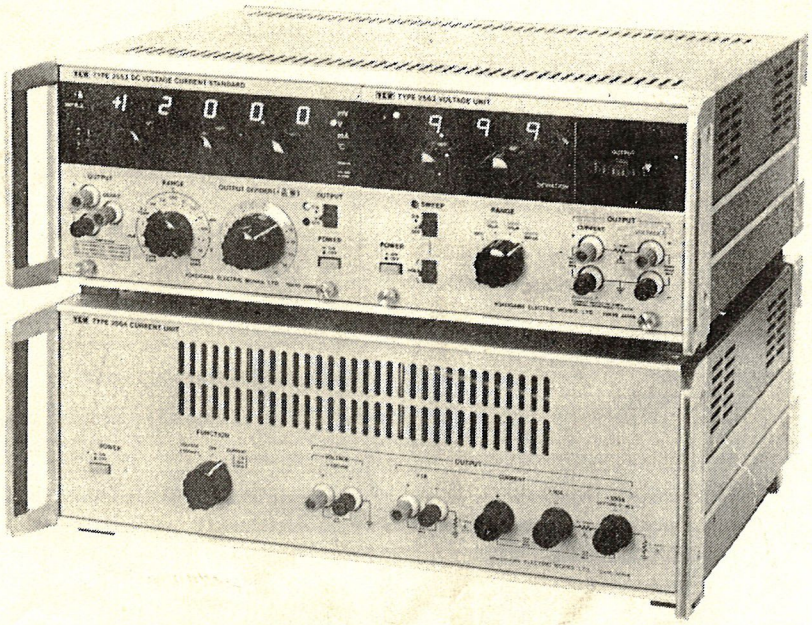
Instruction Manual

Type 2560
DC CALIBRATION SETS



YEW
YOKOGAWA HOKUSHIN ELECTRIC

5th Edition
IM 2560-41E

CERTIFICATION

Yokogawa Hokushin Electric Corporation (YEW) certifies that this instrument underwent stringent inspections and performance tests before it was shipped from the factory, and was found to meet the specifications given in the specifications section of this document.

YEW also certifies that its calibration measurements are traceable to the Electrotechnical Laboratory of the Ministry of International Trade and Industry (which maintains Japan's primary electrical standards) to the extent allowed by the organization's calibration facilities. Calibration measurements not traceable to that organization are traceable to the calibration facilities of other members of the International Electrotechnical Commission, or to those of International Organization for Standardization (ISO) members.

WARRANTY

YEW warrants this product, for one year from the date of delivery, against defects in materials and workmanship. YEW will repair or replace a product which proves defective during the warranty period due to materials or workmanship defects, provided that the product is returned to YEW or a YEW representative authorized to perform in-warranty repair of the product. YEW reserves the right to determine whether product failures are due to defective materials or workmanship, or to other causes not covered by this warranty. No other warranty is expressed or implied. YEW is not liable for consequential damages.

CONTENTS

1. GENERAL.

1-1. Description.

The YEW Type 2560 DC Calibration Sets deliver 0 to 1200 V DC voltage or 0 to 36 A DC current.

There are four Type 2560 DC calibration sets as follows:

Type 2560-41. . .Composed of Type 2553 portable DC voltage/current standard and a voltage unit.

Type 2560-42. . .Composed of Type 2553 portable DC voltage/current standard, a voltage unit and a current unit.

Type 2560-43. . .Type 2560-41 with GP-IB (General purpose Interface Bus).

Type 2560-44. . .Type 2560-42 with GP-IB.

1-2. Features.

(1) **High Accuracy of ±0.02 to ±0.3%.**
A D/A converter system based on an accurate clock is used instead of a conventional resistance divider system, so an accurate and stable output voltage or current is obtained.

(2) **Wide Ranges.**
12 mV to 1200 V DC output voltage or 12 μA to 36 A DC output current is obtained, so most YEW analog meters can be calibrated using these sets. Temperature ranges are also provided the instrument generates emfs (mV) corresponding to five kinds of thermocouples, so is convenient for calibrating temperature measuring equipment.

(3) **Output Divider Function.**
A percentage divider dial for output voltage or current is provided. Thus 0, 25, 50, 75 and 100% of any given voltage or current setting can be quickly obtained, to expedite adjustment, calibration and linearity tests, etc.

(4) **Deviation Read-out Function.**
The percentage deviation of a test value from a setting is displayed digitally.

(5) **Sweep Function.**
The setting value can be changed freely between 0 and 100% using the sweep ON-OFF switch. This function is useful to test for meter needle sticking.

(6) **GP-IB.**
The Type 2560-43 and -44 can be externally programmed using their GP-IB.

