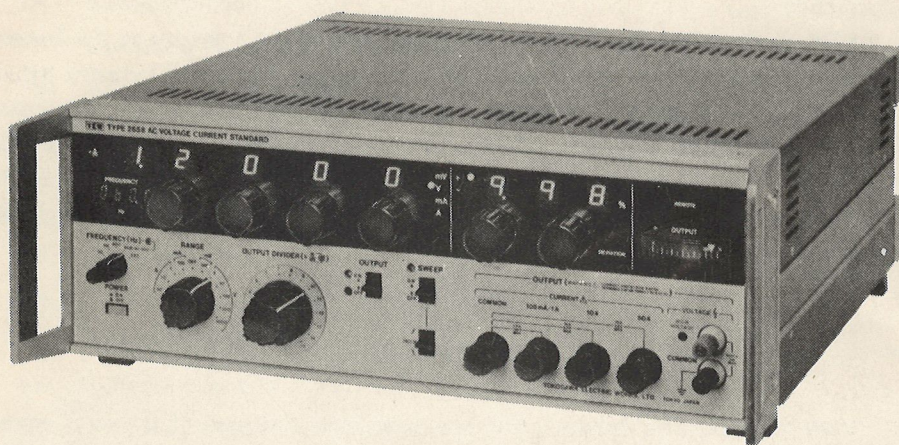


Instruction Manual

Type 2558
AC VOLTAGE CURRENT STANDARD



YEW

YOKOGAWA ELECTRIC WORKS

IM 2558-01E

CERTIFICATION

YEW (Yokogawa Electric Works, Ltd.) 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 Electro-technical 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.

I. GENERAL

1-1. Description

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Figure 1-1.

1. GENERAL

1-1. Description

The YEW Type 2558 AC Voltage Current Standard delivers accurate 1mV to 1200V AC voltages or 1mA to 60A AC currents.

To handle the instruments, only the output voltage or current and output frequency need be set.

The instrument delivers high voltage or current, but it is designed with safety in mind; for example, the output voltages or currents become zero whenever the range selector switch setting is changed.

1-2. Features

1) High accuracy of ±0.08%

The instrument delivers AC voltage or current with ±0.08% accuracy at 50Hz and 60Hz on all except 50A range.

2) Output Divider Function

A percentage divider dial for output voltage or current is provided. The divider can be used to output fractions (n/m) of any voltage or current setting, where m and n are integers, $n \leq m$ and $1 \leq n \leq 15$.

3) Deviation Read-out Function

The deviation of a test value from the true value is displayed digitally as a percentage of range when the pointer is set to the test value by turning the deviation dial.

4) Sweep Function

The output can be swept freely between 0 and approximately 100% upwards or downwards using the sweep ON-OFF switch in about 16 seconds. This function is useful in testing for sticking meter needles etc.

5) Safety Design

The instrument delivers high voltage or current, but it is designed for safety, that is, the voltage or current output is disabled when an overload or operational error occurs.

6) GP-IB (installed only in Type 2558-01)

The range, output voltage or current, output frequency and OUTPUT ON/OFF switch settings on the front panel can be externally controlled, and their settings may be checked.

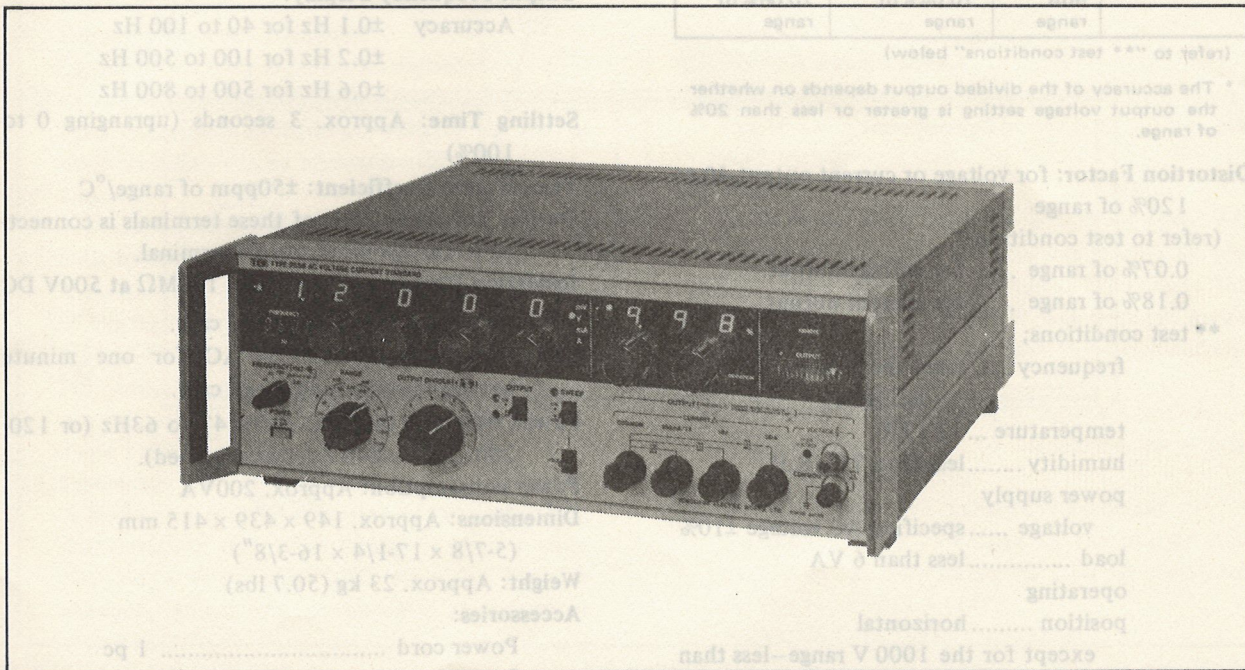


Figure 1-1.

1-3. Specifications

Range	Setting Range (*)	Minimum Resolution	Maximum Output
100mV	1.00 to 120.00mV	10μV	Internal Resistance 10Ω
1V	0.0100 to 1.2000V	100μV	0.5 A min.
10V	0.100 to 12.000V	1mV	Approx. 3A
100V	1.00V to 120.00V	10mV	Approx. 0.3A
300V	3.0 to 360.0V	100mV	Approx. 0.1A
1000V	10.0 to 1200.0V	100mV	Approx. 6mA
100mA	1.00 to 120.00mA	10μA	Approx. 30V
1A	0.0100 to 1.2000A	100μA	Approx. 30V
10A	0.100 to 12.000A	1mA	Approx. 3V
50A	0.50 to 60.00A	10mA	Approx. 0.6V

* When setting is below 1% of range, no output voltage or current is delivered. However, when divided output is used on the 300 V range, output voltage cannot be set between zero and 1.1% of range.

Accuracy:

Output Frequency Setting value		50/60 Hz	400 Hz
		± (0.08% of setting value +0.015% of range)	± (0.1% of setting value +0.015% of range)
20 to 120% of range	Ranges except 50A range	± (0.15% of setting value +0.015% of range)	± (0.2% of setting value +0.015% of range)
	50A range	±0.02% of range	±0.03% of range
1 to 20% of range	Ranges except 50A range	±0.04% of range	±0.06% of range
	50A range		

(refer to "*** test conditions" below)

* The accuracy of the divided output depends on whether the output voltage setting is greater or less than 20% of range.

Distortion Factor: for voltage or current output 40 to 120% of range

(refer to test conditions)

0.07% of range for voltage output

0.18% of range for current output

** test conditions;

frequency fixed frequencies (built-in oscillator)

temperature ... 23 ±3°C

humidity less than 75% R.H.

power supply

voltage specified AC voltage ±10%

load less than 6 VA

operating

position horizontal

except for the 1000 V range—less than

1.2 VA

for the 1 V range—less than

0.1 VA

for the 100 mA range—less than

0.2 VA

Output Setting: Set with four dials (contactless switches using photocouplers).

first dial 0 to 12 in 13 steps

second, third and fourth dials 0 to 9 in 10 steps

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

Unit Marks: mV, V, mA and A

Divider Output Setting:

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

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

n: 0, 1, , 15 (where n ≤ m)

Deviation Setting: Set with two dials (contactless switches using photocouplers).

Deviation Display: 3-digit LED display, maximum reading 9.99%

Sweep Time: Approx. 16 seconds (for zero to 100% change or viceversa)

Output Frequency (Sine wave):

Built-in Oscillator 50 Hz ± 1%

60 Hz ± 1%

400 Hz ± 1%

and variable from 40 to 500 Hz

Temperature coefficient of built-in oscillator

0.02 Hz/°C for fixed frequency of 50 Hz

or 60 Hz

0.1 Hz/°C for fixed frequency of

400 Hz

External Oscillator 40 to 800 Hz

3 ±0.1V

Input Impedance approx. 10kΩ

Output Frequency Display:

Accuracy ±0.1 Hz for 40 to 100 Hz

±0.2 Hz for 100 to 500 Hz

±0.6 Hz for 500 to 800 Hz

Settling Time: Approx. 3 seconds (upranging 0 to 100%)

Temperature Coefficient: ±50ppm of range/°C

Output Terminals: One of these terminals is connected to the common (earth) terminal.

