INSTRUCTION MANUAL

MULTI POWER MONITORING UNIT
(clamp-on current sensor CLSE, Modbus)

MODEL **R9MWTU**

BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact our sales office or representatives.

■ PACKAGE INCLUDES:

Multi power monitoring unit.....(1)
Upper mounting adaptor.....(2)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.
This unit is programmable by using the PC Configurator Software. For detailed information on the PC configuration, refer to the PMCFG users manual. The PMCFG PC Configurator Software is downloadable at our web site.

POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- This equipment is suitable for Pollution Degree 2, Measurement Category II (input, transient voltage 4000V) and Installation Category II (transient voltage 2500V). Prior to installation, check that the insulation class of this unit satisfies the system requirements. Insulation class of this unit is as follows.

Input to Modbus	Reinforced insulation (400V)
Input or Modbus to auxiliary power	Reinforced insulation (300V)

- Altitude up to 2000 meters.
- The equipment must be mounted inside a panel.
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.
- Install lightning surge protectors for those wires connected to remote locations.

■ AUXILIARY POWER INPUT RATING & OPERATIONAL RANGE

- Locate the auxiliary power input rating marked on the product and confirm its operational range as indicated below:
  100 – 240V AC rating: 85 – 264V, 50/60 Hz, < 7VA
  110 – 240V DC rating: 99 – 264V, < 1.2W

■ GENERAL PRECAUTIONS

- Before you remove or mount the unit, turn off the power supply and input signal for safety.
- DO NOT set the switches on the module while the power is supplied. The switches are used only for maintenance without the power.

■ ENVIRONMENT

- Indoor use.
- Do not install the unit where it is directly exposed to rain, water droplets or sunlight.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

■ WIRING

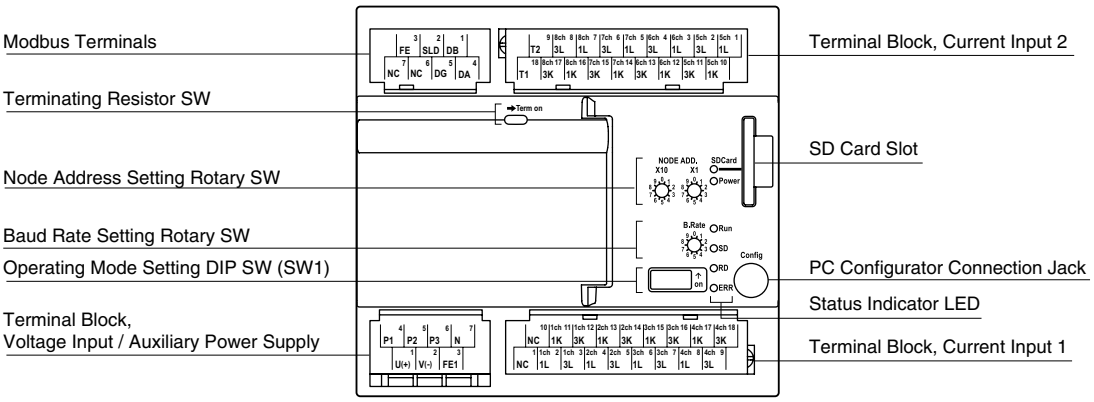
- Wiring to the unit must be conducted by qualified service personnel.
- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND ....

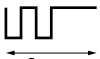
- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

COMPONENT IDENTIFICATION

■FRONT VIEW



■STATUS INDICATOR LED

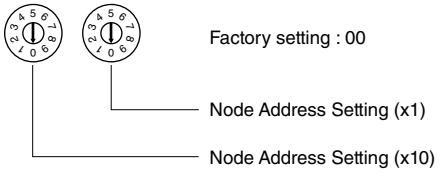
ID	COLOR	STATE	FUNCTION
SDCard	Red	Blinking approx. 1 Hz	The unit is preparing to write. The LED starts blinking 30 seconds before the unit starts writing in the SD card on the hour every hour. DO NOT extract the card while the LED shows the blinking pattern until the writing is complete.
			SD card access error. The unit is unable to normally write in the card because it is full or its data contents are damaged.
			SD card partial access error. The unit was unable to write in the card for unknown reason but now is recovered. A part of the data contents is missing.
		OFF	SD card not inserted.
		ON	SD card inserted.
		Blinking approx. 2 Hz	The unit is writing in the SD card. DO NOT extract the card.
Power	Red	ON	Normal
		Blinking approx. 0.5 Hz	Input overload or no input
		Blinking approx. 2 Hz	Setting error or device error
			Internal calendar error or calendar backup battery life expired. Re-set the calendar with the PC Configurator. The LED blinks in the designated pattern every time when the power is turned on after the battery life has been expired.
		OFF	Device error
RUN	Red	ON	Normal communication
ERR	Red	ON	Received data error
SD	Red	ON	Data transmitting
RD	Red	ON	Data receiving

■TERMINATING RESISTOR

To use the terminating resistor, turn the switch ON.

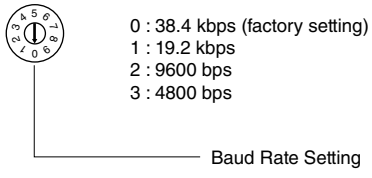
■NODE ADDRESS

Node Address is selected between 1 and 99 in decimal. The left switch determines the tenth place digit, while the right switch does the ones place digit of the address.



■BAUD RATE

Baud Rate is selected with the rotary switch (4 through 9 are not available, be sure to set between 0 and 3).



■ OPERATING MODE SETTING

(*) Factory setting

• System Configuration (SW1-1, 2)

SW1-1	SW1-2	SYSTEM CONFIGURATION
OFF	OFF	Three-phase / 3-wire (*)
ON	OFF	Single-phase / 2-wire
OFF	ON	Single-phase / 3-wire
ON	ON	---

• Balanced or Unbalanced Load (SW1-3)

SW1-3	BALANCED / UNBALANCED
OFF	Unbalanced (*)
ON	Balanced

• Clamp Sensor Type (SW1-4, 5, 6)

SW1-4	SW1-5	SW1-6	CLAMP SENSOR TYPE
OFF	OFF	OFF	CLSE-R5 (5A) (*)
ON	OFF	OFF	CLSE-05 (50A)
OFF	ON	OFF	CLSE-10 (100A)
OFF	OFF	ON	CLSE-20 (200A)
ON	ON	OFF	CLSE-40 (400A)
OFF	ON	ON	CLSE-60 (600A)

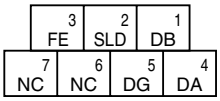
• Configuration Mode (SW1-8)

SW1-8	CONFIGURATION MODE
OFF	DIP switch setting (*) (PC Configurator setting is invalid.)
ON	PC Configurator and communication (DIP switch setting is invalid.)

Note 1: Turn on the power supply to the unit after setting node address, baud rate and operating mode.
Note 2: Be sure to set unused SW1-7 to OFF.
Note 3: Clamp sensor type setting is common to all circuits.
Note 4: The sensor type and other settings for individual circuit can be performed on the PC Configurator or via Modbus.