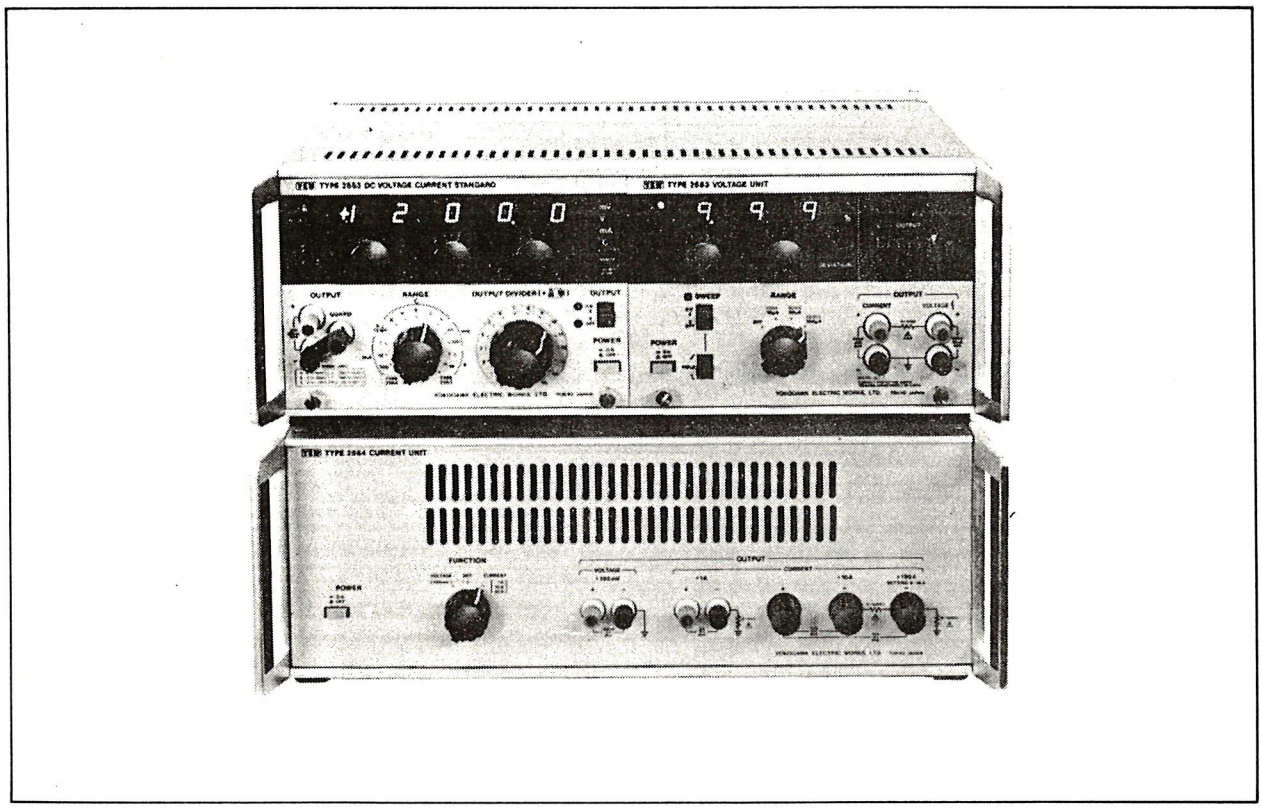


Figure 1-1.

1-3. Specifications.

1-3-1. General Specifications.

Output Setting: Set with three dials (contactless dial switches using photocouples).

First and second dials . . . . . 16 step/1 revolution

Third dial . . . . . 32 step/1 revolution

Display: 5-digit, LED (Light-Emitting Diode) display.

Unit Marks: mV, V, mA and °C.

Divider Output Setting:

(Divider output) = (Setting dial indication) × n/m

m: 1, 2, ... , 15 (15 divisions)

n: 0, 1, ... , 15 (where n ≤ m)

Divider Output Accuracy: Within ±(least significant digit of display).

Calibration Period: Three months.

Warm Up: 30 minutes or more.

Operating Temperature Range: 5 to 40°C.

Operating Humidity Range: 20 to 80% relative humidity.

Storage Temperature Range: −25 to 70°C.

Storage Humidity Range: 5 to 95% relative humidity.

Power Source: 100 V AC ±10% 47 to 63 Hz (or 120, 200, 220 or 240 V AC as specified).

Dimensions:

Type 2560-41, -43

Approx. 149 × 439 × 415 mm

(5-7/8 × 17-1/4 × 16-1/4")

Type 2560-42, -44

Approx. 149 × 439 × 415 mm two layers

(5-7/8 × 17-1/4 × 16-1/4")

Weight:

Type 2560-41, -43 . . . . Approx. 13.5 kg (28.7 lbs)

Type 2560-42, -44 . . . . Approx. 34 kg (74.8 lbs)

Accessories:

Power cord . . . . . 2 or 3pcs

(3 pcs for Type 2560-42 and -44)

Fuse (1 A) . . . . . 2 pcs

Fuse (1 A) slow blow type . . . . . 2 pcs

Fuse (2 A) slow blow type . . . . . 4 pcs

Fuse (5 A) . . . . . 3 pcs

(only for Type 2560-42, -44)

Instruction Manual (Type 2553) . . . . . 1 copy

Instruction Manual (Type 2560) . . . . . 1 copy

Connecting cord (for connecting the voltage and current units) . . . . . 1 pc

(only for Type 2560-42, -44)

1-3-2. Basic Unit Type 2553.

	Range	Setting Range	Accuracy (for 23±3°C)		Maximum Output	Internal Resistance	Minimum Resolution
Voltage	10 V	0 to ±12.000 V	±0.02% of range		100 mA Min.	10 mΩ Max.	1 mV
	1 V	0 to ±1.2000 V	±0.02% of range		100 mA Min.	10 mΩ Max.	100 μV
	100 mV	0 to ±120.00 mV	±0.02% of range		*1) Approx. 1 kΩ	1.5 Ω Max.	10 μV
	10 mV	0 to ±12.000 mV	±(0.02% of range + 4 μV)		*1) Approx. 1 kΩ	1.5 Ω Max.	1 μV
Current	100 mA	0 to ±120.00 mA	±0.02% of range		*2) Approx. 9 V	Approx. 1 MΩ	10 μA
	10 mA	0 to ±12.000 mA	±0.02% of range		12 V Min.	Approx. 10 MΩ	1 μA
	1 mA	0 to ±1.2000 mA	±0.02% of range		12 V Min.	Approx. 10 MΩ	0.1 μA
Generates emfs (mV) according to JIS C 1602-1981. Temperature vs millivolt tables.			When the setting dials set at 25°C x n (where n is a positive integer).	Temperature accuracy at temperature (except those at left).			
Temperature (thermocouple)	R	0 to 1769°C	*3 ±2.76°C (±0.94°C)	*3 ±3.26°C (±1.17°C)		1.5 Ω Max.	1.5°C Max.
	K	−200 to 1200°C				1.5 Ω Max.	0.15°C Max.
	E	0 to 700°C	±0.25°C	±0.31°C		1.5 Ω Max.	0.15°C Max.
	J	−200.0 to 600.0°C	*3 ±0.37°C (±0.68°C)	*3 ±0.44°C (±0.90°C)		1.5 Ω Max.	0.15°C Max.
	T	−200.0 to 200.0°C	*3 ±0.16°C (±0.35°C)	*3 ±0.25°C (±0.50°C)		1.5 Ω Max.	equivalent to 1 μV

*1) Minimum load resistance for −0.1% error

*2) 15 V up to 50 mA.

