

# Quick Manual

## Digital Panel Meter, Model 451F AC Voltage & AC Current Measuring

I-01672

### 1. Preface

Thank you for purchasing our digital panel meter 451F series.

Before use, read this manual carefully and thoroughly, and keep this manual available for routine reference.

Please check contents of the package you received as outlined below.

(1) 451F itself (2) Packing (3) This manual (4) Unit label (5) Connector with 2m flat cable (BCD output option)

For safe use of this product, please observe the following warning and caution.

In order to help the users' safe use of the products, the following symbol marks are used in this manual.

#### **WARNING**

This is the warning to avoid the danger when it is assumed that such danger as may cause fatal accident or severe injury to a user occurs in case that the product is mishandled.

#### **CAUTION**

This is the caution to avoid the danger when it is assumed that such danger as may cause minor injury to a user or generate only physical obstacle occurs in case that the product is mishandled.

#### **WARNING**

- There is no power on-off switch on the model 451A. It immediately starts to operate after turning the power.
- Do not touch terminals when turning the power on.

#### **CAUTION**

Preserve followings for your safety.

- The rated data is, however, defines with more than 15 minutes warming-up times.
  - When the product is installed in the cabinet, perform the appropriate heat radiation to keep less than 50°C in it.
  - Avoid the close-contacted mounting of the meter. The rise of internal temperature affects the life of product.
  - Do not install under the following conditions.
    - Where it is exposed to direct sunlight, dust, corrosive gases, rain, etc.
    - Where ambient temperature or humidity is high.
    - Where it is exposed to excessive noise or static electricity.
    - Where there is constant vibration or shock.
  - Store the instrument within the specified temperature range for storage (-20~70°C).
  - When the front panel or the case becomes dirty, wipe it with soft cloth.
- For heavy dirt, wipe it lightly with the soft cloth wetted with the neutral cleaner thinned by water, and finish the cleaning with dry cloth. Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.

### 2. Specifications

#### 2.1 Installation Specifications

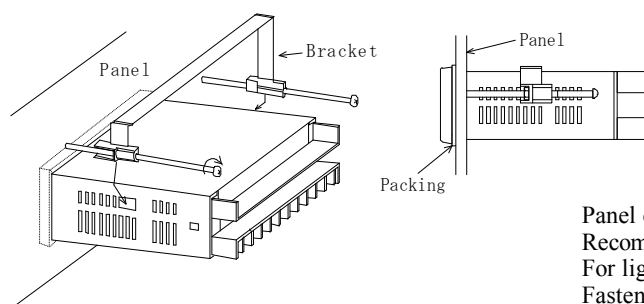
Power Supply	: AC 100 to 240V (90-250V) 50/60Hz, DC12 to 24V (9-32V), DC110V (100-170V).
Power Consumption	: Approx. 7VA at 100VAC, 9VA at 200VAC, 300mA at 12VDC, 150mA at 24VDC, 30mA at 110VDC.
Operating Temperature	: 0 to 50°C
Storage Temperature	: -20 to 70°C
Weight	: Approx. 220g
Mounting Method	: Panel mount with the bracket.

## 2.2 General Specifications

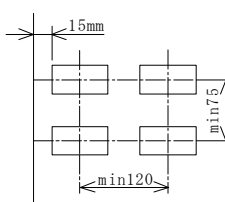
Display	: 0~9999, “-” polarity, with zero-suppress function. Red or green LED (character height 15.2mm)
Decimal Point	: Programmable (No external control).
Over-range indication	: Blinking with 130% display. When exceeded 9999, blinking with 0000. In case of 699.9V measuring, when exceeded 699.9V, blinking with full scale value.
Resolution	: 1/10000
Sampling rate	: Approx. 2 times / sec.
Noise Through	: 1000V (at AC voltage power supply)
Power Supply Line	
Insulation Resistance	: DC500V 100MΩ or more.
Withstanding Voltage	: Input terminals - Case : AC2000V each for 1 min.
	: Power supply terminals - Case : AC2000V each for 1 min.
	: Power supply terminals - Input and output terminals : AC1500V each for 1min.
	: Input terminals - Output terminals : AC500V each for 1 min.
Housing protection	: IP65 for the front panel, IP20 for the rear case, IP00 for terminals

## 3. Mounting

Insert the case with the suitable gasket from the panel front.  
Fix the case using the mounting bracket.  
Cut the panel to mount the case in accordance with the illustration.



Fixing pitch



Panel cut dimension:  $92^{+0.8/0} \times 45^{+0.6/0}$  mm

Recommended panel thickness is 0.6 to 6mm.

For light panel, such as aluminum, should be 1.5mm or more to avoid deform.

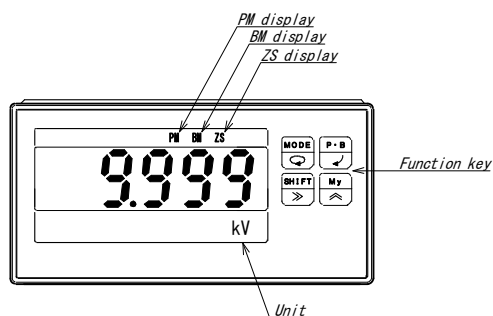
Fasten torque of the mounting bracket is 0.2 to 0.3N·m.

### CAUTION

- Do not overtighten the mounting bracket.
- When plural mounting, pay attention to ventilation to cool down in the panel.

## 4. Nomenclature

### 4.1 Front panel

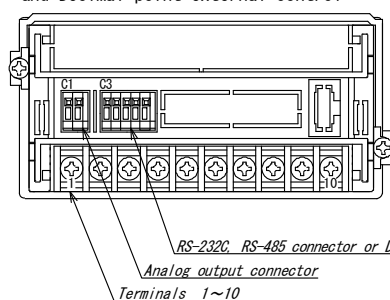


### 4.2 Function key

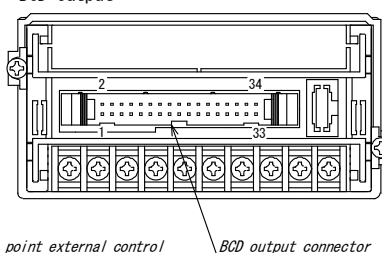
- MODE** (with circular arrow icon) ..... Switch the measuring, the parameter setting, and the calibration mode.
- MODE** (with circular arrow icon) ..... Switch modes during the parameter setting mode.
- P·B** (with left arrow icon) ..... Switch indications during the measuring mode.
- P·B** (with left arrow icon) ..... Enter the input value during the parameter setting mode.
- SHIFT** (with right arrow icon) ..... Shift among the digits during the parameter setting mode.
- My** (with up arrow icon) ..... Switch to My mode during the measuring mode.
- My** (with up arrow icon) ..... Change values during the parameter setting mode.

### 4.3 Rear panel

RS-232C/RS-485/Analog output and Decimal point external control



BCD output



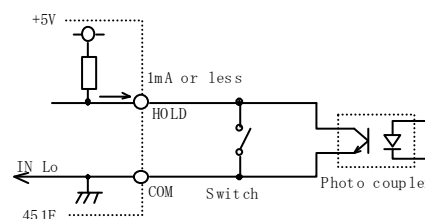
## 5. Connections

### 5.1 Terminals and Connections

<b>⚠ WARNING</b>
<ul style="list-style-type: none"> <li>● To avoid an electrical shock, turn the power off when wiring.</li> <li>● Do not wire with moistened hands. Locate away from the wet place.</li> <li>● Do not touch terminals when turning the power on.</li> </ul>
<b>⚠ CAUTION</b>
<ul style="list-style-type: none"> <li>● Power supply and load should be within the suitable range.</li> <li>● Power supply should be rapidly reach the rated power within few seconds.</li> <li>● When the power is turned OFF and ON again soon after, provide the downtime of 10 seconds or more.</li> <li>● Do not miswiring.</li> </ul>

• Note for wiring

- (1) Lay the input cable and the power cable separately. Otherwise indication may be fluctuated.
- (2) COM, HOLD, ZS and MR terminals are not insulated. Terminals shall be wired to photo coupler, relay, switch, and so on. Each meter shall be insulated when plural mounting.



