-ACUDC 240+

DC POWER & ENERGY METER



AcuDC 240 Series Power and Energy Meter

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 (contact information please see the following page).

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CUSTOMER SERVICE AND SUPPORT

ACCUENERGY provides technical support Monday through Friday between 8:30AM and 5:00PM (EST). However, this manual provides a trouble shooting section in the Appendix that may provide a quicker solution than over the phone consultation.

You can contact Mod-Tronic for support at:

1-800-794-5883

sales@mod-tronic.com

When contacting ACCUENERGY please have the following prepared:

- Meter's part number + serial number (Both found on a sticker at the side of the meter)Multiple CT Input Options compatible with any CT: 5A/1A, 333mV, Flexible Rogowski Coil, 80/100/200mA
- Hardware Version + Firmware Version(Refer to the Appendix C, ordering information)
- A detailed problem description.

PRODUCT WARRANTY

ACCUENERGY provides a 5 year limited warranty for its products.

1. The warranty strictly covers manufacturing defects in material and workmanship in products bought with in United States and Canada. The warranty is valid from the date of purchase by the original purchaser and for a period of 60 months.Hardware Version + Firmware Version(Refer to the Appendix C, ordering information)
2. Exclusions:
   a) Damage or failure caused by abuse, misuse, faulty installation and operation, improper or inadequate maintenance, and any repair or guarantee on repairs not carried out by ACCUENERGY.
   b) Damage resulting from inadequate packaging or carrier mishandling of returned products.
   c) All products purchased outside United States of American and Canada.
3. It is original purchaser's responsibility to provide a dated proof of purchase. The warranty is not transferable.
4. ACCUENERGY will at its sole discretion repair or exchange a product under warranty. No credit will be issued.
5. THE WARRANTY IS VOID WHEN:
   a) The product serial number has been altered or removed.
   b) The product has been altered, service or manipulated by anyone other than ACCUENERGY or without the prior written authorization of ACCUENERGY.
6. All shipping charges must be pre-paid by the sender. ACCUENERGY will, at its own expense, ship back the warranted repaired product to the sender anywhere within the United States and Canada. We will ship best way at our discretion.
7. To secure your warranty coverage, contact Mod-Tronic to obtain the registration card that must be filled out and sent or faxed back to ACCUENERGY with a copy of a dated proof of purchase. Products under warranty receive priority for repairs.

ABOUT ACCUENERGY

Formed in 1998, Accuenergy is a leading producer of power and energy metering products for the distribution, control and management of electrical energy and other dynamic processes. Accuenergy's vision is to make energy usage more dependable and efficient, and to make energy management more convenient and intelligent. Accuenergy products are easily integrated into new and existing energy management, automation and building control systems for intelligent and user-friendly energy systems and are backed by an industry-leading pre and post sale technical support and manufacturer's warranty.

With an emphasis on continuous improvement, innovation and high performance and cost-effective solutions, Accuenergy has developed a growing global footprint with offices in Toronto Canada (Headquarter), Los Angeles and Pretoria.

WARNINGS GLOSSARY

The following symbols in this manual and on AcuDC 240 series meters 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.

When this symbol is seen on the meter, consult this user manual. Refer to Chapter 2 for important safety information regarding mounting and wiring of the AcuDC meter.



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

Note: *Please read this manual carefully before installation, operation and maintenance of an AcuDC 240 series meter.*

Installation and maintenance of the AcuDC 240 meter should only be performed by qualified, competent professionals who have received training and should have experience with high voltage and current devices.

ACCUENERGY shall not be responsible or liable for any damages caused by improper meter installation and/or operation.

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AcuDC 240 Series DC Power and Energy Meters

Chapter 1: Introduction to AcuDC

1.1 Package Contents + Available Accessories

1.2 Introduction and Compliance

1.2.1 Introduction

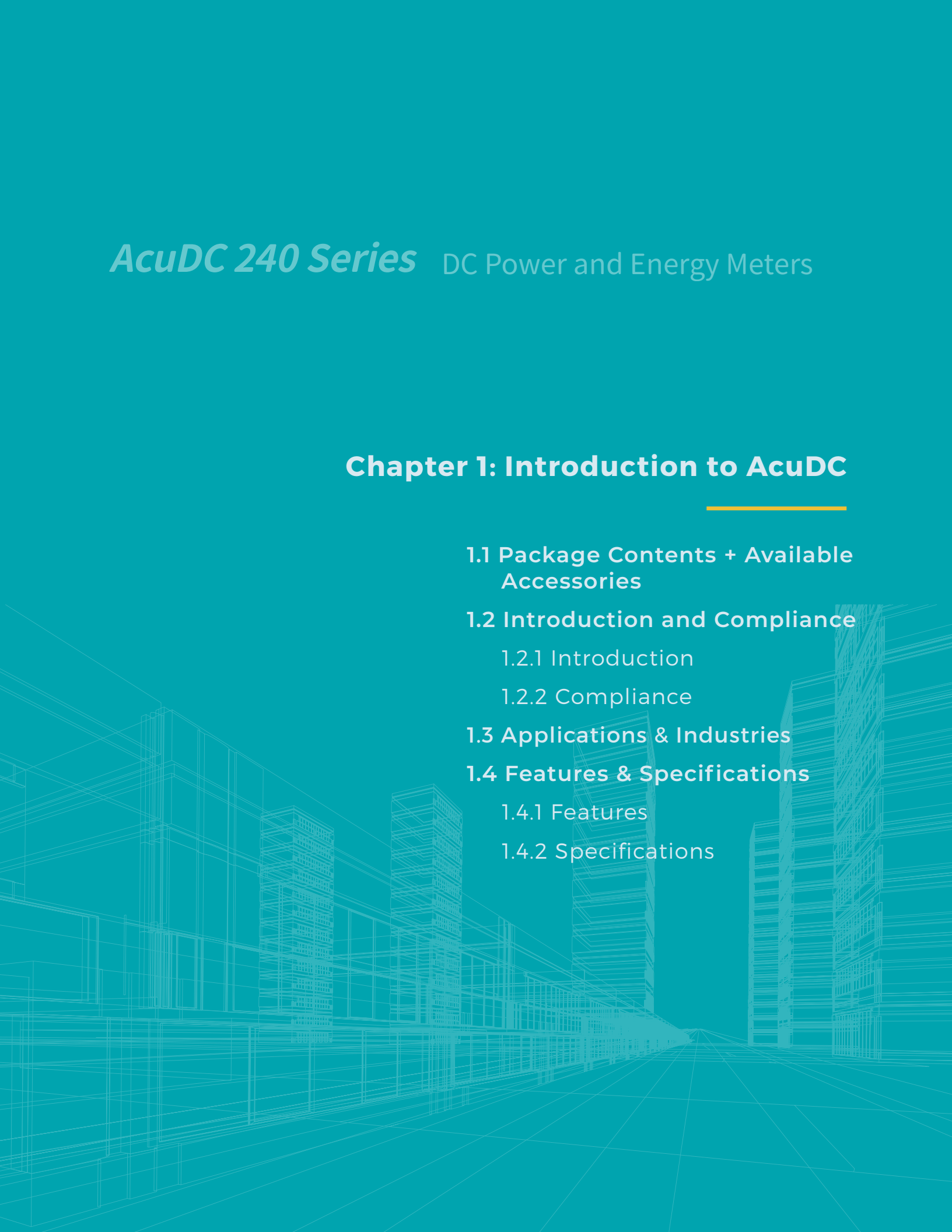
1.2.2 Compliance

1.3 Applications & Industries

1.4 Features & Specifications

1.4.1 Features

1.4.2 Specifications



CHAPTER 1: INTRODUCTION TO THE ACUDC

1.1 Package Contents & Available Accessories

When you open the package, you will find the following items:

1. AcuDC 240 Meter	X1
2. Terminal Blocks	X1 - X3 (Depending on model)
3. Installation Clips	X4 (Already assembled to the meter)

Available Accessories:

I/O modules (Combinations of digital I/O, analog I/O and relay output)

Current transformers

USB to Serial Converters

1.2 Introduction and Compliance

1.2.1 Introduction

Powerful Yet Cost-Effective

AcuDC 240 series monitors DC voltage, current, power and energy. It supports bi-directional current measurement, and also displays meter running hour and load running hour. Analog Output applies to DCS system, industrial monitoring and control. AcuDC 240 has a combination of accurate measurement, intelligent multifunction and simple human machine interface. The cost-effective meter fulfills the requirements of monitoring and controlling the DC circuit.

Compact and Easy to Install

The dimensions of AcuDC 240 series meet DIN 72X72 requirements. With a mounting depth of 65mm, the meter can even fit in small drawer type cabinets. It utilizes a self-lock installation mechanism, eliminating the necessary of fix bolts, which makes installation or removal quick and convenient.

User Friendly Interface

AcuDC 240 series utilizes a clear high-definition LCD screen with large characters. The LCD screen comes with a brightness adjustable backlight, which ensures easy observation of metering data in any environment. With a large LCD screen display, the two keys on the meter from allow users to observe multiple parameter data at the same time. The meter parameter settings can be set either via front panel keys or the communication port. The Parameter settings are saved in the non-volatile EEPROM, which remains when power is off.

High Safety and Reliability

AcuDC 240 series meter was designed according to industrial standards. It can run reliably under high power disturbance conditions. This meter has been fully tested for EMC and safety compliance in accordance with multiple international standards. The casing is highly fire resistant due to high quality, durable engineering plastics.

1.2.2 Compliance

The following table lists the compliances this meter meets:

Safety		Conforms to UL Std 61010-1 Certified to CSA Std C22/2 No. 61010-1 CE certified.
Quality Control		Certified to ISO 9001:2008 standard
Environmental		IEC 60068-2; Nema3 Certified IP54 Certified

1.3 Applications & Industries

Applications:

- **DC meter & metering**
  Metering of DC consumption and generation of different DC electrical systems
- **DC transducer**
  Installed transducer reads power, energy, voltage, current and amp hour data and outputs digital pulse and/or analog signals
- **DC data logger / data logging**
  Installed meter reads, records and stores power, energy, voltage, current and amp hour data for subsequent download, reporting and analysis

Industries:

- **Renewable energy & green systems**
  Generation by solar photovoltaic (PV) arrays, wind turbines, inverter & battery monitoring, DC consumption of electric vehicle (EV) charging stations
- **Transportation Systems**
  Consumption of rail / railway, subway and trains and transit systems and related DC equipment
- **Telecommunications**
  Consumption on cell / cellular towers and equipment
- **Datacenters**
  Consumption of data centers and equipment

1.4 Features & Specifications

1.4.1 Features

DC power system metering;

Monitor and control power switches;

Alarming and analog output;

Standard 72x72mm, allows for drawer type panel installation;

Three line high-definition LCD display;

Accessible with SCADA, PLC systems;

Easy installation, simple wiring;

Data Logging: Offers 3 configurable historical logs where the all of the metering parameters can be recorded. The onboard memory is up to 4 MB and each log size is adjustable.

1.4.2 Specifications

The following tables list the specifications of AcuDC 240 meter.

Parameter	Accuracy	Resolution	Range
Voltage	0.2%	0.001 V	0~9999 V
Current	0.2%	0.001 A	0~±50000 A
Power	0.5%	0.001 kW	0~±60000 kW
Energy	0.5%	0.01 kWh	0~9999999.99 kWh
Drift with Temperature	<100ppm / ˚C		
Stability	0.5‰/year		

Voltage	
Input Range	
Voltage	Direct Input0~1000V; Via Hall Effect Sensor0~9999V
Input Impedance	2MΩ
Load	<0.6W
Accuracy	0.2%

Voltage	
Current	
Input Range	0~±10A(Direct Input, pick up current 0.01A) 0~±50000A(Via Shunt or Hall Effect Sensor, programmable range)
Shunt	50~100mV(programmable)
Hall Effect Sensor	0~±5V/0-±4V, 4~20mA/12mA±8mA
Power Consumption	2W(MAX)
Accuracy	0.2%
Digital Input	
Type	Dry Contact
Isolation Voltage	2500Vac

Environment	
Operation Temperature	-25˚C ~ +70˚C
Storage Temperature	-40˚C ~ +85˚C
Humidity	5%~95%Non-condensing

Output	
Relay Output (RO)	
Type	Mechanical contact, Form A
Max Load Voltage	250Vac/30Vdc
Max Load Current	3A
On Resistance	100mΩ (Max)
Isolation Voltage	4000Vac
Mechanical Life	5 × 106 times
Digital Output (Photo-Mos)	
Load Voltage Range	0~250Vac/dc
Load Current	100mA(Max)
Max Output Frequency	25Hz, 50% duty cycle
Isolation Voltage	2500Vac
Analog Output (AO)	
Load Voltage Range	4-20mA/0~20mA; 0~5V/1-5V
Load Current	0.5%
Max Output Frequency	Current type, max load resistance: 750 Ohm Voltage type, max load current: 20 mA

Communication	
Type	RS485, half duplex, Optical Isolated
Protocol	Modbus-RTU
Baud Rate	1200~38400bps
Isolation Voltage	2500VAC

Power Relay Supply	
Input	(P1)100-240Vac, 50/60Hz, 100-300Vdc (P2) 20-60Vdc
Consumption	3W (typical value)

Installation	
72 x 72 mm	Panel mounted

Table 1-3 lists the functions of AcuDC240 series.

Table 1-3 AcuDC 240 Series

Function			AcuDC 243
Metering	Voltage	V	•
	Current	I	•
	Power	P	•
	Energy	E	•
	Ampere-Hour	Ah	•
I/O	X1: 2DI+2AO (4~20mA/0~20mA)	Support DI Count	○
	X2: 2DI+2AO (0-5V/1-5V)		○
	X3: 2DI+2RO		○
	X4: 2DI+2DO		○
	X5: 2DI+ 15Vdc		○
Data Logging	All metering parameters can be recorded (Voltage, Current, Power, Energy, Ampere-hour, DI Count); Interval 1 minute; Can record 4 months		○
Communication	RS485, Modbus RTU		○
Display	LCD		•
Dimensions	72×72×64.5mm (Cutout: 68x68 mm) / 2.835 x 2.835 x 2.539 inch (Cutout: 2.677 x 2.677 inch)		

Chapter 2: Installation - Physical Setup

2.1 Tools

2.1.1 Tools for Mounting

2.1.2 Tools for Wiring

2.2 Mounting

2.2.1 How to choose installation place

2.2.2 Mounting I/O modules onto meter

2.2.3 Mounting meter onto switchboard panel

2.3 Wiring

2.3.1 Wiring Control Power

2.3.2 Current input wiring

2.3.3 Voltage input wiring

2.3.4 Current & Voltage wiring at the same time

2.3.5 I/O Module wiring

2.3.6 Communications wiring

2.4 Removing meter for servicing or maintenance

CHAPTER 2: INSTALLATION - PHYSICAL SETUP

2.1 Tools

2.1.1 Tools for Mounting

- #2 Flathead Screwdriver
- Wire Cutters

2.1.2 Tools for Wiring

- A 1A/250Vac circuit breaker for the auxiliary power supply loopWire Cutters
- A 1A/250Vac circuit breaker should be used in the voltage input loop.
- Choice of wire of power supply is AWG22-16 or 0.32-1.31mm^2
- The wire for voltage input is AWG16-12 or 1.31-3.31mm^2
- The wire size of current input is AWG15-10 or 1.65-5.26mm^2

The following may be required:

- If using RS485 for communication, use a good quality shielded twisted pair cable, AWG22 (0.32mm^2) or higher
- The wire of digital input should be chosen between AWG22~16 or 0.32~1.31mm^2
- The wire of relay output should be chosen between AWG22~16 or 0.32~1.31mm^2
- The wire of the digital output circuit should be chosen between AWG22~16 or 0.32~1.31mm^2

2.2 Mounting

Considerations When Installing Meters

- Installation of the meter must be performed by qualified personnel only, and should follow standard safety precautions through the installation procedures. Those personnel should have appropriate training and experience with high voltage devices. Appropriate safety gloves, safety glasses and protective clothing are recommended.
- During normal operation, dangerous voltage may be present in many parts of the meter, including terminals, and any connected I/O (Inputs and Outputs) modules and their circuits. All primary and secondary circuits can, at times, produce lethal voltages. **AVOID** contact with any current-carrying surfaces.
- The meter and its I/O output channels are **NOT** designed as primary protection devices and shall **NOT** be used as primary circuit protection or in an energy limiting capacity. The meter and its I/O output channels can only be used as secondary protection. **AVOID** using the meter under situations where failure of the meter may cause injury or death. **AVOID** using the meter for any application where risk of fire may occur.

- All meter terminals should be inaccessible after installation.
- Applying more than the maximum voltage the meter and/or its modules can withstand will permanently damage the meter and/or its modules. Please refer to the specifications in section 1.4.1 for all devices before applying voltages.



NOTE: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



NOTE: There is no required preventive maintenance or inspection necessary for safety. However, any repair or maintenance should be performed by the factory.



DISCONNECT DEVICE: The following part is considered the equipment disconnect device.

A switch or circuit- breaker shall be included in the installation. The switch shall be in close proximity to the equipment and within easy reach of the operator. The switch shall be marked as the disconnecting device for the equipment.

2.2.1 Tools for Mounting

Note: Before installation, please check the environment, temperature and humidity to ensure the AcuDC 240 series meter is being placed in a proper place.

1. **Temperature**

AcuDC 240 operation temperature is -25˚C ~ 70˚C, which will accommodate most user applications. If a special temperature range is needed, please contact Mod-Tronic.

Please Note: It can influence the meter life negatively if the meter operates under extremely high or extremely low temperature environments. AcuDC 240 storage temperature is -40˚C ~ 85˚C.

2. **Humidity**

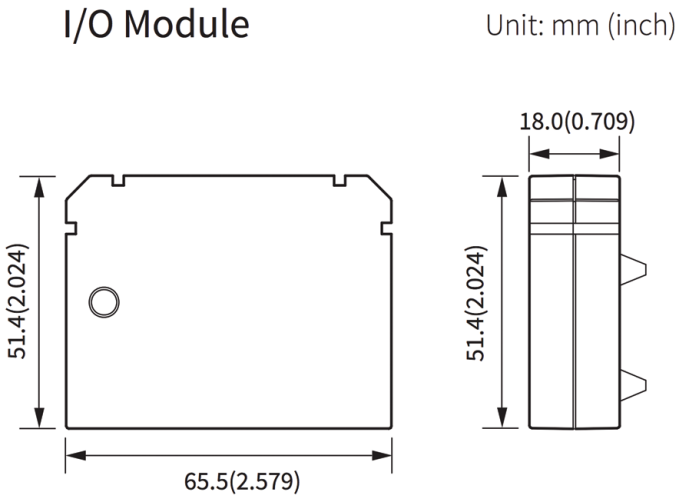
5% to 95% non-condensing

3. **Location**

AcuDC 240 series meter should be installed in a dry and dust free environment. Avoid exposing meter to excessive heat, radiation and high electrical noise sources.

