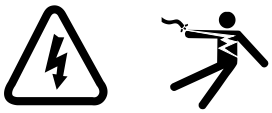
EasyLogic™ DM6000 Series Digital Meter
User Guide

NHA1696405-02
07/2015

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

SAFETY SYMBOLS



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

SAFETY MESSAGES

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **could result in** minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTICE

NOTICE is used to address practices not related to physical injury.

OTHER SYMBOLS

This symbol indicates direct and alternating currents.

This is the double insulation symbol which indicates that, the user-accessible area is protected throughout by double insulation or reinforced insulation.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

REACH Compliance

Complies with Regulation (EC) n° 1907/2006 of Dec 18 2006 named REACH (related to the Registration, Evaluation, Authorization and restrictions applicable to Chemical substances)

FCC Notices

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

This class A digital apparatus complies with Canadian CAN ICES-3 (A) /NMB-3(A).

Modifications: Modifications to this device which are not approved by Schneider Electric may void the authority granted to the user by the FCC to operate this equipment.

Chapter 1 – Product Description

The DM6000 series digital meters offer comprehensive basic volts, amps, and Hz measurements in a compact and rugged package.

This chapter contains the main operating instructions. The remaining chapters explain the installation and setup steps required before the meter is ready for use, and maintenance and troubleshooting procedures for the meter after installation.

The DM6000 series digital meter is a universal digital meter. Before use, please program the SYS (measurement system configuration), and the PT (VT) and CT ratios through the front panel keys. Otherwise, it will read your system incorrectly. Other settings, such as communication parameters, must also be programmed as needed.

Schneider Electric stands behind your DM6000 digital meter with complete user support and service.

Intended use: The DM6000 series digital meter is designed for use in industrial and commercial installations by trained and qualified professionals, not for domestic use

Physical Description

FRONT: The front panel has three rows of four digits / characters each, with auto scaling Kilo (K), Mega (M) and minus (-) indications. The **K** and **M** indicators are lit together to show Giga readings. The load bar graph to the right of the display gives the indication of consumption in terms of the % Amperes Load with respect to the FS (Full scale) selected. Five smart keys make navigating the parameters very quick and intuitive for viewing data and configuring the digital meters.

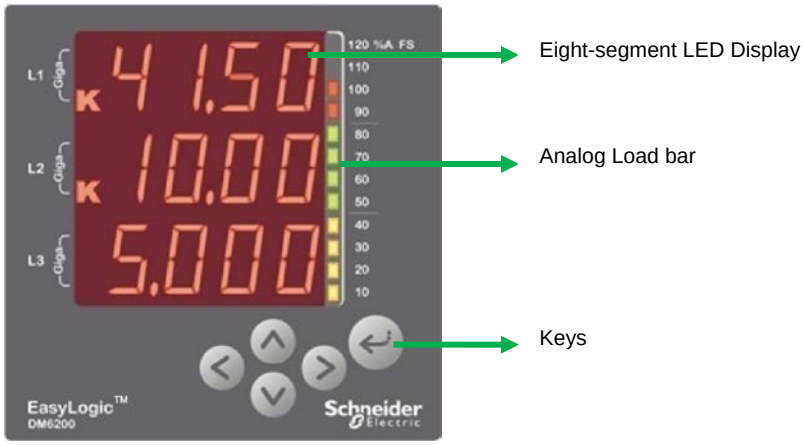
REAR: The voltage and current terminals and the RS-485 communication port are located on the back of the digital meter.
Refer to “Rear Panel” for more information.

Front Panel

The front panel contains the following indicators and controls:

- Three rows of alphanumeric displays, four digits each, that displays three RMS parameters simultaneously. The displayed readings update every second.
- For each row: Kilo, Mega (Kilo + Mega = Giga) indicators, and a Negative (-) indicators.
- Load bar, which gives a unique analog indication of % loading (% FS CT Pri).
- Five keys to scroll through the display page.

Figure 1-1: Parts of DM6000 series front panel



Eight-segment LED display

- The digital meter solves the problem of tiny cluttered indicators by prominently displaying the parameter name right on the large, alphanumeric readouts.
- For the first time in a panel meter, the parameter name is as clearly readable as the value.
- In order to know which parameter value is currently displayed, the digital meters display the parameter name for two seconds, as well as each time you press a key, and then the value for eight seconds.
- This method also allows programmable phase soft-Labels in the digital meters. You can choose from 123 (Factory setting), ABC, RYB, PQR or RST.

Analog Load Bar

- Unique indication of total load % with respect to the full scale through the 12 LEDs at the right side of the display.
- This is bar graph where each LED indicates 10% of load.
- To find the total load, count the number of illuminated LEDs, and then multiply by 10.

Table 1-1: Load percentage and bar graph indication

Load percentage	Bar graph display
Less than 10%	No LEDs are lit.
Between 10 to 40 %	Amber LEDs are lit.
Between 50 to 80%	Green LEDs are lit to indicate that the load is acceptable and should not increase further.
Above 80%	Red LEDs are lit to indicate that the load has exceeded the sanctioned limit and is dangerous.

The Indicators – Kilo, Mega, and Negative

Table 1-2: Indicators

	**Kilo:** When lit, indicates that the reading is in Kilo (10^3). 10,000 is displayed as 10.00 K and 1000 is displayed as 1.0 K.
	**Mega:** When lit, indicates that the reading is in Mega, (10^6). 10,000 K is displayed as 10.00 M and 1000 K is displayed as 1.0 M.
	**Giga:** When **Kilo** and **Mega** are lit together, the reading is in Giga (10^9). 10,000 M is displayed as 10.00 G and 1000 M is displayed as 1.0 G.
	**Negative:** When lit, indicates that the reading is **negative** as per IEEE 100 and industry standard practice.

Table 1-3: Giga, Mega (M), Kilo (K), and decimal point scaling

RMS Reading	Indicator
Less than 0.001	K, M OFF, displays **0.000**
Less than 9999	K, M OFF
Above 9999	K ON, M OFF
Above 9999 K	M ON, K OFF
Above 9999 M	Giga (K + M indicators ON)
Up to 9999 G	Giga
Above 9999 G	Display shows **Hi** for positive numbers, **Lo** for negative numbers

RMS readings are four digits and the maximum number the digital meter handles is 9,999 G for RMS values.

Smart Keys

Operating the digital meter is easy, using the five smart keys to navigate through the keypad operations table. The display pages **expand** as you go to the right, much like the directory or explorer **tree** displayed on any computer. The display shows where you are headed.