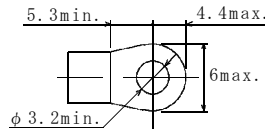
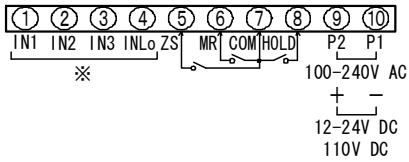
#### ■ Terminals

Terminals are not insulated from the input.

Active "L"  $I_{IL} \leq -1\text{mA}$ , "L"=0~1.5V, "H"=3.5~5V

- Hold : Hold display, data output, current value, peak memory, bottom memory, and display amplitude. Hold the data when the hold input is active.
- ZS : Offset the electrical input value at ZERO. The ZS LED is lit when the Zero set function is effective.
- MR : Rest peak memory, bottom memory, and jump width. You can reset the memory by turning off or pushing function key. Minimum pulse width: 10ms

•Terminals



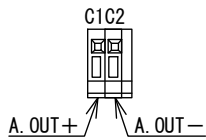
※Refer to terminal number on page 11.  
Please select the input range refer to function explanation parameter 04 on page 7.

Terminal screws : M3  
Fastening torque : 0.46~0.62N·m  
Crimped terminal : Refer to the figure at the above.

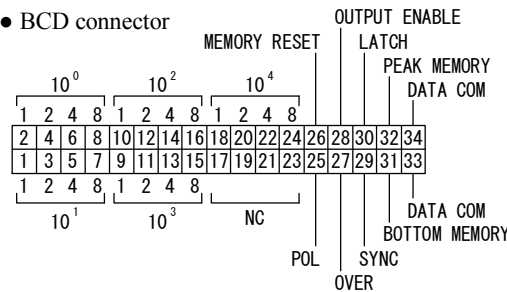
**⚠ CAUTION**

**Make a connection between only one terminal among the terminal No.1 to 3, and the terminal No.4, depending upon the type and range of measuring input.**  
**More than one terminal of the terminal No.1 to 3 must not be used at a time.**  
**Improper connection of the terminal may cause damage, breakdown, malfunction or other trouble of this product.**

• Analog output connector

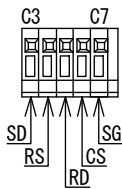


• BCD connector

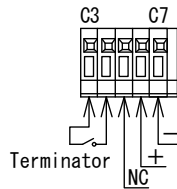


Suitable connector  
XG4M-3430-T:OMRON Corp.  
with 2m cable

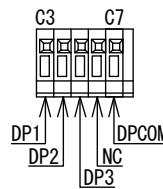
• RS-232C output connector



• RS-485 output connector



• Decimal point external control connector



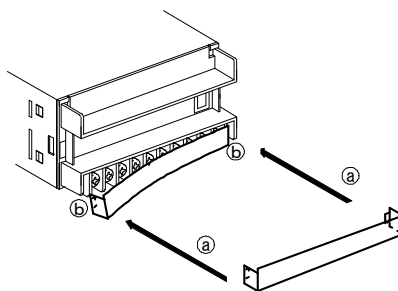
Recommended wire { Solid wire : AWG28 to 22  
Twisted wire : AWG28 to 22  
O.D. 0.125 min.

Strip-off length: 9 to 10mm

### 5.2 Attaching and detaching of terminal block cover

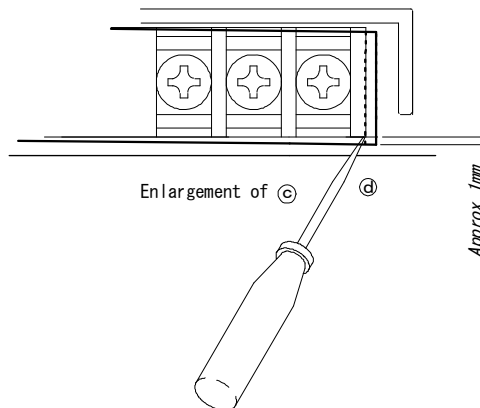
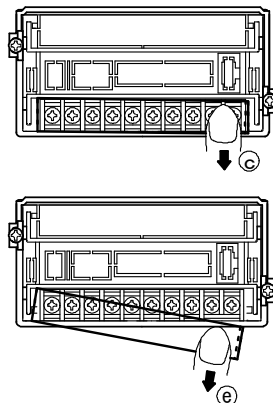
● Assemble procedures

- (1) Direct the claws of the cover to the terminal blocks. "a"
- (2) Insert the claw on either side of the cover as the figure shows. "b"  
Insert the claw on another side until it clicks.  
Thus, the attaching is completed.



● Disassemble procedures

- (1) Pressing the surface on one side of the cover, slightly slide it downwards. "c"
- (2) Insert a small screwdriver into the gap made between the side wall of the terminal blocks and the claw of the cover, and stretch it outward. "d"
- (3) Move whole the cover downwards, then the claw on another side is departed from the terminal blocks. "e"



## 6. Function

### 6.1 Parameter list

#### ● Display function

No.	Function	Display	Contents	Default
01	Scaling offset	OFFS	0 to 9999	0000
02	Scaling full scale	FULL	0 to 9999	9999 Note
	Decimal point	dP.	0, 0.0, 0.00, 0.000	0
04	Input range Changeable -36	CH	CH2 to CH3 Others are indicated by Err1 message	CH3
05	Display cycle	rARE	500ms, 1s, 2s, 4s, 5s	500ms (SP1)
06	Average calculation	ARUE	OFF, ON, 2, 4, 8, 16, and 32 times	OFF
07	Offset fixing	aLoCP	ON, OFF	OFF
08	Zero fixing of 10 <sup>0</sup> digit	ELoCP	ON, OFF	OFF
09	Cut-off	CUF	00.1 to 19.9%	00.1
10	Zero set	SEF	ON, OFF	OFF
11	Display color	Color	G, R	G (Green)
14	Display shutoff timer (Setting of light out time)	Ur n	ON, OFF, 0 to 99 min.	0, 01 (0: OFF)

Note : 6999 at rated input -26A.

#### ● BCD output

No.	Function	Display	Contents	Default
70	BCD output sampling	bcdSP.	SAMP, DISP (sampling cycle or display cycle)	DISP (Display cycle)

#### ● Analog output

No.	Function	Display	Contents	Default
75	Output switching	RSEL	RM, PM, BM, PB	RM (current value)
76	Min. value	Rn n	-09: 0 to 9.9 V -29: 0 to 19.9mA	-09: 01.0 V -29: 04.0 mA
77	Max. value	Rn n	-09: 0.1 to 10.0 V -29: 0.1 to 20.0mA	-09: 05.0 V -29: 20.0 mA
78	Offset	OFFS	0 to 9999	0000
79	Full scale	RFULL	0 to 9999	9999

NOTE: After changing parameter 76 and/or 77, analog output data at the calibration mode resets to default value.

#### ● RS-232C / RS-485

No.	Function	Display	Contents	Default
80	Baud rate	BAUD	4800, 9600, 19200, 38400 bps	9600 bps
81	Data length	LENDF	8 bit, 7 bit	8 bit
82	Parity	PARIF	None, Odd, Even	None
83	Stop bit	SFOP	2 bit, 1 bit	1 bit
84	BCC switching	bCC	ON, OFF	OFF
85	Unit number	rS.no	0 to 99	00

#### ● My setting mode

Registration No.	Code No.	Function
1	01	Offset
2	02	Full scale
3	03	Decimal point
4	00	NC
5	00	NC
6	00	NC
7	00	NC
8	00	NC

#### ● My setting mode

No.	Function	Display	Contents	Default
99	Code registration	MY	00 to 98 (00 for non-registration)	



## 6.2 Explanation of function

- Display function

- Parameter 01 : Select the scaled offset display.
- Parameter 02 : Select the scaled full scale display.
- Parameter 03 : Select the decimal point position.
- Parameter 04 : Select the input range (for -36 only)

Setting	Input	Terminals
	-36	
CH2 (IN2)	999.9 mA	2 – 4
CH3 (IN3)	5.000 A	3 – 4

- Parameter 05 : Select the display rate.  
SP1:500ms、SP2:1s、SP3:2s、SP4:4s、SP5:5s (Becomes 500ms at the moving average.)
- Parameter 06 : Select the numbers of average calculation.  
OFF: No average calculation  
ON: Sectional average  
2, 4, 8, 16, 32 : Numbers of data of moving average
- Parameter 07 : Fix the display equivalent to 0% input.  
Display can be fixed to the offset value when the input value is lower than the offset value.
- Parameter 08 : Fix the display of 10<sup>0</sup> digit to 0.
- Parameter 09 : Cut an unstable zone around 0%.  
The cut area becomes offset value.
- Parameter 10 : Offset the initial input value to 0%.
- Parameter 11 : Select the display color.
- Parameter 14 : Select the shut-off time of the display after the switch operation.