2.2.2 Mounting I/O Modules Onto Meter

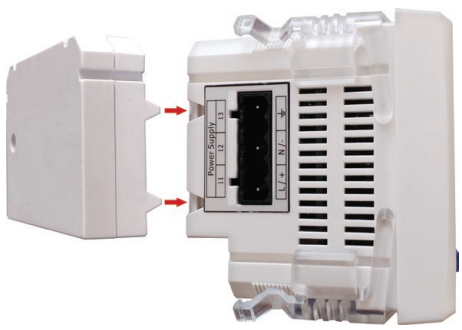
If the meter is equipped with an I/O module, you need to mount the module onto meter before installing the meter.



Installation Method

With the link pins, I/O module is linked to the meter.

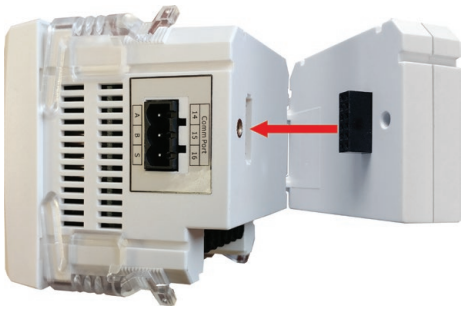
1. Insert the mounting clips to the counterpart of AcuDC 240 meter, and then press the I/O module lightly, so linking is established, as shown in Fig 2-2.



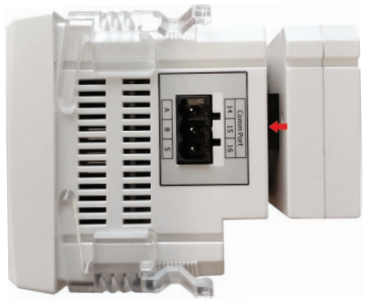
(A)



(B)



(C)



(D)

2. Tighten the installation screws.

Note: Install I/O Module carefully to avoid damage; under no circumstances should any installation be done with the meter powered on. Failure to do so may result in injury or death.

2.2.3 Mounting Meter Onto Switchboard Panel

Appearance and Dimensions

Fig 2-3 AcuDC 240 Appearance

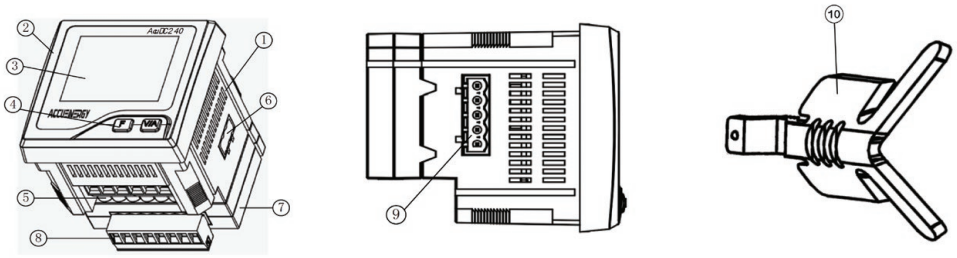


Table 2-1 Part Name of AcuDC 240

Part	Description
1. Casing	High intensity fire resistant engineering plastics
2. Front Casing	Visible portion after mounting onto a panel
3. Display	Large LCD display
4. Key	Two keys are used to select display and set
5. Voltage and Current Input Terminals	Used for voltage and current input
6. Communication Terminals	Communication output
7. I/O Module	Optional I/O module
8. I/O Terminal	Optional I/O terminals, including 2DI, 2AO/2RO
9. Power Supply Terminal	Power supply terminal
10. Installation Clips	Used for securing the meter to the panel

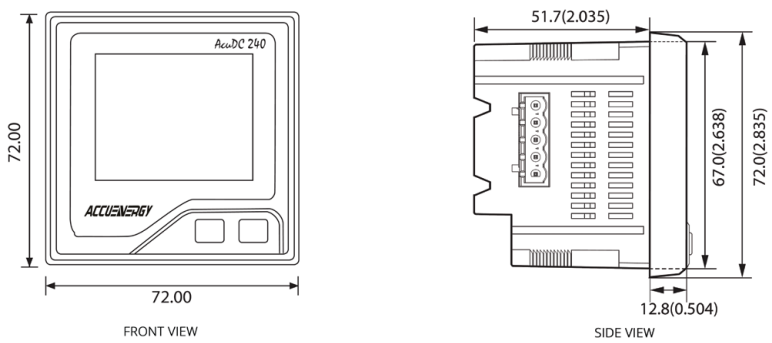


Fig 2-4 AcuDC 240 Dimensions

Installation Steps

AcuDC 240 series meter is generally installed into the switchboard panel.

1. Cut a square hole (Standard DIN). See figure 2-5 for dimensions. Unit:mm

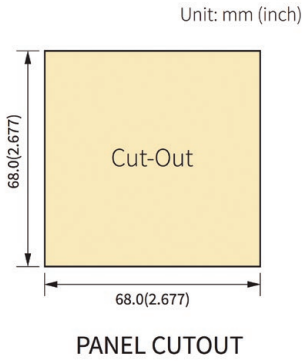
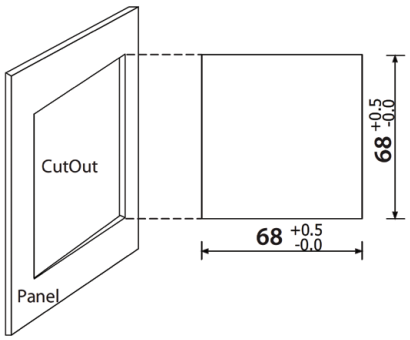
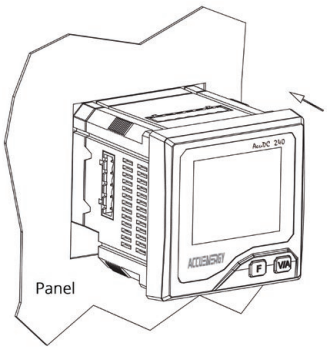


Fig 2-5 Panel Cutout

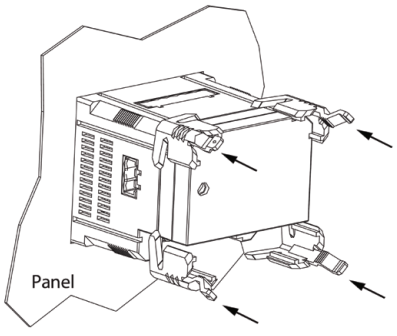
2. Remove the clips (10) from the meter, and insert the meter into the square hole from the front side, as shown in following figures.



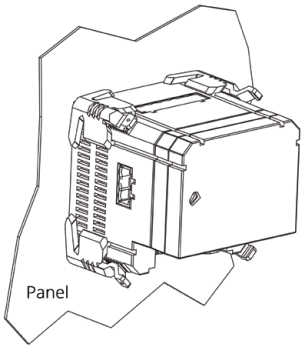
a. Panel Cutout



b. Inserting the Meter to the Panel Square Hole



c. Putting back the Clips at the back of the Panel

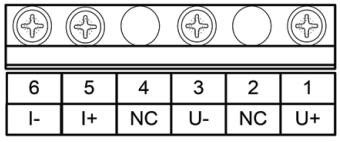


d. Installation Completed

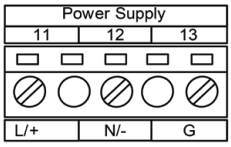
2.3 Wiring

Terminal Strips

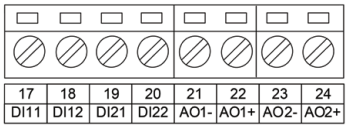
There are 3 groups of current terminal strips. There will be another terminal strip if the meter is connected with the I/O module.



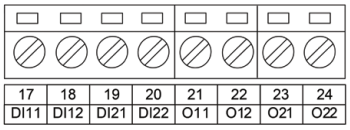
a. Voltage and Current Terminal Strip



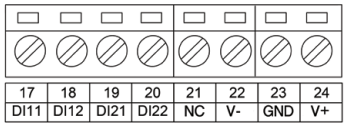
b. Power Supply Terminal Strip



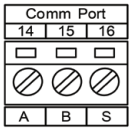
c. I/O Terminal Strip (2DI+2AO)



d. I/O Terminal Strip(2DI+2RO/2DO)



e. I/O Terminal Strip (2DI+±15V)



f. Communication Terminal Strip

Fig 2-7 AcuDC 240 Terminal Strip

DANGER

Only qualified professionals should install, make sure the power supply is cut off and all wires are de-energized. Failure to do so may result in severe injury or death.

Safety Earth Connection

Before setting up the meter's wiring, please make sure that the switchgear has an earth ground terminal. Connect both the meters and the switchgear's ground terminal together.



This ground terminal symbol is used in this user's manual.

2.3.1 Wiring Control Power

CAUTION: Make sure you check the power supply option you have before energizing the meter. Check the silver sticker on the side of the meter to confirm what power supply option you have.

The silver sticker on the side of the meter contains information such as the model number, power supply, voltage/current inputs and serial number.

To power the meter, you need to connect the power supply terminal as shown below.

This will be connected based on the two power supply options available, that is:

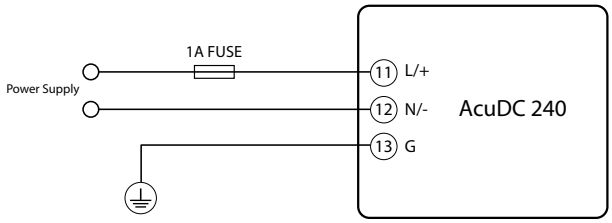


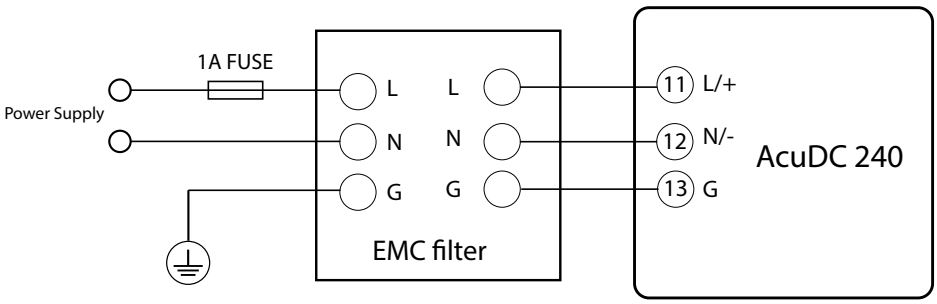
Fig 2-9 Power Supply Wiring

1. The Standard option: 100-240Vac, 50/60Hz or 100-300Vdc
2. The Low Voltage DC option: 20-60Vdc

The independent power supply circuit loop must have a fuse or air circuit breaker. The fuse could be 1A/250Vac, time delay type. If circuit breaker is used, a CE certified product with compliance of IEC947 is recommended.

Terminal G (13) must be connected to the ground for the safety.

An isolated transformer or EMC filter should be used in the auxiliary power supply loop if power quality problem exists in the power supply, as shown in following figure.



2-10 Power Supply Wiring with EMC Filter

Choice of wire power supply is AWG22-16 or 0.32-1.31mm^2.

2.3.2 Current Input Wiring

AcuDC 240 meter current can be wired in three different ways: direct wiring, wiring using a shunt and wiring using a current Hall Effect sensor.

NOTE: When wiring using a shunt or Hall Effect Sensor these must be wired on the negative terminal of the load that is being measured.

Choice of wire current input is AWG15-10 or 1.65-5.26mm2 or equivalent resistance wire.

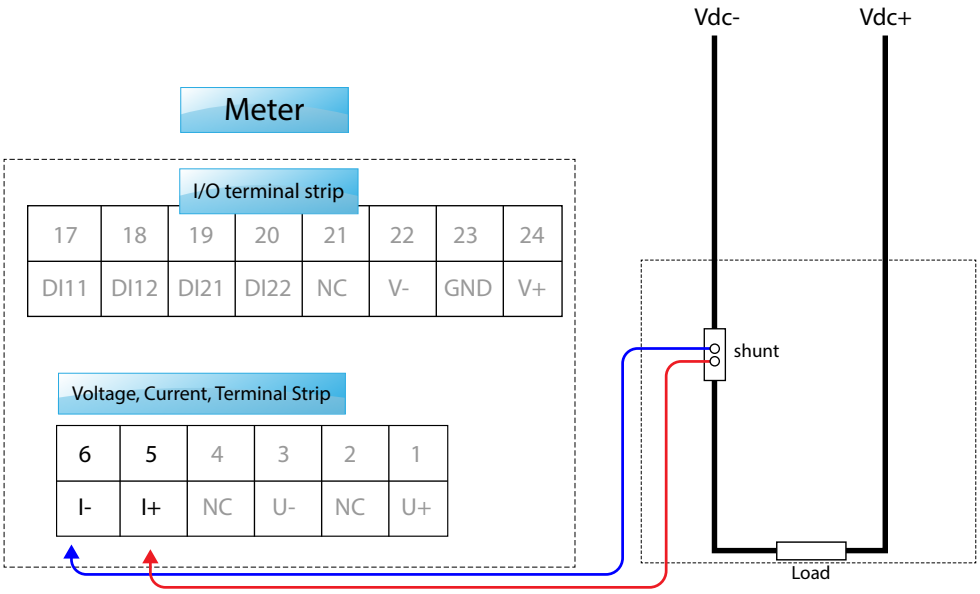


Fig 2-11a Wiring using a Shunt

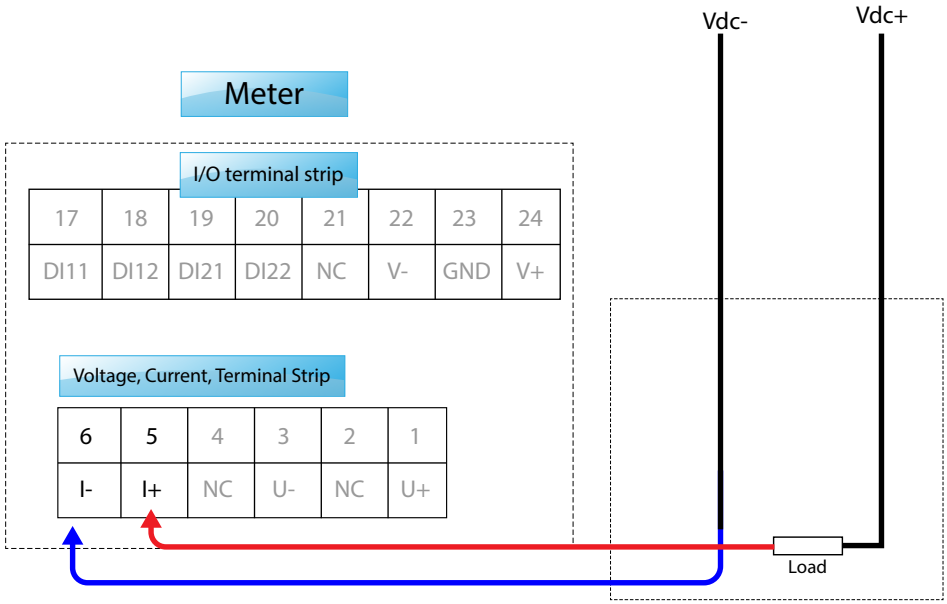


Fig 2-11b Direct Wiring

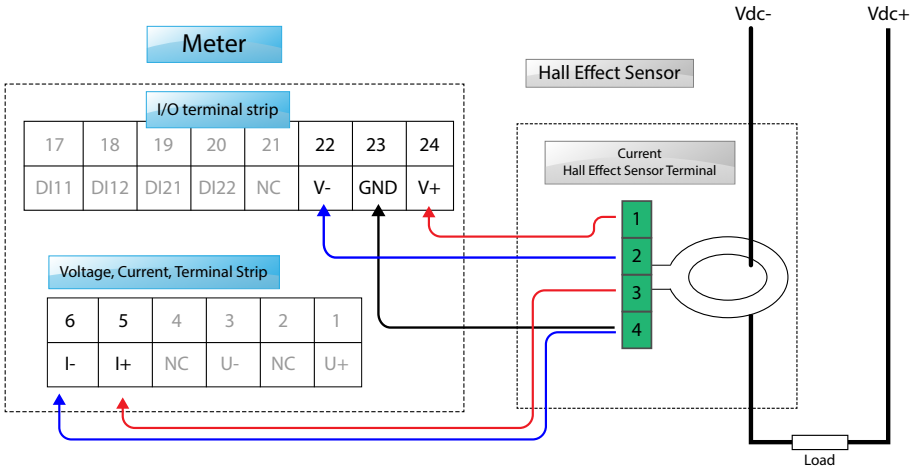


Fig 2-11 C Wiring using a Hall Effect Sensor

Fig 2-11 Current Input Wiring

Table 2-2 Accuenergy Line of Shunts/Hall Effect Sensors for Measuring Current

Shunt (Works with AcuDC 243 A1 Current Input Option)	**Hall Effect Sensor** (Works with AcuDC 243 A2 Current Input Option)
Rated Input: 50A Output: 75mV	Rated Input: 50A Output: 4-20mA Window Size: 21mm
Rated Input: 100A Output: 75mV	Rated Input: 100A Output: 4-20mA Window Size: 21mm
Rated Input: 200A Output: 75mV	Rated Input: 200A Output: 4-20mA Window Size: 21mm
Rated Input: 500A Output: 75mV	Rated Input: 400A Output: 4-20mA Window Size: 40mm
Rated Input: 1000A Output: 75mV	Rated Input: 600A Output: 4-20mA Window Size: 40mm
Rated Input: 1500A Output: 75mV	Rated Input: 1000A Output: 4-20mA Window Size: 40mm
Rated Input: 2000A Output: 75mV	

NOTE: For measuring higher currents or larger window size openings, please contact Mod-Tronic Sales team.

2.3.3 Voltage Input Wiring

AcuDC 240 series meter Voltage can be wired in two different ways: direct wiring and wiring using a voltage Hall Effect sensor. Choice of wire for the voltage input is AWG16-12 or 1.31~3.31 mm². Please see the wiring diagrams for details as shown in fig 2-12.