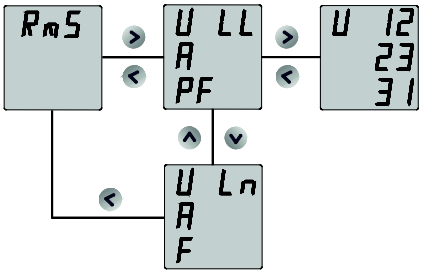
Table 1-4: Smart keys description

	**Right Key** • Go **forward** into sub-parameter pages. • Going right past **EDIT** in **SET** and **CLR** requires code entry to enter the Setup menu (setup and clear). • During setup, select **next** (right side) digit.
	**Left Key:** • Go **back** towards to the main parameter pages. • During setup, select **previous** (left side) digit. • Exits from Edit mode, back to the Setup menu. • The meter enters the SIM (simulation) mode, when you press left key continuously while power up the digital meter. See “SIM (simulation) mode” for more information.
	**Up Key:** • Scroll **up** through display pages at the same level, **within the same function.** • Continuous pressing for three seconds initiates **limited auto-scroll (within the same function).** See “Auto-scroll” for more information. • **While editing, increases** the value of the blinking digit during edit.
	**Down Key:** • Scroll **down** through other display pages at the same level, through **all functions**. • Continuous pressing for three seconds initiates **the full auto-scroll mode,** through all functions. See “Auto-scroll” for more information. • **While editing, decreases** the value of the blinking digit.
	**TURBO Key:** TURBO key provides you one-touch access to the most commonly used parameters pages (factory set). The TURBO pages for DM6000 series are given below. **RMS (home page),** VLL, A, PF VLN, A, F. **If you’re lost, use the TURBO key quickly to return to the RMS home page.** Continuous pressing for three seconds initiates auto-scrolling through the above TURBO pages. See “Auto-scroll” for more information. **During the power up, if the TURBO key is pressed, then the digital meter will go into Setup menu. This is the simplest way to enter into the setup menu.** **See “Quick setup – While powering on” in for more information.**

Keypad Operation
Navigating with the digital meters is very easy and intuitive. Press the key in the direction you want to go. The display shows where you're headed. Press the key that takes you in the desired direction.

Follow these simple steps:
- First take a quick look at what the keys do.

Navigation Concept



The following example explains how you can navigate from the **RMS** page to the **VLN A F** page, and back to the **RMS** in the digital meters.

1. From the **RMS** page, press . The display shows **VLL**
   A
   PF
2. Now press .The display shows **VLN**
   A
   F
3. To return to **RMS,** press .The display shows **RMS**.

Using the left key, you can go back towards to the main parameter pages from the sub-parameter pages.
- Now, try getting around to other parameters, by moving up, down, right and left. The readings are organized as display pages to the right of **RMS** and **INTG**.
- The **Kilo**, **Mega,** and **Negative** Indicators are automatic. **Kilo** and **Mega** light up together to show **Giga**. See "The Indicators" for more information.
- You cannot go right into CLR, to clear INTG values, unless you enter a code.
- Going right through **SET**, you can go down to **VIEW** or **EDIT**. Going right through **EDIT** requires code entry to program these digital meter settings. When done:
- Go left all the way back to **SET.**
- Go down to **CLR.**
- Go right into **RMS** to view the display pages again.

Auto-scroll

Auto-scroll allows you to monitor a group of display pages sequentially, every five seconds, without constant key pressing. This is convenient for viewing from a distance. The meter shows the parameter name (one second) followed by the value (four seconds) on the same large display.

- **To auto-scroll within a page group (e.g., Within RMS group)**

  Go to a particular page in the desired page group. Press  continuously for three seconds and then release. The display flashes **AUTO** and starts auto-scroll within the page group.

- **To auto-scroll down the entire column of pages**

  Go to the desired page. Press  continuously for three seconds and then release. The display flashes **AUTO** and starts auto-scroll down the entire column of pages.

- **To auto-scroll through TURBO pages**

  Press  continuously for three seconds and then release. The display flashes **AUTO** and starts auto-scroll through the TURBO pages.

NOTE: Press any key to revert to manual scrolling. Auto scrolling is not possible in the setup parameters.

Default Display (View) page

You can select any page as a **user-set** default display page. You can scroll to other display pages. The **user-set** page is displayed two minutes after manual scrolling is stopped by the user.

To lock user-set default page:

- Go to the page you want to set as the default page.
- Press  and  simultaneously to lock the page. The digital meter displays **LOCK**.

To unlock user-set default page:

- Once the default display page is active, press  and  simultaneously to unlock the page. The digital meter displays **ULOC**.

*NOTE: Entry into setup (PROG) is allowed only when the **display page** is unlocked.*

Rear Panel

The digital meter terminals are located on the rear panel. 14 terminals are provided, seven terminals on each side:

- Six terminals for current, one **in** and one **out** per phase
- Four terminals for voltage, for three phases and neutral
- Two terminals for auxiliary power supply (control power)
- Two terminals for the RS-485 communications port (DM6200)

Figure 1-2: Rear panel

Models and Parameters

The digital meter can measure, locally display, and remotely transfer over Modbus RTU protocol (DM6200), the following parameters:

Table 1-5: Models and Parameters

Parameter		DM6000	DM6200
RMS	VLL V12, V23, V31 VLN V1, V2, V3	✓	✓
	A A1 A2 A3	✓	✓
	An - Neutral current	✓	✓
	F	✓	✓
	%L – Amps	✓	✓
	% V Unbal, % A Unbal	✓	✓
	PF PF1 PF2 PF3	✓	✓
	%A FS Analog color-coded load bar	✓	✓
	RPM	✓	✓
	A° Phase Angle A°1 A°2 A°3	✓	✓
INTG FWD	ON hours	✓	✓
	INTR	✓	✓
	RS-485	-	✓

The DM6000 series displays:

- **Voltage:** Three voltage measurements line-to-line: 1-2, 2-3, 3-1 and average, three voltage measurements line-to-neutral: 1-4, 2-4, 3-4 and average.
- **Current:** Three current measurements phase-wise (1, 2, 3), average current of all three phases, neutral current and three current phase angles (A°1, A°2, A°3) with respect to the corresponding voltage line-neutral vector.
- **Phase wise load in %:** Three currents in % of the FS (%A FS).
- **Unbalanced load in %:** Current and voltage unbalance.
- **Frequency:** Measures from whichever phase is active.
- **RPM:** Measures the speed of the generator.
- **On hours, supply interruptions (Outages)**
- **% Amperes Load Bar graph:** Load bar graph indicates consumption in terms of %Amperes total. You can quickly estimate the load by viewing the display without operating any keys. The bar graph consists of 12 segments. Each segment indicates a current load of 10% of CT primary.
- **Kilo, Mega, Giga** indication for the above parameters. See “The Indicators” for more information.

Technical Specifications

The DM6000 series digital meter is high-accuracy, low cost, ultra-compact digital meter. It offers ISO 9001 quality, accuracy, and functional flexibility. Selective models of this series have Modbus RTU communications capability. The standard unit flush-mounts in a DIN 96 cut-out and conform to UL product standards.

