1. GENERAL.

1-1. Description.

Type 2509 Digital Wattmeter with selector buttons for voltage and current. The circuitry uses a unique YEW-developed feedback time division multiplier, and the unit has a frequency range of 40 to 400Hz and is accurate to 0.5%.

The voltage range of 250V and the current range of 1 to 10A make this instrument suitable for power measurements over a wide range of general-purpose electrical equipment.

In addition to wattage measurement, an outstanding feature of Type 2509 is its ability to make highly accurate measurements of true voltage, current, or wattage of distorted (non-harmonic) waveforms by means of an algebraic effective value-to-DC converter circuit.

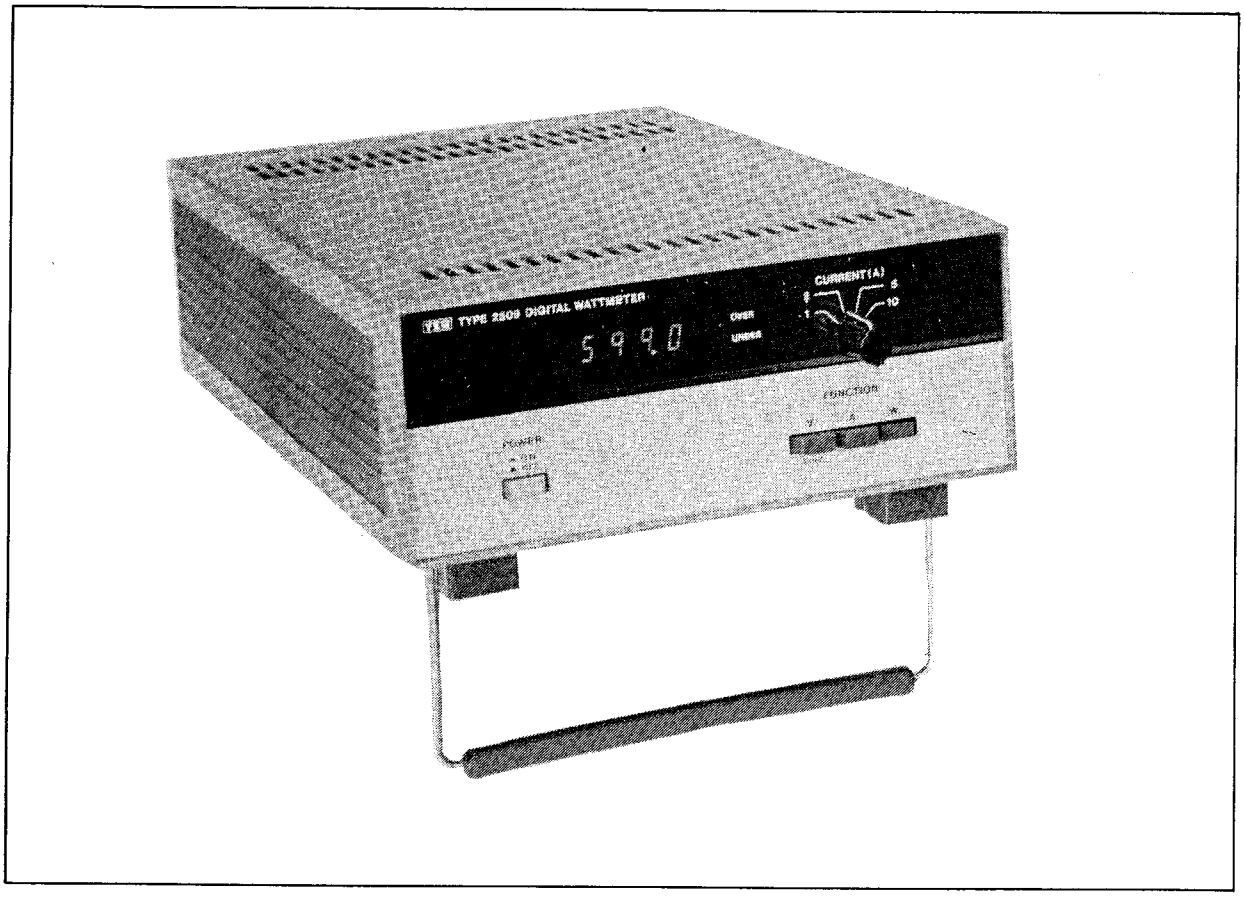

Figure 1-1. External View.

