

# AcuRev 2000

## Smart Metering System

### User's Manual



**ACCUENERGY**



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The information contained in this document is believed to be accurate at the time of publication, however, Accuenergy assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please ask the local representative for latest product specifications before ordering.

Please read this manual carefully before installation, operation and maintenance of AcuRev 2000 series meter. The following symbols in this manual are used to provide warning of danger or risk during the installation and operation of the meters.



**Electric Shock Symbol:** Carries information about procedures which must be followed to reduce the risk of electric shock and danger to personal health.



**Safety Alert Symbol:** Carries information about circumstances which if not considered may result in injury or death.

Prior to maintenance and repair, the equipment must be de-energized and grounded. All maintenance work must be performed by qualified, competent accredited professionals who have received formal training and have experience with high voltage and current devices. Accuenergy shall not be responsible or liable for any damages or injuries caused by improper meter installation and/or operation.

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## ***Welcome to AcuRev 2000!***

You have purchased an advanced, versatile, multifunction power meter.

Please note the following chapter descriptions in order to utilize the power meter properly.

Chapter 1 Introduces the basic AcuRev 2000 features and application areas.

Chapter 2 Introduces AcuRev 2000 installation and wiring methods in detail.

Chapter 3 Walks through how to operate AcuRev 2000 via the display panel, display measurement data and parameter settings.

Chapter 4 Introduces AcuRev 2000 functions with the included software.

Chapter 5 Introduces communication related information, including protocol format and parameter address table.

Appendix The appendix provides AcuRev 2000 technical specifications and ordering information.



# **Chapter 1 Introduction**

**1.1 Meter Overview**

**1.2 Areas of Application**

**1.3 AcuRev 2000 features**

## 1.1 Meter Overview

AccuRev 2000 series performs real-time metering, measures energy consumption and monitors power quality for up to 18 single phase circuits(or 6 three phase circuits)in one unit. It is an advanced intelligent power meter that Accuenergy developed and manufactured for the next generation smart grids. The main features include multi-tenants submetering, cyclic display, tamper proof, which make it highly suitable for large commercial facilities, residential apartments and industrial environments. AccuRev 2000 series has infrared, RS485 and Ethernet communication options as well as I/O options (e.g. Pulse Counting from water or gas meters), making it useful in energy management systems. Due to its communication capability, ease of installation and use, this product can be easily integrated into new and existing energy management systems.

### Measurement Function

Voltage: Line Voltage; Phase Voltage

Current: In-line Current; Each Tenant Current

Power and Power Factor: In-line and Each Tenant Power, Reactive Power, Apparent Power, Power Factor

Frequency: System Frequency

Demand: In-line and Each Tenant Power, Reactive Power, Apparent Power and Current Demand.

### Energy Function

Energy (kWh) measurement meeting international standards.

Accuracy is Class 0.5.

It has Time of Use feature: 14 Seasons, 14 Schedules, 4 Tariffs, supporting weekend and holiday settings, supporting daylight saving time and 10-year holidays automatic

switching; It supports kWh pulse output.

### **System Event Logging**

This product runs self-check on systems. When an important operation is performed (such as reset, energy or demand clear, system parameter changes), it immediately records the event timestamp, event type (via event state word), and judges whether relay output needs to be sent.

### **Over/Under Limit Alarming**

Users can select parameters and set their setpoints. An alarm will be triggered when the setpoint is reached. At the same time, sound and light signals could be sent out via relay output. The time and reason of an alarm event will be recorded.

### **Power Quality Analysis**

Power quality parameters such as voltage and current THD, Odd harmonic distortion (Total Odd HD), even harmonic distortion (Total Even HD), 2 ~ 31 times the harmonic content, Current K-factor (KF), crest factor (CF), telephone interference factor (THFF), voltage and current unbalance etc. will be monitored.

### **I/O Option**

Standard output ports provide energy (kWh) pulse output and time pulse output; digital inputs (DI) provide pulse counting from water, electricity and gas meter, and monitor switch status; relay outputs (RO) react upon alarming conditions.

### **Data Logging and Load Trending**

With 8MB of onboard memory, AcuRev 2000 series can log real-time metering parameters, I/O status, and energy measurement. This information can be used for historical trending and system analysis.

### **Communication and Network**

Supports RS485 communication open protocol: Modbus RTU; supports 10/100M Ethernet interface with protocol ModBus-TCP, HTTP, SMTP, SNMP, DLMS/COSEM; meter reading via infrared port.

## 1.2 Areas of Application

Industrial environment

WARNING: This product shall be installed in an full enclosed industrial cabinet, the access to which is strictly limited to professional personnel.

## 1.3 AcuRev 2000 series Features

### Multifunction, Multi-Tenants

AcuRev 2000 multi-tenants intelligent power meter utilizes powerful data acquisition and processing functions, which implements real-time metering and monitoring for up to 18 single phase circuits (or 6 three phase circuits) in one unit. It will also record system events, over/under limit alarming and data logging functions.

### Innovative Display and Installation

Multi-tenant energy information is cycled through on the high resolution display. The display panel has two options: embedded in the unit or externally installed on a panel. Current input has two options: direct input 20(80A)or external CT model.

### Flexible Wiring

Users can choose measuring circuits and wiring methods. Measuring circuit can be selected as 9 or 18 single phases, three phase 3x3 or 3x6, Single-phase or three-phase hybrid access , including single phase out(1LN), three phase 4 out (3LN), single phase 3 out(2LN), where “out” means the load side, Inline defaults to 3-phase 4-line(3LN).

## Model Selection

AcuRev 2000 series has two models: AcuRev 2010(Basic Measurement) and AcuRev 2020(Multifunction). The function comparison is listed below:

● Standard; ○ Optional; Blank means Not Available

| Function            |                           | Parameter                    | AcuRev 2010 | AcuRev 2020 |
|---------------------|---------------------------|------------------------------|-------------|-------------|
| Energy              | Real Energy               | Ep                           | ●           | ●           |
|                     | Reactive Energy           | Eq                           |             | ●           |
|                     | Apparent Energy           | Es                           |             | ●           |
| TOU                 | 4 Tariffs, 14 Schedules   | TOU                          | ●           | ●           |
|                     | Daylight Saving Time      | DST                          | ●           | ●           |
|                     | Holidays                  |                              | ●           | ●           |
| Demand              | Power Demand              | Demad_P                      | ●           | ●           |
|                     | Power Demand Max          | Demad_P_max                  | ●           | ●           |
|                     | Reactive power Demand     | Demad_Q                      |             | ●           |
|                     | Reactive power Demand Max | Demad_Q_max                  |             | ●           |
|                     | Apparent Power Demand     | Demad_S                      |             | ●           |
|                     | Apparent Power Demand Max | Demad_S_max                  |             | ●           |
|                     | Current Demand            | Line & Each Tenant           |             | ●           |
|                     | Current Demand Max        | Line & Each Tenant           |             | ●           |
| Real-time Parameter | Voltage                   | V1, V2, V3;<br>V12, V23, V31 |             | ●           |
|                     | Current                   | Line & Each Tenant           |             | ●           |
|                     | Power                     | Line & Each Tenant           | ●           | ●           |
|                     | Reactive Power            | Line & Each Tenant           |             | ●           |
|                     | Apparent Power            | Line & Each Tenant           |             | ●           |
|                     | Power Factor              | Line & Each Tenant           |             | ●           |
|                     | Nature of the load        | Line & Each Tenant           |             |             |
|                     | Frequency                 | F                            |             | ●           |

|               |                                       |   |   |   |
|---------------|---------------------------------------|---|---|---|
| Power Quality | THD                                   | THD   |   | • |
|               | Individual Harmonic                   | 2nd-31st  |   | • |
|               | Current K Factor                      | KF  |   | • |
|               | Crest Factor                          | CF  |   | • |
|               | Voltage Unbalance                     | U_unbl  |   | • |
|               | Current Unbalance                     | I_unbl  |   | • |
|               | Voltage telephone interference factor | THFF  |   | • |
| Clock         | Year Month Day Hour<br>Minute Second  |   | • | • |
| Alarming      | Over/Under Limit<br>Alarm             |   | • | • |
| Data Logging  | Up to 8M                              |   | • | • |
| Communication | Infrared                              |   | • | • |
|               | RS485                                 | Modbus-RTU  | • | • |
|               |                                       | DL/T645   | ⊙ | ⊙ |
| Ethernet      | Modbus-TCP, HTTP,<br>SMTP, SNMP, SNTP | ⊙   | ⊙ |   |
| I/O           | 4DI                                   | Demand<br>Cycle, Second<br>Pulse, 2-channel<br>kWh Pulse Output | • | • |
|               | 8DI                                   | Digital Output/Pulse<br>Output                                  | ⊙ | ⊙ |
|               | 4RO                                   | channel Digital/<br>Alarming Output                             | ⊙ | ⊙ |
| Display       | LCD Display                           |   | • | • |

Table 1-1 Model Selection

## **Chapter 2 Installation**

**2.1 Appearance and Dimensions**

**2.2 Installation Methods**

**2.3 Wiring**

## Before Installation

❑ The installation must be performed by qualified, competent accredited professionals who have received formal training and have experience with high voltage and current devices. Appropriate safety wear (gloves, glasses, arc flash suit, etc.) is mandatory to ensure safe installation.

❑ During normal meter operation, caution should be used when handling the following as high voltage may be present: Terminal Blocks, Current Transformer connection nodes, Potential Transformer connection nodes and the related circuits. All primary and secondary circuits may contain lethal current and voltage. Contact with current channels must be avoided.

❑ The power meter and I/O modules cannot be installed on the primary side of transformers or where VA has limitations. The power meter can be only installed on the secondary side. Avoid contact with meter terminals after the completion of installation.

❑ Do not input voltage above the rated maximum limit of the power meter and devices connected to it. Before energizing the meter, please refer to the meter's label and specifications.

❑ Do not perform high voltage test / insulation experiment to output, input or communication terminals.

❑ The use of shorting blocks and fuses are recommended. Current transformers need to be grounded.

❑ Use dry cloth to wipe the meter.

❑ The replace of the Battery must be performed by professionals.

**Note: Failure to follow manufacturer guidelines for installation and use may compromise the safety of the meter and the user.**

**Note: Any repair should only be performed by the manufacturer.**

A switch or circuit breaker should be utilized in the equipment. The switch should be placed close to the equipment and easy to reach. The switch is regarded as a part of the breaking device.

## 2.1 Appearance and Dimensions

| Category               | Appearance             |
|------------------------|------------------------|
| Meter Base             | LxWxH 140x105.4x77.7mm |
| External CT Module(EM) | LxWxH 67x105.4x77.7mm  |
| Internal CT Module(DM) | LxWxH 153x105.4x77.7mm |
| Display Module         | LxWxH 72x72x26.5mm     |

Table 2-1 AcuRev 2000 Appearance

### Meter Base

If a Display Module is specified, an RJ45 jack is equipped in the Meter Base, where the attached cable should be plugged in to connect the Display Module to the Meter Base. See Figure 2-1.

If the Display Module is not specified, the Display Module is embedded in the Meter Base. See Figure 2-2.

Appearance:



Figure 2-1 Meter Base with external Display Module



Figure 2-2 Meter Base with embedded Display Module

### Dimensions

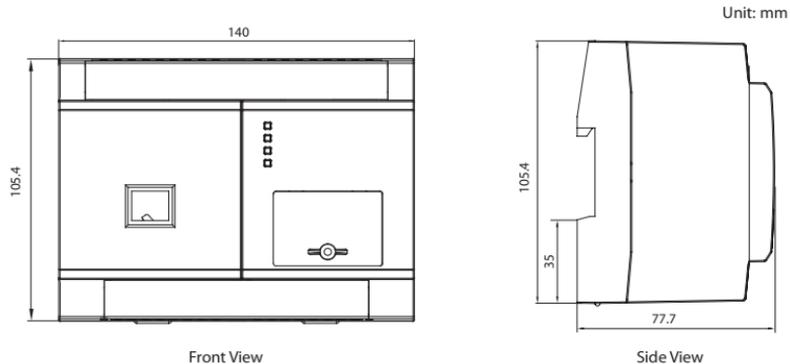


Figure 2-3 Meter Base dimensions

## Display Module

The Display Module can also be panel mounted.

### Appearance



Figure 2-4 Display Module

### Dimensions

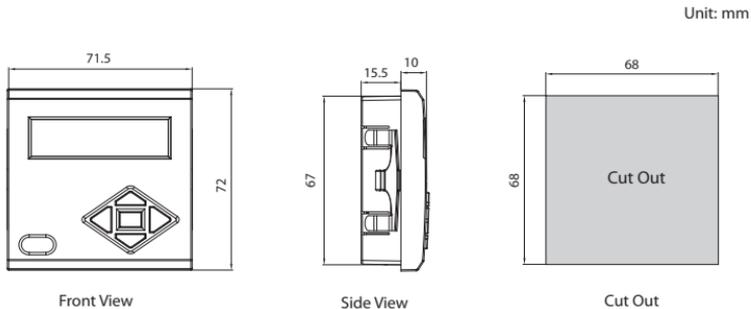


Figure 2-5 Display Module dimensions

## External CT Module(EM)

### Appearance



Figure 2-6 EM module appearance

### Dimensions

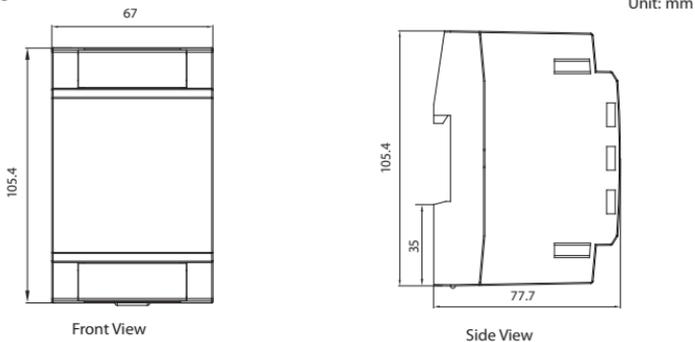


Figure 2-7 EM module dimensions

## Internal CT Module (DM: Direct Module)

### Appearance



Figure 2-8 DM module appearance

### Dimensions

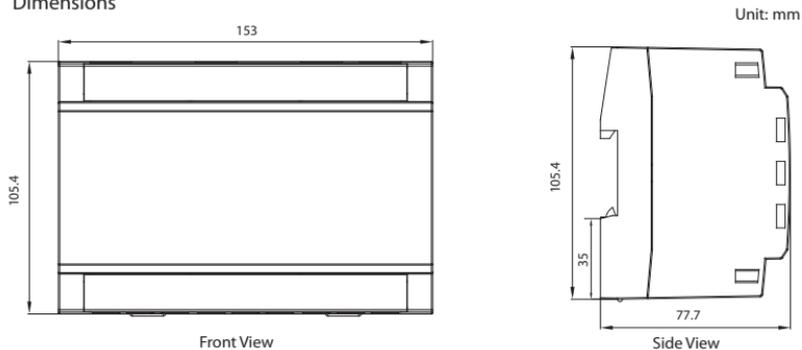


Figure 2-9 DM module dimensions

## 2.2 Installatin Methods

### Environmental

Before installation, please check the environment, temperature and humidity to ensure the AcuRev 2000 series meter is being placed where it will not be damaged.

#### 1. Temperature

AcuRev 2000 operating temperture is  $-25\sim 70^{\circ}\text{C}$ . Exceeding this temperature range will cause damage to the meter. Please note it can influence the meter life negatively if the meter operates in extremely high or extremely low temperatures. AcuRev 2000 storage temperature range is  $-40\sim 85^{\circ}\text{C}$ .

#### 2. Humidity

5% to 95% non-condensing.

#### 3. Location

AcuRev 2000 series meter should be installed in a dry and dust free environment. Avoid exposing meter to excessive heat, radiation and high electrical noise sources.

## Installation of Meter Base and Modules

Below are examples of the assembled meter and modules.

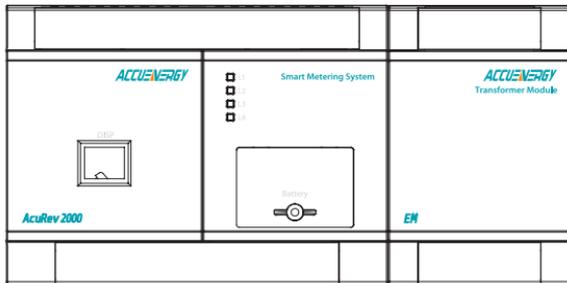


Figure 2-10 Meter Base connected with an EM module (9 channels)

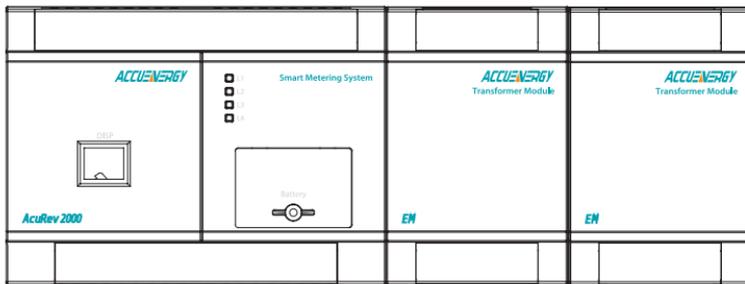


Figure 2-11 Meter Base connected with two EM modules (18 channels)

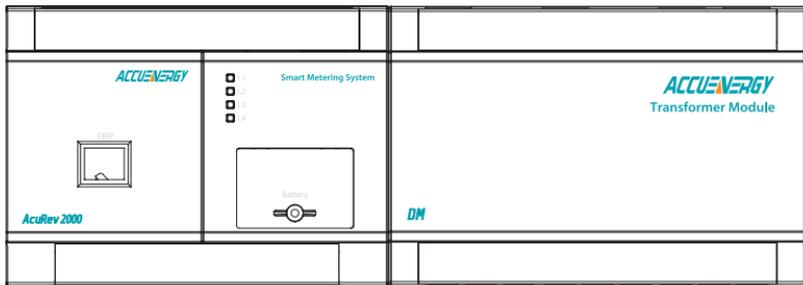


Figure 2-12 Meter Base connected with a DM module (9 channels)



Figure 2-13 Meter Base connected with two DM modules (18 channels)

## Installation Steps:

This meter is DIN rail mounted, which fits 35 mm standard rails.

1. Insert the meter groove all the way into the rail, and flip the meter case as Figure below shows, making the meter mounted into the rail.

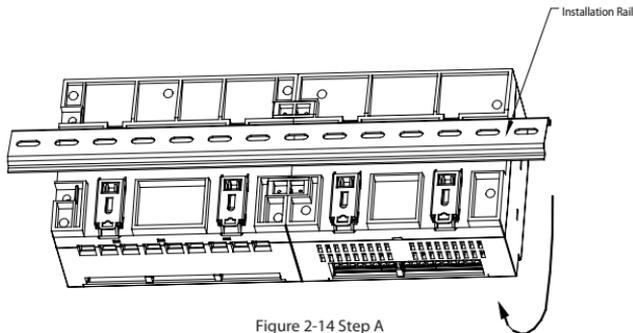


Figure 2-14 Step A

2. Use the metal clips to tighten the rail and installation will be completed.

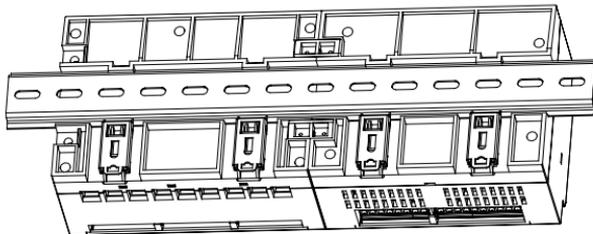


Figure 2-15 Step B

## Display Module Installtion

The Display Module is factory installed on the meter base. Users can use the meter base and display module combination directly. The following steps show how Display Module is installed.

1) Firstly, make a standard panel Cut Out as the Figure 2-16 shows. Unit: mm.

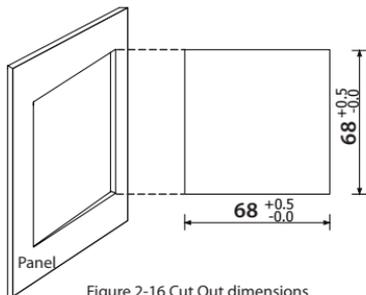


Figure 2-16 Cut Out dimensions

2) Remove the clips of Display Module, install the module into the Cut Out in the direction of arrow.

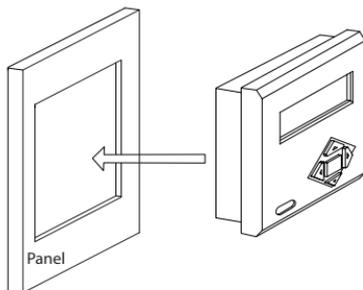


Figure 2-17 Insert Display Module into the Cut Out

3) Install the Display Module into the Cut Out. The module front panel will appear at the front of the Cut Out, the Meter Base case and wiring terminals will appear at the back of the Cut Out. Then, put on two installation clips following the grooves at the back of Display Module, and push forward to tighten the clips. Make sure the clip and the panel are joined tightly. Tighten the screws as Figure below shows and the installation is completed. See Figure 2-18.

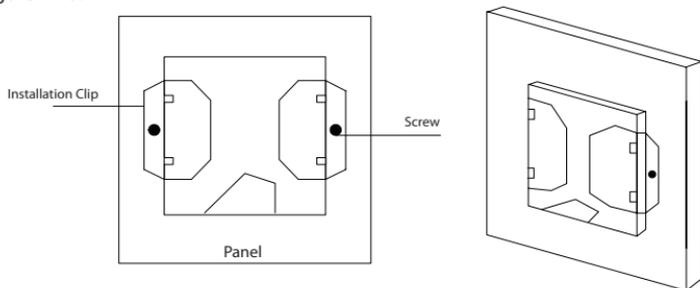


Figure 2-18 Use clips to affix the Display Module

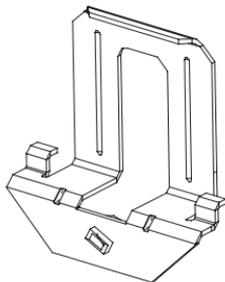


Figure 2-19 Installation Clip

## 2.3 Wiring

### Terminals

#### Meter Base Terminals

Upper row: Power Supply, Pulse Output, Communication, NET

Lower row: Digital Input, Relay Output.

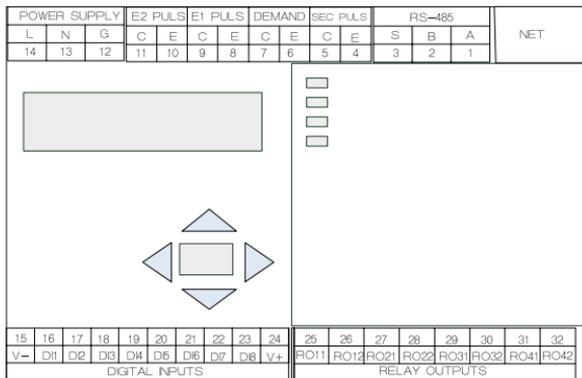


Figure 2-20 Meter Base Terminals

#### External CT Module(EM)Terminals

The upper row has voltage input terminals, the lower row has current input terminals. 9 channel inputs correspond to I1-19, it only requires one EM1 module. 18 inputs correspond to I1-18, it requires two modules: EM1 and EM2. The following figure shows 18 channel inputs.

| EM1                |  |     |  |     |  |     |  | EM2                |  |     |  |     |  |     |  |     |  |    |  |
|--------------------|--|-----|--|-----|--|-----|--|--------------------|--|-----|--|-----|--|-----|--|-----|--|----|--|
| VOLTAGE INPUTS     |  |     |  |     |  |     |  |                    |  |     |  |     |  |     |  |     |  |    |  |
| VN                 |  | V3  |  | V2  |  | V1  |  |                    |  |     |  |     |  |     |  |     |  |    |  |
| 33                 |  | 34  |  | 35  |  | 36  |  |                    |  |     |  |     |  |     |  |     |  |    |  |
|                    |  |     |  |     |  |     |  |                    |  |     |  |     |  |     |  |     |  |    |  |
| -                  |  | 38  |  | 40  |  | 42  |  | 44                 |  | 46  |  | 48  |  | 50  |  | 52  |  | 54 |  |
| 11                 |  | 12  |  | 13  |  | 14  |  | 15                 |  | 16  |  | 17  |  | 18  |  | 19  |  |    |  |
| *                  |  | 37  |  | 39  |  | 41  |  | 43                 |  | 45  |  | 47  |  | 49  |  | 51  |  | 53 |  |
| EM1 CURRENT INPUTS |  |     |  |     |  |     |  | EM2 CURRENT INPUTS |  |     |  |     |  |     |  |     |  |    |  |
| -                  |  | 56  |  | 58  |  | 60  |  | 62                 |  | 64  |  | 66  |  | 68  |  | 70  |  | 72 |  |
| 110                |  | 111 |  | 112 |  | 113 |  | 114                |  | 115 |  | 116 |  | 117 |  | 118 |  |    |  |
| *                  |  | 55  |  | 57  |  | 59  |  | 61                 |  | 63  |  | 65  |  | 67  |  | 69  |  | 71 |  |

Figure 2-21 External CT Module terminals

### Internal CT Module(DM)Terminals

The upper level has voltage input terminals, the lower level has voltage output terminals.

9 channel inputs corresponds to V1-V3, it only requires one DM1 module.18 channel inputs corresponds to V1-V6, it requires two modules: EM1 and EM2.

| DM1             |  |  |          |  |  |          |  |  | DM2             |  |  |          |  |  |          |  |  |          |  |  |     |  |  |     |  |  |
|-----------------|--|--|----------|--|--|----------|--|--|-----------------|--|--|----------|--|--|----------|--|--|----------|--|--|-----|--|--|-----|--|--|
| V1 INPUT        |  |  | V2 INPUT |  |  | V3 INPUT |  |  | VN              |  |  | V4 INPUT |  |  | V5 INPUT |  |  | V6 INPUT |  |  | VN  |  |  |     |  |  |
| 73              |  |  | 74       |  |  | 75       |  |  | 76              |  |  | 86       |  |  | 87       |  |  | 88       |  |  | 89  |  |  |     |  |  |
|                 |  |  |          |  |  |          |  |  |                 |  |  |          |  |  |          |  |  |          |  |  |     |  |  |     |  |  |
| 77              |  |  | 78       |  |  | 79       |  |  | 80              |  |  | 81       |  |  | 82       |  |  | 83       |  |  | 84  |  |  | 85  |  |  |
| V11             |  |  | V12      |  |  | V13      |  |  | V21             |  |  | V22      |  |  | V23      |  |  | V31      |  |  | V32 |  |  | V33 |  |  |
| VOLTAGE OUTPUTS |  |  |          |  |  |          |  |  | VOLTAGE OUTPUTS |  |  |          |  |  |          |  |  |          |  |  |     |  |  |     |  |  |
| 90              |  |  | 91       |  |  | 92       |  |  | 93              |  |  | 94       |  |  | 95       |  |  | 96       |  |  | 97  |  |  | 98  |  |  |
| V41             |  |  | V42      |  |  | V43      |  |  | V51             |  |  | V52      |  |  | V53      |  |  | V61      |  |  | V62 |  |  | V63 |  |  |
| VOLTAGE OUTPUTS |  |  |          |  |  |          |  |  | VOLTAGE OUTPUTS |  |  |          |  |  |          |  |  |          |  |  |     |  |  |     |  |  |

Figure 2-22 DM module terminals

## Aux. Power Supply

AcuRev 2000 power supply is 100-415Vac, 50/60Hz or 100-300Vdc, which are universally supported. If any other power supply is required, please contact the manufacturer. The power consumption of the power meter is low during normal operation, therefore, the power supply can be either via a standalone power supply or via the measured circuit. A regulator is recommended where the voltage is not stabilized. The power supply terminal number is L/N/G.

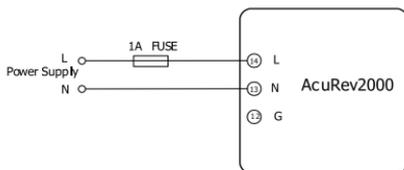


Figure 2-23 Power Supply wiring

Power Supply wiring is AWG22~16 or 0.6~1.5mm<sup>2</sup>.

A fuse or small size circuit breaker is mandatory for AcuRev 2000 Power Supply. The fuse recommendation is 1A/250Vac, time delay. If a circuit breaker is utilized, it must be CE certified and comply with IEC 947 standard.

An isolated transformer or EMC filter should be used in the auxiliary power supply loop if there is a power quality problem in the power supply.

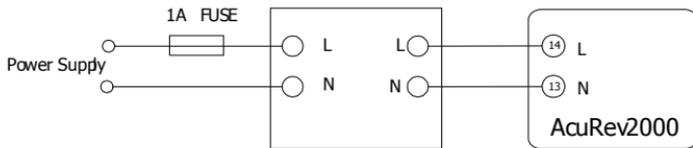


Figure 2-24 Power Supply wiring

## Voltage Input signal

400Vac L-N , 690Vac L-L.A fuse (typical 1A/250Vac) or air circuit breaker must be used in the voltage input loop.

## Current Input signal

Current Input has two options: Direct Connection or Via CT (Current Transformer) Connection. DM module is utilized in Direct Connection, while EM module is utilized in Via CT Connection.

For Direct Connection, each tenant maximum current is 80A, nominal current 20A.

For Via CT Connection, the CTs are solid core type, and should be installed first. The CT accuracy is 0.2%, options are 20A, 80A, 150A, 200A, 250A, 1000A Current transformer or 0.333V Voltage Transformer.

## Vn Connection

Vn is the voltage reference point of AcuRev 2000, a low resistance to Vn connection contributes to a better measurement accuracy. Vn connection is related to the system wiring. Please refer to "Wiring Methods" for details.

## Wiring Methods

AcuRev 2000 wiring methods can be selected in system parameter settings. Inline defaults to 3-phase 4-line(3LN), load wiring can be set to single-phase (1LN), three-phase four-wire (3LN), single-phase three-wire (2LN).

The followings introduces EM and DM wiring methods in those three scenarios.

1. Single phase out(1LN)

**EM:**

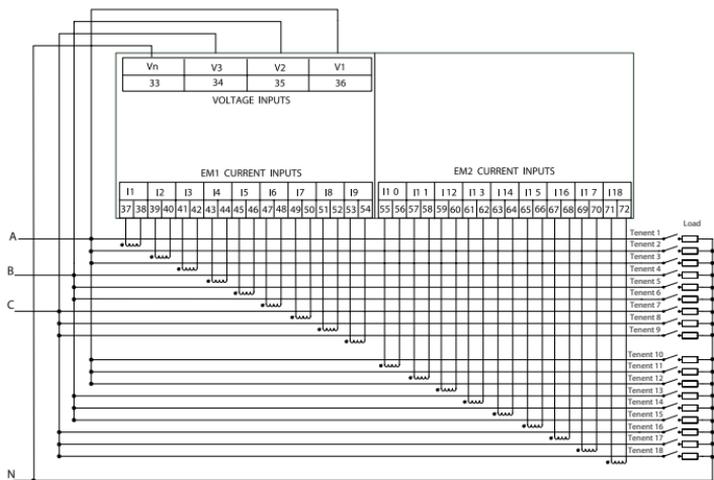
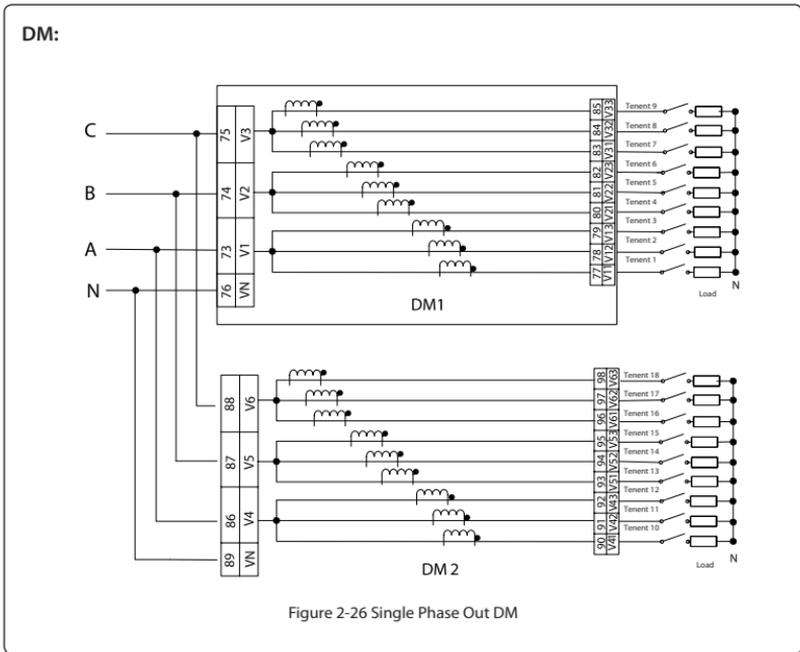


Figure 2-25 Single Phase Out EM



## 2. Three phase 4 out(3LN)

Table 2-2 Three Phase 4 Out current

|         | Tenant 1 | Tenant 2 | Tenant 3 | Tenant 4 | Tenant 5 | Tenant 6 |
|---------|----------|----------|----------|----------|----------|----------|
| Phase A | I1       | I2       | I3       | I10      | I11      | I12      |
| Phase B | I4       | I5       | I6       | I13      | I14      | I15      |
| Phase C | I7       | I8       | I9       | I16      | I17      | I18      |

EM:

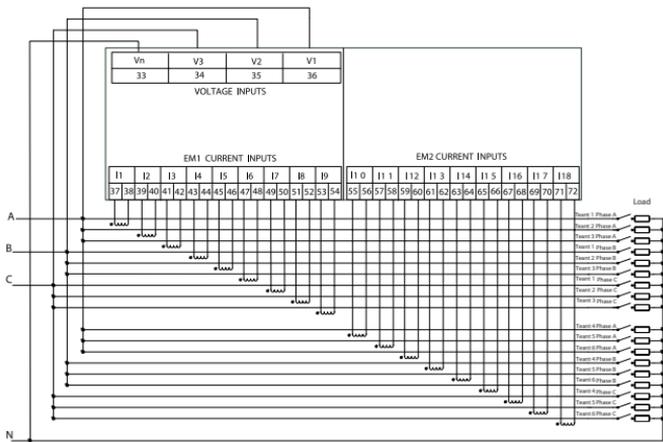


Figure 2-27 Three Phase 4 Out EM

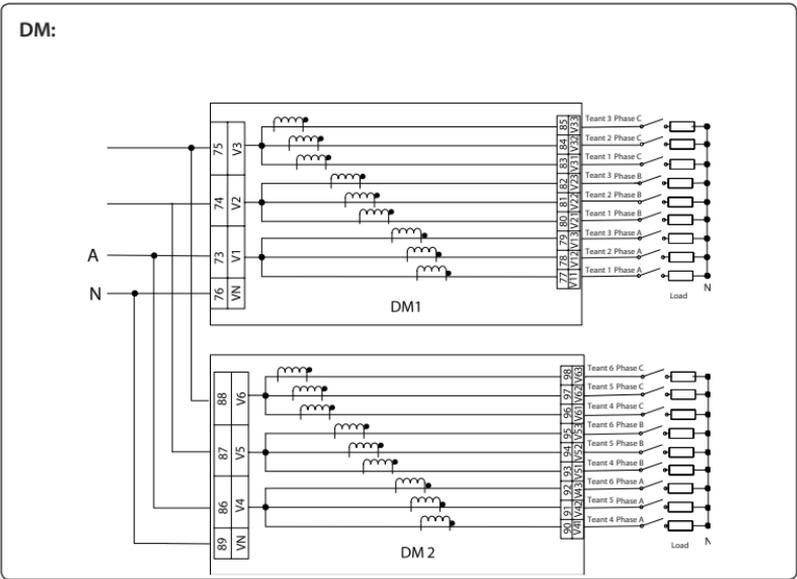


Figure 2-28 Three Phase 4 Out DM

## 3. Single phase 3 out(2LN)

EM:

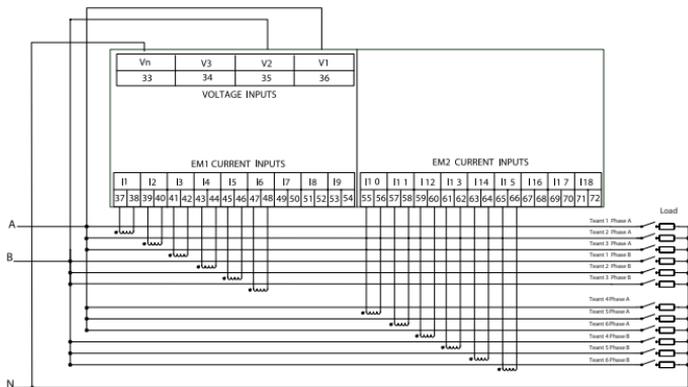


Figure 2-29 Single Phase 3 Out EM

DM:

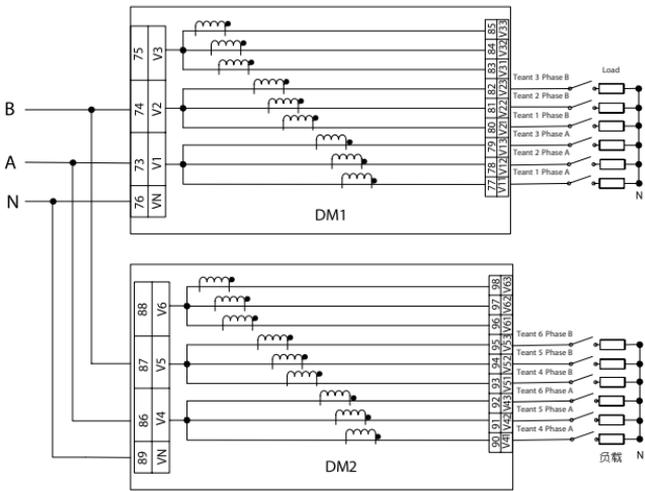


Figure 2-30 Single Phase 3 Out DM

## Communication

AcuRev 2000 communication utilizes RS485 port, via Modbus-RTU protocol. The wiring terminals are A, B, S(1, 2, 3). "A" is called differential signal "+", "B" is called differential signal "-", "S" is connected to the shielding of shielded twisted pair cable. The maximum distance of Shielded Twisted Pair cable is 1200 m. The distance will be shorter if more devices are on the same communication link or using a higher baud rate.

If the master device does not have RS485 but RS232 port, a RS232/485 converter can be utilized. Typical RS485 network topologies include line, circle and star (wye).

In order to improve communication quality, please pay attention to:

1. High-quality Shielded Twisted Pair cable is very important, AWG22 (0.6mm<sup>2</sup>) or lower is recommended. Two cables should be different colors.
2. Pay attention to "single point earthing". It means there is only one point of the shielding connected to ground in a single communication link.
3. Every A(+) should be connected to A(+), B(-) to B(-), or it will influence the network, even damage the communication interface.
4. "T" type connection topology should be avoided. This means no new branches except from the starting point.
5. Keep communication cables away as much as possible from sources of electrical noise.

When several devices are connected (daisy chain) to the same long communication line, an anti signal reflecting resistor (typical value 1200- 3000Ohm, 0.25W) is often used at the end of the circuit (the last meter of the chain) if the communication quality is distorted.

6. Use RS232/RS485 or USB/RS485 converter with optical isolated output and surge protection.

7. A infrared port is also available in the Display Module, which supports meter reading. AcuRev 2000 also supports 10/100M Ethernet (optional), its protocol is ModBus TCP, SMTP, HTTP, SNMP, SNTF.



## **Chapter 3 Meter Display and Operation**

**3.1 Display Panel and Keys**

**3.2 Energy Display and Operation**

**3.3 Demand Display and Operation**

**3.4 I/O Display and Operation**

**3.5 Parameter Settings**

**3.6 Shortcut Code**

**3.7 Real-time Parameters**

**3.8 Device Information**

**3.9 Network Settings**

**3.10 Meter information and key operation**

### 3.1 Meter Display and Operation

Chapter 2.1 shows the dimensions of Display Module. It consists of one LCD screen and five keys.

AcuRev 2000 innovative Display Module can be integrated into the meter base or the display module can also be mounted on the panel.