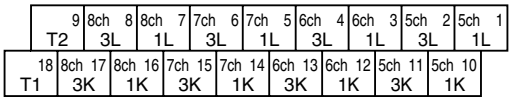
■ TERMINAL ASSIGNMENTS

• Modbus



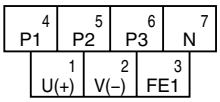
No.	ID	FUNCTION
1	DB	DB
2	SLD	Shield
3	FE	Modbus ground
4	DA	DA
5	DG	DG
6	NC	Unused
7	NC	Unused

• Current Input 2



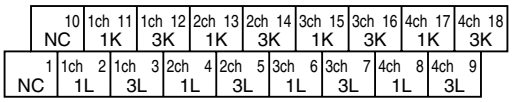
No.	ID	FUNCTION	No.	ID	FUNCTION
1	5ch 1L	Ch.5, Current input 1L	10	5ch 1K	Ch.5, Current input 1K
2	5ch 3L	Ch.5, Current input 3L	11	5ch 3K	Ch.5, Current input 3K
3	6ch 1L	Ch.6, Current input 1L	12	6ch 1K	Ch.6, Current input 1K
4	6ch 3L	Ch.6, Current input 3L	13	6ch 3K	Ch.6, Current input 3K
5	7ch 1L	Ch.7, Current input 1L	14	7ch 1K	Ch.7, Current input 1K
6	7ch 3L	Ch.7, Current input 3L	15	7ch 3K	Ch.7, Current input 3K
7	8ch 1L	Ch.8, Current input 1L	16	8ch 1K	Ch.8, Current input 1K
8	8ch 3L	Ch.8, Current input 3L	17	8ch 3K	Ch.8, Current input 3K
9	T2	Unused	18	T1	Unused

• Auxiliary Power Supply, Voltage Input



No.	ID	FUNCTION
1	U(+)	Auxiliary power (+)
2	V(–)	Auxiliary power (–)
3	FE1	Power ground
4	P1	Voltage input P1
5	P2	Voltage input P2
6	P3	Voltage input P3
7	N	Voltage input N

• Current Input 1

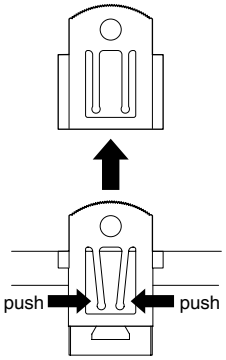


No.	ID	FUNCTION	No.	ID	FUNCTION
1	NC	Unused	10	NC	Unused
2	1ch 1L	Ch.1, Current input 1L	11	1ch 1K	Ch.1, Current input 1K
3	1ch 3L	Ch.1, Current input 3L	12	1ch 3K	Ch.1, Current input 3K
4	2ch 1L	Ch.2, Current input 1L	13	2ch 1K	Ch.2, Current input 1K
5	2ch 3L	Ch.2, Current input 3L	14	2ch 3K	Ch.2, Current input 3K
6	3ch 1L	Ch.3, Current input 1L	15	3ch 1K	Ch.3, Current input 1K
7	3ch 3L	Ch.3, Current input 3L	16	3ch 3K	Ch.3, Current input 3K
8	4ch 1L	Ch.4, Current input 1L	17	4ch 1K	Ch.4, Current input 1K
9	4ch 3L	Ch.4, Current input 3L	18	4ch 3K	Ch.4, Current input 3K

INSTALLATION

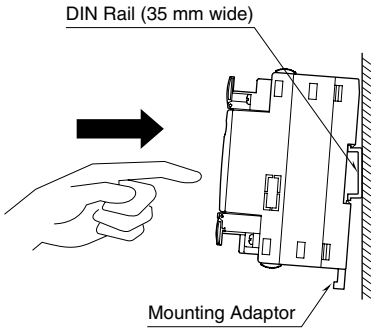
■ WALL MOUNTING

Attach the upper mounting adaptors to the upper side of the unit, and pull out the lower mounting adaptors from the lower side. Fasten a M4 screw through the mounting hole (4.5 mm dia.) of each adaptor. (torque 1.4 N·m)
To remove the upper mounting adaptor from the unit, pull it out while squeezing the latches as shown in the figure below.



■ DIN RAIL MOUNTING

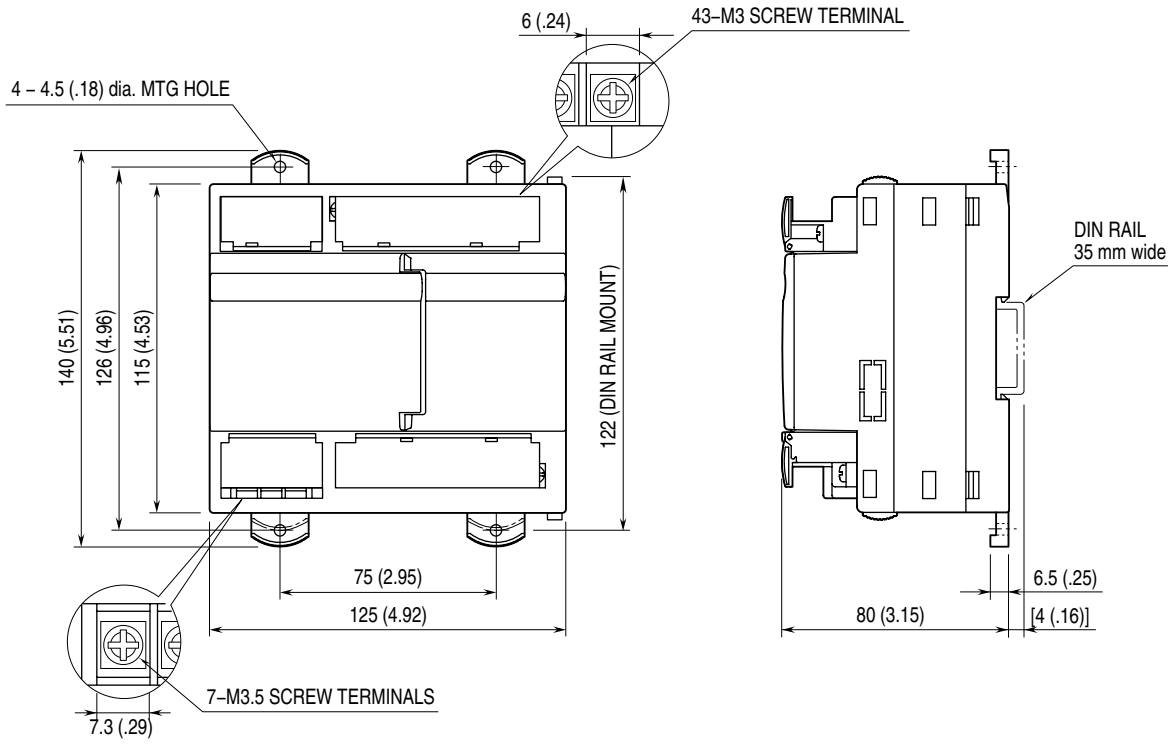
Set the unit so that the lower mounting adaptors are at the bottom. Hook the upper hook at the rear side of the unit onto the DIN rail and push in the lower part of the unit. When removing the unit, pull out the unit while pushing down the adaptors using a minus screwdriver.