- BCD output

- Parameter 70 : Select the BCD data, whether display cycle or sampling rate.  
Disable P-06 and -08 at the sampling rate.

- Analog output

- Parameter 75 : Switch the analog output.
- Parameter 76 : Set the output value at the 0% input.
- Parameter 77 : Set the output value at the 100% input.
- Parameter 78 : Set the display value at the 0% input.
- Parameter 79 : Set the display value at the 100% input.

- RS-232C / RS-485

- Parameter 80 : Select the Baud rate
- Parameter 81 : Select the Data length.
- Parameter 82 : Select the Parity.
- Parameter 83 : Select the Stop bit.
- Parameter 84 : Disable / Enable the BCC.
- Parameter 85 : Select the Unit number.

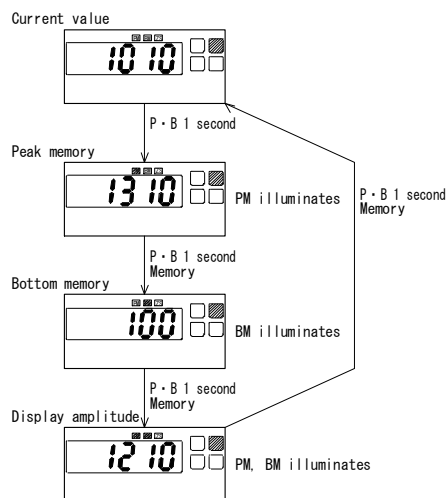
- My setting mode

- Parameter 99 : Register well-used 8 code numbers in the setting mode.

## 7. Parameter Setting

### 7.1 Display switching

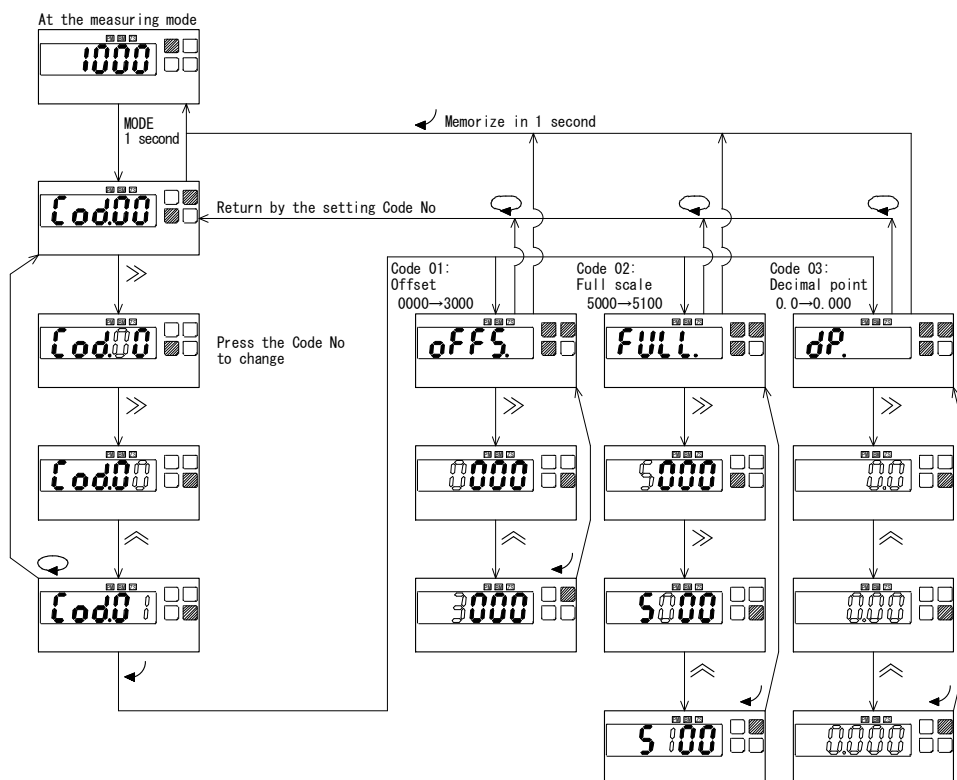
During the measuring mode, the display switches from current value to peak memory, bottom memory, display amplitude, and current value, by pushing **P·B** key.



※During If keep the P·B key pushing more than 3 seconds, memory will be reset after switching the display.

### 7.2 Parameter setting mode

During the measuring mode, the display shows “C 0d00” and switches to the parameter setting mode, by pushing the **MODE** key.





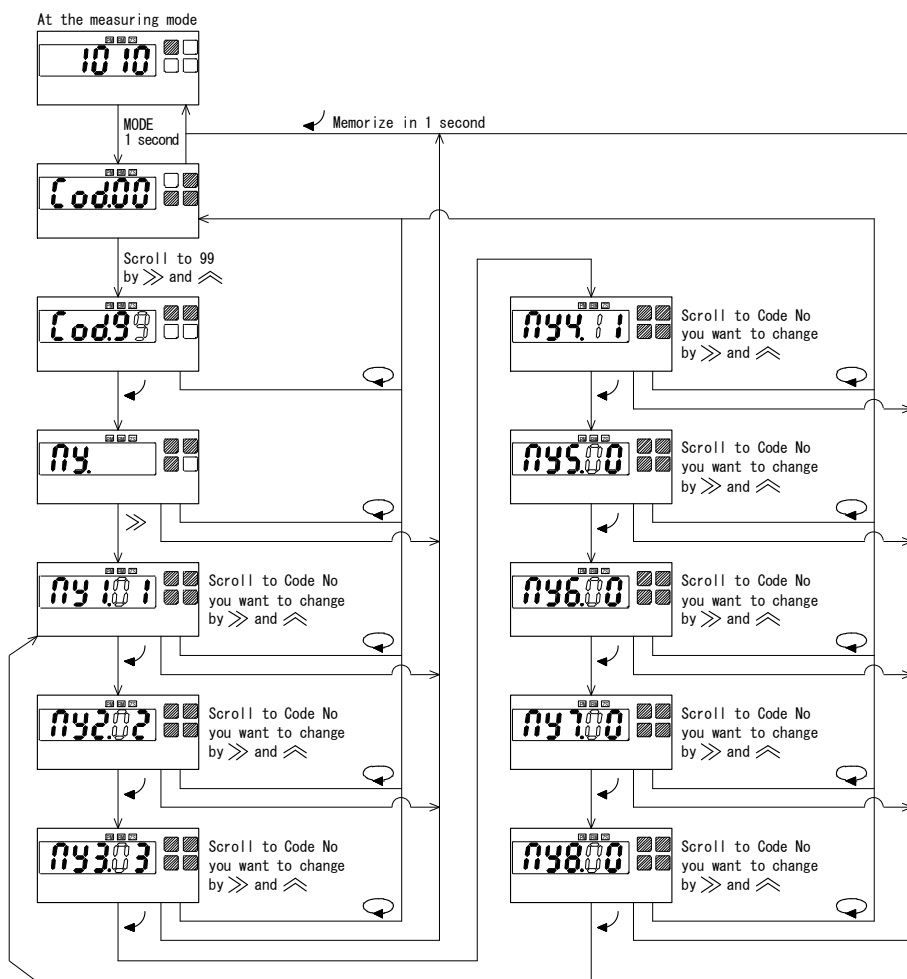
### 7.3 My setting mode

For your convenience, register well-used 8 code numbers in the setting mode.