*3) Figures in parentheses show the accuracy when the setting dials are set below 0°C.

Temperature Coefficient: 50 ppm/°C between 5 and 40°C.

Ripple: Less than ±0.01% of setting range (for frequency components below 60 Hz) for 100 mV, 1 V, 10 V, 10 mA and 100 mA ranges and for 1 mA range . . . . . 0.05%.

Common Mode Rejection Ratio: For 0 to 60 Hz.

Output voltage . . . . . Approx. 120 dB.

Output current . . . . . Approx. 0.1 μA/V.

Effect of Power Supply Voltage Fluctuation: ±0.02% of range for power supply voltage change of ±10%.

Current Limiter: Approx. 200 mA (manually restored).

Voltage Limiter: Approx. 15 V (manually restored).

Power Consumption: Approx. 50 VA.

Dielectric Strength: 100 V AC for 1 minute between case and GUARD terminal and 1500 V AC for 1 minute between case and power supply.

Insulation Resistance: Greater than 100 MΩ at 500 V DC between case and GUARD terminal, and between case and power supply.

1-3-3. Voltage Unit Type 2563.

	Range	Setting Ranges	*Accuracy (of setting value)	Minimum Resolution	Maximum Output	Internal Resistance	Noise (reference data) (1 Hz to 1 kHz)
Voltage	100 V	0 to 120.00 V	±(0.15% + 20 mV)	0.01 V	Approx. 20 mA	Less than 1 Ω	50 mVp-p
	500 V	0 to 600.0 V	±(0.15% + 200 mV)	0.1 V	Approx. 10 mA	Less than 5 Ω	100 mVp-p
	1000 V	0 to 1200.0 V	±(0.15% + 200 mV)	0.1 V	Approx. 5 mA	Less than 10 Ω	100 mVp-p
Current	10 μA	0 to 12.000 μA	±(0.3% + 5 nA)	1 nA	Approx. 0.25 V	Approx. 10 MΩ	5 nAp-p
	50 μA	0 to 60.000 μA	±(0.3% + 20 nA)	10 nA	Approx. 1.25 V	Approx. 10 MΩ	10 nAp-p
	100 μA	0 to 120.00 μA	±(0.3% + 20 nA)	10 nA	Approx. 2.5 V	Approx. 10 MΩ	10 nAp-p

* For ambient temperature within 23 ± 3°C.

Temperature Coefficient: Temperature 5 to 20°C or 26 to 40°C.
±10 mV/°C for 100 V range.
±100 mV/°C for 500 V and 1000 V ranges.

Response Time:
0.2 sec or less (upranging).
0.3 sec or less (downranging).
(time for a value within the specified tolerance).

Effect of Power Supply Voltage Fluctuation: ±(0.05% of setting value +0.005% of range) for power supply voltage change of ±10%.

Sweep Function: ON (Sweep mode command) OFF (Output off) DOWN (decrease output) HOLD (Stop) UP (increase output).

Sweep Time: Approx. 16 seconds (for zero to setting value or viceversa) (Approx. 32 seconds available).

Deviation Function: −9.99 to +9.99% of setting value.

Deviation Minimum Resolution: 0.01% of range.

Over-Voltage Limit:
100 V range . . . . . more than 120 V
500 V range . . . . . more than 600 V
1000 V range . . . . . more than 1200 V

Insulation Resistance: Greater then 100 MΩ at 500 V DC between case and power supply.

Dielectric Strength: 1500 V AC for 1 minute between case and power supply.

Power Consumption: 63 VA max.

1-3-4. Current Unit Type 2564.

Range	Setting Range	*Accuracy (of setting value)	Minimum Resolution	Maximum Output	Internal Resistance	Noise (reference data) (1 Hz to 1 kHz)
1 A	0 to 1.2000 A	±(0.2% + 0.2 mA)	0.1 mA	Approx. 10 V	Approx. 5 kΩ	2 mAp-p
10 A	0 to 12.000 A	±(0.2% + 2 mA)	1 mA	Approx. 1 V	Approx. 500 Ω	20 mAp-p
30 A	0 to 36.00 A	±(0.2% + 20 mA)	10 mA	Approx. 1 V	Approx. 150 Ω	200 mAp-p
100 mV	0 to 120.00 mV	±(0.2% + 0.02 mV)	0.01 mV	Approx. 10 mA	Approx. 20 mΩ	20 μVp-p

* For ambient temperature within 23 ± 3°C.

Temperature Coefficient: (Temperature 5 to 20°C or 26 to 40°C).
±0.01% of range/°C for 30 A range.
±0.03% of range/°C for 1 A, 10 A and 100 mV ranges.

Response Time: 1 second or less. Time for a value within the specified tolerance on each range.

Effect of Power Supply Voltage Fluctuation: ±(0.05% of setting value +0.005% of range) for power supply voltage change of ±10%.

Overcurrent Limit:
Approx. 2 A for ×100 mV and ×1 A ranges.
Approx. 43 A for ×10 A and ×100 A ranges.

Overvoltage Limit:
If voltage rises above approximately 15 V on the 1 A range, the instrument automatically goes into STAND BY state.
If voltage rises above approximately 1.5 V the instrument automatically goes into STAND BY state and instrument must be reset manually.

Insulation Resistance: Greater than 100 MΩ at 500 V DC between case and power supply.