The digital meters are designed for retrofit applications such as replacement of analog meters. Each can be used as a standalone meter in electrical control panels, power distribution units (PDU), switch boards; uninterrupted power supplies (UPS), generator sets, and Motor control centers (MCC) systems. It also provides easy communication to program logic controls (PLC), distributed control systems (DCS), building management systems (BMS), and other systems.
The following table gives the technical specifications of the digital meters. Refer to “Technical Data” for more information.

Table 1-6: Technical specifications

Description	Specification
Sensing/Measurement	True RMS, one second update time
Accuracy*	0.5 % of reading** for voltage and current
Auxiliary supply (control power)	44 to 277 Vac/dc 50/60 Hz
Burden	Voltage and Current input < 0.2 VA per phase Auxiliary supply (Control power) < 3 VA at 240 V, 5 VA Max < 2 W at 300 Vdc
Display	Alphanumeric bright LED
Resolution	RMS four digits ;INTG eight digits
Input voltage	Four voltage inputs (V1, V2, V3, VN) IEC: 80 to 480 V-LL (50 to 277 V-LN) CAT III 80 to 600 V-LL (50 to 350 V-LN) CAT II UL: 80 to 600 V-LL
Input current*	Current inputs (A1, A2, A3) Class 1.0: 50 mA to 6 A (5 mA is the starting)
Frequency	45 to 65 Hz
Overload	10 A max continuous, 50 A for 5 sec/hr, 120 A for 1 sec/hr
Environmental	Operating temperature: -10 ºC to 60 ºC (14 ºF to 140 ºF) Storage temperature: -25 ºC to 70 ºC (-13 ºF to 158 ºF) Humidity 5 to 95% non-condensing Altitude ≤ 2000m
Standards	CAT III - Measurement, Pollution Degree 2, ⧈ - Double insulation at user-accessible area
Weight	400 gms (0.9 lb) approx, unpacked 500 gms (1.1 lb) approx, shipping
Communication (DM6200)	RS-485 serial channel connection Industry standard Modbus RTU protocol
DM6000 Series conforms to	Emission : CISPR11 Class A Fast Transient: 4kV IEC 61000-4-4 Surge withstand: IEC 61000-4-5 Damped Oscillatory: IEC 61000-4-12 ESD: IEC 61000-4- 2 Impulse voltage: 6 kV, IEC 60060, 1.2/50 µs
IP degree of protection	Front Display: IP 51 Meter Body: IP 40 (excluding terminals)

NOTE:

- ** For 5 A universal energy meter, additional error of 0.05% of full scale for dual energy meter input current below 100 mA and for 1A it is below 20 mA.*
- *** Applicable only in star/wye wiring configuration.*

Chapter 2: Safety Precautions

This section contains important safety precautions that must be followed before attempting to install, service, or maintain electrical equipment. Carefully read and follow the safety precautions outlined below.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. In the USA, see NFPA 70E.
- Only qualified electrical workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- If the equipment is not used in a manner specified by the manufacturer, the protection provided by the equipment may be impaired.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back feeding.
- Turn off all power supplying the digital meter and the equipment in which it is installed before working on it.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Before closing all covers and doors, inspect the work area for tools and objects that may have been left inside the equipment.
- When removing or installing panels do not allow them to extend into the energized bus.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use the shorting block to short circuit the leads of the CT before removing the connection from the digital meter.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the digital meter is installed, disconnect all input and output wires to the digital meter. High voltage testing may damage electronic components contained in the digital meter.
- The digital meter should be installed in a suitable electrical enclosure.
- Do not exceed the device's ratings for maximum limits.
- Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit

Failure to follow these instructions will result in death or serious injury

Chapter 3: Quick Start Guide

Setup Menu

- The digital meter must be configured to match the application settings, before use. Otherwise, the readings will be wrong.
- All the setup values can be re-programmed at any time, using **SET** However, the settings: SYS (WYE (Star)/Delta/single-phase/2-phase), Vpri, Vsec, Apri, Asec critically determine the scaling of measured readings.
- The scaling may be used to reduce the errors in readings due to Instrument Transformer errors. However, wrong settings will introduce errors in readings of other running systems.

⚠ CAUTION

HAZARD OF UNINTENDED OPERATION
Only qualified personnel are authorized to set up the digital meter.

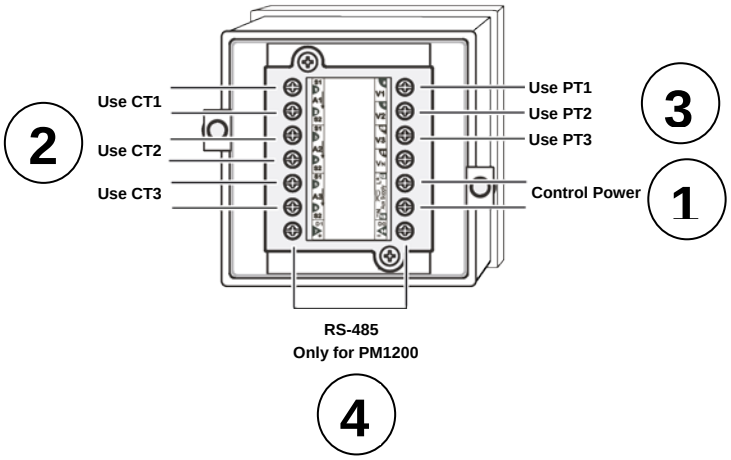
Failure to follow this instruction can result in injury or equipment damage.

You can enter the Setup menu in
- **View only mode**: To view the set parameters.
- **Edit mode**: To view or edit set parameters.

Quick setup – While powering ON

- This is the easiest way to enter the Setup menu.
- To make connections, see “Connection Diagrams”. Here are few tips.

Figure 3-1: Quick setup - connections



1. Connect auxiliary supply (control Power) 44 – 277 Vac/dc to terminals 12 and 13 in order to power ON the digital meter.
   - Keep  pressed for two seconds, while powering up the digital meter. The digital meter directly enters into the Setup menu and displays **EDIT A.PRI 100.0**.

   Program the following setup parameters for accurate readings.
   - A.pri, A.sec: Set these values to match your CT primary and secondary values. For example, if your CT Ratio is 200:5, set A.pri = 200.0 and A.sec = 5.000.
   - V.pri, V.sec
     - Set these values to match the input voltage VLL of circuit, if the input voltage < 480 Vac LL. For example, if input voltage = 300 Vac LL, set V.pri = 300.0 and V.sec = 300.0.
     - Use potential transformer (PT/VT), if the input voltage > 480 Vac LL. Set the V.pri and V.sec values to match the primary and secondary of the PT(VT) respectively. For example, if PT (VT) ratio is 11 kV: 110, set V.pri = 11.00 k and V.sec = 110.0.