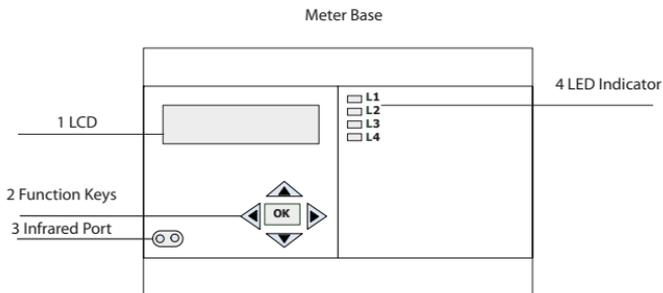


Figure 3-1 Display Module and LED Indicator

## Function Keys:

| Key |         | Function   |
|-----|---------|--|
| ▲   | Up      | Scroll up or increase value(Editing mode)          |
| ▼   | Down    | Scroll down or decrease value(Editing mode)        |
| ◀   | Left    | Decrease tenant number or move cursor to the left  |
| ▶   | Right   | Increase tenant number or move cursor to the Right |
| OK  | Confirm | Show menu or confirmation                          |

Table 3-1 Function Keys illustration

## Key Combination

Holding "Left" and "right" at the same time is quick exit function, In any screen, press this key combination can return to the main menu screen, basic settings and network settings are only available with this key combination to return to the main menu screen.

## Wiring type

The meter supports single-phase user (1LN) and three-phase four-line users (3LN) mixed use, single-phase user (1LN) and single-phase three-wire user (2LN) mixed use. In- line of all connection types according to the three-phase four-wire user (3LN) display.

## Display Mode

Display company name "ACCUENERGY" in LCD screen when powered up, after 2 seconds entering the main menu screen automatically. Arrow keys to move the cursor position, "OK" button to confirm and enter the corresponding menu. If you enter "M" quick code screen, the left and right keys to move the cursor, up and down keys to change the value, the "OK" button to confirm and enter the corresponding screen.

## Settings Mode

In the main menu screen, move the cursor to the setting icon, press “OK” to enter the settings mode. After the password screen, it will display language setting screen. Press “OK” to activate the cursor. When the cursor is inactive, arrow keys to scroll the screens. When the cursor is active, the cursor blinks, “Up” and “Down” to change the value where the cursor stays, “Left” and “Right” to move the cursor, “OK” is for confirmation.

#### LED indicator from top to bottom:

L1- Power Supply. Remains on when the meter is powered. Turns off when meter is not powered.

L2- Pulse Output 1. Blinking: E1 Pulse Output; Non-Blinking: no Pulse Output.

L3- Pulse Output 2. Blinking: E2 Pulse Output; Non-Blinking: no Pulse Output.

L4- Alarming. Blinking: when an alarm is triggered; Non-Blinking: no alarms.

#### Main menu first screen

| Menu Display   | Function             |
|----------------|----------------------|
| E(Energy)      | Energy Measurement   |
| D(Demand)      | Demand Measurement   |
| IO(IO)         | Digital Input Output |
| MUL(Real-time) | Real-time            |
| M              | Obtain Cursor        |

Table 3-2 Main menu first screen

#### Main menu second screen (AcuRev 2010 )

| Menu Display | Function           |
|--------------|--------------------|
| SET          | Basic Settings     |
| NET          | Network Settings   |
| INFO         | Device Information |

Table 3-3 Main menu second screen

Main menu second screen(AcuRev 2020)

| Menu Display | Function           |
|--------------|--------------------|
| PQ           | Harmonic           |
| SET          | Basic Settings     |
| NET          | Network Settings   |
| INFO         | Device Information |

Table 3-4 Main menu second screen(AcuRev 2020)

Main menu screen is shown in Table 3-2, the arrow keys to switch between menus.

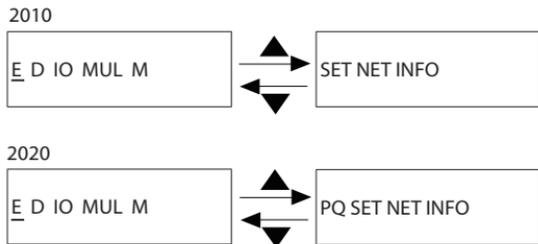


Table 3-2 Menu display

### 3.2 Energy Display and operation

On the first screen of main menu, select "E" by pressing "Left" and "Right", press "OK" to display energy. Press "Left" or "Right" to choose tenant and in line energy. Press "Up" and "Down" to select different screens. Press "OK" return to main menu screen.

If TOU energy is not used, it only displays real-time energy.

| Parameter                   | Screen |
|-----------------------------|--------|
| Real-time energy            | EP     |
| This Month Total Energy     | M TnS  |
| This Month Tariff 1 Energy  | MT1S   |
| This Month Tariff 2 Energy  | MT2S   |
| This Month Tariff 3 Energy  | MT3S   |
| This Month Tariff 4 Energy  | MT4S   |
| Prior Month Total Energy    | U TnS  |
| Prior Month Tariff 1 Energy | UT1S   |
| Prior Month Tariff 2 Energy | UT2S   |
| Prior Month Tariff 3 Energy | UT3S   |
| Prior Month Tariff 4 Energy | UT4S   |
| Reactive energy             | EQ     |
| Apparent energy             | ES     |

Table 3-6 Energy Display

Different wiring, energy data display is not the same, In-line default 3LN wiring, out-line has three ways: single-phase out (1LN), three-phase four-wire out (3LN), single-phase three-wire out (2LN), Details are as follows (AcuRev 2010 meter does not show the screen of yellow background):

### 1. Single Phase Out(1LN)

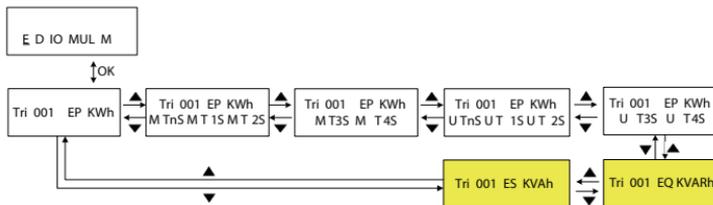


Figure 3-2 Single Phase Out energy display

## 2. Three Phase 4 Out (3LN)

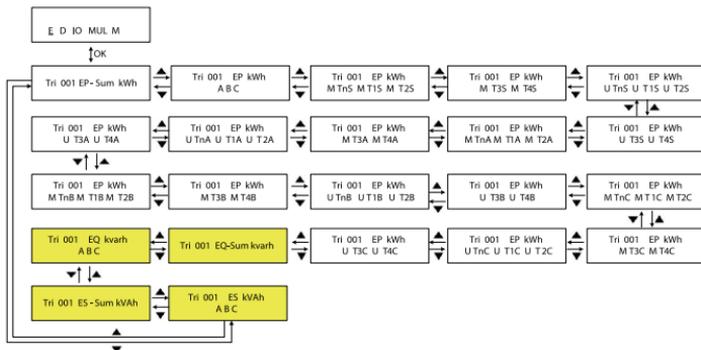


Figure 3-3 Three Phase 4 Out energy display

## 3. Single Phase 3 Out (2LN)

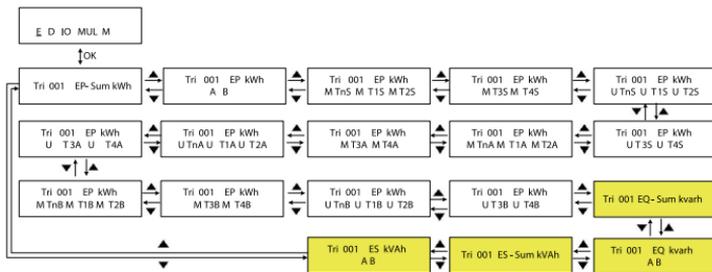


Figure 3-4 Single Phase 3 Out energy display

### 3.3 Demand Display and Operation

On the first page of the main menu, press "D", then press the "OK", the meter displays demands. "Left" and "Right" keys to select a different user or Inline. "Up" and "Down" keys to select the current user's different screen, press "OK" button to return to the main menu.

For AcuRev 2010, only displays the active power demand.

| Parameter        | Display |
|------------------|---------|
| Demand           | DMD     |
| Active Demand    | DMD-P   |
| Reactive Demand  | DMD-Q   |
| Apparent Demand  | DMD-S   |
| Current Demand   | DMD-I   |
| Predicted Demand | Pre     |
| Maximum Demand   | Max     |

Table 3-7 Demand display

Different wiring, demand data display is not the same. Details are as follows (AcuRev 2010 meter does not show the screens of yellow background):

#### 1. Single Phase Out(1LN)

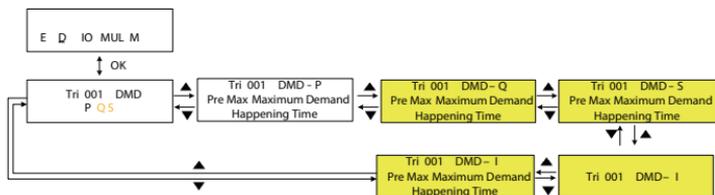


Figure 3-5 Single Phase Out demand display

## 2. Three Phase 4 Out (3LN)

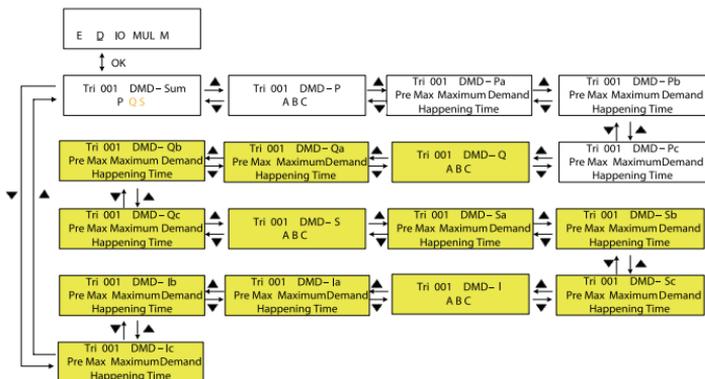


Figure 3-6 Three Phase 4 Out demand display

## 3. Single Phase 3 Out (2LN)

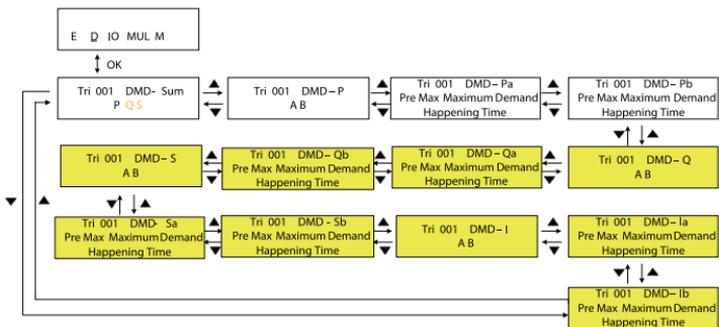


Figure 3-7 Single Phase 3 Out demand display

### 3.4 IO Display and Operations

On the first page of the main menu, press "left" and "right" to choose "IO" then press the center key, the meter displays IO data. "Up" and "Down" to select a different screen, the "OK" key to return to the main menu.

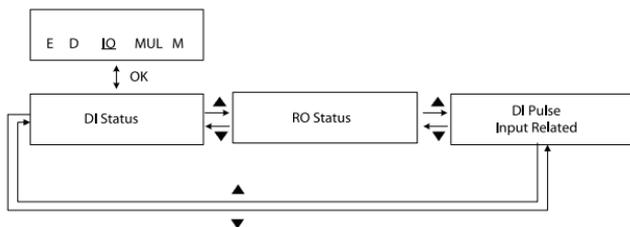


Figure 3-8 IO Display

## 1st screen, DI status, 8-channel DI

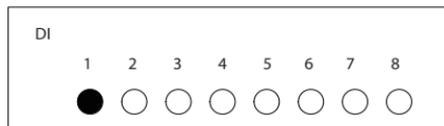
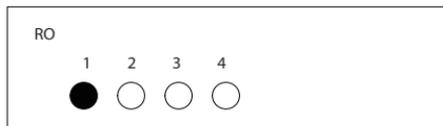


Figure 3-9 DI Display

- indicates this channel DI status "OFF" or Pulse Input
- indicates DI status "ON"

## 2nd screen, RO status, 4-channel RO



- indicates this channel RO status "OFF"
- indicates this RO status "ON"

Figure 3-10 RO Display

3rd screen, DI pulse input number and its parameter, press "Left" and "Right" to select different channel 1-8.

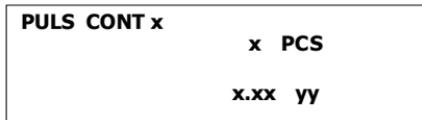


Figure 3-11 DI Pulse Input Display

CONT X indicates DI channel number

PCS indicates pulse number

yy indicates number, such as 6.15 m3 represents 6.15 m3

### 3.5 Real-time display and key operation

On the first screen of the main menu, select "MUL" (real-time), press the "OK" button, the meter displays real-time. "Left" and "right" keys to select a different user or inline, "up" and "down" keys to select the current user's different screen, the "OK" button to return to the main menu.

For Acurev2010, only display the active power.

| Parameter                | Screen Number |
|--------------------------|---------------|
| The total amount of time | MUL-Sum       |
| Active power             | MUL -P        |
| Reactive power           | MUL -Q        |
| Apparent power           | MUL -S        |
| Real-time current value  | MUL -I        |
| Power Factor             | MUL-PF        |
| Nature of the load       | MUL-Load Type |
| Phase voltage            | MUL-Phase U   |

|                       |            |
|-----------------------|------------|
| Phase voltage average | Uavg       |
| Line voltage          | MUL-Line U |
| Line voltage average  | Uavg       |

Different wiring, Real-time display is not the same. Details are as follows (AcuRev 2010 meter does not show the screen of yellow background):

### 1. Single Phase Out(1LN)

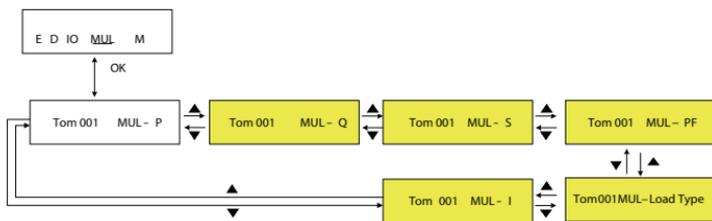


Figure 3-12 Single Phase Out real-time display

### 2. Three Phase 4 Out (3LN)

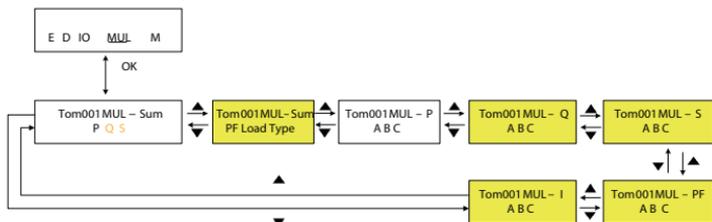


Figure 3-13 Three Phase 4 Out real-time display

### 3. Single Phase 3 Out (2LN)

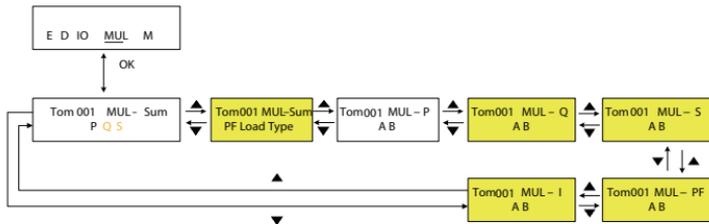


Figure 3-14 Single Phase 3 Out real-time display

### 4. Inline

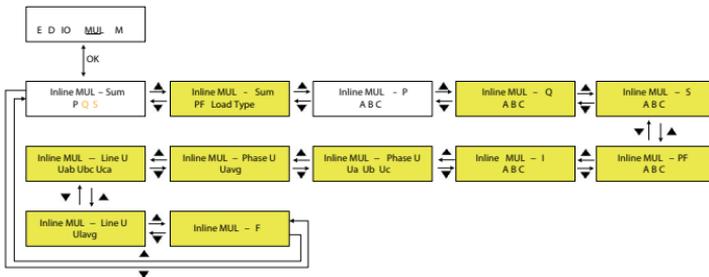


Figure 3-15 Inline real-time display

#### 3.6 Shortcut Code

On the first screen of main page, press "Left" and "Right" keys to choose "M", then press the "OK" key to enter Shortcut Keys page.

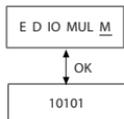


Figure 3-16

Press "Left" and "Right" to move the cursor to choose different digit. Press "Up" and "Down" key to change the digit value, after the input of Shortcut Code, press the center key to enter the corresponding pages.

Shortcut Code consists of five digits. The first digit on the left is to choose functions, as depicted in Table 3-8. 1 represents energy measurement, 2 represents demand measurement, 3 represents Digital Input Digital Output, 4 represents real-time, 5 represents Power Quality, all the other parameters do not have shortcut code.

| Function                     | Shortcut |
|------------------------------|----------|
| Energy Measurement           | 1        |
| Demand Measurement           | 2        |
| Digital Input Digital Output | 3        |
| Real-time Measurement        | 4        |
| Power Quality                | 5        |

Left in the second and third digits are the number of selection screen, the right side, the first and the second is to select the user number. When user Settings screen number is not correct or the selected user number is not enabled, the connection mode of the display module based on user and instrument types and set up accordingly.

When user Settings screen number is not correct or the selected user number is not enabled, **the connection mode of the display module based on user and instrument types and set up accordingly.**

Tip "USER WRONG" indicating that the user is not enabled;

Tip "SCREEN WRONG" setting screen instructions when the number exceeds the limit or chose not to support the screen

Different connection types are also different codes, detailed shortcut code corresponding to the screen, please follow this swift code table:

### 1. Single Phase Out(1LN)

Note "\*" to indicate that only Acurev2020 meter has feature

Note the "#" is enabled only content sharing

| Funtion   | Users | Screen Number | Code        | Content   | Note |
|---|-------|---------------|-------------|---|------|
| Energy<br>(No Time of Use, only real-time energy) | 1~18  | 1             | 10101~10118 | Real-time energy  |      |
|   |       | 2             | 10201~10218 | This month total energy, this month tariff 1 energy, this month tariff 2 energy.    | #    |
|   |       | 3             | 10301~10318 | This month tariff 3 energy, this month tariff 4 energy.                             | #    |
|   |       | 4             | 1~18        | Prior month total energy, prior month tariff 1 energy, prior month tariff 2 energy. | #    |
|   |       | 5             | 10501~10518 | Prior month tariff 3 energy, Prior month tariff 4 energy                            | #    |
|   |       | 6             | 10601~10618 | Reactive energy   | *    |
|   |       | 7             | 10701~10718 | Apparent energy   | *    |
| Demand  | 1~18  | 1             | 20101~20118 | Real power demand ,Reactive power demand, Apparent power demand                     | ①    |
|   |       | 2             | 20201~20218 | Real Power Demand prediction, Real Power Demand Peak and happening time             |      |

|                                  |                |   |             |   |   |
|----------------------------------|----------------|---|-------------|---|---|
| Demand                           | 1~18           | 3 | 20301~20318 | Reactive Power Demand prediction, Reactive Power Demand Peak and happening time | * |
|                                  |                | 4 | 20401~20418 | Apparent Power Demand prediction, Apparent Power Demand Peak and happening time | * |
|                                  |                | 5 | 20501~20518 | Current demand  | * |
|                                  |                | 6 | 20601~20618 | Current Demand prediction, Current Demand Peak and happening time               | * |
| Digital Input and Digital Output | DI Channel 1~8 | 1 | 30101~30108 | DI Status   |   |
|                                  |                | 2 | 30201~30208 | RO Status   |   |
|                                  |                | 3 | 30301~30308 | DI Pulse Input related  |   |
| Real-time                        | 1~18           | 1 | 40101~40118 | Real Power  |   |
|                                  |                | 2 | 40201~40218 | Reactive power  | * |
|                                  |                | 3 | 40301~40318 | Apparent power  | * |
|                                  |                | 4 | 40401~40418 | Power Factor  | * |
|                                  |                | 5 | 40501~40518 | Load Type   | * |
|                                  |                |   | 40601~40618 | Current   | * |
| Power Quality                    | 1~18           | 1 | 50101~50118 | Harmonic distortion, odd harmonic distortion, even harmonic distortion          | * |
|                                  |                | 2 | 50201~50218 | Current K-factor  | * |
|                                  |                | 3 | 50301~50318 | Harmonic of Current (2nd ~ 7th )  | * |
|                                  |                | 4 | 50401~50418 | Harmonic of Current (8th ~13th )  | * |
|                                  |                | 5 | 50501~50518 | Harmonic of Current (14th ~ 19th )  | * |
|                                  |                | 6 | 50601~50618 | Harmonic of Current (20th ~ 25th )  | * |
|                                  |                | 7 | 50701~50718 | Harmonic of Current (26th ~ 31st )  | * |

Note:

① Acurev2010 only include active power demand;

\*: The instrument is Acurev2010, enter an asterisk zone function code when prompted  
SCREEN WRONG

2. Three Phase 4 Out(3LN)

Description: 3LN number of screens begin to run from 21 to distinguish 1LN, 2LN

Note "\*" to indicate that only Acurev2020 meter has feature

Note the "#" is enabled only content sharing

| Function                                       | Users | Screen Number | Code        | Content   | Note |
|--|-------|---------------|-------------|---|------|
| Energy (No Time of Use, only real-time energy) | 1~18  | 1             | 12101~12118 | Total real energy   |      |
|  |       | 2             | 12201~12218 | Phase A,B,C real energy   |      |
|  |       | 3             | 12301~12318 | This month total power-sharing, this month tariff 1 energy, this month tariff 2 energy.                         | #    |
|  |       | 4             | 12401~12418 | This month tariff 3 energy, this month tariff 4 energy.   | #    |
|  |       | 5             | 12501~12518 | Prior month total power-sharing, prior month tariff 1 energy, prior month tariff 2 energy.                      | #    |
|  |       | 6             | 12601~12618 | Prior month tariff 3 energy, prior month tariff 4 energy.   | #    |
|  |       | 7             | 12701~12718 | Phase A this month total power-sharing. Phase A this month tariff 1 energy, Phase A this month tariff 2 energy. | #    |

|  |      |    |             |   |   |
|--|------|----|-------------|---|---|
| Energy (No Time of Use, only real-time energy) | 1~18 | 8  | 12801~12818 | Phase A this month tariff 3 energy, Phase A this month tariff 4 energy.                                     | # |
|  |      | 9  | 12901~12918 | Phase A prior month total energy, Phase A prior month tariff 1 energy, Phase A prior month tariff 2 energy. | # |
|  |      | 10 | 13001~13018 | Phase A prior month tariff 3 energy, Phase A prior month tariff 4 energy                                    | # |
|  |      | 11 | 13101~13118 | Phase B this month total energy. Phase B this month tariff 1 energy, Phase B this month tariff 2 energy.    | # |
|  |      | 12 | 13201~13218 | Phase B this month tariff 3 energy, Phase B this month tariff 4 energy.                                     | # |
|  |      | 13 | 13301~13318 | Phase B prior month total energy, Phase B prior month tariff 1 energy, Phase B prior month tariff 2 energy. | # |
|  |      | 14 | 13401~13418 | Phase B prior month tariff 3 energy, Phase B prior month tariff 4 energy                                    | # |
|  |      | 15 | 13501~13518 | Phase C this month total energy. Phase C this month tariff 1 energy, Phase C this month tariff 2 energy.    | # |
|  |      | 16 | 13601~13618 | Phase C this month tariff 3 energy, Phase C this month tariff 4 energy.                                     | # |

|  |      |    |             |   |   |
|--|------|----|-------------|---|---|
| Energy (No Time of Use, only real-time energy) | 1~18 | 17 | 13701~13718 | Phase C prior month total energy, Phase C prior month tariff 1energy, Phase C prior month tariff2 energy. | # |
|  |      | 18 | 13801~13818 | Phase C prior month tariff 3 energy, Phase C prior month tariff 4 energy                                  | # |
|  |      | 19 | 13901~13918 | Total reactive energy   | * |
|  |      | 20 | 14001~14018 | Phase A,B,C reactive energy   | * |
|  |      | 21 | 14101~14118 | Total apparent energy   | * |
|  |      | 22 | 14201~14218 | Phase A,B,C apparent energy   | * |
| Demand   | 1~18 | 1  | 22101~22118 | System active power demand, System reactive power demand, System apparent power demand                    | ① |
|  |      | 2  | 22201~22218 | Phase A,B,C active power demand   |   |
|  |      | 3  | 22301~22318 | Phase A Real Power Demand prediction, Phase A Real Power Demand Peak and happening time                   |   |
|  |      | 4  | 22401~22418 | Phase B Real Power Demand prediction, Phase B Real Power Demand Peak and happening time                   |   |
|  |      | 5  | 22501~22518 | Phase C Real Power Demand prediction, Phase C Real Power Demand Peak and happening time                   |   |
|  |      | 6  | 22601~22618 | Phase A,B,C Reactive power demand   | * |

|        |      |    |             |   |   |
|--------|------|----|-------------|---|---|
| Demand | 1~18 | 7  | 22701~22718 | Phase A Reactive Power Demand prediction, Phase A Reactive Power Demand Peak and happening time | * |
|        |      | 8  | 22801~22818 | Phase B Reactive Power Demand prediction, Phase B Reactive Power Demand Peak and happening time | * |
|        |      | 9  | 22901~22918 | Phase C Reactive Power Demand prediction, Phase C Reactive Power Demand Peak and happening time | * |
|        |      | 10 | 23001~23018 | Phase A,B,C Apparent power demand   | * |
|        |      | 11 | 23101~23118 | Phase A Apparent Power Demand prediction, Phase A Apparent Power Demand Peak and happening time | * |
|        |      | 12 | 23201~23218 | Phase B Apparent Power Demand prediction, Phase B Apparent Power Demand Peak and happening time | * |
|        |      | 13 | 23301~23318 | Phase C Apparent Power Demand prediction, Phase C Apparent Power Demand Peak and happening time | * |
|        |      | 14 | 23401~23418 | Phase A,B,C Current demand  | * |
|        |      | 15 | 23501~23518 | Phase A Current Demand prediction, Phase A Current Demand Peak and happening time               | * |

|                                  |                |    |             |   |   |
|----------------------------------|----------------|----|-------------|---|---|
| Demand                           | 1~18           | 16 | 23601~23618 | Phase B Current Demand prediction, Phase B Current Demand Peak and happening time | * |
|                                  |                | 17 | 23701~23718 | Phase C Current Demand prediction, Phase C Current Demand Peak and happening time | * |
| Digital Input and Digital Output | DI Channel 1~8 | 1  | 30101~30108 | DI Status   |   |
|                                  |                | 2  | 30201~30208 | RO Status   |   |
|                                  |                | 3  | 30301~30308 | DI Pulse Input related  |   |
| Real-time                        | 1~18           | 1  | 42101~42118 | Total Active Power, Total Reactive Power, Total Apparent Power                    | ② |
|                                  |                | 2  | 42201~42218 | Total Power Factor, Total Load Type   | * |
|                                  |                | 3  | 42301~42318 | Phase A, B, C, Active Power   |   |
|                                  |                | 4  | 42401~42418 | Phase A, B, C, Reactive Power   | * |
|                                  |                | 5  | 42501~42518 | Phase A, B, C, Apparent Power   | * |
|                                  |                | 6  | 42601~42618 | Phase A, B, C, Power Factor   | * |
|                                  |                | 7  | 42701~42718 | Phase A, B, C, Current  | * |
| Power Quality                    | 1~18           | 1  | 52101~52118 | Current unbalance   | * |
|                                  |                | 2  | 52201~52218 | Phase A harmonic distortion, odd harmonic distortion, even harmonic distortion    | * |
|                                  |                | 3  | 52301~52318 | Phase B harmonic distortion, odd harmonic distortion, even harmonic distortion    | * |
|                                  |                | 4  | 52401~52418 | Phase C harmonic distortion, odd harmonic distortion, even harmonic distortion    | * |
|                                  |                | 5  | 52501~52518 | Current K-factor  | * |

|               |             |   |             |   |   |
|---------------|-------------|---|-------------|---|---|
| Power Quality | 1~18        | 6                                       | 52601~52618 | Harmonic of Phase A Current(2nd ~7th)   | * |
|               |             | 7                                       | 52701~52718 | Harmonic of Phase A Current (8th~13th)  | * |
|               |             | 8                                       | 52801~52818 | Harmonic of Phase A Current (14th~19th) | * |
|               |             | 9                                       | 52901~52918 | Harmonic of Phase A Current (20th~25th) | * |
|               |             | 10                                      | 53001~53018 | Harmonic of Phase A Current(26th~31st)  | * |
|               |             | 11                                      | 53101~53118 | Harmonic of Phase B Current (2nd ~7th)  | * |
|               |             | 12                                      | 53201~53218 | Harmonic of Phase B Current(8th~13th)   | * |
|               |             | 13                                      | 53301~53318 | Harmonic of Phase B Current (14th~19th) | * |
|               |             | 14                                      | 53401~53418 | Harmonic of Phase B Current(20th~25th)  | * |
|               |             | 15                                      | 53501~53518 | Harmonic of Phase B Current (26th~31st) | * |
|               |             | 16                                      | 53601~53618 | Harmonic of Phase C Current (2nd ~7th)  | * |
|               |             | 17                                      | 53701~53718 | Harmonic of Phase C Current (8th~13th)  | * |
|               |             | 18                                      | 53801~53818 | Harmonic of Phase C Current(14th~19th)  | * |
|               |             | 19                                      | 53901~53918 | Harmonic of Phase C Current (20th~25th) | * |
| 20            | 54001~54018 | Harmonic of Phase C Current (26th~31st) | *           |   |   |

Note:

- ① Acurev 2010 only include active power demand;
- ② Acurev 2010 only include active power

\*: The instrument is Acurev2010, enter an asterisk zone function code when prompted SCREEN WRONG

### 3. Single Phase 3 Out(2LN)

Description: 2LN number of screens begin to run from 61 to distinguish 1LN, 3LN

Note '\*' to indicate that only Acurev2020 meter has feature

Note the "#" is enabled only content sharing

| Function                                       | Users | Screen Number | Code        | Content  | Note |
|--|-------|---------------|-------------|--|------|
| Energy (No Time of Use, only real-time energy) | 1~18  | 1             | 16101~16118 | Real-time energy   |      |
|  |       | 2             | 16201~16218 | Phase A,B real-time energy   |      |
|  |       | 3             | 16301~16318 | This month total power-sharing, this month tariff 1 energy, this month tariff 2 energy.    | #    |
|  |       | 4             | 16401~16418 | This month tariff 3 energy, this month tariff 4 energy.                                    | #    |
|  |       | 5             | 16501~16518 | Prior month total power-sharing, prior month tariff 1 energy, prior month tariff 2 energy. | #    |
|  |       | 6             | 16601~16618 | Prior month tariff 3 energy, prior month tariff 4 energy.                                  | #    |

|  |      |    |             |   |   |
|--|------|----|-------------|---|---|
| Energy (No Time of Use, only real-time energy) | 1~18 | 7  | 16701~16718 | Phase A this month total energy, Phase A this month tariff 1 energy, Phase A this month tariff 2 energy.    | # |
|  |      | 8  | 16801~16818 | Phase A this month tariff 3 energy, Phase A this month tariff 4 energy.                                     | # |
|  |      | 9  | 16901~16918 | Phase A prior month total energy, Phase A prior month tariff 1 energy, Phase A prior month tariff 2 energy. | # |
|  |      | 10 | 17001~17018 | Phase A prior month tariff 3 energy, Phase A prior month tariff 4 energy                                    | # |
|  |      | 11 | 17101~17118 | Phase B this month total energy, Phase B this month tariff 1 energy, Phase B this month tariff 2 energy.    | # |
|  |      | 12 | 17201~17218 | Phase B this month tariff 3 energy, Phase B this month tariff 4 energy.                                     | # |
|  |      | 13 | 17301~17318 | Phase B prior month total energy, Phase B prior month tariff 1 energy, Phase B prior month tariff 2 energy. | # |
|  |      | 14 | 17401~17418 | Phase B prior month tariff 3 energy, Phase B prior month tariff 4 energy                                    | # |
|  |      | 15 | 17501~17518 | Total reactive energy   | * |
|  |      | 16 | 17601~17618 | Phase A,B, reactive energy  | * |
|  |      | 17 | 17701~17718 | Total apparent energy   | * |
|  |      | 18 | 17801~17818 | Phase A,B, apparent energy  | * |

|        |      |    |             |  |   |
|--------|------|----|-------------|--|---|
| Demand | 1~18 | 1  | 26101~26118 | System active power demand,<br>System reactive power demand,<br>System apparent power demand             | ① |
|        |      | 2  | 26201~26218 | Phase A,B, active power demand   |   |
|        |      | 3  | 26301~26318 | Phase A Real Power Demand<br>prediction, Phase A Real Power<br>Demand Peak and happening<br>time         |   |
|        |      | 4  | 26401~26418 | Phase B Real Power Demand<br>prediction, Phase B Real Power<br>Demand Peak and happening<br>time         |   |
|        |      | 5  | 26501~26518 | Phase A,B, Reactive power<br>demand  | * |
|        |      | 6  | 26601~26618 | Phase A Reactive Power Demand<br>prediction, Phase A Reactive<br>Power Demand Peak and<br>happening time | * |
|        |      | 7  | 26701~26718 | Phase B Reactive Power Demand<br>prediction, Phase B Reactive<br>Power Demand Peak and<br>happening time | * |
|        |      | 8  | 26801~26818 | Phase A,B, Apparent power<br>demand  | * |
|        |      | 9  | 26901~26918 | Phase A Apparent Power<br>Demand prediction, Phase A<br>Apparent Power Demand Peak<br>and happening time | * |
|        |      | 10 | 27001~27018 | Phase B Apparent Power<br>Demand prediction, Phase B<br>Apparent Power Demand Peak<br>and happening time | * |

|                                  |                |    |             |   |   |
|----------------------------------|----------------|----|-------------|---|---|
| Demand                           | 1~18           | 11 | 27101~27118 | Phase A,B, Current demand   | * |
|                                  |                | 12 | 27201~27218 | Phase A Current Demand prediction, Phase A Current Demand Peak and happening time | * |
|                                  |                | 13 | 27301~27318 | Phase B Current Demand prediction, Phase B Current Demand Peak and happening time | * |
| Digital Input and Digital Output | DI Channel 1~8 | 1  | 30101~30108 | DI Status   |   |
|                                  |                | 2  | 30201~30208 | RO Status   |   |
|                                  |                | 3  | 30301~30308 | DI Pulse Input related  |   |
| Real-time                        | 1~18           | 1  | 46101~46118 | Total Active Power, Total Reactive Power, Total Apparent Power                    | ③ |
|                                  |                | 2  | 46201~46218 | Total Power Factor, Total Load Type   | * |
|                                  |                | 3  | 46301~46318 | Phase A, B, Active Power  |   |
|                                  |                | 4  | 46401~46418 | Phase A, B, Reactive Power  | * |
|                                  |                | 5  | 46501~46518 | Phase A, B, Apparent Power  | * |
|                                  |                | 6  | 46601~46618 | Phase A, B, Power Factor  | * |
|                                  |                | 7  | 46701~46718 | Phase A, B, Current   | * |
| Power Quality                    | 1~18           | 1  | 56101~56118 | Current unbalance   | * |
|                                  |                | 2  | 56201~56218 | Phase A harmonic distortion, odd harmonic distortion, even harmonic distortion    | * |
|                                  |                | 3  | 56301~56318 | Phase B harmonic distortion, odd harmonic distortion, even harmonic distortion    | * |
|                                  |                | 4  | 56401~56418 | Current K-factor  | * |
|                                  |                | 5  | 56501~56518 | Harmonic of Phase A Current(2nd ~7th)   | * |

|               |      |    |             |   |   |
|---------------|------|----|-------------|---|---|
| Power Quality | 1~18 | 6  | 56601~56618 | Harmonic of Phase A Current (8th~13th)  | * |
|               |      | 7  | 56701~56718 | Harmonic of Phase A Current (14th~19th) | * |
|               |      | 8  | 56801~56818 | Harmonic of Phase A Current (20th~25th) | * |
|               |      | 9  | 56901~56918 | Harmonic of Phase A Current(26th~31st)  | * |
|               |      | 10 | 57001~57018 | Harmonic of Phase B Current (2nd ~7th)  | * |
|               |      | 11 | 57101~57118 | Harmonic of Phase B Current(8th~13th)   | * |
|               |      | 12 | 57201~57218 | Harmonic of Phase B Current (14th~19th) | * |
|               |      | 13 | 57301~57318 | Harmonic of Phase B Current(20th~25th)  | * |
|               |      | 14 | 57401~57418 | Harmonic of Phase B Current (26th~31st) | * |

Note:

① Acurev2010 only include active power demand;

② Acurev2010 only include active power

\*: The instrument is Acurev2010, enter an asterisk zone function code when prompted  
SCREEN WRONG

4. Inline

Note "\*" to indicate that only Acurev2020 meter has feature

Note the "#" is enabled only content sharing

| Function                                       | Users  | Screen Number | Code  | Content   | Note |
|--|--------|---------------|-------|---|------|
| Energy (No Time of Use, only real-time energy) | Inline | 1             | 10100 | System active energy  |      |
|  |        | 2             | 10200 | Phase A,B,C active energy   |      |
|  |        | 3             | 10300 | System this month total energy. System this month tariff 1 energy, System this month tariff 2 energy.       | #    |
|  |        | 4             | 10400 | System this month tariff 3 energy, System this month tariff 4 energy.                                       | #    |
|  |        | 5             | 10500 | System prior month total energy, System prior month tariff 1 energy, System prior month tariff 2 energy.    | #    |
|  |        | 6             | 10600 | System prior month tariff 3 energy, System prior month tariff 4 energy                                      | #    |
|  |        | 7             | 10700 | Phase A this month total energy. Phase A this month tariff 1 energy, Phase A this month tariff 2 energy.    | #    |
|  |        | 8             | 10800 | Phase A this month tariff 3 energy, Phase A this month tariff 4 energy.                                     | #    |
|  |        | 9             | 10900 | Phase A prior month total energy, Phase A prior month tariff 1 energy, Phase A prior month tariff 2 energy. | #    |
|  |        | 10            | 11000 | Phase A prior month tariff 3 energy, Phase A prior month tariff 4 energy                                    | #    |

|  |        |    |       |   |   |
|--|--------|----|-------|---|---|
| Energy (No Time of Use, only real-time energy) | Inline | 11 | 11100 | Phase B this month total energy. Phase B this month tariff 1 energy, Phase B this month tariff 2 energy.    | # |
|  |        | 12 | 11200 | Phase B this month tariff 3 energy, Phase B this month tariff 4 energy.                                     | # |
|  |        | 13 | 11300 | Phase B prior month total energy, Phase B prior month tariff 1 energy, Phase B prior month tariff 2 energy. | # |
|  |        | 14 | 11400 | Phase B prior month tariff 3 energy, Phase B prior month tariff 4 energy                                    | # |
|  |        | 15 | 11500 | Phase C this month total energy. Phase C this month tariff 1 energy, Phase C this month tariff 2 energy.    | # |
|  |        | 16 | 11600 | Phase C this month tariff 3 energy, Phase C this month tariff 4 energy.                                     | # |
|  |        | 17 | 11700 | Phase C prior month total energy, Phase C prior month tariff 1 energy, Phase C prior month tariff 2 energy. | # |
|  |        | 18 | 11800 | Phase C prior month tariff 3 energy, Phase C prior month tariff 4 energy                                    | # |
|  |        | 19 | 11900 | System reactive energy  | * |
|  |        | 20 | 12000 | Phase A,B C reactive energy   | * |
|  |        | 21 | 12100 | System apparent energy  | * |
|  |        | 22 | 12200 | Phase A,B C apparent energy   | * |

|        |        |   |       |  |   |
|--------|--------|---|-------|--|---|
| Demand | Inline | 1 | 20100 | System active power demand, System reactive power demand, System apparent power demand (Acurev2010 only has active power demand) | ① |
|        |        | 2 | 20200 | Phase A, B, C active power demand  |   |
|        |        | 3 | 20300 | Phase A Real Power Demand prediction, Phase A Real Power Demand Peak and happening time  |   |
|        |        | 4 | 20400 | Phase B Real Power Demand prediction, Phase B Real Power Demand Peak and happening time  |   |
|        |        | 5 | 20500 | Phase C Real Power Demand prediction, Phase C Real Power Demand Peak and happening time  |   |
|        |        | 6 | 20600 | Phase A,B,C Reactive power demand  | * |
|        |        | 7 | 20700 | Phase A Reactive Power Demand prediction, Phase A Reactive Power Demand Peak and happening time                                  | * |
|        |        | 8 | 20800 | Phase B Reactive Power Demand prediction, Phase B Reactive Power Demand Peak and happening time                                  | * |
|        |        | 9 | 20900 | Phase C Reactive Power Demand prediction, Phase C Reactive Power Demand Peak and happening time                                  | * |

|                                  |                |    |             |   |   |
|----------------------------------|----------------|----|-------------|---|---|
| Demand                           | Inline         | 10 | 21000       | Phase A,B,C Apparent power demand   | * |
|                                  |                | 11 | 21100       | Phase A Apparent Power Demand prediction, Phase A Apparent Power Demand Peak and happening time | * |
|                                  |                | 12 | 21200       | Phase B Apparent Power Demand prediction, Phase B Apparent Power Demand Peak and happening time | * |
|                                  |                | 13 | 21300       | Phase C Apparent Power Demand prediction, Phase C Apparent Power Demand Peak and happening time | * |
|                                  |                | 14 | 21400       | Phase A,B,C Current demand  | * |
|                                  |                | 15 | 21500       | Phase A Current Demand prediction, Phase A Current Demand Peak and happening time               | * |
|                                  |                | 16 | 21600       | Phase B Current Demand prediction, Phase B Current Demand Peak and happening time               | * |
|                                  |                | 17 | 21700       | Phase C Current Demand prediction, Phase C Current Demand Peak and happening time               | * |
| Digital Input and Digital Output | DI channel 1~8 | 1  | 30101~30108 | DI Status   |   |
|                                  |                | 2  | 30201~30208 | RO Status   |   |
|                                  |                | 3  | 30301~30308 | DI Pulse Input related  |   |
|                                  |                | 1  | 40100       | System Active Power, System Reactive Power, System Apparent Power                               | Ⓢ |
|                                  |                | 2  | 40200       | System Power Factor, System Load Type   | * |

|           |        |               |        |  |       |  |   |
|-----------|--------|---------------|--------|--|-------|--|---|
| Real-time | Inline | 3             | 40300  | Phase A, B, C, Active Power  |       |  |   |
|           |        | 4             | 40400  | Phase A, B, C, Reactive Power  | *     |  |   |
|           |        | 5             | 40500  | Phase A, B, C, Apparent Power  | *     |  |   |
|           |        | 6             | 40600  | Phase A, B, C, Power Factor  | *     |  |   |
|           |        | 7             | 40700  | Phase A, B, C, Current   | *     |  |   |
|           |        | 8             | 40800  | Phase A, B, C phase voltage  | *     |  |   |
|           |        | 9             | 40900  | Phase A, B, C average of phase voltage   | *     |  |   |
|           |        | 10            | 41000  | Phase A, B, C line voltage   | *     |  |   |
|           |        | 11            | 41100  | Phase A, B, C average of line voltage  | *     |  |   |
|           |        | 12            | 41200  | Voltage Frequency  | *     |  |   |
|           |        | Power Quality | Inline | 1  | 50100 | Voltage unbalance  | * |
|           |        |               |        | 2  | 50200 | Phase A harmonic distortion, odd harmonic distortion, even harmonic distortion | * |
| 3         | 50300  |               |        | Phase B harmonic distortion, odd harmonic distortion, even harmonic distortion | *     |  |   |
| 4         | 50400  |               |        | Phase C harmonic distortion, odd harmonic distortion, even harmonic distortion | *     |  |   |
| 5         | 50500  |               |        | Average voltage of harmonic distortion   | *     |  |   |
| 6         | 50600  |               |        | Crest Factor   | *     |  |   |
| 7         | 50700  |               |        | Telephone harmonic form factor   | *     |  |   |
| 8         | 50800  |               |        | Harmonic of Phase A Current(2nd ~7th)  | *     |  |   |
| 9         | 50900  |               |        | Harmonic of Phase A Current (8th~13th)   | *     |  |   |
| 10        | 51000  |               |        | Harmonic of Phase A Current (14th~19th)  | *     |  |   |
| 11        | 51100  |               |        | Harmonic of Phase A Current (20th~25th)  | *     |  |   |

|  |  |    |       |   |   |
|--|--|----|-------|---|---|
|  |  | 12 | 51200 | Harmonic of Phase A Current(26th~31st)  | * |
|  |  | 13 | 51300 | Harmonic of Phase B Current (2nd ~7th)  | * |
|  |  | 14 | 51400 | Harmonic of Phase B Current(8th~13th)   | * |
|  |  | 15 | 51500 | Harmonic of Phase B Current (14th~19th) | * |
|  |  | 16 | 51600 | Harmonic of Phase B Current(20th~25th)  | * |
|  |  | 17 | 51700 | Harmonic of Phase B Current (26th~31st) | * |
|  |  | 18 | 51800 | Harmonic of Phase C Current (2nd ~7th)  | * |
|  |  | 19 | 51900 | Harmonic of Phase C Current (8th~13th)  | * |
|  |  | 20 | 52000 | Harmonic of Phase C Current(14th~19th)  | * |
|  |  | 21 | 52100 | Harmonic of Phase C Current (20th~25th) | * |
|  |  | 22 | 52200 | Harmonic of Phase C Current (26th~31st) | * |

Note:

- ①Acurev2010 only include active power demand;
- ②Acurev2010 only include active power

\*: The instrument is Acurev2010, enter an asterisk zone function code when prompted  
SCREEN WRONG

### 3.7 Power quality display and key operation

For AcuRev 2010, no power quality menu.

