POWER SERIES Plus

AC Volt / AC AMP / FREQUENCY

Digital Switchboard Meter

User's Manual

WESCHLER INSTRUMENTS
DIVISION OF HUGHES CORPORATION

IM2491VAF-1f
12/19

General Description

The POWER SERIES Plus digital switchboard meters incorporate the latest DSP microprocessor technology. Careful and thoughtful design has resulted in a family of user-friendly, field-adjustable meters.

When ordering the 2491 meter, the following options are available:

- AC Measuring Function(s): DC Volts, AC Volts, AC Amps, Watts, VARs, Power Factor, Phase Angle or Frequency.
- Input Range: 0-150, 0-300V, 0-600V, 0-1 A, 0-5 A, 40-70 Hz, 300-500 Hz
- Wiring Configuration: 1P2W, 1P3W, 3P3W, 3P4W, 3P4W 2½ element
- Analog Output Type: 0 to 1mADC, 4 to 20 mADC, or none
- Power Supply: Universal Power Supply (85VAC-265VAC/110VDC-340VDC), 24VDC, or 48VDC.
- Communications: MODBUS comm., ASCII protocol or no comm.

The meter display and output scaling are completely field-adjustable from the front panel. The meter does not need to be re-calibrated after adjusting the display or output scaling. There are no internal parts that the user needs to service or adjust. When a **POWER SERIES Plus** meter leaves the factory it will be calibrated to meet or exceed its published specifications.

⚠ **SAFETY NOTE**: There are no field-serviceable parts in the unit. If the unit is disassembled for any reason both Auxiliary Power and input voltages and currents must be de-energized.

LIMITED WARRANTY

This meter has been delivered to you after strict quality control and inspection. Weschler Instruments warrants its Equipment to meet applicable specifications and to be free from defects in material and workmanship for a period of one (1) year from date of shipment to the original Purchaser. Upon receipt of prompt notice from Purchaser, referencing the order number and detailing the claimed non-conformity or defect, Seller shall, at its option, repair or replace the Equipment. Equipment returned to Seller will only be accepted with a Returned Material Authorization (RMA) number issued by Seller or one of its authorized representatives. Inbound shipping charges to Seller's factory in Cleveland OH, or other designated facility, are the responsibility of Purchaser. Normal shipping charges for the return to Purchaser of repaired or replacement Equipment shall be the responsibility of the Seller (North American points only).

Repair or replacement of the Equipment in the manner described above is the exclusive warranty remedy and shall constitute complete fulfillment of all Seller's liabilities for breach of this warranty. The Seller assumes no responsibility hereunder for any equipment damage or failure caused by improper installation, operation and maintenance of the Equipment, or normal wear and tear on disposable or consumable parts. This warranty shall be void in the event of unauthorized modification or servicing of the Equipment.

The foregoing warranty is exclusive and in lieu of any other warranties of quality, whether expressed or implied (including any warranty of merchantability or fitness for a particular purpose). In no event shall Seller be liable hereunder for any special, indirect, incidental or consequential damages including the loss of revenue or production.

AC Volts / Amps / Frequency Specifications

PRODUCT FUNCTION: DC Volts / AC Volts / Amps / Frequency
1 phase-2 wire

ACCURACY: Volts & Amps: ±0.2% of Reading ±0.1% of Full Scale
Frequency: ±0.1 Hz from 40-70 Hz
±0.5 Hz from 300-500 Hz

MEASUREMENT UPDATES RATE: 250 milliseconds

OPERATING TEMPERATURE RANGE: -20 to +60 °Celsius

STORAGE TEMPERATURE RANGE: -40 to +85 °Celsius

INPUT RANGES: 0-150 VAC or 0-300 VAC or 0-600 VAC
(Any combination of Volts & Amps) 0-1 Amp AC or 0-5 Amps AC
40-70 Hz or 300-500 Hz

TRANSFORMER RATIO RANGES:

Potential Transformer:	1:1 through 9999:1
Current Transformer:	1:1 through 9999:1
Combined (PT*CT):	1:1 through 1666666:1

ANALOG OUTPUTS (Optional): 0 – 1 mADC 10 VDC compliance into 10 kΩ
4 – 20 mADC 15 VDC compliance into 750 Ω

ANALOG OUTPUT RESPONSE TIME: within ±1% of final value within 1.0 sec

ISOLATION:

Input/Output and Case:	2500 VAC
Output to Aux. Power:	2000 VAC or 500 VDC for DC powered options
Aux. Power to Case:	2000 VAC or 500 VDC for DC powered options
Output to Case:	1000 VAC

CONFIGURING THE 2491 **POWER SERIES** [Plus] METER

The POWER SERIES [Plus] can be configured for voltage and current inputs from instrument transformers, as well as analog outputs, Modbus or ASCII protocol Communications parameters and a rolling average display.

