminal and GUARD terminal for one minute. This instrument should remain normal.

## 2.5 Inspection (special)

**NOTE**

The following inspections need not be carried out every time the Type 2553 is inspected but only when a problem has occurred on a relevant item or when the inspection is expressly requested by the user.

### 2.5.1 Ripple and Noise Inspection

A. Instruments for Inspection

- Oscilloscope :
  TEKTRONIX Model 548B with Model 3A3 plugin or equivalent having sensitivity better than 100 μV/cm
- Insulation transformer
- Metal film resistor : 100 Ω ± 1 %, 2 W
  1 kΩ ± 1 %, 1/4 W
  10 kΩ ± 1 %, 1/4 W

B. Inspection Conditions

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz
- Inspection setup : As specified below

C. Ripple and Noise Inspection at Voltage Output

a) Connect this instrument, insulating transformer and oscilloscope with its frequency bandwidth set at 100 Hz, as shown in Figure 2-6.

b) Set the range and output of this instrument to 1 V and 1.0000 V, respectively.

c) Throw the OUTPUT switch of this instrument to ON and, using the oscilloscope, measure the ripple and noise in the output. Ascertain that the ripple or noise is less than 200 μV p-p or within ±0.01 % of range.

d) Proceed in the same way for the 100 mV and 10 V ranges.

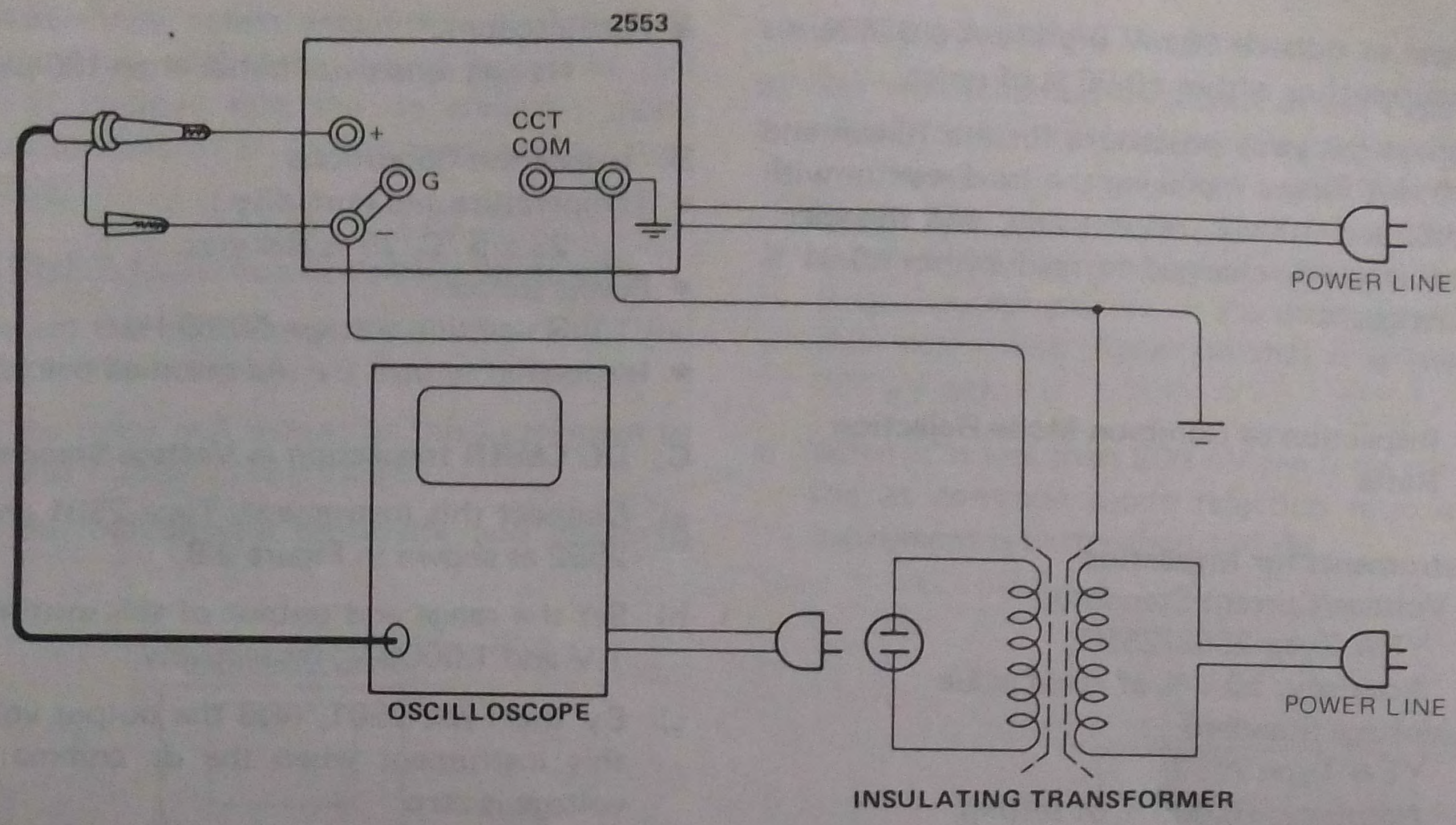



**Figure 2-6. Setup for Ripple and Noise Inspection at Voltage Output.**

### D. Ripple and Noise Inspection at Current Output

a) Connect this instrument, insulating transformer and oscilloscope with its frequency bandwidth set at 100 Hz, and connect the resistor of 10 kΩ between the output terminals of this instrument.

b) Set the range and output of this instrument to 1 mA and 1.0000 mA, respectively.

c) Throw the OUTPUT switch of this instrument to ON and, using the oscilloscope, measure the ripple and noise in the voltage developed across the load resistor of 10 kΩ. Ascertain that the

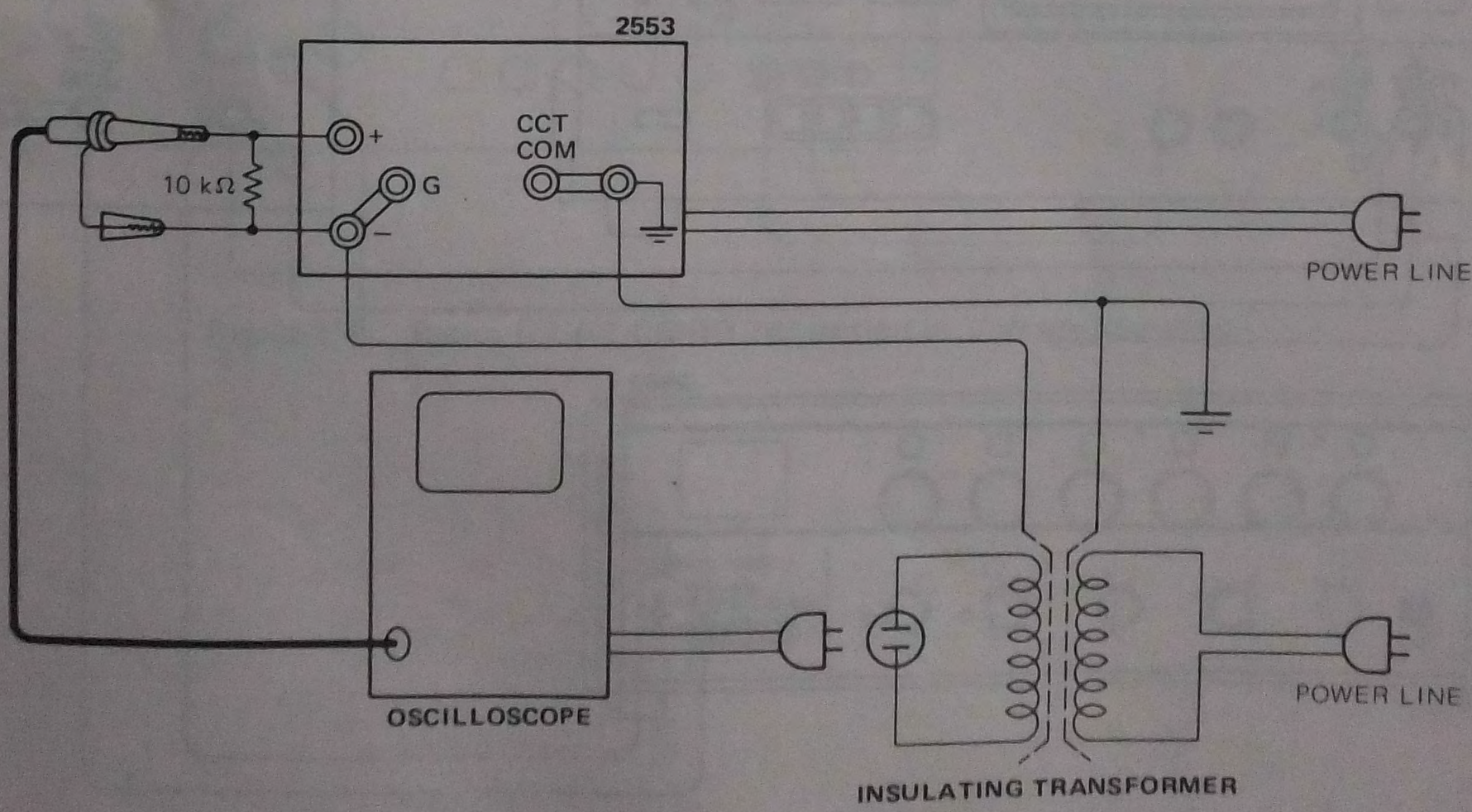



**Figure 2-7. Setup for Ripple and Noise Inspection at Current Output.**

ripple or noise is 10 mV p-p (1 μA p-p in terms of current) or within ±0.05 % of range.

d) Repeat the same procedure for the 10 mA and 100 mA ranges replacing the load resistor with 1 kΩ and 100 Ω, respectively, and the specified accuracy changed to read within ±0.01 % of range.

### 2.5.2 Inspection of Common Mode Rejection Ratio

**A. Instruments for Inspection**

- AC Voltage/Current Standard :
  YEW Tyep 2858/2558
  Accuracy; ±0.1 % of rated value
- DC Voltage Standard :
  YEW Type 2552
  Accuracy; ±0.005 % of setting
- Digital Voltmeter :
  YEW Type 2501
  Accuracy; V ranges . . . . ±0.005 %
  mV ranges . . . ±0.01 %
- Standard Resistor :
  YEW Type 2792 (1 kΩ)
  Tolerance; ±0.005 %
- Oscilloscope:
  Having sensitivity better than 100 μV/cm

**B. Inspection Conditions**

- Temperature and humidity :
  23 ± 5 °C, 75 % RH max.
- Power soruce :
  Rated line voltage, 50/60 Hz
- Inspection setup : As specified below

**C. DC CMRR Inspection as Voltage Standard**

a) Connect this instrument, Type 2501 and Type 2552 as shown in Figure 2-8.

b) Set the range and output of this instrument to 1 V and 1.0000 V, respectively.

c) By the Type 2501, read the output voltage of this instrument when the dc common mode voltage is zero.

d) By the Type 2552, apply a dc common mode voltage of 100 V between the two points illustrated below, and read the output voltage of this instrument by the Type 2501.

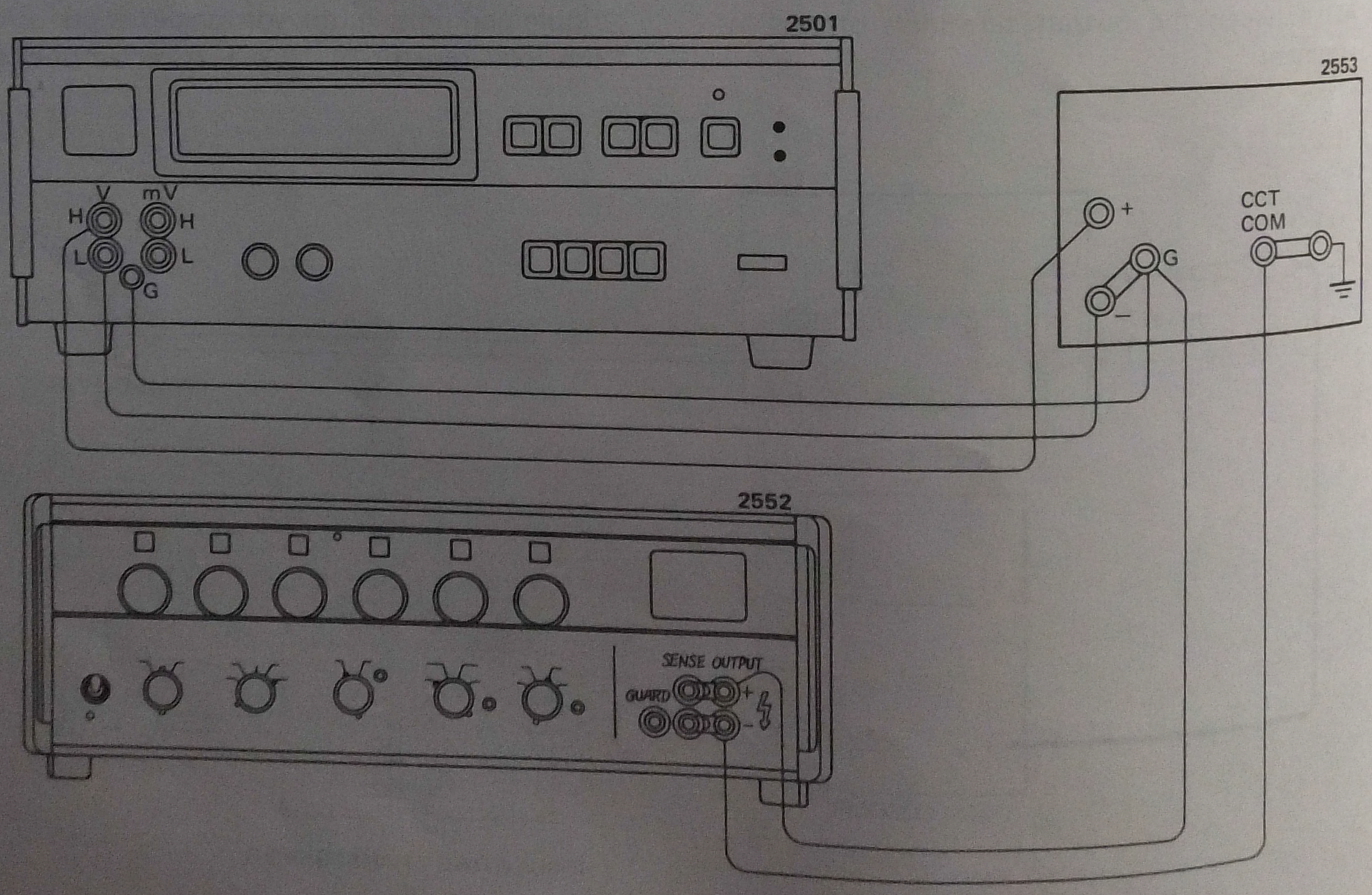



Figure 2-8. Setup for DC CMRR Inspection as Voltage Standard.

e) Compare the values measured in c) and d) above. Their difference should be within 100 μV. It denotes that the dc common mode rejection ratio of this instrument is better than 120 dB.

### D. AC CMRR Inspection as Voltage Standard

a) Connect this instrument, oscilloscope and Type 2858 as shown in Figure 2-9.

b) Set the range and output of this instrument to 1 V and 1.0000 V, respectively.

c) Set the oscilloscope sensitivity and mode to 100 μV/div and AC, respectively.

d) Set the oscillation frequency of the Type 2858 equal to the line frequency, apply an ac common mode voltage of 200 V p-p (71 V rms) between the two points illustrated below, and measure the peak-to-peak value of the line frequency component in the output voltage of this instrument. Ascertain that it is less than 200 μV p-p.

e) When it is less than 200 μV p-p it denotes that the ac common mode rejection ratio of this instrument is better than 120 dB.

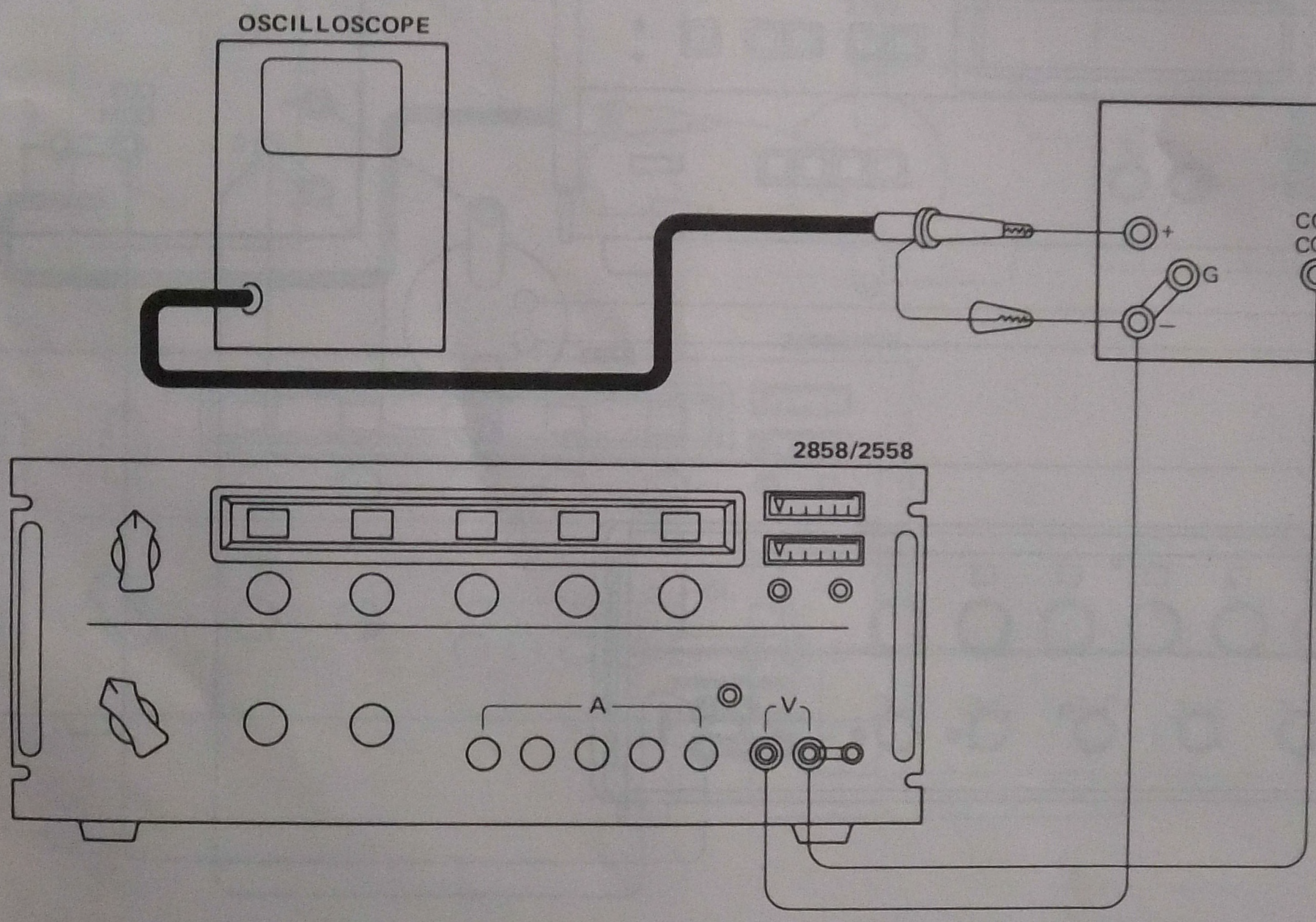



Figure 2-9. Setup for AC CMRR Inspection as Voltage Standard.

## E. DC CMRR Inspection as Current Standard

a) Connect this instrument, Type 2501, Type 2792 (1 kΩ) and Type 2552 as shown in Figure 2-10.

b) Set the range and output of this instrument to 1 mA and 1.0000 mA, respectively.

c) By the Type 2501, read the voltage drop across the Type 2792 (1 kΩ) when the dc common mode voltage is zero.

d) By the Type 2552, apply a dc common mode voltage of 100 V between the two points illustrated below, and measure the voltage drop across the Type 2792 at this time.

e) Compare the values measured in c) and d) above. Their difference should be within 10 mV. It denotes that the dc common mode rejection ratio of this instrument is smaller than 0.1 μA/V.

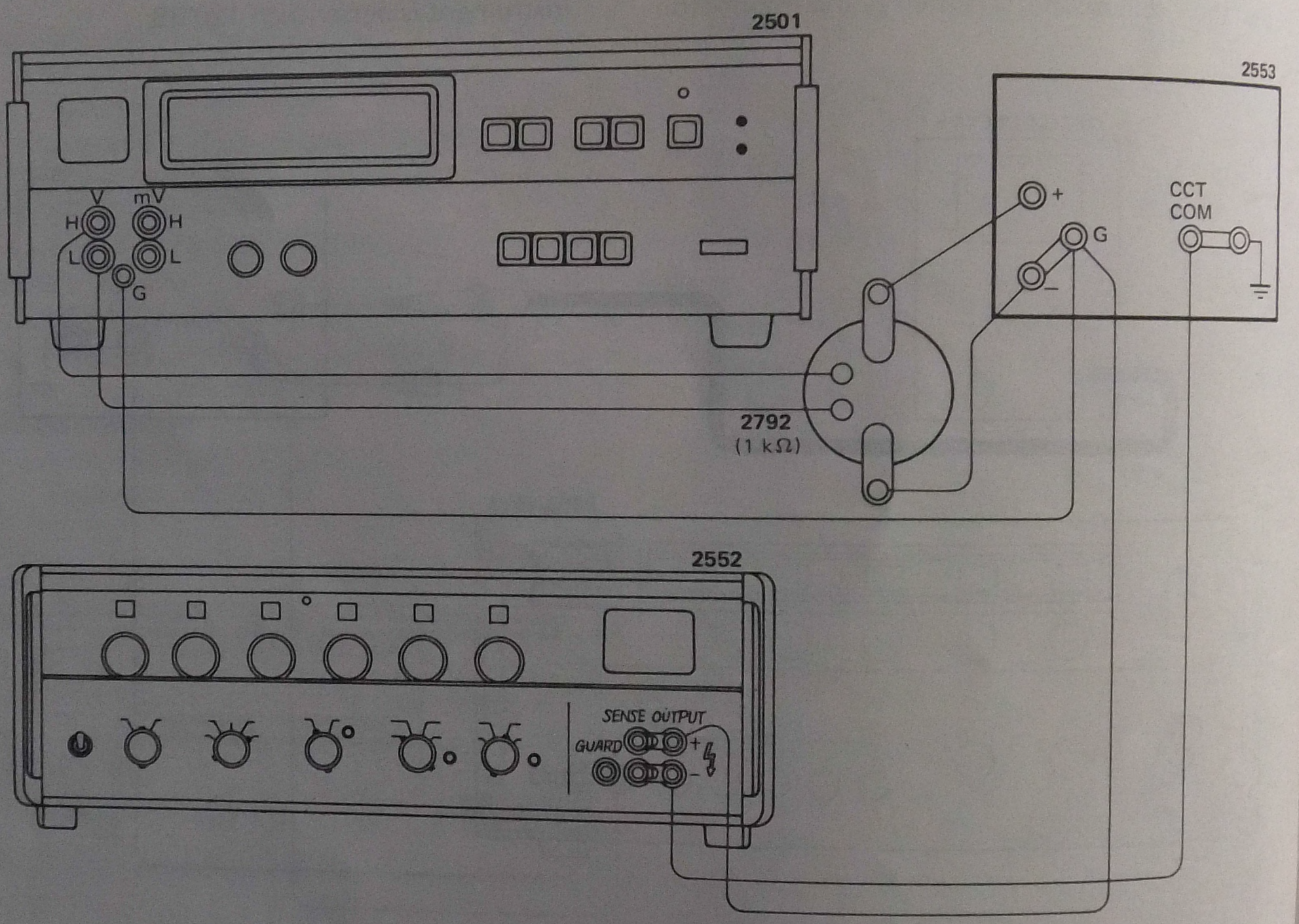



Figure 2-10. Setup for DC CMRR Inspection as Current Standard.

## F. AC CMRR Inspection as Current Standard

a) Connect this instrument, oscilloscope, Type 2792 (1 kΩ) and Type 2858 as shown in Figure 2-11.

b) Set the range and output of this instrument to 1 mA and 1.0000 mA, respectively.

c) Set the oscilloscope sensitivity to 5 mV/div, and the Type 2858 oscillation frequency to the line frequency.

d) Apply an ac common mode voltage of 200 V p-p (71 V rms) between the two points illustrated below, and measure the peak-to-peak value of the line frequency component in the voltage drop across the Type 2792. Ascertain that the value is less than 20 mV p-p.

e) When the value is less than 20 mV p-p it denotes that the ac common mode rejection ratio of this instrument is smaller than 0.1 μA/V.

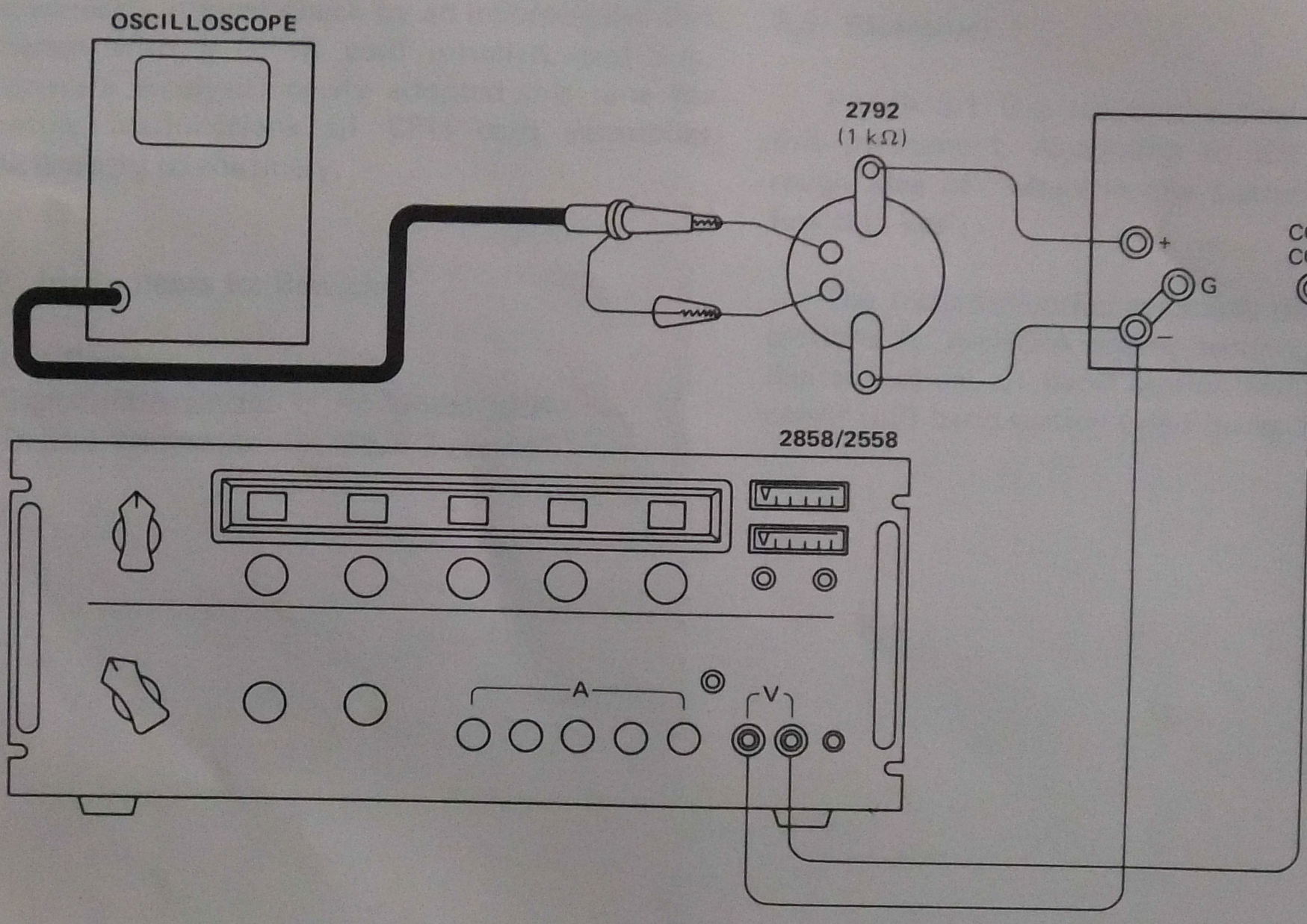



**Figure 2-11. Setup for AC CMRR Inspection as Current Standard.**

# 3. TROUBLESHOOTING

## 3.1 Introduction

This chapter comprises a troubleshooting flowchart as a guide to "locate the malfunction of this instrument", display check by an incorporated test program with a GP-IB card installed, and S.A. (Signature Analysis) newly adopted this time for locating malfunctions of CPU card assemblies which worry us routinely.

