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ELECTRICAL MEASURING INSTRUMENTS

INSTRUCTION MANUAL
FOR
VOLTAGE UNIT, TYPE 2861

Edit 1

YOKOGAWA ELECTRIC WORKS, LTD.

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YEW

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2861

- CONTENTS -

	<u>Page</u>
1. GENERAL DESCRIPTION	1
1.1 Features	1
1.2 Specifications	2
2. OPERATION	4
2.1 Panel Functions	4
2.2 Warm-up	6
2.3 Connection of Terminals	7
2.4 Output Setting	7
2.5 Overload Protection and Reset	7
3. MAINTENANCE	8
3.1 Calibration	8
3.2 Trouble	8
4. COMPOSITION AND OPERATING PRINCIPLE	9
4.1 Operating Principle	9
4.2 High-Voltage Amplifier	10
4.3 Overload Protective Circuit	10
5. CIRCUIT DIAGRAM	10

1. GENERAL DESCRIPTION

1.1 Features

The Voltage Unit, Type 2861, is designed for use with the DC Voltage/Current Standard, Type 2853, to deliver an accurate, stable DC voltage from 0 to 1200V through numerical dial setting.

The output voltage is available in two ranges of 100V/1000V, with four digits setting; the accuracy is $\pm 0.15\%$ of reading +1 division. The output current obtainable is upto 10mA. If the output current exceeds 10mA, the overload protective circuit is actuated to turn off the output.

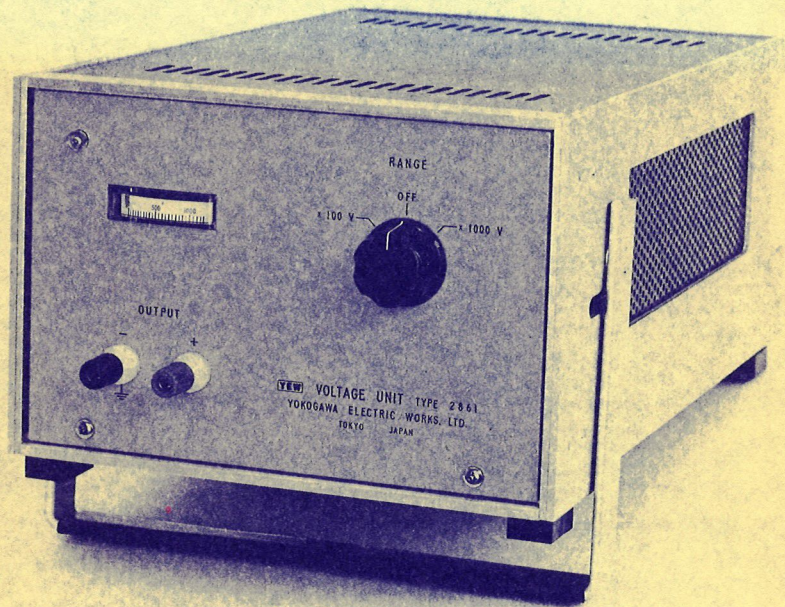


Fig. 1.1 External View of Voltage Unit, Type 2861

2861

W-1939

1.2 Specifications

(1) Ratings

Range	Range of Output Setting	Accuracy (%) of Setting	Resolution
x100V	0~119.99V	$\pm(0.15\% + 0.01V)$	0.01V
x1000V	0~1199.9V	$\pm(0.15\% + 0.1V)$	0.1V

Max. Output	Output Resistance	Output Noise	
		1Hz ~ 1kHz	1kHz ~ 20kHz
Approx. 10mA	Below 1 Ω	Below 50mVp-p	Below 200mVp-p
Approx. 10mA	Below 10 Ω	Below 100mVp-p	Below 300mVp-p

Test Condition (operated in combination with Type 2853)

- Ambient temperature : 20°C \pm 2 deg.
- Power line voltage : 100V
- Warming-up time : more than 10 minutes

- (2) Influence of Temperature (at 5°C to 35°C)
within $\pm 0.07\%$ / 10 deg.
- (3) Influence of Power Supply Voltage
within $\pm 0.05\%$ / $\pm 10\%$ change of line voltage

