OP586-V01

Rayleigh Instruments

RI-D440

Operating Instructions

SPECIFICATIONS

DISPLAY
Liquid crystal display with backlight
1 line, 4 digits and 2 line, 7 digits per line to show electrical Parameters

LCD INDICATIONS
MD - Maximum Demand of Power
⇌ **-** Communication in progress

LED INDICATIONS
INT - Integration of energy

WIRING INPUT
3 Ø - 4 wire, 1 Ø - 2 wire

RATED INPUT VOLTAGE
60 to 300V AC (L-N) ;
104 to 520V AC (L-L)

FREQUENCY RANGE
45-65 Hz

CT PRIMARY
5A to 10,000A (Programmable for any Value)

CT SECONDARY
330mV

PT PRIMARY
100V to 10kV (Programmable for any value)

PT SECONDARY
100 to 500V AC (L-L)(Programmable for any value)

DISPLAY UPDATE TIME
1sec for all parameters

POWER CONSUMPTION
Less than 8VA

ENVIRONMENTAL CONDITIONS
- Indoor use
- Altitude of up to 2000 meters
- Pollution degree II

Temperature : Operating : -10°C to 55°C
Storage : -20°C to 75°C
Humidity : Up to 85% non-condensing

MOUNTING : Din Rail mounting

WEIGHT : 191gms

OUTPUT
Pulse Output : Voltage range : 5 to 27V DC.
Current capacity : 100mA max.
Pulse Duration : Selectable between 0.1 to 2.0sec.
Pulse Weight : Selectable between 0.01 to 9.99kWh

ORDER CODE INFORMATION

Product	Supply	Certification
	Self Supplied(V1,N)	CE
RI-D440	60 to 300V AC, 50 / 60Hz, (±5%)	■
Installation Category III		

SERIAL COMMUNICATION

Interface standard and protocol	RS485 AND MODBUS RTU
Communication address	1 to 255
Transmission mode	Half duplex
Data types	Float and Integer
Transmission distance	500 Metre maximum
Transmission speed	300, 600,1200, 2400, 4800, 9600,19200 (in bps)
Parity	None, Odd, Even
Stop bits	1 or 2

RESOLUTION

PT Ratio x CT Ratio	kWh	INT
<15	0.01K	0.001K
<150	0.1K	0.01K
<1500	1K	0.1K
<15000	0.01M	1K
<150000	0.1M	0.01M

NOTE : 1) For Voltage, Current, Power, resolution is automatically adjusted
2) For power factor, resolution is 0.01

ACCURACY :

Measurement	Accuracy
Voltage V_{L-N}	±0.5% of full Range
Voltage V_{L-L}	±0.5% of full Range
Current	±0.5% of full Range
Frequency For L-N Voltage >20V, For L-L Voltage >35V	±0.1% of full Range
Active Power	±1% of full Range
Apparent power	±1% of full Range
Reactive Power	±1% of full Range
Power factor	±0.01 of full Range
Active energy Class 1	IEC62053-21
Reactive energy Class 2	IEC62053-22
MAX Active Power	±1% of full Range
MAX Apparent Power	±1% of full Range

SAFETY PRECAUTIONS

All safety related codifications, symbols and instructions that appear in this operating manual or on the equipment must be strictly followed to ensure the safety of the operating personnel as well as the instrument.

If the equipment is not used in a manner specified by the manufacturer it might impair the protection provided by the equipment.

- Do not use the equipment if there is any mechanical damage.
- Ensure that the equipment is supplied with correct voltage.

⚠ CAUTION :
1. Read complete instructions prior to installation and operation of the unit.
2. Risk of electric shock.
3. The equipment in its installed state must not come in close proximity to any heating sources, oils, steam, caustic vapors or other unwanted process by products.

WIRING GUIDELINES

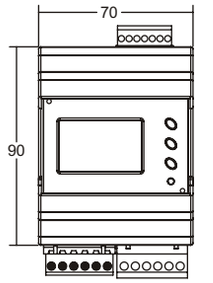
⚠ WARNING :
1. To prevent the risk of electric shock, power supply to the equipment must be kept OFF while doing the wiring arrangement.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference use of wires with adequate ratings and twists of the same in equal size shall be made with shortest connections.
5. Layout of connecting cables shall be away from any internal EMI source.
6. Cable used for connection to power source, must have a cross section of 0.5mm^2 to 2.5mm^2 (20 to 14AWG ; 75^{0}C (min)).
7. Copper cable should be used (Stranded or Single core cable).
8. Before attempting work on device, ensure absence of voltages using appropriate voltage detection device.