Dielectric Strength: 1500 V AC for 1 minute between case and power supply.

Power Consumption: 300 VA max.

1-3-5. GP-IB (Installed only in Type 2560-43, -44).

Electrical Specification: Conform to IEEE standard 488-1975.

Mechanical Specification: Conform to IEEE standard 488-1975.

Functional Specification: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1 and C0.

Code: ISO code.

Addressing: 0 to 15 talkers / listeners can be addressed using the select switch.

Talk Only Mode Designation: Talk-only mode is designated using the mode selector switch.

Remote Status Release: Remote status can be released by setting the mode selector switch to local, but when the local is locked out by the bus controller, remote status cannot be released.

2. NAMES AND FUNCTIONS OF COMPONENTS.

For the Type 2553 DC voltage/current standard, refer to the related instruction manual supplied with the instrument.

2-1. Front Panel.

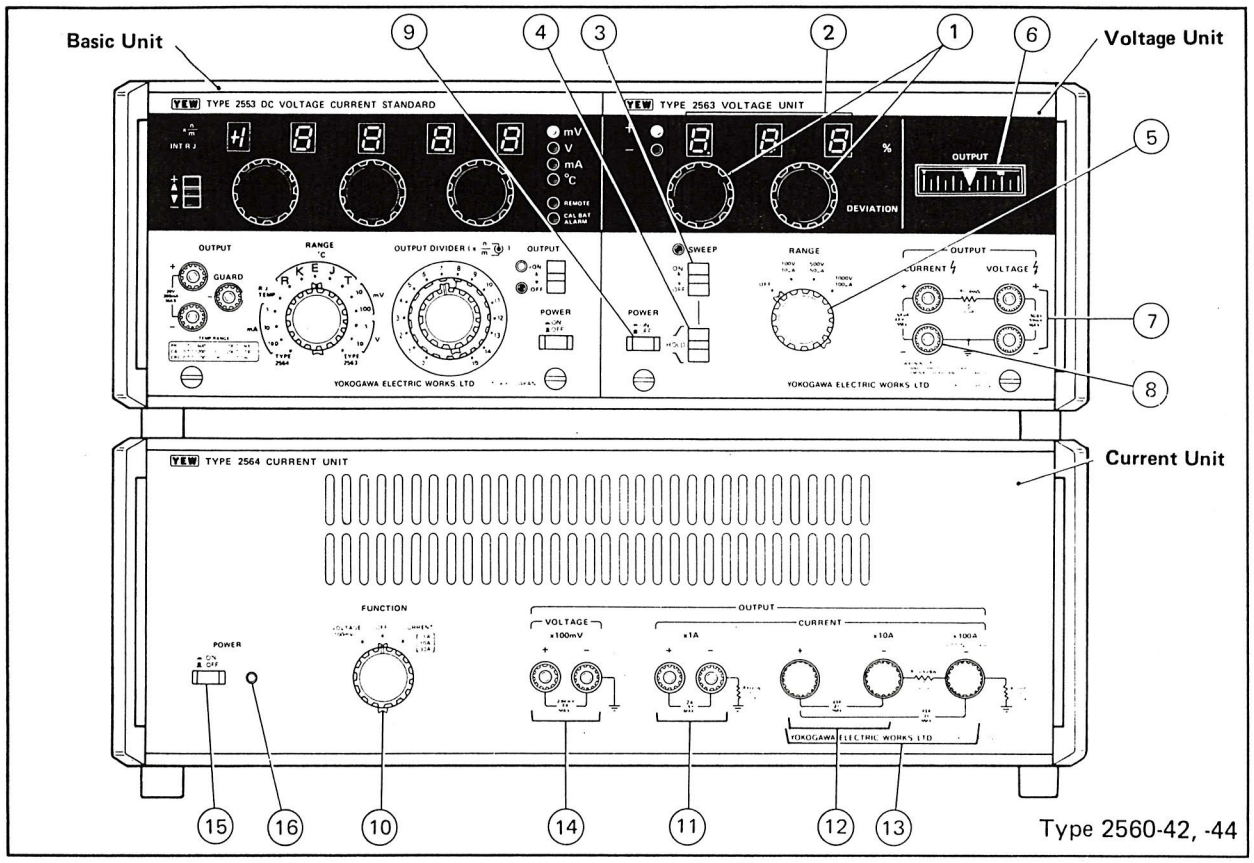


Figure 2-1. Front Panel.

Voltage Unit

① **DEVIATION Dial:**
Percentage error of the maximum setting value can be set using these dials without turning the Type 2553 output setting dials.

② **% Deviation Display:**
A maximum ±9.99% deviation is displayed using the Deviation dials. The deviation dials can be used with both voltage and current units. The display is cleared when output is switched OFF, or when range is changed, n/m is changed or sweep is switched ON.

③ **SWEEP ON-OFF Switch:**
Turns the sweep function ON and OFF. Sweep turns OFF when output is switched OFF, Range is changed, setting is changed or n/m is changed.

④ **Sweep Direction Selector Switch:**
Selects sweep direction (output increase or decrease) with the sweep function turned on, or holds the sweep output at its current value (HOLD). Sweep function can be used with both voltage and current units.

⑤ **RANGE Selector Switch:**
Selects voltage range 100 V, 500 V or 1000 V. The voltage setting is displayed with decimal point and units. Type 2563 delivers small currents (10 μA, 50 μA or 100 μA ranges through the current terminals).

⑥ **OUTPUT Voltage Monitor:**
Output voltage monitor only for the voltage unit. It does not monitor the Type 2553 or the current unit output voltages.

⑦ **VOLTAGE Terminals:**
Terminals for output voltage up to 1200 V maximum. Red for positive (+) and black for negative (−). Negative (−) terminal is connected to the case.

⑧ **CURRENT Terminals:**
Terminals for output current up to 120 μA maximum. Red for positive (+) and black for

negative (−). Negative (−) terminal is connected to the case. Output resistance is approximately 10 MΩ.