In the second page of the main menu, select "PQ" (quality), press the "OK" button to begin the display of power quality data. "Left" and "right" keys to select a different user or into the line, "up" and "down" keys to select the current user's different screen, the Enter key to return to the main menu.

Table3-9 Power quality display

| Parameter                     | Display      |
|-------------------------------|--------------|
| Unbalance                     | UNBL         |
| Harmonic distortion           | THD          |
| Total harmonic distortion     | SUM          |
| Odd harmonic distortion       | ODD          |
| Even harmonic distortion      | EVEN         |
| K-factor                      | K Factor     |
| Crest Factor                  | Crest Factor |
| Telephone interference factor | THFF         |
| Harmonic ratio                | HARMONIC     |

Different wiring, current quality data display is not the same. Details are as follows (AcuRev 2010 meter does not show the screen of yellow background):

#### 1. Single Phase Out(1LN)

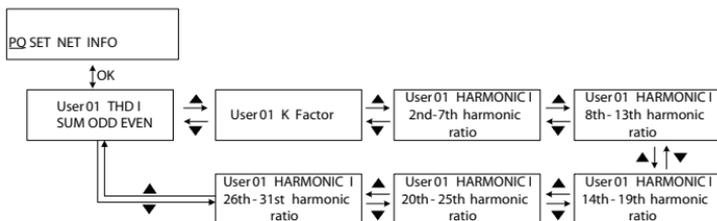


Figure 3-17 Single-phase power quality

## 2. Three Phase 4 Out(3LN)

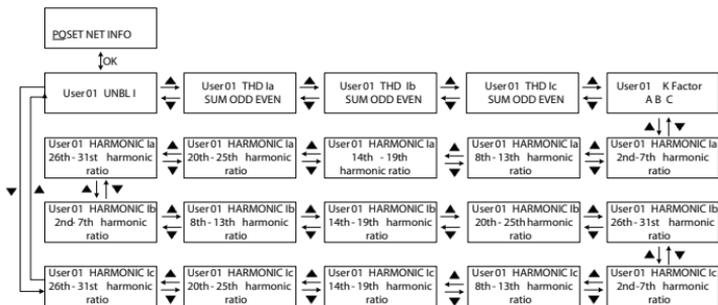


Figure 3-18 Three phase 4 out power quality

### 3. Single phase 3 Out(2LN)

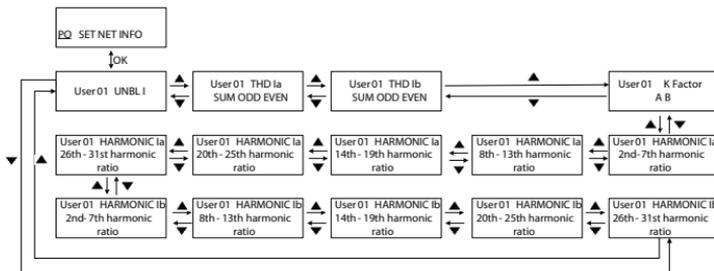


Figure 3-19 Single phase 3 out power quality

### 4. Inline

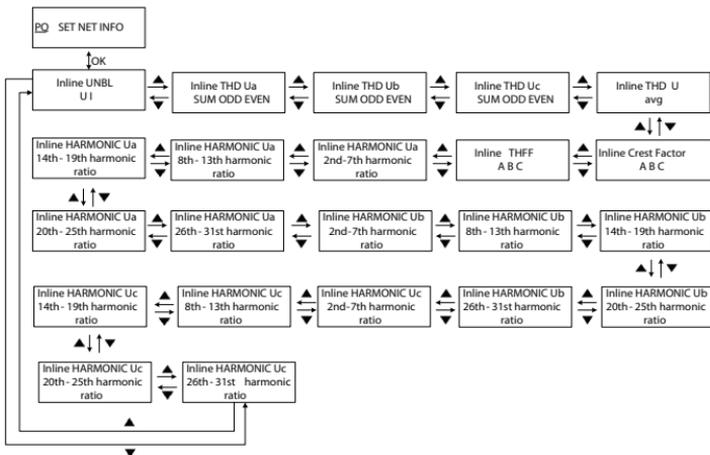


Figure 3-20 Inline power quality

### 3.8. Basic settings and key operation

In the second page of the main menu, select "SET", press the "OK" button, the password inquiry is passed, display language setting interface, the "OK" key to activate the cursor, the cursor is activated, the cursor blinks. When the cursor is not activated, the arrow keys to scroll; when the cursor is activated, the up and down keys to change the value at the cursor, left and right keys to move the cursor, the "OK" button to confirm the changes and stop the cursor. Combination of keys (left and right keys pressed together) to return to the main menu.

When the meter using the DM module, then no CT setting interface set interface; when the meter type is Acurev2010, the basic interface is not (P25) reactive power calculation methods setting interface and (P26) load protocol selection interface.

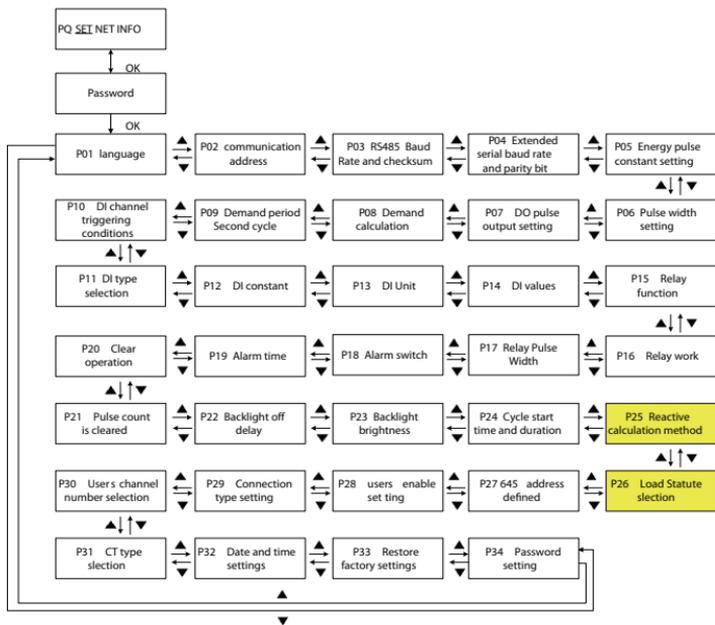


Figure 3-21 basic settings screen

P04 extended serial baud rate and parity settings are infrared meter display module baud rate and parity bit is set; DI constant represents the input number of pulses counted once. DI units represent physical unit that DI count value representing, there are five kinds:  $t$ ,  $m^3$ , kWh,  $\text{¥}$ ,  $\text{\$}$ . DI values represent physical quantity that pulses counted once representing. P33 restore factory setting meaning the user's name, mapping relationship, wiring, CT type revert to the default values.

Select the channel number: For each user corresponding physical channel mapping, mapping relationship in the following table.

| Parameter Setting | Corresponding physical channel |                                  |                     |
|-------------------|--------------------------------|----------------------------------|---------------------|
|                   | 1LN                            | 3LN                              | 2LN                 |
| 1                 | Channel 1                      | Channel 1                        | Channel 1           |
| 2                 | Channel 2                      | Channel 2                        | Channel 2           |
| 3                 | Channel 3                      | Channel 3                        | Channel 3           |
| 4                 | Channel 4                      | Channel 4                        | Channel 4           |
| 5                 | Channel 5                      | Channel 5                        | Channel 5           |
| 6                 | Channel 6                      | Channel 6                        | Channel 6           |
| 7                 | Channel 7                      | Channel 7                        | Channel 7           |
| 8                 | Channel 8                      | Channel 8                        | Channel 8           |
| 9                 | Channel 9                      | Channel 9                        | Channel 9           |
| 10                | Channel 10                     | Channel 10                       | Channel 10          |
| 11                | Channel 11                     | Channel 11                       | Channel 11          |
| 12                | Channel 12                     | Channel 12                       | Channel 12          |
| 13                | Channel 13                     | Channel 13                       | Channel 13          |
| 14                | Channel 14                     | Channel 14                       | Channel 14          |
| 15                | Channel 15                     | Channel 15                       | Channel 15          |
| 16                | Channel 16                     | Channel 16                       | Channel 16          |
| 17                | Channel 17                     | Channel 17                       | Channel 17          |
| 18                | Channel 18                     | Channel 18                       | Channel 18          |
| 19                | --                             | Channel 1 Channel 4<br>Channel 7 | Channel 1 Channel 4 |
| 20                | --                             | Channel 2 Channel 5<br>Channel 8 | Channel 2 Channel 5 |
| 21                | --                             | Channel 3 Channel 6<br>Channel 9 | Channel 3 Channel 6 |

|    |    |                                     |                       |
|----|----|-------------------------------------|-----------------------|
| 22 | -- | Channel 10 Channel 13<br>Channel 16 | Channel 10 Channel 13 |
| 23 | -- | Channel 11 Channel 14<br>Channel 17 | Channel 11 Channel 14 |
| 24 | -- | Channel 12 Channel 15<br>Channel 18 | Channel 12 Channel 15 |

### 3.9 Network Settings

In the second page of the main menu, select "NET"; press "OK" button to enter the password screen, the password authentication is passed into the network settings screen. When the cursor is not enabled, the arrow keys to scroll, when you press the "OK" button to move the cursor starts blinking, left and right keys to switch cursor positions, up and down keys to set the value of the parameter. After setting parameters, press the "OK" button to set parameters success while the cursor is no longer flashing. Combination of keys (left and right keys pressed together) to return to the main menu.

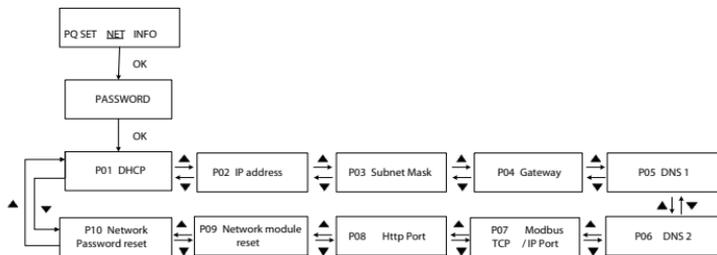


Figure 3-22 Network setting display

P01 DHCP represents DHCP address allocation mode setting, MANU (static allocation) and AUTO (dynamic allocation); P09 network module reset options include not reset, reset network module and restore the default parameters and reset the network module

Network module. Network settings only apply to network module, after setting each network module needs to be reset before work.

### 3.10 Meter information and key operation

In the second page of the main menu, select "INFO" (message), press the "OK" button to start the meter information display. Arrow keys to scroll, press the "OK" button to return to the main menu.

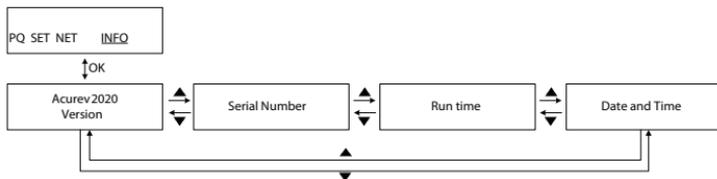


Figure 3-23 Meter information display

## **Chapter 4 Functions and Software**

**4.1 Basic Parameter Functions**

**4.2 IO Functions**

**4.3 Demand**

**4.4 Energy**

**4.5 Sequence of Events(SOE)**

**4.6 Over/Under Limit Alarming**

**4.7 System Event**

**4.8 Trending Record**

**4.9 Seal Function**

**4.10 Device Information**

This chapter introduces AcuRev 2000 Utility Software.



Figure 4-1 AcuRev 2000 Utility Software interface

General Setting, users and CTsetting must be configured properly in order to have AcuRev 2000 operate normally.

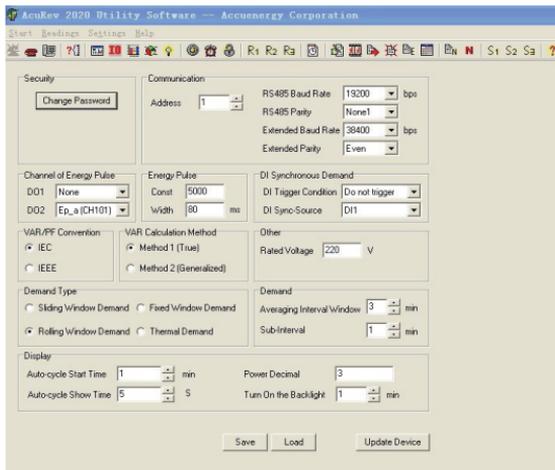


Figure 4-2 General Settings in the software

Energy pulse output setting: energy pulse settings include Pulse Constant and Pulse Width. Pulse Constant's range is 500-20000, Pulse Width range is 20-100ms. In practical applications, Pulse Constant and Pulse Width should be set according to the system's real power, otherwise it will influence the system's energy accuracy.

$$\text{Pulse Period} = 3600000 / (\text{Real Power} \times \text{Pulse Constant})$$

$$\text{Pulse Period} > \text{Pulse Width}$$

The following equation must be fulfilled in order to ensure the energy accuracy, the unit of Real Power is kW, Pulse Width is ms.

$$3600000 / (\text{Real Power} \times \text{Pulse Constant}) > \text{Pulse Width}$$

For example, if the Real Power is 35.2 kW, Pulse Width =  $3600000 / (35.2 \times \text{Pulse Constant})$ , it must meet  $3600000 / (35.2 \times \text{Pulse Constant}) > \text{Pulse Width}$ .

**Note:** The voltage rating is set for alarm, as the voltage rating in the alarm settings.

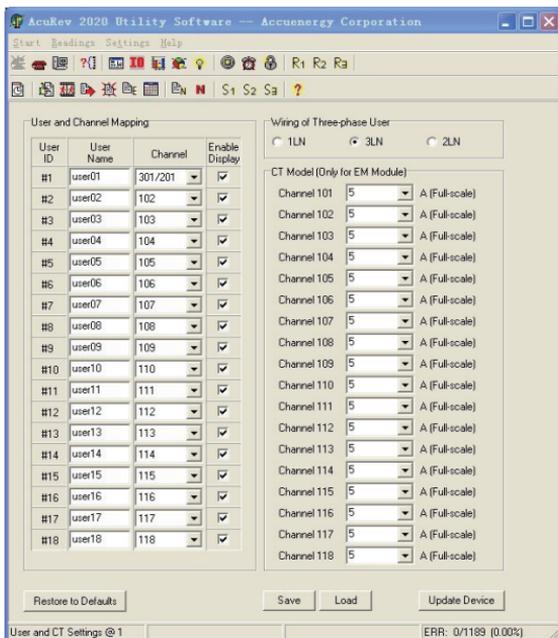


Figure 4-3 User and CT Settings display

About user name and the corresponding channel are described below:

- a) The user name can be customized ,supports up to six (only supports letters and numbers)
- b) correspondence between the 101-118 refers to the physical channel 1-18 road 301/201-306/206 phase refers to the user's physical channel corresponding

c) If either one is not used, you can set the corresponding channel is not displayed (i.e.: remove allowed to display on the hook)

CT model as follows:

When using EM modules: Different channels can access different types transformers, as required by the customer can be independently set.

For example: The first one username Jack01, wiring is 3LN, the first channel phase (composed by the channel 1,4,7); following settings the # 1 users change the name of Jack01, the corresponding channel is set to 301/201 , check allows the display, the user's wiring phase change 3LN.

Note: after the setup, "Update Device" must be clicked in order to send the settings to the meter. All the other setting operations should follow this as well.

#### 4.1 Basic Parameter Functions

The basic parameters measured in the AcuRev 2000 are voltage, current, power, etc. The base module only displays power, including system power, inline A, B, C power, and each tenant's power. Different wiring methods lead to different displays. The following figure is the display of basic parameter measurement (take the first one 3LN wiring for instance).

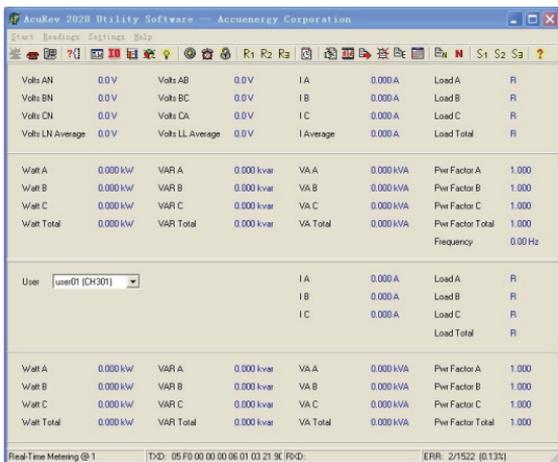


Figure 4-4 AcuRev 2020 Basic Measurement Parameter Display

**Note:** the “user” above is optional, select the user name to be displayed, The user divides the screen into two parts: the upper part is the inline power, the lower part is the user power. When wiring is set differently, gray data is invalid.

In the upper display, Pa represents Phase A Power; In the lower display, Pa (N) represents the N-th tenant’s Phase A power. The power accuracy is 0.5 %, with 4 decimal places.

## 4.2 IO Functions

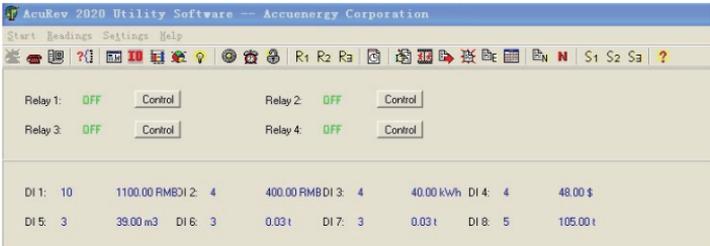


Figure 4-5 DI/RO

As Figure 4-5 shows, AcuRev 2000 has 4 Relay Outputs (RO), 8 Digital Inputs (DO). Please refer to Figure 4-6 for DI/RO related settings.

### RO

Each channel RO can be configured as Relay Control or Alarm Output.

- (1) Relay Control: Latching or Pulse; Pulse width can be set between 50 and 3000 ms.
- (2) Alarm Output

There are two Alarm Output types: Over/Under Limit Alarming and System Event Alarming, the two can be active at the same time. Over/Under Limit Alarming will be introduced in detail later.

There are 12 events for system event alarming, which are:

1. Reset
2. Demand DI Synchronization
3. Demand Command Synchronization

4. Energy Clear
5. Running Hour Clear
6. Battery Runtime Clear
7. System Parameter Change
8. Initialized Energy Set
9. TOU Energy Change
10. System Clock Change
11. Reversed Power Direction
12. DI Pulse Counter Clear

These 12 events can enable the output of Relay 1 to Relay 4 for alarming. The time delay for alarming signal is 1-60000 s (the Relay Output status will latch for that amount of time).

If the Relay Output type is set as Relay Control, click "Control" in Figure 4-5 to send command "close" or "open" to the relay. When the relay is set as alarming output, Relay Control function will be disabled.

## DI Function

DI type: Signal Status; Pulse Counter

DI unit and category: s (second), m3 (cubic meters), kWh (energy), RMB (Renminbi), \$ (dollar).

When DI type is set as Signal Status, it monitors the input status, providing all DI status. High level displays as "ON", low level displays as "OFF".

When DI type is set as Pulse Counter, it counts the input pulses. The Pulse Counter settings include Pulse Constant (how many pulses equals one count), Category and Unit, Value

(Category multiplied by the count number). The display panel displays the number corresponding to the pulse, as well as the calculated value.

For instance, if set 10 pulses = one count, one count represents 5 kWh. When 100 pulses are input, the display panel will display Number = 100/10=10, 10\*5=50 kWh.

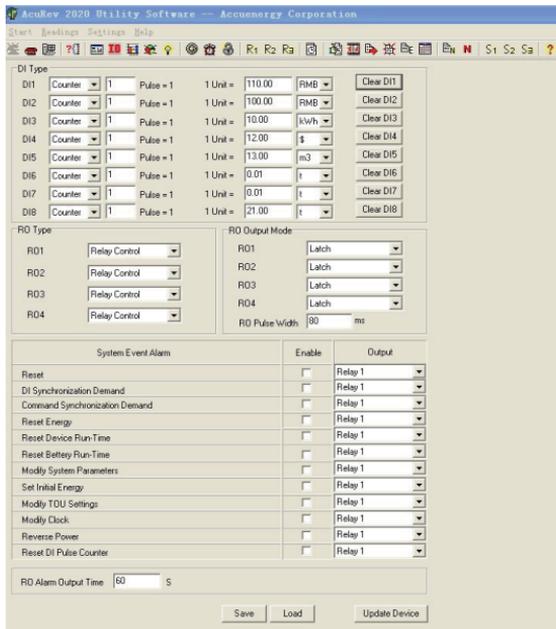


Figure 4-6 DI/RO and System Event alarming setup

## DO Function

AcuRev 2000 has 4 DO output

2-channel energy pulse output, the two channel can be used to send out independant energy pulses (see Appendix B), Pulse Constant, Pulse Width can be set. Tenant Number, Pulse Constant and Pulse Width settings can be implemented as Figure 4-2 shows.

1 channel demand cycle pulse output.

1 channel second pulse output is used to check the system clock's accuracy, or used to be the benchmark of time for the other equipment.

### 4.3 Demand

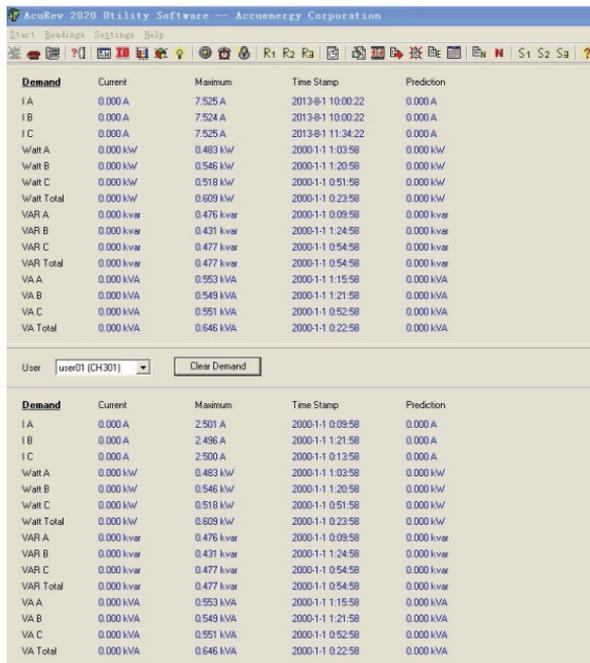


Figure 4-7 Demand

Display Demand, Max Demand, Max Demand Time, Demand Prediction (update per second) of the real power. The users is selective. The users divides the software window into two parts, the upper part indicates the demand related parameters, the lower part indicates the demand of each individual tenant.

Demand calculation has four methods: Sliding Window method, Fixed Window method, Rolling Window method and Thermal method. Users can set the demand period (1-30 minutes)and secondary demand period (1-30 minutes)according to different calculation methods. All related settings can be found in Figure 4-2.

### **Support Demand Synchronization**

Method: Synchronizing with DI; Synchronizing with Command

DI Synchronization: DI triggering can be chosen as no triggering, triggered by rising edge, triggered by falling edge, triggered by changes. DI Synchronization source can set as DI1-DI8.The Synchronizing with DI settings is in Figure 4-2.

The Synchronizing with Command: choose "Clear Demand" in Figure 4-7.

Demand cycle or secondary cycle finishing signal can be sent out by DO.

## **4.4 Energy**

Time of Use bi-directional real energy measurement. It saves up to 2 months energy data, data saving boundary time can be any specified day (auto meter reading day) between 1 and 28.The factory default is at 0 o'clock the first day of each month.

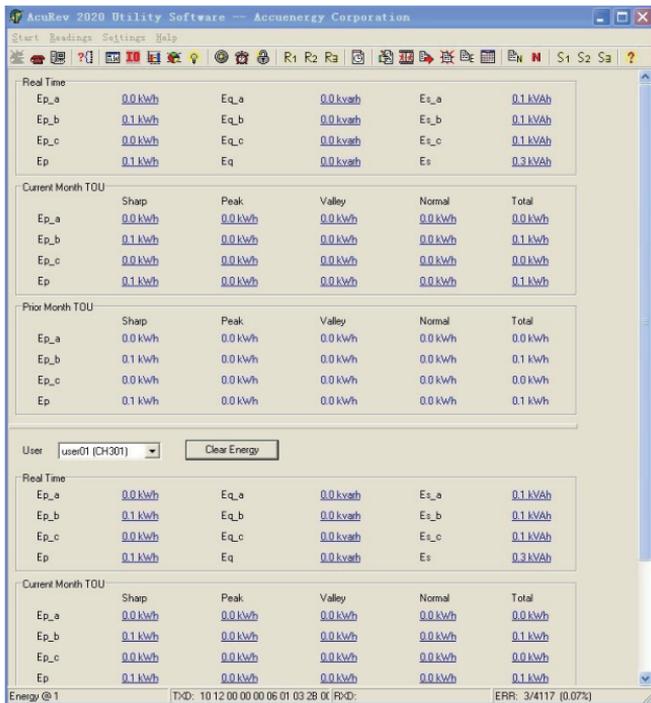


Figure 4-8 Energy

Displays real-time energy, this month TOU energy, prior month TOU energy, individual tenant real-time energy, this month individual tenant TOU energy, prior month individual tenant energy, Critical-peak, On-peak, Mid-peak, Off-peak energy reading. If TOU energy

measurement is not enabled, it displays real-time energy only.

The user divides the screen into two parts, the upper part indicates inline energy parameters, the lower part indicates the individual tenant energy parameters.

AccuRev 2020 Utility Software - Accuenergy Corporation

Season Setting: 12    Schedule Setting: 8    Tariff Setting: 4

Segment Setting: 14    Weekend Schedule: 5    Holiday Setting: 1

Current Tariff: 2    Fault Status Word 1: 0    Fault Status Word 2: 0

Monthly Billing Mode

End of Month

Assign    Day: 1    Hour: 0

Enable TOU     Restore to Defaults

Weekend Day

Monday     Tuesday     Wednesday     Thursday     Friday

Saturday     Sunday

Daylight Saving Time

DST Enable    DST Format: Format 2

Format 1

DST Start

Jul    1    Day    1    Hour    32    Min    Adjust Time    5    Minutes

DST Ending

Jul    1    Day    1    Hour    31    Min    Adjust Time    1    Minutes

Format 2

DST Start

Sep    5th    Sun    at    23    :46    Adjust Time    19    Minutes

DST Ending

Oct    1st    Mon    at    0    :5    Adjust Time    20    Minutes

TOU Seasons

|          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|
| 01-01-01 | 02-01-02 | 02-20-05 | 04-01-04 | 05-01-05 | 06-01-06 | 07-01-07 |
| 08-01-08 | 09-01-01 | 10-01-02 | 11-01-03 | 12-01-04 | 00:00:00 | 00:00:00 |

Holidays

|          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| 01-01-01 | 01-02-02 | 01-03-03 | 00:00:00 | 00:00:00 | 00:00:00 |
| 00:00:00 | 00:00:00 | 00:00:00 | 00:00:00 | 00:00:00 | 00:00:00 |

TOU Settings @ 1    ERR: 3/4505 (0.07%)

Figure 4-9 Time of Use setting

TOU energy settings are in Figure 4-9.

**Season:** the maximum season number is 14.If the season number is smaller than the programmed season number, the energy meter only utilizes the first seasons (for instance, if the season number is 2, it only runs the first 2 seasons).

**Schedule:** the maximum schedule number is 8.If the schedule number is set as 3, the 4th to the 14th schedules will be unavailable.

**Segment:** the maximum segment number is 14.If the segment is set as 4, the 5th to the 14th segments will be unavailable. Only the first 4 segments are available.

**Tariff:** the maximum tariff number is 4.If tariff number in the schedule is larger than the set tariff number or equals 0, the energy in this schedule will be using tariff 1.

**Weekend:** setup the schedule number according to weekends.

**Holiday:** the maximum holiday number is 30.If it is set as 0, it indicates public holiday disabled. For instance, public holidays, such as January 1, December 25th, which users can set. Public holidays and their schedule number can be configured as different public holidays by using different schedule numbers.

**Note: if the public holiday and weekend schedule number is set as 0, it means these public holidays are unavailable. If the weekend and public holidays are overlapped, the public holiday overrides the weekend setting, holiday has the higher priority.**

**Parameter Settings:** changing tariff settings will do an auto check. If there is an error found, it will send out an alert and an error message status. In the error state all tariffs should follow tariff 1, until the status is corrected. Season and Schedule settings must be continuous, the starting time of the 2nd season is the ending time of the 1st season, the same rule applies to the rest.

Daylight saving time (DST): Daylight saving time can be enabled in one of two formats: The fixed date option, or a fixed day of one of the weeks in the month (also named as the non-fixed date option). If you choose a fixed date option, you set the format according to a fixed date, for the daylight saving time switch: the format month / day / hour / minute / adjust time (in minutes). If you choose non-fixed date option, DST will be implemented by which day of which week, whose setting format is month/which day (i. e. Tuesday)/which week (i.e. 1st week)/hour/minute/adjust time(in minutes).

By using the function, you can cause the instrument to automatically switch to and from daylight saving time. When the clock starts to run to daylight saving time, the meter will automatically adjust the clock to a time period in advance, while the clock is running to the end of daylight saving time, meter will automatically adjust the clock pushed back to a time period, as shown in Figure 4-10

The screenshot shows a software interface for configuring Daylight Saving Time (DST) with two distinct format options.

**Format 1 (Fixed Date Option):**

- DST Start:** Jul 1 Day 1 Hour 32 Min Adjust Time 5 Minutes
- DST Ending:** Jul 1 Day 1 Hour 31 Min Adjust Time 1 Minutes

**Format 2 (Fixed Day of Week Option):**

- DST Start:** Sep 5th Sun at 23 : 46 Adjust Time 19 Minutes
- DST Ending:** Oct 1st Mon at 0 : 5 Adjust Time 20 Minutes

Figure 4-10 DST display

### Ten-year Holiday setting

Users can preset holidays of the next decade via the meter software. The holiday format is month/day/year; holiday code; holiday schedule. After the format setup, click on "Make

Holiday Settings (10 year)", then a holiday table for the next decade will be generated.

Holiday Auto Switch: When Ten-year Holiday is enabled, if the current year of the meter falls into the Ten-year Holiday setting, it automatically loads the Ten year Holiday settings into the current TOU settings. If the current year of the meter does not fall into the Ten-year Holiday setting, it remains the current TOU settings.

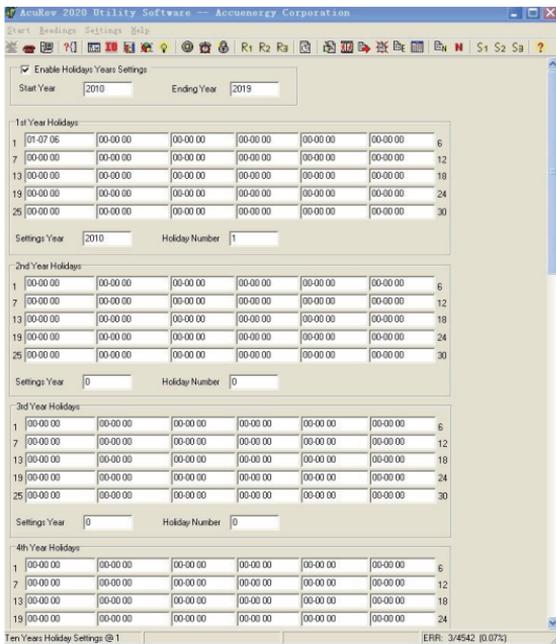


Figure 4-11 Holiday Settings

## 4.5 Sequence of Events(SOE)

AccuRev 2020 Utility Software — Accuenergy Corporation

Start Readings Settings Help

R1 R2 Ra

| No. | Time Stamp        | ms  | DI 1 | DI 2 | DI 3 | DI 4 | DI 5 | DI 6 | DI 7 | DI 8 |
|-----|-------------------|-----|------|------|------|------|------|------|------|------|
| 1   | 2013-7-29 9:35:30 | 495 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 2   | 2013-7-29 9:35:31 | 372 | OFF  |
| 3   | 2013-7-29 9:35:32 | 142 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 4   | 2013-7-29 9:35:33 | 502 | OFF  |
| 5   | 2013-7-29 9:35:34 | 337 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 6   | 2013-7-29 9:35:35 | 93  | OFF  |
| 7   | 2013-7-29 9:35:42 | 148 | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  | ON   | OFF  |
| 8   | 2013-7-29 9:35:42 | 148 | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  | ON   | ON   |
| 9   | 2013-7-29 9:35:44 | 505 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | ON   | ON   |
| 10  | 2013-7-29 9:35:46 | 537 | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  | ON   | ON   |
| 11  | 2013-7-29 9:35:49 | 770 | OFF  | ON   |
| 12  | 2013-7-29 9:35:49 | 770 | OFF  |
| 13  | 2013-7-29 9:35:03 | 604 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 14  | 2013-7-29 9:35:04 | 196 | OFF  |
| 15  | 2013-7-29 9:35:25 | 527 | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  | ON   | OFF  |
| 16  | 2013-7-29 9:35:25 | 527 | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  | ON   | ON   |
| 17  | 2013-7-29 9:35:26 | 629 | OFF  | ON   |
| 18  | 2013-7-29 9:35:26 | 629 | OFF  |
| 19  | 2013-7-29 9:35:28 | 490 | OFF  | ON   | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 20  | 2013-7-29 9:35:29 | 330 | OFF  |

Newest SOE Record No. 12

Clear SOE

Figure 4-12 SOE in software

When DI is used as remote signal detection, it will record SOE. SOE is when DI circuits detect the change of the signal voltage level, it records the channel, the event and the event's timestamp.

The SOE records DI1-DI8 input status change and its time, it allows up to 20 events. The newest event number can be displayed.

## 4.6 Over/Under Limit Alarming

AcuRev 2020 Utility Software -- Accuenergy Corporation

Start Readings Settings Help

R1 R2 R3

| No. | Time Stamp       | ms | Alarm Channel            | Value | Status | Limit ID |
|-----|------------------|----|--------------------------|-------|--------|----------|
| 1   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 2   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 3   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 4   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 5   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 6   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 7   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 8   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 9   | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 10  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 11  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 12  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 13  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 14  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 15  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 16  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 17  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 18  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 19  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |
| 20  | 2000-1-1 0:00:00 | 0  | R1: Frequency (Incoming) | 0     | Reset  | 0        |

Newest Alarm Record No. 0

Clear Alarm

Figure 4-13 Alarming in software

Alarming records alarming timestamp, alarming parameter, over/under limit value, alarming status and alarming condition. Users can setup alarming conditions in "Alarm Setup". The maximum alarming record is 20.