All set-up functions can be performed using the four push-buttons (*1) or via ASCII or Modbus communications.

*1: Remove the front face plate by removing the four (4) screws recessed in the comers of - the switchboard.

Mode	▶	▲	En
This button starts all operations. When viewing or changing settings it is used to back out of a mode.	This button, when viewing or changing settings, moves between settings or between digits.	This button will increment the value being changed. It is also used to display Max readings.	This button, when viewing or changing settings, is used to select a mode, save it, and then move to the next mode in the sequence. It is also used to display Min readings.

All button operations are begun with the **Mode** button.

To see the Min or Max, push the **Mode** button and then the button of the reading you want to see – **Min** or **Max**. The values will display for ten (10) seconds before reverting to the normal display. If you want to reset the values, push the **Min** or **Max** button again before the 10 seconds has expired.

To view the configuration settings, press **Mode** twice (**Mode** – **Mode)** and then press **Set**. The first setting – the Primary Transformer (PT) ratio - will be displayed.. To see the other settings, press **Next**. You can scroll through all the settings by pressing **Next**. To go back to normal operations, press **Mode**. To change the setting being shown, press **Set**. See the specific sections on the following pages for details on how to change the settings. Once a setting is changed it will advance to the next setting. At any point while changing settings, pressing **Mode** will exit the mode without changing anything.

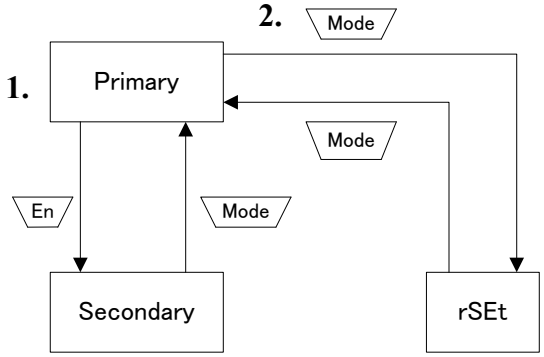
Main Display

Chart one

1. Normal meter operation displays the **Primary** value. To display the **Secondary** (actual meter input at the rear terminals) value press the **En**ter key. The meter will return to normal operation after forty (40) seconds or when the **Mode** key is pressed

2. To change (reset) the meter scaling press the **Mode** key. The meter will display the "rSEt", to continue refer to Chart Two. To return to normal operation press the **Mode** key again.