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

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

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

Power consumption: Approx. 200VA

Dimensions: Approx. 149 × 439 × 415 mm (5-7/8 × 17-1/4 × 16-3/8")

Weight: Approx. 23 kg (50.7 lbs)

Accessories:

Power cord 1 pc

Large current cord 2 pcs

Fuse (2A slow blow type) 2 pcs

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2. NAMES AND FUNCTIONS OF COMPONENTS

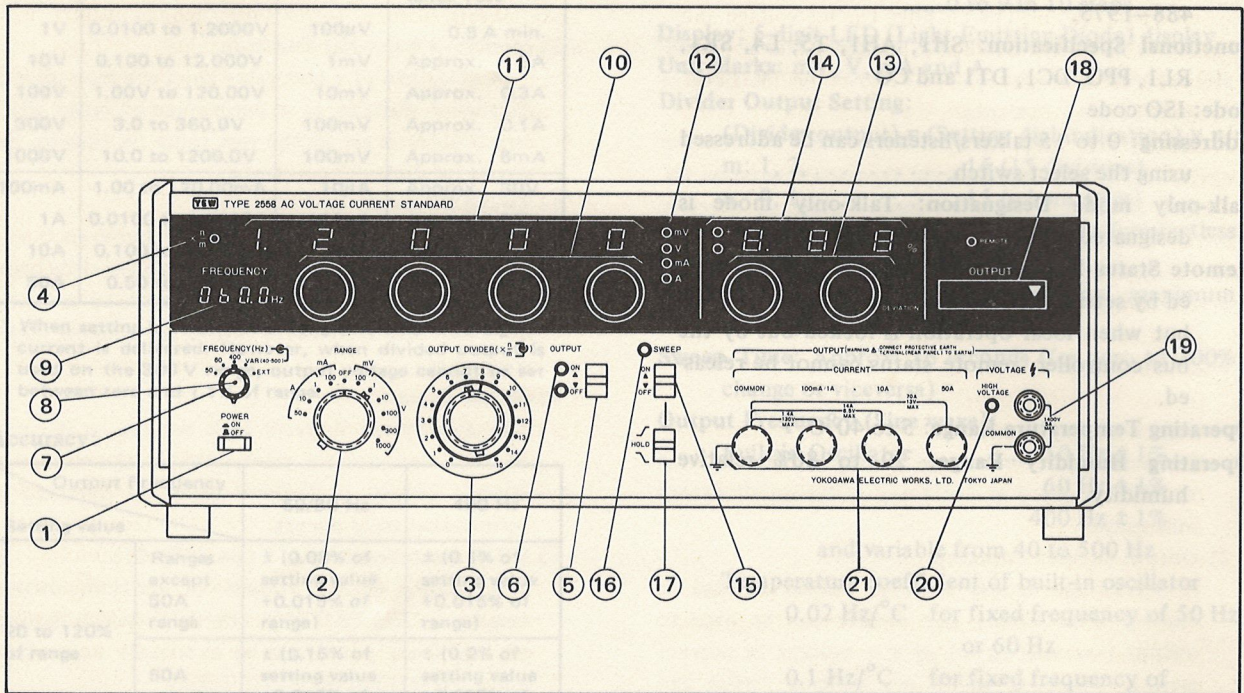


Figure 2-1.

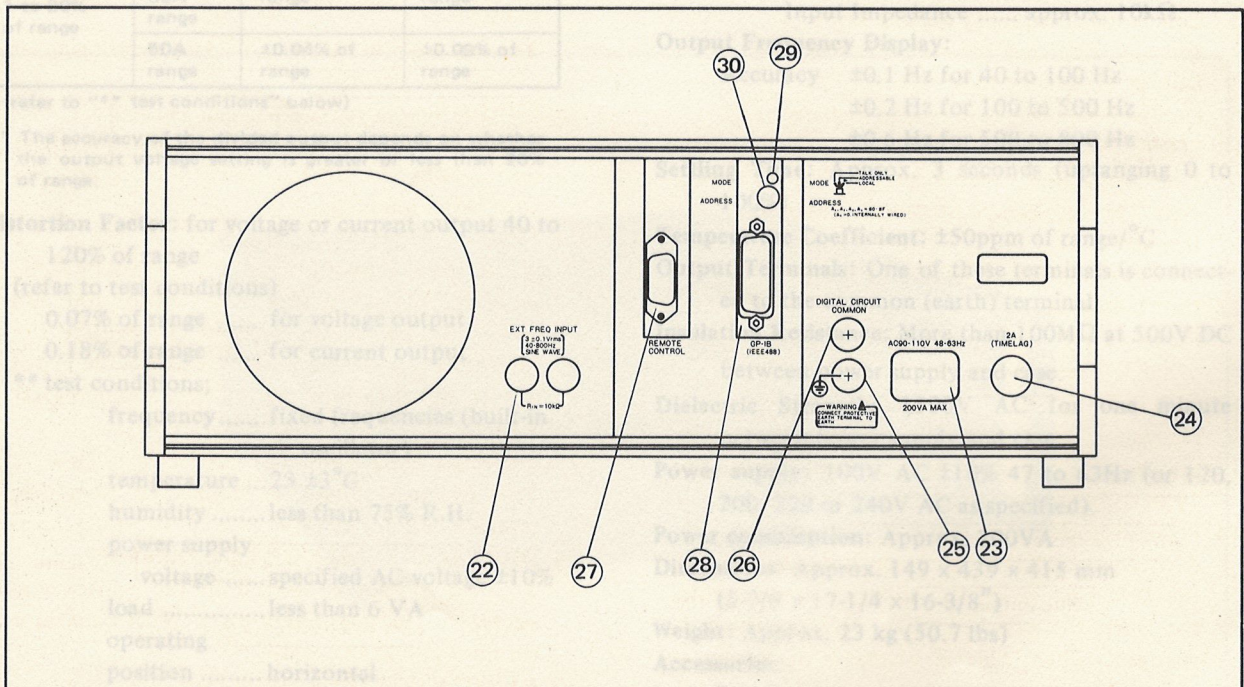


Figure 2-2.

2-1. Front Panel

- ① **POWER ON/OFF switch:**
Press to switch power ON, and press again to switch power OFF.
- ② **RANGE Selector Switch:**
Selects voltage range 100mV, 1, 10, 100, 300 or 1000V (6 ranges) or current range 100mA, 1, 10 or 50A (4 ranges).
- ③ **OUTPUT DIVIDER dial:**
A divided output of n/m of dial set value is delivered. m is the outer dial division and n is the inner dial division. When m=n the set value itself is delivered (m is 1 to 15).
- ④ **xn/m lamp:** lights when n and m of the output divider differ.
- ⑤ **Output ON/OFF Switch:**
The set value is delivered from the output terminal. When the range is changed or when an overload occurs the output voltage or current is cut off automatically.
- ⑥ **Output ON-OFF pilot lamp:**
The green lamp lights when the output is switched ON. and the red lamp lights when the output is switched OFF.
- ⑦ **Frequency Selector Switch:**
Selects 50, 60 or 400Hz fixed frequency or 40 to 500Hz continuous frequency. If set to EXT, an external oscillator can be used.
- ⑧ **Continuous Frequency Setting Knob:**
Sets any frequency between 40 and 500Hz.
- ⑨ **Output Frequency Indicator:**
Output Frequency is indicated digitally.
- ⑩ **Setting Dial:**
Four contactless switches are used for the setting dials. The dials can be turned continuously.
- ⑪ **Display:**
Set value is indicated by five LED digits.
- ⑫ **Unit Indicator:**
Indicates mV, mA or A depending on the setting of the Range Selector Switch.
- ⑬ **DEVIATION Dial:**
Percentage error of the maximum setting value can be set using these dials without turning the Type 2558 output setting dials.
- ⑭ **Percentage Deviation Display:**
A maximum $\pm 9.99\%$ deviation is displayed using the Deviation dials. The display is cleared when the Output is switched OFF, when the Range is changed, when n/m is changed or Sweep is switched ON.
- ⑮ **SWEEP ON-OFF Switch:**
Turns the sweep function ON and OFF.
- ⑯ **Sweep ON lamp:**
Lights when the Sweep function is ON.