Note: The alarming threshold value is not a real measured value, it is the percentage of real measured value over rated value. For instance, if the rated value is 1100, the displayed threshold is 40, then real value = rated value x percentage = 1100×40% = 440.

Please refer to Figure 4-11 for detailed setup.

Enable Alarm

| Limit ID | Enable                   | Alarm Channel                | Setting   |   | Setpoint | Delay (ms) | Output |
|----------|--------------------------|------------------------------|-----------|---|----------|------------|--------|
| #1       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 50       | 300        | RD2    |
| #2       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #3       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #4       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #5       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #6       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #7       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #8       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #9       | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |
| #10      | <input type="checkbox"/> | Real-Time Metering(Incoming) | Frequency | > | 0        | 0          | None   |

Save Load Update Device

Figure 4-14 Alarming Setup

Set up alarming rule, including alarming parameter, alarming condition, alarming target, delay time (ms) and alarming output.

Energy and alarm switch can be set at the same time. Current rating and voltage rating are the load's current and voltage ratings. (Current rating relates to transformer type, such as CT-20 transformer current rating is 5A)

The maximum alarming condition can be set as 10.

Alarming parameters includes inline basic parameter, tenant basic parameter, inline demand and tenant demand.

Inline basic parameters: system real power; real power Pa; real power Pb; real power Pc.

Channel Basic parameters: system real power; real power Pa; real power Pb; real power Pc.

Inline demand: system real power; system real power demand prediction; system power demand Pa; power demand Pa prediction; system power demand Pb; system power demand Pb prediction; system power demand Pc; system power demand Pc prediction

Channel Demand: System Power; real power demand Pa; real power demand Pa prediction; real power demand Pb; real power demand Pb prediction; real power demand Pc; real power demand Pc prediction.

Condition: >(larger than); =(equal) ; <(smaller than).

Alarming setpoint: alarming setpoint is expressed by the percentage of rated value.

For instance: voltage rating is 220 V, transformer type CT-20, now it requires alarms when the 1st tenant's real power is larger than 3 kW. Since rated power is 1.1 kW, 3kW is 1.1kW 273%, then set alarming setpoint as 273.

Time Delay: 0-30000 ms

Output: No output; one of RO1-RO4.

## 4.7 System Event Log

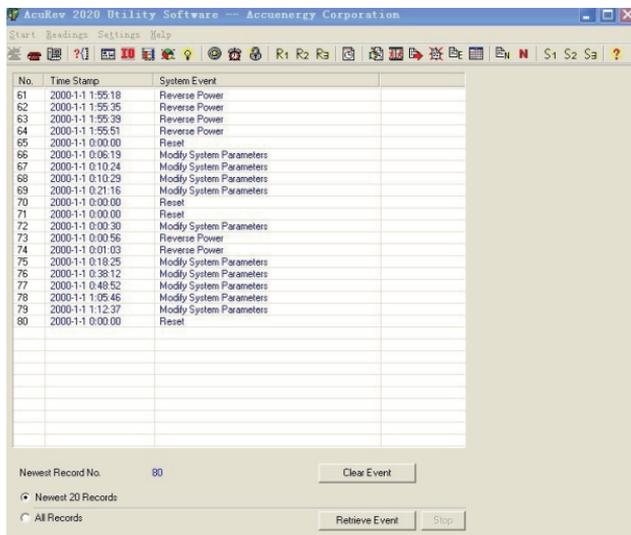


Figure 4-15 System Event Log

Logs system event date and type. Please refer to the 12 system events in 4.2. The max record number is 100. It can be chosen as "the newest 20 records" or "all records".

#### 4.8 Trending Record

In order to have the user understand meter's history, the meter provides trending record function, which is logging a group of data with a preset time interval. AcuRev 2000 has 8 MB of memory, which is used for logging the historic trending. The meter has a system clock therefore, all of the trending records have a timestamp when they are created.

##### Trending Record Setup

AcuRev 2000 has 3 trending logs, each log can be programmed individually. Different contents can be added into 3 logs. Each log slot can be added up to 117 parameters. The memory size of the 3 logs can also be configured, however, the total sector number of the 3 logs cannot be over 100 (each sector has 64 kB). Trending log #1 configuration page can be found in Figure 4-13.

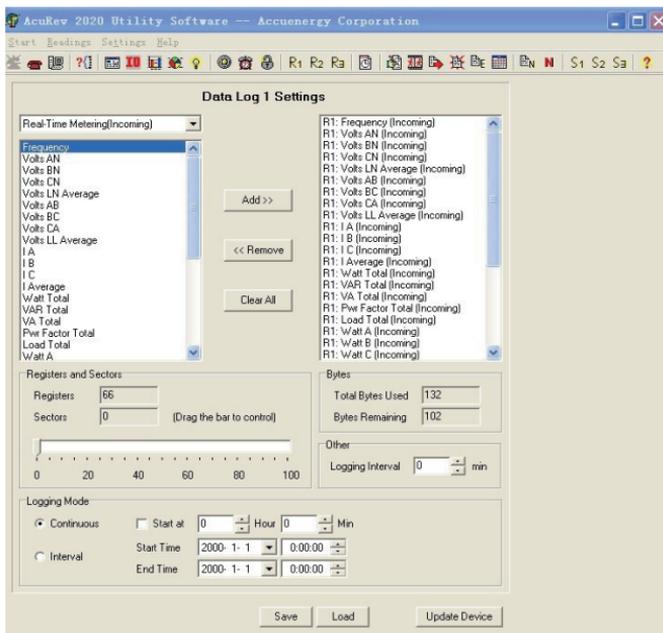


Figure 4-16 Trending Log #1 Configuration

Different contents can be added into 3 logs to meet users' requirements. For example, log #1 can be configured as basic parameter measurement (such as Power), log #2 can be configured as energy measurement, log #3 can be configured as demand measurement. log # can be choose from 8 categories:

1. Real-Time Metering(Incoming),
2. Real-Time Metering(User),
3. Demand(Incoming),
4. Demand(User),
5. Energy(Real-Time Incoming),
6. Energy(Current Month TOU-Incoming),
7. Energy(Prior Month TOU-Incoming),
8. Energy(Real Time-User)

**Inline real-time parameters:**

Users can set different parameters from the 8 categories. Generally, one trending record needs the following settings:

1)8 categories;

2)Choose Parameters:

- a. Select the interested parameters from the left column.
- b. Press "Add" button, the selected parameters will be added to the right column.
- c. If a parameter needs to be removed, select the parameter in the right column, click "Remove" to deselect it.

3)Set logging interval:

The logging interval can be set as any integer between 0-1440.It is how often a record will be logged. When it is set as 0, the logging feature is disabled.

#### 4)Log sector size setup:

The log sector size can be selected between 0 and 100. Make sure the total sector number of the 3 logs does not exceed 100.

#### 5)Select the corresponding trend recording mode.

##### Note:

- If logging Timer mode is selected as Mode 2, when the memory is full, no more records will be logged. If you choose to Mode 1 or Mode 3, when the memory is full, the meter keeps logging, the earliest records will be overwritten by the latest record.
- When overwriting happens, the earliest whole sector will be erased (64 kB data will be erased). It is recommended that users retrieve all the data and save them before the memory is full in order to avoid data loss.
- There are two regions displaying register number, total used bytes and remaining bytes. These values are automatically calculated by the software according to users' selected parameters. The total bytes available is 234.

#### Retrieve Record

There are two methods to retrieve records: manual retrieve and automatic retrieve. The retrieve page can be found in Figure 4-14.

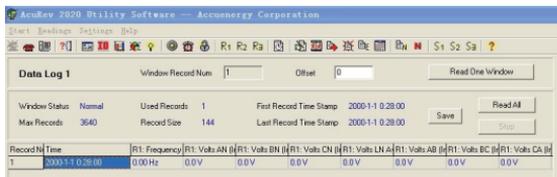


Figure 4-17 Log #1 Record Retrieve

In manual retrieve mode, users can adjust Offset and Window Record Number. Offset is the

deviation number from the first record. Window Record Number is 246 / Record Size, users can retrieve no larger than this number of records by pressing "Read One Window" button.

In automatic retrieve mode, the software retrieves all the Used Records in the memory automatically. Users just press "Read All" button.

#### 4.9 Seal Function

The display module with seal, which has sealed key control, is different with one without seal. When the seal is in opened status, functions are same like normal meters. But when the seal is in sealed status, some functions of meters, which include parameters blocked by seal and optional parameters, will be blocked. These parameters can still be accessible by keys and communication way if they can be accessed before, but in sealed status, these parameters cannot be modified by keys or communication way any more.

Addresses about seal function are 8AFH and 8B0FH.

Address 8AFH is about parameters blocked by seal, which can be configured by users. These setting will be valid only when seal is in sealed status.

Address 8B0H is about if seal function is valid. When the display module is normal one, not connected display module, or the seal module is in invalid sealed status, this address will show seal is open. When the seal is valid, this address will show sealed status and corresponding parameters will be blocked.

| Address | Parameter                               | Description  |
|---------|---|--|
| 8AFH    | Sealed Nonstandard Parameters Selection | Bit0: RS485 communication parameters and infrared communication parameters<br>Bit1: network parameters<br>Bit2: Clear Meter Run Time<br>Bit3: DI pulse counting<br>Bit4: TOU<br>Bit5: RO<br>1: valid of corresponding selection<br>0: invalid of corresponding selection |
| 8B0H    | Seals status                            | 0x0A: Seal sealed; Other: Seal opened.   |

Parameters blocked by seal

As long as seal is in sealed status, parameters below must be blocked, no matter what value of address 8AFH.

#### System parameters setting:

| Address | Parameter                                | Keys | Communication |
|---------|--|------|---------------|
| 806H    | Energy constant pulse                    | √    | √             |
| 807H    | Energy pulse width                       | √    | √             |
| 808H    | DO1 output energy pulse channel settings | √    | √             |
| 809H    | DO2 output energy pulse channel settings | √    | √             |
| 80AH    | Demand calculating mode                  | √    | √             |
| 80BH    | Demand period                            | √    | √             |
| 80CH    | Secondary period of Demand               | √    | √             |
| 80DH    | DI Synchronization Source                | √    | √             |

|           |                                     |    |   |
|-----------|-------------------------------------|----|---|
| 80EH      | DI Triggering Condition             | √  | √ |
| 835H      | Reactive Power                      | √  | √ |
| 836H      | VAR/PF Convention                   | √  | √ |
| 837H-Bit0 | Clear energy data                   | √  | √ |
| 837H-Bit1 | Clear demand data                   | √  | √ |
| 842H      | user01 Mappings                     | √  | √ |
| 846H      | user02 Mappings                     | √  | √ |
| 84AH      | user03 Mappings                     | √  | √ |
| 84EH      | user04 Mappings                     | √  | √ |
| 852H      | user05 Mappings                     | √  | √ |
| 856H      | user06 Mappings                     | √  | √ |
| 85AH      | user07 Mappings                     | √  | √ |
| 85EH      | user08 Mappings                     | √  | √ |
| 862H      | user09 Mappings                     | √  | √ |
| 866H      | user10 Mappings                     | √  | √ |
| 86AH      | user11 Mappings                     | √  | √ |
| 86EH      | user12 Mappings                     | √  | √ |
| 872H      | user13 Mappings                     | √  | √ |
| 876H      | user14 Mappings                     | √  | √ |
| 87AH      | user15 Mappings                     | √  | √ |
| 87EH      | user16 Mappings                     | √  | √ |
| 882H      | user17 Mappings                     | √  | √ |
| 886H      | user18 Mappings                     | √  | √ |
| 887H      | Load voltage rating setting         | -- | √ |
| 888H      | Connection mode of three-phase user | √  | √ |
| 889H      | Channel 1 CT Specifications         | √  | √ |
| 88AH      | Channel 2 CT Specifications         | √  | √ |
| 88BH      | Channel 3 CT Specifications         | √  | √ |
| 88CH      | Channel 4 CT Specifications         | √  | √ |

|      |   |   |   |
|------|---|---|---|
| 88DH | Channel 5 CT Specifications   | √ | √ |
| 88EH | Channel 6 CT Specifications   | √ | √ |
| 88FH | Channel 7 CT Specifications   | √ | √ |
| 890H | Channel 8 CT Specifications   | √ | √ |
| 891H | Channel 9 CT Specifications   | √ | √ |
| 892H | Channel 10 CT Specifications  | √ | √ |
| 893H | Channel 11 CT Specifications  | √ | √ |
| 894H | Channel 12 CT Specifications  | √ | √ |
| 895H | Channel 13 CT Specifications  | √ | √ |
| 896H | Channel 14 CT Specifications  | √ | √ |
| 897H | Channel 15 CT Specifications  | √ | √ |
| 898H | Channel 16 CT Specifications  | √ | √ |
| 899H | Channel 17 CT Specifications  | √ | √ |
| 89AH | Channel 18 CT Specifications  | √ | √ |
| 8ADH | Restore the default parameters<br>(User name and mappings, and CT<br>wiring specifications) | √ | √ |
| 8AFH | Sealed Nonstandard Parameters<br>Selection  | √ | √ |

**Note:** "√" means these addresses will be blocked for keys and communication, and "--" means this function is unavailable.

#### Energy:

| Address     | Parameter                              | Keys | Communication |
|-------------|--|------|---------------|
| 2500H-2501H | Epin-A inline Phase A real time energy | --   | √             |
| 2502H-2503H | Epin-B inline Phase B real time energy | --   | √             |
| 2504H-2505H | Epin-C inline Phase C real time energy | --   | √             |
| 2506H-2507H | Epin-S inline system real time energy  | --   | √             |
| 2508H-2509H | Channel 1 real-time energy             | --   | √             |

|             |   |    |   |
|-------------|---|----|---|
| 250AH-250BH | Channel 2 real-time energy  | -- | √ |
| 250CH-250DH | Channel 3 real-time energy  | -- | √ |
| 250EH-250FH | Channel 4 real-time energy  | -- | √ |
| 2510H-2511H | Channel 5 real-time energy  | -- | √ |
| 2512H-2513H | Channel 6 real-time energy  | -- | √ |
| 2514H-2515H | Channel 7 real-time energy  | -- | √ |
| 2516H-2517H | Channel 8 real-time energy  | -- | √ |
| 2518H-2519H | Channel 9 real-time energy  | -- | √ |
| 251AH-251BH | Channel 10 real-time energy   | -- | √ |
| 251CH-251DH | Channel 11 real-time energy   | -- | √ |
| 251EH-251FH | Channel 12 real-time energy   | -- | √ |
| 2520H-2521H | Channel 13 real-time energy   | -- | √ |
| 2522H-2523H | Channel 14 real-time energy   | -- | √ |
| 2524H-2525H | Channel 15 real-time energy   | -- | √ |
| 2526H-2527H | Channel 16 real-time energy   | -- | √ |
| 2528H-2529H | Channel 17 real-time energy   | -- | √ |
| 252AH-252BH | Channel 18 real-time energy   | -- | √ |
| 252CH-252DH | Channel 1 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 252EH-252FH | Channel 2 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 2530H-2531H | Channel 3 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 2532H-2533H | Channel 4 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 2534H-2535H | Channel 5 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 2536H-2537H | Channel 6 3-phase 4-line / single-phase 3-line real-time system active power energy | -- | √ |
| 2B00H-2B01H | Eqin-A inline Phase A Reactive Power Energy   | -- | √ |

|             |   |    |   |
|-------------|---|----|---|
| 2B02H-2B03H | Eqin-B inline Phase B Reactive Power Energy     | -- | √ |
| 2B04H-2B05H | Eqin-C inline Phase C Reactive Power Energy     | -- | √ |
| 2B06H-2B07H | Eqin-S inline system Reactive Energy            | -- | √ |
| 2B08H-2B2BH | Tenant 1-18 real-time Reactive Power Energy     | -- | √ |
| 2B2CH-2B2DH | Tenant 1 real-time system Reactive Power Energy | -- | √ |
| 2B2EH-2B37H | Tenant 2-6 Reactive Power Energy data           | -- | √ |
| 2B38H-2B39H | Eqin-A inline Phase A Apparent Energy           | -- | √ |
| 2B3AH-2B3BH | Esin-B inline Phase B Apparent Energy           | -- | √ |
| 2B3CH-2B3DH | Esin-C inline Phase C Apparent Energy           | -- | √ |
| 2B3EH-2B3FH | Esin-S inline system Apparent Energy            | -- | √ |
| 2B40H-2B63H | Tenant 1-18 real-time Apparent Energy           | -- | √ |
| 2B64H-2B65H | Tenant 1 real-time system Apparent Energy       | -- | √ |
| 2B66H-2B6FH | Tenant 2-6 Apparent Energy data                 | -- | √ |

#### Sealed Nonstandard Parameters:

1) When bit 0 of address 8AFH is valid, parameters about RS communication should be blocked.

| Address   | Parameter   | Keys | Communication |
|-----------|---|------|---------------|
| 800H      | Meter Address   | √    | √             |
| 801H      | Channel 1 485 communication Modbus parity bit setting | √    | √             |
| 802H      | Infrared communication parity bit setting             | √    | √             |
| 803H      | Channel 1 485 communication Modbus baud rate          | √    | √             |
| 804H      | Infrared communication baud rate                      | √    | √             |
| 839H-83EH | 645 Address   | √    | √             |

2) When bit 1 of address 8AFH is valid, parameters about Network parameters should be blocked.

| Address | Parameter   | Keys | Communication |
|---------|---|------|---------------|
| FFH     | Reset and restore the default values                    | √    | √             |
| 102H    | DHCP setting  | √    | √             |
| 103H    | IP address 1st byte (high)<br>IP address 2nd byte (low) | √    | √             |
| 104H    | IP address 3rd byte (high)<br>IP address 4th byte (low) | √    | √             |
| 105H    | Submask 1st byte (high)<br>Submask 2nd byte (low)       | √    | √             |
| 106H    | Submask 3rd byte (high)<br>Submask 4th byte (low)       | √    | √             |
| 107H    | Gateway 1st byte (high)<br>Gateway 2nd byte (low)       | √    | √             |
| 108H    | Gateway 3rd byte (high)<br>Gateway 4th byte (low)       | √    | √             |
| 109H    | DNS1 1st byte (high)<br>DNS1 2nd byte (low)             | √    | √             |
| 10aH    | DNS1 3rd byte (high)<br>DNS1 4th byte (low)             | √    | √             |
| 10bH    | DNS2 1st byte (high)<br>DNS2 2nd byte (low)             | √    | √             |
| 10cH    | DNS2 3rd byte (high)<br>DNS2 4th byte (low)             | √    | √             |
| 10dH    | Modbus Tcp/Ip port                                      | √    | √             |
| 10eH    | Http port   | √    | √             |

3) When bit 2 of address 8AFH is valid, parameters below should be blocked.

| Address   | Parameter              | Keys | Communication |
|-----------|------------------------|------|---------------|
| 837H-Bit6 | Battery run time clear | √    | √             |
| 837H-Bit5 | Meter run time clear   | √    | √             |

4) When bit 3 of address 8AFH is valid, parameters below should be blocked.

| Address   | Parameter                             | Keys | Communication |
|-----------|---------------------------------------|------|---------------|
| 80FH      | DI Working Mode                       | √    | √             |
| 810H-817H | DI1-8 Pulse Constant for each channel | √    | √             |
| 818H-81FH | DI Category, x8                       | √    | √             |
| 820H-827H | DI Unit, x8                           | √    | √             |
| 838H      | DI Pulse Counter clear                | √    | √             |

5) When bit 4 of address 8AFH is valid, parameters below should be blocked.

| Address | Parameter | Keys | Communication |
|---------|-----------|------|---------------|
| 1054H   | Year      | √    | √             |
| 1055H   | Month     | √    | √             |
| 1056H   | Day       | √    | √             |
| 1057H   | Hour      | √    | √             |
| 1058H   | Minute    | √    | √             |
| 1059H   | Second    | √    | √             |
| 105AH   | Week      | √    | √             |

**Note:** Standard time is valid within  $\pm 5$  minutes, it will be invalid if not in this range.

| Address     | Parameter                         | Keys | Communication |
|-------------|-----------------------------------|------|---------------|
| 8AEH        | Ten years download setting enable | --   | √             |
| TOU         |                                   |      |               |
| 1093H-109EH | Basis parameter of TOU            | --   | √             |

|                    |                                    |    |   |
|--------------------|------------------------------------|----|---|
| 10B0H-10D9H        |                                    | -- | √ |
| 10DAH-1229H        |                                    | -- | √ |
| 122AH-1283H        |                                    | -- | √ |
| Current TOU energy |                                    |    |   |
| 2600H-2627H        | In-line Current TOU energy         | -- | √ |
| 2628H-2717H        | Each channel Current TOU energy    | -- | √ |
| DST setting        |                                    |    |   |
| 4000H              | DST enable                         | -- | √ |
| 4001H              | DST format                         | -- | √ |
| 4002H              | DST Start Mon                      | -- | √ |
| 4003H              | DST Start Day                      | -- | √ |
| 4004H              | DST Start Hour                     | -- | √ |
| 4005H              | DST Start Min                      | -- | √ |
| 4006H              | DST Start Adjust time (Unit: Min)  | -- | √ |
| 4007H              | DST Ending Mon                     | -- | √ |
| 4008H              | DST Ending Day                     | -- | √ |
| 4009H              | DST Ending Hour                    | -- | √ |
| 400AH              | DST Ending Min                     | -- | √ |
| 400BH              | DST Ending Adjust time (Unit: Min) | -- | √ |
| 400CH              | DST Start Mon                      | -- | √ |
| 400DH              | DST Start week                     | -- | √ |
| 400EH              | DST Start First few weeks          | -- | √ |
| 400FH              | DST Start Hour                     | -- | √ |
| 4010H              | DST Start Min                      | -- | √ |
| 4011H              | DST Start Adjust time (Unit: Min)  | -- | √ |
| 4012H              | DST Ending Mon                     | -- | √ |
| 4013H              | DST Ending Week                    | -- | √ |
| 4014H              | DST Ending First few weeks         | -- | √ |
| 4015H              | DST Ending Hour                    | -- | √ |
| 4016H              | DST Ending Min                     | -- | √ |

|                               |                                    |    |   |
|-------------------------------|------------------------------------|----|---|
| 4017H                         | DST Ending Adjust time (Unit: Min) | -- | √ |
| Ten years holiday setting     |                                    |    |   |
| 4100H                         | Holiday setting enable             | -- | √ |
| 4101H                         | Start year holiday setting         | -- | √ |
| 4102H                         | End year holiday setting           | -- | √ |
| The 1st year holiday setting  |                                    |    |   |
| 4103H-415EH                   | Holiday Parameter setting          | -- | √ |
| The 2nd year Holiday setting  |                                    |    |   |
| 415FH-41BA                    | Holiday Parameter setting          | -- | √ |
| The 3rd year Holiday setting  |                                    |    |   |
| 41BBH-4216H                   | Holiday Parameter setting          | -- | √ |
| The 4nd year Holiday setting  |                                    |    |   |
| 4217H-4272H                   | Holiday Parameter setting          | -- | √ |
| The 5nd year Holiday setting  |                                    |    |   |
| 4273H-42CEH                   | Holiday Parameter setting          | -- | √ |
| The 6nd year Holiday setting  |                                    |    |   |
| 42CFH-432AH                   | Holiday Parameter setting          | -- | √ |
| The 7nd year Holiday setting  |                                    |    |   |
| 432BH-4386H                   | Holiday Parameter setting          | -- | √ |
| The 8nd year Holiday setting  |                                    |    |   |
| 4387H-43E2H                   | Holiday Parameter setting          | -- | √ |
| The 9nd year Holiday setting  |                                    |    |   |
| 43E3H-443EH                   | Holiday Parameter setting          | -- | √ |
| The 10nd year Holiday setting |                                    |    |   |
| 443FH-449AH                   | Holiday Parameter setting          | -- | √ |

6) When bit 5 of address 8AFH is valid, parameters about RO should be blocked.

| Address | Parameter                 | Keys | Communication |
|---------|---------------------------|------|---------------|
| 828H    | Relay Output Working Mode | √    | √             |

|      |  |    |   |
|------|--|----|---|
| 829H | Relay Control Mode   | √  | √ |
| 82AH | Relay Control Momentary Time   | √  | √ |
| 82BH | Alarming Feature   | √  | √ |
| 82CH | 1-10 Alarming Channel  | -- | √ |
| 82DH | Each event alarm is sent to RO feature bit. 2 bytes represent 16 events sent to RO feature | -- | √ |
| 82EH | RO alarming, each one of the first 8 events corresponds to RO settings                     | -- | √ |
| 82FH | Same as above, the last 8 events   | -- | √ |
| 830H | RO alarming time delay, not applicable to over/under limit alarming                        | -- | √ |

## 4.10 Device Information

The screenshot displays the AcuRev 2020 Utility Software interface. The title bar reads "AcuRev 2020 Utility Software -- Accuenergy Corporation". The menu bar includes "Start", "Readings", "Settings", and "Help". The toolbar contains various icons for navigation and actions, including "R1", "R2", and "Ra".

The main content area is divided into three sections:

- Device:**
  - Device Type: HC02 (AcuRev 2020)
  - Hardware Version: 2.03
  - Software Version: 2.05
  - Release Date: 20130725
  - Serial Number: (empty)
- Display Module:**
  - Device Type: SA31
  - Hardware Version: 1.03
  - Software Version: 2.03
  - Release Date: 20130715
- Net Module:**
  - Device Type: ANEM
  - Hardware Version: 1.01
  - Software Version: 1.01
  - Release Date: 20130109

At the bottom of the interface, there are controls for time synchronization:

- Device Run-Time: 32.75 Hours (with "Reset Device Run-Time" button)
- Battery Run-Time: 0 Hours (with "Reset Battery Run-Time" button)
- Device Clock: 2000-1-1 0:30:14 SAT (with "Set Device Clock" button)
- Time synchronization options:
  - Use PC Time
  - 2000- 1- 1 [dropdown] 0:00:00 [spinners]

Figure 4-18 Device Information

## **Chapter 5 Communication**

**5.1 Modbus Protocol Introduction**

**5.2 Modbus Communication Format**

**5.3 Ethernet communication**

**5.4 Application Details and Parameter Address Table**

AcuRev 2000 supports Modbus communication protocols. The infrared port supports field meter reading; The meter supports 10/100 M Ethernet port, protocols are Modbus TCP, SMTP, HTTP, SNMP, SNTP

## 5.1 Modbus Protocol Introduction

### 1. Transmission mode

The mode of transmission defines the data structure within a frame and the rules used to transmit data.

|                  |                                      |
|------------------|--------------------------------------|
| ▲ Coding System  | 8 bit                                |
| ▲ Start bit      | 1 bit                                |
| ▲ Data bits      | 8 bit                                |
| ▲ Parity         | No parity / odd parity / even parity |
| ▲ Stop bit       | 1 bit or 2 bit                       |
| ▲ Error checking | CRC                                  |

### 2. Frame

When data frame reaches the terminal unit, it goes through the unit via a special "port", the unit removes the data frame's header, reads the data, if there is no error, then it implements the data's task. Afterwards, the unit puts its own data with the acquired header, and sends back the frame to the sender. The response data frame contains: Address, Function, Data and CRC Check. Any error will cause a failure to respond.

## Frame Format

| Address | Function | Data     | Check   |
|---------|----------|----------|---------|
| 8-Bits  | 8-Bits   | Nx8-Bits | 16-Bits |

Table 5-1 Data Frame Format

### Address Field

The address field is at the start of the frame. It is composed of 1 byte (8 bits), its decimal value range is 0-247.

A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.

### Function Field

When a message is sent from a master to a slave device the function code field tells the slave what kind of action to perform.

| Code | Meaning                   | Action   |
|------|---------------------------|--|
| 01   | Read DO status            | Obtain Digital (Relay) Output current status (ON/OFF)                |
| 02   | Read DI status            | Obtain Digital Input current status (ON/OFF)                         |
| 03   | Read Data                 | Obtain current binary value from one or more registers               |
| 05   | Control DO                | Control Digital (Relay) Output(ON/OFF)                               |
| 16   | Preset multiple registers | Place specific value into a series of consecutive multiple-registers |

Table 5-2 Function Code

## Data Field

Data field contains the data that terminals need to complete the request and the data that terminals respond to the request. This data may be a numerical value, address or setting. For example, Function Code tells the terminal to read one register, Data Field needs to specify reading from which register and how many registers to read.

## Error Check Field

The field allows the error check by master and slave devices. Due to electrical noise and other interferences, a group of data may be changed while transmitting from one location to the other. Error Check ensures master or slave devices do not respond to the distorted data during the transmission, which enhances the system security and efficiency. Error Check uses 16-bit Cyclic Redundancy Check (CRC 16).

### 3. CRC Check

Every message includes an error checking field which is based on the Cyclical Redundancy Check (CRC) method. The CRC field checks the contents of the entire message. It is applied regardless of any parity check method used for the individual characters of the message. The CRC field is two bytes long, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, and is appended to the message.

The receiving device recalculates the CRC value during reception of the message, and compares the calculated value to the actual value it received in the CRC field.

An error will be reported if the two values are not equal. CRC calculation is first started by preloading the whole 16-bit register to 1's. The process begins by applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do not apply to the CRC.

When generating the CRC, each 8-bit character is exclusive ORed with the register

contents. The result is shifted towards the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined, if the LSB equals to 1, the register is exclusive ORed with a preset, fixed value; if the LSB equals to 0, no action will be taken. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit byte is exclusive ORed with the register's current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value. When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

## 5.2 Modbus Communication Format

| Addr | Fun | Data start<br>reg hi | Data start<br>reg lo | Data #of<br>regs hi | Data #of<br>regs lo | CRC16<br>Hi | CRC16<br>Lo |
|------|-----|----------------------|----------------------|---------------------|---------------------|-------------|-------------|
| 06H  | 03H | 00H                  | 00H                  | 00H                 | 21H                 | 84H         | 65H         |

Figure 5-3 Protocol Illustration

Addr: Slave device address

Fun: Function Code

Data start reg hi: Start register address, high byte

Data start reg lo: Start register address, low byte

Data #of reg hi: Number of registers, high byte

Data #of reg lo: Number of registers, low byte

CRC16 Hi: CRC high byte

CRC16 Lo: CRC low byte

## 1. Read Relay Output status(Function Code 01)

### Query

The master device sends query frame to the slave device. Function Code 01 allows users to acquire the relay output status (1=ON, 0=OFF) of the slave device with the specified address. On top of slave device address and function code, query frame must contain the relay register starting address and the number of registers to be read.

Table 5-4 depicts reading Relay 1 and Relay 2 status of the slave device with the address of 17.

| Addr | Fun | Relay start<br>reg hi | Relay start<br>reg lo | Relay #of<br>regs hi | Relay #of<br>regs lo | CRC16<br>Hi | CRC16<br>Lo |
|------|-----|-----------------------|-----------------------|----------------------|----------------------|-------------|-------------|
| 11H  | 01H | 00H                   | 00H                   | 00H                  | 02H                  | BFH         | 5BH         |

Table 5-4 Query frame of reading Relay Output status

### Response

The slave device answers the master device's query. The response frame contains slave device address, function code, data quantity and CRC check. Each relay utilizes one bit(1 = ON , 0 = OFF). Table 5-5 depicts the response frame.

| Addr | Fun | Byte count | Data | CRC16 hi | CRC16 lo |
|------|-----|------------|------|----------|----------|
| 11H  | 01H | 01H        | 02H  | D4H      | 89H      |

### Data Bytes

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

MSB

LSB

(Relay 1 = OFF , Relay 2=ON)

Table 5-5 Response frame of reading Relay Output status

## 2. Read the status of DI (Function Code 02)

### Query

On top of slave device address and function code, query frame must contain the digital input register starting address and the number of registers to be read. DI register address starts from 0000H(DI1=0000H, DI2=0001H, DI3=0002H, DI4=0003H).

Table 5-6 depicts of reading DI1 to DI4 status of the slave device with the address of 17.

| Addr | Fun | DI start<br>addr hi | DI start<br>addr lo | DI num<br>hi | DI num<br>lo | CRC16<br>hi | CRC16<br>lo |
|------|-----|---------------------|---------------------|--------------|--------------|-------------|-------------|
| 11H  | 02H | 00H                 | 00H                 | 00H          | 04H          | 7BH         | 59H         |

Table 5-6 Query frame of reading DI status

### Response

The slave device answers the master device's query. The response frame contains slave device address, function code, data quantity and CRC check. Each DI utilizes one bit (1 = ON, 0 = OFF). Table 5-7 depicts the response frame.

| Addr | Fun | Byte count | Data0 | CRC16 hi | CRC16 lo |
|------|-----|------------|-------|----------|----------|
| 11H  | 02H | 01H        | 03H   | E5H      | 49H      |

### Data Bytes

|   |   |   |   |     |     |     |     |
|---|---|---|---|-----|-----|-----|-----|
| 0 | 0 | 0 | 0 | DI4 | DI3 | DI2 | DI1 |
| 0 | 0 | 0 | 0 | 0   | 0   | 1   | 1   |

MSB

LSB

Table 5-7 Response frame of reading DI status

### 3. Read Data (Function Code 03)

#### Query

This function allows the master to obtain the measurement results from the meter.

Table 5-8 depicts reading slave device (address 17) Inline A real-time energy, Inline B real-time energy, , Inline C real-time energy (these parameters are dword data type, each parameter uses 2 addresses, each address uses 2 bytes). AcuRev 2000 Inline A real-time energy address is 2500H, 2501H; Inline B real-time energy address is 2502H, 2503H; Inline C real-time energy is 2504H, 2505H.

| Addr | Fun | Data start<br>addr hi | Data start<br>Addr lo | Data #of<br>regs hi | Data #of<br>regs lo | CRC16<br>hi | CRC16<br>lo |
|------|-----|-----------------------|-----------------------|---------------------|---------------------|-------------|-------------|
| 11H  | 03H | 25H                   | 00H                   | 00H                 | 06H                 | CCH         | 54H         |

Table 5-8 Query of Inline A real-time energy, Inline B real-time energy, Inline C real-time energy

#### Response

Response frame contains slave device address, function code, data quantity and CRC check.

Table 5-9 depicts Inline A real-time energy=0000000BH(1.1kWh), Inline B real-time energy=0000000CH(1.2kWh), Inline C real-time energy=0000000D(1.3kWh).

| Addr | Fun | Byte<br>count | Data1<br>hi | Data1<br>Lo | Data 2<br>hi | Data2<br>lo | Data3<br>hi | Data3<br>lo | Data4<br>hi | Data4<br>lo |
|------|-----|---------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|
| 11H  | 03H | 0CH           | 00H         | 00H         | 00H          | 0BH         | 00H         | 00H         | 00H         | 0CH         |

| Data5<br>hi | Data5<br>Lo | Data 6<br>hi | Data6<br>lo | CRC16<br>hi | CRC16<br>lo |
|-------------|-------------|--------------|-------------|-------------|-------------|
| 00H         | 00H         | 00H          | 0DH         | 21H         | 88H         |

Table 5-9 Response of Inline A real-time energy, Inline B real-time energy, Inline C real-time energy

#### 4. Control Relay Output (Function Code 05)

##### Query

This query frame forces the relay status to ON or OFF. Data FF00H sets the relay as ON, and data 0000H sets the relay as OFF. The relay will not be influenced by any other data input

The following is to query slave device 17 to set relay status as ON.

| Addr | Fun | DO addr<br>hi | DO addr<br>Lo | Value<br>Hi | Value<br>lo | CRC16<br>hi | CRC16<br>lo |
|------|-----|---------------|---------------|-------------|-------------|-------------|-------------|
| 11H  | 05H | 00H           | 00H           | FFH         | 00H         | 8EH         | AAH         |

Table 5-10 Control relay status query frame

##### Response

The correct response to this request is to send back the received data after the relay status is changed.

| Addr | Fun | Do addr<br>Hi | Do addr<br>Lo | Value<br>Hi | Value<br>Lo | CRC16<br>Hi | CRC16<br>Lo |
|------|-----|---------------|---------------|-------------|-------------|-------------|-------------|
| 11H  | 05H | 00H           | 00H           | FFH         | 00H         | 8EH         | AAH         |

Table 5-11 Control relay status response frame

## 5. Preset/Reset Multi-Register (Function Code 16)

## Query

Function Code 16(10H Hex) allows the user to modify the contents of multiple registers. The example below is a request to preset device address of 17's channel #1's real-time energy as 12345.6 kWh. AcuRev 2000 energy is raw data multiplied by 0.1 kWh, therefore, the value written into the register should be 123456, hex format is 01E240H. Channel #1's real-time energy address is 2508H and 2509H, 32 bit, total 4 Bytes.

| Addr | Fun | Data start<br>reg hi | Data start<br>reg lo | Data #of<br>reg hi | Data #of<br>reg lo | Byte<br>Count |
|------|-----|----------------------|----------------------|--------------------|--------------------|---------------|
| 11H  | 10H | 25H                  | 08H                  | 00H                | 02H                | 04H           |

| Value hi | Value Lo | Value hi | Value lo | CRC hi | CRC lo |
|----------|----------|----------|----------|--------|--------|
| 00H      | 01H      | E2H      | 40H      | 18H    | C8H    |

Table 5-12 Preset tenant #1's real-time energy

## Response

The correct response is to send back address, function code, data starting address, data bytes, CRC check after the value is changed.

| Addr | Fun | Data start<br>reg hi | Data start<br>reg lo | Data #of<br>reg hi | Data #of<br>Reg lo | CRC16<br>hi | CRC16<br>lo |
|------|-----|----------------------|----------------------|--------------------|--------------------|-------------|-------------|
| 11H  | 10H | 25H                  | 08H                  | 00H                | 02H                | C9H         | 96H         |

Table 5-13 Preset Multi-register response frame

## 5.3 Ethernet communication

### 5.3.1 Introduction to Ethernet

Ethernet was originally developed by Xerox and then developed further by Xerox, DEC, and Intel. Ethernet uses a Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol, and provides transmission speeds up to 10 Mbps.

Now Ethernet stands for LAN with CSMA/CD protocol.

Ethernet is the most current communication standard in LAN. This standard defines the used type of cable and the method of Signal processing in LAN.

### 5.3.2 Function Description of Ethernet module

Please read appendix of technical data and specifications of Ethernet module before using.

- \* The Ethernet module supports Modbus-TCP protocol. It is used as a server, the default value of the protocol port is 502, and the user defined range of the protocol port is 2000~5999. The device address is the same as the meter.
- \* The Ethernet module supports SMTP protocol. It has an email function and supports “Send mail for timing” mode and “Send mail for event” mode.
- \* The Ethernet module supports HTTP protocol. It is used as an HTTP server, the default value of the protocol port is 80, and the scope of the protocol port is 6000~9999.
- \* The Ethernet module supports SNMP protocol. It is used as a SNMP agent, providing management to MIB library, so you can get data from the meter.
- \* The Ethernet module supports SNTP protocol. It can get update time to Coordinated Universal Time (UTC).

### 5.3.3 Definition of RJ45 Interface

The Ethernet module uses a standard RJ45 connector to access the Ethernet network. The mechanical and electrical characteristics of the connectors comply with the requirements of IEC 603-7.

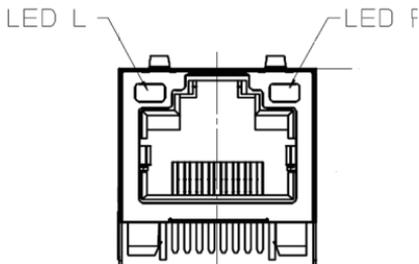


Figure 5-1

| Script | ID  | Content         |
|--------|-----|-----------------|
| 1      | TX+ | Tranceive Data+ |
| 2      | TX- | Tranceive Data- |
| 3      | RX+ | Receive Data+   |
| 4      | n/c | Not connected   |
| 5      | n/c | Not connected   |
| 6      | RX- | Receive Data-   |
| 7      | n/c | Not connected   |
| 8      | n/c | Not connected   |

Table 5-14

**LED\_L (yellow):** displays speed status. LED on indicates 100Mbps, while LED off indicates 10Mbps.

**LED\_R (green):** displays link and activity status combined. LED on indicates link status, while flashing LED indicates activity status.