Chart One



Parameter Display

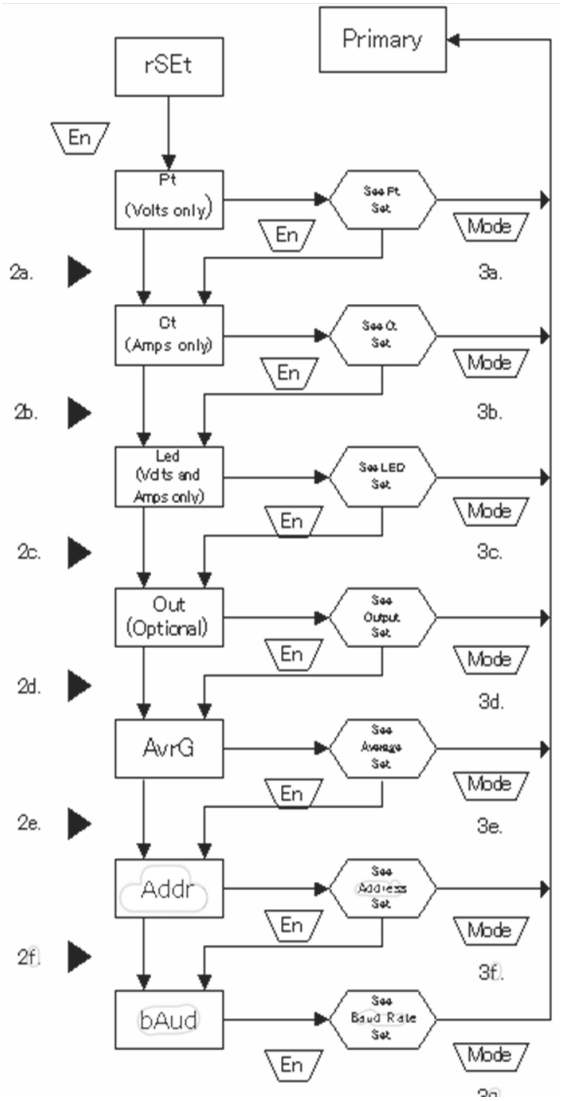
Chart Two

1. To get to the parameters menu from "rSEt" press the **En**ter key. The display will show the first parameter heading for that particular meter type, in the case "**PT**".

2. From the parameter heading press the **En**ter key and refer to the applicable chart. For example, to change a PT ratio refer to the chart labeled "**PT**". To go directly to the next parameter heading press the **Right** key. Keep pressing the **Right** key until you have reached the parameter to be changed.

3. From the parameter heading the **Mode** key will return the user to the Primary display.

Chart Two



PT Setting

1. From the PT heading press the Enter key to access the PT primary heading “Pt”.

2. Press the **En**ter key again to access the active or current PT primary value. This number can be a PT ratio (480:120) or a simplified ration (4:1).

   Note: The PT Secondary can only be “**120.0**” (“**240.0**”,”**480.0**”) or “**1.000**”. Complex ratios have to be addressed while entering the Primary of the Potential Transformer ratio.

3. The most significant digit (MSD) will be flashing. Press the **Up** key until the flashing digit equals the MSD of the primary ratio.

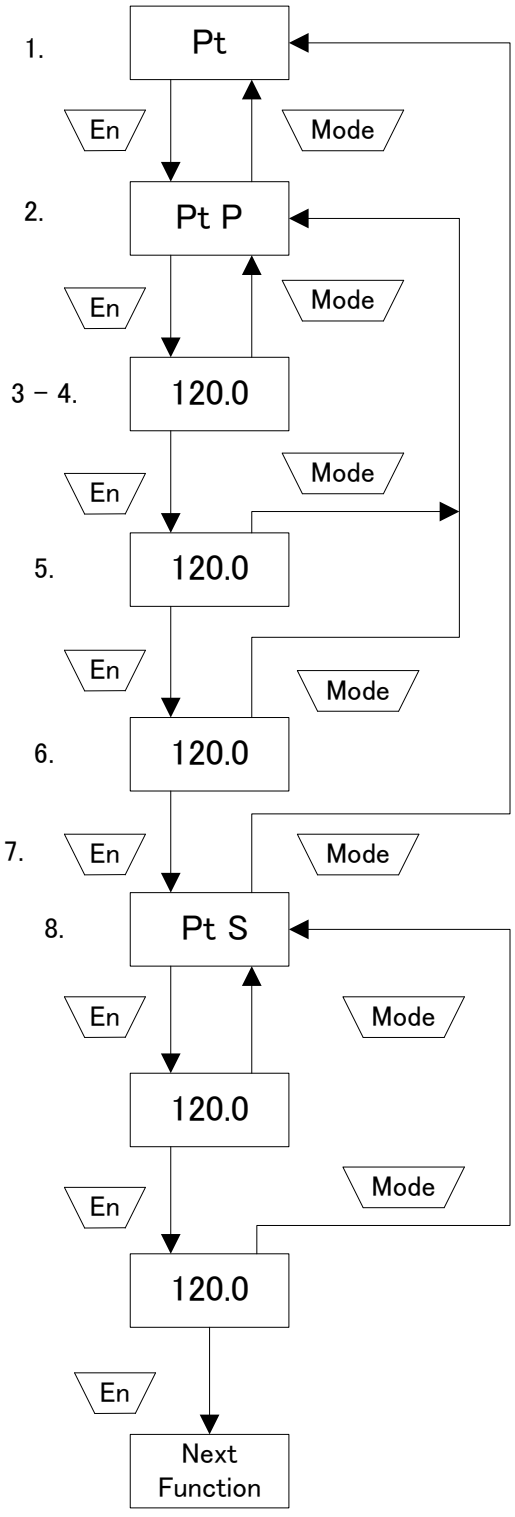
4. Press the **Right** key. The next MSD will flash. Repeat steps 3 & 4 until the primary ratio is correct.