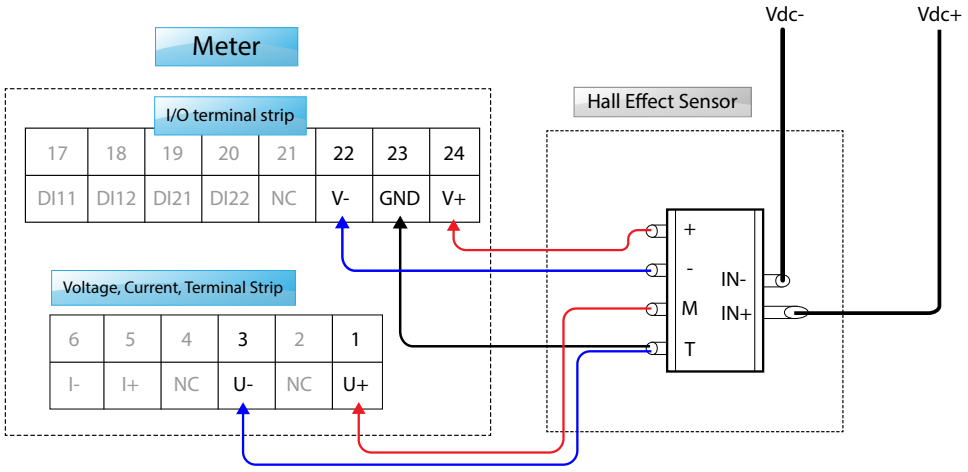


Fig 2-12a Wiring using a Voltage Hall Effect Sensor

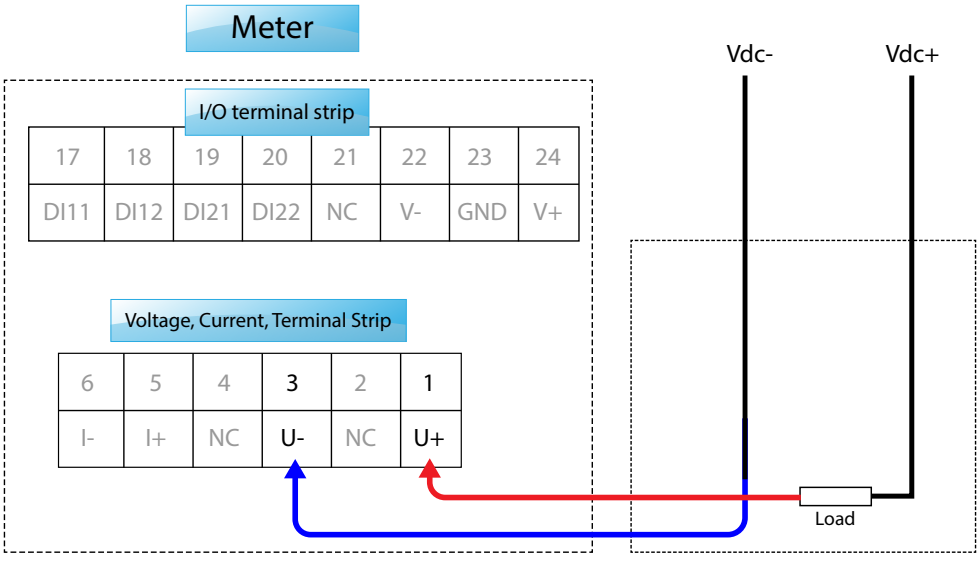


Fig2-12b-Direct Wiring

Fig2-12-Voltage Input Wiring

2.3.4 Current & Voltage Wiring at the Same Time

You can wire the voltage and current for different systems based on the different methods above. Here are the common wiring methods used:

1. Direct voltage connection and a direct current connection see 2-13a.
2. Direct voltage connection and a current connection using a shunt see 2-13b.
3. Direct voltage connection and a current connection using a current Hall Effect sensor see 2-13c.

Direct wiring for both voltage and current measurement is supported only in negative grounding systems.

The different wiring diagrams are shown below:

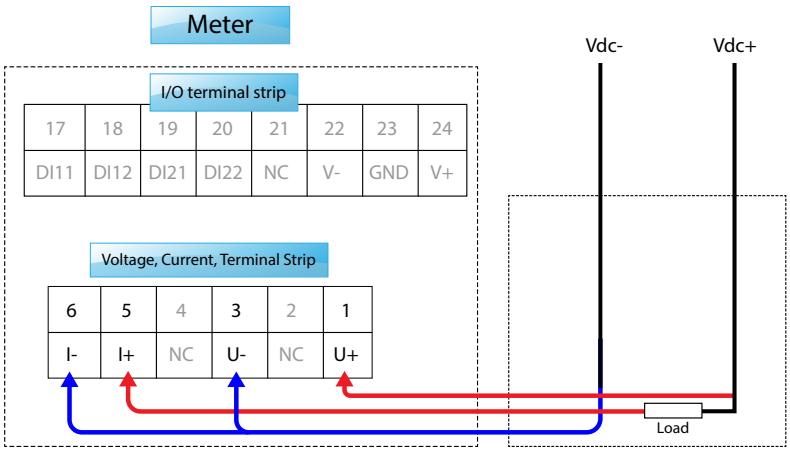


Fig 2-13a Direct Wiring

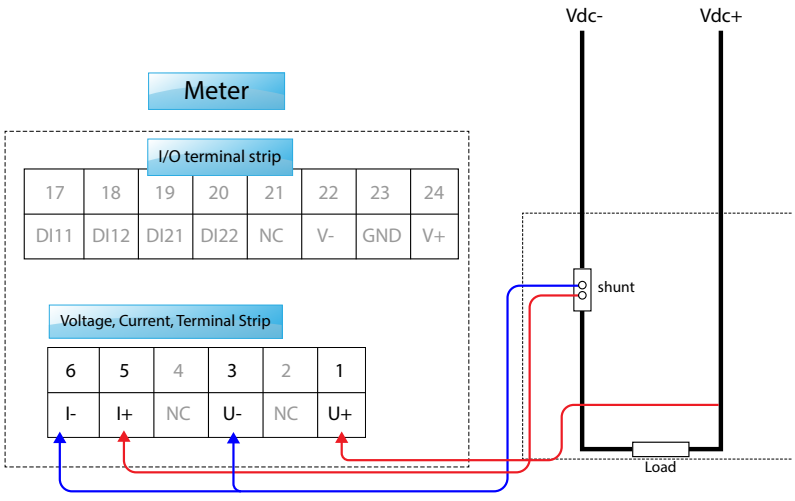


Fig 2-13b Voltage and Current Wiring Using a Shunt

Important - Supported Grounding Systems

Direct wiring for simultaneous voltage and current measurement is supported only in **negative grounding systems**. For **positive, ungrounded**, or **center-tap** grounding systems, an **external voltage Hall-effect sensor is required** between the DC source and the meter's voltage input.

Safety Note

To prevent equipment damage or unsafe operation, **do not** connect non-negative-grounded systems directly to the meter's voltage input without a **voltage Hall effect sensor**.

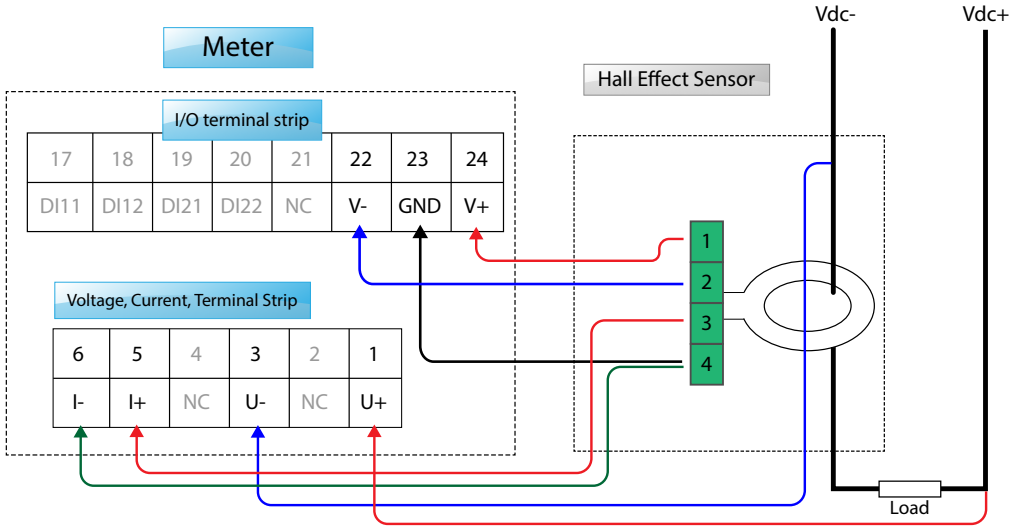


Fig 2-13c Voltage and Current Wiring Using Current Hall Effect Sensor

Important – Supported Grounding Systems

For positive, ungrounded, or center-tap grounding systems, use an external voltage Hall-effect sensor to interface the DC voltage safely. Failure to follow this guidance may result in damage or unsafe operation.

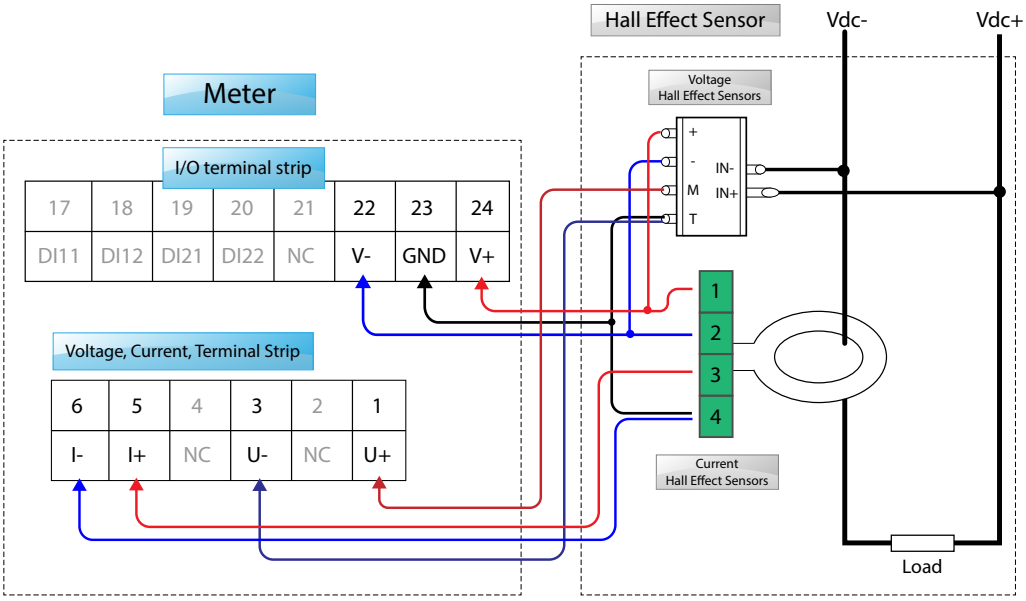
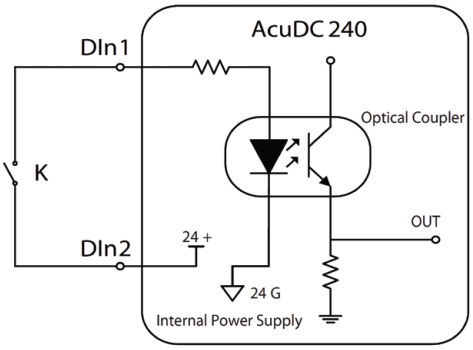


Fig 2-13d Voltage and Current Wiring Using Hall Effect Sensors

Digital Input

AcuDC 240 optional I/O module is equipped with two dry contact digital inputs. The terminals are (17), (18), (19) and (20), as shown in figure 2-7. The Circuit is simplified as:



When the switch is open, there is no current flowing into the diode side of the optical coupler, the triode is off, OUT is in low state. When the switch is closed, there is current flowing into the diode side, the triode is on, OUT is in high state. In this way, the 'high' and 'low' state of OUT corresponding to 'closed' and ''open' state of the switch.

The I/O module has built in power supply therefore the digital input does not require an external power supply.

DI wire may choose AWG22-16 or 0.32-1.31 mm^2.

Analog Output

AcuDC 240 I/O module offers two Analog Output modes, which are the current output 0-20mA/4-20mA(max 24mA) mode, and the voltage output 0-5V/1-5V(max 6V) mode, as shown in figure 2-15.

NOTE: Each module can only has one type of output, please specify when ordering.

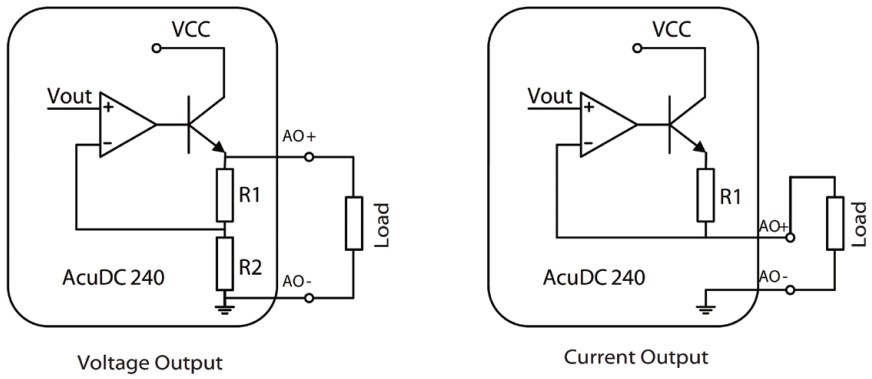
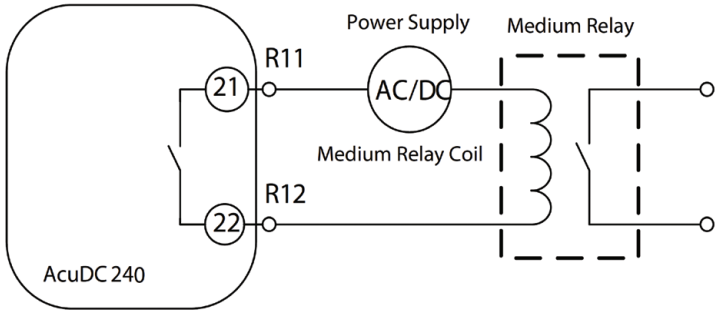


Fig 2-15 Analog Output Wiring

Relay Output

The AcuDC 240 series I/O option has two relay outputs, which are terminal (21), (22) and (23), (24) as shown in Fig 2-7. They can be used to remotely control circuit breakers.

The relay outputs are form A (normally open) electromagnetic relay. The nodal capacity is 3A/250 Vac or 3A/30Vdc. If the coil current is high, a medium relay is recommended.



2.3.5 Communications Wiring

AcuDC 240 series meter uses RS485 serial communication and the Modbus RTU protocol. The terminals of communication are A, B and S (14, 15 and 16). A is differential signal +, B is differential -, and S is connected to the shield of twisted pair cable. The overall length of the RS485 cable connecting all devices cannot exceed 1200m (4000ft). Utilizing a large number of RS485 devices and utilizing a high baud rate will make the communication range shorter. AcuDC 240 works as a Slave device. Master device can be PC, PLC, Data Acquisition Device, or RTU.

Suggestions to improve communication quality:

A high-quality Shielded Twisted Pair cable, AWG22(0.32mm2) or larger diameter cable, is recommended. Two cables should be in different colors.

- Pay attention to 'single point earthling'. Make sure that there is only one point of the shielding connected to ground in a single communication link.
- Every terminal A(+) should be connected to terminal A(+), terminal B(-) to terminal B(-), or it will influence the network, or even damage the communication interface.
- The connection topology should avoid 'T' type which means there is a new branch and it does not begin from the beginning point.
- Keep communication cables away from sources of electrical noise whenever possible.

When using a long communication cable to connect several devices, an anti signal reflecting resistor (typical value 120Ω-300 Ω/0.25W) is normally added to the end of the cable beside the last meter if the communication quality is distorted.

Use RS485 converter with optical isolated output and surge protection.

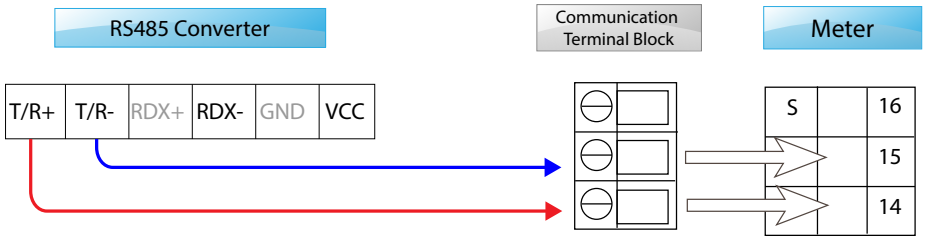


Fig 2-17 Communications Wiring

2.4 Removing meter for servicing or maintenance

Power Supply Inputs

The wires carrying power into the AcuDC 240 meter must be de-energized regardless of whether the meter is powered by an independent source or by the measured load line. De-energize the wires by turning off the switchgear (disconnect switch, breaker or fuse) leading to the terminal block for pins 11 through 13. The terminal block can then be safely removed.



NOTE: Removing the terminal block without turning off the switchgear switch may expose the operator to visible/bare wires that are still connected to dangerously high voltage levels. This may cause injury or death.

Voltage Inputs

1. Preparing for Safe Removal

De-energize the leads into the voltage pins by turning off the switchgear.



NOTE: Removing the voltage leads without turning off the switchgear will expose the operator to dangerously high voltage levels. This may cause injury or death.

2. Disconnecting the Voltage Inputs

Using a #2 flathead screw driver, turn each of the screws on pins 1 and 3 counter-clock wise. Stop turning when the wires can be easily removed from their housing.

Current Inputs

1. Preparing for Safe Removal

If the meter was wired directly in series to the current carrying lines without the use of a shunt/Hall effect sensor then the operator must de-energize the circuit before removing the circuit wires from the AcuDC meter.

2. Disconnecting the current inputs

Using a #2 flat head screw driver, screw driver, turn the screws on pins 5 and pin 6 counter-clock wise. Stop turning when the wire can be easily removed from its housing.

Cleaning the Meter

ACCUENERGY recommends using a dry cloth to wipe the meter.

AcuDC 240 Series DC Power and Energy Meters

Chapter 3: Installation - Configuration parameter set-up via display

3.1 Display panel and keys

3.2 General parameter setup

- 3.2.1 Key's function in parameters setup
- 3.2.2 Configure AcuDC to work with shunt
- 3.2.3 Configure AcuDC for current hall effect sensor
- 3.2.4 Configure AcuDC for current and hall effect sensor
- 3.2.5 Clear energy Ah and DI counter
- 3.2.6 Set backlight brightness
- 3.2.7 Meter clock setting
- 3.2.8 Password setting

3.3 AcuDC Communication Setup

3.4 I/O Parameter Setup

- 3.4.1 AO parameter setting
- 3.4.2 RO parameter setting

CHAPTER 3: INSTALLATION - CONFIGURATION PARAMETER SET-UP VIA DISPLAY

3.1 Display Panel and Keys

The front of the AcuDC 240 series meter consists of an LCD screen and two control keys. All the display segments are illustrated in Fig 3-1. Users should note that all the segments will not display in a single page under normal conditions.

There are two keys on the front panel, marked as 'F' key and 'V/A' key, which are used to display different parameter data and parameter settings.

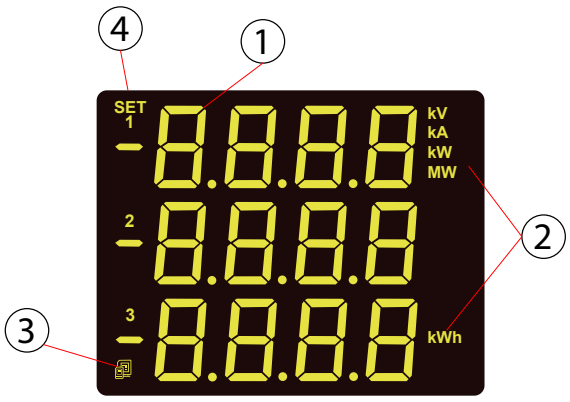


Fig 3-1 All Display Segments

Number	Display	Description
1		Display data of voltage, current, power and energy
2	kV, kA, kW, MW, Hz, kvar, Mvar, kVA, MVA, kWh, kvarh, kVAh	Data Unit
3	 Communication	No Icon: no communication One icon: query sent Two icons: query sent and response received
4	SET	Setting mode: Indicates the meter is in Setting Mode

3.2 General Parameter Setup

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, pressing 'F' and 'V/A' simultaneously will exit the system parameter setting mode and return to the metering data mode.