   Select one of the following systems according to your wiring configuration:
   - SYS: DLTA for 3-phase 3-wire system
   - SYS: WYE/Star for 3-phase 4-wire system
   - SYS : 2-phase for 2-phase 3-wire system
   - SYS: single-phase for single-phase 2-wire system

2. Connect the current transformers (CTs).

CT1	CT2	CT3
1, 2	3, 4	5, 6

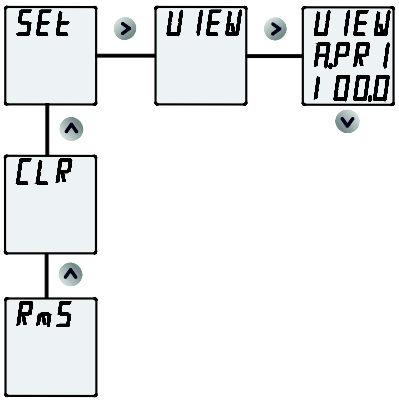
3. Connect the voltage inputs. Use PT(VT), if voltage exceeds 480 Vac LL.

PT1	PT2	PT3	Neutral
8	9	10	11

4. RS-485 terminals (DM6200).

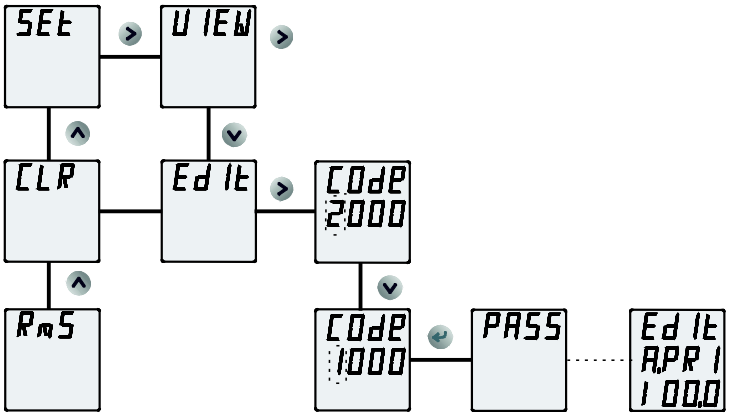
+ve	-ve
7	14

Enter Setup Menu in View (Read-Only) Mode



1. From RMS, press . The display shows **CLR.**
2. Press . The display shows **SET.**
3. Press . The display shows **VIEW.**
4. Press . Use and to scroll and view the setup parameters and their current settings.

Enter Setup Menu in Edit Mode

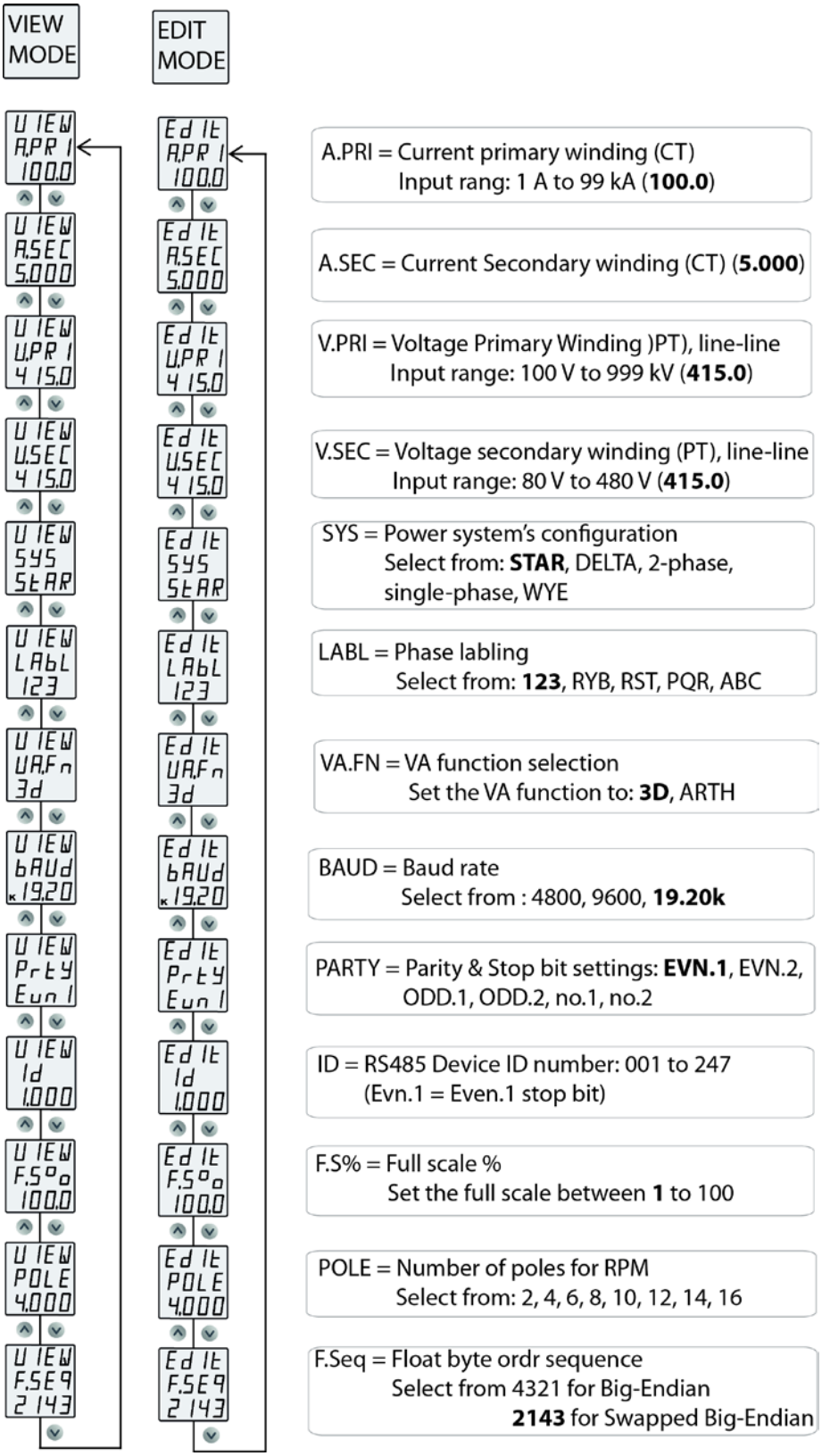


NOTE: means blinking
2 means blinking 2

1. From RMS, press . The display shows **CLR.**
2. Press . The display shows **SET**.
3. Press . The display shows **VIEW**.
4. Press . The display shows **EDIT**. CODE entry is required to enter the setup menu in edit mode.
5. Press for two seconds. The display shows **CODE 2000** with **2** blinking The factory set code is 1000.
6. Press . The display shows **CODE 1000** with **1** blinking.
7. Press once or four times to accept the new CODE value. The display shows **PASS** and then **EDIT A.PRI 100.0** indicating the successful entry to the setup menu in edit mode.

NOTE: If you enter a wrong code, the display flashes FAIL and then displays EDIT. Repeat the procedure and make sure that you enter correct code.