### 5.3.4 Cable

Shielded twisted-pair cable (standard 568A or standard 568B) is usually recommended as reference to the EIA/TIA standard.

### 5.3.5 Connection Method

#### 1. Direct Connect

The Ethernet module uses cross line (standard 568A) to connect to computers. The module supports Modbus-TCP, SNMP and HTTP functions for a direct connection.

#### 2. Indirect Connect

The Ethernet module uses straight line (standard 568B) to access the Ethernet through a router or hub.

### 5.3.6 Initializing Ethernet Module

AXM-NET Module's default settings are as follows:

IP Address (192.168.1.254);

Subnet Mask (255.255.255.0);

Gateway (192.168.1.1);

This information can be found by using the keys on the meter front. The following process shows how to configure Ethernet module settings by using the front panel:

1. Pressing “◀” key and “▶” key simultaneously on the meter will go to the menu selecting mode. Cursor “E” flashes in this mode.



Figure 5-2

2. Press “▲” key or “▼” key to move the cursor to “NET”. Press “OK” key to go to the Ethernet module setting mode. Access Code page is the first page of “NET” mode. Press “OK” key to go to the Ethernet parameter setting page.



Figure 5-2

3. Set configuration mode in the first setting page. “AUTO” means that users configure module settings with DHCP protocol while “MANU” means that users configure module settings with manual setting. Press “OK” key, to go to the setting state. Press “▲” key or “▼” key to select configuration mode, press “OK” key to accept. Press the “▲” key again to go to the second setting page for IP Address.

**Note:** If you select the “AUTO” mode, please go to step 11 directly and reset module. Wait until the reset is finished and find the new IP address in the following step.

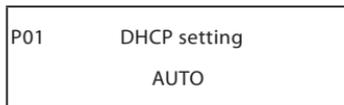


Figure 5-3

4. Set IP Address in the second setting page, such as 192.168.1.21 as shown below. Press the "OK" key to go to the IP setting page. The cursor starts at the first digit. After setting the IP address, press the "OK" key to accept. Press the "▲" key again to go to the third setting page for Subnet Mask.

|     |                |
|-----|----------------|
| P02 | IP Address     |
|     | 192.168.001.21 |

Figure 5-4

5. Set Subnet Mask in the third setting page, such as 255.255.255.0. Press the "OK" key to go to the setting page. The cursor starts at the first digit. After setting the Subnet Mask, press the "OK" key to accept. Press the "▲" key again to go to the fourth setting page for Gateway.

|     |                 |
|-----|-----------------|
| P03 | Submask         |
|     | 255.255.255.000 |

Figure 5-5

6. Set Gateway in the fourth setting page, such as 192.168.1.1. Press the "OK" key to go to the setting page. The cursor starts at the first digit. After setting the Gateway, press the "OK" key to accept. Press the "▲" key to go to the fifth setting page for DNS Primary Server.

|     |                 |
|-----|-----------------|
| P04 | Gateway         |
|     | 192.168.001.000 |

Figure 5-5

7. Set DNS Primary Server in the fifth setting page, such as 202.106.0.20. Press the "OK" key

to go to the setting page. The cursor starts at the first digit. After setting the DNS Primary Server, press the “OK” key to accept. Press the “▲” key to go to the sixth setting page for DNS Secondary Server.

**Note: the DNS parameters must be set correctly to use the SMTP functions.**

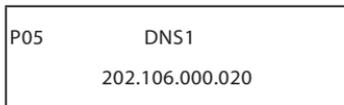


Figure 5-6

8. Set DNS Secondary Server in the sixth setting page, such as 202.106.196.115. Press the “OK” key to go to the setting page. The cursor starts at the first digit. After setting the DNS Secondary Server, press the “OK” key to accept. Press the “▲” key to go to the seventh setting page for the Modbus-TCP port.

**Note: the DNS parameters must be set correctly in order to use the SMTP functions.**

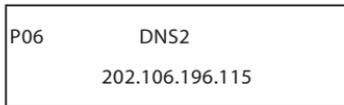


Figure 5-7

9. Set Modbus-TCP port in the seventh setting page, such as 502. Press the “OK” key to go to the setting page. The cursor starts at the first digit. After setting the Modbus-TCP port, press the “OK” key to accept. Press the “▲” key to go to the eighth setting page for the HTTP port. The Modbus-TCP port’s default value is 502, and the user defined range of port is 2000~5999. If the set port is not in the correct range, the set port will return to the default value.

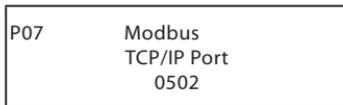


Figure 5-8

10. Set HTTP port in the eighth setting page, such as 80. Press the "OK" key to go to the setting page. The cursor starts at the first digit. After setting the HTTP port, press the "OK" key to accept. Press the "▲" key to go to the ninth setting page for the reset mode. The HTTP port's default value is 80, and the user defined range of port is 6000~9999. If the set port is not in the correct range, the set port will return to the default value.



Figure 5-9

11. Set resetting mode in the ninth setting page. Select "RESET" to reset the module. Selecting "NO" will not reset the module. Selecting "DEFAULT" will load the module with default settings and reset module. Press the "OK" key to go to the setting page. Press "▲" key or "▼" key to select configuration mode, press the "OK" key to accept.

Note: When configuring Ethernet module settings completely, users must select "RESET" to restart module and new settings will take effect.

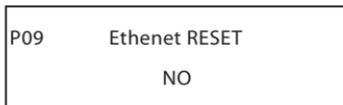


Figure 5-9

12. The password of AXM-NET module can be reset by selecting "RESET". The password then becomes "12345678". Selecting "NO" means no change. Press "OK" key to accept.

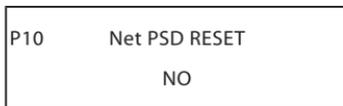


Figure 5-10

13. After configuring AXM-Net settings completely, press "►" key and "◀" key simultaneously to return to menu selecting mode.

### 5.3.7 Searching IP Address of Ethernet Module

The utility software of AcuRev 2000 series meter supports a meter search function. Users can use this function to obtain IP and MAC addresses of Ethernet Modules.

#### Operation steps:

- 1) Click "Start" menu of utility software.
- 2) Click "Search Device" menu.

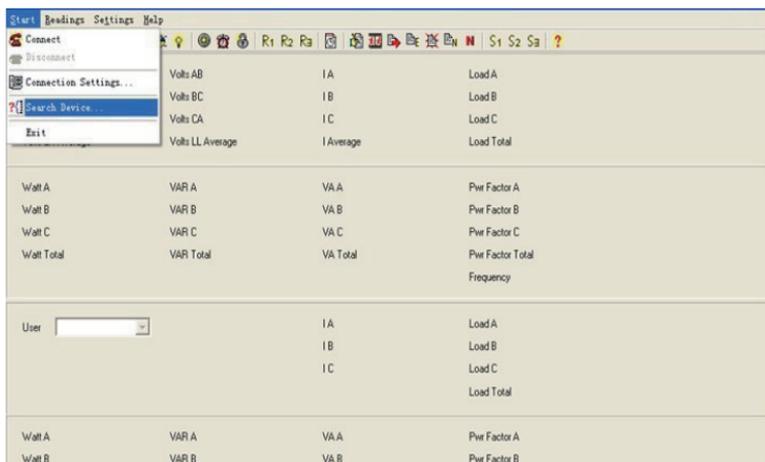


Figure 5-11

3) Utility software pop-ups “Search Device(s)” window, and the window displays IP address and MAC address of module.

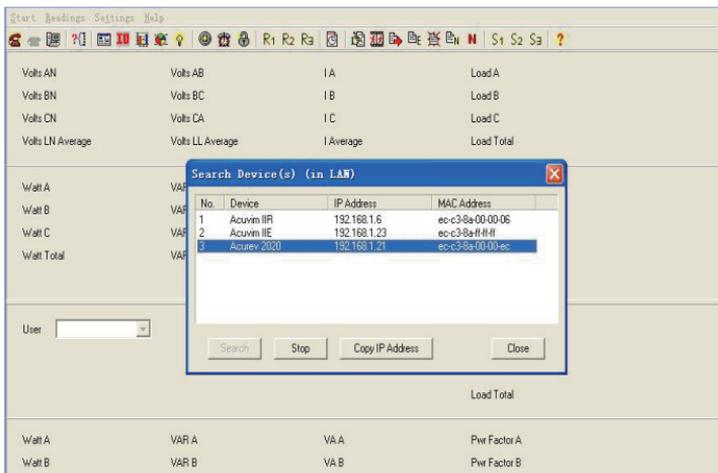


Figure 5-12

**Note:**This function is used only in LAN, not used in WAN or direct connect to computer.

### 5.3.8 Description of Modbus-TCP protocol

The Modbus-TCP protocol is used for communication in Ethernet modules. The protocol sets up master/slave link in Ethernet. First, master device (client) sets up TCP link with slave device (server). Second, master device sends request frame to slave device, and slave device receives request frame and returns response frame to master device. Figure 5-13 displays working mode of Modbus-TCP protocol.

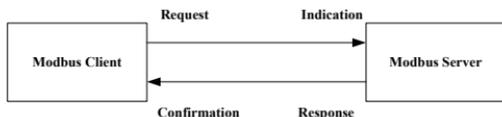


Figure 5-13

## 1. Protocol

### a. Data Frame Format

Table 5-15

|             |          |          |
|-------------|----------|----------|
| MBAP Header | Function | Data     |
| 7x8-Bits    | 8-Bits   | Nx8-Bits |

### b. Modbus Application Header (MBAP Header) Field

The Modbus application header field is the start of the data frame and consists of seven bytes.

Table 5-16

| Field                  | Length  | Description   |
|------------------------|---------|---|
| Transaction Identifier | 2 Bytes | Identification of a Modbus Request/Response transaction |
| Protocol Identifier    | 2 Bytes | Modbus protocol=0                                       |
| Length                 | 2 Bytes | Number of following bytes                               |
| Unit Identifier        | 1 Byte  | Slave address, in the range of 0~247 decimal.           |

### c. Function Field

The function code field of a message frame contains eight bits. Valid codes are in the range of 1~255 decimal. When a message is sent from a client to a server device the function code field tells the server what kind of action to perform.

Table 5-17

| Code | Meaning                       | Action   |
|------|-------------------------------|--|
| 01   | Read Relay Output Status      | Obtain current status of Relay Output                                |
| 02   | Read Digital Input(DI) Status | Obtain current status of Digital Input                               |
| 03   | Read Data                     | Obtain current binary value in one or more registers                 |
| 05   | Control Single Relay Output   | Force Relay to a state of on or off                                  |
| 16   | Write Multiple-registers      | Place specific value into a series of consecutive multiple-registers |

#### d. Data Field

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. The data field of messages sent from a master to slave devices contains additional information which the slave must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of items to be handled, and the count of actual data bytes in the field. For example, if the master requests a slave to read a group of holding registers (function code 03), and the data field specifies the starting register and how many registers are to be read. If the master writes to a group of registers in the slave (function code 10 hexadecimal), the data field specifies the starting register, how many registers to write, the count of data bytes to follow in the data field, and the data to be written into the registers.

#### 2. Format of communication

##### Explanation of frame

Table 5-18

|                           |                           |                        |                        |                  |           |                 |
|---------------------------|---------------------------|------------------------|------------------------|------------------|-----------|-----------------|
| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi        | Length lo | Unit identifier |
| 00H                       | 00H                       | 00H                    | 00H                    | 00H              | 06H       | 01H             |
| Fun                       | Data start reg hi         | Data start reg lo      | Data #of regs hi       | Data #of regs lo |           |                 |
| 03H                       | 40H                       | 00H                    | 00H                    | 48H              |           |                 |

As shown in Table 5-4 the meaning of each abbreviated word is:

Transaction identifier hi: Transaction Identifier high byte

Transaction identifier lo: Transaction Identifier low byte

Protocol identifier hi: Protocol Identifier high byte

Protocol identifier lo: Protocol Identifier low byte

Length hi: length high byte

Length lo: length low byte

Unit identifier: slave address

Fun: function code

Data start reg hi: start register address high byte

Data start reg lo: start register address low byte

Data #of regs hi: number of register high byte

Data #of regs lo: number of register low byte

#### **a. Read Status Relay (Function Code 01)**

##### **Function Code 01**

This function code is used to read relay status in AcuRev 2000 series meter.

1=On

0=Off

There are 8 Relays in the meter, and the starting address is 0000H.

The following query is to read 2 Relays Status of the meter Address 1.

## Query

Table 5-19 Read 2 Relays Status Query Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 06H       | 01H             |

| Fun | Data start reg hi | Data start reg lo | Data #of regs hi | Data #of regs lo |
|-----|-------------------|-------------------|------------------|------------------|
| 01H | 00H               | 00H               | 00H              | 02H              |

## Response

The AcuRev 2000 series meter response includes MBAP Header, function code, quantity of data byte and the data. For example response to read the status of Relay 1 and Relay 2 is shown as Table 5-6. The status of Relay 1 and Relay 2 is responding to the last 2 bit of the data.

Table 5-20 Read 2 Relays Status Response Message

Relay 1: bit0

Relay 2: bit1

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 04H       | 01H             |

| Fun | Byte count | Data |
|-----|------------|------|
| 01H | 01H        | 02H  |

The content of the data is,

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

MSB

LSB

(Relay 1 = OFF , Relay 2=ON)

## Response

An example response to read Time (2006-12-18 14:15:20) is shown as Table 5-10.

Table 5-21 Read Time Response Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 0FH       | 01H             |

| Fun | Byte count | Data1 hi | Data1 lo | Data2 hi | Data2 lo | Data3 hi | Data3 lo | Data4 hi | Data4 lo | Data5 hi | Data5 lo | Data6 hi | Data6 lo |
|-----|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 03H | 0CH        | 07H      | D6H      | 00H      | 0CH      | 00H      | 12H      | 00H      | 0EH      | 00H      | 0FH      | 00H      | 14H      |

### d. Control Relay (Function Code 05)

#### Query

The message forces a single Relay either on or off. Any Relay that exists within the AcuRev 2000 series meter can be forced to be either status (on or off). The address of Relay starts at 0000H, and the meter has eight Relays.

The data value FF00H will set the Relay on and the value 0000H will turn it off; all other values are invalid and will not affect that relay.

The example below is a request to AcuRev 2000 series meter address 1 to turn on Relay 1.

Table 5-22 Control Relay Query Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 06H       | 01H             |

| Fun | Data start reg hi | Data start reg lo | Value hi | Value lo |
|-----|-------------------|-------------------|----------|----------|
| 05H | 00H               | 00H               | FFH      | 00H      |

## Response

The normal response to the command request is to retransmit the message as received after the Relay status has been altered.

Table 5-23 Control Relay Response Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 06H       | 01H             |

| Fun | Data start reg hi | Data start reg lo | Value hi | Value lo |
|-----|-------------------|-------------------|----------|----------|
| 05H | 00H               | 00H               | FFH      | 00H      |

### e. Preset/Reset Multi-Register (Function Code 16)

#### Query

Function code 16 allows the user to modify the contents of a Multi-Register. The example below is a request to an AcuRev 2000 series meter address 1 to Preset CT1 (500) and CT2 (5). CT1 data address is 1008H, and CT2 data address is 1009H.

Table 5-24 Preset CT Value Query Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 08H       | 01H             |

| Fun | Data start reg hi | Data start reg lo | Data #of regs hi | Data #of regs lo | Byte count | Value1 hi | Value1 lo | Value2 hi | Value2 lo |
|-----|-------------------|-------------------|------------------|------------------|------------|-----------|-----------|-----------|-----------|
| 10H | 10H               | 08H               | 00H              | 02H              | 04H        | 01H       | F4H       | 00H       | 05H       |

## Response

The normal response to a preset Multi-Register request includes MBAP Header, function code, data start register and the number of registers.

Table 5-25 Preset Multi-Registers Response Message

| Transaction identifier hi | Transaction identifier lo | Protocol identifier hi | Protocol identifier lo | Length hi | Length lo | Unit identifier |
|---------------------------|---------------------------|------------------------|------------------------|-----------|-----------|-----------------|
| 00H                       | 00H                       | 00H                    | 00H                    | 00H       | 06H       | 01H             |

| Fun | Data start reg hi | Data start reg lo | Data #of regs hi | Data #of regs lo |
|-----|-------------------|-------------------|------------------|------------------|
| 10H | 10H               | 08H               | 00H              | 02H              |

Users may refer to the sixth chapter “Communication” and get the details of AcuRev 2000 series meter.

When using Modbus/TCP function, it is best to set the Scan interval of the software to under 1000 ms.

When using Third Party software, it is best to set Frame interval for the Modbus-TCP function to under 1000 ms.

### 5.3.9 Webpage Browsing and Parameter Settings

The Ethernet module supports HTTP protocol and has a Web Server function making the AcuRev 2000 series meter accessible through Ethernet at anytime from anywhere.

The Ethernet module supports IE Browser 6.0 and higher editions and the Webpage Settings only support ASCII characters.

The IP address will be referred to as "192.168.1.200" for the remainder of this chapter.

#### 1. Main page

Users enter the correct IP address and HTTP port of the module in the address bar of the web browser. This provides access to "Data", "Settings" and "Module Status".

**ACUENERGY**

Main Page      **AcuRev 2000 Series Web Server**

Data

Settings

Module Status

AcuRev 2000 series performs real-time metering, measures energy consumption and monitors power quality for up to 16 single phase circuits (or 6 three phase circuits) in one unit. It is an advanced intelligent power meter that Accuenergy developed and manufactured for the next generation smart grids. The main features include multi-lansmits submetering, cyclic display, tamper proof, which make it highly suitable for large commercial facilities, residential apartments and industrial environments. AcuRev 2000 series has infrared, RS485 and Ethernet communication options as well as I/O options (e.g. Pulse Counting from water or gas meters), making it useful in energy management systems. Due to its communication capability, ease of installation and use, this product can be easily integrated into new and existing energy management systems.

Areas of Application:

- Large Commercial Centers
- Railway Transportation
- Schools
- Public Infrastructures
- Hotel/Office Buildings
- Intelligent Power Distributions
- Condominium/Residential Buildings
- Energy Management Systems
- Industrial Environment
- Energy Saving Systems

Figure 5-14

## 2. Module Status Webpage

By selecting the "Module Status" link, users can view the status and change the settings of the Ethernet module.

**ACUENERGY**

Main Page

Data

Settings

Module Status

|                    |                   |                   |                        |
|--------------------|-------------------|-------------------|------------------------|
| Device Description | AcuRev2000        | Mail From         | Acurev2000             |
| DHCP Mode          | MANUAL            | Mail to #1        | ac@acuenergy.com.cn    |
| IP Address         | 132.168.1.21      | Mail to #2        |                        |
| Subnet Mask        | 255.255.255.0     | Mail to #3        |                        |
| Gateway            | 132.168.1.1       | Subject           | Metering               |
| DNS Primary        | 132.168.1.4       | SMTP Server       | mail.acuenergy.com.cn  |
| DNS Secondary      | 132.168.1.79      | User Name         | test1@acuenergy.com.cn |
| MODBUS Port        | 502               | Triggered Sending | disabled               |
| HTTP Port          | 80                | Timed Sending     | disabled               |
| MAC Address        | 8c-12-0a-0c-00-ec | Mail Content      |                        |
| Meter Model        | Acurev2020        | Meter SN          | CA010H12               |
| Meter Firmware     | 2.01              | NET Firmware      | 1.01                   |
| Default frequency  | 50Hz              | Device Clock      | 2008-1-1 01:45         |

Figure 5-15

### 3. Settings Webpage

By selecting the "Settings" link, users can access "Network Settings", "Mail Settings", "Webpage Settings", "Load Default" and "Password Setting".

When accessing the "Settings" link, users will be prompted to enter a password. The default password is 12345678.

#### a. "Password" Webpage

Figure 5-16: "Password" webpage. If the password is valid, the browser will go to the "Network Settings" webpage. If an incorrect password is used, users will be notified of "Invalid Password".

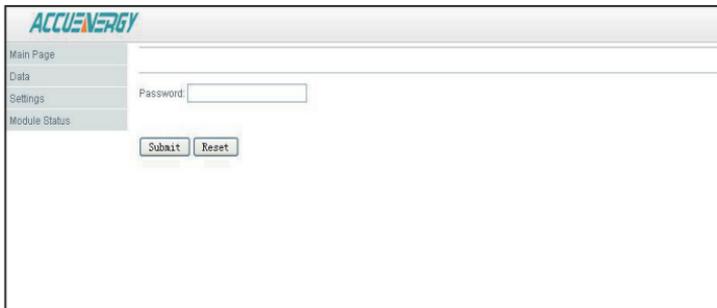


Figure 5-16

#### b. "Network Settings" Webpage

Figure 5-45: "Network Settings" webpage. There are two sections for you to set: Ethernet setting and SNTP setting. In Ethernet setting section, it supports two network setting modes: Manual or Auto. There are two port settings: HTTP port and Modbus-TCP port.

The default value of Modbus-TCP port is 502, and the user defined range is 2000~5999. The default value of HTTP port is 80, and the user defined range is 6000~9999.

In SNTP setting section, there are four contents:

- SNTP Enable, enable SNTP function.
- SNTP Interval, setup interval seconds which SNTP client check SNTP server. The default value is 10min, and the user defined range is 1-60000min.
- SNTP Server, setup SNTP Server which SNTP client update from. Please find available SNTP server from internet.
- Time Zone Selecting: select Time Zone which match your location.

**ACCUEnergy**

Main Page  
Data  
Settings  
Module Status

**Network Parameter Configuration**

Manual Setting     Auto Setting

Network Parameter:

IP Address:     (Example: 192.168.1.254)

Subnet Mask:     (Example: 255.255.255.0)

Gateway:     (Example: 192.168.1.1)

DNS Primary Server:     (Example: 202.106.0.20)

DNS Secondary Server:     (Example: 202.106.196.115)

Port Setting:

MODBUS Port:  (Default: 502, Scope: 2000~5999)

HTTP Port:  (Default: 80, Scope: 6000~9999)

SNTP Setting: (Please restart AXMINET Module after SNTP setting.)

SNTP Enable

SNTP Interval:  min (Default: 10, Scope: 1~60000)

SNTP Server:

Time Zone Selecting:  
 ▼

Figure 5-17

### c. "Mail Settings" Webpage

Figure 5-18: "Mail Settings" webpage. Users can choose between 4 mail sending modes: "Triggered Sending", "Timed Sending", both "Triggered and Timed Sending" and "None". Boxes marked with "\*" cannot be left blank. "Triggered Sending" means users will receive mail when the meter detects a new event, such as an "Alarm Event", "SOE Event" or "System Event". "Timed Sending" means users can receive mail every 5~1440 minutes (user settable) reporting "Metering", "Energy", "Demand", "Max/Min", "Alarm Record", "SOE Record" and "System Record".

Sending Modes can be set as follows:

Setting "Triggered Sending" mode: users can select one or all of the checkboxes below. Triggered Sending includes "Alarm Event", "SOE Event" and "System Record" as seen in Figure 5-18. Triggered Sending mode is disabled if neither "Alarm Event", "SOE Event" or "System Event" is selected.

Setting "Timed Sending" mode: users enter a number between 5 and 1440 minutes into the box beside "Timed Sending". This number is the interval time between mail. Sending mode is disabled if 0 is entered. Users can also select which parameters to receive reports on by checking the checkboxes below "Timed Sending" in Figure 5-46. Setting both "Triggered Sending" and "Timed Sending" mode: users follow the steps for both "Triggered Sending" and "Timed Sending" above.

"None" mode: users disable both "Triggered Sending" and "Timed Sending" modes.

Note: Mail Server part includes "SMTP Server", "User Name" and "Password". For the "SMTP Server" users can input either domain name such as "mail.accuenergy.com" or an IP address such as "222.128.6.73" which is from "mail.accuenergy.com" resolved. A user name and password will be required to log in.

**ACCUEnergy**

Main Page  
Data  
Settings  
Module Status

**Mail Information**

Mail From:  \* (Example: Technical Support)

Mail To #1:  \* (Example: abc@accuenergy.com)

Mail To #2:  (Example: abc@gmail.com)

Mail To #3:  (Example: abc@yahoo.com)

Subject:  \* (Example: test mail)

**Mail Server**

SMTP Server:  \*

User Name:  \*

Password:  \*

**Mail Content**

Triggered Sending:

Alarm Event  SOE Event  System Event

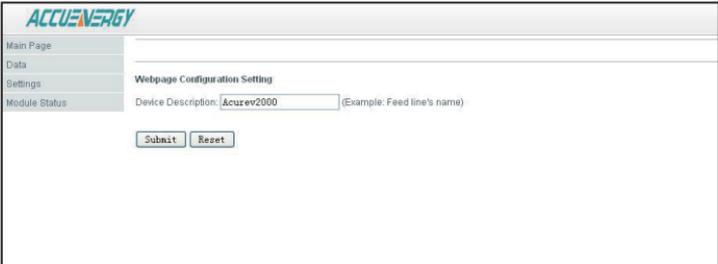
Timed Sending:  min \* (Time Scope: 5-1440min, 0 for disable)

Metering  Energy  Harmonics  Demand  Alarm Record  SOE Record  System Record

Figure 5-18

#### d. "Web Configuration Settings" Webpage

Figure 5-19: "Webpage Settings" page. Users set the "Device Description" according to the meter type.



|  |   |
|--|---|
| ACCUENERGY   |   |
| Main Page  |   |
| Data   |   |
| Settings   | Webpage Configuration Setting   |
| Module Status  | Device Description: <input type="text" value="Acuzev2000"/> (Example: Feed line's name) |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> |   |

Figure 5-19

#### e. "Management" webpage

Figure 5-20: "Management" webpage. Users can easily update the software online by selecting the updated file, which can be got from Accuenergy Corporation. The "Reboot NET module" option resets the module itself.

IP Address:192.168.1.254

Subnet Mask:255.255.255.0

Gateway:192.168.1.1

DNS Primary: 202.106.0.20

DNS Secondary: 202.106.196.115

MODBUS Port: 502

HTTP Port: 80

ACCUENERGY

Main Page

Data

Settings

Module Status

Please select an updated file!

浏览...

(Note: Reboot the NET module after the update!)

Update

Load Default Setting

Reboot NET Module

Submit

Figure 5-20

#### f. "Password Setting" Webpage

Figure 5-21: "Password Setting" webpage. To change the password, users need to input the current password first.

ACCUENERGY

Main Page

Data

Settings

Module Status

Change Password

Current Password:

New Password:  (6 -12bits)

Confirm Password:  (6 -12bits)

Submit Reset

Figure 5-21

#### 4. Data Webpage

Click "Data" Link to Visit Data webpages. There are eight kinds of data webpages. They are "Metering" webpage, "Demand" webpage, "Energy" webpage, "Harmonics" webpage, "IO Status" webpage, "Alarm Record" webpage, "SOE Record" webpage and "System Record" webpage. Each webpage shows the working status of the meter.

"Metering" webpage includes the data of real-time parameters for Acurev 2000 series meter, such as Volts AN, I A, Watt A of inline and each user.

"Demand" webpage includes the demand data for Acurev 2000 series meter, such as real-time value, predictive value, maximum value and the maximum value timestamp of inline and each user.

"Energy" webpage includes the energy data for Acurev 2000 series meter, such as Delivered kWh, kVAh of inline and each user.

"Harmonics" webpage includes harmonics parameters for Acurev 2000 series meter, such as THD Volts Average of inline and each user.

"IO Status" webpage includes RO status, DI status or DI counters, DI value and DI unit.

"Alarm Record" webpage includes alarm records for Acurev 2000 series meter. There are twenty records. Each record includes Time Stamp, Limit ID, Status, Alarm Channel and Value.

"SOE Record" webpage includes SOE record for Acurev 2000 series meter. There are twenty records. Each record includes Time Stamp and DI Status.

"System Record" webpage includes system record for Acurev 2000 series meter. There are one hundred records. Each record includes Time Stamp and system event.

| ACUENERGY     |   |
|---------------|---|
| Main Page     | AcuRev 2000 Series Web Server   |
| Data          | Metering  |
| Settings      | Demand  |
| Module Status | Energy  |
|               | Harmonics   |
|               | IO Status   |
|               | Alarm Record  |
|               | SOE Record  |
|               | System Record   |
|               | <ul style="list-style-type: none"> <li>■ Oil/Gas</li> <li>■ Public Infrastructures</li> <li>■ Hotel/Office Buildings</li> <li>■ Intelligent Power Distributions</li> <li>■ Condominium/Residential Buildings</li> <li>■ Energy Management Systems</li> <li>■ Industrial Environment</li> <li>■ Energy Saving Systems</li> </ul> |

Figure 5-22

### 5.3.10 Email Function

The Ethernet module supports SMTP protocol, which provides email capabilities. Before sending emails, users must set their own DNS Server. Please refer to "Network settings" which includes DNS Server setting.

Please note, as per 3.c of Section 5.3.9, there are three modes users can select. The first is "Triggered Sending", which means once new events happen, users can receive email notifications immediately. The second is "Timed Sending" mode. Users can receive emails based on preset time intervals (5~1440 minutes), which include all information on "Data" webpage.

The third mode is a combination of "Triggered Sending" and "Timed Sending".

### 5.3.11 SNMP Function

Ethernet communication supports SNMP (Simple Network Management Protocol) protocol, so you can get data from the meter through SNMP, by get, get-next, and walk instructions. To master this manual, you suppose to be familiar with SNMP protocol, and you have generously mastered the function and application of this product.

We will show you an example of how to use SNMP server software to get data from the meter. The example is showed by MG-SOFT MIB Browser Professional SNMPv1/v2c Edition 2010.

NOTE: MG-SOFT MIB Browser Professional is the production of MG-SOFT Corporation, and its copyrights are reserved by MG-SOFT Corporation. We will not supply MG-SOFT MIB Browser Professional with our meters.

#### 1. Compile MIB

After installed MG-SOFT MIB Browser Professional, you can load Acurev 2000.mib file by MIB Compiler, which is one part of MG-SOFT MIB Browser Professional.

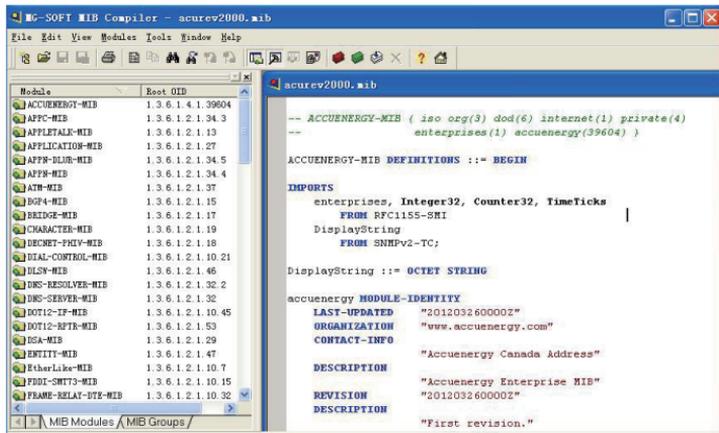


Figure 5-23

Using F7 on keyboard to compile this MIB,then select ACCUENERGY-MIB,select Save.

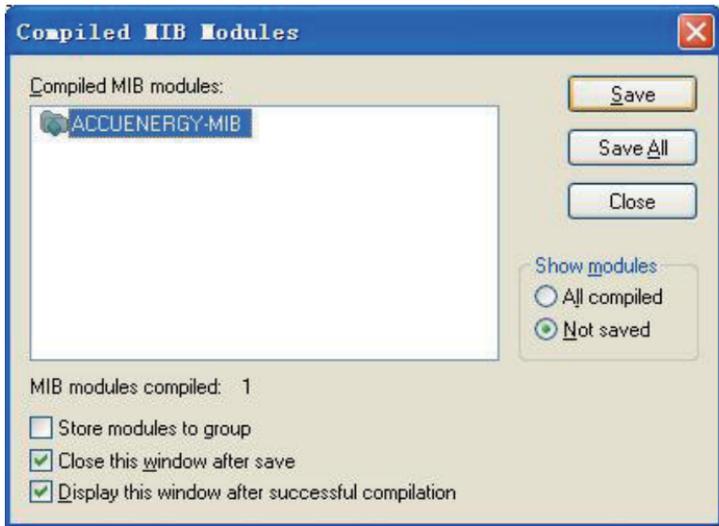


Figure 5-24

After successfully adding Acurev 2000 MIB,there should show ACCUENERGY-MIB in MIB Modules, which OID is 1.3.6.1.4.1.39604.

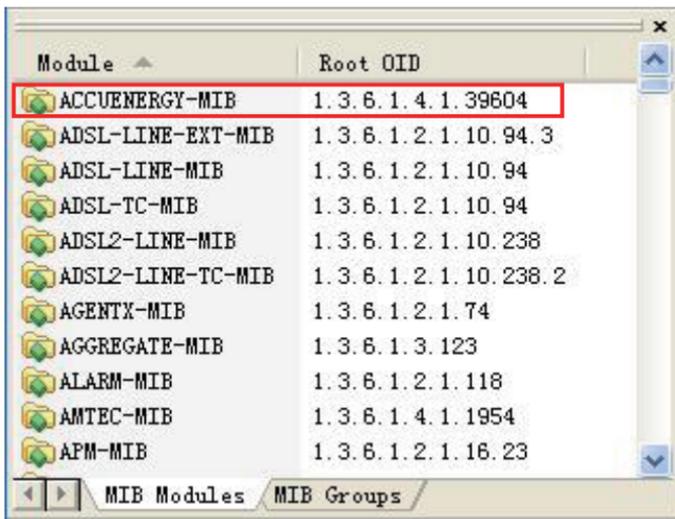


Figure 5-25

## 2. Load ACCUENERGY-MIB

Opening MIB Browser, which is part of MG-SOFT, select MIB Table, then load ACCUENERGY-MIB from MIB Modules, unload unnecessary MIBs from Loaded MIB modules.

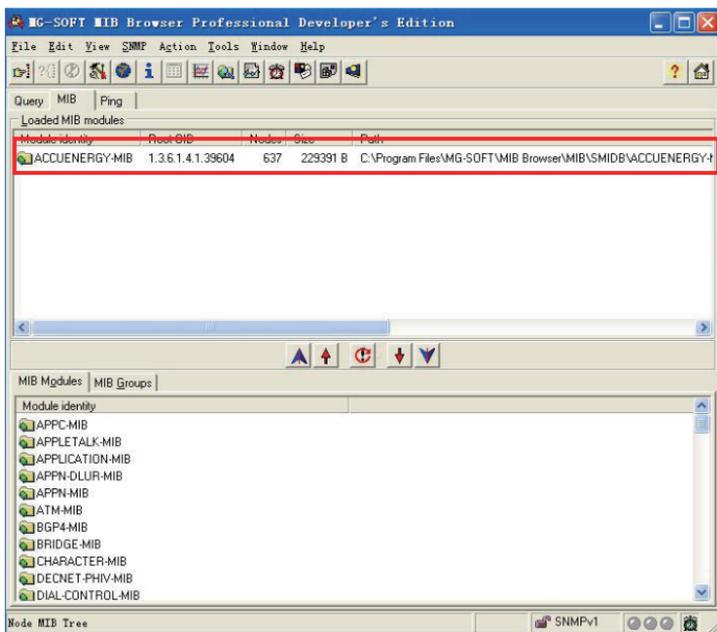


Figure 5-26

### 3. Contact SNMP Agent

Change to Query Label, input IP address under Remote SNMP agent, such as 192.168.1.249, select Contact button  , if the SNMP agent works on this IP, it will return like this,

Remote address: 192.168.1.249 port: 161 transport: IP/UDP

Local address: 192.168.1.126 port: 3592 transport: IP/UDP

Protocol version: SNMPv1

1: [Loaded: RFC-1215] sysUpTime.0 (timeticks) 0 days 20h:11m:50s.23th (7271023)

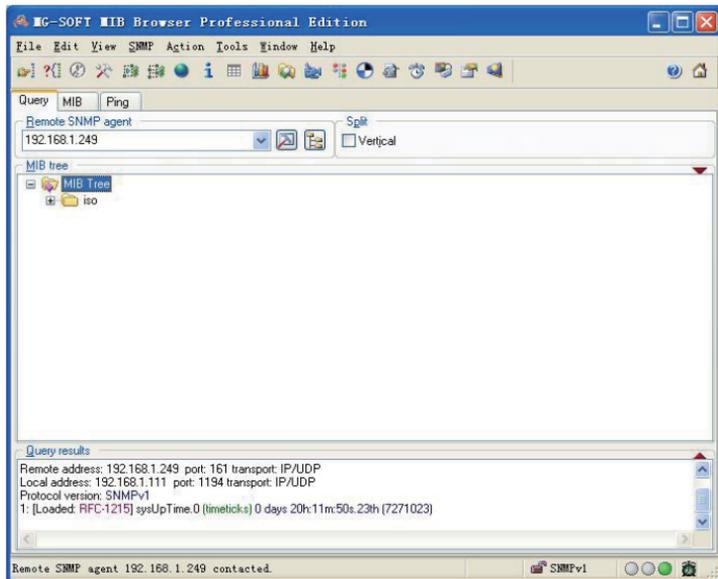


Figure 5-27

#### 4. Walk the MIB

Right Click on the tree root, then expand MIB, find Acurev 2000 OID, right click to select walk, then query whole acurev 2000 MIB.

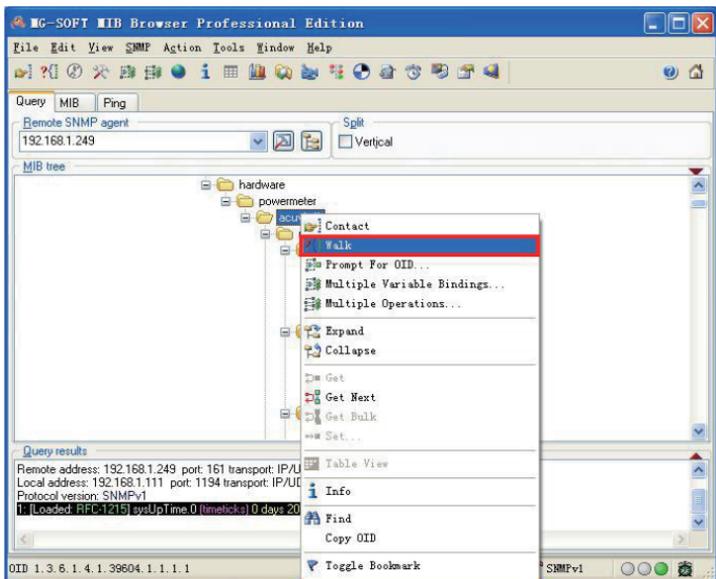


Figure 5-28

QUERY returns like these,

\*\*\*\*\* SNMP QUERY STARTED \*\*\*\*\*

1: phaseVoltageA.0 (integer) 0

2: phaseVoltageB.0 (integer) 0

3: phaseVoltageC.0 (integer) 0

4: averagePhaseVoltage.0 (integer) 0

5: lineVoltageAB.0 (integer) 30540

.....

582: user16MappingRelationships.0 (integer) 272

583: user17Name.0 (octet string) user17 [75.73.65.72.31.37 (hex)]

584: user17MappingRelationships.0 (integer) 273

585: user18Name.0 (octet string) user18 [75.73.65.72.31.38 (hex)]

586: user18MappingRelationships.0 (integer) 277

587: threePhaseInputWiringType.0 (integer) 2

\*\*\*\*\* SNMP QUERY FINISHED \*\*\*\*\*

5. Get a value

Right Click on one MIB OID, which you want to query, then select Get  , and then return the OID value.

For example, the followings demonstrate the result of getting the value of phaseVoltageA.