5. Press the **En**ter key. The decimal point will flash. Use the **Up** key to move the decimal point into the correct position.

6. Press the **En**ter key. An LED will flash. Use the **Up** key to select the correct engineering units (Volts or Kilovolts) for this application.

7. Press the **En**ter key. The new primary ratio, decimal point and LED will flash. If this is correct, press the Enter key again. If not, press the **Mode** key to return to the PT Ratio heading.

8. The display reads “Pt S”. Press **En**ter and the active PT secondary is displayed. This will be “120.0” (“240.0”, “480.0”) or “1.000”. The **Up** key will toggle between these two values. When you have selected the correct transformer secondary value repeat step 7.



CT Setting

1. From the CT heading press the **En**ter key to access the CT primary heading "Ct".

2. Press the **En**ter key again to access the active or current PT primary value. This number can be a CT ratio (50:5) or a simplified ration (10:1).

   Note: The CT Secondary can only be "**5.000**" or "**1.000**". Complex ratios have to be addressed while entering the Primary of the Potential Transformer ratio.

3. The most significant digit (MSD) will be flashing. Press the **Up** key until the flashing digit equals the MSD of the primary ratio.

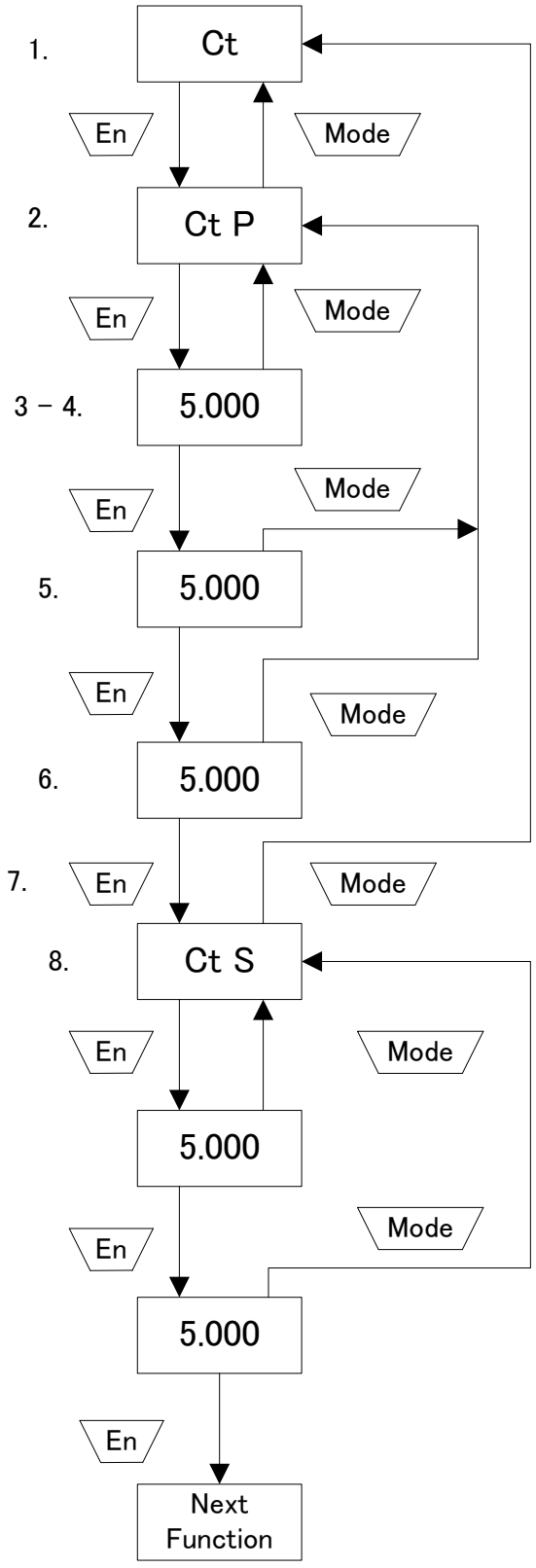
4. Press the **Right** key. The next MSD will flash. Repeat steps 3 & 4 until the primary ratio is correct.