TERMINAL CONNECTIONS

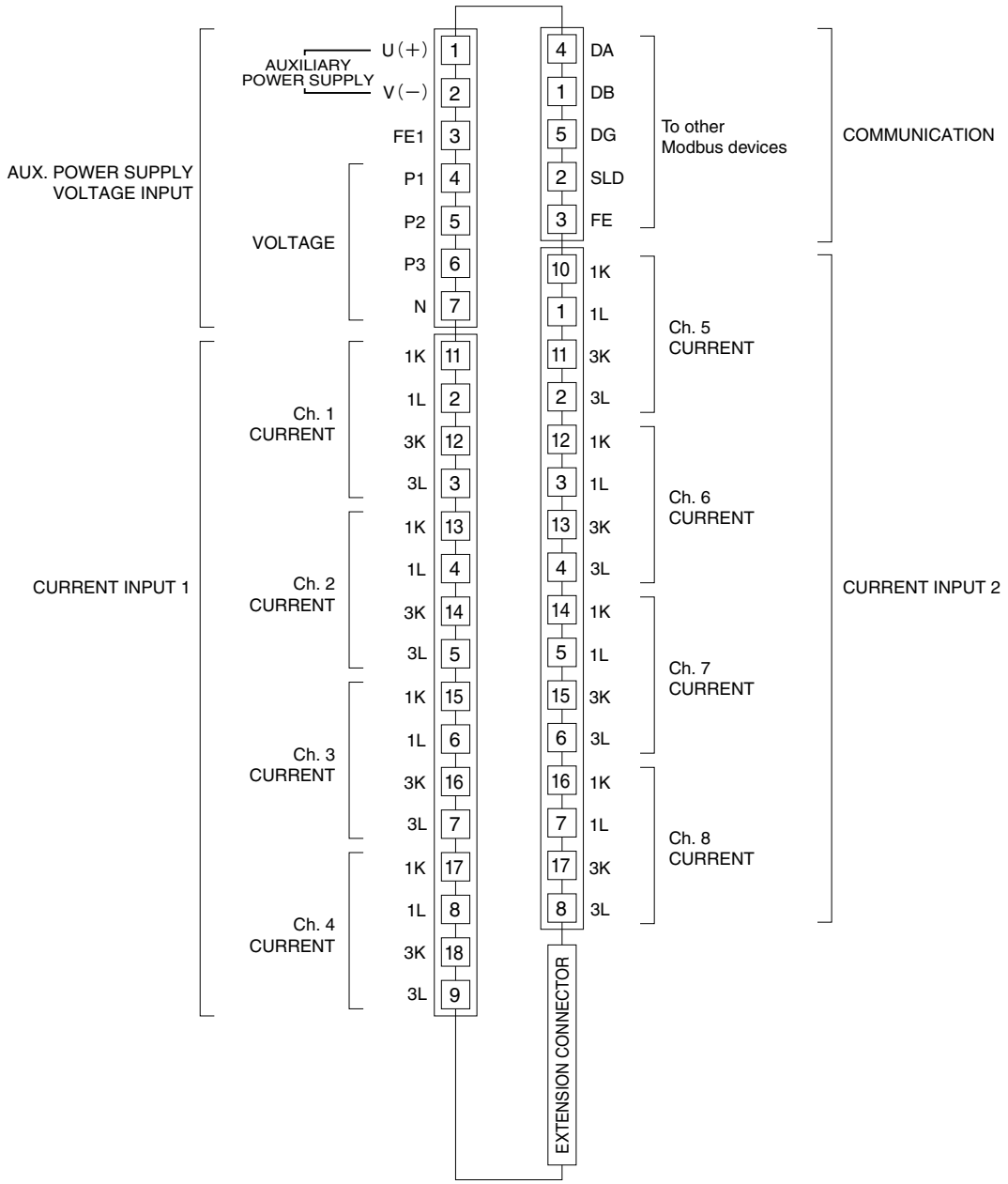
Connect the unit as in the diagram below.

■ EXTERNAL DIMENSIONS unit: mm (inch)



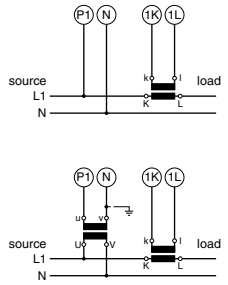
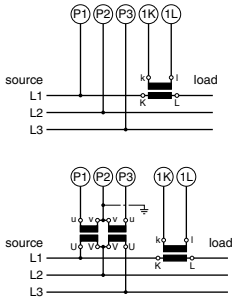
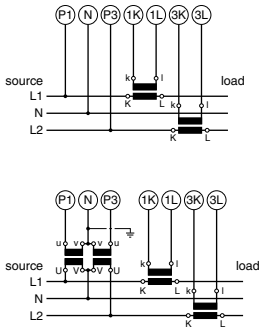
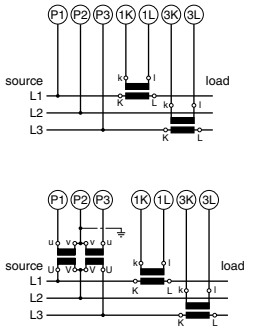
■ CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FE1 terminal to ground.
Caution: FE1 terminal is NOT a protective conductor terminal.



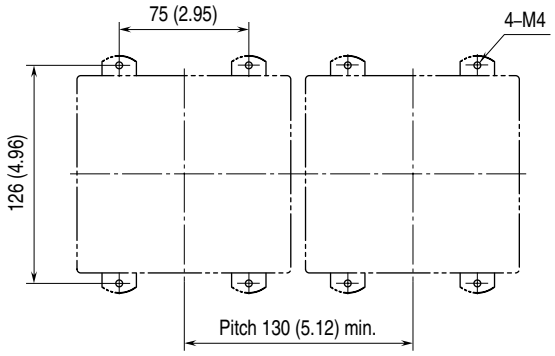
■ INPUT WIRING

Use the model CLSE clamp sensor for current inputs.
The figure below shows only one circuit.
A maximum of eight (8) current sensor inputs can be connected (Ch. 1 through Ch. 8).
Grounding is not required for low voltage circuits.

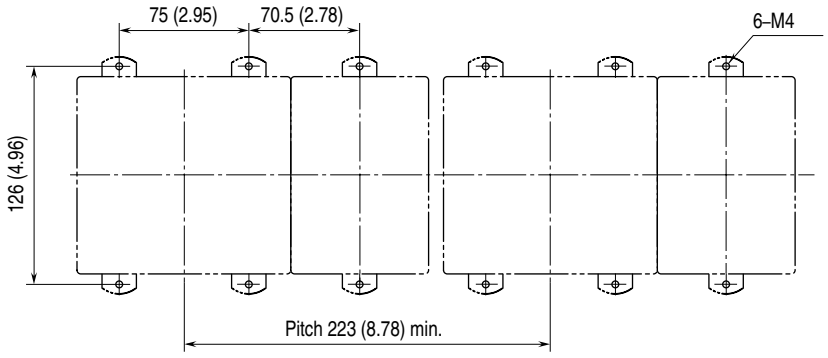
System / Application	Terminal	System / Application	Terminal
Single-phase / 2-wire		Three-phase / 3-wire balanced load	
Single-phase / 3-wire		Three-phase / 3-wire unbalanced load	

MOUNTING REQUIREMENTS unit: mm (inch)

■ SINGLE MOUNTING



■ BASIC + EXTENSION UNIT



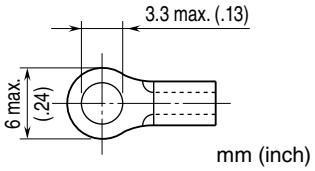
WIRING INSTRUCTIONS

■ SOLDERLESS TERMINAL

Refer to the drawing below for recommended ring tongue terminal size. Spade tongue type is also applicable.