Operation: Get

Request binding:

1: phaseVoltageA.0 (null) null

Response binding:

1: phaseVoltageA.0 (integer) 0

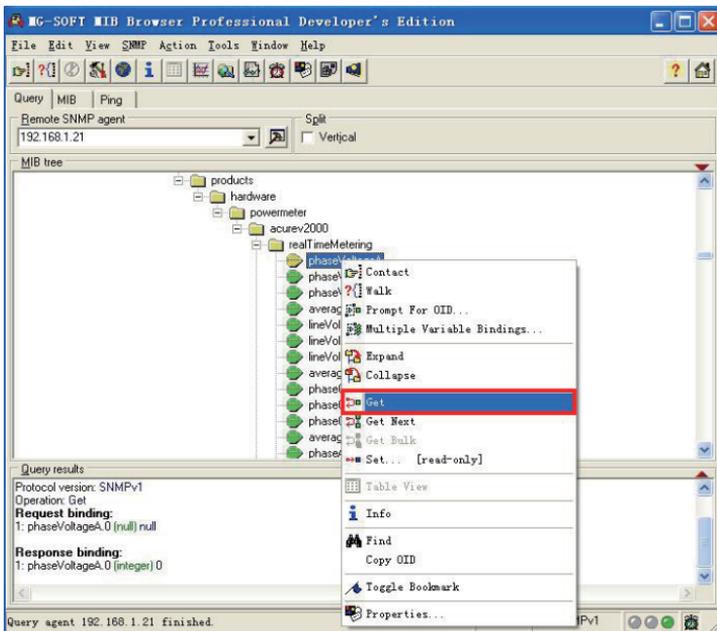


Figure 5-29

### 5.3.12 SNTP Function

Ethernet communication supports SNTP (Simple Network Time Protocol) protocol, so meters can get update time to Coordinated Universal Time (UTC). Please find the SNTP Settings – Network Settings by Internet Explorer,



The screenshot shows a configuration window for SNTP settings. It includes a checked checkbox for 'SNTP Enable', a text input for 'SNTP Interval' set to '10' with a unit of 'min' and a default note '(Default: 10, Scope: 1~60000)', a text input for 'SNTP Server' set to 'time.windows.com', a 'Time Zone Selecting:' label, and a dropdown menu currently showing '(UTC+08:00) Beijing, Chongqing, Hong Kong, Urumqi'. At the bottom are 'Submit' and 'Reset' buttons.

|  |
|--|
| <input checked="" type="checkbox"/> SNTP Enable                                  |
| SNTP Interval: <input type="text" value="10"/> min (Default: 10, Scope: 1~60000) |
| SNTP Server: <input type="text" value="time.windows.com"/>                       |
| Time Zone Selecting:   |
| <input type="text" value="(UTC+08:00) Beijing, Chongqing, Hong Kong, Urumqi"/>   |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/>       |

Figure 5-30

## 5.4 Application Details and Parameter Address Table

### 1. Data Type

"Bit" is binary value;

"Word" is 16-bit unsigned integer, using one register address, 2 bytes. The data range is 0-65535.

"int" is 16-bit signed integer, using one register address, 2 bytes. The data range is -32768-32767.

"dword" is 32-bit unsigned integer, using two register addresses, high bytes followed by low bytes, using 4 bytes in total. The data range is 0-4294967295; Rx = High Word x 65536 + Low Word.

"float" is single precision floating point, using two register addresses, 4 bytes. The data range is 0.0-3.402823E +38.

### 2. The relationship between communication value and real value

The meter's communication value does not always equal the real value. There is a conversion relationship between them. It is very important to be aware of the parameter relationship when users design a communication software, otherwise the result may be incorrect.

| Parameter                           | Relationship                                  | Unit                                  |
|-------------------------------------|---|---------------------------------------|
| System Parameter, Status, Parameter | The communication value equals the real value | No Unit                               |
| Meter and Battery runtime           | $T = Rx/100$                                  | Hour                                  |
| Real-time Clock, Timestamp          | The communication value equals the real value | Time Unit                             |
| Energy                              | $E = Rx/10$ (A decimal)                       | Ep: kWh<br>Eq: kvarh<br>Es: kVAh      |
| Demand                              | The communication value equals the real value | Dp: kW<br>Dq: kvar<br>Ds: kVA<br>I: A |
| Frequency                           | The communication value equals the real value | Hz                                    |
| Power Factor                        | The communication value equals the real value | No Unit                               |
| Voltage                             | The communication value equals the real value | Volt                                  |
| Current                             | The communication value equals the real value | Ampere                                |
| Unbalance                           | $Unbl = (Rx/1000) \times 100\%$               | No Unit                               |
| Total Harmonic distortion           | $THD = (Rx/10000) \times 100\%$               | No Unit                               |
| All times Harmonic ratio            | $HDn = (Rx/10000) \times 100\%$               | No Unit                               |
| Odd harmonic ratio                  | $HDo = (Rx/10000) \times 100\%$               | No Unit                               |
| Even harmonic ratio                 | $HDe = (Rx/10000) \times 100\%$               | No Unit                               |
| Crest Factor                        | $CF = Rx/1000$                                | No Unit                               |
| K-factor                            | $KF = Rx/10$                                  | No Unit                               |
| Phone Form Factor                   | $THFF = (Rx/10000) \times 100\%$              | No Unit                               |
| Pulse Counted                       | Value = Rx/100                                | According to settings                 |

Table 5-26 The relationship between communication value and real value (Rx is the communication value)

### 3. Parameter Address Table

#### System Settings

Users should thoroughly understand the system settings as they contribute to the meter operation mode. The details on system settings can be found in Chapter 4.

Function Code 10H: Write, 03H: Read

| Address | Parameter   | Property | Range  | Default | Date Type |
|---------|---|----------|--|---------|-----------|
| 800H    | Meter Address   | R/W      | 1-247  | 1       | word      |
| 801H    | Channel 1 485 communication Modbus parity bit setting | R/W      | 0: Even parity<br>1: Odd parity<br>2: No parity 2<br>3: No parity 1                    | 3       | word      |
| 802H    | Infrared communication parity bit setting             | R/W      | 0: Even parity<br>1: Odd parity<br>2: No parity Stop Bit 2<br>3: No Parity, Stop Bit 1 | 3       | word      |
| 803H    | Channel 1 485 communication Modbus baud rate          | R/W      | 1200-38400   | 9600    | word      |
| 804H    | Infrared communication baud rate                      | R/W      | 1200-38400   | 9600    | word      |
| 805H    | Password  | R/W      | 0000-9999  | 0000    | word      |
| 806H    | Energy Pulse constant                                 | R/W      | 500-20000  | 5000    | word      |
| 807H    | Energy Pulse width                                    | R/W      | 20-100ms   | 80      | word      |

|           |                                       |     |  |    |      |
|-----------|---------------------------------------|-----|--|----|------|
| 808H      | DO1 Energy Pulse Output setting       | R/W | See Appendix B   | 0  | word |
| 809H      | DO1 Energy Pulse Output setting       | R/W | Same as above  | 0  | word |
| 80AH      | Demand calculation                    | R/W | 0: Sliding Window<br>1: Rolling Window<br>2: Fixed Window<br>3: Thermal    | 0  | word |
| 80BH      | Primary Demand Window                 | R/W | 1-30 minutes   | 15 | word |
| 80CH      | Secondary Demand Window               | R/W | 1-30 minutes   | 1  | word |
| 80DH      | DI Synchronization Source             | R/W | 1-8: DI1-DI8 as Synchronization Source                                     | 1  | word |
| 80EH      | DI Triggering Condition               | R/W | 0: No Triggering<br>1: Rising Edge<br>2: Falling Edge<br>3: By Changes     | 0  | word |
| 80FH      | DI Working Mode                       | R/W | bit0-bit7 correspond to DI1-DI8<br>0: State Monitoring<br>1: Pulse Counter | 0  | word |
| 810H-817H | DI1-8 Pulse Constant for each channel | R/W | 1-65535  | 1  | word |
| 818H-81FH | DI Category, x8                       | R/W | i.e. one pulse represents 20 tons water                                    | 1  | word |

|           |  |     |  |    |      |
|-----------|--|-----|--|----|------|
| 820H-827H | DI Unit, x8  | R/W | 1: t(ton)<br>2: m3(cubic meter)<br>3: kWh<br>4: (RMB)<br>5: \$(US Dollar)  | 1  | word |
| 828H      | Relay Output Working Mode  | R/W | bit0-bit3 correspond to RO1-RO4<br>0: Relay Control<br>1: Alarming         | 0  | word |
| 829H      | Relay Control Mode   | R/W | bit0-bit3 correspond to RO1-RO4<br>0: Latching<br>1: Momentary             | 0  | word |
| 82AH      | Relay Control Momentary Time   | R/W | 50-3000ms  | 80 | word |
| 82BH      | Alarming Feature   | R/W | 0: Disable<br>1: Enable  | 0  | word |
| 82CH      | 1-10 Alarming Channel  | R/W | Bit0-bit9 correspond to 1-10 alarming channels<br>1: Active<br>0: Inactive | 0  | word |
| 82DH      | Each event alarm is sent to RO feature bit. 2 bytes represent 16 events sent to RO feature | R/W | Bit0-15 correspond to 16 Events<br>1: Enable<br>0: Disable                 | 0  | word |

|      |  |     |  |    |      |
|------|--|-----|--|----|------|
| 82EH | RO alarming, each one of the first 8 events corresponds to RO settings | R/W | 2 Bytes. Every 2 bit correspond to one event, the RO number is:<br>00 RO1<br>01 RO2<br>10 RO3<br>11 RO4  | 0  | word |
| 82FH | Same as above, the last 8 events                                       | R/W | 2 Bytes. Every 2 bits correspond to one event, the RO number is:<br>00 RO1<br>01 RO2<br>10 RO3<br>11 RO4 | 0  | word |
| 830H | RO alarming time delay, not applicable to over/under limit alarming    | R/W | 1-60000 second   | 60 | word |
| 831H | Backlight time   | R/W | 0-60 minute  | 1  | word |
| 832H | Automatic display if no key is pressed in how long                     | R/W | 1-60(minute)   | 1  | word |
| 833H | Automatic Display, each screen duration                                | R/W | 5-100(second)  | 5  | word |
| 834H | Display Power (demand) decimal place                                   | R/W | 3-4 digit  | 3  | word |
| 835H | Reactive Power   | R/W | 0: True<br>1: Generalized  | 0  | word |

|           |  |     |   |        |      |
|-----------|--|-----|---|--------|------|
| 836H      | VAR/PF Convention                          | R/W | 0: IEC<br>1: IEEE   | 0      | word |
| 837H      | Clear all data digits to clear all records | R/W | See Appendix  | 0      | word |
| 838H      | DI Pulse Counter clear                     | R/W | bit0-bit7 correspond to DI1-DI8, 1 means clearing the counter   | 0      | word |
| 839H-83EH | 645 Address                                | R/W |   | 0      | word |
| 83FH-841H | user01 user name                           | R/W | User name(6 ASCII)  | user01 | Word |
| 842H      | user01 Mappings                            | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0101 | Word |
| 843H-845H | user02 user name                           | R/W | user name (6 ASCII)   | user02 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 846H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0102 | Word |
| 847H-849H | user03 user name | R/W | user name (6 ASCII)   | user03 | Word |
| 84AH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0103 | Word |
| 84BH-84DH | user04 user name | R/W | user name (6 ASCII)   | user04 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 84EH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0104 | Word |
| 84FH-851H | user05 user name | R/W | user name (6 ASCII)   | user05 | Word |
| 852H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0105 | Word |
| 853H-855H | user06 user name | R/W | user name (6 ASCII)   | user06 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 856H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0106 | Word |
| 857H-859H | user07 user name | R/W | user name (6 ASCII)   | user07 | Word |
| 85AH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0107 | Word |
| 85BH-85DH | user08 user name | R/W | user name (6 ASCII)   | user08 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 85EH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0108 | Word |
| 85FH-861H | user09 user name | R/W | user name (6 ASCII)   | user09 | Word |
| 862H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0109 | Word |
| 863H-865H | user10 user name | R/W | user name (6 ASCII)   | user10 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 866H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010a | Word |
| 867H-869H | user11 user name | R/W | user name (6 ASCII)   | user11 | Word |
| 86AH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010b | Word |
| 86BH-86DH | user12 user name | R/W | user name (6 ASCII)   | user12 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 86EH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010c | Word |
| 86FH-871H | user13 user name | R/W | user name (6 ASCII)   | user13 | Word |
| 872H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010d | Word |
| 873H-875H | user14 user name | R/W | user name (6 ASCII)   | user14 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 876H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010e | Word |
| 877H-879H | user15 user name | R/W | user name (6 ASCII)   | user15 | Word |
| 87AH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x010f | Word |
| 87BH-87DH | user16 user name | R/W | user name (6 ASCII)   | user16 | Word |

|           |                  |     |   |        |      |
|-----------|------------------|-----|---|--------|------|
| 87EH      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0110 | Word |
| 87FH-881H | user17 user name | R/W |   | user17 | Word |
| 882H      | Mappings         | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0111 | Word |
| 883H-885H | user18 user name | R/W | user name (6 ASCII)   | user18 | Word |

|      |                                     |     |   |        |      |
|------|-------------------------------------|-----|---|--------|------|
| 886H | Mappings                            | R/W | High byte:<br>0: The display module does not display the user<br>1: The display module displays the user<br>Low byte:<br>0: Disable<br>1-18: The corresponding physical channel<br>19-24: corresponding channel 1-6 three-phase users | 0x0112 | Word |
| 887H | Load voltage rating setting         | R/W | Default 220V  | 220    | Word |
| 888H | Connection mode of three-phase user | R/W | 0: No three-phase wiring 1LN<br>1: Three-phase user wiring is 3LN (three-phase four-wire)<br>2: Three-phase user wiring is 2LN (single-phase three-wire)  | 0      | word |
| 889H | Channel 1 CT Specifications         | R/W | Note: EM effective, DM invalid<br>Can be set, for example:<br>20: CCT-20 (full scale 20A)<br>80: CCT-80 (full scale 80A)<br>150: CCT-150 (full scale 150A)<br>200: CCT-200 (full scale 200A)  | 20     | Word |
| 88AH | Channel 2 CT Specifications         | R/W | Same as above   | 20     | Word |
| 88BH | Channel 3 CT Specifications         | R/W | Same as above   | 20     | Word |
| 88CH | Channel 4 CT Specifications         | R/W | Same as above   | 20     | Word |

|      |                              |     |               |    |      |
|------|------------------------------|-----|---------------|----|------|
| 88DH | Channel 5 CT Specifications  | R/W | Same as above | 20 | Word |
| 88EH | Channel 6 CT Specifications  | R/W | Same as above | 20 | Word |
| 88FH | Channel 7 CT Specifications  | R/W | Same as above | 20 | Word |
| 890H | Channel 8 CT Specifications  | R/W | Same as above | 20 | Word |
| 891H | Channel 9 CT Specifications  | R/W | Same as above | 20 | Word |
| 892H | Channel 10 CT Specifications | R/W | Same as above | 20 | Word |
| 893H | Channel 11 CT Specifications | R/W | Same as above | 20 | Word |
| 894H | Channel 12 CT Specifications | R/W | Same as above | 20 | Word |
| 895H | Channel 13 CT Specifications | R/W | Same as above | 20 | Word |
| 896H | Channel 14 CT Specifications | R/W | Same as above | 20 | Word |
| 897H | Channel 15 CT Specifications | R/W | Same as above | 20 | Word |
| 898H | Channel 16 CT Specifications | R/W | Same as above | 20 | Word |
| 899H | Channel 17 CT Specifications | R/W | Same as above | 20 | Word |
| 89AH | Channel 18 CT Specifications | R/W | Same as above | 20 | Word |

|           |   |     |  |     |      |
|-----------|---|-----|--|-----|------|
| 89BH-8ACH | Reserved  |     |  |     |      |
| 8ADH      | Restore the default parameters (User name and mappings, and CT wiring specifications) | R/W | 0: no action<br>0xAA: Restore factory settings<br>Note: The recovery zone for the user name, CT specifications, three-phase wiring   | 0   | Word |
| 8AEH      | A decade setting load enable  | R/W | 1: Enable active   | 0   | Word |
| 8AFH      | Sealed Nonstandard Parameters Selection   | R/W | Bit0: RS485 communication parameters and infrared communication parameters<br>Bit1: Network parameters<br>Bit2: Clear Meter Run Time<br>Bit3: DI pulse counting<br>Bit4: TOU<br>Bit5: RO<br>1: valid of corresponding selection<br>0: invalid of corresponding selection | 0   | Word |
| 8B0H      | Seals status  | R   | 0x0A: Seal sealed; Other: Seal opened.   | 0x0 | Word |
| 8B1H-8BF  | Reserved  |     |  |     |      |

### Clear

| Bit7       | Bit6       | Bit5       | Bit4       | Bit3       | Bit2       | Bit1       | Bit0       |
|------------|------------|------------|------------|------------|------------|------------|------------|
| 1 to clear |

|         |                       |                     |                     |                     |                   |              |  |
|---------|-----------------------|---------------------|---------------------|---------------------|-------------------|--------------|--|
| Reserve | Clear battery runtime | Clear meter runtime | Clear event records | Clear alarm records | Clear SOE records | Clear demand | Clear this month and historical energy |
|---------|-----------------------|---------------------|---------------------|---------------------|-------------------|--------------|--|

### Meter and Battery Runtime

Function Code 03: Read. Data Type: Word

| Address     | Parameter       | Property | Range | Default | Data Type |
|-------------|-----------------|----------|-------|---------|-----------|
| 1050H-1051H | Meter Runtime   | R        |       |         | Dword     |
| 1052H-1053H | Battery Runtime | R        |       |         | Dword     |

### Clock

Function Code 03: Read, Function Code 16: Write. Date Type: Word

| Address | Parameter | Property | Range         | Default | Data |
|---------|-----------|----------|---------------|---------|------|
| 1054H   | Year      | R/W      | 0-99          |         | Word |
| 1055H   | Month     | R/W      | 1-12          |         | Word |
| 1056H   | Day       | R/W      | 1-31          |         | Word |
| 1057H   | Hour      | R/W      | 0-23          |         | Word |
| 1058H   | Minute    | R/W      | 0-59          |         | Word |
| 1059H   | Second    | R/W      | 0-59          |         | Word |
| 105AH   | Week      | R/W      | 0-6, 0 Sunday |         | Word |

### Over/Under Limit Alarming

There are a total of 10 groups for alarming, each group follows the same format. Function

Code 03: Read. Function Code 16: Write.

| Address     | Parameter                       | Property | Range  | Default | Data    |
|-------------|---------------------------------|----------|--|---------|---------|
| 105BH       | Group 1:<br>Parameter<br>Number | R/W      | 0~352  | 0       | Integer |
| 105CH       | Group 1:<br>Comparison          | R/W      | 1: larger than<br>2: equal to<br>3: smaller than | 1       | Integer |
| 105DH       | Group 1: Set<br>Value           | R/W      | Related percentage                               |         | Integer |
| 105EH       | Group 1:<br>Delay Time          | R/W      | 0~30000ms  | 0       | Integer |
| 105FH       | Group 1:<br>Output to RO        | R/W      | 0: disabled<br>1-4: RO number                    | 0       | Integer |
| 1060H-1064H | Group 2<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 1065H-1069H | Group 3<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 106AH-106EH | Group 4<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 106FH-1073H | Group 5<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 1074H-1078H | Group 6<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 1079H-107DH | Group 7<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 107EH-1082H | Group 8<br>setup                | R/W      | The same as Group 1                              |         | Integer |
| 1083H-1087H | Group 9<br>setup                | R/W      | The same as Group 1                              |         | Integer |

|             |                |     |                     |  |         |
|-------------|----------------|-----|---------------------|--|---------|
| 1088H-108CH | Group 10 setup | R/W | The same as Group 1 |  | Integer |
|-------------|----------------|-----|---------------------|--|---------|

### Time of Use Parameter Setup

Before time of address 109F is the basic parameters for the setting, then the time zone, time tables and holidays specific settings.

Up to 14 time zones, eight times tables, 14 hours, 30 holidays. Two error status word is used to indicate that when parameter setting wrong

Function Code 03: Read, Function Code 10: Write

| Address | Parameter                     | Property | Range                   | Default | Data Type |
|---------|-------------------------------|----------|-------------------------|---------|-----------|
| 1090H   | Error word 1(basic parameter) | R        | See Appendix            |         | Word      |
| 1091H   | Error word 2(schedule table)  | R        | See Appendix            |         | Word      |
| 1092H   | Current Tariff                | R        | 1~4                     | 1       | Word      |
| 1093H   | Season                        | R/W      | 1~14                    | 2       | Word      |
| 1094H   | Schedule Table                | R/W      | 1~8                     | 2       | Word      |
| 1095H   | Schedule                      | R/W      | 1~14                    | 9       | Word      |
| 1096H   | Tariff                        | R/W      | 1~4                     | 4       | Word      |
| 1097H   | Weekend                       | R/W      | Bit0-7<br>1: ON, 0: OFF | 0x7F    | Word      |
| 1098H   | Weekend Schedule              | R/W      | 1-8                     | 2       | Word      |
| 1099H   | Holiday                       | R/W      | 0-30                    | 0       | Word      |

|             |   |     |                                   |   |      |
|-------------|---|-----|-----------------------------------|---|------|
| 109AH       | TOU Energy monthly settle up                | R/W | 1: special day<br>0: end of month | 0 | Word |
| 109BH       | TOU Energy Special Day settle up: Day       | R/W | 1~28                              | 1 | Word |
| 109CH       | TOU Energy Special Day settle up: Time      | R/W | 0~23                              | 0 | Word |
| 109DH       | TOU Energy Enable                           | R/W | 1                                 | 1 | Word |
| 109EH       | TOU Energy reset to factory                 | R/W | 1                                 |   | Word |
| 109FH-10AFH | Reserved                                    |     |                                   |   |      |
| 10B0H-10B2H | Season 1(month, Day, Schedule Table Number) | R/W |                                   |   | Word |
| 10B3H-10B5H | Season 2(month, Day, Schedule Table Number) | R/W |                                   |   | Word |
| 10B6H-10B8H | Season 3(month, Day, Schedule Table Number) | R/W |                                   |   | Word |
| 10B9H-10BBH | Season 4(month, Day, Schedule Table Number) | R/W |                                   |   | Word |
| 10BCH-10BEH | Season 5(month, Day, Schedule Table Number) | R/W |                                   |   | word |
| 10BFH-10C1H | Season 6(month, Day, Schedule Table Number) | R/W |                                   |   | Word |

|             |  |     |  |  |      |
|-------------|--|-----|--|--|------|
| 10C2H-10C4H | Season 7(month, Day, Schedule Table Number)                  | R/W |  |  | Word |
| 10C5H-10C7H | Season 8(month, Day, Schedule Table Number)                  | R/W |  |  | Word |
| 10C8H-10CAH | Season 9(month, Day, Schedule Table Number)                  | R/W |  |  | Word |
| 10CBH-10CDH | Season 10(month, Day, Schedule Table Number)                 | R/W |  |  | Word |
| 10CEH-10D0H | Season 11(month, Day, Schedule Table Number)                 | R/W |  |  | Word |
| 10D1H-10D3H | Season 12(month, Day, Schedule Table Number)                 | R/W |  |  | Word |
| 10D4H-10D6H | Season 13(month, Day, Schedule Table Number)                 | R/W |  |  | Word |
| 10D7H-10D9H | Season 14(month, Day, Schedule Table Number)                 | R/W |  |  | Word |
| 10DAH-10DCH | Schedule Table 1, 1st schedule (Hour, Minute, Tariff Number) | R/W |  |  | Word |
| 10DDH-10DFH | Schedule Table 1, 2nd schedule (Hour, Minute, Tariff Number) | R/W |  |  | Word |

|             |   |     |  |  |      |
|-------------|---|-----|--|--|------|
| 10E0H-10E2H | Schedule Table 1, 3rd schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10E3H-10E5H | Schedule Table 1, 4th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10E6H-10E8H | Schedule Table 1, 5th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10E9H-10EBH | Schedule Table 1, 6th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10ECH-10EEH | Schedule Table 1, 7th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10EFH-10F1H | Schedule Table 1, 8th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10F2H-10F4H | Schedule Table 1, 9th schedule (Hour, Minute, Tariff Number)  | R/W |  |  | Word |
| 10F5H-10F7H | Schedule Table 1, 10th schedule (Hour, Minute, Tariff Number) | R/W |  |  | Word |

|             |   |     |                              |  |      |
|-------------|---|-----|------------------------------|--|------|
| 10F8H-10FAH | Schedule Table 1, 11th schedule (Hour, Minute, Tariff Number)     | R/W |                              |  | Word |
| 10FBH-10FDH | Schedule Table 1, 12th schedule (Hour, Minute, Tariff Number)     | R/W |                              |  | Word |
| 10FEH-1100H | Schedule Table 1, 13th schedule (Hour, Minute, Tariff Number)     | R/W |                              |  | Word |
| 1101H-1103H | Schedule Table 1, 14th schedule (Hour, Minute, Tariff Number)     | R/W |                              |  | Word |
| 1104H-112DH | Schedule Table 2, 1st-14th schedule (Hour, Minute, Tariff Number) | R/W | The same as Schedule Table 1 |  | Word |
| 112EH-1157H | Schedule Table 3, 1st-14th schedule (Hour, Minute, Tariff Number) | R/W | The same as Schedule Table 1 |  | Word |
| 1158H-1181H | Schedule Table 4, 1st-14th schedule (Hour, Minute, Tariff Number) | R/W | The same as Schedule Table 1 |  | Word |
| 1182H-11ABH | Schedule Table 5, 1st-14th schedule (Hour, Minute, Tariff Number) | R/W | The same as Schedule Table 1 |  | Word |

|             |  |     |                                 |  |      |
|-------------|--|-----|---------------------------------|--|------|
| 11ACH-11D5H | Schedule Table 6,<br>1st-14th schedule<br>(Hour, Minute,<br>Tariff Number) | R/W | The same as Schedule Table<br>1 |  | Word |
| 11D6H-11FFH | Schedule Table 7,<br>1st-14th schedule<br>(Hour, Minute,<br>Tariff Number) | R/W | The same as Schedule Table<br>1 |  | Word |
| 1200H-1229H | Schedule Table 8,<br>1st-14th schedule<br>(Hour, Minute,<br>Tariff Number) | R/W | The same as Schedule Table<br>1 |  | Word |
| 122AH-122CH | The 1st<br>Holiday(Month,<br>Day, Schedule<br>Number)                      | R/W |                                 |  | Word |
| 122DH-122FH | The 2nd<br>Holiday(Month,<br>Day, Schedule<br>Number)                      | R/W |                                 |  | Word |
| 1230H-1232H | The 3rd<br>Holiday(Month,<br>Day, Schedule<br>Number)                      | R/W |                                 |  | Word |
| 1233H-1235H | The 4th<br>Holiday(Month,<br>Day, Schedule<br>Number)                      | R/W |                                 |  | word |
| 1236H-1238H | The 5th<br>Holiday(Month,<br>Day, Schedule<br>Number)                      | R/W |                                 |  | Word |

|             |  |     |  |  |      |
|-------------|--|-----|--|--|------|
| 1239H-123BH | The 6th<br>Holiday(Month,<br>Day, Schedule<br>Number)  | R/W |  |  | Word |
| 123CH-123EH | The 7th<br>Holiday(Month,<br>Day, Schedule<br>Number)  | R/W |  |  | Word |
| 123FH-1241H | The 8th<br>Holiday(Month,<br>Day, Schedule<br>Number)  | R/W |  |  | Word |
| 1242H-1244H | The 9th<br>Holiday(Month,<br>Day, Schedule<br>Number)  | R/W |  |  | Word |
| 1245H-1247H | The 10th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1248H-124AH | The 11th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 124BH-124DH | The 12th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 124EH-1250H | The 13th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |

|             |  |     |  |  |      |
|-------------|--|-----|--|--|------|
| 1251H-1253H | The 14th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1254H-1256H | The 15th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1257H-1259H | The 16th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 125AH-125CH | The 17th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 125DH-125FH | The 18th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1260H-1262H | The 19th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | word |
| 1263H-1265H | The 20th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1266H-1268H | The 21st<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |

|             |  |     |  |  |      |
|-------------|--|-----|--|--|------|
| 1269H-126BH | The 22nd<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 126CH-126EH | The 23rd<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 126FH-1271H | The 24th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1272H-1274H | The 25th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1275H-1277H | The 26th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 1278H-127AH | The 27th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 127BH-127DH | The 28th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |
| 127EH-1280H | The 29th<br>Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  |  | Word |

|             |   |     |  |  |      |
|-------------|---|-----|--|--|------|
| 1281H-1283H | The 30th Holiday(Month, Day, Schedule Number) | R/W |  |  | Word |
|-------------|---|-----|--|--|------|

### Weekend

| Bit7     | Bit6     | Bit5   | Bit4     | Bit3      | Bit2    | Bit1   | Bit0   |
|----------|----------|--------|----------|-----------|---------|--------|--------|
| 0        | 1: Work  |        |          | 0: Rest   |         |        |        |
| Reserved | Saturday | Friday | Thursday | Wednesday | Tuesday | Monday | Sunday |

### Tariff parameter error word 1(basic parameter)

| Bit7                           | Bit6                  | Bit5                   | Bit4                 | Bit3                  | Bit2                   | Bit1                   | Bit0           |
|--------------------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|------------------------|----------------|
| 1                              | 1                     | 1                      | 1                    | 1                     | 1                      | 1                      | 1              |
| Weekend Schedule Setting Error | Holiday Setting Error | Holiday Number Exceeds | Season Setting Error | Season Number Exceeds | Schedule Table Exceeds | Schedule Setting Error | Tariff Exceeds |

### Tariff parameter error word 1(basic parameter)

| Bit7             | Bit6             | Bit5             | Bit4             | Bit3             | Bit2             | Bit1             | Bit0             |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 1                | 1                | 1                | 1                | 1                | 1                | 1                | 1                |
| Schedule 8 Error | Schedule 7 Error | Schedule 6 Error | Schedule 5 Error | Schedule 4 Error | Schedule 3 Error | Schedule 2 Error | Schedule 1 Error |

### Trending Record Settings

|       |                           |     |                                      |      |
|-------|---------------------------|-----|--------------------------------------|------|
| 1300H | Log1 #Registers # Sectors | R/W | #Registers: 0-117<br># Sectors: 0-10 | Word |
| 1301H | Log1 Interval             | R/W | 0-65535                              | Word |

|              |                                   |     |   |      |
|--------------|-----------------------------------|-----|---|------|
| 1302H~1376H  | Log1 register #1-#117 identifier  | R/W | 0-65535   | Word |
| 1377H~13B1H  | Log1 register #1-#117 descriptors | R/W | High 4 bit: data type<br>Low 4 bit: data length | Byte |
| 13B2H        | log mode selection                | R/W | 0: Mode 1<br>1: Mode 2<br>2: Mode 3             | Word |
| 13B3H        | Starting Year/<br>Month           | R/W |   | Word |
| 13B4H        | Starting Day/<br>Hour             | R/W |   | Word |
| 13B5H        | Starting<br>Minute/Second         | R/W |   | Word |
| 13B6H        | Ending Year/<br>Month             | R/W |   | Word |
| 13B7H        | Ending Day/<br>Hour               | R/W |   | Word |
| 13B8H        | Ending Minute/<br>Second          | R/W |   | Word |
| 13B9H        | Clear Trending<br>Log             | R/W | 0: not clear 1:<br>clear                        | Word |
| 13C0H~1479H  | Log2 setting                      |     | the same as<br>Log1                             |      |
| 1480H~ 1539H | Log3 setting                      |     | the same as<br>Log1                             |      |

The logging can be implemented by putting the desired parameter Modbus address in the register of Trending Record. Some parameters use 2 Modbus registers, so the descriptor is required. A descriptor represents how many Modbus registers a parameter uses.

For example, register 4102H and 4103H are configured as a specific record, the corresponding descriptor is 2, the software can display content as "Frequency"

Trending log setting includes: Log1 Setting, Log2 Setting, Log3 Setting.

1300H-13BFH (Log1)

13C0H-147FH (Log2)

1480H-153FH (Log3)

Range: each record uses 192 registers (384 bytes)

Trending record setting:

|               |                            |                   |                   |
|---------------|----------------------------|-------------------|-------------------|
| 1300H – 1301H | 1302H – 1376H              | 1377H – 13B1H     | 13B2H – 13B8H     |
| Log Settings  | Parameter Register Address | Register Property | Register Property |

#### 1. Log Settings

Register 1300H – 1301H

Size 2

| Address   | 1300H       |              | 1301H        |              |
|-----------|-------------|--------------|--------------|--------------|
| Bytes     | 0(Low byte) | 1(High byte) | 2(Low byte)  | 3(High byte) |
| Parameter | Sector #    | Register #   | Logging time |              |

Register Number: The number of Modbus registers. Data range 0-117. The trending record size is Register Number x 2 + 12.

Sector Number: Each sector is 64 kB. Trending Log1, Log2, Log3 in total use 100 sectors, the range is 0-100. (The logging is disabled if the setting is set as 0)

Logging Interval: the time interval between two records. the unit is minute. The range is 0-1440. (when it is set as 0, logging will be disabled)

## 2. Parameter Address

Register: 1302H-1376H

Size: One parameter uses one, two or three Modbus register addresses, in total there are 117 addresses.

**Modbus register address list, you can set the parameters that are recorded in the record set the trend**, because some parameters, such as power and electricity, etc., takes up two Modbus address, to record these parameters need to use two Modbus address to characterize. Some parameter take up 3 Modbus address such as maximum demand happening time.

For example: Register 2000H and 2001H is set in the trend recorded in the register list, **the trends recorded in these registers record access frequency value**. Frequency Modbus addresses is 2000H and 2001H.

**Note:** when 117 registers are all fully assigned, be sure that no extra parameters will be assigned. For example, all parameter registers are energy, when all 117 registers are full, it leads to that the last energy only uses one Modbus address. The last value will be incorrect because every energy uses two Modbus addresses.

- Unused register should be set as 0000H or FFFFH.
- Each logging size is decided by the above register number

## 3. Register property:

Register: 1377H-13B1H

Size: one register uses one byte, in total there are 117 descriptors.(59 register addresses)  
The descriptor indicates how many register number one parameter uses. It can be set as 1

or 2 or 3.

For example: If the first descriptor is 2, the second descriptor is 1, then the first two Modbus addresses belong to the first, the third Modbus address belongs to the second descriptor.

**Note:** From the above example can be seen between the register list and the descriptor is not one to one, a record register property may correspond to two recording parameter register address.

#### 4. Logging mode setting

Logging mode as follows:

Mode 1: Interval setting time recording, recording full set sector, the records covering the trend originated.

Mode 2: within the set time, recording data, if within a set range record full set sector, to stop recording.

Mode 3: To set the start time to start recording data, records full set sector, the records covering the trend originated.

Register address 13B2H is the trend recording a mode setting register, 0-Log 1; 1-Log 2; 2-Log 3.

13B3H to 13B5H is to set the starting time of the trend recording, 13B6H to 13B7H is to set the trend recording ending time.

Register 13B3H-13B5H(Logging Timer starting time)

13B6H-13B8H(Logging Timer ending time)

Size 3

|           |      |       |     |      |        |        |
|-----------|------|-------|-----|------|--------|--------|
| Byte      | 0    | 1     | 2   | 3    | 4      | 5      |
| Parameter | Year | Month | Day | Hour | Minute | Second |

### Trending Log Status

Trending Log Status describes the current status of each record.

| Address     | Parameter                   | Property | Range    | Data Type |
|-------------|-----------------------------|----------|----------|-----------|
| 3C00H~3C01H | Logging 1 Max record        | R        | 0-468100 | dword     |
| 3C02H~3C03H | Logging 1 Used Record       | R        | 0-468100 | dword     |
| 3C04H       | Logging 1 Record Size       | R        | 14-246   | word      |
| 3C05H       | Reserved                    |          |          |           |
| 3C06H~3C08H | Logging 1 First Record Time | R        |          | word      |
| 3C09H~3C0bH | Logging 1 Last Record Time  | R        |          | word      |
| 3D00H~3D01H | Logging 2 Used Record       | R        | 0-468100 | dword     |
| 3D02H~3D03H | Logging 2 Record Size       | R        | 0-468100 | dword     |
| 3D04H       | Reserved                    | R        | 14-246   | word      |
| 3D05H       | Logging 2 First Record Time | R        |          |           |
| 3D06H~3D08H | Logging 2 Last Record Time  | R        |          | word      |
| 3D09H~3D0bH | Logging 2 Used Record       | R        |          | word      |

|             |                             |   |          |       |
|-------------|-----------------------------|---|----------|-------|
| 3E00H~3E01H | Logging 3 Used Record       | R | 0-468100 | dword |
| 3E02H~3E03H | Logging 3 Record Size       | R | 0-468100 | dword |
| 3E04H       | Reserved                    | R | 14-246   | word  |
| 3E05H       | Logging 3 First Record Time | R |          |       |
| 3E06H~3E08H | Logging 3 Last Record Time  | R |          | word  |
| 3E09H~3E0bH | Logging 3 Used Record       | R |          | word  |

**Max Record:** the maximum number of records the log can record based on the given Record Size and Sector Number.

**Used Record:** The record number of the log, when the log is full, it should equal Max Record.

When the log is reset, User Record will be changed to 0.

**Record Size:** Each record size in the log, including timestamp.

The trending record format is Record Number(4bytes) + Timestamp(6bytes) + [Data1-DataN] (2Nbytes) + CRC(2bytes).

**Record Starting Time:** First Record, the earliest record time.

**Record Ending Time:** Last Record, the latest record time.

**Trending Record Retrieve**

Trending Record can be divided into two parts: File Header and Main Window. File Header is used to finalize the contents displayed in Main Window. Main Window is a sliding window representing all the records. 3 trending records have one address.

Register 3B00H-3B03H

Size 4

| Address     | Parameter                     | Property | Format    | Description          |
|-------------|-------------------------------|----------|-----------|----------------------|
| 3B00H       | Record Type                   | R/W      | Nnnnnnnn  | Record Type          |
|             |                               |          | ssssssss  | Reserved             |
| 3B01H       | Window Record Number,Status   | R/W      | wwwwwwwww | status               |
|             |                               |          | nnnnnnnn  | Window Record Number |
| 3B02H~3B03H | Window Status + Record Offset | R/W      |           |                      |
| 3B04H~3B7eH | Window                        | R        |           |                      |

Record Type: which record will be read

- 0 — Log 1
- 1 — Log 2
- 2 — Log 3

Record Number: the record number each window displays. Please note this Record Number cannot exceed the window size. This setting tells AcuRev 2000 how many records are saved in Main Window. Window size bytes equal window record multiplied with Record Size.

For example, a record size is 50, the window size should be  $246/50 = 4$ .

Status: Window Status indicates the data status of the current window. It may exceed the time delay 1 second when AcuRev 2000 is preparing for a one window size data. This byte represents the data effectiveness, if the window records are not effective, the data will be ignored. In addition, it takes time to erase the memory. The memory erasing status can be represented by this byte. If Window Status is read only, all writing operations are disabled.

bH Window Status effective

FFH Window Status not effective

aaH Data Log erasing in operation

bbH Data Log erasing not in operation

Offset: this parameter is configurable. In order to read all the records of one log, users can just modify this offset value. When the data is retrieved, the first data is locked, so offset 0 is always pointed at the first data.

Window: a window is where to store the data, the window is read only. Please note, the data number in the window is an integer.

Retrieve Note

As the trend recording record full case, when using trend record mode 1 and mode 3 will erase the earliest record of a sector of data in order to continue to record. When reading the whole trend recording so try to avoid in read write full set by sector is, whether going to write full set by sector depends on whether has with the record number close to the maximum number of records. **If set to be filled with the situation of the sector continue to read, you should read before reading a window about the current record number of records that have been used to compare this with the number of records that have been are down from decreases with the number of records by dividing the maximum number of records record number of sectors, if this offset is less than the maximum number of records divided by the number of sectors records, then the number of records to be read should subtract this number from . The earliest record data of one sector data has been erased irreversible. If at this time if the time offset is greater than the maximum number of records divided by the number of sectors records, then the offset should be unified after subtracting this number. To avoid these problems, we recommend that users use as much as possible before the trend for reading demerit record.**

For example, log 1 uses 3 sectors, each sector saves 448 records, in total there will be 1344 records. When the user retrieves the data when 1340 records are used, the first sector of log 1 will be erased without being retrieved.

#### Data Retrieve Example

- The example is based on log 1.
- The logging content is Channel 1 Active Power, Channel 2 Active Power and Channel 3 Active Power (12 bytes), the logging interval is 1 minute, sector number is 10, register number is 6, using log 1.
- The Offset is 0.
- There are no new records logged while retrieving.