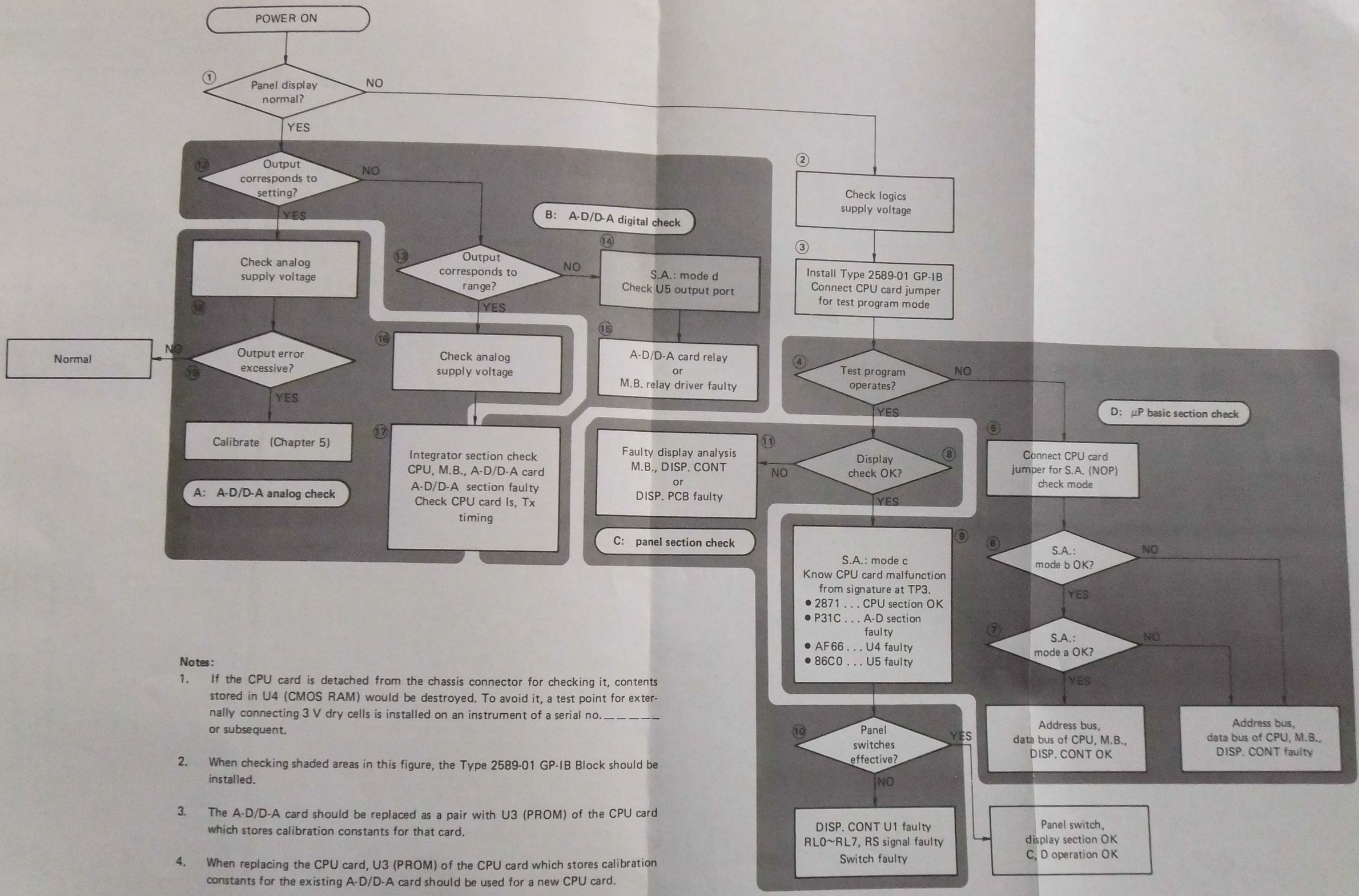
## 3.2 Instruments for Servicing

- Oscilloscope
- Signature Analyzer : hp Model 5004A
- Digital Voltmeter : YEW Type 2501
- GP-IB Block : YEW Type 2589-01
- Extension card : B9268WR

## 3.3 Flowchart

Figure 3-1 is a troubleshooting flowchart for this instrument. According to the chart, get a rough idea of "where in the instrument the malfunction lies".

The troubleshooting is roughly divided for four sections A: A-D/D-A analog section, B: A-D/D-A digital section, C: panel section and D: microprocessor ($\mu$P) basic section (see Figures 3-2 ~ 5).




**Notes:**

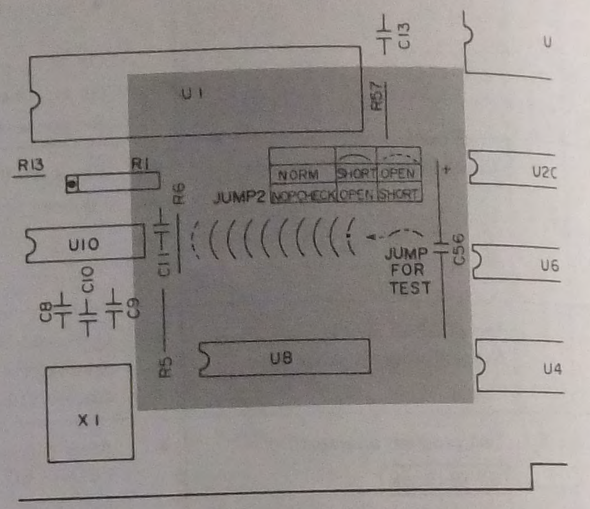
1. If the CPU card is detached from the chassis connector for checking it, contents stored in U4 (CMOS RAM) would be destroyed. To avoid it, a test point for externally connecting 3 V dry cells is installed on an instrument of a serial no. _____ or subsequent.
2. When checking shaded areas in this figure, the Type 2589-01 GP-IB Block should be installed.
3. The A-D/D-A card should be replaced as a pair with U3 (PROM) of the CPU card which stores calibration constants for that card.
4. When replacing the CPU card, U3 (PROM) of the CPU card which stores calibration constants for the existing A-D/D-A card should be used for a new CPU card.
5. After analog parts of the A-D/D-A card are replaced, calibration should be performed. For calibration, see Chapter 5.

**Figure 3-1. Troubleshooting Flowchart.**

## 3.4 Troubleshooting Procedure

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| | 1 | **Panel display normal?** | 1.1 Panel display changed according to switch setting?<br>• Range change ⟶ point location, unit<br>• X n/m-dials ⟶ X n/m-lamp lit when m ≠ n<br>• Setting dials ⟶ display increases and decreases at each digit?<br>OK ⟶ to **12**<br>No response at all to all setting switches ⟶ to **2**<br>Response abnormal to certain switches ⟶ to **5** | Set value display:<br>10 V, 1 V, 100 mV, 10 mV<br>100 mA, 10 mA, 1 mA<br>PR, CA, CRC, CC, IC } . . . . . direct reading<br>R.J. TEMP<br>Type 2563: direct reading when Voltage Unit range is selected<br>Type 2564: 1.0000/rated value, without unit |
| | 2 | **Check logics supply voltage** | 2.1 Check +5 V, +6.2 V (for photocoupler, relay)<br>OK ⟶ to **3** | Measure voltage between pins of mother board connector: CN101<br>Rated Value / Permissible Range / Test Point<br>5 V / 4.8 ~ 5.2 V / ③, ④ – ①, ②<br>6.2 V / 6.0 ~ 6.7 V / ⑤, ⑥ – ①, ② |
| | 3 | **Install GP-IB Block**<br>**Set test program mode** | 3.1 Designate test program mode<br>Short-circuit position marked ◜•◝ of CPU card assembly: B9268WD ⟶ to **4** | Execution of test program destroys calibration constant information in CMOS RAM |
| D | 4 | **Test program operates?**<br>GP-IB Block | 4.1 After turning on power, perform display test of LEDs, LED numerical indicators<br>Illuminating order . . . . illumination increments about every second<br>Turn on power → Numerical Indicators: Polarity / Numeric; Other LEDs<br>– / 17654 / OUTPUT-ON<br>+ / 17654 / INT. R.J.<br>+ / 17654 / REMOTE<br>+ / 17654 / mV<br>+ / 17654 / V<br>+ / 17654 / mA<br>+ / 17654 / °C<br>+ / 17654 / X n/m<br>*1 + / 1.7.6.5.4 / X n/m<br>Display increments ⟶ to **8**<br>Display does not increment ⟶ to **5** | After display test is performed, display of *1 is maintained.<br>Only check here if display increments, disregarding whether certain LEDs or numerical indicators do not light or light unduly. |

(Cont'd)

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| D | 5 | Designate NOP*1 check | 5.1 Designate CPU card jumpers as follows:<br>• Symbol ⌒• ⌒ ... short-circuit<br>• Symbol ⌒ *2 ⌒ ... open-circuit<br>• Symbol ⌒ ⌒ ... short-circuit<br>→ to 6 | *1 NOP: NO OPERATION CHECK<br>*2 Cut 8 jumper patterns wired on parts side taking care not to damage other patterns<br>  |
| D | 6 | S.A. mode b OK?<br>S.A. | Before S.A. check, ascertain 5 MHz at pin 1 of CPU card U1<br>6.1 Set signature analyzer<br>(Mode b: address bus*1 check)<br>• Mode b OK with CPU + DISP. CONT + GP-IB → to 7<br>• Mode b NG with CPU + DISP. CONT + GP-IB → to 6.2<br>6.2 Mode b check removing GP-IB Block (2589-01), DISP. CONT (B9268WS)<br>• Mode b OK with CPU only → GP-IB A12 ~ A15, CS1 faulty or DISP. CONT CS4 faulty<br>• Mode b NG even with CPU only → CPU A12 ~ A15, CS0 ~ CS5 faulty or mother board CS0 ~ CS5 faulty | *1 Address bus: should be on U1 pins 21 ~ 28 (A8 ~ A15)<br>Signature table (mode b)<br>• CPU card |

| 5004A Gating Lead | CPU Card Test Point | 5004A Switch Setting |
|---|---|---|
| START | TP7 (A15) | ⌒ |
| STOP | TP7 (A15) | ⌒ |
| CLOCK | TP5 ($\overline{\text{MEMR}}$) | ⌒ |
| GND | COM | |

| Signal Name | Check Point | | | | | Signature |
|---|---|---|---|---|---|---|
| A12 | U1-25 | U7-15 | | | 56R | b-HAP7 |
| A13 | U1-26 | U7-14 | | | 55R | b-3C96 |
| A14 | U1-27 | U7-13 | | | 54R | b-3827 |
| A15 | U1-28 | U7-12 | | | 53R | b-755P |
| $\overline{\#0XXX}$ | U7-1 | U2-20, 21 | U11-13 | | 31R | b-CA11 |
| $\overline{\#2XXX}$ | U7-3 | U5-7 | U11-4 | | | b-A3UH |
| $\overline{\#3XXX}$ | U7-4 | | U11-5 | | | b-AA6A |
| $\overline{\#4XXX}$ | U7-5 | | | | 29R | b-A711 |
| $\overline{\#5XXX}$ | U7-6 | U3-13, 14 | U11-12 | U4-19 | 32R | b-54F5 |
| $\overline{\#7XXX}$ | U7-9 | | | | 30R | b-826U |
| | | | U11-3 | U8-19 | | b-PPH5 |
| | | | U11-6 | U5-8 | | b-0997 |
| +5 V | | | | | | b-0001 |

Connector terminal no. ↑ Mode ↑

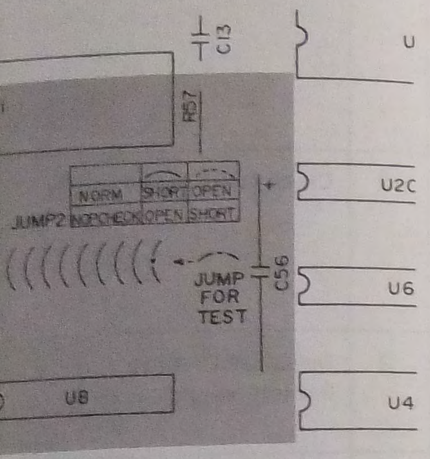




| Classif. | No. | Item | |
|---|---|---|---|
| D | 6 | S.A. mode b OK?<br>S.A. | 6. |
| D | 7 | S.A. mode a OK?<br>S.A. | 7. |

(Cont'd)

| Remarks |
|---|
| N CHECK<br>wired on parts side taking care not to damage |




on U1 pins 21 ~ 28 (A8 ~ A15)

| Check Point | | | | Signature |
|---|---|---|---|---|
| 7-15 | | | 56R | b-HAP7 |
| 7-14 | | | 55R | b-3C96 |
| 7-13 | | | 54R | b-3827 |
| 7-12 | | | 53R | b-755P |
| 20, 21 | U11-13 | | 31R | b-CA11 |
| 5-7 | U11-4 | | | b-A3UH |
| | U11-5 | | | b-AA6A |
| | | | 29R | b-A711 |
| 13, 14 | U11-12 | U4-19 | 32R | b-54F5 |
| | | | 30R | b-826U |
| | U11-3 | U8-19 | | b-PPH5 |
| | U11-6 | U5-8 | | b-0997 |
| | | | | b-0001 |

Connector terminal no. — Mode



(Cont'd)

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| D | 6 | **S.A. mode b OK?**<br>S.A. | 6.3 Faulty signal line<br>• Certain signals display same S.A. pattern<br>→ signal lines short-circuited, bridged<br>• Perform check by successively tracing back signal line | • Display Control card |
| D | 7 | **S.A. mode a OK?**<br>S.A. | 7.1 Set signature analyzer<br>(Mode a: data bus check) | Signature table (mode a) |

Display Control card

| Signal Name | Check Point | | | | | Signature |
|---|---|---|---|---|---|---|
| #4XXX | 29 | U1-22 | | | | b-A711 |

Connector terminal no. — Mode

| 5004A Gating Lead | CPU Card Test Point | 5004A Switch Setting |
|---|---|---|
| START | TP6 (#0XXXX) | ↘ |
| STOP | TP6 (#0XXXX) | ↗ |
| CLOCK | TP5 (MEMR) | ↗ |
| GND | COM | |

Mode a OK → to **8**

Mode a NG
→ mode a check removing GP-IB Block, DISP. CONT

- Mode a OK with CPU card only
  → GP-IB Block, DISP. CONT AD0 ~ AD7 faulty
- Mode a NG even with CPU card only
  → CPU card, mother board AD0 ~ AD7, A0 ~ A7 faulty

Note 1: Signature in column marked *1 is applied to CPU card whose U2 is μPD2332C-71

Note 2: Signature in column marked *2 is applied to CPU card whose U2 is μPD2332C-207

- CPU card

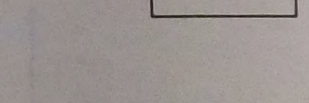
| Signal Name | Check Point | | | | | Signature *1 | Signature *2 |
|---|---|---|---|---|---|---|---|
| A8 | U1-21 | U2-23 | | | 60R | a-5H21 | a-5H21 |
| A9 | U1-22 | U2-22 | | | 59R | a-19H6 | a-19H6 |
| A10 | U1-23 | U2-19 | | | 58R | 1-HP66 | a-HP66 |
| A11 | U1-24 | U2-18 | | | 57R | a-7A70 | a-7A70 |
| A0 | U6-2 | U2-8 | U3-5 | U4-4 | 34L | a-7P25 | a-7P25 |
| A1 | U6-5 | U2-7 | U3-6 | U4-3 | 33L | a-2A1F | a-2A1F |
| A2 | U6-6 | U2-6 | U3-7 | U4-2 | 32L | a-A206 | a-A206 |
| A3 | U6-9 | U2-5 | U3-4 | U4-1 | 31L | a-C133 | a-C133 |
| A4 | U6-12 | U2-4 | U3-3 | U4-21 | 30L | a-8P3U | a-8P3U |
| A5 | U6-15 | U2-3 | U3-2 | U4-5 | 29L | a-3319 | a-3319 |
| A6 | U6-16 | U2-2 | U3-1 | U4-6 | 28L | a-7C47 | a-7C47 |
| A7 | U6-19 | U2-1 | U3-15 | U4-7 | 27L | a-C25F | a-C25F |
| D0 | U2-9 | U8-18 | U3-12 | | | a-59A8 | a-PA07 |
| D1 | U2-10 | U8-16 | U3-11 | | | a-F1H4 | a-13C3 |
| D2 | U2-11 | U8-14 | U3-10 | | | a-FHP2 | a-6U2U |
| D3 | U2-13 | U8-12 | U3-9 | | | a-2C9H | a-6686 |
| D4 | U2-14 | U8-2 | U4-10 | | | a-7778 | a-966U |
| D5 | U2-15 | U8-4 | U4-12 | | | a-CUF0 | a-2P42 |
| D6 | U2-16 | U8-6 | U4-14 | | | a-2uC9 | a-9211 |
| D7 | U2-17 | U8-8 | U4-16 | | | a-1CCC | a-9F80 |
| AD0 | U8-17 | U5-12 | | | 52R | a-59A8 | a-PA07 |
| AD1 | U8-15 | U5-13 | | | 51R | a-F1H4 | a-13C3 |
| AD2 | U8-13 | U5-14 | | | 50R | a-FHP2 | a-6U2U |
| AD3 | U8-11 | U5-15 | | | 49R | a-2C9H | a-6686 |
| AD4 | U8-3 | U5-16 | U4-9 | | 48R | a-7778 | a-966U |
| AD5 | U8-5 | U5-17 | U4-11 | | 47R | a-CUF0 | a-2P42 |
| AD6 | U8-7 | U5-18 | U4-13 | | 46R | a-2UC9 | a-9211 |
| AD7 | U8-9 | U5-19 | U4-15 | | 45R | a-1CCC | a-9F80 |
| +5 V | | | | | | a-826P | a-826P |

Connector terminal no. — Mode

- Display Control Card

| Signal Name | Check Point | | Signature *1 | Signature *2 |
|---|---|---|---|---|
| AD0 | 52 | U1-12 | a-59A8 | a-PA07 |
| AD1 | 51 | U1-13 | a-F1H4 | a-13C3 |
| AD2 | 50 | U1-14 | a-FHP2 | a-6U2U |
| AD3 | 49 | U1-15 | a-2C9H | a-6686 |
| AD4 | 48 | U1-16 | a-7778 | a-966U |
| AD5 | 47 | U1-17 | a-CUF0 | a-2P42 |
| AD6 | 46 | U1-18 | a-2UC9 | a-9211 |
| AD7 | 45 | U1-19 | a-1CCC | a-9F80 |
| A8 | 60 | U1-21 | a-5H21 | a-5H21 |

Connector terminal no. — Mode

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| C | 8 | **Display check OK?**<br>GP-IB Block | 8.1 In conditions in 4 above, display of LEDs and numerical indicators perfect?<br>YES ⟶ to **11**<br>NO ⟶ to **9** | |
| D | 9 | **S.A. mode c OK?**<br>S.A. | 9.1 Set signature analyzer<br>(Mode c: check A-D section, RAM section)<br>* Install GP-IB Block, DISP. CONT<br>5004A Gating Lead / CPU Card Test Point / 5004A Switch Setting:<br>START — TP3 (SOD) — ⌐‾<br>STOP — TP3 (SOD) — ‾⌐<br>CLOCK — TP5 ($\overline{MEMR}$) — ⌐‾<br>GND — COM<br>2553 X n/m-dials — m = n = 1<br>9.2 Judge signature<br>Signature at TP3<br>2871 ⟶ CPU section OK ⟶ to **10**<br>P31C ⟶ A-D section faulty<br>AF66 ⟶ CPU card U4 faulty<br>86C0 ⟶ CPU card U5 faulty<br>Others ⟶ S.A. test program does not operate ⟶ to **4**<br>* Test program is automatically started after turning on power (after display check) | Here check RAMs (RANDOM ACCESS MEMORIES: U4, U5) with S.A. pattern generated by test program<br>Signature / Judgement:<br>2871 — CPU normal<br>P31C — A-D section faulty<br>AF66 — U4 faulty<br>86C0 — U5 faulty<br>  |
| C | 10 | **Panel switches effective?** | 10.1 Change jumper designation on CPU card<br>• Symbol ⌒• ⌒ . . . open-circuit<br>• Symbol ⌒ . . . short-circuit<br>• Symbol ⌒ . . . open-circuit<br>10.2 Perform operation according to program of Type 2553 by turning on power<br>10.3 Check if panel switches (X n/m, range, polarity, OUTPUT ON/OFF) are effective<br>OK ⟶ to **10.4**<br>All ineffective ⟶ DISP. CONT or U1, U2 faulty<br>Certain switches ineffective ⟶ U1 or RL0 ~ RL7 signal lines, row designation signal line faulty | Information of input address map.<br>Panel switch is read by time sharing as follows from RL0 ~ RL7 lines of DISP. CONT U1: |

| ROW | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| RL7 | OUT. ON | + | m-dial d | Range dial d | 1000 V | | DEV |
| RL6 | OUT. OFF | – | m-dial c | Range dial c | 500 V | SWEEP 35 s | |
| RL5 | Dial 1 | ENT | m-dial b | Range dial b | 100 V | ⌐‾ | |
| RL4 | Dial 1 | | m-dial a | Range dial a | | ‾⌐ | |
| RL3 | Dial 2 | | n-dial d | | | | PRINT |
| RL2 | Dial 2 | | n-dial c | | | | |
| RL1 | | NORM | n-dial b | | | | |
| RL0 | Dial 3 | GP-IB IN | n-dial a | | | | |



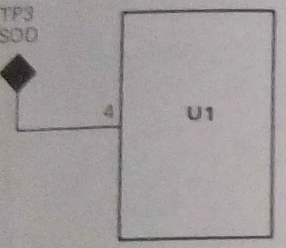
| Classif. | No. | Item |
|---|---|---|
| C | 10 | **Panel switches effective?** |
| C | 11 | **Faulty display analysis** |

(Cont'd)

| Remarks |
|---|
| |
| |
| NDOM ACCESS MEMORIES: U4, U5) with S.A. |
| st program |

| Signature | Judgement |
|---|---|
| 2B71 | CPU normal |
| P31C | A-D section faulty |
| AF66 | U4 faulty |
| 86C0 | U5 faulty |

TP3
SOD

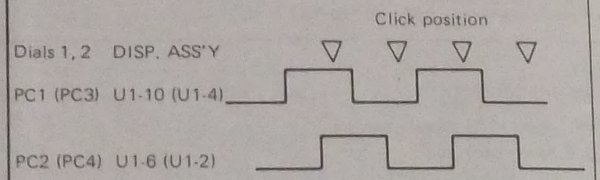
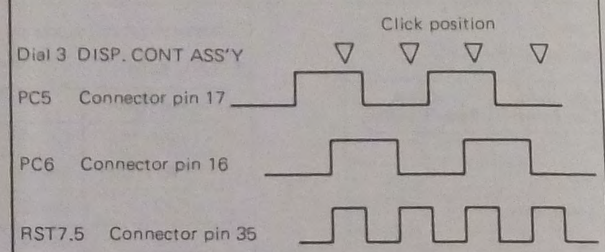



dress map.
ime sharing as follows from RL0 ~ RL7 lines of

| 2 | 3 | | 4 | | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| + | m-dial | d | Range dial | d | 1000 V | | DEV |
| – | | c | | c | 500 V | SWEEP 35 s | |
| ENT | | b | | b | 100 V | | |
| | | a | | a | | | |
| | m-dial | d | | | | | PRINT |
| | | c | | | | | |
| NORM | | b | | | | | |
| GP-IB IN | | a | | | | | |



(Cont'd)

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| C | 10 | **Panel switches effective?** | 10.4 When dials 1 ~ 3 are abnormal, observe output signals by oscilloscope when rotating dials<br>  <br><br>  <br><br>\| \| CCW \| CW \|<br>\|---\|---\|---\|<br>\| Q1 U6-5 \| H \| L \|<br>\| Q2 U6-9 \| L \| H \|<br><br>Q1, Q2 are rotating direction discriminating signals for dial 3. Output is as shown in table above when rotating by 2 clicks or more in same direction.<br><br>OK ——→ to **12** | Notes: 1. ROW addresses 1 ~ 7 correspond to outputs of U2 pins 2 ~ 9 (pin 8: COM) (dynamically read at all times).<br>Information of switches designated by ROW addresses is read through RL0 ~ RL7.<br>2. At ROW addresses 5 ~ 7, information of switches in Type 2563 Voltage Unit in usage as Type 2560 DC Calibration Set is read<br>3. ENT, NORM, GP-IB IN information is read from CPU card, GP-IB Block<br>4. m, n, range dial output codes are as shown below:<br><br>\| m \| n \| Range \| Output Code \| \| \| \|<br>\| \| \| \| d \| c \| b \| a \|<br>\|---\|---\|---\|---\|---\|---\|---\|<br>\| \| 0 \| Type 2564 \| 0 \| 0 \| 0 \| 0 \|<br>\| 1 \| 1 \| 100 mA \| 0 \| 0 \| 0 \| 1 \|<br>\| 2 \| 2 \| 10 mA \| 0 \| 0 \| 1 \| 1 \|<br>\| 3 \| 3 \| 1 mA \| 0 \| 0 \| 1 \| 0 \|<br>\| 4 \| 4 \| R.J. TEMP \| 0 \| 1 \| 1 \| 0 \|<br>\| 5 \| 5 \| PR \| 0 \| 1 \| 1 \| 1 \|<br>\| 6 \| 6 \| CA \| 0 \| 1 \| 0 \| 1 \|<br>\| 7 \| 7 \| CRC \| 0 \| 1 \| 0 \| 0 \|<br>\| 8 \| 8 \| IC \| 1 \| 1 \| 0 \| 0 \|<br>\| 9 \| 9 \| CC \| 1 \| 1 \| 0 \| 1 \|<br>\| 10 \| 10 \| 10 mV \| 1 \| 1 \| 1 \| 1 \|<br>\| 11 \| 11 \| 100 mV \| 1 \| 1 \| 1 \| 0 \|<br>\| 12 \| 12 \| 1 V \| 1 \| 0 \| 1 \| 0 \|<br>\| 13 \| 13 \| 10 V \| 1 \| 0 \| 1 \| 1 \|<br>\| 14 \| 14 \| Type 2563 \| 1 \| 0 \| 0 \| 1 \|<br>\| 15 \| 15 \| / \| 1 \| 0 \| 0 \| 0 \|<br><br>\| \| RL0 ~ RL7 Level \| Switch \|<br>\|---\|---\|---\|<br>\| "1" \| +5 V \| Open \|<br>\| "0" \| 0 V \| Short \| |
| C | 11 | **Faulty display analysis** | 11.1 Certain digits faulty ——→ RS0 ~ RS2 faulty<br>Check DISP. CONT RS0 ~ RS2<br><br>\| RS2 \| L L L L H H H H \|<br>\|---\|---\|<br>\| RS1 \| L L H H L L H H \|<br>\| RS0 \| L H L H L H L H \|<br>\| ROW No. \| 0 1 2 3 4 5 6 7 \|<br><br>RS0 ~ RS2 repeat operation in above table at all times<br><br>Certain display pattern faulty<br>——→ PA0 ~ PA3, PB0 ~ PB3 faulty<br><br>OK ——→ to **9** | Display is 8-digit dynamic type.<br>Row designation signal is common to switch read row signal of 10 above.<br>**Dynamic Display Map**<br><br>\| \| ROW 0 \| 1 \| 2 \| 3 \| 4 \| 5 \| 6 \| 7 \|<br>\|---\|---\|---\|---\|---\|---\|---\|---\|---\|<br>\| PA3 \| \| \| \| \| \| \| \| \|<br>\| PA2 \| + \| + \| OUTPUT ON \| EXT R.J. \| REMOTE \| + \| – \| \|<br>\| PA1 \| mV \| V \| mA \| °C \| n/m \| SWEEP \| \| \|<br>\| PA0 \| • \| • \| • \| • \| • \| • \| \| \|<br>\| PB3 \| \| \| \| \| \| d \| \| \|<br>\| PB2 \| Output set value \| \| \| \| \| c \| Deviation display \| \|<br>\| PB1 \| 1 \| 2 \| 0 \| 0 \| 0 \| b \| 0 \| 0 \| 0 \|<br>\| PB0 \| \| \| \| \| \| a \| \| \|<br><br>Note: LEDs of ROW addresses 5 ~ 7 are mounted on Type 2563 Voltage Unit |

(Cont'd)

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| B | 12 | Output corresponds to setting? | 12.1 Accuracy should be within ±7 %<br>YES ⟶ to **18**<br>NO ⟶ to **13** | |
| B | 13 | Output corresponds to range? | 13.1 Notice output order (absolute value does not matter)<br>(Ex.) When 10000 is set, (1 V range output) ≈ 1/10 (10 V range output)?<br>YES ⟶ to **16**<br>NO ⟶ to **14** | |
| B | 14 | S.A. check mode d OK?<br>S.A.<br>GP-IB Block | 14.1 Set signature analyzer<br>(Mode d: relay drive signal check)<br>5004A Gating Lead: START — CPU Card Test Point: TP3 (SOD) — 5004A Switch Setting: ⌐‾<br>5004A Gating Lead: STOP — CPU Card Test Point: TP3 (SOD) — 5004A Switch Setting: ‾¬<br>5004A Gating Lead: CLOCK — CPU Card Test Point: TP5 ($\overline{MEMR}$) — 5004A Switch Setting: ⌐‾<br>5004A Gating Lead: GND — CPU Card Test Point: COM<br>2553 X n/m-dials: m = 1, n = 0<br>14.2 Change jumper designation on CPU card<br>• Symbol ⌒ . . . short-circuit<br>This test program is automatically started after turning on power and display check<br>• Also check if correct signature is obtained at Q206, Q207 input on mother board<br>OK ⟶ to **15** | Signature table (mode d)<br>• CPU card<br>Signal Name: PA0 — Check Point: U5-21, U12-1 — Signature: d-6CHA<br>PA1 — U5-22, U12-10 — d-UHAC<br>PA2 — U5-23, U12-9 — d-338P<br>PA3 — U5-24, U12-11, U17-9, 10 — d-U720<br>PA4 — U5-25, U17-5 — d-62U0<br>PA5 — U5-26, U16-5, 17R — d-H8P0<br>PA6 — U5-27, U16-4, 18R — d-9AP6<br>PA7 — U5-28, 16R — d-F393<br>PB0 — U5-29, 13R — d-1336<br>PB1 — U5-30, 14R — d-07FF<br>PB2 — U5-31, U16-10, 7R — d-U980<br>PB3 — U5-32, 12R — d-3014<br>PB4 — U5-33, 9R — d-0282<br>PB5 — U5-34, 10R — d-504H<br>PB6 — U5-35, U11-9, 25R — d-09CH<br>PB7 — U5-36, U11-10, 26R — d-37A6<br>(Connector terminal no. / Mode) |
| B | 15 | Relay operation check | 15.1 Remove short-circuit at ⌒ on CPU card<br>15.2 Turn on power and check if relay on A-D/D-A card operates properly by range changeover<br>Anomaly of relay operation<br>• Faulty relay driver section on mother board, A-D/D-A card<br>• Relay contact faulty<br>OK ⟶ to **16** | Except RL7, relay contact operation is visible on A-D/D-A card (employed relays are housed in transparent plastic case)<br>RELAYS TABLE (○ MAKE, X BREAK, – DON'T CARE)<br>RANGE: 10 V — RL1 ○, RL2 ○, RL3 –, RL4 X, RL5 X, RL6 –, RL7 ○<br>1 V — ○ ○ – X X – X<br>100 mV — X X – ○ X – ○<br>10 mV — X X – X ○ – ○<br>50 mV (TMP) — X X – ○ X – X<br>100 mA — X ○ – ○ X – ○<br>10 mA — X ○ – X ○ – ○<br>1 mA — X ○ – X X – ○<br>STAND BY/OUTPUT ON — – – – – – X/○ –<br>+/– — – – X/○ – – – – |



| Classif. | No. | Item | |
|---|---|---|---|
| A | 16 | Check analog supply voltage | 1 |
| A<br>B | 17 | Integrator section check | 1 |

(Cont'd)

| Remarks |
|---|
| |
| |
| |
| |
| |

| Check Point | | | Signature |
|---|---|---|---|
| | | | d-6CHA |
| 10 | | | d-UHAC |
| 9 | | | d-338P |
| 11 | U17-9, 10 | | d-U720 |
| 5 | | | d-62U0 |
| 5 | | 17R | d-H8P0 |
| | | 18R | d-9AP6 |
| | | 16R | d-F393 |
| | | 13R | d-1336 |
| | | 14R | d-07FF |
| 0 | | 7R | d-U980 |
| | | 12R | d-3014 |
| | | 9R | d-0282 |
| | | 10R | d-504H |
| | | 25R | d-09CH |
| 0 | | 26R | d-37A6 |