⑨ **POWER Switch:**
ON/OFF push button switch controls the power supply to the voltage unit.

WARNING

The voltage unit generates voltage or current spikes as follow, when the power switch is turned ON/OFF:
voltage terminals; 1500 V (50 mA) maximum.
current terminals; 150 μA (1500 V) maximum.
Observe the warnings of section 3 OPERATION to avoid electric shock.

Current Unit

⑩ **FUNCTION Selector Switch:**
Selects either current output (1 A, 10 A and 30 A) or voltage output (100 mV).

⑪ **X1 A CURRENT Terminals:**
Current terminals to output 1.2 A maximum. Negative (−) terminal is connected to the case through a 0.1 ohm resistor.

⑫ **X10 A CURRENT Terminals:**
Current terminals to output 12 A maximum. Negative (−) terminal is connected to the case through a 0.01 ohm resistor.

⑬ **X100 A CURRENT Terminals:**
Current terminals to output 36 A maximum. Negative (−) terminal is connected to the case through a 0.001 ohm resistor.

⑭ **X100 mV VOLTAGE Terminals:**
Voltage terminals to output 120 mV maximum.

WARNING

The current unit generates current or voltage spikes when the power switch is turned ON /OFF as follows.
X1 A current terminals; 6 A (25 V) maximum.
X10 A current terminals; 50 A (25 V) maximum.
X100 A current terminals; 150 A (25 V) maximum.
X100 mV voltage terminals; 600 mV (6 A) maximum.

⑮ **POWER Switch:**
Turns the power supply ON and OFF.

⑯ **POWER Pilot Lamp:**
Lights with the power switch ON.

2-2. Rear Panel.

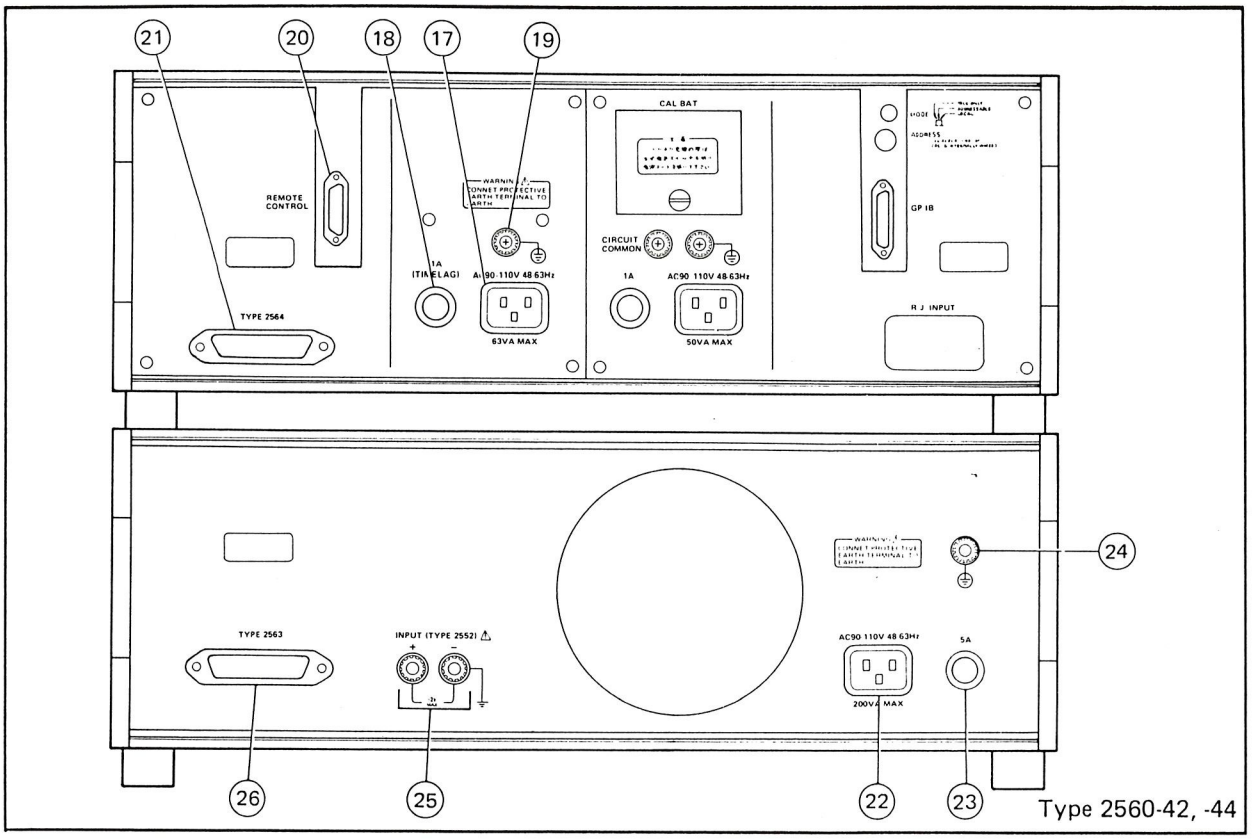


Figure 2-2. Rear Panel.

Voltage Unit

⑰ **Power Supply Socket:**
Connects the instrument to the designated power source using the supplied power cord. This is a three pin socket, with ground lead.

⑱ **Fuse:**
A 1 A slow blow fuse for a 100 to 120 V AC power supply, or 0.5 A slow blow fuse for 200, 220 and 240 V AC power supplies. To replace the fuse, first remove the power plug from the mains supply and then turn the fuse cap counter-clockwise.

⑲ **Protective Earth Terminal:**
Connceted to case. This terminal should be connected to a protective earth, for safety.

⑳ **REMOTE CONTROL Connector:**
Used with the GP-IB installed in the Type 2553. The range selector of the voltage unit can be set remotely.