General parameter setup will define the general operating characteristics, such as current range setting, shunt current output range setting, rated voltage of voltage Hall Effect sensor, reset energy, Ah and DI counter, meter clock setting, and password reset etc., as shown in table 3-2.

NOTE: Some of these settings will vary depending on the model number and firmware version of the meter.

	Label	Paramters	Default	Options	Description	Note
Communication parameter setup	Add	Communication address	1	1 ~ 247	The address can be any integer between 1~247	Assign different addresses to meters on same bus
	bPS	Baud Rate	19200	1200; 2400; 4800; 9600; 19200; 38400	Data Transmission Rate	All devices on the same communication bus must use the same baud rate
	CHEC	Parity	Non1	even; odd; non1; non2		All devices on the same communication bus must use the same parity
Shunt/Hall Effect Sensor Parameter Setup	I IN	Current input of the shunt / hall effect sensor	20	20 ~ 50000A		Only indirect current measurement has this screen
	I o	Current output of the shunt	100	50 ~ 100mV		Corresponds to the output range of the shunt
Hall Effect Sensor Setup	I P	output range of the current Hall Effect Sensor	0	0; 1	0: 4~20mA/0~±5V 1: 4~12-20mA/0~±4V	
	U IN	rated voltage of the Voltage Hall Effect Sensor		0 ~ 3000V		Only meter with indirect voltage measurement has this screen.
	U P	output range of the voltage Hall Effect Sensor	0	0; 1	0: 0 ~ ±5V; 1: 0 ~ ±4V	
Energy, Ah and DI counter clear setup	EdEL	Energy delete(energy clear)	NO	NO; Yes	No: energy not cleared; Yes: clear energy to 0	

	Label	Paramters	Default	Options	Description	Note
Energy, Ah and DI counter clear setup	dDEL	DI counter delete(DI counter clear)	NO	NO; Yes	No: means DI counter not cleared DI; Yes: clear DI counter to 0	
Brightness Setup	bL	Backlight brightness	5	1 ~ 5	1: minimum light level; 5: maximum light level	
Meter Clock Setup	dATE	Date		1 ~ 31	Year/month/ date	
	TIME	Time		0 ~ 59	24-hour clock	
Password Setup	PASS	Password	0000	4 Digitals		

3.2.1 Key's Function in parameters setup

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, pressing 'F' and 'V/A' simultaneously will exit the system parameter setting mode and return to the metering data mode.

In the setting mode:

- 'V/A' can be used to confirm changes or go to the next screen
- 'F' can be used to change a setting or enter edit mode. A digit

When in edit mode:

- Press 'F' to increase the number of the flashing digit
- Press 'V/A' to switch the flashing digit
- Press 'V/A' on the last digit to confirm the change; the cursor should stop flashing.

Once you are in the settings mode, you will be required to type in a password on the 'PASS' screen.

- Enter your password or leave it as default '0000' if it wasn't changed.
- Press 'V/A' to enter the system parameter settings mode.

3.2.2 Configure AcuDC to work with Shunt

If the meter is wired to use a shunt to measure the current, you need to configure the full range current setting and shunt output range in the AcuDC so that it can read accurately from the shunt.

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In the parameter setting mode, Press 'V/A' until you get to the 'I In' screen. Enter the rated current input of the shunt in this screen.

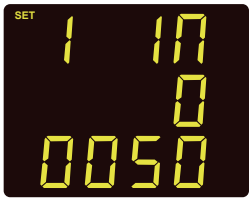


Fig 3-2 Full range current setting

Press 'F' to change this setting. A digit will begin to flash and you will enter the edit mode. Press 'F' to increase the value of the flashing digit and press 'V/A' to switch the flashing digit. Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point

NOTE: The setting can be configured in the range of 20-50000A.

NOTE: Only indirect current wiring has this screen.



Fig 3-3 Full range shunt setting

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In the parameter setting mode, press 'V/A' until the screen 'I o' displays. This setting corresponds to the output range of the shunt. Press 'F' to change this setting. The first digit will begin to flash. Press 'F' to increase the value of the flashing digit. Use 'V/A' to switch the flashing digit. Press 'V/A' to confirm the change on the last flashing digit to go to the next screen.

NOTE: The setting can be configured in the range of 50-100mV.

3.2.3 Configure AcuDC to work with Current Hall Effect Sensor

If the meter is wired to measure current using a Hall Effect sensor, you will have to configure the full range current setting and Current Hall Effect sensor output range in the AcuDC, so that it can read accurately from the Hall Effect Sensor. To change the settings from the meter's display, first get to the parameter setting mode.



Fig 3-4 Current Hall Effect sensor setting

Refer to section 3.2.2 configure AcuDC to work with Hall Effect Sensor, first set the full range current setting as shown in Fig 3-2. Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In the parameter setting mode, Press 'V/A' until you get to the 'I In' screen as shown in Fig 3-2. Enter the rated current input of the shunt in this screen. After setting up the current range, press 'V/A' until the screen 'I P' displays. This setting corresponds to the output range of the Hall Effect Sensor. Press 'F' to change this setting and to select required output. Press 'V/A' to confirm this setting; the cursor will stop flashing at this point.

NOTE: The default setting is '0' for 4~20mA/0~±5V. The other mode is '1' for 4-12~20mA/0~±4V.

3.2.4 Configure AcuDC to work with Current and Voltage Hall Effect Sensor

If the meter is wired to measure current and voltage using a current hall effect sensor and voltage hall effect sensor respectively, You need to configure the settings in the AcuDC so that it can read accurately from both Hall Effect Sensors.

Refer to section 3.2.2 configure AcuDC to work with shunt, first set up the current input range as shown in Fig 3-2 full range current setting.



Fig 3-5 Current Hall Effect sensor setting

After setting up the current range, press 'V/A' to go to the next screen, as shown in Fig 3-5. This will be the 'I P' screen. This setting corresponds to the output range of the current Hall Effect Sensor. Press 'F' to change this setting and to select required output. Press 'V/A' to confirm this setting; the cursor will stop flashing at this point.

NOTE: The default setting is '0' for 4~20mA/0~±5V. The other mode is '1' for 4-12~20mA/0~±4V.



Fig3-6 Range Voltage setting

After setting up the output range of the Current Hall Effect Sensor, as shown in Fig 3-5, press 'V/A' to go to the next screen. This will be the 'U In' screen, as shown in Fig 3-6. Enter the rated voltage of the Voltage Hall Effect Sensor. Press 'F' to change this setting. A digit will begin to flash and you will enter edit mode. Press 'F' to increase the value of the flashing digit. Press 'V/A' to switch the flashing digit. Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point.



Fig 3-7 Voltage Hall Effect Sensor setting

After setting up the rated voltage of the voltage Hall Effect Sensor, as shown in Fig 3-6, press 'V/A' to go to the next screen. This will be the 'U P' screen. This setting corresponds to the output range of the voltage Hall Effect Sensor. Press 'F' to change this setting and to select required output. Press 'V/A' to confirm this setting; the cursor will stop flashing at this point.

NOTE: The default setting is '0': 0~±5V. The other mode is '1': for 0~±4V.

3.2.5 Clear Energy, Ah and DI Counter



Fig 3-8 Clear Energy

To clear the readings from the meter display mode, first get to the Setting mode. Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, press 'V/A' until you get to the 'EdEL' screen, as shown in Fig 3-8. The screen displays 'No', which means energy not cleared. Press 'F' twice and it will show 'YES', which means 'clear energy', and the energy will be cleared to 0. After you choose 'YES' or 'NO', press 'V/A' to confirm and go to the next screen.



Fig 3-9 Clear Ah

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, press 'V/A' until you get to the 'AdEL' screen, as shown in Fig 3-9. The screen displays 'No', which means charge not cleared. Press 'F' twice and it will show 'YES', which means clear charge Ah, and the charge Ah will be cleared to 0. After you choose 'YES' or 'NO', press 'V/A' to confirm and go to the next screen.

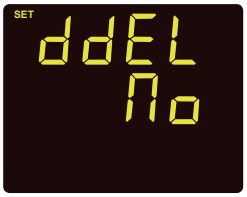


Fig 3-10 DI Counter Reset

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, press 'V/A' until you get to the 'ddEL' screen, as shown in Fig 3-10. The screen displays 'No', which means DI counter not cleared'. Press 'F' twice and it will show 'YES', which means clear Di counter , and DI counter will be cleared to 0. After you choose 'YES' or 'NO', press 'V/A' to confirm and go to the next screen.

3.2.6 Set Backlight Brightness

To set the backlight brightness from the meter display mode, first get to the Setting mode.

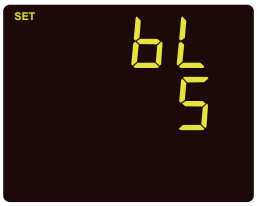


Fig 3-11 Backlight Brightness Setting

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In the parameter setting mode, press 'V/A' until you get to the 'bL' screen, as shown in Fig 3-11. There are 5 levels backlight brightness. '1' is minimum light level and '5' is maximum light level. Press 'F' to select and press 'V/A' to confirm and go to the next screen.

3.2.7 Meter Clock Setting



Fig 3-12 Date Adjustment

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, press 'V/A' until you get to the 'dATE' screen, as shown in Fig 3-12. Press 'F' to change this setting. A digit will begin to flash and you can change the number. Press 'F' to increase the value of the flashing digit. Press 'V/A' to switch the flashing digit. Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point. Press 'V/A' to confirm and go to the time setting screen.

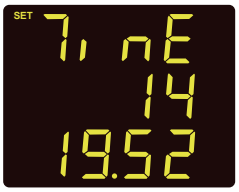


Fig 3-13 Time Adjustment

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In the parameter setting mode, press 'V/A' until you get to the 'TinE' screen, as shown in Fig 3-13. The meter uses the 24-hour clock system. The time shown in Fig 3-15 is 14:19:52. Press 'F' to change this setting. A digit will begin to flash and you can change the number. Press 'F' to increase the value of the flashing digit. Press 'V/A' to switch the flashing digit. Pressing 'V/A' when on the last digit will confirm the change; the cursor will stop flashing at this point. Press 'V/A' to confirm and go to the next screen.

3.2.8 Password Setting



Fig 3-14 Password Setting

Press 'F' and 'V/A' simultaneously whiles in the metering display mode to get to the system parameter setting mode. In parameter setting mode, press 'V/A' until you get to the 'PASS' screen, as shown in Fig 3-14. Press 'F' to change this setting. A digit will begin to flash and you can change the number. Press 'F' to increase the value of the flashing digit. Press 'V/A' to switch the flashing digit. Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point. Press 'V/A' to confirm and go to the next screen.

By now the parameter settings are almost completed, except for the I/O module setting. Pressing 'F' and 'V/A' simultaneously will exit system parameter settings mode and return to the metering data mode.

3.3 AcuDC Communication Setup

NOTE: Only meters with communication options have device address, baud rate and parity setting screens.

To set communication parameters from the meter display mode, you must first press the 'F' and 'V/A' buttons simultaneously to get to the parameter setting mode. The communication parameter setup includes address setup, Baud rate setup, and parity setting, as shown in table 3-3.



Fig 3-15 Communication Address Setup

Communication address can be any integer 1 ~ 247. Fig 3-15 shows the address number is 1. Press 'F' to change this setting. The first digit will begin to flash and you can change the edit mode. Press 'F' to increase the value of the flashing digit. Press 'V/A' to switch the flashing digit. Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point. Press 'V/A' to confirm and scroll to the next screen.

NOTE: Modbus-RTU communication protocol requires that all meters on the same communication bus should have different addresses.



Fig 3-16 Baud Rate Setting

After address setup, the second screen is Baud rate setting page, or in parameter setting mode, press 'V/A' until see 'bPS' on the screen. Baud rate can be set as 1200, 2400, 4800, 9600, 19200 and 38400. Fig 3-18 shows the baud rate is 19200 bps. Press 'F' to select the desired baud rate, and then press 'V/A' to confirm and go to the next screen.



Fig 3-17 Parity Setting

After Baud rate setup, the next screen is the Parity setting page, or in parameter setting mode, press the 'V/A' button until you see 'CHEC' on the screen. Parity can be set as EVEN: even parity, 1 stop bit; ODD: odd parity, 1 stop bit; 1: no parity, 1 stop bit; 2: no parity, 2 stop bits. Fig 3-17 shows no parity, and 1 stop bit. Press 'F' to select the desired baud rate, and then press 'V/A' to confirm and go to the next screen.

NOTE: All devices on the same communication bus should use the same baud rate and parity settings.

3.4 I/O Parameter Setup

I/O module has two optional types: AO(Analog Output) type and RO(Relay Output) type.

In the system parameter setting operation, hold the 'F" key for 3 seconds to enter the AO parameter setting mode, or hold the 'V/A' key for 3 seconds to enter the RO parameter setting mode. In the AO or RO setting mode, key functions are the same as in system parameter settings mode. 'F' key is used to increase value by 1 for the flashing digit. 'V/A' key is used to confirm the flashing digit and move to the cursor. At the last digit of the parameter, pressing 'V/A' key will confirm and go to the next screen. On ant screen, pressing 'F' and 'V/A' simultaneously will exit AO or RO parameter settings mode and return to the system parameter settings mode.

Note: only the meters have AO or RO functions have the valid operations for the corresponding AO or RO parameter setting .

3.4.1 Meter Clock Setting

For the module that supports the Analog Output function, it offers two AO channels. The AO parameter can be voltage, current and power. AO upper and lower limits include 'sign' and 'percentage' digit. The sign digit has three options":  represents (+),  represents (-),  represents (±). The range of the percentage digit is '0.00~1.00', representing '0%~100%' of the full range value. When the AO parameter is set as voltage, the upper and lower limit setting is '0%~100%'. When AO parameter is set as current or power, there are four modes:' 0%~ +100%'; 0%~ -100%';'-100%~ +100%' and '0%~ ±100%'.

NOTE:

1. There is no 'sign' digit when AO is set as voltage. 'sign' digit is invisible when percentage is 0.
2. For limit setting, 1.00 is 100%, 0 is 0%, and 0.25 is 25%.



Fig 3-18 AO Output Setting

In parameter setting mode, hold 'F' for 3 seconds until the screen 'AotP' displays (as shown in Fig 3-18), the meter is in AO parameter setting mode. It is the AO output setting. There are four AO output modes: 0: 0 ~ 5V; 1: 1 ~ 5V; 2: 0 ~ 20mA; 3: 4 ~ 20mA. Press 'F' key to select the type number (0, 1, 2 or 3), and then press 'V/A' key to confirm and scroll to the next screen setting page. For example, Fig 3-18 shows the output type is 3, it means its AO output type is 4~20mA mode.

NOTE: AO output type is determined by the equipped I/O module you ordered; incorrect parameter setting will result in invalid AO output value.



Fig 3-19 AO1 Parameter Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 1P' displays (as shown in Fig 3-19). It is AO1 parameter setting. There are three options: 0: voltage; 1: current; 2: power. Press 'F' key to select the parameter number (0, 1, or 2), and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-19 shows the AO1 is se t as current.

NOTE: AO1 is set as what is being measured.



Fig 3-20 AO1 Lower Limit Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 1L' displays (as shown in Fig 3-20). It is AO1 lower limit setting, range is '0.00 ~ 1.00'. There is no 'sign' digit when the limit is 0. When the limit is not 0, the 'sign' digit will be visible, the sign can be adjusted by moving the cursor to the digit. Press 'F' and 'V/A' to edit the value, and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-20 shows the AO1 lower limit is set as 0.



Fig 3-21 AO1 Up Limit Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 1H' displays (as shown in Fig 3-21). It is AO1 upper limit setting, range is '-100% ~ +100%'. The entire upper limit's absolute value cannot be smaller or equal to the lower limit'. Under no circumstance can the upper limit be 0. Press 'F' to edit the value, and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-21 shows the AO1 up limit is set as +100%.



Fig 3-22 AO2 Parameter Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 2P' displays (as shown in Fig 3-22). It is AO2 parameter setting. There are three options: 0: voltage; 1: current; 2: power. Press 'F' key to select the parameter number (0, 1, or 2), and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-22 shows the AO2 is set as voltage.

NOTE: AO1 is set as what is being measured.



Fig 3-23 AO2 Lower Limit Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 2L' displays (as shown in Fig 3-23). It is AO1 lower limit setting, range is '0.00 ~ 1.00'. There is no 'sign' digit when the limit is 0. When the limit is not 0, the 'sign' digit will be visible, the sign can be adjusted by moving the cursor to the digit. Press 'F' to edit the value, and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-23 shows the AO1 lower limit is set as 0.



Fig 3-24 AO2 Up Limit Setting

In AO parameter setting mode, press 'V/A' until the screen 'Ao 2H' displays (as shown in Fig 3-22). It is the AO2 upper limit setting, range is '-100% ~ +100%'. The entire upper limit's absolute value cannot be smaller or equal to the lower limit'. Under no circumstance can the upper limit be 0. Press 'F' to edit the value, and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-24 shows the AO1 up limit is set as +100%.

3.4.2 RO parameter setting

In the system parameter setting operation page after successfully entering the password, hold the 'V/A' key for 3 seconds to enter the RO parameter setting page. The I/O module that contains the Relay Output function offers two RO channels. There are three modes for RO: Latch, Momentary and alarm. The mode setting depends on the object requirement i.e. A circuit breaker use Momentary. The momentary delay time is 300-5000 ms. Due to the relay action time error, this delay time has up to 3ms error.



Fig 3-25 RO1 Mode Setting

RO1 mode setting: In the parameter setting mode, hold 'V/A' for 3 seconds until the screen 'Ro1F' displays (as shown in Fig 3-23), the meter is in RO parameter setting mode. There are 3 RO1 modes: 0: Latch; 1: Momentary; 2: Alarm. Press 'F' key to select the mode number (0, 1 or 2), and then press 'V/A' key to confirm and scroll to the next screen setting page. For example, Fig 3-25 shows the RO1 mode is Latch.



Fig 3-26 RO1 Momentary Delay Time

RO1 momentary delay time setting: In RO parameter setting mode, if RO1 mode is set as 1, Momentary, press 'V/A' key until the screen 'Ro1d' displays. The delay range in 300 ~ 5000 ms. Press 'F' to set the delay time. And then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-26 shows the RO1 momentary delay time is 500ms, or 0.5s.



Fig 3-27 RO1 Alarm Parameter Setting

RO1 alarm parameter setting: In RO parameter setting mode, if RO1 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro1P' displays. There are 4 options: 0: no alarm; 1: voltage; 2: current; 3: power. Press 'F' to select setting and press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-27 shows the RO1 alarm is 'no alarm'.