Connector terminal no. Mode

on is visible on A-D/D-A card
nsparent plastic case)

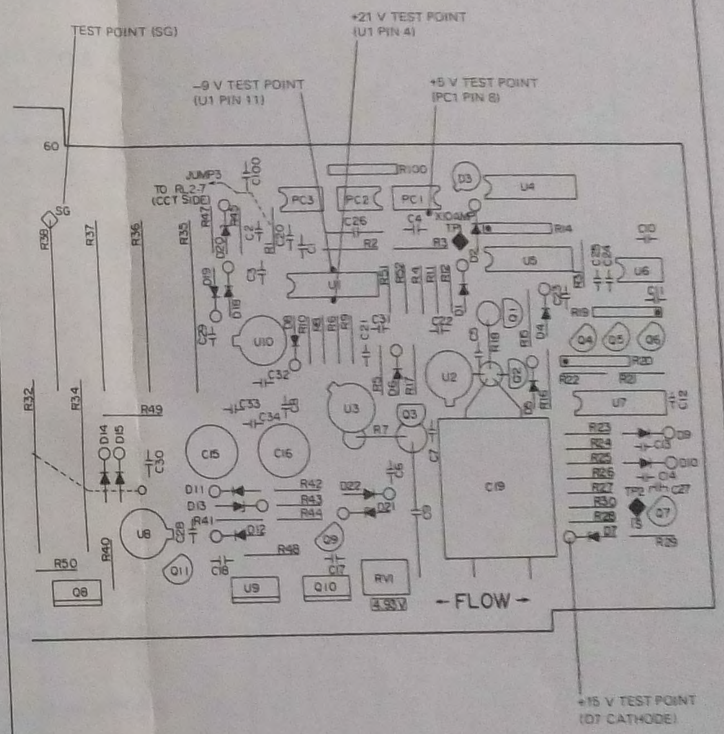
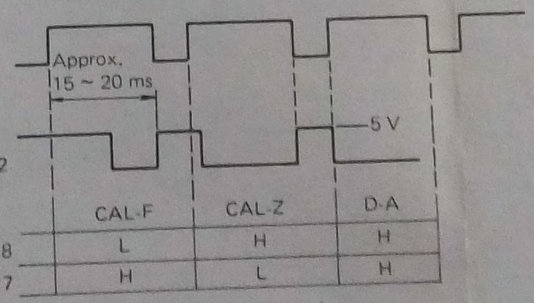
YS TABLE

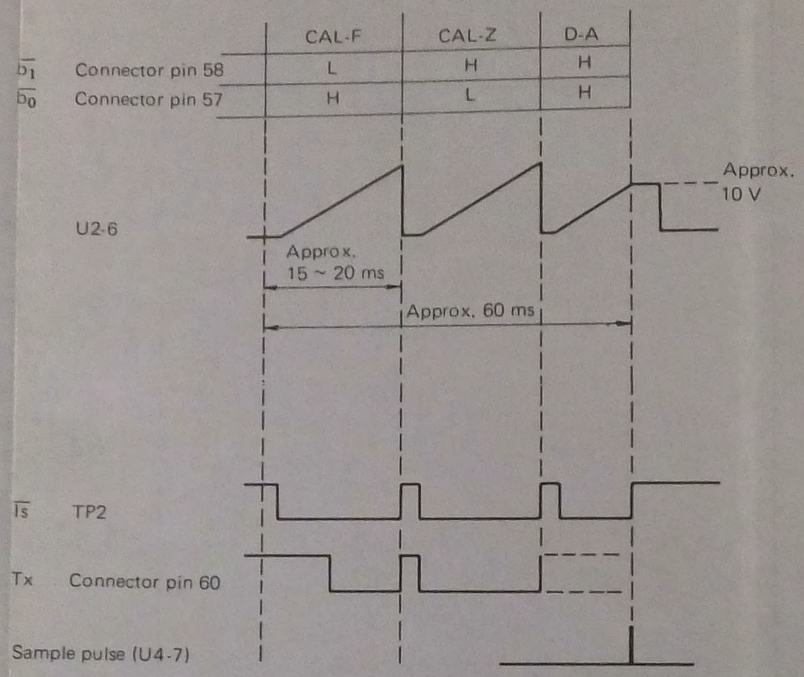
○ MAKE
× BREAK
– DON'T CARE

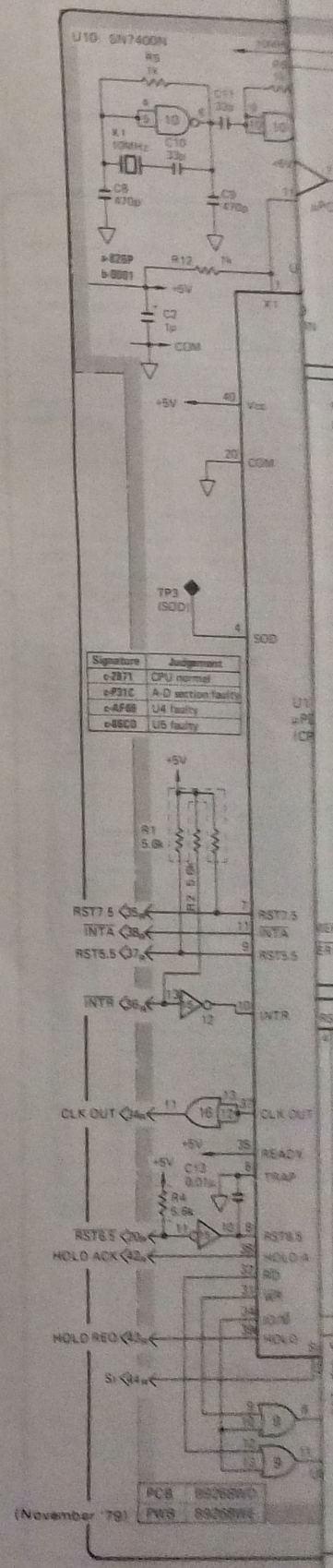
| RL1 | RL2 | RL3 | RL4 | RL5 | RL6 | RL7 |
|---|---|---|---|---|---|---|
| ○ | ○ | – | × | × | – | ○ |
| ○ | ○ | – | × | × | – | × |
| × | × | – | ○ | × | – | ○ |
| × | × | – | × | ○ | – | ○ |
| × | × | – | ○ | × | – | × |
| × | ○ | – | ○ | × | – | ○ |
| × | ○ | – | × | ○ | – | ○ |



(Cont'd)

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| A | 16 | **Check analog supply voltage** | 16.1 Check analog power supply on A-D/D-A card<br><br>Rated Value / Permissible Range / Test Point<br>21 V / 20.2 ~ 22.2 V / U1 pin 4 – SG<br>15 V / 13.8 ~ 15.6 V / D7 cathode – SG<br>5 V / 4.8 ~ 5.4 V / PC1 pin 8 – SG<br>–9 V / –8.9 ~ –9.7 V / U1 pin 11 – SG<br><br>OK ⟶ to **17** |  |
| A<br>B | 17 | **Integrator section check** | 17.1 Check A-D, D-A sections (Is, Tx sections) on CPU, M.B., A-D/D-A cards<br><br>A-D/D-A drive waveforms at normal operation (CPU card OUT-GUARD section)<br>• 1 V output at 1 V range<br>• CPU card<br><br>Is U15-2<br>Tx Connector pin 22<br>$\overline{b_1}$ Connector pin 18<br>$\overline{b_0}$ Connector pin 17<br><br>  <br>CAL-F: $\overline{b_1}$ L, $\overline{b_0}$ H<br>CAL-Z: $\overline{b_1}$ H, $\overline{b_0}$ L<br>D-A: $\overline{b_1}$ H, $\overline{b_0}$ H | A-D/D-A card repeats A-D, D-A operations at all times |

| Classif. | No. | Item | Check Point | Remarks |
|---|---|---|---|---|
| A<br>B | 17 | **Integrator section check** | • Analog section waveforms<br>A-D/D-A operation cycle<br>(10 V output at 10 V range)<br>• A-D/D-A card<br>  <br><br>OK ⟶ to **19** | |
| A | 18 | **Check analog supply voltage** | 18.1 Check analog power supply on A-D/D-A card<br>⟶ see **16** | |
| A | 19 | **Output error excessive?** | 19.1 After part of A-D/D-A card is replaced, calibration is necessary<br>⟶ see Section **5. CALIBRATION**<br>19.2 Replace A-D/D-A card as a set together with FUSE ROM (U3) on CPU card | FUSE ROM contains calibration constant information according to memorized analog characteristics of each A-D/D-A card |



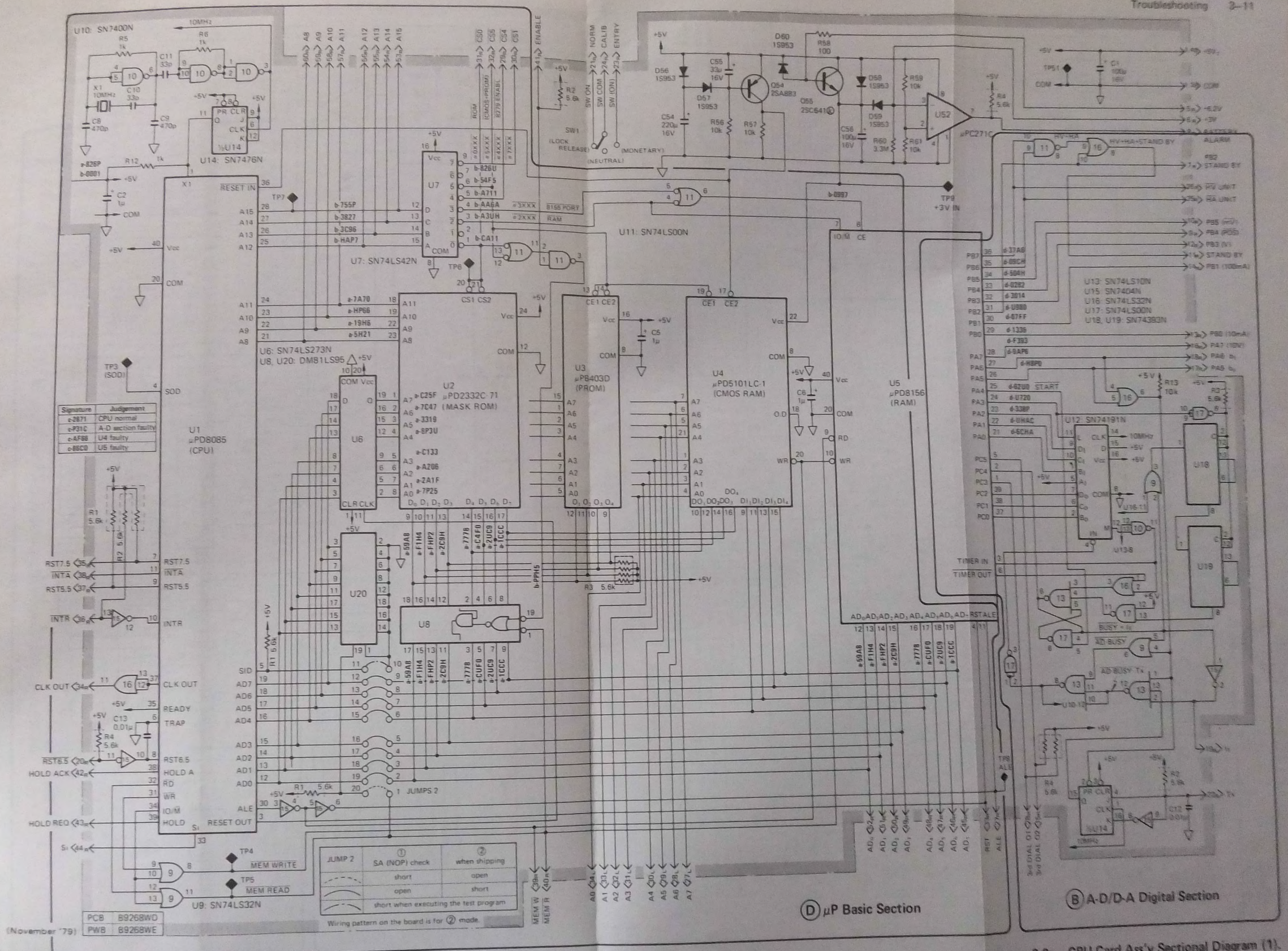



Figure 3-2a. CPU Card Ass'y Sectional Diagram (1).

Note 1: Signatures shown in this figure are applied to instruments of serial no. _ _ _ _ _ or preceding. Make sure code of employed U2 is μPD2332C-71.

Note 2: Alphabet followed by signature denotes S.A. mode.

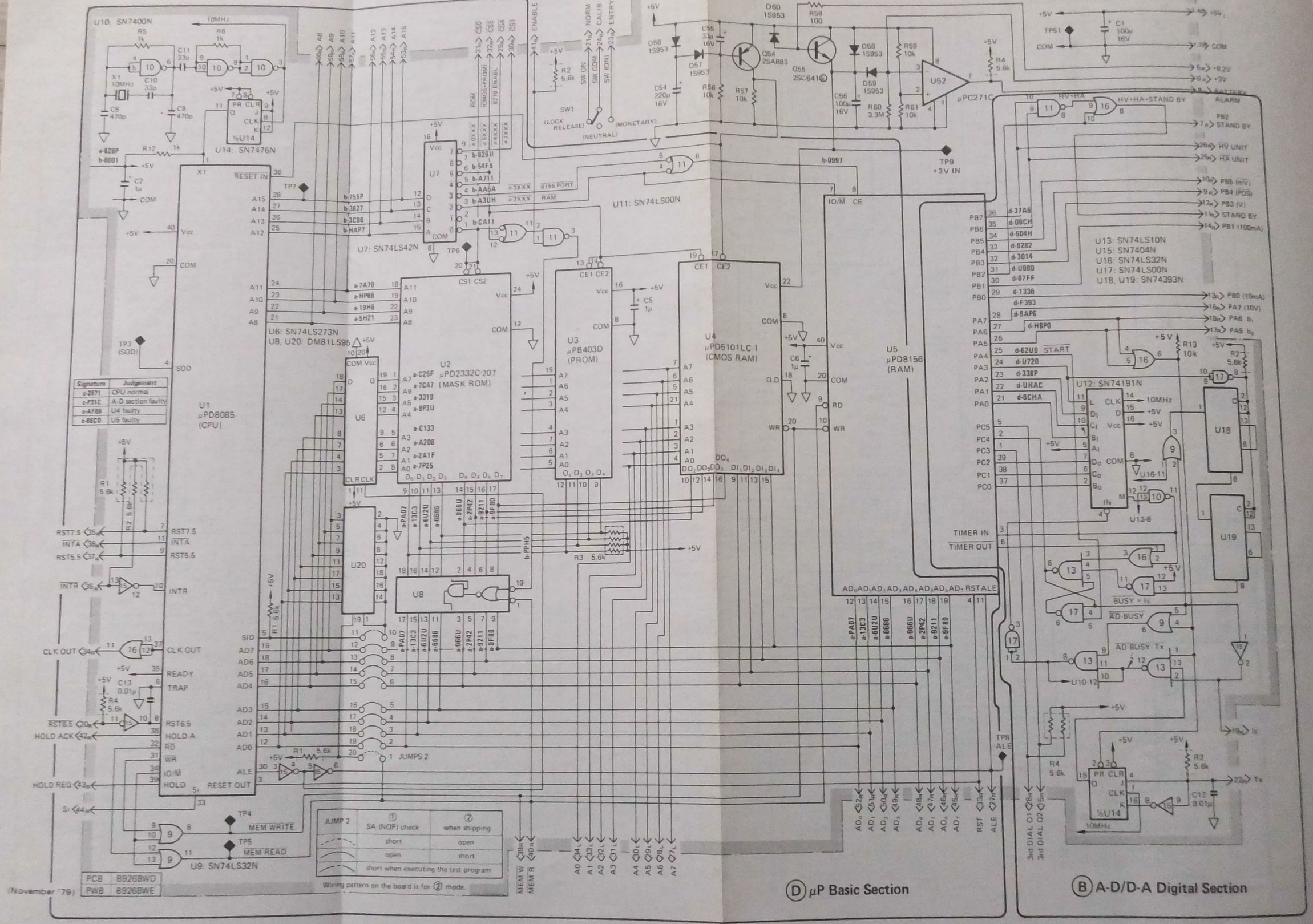



Figure 3-2b. CPU Card Ass'y Sectional Diagram (2).

Note 1: Signatures shown in this figure are applied to instruments of serial no. _____ or subsequent.
Make sure code of employed U2 is μPD2332C-207.
Note 2: Alphabet followed by signature denotes S.A. mode.

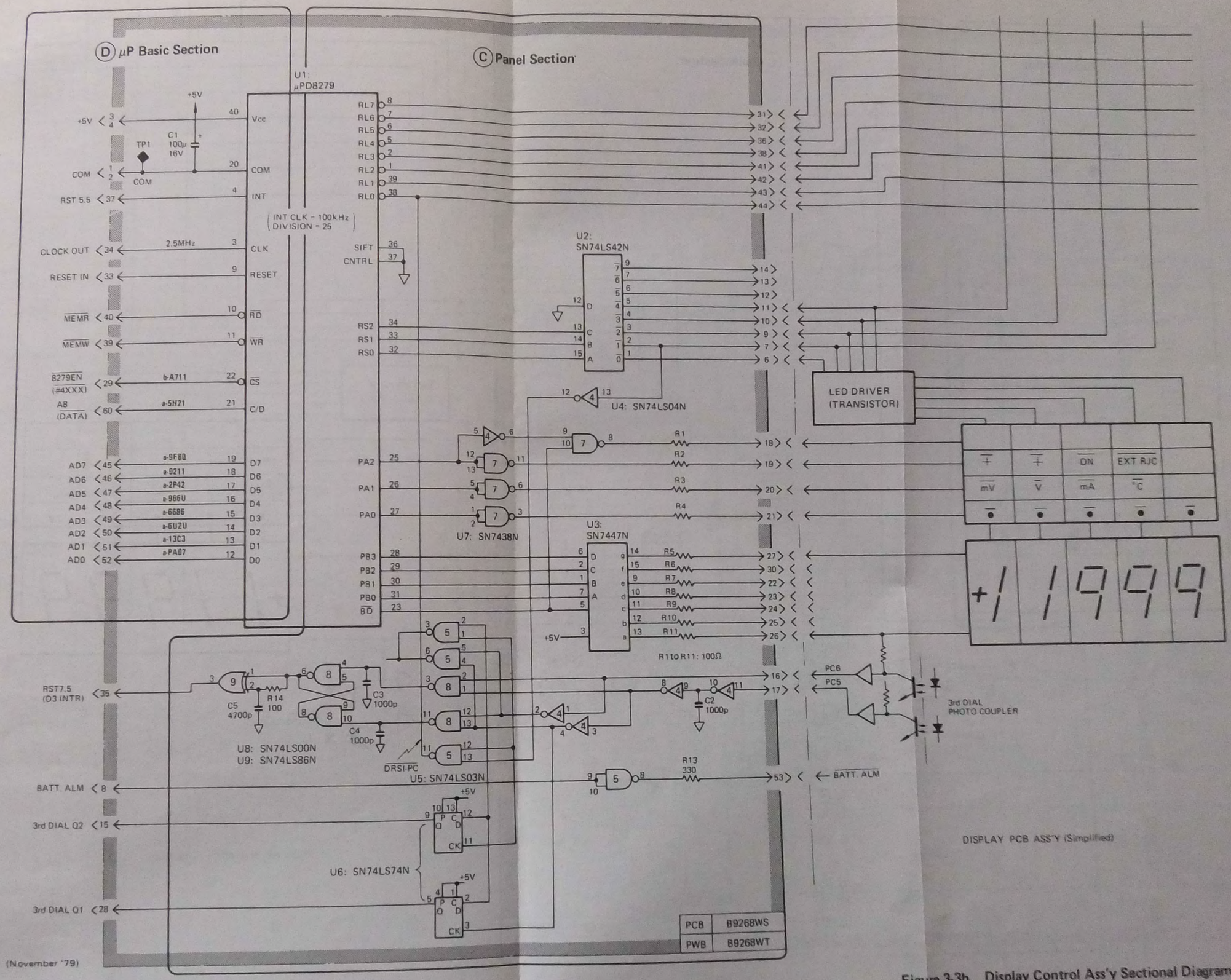



Figure 3-3b. Display Control Ass'y Sectional Diagram (2).

Note 1: Signatures shown in this figure are applied to instruments of serial no. _____ or subsequent.
Note 2: Alphabet followed by signature denotes S.A. mode.

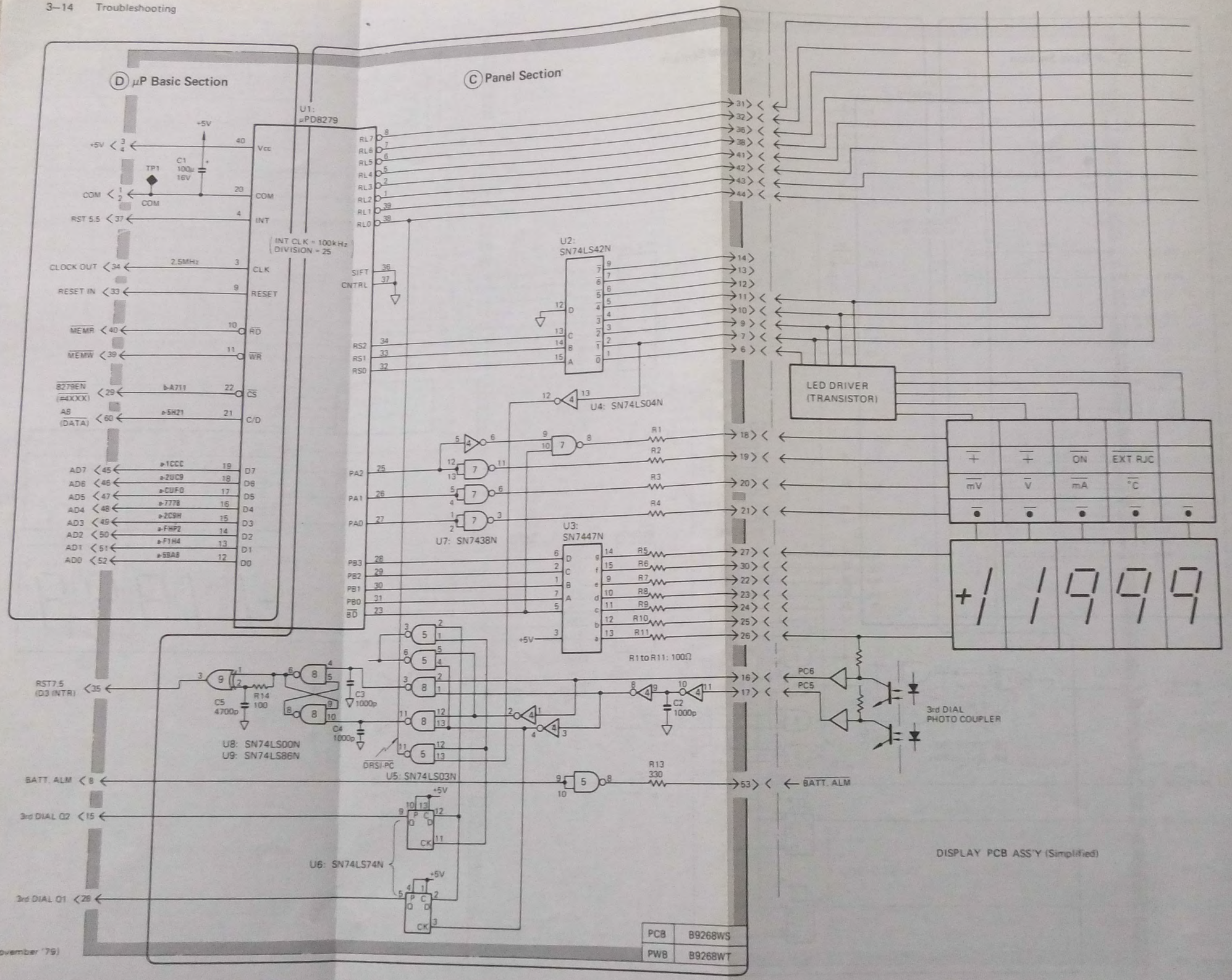
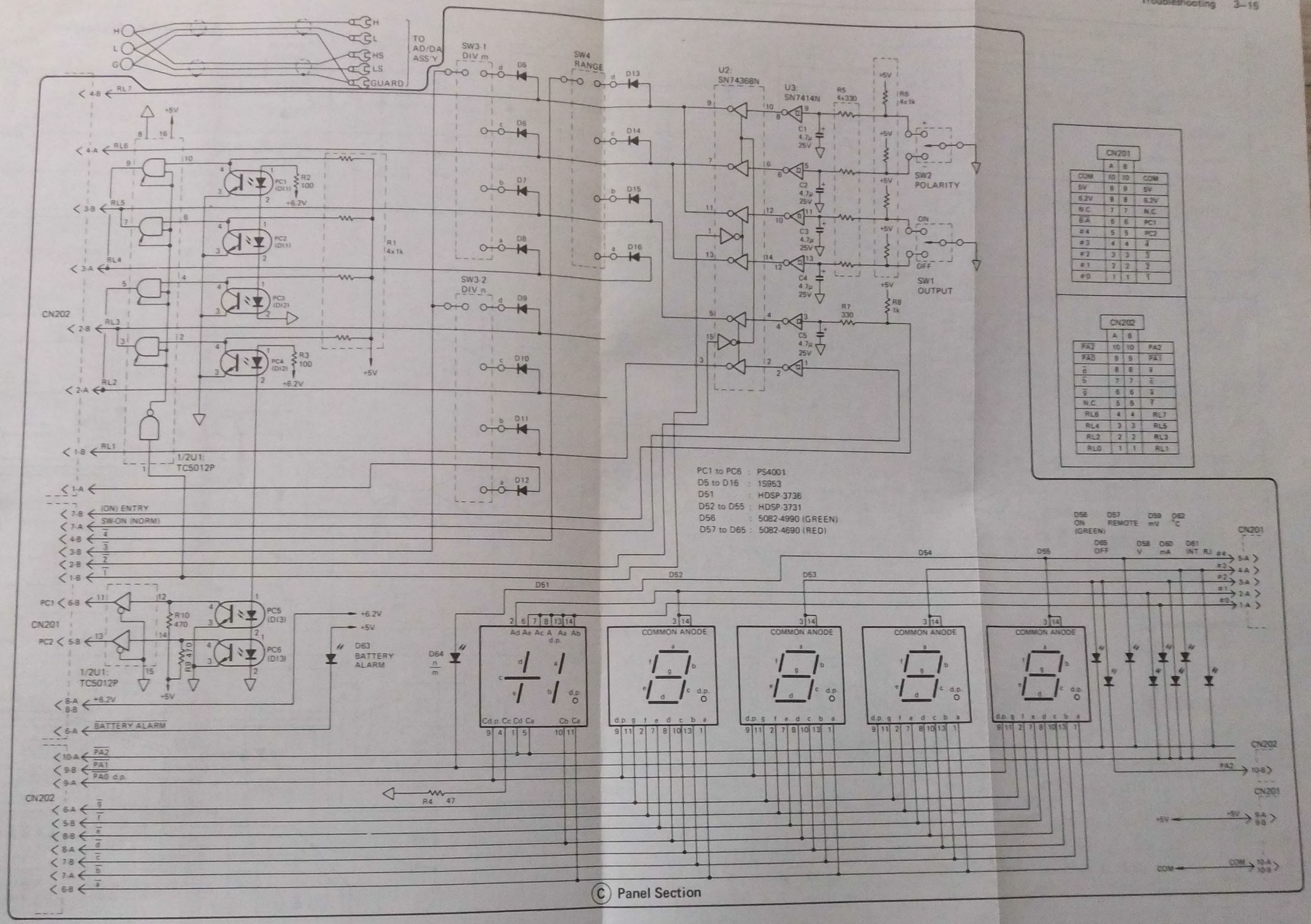



Figure 3-3a. Display Control Ass'y Sectional Diagram (1).