(4) Response for Setting

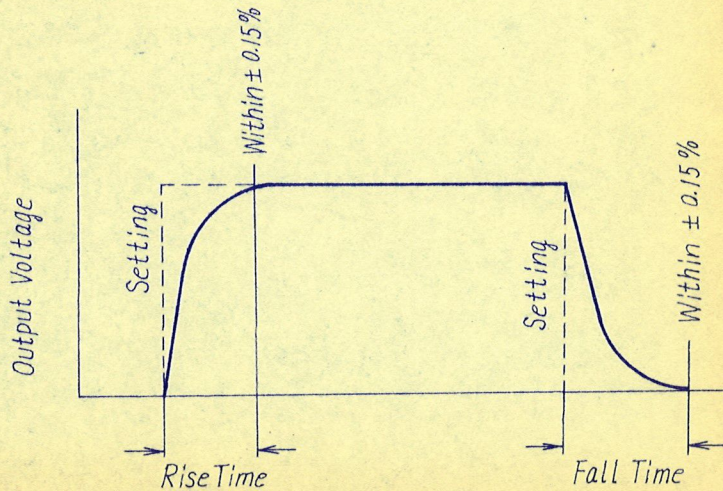
Rise time : within 0.2 s

Fall time : (a) whichever smaller value, $0.05 R_L$
or 3 s in x100V range

(b) whichever smaller value, $0.005 R_L$
or 5 s in x1000V range

Note 1. R_L is a load resistance ($k\Omega$)

2. "rise time" and "fall time" are defined as follows.



(5) Output Terminals

⊖ side stands for the outer case potential.

(6) Operating Temperature

0 to 45°C at less than 75% humidity

(7) Power Supply

100V ±10V AC, 50 or 60 Hz

(Also available AC 115V, 200V or 230V)

Note: The power is supplied by way of Type 2853
DC Voltage/Current Standard.

(8) Dimensions and Weight (in combination with Type 2853)

437 (W) x 149 (H) x 360 (D) mm

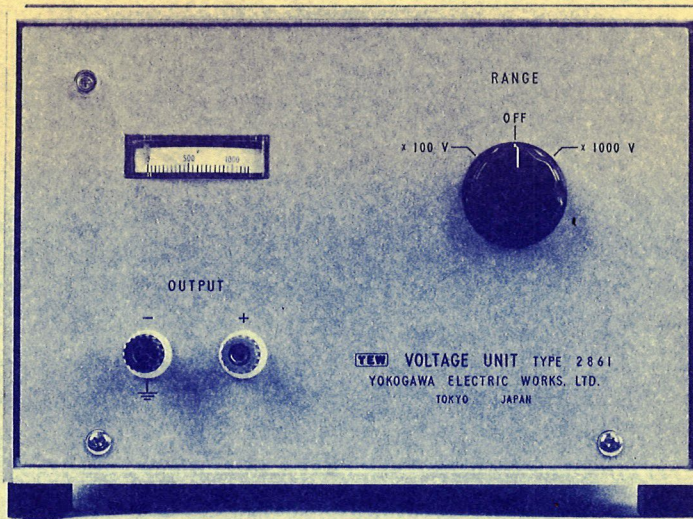
approx. 17 kg

2. OPERATION

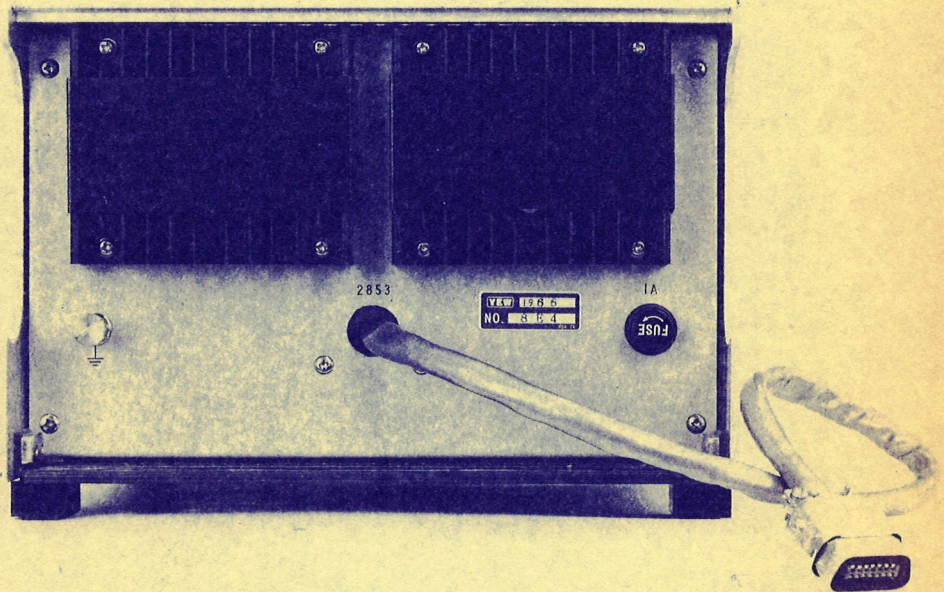
2.1 Panel Functions (Refer to Fig. 2.1)