Fig 3-28 RO1 Alarm Inequality Setting

RO1 alarm inequality setting: In RO parameter setting mode, if RO1 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro1S' displays. There are 2 options: 0: smaller than; 1: larger than. Press 'F' to select and press 'V/A' key to confirm and scroll to the next screen setting page.



Fig 3-29 RO1 Alarm Threshold Range Setting

RO1 alarm threshold range setting: In RO parameter setting mode, if RO1 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro1u' displays. The threshold setting range is the same as measurement range. Voltage: 0 ~ 3000V; Current: 0 ~ 50000A; Power: 0- 60000kW. Press 'F' to edit the value, and press 'V/A' key to confirm and scroll to the next screen setting page.



Fig 3-30 RO1 Alarm Delay Setting

RO1 alarm delay setting: In RO parameter setting mode, if RO1 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro1t' displays. The alarm delay time range is 0 ~ 255 s. In Fig 3-30, the alarm delay time is 15 seconds. If the alarm condition is met, after 15 second, the alarm will be triggered; or if the alarm condition is no longer met, after 15 seconds, the alarm will be restored. Press 'F' to edit the value, and press 'V/A' key to confirm and scroll to the next screen setting page.



Fig 3-31 RO2 Mode Setting

RO2 mode setting: In RO parameter setting mode, press 'V/A' until the screen 'Ro2F' displays (as shown in Fig 3-31). There are 3 RO2 modes: 0: Latch; 1: Momentary; 2: Alarm. Press 'F' key to select the mode number (0, 1 or 2), and then press 'V/A' key to confirm and scroll to the next screen setting page. For example, Fig 3-29 shows the RO2 mode is Latch.



Fig 3-32 RO2 Momentary Delay Time

RO2 momentary: In RO parameter setting mode, if RO1 mode is set as 1, Momentary, press 'V/A' key until the screen 'Ro2d' displays. The delay range in 300 ~ 5000 ms. Press 'F' to set the delay time and then press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-30 shows the R21 momentary delay time is 500ms, or 0.5s.



Fig 3-33 RO2 Alarm Parameter Setting

RO2 alarm parameter setting : In RO parameter setting mode, if RO2 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro2P' displays. There are 4 options: 0: no alarm; 1: voltage; 2: current; 3: power. Press 'F' to select and press 'V/A' key to confirm and scroll to the next screen setting page. Fig 3-33 shows the RO2 alarm parameter is set as 'voltage'.



Fig 3-34 RO2 Alarm Inequality Setting

RO2 alarm inequality setting: In RO parameter setting mode, if RO2 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro2S' displays. There are 2 options: 0: smaller than; 1: larger than. Press 'F' to select and press 'V/A' key to confirm and scroll to the next screen setting page.



Fig 3-35 RO2 Alarm Threshold Range Setting

RO2 alarm threshold range setting: In RO parameter setting mode, if RO2 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro2u' displays. The threshold setting range is the same as measurement range. Voltage: 0 ~ 3000 V; Current: 0 ~ 50000A; Power: 0~ 60000kW. Press 'F' to edit the value and press 'V/A' key to confirm and scroll to the next screen setting page.



Fig 3-36 RO2 Alarm Delay Setting

RO2 alarm delay setting: In RO parameter setting mode, if RO2 mode is set as 2, Alarm, press 'V/A' key until the screen 'Ro2t' displays. The alarm delay time range is 0 ~ 255, unit: second. In Fig 3-36, the alarm delay time is 15 second. If the alarm condition is met, after 15 second, alarm will be triggered; or if the alarm condition is no longer met, after 15 seconds, the alarm will be restored. Press 'F' to edit the value, and press 'V/A' key to confirm and scroll to the next screen setting page.

Table 3-3 I/O Parameter Setting

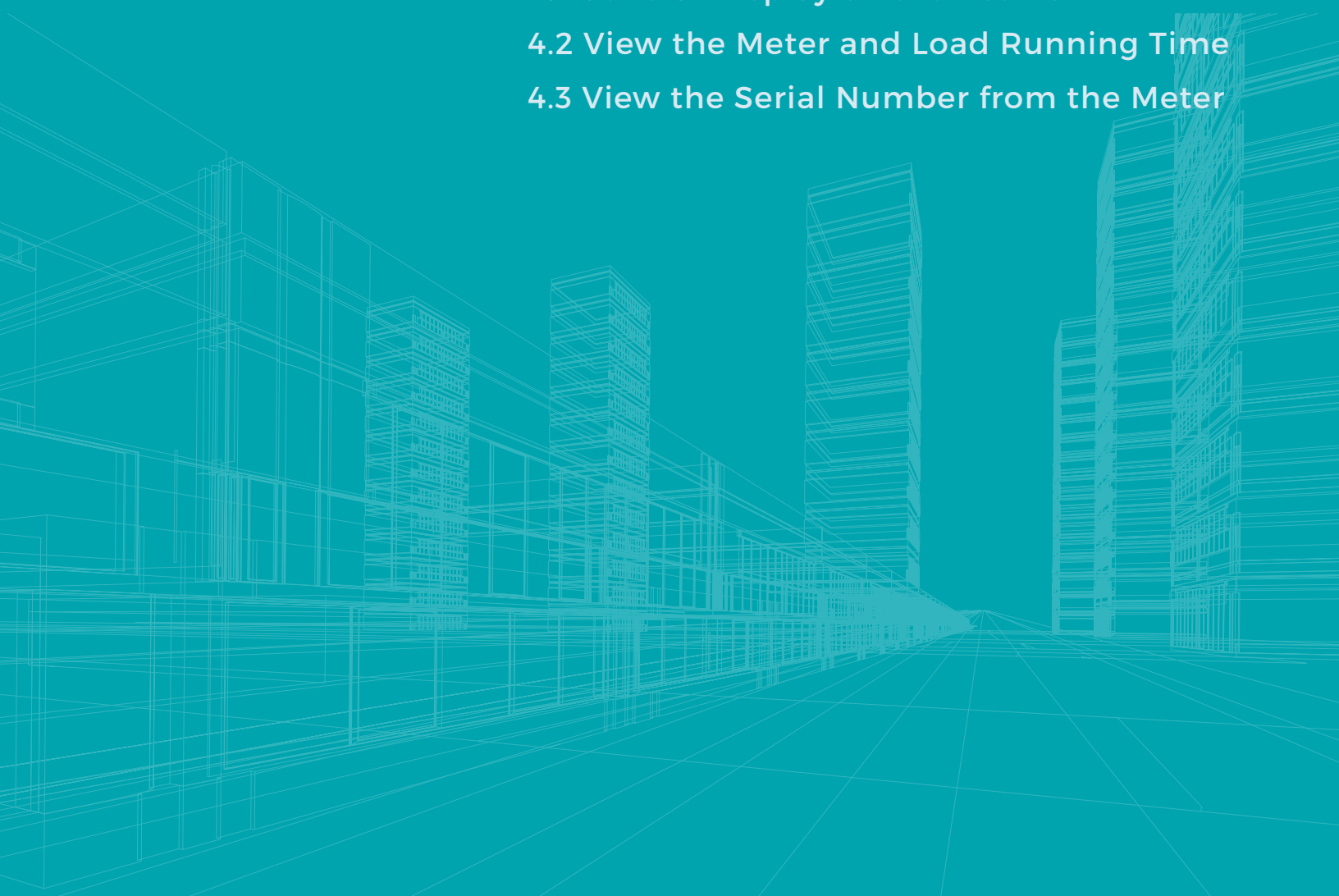
	Label	Paramters	Options	Description
AO (Analogy Output)	AotP	AO Output	0; 1; 2; 3	0: 0 ~ 5V; 1: 1 ~ 5V; 2: 0 ~ 20mA; 3: 4 ~ 20mA
	Ao1P	AO1 Parameter	0; 1; 2	0: voltage; 1: current; 2: power
	Ao1L	AO1 lower limit	0.00 ~ 1.00	0%-100%
	Ao1H	AO1 up limit	-1.00 ~ +1.00	-100%~100% The entire upper limit's absolute value should be larger than the lower limit.
	Ao2P	AO2 parameter	0; 1; 2	0: voltage; 1: current; 2: power
	Ao2L	AO2 lower limit	0.00 ~ 1.00	0%~100%
	Ao2H	AO2 up limit	-1.00 ~ +1.00	-100%~100% The entire upper limit's absolute value should be larger than the lower limit.
RO	to1F	RO1 mode	0; 1; 2	0: Latch; 1:Momentary; 2: Alarm
	to1d	RO1 momentary delay time	300 ~ 5000	Unit: ms
	to1P	RO1 alarm parameter	0; 1; 2; 3	0: no alarm; 1: voltage; 2: current; 3: power

	Label	Paramters	Options	Description
RO		RO1 alarm inequality	0; 1	0: smaller than; 1: larger than
		RO1 alarm threshold range	Voltage: 0 ~ 3000 V; Current: 0 ~ 50000A; Power: 0~ 60000kW.	
		RO1 alarm delay	0 ~ 255	unit: second
		RO2 mode	0; 1; 2	0: Latch; 1:Momentary; 2: Alarm
		RO2 momentary delay time	300 ~ 5000	Unit: ms
		RO2 alarm parameter	0; 1; 2; 3	0: no alarm; 1: voltage; 2: current; 3: power
		RO2 alarm inequality	0; 1	0: smaller than; 1: larger than
		RO2 alarm threshold range	Voltage: 0 ~ 1200V; Current: 0 ~ 50000A; Power: 0~ 6000kW	
		RO2 alarm delay	0 ~ 255	unit: second

AcuDC 240 Series DC Power and Energy Meters

Chapter 4: Viewing Metering Parameters via Display

4.1 General Display on the AcuDC
4.2 View the Meter and Load Running Time
4.3 View the Serial Number from the Meter



CHAPTER 4: VIEWING METERING PARAMETERS – VIA DISPLAY

You can view different information from the metering screen. For example, you can view voltage, current, power, energy, electric charge and clock information.

In the metering screen, press 'F' to go to next screen, press 'V/A' to go to the different windows to view different information.

4.1 General Display on the AcuDC

The first screen on the metering screen shows voltage, current and power.

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Fig 4-3 Multifunction Display

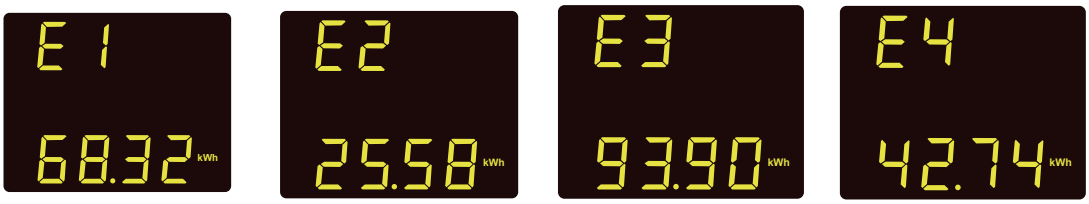
The AcuDC 243 screen displays current, voltage and power, and the units are 'V, A and kW' shown at the top right corner. The first line displays voltage, the second line displays current and the third line displays power. For example, the voltage shown in the left figure is 220.2V; the current shown in the left figure is 49.99A, the power shown in the left figure is 11.00KW. Communication status is active.

NOTE: Communication status is displayed on every screen in AcuDC 243.

Press 'F' to view the Energy data.

You can press 'V/A' on the energy screen to switch between different types of energy.

E1 = Import Energy (consumed energy), E2 = Export Energy (generated energy) , E3 = Total Energy (absolute sum of import energy and export energy), and E4 = Net Energy (algebraic sum of import energy and export energy).

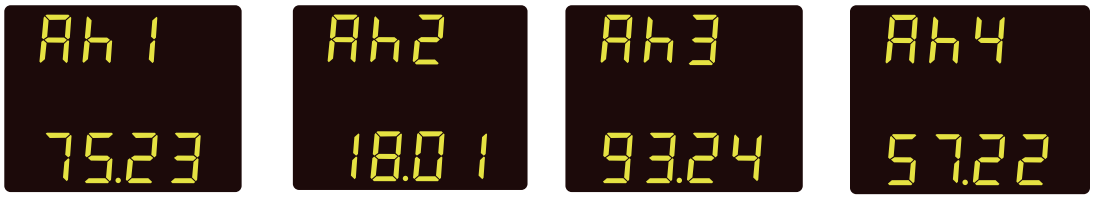


(a) Import Energy (b) Export Energy (c) Total Energy (d) Net Energy

Fig 4-4 Energy Display

Press 'F' to go to the third screen. The third screen shows Electric charge.

You can press 'V/A' on the electric charge screen to switch between different types of charges. Ah1 = Import Charge, Ah2 = Export Charge, Ah3 = Total Charge (absolute sum of Import Charge Ah and Export Charge Ah), and Ah4 = Net Charge (algebraic sum of Import Charge Ah and Export Charge Ah).



(a) Import Charge (b) Export Charge (c) Total Charge (d) Net Charge

Fig 4-5 Charge Display

Press 'F' to go to the fourth screen. The fourth screen shows clock information. For example, screen displayed in Fig 4-6a shows the date is 2014:04:09; screen displayed in Fig 4-6b shows the time is 14:19:52. You can press 'V/A' on the clock information screen to switch between the date and time.



(a) Date Display (b) Time Display

Fig 4-6 Clock Information Display

If the meter is equipped with DI counting function (AcuDC 243 with I/O module), press 'F' key to go to the DI count display screen. You can press 'V/A' on the DI counting screen to switch between the DI1 and DI2 counting.



(a) DI1 Count Display (b) DI2 Count Display

Fig 4-7 DI Count Display

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		Screen No.	Widnow No.	Description	Operation
Voltage Current Power		1	1	243 displays all	First screen in metering data display mode
Energy	E1	2	1	E1: import energy	Press 'F' at last screen
	E2		2	E2: export energy	Press 'V/A'
	E3		3	E3: Total energy	Press 'V/A'
	E4		4	E4: net energy	Press 'V/A'
Charge	Ah1	3	1	Ah1: import charge	Press 'F' at last screen
	Ah2		2	Ah2: export charge	Press 'V/A'
	Ah3		3	Ah3: Total charge	Press 'V/A'
	Ah4		4	Ah4: net charge	Press 'V/A'
Meter Clock	Date	4	1	Year/month/day	Press 'F' at last screen
	Time		2	Hour/min/sec 24-hour clock	Press 'V/A'
DI count number	DI1 Count	5	1		Press 'F' at last screen
	DI2 Count		2		Press 'V/A'

4.2 View the Meter and Load Running Time

If you press down the 'F' button for about 3 seconds while in the metering data mode, you will get to the meter information display mode. You can press 'F' to exit the meter information display mode.

- In this meter information display mode, you can press 'V/A' to switch between the meter running hours and load running hours. 'r' means meter running hours while 'L' means load running hours.



(a) Meter Running Time



(b) Load Running Time

Fig 4-8 Running Time Display

4.3 View the serial number from the meter

If you press down the 'V/A' button for about 3 seconds while in the metering data mode, you will get to the serial number display mode. You can press 'V/A' to exit the serial number display mode.



Fig 4-9 Serial Number

NOTE: This screen displays the last 8 digits of the meter's serial number.

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AcuDC 240 Series DC Power and Energy Meters

Chapter 5: Viewing Real-Time Readings via Acuview Software

5.1 Connection Setup

5.1.1 Wiring

5.1.2 Acuview software setup

5.2 Configuration Parameters Setup

5.2.1 General meter parameter setting

5.2.2 Configure the Data Log using the meter's memory

5.2.3 Configure the Data Log to log to computer memory

5.3 Viewing Metering Parameters

5.3.1 Real-time Metering

5.3.2 Reading Data Log on meter's onboar memory

5.3.3 Reading Data Log on a computer's memory

CHAPTER 5: Viewing Real-time Readings Via AcuView Software

This chapter will mainly discuss how to use the meter via the communication port using software. It is highly recommended that previous chapters be read before moving onto Chapter 5, a familiarity with Modbus would also be helpful.

5.1 Connection Setup

5.1.1 Wiring

Refer to section 2.3.6(Communications Wiring)

5.1.2 Acuview Software Setup

1. New Connection:

A connection is required before communicating with the meter. To add a new connection, do one of the following:

1) Click **Setting > Connection Manager**

or

2) Click the icon 

The Connection Manager is shown as in Fig 5-1.

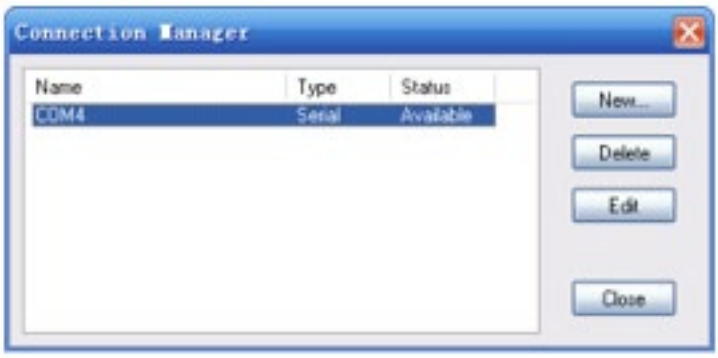


Fig 5-1 Connection Manager

- **New:** add a new connection
- **Delete:** Delete the select connection
- **Edit:** Edit the selected connection settings.
- **Close:** Close the window
- **Status:** 'Available' means Com Port is active, and 'not Available' means Com Port is inactive. If the status is blank, it means that Com Port has not been established.

2. Connection Settings:

Set the connection parameters. The Connection Settings box is shown on the screen as in Fig. 5-2 Click 'OK' after settings finish.

1) Click **Operation** > **Add Device**

or

2) Click the icon 

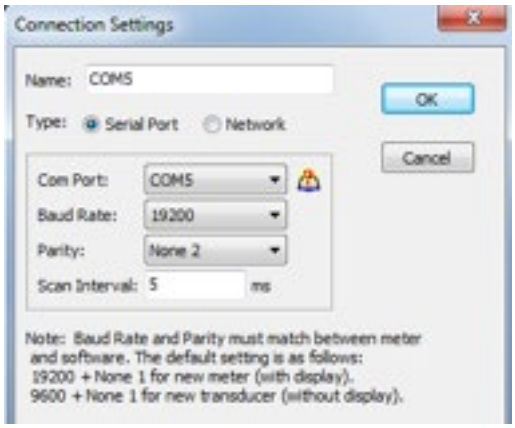


Fig 5-2 Acuview Software Connection Settings

- **Name:** Give connection a name
- **Type:** Select the serial port that the RS485 connection is using
- **Com Port:** Select the serial port that the RS485 connection is using
- **Baud Rate:** Should match the baud rate in the meter settings.
- **Parity:** Should match the parity in the meter settings.
- **Scan Interval:** Used to adjust the time interval between two message(200ms or 500ms is recommended)

NOTE: Baud Rate and Parity must match between meter and software.

NOTE: How to find 'Com Port' in your computer
Right click on 'Computer', then click 'Properties' menu. In the pop up window click on 'Device Manager' from the left navigation panel to find the port number. In the device Manager window, double click on 'Port (COM&LPT)' from the dropdown list. Find the 'USB Serial Port (COMx)' the number in brackets is the port number, i.e. COM4. Please select the corresponding Com Port here.