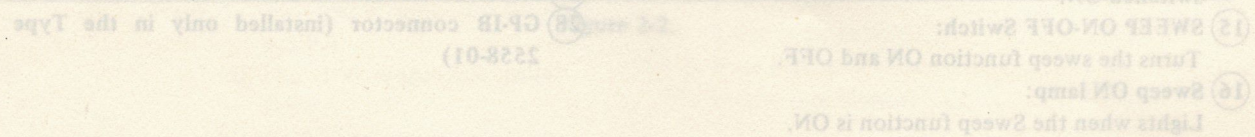
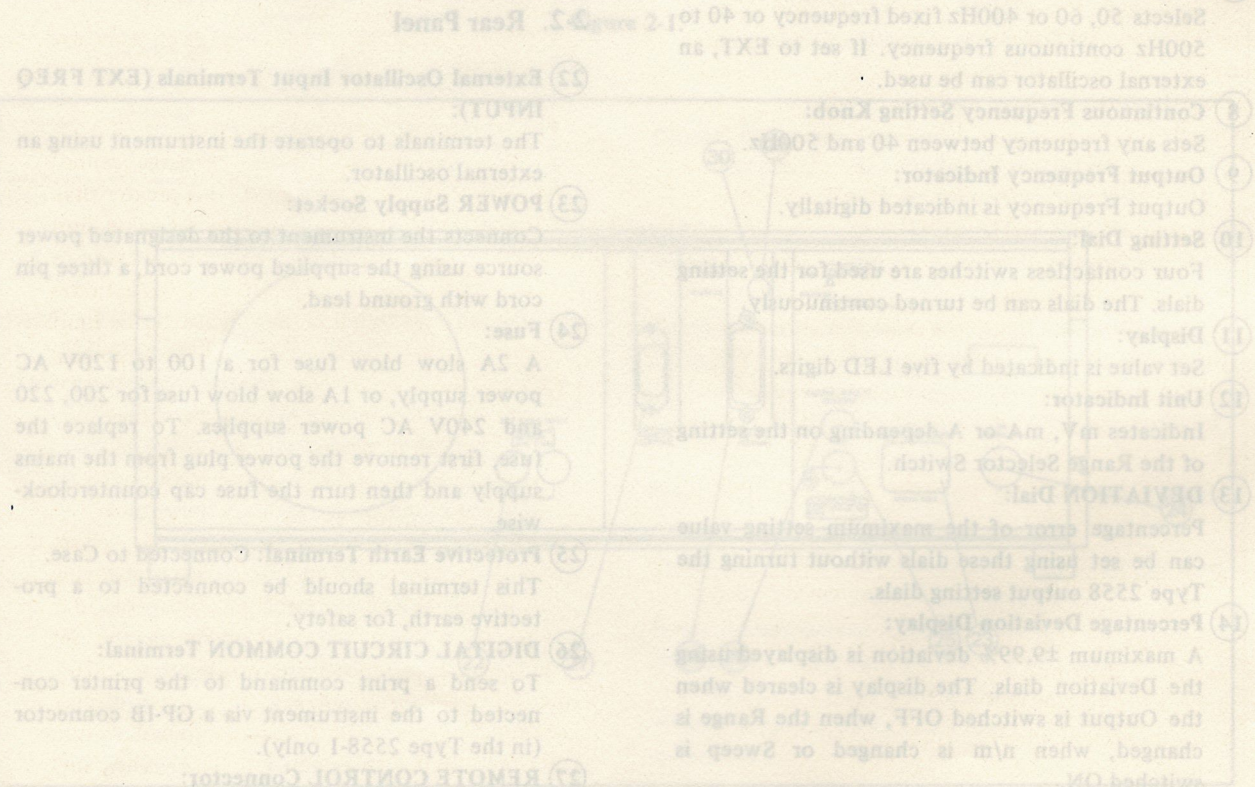
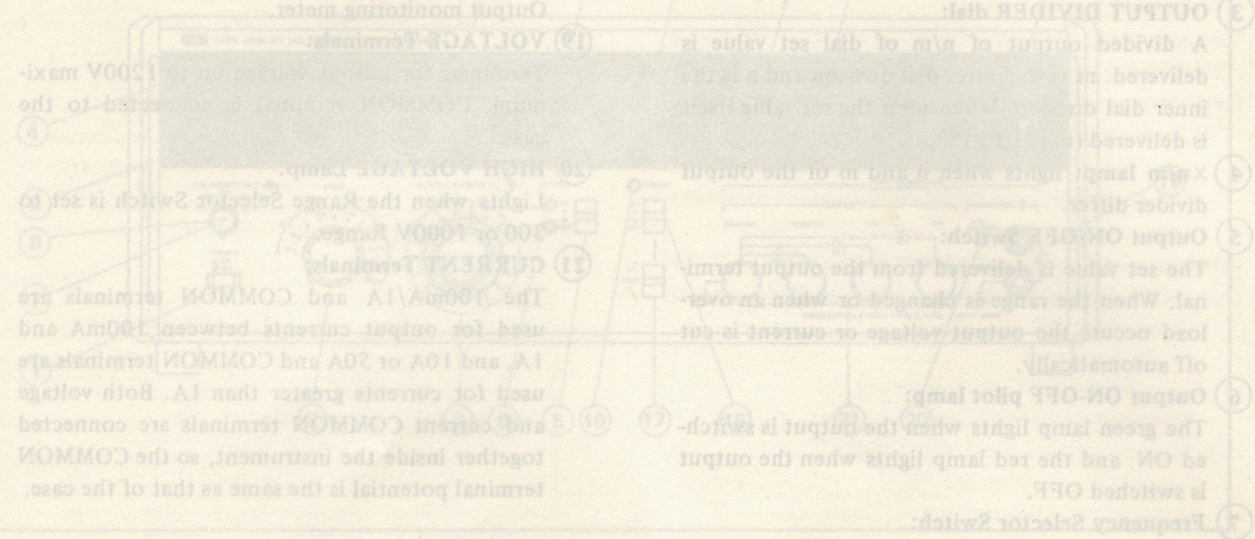
- ⑰ **Sweep Direction Selector Switch:**
Selects sweep direction (output increase or decrease) with the sweep function turned ON, or holds the sweep output at its current value (HOLD). Sweep turns OFF when output is switched OFF, Range is changed, Settings is changed or n/m is changed. This switch is disabled when the output is switched OFF.
 - ⑱ **Output Monitor:**
Output monitoring meter.
 - ⑲ **VOLTAGE Terminals:**
Terminals for output voltage up to 1200V maximum. COMMON terminal is connected to the case.
 - ⑳ **HIGH VOLTAGE Lamp:**
Lights when the Range Selector Switch is set to 300 or 1000V Range.
 - ㉑ **CURRENT Terminals:**
The 100mA/1A and COMMON terminals are used for output currents between 100mA and 1A, and 10A or 50A and COMMON terminals are used for currents greater than 1A. Both voltage and current COMMON terminals are connected together inside the instrument, so the COMMON terminal potential is the same as that of the case.
- 2-2. Rear Panel
- ㉒ **External Oscillator Input Terminals (EXT FREQ INPUT):**
The terminals to operate the instrument using an external oscillator.
 - ㉓ **POWER Supply Socket:**
Connects the instrument to the designated power source using the supplied power cord, a three pin cord with ground lead.
 - ㉔ **Fuse:**
A 2A slow blow fuse for a 100 to 120V AC power supply, or 1A slow blow fuse for 200, 220 and 240V AC power supplies. To replace the fuse, first remove the power plug from the mains supply and then turn the fuse cap counterclockwise.
 - ㉕ **Protective Earth Terminal:** Connected to Case.
This terminal should be connected to a protective earth, for safety.
 - ㉖ **DIGITAL CIRCUIT COMMON Terminal:**
To send a print command to the printer connected to the instrument via a GP-IB connector (in the Type 2558-1 only).
 - ㉗ **REMOTE CONTROL Connector:**
 - ㉘ **GP-IB connector (installed only in the Type 2558-01)**

29 MODE Setting Switch (installed only in the Type 2558-01)

The setting of TALK ONLY, ADDRESSABLE or Local are selectable.

30 ADDRESS Setting Switch (installed only in the Type 2558-01)

Used to set the address on the GP-IB. Address can be set with a screwdriver between 0 and 15 decimal.



3. OPERATION

3-1. Preparation

Always check the following items before performing measurements.

POWER ON/OFF Switch: OFF

OUTPUT DIVIDER Dial: $n/m = 1$

Protective Earth Terminal: connect to protective earth.

Output Terminals: disconnect the load

Power cord: connect the supplied power cord to the instrument power socket, then plug the other end of the power cord into an AC line outlet whose voltage corresponds with that written on the rear panel.

Frequency Selector Switch: Set this switch to the 50 Hz position for 60 Hz line and the 60 Hz position for 50 Hz line.

3-2. Warmup

Press to POWER ON/OFF Switch ON and allow the instrument to warmup for at least thirty minutes.

If you turn the output switch ON immediately after the power ON/OFF switch turned ON, the alarm function may actuate and flash the panel display. In this case, turn the output switch OFF and then turn it ON again.

CAUTION

- Frequency Control

If you turn the frequency selector switch or the continuous frequency setting knob abruptly, the alarm function may actuate.

- Output

When the frequency is changed, the output always turns OFF.

- Zero Output Display

If the instrument is set to less than 1% of the range or $(\text{set value} \times n/m) \times (1 - \text{deviation value})$ is less than 1% of the range (less than approx. 1.1% of the range on 300 V range), the instrument display and output will be zero (oscillate between zero and setting).

- Output Frequency Display

The output frequency range is from 38.2

up to 899.9 Hz. The instrument displays 999.9 Hz when frequency is set outside this range. When the Frequency Selector Switch is set to VAR, 999.9 Hz is displayed if the oscillator frequency is set below 38.2 Hz.