㉑ **Connector to Connect the Current Unit:**
When connecting the current unit, use the supplied connecting cord.

㉒ **Power Supply Socket:**
Connect the instrument to the designated power source with the supplied power cord. This is a three pin socket including ground lead.

㉓ **Fuse:**
Fuse rating is 5 A for a 100 to 120 V AC power supply, or 3 A for 200, 220 and 240 V AC power supplies.

㉔ **Protective Earth Terminal:**
Connected to the case. This terminal should be connected to a protective earth, for safety.

㉕ **Voltage INPUT Terminals:**
Use these terminals when the instrument is used with the Type 2552 DC Voltage Standard. Apply 0 to 12 V DC between these terminals to output 0 to 1.2 A, 0 to 12 A and 0 to 120 mV from X1 A, X10 A and X100 mV output terminals, respectively. Further, apply 0 to 3.6 V DC across these terminals to output 0 to 36 A DC from X100 A terminals.

㉖ **Connector to Connect the Voltage Unit:**
When connecting the voltage unit, use the supplied connecting cord.

CAUTION

When the current unit is used with the Type 2552 DC voltage standard, a dummey connector must be plugged into connector ㉖ . The dummy connector is available at extra cost.

(Im Dummystecker sind Pin 1, 2 und 3 miteinander verbunden)

3. OPERATION.

For operating the basic Type 2553 DC voltage /current standard, refer to the separate instruction manual.

3-1. Preparation.

(1) Connect the voltage and current units using the supplied cord.
(2) The protective earth terminal of each unit should be connected to a protective earth (ground) conductor.
(3) Confirm that all units power switches are set OFF (up position), and plug the power cords supplied with the instrument into the instrument rear panel power cord connectors. Plug the other ends of the power cords into AC line outlets whose voltage corresponds to that written on the rear panel.
(4) Always press the Type 2553 POWER switch ON first, then press the voltage and current unit POWER switches ON. If the POWER switches are pressed in the reverse order to that described above, the Type 2553 panel switches may lock and the instrument not operate. This is not a fault. Press the Type 2553 POWER switch OFF, then press the switch ON again, and the Type 2553 operates normally.
(5) After all power switches are turned ON, allow the instruments to warmup for at least 30 minutes.

NOTE

While the output switch is turned ON, do not turn the power switch ON or OFF or plug or unplug the connector cable of the voltage or current unit, otherwise the output protection circuit may be tripped and turn the output OFF.

3-2. Operation of the Voltage Unit.

3-2-1. Load Connection.

Connect a load to the voltage unit output terminals. The red terminal is positive (+), and the black terminal is negative (−) and is connected to the instrument case.

WARNING

This instrument generates high voltages. Take care to avoid an electric shock, and the circuit dielectric strength should be checked carefully.

3-2-2. Output Voltage Setting.

(1) Set the Type 2553 RANGE selector switch to select the Type 2563, and confirm that the Type 2553 display indicates zero.
(2) Set the voltage unit RANGE selector switch to any desired setting.
(3) Turn the Type 2553 OUTPUT switch ON, and set its setting dials appropreately. The voltage setting appears across the voltage unit OUTPUT terminals and is indicated on the output monitor.
(4) When the voltage unit is used, only a positive output voltage is available (negative output voltage is not available).

WARNING

- When the voltage unit RANGE selector switch setting is changed, the Type 2553 OUTPUT switch will turn OFF automatically, however, – for safety – always set the Type 2553 setting dials to zero when changing the voltage unit RANGE selector switch setting.
- When the instrument is not being used, always set the voltage unit RANGE selector switch "OFF" to avoid electric shock.
- For the output voltage to be correct, the load resistance must be at least 10Ω.

3-3. Operation of the Current Unit.

3-3-1. Load Connection.

Connect a load to the proper current unit current terminals according to the current range desired. Use thick leadwires.

3-3-2. Output Current Setting.

(1) Set the Type 2553 RANGE Selector Switch to select the Type 2564, and confirm that the Type 2553 display indicates zero.
(2) Set the current unit FUNCTION Selector Switch to the desired function.
(3) Turn the Type 2553 OUTPUT Switch ON, and set its setting dials appropriately. The output current (setting value X multiplier indicated above the output terminals) is delivered through the output terminals.
(4) When the current unit is used, only a positive current is available (negative current not available).

WARNING

- When the current unit is not being used, always set the Type 2553 setting value to zero or turn the OUTPUT switch OFF.

- On the X 100 mV range, do not connect a load whose resistance less than 10 Ω or the output voltage will not be correct.
- Be careful not to short circuit the VOLTAGE X 100 mV output terminals, otherwise an excessive current may flow from the current output terminals.
- Do not connect a load to the X 100 mV terminals when the current terminals are used, otherwise the instrument may not output the correct current.
- If the X 100 mV output terminals are short circuited by mistake, the Type 2564's fuse will blow.

If the fuse is blown, replace it according to par. 4-2.

3-4. Deviation Measurement.

A percentage error for meter calibration can be obtained using the DEVIATION dials. The DEVIATION dials are common to the current and voltage units for measuring compensating factor.

(1) Meter Full Scale Calibration.

For example, to calibrate a DC voltmeter (100 V DC full scale rating, accuracy 0.5%) connect the voltmeter to the voltage unit output terminals. Set the DC calibration set controls to measure 100 V DC.

Turn the deviation dials so that the DC voltmeter pointer indicates 100 V exactly. Then the deviation dispaly indicates meter compensating data. For example, if the deviation display indicates +0.3% and the meter pointer indicates 100 V correctly, the DC calibration sets deliver 99.7 V. Therefore

compensating factor = – (percentage error)

so, when the percentage error is +0.3%, the compensating factor is –0.3%.

(2) Meter Scale Division Calibration.

The meter scale divisions can be calibrated using the Type 2553 OUTPUT DIVIDER. In this case, the percentage error of the deviation measurement is indicated as a percentage of the meter full scale value.