3. Add Device:

After performing step 1 and 2 above, you need to add a device to communicate with. To add a new device, do one of the following:

1) Click **Operation >Add Device**

or

2) Click the icon 

The Add Device box is shown as Fig 5-3. Click 'OK' after settings finish.



Fig 5-3 Add Device

- Device Type: The model of the device you are going to communicate with
- Connection: Select a connection for the communication
- Device Address: Should match the address in the meter settings
- Description: Device description such as where the device is used, for example, 'Building 1'.

4. Connection:

You can read all the measurement data after you successfully complete Step 3. To connect, do one of the following:

1) Click **Operation** > **Connect**

Or

2) Click the icon 

Or

3) Press F9 on keyboard

If the connection is successful, the screen will show the measured data on the screen, and you will see 'Com Failure = 0, Log Failure = 0' at the bottom right corner on the screen.

If the connection is not successful, no measured data will appear on the screen, and you will see 'Com Failure = 1, Log Failure = 0' at the bottom right corner on the screen in red.

NOTE: If connection is not successful, please make sure: The physical connection of the device is correct; the communication parameters, such as Baud Rate, Parity, device type and device address are not properly set.

5.2 Configuration Parameters Setup

5.2.1 General Meter Parameter Setting

- From the left navigation panel click on the 'Settings' tab and then on 'General'. You can set up the system parameters and I/O settings from this section, as shown in Fig 5-4.
- Click on 'Update Device' after making changes, so that the changes can be saved on the meter.

Parameters can be setup with following rules:

Security and **Communication**: You can set the meter's password, device address, Baud Rate and parity from this section and the meter will make the corresponding changes.

Voltage and **Current**: If you are measuring your voltage using a voltage Hall Effect sensor and/or your current using either a Hall Effect sensor or a shunt, you will have to set the **Voltage** and/or **Current** sections.

RO1 Output Mode/RO2 Output Mode: This is available with the 'X3' module

Choose between the three modes:

- Latch: To manually turn on and off the relay
- Momentary: To turn on the relay for a set number of seconds before it goes back off.
- If momentary mode is selected, set the delay time 'On Time'; the range is 300-5000ms. The delay time has an error of up to 3ms (due to the relay action time error)
- Alarm: To trigger the relay output through an alarm event.

RO Alarm Limit: Set the Alarm Channel, Setting, Setpoint and Delay (in sec) for both RO1 and RO2; this is needed if RO1/RO2 Output mode is set as 'Alarm'

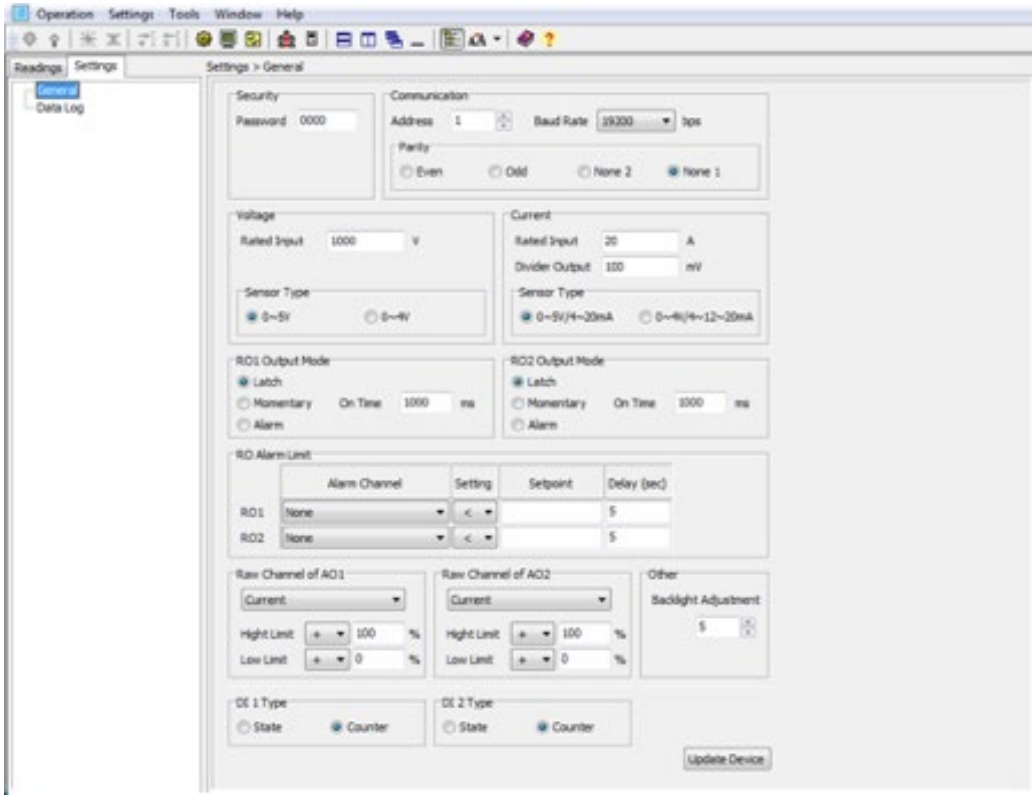


Fig 5-4 General settings

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Raw Channel of AO1/Raw Channel of AO2: The settings are available with the X1 and X2 modules

Select the parameter (Voltage, Current, Power) you will like to send as an Analog Output.

Set the High and Low Limit based on the parameter you have selected.

Note:

- When AO parameter is set as voltage, the upper and lower limit setting range is between 0% - 100%. E.g. it can be set as: 0% - 100%, 0% - 50% etc.
- When AO parameter is set as current or power, there are four different modes for the upper and lower limit setting range. It can be between: 0% - +100%, 0% - -100%, -100% - +100%, and 0% - ±100%. E.g. it can be set as: 0% - +50%, 0% - -50% etc.
- Upper Limit cannot be 0%

Other:

- You can adjust the backlight brightness under the Backlight Adjustment section. The range is from 1 to 5.

DI 1 Type/ DI 2 Type:

Select DI 1 or DI 2 as:

- State: DI will act as a switch status monitor
- Counter: DI will act as a pulse counter.

NOTE: You can 'import' a saved device profile to quickly setup the meter parameters:

Click Tools->Import Device Settings, select the desired file and click 'Open', and after importing successfully, click 'Update Device', or click Tools->Import and Update Device, select the desired file.

You also can save the current settings to a file via the **export device profile** function in '**Tools**'.

5.2.2 Configure the Data Log using the meter's onboard memory

You can set up the meter to log data on the onboard memory.

- From the left navigation panel click on the settings tab then click 'Data Log' to access the data log setting page (as shown in Fig 5-5).

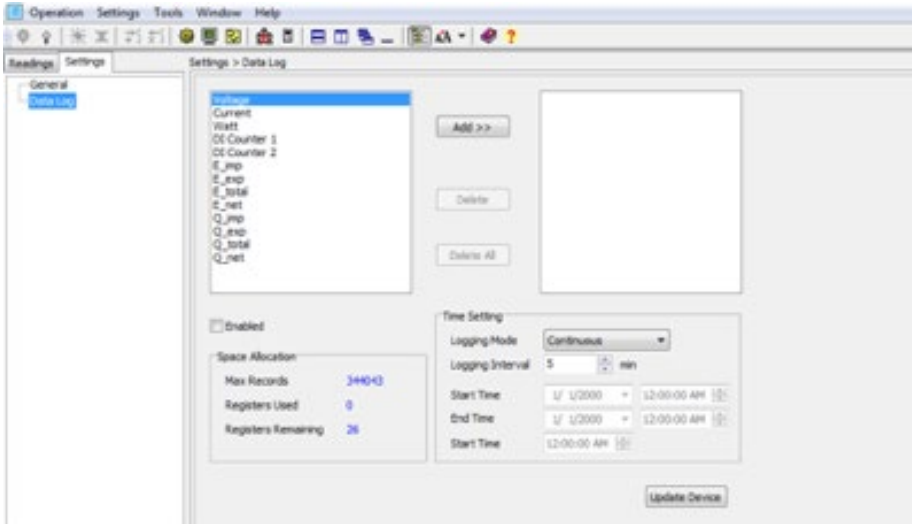


Fig 5-5 Data Log readings

Parameter Selection: Select the parameters you would like to log (from the left box), click 'Add' to add them to the box on the right.

Enable Data Log: Make sure you check the box 'Enabled' to enable data log.

Time Setting: There are three different Logging Modes.

- Continuous: This will start logging data immediately, after the 'Update Device' button is clicked.
- In this mode, you will have to set the Logging Interval.
  - Scheduling: This will start logging data from a set Start Time.
- In this mode, you will have to set the Logging Interval and Start Time.

NOTE: When the memory is full, a memory sector is deleted and the data logging will continue for the above two modes.

- Interval: This will log data from a start time to an end time.
  - In this mode, you will have to set the Logging Interval, as well as the Start Time and End Time.

NOTE: When the memory is full, the data logging will stop. Make sure to click on 'Update Device' after making changes, so that the changes can be saved on the meter.

NOTE: When you click on 'Update Device', the meter's data log memory will be erased.

5.2.3 Configure the data log to log the readings on the computer's memory

This applies to AcuDC 240 series meters with communication option; the meters do not need to have onboard memory since the data will be logged directly on the computer's memory.

You can set up the meter to log data directly on the computer memory. **You must always be connected to the software for this data log method to work.**

You can access this data log setting by clicking on the 'Settings' option located on the menu toolbar, and then clicking on 'Data Log Settings' or click the icon

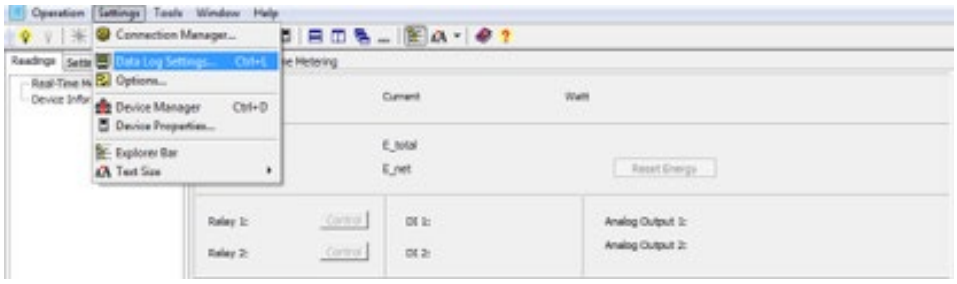


Fig 5-6 Accessing Data Log

The Data Log Setting window will open. This is shown in Fig 5-6.

In data log setting, as shown in Fig 5-7, make sure you check the 'Enabled' box in the window.

Under the 'Logging Items of Selection' Section: click on the required groups of parameters you will like to log.

Under the 'Logging Options' Section:

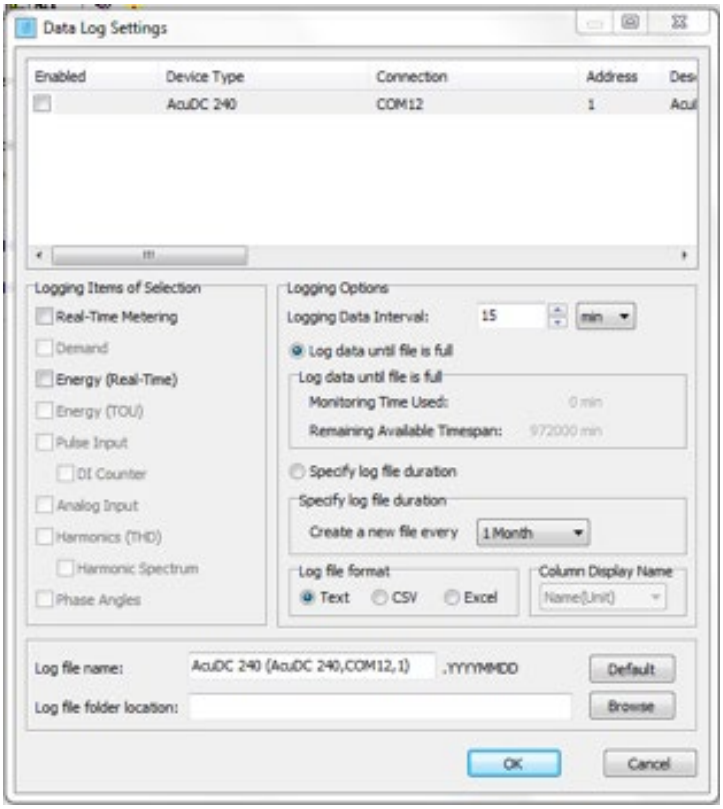


Fig 5-7 Data Log settings

In data log setting, as shown in Fig 5-7, make sure you check the 'Enabled' box in the window.

Under the 'Logging Items of Selection' Section: click on the required groups of parameters you will like to log.

Under the 'Logging Options' Section:

- Choose the 'Logging Data Interval'.
- Choose between the options 'Log data until file is full' or 'Specify Log file duration'
- If 'Specify Log file duration' is selected: Choose how often you want a new file created.
    - Choose the 'Log file format' you want the file(s) saved as.

Enter the preferred name for the file in 'Log file name'.

Choose the 'Log file folder location' where the file(s) will be saved.

Once everything is set, click 'OK'.

Finally, make sure you click the icon on the top of the screen to start data logging on the computer. You can click the icon on the top of the screen to stop data logging.

WARNING: If 'Excel' is chosen as the 'Log file format': After you click on the icon to start data logging, a warning window will pop up. Take note of the warning in order to prevent your files from being corrupt.

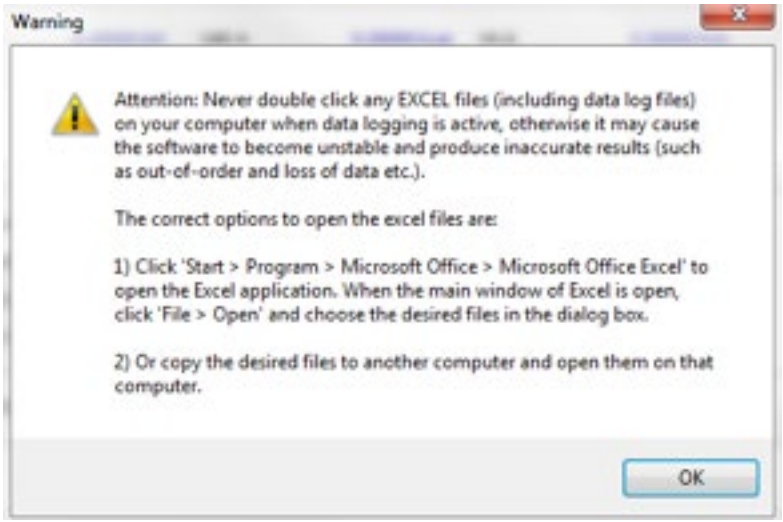


Fig 5-8 Warning

To get help or more information on the Acuview software, please click 'help' in the main menu bar, of click the icon .

5.3 Viewing Metering Parameters

5.3.1 Real-Time Metering

From the left navigation panel click on the 'Readings' tab and then select 'Real-Time Metering' to view the meter's real time data. You can read voltage, current, energy, charge etc, as shown in Fig 5-9.

You can modify the value of energy and charge by clicking the underlined figures. And you can also reset the energy, charge, DI counter and Max and Min by clicking 'Reset', the values will reset to 0.

On this reading window you can also control relay 1 and relay 2.

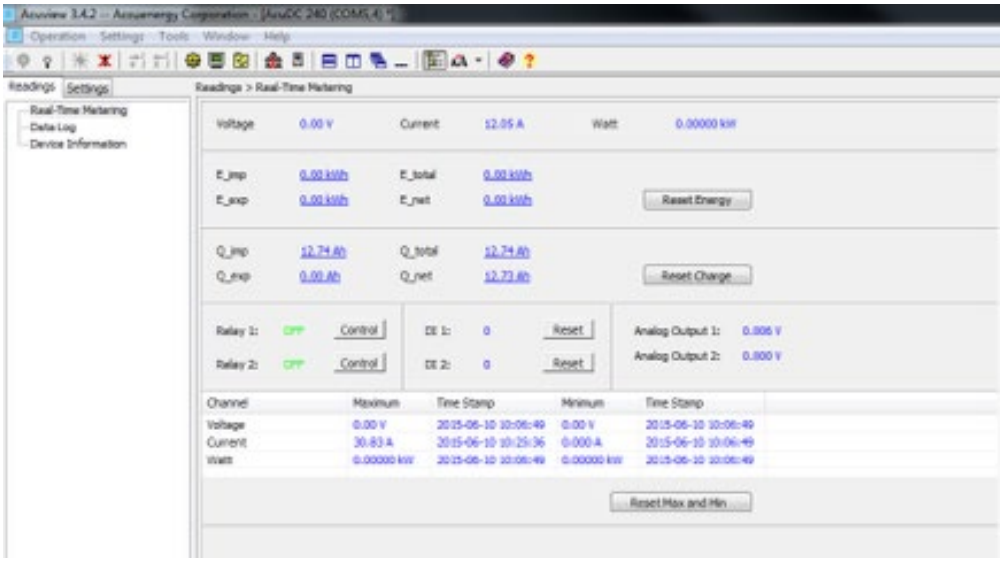


Fig 5-9 Reading Real Time Meter (change another picture, with load, this reading without load, so voltage is 0)

5.3.2 Reading Data Log on Meter's Onboard Memory

From the left navigation panel click on the 'Readings' tab and then select 'Data Log' to retrieve the meter's logged readings. The parameter settings for data log in meter's onboard memory refer to section 5.2.2 (Configure the Data Log using the meter's onboard memory).

On this window you can view the data log, while the maximum record number is 85995.

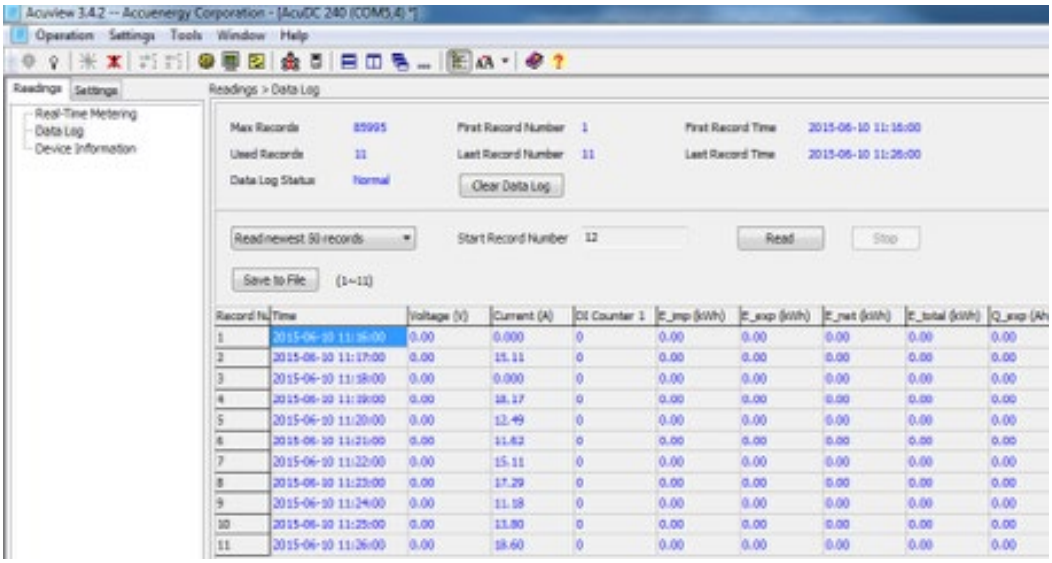


Fig 5-12 Reading Data Log on Meter's Onboard Memory

5.3.3 Reading Data Log on the computer's memory

Find the data log files from the specified folder location where the file was saved. **The parameter settings for data log on the computer's memory refer to section 5.2.3.** If you chose the default path, there is a folder named MonData in the Acuview installation directory where all the data log files are stored. By default, each file name consists of device description, device type, port(Serial mode), device address and data logging starting time whose format is YYYYMMDD(Year, Month, Day).