In this case, turn the oscillator frequency setting knob clockwise to set the oscillator frequency above 38.2 Hz. When the Frequency Selector Switch is set to EXT, and the instrument displays 999.9 Hz, check the external oscillator. The cause may be incorrect frequency setting (see par 3-7) or disconnection of the external oscillator.

- Alarm Display

If (during voltage output) you short circuit the output voltage, or (during current output) if you open circuit the output, the alarm function may actuate and flash the panel display (however, frequency display and deviation decimal point display do not flash). In this case, turn the output switch OFF, correct the problem, then turn it ON again.

* Note that when the set value is small, an alarm may not be displayed.

- Set Value Limit Function

A value greater than 120% of range cannot be set on this instrument. If a value greater than 120% of range is set in error, the set value limit function will actuate to clamp the set value to 120% of range. This function also actuates if a value less than 0 is set. The set value limit function actuates when either of the following two equations is satisfied.

$$\text{Set value} \times n/m \times (1 + \text{deviation value})$$

$$> 120\% \text{ of range}$$

$$\text{Set value} \times n/m \times (1 - \text{deviation value})$$

$$< 0 \text{ of range}$$

Further, this function actuates the alarm display in the following cases. When changing the Range Selector Switch to 300 V or 50 A from other range without changing the set value setting, and the value would exceed 120% of 300 V or 50 A ranges, the panel display flashes (however, the frequency and deviation decimal point displays do not flash). The panel display flashing is stopped by setting a value less than 120% of 300 V or 50 A ranges and by setting the output switch OFF.

- Operation Notes for Output Divider Dial

The accuracy of the output when using the output divider dial depends on the set value of output setting dials.

For example:

The accuracy on 100 V range (50 Hz, with set value 100.00 V and $n/m = 1/10$ is

$$\pm(0.08\% \text{ of set dial} + 0.015\% \text{ of range})$$

$$= \pm(100 \text{ V} \times 1/10 \times 0.08\% + 100 \text{ V} \times 0.015\%)$$

and the accuracy on 100 V range (50 Hz), with set value 10.00 V and $n/m = 1/1$ is

$$\pm(0.02\% \text{ of range}) = \pm(100 \text{ V} \times 0.02\%)$$

And when using output divider dial on 300 V range, the instrument give zero output state at less than approx. 1.1% of range.

- Dial Setting Speed

The output and Deviation dials should be turned at the speed less than approx. 50 ms/click, otherwise, the instrument display cannot follow this speed (however, the output always corresponds to the displayed value).

3-3. Voltage Output

To output a voltage from the voltage terminals, proceed as follows:

- 1) Confirm that the output monitor indication is zero and that the setting dials are set to 0000, then connect a load to the voltage terminals.
- 2) Set the output frequency.
- 3) Set the range selector switch to appropriate range.
- 4) Turn the output switch ON.
- 5) Set the setting dials to desired value to deliver the set voltage.
- 6) To divide the output voltage in a certain ratio, use the OUTPUT DIVIDER dial.

For example, if a 0 to 150V AC voltmeter with scale divisions at 150, 120, 90, 60 and 30V must be calibrated, set the RANGE to 150V and set the OUTPUT DIVIDER outer and inner dials to 5 ($m=n=5$). Then, when the inner (divider) dial is turned from $n=4, 3, 2$ to 1, the $\times \frac{n}{m}$ lamp lights and 120, 90, 60 and 30V outputs are obtained in succession from the voltage terminals without turning the setting dials.

The output voltage can be divided as above, however, the display does not change.

WARNING

- Output Current Terminals

When the instrument is in Output Voltage Mode, output current terminals should not be connected together. If a load is connected to the output current terminals, the display will be incorrect and a dangerous voltage may be output.

- High Output Voltage

The HIGH VOLTAGE lamp lights when the Range Selector switch is set to 300 or 1000V range. This instrument generates high voltages. Take care to avoid an electric shock, and check the rated breakdown voltage or the circuit under test before applying high voltage.

Note that the instrument may generate approximately 1400V (5A) momentarily when the Output ON/OFF switch is turned ON or OFF.

- Load Condition

If a resonant circuit including large capacitance or inductance is connected to the instrument, the instrument output amplifier may oscillate and dangerous high voltages may appear at the output terminals. Turn the output switch OFF immediately if such oscillation occurs.

- Large Inductance or Capacitance

If a very large inductance or capacitance is connected to the voltage output terminals, turn the output setting dials slowly from zero to the desired value, otherwise the alarm may be triggered.

- Non-linear Load

When the load is extremely non-linear — for example, due to iron core saturation — the output voltage waveform may be distorted. Observe output waveform on an oscilloscope.

- Line voltage Drop

On the lower voltage ranges, the current flowing may be large at maximum load conditions, and the voltage drop due to lead resistance may cause voltage errors. To avoid this, use lead-wires of sufficiently large diameter.

- Connection at Current Terminals

Avoid connecting a load to the 10 or 50A current terminals when the instrument is operating as a voltage source.

3-4. Current Output

To output a current output from the current output terminals, proceed as follows:

- 1) Conform that the output monitor indication is zero and that the setting dials are set to 0000, then connect a load to the appropriate current terminals.
 - 2) Set the output frequency.
 - 3) Set the range selector switch to the appropriate range.
 - 4) Turn the output switch ON.
 - 5) Set the setting dials to the desired current setting.
 - 6) To divide output current in a certain ratio, use the OUTPUT DIVIDER dials.
- Refer to the voltage output case for operation of the OUTPUT DIVIDER dial.

WARNING

- Output Voltage Terminals

No load should be connected across the output voltage terminals when the instrument is used in current mode. Three current terminals 100 mA/1 A, 10 A and 50 A are equipped. The appropriate one should be selected and the other terminals left open circuit. If a load is connected to any other terminals, the display will be incorrect and a dangerous voltage may be output.

- Load Conditions

If a resonant circuit including extremely large capacitance or large inductance is connected to the instrument, the instrument output amplifier may oscillate and dangerous high voltages may appear at the output terminals. Turn the output switch OFF immediately if such oscillation occurs.

- Large Inductance or Capacitance

If an exceedingly large inductance, or a resonant circuit is connected to the current output terminals, turn the output setting dials slowly from zero to the desired value, otherwise the alarm may be triggered.

- Non-linear Load

When the load is extremely non-linear – for example, due to iron core saturation – the output waveform may be distorted. Observing output waveform on an oscilloscope.

- Line Loss

When a high current range is selected, the voltage drop due to lead resistance becomes large. To avoid this use the leads which are supplied as accessories.

Although such voltage drops should not cause an error, the maximum output is reduced in proportion to the voltage drop.

- When handling the supplied current lead wires, never touch the metallic part of the terminals to avoid electric shock.

- Note that current output terminals deliver current as shown below when the power switch is turned ON or OFF.

100mA/1A terminals	Max. 1.4A (Max. 130V)
10A terminals	Max. 14A (Max. 6.5V)
50A terminals	Max. 70A (Max. 1.3V)

voltage between terminals

3-5. Deviation Measurement

Percentage error for meter calibration can be obtained using the DEVIATION dials. For example, to calibrate an AC voltmeter (100 V AC full scale, accuracy 0.5% of full scale value), connect the voltmeter to the voltage output terminals.

Set the AC calibration set controls to measure 100 V AC. Set the OUTPUT DIVIDER dials so that $\times^n/m = 1$.

Turn the deviation dials so that the AC voltmeter pointer indicates the 100 V scale mark exactly. Then the deviation display indicates the meter percentage error. For example, if the deviation display indicates +0.3% and the meter pointer indicates 100 V correctly, the AC calibration set delivers 99.7 V. Therefore compensating factor = – (percentage error) so the compensating factor in the above example is –0.3%. The lower scale mark calibration is also possible as per the above procedure. In this case, the percentage error of the deviation measurement is indicated in % of full scale (range setting).

Deviation setting is not always displayed in 0.01% steps.

3-6. Sweep Function

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

1) Sweep from full scale to zero.

Set the OUTPUT Switch ON and the Sweep direction selector switch to HOLD, turn the setting dials 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 the sweep. The sweep can be stopped if desired, by setting the sweep direction selector switch to HOLD.

2) Sweep from zero to full scale.

Turn the setting dials so that the meter pointer indicates the full scale value as described above. Set the OUTPUT DIVIDER inner knob (n) to zero so the meter pointer indicates zero. Set the sweep ON/OFF switch to ON, then set the sweep direction selector switch upwards to begin the sweep.