5. Press the **En**ter key. The decimal point will flash. Use the **Up** key to move the decimal point into the correct position.

6. Press the **En**ter key. An LED will flash. Use the **Up** key to select the correct engineering units for this application.

7. Press the **En**ter key. The new primary ratio, decimal point and LED will flash. If this is correct, press the **En**ter key again. If not, press the **Mode** key to return to the CT Ratio heading.

8. The display reads "Ct S". Press **En**ter and the active CT secondary is displayed. This will be "120.0" ("240.0", "480.0") or "1.000". The **Up** key will toggle between these two values. When you have selected the correct transformer secondary value repeat step 7.

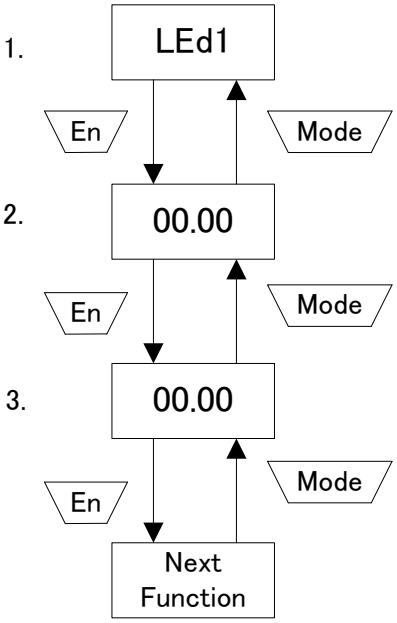


LED Setting

1. From the Led heading press the **En**ter key the default display will appear. Two things will happen when a change is made in this parameter. The front panel LED will change and the decimal point on the display will move to the appropriate position.

2. To change to "**Kilo**" for example press the Enter key and the default display will appear. Press the **Up** key and the LED will increment and the decimal point will move three positions.

3. Press the **En**ter key. The display and LED will flash. If this information is correct, press the Enter key again to approve the change and move to the next parameter. If not, press the **Mode** key to return to the default parameters.



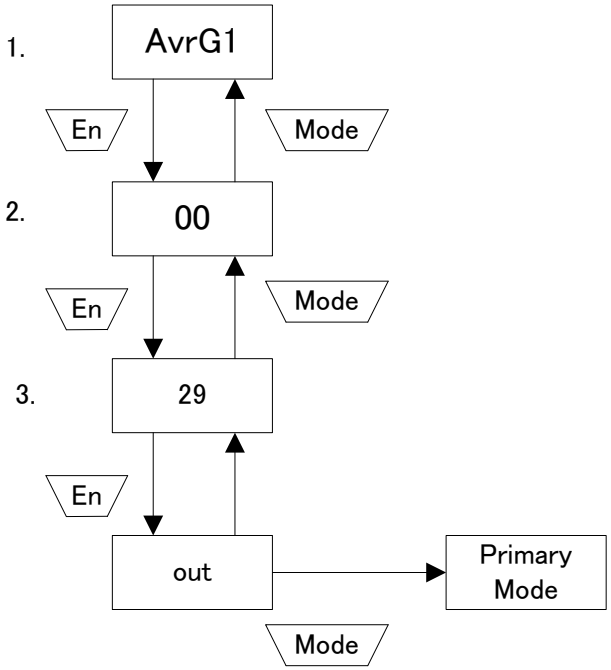
Moving Average Set

(Sampling Rate)

1. From the **AvrG** display, press the Enter key to see the current sample rate value (00 - 29). The most significant digit (MSD) will be flashing. The **right** arrow key will change the active digit.

2. Use the **Up** arrow key to increment the active digit.

3. Press the **En**ter key to accept the change. The display will flash. Press the **En**ter key again to approve the change. Press the mode key to return to the **AvrG** header



The following Error Codes May appear during the Range Set Mode(rSEt).

Error Code	Description	Definition
ErrH	Over-range Set	PT, CT ratio or output set is too large.
ErrL	Under-range Set	PT, CT ratio or output set is too small.
ErrS	Improper Span Set	The span selected is too large or too small.

Analog Output Set

Power Series plus meters can be ordered with an optional 4 – 20 mADC output or a 0 – 1 mADC output. Refer to the flow chart and the following steps for assistance with this process.