Make sure to follow the following rules before you open any Excel file:

Special Attention:

Never double click any EXCEL files (including data log files) on your computer when data logging is active, otherwise it may cause the software to become unstable and potentially produce inaccurate results (such as out-of-order and loss of data etc.).

The correct options to open the excel files are:

1) Click **Start** > **Program** > **Microsoft Office** > **Microsoft Office Excel** to open the Excel application. When the main window of Excel is open, click **File** > **Open** and choose the desired files in the dialog box.

or

2) Copy the desired files to another computer and open them on that computer.

After you open a data log file, you will see the following items: 'Time U (V) I (A) P (kW)'.

The file content is the same whether data is saved as .txt or .csv or .Excel.

AcuDC 240 Series DC Power and Energy Meters

Appendix

A. Troubleshooting

B. Modbus Register Map

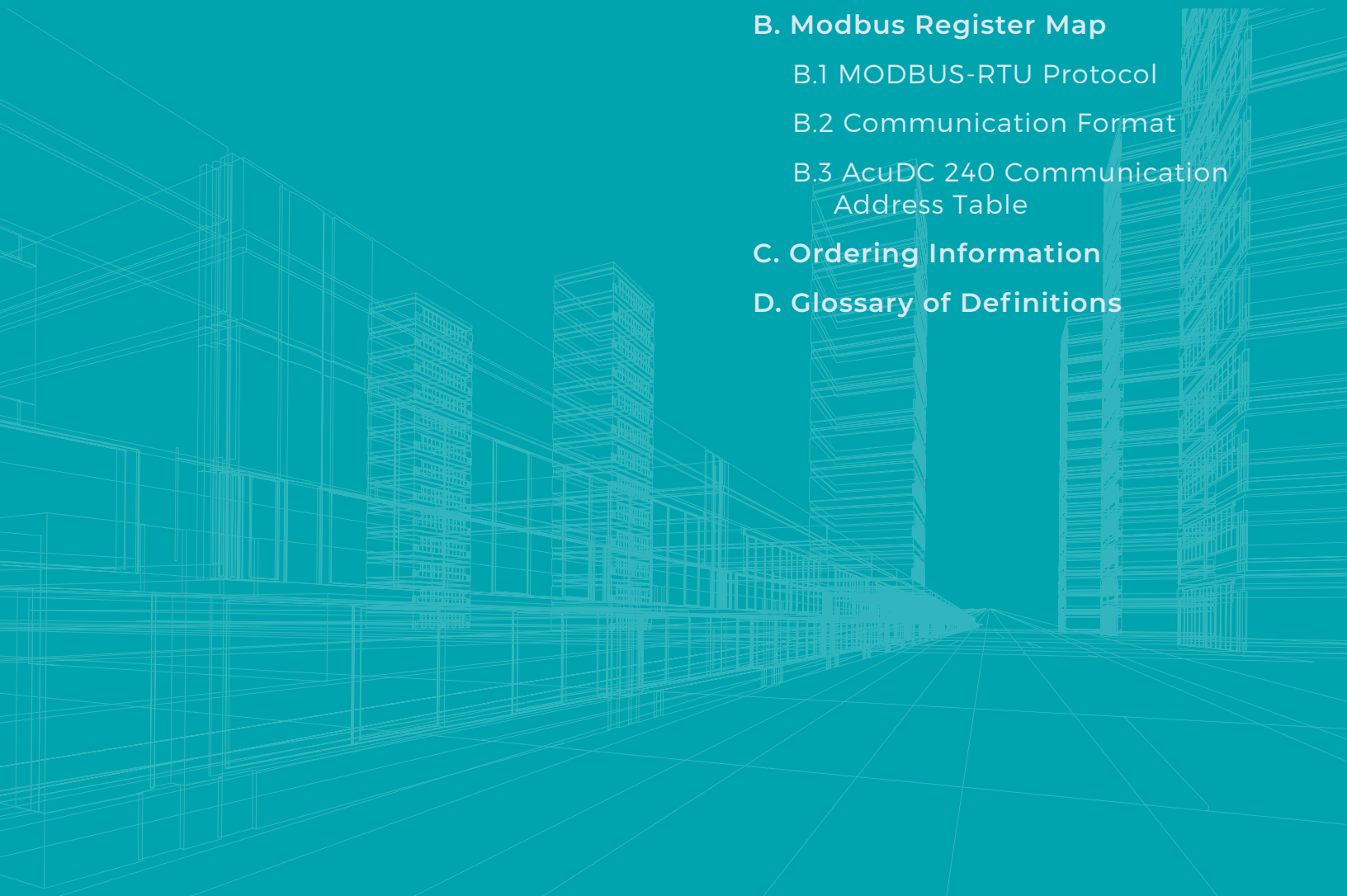
B.1 MODBUS-RTU Protocol

B.2 Communication Format

B.3 AcuDC 240 Communication Address Table

C. Ordering Information

D. Glossary of Definitions



APPENDIX

This chapter will mainly discuss how to use the meter via the communication port using software. It is highly recommended that previous chapters be read before moving onto Chapter 5, a familiarity with Modbus would also be helpful.

A. Troubleshooting

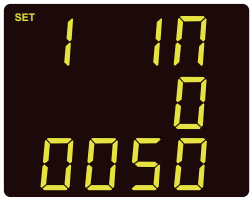
My AcuDC 243 is displaying the correct current but the power (kW) is negative.

Check to see if the AcuDC is installed on the negative terminal of the load.

Why is my AcuDC 243 measuring the wrong current with the Current Hall Effect Sensor?

A connection is required before communicating with the meter. To add a new connection, do one of the following:

- The Hall Effect Sensor should be installed on the negative side of the load.
- Ensure that the Hall Effect sensor is being powered. If the sensor was purchased from Accuenergy then the sensor will need a ±15V dc power supply.
- Ensure that the wiring of the sensor is to the AcuDC is correct.
- Terminal 3 of the sensor should be connected to 'I+' of the AcuDC 243.
- Terminal 4 of the sensor should be connected to 'I-'of the AcuDC 243.
    - Terminal 4 of the sensor must also be connected to I/O terminal strip "GND".
    - Check that the settings in the meter are configured to read accurately from that sensor.
- Press 'F' and 'V/A' simultaneously whiles on the meter data mode to get to the settings mode.
- A password screen will display. Leave the password as default '0000' and press 'V/A' to enter the setting mode; the communication address 'AddR' screen will display next.
- Press 'V/A' until you get to the 'I In' screen. Enter the rated current input of the Hall Effect Sensor in this screen.
- Press 'F' to change this setting. A digit will begin to flash and you will enter the edit mode.
- Press 'F' to increase the value of the flashing digit
    - Press 'V/A' to switch the flashing digit
    - Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point



- Press 'V/A' to go to the next screen. This will be the 'I P' screen. This setting corresponds to the output range of the Hall Effect Sensor.
  - Press 'F' to change this setting and to select required output.

NOTE: The default setting is '0' for 4-20mA/0-±5V. The other mode is '1' for 4-12-20mA/0-±4V.

- Press 'V/A' to confirm this setting; the cursor will stop flashing at this point



Why is my AcuDC 243 measuring the wrong current with the shunt I am using?

- The shunt should be installed on the negative side of the load.
- Ensure that the AcuDC 243 is wired correctly to the shunt so that it can be read accurately.
- The positive output from the shunt should be connected to the AcuDC 243 'I+' terminal.
  - The negative output from the shunt should be connected to the 'AcuDC 243 'I-'terminal.
  - If the voltage is also being measured ensure that the positive DC source is connected to the AcuDC 243 'V+' terminal whiles the AcuDC 243 'V-' terminal should be connected to the 'I-' terminal on the AcuDC 243.
- Ensure that the shunt being used outputs a signal in the range of 50-100mV to work with the meters current input.
- Check that the settings in the meter are configured to read accurately from the shunt.
- Press 'F' and 'V/A' simultaneously whiles on the meter data mode to get to the settings mode.

- A password screen will display. Leave the password as default '0000' and press 'V/A' to enter the setting mode; the communication address 'AddR' screen will display next.
- Press 'V/A' until you get to the 'I In' screen. Enter the rated current input of the shunt in this screen.
- Press 'F' to change this setting. A digit will begin to flash and you will enter the edit mode.
  - Press 'F' to increase the value of the flashing digit
  - Press 'V/A' to switch the flashing digit
  - Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point.



- Press 'V/A' to go to the next screen. This will be the 'I o' screen. This setting corresponds to the output range of the shunt.
  - Press 'F' to change this setting. The first digit will begin to flash and you will enter the edit mode.
  - Press 'F' to increase the value of the flashing digit
  - Press 'V/A' to switch the flashing digit
  - Press 'V/A' when on the last digit to confirm the change; the cursor will stop flashing at this point



Why won't my meter connect to the AcuView software?

- The physical connection of the device is incorrect, please refer to section 2.3.6;
- The communication parameters, such as Baud Rate, Parity, device type, device address are not properly selected the same as the meter.
- The "Com Port" in the software is not selected as the same as the computer. Please refer to section 5.1.2.

B. Modbus Register Map

This chapter will discuss how to operate the meter via the communication port using software. Before starting this chapter, you should be familiar with Modbus and read other chapters of this manual to make sure that you have a good understanding of the functions and applications of this product.

This chapter includes: Modbus protocol, communication format and communication address table.

B.1 MODBUS-RTU Protocol

Modbus RTU protocol is used for AcuDC 240's communication. Data format and error check methods are defined in Modbus protocol. The half duplex query and respond mode is adopted in Modbus protocol.

Modbus allows master device (PC, PLC etc.) to communicate with slave devices, it will not allow data exchange between slave devices. Therefore, terminal devices will not engage the communication link at initialization, only response to the master's request.

B.1.1 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 8bits
- Parity Even/ Odd/ None2/ None1
- Stop Bit 1/2bit
- Error Checking CRC

B.1.2 Modbus Protocol

1. Frame

When data frame reaches the terminal unit, the unit removes the data frame's header, reads the data, if there is no error, it'll implement 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, Data and CRC Check. Any error will cause a failure to respond.

Table B-1 Data Frame Format

Address	Function	Data	Check
8-Bits	8-Bits	N X 8-Bits	16-Bits

2. 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 0~255.

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.

3. 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.

Table B-2 Function Code

Code	Meaning	Action
01	Read RO Status	Obtain Relay Output Current Status (ON/OFF)
02	Read DI status	Obtain Digital Input Current Status(ON/OFF)
03	Read holding register	Obtain Current Binary Value of One or Multiple Registers
05	Control RO	Control Relay Output(ON/OFF))
16	Preset multiple registers	Place Specific Binary Value into Multiple Registers

4. 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 from which register and how many registers to read.

5. Error Check Field

The field allows the error check by master and slave devices. Due to electrical noise and other interfaces, 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 enhance the system security and efficiency. Error Check uses 16-bit Cyclic Redundancy Check (CRC 16).

6. 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, the final contents of the register, which should exchange the high-byte and low-byte, 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.

B.2 Communication Format

This section will illustrate the format indicated in Table B-3.

Table B-3 Protocol Illustration (Hex value and Decimal value)

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	CRC16 Hi	CRC 16 Lo
Hex	06 H	03H	00H	00H	00H	21H	84H	65H
Dec	6	3	0	0	0	33	132	101

Addr: Slave device address

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

CRC 16 hi: CRC high byte

CRC 16 lo: CRC low byte

B.2.1 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. Along with slave device address and function code, query frame must contain the relay register starting address and the number of registers to be read.

AcuDC 240 relay output address starts from 0000H (Relay 1=0000H, Relay 2=0001H).

Table B.4 depicts reading Relay 1 and 2 statuses from slave address 17.

Table B-4 Query Frame of Reading Relay Output Status

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	CRC16 Hi	CRC 16 Lo
Hex	11H	01H	00H	00H	00H	02H	BFH	5BH
Dec	17	1	0	0	0	2	191	91

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 B-5 depicts the response frame.

Table B-5 Response Frame of Reading Relay Output Status

Addr		Fun	Byte Count	Data	CRC16 Hi	CRC 16 Lo
Hex	11H	01H	01H	02H	D4H	89H
Dec	17	1	1	2	212	137

Data Bytes

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

(Relay 1=OFF, Relay 2=ON)

B.2.2 Read DI Status (Function Code 02)

Query

This function allows the user to obtain DI status ON/OFF (1=ON, 0=OFF). 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. AcuDC 240 DI address starts from 0000H (DI1-0000H, DI2-0001H).

Table B.6 depicts reading DI1 to DI2 status of the slave device with the address of 17.

Table B-6 Query Frame of Reading DI Status

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	CRC16 Hi	CRC 16 Lo
Hex	11H	02H	00H	00H	00H	02H	FBH	5BH
Dec	17	2	0	0	0	2	251	91

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 B-7 depicts the response frame.

Table B-7 Response Frame of Reading DI Status

Addr		Fun	Byte Count	Data	CRC16 Hi	CRC 16 Lo
Hex	11H	02H	01H	01H	64H	88H
Dec	17	2	1	1	251	136

B.2.3 Read Data (Function Code 03)

Query

This function allows the master to obtain the measurement results from the meter. Table B.6 depicts reading slave device (address 1) voltage. The AcuDC 240 voltage address is 0200H-0201H.

Table B-8 Query Frame of Reading Voltage

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	CRC16 Hi	CRC 16 Lo
Hex	01H	03H	02H	00H	00H	02H	C5H	B3H
Dec	1	3	2	0	0	2	197	179

Response

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

Table B-9 depicts the response of V=402851D8H (2.6299953V)

Table B-9 Response Frame of Reading Voltage

Addr		Fun	Byte Count	Data1 Hi	Data1 Lo	Data2 Hi	Data2 Lo	CRC16 Hi	CRC 16 Lo
Hex	01H	03H	04H	40H	28H	51H	D8H	52H	31H
Dec	1	3	4	64	40	81	216	82	49

B.2.4 Control Relay Output (Function Code 05)

Query

This query frame forces the rely status to ON or OFF. The AcuDC 240 relay output address starts from 0000H(Relay 1= 0000H, Relay 2= 0001H).

Data FF00H changes the relay status to ON, data 0000H changes the relay status to OFF. The relay will not be influenced by any other data input.

The following is to query slave device 1 to set relay status as ON.

Table B-10 Query Frame of Control Relay Status

Addr		Fun	DO Addr Hi	DO Addr Lo	Value Hi	Value Lo	CRC16 Hi	CRC 16 Lo
Hex	01H	05H	00H	00H	FFH	00H	8CH	3AH
Dec	1	5	0	0	255	0	140	58

Response

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

Table B-11 Response Frame of Control Relay Status

Addr		Fun	DO Addr Hi	DO Addr Lo	Value Hi	Value Lo	CRC16 Hi	CRC 16 Lo
Hex	01H	05H	00H	00H	FFH	00H	8CH	3AH
Dec	1	5	0	0	255	0	140	58

B.2.5 Read Data (Function Code 03)

Query

Function Code 16 (10 H Hex) allows the user to modify the contents of multiple registers. AcuDC 240 system parameters can be written by this function code.

The following example depicts how to preset slave device 1's AO1 parameter (current), lower limit sign (+), lower limit value (0%), upper limit sign(+), upper limit value (100%)

Table B-12 Query Frame of Preset Multiple Registers

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	Byte Count	Value 1 Hi	Value 1 Lo
Hex	01H	10H	01H	09H	00H	05H	0AH	00H	01H
Dec	1		1	9	0	5	10	0	1

Value 2 Hi	Value 2 Lo	Value 3 Hi	Value 3 Lo	Value 4 Hi	Value 4 Lo	Value 5 Hi	Value 5 Lo	CRC 16 Hi	CRC 16 Lo
00H	00H	00H	00H	00H	00	00H	64H	C5H	8AH
0	0	0	0	0	0	0	100	197	138

Response

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

Table B-13 Preset Multiple Registers Response

Addr		Fun	Data Start Reg Hi	Data Start Reg Lo	Data # of Regs Hi	Data # of Regs Lo	CRC 16 Hi	CRC 16 Lo
Hex	01H	10H	01H	09H	00H	05H	D1H	F4H
Dec	1	16	1	9	0	5	209	244

B.3 AcuDC240 Communication Address Table

Basic Measurement Parameter Address

Use Function Code 03 to read

Table 5-14 Real-Time Measurement Address Table

Address (Hex)	Address (dec)	Parameter	Data Type	Property
0200H- 0201H	512- 513	Voltage	Float	R
0202H- 0203H	514- 515	Current	Float	R
0204H- 0205H	516- 517	Power	Float	R
0206H- 0207H	518- 519	AO1	Float	R
0208H- 0209H	520- 521	AO2	Float	R
020AH- 020BH	522- 523	DI1 Count Value	UINT32	R
020CH- 020DH	524- 525	DI2 Count Value	UINT32	R

NOTE: The high byte is followed by the low byte.

Running Time

The data space below is for running time; function code: 03 Read.

Table B-15 Running Time Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0280H-0281H	640- 641	Meter running time	0 ~ 999999999	long	R
0282H- 0283H	642- 643	Load running time	0 ~ 999999999	long	R

Energy

The data space below is for energy;

Function Code: 03 Read; 16 Write

Table B-16 Energy and Charge (Ah) Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0300H- 0301H	768- 769	Import energy	0 ~ 999999999	long	R/W
0302H- 0303H	770- 771	Export energy	0 ~ 999999999	long	R/W
0304H- 0305H	772- 773	Total energy	0 ~ 999999999	long	R/W
0306H- 0307H	774- 775	Net energy	0 ~ ± 999999999	long	R/W
0308H- 0309H	776- 777	Import Ah	0 ~ 999999999	long	R/W
030AH- 030BH	778- 779	Export Ah	0 ~ 999999999	long	R/W
030CH- 030DH	780- 781	Total Ah	0 ~ 999999999	long	R/W
030EH- 030FH	782- 783	Net Ah	0 ~ ± 999999999	long	R/W

The relationship between the register value and the real value (Rx is the register value).