1-2. Specifications.

General Specifications.

Type of Input: Floating.
Display: Light emitting diode (LED) display.
Sample Rate: Approx. 2 times/second.
Maximum Readout: 5990.
Readout Unit: Shown on function switch.
Current Range Selection: Manual.
Function Selection: Manual.
Effective Input Range: Approx. 30 to 110% of voltage and current range.
Response Time: Approx. 3 seconds (for reading within specified accuracy after abrupt change from 30 to 100% of range or from 100 to 30% of range).
Operating Temperature Range: 5 to 40°C (41 to 104°F).
Operating Humidity Range: 20 to 80% relative humidity.
Warmup Time: Approx. 30 minute (for readings within specified accuracy).
Power Supply: 108 to 132V AC, 50/60Hz (100, 200, 220, 240V AC versions available on request).
Effect of Power Supply Fluctuation: Less than ±0.1% of range for a 10% fluctuation in power supply voltage.
Dielectric Strength: Withstands 1500V AC, 50Hz for one minute between voltage and current terminals, or between voltage terminals and power line, or current terminals and power line.
Insulation Resistance: More than 20MΩ at 500V DC.
Power Consumption: Approx. 10VA.
Weight: Approx.3.1kg (6.6 lbs.)
Dimensions: Approx. 90 X 210 X 330mm (3-1/2 X 8-1/4 X 13").
Accessories Supplied at no Extra Cost:
Power cord . . . . . 1pc.
Fuses (0.5A for 100, 108 to 132 V AC
0.2A for 200, 220 or 240V AC) . . . . . 2 pcs.
Instruction Manual . . . . . 1 copy

Measuring Function	Voltage	Current	Power
Principle of Operation	Steepest descent method	Same as Voltage	Feedback time division multiplier
Rated Input	250V (single range)	1A, 2A, 5A, and 10A	250W to 2500W In accordance with V and A range combination
Resolution	100mV/digit	1mA/digit	100mW/digit
Frequency Range	40 to 400Hz	Same as Voltage	Same as Voltage
Crest Factor	~~less than~~ 2 at rated value	~~Less than~~ 3 at rated value	Same as V and A ranges
Accuracy (when used under the following conditions: Ambient temperature: 23 ±3°C Supply voltage: 100V ±1% Input waveform: Sinusoidal Calibration cycle: 3 monthly Voltage/current input: 30 to 100% of range)	±(0.5% of rdg + 0.1% of ±(1% of rdg + 0.2% of ±(1% of range + 0.2% of range) at 40 to 47Hz and 63 to 400Hz	Same as Voltage	±(0.5% of rdg + 0.1% of range) at 47 to 63Hz ±(1% of rdg + 0.2% of range) at 40 to 47Hz and 63 to 400Hz Effect of Power Factor: Less than ±0.5% of range at cos φ = 0.5, 50/60Hz
Temperature Coefficient : Voltage/current: 30 to 100% at 50/60Hz, 5 to 20°C, 26 to 40°C	Less than 0.1% of range /°C	Same as Voltege	Same as Voltage
Instrument Power Loss	Approx. 250kΩ	1A range: Approx. 0.05VA 2A range: Approx. 0.06VA 5A range: Approx. 0.2VA 10A range: Approx. 0.5VA	Same as V and A ranges
*Max. Allowable Input (for less than 1 second)	3 X Range (peak value)	5 X Range (peak value)	Same as V and A ranges
*Max. Allowable Input (continuous)	2 X Range (peak value)	3 X Range (pead value)	Same as V and A ranges

*Power switch at ON or OFF.

2. PANEL LAYOUT AND FUNCTIONS.

2-1. Front Panel.