Note 1: Signatures shown in this figure are applied to instruments of serial no. _ _ _ _ _ or preceding.
Note 2: Alphabet followed by signature denotes S.A. mode.




| CN201 | A | B | |
|---|---|---|---|
| COM | 10 | 10 | COM |
| 5V | 9 | 9 | 5V |
| 6.2V | 8 | 8 | 6.2V |
| N.C. | 7 | 7 | N.C. |
| B/A | 6 | 6 | PC1 |
| #4 | 5 | 5 | PC2 |
| #3 | 4 | 4 | $\overline{a}$ |
| #2 | 3 | 3 | $\overline{b}$ |
| #1 | 2 | 2 | $\overline{c}$ |
| #0 | 1 | 1 | $\overline{f}$ |

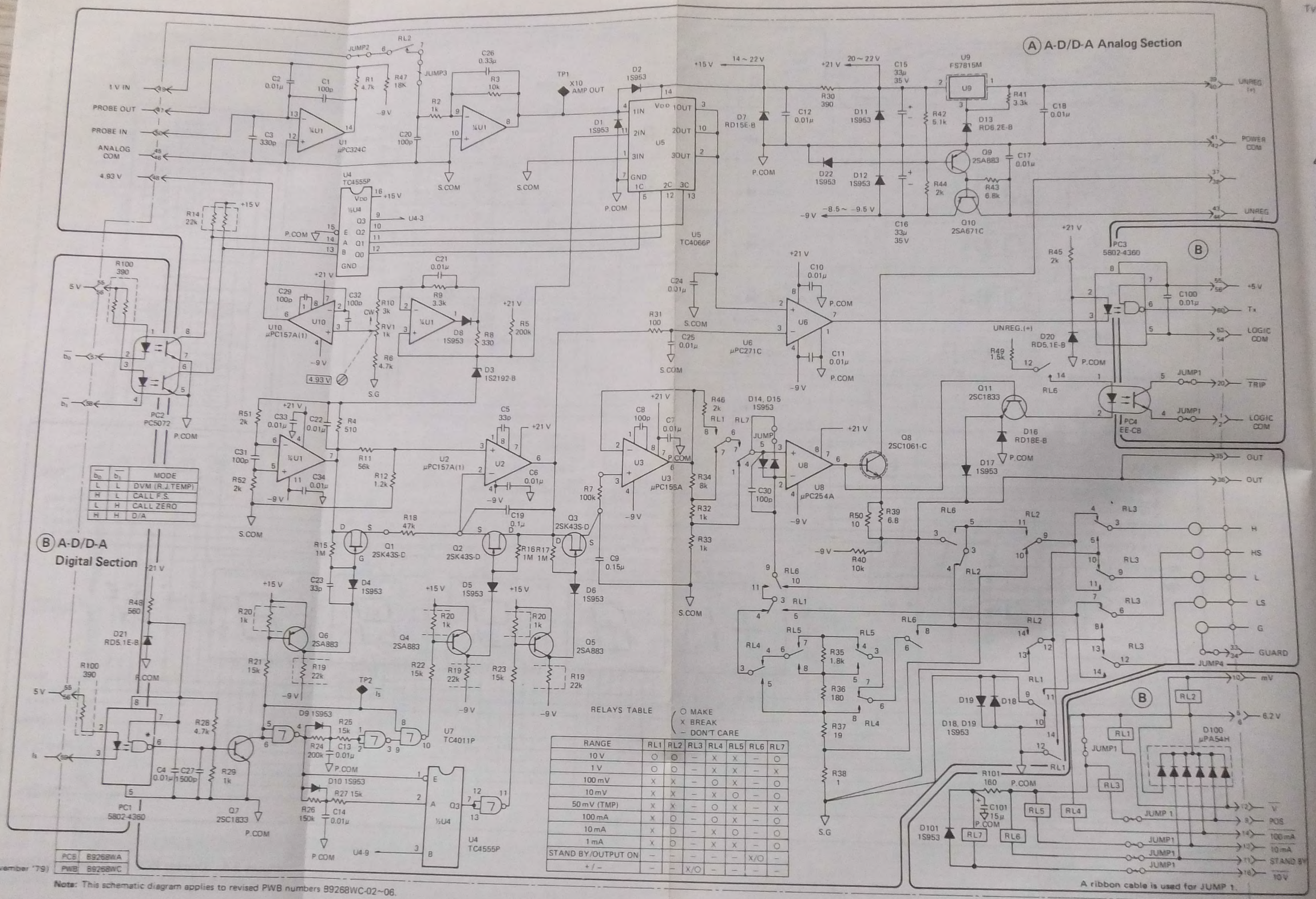
| CN202 | A | B | |
|---|---|---|---|
| PA2 | 10 | 10 | PA2 |
| PA0 | 9 | 9 | PA1 |
| d | 8 | 8 | e |
| b | 7 | 7 | c |
| g | 6 | 6 | g |
| N.C. | 5 | 5 | f |
| RL6 | 4 | 4 | RL7 |
| RL4 | 3 | 3 | RL5 |
| RL2 | 2 | 2 | RL3 |
| RL0 | 1 | 1 | RL1 |

Ⓒ Panel Section

| PCB | B9268WJ |
|---|---|
| PWB | B9268WL |

(November '79)

Figure 3-4. Display PCB Ass'y Sectional Diagram.




| RANGE | RL1 | RL2 | RL3 | RL4 | RL5 | RL6 | RL7 |
|---|---|---|---|---|---|---|---|
| 10 V | O | O | – | X | X | – | O |
| 1 V | O | O | – | X | X | – | X |
| 100 mV | X | X | – | O | X | – | O |
| 10 mV | X | X | – | X | O | – | O |
| 50 mV (TMP) | X | X | – | O | X | – | X |
| 100 mA | X | O | – | O | X | – | O |
| 10 mA | X | O | – | X | O | – | O |
| 1 mA | X | O | – | X | X | – | O |
| STAND BY/OUTPUT ON | – | – | – | – | – | X/O | – |
| + / – | – | – | X/O | – | – | – | – |

**Note:** This schematic diagram applies to revised PWB numbers 99268WC-02~06.

**Figure 3-5. A-D/D-A PCB Ass'y Sectional Diagram.**

SM 2553-1E

# 4. ADJUSTMENT

## 4.1 Introduction

On this instrument, compensation corresponding to zero and span adjustments for each range is digitally stored in the incorporated FUSE ROM type nonvolatile memory as calibration constants (CAL. CONST.), thereby minimizing troublesome adjustments.

Therefore, self-calibration is available with a simple operation as described in "5. CALIBRATION". The only adjustment necessary on this instrument is the following:

## 4.2 Reference Voltage Adjustment

### 4.2.1 Instrument for Adjustment (following or equivalent)

- Digital Voltmeter :
  YEW Type 2501
  Accuracy; V ranges . . . . . ±0.005 %

### 4.2.2 Adjustment Conditions

- Temperature and humidity:
  23 ± 3 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz

### 4.2.3 Adjustment Procedure

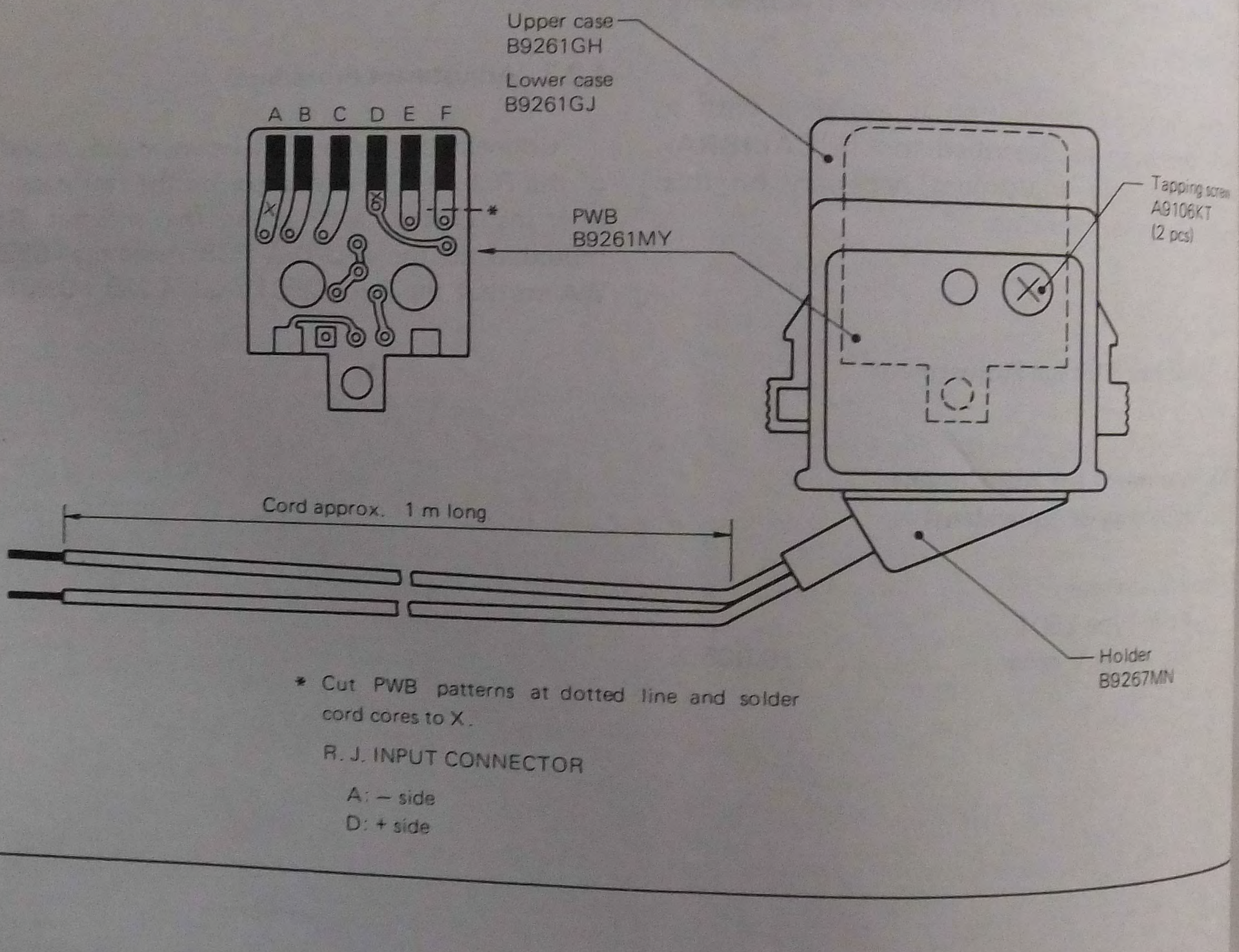
Connect the Type 2501 between pins A and D of the R.J. INPUT connector on the rear panel of this instrument, and adjust the rheostat RV1 mounted on the A-D/D-A PCB Assembly: B9268 WA so that the Type 2501 reads 4.930 ± 0.001 V.

## REFERENCE

For a structural reason, the R.J. INPUT connector is mounted on a position recessed from the rear panel. In this adjustment, therefore, you might find difficulty in engaging the input cord of the Type 2501 to the connector terminals.

To solve this inconvenience, it is recommended to build a jig for adjustment as illustrated below using parts for temperature probe.

When the jig for inspection stated in "2. INSPECTION" has already been built, it may be used commonly for inspection and adjustment by adding a cord to the terminal D.




* Cut PWB patterns at dotted line and solder cord cores to X.

R. J. INPUT CONNECTOR

A: – side
D: + side

## 5.1 Introduction

As described
strument is fac
constants (CAL.
ROM type memo
constants can b
incorporated in t

Calibration c
CMOS RAM at a
and a calibration
provided that su
struments are usec

When a bette
the operation to
agent.

Because this C
dry cells housed
written informati
when the commer
if the dry cell vol
information woul
desires to store ca
RAM, therefore,
position and they
ones within one ye

When the d
the CPU card is
backup by the d
moment, thereb
written in the C
advisable to repl
before a calibrati

The instrume
subsequent is eq
for externally c
CPU card. By co
reverse current p
said TP9 and C
can be protected
rated dry cells or

# 5. CALIBRATION

## 5.1 Introduction

As described in the previous chapter, this instrument is factory delivered with calibration constants (CAL. CONST.) stored in the FUSE ROM type memory. In addition to it, calibration constants can be written in the CMOS RAM incorporated in this instrument on the user side.

Calibration constants can be written in the CMOS RAM at a calibration resolution of 0.01 % and a calibration accuracy of 0.04 to 0.05 % provided that sufficiently controlled standard instruments are used for calibration.

When a better calibration is necessary, entrust the operation to YEW, the service station or sales agent.

Because this CMOS RAM is backed by the 3 V dry cells housed in the rear of this instrument, written information will not be destroyed even when the commercial frequency is turned off but, if the dry cell voltage drops to a certain level, the information would be destroyed. When the user desires to store calibration constants in the CMOS RAM, therefore, dry cells should be installed in position and they should be replaced with new ones within one year.

**CAUTION**

When the dry cells are replaced or when the CPU card is extracted from the connector, backup by the dry cells would be lost for the moment, thereby destroying the information written in the CMOS RAM. It is, therefore, advisable to replace the dry cells immediately before a calibration.

The instrument of a serial no._____or subsequent is equipped with a test point TP9 for externally connecting dry cells on the CPU card. By connecting 3 V dry cells and a reverse current preventive diode between the said TP9 and COM, the stored information can be protected when replacing the incorporated dry cells or extracting the CPU card.

## 5.2 Replacement of Dry Cells

After turning off the POWER switch of this instrument, remove the CAL. BAT. lid on the rear panel, and replace the dry cells (2 pcs SUM-3N).

**CAUTION**

1) Replace the dry cells with the commercial frequency turned off.
2) When it is absolutely necessary to replace them in an energized state, observe the following for safety's sake:
   a) Detach the leads from the output terminals.
   b) Interconnect the CIRCUIT COMMON terminal and ⏚ terminal on the rear panel.
   c) Connect the ⏚ terminal to ground.

## 5.3 Calibration

Calibrate this instrument using the following instruments or equivalent instruments the accuracy of which is warranted by periodical inspections at a testing organ where traceability to the national standards is available.

### 5.3.1 Instruments for Calibration

- Digital Voltmeter :
  YEW Type 2501
  Accuracy; V ranges . . . . . ±0.005 %
  mV ranges . . . . . ±0.01 %
- Standard Resistors :
  YEW Type 2792
  1 pc each 10 Ω, 1 kΩ
  Tolerance . . . . . ±0.005 %
- DC Voltage Standard :
  YEW Type 2552
  Accuracy . . . . . ±0.005 %

### 5.3.2 Calibration Conditions

- Temperature and humidity :
  23 ± 1 °C, 75 % RH max.
- Power source :
  Rated line voltage, 50/60 Hz
- Calibration setup :
  As specified below

**CAUTION**

Calibration is performed according to the procedures described in 5.3.3 to 5.3.6. In calibration, be sufficiently careful about the following:

1) Control and maintenance of accuracy of standard instruments on user side
2) Ambient conditions at calibration
3) Operating conditions at warmup
4) Period during which internal instrument is drawn out at calibration and during which instrument is calibrated

### 5.3.3 Calibration of Voltage Ranges

**A. Preparation**

a) With the instrument installed in the case, set the range, level and output divider to 1 V, 1 V and n/m = 1, respectively, and allow approximately four hour warmup.

b) After a four hour warmup, remove two screws from the bottom rear and loosen two lock screws on the front panel by rotating them counterclockwise. With the instrument kept energized, draw out the internal instrument from the case until the mode selector on the CPU card can be operated as shown in Figure 5-1.

**CAUTION**

Because the instrument is energized, take sufficient safety precautions.

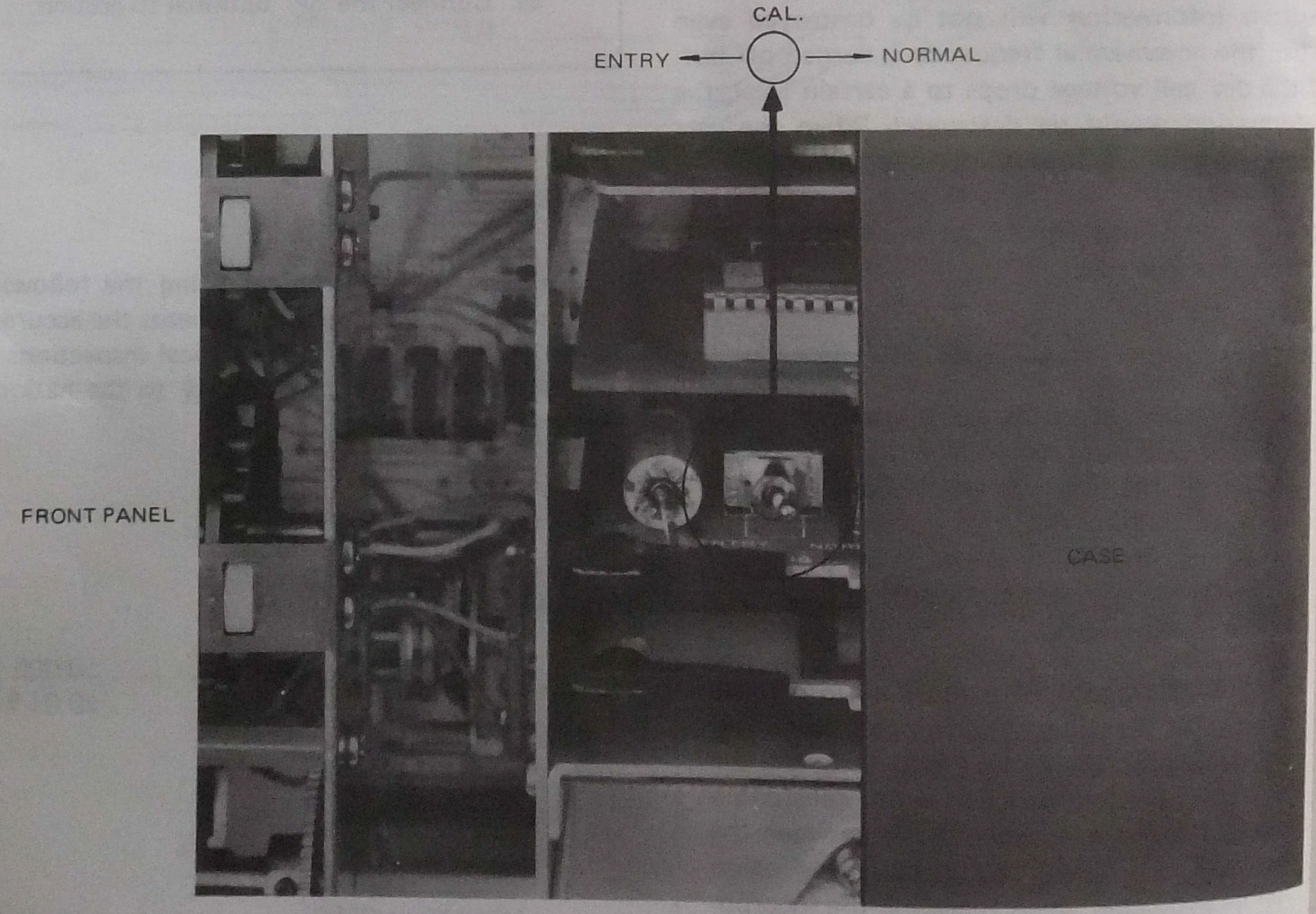
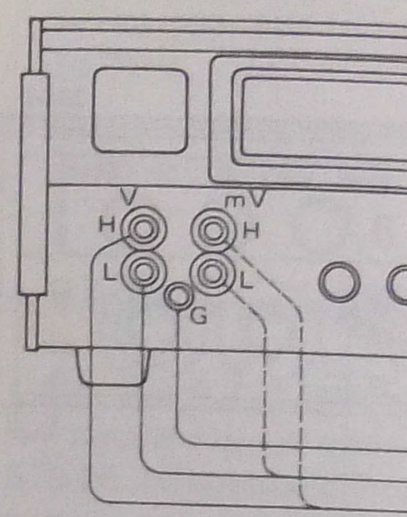



**Figure 5-1. Mode Selector on CPU Card.**





c) Connect the Type 2
terminals of this instr
5-2.




**B. Rated Value Calibratio**

a) Set the mode selector
shown in Figure 5-1 to

b) Select a range to be ca
OUTPUT switch.

c) Operate the setting d
2501 reads the rated
instrument.

d) As soon as the Type
value, throw SW1 to EN
Thus the calibration co
the setting is stored in
same time, the displa
changes to the rated va
the calibration of the ra

e) Ascertain that the read
and Type 2501 match
range.

**C. Zero Calibration**

a) Operate the setting dial
that the Type 2501 reads

b) As soon as the Type 2
SW1 to ENTRY. Thus t
corresponding to the set
RAM and, at the same ti

c) Connect the Type 2501 between the output terminals of this instrument as shown in Figure 5-2.

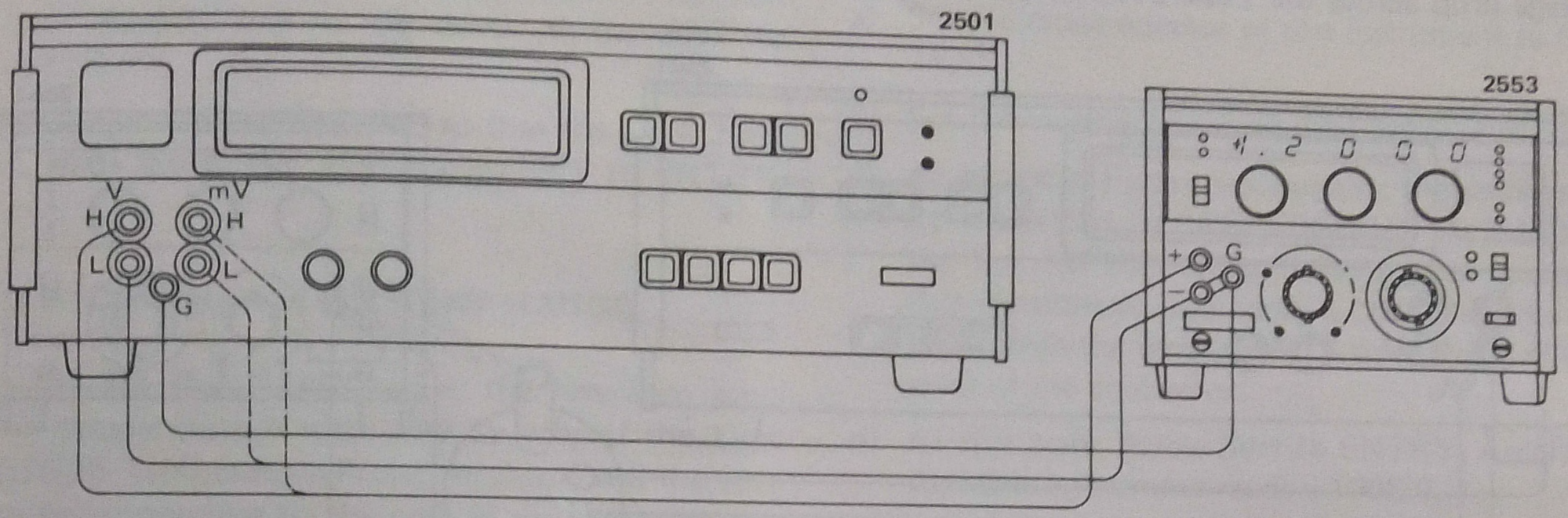



Figure 5-2. Setup for Voltage Range Calibration.

**B. Rated Value Calibration**

a) Set the mode selector SW1 on the CPU card shown in Figure 5-1 to CAL.

b) Select a range to be calibrated and turn on the OUTPUT switch.

c) Operate the setting dial so that the Type 2501 reads the rated output level of this instrument.

d) As soon as the Type 2501 reads the rated value, throw SW1 to ENTRY.
Thus the calibration constant corresponding to the setting is stored in CMOS RAM and, at the same time, the display on this instrument changes from the set value to zero, thereby completing the zero calibration.

e) Ascertain that the readings on this instrument and Type 2501 match the rated value of the range.

**C. Zero Calibration**

a) Operate the setting dials of this instrument so that the Type 2501 reads zero.

b) As soon as the Type 2501 reads zero, throw SW1 to ENTRY. Thus the calibration constant corresponding to the setting is stored in CMOS RAM and, at the same time, the display on this instrument changes from the set value to zero, thereby completing the zero calibration.

c) Ascertain that the readings on this instrument and Type 2501 are zero.

**D. Calibration on Other Voltage Ranges**

For other voltage ranges to be calibrated, repeat calibration of rated values and zeroes in the same procedure as stated above.

**REFERENCE**

1) On ranges for which calibration constants are not written in the CMOS RAM, those in the FUSE ROM are effective. In other words, only necessary ranges have to be calibrated.

2) Whether a calibration constant stored in the CMOS RAM by a calibration is proper or not is judged when it is read out. When it is abnormal, it is disregarded and a calibration constant written in the FUSE ROM when the instrument is factory delivered is reat out. In other cases, calibration constants written in the CMOS RAM by the calibration are reat out when delivering outputs.

### 5.3.4 Calibration of Current Ranges

A current range is calibrated in the same procedure as for a voltage range by measuring the voltage drop across the Type 2792 in the setup as shown in Figure 5-3.

As for the Type 2792, 10 Ω is used for calibrating the 100 mA range, and 1 kΩ is used for the 10 mA and 1 mA ranges, respectively.

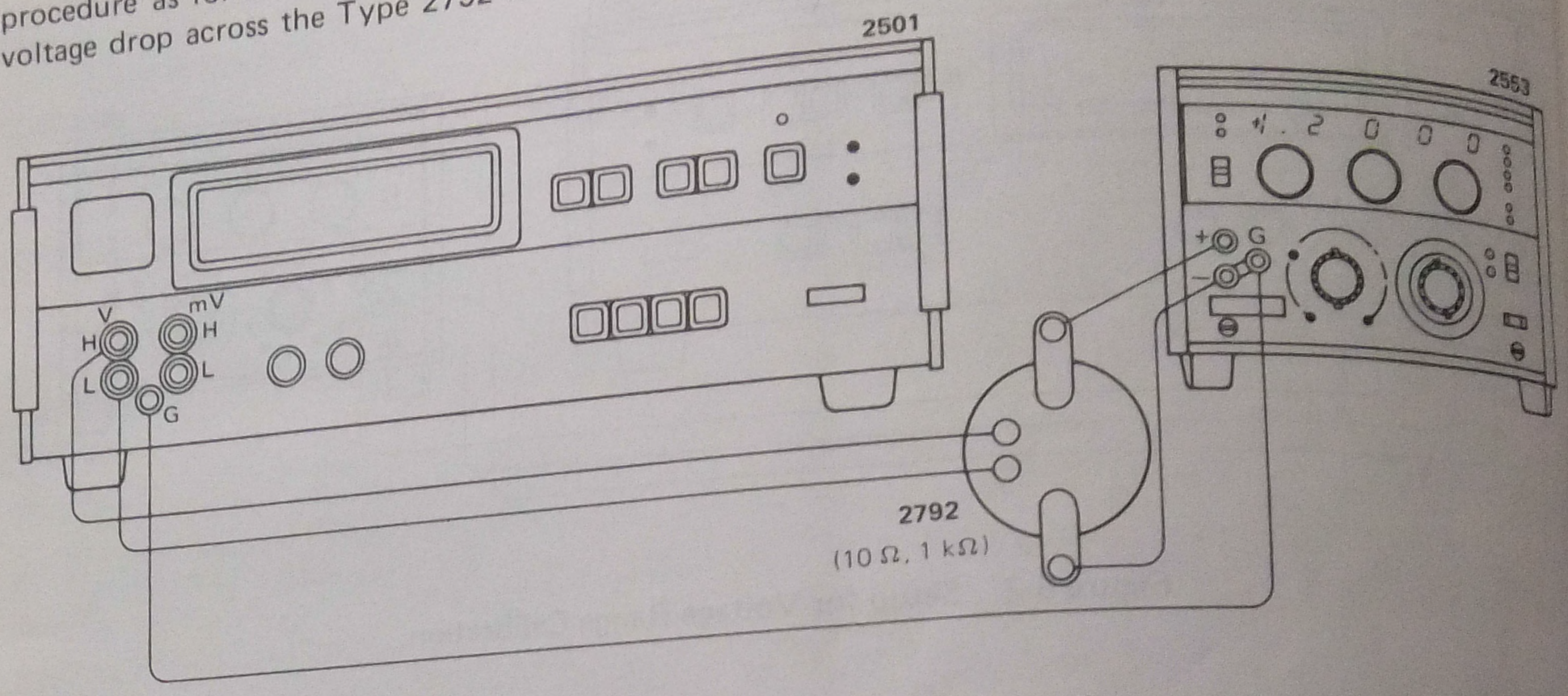



Figure 5-3. Setup for Calibration of Current Ranges.

### 5.3.5 Calibration of Temperature Setting – mV Generating Ranges

A. CC Range

The CC range is automatically calibrated by a calibration of the 10 mV range.

B. PR, CA, CRC and IC Ranges

For these four ranges excluding the CC range, the instrument has in its interior a 50 mV output range. For calibrating these four ranges, therefore, the incorporated 50 mV range has only to be calibrated.

a) Set the range selector on the front panel to PR. Note that calibration is unavailable on another range.

b) Set SW1 to CAL.

c) Connect this instrument and Type 2501 as shown in Figure 5-4, and proceed to a calibration in the same procedure as for a voltage range.

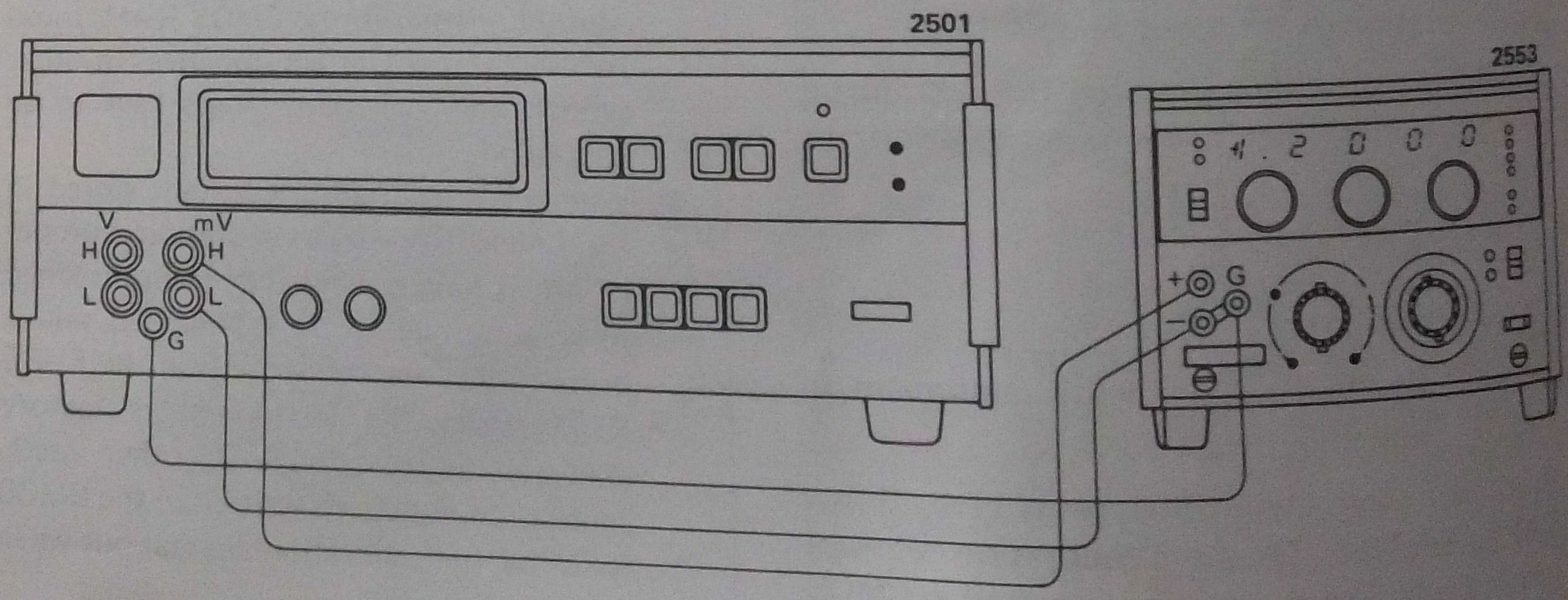



Figure 5-4. Setup for Calibration of Temperature Setting – mV Generating Ranges.

d) Set the dials to 1000.0 and turn ON the OUTPUT switch. Then 50 mV will appear across the output terminals.

e) Operate the setting dials of this instrument so that the Type 2501 reads 50.000 mV. As soon as 50.000 mV is obtained, throw SW1 to ENTRY.

f) Operate the setting dials so that the Type 2501 reads 0.000 mV, and throw SW1 to ENTRY.

### 5.3.6 Calibration of R.J. TEMP RANGE

On the R.J. TEMP range, the reference junction temperature is measured by way of the Type 2578-25 Temperature Probe (option), and the voltage corresponding to the emf of the thermocouple for the temperature is automatically added as an offset.

This range is calibrated in the following procedure.

**A. Calibration Procedure**

a) Set the range selector of this instrument to R.J. TEMP.

b) Set the mode selector on the CPU card to CAL.

c) As shown in Figure 5-5, connect the calibration jig (described in "REFERENCE" in 2.4.2) to the R.J. INPUT connector on the rear panel of this instrument, and apply a DC voltage of −1 V between the terminal F (− side) and A (COM side) of the connector.

d) At this state, throw SW1 to ENTRY. Ascertain that this instrument reads −1000.0.

e) Set the output of the Type 2552 to −10 mV and throw SW1 to ENTRY. Ascertain that this instrument reads −0010.0.