#### a) Setup Log 1:

1. Set Tenant 1 Power, Tenant 2 Power, Tenant 3 Power into this log. Since each parameter uses two Modbus registers, set 0x2102, 0x2103, 0x210e, 0x210f, 0x211a, 0x211b to 0x1302, 0x1303, 0x1304, 0x1305, 0x1306 and 0x1307. The descriptor is 2, so at the same time set 0x0202, 0x0200 to 0x1377, 0x1378
2. The register number is 6, it uses 10 sectors. So set 0x060A to 0x1300
3. The logging interval is 1 minute, set 0x0001 to 0x1301.
4. Log 1, set 0 to 0x13b9, the default is the log 1

#### b) Data Log Retrieve

The following describes how to retrieve from the earliest record to the latest record.

1. Calculate the max record number a window holds. The max record number =  $246 / \text{Record Size}$ . In this example,  $246 / 24 = 10$ .

2. Set the max record number and Offset to the meter. Initially the Offset is 0. In this example, set 0x0A0B and 0x0000 to 0x3B01 and 0x3B02.
3. Read the Window Status from 0x3B01, if the status says 0xFF, then go to step 2 to set max record number and Offset again. If the status says 0x0B, the content of the window will be read.
4. Read the window content and calculate the next record offset. The next record offset is the last record offset plus the max record number per window. After completing, set the new offset to 0x3B02. Then repeat step 3 until all the records are retrieved.

### Basic Measurement

AcuRev 2010 only takes power related measurements. The format is floating point. Each parameter uses 4 bytes, high bytes are followed by low bytes. Function Code: 03. Read only.

| Address     | Parameter                   | Property | Alarm parameter label | Default | Data Type |
|-------------|-----------------------------|----------|-----------------------|---------|-----------|
| 2000H-2001H | F                           | R        | 0                     |         | float     |
| 2002H-2003H | U1                          | R        | 1                     |         | float     |
| 2004-2005H  | U2                          | R        | 2                     |         | float     |
| 2006-2007H  | U3                          | R        | 3                     |         | float     |
| 2008-2009H  | Uavg                        | R        | 4                     |         | float     |
| 200AH-200BH | U12                         | R        | 5                     |         | float     |
| 200CH-200DH | U23                         | R        | 6                     |         | float     |
| 200EH-200FH | U31                         | R        | 7                     |         | float     |
| 2010H-2011H | Ulavg                       | R        | 8                     |         | float     |
| 2012H-2013H | IL1(Phase A inline current) | R        | 9                     |         | float     |
| 2014H-2015H | IL2(Phase B inline current) | R        | 10                    |         | float     |

|             |                                     |   |    |  |       |
|-------------|-------------------------------------|---|----|--|-------|
| 2016H-2017H | IL3(Phase C inline current)         | R | 11 |  | float |
| 2018H-2019H | Iavg(Average Current)               | R | 12 |  | float |
| 201AH-201BH | Pin-s inline system real power      | R | 13 |  | float |
| 201CH-201DH | Qin-s inline system reactive power  | R | 14 |  | float |
| 201EH-201FH | Sin-s inline system apparent power  | R | 15 |  | float |
| 2020H-2021H | PFin-s inline system power factor   | R | 16 |  | float |
| 2022H-2023H | Inline System Load Nature           | R |    |  | float |
| 2024H-2025H | Pin-A inline Phase A real power     | R | 17 |  | float |
| 2026H-2027H | Pin-B inline Phase B real power     | R | 18 |  | float |
| 2028H-2029H | Pin-C inline Phase C real power     | R | 19 |  | float |
| 202AH-202BH | Qin-A inline Phase A reactive power | R | 20 |  | float |
| 202CH-202DH | Qin-B inline Phase B reactive power | R | 21 |  | float |
| 202EH-202FH | Qin-C inline Phase C reactive power | R | 22 |  | float |
| 2030H-2031H | Sin-A inline A apparent power       | R | 23 |  | float |
| 2032H-2033H | Sin-B inline B apparent power       | R | 24 |  | float |
| 2034H-2035H | Sin-C inline C apparent power       | R | 25 |  | float |

|             |                                      |   |                             |  |       |
|-------------|--------------------------------------|---|-----------------------------|--|-------|
| 2036H-2037H | PFin-A inline A power factor         | R | 26                          |  | float |
| 2038H-2039H | PFin-B inline B power factor         | R | 27                          |  | float |
| 203AH-203BH | PFin-C inline C power factor         | R | 28                          |  | float |
| 203CH-203DH | A inline load nature                 | R |                             |  | float |
| 203EH-203FH | B inline load nature                 | R |                             |  | float |
| 2040H-2041H | C inline load nature                 | R |                             |  | float |
| 2100H-2101H | I1(Channel 1 Current)                | R | 29                          |  | float |
| 2102H-2103H | P1(Channel 1 Real power)             | R | 30                          |  | float |
| 2104H-2105H | Q1(Channel 1 Reactive power)         | R | 31                          |  | float |
| 2106H-2107H | S1(Channel 1 Apparent Power)         | R | 32                          |  | float |
| 2108H-2109  | PF1(Channel 1 Power Factor)          | R | 33                          |  | float |
| 210AH-210B  | Load Nature 1(Channel 1 Load Nature) | R |                             |  | float |
| 210CH-2117H | Channel 2 Measurement                | R | The same as Channel 1 34-38 |  | float |
| 2118H-2123H | Channel 3 Measurement                | R | The same as Channel 1 39-43 |  | float |
| 2124H-212FH | Channel 4 Measurement                | R | The same as Channel 1 44-48 |  | float |
| 2130H-213BH | Channel 5 Measurement                | R | The same as Channel 1 49-53 |  | float |
| 213CH-2147H | Channel 6 Measurement                | R | The same as Channel 1 54-58 |  | float |

|             |  |   |                                  |  |       |
|-------------|--|---|----------------------------------|--|-------|
| 2148H-2153H | Channel 7<br>Measurement   | R | The same as Channel<br>1 59-63   |  | float |
| 2154H-215FH | Channel 8<br>Measurement   | R | The same as Channel<br>1 64-68   |  | float |
| 2160H-216BH | Channel 9<br>Measurement   | R | The same as Channel<br>1 69-73   |  | float |
| 216CH-2177H | Channel 10<br>Measurement  | R | The same as Channel<br>1 74-78   |  | float |
| 2178H-2183H | Channel 11<br>Measurement  | R | The same as Channel<br>1 79-83   |  | float |
| 2184H-218FH | Channel 12<br>Measurement  | R | The same as Channel<br>1 84-88   |  | float |
| 2190H-219BH | Channel 13<br>Measurement  | R | The same as Channel<br>1 89-93   |  | float |
| 219CH-21A7H | Channel 14<br>Measurement  | R | The same as Channel<br>1 94-98   |  | float |
| 21A8H-21B3H | Channel 15<br>Measurement  | R | The same as Channel<br>1 99-103  |  | float |
| 21B4H-21BFH | Channel 16<br>Measurement  | R | The same as Channel<br>1 104-108 |  | float |
| 21C0H-21CBH | Channel 17<br>Measurement  | R | The same as Channel<br>1 109-113 |  | float |
| 21CCH-21D7H | Channel 18<br>Measurement  | R | The same as Channel<br>1 114-118 |  | float |
| 21D8H-21D9H | Ps1(Channel 1<br>3-phase 4-line/single-<br>phase 3-line total<br>active power)   | R | 119                              |  | float |
| 21DAH-21DBH | Qs1(Channel 1<br>3-phase 4-line/single-<br>phase 4-line total<br>reactive power) | R | 120                              |  | float |

|             |  |   |   |  |       |
|-------------|--|---|---|--|-------|
| 21DCH-21DDH | Ss1(Channel 1 3-phase 4-line/single-phase 3-line total apparent power)               | R | 121   |  | float |
| 21DEH-21DFH | PFs1(Channel 1 3-phase 4-line/single-phase 3-line total power factor)                | R | 122   |  | float |
| 21E0H-21E1H | Nature of the load (Channel 1 3-phase 4-line/single-phase 3-line nature of the load) | R |   |  | float |
| 21E2H-21EBH | Channel 2 Measurement  | R | Same as to Channel 1 3-phase 4-line / single-phase 3-line 123-126 |  | float |
| 21ECH-21F5H | Channel 3 Measurement  | R | Same as to Channel 1 3-phase 4-line / single-phase 3-line 127-130 |  | float |
| 21F6H-21FFH | Channel 4 Measurement  | R | Same as to Channel 1 3-phase 4-line /single-phase 3-line131-134   |  | float |
| 2200H-2209H | Channel 5 Measurement  | R | Same as to Channel 1 3-phase 4-line / single-phase 3-line 135-138 |  | float |
| 220AH-2213H | Channel 6 Measurement  | R | Same as to Channel 1 3-phase 4-line / single-phase 3-line 139-142 |  | float |

## Energy

The decimal place for energy is 1, the real value is communication value divided by 10. The unit is kWh. Real-time energy and this month TOU energy is editable, but the prior month TOU energy cannot be edited. The data type is double word, each parameter uses two register address, 4 bytes. High bytes are followed by low bytes. Function Code 03 to read, Function Code 10 to write.

### Real Time Energy

| Address(H)  | Parameter                              | Property | Range | Default | Data Type |
|---|--|----------|-------|---------|-----------|
| Inline real time energy   |  |          |       |         |           |
| 2500H-2501H   | Epin-A inline Phase A real time energy | R/W      |       |         | dword     |
| 2502H-2503H   | Epin-B inline Phase B real time energy | R/W      |       |         | dword     |
| 2504H-2505H   | Epin-C inline Phase C real time energy | R/W      |       |         | dword     |
| 2506H-2507H   | Epin-S inline system real time energy  | R/W      |       |         | dword     |
| Channel 1-18 single-phase 3+Channel 1-6 3-phase 4-line/single-phase 3-line real-time energy |  |          |       |         |           |
| 2508H-2509H   | Channel 1 real-time energy             | R/W      |       |         | dword     |
| 250AH-250BH   | Channel 2 real-time energy             | R/W      |       |         | dword     |

|             |                             |     |  |  |       |
|-------------|-----------------------------|-----|--|--|-------|
| 250CH-250DH | Channel 3 real-time energy  | R/W |  |  | dword |
| 250EH-250FH | Channel 4 real-time energy  | R/W |  |  | dword |
| 2510H-2511H | Channel 5 real-time energy  | R/W |  |  | dword |
| 2512H-2513H | Channel 6 real-time energy  | R/W |  |  | dword |
| 2514H-2515H | Channel 7 real-time energy  | R/W |  |  | dword |
| 2516H-2517H | Channel 8 real-time energy  | R/W |  |  | dword |
| 2518H-2519H | Channel 9 real-time energy  | R/W |  |  | dword |
| 251AH-251BH | Channel 10 real-time energy | R/W |  |  | dword |
| 251CH-251DH | Channel 11 real-time energy | R/W |  |  | dword |
| 251EH-251FH | Channel 12 real-time energy | R/W |  |  | dword |
| 2520H-2521H | Channel 13 real-time energy | R/W |  |  | dword |
| 2522H-2523H | Channel 14 real-time energy | R/W |  |  | dword |
| 2524H-2525H | Channel 15 real-time energy | R/W |  |  | dword |
| 2526H-2527H | Channel 16 real-time energy | R/W |  |  | dword |
| 2528H-2529H | Channel 17 real-time energy | R/W |  |  | dword |
| 252AH-252BH | Channel 18 real-time energy | R/W |  |  | dword |

|             |   |     |  |  |      |
|-------------|---|-----|--|--|------|
| 252CH-252DH | Channel 1 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy | R/W |  |  | dwod |
| 252EH-252FH | Channel 2 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy | R/W |  |  | dwod |
| 2530H-2531H | Channel3 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy  | R/W |  |  | dwod |
| 2532H-2533H | Channel 4 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy | R/W |  |  | dwod |
| 2534H-2535H | Channel 5 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy | R/W |  |  | dwod |
| 2536H-2537H | Channel 6 3-phase<br>4-line / single-<br>phase 3-line real-<br>time system active<br>power energy | R/W |  |  | dwod |

**TOU Energy – This Month TOU Energy**

| Address                      | Parameter  | Property | Range | Default | Data Type |
|------------------------------|--|----------|-------|---------|-----------|
| Inline this month TOU energy |  |          |       |         |           |
| 2600H-2601H                  | Epin-S inline system this month TOU energy             | R/W      |       |         | dwod      |
| 2602H-2603H                  | Epin-S inline system this month TOU energy (tariff 1)  | R/W      |       |         | dwod      |
| 2604H-2605H                  | Epin-S inline system this month TOU energy (tariff 2)  | R/W      |       |         | dwod      |
| 2606H-2607H                  | Epin-S inline system this month TOU energy (tariff 3)  | R/W      |       |         | dwod      |
| 2608H-2609H                  | Epin-S inline system this month TOU energy (tariff 4)  | R/W      |       |         | dwod      |
| 260AH-260BH                  | Epin-A inline Phase A this month TOU energy (total)    | R/W      |       |         | dwod      |
| 260CH-260DH                  | Epin-A inline Phase A this month TOU energy (tariff 1) | R/W      |       |         | dwod      |
| 260EH-260FH                  | Epin-A inline Phase A this month TOU energy (tariff 2) | R/W      |       |         | dwod      |
| 2610H-2611H                  | Epin-A inline Phase A this month TOU energy (tariff 3) | R/W      |       |         | dwod      |
| 2612H-2613H                  | Epin-A inline Phase A this month TOU energy (tariff 4) | R/W      |       |         | dwod      |

|  |  |     |  |  |      |
|--|--|-----|--|--|------|
| 2614H-2615H  | Epin-B inline Phase B this month TOU energy(total)     | R/W |  |  | dwod |
| 2616H-2617H  | Epin-B inline Phase B this month TOU energy (tariff 1) | R/W |  |  | dwod |
| 2618H-2619H  | Epin-B inline Phase B this month TOU energy (tariff 2) | R/W |  |  | dwod |
| 261AH-261BH  | Epin-B inline Phase B this month TOU energy (tariff 3) | R/W |  |  | dwod |
| 261CH-261DH  | Epin-B inline Phase B this month TOU energy (tariff 4) | R/W |  |  | dwod |
| 261EH-261FH  | Epin-C inline Phase C this month TOU energy(total)     | R/W |  |  | dwod |
| 2620H-2626H  | Epin-C inline Phase C this month TOU energy (tariff 1) | R/W |  |  | dwod |
| 2622H-2623H  | Epin-C inline Phase C this month TOU energy (tariff 2) | R/W |  |  | dwod |
| 2624H-2625H  | Epin-C inline Phase C this month TOU energy (tariff 3) | R/W |  |  | dwod |
| 2626H-2627H  | Epin-C inline Phase C this month TOU energy (tariff 4) | R/W |  |  | dwod |
| Channel 1-18 single-phase 3+Channel 1-6 3-phase 4-line/single-phase 3-line this month TOU energy |  |     |  |  |      |

|             |  |     |  |  |      |
|-------------|--|-----|--|--|------|
| 2628H-2629H | Channel 1 this month TOU energy (total)                | R/W |  |  | dwod |
| 262AH-262BH | Channel 1 this month TOU energy (Tariff 1)             | R/W |  |  | dwod |
| 262CH-262DH | Channel 1 this month TOU energy (Tariff 2)             | R/W |  |  | dwod |
| 262EH-262FH | Channel1 this month TOU energy (Tariff 3)              | R/W |  |  | dwod |
| 2630H-2631H | Channel1 this month TOU energy (Tariff 4)              | R/W |  |  | dwod |
| 2632H-263BH | Channel 2 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 263CH-2645H | Channel 3 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 2646H-264FH | Channel 4 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 2650H-2659H | Channel 5 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 265AH-2663H | Channel 6 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 2664H-266DH | Channel 7 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 266EH-2677H | Channel 8 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |

|             |   |     |  |  |      |
|-------------|---|-----|--|--|------|
| 2678H-2681H | Channel 9 this month TOU energy –The same as Channel 2  | R/W |  |  | dwod |
| 2682H-268BH | Channel 10 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 268CH-2695H | Channel 11 this month TOU energy –The same as Channel   | R/W |  |  | dwod |
| 2696H-269FH | Channel 12 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26A0H-26A9H | Channel 13 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26AAH-26B3H | Channel 14 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26B4H-26BDH | Channel 15 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26BEH-26C7H | Channel 16 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26C8H-26D1H | Channel 17 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |
| 26D2H-26DBH | Channel 18 this month TOU energy –The same as Channel 1 | R/W |  |  | dwod |

|                 |   |     |  |  |      |
|-----------------|---|-----|--|--|------|
| 26DCH-<br>26DDH | Channel 1 3-phase 4-line / single-phase 3-line system this month TOU energy(total)  | R/W |  |  | dwod |
| 26DEH-<br>26DFH | Channel 1 3-phase 4-line / single-phase 3-line system this month TOU energy(tariff 1)                                     | R/W |  |  | dwod |
| 26E0H-<br>26E1H | Channel 1 3-phase 4-line / single-phase 3-line system this month TOU energy(tariff 2)                                     | R/W |  |  | dwod |
| 26E2H-<br>26E3H | Channel 1 3-phase 4-line / single-phase 3-line system this month TOU energy(tariff 3)                                     | R/W |  |  | dwod |
| 26E4H-<br>26E5H | Channel 1 3-phase 4-line / single-phase 3-line system this month TOU energy(tariff 4)                                     | R/W |  |  | dwod |
| 26E6H-<br>26EFH | Channel 2 3-phase 4-line/ single-phase 3-line data-<br>The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R/W |  |  | dwod |
| 26F0H-<br>26F9H | Channel 3 3-phase 4-line/ single-phase 3-line data-<br>The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R/W |  |  | dwod |

|             |   |     |  |  |      |
|-------------|---|-----|--|--|------|
| 26FAH-2703H | Channel 4 3-phase 4-line/<br>single-phase 3-line data-<br>The same as to Channel<br>1 3-phase 4-line / single-<br>phase 3-line data | R/W |  |  | dwod |
| 2704H-270DH | Channel 5 3-phase 4-line/<br>single-phase 3-line data-<br>The same as to Channel<br>1 3-phase 4-line / single-<br>phase 3-line data | R/W |  |  | dwod |
| 270EH-2717H | Channel 6 3-phase 4-line/<br>single-phase 3-line data-<br>The same as to Channel<br>1 3-phase 4-line / single-<br>phase 3-line data | R/W |  |  | dwod |

#### TOU Energy – Prior month TOU energy

| Address(H)                    | Parameter  | Property | Range | Default | Data Type |
|-------------------------------|--|----------|-------|---------|-----------|
| Inline prior month TOU energy |  |          |       |         |           |
| 2900H-2901H                   | Epin-S inline system prior month TOU energy(total)     | R        |       |         | dwod      |
| 2902H-2903H                   | Epin-S inline system prior month TOU energy (tariff 1) | R        |       |         | dwod      |
| 2904H-2905H                   | Epin-S inline system prior month TOU energy (tariff 2) | R        |       |         | dwod      |

|             |   |   |  |  |      |
|-------------|---|---|--|--|------|
| 2906H-2907H | Epin-S inline system prior month TOU energy (tariff 3)  | R |  |  | dwod |
| 2908H-2909H | Epin-S inline system prior month TOU energy (tariff 4)  | R |  |  | dwod |
| 290AH-290BH | Epin-A inline Phase A prior month TOU energy (total)    | R |  |  | dwod |
| 290CH-290DH | Epin-A inline Phase A prior month TOU energy (tariff 1) | R |  |  | dwod |
| 290EH-290FH | Epin-A inline Phase A prior month TOU energy (tariff 2) | R |  |  | dwod |
| 2910H-2911H | Epin-A inline Phase A prior month TOU energy (tariff 3) | R |  |  | dwod |
| 2912H-2913H | Epin-A inline Phase A prior month TOU energy (tariff 4) | R |  |  | dwod |
| 2914H-2915H | Epin-B inline Phase B prior month TOU energy (total)    | R |  |  | dwod |
| 2916H-2917H | Epin-B inline Phase B prior month TOU energy (tariff 1) | R |  |  | dwod |
| 2918H-2919H | Epin-B inline Phase B prior month TOU energy (tariff 2) | R |  |  | dwod |

|   |   |   |  |  |      |
|---|---|---|--|--|------|
| 291AH-291BH   | Epin-B inline Phase B prior month TOU energy (tariff 3) | R |  |  | dwod |
| 291CH-291DH   | Epin-B inline Phase B prior month TOU energy (tariff 4) | R |  |  | dwod |
| 291EH-291FH   | Epin-C inline Phase C prior month TOU energy (total)    | R |  |  | dwod |
| 2920H-2921H   | Epin-C inline Phase C prior month TOU energy (tariff 1) | R |  |  | dwod |
| 2922H-2923H   | Epin-C inline Phase C prior month TOU energy (tariff 2) | R |  |  | dwod |
| 2924H-2925H   | Epin-C inline Phase C prior month TOU energy (tariff 3) | R |  |  | dwod |
| 2926H-2927H   | Epin-C inline Phase C prior month TOU energy (tariff 4) | R |  |  | dwod |
| Channel 1-18 single-phase 3+Channel 1-6 3-phase 4-line/single-phase 3-line prior month TOU energy |   |   |  |  |      |
| 2928H-2929H   | Channel 1 prior month TOU energy (total)                | R |  |  | dwod |
| 292AH-292BH   | Channel 1 prior month TOU energy (Tariff 1)             | R |  |  | dwod |
| 292CH-292DH   | Channel 1 prior month TOU energy (Tariff 2)             | R |  |  | dwod |

|             |  |   |  |  |      |
|-------------|--|---|--|--|------|
| 292EH-292FH | Channel 1 prior month TOU energy (Tariff 3)                | R |  |  | dwod |
| 2930H-2931H | Channel 1 prior month TOU energy (Tariff 4)                | R |  |  | dwod |
| 2932H-293BH | Channel 2 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |
| 293CH-2945H | Channel 3 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |
| 2946H-294FH | Channel 4 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |
| 2950H-2959H | Channel 5 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |
| 295AH-2963H | Channel 6 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |
| 2964H-296DH | Channel 7 prior month TOU energy<br>–The same as Channel 1 | R |  |  | dwod |

|             |   |   |  |  |      |
|-------------|---|---|--|--|------|
| 296EH-2977H | Channel 8 prior month TOU energy<br>-The same as Channel 1  | R |  |  | dwod |
| 2978H-2981H | Channel 9 prior month TOU energy<br>-The same as Channel 1  | R |  |  | dwod |
| 2982H-298BH | Channel 10 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |
| 298CH-2995H | Channel 11 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |
| 2996H-299FH | Channel 12 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |
| 29A0H-29A9H | Channel 13 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |
| 29AAH-29B3H | Channel 14 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |
| 29B4H-29BDH | Channel 15 prior month TOU energy<br>-The same as Channel 1 | R |  |  | dwod |

|             |  |   |  |  |      |
|-------------|--|---|--|--|------|
| 29BEH-29C7H | Channel 16 prior month TOU energy<br>-The same as Channel 1                          | R |  |  | dwod |
| 29C8H-29D1H | Channel 17 prior month TOU energy<br>-The same as Channel 1                          | R |  |  | dwod |
| 29D2H-29DBH | Channel 18 prior month TOU energy<br>-The same as Channel 1                          | R |  |  | dwod |
| 29DCH-29DDH | Channel 1 3-phase 4-line/single-phase 3-line prior month system TOU energy(Total)    | R |  |  | dwod |
| 29DEH-29DFH | Channel 1 3-phase 4-line/single-phase 3-line prior month system TOU energy(Tariff 1) | R |  |  | dwod |
| 29E0H-29E1H | Channel 1 3-phase 4-line/single-phase 3-line prior month system TOU energy(Tariff 2) | R |  |  | dwod |
| 29E2H-29E3H | Channel 1 3-phase 4-line/single-phase 3-line prior month system TOU energy(Tariff 3) | R |  |  | dwod |

|             |  |   |  |  |      |
|-------------|--|---|--|--|------|
| 29E4H-29E5H | Channel 1 3-phase 4-line/single-phase 3-line prior month system TOU energy(Tariff 4)                                 | R |  |  | dwod |
| 29E6H-29EFH | Channel 2 3-phase 4-line/single-phase 3-line data-The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R |  |  | dwod |
| 29F0H-29F9H | Channel 3 3-phase 4-line/single-phase 3-line data-The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R |  |  | dwod |
| 29FAH-2A03H | Channel 4 3-phase 4-line/single-phase 3-line data-The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R |  |  | dwod |
| 2A04H-2A0DH | Channel 5 3-phase 4-line/single-phase 3-line data-The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R |  |  | dwod |

|             |  |   |  |  |      |
|-------------|--|---|--|--|------|
| 2A0EH-2A17H | Channel 6 3-phase 4-line/single-phase 3-line data-The same as to Channel 1 3-phase 4-line / single-phase 3-line data | R |  |  | dwod |
|-------------|--|---|--|--|------|

### Reactive Energy

| Address   | Parameter                                       | Property | Range | Default | Data Type |
|---|---|----------|-------|---------|-----------|
| <b>Inline Reactive Power Energy</b>   |   |          |       |         |           |
| 2B00H-2B01H   | Eqin-A inline Phase A Reactive Power Energy     | R/W      |       |         | dwod      |
| 2B02H-2B03H   | Eqin-B inline Phase B Reactive Power Energy     | R/W      |       |         | dwod      |
| 2B04H-2B05H   | Eqin-C inline Phase C Reactive Power Energy     | R/W      |       |         | dwod      |
| 2B06H-2B07H   | Eqin-S inline system Reactive Energy            | R/W      |       |         | dwod      |
| <b>Channel 1-18 single-phase 3+Channel 1-6 3-phase 4-line/single-phase 3-line reactive power energy</b> |   |          |       |         |           |
| 2B08H-2B2BH   | Tenant 1-18 real-time Reactive Power Energy     | R/W      |       |         | dwod      |
| 2B2CH-2B2DH   | Tenant 1 real-time system Reactive Power Energy | R/W      |       |         | dwod      |

|                 |  |     |  |  |  |
|-----------------|--|-----|--|--|--|
| 2B2EH-<br>2B37H | Tenant 2-6 Reactive<br>Power Energy data | R/W |  |  |  |
|-----------------|--|-----|--|--|--|

### Apparent Energy

| Address   | Parameter                                       | Property | Range | Default | Data Type |
|---|---|----------|-------|---------|-----------|
| Inline Apparent Energy  |   |          |       |         |           |
| 2B38H-<br>2B39H   | Eqin-A inline Phase A<br>Apparent Energy        | R/W      |       |         | dwod      |
| 2B3AH-<br>2B3BH   | Esin-B inline Phase B<br>Apparent Energy        | R/W      |       |         | dwod      |
| 2B3CH-<br>2B3DH   | Esin-C inline Phase C<br>Apparent Energy        | R/W      |       |         | dwod      |
| 2B3EH-<br>2B3FH   | Esin-S inline system<br>Apparent Energy         | R/W      |       |         | dwod      |
| Channel 1-18 single-phase 3+Channel 1-6 3-phase 4-line/single-phase 3-line prior<br>month apparent energy |   |          |       |         |           |
| 2B40H-<br>2B63H   | Tenant 1-18 real-time<br>Apparent Energy        | R/W      |       |         | dwod      |
| 2B64H-<br>2B65H   | Tenant 1 real-time<br>system Apparent<br>Energy | R/W      |       |         | dwod      |
| 2B66H-<br>2B6FH   | Tenant 2-6 Apparent<br>Energy data              | R/W      |       |         |           |

### Demand

| Address       | Parameter | Property | Remark | Alarm parameter label | Data Type |
|---------------|-----------|----------|--------|-----------------------|-----------|
| Inline Demand |           |          |        |                       |           |

|             |   |   |  |     |       |
|-------------|---|---|--|-----|-------|
| 2D00H-2D01H | Pin-s-dema inline system demand                           | R |  | 143 | float |
| 2D02H-2D03H | PinS inline system power demand prediction                | R |  | 144 | float |
| 2D04H-2D05H | Pin-s-dema-max inline system demand peak                  | R |  |     | float |
| 2D06H-2D08H | Pin-s-time inline system demand peak times                | R | Year, Month, Day, Hour, Minute, Second |     | word  |
| 2D09H-2D0AH | Qin-s-dema inline system reactive power demand            | R |  | 145 | float |
| 2D0BH-2D0CH | QinS inline system reactive power demand prediction       | R |  | 146 | float |
| 2D0DH-2D0EH | Qin-s-dema-max inline system reactive power demand peak   | R |  |     | float |
| 2D0FH-2D11H | Qin-s-time inline system reactive power demand peak times | R | Year, Month, Day, Hour, Minute, Second |     | word  |
| 2D12H-2D13H | Sin-s-dema inline system apparent demand                  | R |  | 147 | float |
| 2D14H-2D15H | SinS inline system apparent demand prediction             | R |  | 148 | float |

|                 |  |   |  |     |       |
|-----------------|--|---|--|-----|-------|
| 2D16H-<br>2D17H | Sin-s-dema-max<br>inline system<br>apparent demand<br>peak   | R |  |     | float |
| 2D18H-<br>2D1AH | Sin-s-time inline<br>system apparent<br>demand peak times    | R | Year, Month,<br>Day, Hour,<br>Minute, Second |     | word  |
| 2D1BH-<br>2D1CH | IL1-dema(Phase<br>A inline current<br>demand)                | R |  | 149 | float |
| 2D1DH-<br>2D1EH | Phase A inline<br>current demand<br>prediction               |   |  | 150 | Float |
| 2D1FH-<br>2D20H | IL1-dema-<br>max(Phase A<br>inline max current<br>demand)    | R |  |     | float |
| 2D21H-<br>2D23H | IL1-time(Phase A<br>inline max current<br>demand occurrence) | R | Year, Month,<br>Day, Hour,<br>Minute, Second |     | word  |
| 2D24H-<br>2D25H | Pin-A-dema inline<br>phase A power<br>demand                 | R |  | 151 | float |
| 2D26H-<br>2D27H | PinA inline phase<br>A power demand<br>prediction            | R |  | 152 | float |
| 2D28H-<br>2D29H | Pin-A-dema-max<br>inline phase A<br>power demand peak        | R |  |     | float |
| 2D2AH-<br>2D2CH | Pin-A-time inline<br>phase A power<br>demand peak times      | R | Year, Month,<br>Day, Hour,<br>Minute, Second |     | word  |

|                 |   |   |  |     |                                   |
|-----------------|---|---|--|-----|-----------------------------------|
| 2D2DH-<br>2D2EH | Qin-A-dema inline<br>phase A reactive<br>power demand               | R |  | 153 | float                             |
| 2D2FH-<br>2D30H | QinA inline phase<br>A reactive power<br>demand prediction          | R |  | 154 | float                             |
| 2D31H-<br>2D32H | Qin-A-dema-<br>max inline phase<br>A reactive power<br>demand peak  | R |  |     | float                             |
| 2D33H-<br>2D35H | Qin-A-time inline<br>phase A reactive<br>power demand peak<br>times | R | Year, Month,<br>Day, Hour,<br>Minute, Second |     | word                              |
| 2D36H-<br>2D37H | Sin-A-dema inline<br>phase A apparent<br>demand                     | R |  | 155 | float                             |
| 2D38H-<br>2D39H | SinA inline phase A<br>apparent demand<br>prediction                | R |  | 156 | float                             |
| 2D3AH-<br>2D3BH | Sin-A-dema-max<br>inline phase A<br>apparent demand<br>peak         | R |  |     | float                             |
| 2D3CH-<br>2D3EH | Sin-A-time inline<br>phase A apparent<br>demand peak times          | R | Year, Month,<br>Day, Hour,<br>Minute, Second |     | word                              |
| 2D3FH-<br>2D62H | Inline phase B<br>demand data                                       |   |  |     | Same as phase A<br>demand 157-164 |
| 2D63H-<br>2D86H | Inline phase C<br>demand data                                       |   |  |     | Same as phase A<br>demand 165-172 |

|             |                        |   |  |                                |  |
|-------------|------------------------|---|--|--------------------------------|--|
| 2D87H-2DAAH | Channel 1 demand data  | R |  | Same as phase A demand 173-180 |  |
| 2DABH-2DCEH | Channel 2 demand data  | R |  | Same as phase A demand 181-188 |  |
| 2DCFH-2DF2H | Channel 3 demand data  | R |  | Same as phase A demand 189-196 |  |
| 2DF3H-2E16H | Channel 4 demand data  | R |  | Same as phase A demand 197-204 |  |
| 2E17H-2E3AH | Channel 5 demand data  | R |  | Same as phase A demand 205-212 |  |
| 2E3BH-2E5EH | Channel 6 demand data  | R |  | Same as phase A demand 213-220 |  |
| 2E5FH-2E82H | Channel 7 demand data  | R |  | Same as phase A demand 221-228 |  |
| 2E83H-2EA6H | Channel 8 demand data  | R |  | Same as phase A demand 229-236 |  |
| 2EA7H-2ECAH | Channel 9 demand data  | R |  | Same as phase A demand 237-244 |  |
| 2ECBH-2EEEH | Channel 10 demand data | R |  | Same as phase A demand 245-252 |  |
| 2EEFH-2F12H | Channel 11 demand data | R |  | Same as phase A demand 253-260 |  |
| 2F13H-2F36H | Channel 12 demand data | R |  | Same as phase A demand 261-268 |  |
| 2F37H-2F5AH | Channel 13 demand data | R |  | Same as phase A demand 269-276 |  |
| 2F5BH-2F7EH | Channel 14 demand data | R |  | Same as phase A demand 277-284 |  |
| 2F7FH-2FA2H | Channel 15 demand data | R |  | Same as phase A demand 285-292 |  |
| 2FA3H-2FC6H | Channel 16 demand data | R |  | Same as phase A demand 293-300 |  |

|             |   |   |  |  |  |
|-------------|---|---|--|--|--|
| 2FC7H-2FEAH | Channel 17 demand data                                    | R |  | Same as phase A demand 301-308   |  |
| 2FEBH-300EH | Channel 18 demand data                                    | R |  | Same as phase A demand 309-316   |  |
| 300FH-3029H | Channel 1 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to inline system demand(active demand, reactive power demand, apparent demand) 317-322 |  |
| 302AH-3044H | Channel 2 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to Channel 1 3-phase 4-line / single-phase 3-line 323-328                              |  |
| 3045H-305FH | Channel 3 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to Channel 1 3-phase 4-line / single-phase 3-line 329-334                              |  |
| 3060H-307AH | Channel 4 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to Channel 1 3-phase 4-line / single-phase 3-line 335-240                              |  |
| 307BH-3095H | Channel 5 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to Channel 1 3-phase 4-line / single-phase 3-line 341-346                              |  |
| 3096H-30B0H | Channel 6 3-phase 4-line/single-phase 3-line total demand | R |  | The same as to Channel 1 3-phase 4-line / single-phase 3-line 347-352                              |  |

### Energy Quality

The Power Quality parameters include Unbalance Factor, Total Harmonic Distortion, Crest-Factor Current K-Crest, Telephone interference factor and 2nd-31st harmonic data. 2010 does not measure power quality parameters. The power quality parameter data type is Integer. Each parameter uses 4 bytes (high bytes followed by low bytes).

Function Code 03: read.