3-5. Sweep Function.

The sweep function is used to check for meter needle sticking, and the pointer runs the meter up to full span and back down in approximately 16 seconds (or 32 seconds) at a constant speed, by turning sweep switch ON.

(1) Sweep from Full Scale to Zero.

Set the sweep direction selector switch to HOLD, turn the Type 2553 setting dial so that the meter pointer indicates the full scale value. Set the sweep ON/OFF switch to ON, then set the sweep direction selector switch downwards to begin to sweep. Sweep can be stopped if desired, by setting the sweep direction selector switch to HOLD.

(2) Sweep from Zero to Full Scale.

Turn the Type 2553 setting dial so that the meter pointer indicates the full scale value as described above. Set the OUTPUT DIVIDER switch to zero to the meter pointer indicates zero. Set the sweep ON/OFF switch to ON, then set the sweep direction selector switch upwards to begin to sweep.

NOTE

Sweep voltages change in steps of 0.4% of setting value.

3-6. Remote Control Function.

The following two functions are controlled remotely using the remote control connector on the Type 2563 rear panel.

- **Switchover of the voltage unit voltage ranges.**

The voltage unit can be selected, output voltage (current) turned on or off and sweep control turned on or off, using the GP-IB. See (1) below. Voltage ranges cannot be changed using the GP-IB, however, they can be changed using the remote control connector.

- **Output data print command. See (2) below.**

Table 3-1 shows the Remote Control Connector pin connections.

(1) To control the voltage ranges of the voltage unit remotely, first turn the voltage unit range selector switch OFF. Connect any desired one of pins 1 to 3 of remote control connector to No. 7 D-COM pin, to select the desired range. To turn the output voltage (or current) OFF, connect the No. 4 pin to D-COM pin. When voltage unit range switching is required while operating the GP-IB, turn the output voltage (or current) OFF using the GP-IB, then switch the voltage unit ranges using the remote control connector. The voltage unit ranges can also be switched using the range selector switch on the front panel without using the remote control when operating the GP-IB.

(2) The output data can be typed out on a printer while operating the Type 2560 in TALK ONLY MODE, and when the Type 2560 is connected to the printer using the GP-IB.

Refer to the Type 2553 instruction manual for the TALK ONLY MODE and output data format. Prepare a one pole momentary contact switch, and connect the N.C. (Normal close) terminal to the No. 5 pin, N.O. (Normal open) terminal to the No. 6 pin and the central terminal to the No. 7 pin as shown in Figure 3-1. The printer types out the data whenever the switch is turned on.

Table 3-1.

Pin No.		Pin No.	
1	$\overline{1000}$ V EXT	8	D-COM
2	$\overline{500}$ V EXT	9	D-COM
3	$\overline{100}$ V EXT	10	D-COM
4	$\overline{OFF}$ EXT	11	D-COM
5	PRINT N.C	12	D-COM
6	PRINT N.O	13	D-COM
7	D-COM	14	D-COM

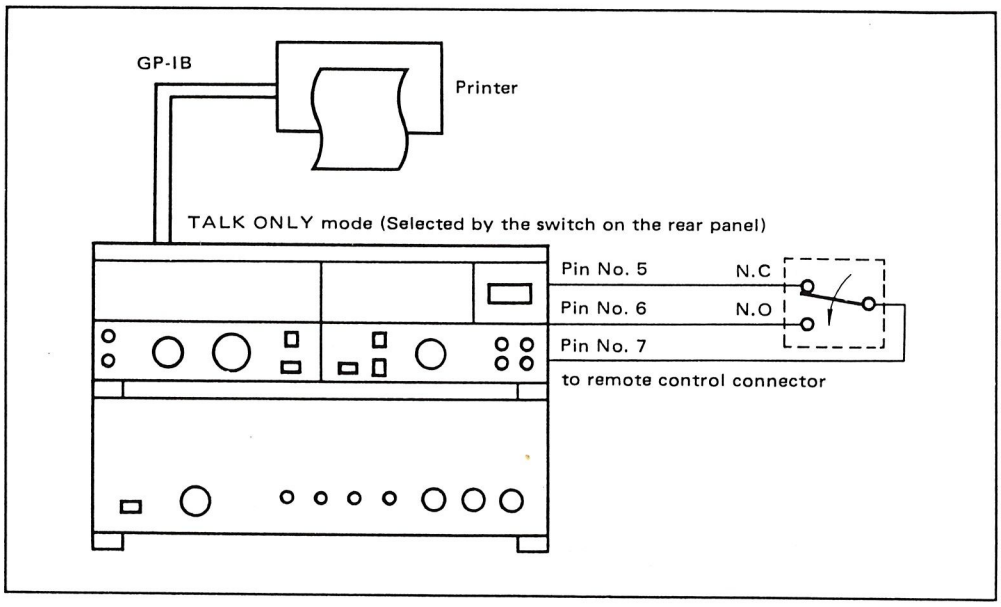


Figure 3-1.

4. MAINTENANCE.

4-1. Storage.

When storing the instrument, avoid areas which are:

- Very humid.
- Subject to direct sunlight.
- Near high temperature heat sources.
- Subject to strong vibration.
- Very dusty, or contain corrosive gases.

4-2. Replacing the Fuse in the Current Unit.

Replace the fuse by the following procedure.

(1) Always turn the POWER switch OFF and unplug the power cords from the instrument.

(2) Remove four fixing screws on the instrument side panels to open the top cover. Check if fuse F_1 or F_2 (2 A slow blow fuse on the PCB Ass'y: B9270PD is blown.

(3) If either F_1 or F_2 fuses is blown, replace it with a spare fuse. Figure 4-1. shows the location of the fuses F_1 and F_2.