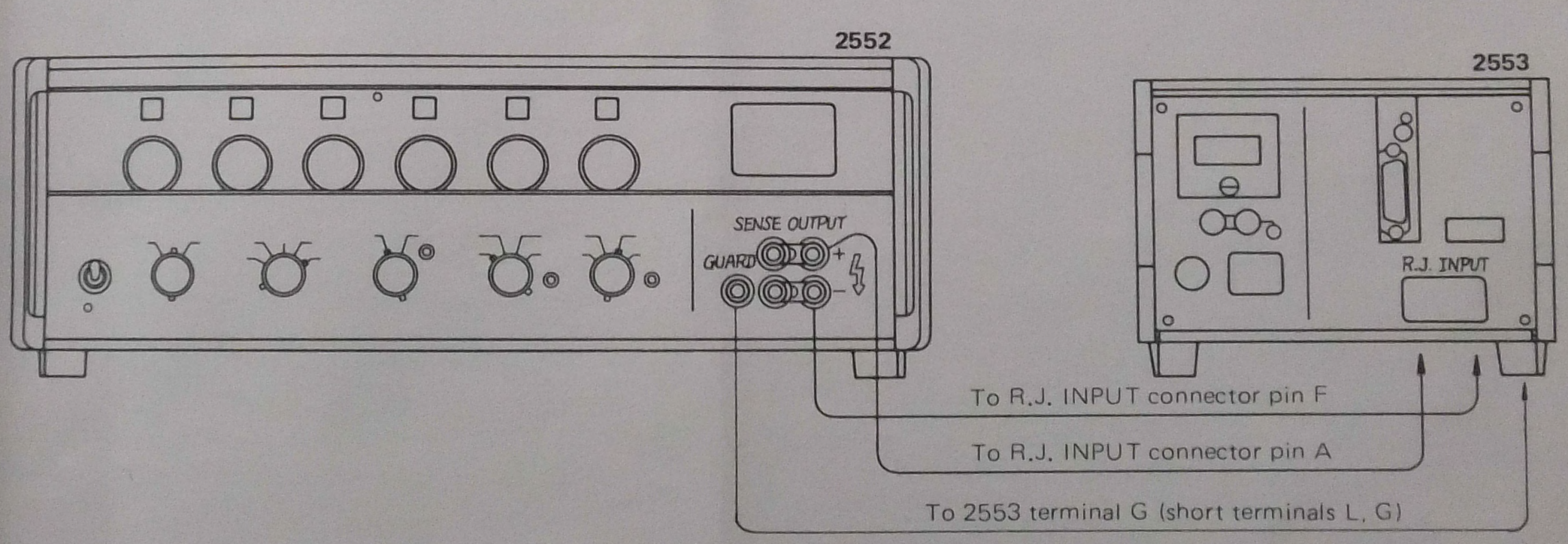



**Figure 5-5. Setup for Calibration of R.J. TEMP Range.**

Among the different calibrations stated above, calibrate only necessary ranges. Thus this instrument has been calibrated.

**CAUTION**

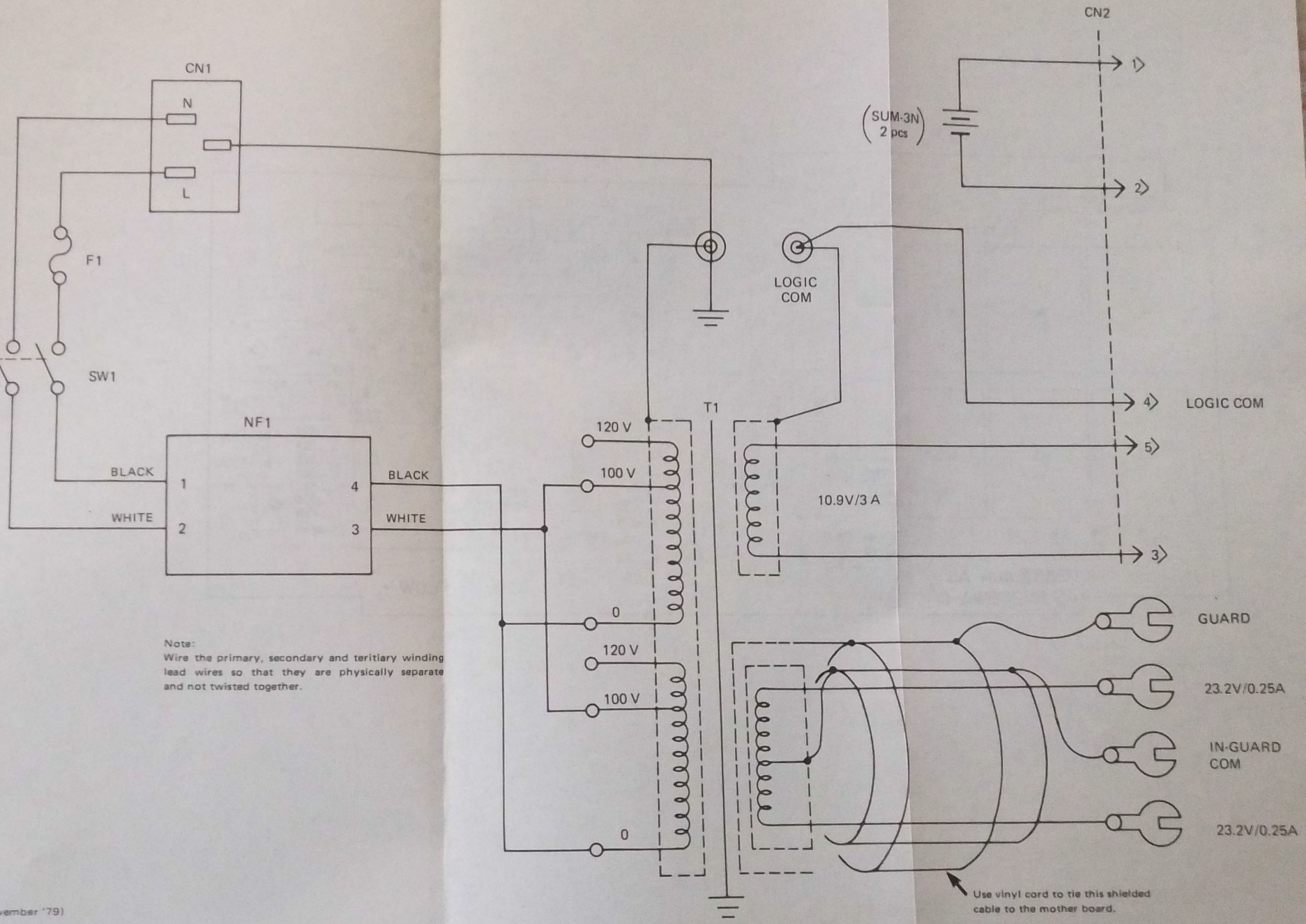
In order to reduce influcence by temperature rise in the instrument, make it a rule to finish the calibration of a necessary range within half an hour.

### 5.3.7 Procedure after Completion of Calibration

- After completion of calibration, set the mode selector SW1 on the CPU card to NORMAL.
- Install the instrument into the case.

# 6. SCHEMATIC DIAGRAMS AND COMPONENT LOCATION DIAGRAMS

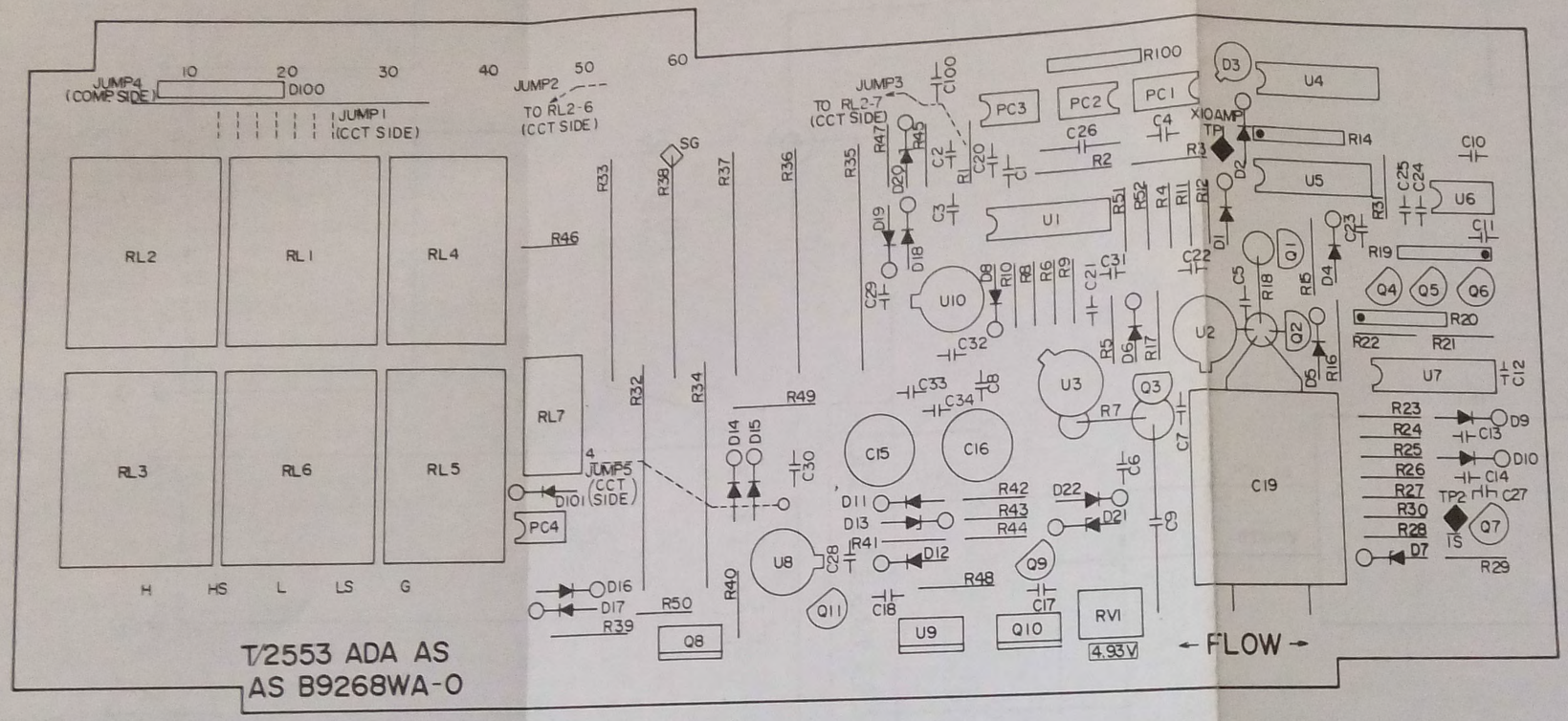

| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 1 | Power Supply Ass'y Schematic Diagram | B9268DA | 6-1 | 6–2 |
| 2 | A-D/D-A PCB Ass'y Component Location Diagram | B9268WA | 6-2a | 6–3 |
| | A-D/D-A PCB Ass'y Schematic Diagram | | 6-2b | 6–4 |
| 3 | CPU Card Ass'y Component Location Diagram | B9268WD | 6-3a | 6–5 |
| | CPU Card Ass'y Schematic Diagram | | 6-3b | 6–6 |
| 4 | Display PCB Ass'y Component Location Diagram | B9268WJ | 6-4a | 6–7 |
| | Display PCB Ass'y Schematic Diagram | | 6-4b | 6–8 |
| 5 | Mother Board PCB Ass'y Component Location Diagram | B9268WM | 6-5a | 6–9 |
| | Mother Board PCB Ass'y Schematic Diagram | | 6-5b | 6–10 |
| 6 | Display Control Ass'y Component Location Diagram | B9268WS | 6-6a | 6–11 |
| | Display Control Ass'y Schematic Diagram | | 6-6b | 6–12 |




Note:
Wire the primary, secondary and teritiary winding lead wires so that they are physically separate and not twisted together.

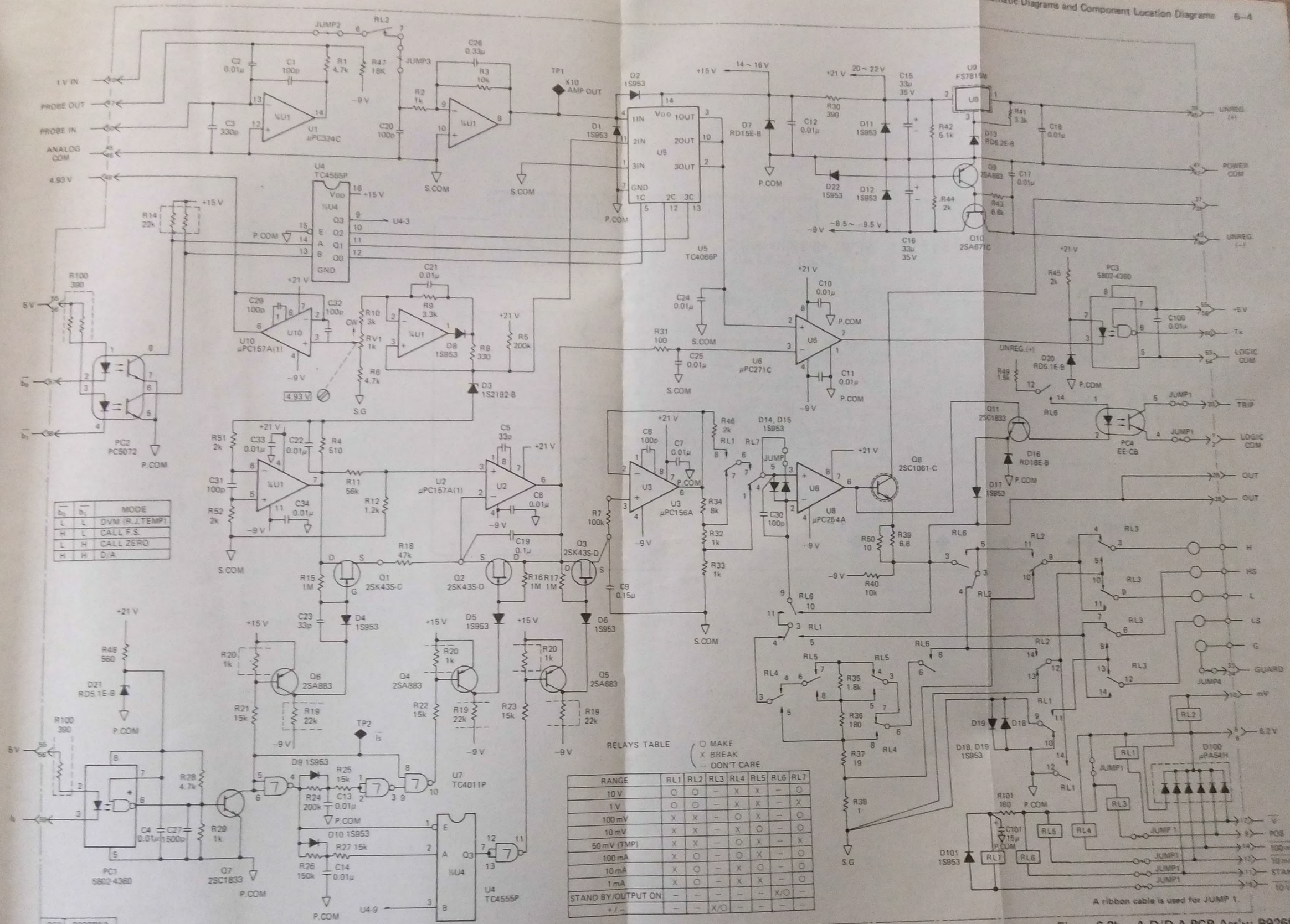
(November '79)

**Figure 6-1. Power Supply Ass'y: B9268DA Schematic Diagram.**




(November '79)

Figure 6-2a. A-D/D-A PCB Ass'y: B9268WA Component Location Diagram.




| $\overline{b_0}$ | $\overline{b_1}$ | MODE |
|---|---|---|
| L | L | DVM (R.J.TEMP) |
| H | L | CALL F.S. |
| L | H | CALL ZERO |
| H | H | D/A |

| RANGE | RL1 | RL2 | RL3 | RL4 | RL5 | RL6 | RL7 |
|---|---|---|---|---|---|---|---|
| 10 V | O | O | – | X | X | – | O |
| 1 V | O | O | – | X | X | – | X |
| 100 mV | X | X | – | O | X | – | O |
| 10 mV | X | X | – | X | O | – | O |
| 50 mV (TMP) | X | X | – | O | X | – | X |
| 100 mA | X | O | – | O | X | – | O |
| 10 mA | X | O | – | X | O | – | O |
| 1 mA | X | O | – | X | X | – | O |
| STAND BY/OUTPUT ON | – | – | – | – | – | X/O | – |
| +/− | – | – | X/O | – | – | – | – |

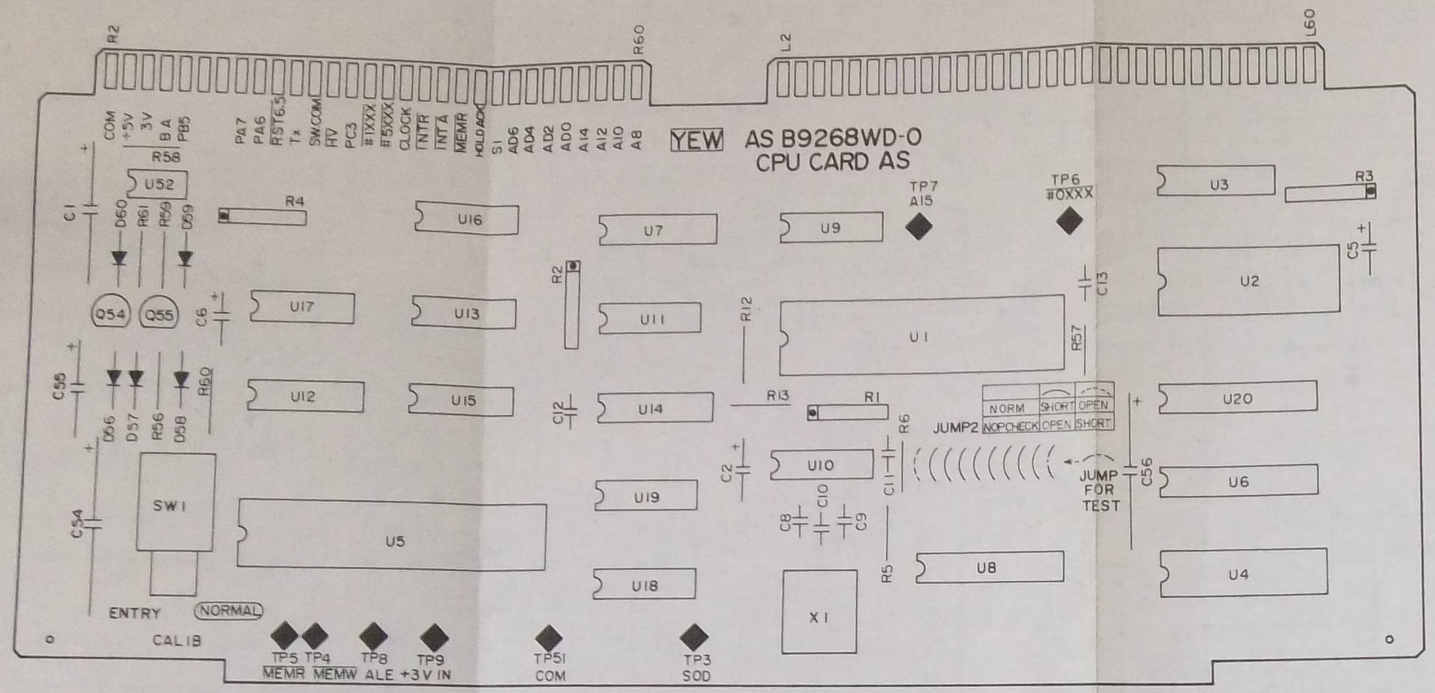
| PCB | B9268NA |
|---|---|
| PWB | B9268WC |

(November '79)

Note: This schematic diagram applies to revised PWB numbers B9268WC-02~06.

Figure 6-2b. A-D/D-A PCB Ass'y: B9268WA Schematic Diagram.

SM 2553-16




(November '79)

Figure 6-3a. CPU Card Ass'y: B9268WD Component Location Diagram.

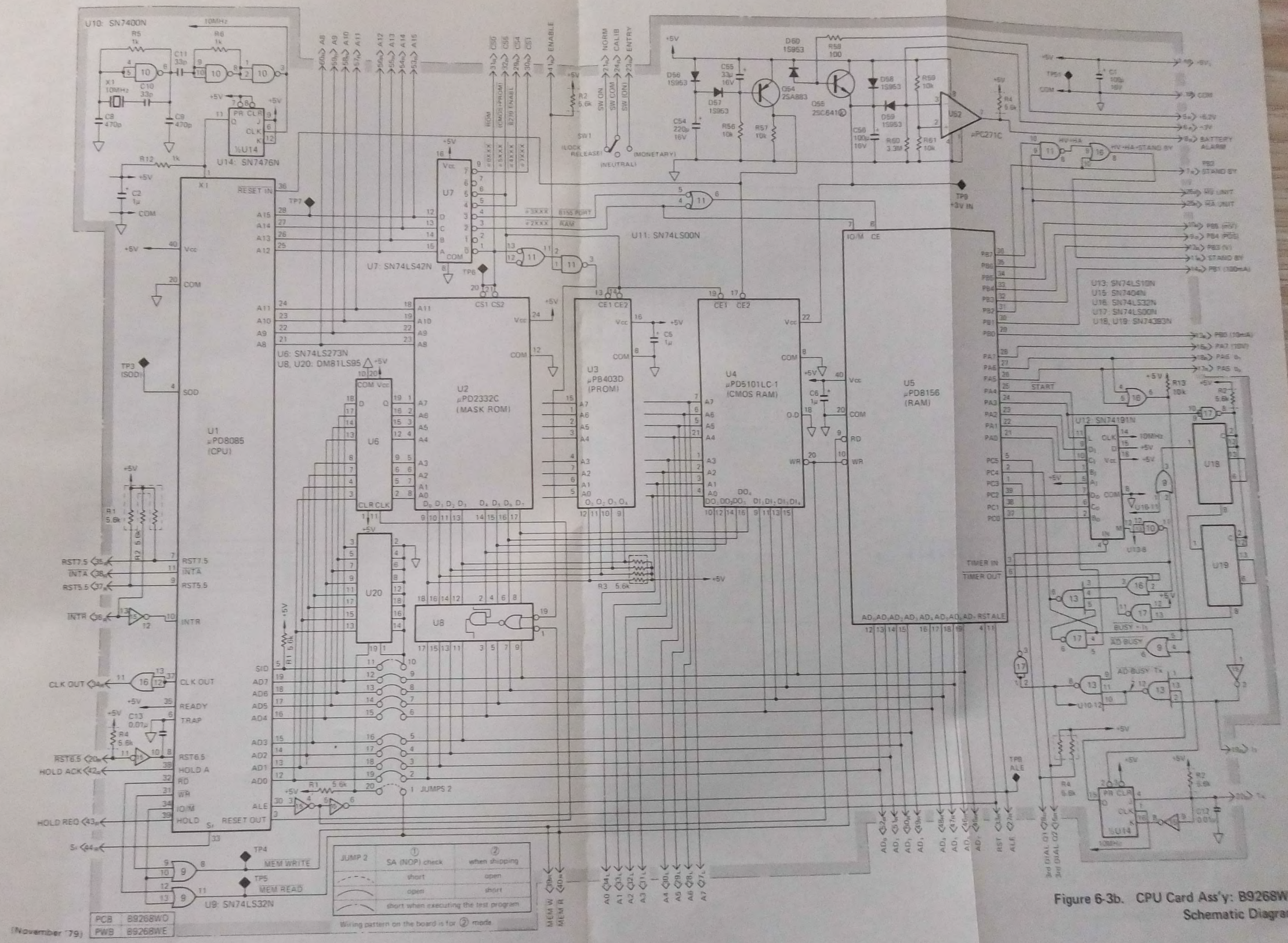
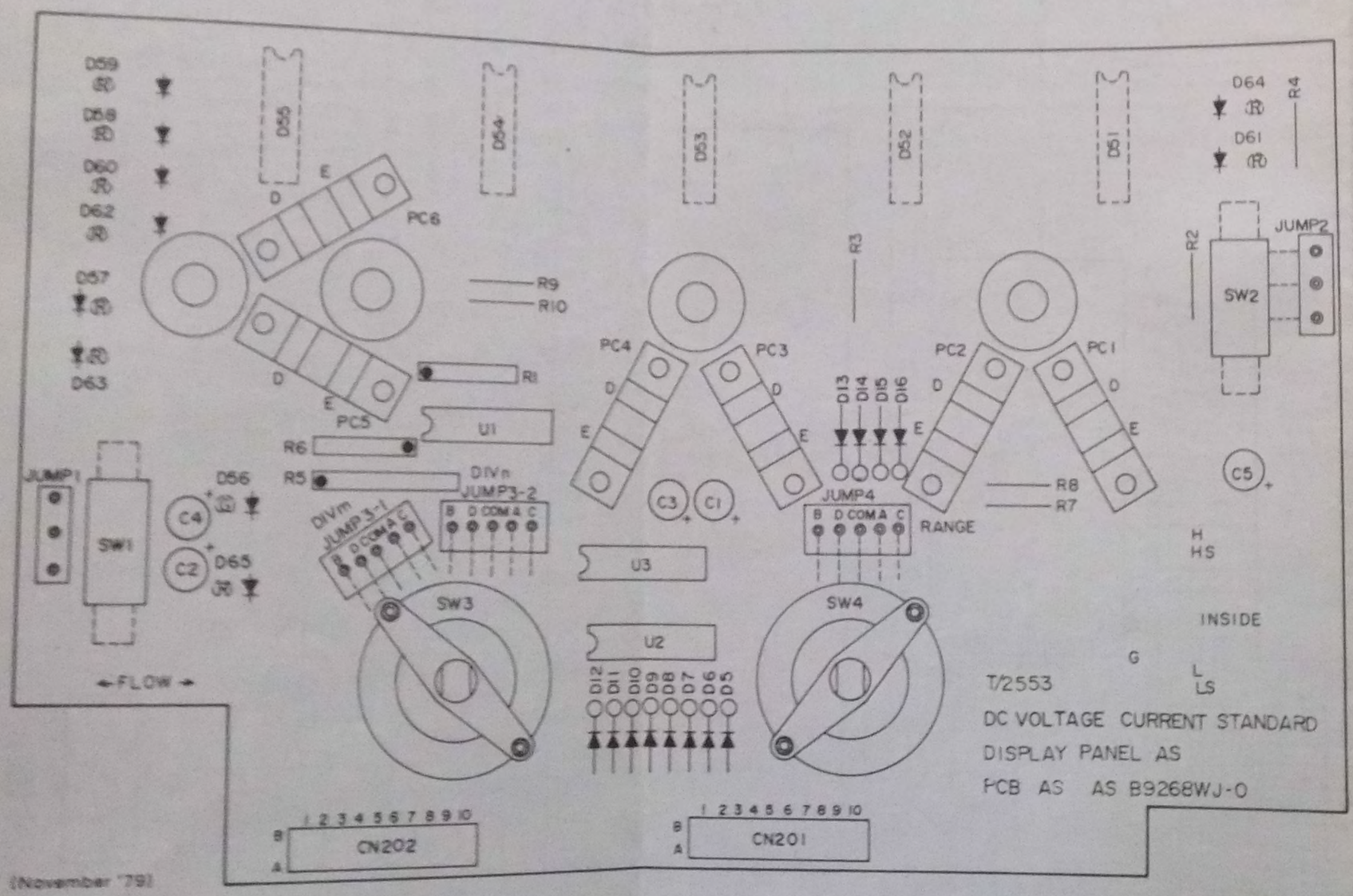
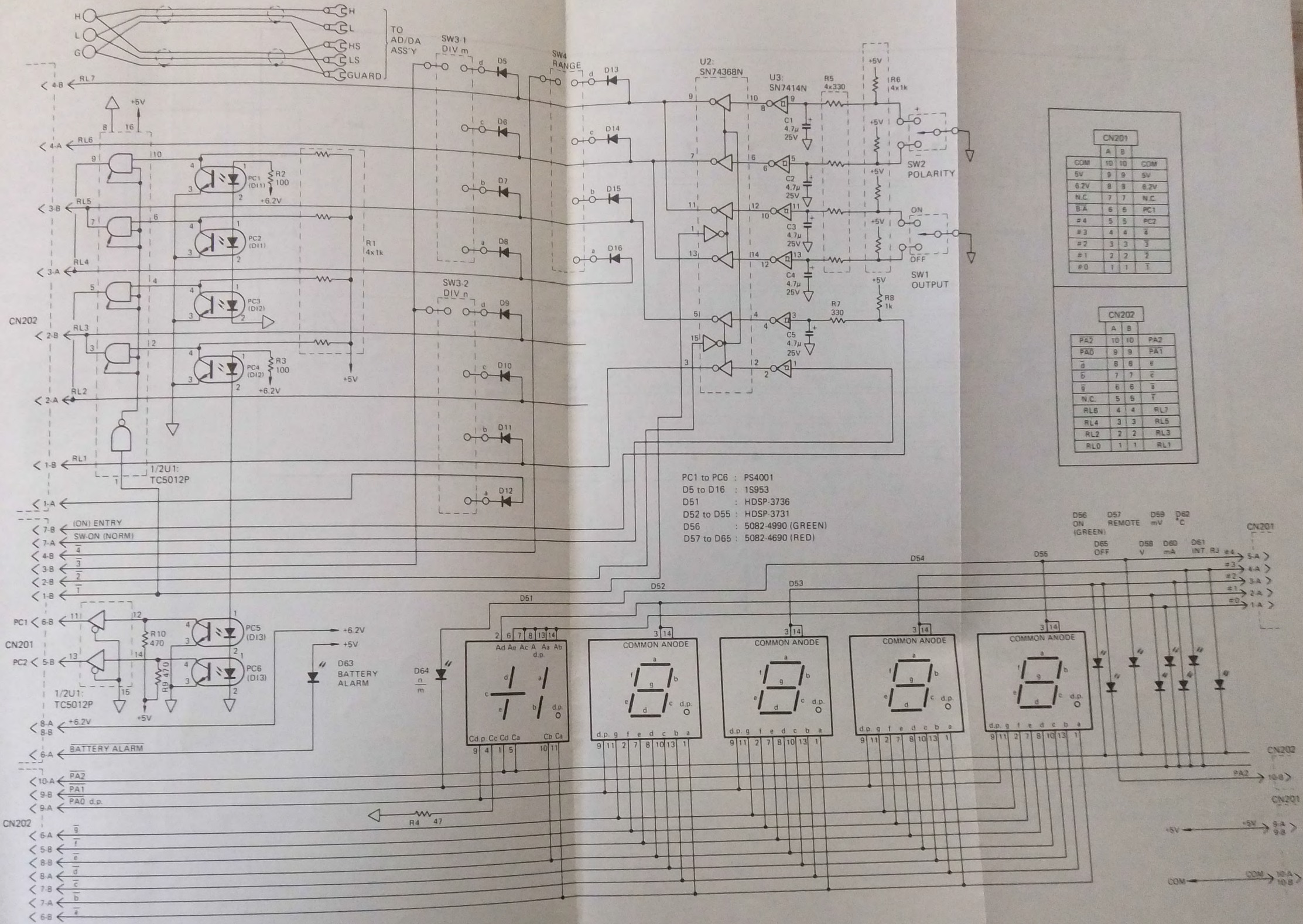



Figure 6-3b. CPU Card Ass'y: B9268WD Schematic Diagram.