INSTALLATION GUIDELINES

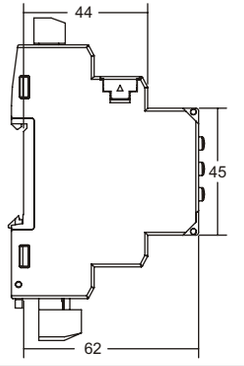
⚠ CAUTION :
1. This equipment, being built-in-type, normally becomes a part of main control panel and in such case the terminals do not remain accessible to the end user after installation and internal wiring.
2. Conductors must not come in contact with the internal circuitry of the equipment or else it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
3. Circuit breaker or mains switch must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function. However this switch or breaker must be installed in a convenient position normally accessible to the operator.
4. The equipment shall not be installed in environmental conditions other than those mentioned in this manual.
5. The equipment does not have a built-in-type fuse. Installation of external fuse of rating 275V AC / 0.5Amp for electrical circuitry / battery is highly recommended.

DIMENSIONS (All dimensions in mm)

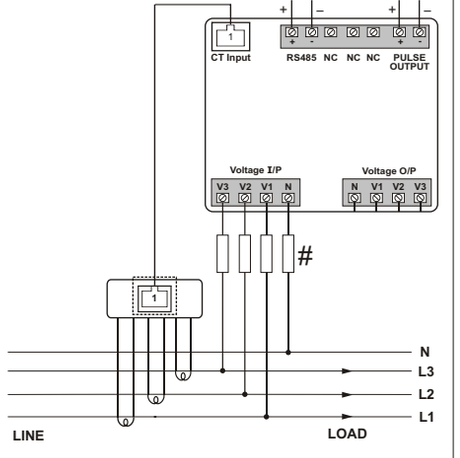
Front View



Side View

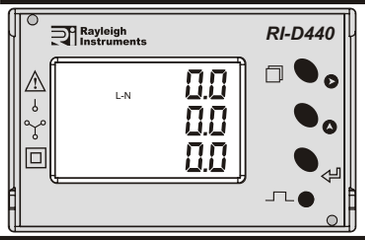


TERMINAL CONNECTIONS



All fuse types : 0.5A class CC UL type
0.5A fast acting 600V

FRONT PANEL DESCRIPTION



ONLINE PAGE DESCRIPTION

There are 2 dedicated key labeled as PAGE and PRG with symbols marked as ▶ and ▲ to read meter parameters.

At power ON meter displays average phase to neutral voltage and active energy of three phases. If any key is not pressed for 60sec., unit resumes manual mode.

KEY PRESS	PARAMETER KEY	DESCRIPTION
ONLINE PAGE DESCRIPTION		
Press page (▶) key (1st time)	—	Displays line to neutral voltage of three phases
	Press ▲ key	Displays line to line voltage of three phases
	Press ▶ key 3 sec.	Displays voltage sequence.
Press page (▶) key (2nd time)	—	Displays phase current of three phases
Press page (▶) key (3rd time)	—	Displays average phase to neutral voltage, current and power factor of three phases and frequency
	Press ▲ key	Displays average line to line voltage, current and power factor of three phases and frequency.
Press page (▶) key (4th time)	—	Displays power factor of three phases and frequency.
	Press ▲ key 1st time	Displays active power of three phases
	Press ▲ key 2nd time	Displays reactive power of three phases
	Press ▲ key 3rd time	Displays apparent power of three phases
	Press ▲ key 4th time	Displays total active power of three phases
	Press ▲ key 5th time	Displays total reactive power of three phases
	Press ▲ key 6th time	Displays total apparent power of three phases
	Press ▲ key 7th time	Displays max demand of active power
	Press ▲ key 8th time	Displays max demand of apparent power
Press page (▶) key (5th time)	—	Displays average phase to neutral voltage and active energy of three phases.
	Press ▲ key	Displays average phase to neutral voltage and reactive energy of three phases.