WARNING

Note that the maximum sweep voltage may reach the following value (See Figure 3-1)
 When the set value is between 25 and 120% of range – maximum 125% of set value
 (example) maximum 125V for 100V setting
 When the set value is between 0 and 25% of range – maximum 138% of set value
 (example) maximum 34.5V for 25V setting

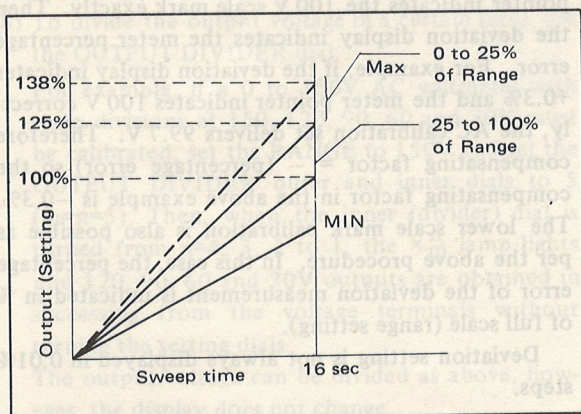


Figure 3-1. Output (Setting value) Sweep time

3-7. Operation using External Oscillator

To operate the instrument using external oscillator, set the oscillator as follows:

Oscillator frequency40 to 800Hz

Output voltage2.9 to 3.1V (Sine wave)

The input impedance of the external oscillator connecting terminal is 10kΩ (pure resistance)

CAUTION

A 2.9 to 3.1V and 40 to 800Hz sine wave voltage must be applied to the external oscillator terminals, otherwise the instrument may be damaged.

3-8. Remote Control Function

The output data can easily be typed out on a printer using the remote control connector on the rear panel.

This function is provided only in the GP-IB installed type 2558-01.

Set the MODE selector switch on the rear panel to TALK ONLY mode, and connect a printer to the GP-IB connector. For the output data format refer to par. 4. GP-IB.

Prepare a one pole momentary contact switch, and connect the N.C (Normal closed) 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 3-2.

The printer types out the data whenever the switch is turned on.

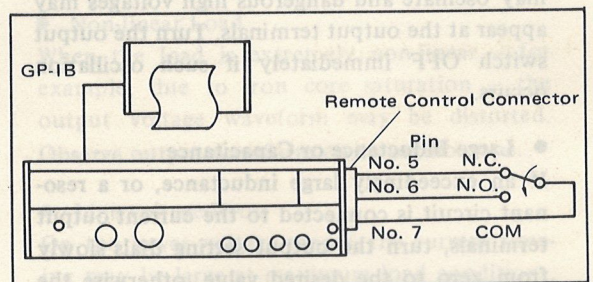


Figure 3-2. Remote control connector

Notes:

1. Use dry contacts for this switch.
2. As a manual switch may be used, ON-OFF time interval must be more than 50 ms.
3. Take care to keep cables away from power wiring and such like.
4. Use AMPHENOL 53-30140 connector or equivalent.
5. If the switches or dials on the front panel are operated with the manual switch set ON (short circuit between NC terminals), the data will be transmitted on each operation.

4. GP-IB

The range and setting may be changed, output ON-OFF switch operated and voltage or current sweep initiated by GP-IB control signals via the GP-IB.

The IEEE standard 488-1975 GP-IB (General Purpose Interface Bus) is widely used internationally for controlling digital measuring instruments.

4-1. Interface Function

Table 4-1 shows the interface bus function of the instrument.

Table 4-1.

Function	Description
SH1	Source Handshake—Complete Capability
AH1	Acceptor Handshake—Complete Capability
T5	Basic Talker, Talk Only Mode, Serial Poll, Unaddress if MLA (My Listen Address)
L4	Basic Listener, Unaddress if MTA (My Talk Address)
SR1	Service Request—Complete Capability
RL1	Remote Local—Complete Capability
PPO	Parallel Poll—no Capability
DC1	Device Clear—Complete Capability
DT1	Device Trigger—Complete Capability
CO	Controller—no Capability

4-2. Bus Driver

An Open-collector type GP-IB bus driver is used.

4-3. Remote Control

As shown in Figure 4-1, the items that can be controlled via the GP-IB are the RANGE selector switch, setting dials, output ON-OFF switch, Frequency Selector Switch, Sweep ON-OFF switch and the Sweep direction selector switch.

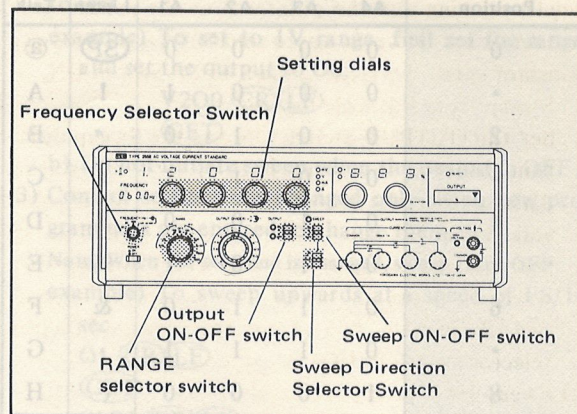


Figure 4-1.

4-4. "MY Address" Setting

Up to 15 instruments can be connected to the GP-IB, so each instrument address must be set properly. For the Type 2558, the address can be set between 0 and 15 decimal. Set the address by turning the "MY address" switch on the rear panel with a screw driver, as shown in Figure 4-2, Table 4-2 shows the address codes.

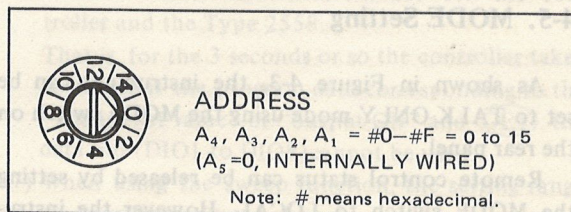


Figure 4-2.

CAUTION

Set or change the address with the instrument power switch turned OFF.

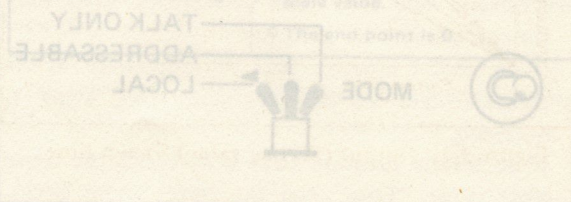


Figure 4-3.

Table 4-2.

Address Switch Position	Address code				Address character	
	A4	A3	A2	A1	Listen	Talk
0	0	0	0	0	(SP)	@
•	0	0	0	1	!	A
2	0	0	1	0	"	B
•	0	0	1	1	#	C
4	0	1	0	0	\$	D
•	0	1	0	1	%	E
6	0	1	1	0	&	F
•	0	1	1	1	,	G
8	1	0	0	0	(H
•	1	0	0	1)	I
10	1	0	1	0	*	J
•	1	0	1	1	+	K
12	1	1	0	0	,	L
•	1	1	0	1	-	M
14	1	1	1	0	.	N
•	1	1	1	1	/	O

A5 is set to 0 inside the instrument

4-5. MODE Setting

As shown in Figure 4-3, the instrument can be set to TALK ONLY mode using the MODE switch on the rear panel.

Remote control status can be released by setting the MODE switch to LOCAL. However the instrument cannot be set to LOCAL status if the bus controller has set the instrument status to LOCAL LOCK OUT. When the controller is used, set the MODE switch to ADDRESSABLE mode.

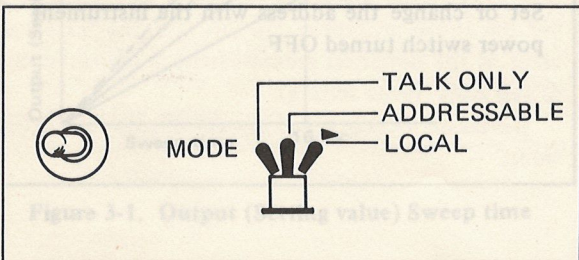


Figure 4-3.

4-6. Listener Function

4-6-1. Program Data

The program data corresponding to the settings of the dials and switches on the instrument front panel are shown in the following tables.

ISO (ASC II) characters are used for the codes of the program data.

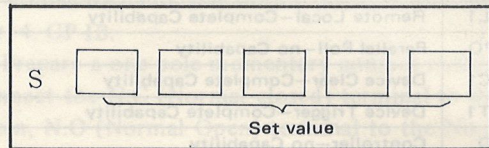
(a) Range

The program data corresponding to the RANGE selector switch settings are:

Range	Program data	Range	Program data
OFF	V0	OFF	A0
100mV	V1	100mA	A1
1V	V2	1A	A2
10V	V3	10A	A3
100V	V4	50A	A4
300V	V5		
1000V	V6		

(b) Set value

The program data corresponding to the set values are:



Note: Setting Range

300 V Range: 00000 to 03600

50 A Range: 00000 to 06000

For ranges other than the above:

00000 to 12000

(c) Frequency

The program data corresponding to the Frequency Selector Switch settings are:

Function	Program Data
50 Hz	F0
60 Hz	F1
400 Hz	F2

When the frequency selector switch is in remote status, VAR (variable) function cannot be used, and when the frequency selector switch is set to EXT, the external oscillator frequency is used even in remote status.

(d) Sweep Function

The program data corresponding to the Sweep ON-OFF and Sweep Direction selector switch settings are:

Function	Program Data
HOLD	C0
UP	C1
DOWN	C2
SWEEP OFF	R0
FS/16 sec	R1
FS/32 sec	R2

R0; Used to release the sweep mode. If the OUTPUT switch is ON, the instrument delivers the set value.