D59
D58
D60
D62
D57
D63
D55
D54
D53
D52
D51
D64
D61
R4
R2
R3
JUMP2
SW2
PC6
R9
R10
PC4
PC3
PC2
PC1
D13
D14
D15
D16
R1
U1
PC5
R6
R5
DIVn
JUMP3-2
DIVm
JUMP3-1
B D COM A C
JUMP4
RANGE
R8
R7
JUMP1
SW1
D56
C4
C2
D65
C3
C1
C5
U3
U2
SW3
SW4
H
HS
INSIDE
G
L
LS
←FLOW→
T/2553
DC VOLTAGE CURRENT STANDARD
DISPLAY PANEL AS
PCB AS AS B9268WJ-0
1 2 3 4 5 6 7 8 9 10
B
A
CN202
CN201
(November '79)



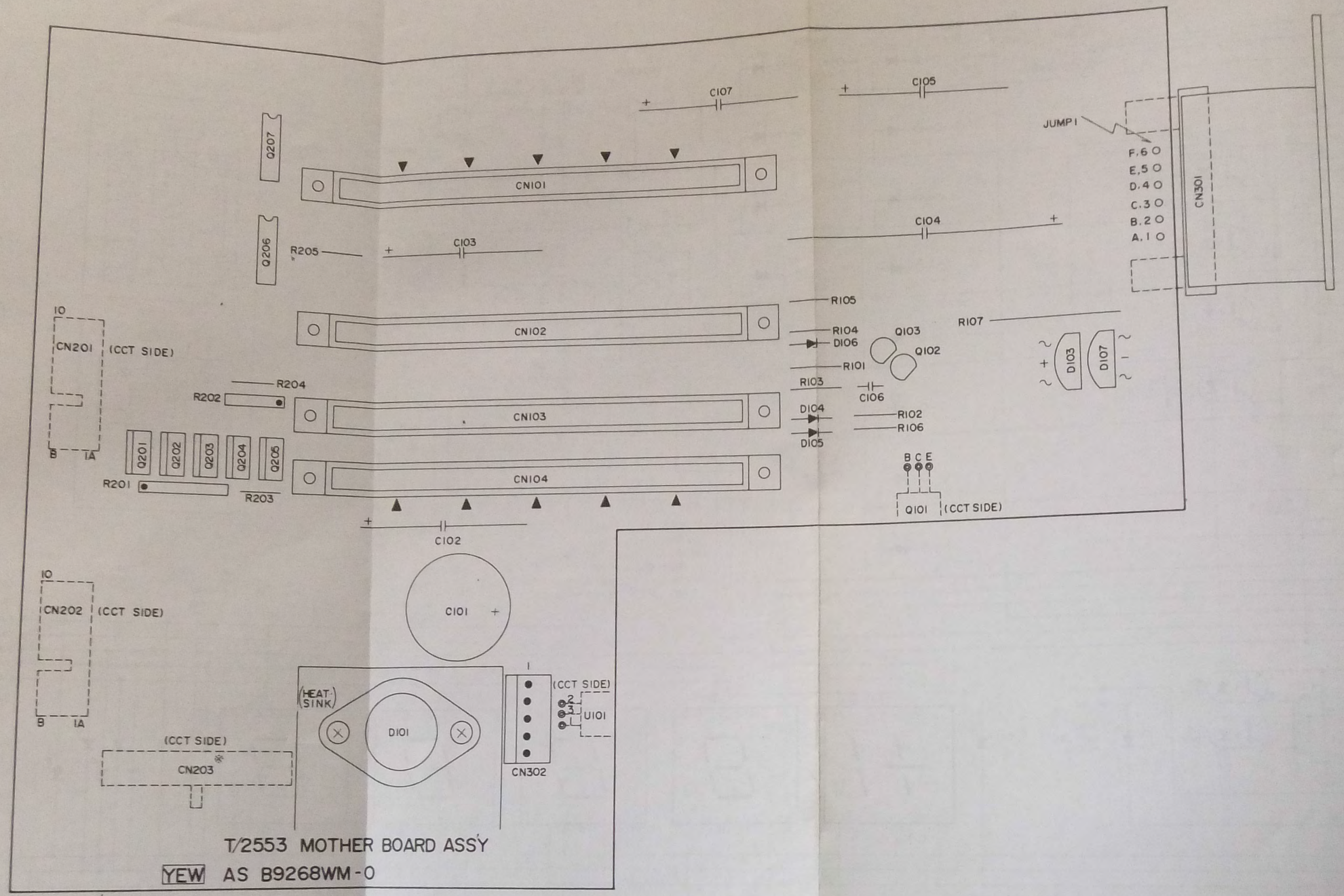

| CN201 | A | B | |
|---|---|---|---|
| COM | 10 | 10 | COM |
| 5V | 9 | 9 | 5V |
| 6.2V | 8 | 8 | 6.2V |
| N.C. | 7 | 7 | N.C. |
| B.A | 6 | 6 | PC1 |
| #4 | 5 | 5 | PC2 |
| #3 | 4 | 4 | $\overline{4}$ |
| #2 | 3 | 3 | $\overline{3}$ |
| #1 | 2 | 2 | $\overline{2}$ |
| #0 | 1 | 1 | $\overline{1}$ |

| CN202 | A | B | |
|---|---|---|---|
| $\overline{PA2}$ | 10 | 10 | PA2 |
| $\overline{PA0}$ | 9 | 9 | $\overline{PA1}$ |
| $\overline{d}$ | 8 | 8 | $\overline{e}$ |
| $\overline{b}$ | 7 | 7 | $\overline{c}$ |
| $\overline{g}$ | 6 | 6 | $\overline{a}$ |
| N.C. | 5 | 5 | $\overline{f}$ |
| RL6 | 4 | 4 | RL7 |
| RL4 | 3 | 3 | RL5 |
| RL2 | 2 | 2 | RL3 |
| RL0 | 1 | 1 | RL1 |

| PCB | B9268WJ |
|---|---|
| PWB | B9268WL |

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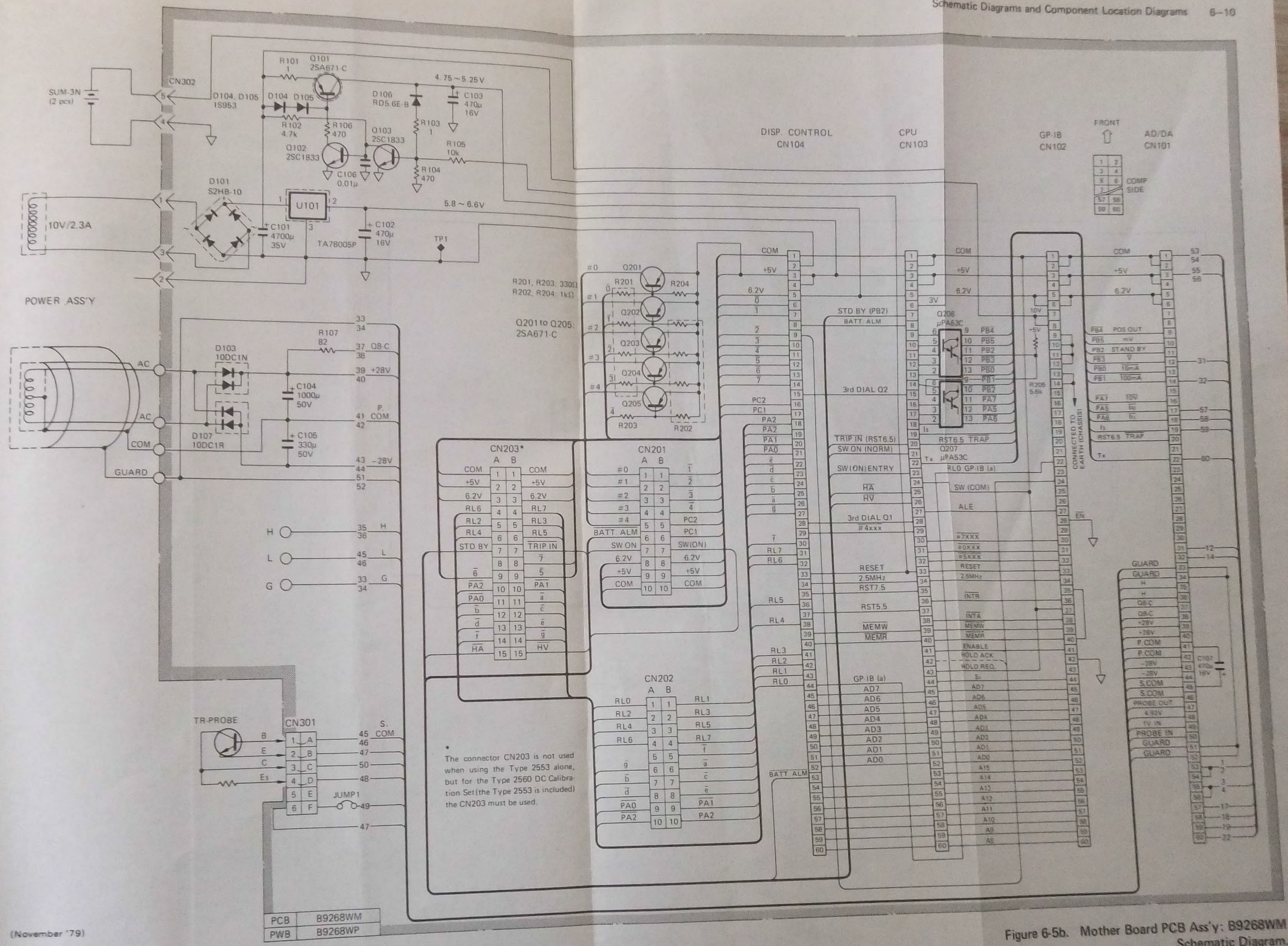
Figure 6-4b. Display PCB Ass'y: B9268WJ Schematic Diagram.




The connector CN203 is not used when using the Type 2553 alone, but for the Type 2560 DC Calibration Set (the Type 2553 is included) the CN203 must be used.

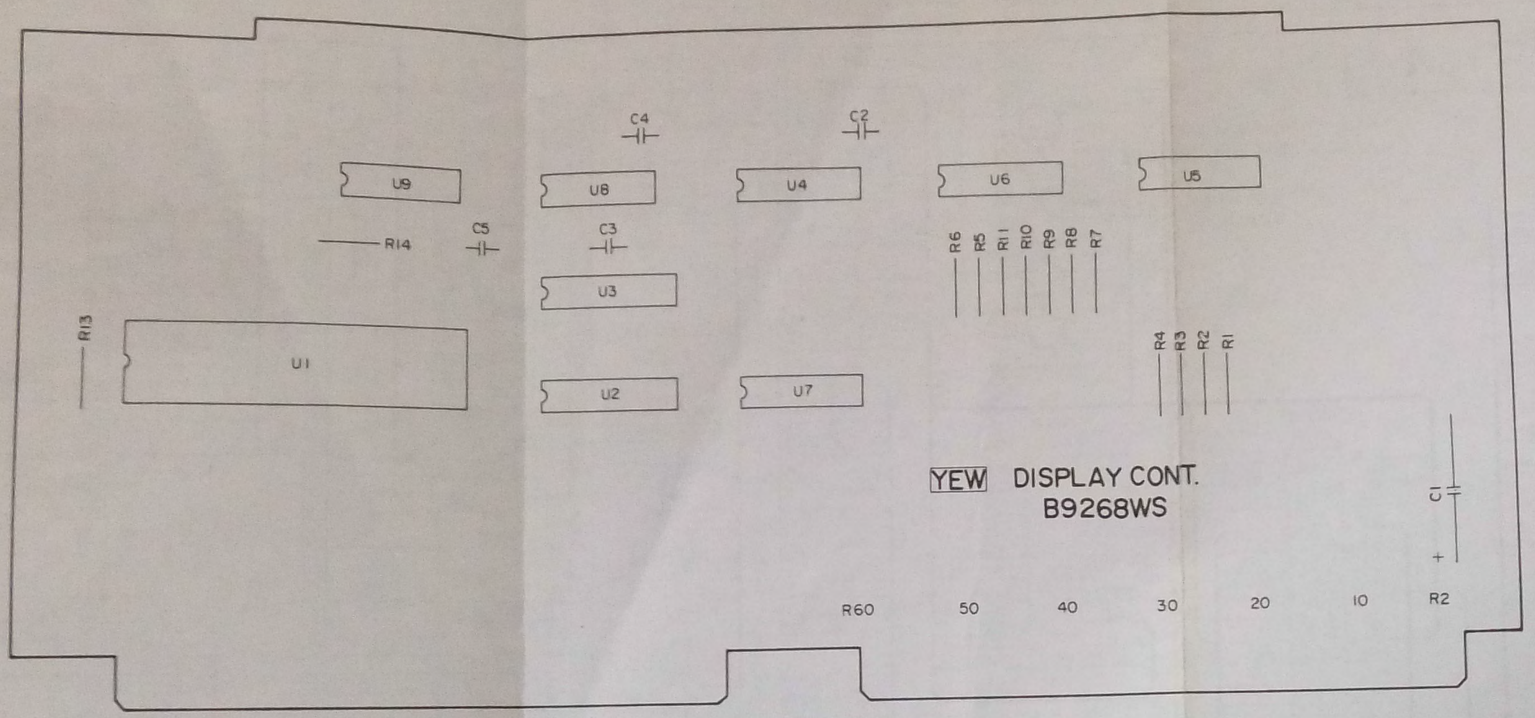
(November '79)

**Figure 6-5a. Mother Board PCB Ass'y: B9268WM Component Location Diagram.**




(November '79)

Figure 6-5b. Mother Board PCB Ass'y: B9268WM Schematic Diagram.




(November '79)

Figure 6-6a. Display Control Ass'y: B9268WS Component Location Diagram.

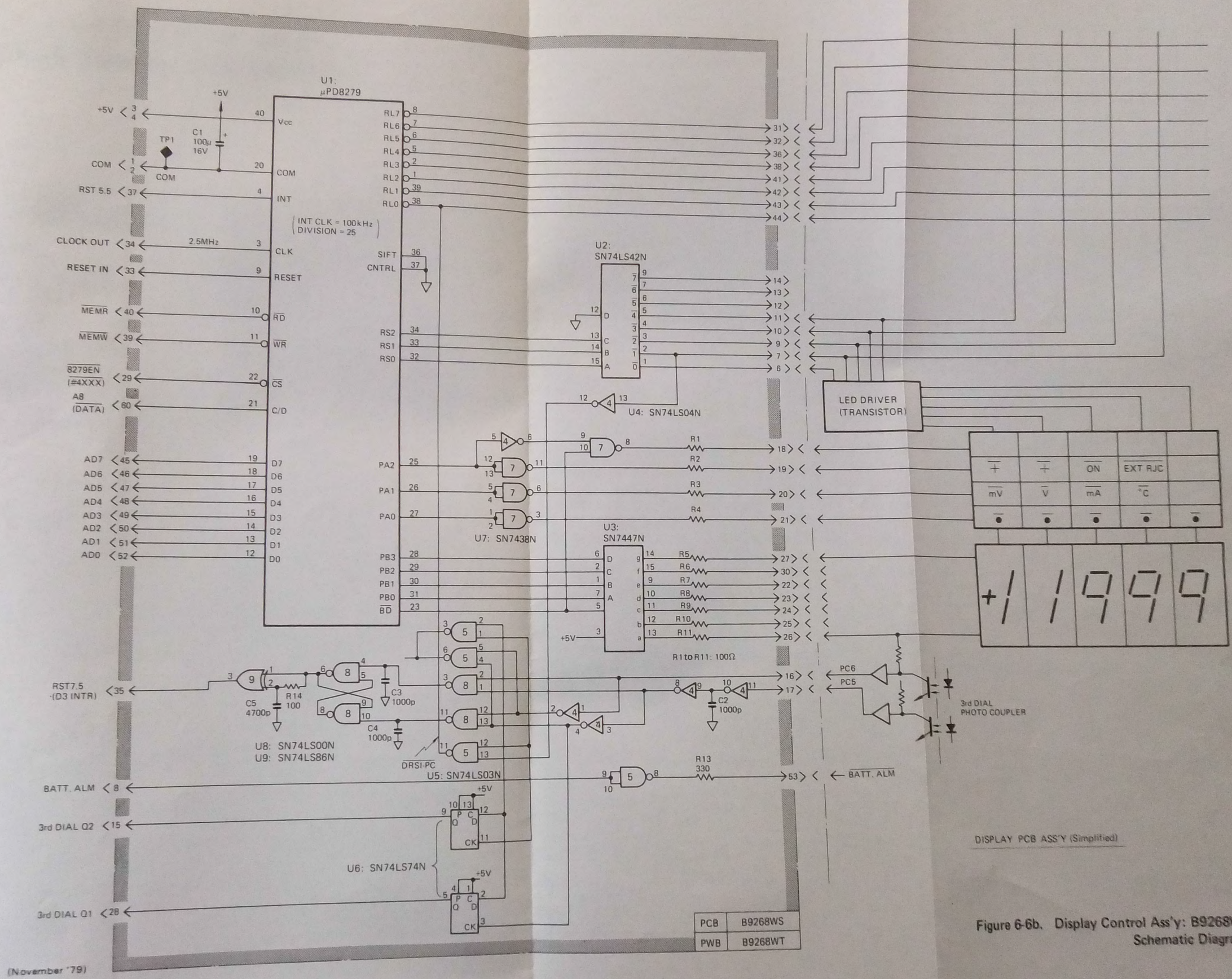



Figure 6-6b. Display Control Ass'y: B9268WS Schematic Diagram.

(November '79)

# 7. PARTS LISTS AND STRUCTURAL DIAGRAMS

Parts Lists:


| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 7-1 | Type 2553 DC Voltage/Current Standard | B9268AA | | 7–3 |
| 7-2 | Main Ass'y | B9268BA | 7-1 | 7–3 |
| 7-3 | Front Panel Ass'y | B9268BP | 7-2 | 7–3 |
| 7-4 | Chassis Ass'y | B9268CA | 7-1 | 7–4 |
| 7-5 | Power Supply Ass'y | B9268DA | 7-3 | 7–4 |
| 7-6 | Display Ass'y | B9268DQ | 7-4 | 7–5 |
| 7-7 | Display PCB Ass'y | B9268WJ | 6-4a | 7–6 |
| 7-8 | Mother Board Ass'y | B9268FA | 7-5 | 7–6 |
| 7-9 | Mother Board PCB Ass'y | B9268WM | 6-5a | 7–7 |
| 7-10 | A-D/D-A Card Ass'y | B9268FF | 7-6 | 7–8 |
| 7-11 | A-D/D-A PCB Ass'y | B9268WA | 6-2a | 7–8 |
| 7-12 | CPU Card Ass'y | B9268WD | 6-3a | 7–10 |
| 7-13 | Display Control Ass'y | B9268WS | 6-6a | 7–11 |


Structural Diagrams:


| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 1 | Main Ass'y | B9268BA | 7-1 | 7–12 |
| 2 | Front Panel Ass'y | B9268BP | 7-2 | 7–13 |
| 3 | Power Supply Ass'y | B9268DA | 7-3 | 7–14 |
| 4 | Display Ass'y | B9268DQ | 7-4 | 7–15 |
| 5 | Mother Board Ass'y | B9268FA | 7-5 | 7–16 |
| 6 | A-D/D-A Card Ass'y | B9268FF | 7-6 | 7–17 |

# INDEX

## List of abbreviations

| | | |
|---|---|---|
| ac | = | alternating current |
| Ag | = | silver (ed) |
| Al | = | aluminum |
| amp | = | amplifier |
| ass'y | = | assembly |
| Au | = | gold |
| car flm | = | carbon film |
| cap | = | capacitor |
| cct | = | circuit |
| cer | = | ceramic |
| coef | = | coefficient |
| com | = | common |
| comp | = | composition |
| conn | = | connector |
| dc | = | direct current |
| dia | = | diameter |
| elect | = | electrolytic |
| FET | = | field effect transistor |
| flm | = | film |
| fxd | = | fixed |
| Ge | = | germanium |
| gnd | = | ground |
| IC | = | integrated circuit |
| JIS | = | Japanese Industrial Standard |
| L | = | inductor |
| met | = | metal (lized) |
| mfr | = | manufacturer |
| Ne | = | neon |
| nom val | = | nominal value |
| OSC | = | oscillator |
| pwb | = | printed wiring board |
| pcb | = | printed circuit board |
| plstc | = | plastic |
| polye | = | polyester |
| polys | = | polystyrene |
| pot | = | potentiometer |
| prec | = | precision (temperature coefficient, long term stability, and/or tolerance) |
| res | = | resistor |
| rng | = | range |
| rtry | = | rotary |
| Se | = | selenium |
| sect | = | section(s) |
| Si | = | silicon |
| sub-ass'y | = | sub-assembly |
| sw | = | switch |
| sys | = | system |
| sply | = | supply |
| Ta | = | tantalum |
| temp | = | temperature |
| trim | = | trimmer |
| TSTR | = | transistor |
| trans | = | transformer |
| var | = | variable |
| ww | = | wire wound |
| YEW spec | = | special specification of Yokogawa Electric Works, Ltd. - YEW. |

† = Request the item marked with † to YEW.

†† = Replace the item marked with †† as a complete part set even when one of its parts is damaged. Request the complete part set to YEW.

††† = Replace the item marked with ††† as an assembly even when a part of it is damaged. Request the assembly to YEW.

†††† = Optimum value selected at factory, average value shown (part may be omitted).

## Example

Conn : multi = multi connector
Cap : fxd Al elect = Fixed aluminum electrolytic capacitor
Cap : fxd met polye flm = Fixed metallized polyester film capacitor
PCB Ass'y or PCB Assy = Printed circuit board assembly
Res : fxd car flm = Fixed carbon film resistor
Res : var ww = Wirewound variable resistor
Temp coef = Temperature coefficient

## 7-1. Type 2553 DC Voltage/Current Standard: B9268AA.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268BA | Main ass'y | | | see Par. 7-2, Fig. 7-1 |
| | B9552DG | Case | | | |
| | B9268AX | Accessory ass'y | | | |
| | A9009WD | Power supply cord ass'y | | | UL Standard for U.S.A } select |
| | A9005WD | Power supply cord ass'y | | 8120-1378 | |
| | A9011WD | Power supply cord ass'y | | CEE 8120-1692 | VDE standard for Europe } select |
| | A9041KF | Fuse: 1A | (2 pcs) | MF61NR 250V 1A AC05 | for 100/120V line } select |
| | A9040KF | Fuse: 0.5A | (2 pcs) | MF61NR 250V 0.5A AC05 | for 200/220/240V line } select |
| | B9268AH | Instruction Manual | | | JAP. } select |
| | B9268AJ | Instruction Manual | | | ENG. } select |
| | A9024ED | Battery | (2 pcs) | SUM-3N | |

## 7-2. Main Ass'y: B9268BA.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268BG | Knob ass'y | | | |
| | B9268BK | Knob ass'y | | | |
| | B9268BP | Front panel ass'y | | | see Par. 7-3, Fig. 7-2 |
| | B9268CA | Chassis ass'y | | | see Par. 7-4, Fig. 7-1 |
| | B9268FZ | FUSE ROM ass'y | | | see Par. 7-12, U3 |
| | B9268BD | Spacer | (2 pcs) | | |
| | B9268BE | Rod | | | |
| | A9011KU | Knob cap | (5 pcs) | 040-502 | |
| | A9039KU | Knob | | 023-542 | |
| | A9049KU | Knob | (3 pcs) | 020-542 | |
| | A9071KU | Knob | | 042-600 | |
| | A9146ZH | Shorting bar | (2 pcs) | | |
| | A9551ZJ | Nameplate | | | |
| | Y9306EB | Screw | (7 pcs) | | |
| | Y9306SK | Screw | (2 pcs) | | |

## 7-3. Front Panel Ass'y: B9268BP.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268BS | Panel | | | |
| | B9268BT | Panel ass'y | | | |
| | B9268BV | Bracket ass'y | | | |
| | B9268BX | Bracket ass'y | | | |
| | A9020ZB | Panel lock ass'y | (2 pcs) | CD03 | |
| | Y9204FS | Screw | | | |
| | Y9306EB | Screw | (2 pcs) | | |
| | Y9301BB | Nut | (2 pcs) | | |

## 7-4. Chassis Ass'y: B9268CA.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268DA | Power supply ass'y | | | see Par. 7-5, Fig. 7-3, Fig. 6-1 |
| | B9268DQ | Display ass'y | | | see Par. 7-6, Fig. 7-4 |
| | B9268FA | Mother board ass'y | | | see Par. 7-8, Fig. 7-5 |
| | B9268FF | A-D/D-A card ass'y | | | see Par. 7-10, Fig. 7-6 |
| | B9268WD | CPU card ass'y | | | see Par. 7-12, Fig. 6-3 |
| | B9268WS | Display control ass'y | | | see Par. 7-13, Fig. 6-6 |
| | B9268CD | Cover ass'y | | | |
| | B9268CH | Bracket ass'y | | | |
| | B9268CK | Bracket ass'y | | | |
| | B9268CP | Bracket | | | |
| | B9268CS | Bracket ass'y | | | |
| | B9268CX | Rear panel | | | |
| | A9007KY | Clamp | | CV-100 | |
| | A9013YC | Bracket | (7 pcs) | PG02-00 | |
| | A9034YC | Block | (6 pcs) | | |
| | A9036YC | Panel | | | |
| | Y9305LB | Screw | (11 pcs) | | |
| | Y9306EB | Screw | (16 pcs) | | |
| | Y9308LB | Screw | (10 pcs) | | |

## 7-5. Power Supply Ass'y: B9268DA.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| CN1 | A9172KC | Conn: receptacle | | EAC-301 | |
| CN2 | A9312KP | Conn: jack | | 2139-05 | |
| | A9250KP | Pin contact | (5 pcs) | 2478TL | |
| F1 | A9041KF | Fuse: 1A | | MF61NR 250V 1A AC05 | for 100/120V line |
| F1 | A9040KF | Fuse: 0.5A | | MF61NR 250V 0.5A AC05 | for 200/220/240V line |
| | A9020KF | Fuseholder | | S-N1301 | |
| NF1 | A9003EF | Noise filter | | ZGB2203-02 | |
| SW1 | A9119SP | Sw: push button | | NE-15J-2 EENo19 | |
| T1 | B9268FY | Trans:power | | | |
| | A9025ED | Battery holder | | TYPE 32-4 UM3 X 2 | |
| | A9383KP | Tip | (4 pcs) | 171505-1 | |

## 7-5. Power Supply Ass'y: B9268DA (continued).

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268DC | Bracket | | | |
| | B9268DD | Bracket | | | |
| | B9268DE | Lever | | | |
| | B9268DH | Bracket ass'y | | | |
| | B9254ME | Plate ass'y | (2 pcs) | | |
| | A9007ZH | Terminal ass'y | | TM01-B | |
| | A9013ZH | Terminal ass'y | | TM03 | |
| | A9146ZH | Terminal | | | |
| | A9054ZG | Knob | | | |
| | A9300ET | Retainer ring | | | |
| | Y9308LB | Screw | (10 pcs) | | |
| | Y9310EB | Screw | (4 pcs) | | |
| | Y9301BB | Nut | (2 pcs) | | |

## 7-6. Display Ass'y: B9268DQ.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| | B9268DS | Boss | (4 pcs) | | |
| | B9268DT | Shaft | (3 pcs) | | |
| | B9268DU | Shaft | | | |
| | B9268DV | Bracket | (3 pcs) | | |
| | B9268DW | Rod | (4 pcs) | | |
| | B9268DX | Rod | (2 pcs) | | |
| | B9268DY | Bracket | | | |
| | B9268DZ | Plate | | | |
| | B9268EA | Gear | | | |
| | B9268EK | Gear ass'y | | | |
| | B9268EN | Spring ass'y | (2 pcs) | | |
| | B9268ET | Spring ass'y | | | |
| | B9268WJ | Display PCB ass'y | | | see Par. 7-7, Fig. 6-4 |
| | A9008ZH | Terminal ass'y | | TM01-A | |
| | A9009ZH | Terminal ass'y | | TM02-R | |
| | A9011ZH | Terminal ass'y | | TM02-B | |
| | B9413CW | Spacer | (3 pcs) | | |
| | Y9304SK | Screw | (10 pcs) | | |
| | Y9306LB | Screw | (19 pcs) | | |

## 7-7. Display PCB Ass'y: B9268WJ.

(November '79)

| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| R1, R6 | A9019RL | Res: module | 1kΩ ±10% | 1/8W RK1/8B4 1kΩk | 4 elements |
| R2, R3 | A9653RM | Res: fxd met flm | 100Ω ±1% | 1/4W ERO-25CKF 1000 | |
| R4 | A9645RM | Res: fxd met flm | 47Ω ±1% | 1/4W ERO-25CKF 47R0 | |
| R5 | A9047RL | Res: module | 330Ω ±10% | 1/8W RK1/8B4S 330ΩK | 4 elements |
| R7 | A9665RM | Res: fxd met flm | 330Ω ±1% | 1/4W ERO-25CKF 3300 | |
| R8 | A9677RM | Res: fxd met flm | 1kΩ ±1% | 1/4W ERO-25CKF 1001 | |
| R9, R10 | A9669RM | Res: fxd met flm | 470Ω ±1% | 1/4W ERO-25CKF 4700 | |
| C1 to C5 | A9037CA | Cap: fxd Al elect | 4.7μF | 25V ECE-A25V4R7L | |
| D5 to D16 | A9248HD | Diode: Si | | 1S953 | |
| D17 to D50 | | not assigned | | | |
| D51 | A9053HP | Diode: LED | | HDSP-3736 | |
| D52 to D55 | A9052HP | Diode: LED | | HDSP-3731 | |
| D56 | A9054HP | Diode: LED | | 5082-4990 | green |
| D57 to D65 | A9049HP | Diode: LED | | 5082-4690 | red |
| U1 | A9142LM | IC: digital | | TC5012P | |
| U2 | A9232LB | IC: digital | | SN74368N | |
| U3 | A9193LB | IC: digital | | SN7414N | |
| PC1 to PC6 | A9070HL | Photocoupler | | PS4001 | |
| SW1, SW2 | A9108SS | SW: toggle | | M-2018N | lever: black |
| SW3 | A9344SR | Sw: rtry | | RS620NdI 1-1-15 20°<br>1-1-16 20° | |
| SW4 | A9343SR | SW: rtry | | RS620N 1-1-15 20° | |
| CN201, CN202 | A9147KP | Conn | | PS-20PA-D4T1-A1 | |
| | B9268WL | PWB | | | |
| | A9383KP | Terminal | (5 pcs) | 171505-1 | |
| | A9017WC | Wire:shield | (0.7 m) | | 2 core |
| | B9268EB | Spacer | (2 pcs) | | |
| | Y9903YA | Spacer | (10 pcs) | | |
| | Y9906YA | Spacer | (2 pcs) | | |
| | Y9208KB | Screw | (4 pcs) | | |
| | Y9231BB | Nut | (4 pcs) | | |