- 1 Power Lamp This lamp lights when the power switch of Type 2853 is turned on.
- 2 "RANGE" Switch .. This switch gives range selection or turns off the output.
- 3 "OUTPUT" Terminals The red terminal is + side, and the metallic one is - side which is connected with the outer case.
- 4 Output Voltmeter .. This is for output monitoring. The accuracy of the meter is $\pm 30V$ of reading.
- 5 Mounting Screw of Main Body Two each are provided on the front and rear panels respectively.
- 6 Connector This connector is connected to the connector "2861" on the rear panel of Type 2853.
- 7 Fuse 1 ampere fuse.
- 8 \perp This terminal is for grounding and has connection to the outer case.

2861



(a) Front Panel



(b) Rear Panel

Fig. 2.1 Panel Functions

MEMO 5/10/13 MEMO 5/10/13

M-1938

2861

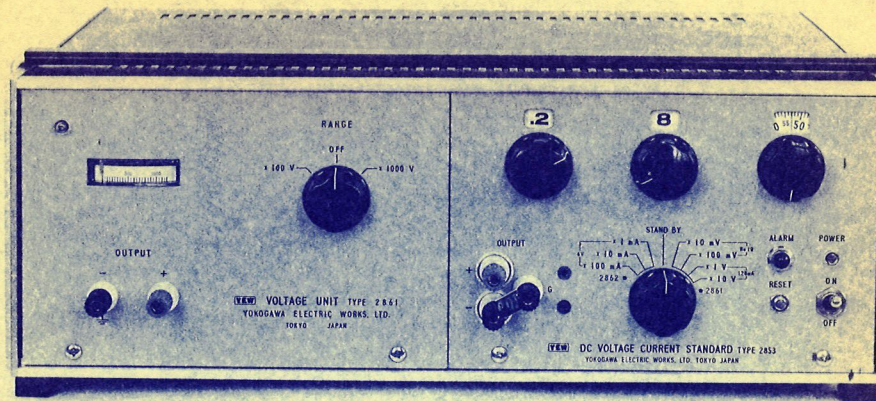


Fig. 2.2 External View of Type 2861 Voltage Unit housed with Type 2853 into one case

2.2 Warm-up

- (1) Connect Type 2861 to Type 2853 using the cord connected with Type 2861. Plug the cord into the connector "2861" on the rear panel of Type 2853. (Refer to Fig. 2.2)
- (2) Place the setting dial of Type 2853 to the zero position.
- (3) Place the range switch of Type 2861 to the 'OFF' position.
- (4) Change over the range selector switch of Type 2853 to the "2861" position.
- (5) Turn on the power switch of Type 2853. Then, the power lamps of Type 2853 and Type 2861 will light. If the "ALARM" lamp of Type 2853 lights, push the "RESET" button to restore the instrument to the normal condition.
- (6) Warm-up the instrument for about 10 minutes under this state.

2.3 Connection of Terminals

- (1) Connect the load to the output terminal of Type 2861. The red terminal denotes \oplus , and the metallic one is \ominus which is connected with the case. For safety guard, it is recommended to ground the earth potential at all times.

Note: (a) Be sure to use the metallic terminal at the earth potential. Remember this terminal is connected with the outer case of the instrument.