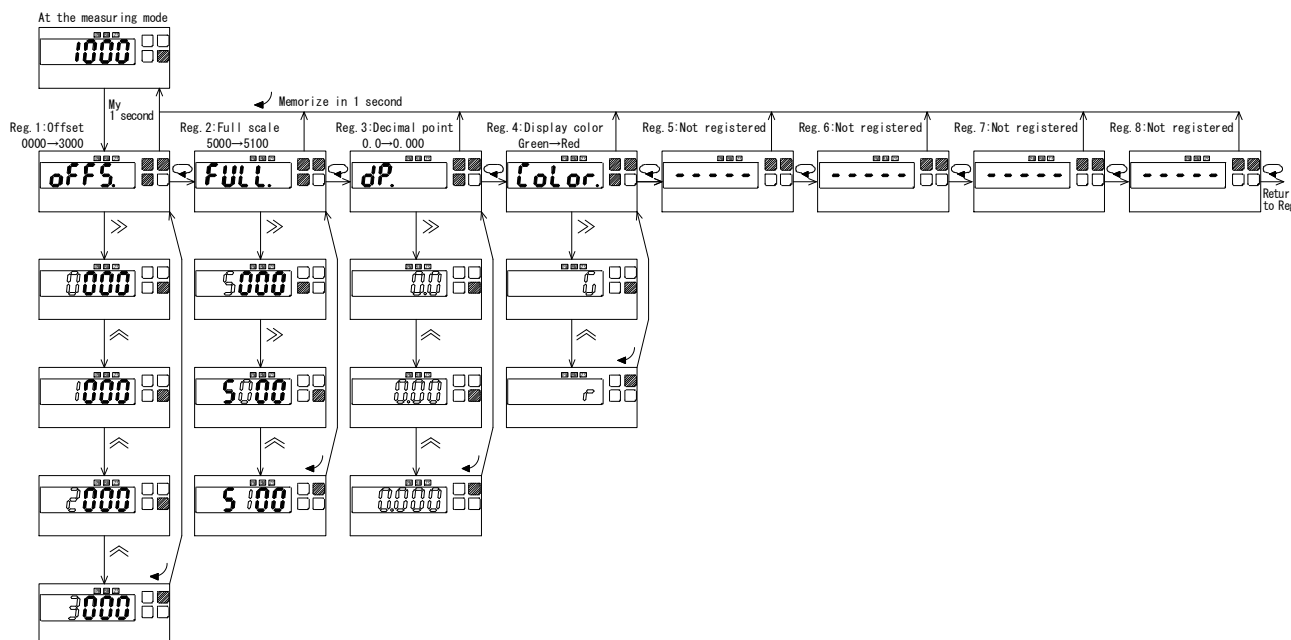
During the measuring mode, the display switches the My setting mode by pushing **My** key.

**The setting can be simplified by registering only the necessary function.**

- How to register codes



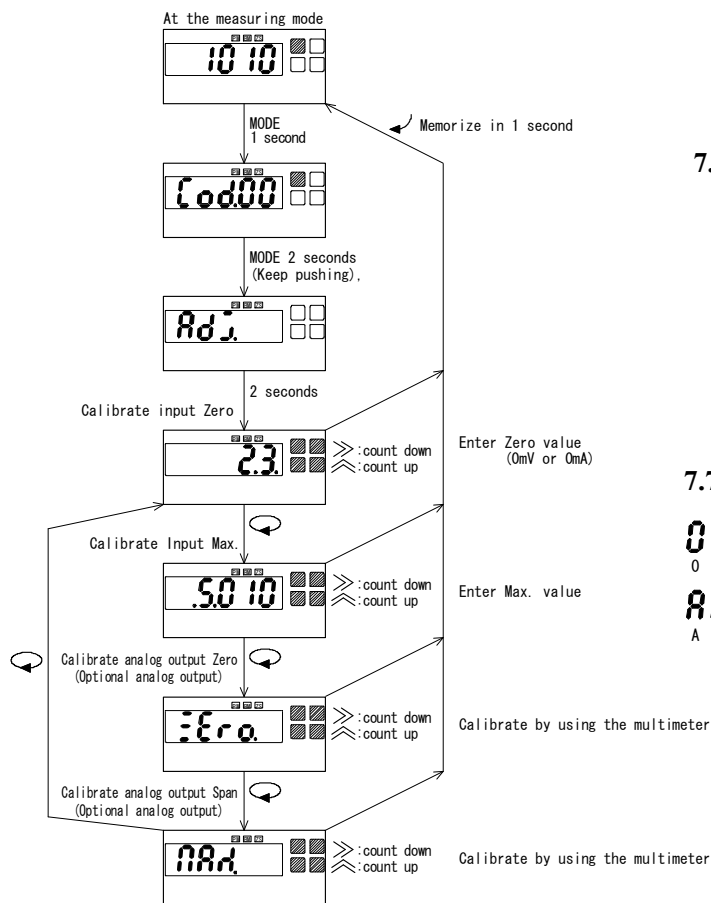
- How to change setting value



### 7.4 Calibration mode

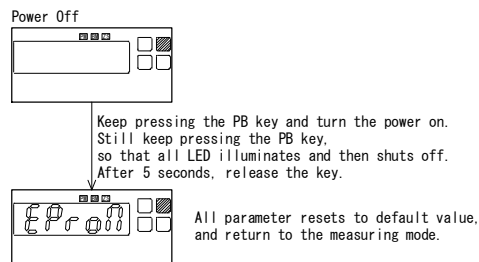
This mode is ideal for fine calibration of the display and the optional analog output.

During the measuring mode, the display shows “Ad.” and switches the Calibration mode by pushing **MODE** key.



\* When calibrating input Zero, input 0.5% of the rated input value.  
Do not apply 0% to avoid excess error.  
For example, your product is code-25 (99.99Vrms) to scale 0 to 9999 display range, input 0.5 Vrms to adjust 005.0.

### 7.5 Reset to Default value



### 7.6 Error message

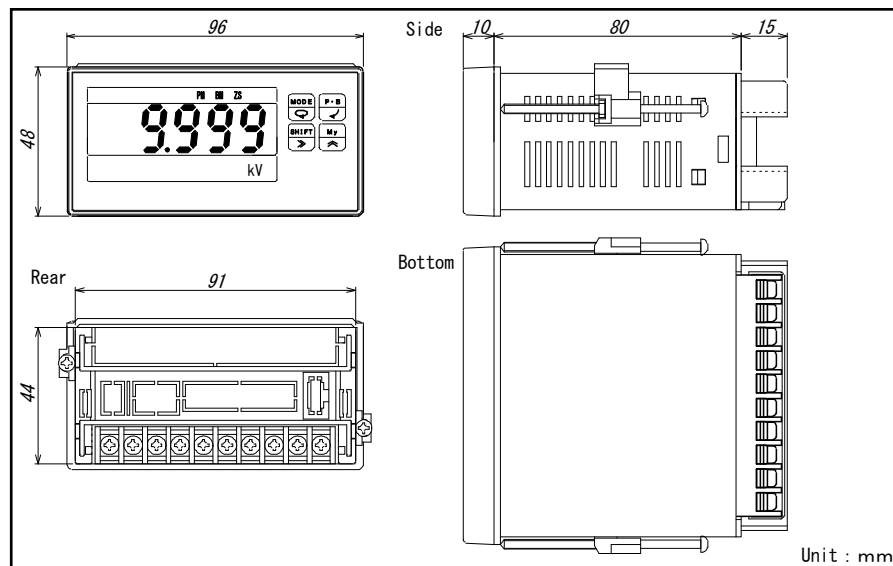
Display	Cause of trouble	Countermeasure
Err 1	Entered Code No. is not applicable.	Enter correct Code No.
Err 2	Entered value is out of range.	Enter correct value

※ During the parameter setting mode and the My setting mode, return automatically to the measuring mode if you do not touch the switch more than 5 minutes.  
Changed value does not memorize in this case.