R1: Sweeps between zero and the set value for approximately 16 seconds.

R2: Sweeps between zero and the set value for approximately 32 seconds.

Notes:

1. If the sweep function is released while sweeping, the instrument delivers the set value.
2. If status byte or output data are sent during sweep operation, sweep time may fluctuate.

(e) Output

The program data corresponding to the OUTPUT switch settings are:

Function	Program Data
OFF	O0
ON	O1

4-6-2. Writing Programs

For the Type 2558 the following programming rules are laid down to minimize mistakes. Keep these rules when writing programs.

1) Program data are delimited by **CR** **LF** delimiters and are executed after the **GET** (Group Execute Trigger) Command is received.

example) To set 100mV on the 100mV range, proceed as follows:

V1S10000 **CR** **LF**
GET

here, **CR** denotes Carriage Return and **LF** Line Feed

2) Do not combine the following operations in one command (delimited by **CR** **LF** and **GET**).

a) Do not combine range or frequency change and OUTPUT switch turn ON operations (when changing the range or frequency, always set the output to 00).

example) To set to 1V range, first set the range, and set the output to 00.

V200 **CR** **LF**
GET

b) Do not initiate sweep when the output is OFF.

3) Control settings are changed only when new program data are entered to change them.

Note: When the set value is changed, sweep turns OFF.

example) To sweep upwards at a speed of FS/16 sec.

O1 **CR** **LF**
GET
C1R1 **CR** **LF**
GET

example) V2S10000 **CR** **LF**
GET 1.0000V is set on 1V range.

S0S000 **CR** **LF**
GET 0.5000V is set on 1V range.

4) In remote status (with REM lamp lit), the set value is always delivered (n/m=1), regardless of the front panel OUTPUT DIVIDER dial setting.

5) In remote status, the deviation dial setting has no effect.

6) After "change set value" or "output ON" program data commands the bus line is busy for about 3 seconds with communications between the controller and the Type 2558.

That is, for the 3 seconds or so the controller takes to transmit the program data corresponding to the "change set value" or "output ON" and **GET**, the data bus (DIO1 to DIO8) cannot be used.

7) When using the sweep function, the setting range limits should be as follows.

Upwards sweeping	<ul style="list-style-type: none"> ○ The start point can be set at any point between 0 and full scale value. ○ The end point is the full scale value.
Downwards sweeping	<ul style="list-style-type: none"> ○ The start point can be set at any point between 0 and full scale value. ○ The end point is 0.

4-6-3. Program Data Format-Examples

1) To output 50.00 mV on the 100 mV range at 50 Hz, proceed as follows:

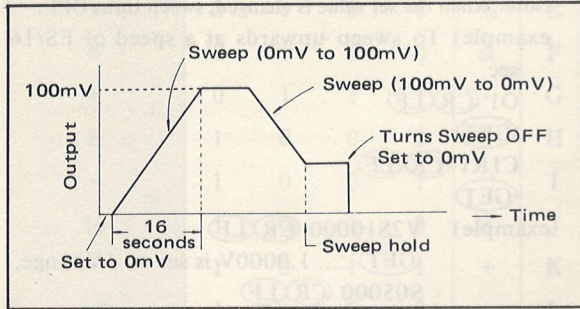
FOV1S0500000 (CR)(LF)

(GET) Turns output OFF, changes to 100mV

O1 (CR)(LF)

(GET) Output 50mV on the 100mV range

2) Make the following sweep (00.00 mV to 100 mV) on the 100 mV range at 50 Hz.



oFOV1S0000000 (CR)(LF)

(GET) Turns output OFF, sets to 000.00mV output on the +100mV range at 50Hz

oO1 (CR)(LF)

GET Turns output ON

oS10000C1R1 (CR)(LF)

GET Sweeps to increase output from 0mV to 100mV over about 16 seconds

oC2 (CR)(LF)

(GET) Sweeps to decrease output from 100mV towards 0mV when the GET command is received

oC0 (CR)(LF)

(GET) Stops the sweep to hold output when the GET command is received

oROS00000 (CR)(LF)

(GET) 00.000mV

4-6-4. Syntax Errors

1) If an undefined character (in the program data) is received, a syntax error is generated, and the received data is ignored.

2) If invalid data are mixed with correct ones, only the correct data are accepted.

If an invalid program data P0 is included in the program data VOP0F1 are sent, only VOF1 is accepted.

If an invalid program code is detected, the signal SRQ turns "True" and the status bytes DIO3, DIO6 and DIO7 turn "1".

3) An illegal program code – or a set value exceeding the output setting range – generates a syntax error, and the previous setting are not changed.

4-7. Responses to Interface Messages

Responses to interface messages are listed in the table below.

Table 4-3.

Message	Meaning	Action (Response)
IFC	Interface Clear	Release Talker or Listener Function
SDC	Selected Device Clear	Output OFF
DCL	Device Clear	Sweep OFF
GET	Group Execute Trigger	<ul style="list-style-type: none"> o Program code being transmitted becomes valid. o After receiving GET command, the 29 characters (the information showing the instrument status) are output when the Talker is addressed. Refer to the Talker Functions below.

4-8. Talker Function

4-8-1. Talker Functions

When any of the following conditions occur, 29 ISO (ASC II) characters showing talker status are output from the talker.

- 1) When the talker is addressed after receiving a GET command.
- 2) When the talker is addressed after receiving a print command contact input through the remote control connector of the voltage unit.
- 3) When receiving a print command contact input through the remote control connector of the voltage unit with the rear panel switch set to TALK ONLY mode.

4-8-2. Output Data Format.

Output Sequence Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Set value	S	U ₂	U ₁	Sp	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	.	I	E ₃	E ₂	E ₁	CR	LF	
Frequency	R	H	Z	Sp	F ₄	F ₃	F ₂	F ₁	.	CR	LF							

Output Information	Output Symbol
S	Output set information (Sp) : When the output is ON and instrument is not in sweep mode N : When the output is ON and instrument is in sweep mode E : When the output is OFF
U ₂ U ₁	Unit MV : mV (Sp)V : V MA : mA (Sp)A : A
D ₆ to D ₁	Output Set Value The data corresponding to the output display. The decimal point is included in any of D ₆ to D ₁ . The output value of D ₆ to D ₁ in Local mode is dial set value x n/m.
IE ₃ E ₂ E ₁	The data corresponding to the deviation value. I is (Sp) when the deviation is 0.00, otherwise I is + or -. The decimal point position is fixed.
R	Frequency information (Sp) : When the frequency is between 38.2 and 899.9 Hz. E : Other frequencies.
Hz	Frequency Unit Hz (fixed)
F ₄ F ₃ F ₂ F ₁	Frequency Data The data corresponding to the indicated output frequency. Displays the output frequency when it is between 38.2 and 899.9 Hz. When the frequency is outside of 38.2 and 899.9 Hz or when the external oscillator is disconnected with the frequency selector switch switched to EXT, displays 999.9. example) when the frequency is set to 50 Hz displays 050.0.

note) The set value differs from the output value under the following conditions:

- 1) When the deviation dial is set to a position other than zero.
- 2) When the instrument is sweeping.

CAUTION

• When the delimiter (LF) is transmitted, EOI turns "True".

• After the GET command is transmitted, do not execute serial polling till the data transmission is over.

If serial polling is executed before the data is transmitted, send the GET command again, to retransmit the data. Always set the value using 5 digit numerals or space codes.

The decimal point is fixed on each range, so is not included in setting data.

example) To set 500V on the 1000V range, proceed as follows:

S (Sp) 5000 or S05000

examples of Output Data Format)

1) In local model at 50Hz, with output 10.000V and deviation +0.03%.

(Sp) (Sp) V (Sp) 10.000, + 0.03 (CR) (LF)

(Sp) Hz (Sp) 050.0 (CR) (LF)

2) Talker is addressed while sweeping F.S 10.000V (400Hz)

N (Sp) V (Sp) 10.000, (Sp) 0.00 (CR) (LF)

(Sp) Hz (Sp) 400.0 (CR) (LF)

3) Frequency is outside the range 38.5 to 899.9 Hz.

E (Sp) V (Sp) 1.0000, (Sp) 0.00 (CR) (LF)

E Hz (Sp) 999.9 (CR) (LF)

4-8-3. Status Byte Format

The status byte format at the time of transmitting data in serial polling mode using the instrument is shown in Table 4-4 below.

Table 4-4.

DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1
0	RQS	ERROR	BUSY	OVER LOAD ALARM	SYNTAX ERROR	OUTPUT ON	0

1) RQS

In the event of an ERROR, RQS="1", SRQ="True" and an interrupt occurs in the controller. After serial polling, DIO7, DIO6, DIO4 and DIO3 turn "0".