- (b) The instrument generates a high voltage. Be strictly careful not to touch the high voltage side. Also, be sure to operate the instrument within dielectric strength of the circuit under test.

2.4 Output Setting

- (1) Make sure that the setting dial of Type 2853 is in the zero position.
- (2) Set the range switch of Type 2861 to the desired position.
- (3) Set the setting dial of Type 2853 to the desired position. By this, the setting voltage will come out at the output terminals, and the output voltmeter will indicate this voltage.
- (4) Be sure to place the setting dial of Type 2853 to the zero position before changing over the range switch of Type 2861. This will prevent the circuit under test from incurring damage due to overvoltage.
- (5) For safety guard, be sure to place the range switch of Type 2861 to the "OFF" position whenever the instrument is not used.

2.5 Overload Protection and Reset

- (1) The overload protective circuit will operate to turn off the output circuit and to light the "ALARM" lamp of Type 2853 when:
 - (a) the range switch of Type 2861 voltage unit is changed over under the condition where output is delivered, or
 - (b) the output current exceeds 10 mA.

- (2) In the event of overload, first remove the overload, and push the "RESET" button of Type 2853. Thus the circuit is restored to the normal state, to give output voltage.
- (3) If the "RESET" button is pressed under the overload condition, the "ALARM" lamp lights and the output circuit will repeat on/off. If leaving the instrument as it is, the circuit may be damaged.

3. MAINTENANCE

3.1 Calibration

Since this voltage unit is designed for use with Type 2853 DC voltage/current standard, the characteristic is determined by both the characteristics of Type 2861 and Type 2853.

In case the output voltage is excessing (i.e., more than the rated value) even though the setting dial is in the zero position, or in case the error of the output voltage is large, the cause is considered attributable to the error of Type 2853. If such is the case, calibrate Type 2853 according to the instructions prepared for Type 2853.

3.2 Trouble

If no output is available despite the condition where the Type 2853 DC voltage/current standard is operated normal, this shows that the Type 2861 voltage unit is wrong.

Note that Type 2861 is a high-voltage generator, and repair accompanies danger. In addition, this voltage unit is a precision instrument, and requires delicate adjustment and calibration after repair. In the event of trouble, contact YEW for service.

4. COMPOSITION AND OPERATING PRINCIPLE

4.1 Operating Principle

Fig. 4.1 shows the combined circuit of Type 2861 and Type 2853.