Setup Parameters in View and Edit Modes



NOTE:

- *Default setup values are given in BOLD.*
- *BAUD, PRTY, and ID are applicable only for DM6200.*

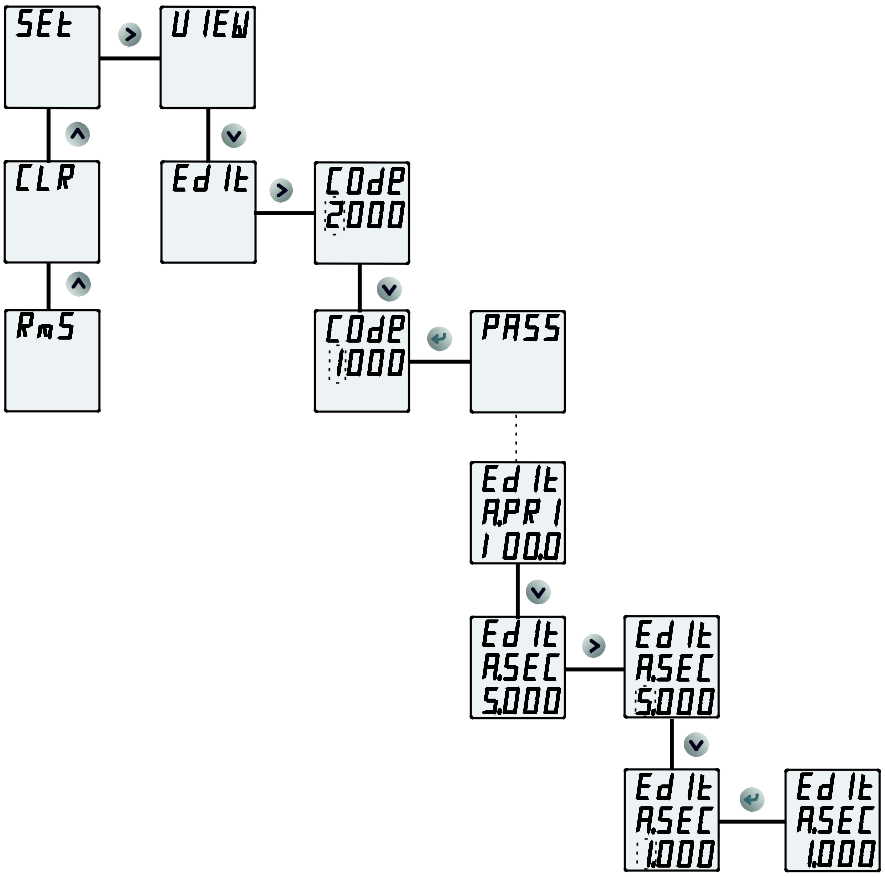
Edit Set Parameters

This example explains how to edit the value of A.SEC from **5.000** to **1.000** in the Setup menu of the digital meters.

For easy understanding, setup parameter editing is explained two parts: **edit and accept setup, and save the new value in the setup**.

NOTE: After entering into the setup, if there is no key press for > 2 minutes, the digital meter will exit from the setup automatically.

Edit and Accept Setup

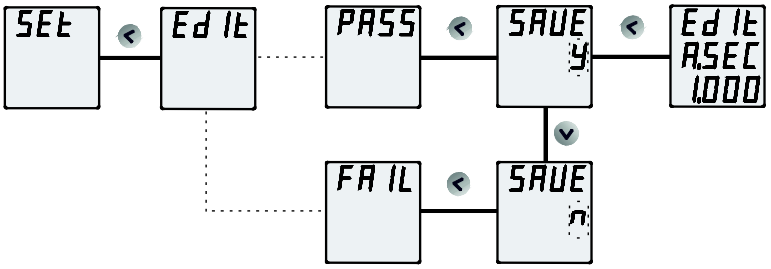


NOTE: *means blinking*
means blinking 2

1. After entering the setup menu in edit mode, (Refer to “Enter setup menu in Edit mode” for more information) press . The display shows **EDIT A.SEC 5.000**.
2. Press . The display shows **EDIT A.SEC 5.000** with blinking **5**. The value can be edited.
3. Press four times. The display shows **EDIT A.PRI 1.000** with blinking **1**.
4. Press to accept the new value.

To edit next parameter, press and repeat the above steps

Save the New Value in the Setup

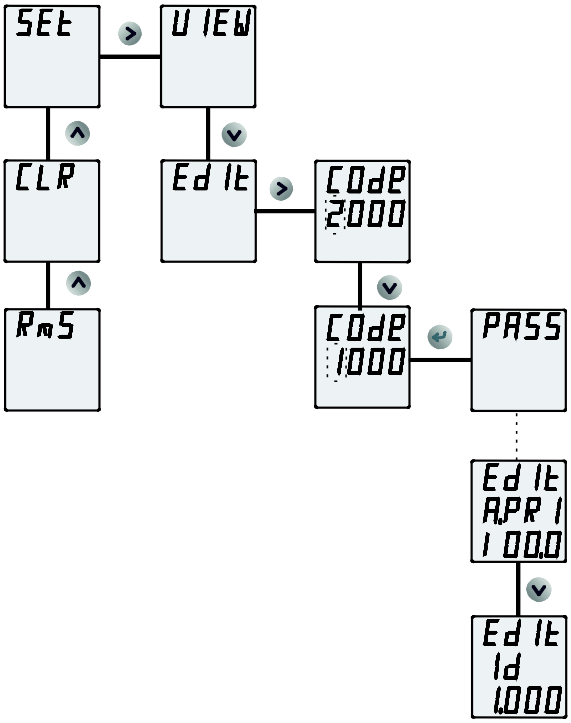


NOTE: y means blinking
y means blinking y

1. After you edit and accept the parameter as previously described, press . The display shows **SAVE y** with blinking **y.**
2. Press or to save the new value. The display flashes **PASS** and then shows **EDIT**.
3. Press to return to **SET**.

*NOTE: If you do not want to save the new value, press to change the value from **SAVE y** to **SAVE n** in step 1. Then press or . The display flashes **FAIL** and shows **EDIT**. Proceed to step 3.*

Edit ID



NOTE: y means blinking/editable
2 means blinking 2

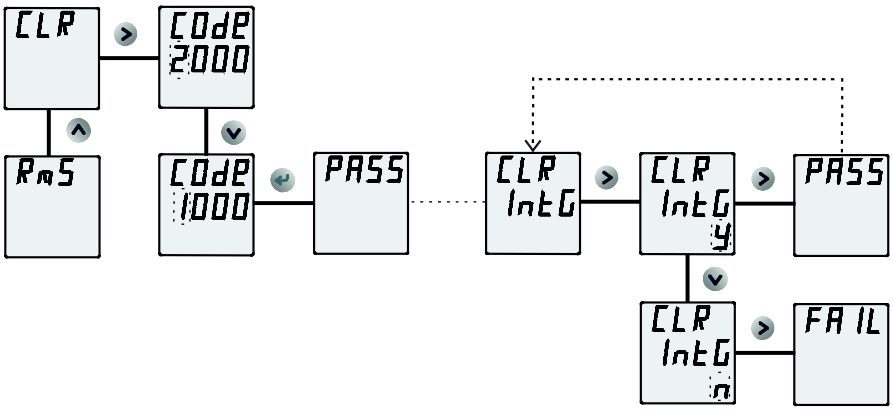
1. From **RMS**, press . The display shows **CLR.**
2. Press . The display shows **SET**.
3. Press . The display shows **VIEW**.