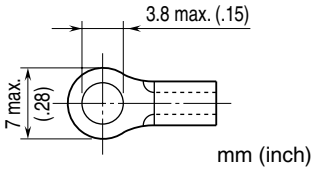
• M3 Screw (Modbus and current input)

Applicable wire size: 0.25 to 1.65 mm² (AWG22 to 16)
Torque: 0.5 N·m



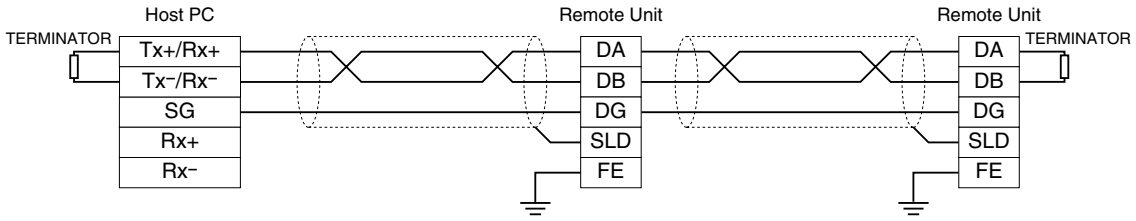
• M3.5 Screw (auxiliary power and voltage input)

Applicable wire size: 1.04 to 2.63 mm² (AWG16 to 14)
Torque: 0.8 N·m



COMMUNICATION CABLE CONNECTIONS

■ MASTER CONNECTION



Be sure to connect the terminating resistor across DA and DB at both ends of communication line.
When this unit is located at an end, turn the terminating resistor SW ON.
The Host PC can be located at not only both ends but also any node of the of communication line.

MODBUS - BASICS

This device conforms with Modbus-RTU protocol (MODBUS APPLICATION PROTOCOL V1.1a / Modbus over Serial Line Specification & Implementation Guide V1.0).
The following communication parameters are selectable.

COMM. PROPERTY	SELECTION
Modbus address	1 to 99
Baud rate	4800 bps 9600 bps 19200 bps 38400 bps (*)
Parity bit	None Odd (*) Even
Stop bit	1 bit (*) 2 bits
Protocol	Modbus-RTU (Data length 8 bits) (*) Modbus-ASCII (Data length 7 bits)

(*) Factory setting

When appropriately set, the host PC connected via RS-485 can read measurands from and write configurations (setting) to the device.
All registers are assigned to Holding Registers, can be read out using Read Holding Registers or Read Input Registers command. If reading an address with no assigned register is attempted, '0' is given.
Write Multiple Registers command is used to write registers. If writing an address with no assigned register is attempted, 'Exception' is given.

FUNCTION CODE	COMMAND	RECOMMENDED TIME OUT VALUE
03	Read Holding Registers	0.5 seconds
04	Read Input Registers	0.5 seconds
16	Write Multiple Registers	2 seconds

These commands enable reading measurands and writing configurations.
One (1) word registers are represented in 16-bit integers, while two (2) word registers are in 32-bit. All registers are in the form of integer unless specifically given in the explanations.
The lower digit word in a 32-bit register is assigned to the lower address (n), while the upper digit word is assigned to the higher address (n+1).
The 32-bit register must be read out and written in single command sequence.

It is recommended to wait for a time period indicated under 'recommended time out value' in the above table to receive a response for a command. If no response is received for these time periods, take appropriate error processing such as retrying.

MODBUS - OPERATIONS

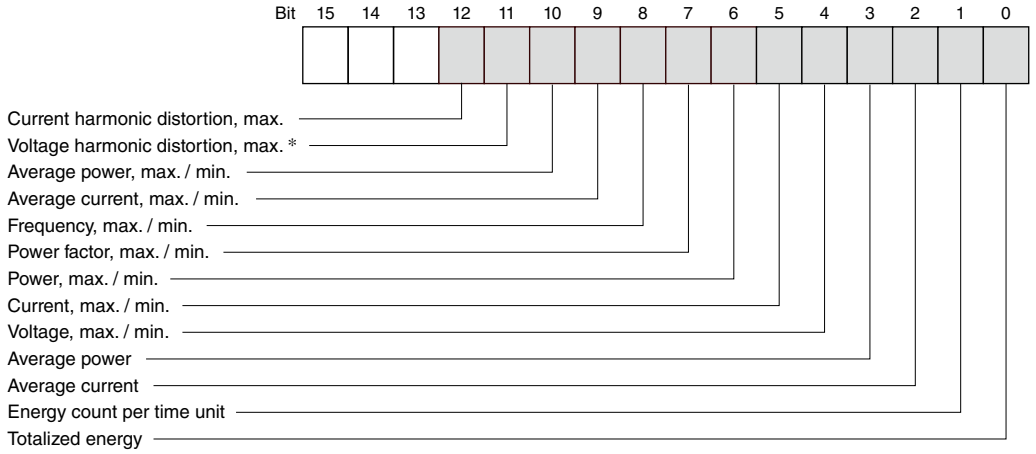
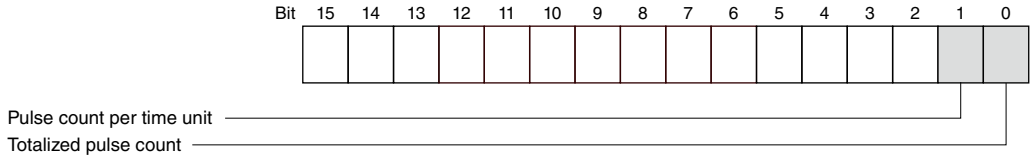
■ MODBUS REGISTER ACCESS SETTING

ADDR.	WORD	PARAMETER
8977	2	Passcode entry for deactivating Modbus register write protection Write a preset passcode in this register to deactivate the write protection via Modbus. When the value set in this register matches the preset passcode, '1' is set in the register address 8979 to enable writing in Modbus registers. The value set in this register cannot be read out. It reads always '-1' regardless of the set value. When writing in the Modbus registers for setting change is complete, be sure to set a value ('0' is recommended) other than the passcode to activate the write protection again.
8979	1	Modbus register access setting 0 : Write disable (*) 1 : Write enable Other : Write disable This setting is cleared when the power supply to the unit is removed. It always starts with '0' (Write disable) when the power supply is turned on. Set '1' before writing in other registers. Note that '1' (Write enable) cannot be written in this register when the Modbus register write protection passcode is preset and the write protection is enabled. Be sure to write the correct passcode in the register address 8977 before changing the register setting from '0' (Write disable) to '1' (Write enable).

(*) Factory setting

■ SYSTEM OPERATIONS

System operations include resetting accumulated values and rebooting.

ADDR.	WORD	PARAMETER
8993	1	Reboot system Write '10001' to reboot the system. (Any other values can be written but invalid.)
8994	2	Setting Modbus register write protection passcode Set a passcode for enabling/disabling writing in registers via Modbus. 0 : Cancel write protection (*) 1 to 999 999 999: The set value is used as the passcode Write the passcode in the register address 8977 before setting '1' in the address 8979 to deactivate the write protection. The value in this register is encrypted when it is read out. Only '0' (Cancel write protection) is read out as it is. When a new passcode is written, the register address 8979 is immediately reset to '0' so as to limit the next write command in access.
8996	1	Ch. 1 Reset count Resetting specific count values among the channel 1 counts by writing a bit pattern as shown below. Resetting is not executed for the bits set to '0.'  *Resetting voltage related values is available only at Ch. 1.
8997	1	Ch. 2 Reset count
8998	1	Ch. 3 Reset count
:	:	:
9003	1	Ch. 8 Reset count
9004	1	Ch. 9 Reset count (DI 1 Reset count) With the R9WTU-ED16 module, resetting specific count values among the DI 1 counts by writing a bit pattern as shown below. Resetting is not executed for the bits set to '0.'  With the R9WTU-EP8 module, Ch. 9 bit pattern is identical to that for Ch. 1.
9005	1	Ch. 10 Reset count (DI 2 Reset count)
9006	1	Ch. 11 Reset count (DI 3 Reset count)
:	:	:
9011	1	Ch. 16 Reset count (DI 8 Reset count)