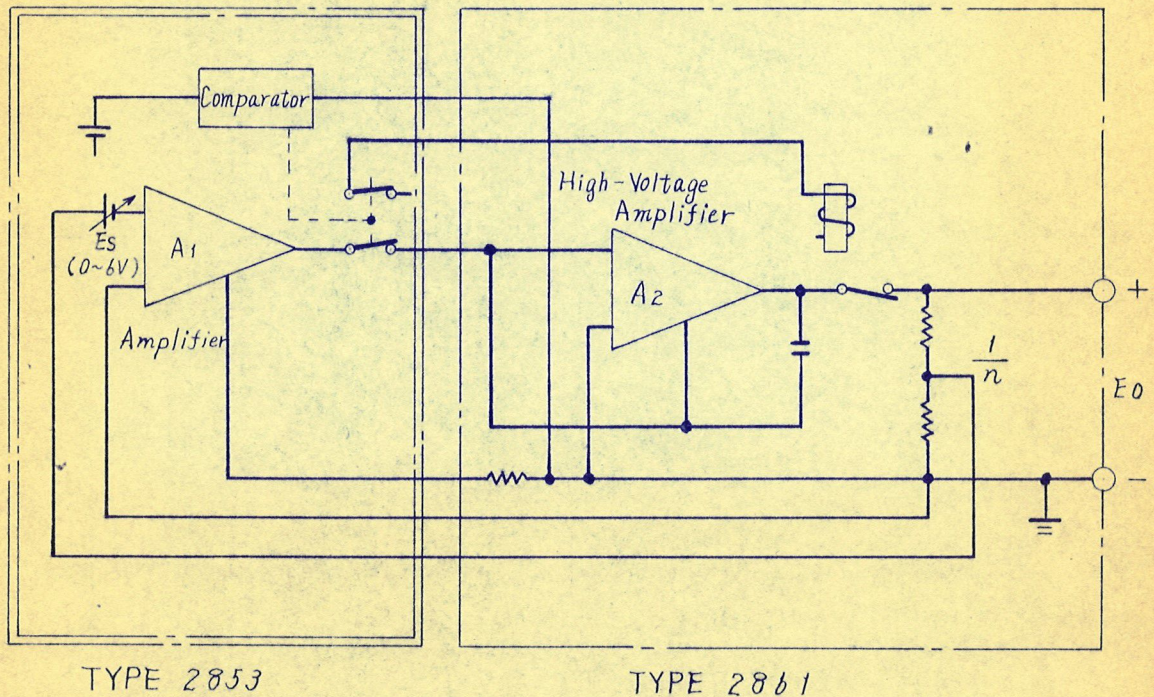


Fig. 4.1 Block Diagram of Type 2861 in combination with Type 2853

The voltage unit, Type 2861 is composed essentially of a DC high voltage amplifier A₂ and a voltage divider. When Type 2861 is combined with Type 2853 then the high voltage amplifier of Type 2861 is interconnected with the amplifier output circuit of Type 2853 in the form of cascade connection. The output voltage E_o is accurately divided by the voltage divider and then fed back to Type 2853. This voltage is then compared with the input standard voltage E_s which can be varied through the setting dial. The resultant difference voltage is amplified by the amplifiers A₁ and A₂ to give the output voltage E_o. When the amplifier gain is high enough, the difference voltage can be neglected in view of the value of the standard voltage E_s, as expressed by:

$$E_o = nE_s$$

where n is a voltage division ratio of the voltage divider. In other words, the output voltage is determined by " E_s " and " n " and therefore is given accurately.

4.2 High-Voltage Amplifier

This amplifier is a DC-DC converter type amplifier consisting of an oscillator which generates an AC voltage whose amplitude is proportional to the input voltage, a step-up transformer which provides a high voltage from the given AC voltage, and a demodulator which rectifies and filters the AC high voltage.

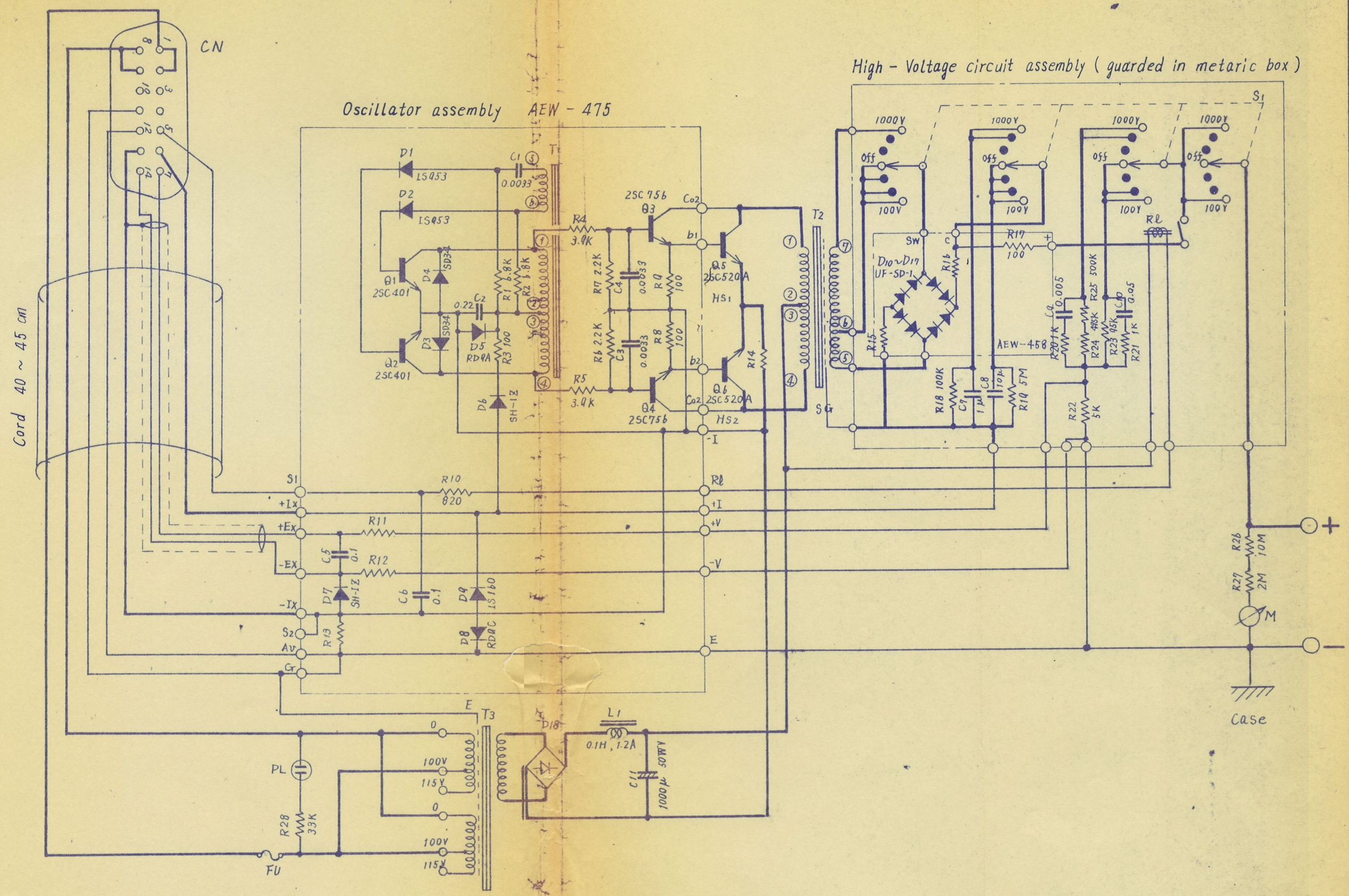
Since the frequency of this AC voltage is as high as about 20 kHz, the instrument causes no hum, and makes available a fairly wide gain-band width.