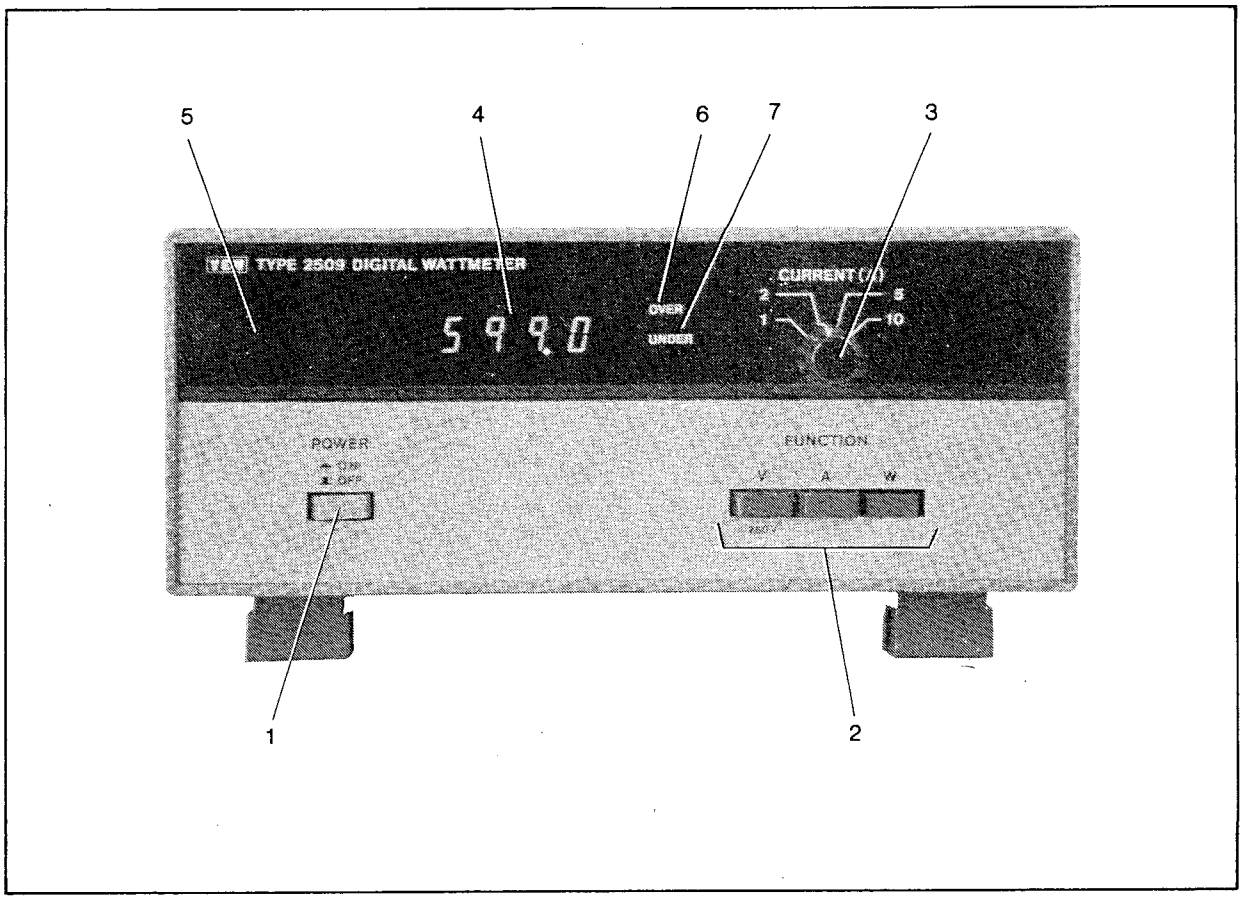

Figure 2-1. Front Panel.

1 Power Switch:
ON/OFF push on-off switch (press to set and press again to reset) controls the power supply to the entire instrument.

2 Function Selectors:
Measuring functions are selected by push-button switches. Press the V switch to measure effective voltage, A switch for effective current, or W for power. *Be careful not to press more than one switch at a time.*

3 Current Range Selector:
Selects a measuring range of 1A, 2A, 5A, or 10A. Selection can be done with power ON.

4 Digital Display:
Gives a direct digital readout in four digits (maximum possible display value is 5990) including decimal point.
Note that the display may show a small current or voltage value (the lowest one or two digits may not be zero) even when zero input is applied to the terminals. Such an effect is normal for conversion circuits of the type used in this unit. Be careful that the voltage and current values fall within the effective measuring range (30 to 110% of specified range).

5 Polarity Indicator:
No indication appears for positive values, but a minus sign will be displayed to the left of negative power readings.

6 OVER-range Indicator:
This lamp lights when voltage and current inputs exceed 110% of range.

7 UNDER-range:
This lamp lights when voltage and current inputs are less than approx. 30% of range.

2-2. Rear Panel.