MODBUS - SETTING

■ SYSTEM SETTING

ADDR.	WORD	PARAMETER	UNIT
9041	1	System configuration 0 : Single-phase / 2-wire (1CT) 1 : Single-phase / 3-wire (2CT) 2 : Three-phase / 3-wire, balanced load (1CT) 3 : Three-phase / 3-wire, unbalanced load (2CT) (*)	---
9042	1	Reserved	
9043	1	Reserved	
9044	2	VT rating, Primary 0 to 400 000 : Voltage (V) Factory setting : 110	V
9046	1	VT rating, Secondary 50 to 500 : Voltage (V) Factory setting : 110 The secondary can be set up to 500V. However, this does not mean the unit accepts 500V for input. Do not use with the condition exceeding input rating written in the specification sheet of the unit.	V
9047	1	Reserved	
9048	1	Reserved	
9049	1	Low-end cutout, Voltage 0 to 999 : Rated voltage × 0.001 × Specified value Factory setting : 10	%/10

(*) Factory setting

■ DEMAND SETTING

ADDR.	WORD	PARAMETER	UNIT
9057	1	Average (demand) current update interval 1 to 30 : Minutes Factory setting : 30 Data updated at the integral multiple minutes of the setting (e.g. Setting = 15 minutes, Updated at 0, 15, 30, and 45 minutes every hour)	Minutes
9058	1	Average (demand) power update interval 1 to 30 : Minutes Factory setting : 30 Data updated at the integral multiple minute of the setting	Minutes

■ STYLE SETTING

ADDR.	WORD	PARAMETER
9073	1	Power factor (PF1 through PF3, PF) sign 0 : Standard (IEC), Identical to the active energy (*) 1 : Special type 1 (IEEE), Positive in LAG, Negative in LEAD
9074	1	Reactive power (Q1 through Q3, Q) sign 0 : Standard (IEC), Positive from PF = 1.0 to 180° in LAG direction; Negative for the other direction (*) 1 : Special type 1, Positive in LAG, Negative in LEAD
9075	1	Reactive power (Q1 through Q3) calculation (Q = Q1 + Q2 + Q3) 0 : Standard (*) $Qn = \sqrt{Sn^2 - Pn^2}$ 1 : Reactive power meter method $Qn = \frac{1}{Nsmp} \sum_{i=1}^{Nsmp} (Uni - Nui)\, I_{i + (Nsmp / 4)}$
9076	1	Apparent power (S) calculation 0 : Standard (*) $S = \sqrt{P^2 + Q^2}$ 1 : Sum $S = S1 + S2 + S3$

Note: '1,' '2,' '3' in expressions like Q1, Q2, Q3 indicate 'R,' 'S,' 'T phases' respectively.

■ MODBUS SETTING

The device must be reset or the power supply to it must be turned off and on in order to enable the Modbus setting.

ADDR.	WORD	PARAMETER	UNIT
9089	1	Parity bit 0 : None 1 : Odd (*) 2 : Even	
9090	1	Stop bit 0 : 1 bit (*) 1 : 2 bits	
9091	4	Reserved	
9095	1	Protocol 0: Modbus-RTU (*) 1: Modbus-ASCII	
9096	1	RUN LED time out RUN LED turns off if the unit receives no Modbus command for the specified time period. 0 to 32 000 : Specified value × 0.1 seconds Factory setting: 10	Sec./10

■ DATE/TIME SETTING

The three registers must be written at once.

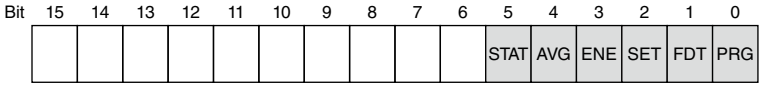
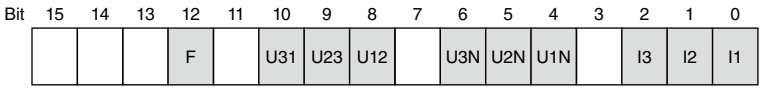
ADDR.	WORD	PARAMETER
9105	3	Current date/time setting Reading/writing the current date and time. Data/time is stored in BCD format in the following address:

Address	b15	b8	b7	b0
9105	BCD Year	(00 to 99)	BCD Month	(01 to 12)
9106	BCD Day	(01 to 31)	BCD Hour	(00 to 23)
9107	BCD Minute	(00 to 59)	BCD Second	(00 to 59)

■ SENSOR SETTING

ADDR.	WORD	PARAMETER	UNIT
9393	1	Ch. 1 CT rating, Primary 1 to 20 000 : Current (A) Factory setting : 5 Valid only for the sensor type CLSE-R5. Selected sensor's rating is automatically set for other types of sensors.	A
9394	1	Ch. 1 CT sensor type 0 : CLSE-R5 (*) 1 : CLSE-05 2 : CLSE-10 3 : CLSE-20 4 : CLSE-40 5 : CLSE-60 6 : Reserved 7 : Reserved	---
9395	1	Low-end cutout, Current Ch. 1 0 to 999 : Rated current × 0.001 × Specified value Factory setting : 10	%/10
9396	1	Reserved	
9397 : 9400	4	Ch. 2 setting Same as with the address 9393 through 9396	---
:	:	:	
9543 : 9456	1	Ch. 16 setting Same as with the address 9393 through 9396 Ch. 9 through 16 are valid only when the R9WTU-EP8 is used.	---

■ DEVICE STATUS

ADDR.	WORD	PARAMETER
9537	1	Ch. 1 and Ch. 2 System error Bit assignment as shown below.  PRG : Control software error FDT : Factory calibration data error SET : User setting data error ENE : Energy data error AVG : Average data error STAT : Maximum / minimum data error '1' is placed when the respective errors are detected. All measuring operations stop while one or more system errors are detected.
9538	1	Ch. 3 and Ch. 4 System error Same as with the address 9537
:	:	:
9544	1	Ch. 15 and Ch. 16 System error Same as with the address 9537 Ch. 9 through 16 are valid only when the R9WTU-EP8 is used.
9545	1	Ch. 1 Input overload Bit assignment as shown below.  F: Frequency I1: Line 1 current I2: Line 2 current I3: Line 3 current U1N : Phase 1 voltage U2N : Phase 2 voltage U3N : Phase 3 voltage U12 : Line 1 - 2 voltage U23 : Line 2 - 3 voltage U31 : Line 3 - 1 voltage '1' is placed at the bit where an overload is detected.
9546	1	Ch. 2 Input overload Same as with the address 9545
:	:	:
9560	1	Ch. 16 Input overload Same as with the address 9545 Ch. 9 through 16 are valid only when the R9WTU-EP8 is used.