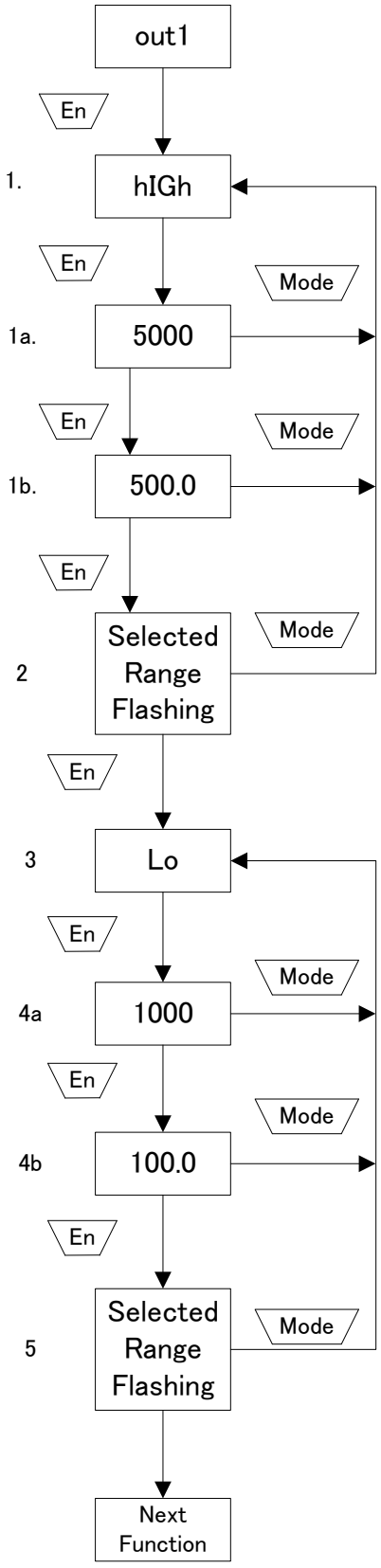
1. From the "out1" display press the Enter key. The display will read "high". This is where you enter the Volts, Amps or Frequency equal to +1 mADC or 20 mADC. Press the Enter key. The display will read "1.000" or the last value entered. The MSD will be flashing. Use the UP key to increment the flashing digit to the desired value. Use the Right key to change to the next MSD. Repeat until finished.

2. The display will flash your selection. If this is correct, press the Enter key. If not, press the Mode key to return to step (1).

3. The display will read "Lo". This will be the Volts, Amps or Frequency equal to 0 mADC for a 0 -1 mADC output. If you have a 4 – 20 mADC output "Lo" will be equal to 4 mADC. Press the Enter key.

4. The display will read "1.000" or the last value entered. The MSD will be flashing. Use the UP key to increment the flashing digit to the desired value. Use the Right key to change to the next MSD. Repeat until finished.

5. The display will flash your selection. If this is correct, press the Enter key. If not, press the Mode key to return to step four (4).



Bus Address & Baud Rate Setting

1. To change the meter address, enter the Programming mode by pressing the **Mode** key.
2. With rSEt on the display, press the **En**ter key.
3. Press the ▶ key until Addr appears on the display.
4. Press the Enter key. The 2 digit address will be displayed.
5. Use the ▶ key to choose the digit to change. Use the ▲ key to increment the digit to the desired value. The address can be set to any value from 01 to 32.

   Note: For proper operation, make sure no two units on a network have the same address.
6. Press the **En**ter key twice to save the value and enter the Baud Rate menu (bAud displayed).
7. Press **En**ter again to view the baud rate setting.
6. Press the ▲ key to change the baud rate. Choices are 9600 (default), 4800, 2400 and 1200.
7. Press the **En**ter key twice to save the new setting and return to the main menu.
8. Press the Mode key to exit setup and return to normal operation.