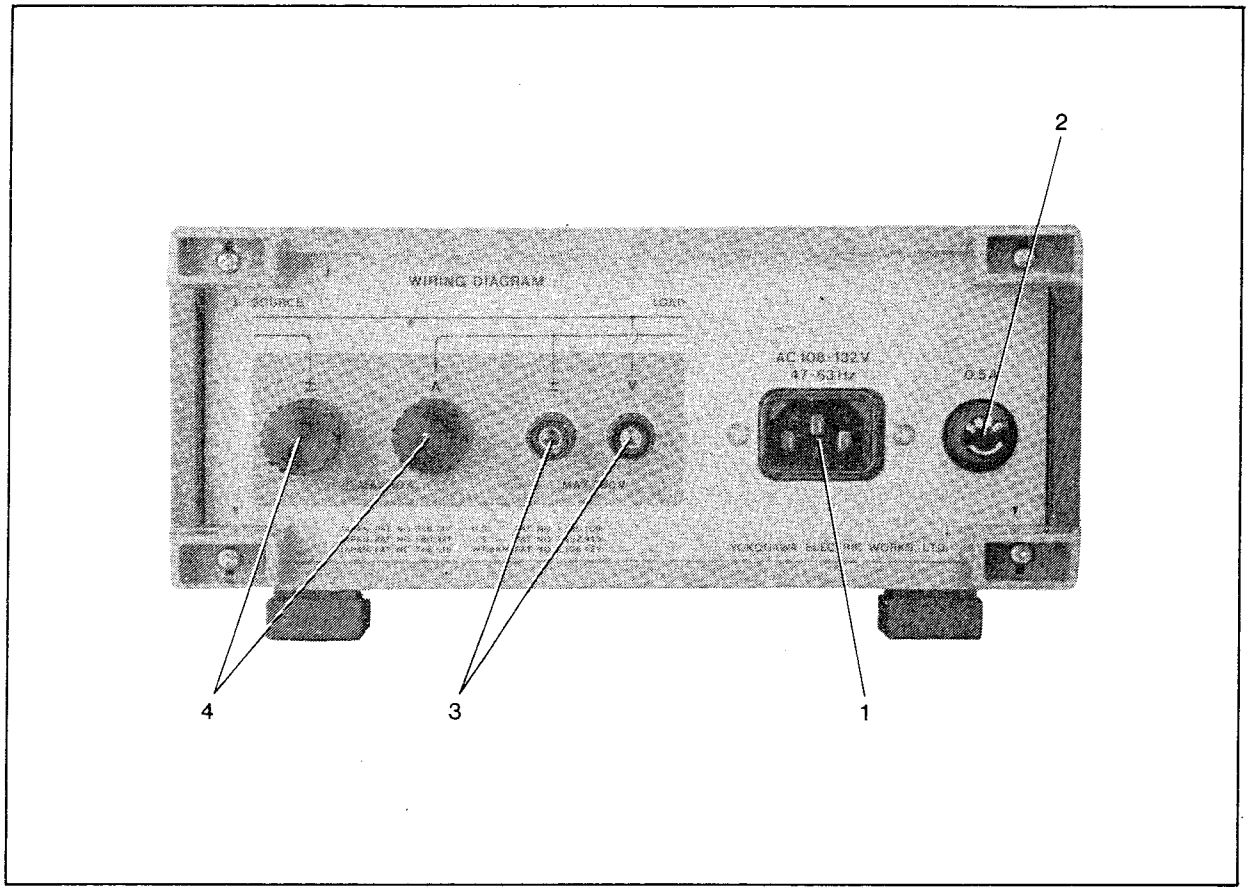

Figure 2-2. Rear Panel.

1 **Power Cord Connector:**
This is a three-pronged socket for an AC power cord with grounding lead. The standard power cable that plugs into this socket is supplied with a plug appropriate for the area to which this instrument is shipped.

2 **Fuse:**
The fuse rating is 0.5A for instruments on 100 or 120V AC line power, or 0.2A for 200, 220 or 240V AC. To replace the fuse, unplug the power cord and turn the fuse socket cap counterclockwise. Pull out cap, replace fuse, and reinstall cap with new fuse.

3 **Voltage Input Terminals:**
The maximum continuous voltage input is 250V.

4 **Current Input Terminals:**
The maximum continuous current input is 10A. After the current input terminals have been connected to the circuit to be tested, the current range selector switch on the front panel can be set.

Be very careful to connect the Voltage Input Terminals and Current Input Terminals correctly. Also make sure that the input voltage and current never exceed the maximum allowable values (specified in Section 6), even when the instrument is switched off.