## 7-8. Mother Board Ass'y: B9268FA.

(November '79)

| Item | Part No. | Part Name and Description | | Remarks |
|---|---|---|---|---|
| | B9268WM | Mother board PCB ass'y | | see Par. 7-9, Fig. 6-5 |
| | B9268FB | Plate ass'y | | |
| | A9034YC | Block | | |
| | Y9306LB | Screw | (5 pcs) | |
| | Y9308LB | Screw | (2 pcs) | |
| | Y9310LB | Screw | (4 pcs) | |
| | Y9301WB | Washer | (2 pcs) | |

## 7-9. Mother Board PCB Ass'y: B9268WM.

(November '79)

| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| R101, R103 | A9211RK | Res: fxd met flm | 1Ω | ±5% | 1/2W | ERX-12AVJ 1.0Ω | |
| R102 | A9693RM | Res: fxd met flm | 4.7kΩ | ±1% | 1/4W | ERO-25CKF 4701 | |
| R104, R106 | A9669RM | Res: fxd met flm | 470Ω | ±1% | 1/4W | ERO-25CKF 4700 | |
| R105 | A9701RM | Res: fxd met flm | 10kΩ | ±1% | 1/4W | ERO-25CKF 1002 | |
| R107 | A9280RK | Res: fxd met flm | 82Ω | ±5% | 2W | ERG-2AVJ 820 | |
| R201 | A9047RL | Res: module | 330Ω | ±10% | 1/8W | RK1/8B4S 330ΩK | 4 elements |
| R202 | A9019RL | Res: module | 1kΩ | ±10% | 1/8W | RK1/8B4 1kΩK | 4 elements |
| R203 | A9665RM | Res: fxd met flm | 330Ω | ±1% | 1/4W | ERO-25CKF 3300 | |
| R204 | A9677RM | Res: fxd met flm | 1kΩ | ±1% | 1/4W | ERO-25CKF 1001 | |
| R205 | A9695RM | Res: fxd met flm | 5.6kΩ | ±1% | 1/4W | ERO-25CKF 5101 | |
| C101 | A9261CA | Cap: fxd Al elect | 4700μF | | 35V | 35VP-4700 | |
| C102, C103, C107 | A9102CA | Cap: fxd Al elect | 470μF | | 16V | SL16T-470 | |
| C104 | A9140CA | Cap: fxd Al elect | 1000μF | | 50V | SL50T-1000 | |
| C105 | A9138CA | Cap: fxd Al elect | 330μF | | 50V | SL50T-330 | |
| C106 | A9221CY | Cap: fxd polye flm | 0.01μF | ±10% | 100V | 501N1003-103K | |
| D101 | A9037HL | Diode: module | | | | S2HB-10 | |
| D102 | | not assigned | | | | | |
| D103 | A9007HL | Diode: module | | | | 10DC1N | |
| D104, D105 | A9248HD | Diode: Si | | | | 1S953 | |
| D106 | A9300HD | Diode: zener | | | | RD5.6E-B | |
| D107 | A9008HL | Diode: module | | | | 10DC1R | |
| Q101 | A9045HQ | TSTR: Si PNP | | | | 2SA671C | |
| Q102, Q103 | A9340HQ | TSTR: Si NPN | | | | 2SC1833 | |
| Q201 to Q205 | A9045HQ | TSTR: Si PNP | | | | 2SA671C | |
| Q206, Q207 | A9067HL | TSTR: module | | | | μPA53C | |
| U101 | A9129LA | IC: +5V voltage reg. | | | | TA78005P | |
| CN101 to CN104 | A9401KP | Conn | | | | PBRS-60-2T2B | |
| CN201, CN202 | A9173KP | Conn | | | | PS-20SD-D4T1-1 | |
| CN203 | | not assigned | | | | | see Fig. 6-5b |
| CN301 | A9224KP | Conn | | | | 225J-20621-188 (115) | |
| CN302 | A9311KP | Conn | | | | 5082-05A | |
| | B9268WN | PWB ass'y | | | | | |
| | B9261BZ | Case | | | | | |
| | B9268FD | Fin | | | | | |
| | A9017KY | Clamp | | | | CV-150 | |
| | Y9720YA | Spacer | (2 pcs) | | | | |
| | Y9312LB | Screw | (2 pcs) | | | | |

## 7-10. A-D/D-A Card Ass'y: B9268FF.

(November '79)

| Item | Part No. | Part Name and Description | | Remarks |
|---|---|---|---|---|
| | B9268FH | Bracket | | |
| | B9268FJ | Plate | (4 pcs) | |
| | B9268FK | Screw | | |
| | B9268FL | Bracket | | |
| | B9268WA | AD/DA PCB ass'y | | see Par. 7-11, Fig. 6-2 |
| | A9034YC | Rod | (2 pcs) | |
| | Y9203KB | Screw | (4 pcs) | |
| | Y9304LB | Screw | (4 pcs) | |
| | Y9306LB | Screw | (3 pcs) | |

## 7-11. A-D/D-A PCB Ass'y: B9268WA.

(November '79)

| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| R1, R6, R28 | A9693RM | Res: fxd met flm | 4.7kΩ | ±1% | 1/4W | ERO-25CKF 4701 | |
| R2 | A9886RN | Res: fxd met flm | 1kΩ | ±0.5% | 1/8W | RN60E 1kΩD | ±25 ppm/°C |
| R3 | A9434RP | Res: fxd met flm | 10kΩ | ±0.5% | 1/8W | RN60E 10kΩD | ±25 ppm/°C |
| R4 | A9670RM | Res: fxd met flm | 510Ω | ±1% | 1/4W | ERO-25CKF 5100 | |
| R5, R24 | A9732RM | Res: fxd met flm | 200kΩ | ±1% | 1/4W | ERO-25CKF 2003 | |
| R7 | A9725RM | Res: fxd met flm | 100kΩ | ±1% | 1/4W | ERO-25CKF 1003 | |
| R8 | A9665RM | Res: fxd met flm | 330Ω | ±1% | 1/4W | ERO-25CKF 3300 | |
| R9, R41 | A9689RM | Res: fxd met flm | 3.3kΩ | ±1% | 1/4W | ERO-25CKF 3301 | |
| R10 | A9688RM | Res: fxd met flm | 3kΩ | ±1% | 1/4W | ERO-25CKF 3001 | |
| R11 | A9719RM | Res: fxd met flm | 56kΩ | ±1% | 1/4W | ERO-25CKF 5602 | |
| R12 | A9679RM | Res: fxd met flm | 1.2kΩ | ±1% | 1/4W | ERO-25CKF 1201 | |
| R13 | | not assigned | | | | | |
| R14, R19 | A9041RL | Res: module | 22kΩ | ±10% | 1/8W | RK1/8B4 22kΩK | 4 elements |
| R15 to R17 | A9870RM | Res: fxd met flm | 1MΩ | ±1% | 1/2W | ERO-50CKF 1004 | |
| R18 | A9717RM | Res: fxd met flm | 47kΩ | ±1% | 1/4W | ERO-25CKF 4702 | |
| R20 | A9019RL | Res: module | 1kΩ | ±10% | 1/8W | RK1/8B4 1kΩK | 4 elements |
| R21 to R23, R25, R27 | A9705RM | Res: fxd met flm | 15kΩ | ±1% | 1/4W | ERO-25CKF 1502 | |
| R26 | A9729RM | Res: fxd met flm | 150kΩ | ±1% | 1/4W | ERO-25CKF 1503 | |
| R29 | A9677RM | Res: fxd met flm | 1kΩ | ±1% | 1/4W | ERO-25CKF 1001 | |
| R30 | A9667RM | Res: fxd met flm | 390Ω | ±1% | 1/4W | ERO-25CKF 3900 | |
| R31 | A9653RM | Res: fxe met flm | 100Ω | ±1% | 1/4W | ERO-25CKF 1000 | |
| R32, R33 | A9919YA | Res: fxd ww | 1kΩ | ±0.1% | | BV-11 1kΩ | |
| R34 | A9917YA | Res: fxd ww | 8kΩ | ±0.1% | | BV-11 8kΩ | |
| R35 | A9918YA | Res: fxd ww | 1.8kΩ | ±0.1% | | BV-11 1.8kΩ | |
| R36 | A9920YA | Res: fxd ww | 180Ω | ±0.1% | | BV-11 180Ω | |
| R37 | A9210RQ | Res: fxd met flm | 19Ω | ±0.1% | 1W | RN75R 19ΩB | |
| R38 | A9921YA | Res: fxd ww | 1Ω | ±0.1% | | BV-11 1Ω | |
| R39 | A9219RK | Res: fxd met flm | 6.8Ω | ±5% | 1/2W | ERX-12AVJ 6.8Ω | |
| R40 | A9701RM | Res: fxd met flm | 10kΩ | ±1% | 1/4W | ERO-25CKF 1002 | |
| R42 | A9694RM | Res: fxd met flm | 5.1kΩ | ±1% | 1/4W | ERO-25CKF 5101 | |
| R43 | A9697RM | Res: fxd met flm | 6.8kΩ | ±1% | 1/4W | ERO-25CKF 6801 | |

## 7-11. A-D/D-A PCB Ass'y: B9268WA (continued).

| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| R44 to R46, R51, R52 | A9684RM | Res: fxd met flm | 2kΩ | ±1% | 1/4W | ERO-25CKF 2001 | |
| | A9707RM | Res: fxd met flm | 18kΩ | ±1% | 1/4W | ERO-25CKF 1802 | |
| R47 | A9792RM | Res: fxd met flm | 560Ω | ±1% | 1/2W | ERO-50CKF 5600 | |
| R48 | A9802RM | Res: fxd met flm | 1.5kΩ | ±1% | 1/2W | ERO-50CKF 1501 | |
| R49 | A9629RM | Res: fxd met flm | 10Ω | ±1% | 1/4W | ERO-25CKF 10R0 | |
| R50 | | | | | | | |
| R100 | A9082RL | Res: module | 390Ω | ±5% | 1/8W | RK1/8B4 390ΩJ | 4 elements |
| R101 | A9658RM | Res: fxd met flm | 160Ω | ±1% | 1/4W | ERO-25CKF 1600 | |
| RV1 | A9585RV | Res: var cermet | 1kΩ | ±20% | 1/2W | RJ-6S 1kΩ | |
| C1, C8, C20, C29 to C32 | A9025CN | Cap: fxd mica | 100pF | ±10% | 100V | DM05C 101K1 | |
| C2, C12 to C14, C17, C18, C21, C22, C24, C25 | A9221CY | Cap: fxd polye flm | 0.01μF | ±10% | 100V | 501N1003-103K | |
| C3 | A9032CN | Cap: fxd mica | 330pF | ±10% | 100V | DM05C 331K1 | |
| C4, C6, C7, C10, C11, C33, C34 | A9003CC | Cap: fxd cer | 0.01μF | | 50V | BLD-1H 103ZA | |
| C5, C23 | A9019CN | Cap: fxd mica | 33pF | ±10% | 100V | DM05C 330K1 | |
| C9 | A9235CY | Cap: fxd polye flm | 1.5μF | ±10% | 100V | ECQ-E 1155KZ | |
| C15, C16 | A9186CA | Cap: fxd Al elect | 33μF | | 35V | ECE-A35V33L | |
| C19 | A9048CS | Cap: fxd polys flm | 0.1μF | ±1% | 50V | CQ28L-1H-1002-D02 | |
| C26 | A9232CY | Cap: fxd polye flm | 0.33μF | ±10% | 100V | ECQ-E 1334KZ | |
| C27 | A9065CY | Cap: fxd polye flm | 1500pF | ±10% | 100V | 501N1003-152K1 | |
| C100 | A9003CC | Cap: fxd cer | 0.01μF | | 50V | BLD-1H 103ZA | |
| C101 | A9144CT | Cap: fxd Ta elect | 15μF | ±20% | 20V | 111N2002-156M | |
| D1, D2, D4 to D6, D8 to D12, D14, D15, D17 to D19, D22 | A9248HD | Diode: Si | | | | 1S953 | |
| D3 | A9101HD | Diode: zener | | | | 1S2192-B | |
| D7 | A9310HD | Diode: zener | | | | RD15E-B | |
| D13 | A9301HD | Diode: zener | | | | RD6.2E-B | |
| D16 | A9312HD | Diode: zener | | | | RD18E-B | |
| D20, D21 | A9230HD | Diode: zener | | | | RD5.1E-B | |
| D100 | A9084HL | Diode: module | | | | μPA54H | |
| D101 | A9248HD | Diode: Si | | | | 1S953 | |
| Q1 to Q3 | A9187HQ | TSTR: FET | | | | 2SK43S-D | |
| Q4 to Q6, Q9 | A9338HQ | TSTR: Si PNP | | | | 2SA883 | |
| Q7, Q11 | A9340HQ | TSTR: Si NPN | | | | 2SC1833 | |
| Q8 | A9287HQ | TSTR: Si NPN | | | | 2SC1061-C | |
| Q10 | A9045HQ | TSTR: Si PNP | | | | 2SA671-C | |
| PC1, PC3 | A9086HL | Photocoupler | | | | 5082-4360 | |
| PC2 | A9072HL | Photocoupler | | | | PC5072 | |
| PC4 | A9057HL | Photocoupler | | | | EE-CB | |
| U1 | A9077LA | IC: OP amp | | | | μPC324C | |
| U2, U10 | A9092LA | IC: OP amp | | | | μPC157A(1) | |
| U3 | A9036LA | IC: OP amp | | | | μPC156A | |

## 7-11. A-D/D-A PCB Ass'y: B9268WA (continued).

| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| U4 | A9148LM | IC: digital | | | | TC4555P | |
| U5 | A9072LM | IC: digital | | | | TC4066P | |
| U6 | A9085LA | IC: OP amp | | | | μPC271C | |
| U7 | A9030LM | IC: digital | | | | TC4011P | |
| U8 | A9042LA | IC: OP amp | | | | μPC 254A | |
| U9 | A9073LA | IC: +15V voltage reg. | | | | FS7815M | |
| RL1 to RL3, RL6 | A9175MR | Relay | | | | MR24-5S | |
| RL4, RL5 | A9182MR | Relay | | | | MR22-5S | |
| RL7 | A9024MR | Relay | | | | NR5V-SD | |
| | B9268WB | PWB ass'y | | | | | |
| | A9050KP | Feedthrough | (3 pcs) | | | FT-E-12 | |
| | A9051KP | Feedthrough | | | | FT-E-15 | |
| | A9030YC | Test point | (2 pcs) | | | PA-02 | |
| | A9012YC | Lever | (2 pcs) | | | | |
| | Y9706PS | Spring pin | (2 pcs) | | | | |

## 7-12. CPU Card Ass'y: B9268WD.

(November '79)

| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| R1 to R4 | A9021RL | Res: module | 5.6kΩ | ±10% | 1/8W | RK1/8B4 5.6kΩK | 4 elements |
| R5, R6, R12 | A9677RM | Res: fxd met flm | 1kΩ | ±1% | 1/4W | ERO-25CKF 1001 | |
| R7 to R11 | | not assigned | | | | | |
| R13 | A9701RM | Res: fxd met flm | 10kΩ | ±1% | 1/4W | ERO-25CKF 1002 | |
| R14 to R55 | | not assigned | | | | | |
| R56, R57, R59, R61 | A9701RM | Res: fxd met flm | 10kΩ | ±1% | 1/4W | ERO-25CKF 1002 | |
| R58 | A9653RM | Res: fxd met flm | 100Ω | ±1% | 1/4W | ERO-25CKF 1000 | |
| R60 | A9193RK | Res: fxd met flm | 3.3MΩ | ±5% | 0.3W | RG08V2F 3.3MΩJ | |
| C1 | A9097CA | Cap: fxd Al elect | 100μF | | 16V | ECE-B16V100LU | |
| C2, C5, C6 | A9217CA | Cap: fxd Al elect | 1μF | | 35V | CA92C-1C-1R000-R56 | |
| C3, C4, C7 | | not assigned | | | | | |
| C8, C9 | A9068CN | Cap: fxd mica | 470pF | ±10% | 100V | DM15C 471K1 | |
| C10, C11 | A9019CN | Cap: fxd mica | 33pF | ±10% | 100V | DM05C 330K1 | |
| C12, C13 | A9221CY | Cap: fxd polye flm | 0.01μF | ±10% | 100V | 501N1003-103K | |
| C14 to C53 | | not assigned | | | | | |
| C54 | A9098CA | Cap: fxd Al elect | 220μF | | 16V | ECE-B16V220L | |
| C55 | A9093CA | Cap: fxd Al elect | 33μF | | 16V | ECE-B16V33L | |
| C56 | A9097CA | Cap: fxd Al elect | 100μF | | 16V | ECE-B16V100LU | |
| D1 to D55 | | not assigned | | | | | |
| D56 to D60 | A9248HD | Diode: Si | | | | 1S953 | |
| Q1 to Q53 | | not assigned | | | | | |
| Q54 | A9338HQ | TSTR: Si PNP | | | | 2SA883 | |
| Q55 | A9121HQ | TSTR: Si NPN | | | | 2SC641Ⓚ | |
| U1 | A9143LM | IC: digital | | | | | |
| U2* | B9268FX | IC: digital | | | | μPD8085 | CPU |
| U2* | B9268FW | IC: digital | | | | μPD2332C-71 | MASK ROM |
| U3 | B9268FZ | IC: digital | | | | μPD2332C-207 | MASK ROM |
| U4 | A9147LM | IC: digital | | | | μPB403D | PROM (programmed) |
| U5 | A9144LM | IC: digital | | | | μPD5101LC-1 | RAM |
| | | | | | | μPD8156 | RAM |

## 7-12. CPU Card Ass'y: B9268WD (continued).

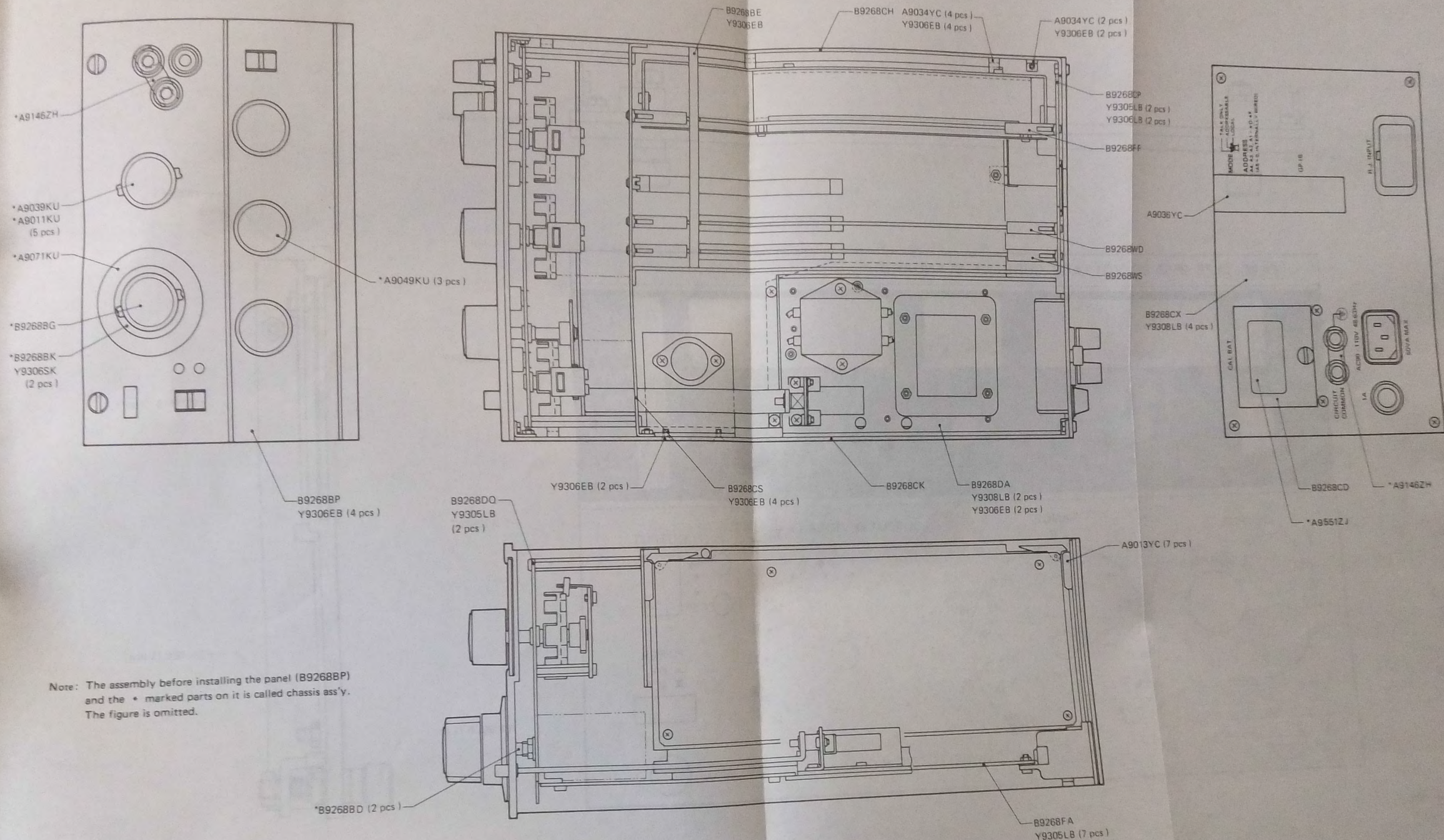
| Item | Part No. | Part Name and Description | | | Remarks |
|---|---|---|---|---|---|
| U6 | A9328LB | IC: digital | | SN74LS273N | |
| U7 | A9175LB | IC: digital | | SN74LS42N | |
| U8, U20 | A9313LB | IC: digital | | DM81LS95 | |
| U9, U16 | A9148LB | IC: digital | | SN74LS32N | |
| U10 | A9014LB | IC: digital | | SN7400N | |
| U11, U17 | A9120LB | IC: digital | | SN74LS00N | |
| U12 | A9062LB | IC: digital | | SN74191N | |
| U13 | A9122LB | IC: digital | | SN74LS10N | |
| U14 | A9041LB | IC: digital | | SN7476N | |
| U15 | A9018LB | IC: digital | | SN7404N | |
| U18, U19 | A9231LB | IC: digital | | SN74393N | |
| U21 to U51 | | not assigned | | | |
| U52 | A9085LA | IC: OP amp | | μPC271C | |
| | A9030KH | IC socket | | 821-20011-164 | for U3 |
| | A9099KP | IC socket | | DICA-24A-T1 | for U2 |
| SW1 | A9109SS | SW: toggle | | 8G1054 | |
| X1 | A9047EX | Quartz resonator | | HC18U 10MHz | |
| | B9268WE | PWB | | | |
| | A9030YC | Test point | (8 pcs) | PA-02 | |
| | A9012YC | Lever | (2 pcs) | | |
| | Y9706PS | Spring pin | (2 pcs) | | |

*U2: μPD2332C-71: B9268FX is used on instrument of serial no._____or before, or μPD2332C-207: B9268FW on serial no._____ or subsequent.

## 7-13. Display Control Ass'y: B9268WS.

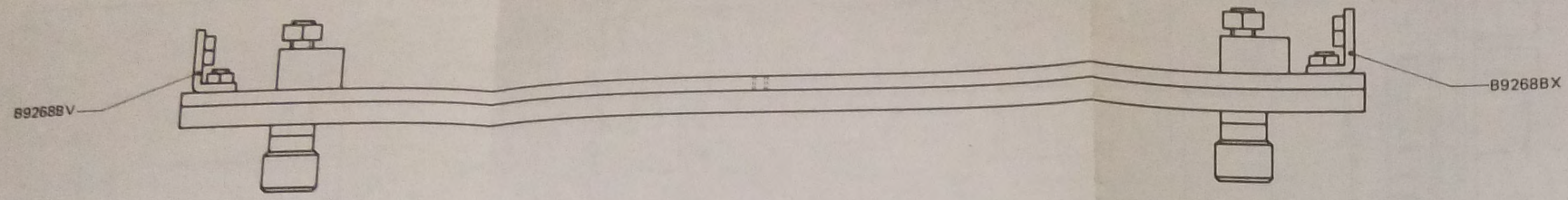
(November '79)

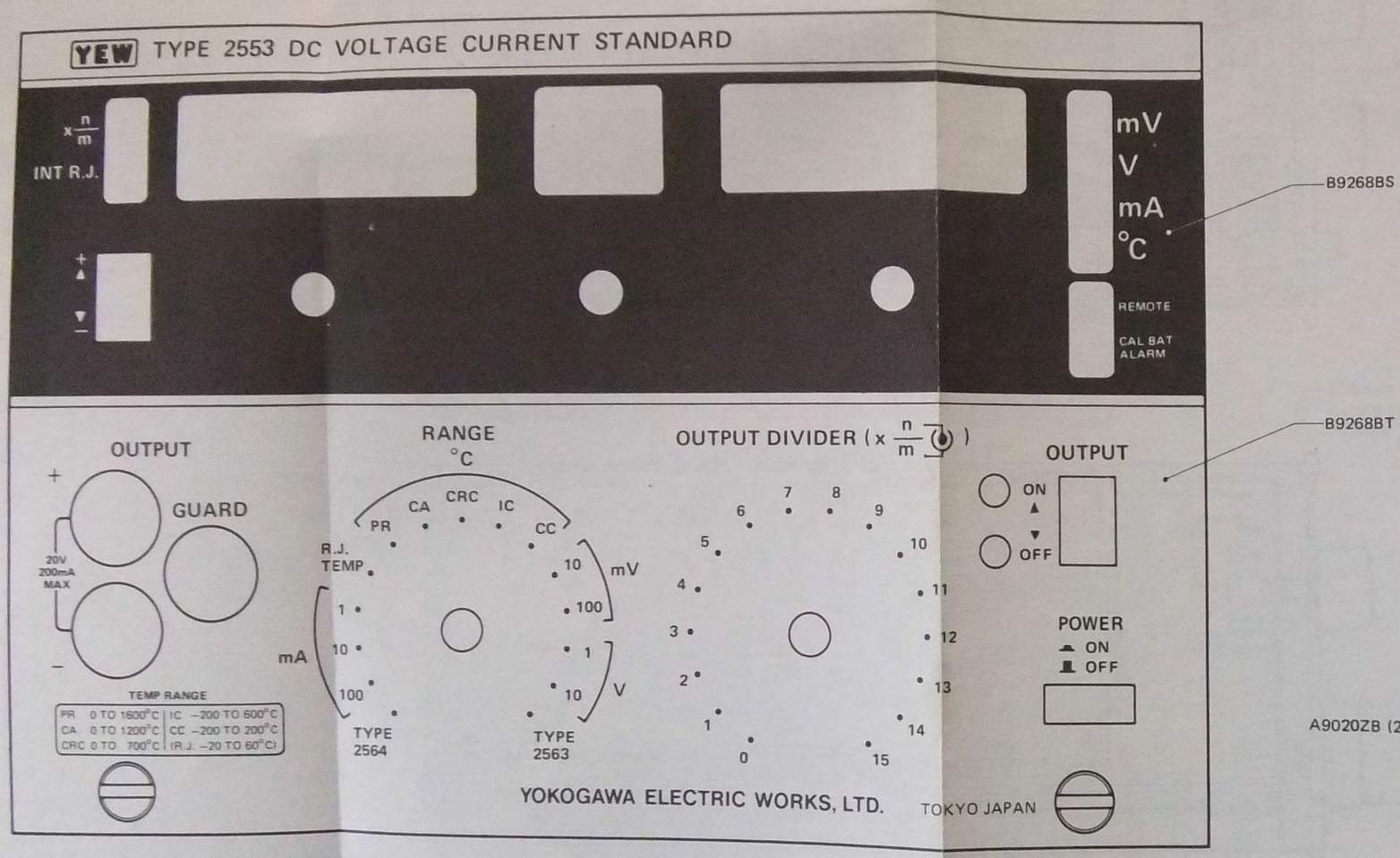
| Item | Part No. | Part Name and Description | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| R1 to R11, R14 | A9653RM | Res: fxd met flm | 100Ω | ±1% | 1/4W | ERO-25CKF 1000 | |
| R12 | | not assigned | | | | | |
| R13 | A9665RM | Res: fxd met flm | 330Ω | ±1% | 1/4W | ERO-25CKF 3300 | |
| C1 | A9097CA | Cap: fxd Al elect | 100μF | | 16V | ECE-B16V100LU | |
| C2 to C4 | A9064CY | Cap: fxd polye flm | 1000pF | ±10% | 100V | 501N1003-102K1 | |
| C5 | A9222CY | Cap: fxd polye flm | 4700pF | ±10% | 100V | 501N1003-472K1 | |
| U1 | A9145LM | IC: digital | | | | μPD8279 | |
| U2 | A9175LB | IC: digital | | | | SN74LS42N | |
| U3 | A9111LB | IC: digital | | | | SN7447N | |
| U4 | A9121LB | IC: digital | | | | SN74LS04N | |
| U5 | A9145LB | IC: digital | | | | SN74LS03N | |
| U6 | A9149LB | IC: digital | | | | SN74LS74N | |
| U7 | A9110LB | IC: digital | | | | SN7438N | |
| U8 | A9120LB | IC: digital | | | | SN74LS00N | |
| U9 | A9132LB | IC: digital | | | | SN74LS86N | |
| | B9268WT | PWB | | | | | |
| | A9030YC | Test point | | | | PA-02 | |
| | A9012YC | Lever | (2 pcs) | | | | |
| | Y9706PS | Spring pin | (2 pcs) | | | | |

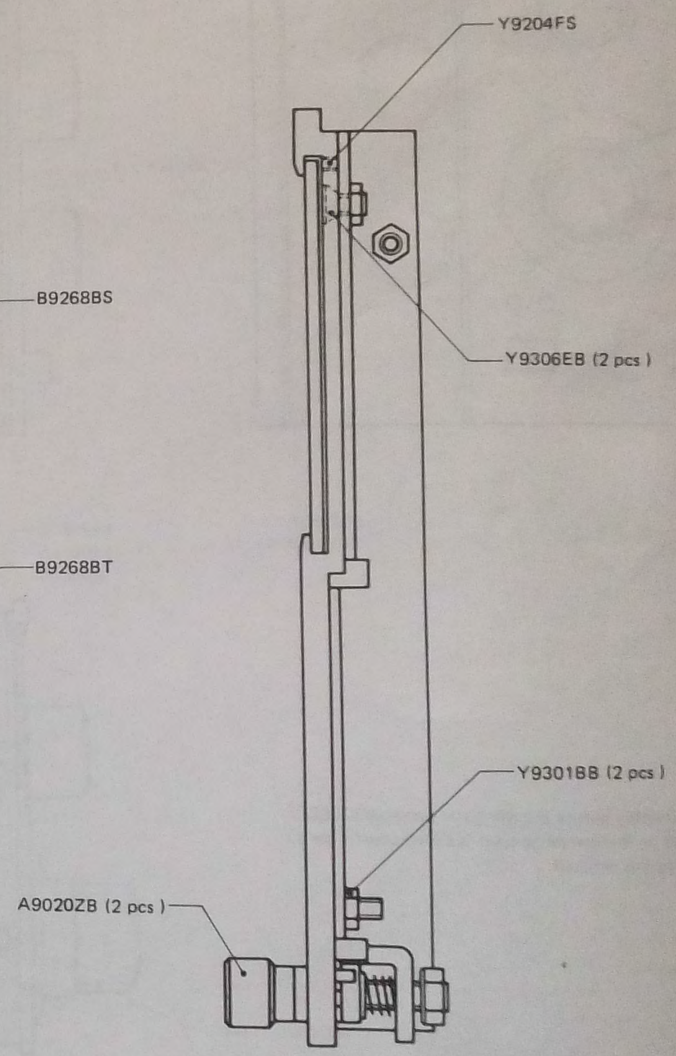



Note: The assembly before installing the panel (B9268BP) and the * marked parts on it is called chassis ass'y. The figure is omitted.