The following values apply to the POWER SERIES^{Plus} AC Volts, Amps or Frequency meters:

For Output ():

Input	Default LO	Minimum LO	Default HI	Maximum HI	Minimum Span
0-150 Volts	0.0	0.0	150.0	162.0	45
0-300 Volts	0.0	0.0	300.0	324.0	90
0-600 Volts	0.0	0.0	600.0	648.0	135
0-1 Amp	0.0	0.0	1.0	1.8	0.5
0-5 Amps	0.0	0.0	5.0	9.0	2.5
40-70 Hertz (0-1 mA out)	55.0	43.0	65.0	67.0	7.5
40–70 Hertz (4-20 mA out)	45.0				
300-500 Hz (0-1 mA out)	400.0	320.0	473.0	480.0	50.0
300-500 Hz (4-20 mA out)	327.0				

The above values are without any scaling by the PT ratio or CT ratio. If the PT ratio is greater than 1 to 1, than the output setting values for voltage above must be multiplied by the PT ratio. For example, if the PT ratio is changed to 3 to 1, then all the values in the chart above will be multiplied by 3. Likewise, a change in the CT ratio will proportionally change the amp values in the chart above. Frequency is not affected by the transformer ratios.

You cannot set a value lower than the minimum LO or higher than the maximum HI.

The span between the LO and HI must not be smaller than the minimum span. So with a 150V Voltmeter, you could set the LO to 0 and the HI to 45. Or you could set the LO to 115 and the HI to 160. But you could not set the LO to 50 and the high to 90. 90 minus 50 is less than 45.

If a value is too low you will get the error "**ErrL**". If the value is too high you will see the message "**ErrH**". If the span is not big enough the message is "**ErrS**".

If the input is greater than the HI setting the output will match it until it reaches the limit of the unit. For a 0-1mA unit that limit is 1.06mA. For a 4-20mA unit that limit is 20.96mA. Likewise, if you set LO to 10 Volts, for example, and the input dropped below that, the lower end of the output is limited to 3.04mA for a 4-20mA unit. A 0-1mA unit can never go below 0mA.

Connection Diagram

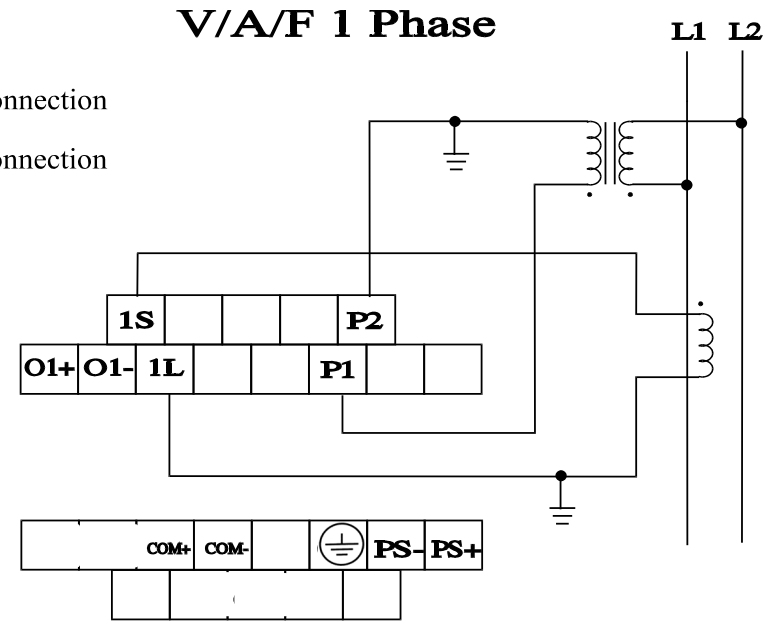
All circuits should be de-energized when making connections to the rear terminal block.

PS+ is the positive Power Supply connection (line voltage for AC supplies).
PS- is the negative Power Supply connection (neutral for AC supplies).