Table B-17 The relationship between Register Value and Real Value

Parameter	Relationship	Unit
Voltage	Real=Rx	V
Current	Real=Rx	A
Power	Real=Rx	kW
Energy	Real=Rx/100	kWh
Ah	Real=Rx/100	Ah
AO	Real=Rx	V or mA(depends on the AO Type)
Running Time	Real=Rx/100	Hour

Real-Time Clock Area

(Data obtained only by AcuDC 243 meter equipped with storage function.)

Table B-18 Real Time Clock Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0284H	644	Year	2000 ~ 2099	Word	R/W
0285H	645	Month	1 ~ 12	Word	R/W
0286H	646	Day	1 ~ 31	Word	R/W
0287H	647	Hour	0 ~ 59	Word	R/W
0288H	648	Minute	0 ~ 59	Word	R/W
0289H	649	Second	0 ~ 59	Word	R/W

MAX records

(Data obtained only by AcuDC 243 meter equipped with storage function.)

Function code: 03H for reading

Table B-19 MAX Records Address Table

Address (Hex)	Parameter	Range	Data Type	Property
0400H-0401H	Voltage MAX		Float	R
0402H	Time of occurrence, Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
0403H		High byte: day; low byte: hour		
0404H		High byte: minute; low byte: second		
0405H-0406H	Current MAX		Float	R
0407H	Time of occurrence, Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
0408H		High byte: day; low byte: hour		
0409H		High byte: minute; low byte: second		
040AH-040BH	Power MAX		Float	R
040CH	Time of occurrence, Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
040DH		High byte: day; low byte: hour		
040EH		High byte: minute; low byte: second		

MIN records

(Data obtained only by AcuDC 243 meter equipped with storage function.)

Function code: 03H for reading

Table B-20 MIN Records Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0460H-0461H	1120-1121	Voltage MIN		Float	R
0462H	1122	Time: Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
0463H	1123		High byte: day; low byte: hour		
0464H	1124		High byte: minute; low byte: second		
0465H-0466H	1125-1126	Current MIN		Float	R
0467H	1127	Time: Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
0468H	1128		High byte: day; low byte: hour		
0469H	1129		High byte: minute; low byte: second		
046AH-046BH	1130-1131	Power MIN		Float	R
046CH	1132	Time: Year, Month, Day, Hour, Minute, Second	High byte: year; low byte: month	Word	R
046DH	1133		High byte: day; low byte: hour		
046EH	1134		High byte: minute; low byte: second		

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Data Logging Setting

(Data obtained only by AcuDC 243 meter equipped with storage function .)

Function code: 03H for reading, 16H for presetting

Table B-21 Data Logging Setting Address Table

Address (Hex)	Address (dec)	Parameter	Range	Initial Value	Data Type	Property	Register Number
0500H	1280	Enable data logging	0: Disable 1: Enable	0	Word	R/W	1
0501H	1281	Mode of data logging	0: mode 1, continuous mode (start after set parameters) 1: mode 2, timing start and stop 2: mode 3, specifies the start time (hour, minute)	0	Word	R/W	1
0502H	1282	Interval time	1 ~ 1440 (Minute)	5	Word	R/W	1
0503H	1283	Start time (year, month)	High Byte: year(00~99) Low Byte: Month(1-12)	(Only used in mode 2)	Word	R/W	1
0504H	1284	Start time (day, hour)	High Byte: day(1~31) Low Byte: hour (0~23)		Word	R/W	1
0505H	1285	Start time (minute)	High Byte: minute(0~59) Low Byte: reserve		Word	R/W	1
0506H	1286	End time (year, month)	High Byte: year(00~99) Low Byte: Month(1-12)		Word	R/W	1
0507H	1287	End time (day, hour)	High Byte: day(1~31) Low Byte: hour (0~23)		Word	R/W	1
0508H	1288	End time (minute)	High Byte: minute(0~59) Low Byte: reserve		Word	R/W	1
0509H	1289	The specified start recording time: hour and minute	High Byte: hour(0~23) Low Byte: minute(0~59)	(Only used in mode 3)	Word	R/W	1
050AH	1290	Number of registers in a log	Register number: 1~26	0	Word	R/W	1
050BH-0524H	1291-1316	The contents of a log (ModBus Register)		0	Word	R/W	26

The contents of one log

Users can select any parameters they want to log from the 13 parameters. In order to generate historical logs for the selected parameters, users should program the meter so that selected parameters from the corresponding Modbus registers can be copied to the historical log record. That is to say, if you want to log a certain parameters, only need to set the corresponding Modbus address in the register of data logging. One parameter in the meter is taking up two Modbus registers. The 13 parameters are voltage, current, power, import energy, export energy, total energy, net energy, , import Ah, export Ah, total Ah, net Ah, DI1 count value and DI2 count value.

For example" log the current data, register 0200H and 0201H programmed to be recorded.

The number of Registers in a log

In a log, a parameter using two registers, if you select all of 13 parameters, there are 26 registers to be used.

Log Statue Block

(Data obtained only by AcuDC 243 meter equipped with storage function make sense.)
Function code: 03H for reading

Table B-22 Log Status Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property	Register Number
0700H-0701H	1792-1793	MAX Records	0~350890	Unit32	R	2
0702H-0703H	1794-1795	Used Records	0~350890	Unit32	R	2
0704H	1796	MAX records in the Retrieval window		Word	R	1
0705H-0706H	1797-1798	Newest NO. of records		Unit32	R	2
0707H-0708H	1799-1800	Oldest NO. of records		Unit32		2
0709H	1801	Newest Record Time stamp	High Byte: year(00~99) Low Byte: Month(1-12)	Word	R	3
070AH	1802		High Byte: day(1~31) Low Byte: hour (0~23)			
070BH	1803		High Byte: minute(0~59) Low Byte: reserve			
070CH	1804	Oldest Record Time stamp	High Byte: year(00~99) Low Byte: Month(1-12)	Word	R	3
070DH	1805		High Byte: day(1~31) Low Byte: hour (0~23)			
070EH	1806		High Byte: minute(0~59) Low Byte: reserve			
070FH	1807	Memory status	High Byte: reserve Low Byte: FEH, memory is erasing; other, erased	Word	R	1

1) MAX Record

The MAX number of Record of logs is determined by the maximum capacity and the memory space occupied by one log.

2) Number of records

Number of records is the number of records that has currently been logged, which should be less than or equal to MAX number.

3) MAX Records in the Retrieval Window

In the Retrieval Window, the maximum number of records can be read.

4) Newest Serial No. of Records

The serial number of the first record is 1, and then is accumulated by 1 as one more record is put in. The system will delete the old record when the storage memory is full, but the serial number will not reset, continue to accumulate by the latest serial number.

5) Oldest Serial No. of Records

After storage memory is full, the system will delete the old data to record new data. The Oldest Serial No. of records is the serial number of the oldest record under the current state.

6) Latest Record Timestamp

The recording time of the latest record

7) Oldest Record Timestamp

The recording time of the oldest record

8) Memory Status

Check the status of the memory. To check whether it is in erasing.

Log Statue Block

(Data obtained only by AcuDC 243 meter equipped with storage function make sense.)
Function code: 03H for reading, 16H for presetting.

Table B-23 Log Retrieval Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0601H-0602H	1537-1538	Starting Record No.	Oldest No. of Records ~ Newest No. of Records +1	UNIT32	R/W
0603H	1539	Records number(High byte)	High byte: 1~ the MAX record number in the window	Word	R/W
		Record status(low byte) read only, write invalidate	Low byte: 0~ the MAX record number in a window: effective number of records in the window; FDH: Non-effective 'Start record No.' or invalid 'record number in a window'; FEH: memory is erasing; FFH: Non-effective data		
0604H-067BH	1540-1659	Window	Window data: time mark(6 Bytes) + [data1~dataN](4N bytes) Invalid data set to 0		

1) Starting Record No.

The Starting Record No. is accumulated by the number of records in one window after reading the records in that window. If the new Starting Record No. is larger than the Latest Serial No., then the Starting Record No. equals to the Latest Serial No. of Records plus 1.

For example, the initial Starting Record No. of Records is 34, after reading 8 records in one window, the Starting Record No. automatically turns into 42.

2) Records number

The number of records that fit within a window, which should not be larger than the maximum record number in one window

The MAX number of records is 240 divided by the size of bytes of one record.

3) Record status

This parameter shows the status of the read data in current window, and is characterized by the validity of read data. If display data is invalid, window data should be ignored.
If parameters set up correctly and read data is correct, it will return a valid data record number, otherwise it will return error. This parameter is read-only.

0~maximum records that one window can display: number of valid records in the window.

FDH: Invalid 'Starting record No.' or invalid 'record number in a window';

FEH: Memory is erasing

FFH: The window is displaying invalid data

4) Window

Window displays valid record data, read-only.

The contents of each record is: time mark (6 bytes) + [data1 ~ data N] (4N bytes).

Note: the number of records in the window is an integer.

System Parameter Setting Address

The system parameter settings, including communication settings and I/O settings, use Function Code 03H to read, Function Code 16H to preset.

Table B-24 System Parameter Settings

Address (Hex)	Address (dec)	Parameter	Range	Default	Data Type	Property
0100H	256	Password	0~9999	0000	Word	R/W
0101H	257	Device Address	1~247	1	Word	R/W
0102H	258	Baud Rate	1200; 2400; 4800 9600; 19200; 38400	19200	Word	R/W
0103H	259	Parity Setting	0: Even; 1: Odd; 2: None 2, and 3: None 1	3	Word	R/W
0104H	260	Full Range Current Value	20~50000A	20	Word	R/W
0105H	261	Full Range Shunt Value	50~100mV	100	Word	R/W
0106H	262	Current Hall Effect Sensor(V)	0: 0~±5V; 1: 0~±4V	1		
		Current Hall Effect Sensor(mA)	0: 4~20mA; 1: 4~12~20mA			
0107H	263	Full Range Voltage Value	5~9999	1000	Word	R/W
0108H	264	Voltage Hall Effect Sensor(mA)	0: 0~±5V; 1: 0~±4V	1	Word	R/W
0109H	265	AO1 Parameter	0: voltage; 1: current; 2: power	0	Word	R/W
010AH	266	AO1 Lower Limit Sign	0: +; 1: -; 2: ±	0	Word	R/W
010BH	267	AO1 Lower Limit	0 ~ 100(%)	0	Word	R/W
010CH	268	AO1 Upper Limit Sign	0: +; 1: -; 2: ±	0	Word	R/W
010DH	269	AO1 Upper Limit	0 ~ 100(%)	100	Word	R/W
010EH	270	AO2 Parameter	0: voltage; 1: current; 2: power	0	Word	R/W
010FH	271	AO2 Lower Limit Sign	0: +; 1: -; 2: ±	0	Word	R/W
0110H	272	AO2 Lower Limit	0 ~ 100(%)	0	Word	R/W
0111H	273	AO2 Upper Limit Sign	0: +; 1: -; 2: ±	0	Word	R/W

Address (Hex)	Address (dec)	Parameter	Range	Default	Data Type	Property
0112H	274	AO2 Upper Limit	0 ~ 100(%)	100	Word	R/W
0113H	275	RO1 Mode	0: Latch; 1: Momentary; 2: Alarm	2	Word	R/W
0114H	276	RO1 Momentary Time Delay	300~5000ms	1000	Word	R/W
0115H	277	RO1 Alarm Parameter	0: No Alarm; 1: Voltage; 2: Current; 3: Power	0	Word	R/W
0116H	278	RO1 Alarm Inequality	0: Smaller than; 1: Larger than	0	Word	R/W
0117H	279	RO1 Alarm Time Delay	0~255 S	5	Word	R/W
0118H-0119H	280-281	RO1 Alarm Threshold	The same as full range values		Float	
011AH	282	RO2 Mode	0: Latch; 1: Momentary; 2: Alarm	2	Word	R/W
011BH	283	RO2 Momentary Time Delay	300~5000ms	1000	Word	R/W
011CH	284	RO2 Alarm Parameter	0: No Alarm; 1: Voltage; 2: Current; 3: Power	0	Word	R/W
011DH	285	RO2 Alarm Inequality	0: Smaller than; 1: Larger than	0	Word	R/W
011EH	286	RO2 Alarm Time Delay	0~255 S	5	Word	R/W
011FH-0120H	287-288	RO2 Alarm Threshold	The same as full range values		Float	R/W
0121H	289	Backlight Brightness Level	1~5	5	Word	R/W
0122H	290	Clear Energy	0X0A: Enable		Word	W
0123H	291	Clear Meter Running Hour	0X0A: Enable		Word	W
0124H	292	Clear Load Running Hour	0X0A: Enable		Word	W
0125H	293	DI Working Mode	according to Bit value: 0: Level mode; 1: Count mode; Bit0: DI1 working mode; Bit1: DI2 working mode	3	Word	R/W
0126H	294	Clear DI Count Value	according to Bit value: 0: Not clear; 1: Clear Bit0: Clear DI1 Bit1: Clear DI2		Word	W
0127H	295	Clear Ah	0X0A: Effective		Word	W
0128H	296	Clear MAX/MIN Value	0X0A: Effective		Word	W
0129H	297	Clear Data Logging	0X0A: Effective		Word	W

DI Status

Use Function Code 02 to read DI status.

Table B-25 DI Address Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0000H	0	DI1	1=ON; 0= OFF	Bit	R
0001H	1	DI2	1=ON; 0= OFF	Bit	R

Relay Status

Use Function Code 01 to read Relay Status, Function Code 05 to control.

Table B-26 Relay Status Table

Address (Hex)	Address (dec)	Parameter	Range	Data Type	Property
0000H	0	DO1	1=ON; 0= OFF	Bit	R/W
0001H	1	DO2	1=ON; 0= OFF	Bit	R/W

NOTE:

1. Data Type: 'Bit' is 1-bit binary; 'Word' is 16-bit unsigned integer; 'Integer' is 16-bit signed integer; 'Float' is 32-bit floating point.Table B-26 Relay Status Table

2. Read/Write: 'R' is read only, reading DI is Function Code 02H; reading DO is Function Code 01H; reading the other parameter is 03H; 'R/W' is read/write, write(control) relay by Function Code 05H; Use Function Code 10H to write system parameters. Writing into non-writable address is forbidden.

C. Ordering Information

Meter Model -	Voltage Option -	Current Option -	Power Supply Option -	I/O Option -	Communication -	Datalogging
AcuDC 243: Multifunction	**1000V:** Nominal Input Voltage 1000Vdc	**A0:** 0~±10A	**P1:** 100-240Vac 50/60Hz, 100-300Vdc	**X1:** 2DI+2AO (4~20mA/0~20mA)	**C:** RS485, Modbus RTU	**D:** Datalogging
	600V: Nominal Input Voltage 600Vdc	**A1:** Shunt (50~100mV)	**P2:** 20-60Vdc	**X2:** 2DI+2AO (0~5V/1~5V)		
	300V: Nominal Input Voltage 300Vdc	**A2:** Current Hall Effect Sensor (4~20mA/12mA±8mA)		**X3:** 2DI+2RO		
	60V: Nominal Input Voltage 60Vdc	**A3:** Voltage Hall Effect Sensor (0~±5/0~±4V)		**X4:** 2DI+2DO		
	5V: Via Hall Effect Sensor (0-5V/0-4V), ratio settable			**X5:** 2DI+ ±15Vdc		
Ordering Example:	**AcuDC 243 - 300V - A1 - P1 - X1 - C - D**					
	AcuDC 243 - 1000V - A1 - P2 - C - D					

NEW ACUDC 240 EV CHARGER APPLICATION ORDER INFORMATION

Meter Model -	Shunt Options (Single Direction)
AcuDC 243-1000V-A1-P2-C-U	50A (0~75mV)
	100A (0~75mV)
	200A (0~75mV)
	300A (0~75mV)
	400A (0~75mV)
	500A (0~75mV)
	600A (0~75mV)
	1000A (0~75mV)
Ordering Example:	**AcuDC 243 - 1000V - A1 - P2 - C - U**
	AcuDC 243 - 1000V - A1 - P2 - C - U - 1000A

Accessories *(Optional)*	
USB-RS485:	USB-to-RS485 Converter
DC-DIN:	DIN Rail Mounting Accessory
Ordering Example:	**USB-RS485**

Note: When the input voltage is above 1000V, or the system design requires an isolation sensor, the voltage input can be selected as Hall Effect Sensor (0~5V). The voltage Hall Effect sensor output range requires 0~5V.

D. Glossary of Definitions

AWG: American Wire Gauge, is an U.S. standard of wire conductor sizes. The 'gauge' is related to the diameter of the wire. Larger 'gauge' means smaller diameter and thinner wire.

AO (Analog Output): is a measurable electrical signal with a defined range that is generated by a controller and sent to a controlled device. The AcuDC 240 series power meter can output analog voltage or analog current. When it outputs analog voltage, the range of voltage is from 0 to 5V or from 1 to 5V. When it outputs analog current, the range of current is from 0 to 20mA or from 4 to 20mA.

Baud Rate: Baud rate is the data transmission rate. In the AcuDC 240 series power meter, the Baud Rate is used to define the communication rate of RS485, which can be set as 1200, 2400, 4800, 9600, 19200 or 38400.

Charge: the flow of electric charge is called electric current. In the AcuDC 240 series power meter, the unit of charge is Ah (ampere hour), which equals to the charge transferred by a steady current of one ampere flowing for one hour

Import Charge: Charge that flows to the load from the grid or source

Export Charge: Charge that flows to the grid or source from the load

Total Charge: absolute sum of import charge and export charge

Net Charge: algebraic sum of import charge and export charge

DC: Direct Current is the electrical current which flows consistently in one direction.

DI counter: Digital Input counter for interfacing with devices that output pulses such as a gas meter.

EMC filter: is a passive electronic device (comprised of multiple components) for suppressing conducted interference found on any signal or power line to improve the immunity from EMI (Electromagnetic Interference) signals in the surrounding setting.

Energy: is the integration of power over a defined time increment, measured in unit of kWh (kilowatt hours). A kWh represents a constant load of 1000 watts for one hour. Almost all electric bills are based on energy, so energy is a very important measurement parameter.

Import Energy: energy that is consumed by the load from the grid or source.

Export Energy: energy that is absorbed by the grid or source from the load.

Total Energy: absolute sum of import energy and export energy

Net Energy: algebraic sum of import energy and export energy

Hall Effect Sensor: is a transducer that is used to measure current and voltage.

I/O (Input/Output) Module: is interface card where data is transferred to accomplish a function.

Parity: refers to a technique of checking whether data has been lost or written over when it is moved from one place in storage to another or when transmitted. Usually parity has odd parity, even parity or no parity. 'No parity' means it will not transmit or check a parity bit.

Power: is the rate at which electric energy is transferred by an electric circuit. Power is an instantaneous reading. Power = Voltage X Current, measured in unit of watts.

RO(Relay Output): A relay is an electrical switch that opens and closes under control of another electrical circuit. Existence of relays as outputs makes it easier to connect with external devices.

Shunt: is a device which allows electric current to pass around another point in the circuit by creating a low resistance path.

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TORONTO

MOD-TRONIC INSTRUMENTS LIMITED

1-800-794-5883

sales@mod-tronic.com

Pretoria, 0181, South Africa

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