### 7.7 Numeric and Character Indications



## 8. External Dimensions



## 9. Model Numbering

451F-(1)-(2)-(3)-(4)

### [1] Measuring Input

Model	Measuring Range	Input Resistance	Error *1	Thermal Coefficient*2	Input Overload	Terminals	
AC Voltage	-22A	99.99 mVrms	100k $\Omega$	$\pm(0.2\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 10V	1 - 4
	-23A	999.9 mVrms	100k $\Omega$	$\pm(0.2\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 100V	1 - 4
	-24A	9.999 Vrms	1M $\Omega$	$\pm(0.2\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 400V	1 - 4
	-25A	99.99 Vrms	1.9M $\Omega$	$\pm(0.2\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 400V	2 - 4
	-26A	699.9 Vrms	1.9M $\Omega$	$\pm(0.3\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 700V	3 - 4
	-20A	Others (from AC100mV to AC700V) but one range					Depends on rated
AC Current	-32	99.99 $\mu\text{Arms}$	1k $\Omega$	$\pm(0.3\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 20mA	1 - 4
	-33	999.9 $\mu\text{Arms}$	100 $\Omega$	$\pm(0.3\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 50mA	1 - 4
	-34	9.999 mArms	10 $\Omega$	$\pm(0.3\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC150mA	1 - 4
	-35	99.99 mArms	1 $\Omega$	$\pm(0.3\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC500mA	1 - 4
	-36 *3	999.9 mArms	0.1 $\Omega$	$\pm(0.5\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 2A	2 - 4
		5.000 Arms	0.01 $\Omega$	$\pm(0.5\%$ of rdg + 10 digits)	$\pm 300\text{ppm}/^\circ\text{C}$	AC 10A	3 - 4
	-30	Others (from 100 $\mu\text{A}$ to 1A) but one range					Depends on rated

\*1 Error  $\pm 23^\circ\text{C} \pm 5^\circ\text{C}$ , 45~75%RH  
Input sine wave of input frequency 40Hz ~ 1kHz  
 $\pm 0.2\%$  of FS, if max input is less than 10%.

\*2 Thermal Coefficient 0~50 $^\circ\text{C}$   
Crest factor=4 ( up to peak 1000V at 699.9V)

\*3 Default Set CH3 for the code -36  
Set to 0, if rated input is 0.1% or lower.

### [2] Power Supply Voltage

Code	Power Source Voltage
A	AC100 to 240V
B	DC 12 to 24V
C	DC110V

### [3] Data Output 1

Code	Specifications	Impedance	Max. Load
Null	No output		
09	Analog voltage (positive input side outputs) DC 0-10V (Available scaling, Default: 1-5V)	Max. 0.1 $\Omega$	Min. 100 $\Omega$ at DC 0-1V Min. 1k $\Omega$ at DC 0-10V Min. 500 $\Omega$ at DC 1-5V
29	Analog current (positive input side outputs) DC 0-20mA (Available scaling, Default: 4-20mA)	Min. 5M $\Omega$	Max. 2.4k $\Omega$ at DC 0-5mA Max. 600 $\Omega$ at DC 0-20mA Max. 600 $\Omega$ at DC 4-20mA
BP	BCD output (TTL level positive logic)		
BN	BCD output (TTL level negative logic)		
DP	BCD output (transistor output, source type)		
DN	BCD output (transistor output, sink type)		
E0	RS-232C		
E1	RS-485		
EC	Decimal point external control		

### [4] Data Output 2 (Available -09 and -29 of Data output 1 only)

Code	Specifications
Blank	No output
E0	RS-232C
E1	RS-485
EC	Decimal point external control

#### Contact Information

Name : Tsuruga Electric Corporation  
Address : 1-3-23 Minami-Sumiyoshi, Sumiyoshi-ku, Osaka-shi  
558-0041 Japan

# Quick Manual

## Digital Panel Meter, Model 451F / Meter Relay, Model 452F BCD Output

I-01674

### 1. Data Output Code

Code	Specifications
BP	BCD output (TTL level positive logic)
BN	BCD output (TTL level negative logic)
DP	BCD output (transistor output, source type)
DN	BCD output (transistor output, sink type)

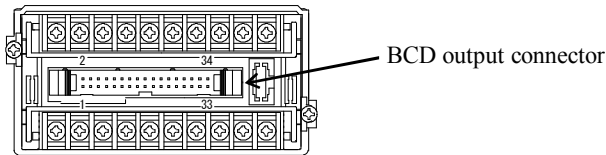
### 2. Connector and Connections

#### ⚠ WARNING

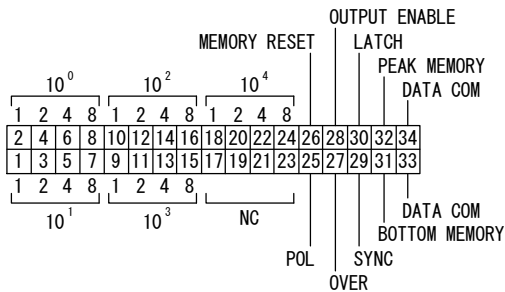
- To avoid an electrical shock, turn the power off when wiring.
- Do not wire with moistened hands. Locate away from the wet place.
- Do not touch terminals when turning the power on.

#### ⚠ CAUTION

- Do not miswiring. Otherwise, the meter may be broken.



#### 2.1 Connections



Suitable connector (attached)  
XG4M-3430-T:OMRON Corp.  
with 2m cable

#### 2.2 TTL output

- Input / Output rating

	Signal	Type -BP	Type -BN	Rating
Output	$\times 10^0$ to $\times 10^4$	Positive logic	Negative logic	TTL level Fo=2 CMOS compatible
	POL	+=H, -=L	+=L, -=H	
	OVER	H at over	L at over	
	SYNC	L pulse of 10ms		
Input	LATCH	Hold at L (short-circuit)		$I_{IL} \leq -1\text{mA}$ L = 0 to 1.5V H = 3.5 to 5.0V
	ENABLE	Enable at H (open), Disable at L (short-circuit)		
	MEMORY RESET	Reset at L (short-circuit)		
	PEAK/BOTTOM MEMORY	Refer to each item		

- Measuring data output ( $\times 10^0$  to  $\times 10^4$ )  
Parallel BCD (1-2-4-8) code, latch output. The output is Tri-state type, so a connection to the data bus is easy.

- Polarity Output (POL)  
Outputs data polarity to No.25 pin.

- Over Output (OVER)  
Outputs over display to No. 27 pin.

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When exceeded 130% display, outputs both 130% display and over data. When exceeded 9999, outputs 0 data and over data.

- Synchronization (SYNC)  
Outputs L pulse of 10ms, which synchronizes display cycle, to No. 29 pin. Readouts the data on the rising edge of this SYNC. Wired OR connection is possible when connecting several data bus.

- Data enable input (OUTPUT ENABLE)  
Outputs datum, includes POL and OVER, when opening (setting to H) No. 28 pin. When short-circuiting (setting to L) with DATA COM between No. 33 and No.34 pin, DATA, includes POL and OVER, changes to high impedance condition. In this state, SYNC output is prohibited and the connection to the data bus is easy.

- Latch input (LATCH)  
Latches BCD data by short-circuiting between No. 30 and DATA COM (No. 33 and No. 34 pins) or setting to L. Display does not latch.

- PEAK MEMORY and BOTTOM MEMORY  
Switches output data to current value, peak memory value, bottom memory value, and amplitude value, by the operation of No. 31 to No. 34 pins.

Signal	Current value	Peak memory value	Bottom memory value	Amplitude value
No. 32 pin (Peak memory)	Open H	Short-circuit L	Open H	Short-circuit L
No. 31 pin (Bottom memory)	Open H	Open H	Short-circuit L	Short-circuit L

- MEMORY RESET  
Switches peak memory and bottom memory to current value by short-circuiting between No. 26 pin and DATA COM (No. 33 and No. 34 pins).

- Data common (DATA COM)  
No. 33 and No. 34 pins are common for measuring data output, POL, OVER, SNYC, LATCH, OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, and MEMORY RESET.

- NC  
Do not use non-occupied NC pin for junction purpose.

※Do not apply 5V DC or more due to uniform to TTL level of data output and control signal. Arrange the wiring of data output and control input/output lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

### 2.3 Transistor output

Wired OR connection is possible for the measuring data, including POL and OVER, and SYNC when connecting several BCD outputs to a PC.