■ **DEVICE INFORMATION**

ADDR.	WORD	PARAMETER
9601	1	Device ID 9901 : R9xWTU
9602	1	Device version Version number × 100 (e.g. Version 1.00 = 100)
9603	4	Serial No. Each character is stored in the following address: Address / Upper Byte / Lower Byte 9603 / 2nd / 1st 9604 / 4th / 3rd 9605 / 6th / 5th 9606 / 8th / 7th
9607	8	Tag name This register is writable. Each character is stored in the following address: Address / Upper Byte / Lower Byte 9607 / 2nd / 1st 9608 / 4th / 3rd 9609 / 6th / 5th 9610 / 8th / 7th 9611 / 10th / 9th 9612 / 12th / 11th 9613 / 14th / 13th 9614 / 16th / 15th
9623	1	Extension function flag Reading the following values depending upon the function: 0002H : RS-485 (Modbus RTU) 0080H : LonWorks 0100H : CC-Link 2000H : Modbus/TCP
9624	1	Number of discrete input 0 : None 8 : 8 points (with the R9WTU-ED16)
9625	1	Number of discrete output 0 : None 8 : 8 points (with the R9WTU-ED16)
9626	1	Reserved
9627	1	Number of circuits 8 : 8 circuits 16 : 16 circuits (with the R9WTU-EP8)
9628	1	Number of counters 0 : None 8 : 8 points (with the R9WTU-ED16)

MODBUS - MAPPING

■ PARAMETER TYPES

TYPE	WORD	UNIT	RANGE
Current	2	mA	0 to 2 000 000 000 mA
Voltage	2	V/100	0 to 20 000 000.00 V
Active power	2	W	-2 000 000 000 to 2 000 000 000 W
Reactive power	2	var	-2 000 000 000 to 2 000 000 000 var
Apparent power	2	VA	0 to 2 000 000 000 VA
Power factor	2	cos φ	-1.0000 to 1.0000
Frequency	2	Hz/100	0 or 40.00 Hz to 70.00 Hz
Active energy	2	kWh/10	0 to 99 999 999.9 kWh *1
Reactive energy	2	kvarh/10	0 to 99 999 999.9 kvarh *1
Harmonic distortion	1	%/10	0 to 999.9 %
Date/time	3	---	Each value is in BCD format. Year value represented in the offset from 2000. e.g. 100817160752h = Year 2010, August 17, 16:07:52 b48 b40 b39 b32 b31 b24 b23 b16 b15 b8 b7 b0 Year | Month | Day | Hour | Minute | Second

*1. Reset to 0 at overflow

■ ADDRESS

If base address and offset is given separately in the following tables, add both values to determine the address for a particular parameter.
[Example]
Ch. 1, Line 1 current, Present value = 65 + 0 = 65
Ch. 1, Line 1 current, Max. value = 65 + 10 = 75

• Voltage and Frequency

PARAMETER	PRESENT	MAX	MIN
Delta voltage, 1 – 2	1	17	33
Delta voltage, 2 – 3	3	19	35
Delta voltage, 3 – 1	5	21	37
Phase voltage, Phase 1	7	23	39
Phase voltage, Phase 2	9	25	41
Phase voltage, Phase 3	11	27	43
Total voltage *2	13	29	45
Frequency	15	31	47

*2. Total voltage
Single-phase/2-wire: Phase 1 voltage
Single-phase/3-wire: (Phase 1 + 3) / 2
Three-phase/3-wire: {Delta (1 – 2) + (2 – 3) + (3 – 1)} / 3

• Current

PARAMETER	BASE ADDRESS
BASIC UNIT	
Ch. 1 Current	65
Ch. 2 Current	97
Ch. 3 Current	129
Ch. 4 Current	161
Ch. 5 Current	193
Ch. 6 Current	225
Ch. 7 Current	257
Ch. 8 Current	289
R9WTU-EP8	
Ch. 9 Current	321
Ch. 10 Current	353
Ch. 11 Current	385
Ch. 12 Current	417
Ch. 13 Current	449
Ch. 14 Current	481
Ch. 15 Current	513
Ch. 16 Current	545

PARAMETER	OFFSET		
	PRESENT	MAX	MIN
Current, Line 1	+0	+10	+20
Current, Line 2	+2	+12	+22
Current, Line 3	+4	+14	+24
Neutral current	+6	+16	+26
Total current *3	+8	+18	+28

*3. Total current
Single-phase/2-wire: Line 1 current
Single-phase/3-wire: (Line 1 + 3) / 2
Three-phase/3-wire: (Line 1 + 2 + 3) / 3

• Power and Power Facto

PARAMETER	BASE ADDRESS
BASIC UNIT	
Ch. 1 Power, Power factor	577
Ch. 2 Power, Power factor	673
Ch. 3 Power, Power factor	769
Ch. 4 Power, Power factor	865
Ch. 5 Power, Power factor	961
Ch. 6 Power, Power factor	1057
Ch. 7 Power, Power factor	1153
Ch. 8 Power, Power factor	1249
R9WTU-EP8	
Ch. 9 Power, Power factor	1345
Ch. 10 Power, Power factor	1441
Ch. 11 Power, Power factor	1537
Ch. 12 Power, Power factor	1633
Ch. 13 Power, Power factor	1729
Ch. 14 Power, Power factor	1825
Ch. 15 Power, Power factor	1921
Ch. 16 Power, Power factor	2017

PARAMETER	OFFSET		
	PRESENT	MAX	MIN
Active power, Phase 1	+0	+32	+64
Active power, Phase 2	+2	+34	+66
Active power, Phase 3	+4	+36	+68
Active power	+6	+38	+70
Reactive power, Phase 1	+8	+40	+72
Reactive power, Phase 2	+10	+42	+74
Reactive power, Phase 3	+12	+44	+76
Reactive power	+14	+46	+78
Apparent power, Phase 1	+16	+48	+80
Apparent power, Phase 2	+18	+50	+82
Apparent power, Phase 3	+20	+52	+84
Apparent power	+22	+54	+86
Power factor, Phase 1	+24	+56	+88
Power factor, Phase 2	+26	+58	+90
Power factor, Phase 3	+28	+60	+92
Power factor	+30	+62	+94

• Average (demand) (AVG)

PARAMETER	BASE ADDRESS
BASIC UNIT	
Ch. 1 Average	2113
Ch. 2 Average	2257
Ch. 3 Average	2401
Ch. 4 Average	2545
Ch. 5 Average	2689
Ch. 6 Average	2833
Ch. 7 Average	2977
Ch. 8 Average	3121
R9WTU-EP8	
Ch. 9 Average	3265
Ch. 10 Average	3409
Ch. 11 Average	3553
Ch. 12 Average	3697
Ch. 13 Average	3841
Ch. 14 Average	3985
Ch. 15 Average	4129
Ch. 16 Average	4273

PARAMETER	OFFSET				
	LATEST	MAX	MAX DATE/ TIME	MIN	MIN DATE/ TIME
Current AVG date/time	+0				
Current AVG	+3	+28	+30	+83	+85
Current AVG, Line 1	+5	+33	+35	+88	+90
Current AVG, Line 2	+7	+38	+40	+93	+95
Current AVG, Line 3	+9	+43	+45	+98	+100
Neutral current AVG	+11	+48	+50	+103	+105
Power AVG date/time	+13				
Active power AVG	+16	+53	+55	+108	+110
Reactive power AVG	+18	+58	+60	+113	+115
Apparent power AVG	+20	+63	+65	+118	+120

• Energy / Pulse Count

PARAMETER		BASE ADDRESS
BASIC UNIT		
Ch. 1 Energy		4417
Ch. 2 Energy		4481
Ch. 3 Energy		4673
Ch. 4 Energy		4737
Ch. 5 Energy		4929
Ch. 6 Energy		4993
Ch. 7 Energy		5185
Ch. 8 Energy		5249
EXTENSION UNIT		
R9WTU-EP8	R9WTU-ED16	BASE ADDRESS
Ch. 9 Energy	DI 1 Pulse count	5441
Ch. 10 Energy	DI 2 Pulse count	5505
Ch. 11 Energy	DI 3 Pulse count	5697
Ch. 12 Energy	DI 4 Pulse count	5761
Ch. 13 Energy	DI 5 Pulse count	5953
Ch. 14 Energy	DI 6 Pulse count	6017
Ch. 15 Energy	DI 7 Pulse count	6209
Ch. 16 Energy	DI 8 Pulse count	6273