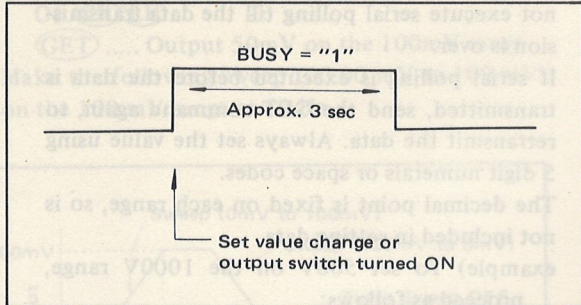
2) ERROR

In the event of an ERROR DIO6 turns "1" and DIO4 or DIO3 turns "1" to indicate error cause.

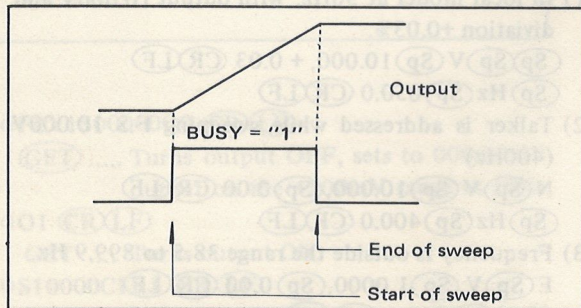
3) BUSY

In either of the following cases, Busy turns "1".

- a) After changing the set value or turning the OUTPUT switch ON, BUSY turns "1" for about 3 seconds.



- b) BUSY turns "1" while the output is sweeping (not at zero or set valve)



4) OVERLOAD ALARM

Turns "1" when the output has turned OFF due to an overload.

5) SYNTAX ERROR

Turns "1" in the event of a syntax error. Some syntax errors are described below.

- If an undefined character is received. (example) P0 P is undefined
- If an integer number is invalid (example) V9 9 is undefined
- If the characters (defined) are in an invalid sequence.

Refer to par. 4. 6. 2 (2).

6) OUTPUT ON

Indicates output control status, and turns "1" when output is ON.

7) Abnormal Operation processing

- If there is an overload alarm, eliminate the overload causes, transmit SDC or DCL command "O1" and then the GET command. In sweep operation, transmits the program mode again.
- If there is a syntax error, retransmit a correct program data.

4-9. GP-IB Commands for Remote-Local Mode Switching

1) From Remote to Local

The status of setting dials and switches is as described below.

- RANGE selector switch } the states corresponding to the front panel switch positions
- OUTPUT DIVIDER (n/m) }
- Frequency Selector switch }
- Setting dial the most recent data set by program codes
- Sweep switch OFF
- Output switch OFF

2) From Local to Remote

- RANGE selector switch } the panel setting information just before changing to remote status
- Setting dial }
- Frequency selector F0 (50Hz), or the external oscillator frequency when this switch is set to EXT.
- Sweep switch C0 (HOLD)
R0 (SWEEP OFF)
- Output Divider 1/1
- Output switch OFF

CAUTION

The instrument operates in Local mode immediately after the POWER is switched ON.

4-10. Application Examples

Some examples of remote control using a personal computer the HP Model 9825A as the controller are described below.

4-10-1. The Model 9825A setting

- 1) The following Model 9825A ROMS are necessary
 - I/O control ROM
 - Extended I/O control ROM
 - Character string control ROM
- 2) Set the select code of the HP-IB installed in the Model 9825A to 7, and set its address to 21.

4-10-2. The Type 2558 setting

- 1) Set the Mode selector switch to ADDRESSABLE
- 2) Set the address to 4

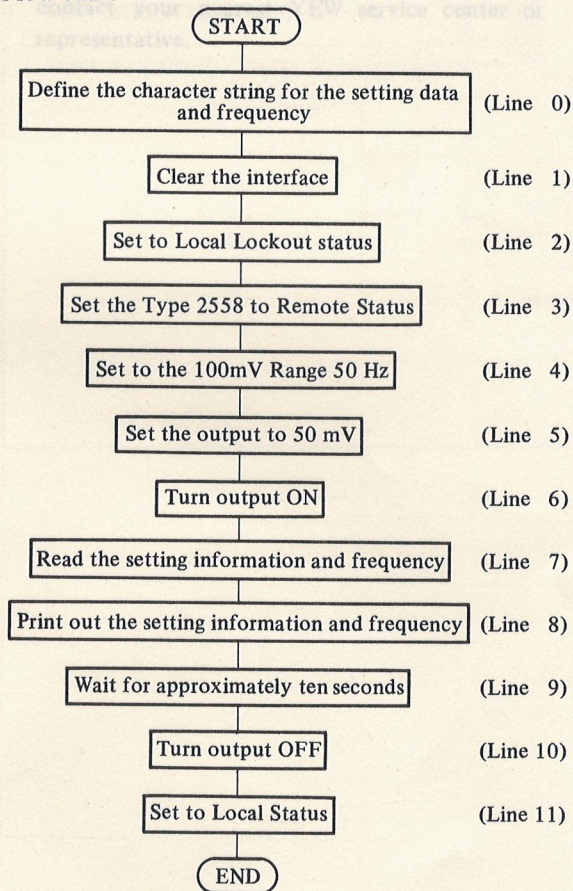
4-10-3. Remote control and data transmission of the Type 2558

Using the GP-IB, set the Type 2558 range selector switch to 100 mV, set the output to 50 mV then turn the OUTPUT switch ON to print the set voltage and frequency on the Model 9825A printer. After approximately 10 seconds have elapsed, turn the OUTPUT switch OFF.

```

0 : dim D$ [18], H$[11]
1 : cli 7
2 : llo 7
3 : rem 704
4 : wrt 704, "00V1"; trg 704
5 : wrt 704, "S05000"; trg 704
6 : wrt 704, "O1"; trg 704
7 : red 704, D$, H$
8 : prt D$, H$
9 : wait 10000
10 : clr 704
11 : lcl 704
12 : end
    
```

Flow chart



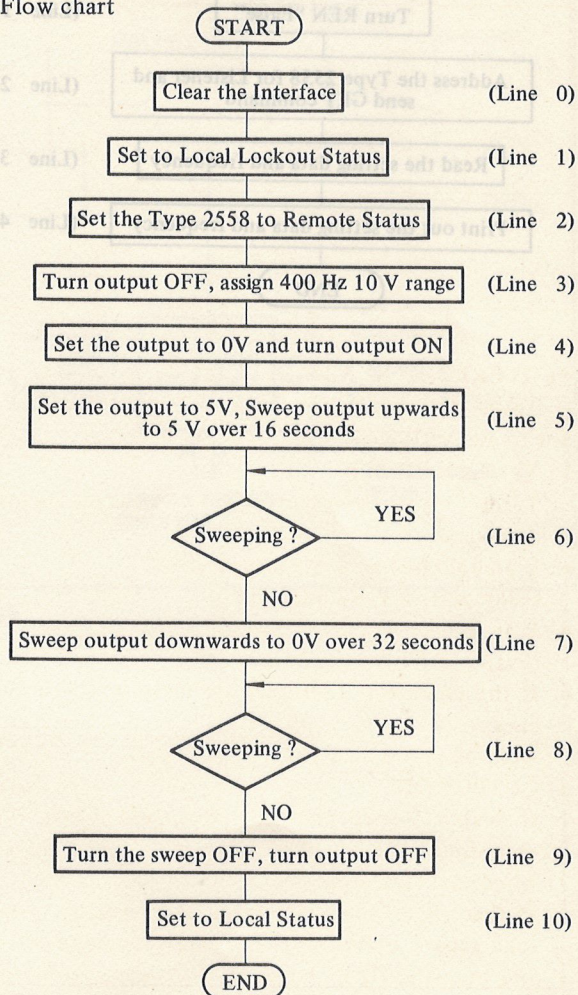
4-10-4. Sweep Control of the Type 2558

Set the output to 5V on the 10V range, set the output frequency to 400Hz, and sweep from 0 to 5V over approximately 16 seconds. Then sweep from 5 to 0V over approximately 32 seconds.

```

0 : cli 7
1 : llo 7
2 : rem 704
3 : wrt 704, "00F2V3"; trg 704
4 : wrt 704, "S0000001"; trg 704
5 : wrt 704, "R1C1S05000"; trg 704
6 : if bit [4, rds (704)] = 1; gto - 0
7 : wrt 704, "R2C2"; trg 704
8 : if bit [4, rds (704)] = 1; gto - 0
9 : clr 704
10 : lcl 704
11 : end
    
```