4. Press . The display shows **EDIT**.
5. Press for two seconds. The display shows **CODE 2000** with **2** blinking. The factory set **CODE** is **1000**.
6. Press . The display shows **CODE 1000** with **1** blinking.
7. Press once or four times to accept the new **CODE** value. The display shows **PASS** and then **EDIT A.PRI 100.0** indicating the successful entry to the setup menu in edit mode.
8. Press until the display shows **Edit ID 1.000** page. Press to set the desired **Edit ID** value. Press to view the **Edit ID** page set with the new values.

NOTE: If you enter a wrong code, the display flashes FAIL and then displays EDIT. Repeat the procedure and make sure that you enter correct code.

Clear INTG

The digital meters are equipped with Integrator INTG, where ON hours and INTR values are accumulated.



NOTE: means blinking
y means blinking y

1. From **RMS**, press . The display shows **CLR.** CODE entry is required to clear the **INTG** values.
2. Press for two seconds. The display shows **CODE 2000** with blinking **2.** The factory set CODE is 1000.
3. Press . The display shows **CODE** 1000 with blinking 1.
4. Press once or four times to accept the new value. After the successful **CODE** entry, the display shows **CLR INTG**.
5. In order to clear **INTG,** press . The display shows **CLR INTG y** with blinking **y**.
6. Press to clear **INTG**. The display flashes **PASS** and then **CLR INTG**.
7. Press . The display shows **CLR**.
8. Press to return to **RMS** page.

*NOTE: If you do not want to clear the integrators, press to change the value from **CLR INTG y** to **CLR INTG n** in step 5. Then press . The display flashes **FAIL** and shows **CLR INTG**. Proceed to step 7.*

Menu Hierarchy

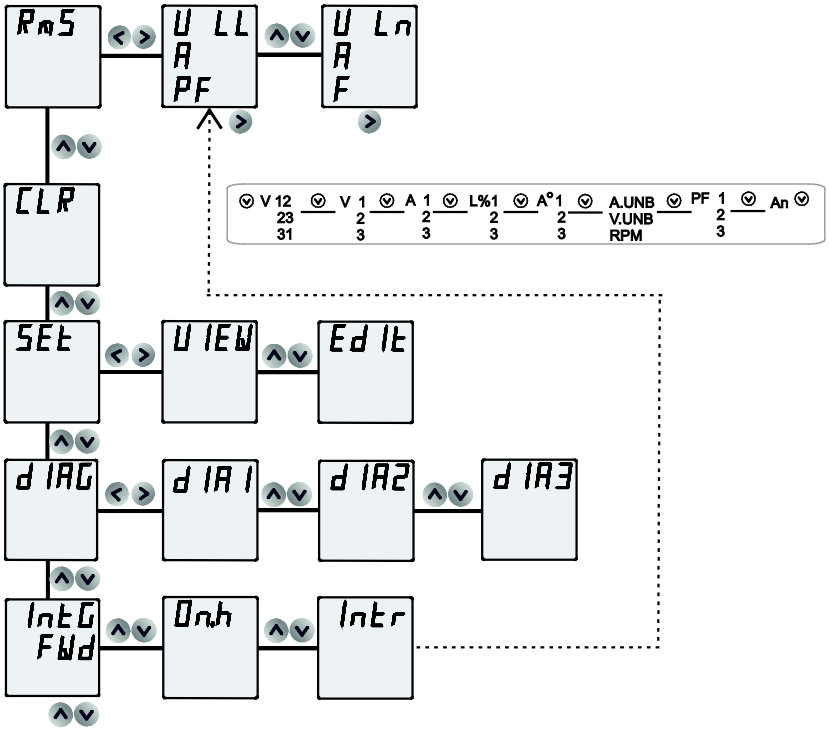


Table 3-1: Description of Parameters

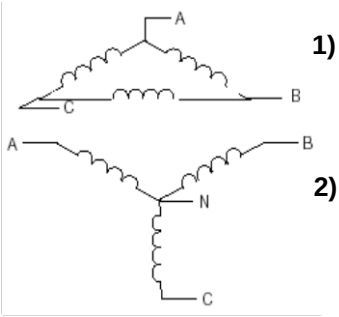
Parameters	Description
A	Current average of 3-Phases (**Amps**)
A1	RMS current, phase 1 (**Amps**)
A2	RMS current, phase 2 (**Amps**)
A3	RMS current, phase 3 (**Amps**)
A°1	Current phase angle, phase 1 in degrees
A°2	Current phase angle, phase 2 in degrees
A°3	Current phase angle, phase 3 in degrees
A%1	Current THD, phase 1 (**ATHD**)
A%2	Current THD, phase 2 (**ATHD**)
A%3	Current THD, phase 3 (**ATHD**)
An	Neutral current (**Amps**)
A.UNB	Current unbalance between 3-Phases
CLR	To clear integrators
DIAG	Diagnostics pages
Dia1	Communication settings
Dia2	Product model and version number
Dia3	Display scanning for display LED check
Edit	To edit parameter values
F	Frequency in Hz
FAIL	Confirms the unsuccessful completion of a command
INTR	No. of power interruptions
INTG. Fwd	Forward Integrator
L%1	% of load, phase 1
L%2	% of load, phase 2
L%3	% of load, phase 3
On.h	Duration of supply ON hours
PASS	Confirms the successful completion of a command
PF	Power Factor average of 3-Phases
PF1	Power Factor, phase 1
PF2	Power Factor, phase 2
PF3	Power Factor, phase 3
RMS	Root Mean Square
RPM	Revolution Per Minute of the motor
Set	To edit set parameter values
V1	RMS Voltage, phase 1 to neutral (**Volts**)
V2	RMS Voltage, phase 2 to neutral (**Volts**)
V3	RMS Voltage, phase 3 to neutral (**Volts**)
V12	RMS Voltage, phase 12 (**Volts**)
V23	RMS Voltage, phase 23 (**Volts**)
V31	RMS Voltage, phase 31 (**Volts**)
View	To view set parameter values
VLL	Phase-phase voltage average (**Volts**)
VLN	Phase-neutral voltage average (**Volts**)
V.UNB	Voltage unbalance between 3-Phases

Chapter 4: AC Power Measurement

3-Phase Systems

A 3-phase system delivers higher levels of power for industrial and commercial applications. The three phases correspond to three potential lines. A 120° phase shift exists between the three potential lines.
A typical configuration has either a Delta connection or a Wye (Star) connection

In a 3-phase system, the voltage levels between the phases and the neutral are ideally defined by V1 = V2 = V3 = V12 / √3 = V23 / √3 = V31 / √3. In practice, there will be some unbalance (difference).