PARAMETER		OFFSET
BASIC UNIT R9WTU-EP8	R9WTU-ED16	
Totalized energy*	Totalized pulse count*	+0
Totalized reactive energy (LAG)*	Reserved	+2
Energy, last 1 hour	Pulse count, last 1 hour	+6
Energy, last 1 minute	Pulse count, last 1 minute	+8
Energy, 0 to 1 (o'clock)	Pulse count, 0 to 1 (o'clock)	+10
Energy, 1 to 2	Pulse count, 1 to 2	+12
Energy, 2 to 3	Pulse count, 2 to 3	+14
Energy, 3 to 4	Pulse count, 3 to 4	+16
Energy, 4 to 5	Pulse count, 4 to 5	+18
Energy, 5 to 6	Pulse count, 5 to 6	+20
Energy, 6 to 7	Pulse count, 6 to 7	+22
Energy, 7 to 8	Pulse count, 7 to 8	+24
Energy, 8 to 9	Pulse count, 8 to 9	+26
Energy, 9 to 10	Pulse count, 9 to 10	+28
Energy, 10 to 11	Pulse count, 10 to 11	+30
Energy, 11 to 12	Pulse count, 11 to 12	+32
Energy, 12 to 13	Pulse count, 12 to 13	+34
Energy, 13 to 14	Pulse count, 13 to 14	+36
Energy, 14 to 15	Pulse count, 14 to 15	+38
Energy, 15 to 16	Pulse count, 15 to 16	+40
Energy, 16 to 17	Pulse count, 16 to 17	+42
Energy, 17 to 18	Pulse count, 17 to 18	+44
Energy, 18 to 19	Pulse count, 18 to 19	+46
Energy, 19 to 20	Pulse count, 19 to 20	+48
Energy, 20 to 21	Pulse count, 20 to 21	+50
Energy, 21 to 22	Pulse count, 21 to 22	+52
Energy, 22 to 23	Pulse count, 22 to 23	+54
Energy, 23 to 24	Pulse count, 23 to 24	+56
Max. energy	Max. pulse count	+58
Max. energy data/time	Max. pulse count date/time	+60

*. The value can be preset by writing. (Ver.1.30 or later)

• Voltage Harmonic Distortion (HD)

PARAMETER	PRESENT	MAX
Delta voltage HD, 1 – 2	6465	6473
Delta voltage HD, 2 – 3	6466	6474
Delta voltage HD, 3 – 1	6467	6475
Phase voltage HD, Phase 1	6468	6476
Phase voltage HD, Phase 2	6469	6477
Phase voltage HD, Phase 3	6470	6478

• Current Harmonic Distortion (HD)

PARAMETER	BASE ADDRESS
BASIC UNIT	
Ch. 1 Current HD	6481
Ch. 2 Current HD	6489
Ch. 3 Current HD	6497
Ch. 4 Current HD	6505
Ch. 5 Current HD	6513
Ch. 6 Current HD	6521
Ch. 7 Current HD	6529
Ch. 8 Current HD	6537
R9WTU-EP8	
Ch. 9 Current HD	6545
Ch. 10 Current HD	6553
Ch. 11 Current HD	6561
Ch. 12 Current HD	6569
Ch. 13 Current HD	6577
Ch. 14 Current HD	6585
Ch. 15 Current HD	6593
Ch. 16 Current HD	6601

PARAMETER	OFFSET	
	PRESENT	MAX
Current HD, Line 1	+0	+4
Current HD, Line 2	+1	+5
Current HD, Line 3	+2	+6
Neutral current HD	+3	+7

• Voltage Harmonic Content (HC)

PARAMETER	3rd	5th	...	29th	31st
Delta voltage HC, 1 – 2	6609	6610	...	6622	6623
Delta voltage HC, 2 – 3	6625	6626	...	6638	6639
Delta voltage HC, 3 – 1	6641	6642	...	6654	6655
Phase voltage HC, Phase 1	6657	6658	...	6670	6671
Phase voltage HC, Phase 2	6673	6674	...	6686	6687
Phase voltage HC, Phase 3	6689	6690	...	6702	6703

• Current Harmonic Content (HC)

PARAMETER	BASE ADDRESS
BASIC UNIT	
Ch. 1 Current HC	6705
Ch. 2 Current HC	6769
Ch. 3 Current HC	6833
Ch. 4 Current HC	6897
Ch. 5 Current HC	6961
Ch. 6 Current HC	7025
Ch. 7 Current HC	7089
Ch. 8 Current HC	7153
R9WTU-EP8	
Ch. 9 Current HC	7217
Ch. 10 Current HC	7281
Ch. 11 Current HC	7345
Ch. 12 Current HC	7409
Ch. 13 Current HC	7473
Ch. 14 Current HC	7537
Ch. 15 Current HC	7601
Ch. 16 Current HC	7665

PARAMETER	OFFSET				
	3rd	5th	...	29th	31st
Current HC, Line 1	+0	+1	...	+13	+14
Current HC, Line 2	+16	+17	...	+29	+30
Current HC, Line 3	+32	+33	...	+45	+46
Neutral current HC	+48	+49	...	+61	+62

• Discrete Input (DI)

'0' is read if the R9WTU-ED16 is not used.

ADDR.	WORD LENGTH	PARAMETER
7745	1	DI 1 Status 0 : OFF 1 : ON
7746	1	DI 2 Status 0 : OFF 1 : ON
7747	1	DI 3 Status 0 : OFF 1 : ON
7748	1	DI 4 Status 0 : OFF 1 : ON
7749	1	DI 5 Status 0 : OFF 1 : ON
7750	1	DI 6 Status 0 : OFF 1 : ON
7751	1	DI 7 Status 0 : OFF 1 : ON
7752	1	DI 8 status 0 : OFF 1 : ON

• Pulse Count

'0' is read if the R9WTU-ED16 is not used.
The value can be preset by writing.

ADDR.	WORD LENGTH	PARAMETER
7777	2	DI 1 Pulse count Pulse train input at DI 1 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7779	2	DI 2 Pulse count Pulse train input at DI 2 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7781	2	DI 3 Pulse count Pulse train input at DI 3 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7783	2	DI 4 Pulse count Pulse train input at DI 4 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7785	2	DI 5 Pulse count Pulse train input at DI 5 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7787	2	DI 6 Pulse count Pulse train input at DI 6 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7789	2	DI 7 Pulse count Pulse train input at DI 7 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
7791	2	DI 8 Pulse count Pulse train input at DI 8 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.

• Discrete Output (DO)

'Exception' is given if the R9WTU-ED16 is not used.

ADDR.	WORD LENGTH	PARAMETER
7841	1	DO 1 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7842	1	DO 2 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7843	1	DO 3 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7844	1	DO 4 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7845	1	DO 5 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7846	1	DO 6 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7847	1	DO 7 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON
7848	1	DO 8 Output contact at the Extension Unit is turned on/off by writing in the address. 0 : OFF / 1 : ON

DATA LOGGING IN SD CARD

■ GENERAL DESCRIPTION

The R9MWTU is equipped with a SD card slot.
The unit transfers to the card at 0 minute every hour its internal memory data: energy per hour; and voltage, current, power and energy per minute.
A 4-GB SD card can store information of 8 channels for approx. 16 years.