Figure 7-1. Main Ass'y: B9268BA (SCALE:1/2)

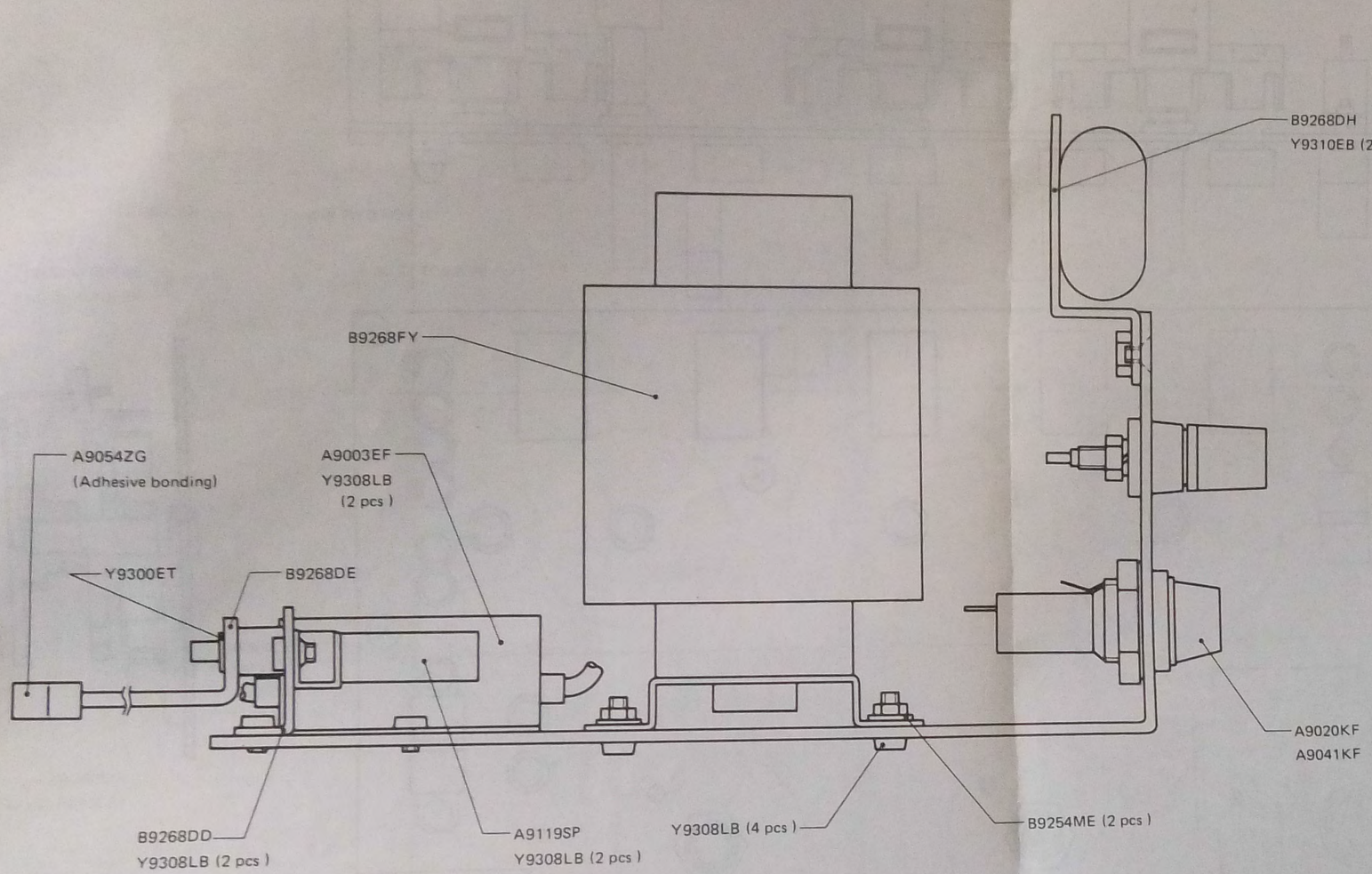



(November '79)

Figure 7-2. Front Panel Ass'y: B9268BP.



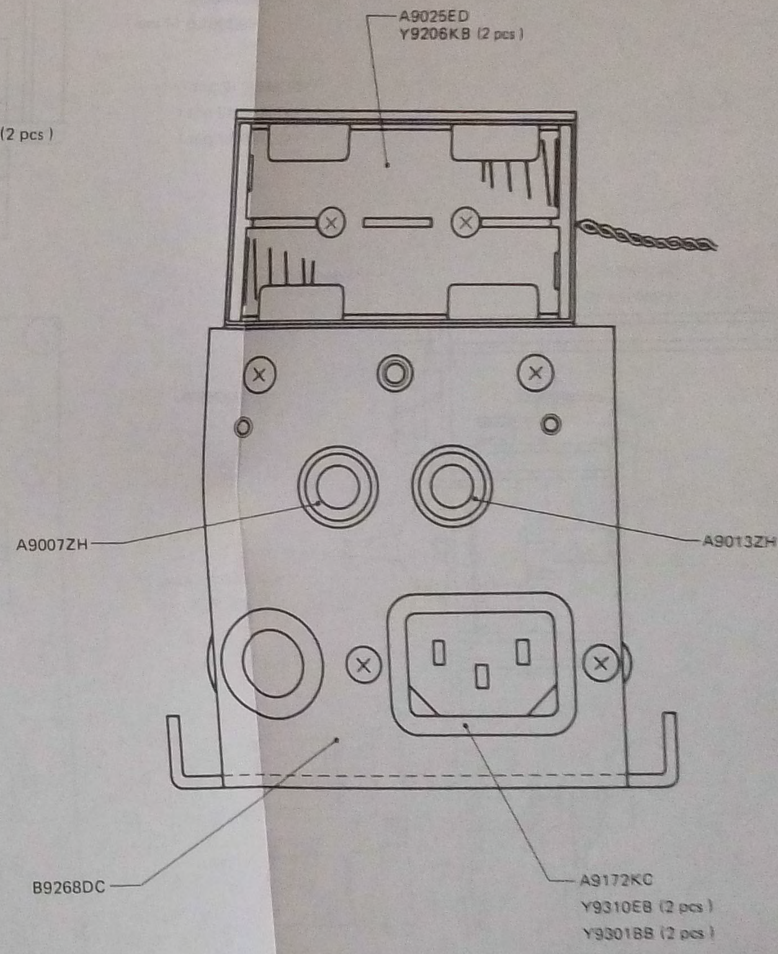
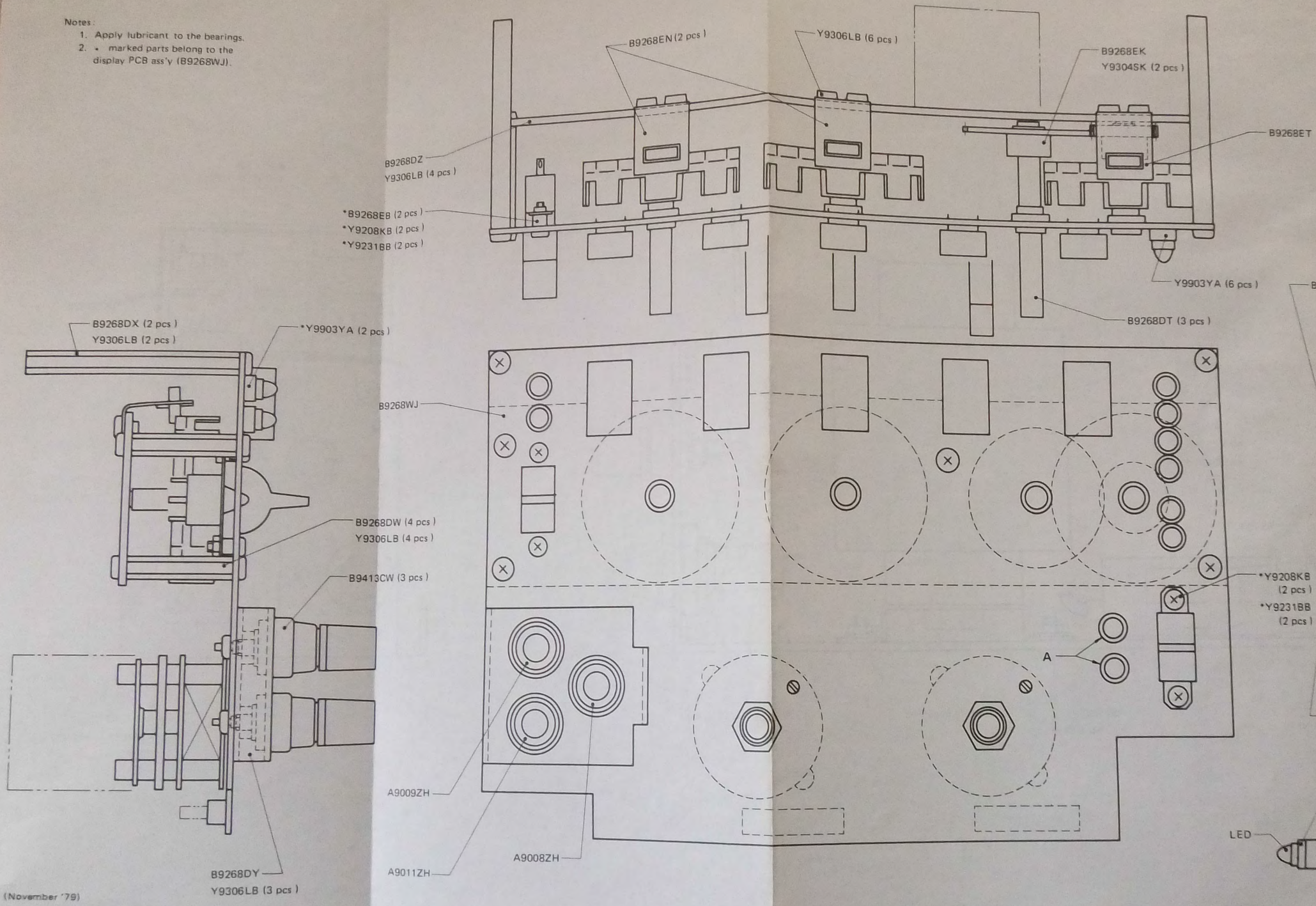




Figure 7-3. Power Supply Ass'y: B9268DA.

Notes:
1. Apply lubricant to the bearings.
2. • marked parts belong to the display PCB ass'y (B9268WJ).




(November '79)

Figure 7-4. Display Ass'y: B9268DQ.

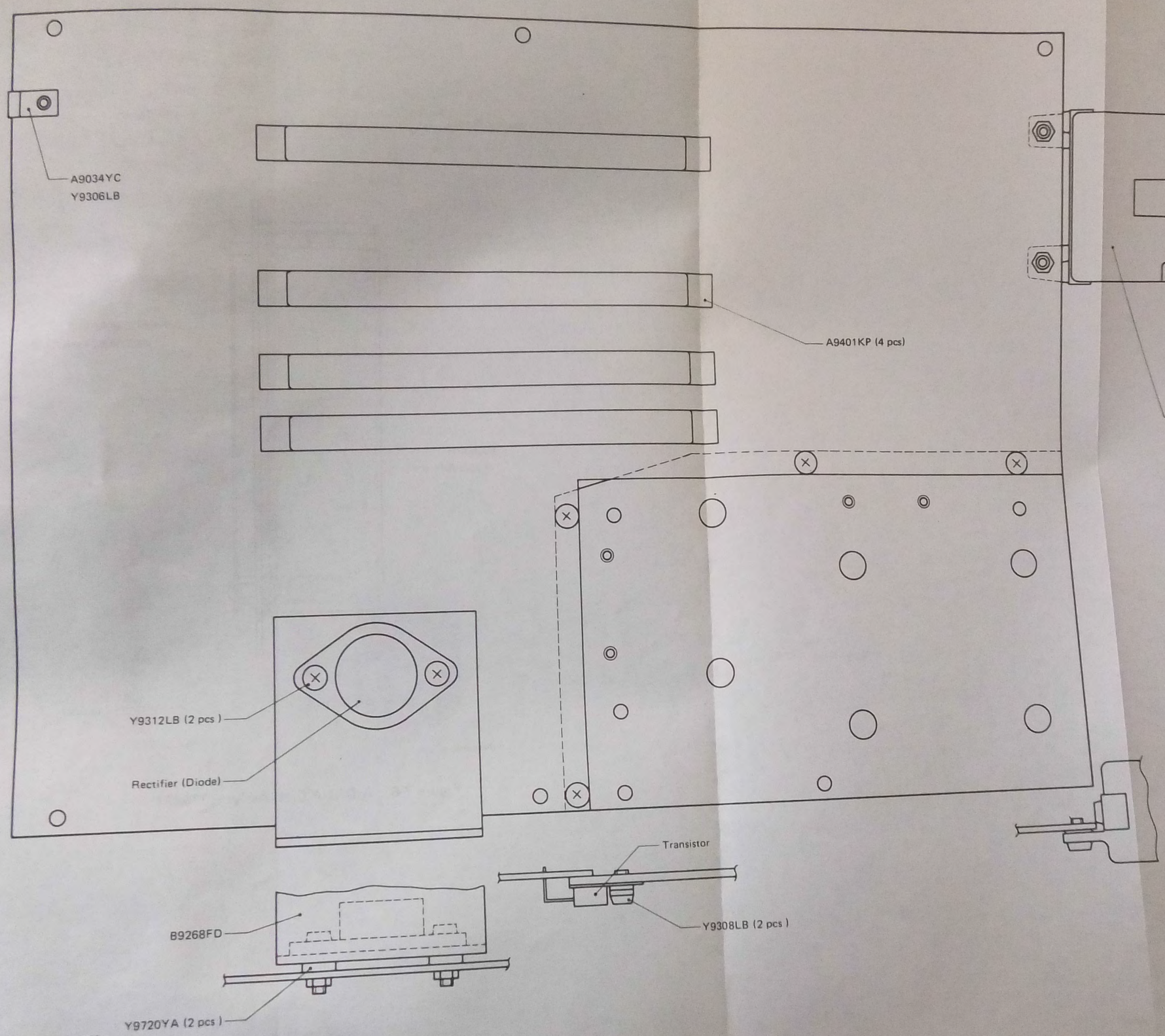
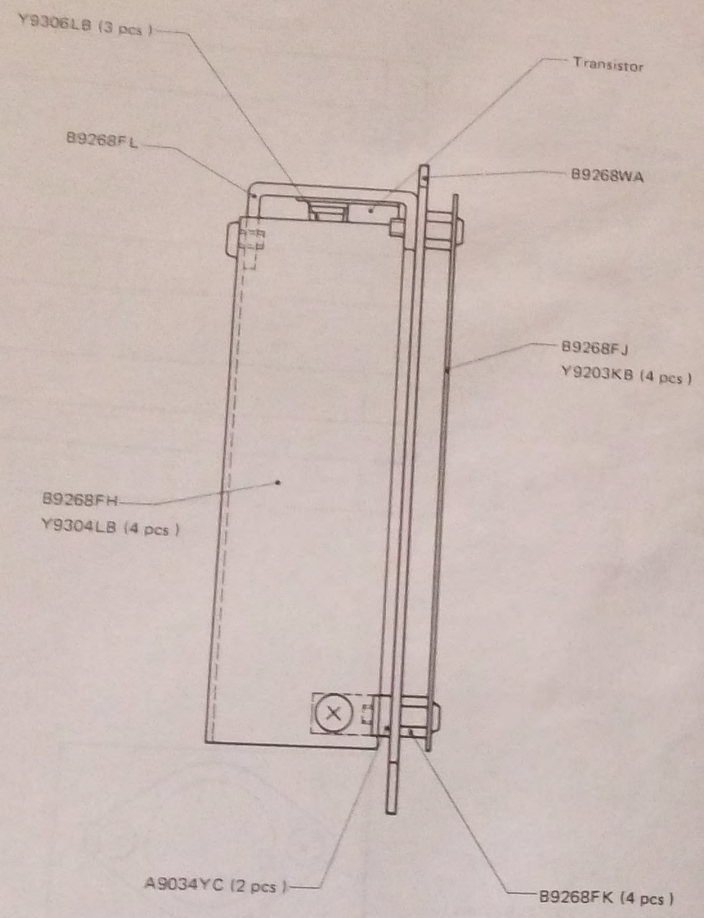



Figure 7-5. Mother Board Ass'y: B9268FA.




(November '79)

Figure 7-6. A-D/D-A Card Ass'y: B9268FF.

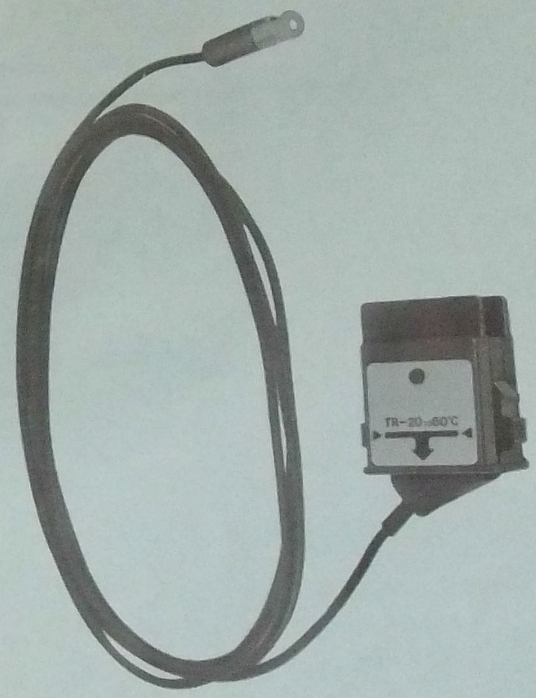


Option

# Service Manual

## Type 2578-25

## TEMPERATURE PROBE




YEW
YOKOGAWA ELECTRIC WORKS
SM 2578-25-1E

# CONTENTS


| *Section* | *Title* | *Page* |
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| 1. | **SCHEMATIC DIAGRAM** | 1–1 |
| 2. | **PARTS LISTS AND STRUCTURAL DIAGRAM** | 2–1 |


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# 1. SCHEMATIC DIAGRAM

| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 1 | Temperature Probe Ass'y<br>Schematic Diagram | B9268HP | 1-1 | 1–1 |

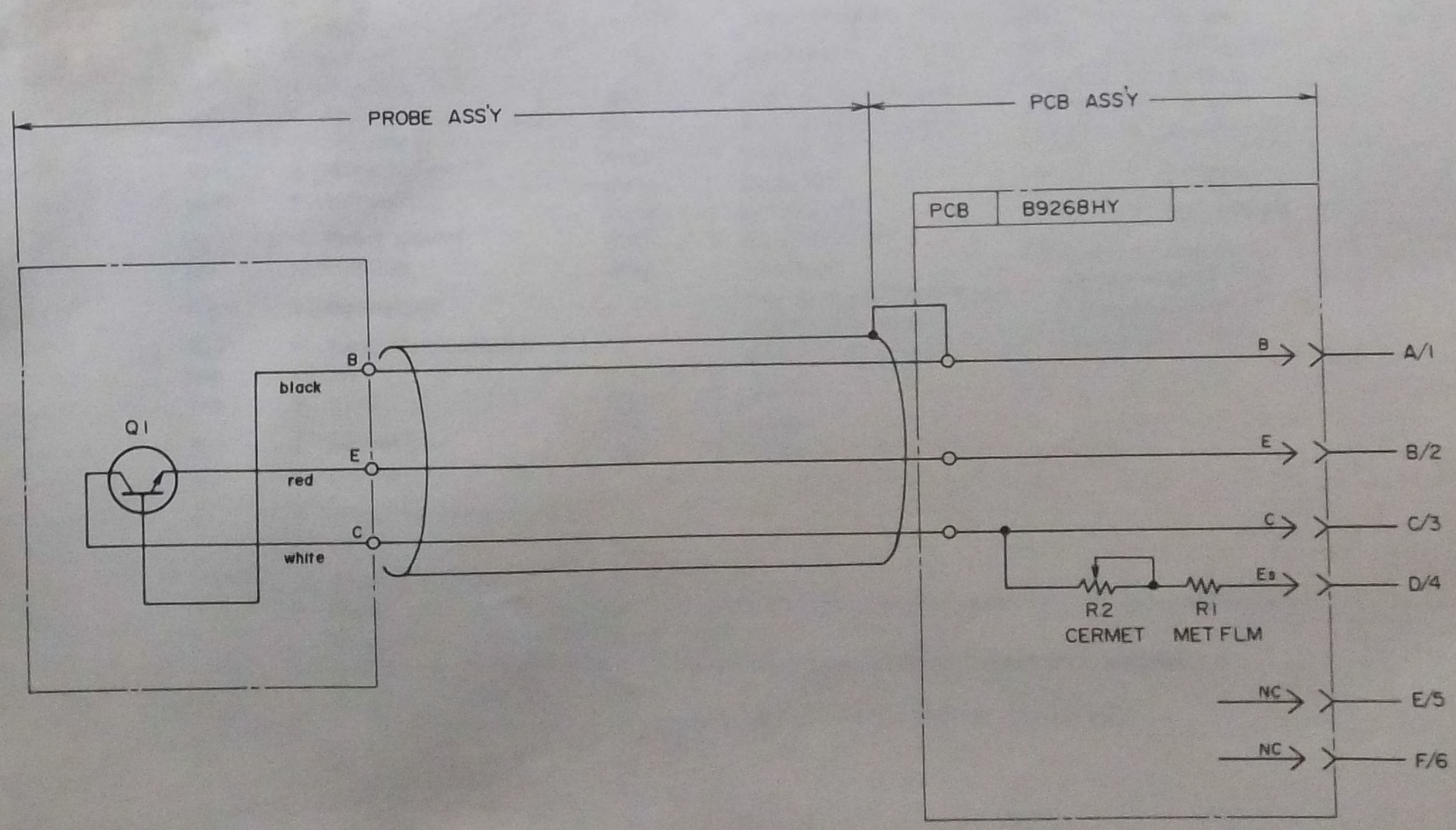



Figure 1-1. Temperature Probe Ass'y: B9268HP
Schematic Diagram.

# 2. PARTS LISTS AND STRUCTURAL DIAGRAM

**Parts Lists:**



| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 2-1 | Type 2578-25 Temperature Probe | B9268HA | | 2–2 |
| 2-2 | Temperature Probe Ass'y | B9268HP | 2-1 | 2–2 |



**Structural Diagram:**



| Par. | Description | Ass'y No. | Figure No. | Page |
|---|---|---|---|---|
| 1 | Temperature Probe Ass'y | B9268HP | 2-1 | 2–3 |



## INDEX

### List of abbreviations

ac = alternating current
Ag = silver (ed)
Al = aluminum
amp = amplifier
ass'y = assembly
Au = gold
car flm = carbon film
cap = capacitor
cct = circuit
cer = ceramic
coef = coefficient
com = common
comp = composition
conn = connector
dc = direct current
dia = diameter
elect = electrolytic
FET = field effect transistor
flm = film
fxd = fixed
Ge = germanium
gnd = ground
IC = integrated circuit
JIS = Japanese Industrial Standard
L = inductor
met = metal (lized)
mfr = manufacturer
Ne = neon
nom val = nominal value
OSC = oscillator
pwb = printed wiring board
pcb = printed circuit board
plstc = plastic
polye = polyester
polys = polystyrene
pot = potentiometer
prec = precision (temperature coefficient, long term stability, and/or tolerance)
res = resistor
rng = range
rtry = rotary
Se = selenium
sect = section(s)
Si = silicon
sub-ass'y = sub-assembly
sw = switch
sys = system
sply = supply
Ta = tantalum
temp = temperature
trim = trimmer
TSTR = transistor
trans = transformer
var = variable
ww = wire wound
YEW spec = special specification of Yokogawa Electric Works, Ltd. - YEW.

† = Request the item marked with † to YEW.
†† = Replace the item marked with †† as a complete part set even when one of its parts is damaged. Request the complete part set to YEW.
††† = Replace the item marked with ††† as an assembly even when a part of it is damaged. Request the assembly to YEW.
†††† = Optimum value selected at factory, average value shown (part may be omitted).

### Example

Conn : multi = multi connector
Cap : fxd Al elect = Fixed aluminum electrolytic capacitor
Cap : fxd met polye flm = Fixed metallized polyester film capacitor
PCB Ass'y = Printed circuit board assembly
Res : fxd car flm = Fixed carbon film resistor
Res : var ww = Wirewound variable resistor
Temp coef = Temperature coefficient

## 2–2 Parts Lists and Structural Diagram

### 2-1. Type 2578-25 Temperature Probe: B9268HA.

(November '79)

| Item | Part No. | Part Name and Description | Remarks |
|---|---|---|---|
| | B9268HP | Temperature probe ass'y | see Par. 2-2, Fig. 2-1 |
| | Y9401TP | Tip (5 pcs) | accessory |

### 2-2. Temperature Probe Ass'y: B9268HP.

(November '79)

| Item | Part No. | Part Name and Description | Remarks |
|---|---|---|---|
| | B9268HQ | Nameplate | supplied as set |
| | B9268HR | Probe ass'y | |
| | B9268HY | PCB ass'y | |
| | B9261GH | Case | |
| | B9261GJ | Case | |
| | B9267MN | Cable holder | |
| | B9261GP | Pipe | |
| | A9341ZJ | Nameplate | |
| | A9106KT | Screw: tapping (2 pcs) | |
| | A9213XK | Adhesive Cemedine High Super | |

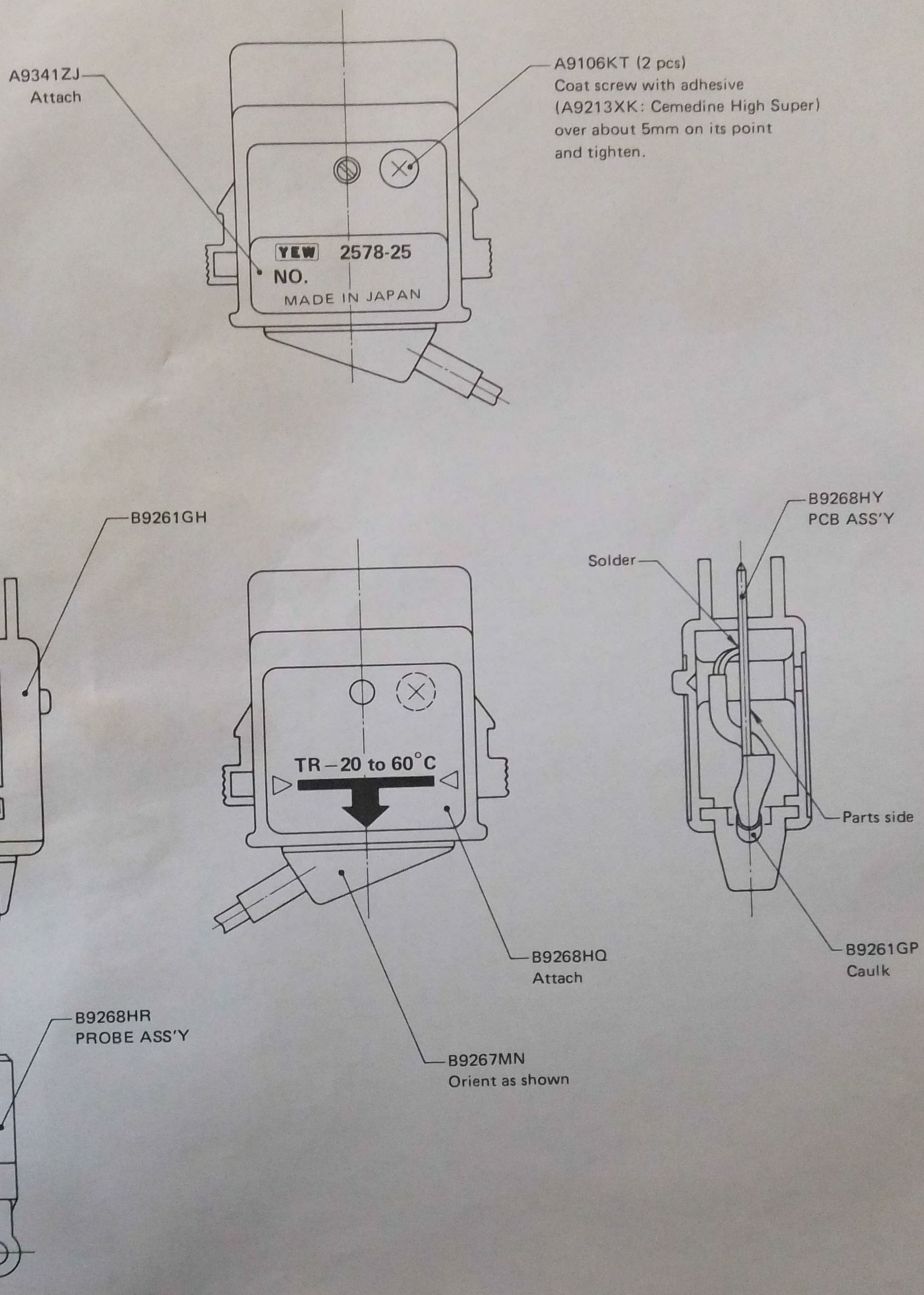



Figure 2-1. Temperature Probe Ass'y: B9268HP.