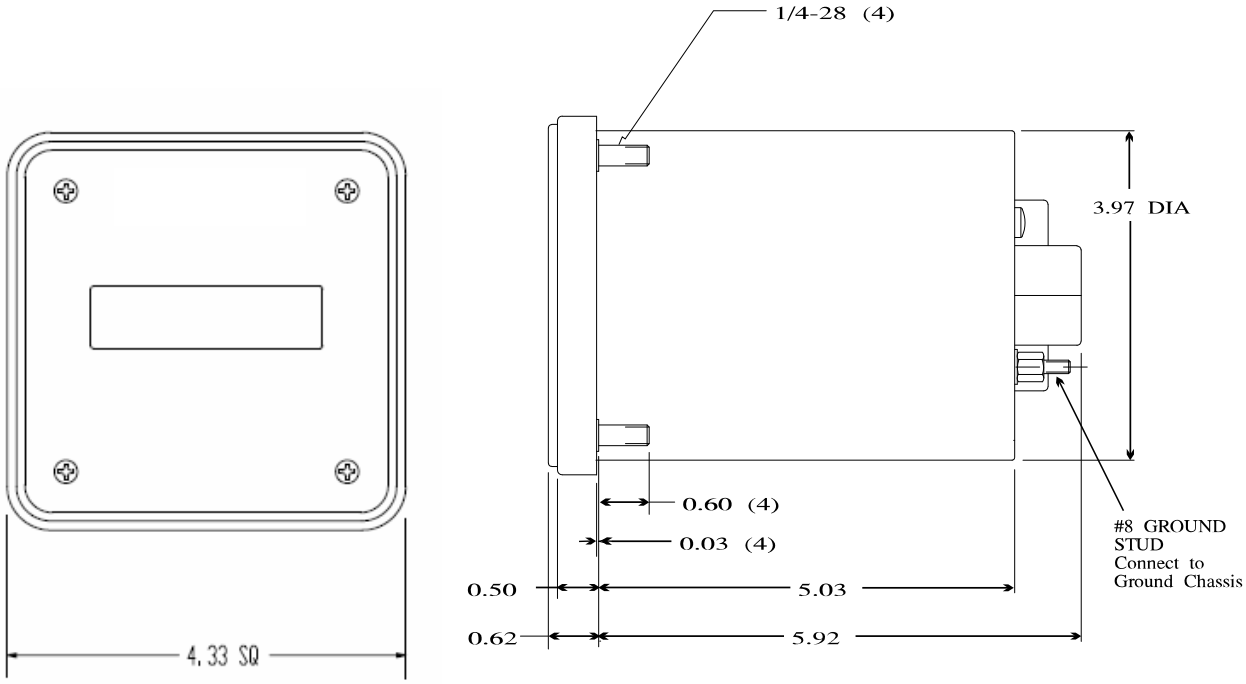
COM is RS-485 communications.

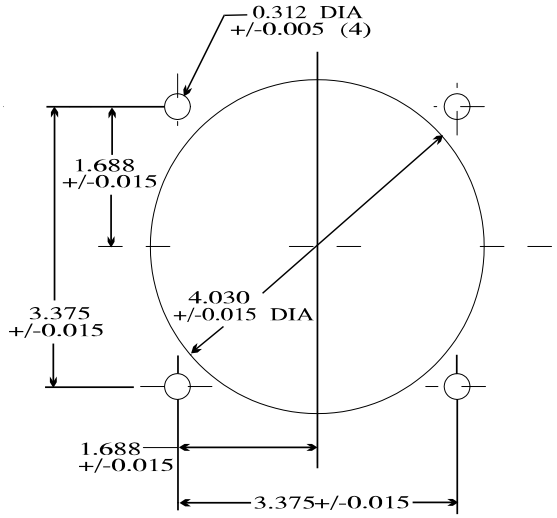
Analog Output

O1: Volts, Amps or Frequency

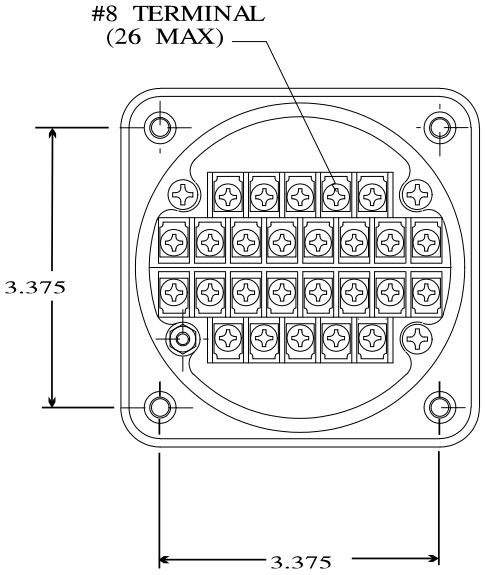


Mounting and Outline





PANEL CUT-OUT DIMENSIONS



WESCHLER INSTRUMENTS
16900 Foltz Pkwy
Cleveland OH 44149 USA

800-903-9870
info@weschler.com
www.weschler.com