- Input / Output rating

Signal		Item	Type -DP	Type -DN
Output	$\times 10^0$ to $\times 10^4$	Output	Source type	Sink type
	POL OVER SYNC	Output capacity	DC30V 30mA Max., Saturation Voltage: 1.6V Max.	
Input	LATCH ENABLE MEMORY RESET PEAK MEMORY BOTTOM MEMORY	Signal level	Input current: Max. 1mA OFF (H) = 3.5 to 5.0V, ON (L) = 0 to 1.5V	

- Measuring data output ( $\times 10^0$  to  $\times 10^4$ )  
Parallel BCD code (1-2-4-8), Latch output.  
Transistor turns on (ON) at 1 measuring data.  
Transistor turns off (OFF) at 0 measuring data.

- Polarity Output (POL)  
Outputs data polarity to No.25 pin.  
Transistor turns on (ON) at (+) display value.  
Transistor turns off (OFF) at (-) display value.

- Over Output (OVER)  
Outputs over display to No. 27 pin.  
Transistor turns on (ON) at over display.  
When exceeded 130% display, outputs both 130% display and over data. When exceeded 9999, outputs 0 data and over data.

- Synchronization (SYNC)  
Outputs L pulse of 10ms, which synchronizes display cycle, to No. 29 pin.  
Readouts the data on the rising edge of this SYNC.

- Data enable input (OUTPUT ENABLE)  
Outputs datum, includes POL and OVER, when opening (setting to H) No. 28 pin.  
When short-circuiting (ON) with DATA COM between No. 33 and No.34 pin, DATA, includes POL and OVER, changes to OFF condition. In this state, SYNC output is prohibited and the connection to the data bus is easy.

● Latch input (LATCH)

Latches BCD data by short-circuiting between No. 30 and DATA COM (No. 33 and No. 34 pins). Display does not latch.

● PEAK MEMORY and BOTTOM MEMORY

Switches output data to current value, peak memory value, bottom memory value, and amplitude value, by the operation of No. 31 to No. 34 pins.

Signal	Current value	Peak memory value	Bottom memory value	Amplitude value
No. 32 pin (Peak memory)	Open	Short-circuit	Open	Short-circuit
No. 31 pin (Bottom memory)	Open	Open	Short-circuit	Short-circuit

● MEMORY RESET

Switches peak memory and bottom memory to current value by short-circuiting between No. 26 pin and DATA COM (No. 33 and No. 34 pins).

● Data common (DATA COM)

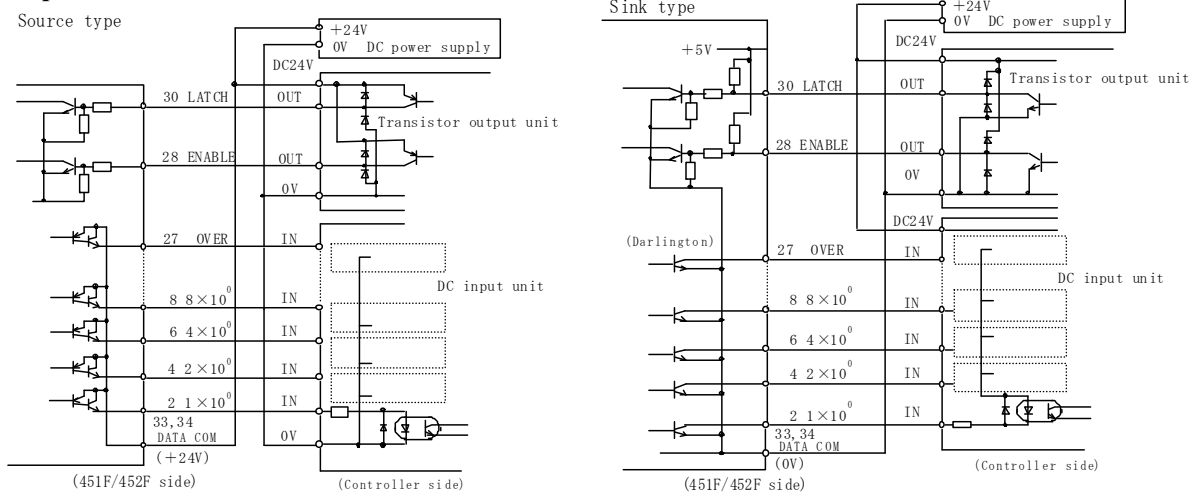
No. 33 and No. 34 pins are common for measuring data output, POL, OVER, SNYC, LATCH, OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, and MEMORY RESET.

● NC

Do not use non-occupied NC pin for junction purpose.

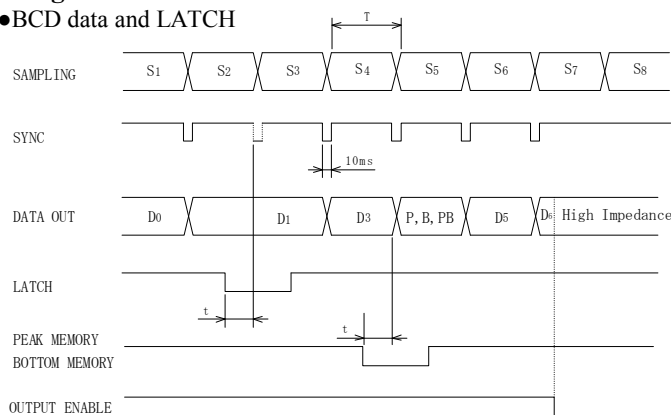
※Arrange the wiring of data output and control input/output lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

3.Example of connection



4.Timing chart

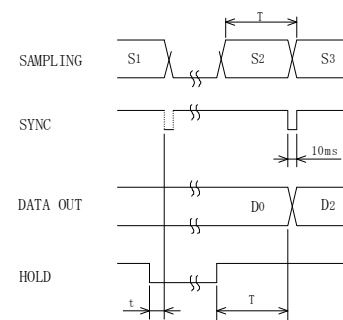
●BCD data and LATCH



PorB: Peak memory value, Bottom memory value or amplitude value

$t$  : internal operation time approx. 15ms  
 $T$  : display cycle or sampling cycle (500ms)

●BCD data and HOLD



$t$ : internal operation time approx. 15ms  
 $T$ : display cycle or sampling cycle (500ms)

**⚠ CAUTION**

Regarding the BCD output when supplying the power

1. Supply power shall rise to the rated voltage within 1 second after activation.
2. The model 451F/452F may output unstable data due to initialization within 3 seconds of starting.  
Start data acquisition 3 seconds later after reaching the rated voltage.



## 5. Switch BCD output cycle

BCD output cycle is possible to choose whether display cycle or sampling cycle (500ms).

Refer to our Quick manual,451F : I-01672 and 452F : I-01673, for detailed setting procedures.

<b>Contact Information</b>	
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# Quick Manual

## Digital Panel Meter, Model 451F / Meter Relay, Model 452F RS-232C / RS-485 Output

I-01676

### 1. Data Output Code

Code	Output
E0	RS-232C
E1	RS-485

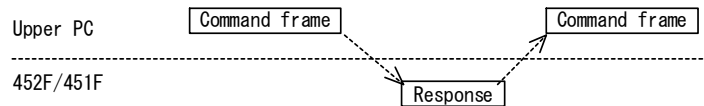
### 2. Specifications

#### 2.1 Common specifications for RS-232C and RS-485

The measuring input and the RS-232C and RS-485 output is insulated.

Transmission	: Start-Stop half-duplex transmission
Transmission speed	: 4800, 9600, 19200, 38400 bps
Data length	: 7bit / 8bit
Parity	: None, Odd, Even
Stop bit	: 1bit / 2bit
Data	: In conjunction with JIS 8 units code
X parameter	: None
Error detection	: Parity (Choose BCC availability) Operation results of exclusive logic sum just after STX to ETX
Control character	: STX (02H) start of text / ETX (03H) end of text
Device No.	: 00 to 99 Set the device No. to each device, and match each command of device
Transmission character	: Max. 32
Transmission process	: Ignored

452F/451F transmits response in accordance with command frame from the upper PC.