Note - For 1 phase 2 wire network, all page will be same as 3 phase 4 wire, but only selected phase parameter will display.

SERIAL NUMBER DESCRIPTION

Press ▲ key for 10sec. to display 8 digit serial number, the serial number will be displayed for 10 second

CONFIGURATION

There are 3 dedicated key with symbols marked as ▶, ▲ and ⏎. Use these 3 key to enter into configuration / change setting.

Note : The settings should be done by a professional, after going through this users manual and after having understood the application situation.

For the configuration setting mode :

- Use ▲ and ⏎ for 3sec. to enter or exit from config. mode.
- Use ▶ shift key to move cursor left or right by one digit each time. After last digit of display cursor shift at 1st digit of display.
- Use ▲ increment key for increasing the parameter value.
- Use ⏎ key to save the setting and move on to next page.
- Use ▲ and ▶ keys to go back and to previous page.

Config. page.	Function	Range or Selection	Factory Setting
	Password	0000 to 9998	1000
1	Change Password	No / Yes	No
1.1	New Password	0000 to 9998	1000
2	Network Selection	3P4W, 1P2W-P1, 1P2W-P2, 1P2W-P3.	3P4W
3	CT Secondary	Preset	5
4	CT Primary	5A to 10,000A	160
5	PT Secondary	100V to 500V	350
6	PT primary	100V to 10kV	350
7	Slave Id	1 to 255	1
8	Baud Rate	300, 600, 1200, 2400, 4800, 9600 and 19200	9600
9	Parity	None, Even, Odd	None
10	Stop Bit	1 or 2	1
11	Back Light	0 to 7200 sec.	0000
12	Demand interval method	Sliding / Fixed	Sliding
13	Demand interval duration	1 to 30	15
14	Demand interval length	1 to 30min	1
15	Pulse Weight	0.01 to 9.99kWh	0.10
16	Pulse Duration	0.1 to 2.0 sec.	0.1
17	Factory Default	No / Yes	No
18	Reset Energy and Max Demand	No / Yes	No
•18.01	Password	0001 to 9999	1001
18.02	Reset Active Energy	No / Yes	No
18.03	Reset Reactive Energy	No / Yes	No
18.04	Reset Max Power	No / Yes	No

• For resetting energy parameters user will be prompted the password. If correct password is entered, the user will be able to reset all energy parameters. This password will be value which will be greater than the configuration password by 1.

LEFT HAND CT MOUNTING PHASE CORRECTION

The meter phases L1, L2 & L3 are setup as default for the CT to be mounted as an incomer or on the RHside of the board.

Meter display shows rH when "⏎" is pressed for 3 sec.

When the CT is mounted on the LH side of the board the phase sequence needs to be reversed.

1. Press "⏎" for seconds, then release and then press again for 3 sec. Phase will be reversed and display will show LH
2. Wait 5 sec. for meter to resume online reading.Meter display shows LH when "⏎" is pressed for 3 sec.

MODBUS REGISTER ADDRESSES LIST

Readable / writable parameters

Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Min value	**Max value**		
40000	0x00	Password	0	9998	1	Integer
			Value	**Meaning**		
40001	0x01	N/W selection	0x0000	3P-4W	1	Integer
			0x0002	1P2W-P1	1	Integer
			0x0003	1P2W-P2	1	Integer
			0x0004	1P2W-P3	1	Integer
			Min value	**Max value**		
40002	0x02	CT Secondary (A)	5	5	1	Integer
40003	0x03	CT primary	5	10000	1	Integer
40004	0x04	PT Secondary (V)	100	500	1	Integer
40005	0x05	PT primary (V)	100	10000	2	Integer
40007	0x07	Slave id	1	255	1	Integer
			Value	**Meaning**		
40008	0x08	Baud rate (bps)	0x0000	300	1	Integer
			0x0001	600		
			0x0002	1200		
			0x0003	2400		
			0x0004	4800		
			0x0005	9600		
			0x0006	19200		
40009	0x09	Parity	0x0000	None	1	Integer
			0x0001	Odd		
			0x0002	Even		
40010	0x0A	Stop bit	0x0000	1	1	Integer
			0x0001	2		
			Min value	**Max value**		
40011	0x0B	Backlight OFF (sec.)	0	7200	1	Integer
			Value	**Meaning**		
40012	0x0C	Factory Default	1	Set to factory setting range	1	Integer
40013	0x0D	Reset kWh	1	Reset Total Active Energy	1	Integer
40015	0x0F	Reset kVArh	1	Reset Total Reactive Energy	1	Integer
40034	0x22	Demand Interval Method	0X0000	Sliding	1	Integer
			0X0001	Fixed		
40035	0x23	Demand Interval Duration	MIN Value : 1	MAX Value : 30	1	Integer
40036	0x24	Demand Interval Length(min)	MIN Value : 1	MAX Value : 30	1	Integer
40037	0x25	Reset max kW	1	Reset max Active power	1	Integer
40041	0x29	Reset max kVA	1	Reset max Apparent power	1	Integer
			Min value	**Max value**		
*40057	0x39	Pulse Duration (sec.)	0.1	2.0 (sec.)	1	Integer
#40058	0x3A	Pulse Weight	0.01	9.99 (kWh)	1	Integer
#40059	0x3B	Pulse Weight (kWh)	0.01	9.99 (kWh)	1	Integer