There is Corresponding relationship between communication and actual values

Unbalance:  $Unbl = (Rx/1000) \times 100\%$

Total harmonic distortion:  $THD = (RX/10000) \times 100\%$

The harmonic distortion:  $HDn = (RX/10000) \times 100\%$

Odd harmonic distortion:  $HDo = (RX/10000) \times 100\%$

Even harmonic distortion:  $HDe = (RX/10000) \times 100\%$

Crest Factor:  $CF = RX/1000$

K-Factor:  $KF = Rx/10$

Telephone interference factor:  $THFF = (RX/10000) \times 100\%$

Rx Communications value

| Address               | Parameter                | Property | Range | Default | Data Type |
|-----------------------|--------------------------|----------|-------|---------|-----------|
| Inline Energy Quality |                          |          |       |         |           |
| 3200H                 | Voltage Unbalance Factor | R        |       |         | word      |
| 3201H                 | U1 or U12 THD-U1         | R        |       |         | word      |
| 3202H                 | U2 or U23 THD-U2         | R        |       |         | word      |

|       |                             |   |  |      |
|-------|-----------------------------|---|--|------|
| 3203H | U3 or U31 THD-U3            | R |  | word |
| 3204H | Voltage THD average         | R |  | word |
| 3205H | U1 or U12 2nd harmonic      | R |  | word |
| 3206H | U1 or U12 3rd harmonic      | R |  | word |
| ..... | .....                       | R |  | word |
| 3222H | U1 or U12 31st harmonic     | R |  | word |
| 3223H | U2 or U23 2nd harmonic      | R |  | word |
| 3229H | U2 or U23 3rd harmonic      | R |  | word |
| ..... | .....                       | R |  | word |
| 3240H | U2 or U23 31st harmonic     | R |  | word |
| 3241H | U3 or U31 2nd harmonic      | R |  | word |
| 3242H | U3 or U31 3rd harmonic      | R |  | word |
| ..... | .....                       | R |  | word |
| 325EH | U3 or U31 31st harmonic     | R |  | word |
| 325FH | Current Unbalance Factor    | R |  | Word |
| 3260H | U1 Odd harmonic distortion  | R |  | Word |
| 3261H | U1 Even harmonic distortion | R |  | Word |
| 3262H | U1 crest factor             | R |  | Word |

|       |  |   |  |  |      |
|-------|--|---|--|--|------|
| 3263H | U1 Telephone harmonic form factor          | R |  |  | Word |
| 3264H | U2 Odd harmonic distortion                 | R |  |  | Word |
| 3265H | U2 Even harmonic distortion                | R |  |  | Word |
| 3266H | U2 crest factor                            | R |  |  | Word |
| 3267H | U2 Telephone harmonic form factor          | R |  |  | Word |
| 3268H | U3 Odd harmonic distortion                 | R |  |  | Word |
| 3269H | U3 Even harmonic distortion                | R |  |  | Word |
| 326AH | U3 crest factor                            | R |  |  | Word |
| 326BH | U3 Telephone harmonic form factor          | R |  |  | Word |
|       |  |   |  |  |      |
| 32A0H | Channel 1 Current Odd harmonic distortion  | R |  |  | Word |
| 32A1H | Channel 1 Current Even harmonic distortion | R |  |  | Word |
| 32A2H | Channel 1 Current K-Factor                 | R |  |  | Word |
| 32A3H | Channel 2 Current Odd harmonic distortion  | R |  |  | Word |
| 32A4H | Channel 2 Current Even harmonic distortion | R |  |  | Word |
| 32A5H | Channel 2 Current K-Factor                 | R |  |  | Word |
| 32A6H | Channel 3 Current Odd harmonic distortion  | R |  |  | Word |

|       |  |   |  |      |
|-------|--|---|--|------|
| 32A7H | Channel 3 Current Even harmonic distortion | R |  | Word |
| 32A8H | Channel 3 Current K-Factor                 | R |  | Word |
| 32A9H | Channel 4 Current Odd harmonic distortion  | R |  | Word |
| 32AAH | Channel 4 Current Even harmonic distortion | R |  | Word |
| 32ABH | Channel 4 Current K-Factor                 | R |  | Word |
| 32ACH | Channel 5 Current Odd harmonic distortion  | R |  | Word |
| 32ADH | Channel 5 Current Even harmonic distortion | R |  | Word |
| 32AEH | Channel 5 Current K-Factor                 | R |  | Word |
| 32AFH | Channel 6 Current Odd harmonic distortion  | R |  | Word |
| 32B0H | Channel 6 Current Even harmonic distortion | R |  | Word |
| 32B1H | Channel 6 Current K-Factor                 | R |  | Word |
| 32B2H | Channel 7 Current Odd harmonic distortion  | R |  | Word |
| 32B3H | Channel 7 Current Even harmonic distortion | R |  | Word |
| 32B4H | Channel 7 Current K-Factor                 | R |  | Word |
| 32B5H | Channel 8 Current Odd harmonic distortion  | R |  | Word |
| 32B6H | Channel 8 Current Even harmonic distortion | R |  | Word |

|       |   |   |  |  |      |
|-------|---|---|--|--|------|
| 32B7H | Channel 8 Current<br>K-Factor                     | R |  |  | Word |
| 32B8H | Channel 9 Current Odd<br>harmonic distortion      | R |  |  | Word |
| 32B9H | Channel 9 Current Even<br>harmonic distortion     | R |  |  | Word |
| 32BAH | Channel 9 Current<br>K-Factor                     | R |  |  | Word |
| 32BBH | Channel 10 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32BCH | Channel 10 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32BDH | Channel 10 Current<br>K-Factor                    | R |  |  | Word |
| 32BEH | Channel 11 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32BFH | Channel 11 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32C0H | Channel 11 Current<br>K-Factor                    | R |  |  | Word |
| 32C1H | Channel 12 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32C2H | Channel 12 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32C3H | Channel 12 Current<br>K-Factor                    | R |  |  | Word |

|       |   |   |  |  |      |
|-------|---|---|--|--|------|
| 32C4H | Channel 13 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32C5H | Channel 13 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32C6H | Channel 13 Current<br>K-Factor                    | R |  |  | Word |
| 32C7H | Channel 14 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32C8H | Channel 14 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32C9H | Channel 14 Current<br>K-Factor                    | R |  |  | Word |
| 32CAH | Channel 15 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32CBH | Channel 15 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32CCH | Channel 15 Current<br>K-Factor                    | R |  |  | Word |
| 32CDH | Channel 16 Current<br>Odd harmonic<br>distortion  | R |  |  | Word |
| 32CEH | Channel 16 Current<br>Even harmonic<br>distortion | R |  |  | Word |
| 32CFH | Channel 16 Current<br>K-Factor                    | R |  |  | Word |

|   |   |   |                   |  |      |
|---|---|---|-------------------|--|------|
| 32D0H   | Channel 17 Current<br>Odd harmonic<br>distortion  | R |                   |  | Word |
| 32D1H   | Channel 17 Current<br>Even harmonic<br>distortion | R |                   |  | Word |
| 32D2H   | Channel 17 Current<br>K-Factor                    | R |                   |  | Word |
| 32D3H   | Channel 18 Current<br>Odd harmonic<br>distortion  | R |                   |  | Word |
| 32D4H   | Channel 18 Current<br>Even harmonic<br>distortion | R |                   |  | Word |
| 32D5H   | Channel 18 Current<br>K-Factor                    | R |                   |  | Word |
| Channel 1-Channel 18 single-phase 3-line data |   |   |                   |  |      |
| 3300H   | Channel 1 current<br>THD-I1                       | R |                   |  | word |
| 3301H   | Channel 1 current<br>THD-I2                       | R |                   |  | word |
| .....   | .....   | R |                   |  | word |
| 331EH   | Channel 1 current<br>THD-I31                      | R |                   |  | word |
| 331FH-<br>333DH                               | Channel 2 current<br>harmonic data                | R | Same as Channel 1 |  | word |
| 333EH-<br>335CH                               | Channel 3 current<br>harmonic data                | R | Same as Channel 1 |  | word |
| 335DH-<br>337BH                               | Channel 4 current<br>harmonic data                | R | Same as Channel 1 |  | word |
| 337CH-<br>339AH                               | Channel 5 current<br>harmonic data                | R | Same as Channel 1 |  | word |

|  |   |   |                   |  |      |
|--|---|---|-------------------|--|------|
| 339BH-33B9H  | Channel 6 current harmonic data                                 | R | Same as Channel 1 |  | word |
| 33BAH-33D8H  | Channel 7 current harmonic data                                 | R | Same as Channel 1 |  | word |
| 33D9H-33F7H  | Channel 8 current harmonic data                                 | R | Same as Channel 1 |  | word |
| 33F8H-3416H  | Channel 9 current harmonic data                                 | R | Same as Channel 1 |  | word |
| 3417H-3435H  | Channel 10 current harmonic data                                | R | Same as Channel 1 |  | word |
| 3436H-3454H  | Channel 11 current harmonic data                                | R | Same as Channel 1 |  | word |
| 3455H-3473H  | Channel 12 current harmonic data                                | R | Same as Channel 1 |  | word |
| 3474H-3492H  | Channel 13 current harmonic data                                | R | Same as Channel 1 |  | word |
| 3493H-34B1H  | Channel 14 current harmonic data                                | R | Same as Channel 1 |  | word |
| 34B2H-34D0H  | Channel 15 current harmonic data                                | R | Same as Channel 1 |  | word |
| 34D1H-34EFH  | Channel 16 current harmonic data                                | R | Same as Channel 1 |  | word |
| 34F0H-350EH  | Channel 17 current harmonic data                                | R | Same as Channel 1 |  | word |
| 350FH-352DH  | Channel 18 current harmonic data                                | R | Same as Channel 1 |  | word |
| Channel 1-Channel 6 3-phase 4-line/single -phase 3-line data |   |   |                   |  |      |
| 352EH  | Channel 1 3-phase 4-line/single -phase 3-line current unbalance | R |                   |  | word |

|       |   |   |  |  |      |
|-------|---|---|--|--|------|
| 352FH | Channel 2 3-phase<br>4-line/single –<br>phase 3-line current<br>unbalance | R |  |  | word |
| 3530H | Channel 3 3-phase<br>4-line/single –<br>phase 3-line current<br>unbalance | R |  |  | word |
| 3531H | Channel 4 3-phase<br>4-line/single –<br>phase 3-line current<br>unbalance | R |  |  | word |
| 3532H | Channel 5 3-phase<br>4-line/single –<br>phase 3-line current<br>unbalance | R |  |  | word |
| 3533H | Channel 6 3-phase<br>4-line/single –<br>phase 3-line current<br>unbalance | R |  |  | word |

### Over/Under Limit Alarm

A High Byte indicates an alarming channel number 1-10. Low Byte: bit0 = 1 indicates alarming, bit0 = 0 indicates restoration.

Only one alarming record can be read each time. The reading will be implemented via the current alarming record number, and it can save up to 20 alarming records.

Function Code 03 is to read. Function Code 10 is to write.

| Address | Parameter | Property | Range | Default | Data |
|---------|-----------|----------|-------|---------|------|
|---------|-----------|----------|-------|---------|------|

|             |  |     |  |   |      |
|-------------|--|-----|--|---|------|
| 3700H       | Group 1: Alarm State                     | R   | High byte: Alarm Channel 1-10<br>Bit0<br>1: Alarm happening<br>0: Alarm recovery |   | word |
| 3701H       | Group 1: Parameter Number                | R   | 0-352  |   | word |
| 3702H       | Group 1: Over limit or restoration value | R   |  |   | word |
| 3703H-3709H | Group 1: Happening Time                  | R   | Year, Month, Day, Hour, Minute, Second, Millisecond                              |   | word |
| 370AH       | Newest alarm record number               | R   | 1-20, 0 indicates no alarm record  | 0 | word |
| 370BH       | Alarm Record Number currently being read | R/W | 1-20   | 1 | word |

### System Event Log

Records event happening and event. Please refer to Chapter 4 for details.

Only one record can be read every time via current event number, it can be saved up to 100 records.

Function Code 03 is to read. Function Code 10 is to write.

| Address     | Parameter            | Property | Range                                  | Default | Data |
|-------------|----------------------|----------|--|---------|------|
| 3800H-3805H | Event Happening Time | R        | Year, Month, Day, Hour, Minute, Second |         | word |
| 3806H       | Event Marking        |          | 1-16 indicating 1-16 events            |         | word |
| 3807H       | Newest Event Number  |          | 1-100, 0 indicates null                | 0       | word |

|       |                                   |     |       |   |      |
|-------|-----------------------------------|-----|-------|---|------|
| 3808H | Event number currently being read | R/W | 1-100 | 1 | word |
|-------|-----------------------------------|-----|-------|---|------|

### SOE Record

When an event happens, SOE records the DI state and its time of occurrence. Each time only one SOE record can be read, via current SOE record setting, it can save up to 20 SOE records.

Function Code 03 is to read, Function Code 10 is to write.

| Address | Parameter                                     | Property | Range  | Default | Data |
|---------|---|----------|--|---------|------|
| 3900H   | DI SOE first record:<br>Year                  | R        |  |         | word |
| 3901H   | DI SOE first record:<br>Month                 | R        |  |         | word |
| 3902H   | DI SOE first record:<br>Day                   | R        |  |         | word |
| 3903H   | DI SOE first record:<br>Hour                  | R        |  |         | word |
| 3904H   | DI SOE first record:<br>Minute                | R        |  |         | word |
| 3905H   | DI SOE first record:<br>Second                | R        |  |         | word |
| 3906H   | DI SOE first record:<br>millisecond high byte | R        |  |         | word |
| 3907H   | DI SOE first record:<br>millisecond low byte  | R        |  |         | word |
| 3908H   | DI SOE 1st record:<br>status                  | R        | Bit0-7 indicates the 8 channel's DI statue.1 means ON, 0 means OFF |         | word |

|       |                              |     |                    |  |      |
|-------|------------------------------|-----|--------------------|--|------|
| 3909H | Newest SOE record number     | R   | 1-20, 0 means null |  | word |
| 390AH | SOE record number being read | R/W | 1-20               |  | word |

### DI Pulse Counter and Value

DI can query the number of counts 1-8, pulse count value, pulse count value is the number of the set pulse count value obtained by multiplying the pulse counting dimension, plus get the value of units. Pulse count value is the actual value of the communication value divided by 100.

DI pulse counter remains when power is off. When DI type is changed from Pulse Counter to Signal Detection, the pulse number still remains. Function Code 03 is to read.

| Address     | Parameter         | Property | Range | Default | Data Type | Format |
|-------------|-------------------|----------|-------|---------|-----------|--------|
| 3A00H-3A01H | DI1 Pulse Counter | R        |       |         | dword     | F1     |
| 3A02H-3A03H | DI2 Pulse Counter | R        |       |         | dword     | F1     |
| 3A04H-3A05H | DI3 Pulse Counter | R        |       |         | dword     | F1     |
| 3A06H-3A07H | DI4 Pulse Counter | R        |       |         | dword     | F1     |
| 3A08H-3A09H | DI5 Pulse Counter | R        |       |         | dword     | F1     |
| 3A0AH-3A0BH | DI6 Pulse Counter | R        |       |         | dword     | F1     |
| 3A0CH-3A0DH | DI7 Pulse Counter | R        |       |         | dword     | F1     |

|             |                   |   |  |       |    |
|-------------|-------------------|---|--|-------|----|
| 3A0EH-3A0FH | DI8 Pulse Counter | R |  | dword | F1 |
| 3A10H-3A11H | DI1 Pulse Counter | R |  | float | F1 |
| 3A12H-3A13H | DI2 Pulse Counter | R |  | float | F1 |
| 3A14H-3A15H | DI3 Pulse Counter | R |  | float | F1 |
| 3A16H-3A17H | DI4 Pulse Counter | R |  | float | F1 |
| 3A18H-3A19H | DI5 Pulse Counter | R |  | float | F1 |
| 3A1AH-3A1BH | DI6 Pulse Counter | R |  | float | F1 |
| 3A1CH-3A1DH | DI7 Pulse Counter | R |  | float | F1 |
| 3A1EH-3A1FH | DI8 Pulse Counter | R |  | float | F1 |

### DI State Parameter

1-8 DI status. Function Code 02 to read.

| Address   | Parameter | Property | Range         | Default | Data |
|-----------|-----------|----------|---------------|---------|------|
| 0000      | DI1       | R        | 1: ON, 0: OFF | 0       | bit  |
| 0001-0007 | DI2~DI8   | R        | 1: ON, 0: OFF | 0       | bit  |

### RO state

1-4 channel Relay Output. Function Code 01 to read; function code 05 to write.

| Address | Parameter | Property | Range         | Default | Data |
|---------|-----------|----------|---------------|---------|------|
| 0000    | RO1       | R        | 1: ON, 0: OFF |         | bit  |

|      |     |   |               |  |     |
|------|-----|---|---------------|--|-----|
| 0001 | RO2 | R | 1: ON, 0: OFF |  | bit |
| 0002 | RO3 | R | 1: ON, 0: OFF |  | bit |
| 0003 | RO4 | R | 1: ON, 0: OFF |  | bit |

### Daylight saving time setting

Function Code 03 to read; function code 10 to write.

| Address | Parameter                               | Property | Range                      | Default | Data type |
|---------|---|----------|----------------------------|---------|-----------|
| 4000H   | DST enable                              | R/W      | 0: disable<br>1: enable    | 0       | word      |
| 4001H   | DST format                              | R/W      | 0: format 1<br>1: format 2 | 0       | word      |
| 4002H   | DST Start<br>Mon                        | R/W      | 1-12                       | 1       | word      |
| 4003H   | DST Start Day                           | R/W      | 1-31                       | 1       | word      |
| 4004H   | DST Start<br>Hour                       | R/W      | 0-23                       | 0       | word      |
| 4005H   | DST Start Min                           | R/W      | 0-59                       | 0       | word      |
| 4006H   | DST Start<br>Adjust time<br>(Unit: Min) | R/W      | 1-120                      | 60      | word      |
| 4007H   | DST Ending<br>Mon                       | R/W      | 1-12                       | 1       | word      |
| 4008H   | DST Ending<br>Day                       | R/W      | 1-31                       | 1       | word      |
| 4009H   | DST Ending<br>Hour                      | R/W      | 0-23                       | 0       | word      |
| 400AH   | DST Ending<br>Min                       | R/W      | 0-59                       | 0       | word      |

|       |                                    |     |  |    |      |
|-------|------------------------------------|-----|--|----|------|
| 400BH | DST Ending Adjust time (Unit: Min) | R/W | 1-120  | 60 | word |
| 400CH | DST Start Mon                      | R/W | 1-12   | 1  | word |
| 400DH | DST Start week                     | R/W | 0-6<br>0: Sunday<br>1~6 Monday<br>to<br>Saturday | 0  | word |
| 400EH | DST Start First few weeks          | R/W | 1-5  | 1  | word |
| 400FH | DST Start Hour                     | R/W | 0-23   | 0  | word |
| 4010H | DST Start Min                      | R/W | 0-59   | 0  | word |
| 4011H | DST Start Adjust time (Unit: Min)  | R/W | 1-120  | 60 | word |
| 4012H | DST Ending Mon                     | R/W | 1-12   | 1  | word |
| 4013H | DST Ending Week                    | R/W | 0-6<br>0: Sunday<br>1~6 Monday<br>to<br>Saturday | 0  | word |
| 4014H | DST Ending First few weeks         | R/W | 1-5  | 1  | word |
| 4015H | DST Ending Hour                    | R/W | 0-23   | 0  | word |

|       |                                    |     |       |    |      |
|-------|------------------------------------|-----|-------|----|------|
| 4016H | DST Ending Min                     | R/W | 0-59  | 0  | word |
| 4017H | DST Ending Adjust time (Unit: Min) | R/W | 1-120 | 60 | word |

### Ten Years Holiday Setting

Function Code 03 to read; function code 10 to write.

| Address | Parameter                  | Property | Range                      | Default | Data Type |
|---------|----------------------------|----------|----------------------------|---------|-----------|
| 4100H   | Holiday setting enable     | R/W      | 0: disable<br>1: enable    | 0       | word      |
| 4101H   | Start year holiday setting |          | 0-99<br>Less than 10 years | 0       |           |
| 4102H   | End year holiday setting   |          | 0-99                       | 0       |           |

#### The first year holiday setting

|             |  |     |  |         |  |
|-------------|--|-----|--|---------|--|
| 4103H-4105H | The 1st Holiday(Month, Day, Schedule Number) | R/W |  | 00:00 0 |  |
| 4106H-4108H | The 2nd Holiday(Month, Day, Schedule Number) | R/W |  | 00:00 0 |  |
| 4109H-410BH | The 3rd Holiday(Month, Day, Schedule Number) | R/W |  | 00:00 0 |  |
| 410CH-410EH | The 4th Holiday(Month, Day, Schedule Number) | R/W |  | 00:00 0 |  |

|                 |   |     |  |         |  |
|-----------------|---|-----|--|---------|--|
| 410FH-<br>4111H | The 5th<br>Holiday(Month, Day,<br>Schedule Number)  | R/W |  | 00:00 0 |  |
| 4112H-<br>4114H | The 6th<br>Holiday(Month, Day,<br>Schedule Number)  | R/W |  | 00:00 0 |  |
| 4115H-<br>4117H | The 7th<br>Holiday(Month, Day,<br>Schedule Number)  | R/W |  | 00:00 0 |  |
| 4118H-<br>411AH | The 8th<br>Holiday(Month, Day,<br>Schedule Number)  | R/W |  | 00:00 0 |  |
| 411BH-<br>411DH | The 9th<br>Holiday(Month, Day,<br>Schedule Number)  | R/W |  | 00:00 0 |  |
| 411EH-<br>4120H | The 10th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4121H-<br>4123H | The 11th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4124H-<br>4126H | The 12th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4127H-<br>4129H | The 13th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 412AH-<br>412CH | The 14th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |

|                 |   |     |  |         |  |
|-----------------|---|-----|--|---------|--|
| 412DH-<br>412FH | The 15th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4130H-<br>4132H | The 16th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4133H-<br>4135H | The 17th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4136H-<br>4138H | The 18th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4139H-<br>413BH | The 19th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 413CH-<br>413EH | The 20th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 413FH-<br>4141H | The 21st<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4142H-<br>4144H | The 22nd<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4145H-<br>4147H | The 23rd<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |
| 4148H-<br>414AH | The 24th<br>Holiday(Month, Day,<br>Schedule Number) | R/W |  | 00:00 0 |  |

|                              |  |     |  |         |  |
|------------------------------|--|-----|--|---------|--|
| 414BH-414DH                  | The 25th<br>Holiday(Month, Day,<br>Schedule Number)    | R/W |  | 00:00 0 |  |
| 414EH-4150H                  | The 26th<br>Holiday(Month, Day,<br>Schedule Number)    | R/W |  | 00:00 0 |  |
| 4151H-4153H                  | The 27th<br>Holiday(Month, Day,<br>Schedule Number)    | R/W |  | 00:00 0 |  |
| 4154H-4156H                  | The 28th<br>Holiday(Month, Day,<br>Schedule Number)    | R/W |  | 00:00 0 |  |
| 4157H-4159H                  | The 29th<br>Holiday(Month, Day,<br>Schedule Number)    | R/W |  | 00:00 0 |  |
| 415AH-415CH                  | The<br>30th Holiday(Month,<br>Day, Schedule<br>Number) | R/W |  | 00:00 0 |  |
| 415DH                        | The 1st setting year                                   | R/W |  | 0       |  |
| 415EH                        | Holiday number of the<br>1st year                      | R/W |  | 0       |  |
| The 2nd year Holiday setting |  |     |  |         |  |
| 415FH-41BAH                  | The same as to first<br>year                           |     |  |         |  |
| The 3rd year Holiday setting |  |     |  |         |  |
| 41BBH-4216H                  | The same as to first<br>year                           |     |  |         |  |
| The 4th year Holiday setting |  |     |  |         |  |
| 4217H-4272H                  | The same as to first<br>year                           |     |  |         |  |
| The 5th year Holiday setting |  |     |  |         |  |

|                               |                              |  |  |  |  |
|-------------------------------|------------------------------|--|--|--|--|
| 4273H-<br>42CEH               | The same as to first<br>year |  |  |  |  |
| The 6th year Holiday setting  |                              |  |  |  |  |
| 42CFH-<br>432AH               | The same as to first<br>year |  |  |  |  |
| The 7th year Holiday setting  |                              |  |  |  |  |
| 432BH-<br>4386H               | The same as to first<br>year |  |  |  |  |
| The 8th year Holiday setting  |                              |  |  |  |  |
| 4387H-<br>43E2H               | The same as to first<br>year |  |  |  |  |
| The 9th year Holiday setting  |                              |  |  |  |  |
| 43E3H-<br>443EH               | The same as to first<br>year |  |  |  |  |
| The 10th year Holiday setting |                              |  |  |  |  |
| 443FH-<br>449AH               | The same as to first<br>year |  |  |  |  |

## **Appendix**

**Appendix A Technical Data and Specification**

**Appendix B Pulse Output Settings**

**Appendix C Ordering Information**

**Appendix D TP900 meter reader Instructions**

**Appendix E Version Information**

## Appendix A Technical Data and Specifications

### 1. Input

| Voltage Input   |   |
|-----------------|---|
| Voltage Rating  | 400Vac L-N, 690Vac L-L ⚠ CAT III                |
| Overload        | 1500Vac Continuously; 2500Vac, 50/60Hz 1 minute |
| Input Impedance | 2M $\Omega$ / phase                             |
| Frequency Range | 45Hz-65Hz                                       |
| PT Burden       | <0.2VA  |

| Current Input (Direct Input or Via CT)      |  |
|---|--|
| Via CT                                      |  |
| Solid Core CT, 20A, 80A, 150A, 200A         |  |
| Direct Input                                |  |
| Each Tenant Max Current 20 (80) A ⚠ CAT III |  |

Measurement category III (CAT III) is for measurements performed in the building installation.

**NOTE:** Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

## 2.Measurement

| Parameter      | Accuracy $\pm$ (%rdg) | Resolution | Range            |
|----------------|-----------------------|------------|------------------|
| Real Energy    | 1%                    | 0.01kWh    | 0~999999.9kwh    |
| Voltage        | 0.5%                  | 0.1V       | 10~400V          |
| Current        | 0.5%                  | 0.001A     | 5mA~10000A       |
| Real Power     | 1%                    | 0.1var     | 4000.0kW         |
| Reactive Power | 1%                    | 0.1VA      | 4000.0kvar       |
| Apparent Power | 1%                    | 0.1VA      | 4000.0kVA        |
| Power Factor   | 1%                    | 0.001      | -1.000~1.000     |
| Frequency      | 0.2%                  | 0.01Hz     | 45~65Hz          |
| Power Demand   | 1%                    | 0.1W       | 4000.0kW         |
| Current Demand | 0.5%                  | 0.001A     | 5mA~10000A       |
| Harmonics      | 2%                    | 0.01%      | 0~100%           |
| Unbalance      | 1%                    | 0.01%      | 0~100%           |
| Meter Runtime  |                       | 0.01 hour  | 0~999999.9 hours |

## 3.IO

| Digital Input(DI)   |                        |
|---------------------|------------------------|
| Input Type          | Dry Contact            |
| Max Input Current   | 2 mA                   |
| Input Voltage       | 15-30 V                |
| Start Voltage       | 12 V                   |
| Stop Voltage        | 10 V                   |
| Pulse Max Frequency | 100 Hz, 50% Duty Ratio |
| SOE Resolution      | 2 ms                   |

| <b>DI Power Supply (24V)</b> |        |
|------------------------------|--------|
| Voltage                      | 24 Vdc |
| Power                        | 1 W    |

| <b>Relay Output(RO)</b> |                   |
|-------------------------|-------------------|
| Voltage                 | 250 Vac, 30 Vdc   |
| Load Current            | 3 A               |
| Set Time                | 10 ms(Max)        |
| Contact Resistance      | 100 mΩ(Max)       |
| Isolation Voltage       | 2500 V            |
| Mechanical Life         | $1.5 \times 10^7$ |

#### 4.Power Supply

|              |                                 |
|--------------|---------------------------------|
| Power Supply | 100-415Vac, 50/60Hz; 100-300Vdc |
| Burden       | 5W                              |

#### 5.Environment

|                           |                       |
|---------------------------|-----------------------|
| Operation Temperature     | -25°C-70°C            |
| Power Consumption         | 1 W                   |
| Relative Humidity         | 5%-95% non-condensing |
| Elevation above sea level | 3000 m                |

#### 6. Measurement Standard

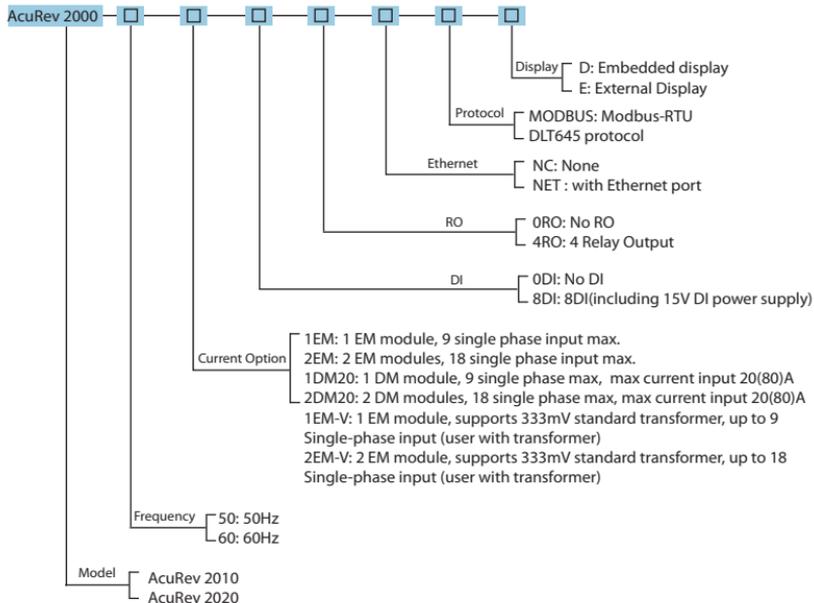
| <b>Measurement Standard</b> |   |
|-----------------------------|---|
| IEC62053-21                 | Static meters for active energy (classes 1 and 2) |
| Environmental Standard      | IEC 60068-2                                       |
| Safety Standard             | IEC 61010-1, UL 61010-1                           |

## Appendix B Pulse Output Setup

| Set Value | Output(Active energy pulse output circuit)                    |
|-----------|---|
| 0         | No Output   |
| 1         | Channel1 single-phase   |
| 2         | Channel 2 single-phase  |
| 3         | Channel 3 single-phase  |
| 4         | Channel 4 single-phase  |
| 5         | Channel 5 single-phase  |
| 6         | Channel 6single-phase   |
| 7         | Channel 7 single-phase  |
| 8         | Channel 8 single-phase  |
| 9         | Channel 9 single-phase  |
| 10        | Channel 10 single-phase                                       |
| 11        | Channel 11 single-phase                                       |
| 12        | Channel 12 single-phase                                       |
| 13        | Channel 13 single-phase                                       |
| 14        | Channel 14 single-phase                                       |
| 15        | Channel 15 single-phase                                       |
| 16        | Channel 16 single-phase                                       |
| 17        | Channel 17 single-phase                                       |
| 18        | Channel 18 single-phase                                       |
| 19        | Channel 1 3-phase 4-line user/ Single-phase 3-line user total |
| 20        | Channel 2 3-phase 4-line user/ Single-phase 3-line user total |
| 21        | Channel 3 3-phase 4-line user/ Single-phase 3-line user total |
| 22        | Channel 4 3-phase 4-line user/ Single-phase 3-line user total |
| 23        | Channel 5 3-phase 4-line user/ Single-phase 3-line user total |

|    |   |
|----|---|
| 24 | Channel 6 3-phase 4-line user/ Single-phase 3-line user total |
| 25 | Inline total  |
| 26 | Inline A phase  |
| 27 | Inline B phase  |
| 28 | Inline C phase  |

## Appendix C Ordering Information



## Current Transformer

Solid Core

CCT- 

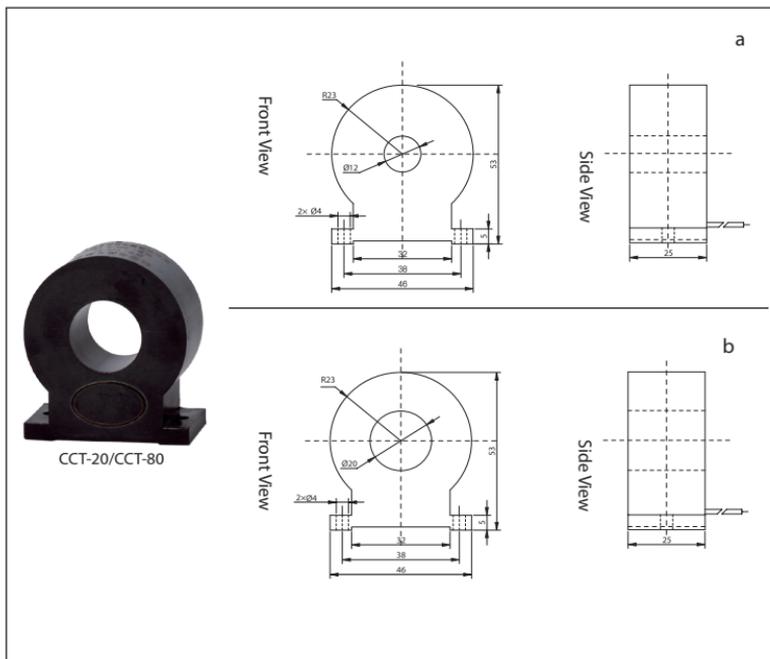
Type

CCT-20 : Full Range 20A  
CCT-80 : Full Range 80A  
CCT-150 : Full Range 150A  
CCT-200 : Full Range 200A

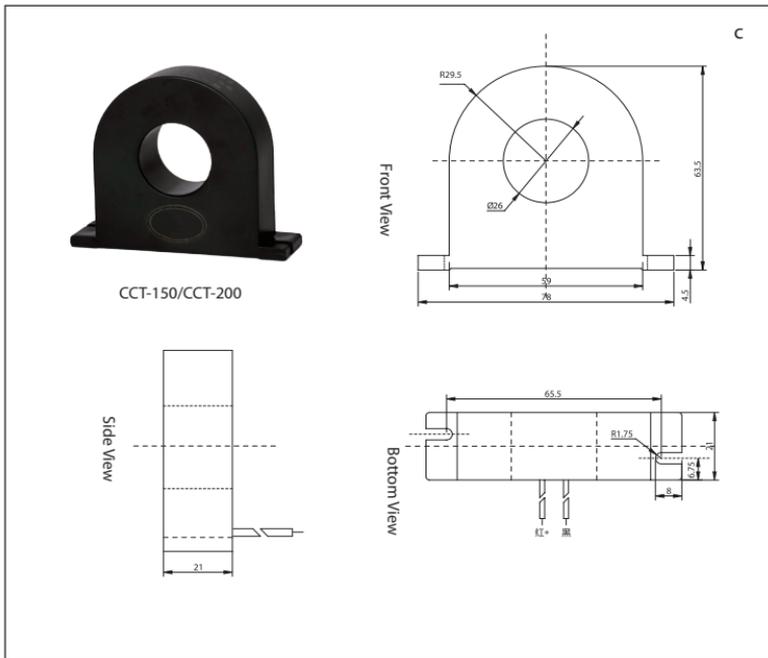
SCT- 

Type

SCT-20 : Full Range 20A  
SCT-80 : Full Range 80A  
SCT-150 : Full Range 150A  
SCT-200 : Full Range 200A  
SCT-250 : Full Range 250A  
SCT-1000 : Full Range 1000A

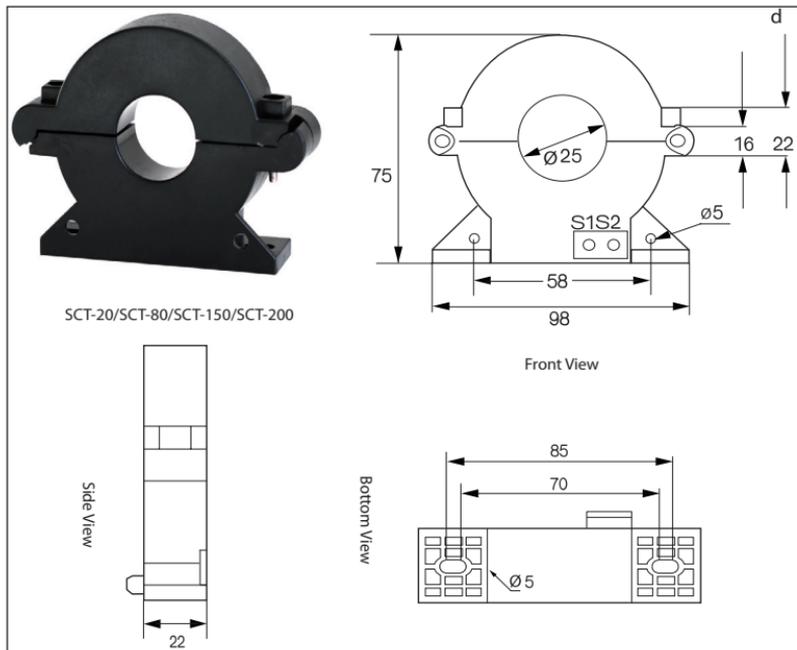


| Type   | Φ  | Height(mm) | Length(mm) | Width(mm) | Dimensions |
|--------|----|------------|------------|-----------|------------|
| CCT-20 | 12 | 53         | 46         | 25        | Figure-a   |
| CCT-80 | 20 | 53         | 46         | 25        | Figure-b   |

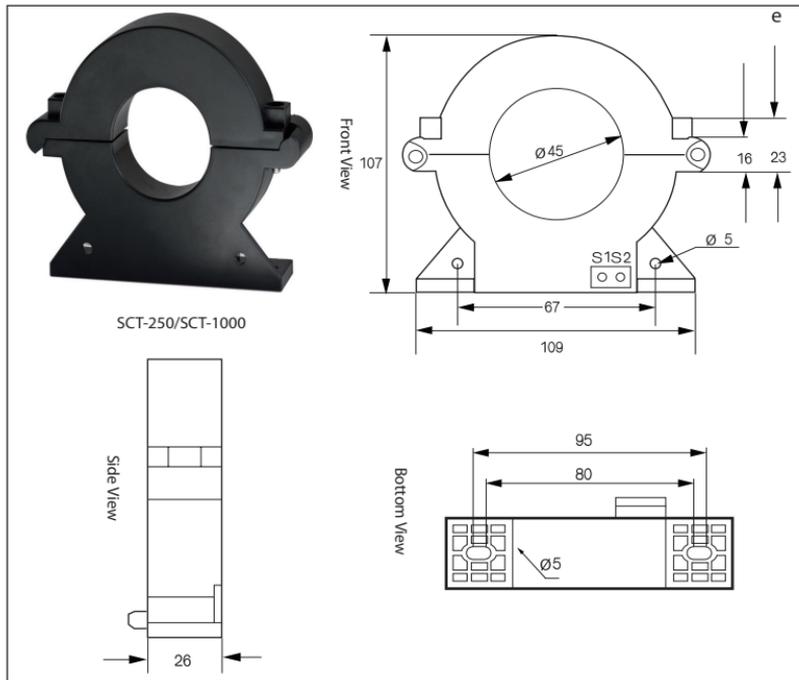


CCT-150/CCT-200

| Type    | Φ  | Height(mm) | Length(mm) | Width(mm) | Dimensions |
|---------|----|------------|------------|-----------|------------|
| CCT-150 | 26 | 63.5       | 78         | 21        | Figure-c   |
| CCT-200 | 26 | 63.5       | 78         | 21        |            |



| Type    | $\Phi$ | Height (mm) | Length (mm) | Width (mm) | Dimensions |
|---------|--------|-------------|-------------|------------|------------|
| SCT-20  | 25     | 75          | 98          | 22         | Figure-c   |
| SCT-80  | 25     | 75          | 98          | 22         |            |
| SCT-150 | 25     | 75          | 98          | 22         |            |
| SCT-200 | 25     | 75          | 98          | 22         |            |



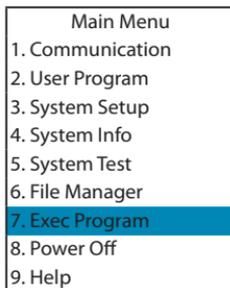
| Type     | Φ  | Height(mm) | Length(mm) | Width(mm) | Dimensions |
|----------|----|------------|------------|-----------|------------|
| SCT-250  | 45 | 107        | 109        | 26        | Figure-d   |
| SCT-1000 | 45 | 107        | 109        | 26        |            |

## Appendix D TP900 meter reader Instructions

AcuRev 2000 series meters support on-site infrared meter reader, meter reading before, meter reader and meter needs for simply setup, and then use the TP900 meter reader reads the brightest active energy values.

### 1. TP900 meter reader settings

Boot into the main menu, as shown in Figure 1. Select "7.Exec Program", press "ENTER"



key to enter into the program list screen, shown in Figure 2.

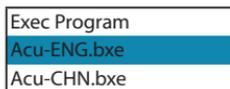


Figure 1

Figure 2

There are two programs to choose from, Acu-ENG.bxe is the English program, Acu-CHI.bxe is the Chinese program. To use English program, you can use "up" and "down" keys

option to Acu-ENG.bxe, as shown in Figure 2, and then right-click Figure 3 will appear "\*\*", then you set the default process of meter reader . Return to the main menu, enter "2.User Program", as shown in Figure 4, the English program will be executed, and after boot, it will go directly to the English program. If you want to set Chinese program, it same as to English program setting.

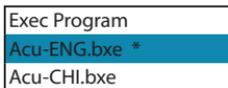


Figure 3

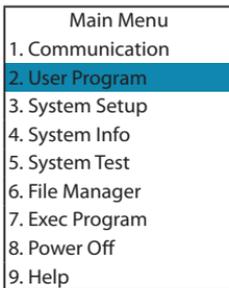


Figure 4

2, on-site infrared meter reading

AcuRev 2000 infrared meter reader default baud rate is 1200bps,open the TP900 meter reader, enter the interface, as shown in Figure 5

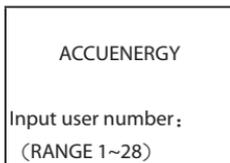


Figure 5

After the "Input user number:" input user number, the value range from 1 to 28, 1 to 28 are read values in Table 1 have the following meanings.

| User | Energy                                      |
|------|---|
| 1    | Channel 1 single-phase active energy value  |
| 2    | Channel 2 single-phase active energy value  |
| 3    | Channel 3 single-phase active energy value  |
| 4    | Channel 4 single-phase active energy value  |
| 5    | Channel 5 single-phase active energy value  |
| 6    | Channel 6 single-phase active energy value  |
| 7    | Channel 7 single-phase active energy value  |
| 8    | Channel 8 single-phase active energy value  |
| 9    | Channel 9 single-phase active energy value  |
| 10   | Channel 10 single-phase active energy value |
| 11   | Channel 11 single-phase active energy value |
| 12   | Channel 12 single-phase active energy value |
| 13   | Channel 13 single-phase active energy value |
| 14   | Channel 14 single-phase active energy value |
| 15   | Channel 15 single-phase active energy value |
| 16   | Channel 16 single-phase active energy value |
| 17   | Channel 17 single-phase active energy value |
| 18   | Channel 18 single-phase active energy value |

|    |   |
|----|---|
| 19 | Channel 1 three phase/single –three phase total active energy value |
| 20 | Channel 2 three phase/single –three phase total active energy value |
| 21 | Channel 3 three phase/single –three phase total active energy value |
| 22 | Channel 4 three phase/single –three phase total active energy value |
| 23 | Channel 5 three phase/single –three phase total active energy value |
| 24 | Channel 6 three phase/single –three phase total active energy value |
| 25 | Inline total active energy value                                    |
| 26 | Inline Phase A active energy value                                  |
| 27 | Inline Phase B active energy value                                  |
| 28 | Inline Phase C active energy value                                  |

AcuRev 2000

user number: 5  
energy: 5.0kWh  
address: 012345678999

Figure 6

After input user number, press "ENTER" button to start meter reading, when meter reading, meter reader will read the meter 645 addresses, and then according to 645 addresses and user number to read energy data. If we can read the data correctly, the meter reader can show the value of the household's electricity and 645 address (A5 ~ A0 displayed in the order), as shown in Figure 6, Energy is 5.0kWh, 645 address 012345678999 (A5 ~ A0 order), press any key to return to the main interface, you can re-read the other ones of the energy value.

## Appendix E Revision History

| Version | Date       | Description   |
|---------|------------|---|
| V1.01   | 2012.04.20 | 1 <sup>st</sup> edition   |
| V1.02   | 2012.08.08 | P95: Add the range of measured values   |
| V2.01   | 2013.08.02 | <ol style="list-style-type: none"><li>1. Add the network module content</li><li>2. Redefining wiring, the user name</li><li>3. CT mix to increase user functionality</li><li>4. Improve Measurement Accuracy of Meter</li><li>5. Add daylight saving time and ten holidays automatic switching function</li></ol> |
| V2.10   | 2014.01.07 | <ol style="list-style-type: none"><li>1. Add seals Description</li><li>2. Add channel options described</li><li>3. Add the rated voltage described</li></ol>  |

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