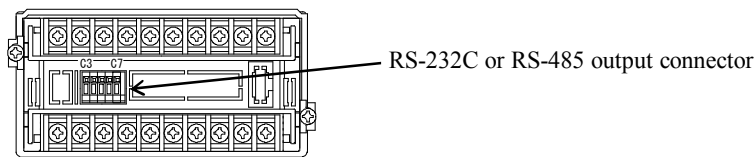
#### • RS-485

Connected device numbers	: Max. 32, including the upper PC
Line length	: Up to 500 m by using shielded twisted-pair cable, AWG28 to 22.
Terminator	: Switched by the jumper at the terminal, terminated at 200 Ω

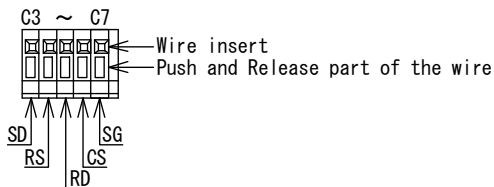
NOTE followings for the use of multi-drop.

- Unify the transmission format.
- Do not duplicate the device number.

### 3.Connector and Connections

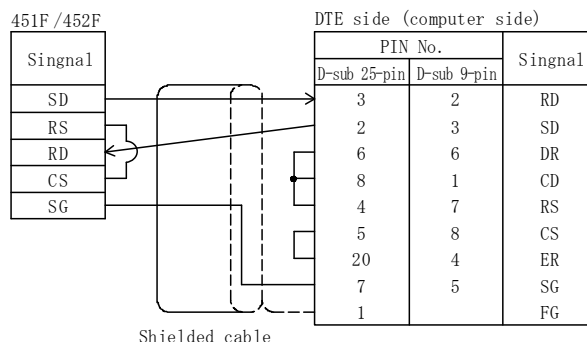


#### 3.1 RS-232C

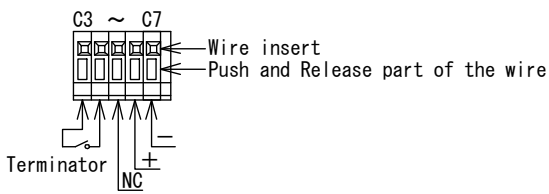


Recommended wire ( Solid wire : AWG28 to 22  
Twisted wire : AWG28 to 22  
O.D. 0.125 min.

Strip-off length: 9 to 10mm



### 3.2 RS-485



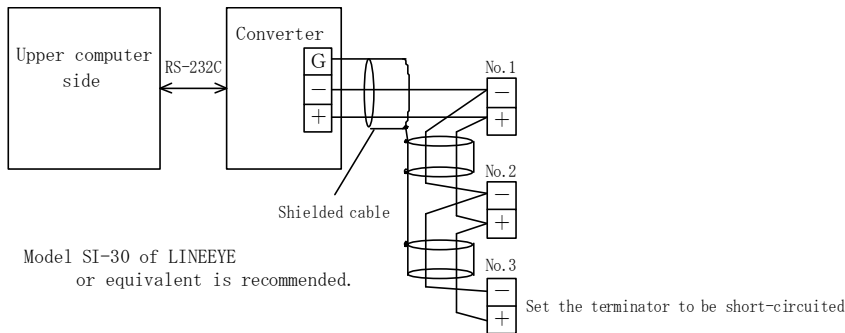
※ Recommended wire ( Solid wire : AWG28 to 22  
Twisted wire : AWG28 to 22  
O.D. 0.125 min.  
Strip-off length: 9 to 10mm

※ In case of multi-drop connection, strand twisted wire AWG28 to AWG26 and insert.

Terminator: When short-circuiting the connector, 200 Ω resistor is connected in parallel to the line  
Input/Output: “+” is non-inverse output, and “-” is inverse output.

• Connection

In case of RS-485 connection, up to 32 devices, includes the upper computer, are possible to connect. Specify the end station for both ends of device on the line. Set the terminator to be short-circuited for the identification of the end station. Lead wire for short-circuit is not attached. Use the converter for another identification to set the terminator.



### 3.3 Communication setting

Use keys on the front panel for communication setting. Refer to 451F:I-01672 or 452F:I-01673 for key operation.

- Transmission speed, Data length, Parity, Stop bit, BCC availability
- Device number

## 4. Communication command

### 4.1 Notes for Command

- 1) BCC should be added after ETX if BCC function is available.
- 2) All frame of command  
Command: STX device No., Command or Command frame, ETX (BCC)  
Response: STX device No., End code, Response, ETX (BCC)
- 3) Character of command is effective with 4-character from the top. Ex)RLATCH → RLAT
- 4) Both figure and character is effective. Ex) WC07 0 or WC07 OFF
- 5) End code

Return the receive condition of the command frame.

End code	Contents
A (41H)	Normal end
B (42H)	During setting (communicates during setting)
C (43H)	Setting error (out of setting range or error)
D (44H)	BCC error (with BCC function)
P (50H)	Command error (impossible to analyze the received command)

Response at the command error

STX	Device No.	End code	ETX	(BCC)	
(02H)	(30H)	(30H)	(50H)	(03H)	Device No. 00

Response during setting

STX	Device No.	End code	ETX	(BCC)	
(02H)	(30H)	(30H)	(42H)	(03H)	Device No. 00

### ⚠ CAUTION

Regarding the command when supplying the power

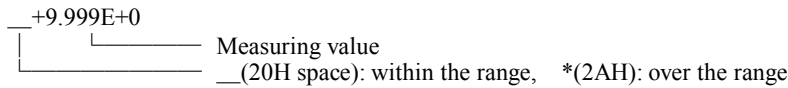
1. Supply power shall rise to the rated voltage within 1 second after activation.
2. The model 451F/452F may not respond due to initialization or may return unstable response within 3 seconds of starting. Start communication 3 seconds later after reaching the rated voltage.

### 4.2 Command / Response

• Measuring command

- Command : DATA? The current data, Request to judge
- Response : response to DATA? Collect the current data, judgment
- Command : RMREad, request to the current data
- Response : response to RMREad, Collect the current data
- Command : PMREad, request to the peak memory data
- Response : response to PMREad, Collect the peak memory data
- Command : BMREad, request to the bottom memory data
- Response : response to BMREad, Collect the bottom memory data
- Command : PBREad, request to the amplitude
- Response : response to PBREad, Collect the amplitude measuring data

Data format



- Command : DATA? The current data, Request to judge
- Response : response to DATA?  
 +9.999 ..... 451F  
 +9.999 AL1, AL2, ON..... 452F

Command frame

STX	Device No.	D	A	T	A	?	ETX (BCC)
02H	30H	30H	44H	41H	54H	41H	3FH

Device No. 00

Response

STX	Device No.	↓	End code	↓	+	9	.	9	9	9	E	+	0	ETX(BCC)
02H	30H	30H	41H	20H	2BH	39H	2EH	39H	39H	39H	45H	2BH	30H	03H

.....451F

STX	Device No.	↓	End code	↓	+	9	.	9	9	9	E	+	0	,	0	3	ETX(BCC)
02H	30H	30H	41H	20H	2BH	39H	2EH	39H	39H	39H	45H	2BH	30H	2CH	30H	33H	03H

.....452F

- Command : PMREAD, Request to peak memory data
- Response : response to PMREAD  
+9.999

Command frame

STX	Device No.	P	M	R	E	A	D	ETX (BCC)
02H	30H	30H	50H	4DH	52H	45H	41H	44H

Device No. 00

Response

STX	Device No.	↓	End code	↓	+	9	.	9	9	9	E	+	0	ETX(BCC)
02H	30H	30H	41H	20H	2BH	39H	2EH	39H	39H	39H	45H	2BH	30H	03H

• Readout the device information

- Command : IDNT? Read out the device information
- Response : response to IDNT?  
452F-25, No.511-000 (Model No. Soft registration No. (Tsuruga))

Command frame

STX	Device No.	I	D	N	T	?	ETX(BCC)
02H	30H	30H	49H	44H	4EH	54H	3FH

Device No. 00

Response

STX	Device No.	↓	End code	↓	4	5	2	F	-	2	5
02H	30H	30H	41H	34H	35H	32H	46H	2DH	32H	35H	

,	N	o	.	5	1	1	-	0	0	0	ETX(BCC)
2CH	4EH	6FH	2EH	35H	31H	31H	2DH	30H	30H	30H	03H

• Readout the judgment

- Command : ALARm, Read out the judgment
- Response : response to ALARm  
16 (GO output)