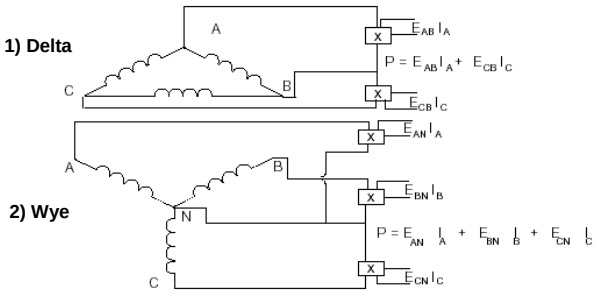


1) Delta

2) Wye

Voltages between the phases vary, depending on loading factors and the quality of distribution transformers.

Power measurement in a poly-phase system is governed by Blondel's Theorem. Blondel's theorem states that, in a power distribution network, which has N conductors, the number of measurement elements required to determine power is N-1. A typical configuration of a poly-phase system has either a Delta connection or a Wye (Star) connection (see Figure below).



Where E_{AB}= Voltage across points A and B
E_{CB}= Voltage across points C and B
E_{AN}= Voltage across points A and N (Neutral)
E_{BN}= Voltage across points B and N (Neutral)
E_{CN}= Voltage across points C and N (Neutral)
I_A = Current through conductor A
I_B = Current through conductor B
I_C = Current through conductor C

Poor Power Factor

Poor power factor: Results in reactive power consumption. Transferring reactive power over a distribution network causes energy loss. To force consumers to correct their power factor, utilities monitor reactive power consumption and penalize the user for poor power factor.

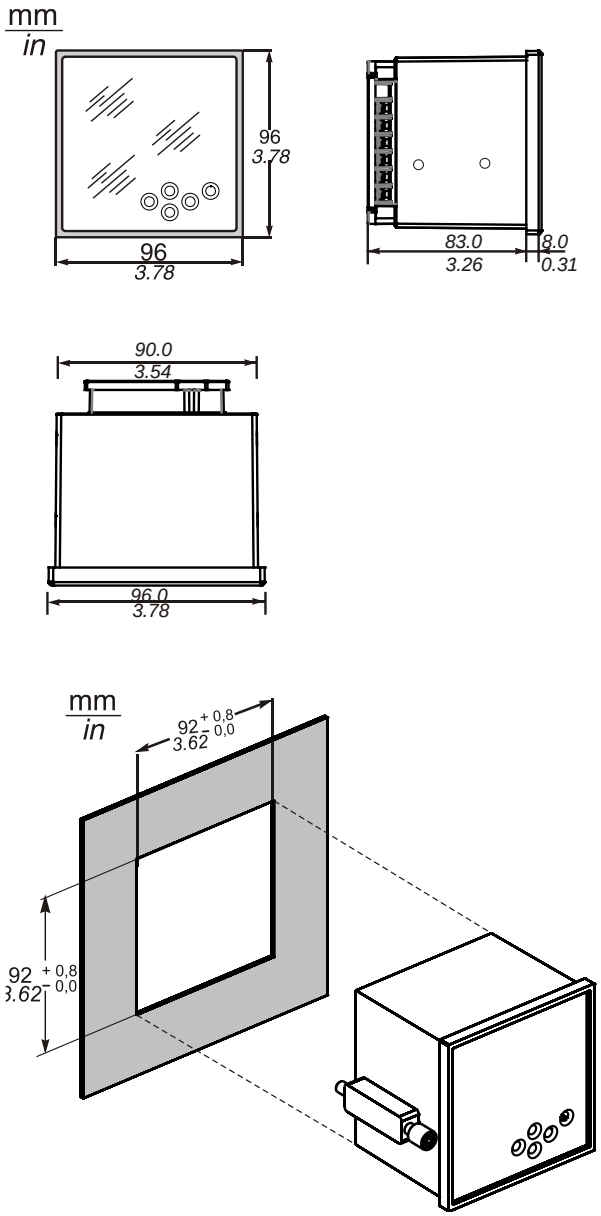
Chapter 5: Installation

Mechanical Installation

The DM6000 series digital meters are panel-mounted and have reliable, rear-mounted terminal strips rated at 480 V.
The 92 x 92 mm (3.62 x 3.62 in.) cut-out and 96 x 96 mm (3.78 x 3.78 in.) bezel dimensions adhere to IEC 61554 and DIN 43700.

The diagram below displays the various dimensions of mechanical installations.

Figure 5-1: Mechanical dimensions and recommended panel cut-out



Installation Procedure

Usage

First, decide how the digital meter is to be used. If you do not already have an energy management program in operation, then your energy consultant should be able to help you identify which load(s) offer maximum savings potential. This will help you decide which point is to be monitored, where the readings will be viewed from, who must have access to the instrument, and how often. Otherwise, decide the location of the digital meter and install it. For best performance, choose a location that provides all the required signals with minimum wiring lengths.

Panel Considerations and Environment

The digital meter is a high-precision measuring instrument, and its operating environment is of utmost importance. For maximum performance, the instrument should be mounted in a dry, dust-free location, away from heat sources and strong electromagnetic fields. To operate reliably, the following conditions must be met:

Table 5-1: Environmental Conditions

Description	Specification
Storage Temperature	-25 °C to 70 °C, (-13 °F to 158 °F)
Operating Temperature	-10 °C to 60 °C, (14 °F to 140 °F)
Relative Humidity	5% to 95%, non-condensing
Altitude	≤ 2000m

The digital meter should be separated from other equipment, and sufficient space must be provided all around, for cooling air to rise vertically past the instrument. The cooling air temperature must be below the specified operating temperature.

The panel or housing, in which the digital meter is mounted, should protect it from dust, moisture, oil, corrosive vapors, etc.

The panel doors must be easily opened to provide easy access to the digital meter wiring for troubleshooting. Allow clearance if the unit is going to swing out, as well as adequate slack in the wiring. Allow space for terminal blocks, CT shorting blocks, fuses, auxiliary contactors, and other necessary components.

Viewing

For ease of operation, the location should be preferably at, or slightly above, eye level. For viewing comfort, minimize glare and reflections from strong light sources.

Mounting

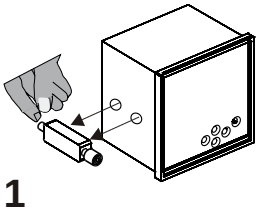
The digital meters are panel mountable.