Flow chart



4-10-5. Local Control and data transmission of the Type 2558

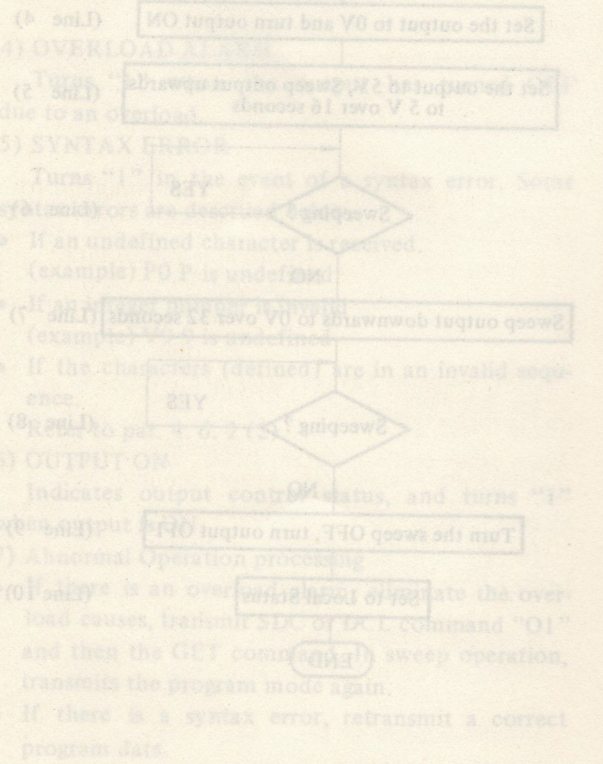
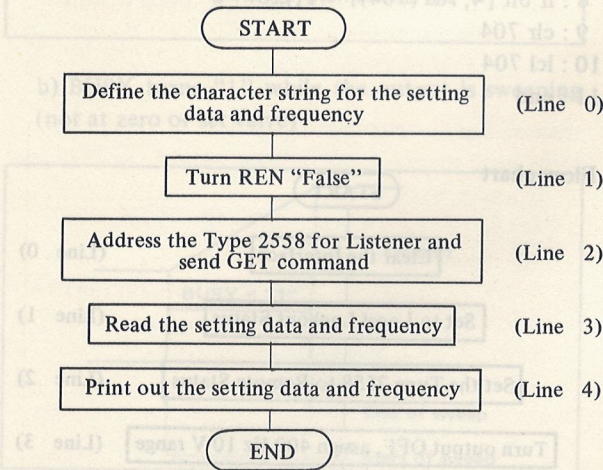
Set the Type 2558 to Local status with REN turned "False". print the output data on the Model 9825A printer

```

0 : dim D$ [18], H$[11]
1 : lcl 7
2 : trg 704
3 : red 704, D$, H$
4 : prt D$, H$
5 : end

```

Flow chart



5. MAINTENANCE

5-1. 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

~~~~~

#### WARNING

~~~~~

- The AC voltage and Current Standard generates high voltages inside the case, so never remove its case cover.
- It is dangerous to calibrate the AC voltage and Current Standard; this instrument should always be calibrated at YEW.

NOTE

If you have any problems with the instrument, contact your nearest YEW service center or representative.

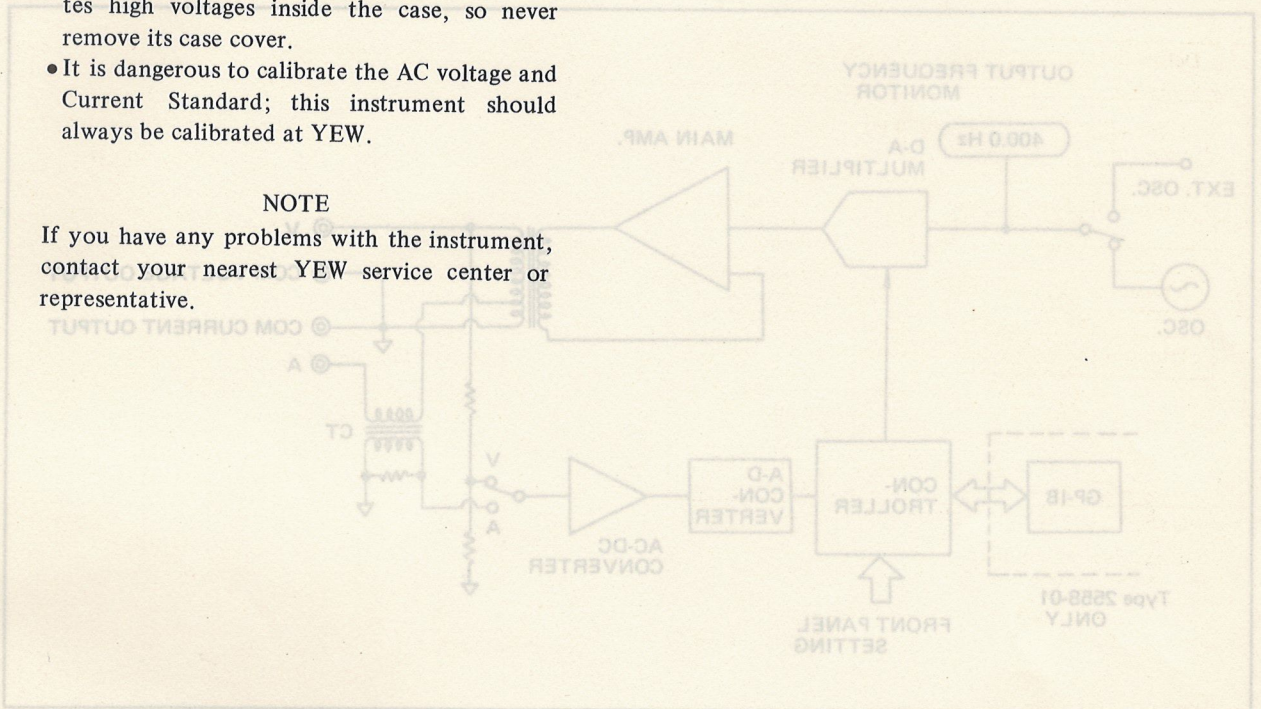


Figure 6-1.

6. PRINCIPLES OF OPERATION

A block diagram of the Type 2558 AC voltage current standard is shown in Figure 6-1.

The oscillator output is multiplied by the controller digital output signal and amplified by the main amplifier to deliver the reference output voltage or current.

For voltage output, voltage feedback is used; for current output, voltage feedback via current transformer CT and an associated resistor is used. The AC voltage feedback is converted into a DC voltage by the AC-DC converter.

The DC signal voltage is converted into a digital signal voltage by the A-D converter, and this digital signal is applied to the controller input.

The controller compares this feedback signal and the front panel setting and adjusts the controller output accordingly.

Thus, accurate outputs are obtained.

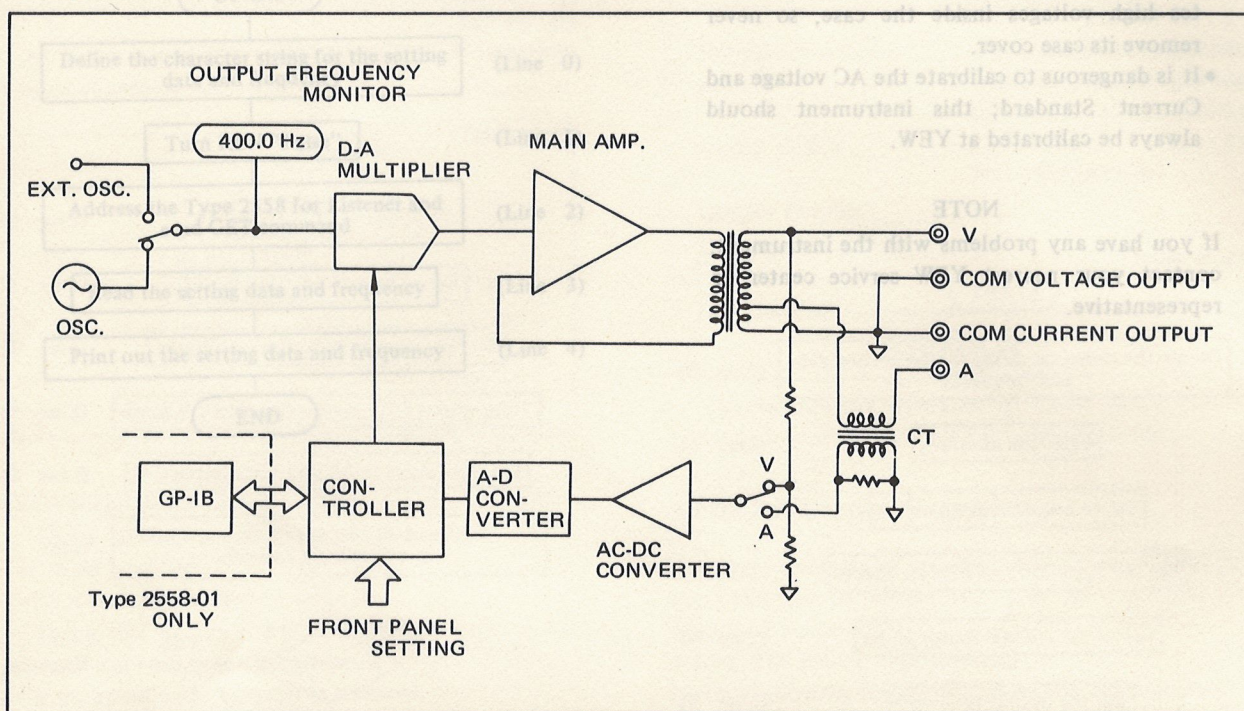


Figure 6-1.

YEW

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