* 0.1 resolution [1 = 0.1sec.] # 0.01 resolution [1 = 0.01kWh]

MODBUS REGISTER ADDRESSES LIST

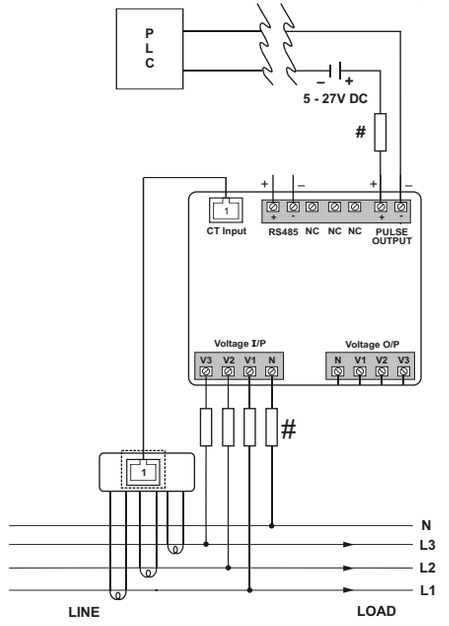
Readable parameters : [Length (Register) : 2 ; Data Structure : Float]

NOTE : In 4 byte data type, LSB will be displayed on lower address and MSB will be displayed on higher address.

Address	Hex Address	Parameter
30000	0x00	Voltage V1N
30002	0x02	Voltage V2N
30004	0x04	Voltage V3N
30006	0x06	Average Voltage LN
30008	0x08	Voltage V12
30010	0x0A	Voltage V23
30012	0x0C	Voltage V31
30014	0x0E	Average Voltage LL
30132	0x84	Serial No (Data Structure : Hex)
30016	0x10	Current I1
30018	0x12	Current I2
30020	0x14	Current I3
30022	0x16	Average Current
30024	0x18	kW1
30026	0x1A	kW2
30028	0x1C	kW3
30030	0x1E	kVA1
30032	0x20	kVA2
30034	0x22	kVA3
30036	0x24	kVAr1
30038	0x26	kVAr2
30040	0x28	kVAr3
30042	0x2A	Total kW
30044	0x2C	Total kVA
30046	0x2E	Total kVAr
30048	0x30	PF1
30050	0x32	PF2
30052	0x34	PF3
30054	0x36	Average PF
30056	0x38	Frequency
30058	0x3A	kWh
30062	0x3E	kVArh
30064	0x40	kW MAX Active Power
30072	0x48	kVA MAX Apparent Power
30134	0x86	Existing kW MAX Active Power
30138	0x8A	Existing kVA MAX Apparent Power
*30142	0x8E	Existing kVA MAX Apparent Power

APPLICATION OF PULSE OUTPUT

● **PROCESS INTEGRATION** ■



Pulse output from RI-D440 meter can be interfaced into a process through a PLC for on line control of energy content in the process.
If the PLC has a self excited digital input, external DC supply is not needed.
The kWh pulse is also used to derive average kWh information at the PLC.

All fuse types : 0.5A class CC UL type
0.5A fast acting 600V

(Specifications subject to change as development is a continuous process.)

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