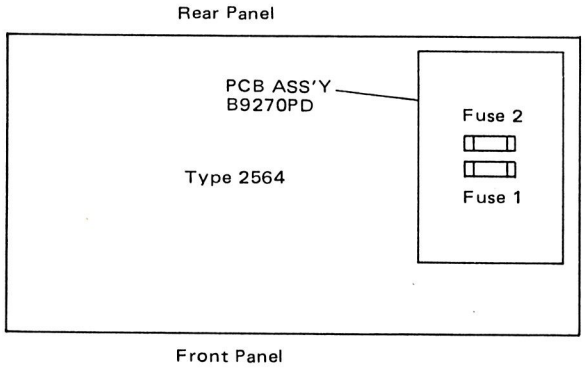


Figure 4-1.

4-3. Calibration.

Both voltage and current units are used with the Type 2553, and these characteristics are determined by their own characteristics and that of the Type 2553.

If the residual output voltage or current is large even when the setting dials are set to zero, check the output voltage of the Type 2553 set to the 10 V range.

If the 10 V range does not meet the specification, calibrate the Type 2553 according to the supplied Type 2553 instruction manual. If 10 V range is normal, please contact your nearest YEW service station or sales agent, because the voltage and/or current units must be calibrated.

WARNING

- It is dangerous to calibrate the voltage and the current units (especially the voltage unit); these units should always be calibrated at YEW.
- The voltage unit generates high voltages, so never remove it from its case. If the Type 2553 and the voltage unit must be removed from the case to calibrate the Type 2553, always unplug the voltage unit power cord, then calibrate the Type 2553 with only the Type 2553 power connected.

5. PRINCIPLES OF OPERATION.

Figure 5-1 shows a block diagram of the voltage unit. In this figure, Es is a variable voltage supplied from the basic unit. Es is reversed in sign and amplified by the BUFFER AMP (buffer amplifier) and its level shifted; the result is applied through resistor $R3$ to the ERROR AMP (error amplifier). The output voltage $E0$ is also applied to the ERROR AMP through feedback resistor $R5$. The difference voltage between these voltages is amplified by the ERROR AMP. The output voltage of the ERROR AMP is converted to a PWM (pulse width modulation) signal, then the pulse output voltage is boosted and rectified by a DC-DC converter to output high voltage. In the figure, if $R2 = R3 = R4$, $E0$ is expressed as

$$E0 = \frac{R5}{R1} Es$$

Figure 5-2 shows a block diagram of the current unit. In this figure, Es is a variable reference voltage supplied from the basic unit. Assume that the input voltage of the ERROR AMP is e

$$e = RsI_L - Es$$

Here, assume that the amplifier again is large enough, then $e \fallingdotseq 0$

$$I_L = \frac{Es}{Rs}$$

that is $I_L \propto Es$, so any DC current can be obtained by setting Es.

OVERLOAD DETECTING circuit A, detects over load and turns the output switch OFF. OVERLOAD DETECTING circuit B is to detect over loads on the X1 A range.

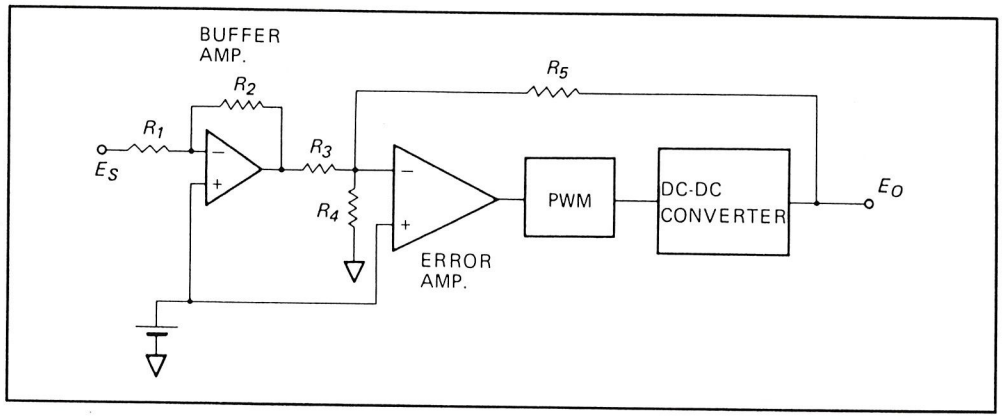


Figure 5-1.

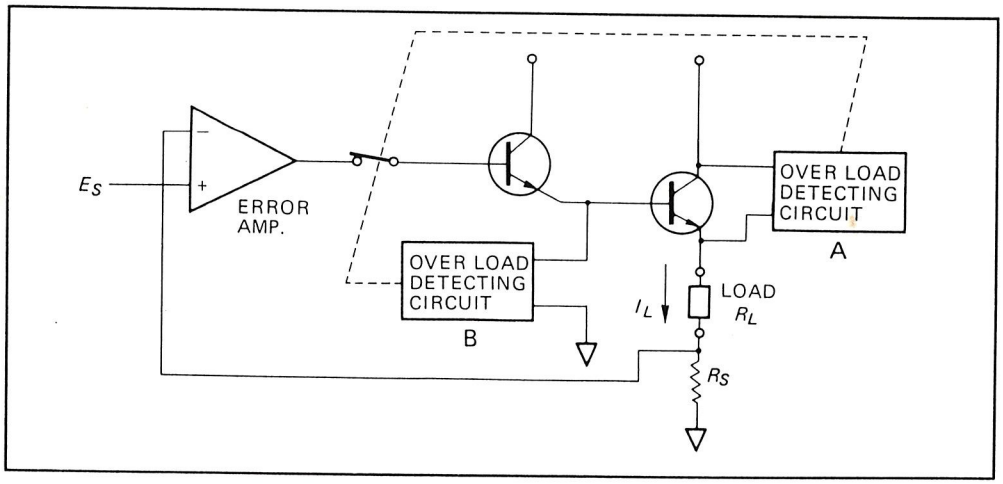


Figure 5-2.