■ TIMING

Data recording is started from 0 minute of the hour when the card is inserted.
For example, if it is inserted at 9:50, data from 9:00 to 10:00 is transferred to the card at 10:00, and later data is added every hour until the card is extracted. (If the unit has been started later than 9:00, data before the startup is not available.)
If the card is not in the unit on the hour, data transfer is not executed and the internal data is automatically erased until one is inserted to the unit again.
The SDCard LED starts blinking 30 seconds before the hour every hour for noticing start of writing operation.
DO NOT extract the card while the LED is blinking until the writing is complete.
If the card is extracted or the power supply to the unit is turned off while it is writing, stored data may be destroyed and inaccessible.

■ SD CARD

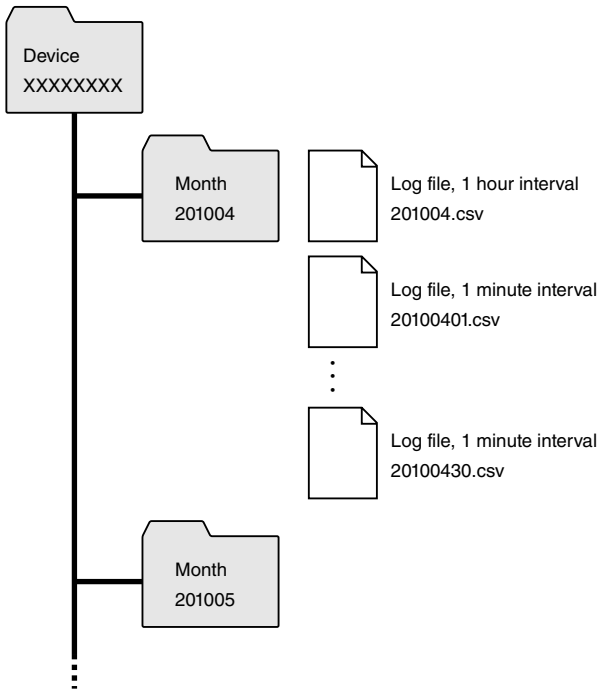
Prepare one of the following types of memory card:
- Manufacturer: Hagiwara Solutions
  Model: NSD6-004GH(A00SDI (discontinued),
  NSDA-004GT (discontinued),
  NSDA-004GL (discontinued),
  NSD6-004GH(B21SEI
- Manufacturer: Apacer Technology
- Model: AP-ISD04GIS4B-T, AP-ISD04GIS4B-3T

WE ARE NOT LIABLE FOR ANY LOSS OF DATA.
Data may be lost in but not limited to the following cases:
- Wrong handling of the card
- Static or electric noise interference
- When the card is extracted or when the power supply to the unit is turned off while it is accessed.
- When formatting SD card, use a dedicated software “SD Card Formatter”.
- “SD Card Formatter” is downloadable at SD Association’s web site.
  https://www.sdcard.org

■ CALENDAR

The incorporated calendar IC is backed up with a battery which enables the calendar backup for 2 years with no external power supply.
We recommend that the power supply is maintained as long as possible while the SD card is used.
The battery does not wear while the external power is supplied, however, the calendar cannot be backed up after the total elapsed time without power supply exceeds 2 years.
The unit indicates a calendar error with POWER LED, and resets the date and time to Year 2000, January 1, 00:00:00. Refer to “COMPONENT IDENTIFICATION” section. Set the date and time again in such a case.
Once the backup battery life is expired, the unit indicates the same error every time the power supply to it is turned on.

■ DIRECTORY



• Device Folder

A data folder inherent to the device is automatically created, and monthly folders are created in it.
Device folder is identified with the device’s serial number (8 characters).

• Monthly Folder

Monthly folders are identified with year (4 characters) and month (2 characters). All log files for the designated month are stored in it.

• Log File, 1 Hour Interval

Energy (watthour) and pulse counts per hour for each channel is stored on the hour every hour.
Each data storage cycle takes 1 row, and at the maximum of 1 month data is stored in a CSV (divided with comma) format file. The first row of the file contains the data contents descriptions and the second contains the engineering unit descriptions.

PARAMETER	DATE	TIME	Ch. 1 Energy	Ch. 2 Energy	....	Ch. 8 Energy*1	DI 1 Pulse Count*2	DI 2 Pulse Count*2	....	DI 8 Pulse Count*2
Row 1 Comment	Date	Time	1ch-EP	2ch-EP		8ch-EP	DI1-count	DI2-count		DI8-count
Row 2 Unit			kWh	kWh		kWh	pulse	pulse		pulse
Example	2010/08/25	10:00	123.4	123.4		123.4	4567	4567		4567
	2010/08/25	11:00	123.4	123.4		123.4	4567	4567		4567

• Log File, 1 Minute Interval

Voltage, current, power, energy (watthour), and pulse counts per minute for each channel is stored.
Data transfer for the whole hour to the SD card is executed only at the same moment as for the hourly data.
Each data storage cycle takes 1 row, and at the maximum of 1 day data is stored in a CSV (divided with comma) format file. The first row of the file contains the data contents descriptions and the second contains the engineering unit descriptions.

PARAMETER	DATE	TIME	Voltage 1	Voltage 2	Voltage 3	Ch.1 Current 1	Ch. 1 Current 2	Ch. 1 Current 3	Ch. 2 Current 1	
Row 1 Comment	Date	Time	U1	U2	U3	1ch-I1	1ch-I2	1ch-I3	2ch-I1	
Row 2 Unit			V	V	V	A	A	A	A	....
Example	2010/08/25	10:00	110.00	110.00	110.00	5.000	5.000	5.000	5.000	
	2010/08/25	10:01	110.00	110.00	110.00	5.000	5.000	5.000	5.000	

....	Ch. 8 Current 3*1	Ch. 1 Power	Ch. 2 Power	....	Ch. 8 Power*1	Ch. 1 Energy	Ch. 2 Energy	....	Ch. 8 Energy*1	DI 1 Pulse Count*2	DI 2 Pulse Count*2	....	DI 8 Pulse Count*2
	8ch-I3	1ch-P	2ch-P		8ch-P	1ch-EP	2ch-EP		8ch-EP	DI1-count	DI2-count		DI8-count
	A	kW	kW		kW	kWh	kWh		kWh	pulse	pulse		pulse
	5.000	1.650	1.650		1.650	12.3	12.3		12.3	456	456		456
	5.000	1.650	1.650		1.650	12.3	12.3		12.3	456	456		456

*1. Up to 16 channels with the R9WTU-EP8
*2. DI pulse counts are recorded only with the R9WTU-ED16

Voltage and current data are assigned as in the following table.

Three-phase / 3-wire	Voltage 1	Delta voltage, 1 – 2	Single-phase / 3-wire	Voltage 1	Phase voltage, Phase 1	Single-phase / 2-wire	Voltage 1	Phase voltage, Phase 1
	Voltage 2	Delta voltage, 2 – 3		Voltage 2	Phase voltage, Phase 3		Voltage 2	0
	Voltage 3	Delta voltage, 3 – 1		Voltage 3	Delta voltage, 3 – 1		Voltage 3	0
	Current 1	Current, Line 1		Current 1	Current, Line 1		Current 1	Current, Line 1
	Current 2	Current, Line 2		Current 2	Current, Line 3		Current 2	0
	Current 3	Current, Line 3		Current 3	Neutral current		Current 3	0

LIGHTNING SURGE PROTECTION

We offer a series of lightning surge protector for protection against induced lightning surges. Please contact us to choose appropriate models.