4.3 Overload Protective Circuit

The output current at the output terminal of Type 2861 is detected to be given as an input to the comparator of the overload protective circuit. When this current exceeds the set value (10 mA), the "ALARM" of Type 2853 is actuated to turn off the output circuit relay of Type 2853. Then, through the interlocking relay, the output circuit relay of Type 2861 is released. All these relays are of reed relay to maintain reliable and quickly responsive relay action (in 10 ms), and thus to realize reliable protective function of the circuit.

5. CIRCUIT DIAGRAM

The circuit diagram of the voltage unit, Type 2861, is shown in the appended drawing.



Cord 40 ~ 45 cm

High - Voltage circuit assembly (guarded in metallic box)

Oscillator assembly AEW - 475

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Main Products

Industrial Process and Laboratory Instruments :

Electronic & Pneumatic Indicators, Recorders & Controllers for process measurement and control of temperature, pressure, flow, liquid level, pH, gas analysis, solution conductivity, illumination, humidity, dewpoint, viscosity, turbidity, etc. Polarocorders, Platrode, Process Titrator, Laboratory pH Meters, Beta Ray Thickness Gauge, Computer Control System, Meteorological Observation Equipment, Gas Chromatographs, etc.

Electrical Indicating Instruments :

Laboratory Standard Instruments; Portable, Panel and Switch board Instruments; Recording Instruments; (Voltmeters, Ammeters, Frequency Meters, Wattmeters, Power Factor Meters, Varmeters, Tachometers). Electrostatic Voltmeters, Instrument Transformers, Line Current Testers, Battery Tester, VU Meters, Thermocouple Thermometers, Thermistor Thermometers, Optical Pyrometers, etc.

Electrical Measuring Instruments :

DC Voltage Standard, DC Galvanometers, DC Potentiometers, DC Bridges, Standard Resistors, Variable Dial Resistors, Slide Resistors, Circuit Testers, Insulation Testers, Earth Resistance Testers, Leakage Current Testers, Digital Ohmmeter, Digital Voltmeter, X-Y Recorders, Laboratory Recorders, Scratch Recorders, Electromagnetic Oscillographs & Peripheral Equipment, Flux Meters, Gauss Meters, Epstein Iron Loss Test Set, Magnetic Hysteresis Loop Tracers, All-Electronic AC Network Analyzers, Analog Computer, etc.

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