Command frame

STX	Device No.	A	L	A	R	M	ETX (BCC)
02H	30H	30H	41H	4CH	41H	52H	4DH

Device No. 00

Response

STX	Device No.	↓	End code	↓	1	6	ETX (BCC)
02H	30H	30H	41H	16H	06H	03H	03H

---

02H	30H	30H	41H	31H	36H	03H	
-----	-----	-----	-----	-----	-----	-----	--

• Readout the setting data

Command : RC01, Read out the offset setting

Response : response to RC01.  
0000

Command frame

STX	Device No.	R	C	0	1	ETX (BCC)
02H	30H	30H	52H	43H	30H	31H 03H

Device No. 00

Response

STX	Device No.	End code	0	0	0	0	ETX(BCC)
02H	30H	30H	41H	30H	30H	30H	03H

• Set the function command data

Command : WC01\_0000, Set the offset

Response : response to WC01\_0000.  
0000

Command frame

STX	Device No.	W	C	0	1	0	0	0	0	ETX(BCC)
02H	30H	30H	57H	43H	30H	31H	20H	30H	30H	30H 03H

Device No. 00

Response

STX	Device No.	End code	0	0	0	0	ETX(BCC)
02H	30H	30H	41H	30H	30H	30H	03H

• Readout the control command data

Command : RLATch, Read out the latching

Response : response to RLATch.  
0 (OFF)

Command frame

STX	Device No.	R	L	A	T	C	H	ETX (BCC)
02H	30H	30H	52H	4CH	41H	54H	43H	48H 03H

Device No. 00

Response

STX	Device No.	End code	0	ETX (BCC)
02H	30H	30H	41H	30H 03H

• Set the control command data

Command : WLATch\_0, Set the latching

Response : response to WLATch\_0.  
0 (OFF)

Command frame

STX	Device No.	W	L	A	T	C	H	0	ETX (BCC)
02H	30H	30H	57H	4CH	41H	54H	43H	48H	20H 30H 03H

Device No. 00

Response

STX	Device No.	End code	0	ETX (BCC)
02H	30H	30H	41H	30H 03H

• Memory control command

• Write command: Write the setting data into the EEPROM.

Command : STOR

Response : End code

Command frame

STX	Device No.	S	T	O	R	ETX (BCC)
02H	30H	30H	53H	54H	4FH	52H 03H

Device No. 00

Response

STX	Device No.	End code	ETX (BCC)
02H	30H	30H	41H 03H

Normal end

• Memory initialization: Setting datum resets to default, except of transmission speed, data length, parity, stop bit, BCC switch, and device No.

Command : DEFault

Response : End code

Command frame

STX	Device No.	D	E	F	A	U	L	T	ETX (BCC)
02H	30H	30H	44H	45H	46H	41H	55H	4CH	54H 03H

Device No. 00

Response

STX	Device No.	End code	ETX (BCC)
02H	30H	30H	41H 03H

Normal end

4.3 Command table

• Setting command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Function, range	
Scaling offset	RC01	0000	WC01_0000	0000	0 to 9999	Common
Scaling full scale	RC02	9999	WC02_9999	9999	0 to 9999	
Decimal point	RC03	0	WC03_0	0	0:0, 1:0.0, 2:0.00, 3:0.000,	
Input range selection	RC04	3	WC04_3	3	2, 3	
Display cycle	RC05	1	WC05_1	1	0:500ms, 1:1s, 2:2s, 3:4s, 4:5s	
Average calculation (Section, Moving)	RC06	0	WC06_0	0	0:OFF, 1:ON, 2:2, 3:4, 4:8, 5:16, 6:32 times	
Offset fixing	RC07	0	WC07_0	0	1:ON, 0:OFF	
Zero fixing of 10 <sup>0</sup> digit	RC08	0	WC08_0	0	1:ON, 0:OFF	
Cut-off	RC09	00.0	WC09_10.0	10.0	0.1 to 19.9	
Zero set	RC10	0	WC10_1	1	1:ON, 0:OFF	
PV Display color	RC11	1	WC11_3	3	0:RR, 1:RG, 2:GR, 3:GG	452F
	RC11	3	WC11_3	3	0:RR, 3:GG	451F
SV1 Display	RC12	3	WC12_0	0	0:OFF, 1:AL1, 2:AL2, 3:AL3, 4:AL4, 5:RM, 6:PM, 7:BM, 8:PB	452F
SV2 Display	RC13	2	WC13_1	1	0:OFF, 1:AL1, 2:AL2, 3:AL3, 4:AL4, 5:RM, 6:PM, 7:BM, 8:PB	
Display shutoff timer (Setting of light out time for PV, SV1 and SV2)	RC14	1, 1, 1, 99	WC14_1, 1, 1, 99	1, 1, 1, 99	1:ON, 0:OFF, 0 to 99	452F
	RC14	1, 99	WC14_1, 99	1, 99	1:ON, 0:OFF, 0 to 99	451F
Power On delay	RC40	4	WC40_99	99	4 to 99	452F
Comparison data	RC41	5	WC41_5	5	5:RM, 6:PM, 7:BM, 8:PB	
AL1 Comparison value	RC42	2000	WC42_9999	9999	0 to 9999	
AL2 Comparison value	RC43	3000	WC43_9999	9999	0 to 9999	
AL3 Comparison value	RC44	7000	WC44_9999	9999	0 to 9999	
AL4 Comparison value	RC45	8000	WC45_9999	9999	0 to 9999	
AL1 Hysteresis	RC46	1	WC46_999	999	1 to 999	
AL2 Hysteresis	RC47	1	WC47_999	999	1 to 999	
AL3 Hysteresis	RC48	1	WC48_999	999	1 to 999	
AL4 Hysteresis	RC49	1	WC49_999	999	1 to 999	
AL1 Comparison method	RC50	0	WC50_0	0	0:OFF, 1:HI, 2:LO	
AL2 Comparison method	RC51	2	WC51_2	2	0:OFF, 1:HI, 2:LO	
AL3 Comparison method	RC52	1	WC52_1	1	0:OFF, 1:HI, 2:LO	
AL4 Comparison method	RC53	0	WC53_0	0	0:OFF, 1:HI, 2:LO	
Output Delay	RC54	0	WC54_99	99	0 to 99	
Comparison conditions	RC55	0	WC55_1	1	1:GO, 0:NG	
Zone setting	RC56	0	WC56_1	1	1:ON, 0:OFF	
Analog output switching	RC75	5	WC75_6	6	5:RM, 6:PM, 7:BM, 8:PB	
Analog output offset	RC78	0000	WC78_9999	9999	0 to 9999	
Analog output full scale	RC79	9999	WC79_9999	9999	0 to 9999	452F
Code registration of My setting mode	RC99	42, 43, 44, 45, 01, 02, 03, 00	WC99_42, 43, 44, 45, 01, 02, 03, 00	42, 43, 44, 45, 01, 02, 03, 00	00 to 98	
	RC99	01, 02, 03, 00, 00, 00, 00, 00	WC99_01, 02, 03, 00, 00, 00, 00, 00	01, 02, 03, 00, 00, 00, 00, 00		451F

• Measuring command

Function	Requested command		Applicable Model
	Command	Response	
Current value data	DATA?	_+9.999E+0, 16	452F 451F
	DATA?	_+9.999E+0	
Current value data	RMREad	_+9.999E+0	Common
Peak data	PMREad	_+9.999E+0	
Bottom data	BMREad	_+9.999E+0	
Amplitude data	PBREad	_+9.999E+0	

• Judgment command

Function	Requested command		Applicable Model
	Command	Response	
AL1 to AL4, GO	ALARm	16 (00 at ALRESET)	452F
		Output Weight of data	
		AL1 01	
		AL2 02	
		AL3 04	
		AL4 08	
		GO 16	

• Control command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Item	
Latch	RLATch	1	WLATch 1	1	1:ON, 0:OFF	Common
Hold	RHOLd	0	WHOLd 1	1	1:ON, 0:OFF	
Alarm reset	RALRst	1	WALRst 1	1	1:ON, 0:OFF	452F
Memory reset			MR	End code		Common

• Memory control command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Item	
Write			STOR	End code		Common
Default			DEFALt	End code		

Contact Information

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 558-0041 Japan