Table 5-2: Mounting

Description	Specification
Panel cut-out	$92^{+0.5}_{-0}$ mm (w) x $92^{+0.5}_{-0}$ mm(h) ($3.62^{+0.02}$ x $3.62^{+0.02}$ in.) IEC 61554 and DIN 43700
Panel thickness	0.5 to 4.0 mm (0.02 to 0.16 in.)
Instrumental bezel dimension	96 x 96 mm (3.78 x 3.78 in.)
Depth behind bezel	83 mm (3.26 in.)
Mounting clamps screws	Two in numbers, Slotted
Terminal screws	Combination Phillips and Slotted head

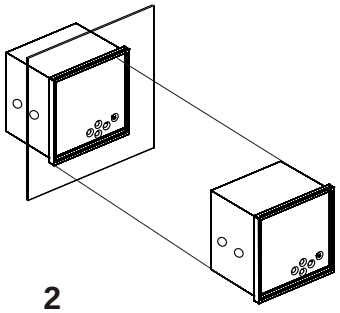
The cut-out should be punched with the proper tool and should be free from burrs. The following figure explains the mounting of the digital meter.

Figure 5-2: Mounting



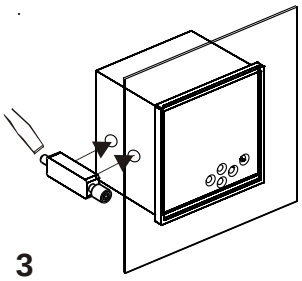
1

Remove the mounting clamps from the digital meter.



2

Gently slide the digital meter through the cut-out.



3

Put the mounting clamps back in the digital meter and tighten the mounting clamps screws.

While supporting the digital meter from the front, tighten both side clamp screws in a criss-cross pattern till all slack is taken up and then apply one full turn. Do not over-tighten. Over-tightening could result in breaking of the clamps.

The digital meters should be separated from other equipment, and sufficient space must be provided all around the digital meter, to allow air to rise vertically around the digital meter. Lack of sufficient air for cooling may result in overheating of the digital meters.

NOTE: It is much easier to set up the meter before you mount the meter on the panel. See "Quick Setup" for more information.

Electrical Installation

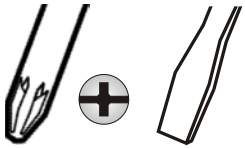
This section describes the following:

- The need for, and selection of, potential transformers (PTs) and current transformers (CTs).
- Auxiliary supply (control power), PT (VT), and CT Connections.

NOTICE
DAMAGE TO THE DEVICE • Use only the specified tool for tightening and loosening the screw • Do not over-torque the screw above the specified range **Failure to follow these instructions can result in equipment damage.**

For best results, ensure the following specifications:

- Torque driver preferred, hand screwdriver OK.
- TIP: Phillips head is preferred, but flat head is acceptable. Do not use Pozidriv tips.



M3.5 screw; screw head diameter = 6 mm (0.24 in.)
TIP shaft diameter < 5 mm (0.2 in.)

IMPORTANT: Screwdriver shafts inserted angularly or of diameter ≥ 5 mm (0.2 in.) will get stuck in the cover.
Tightening Torque: 0.25 to 1 N.m (2.21 to 8.85 lb-in)

NOTE: If the torque is more than 1 N.m (8.85 lb-in), then it may damage the screw or the screw head.

Loosening Torque: 1.2 N.m (10.62 lb-in)

Connecting Cable Recommendations

Table 5-3: Connecting cable

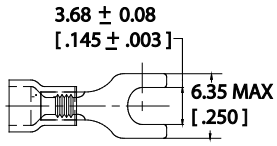
	Insulation Rating	Current Rating
Voltage Circuit	> 600 VAC	> 0.1 A
Current Circuit		> 7.5 A (1.5-2.5 mm^2 /16-14 AWG)

NOTE: Installations should include a disconnecting device, like a switch or circuit breaker, with clear ON/OFF markings to turn-off the auxiliary supply (control power). The disconnecting device should be placed within the reach of the equipment and the operator.

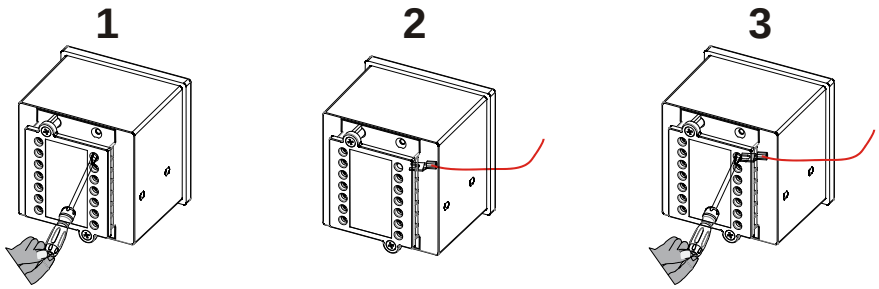
Terminal connections using lugs

Terminal connection using U lugs

Lug type: Insulated sleeved U lugs
Cross-section: 1.5-2.5 mm^2 /16-14 AWG



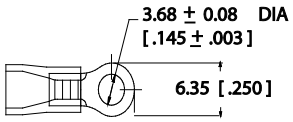
It is very simple and easy to connect the terminals using the U lugs. The following steps explain how to connect the digital meter terminals using U lugs.



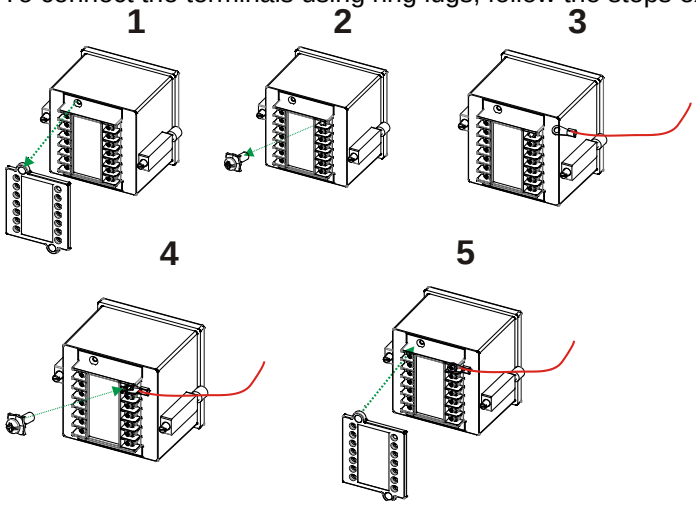
1. Loosen the terminal screw.
2. Connect the wire with the U lug to the digital meter terminal.
3. Tighten the terminal screw.

Terminal connections using ring lugs

Lug type: Ring lugs
Cross-section: 1.5-2.5 mm^2 /16-14 AWG



To connect the terminals using ring lugs, follow the steps explained below.



1. Remove the protective cover from the digital meter.
2. Remove the terminal screw from the digital meter.
3. Connect the wire with the ring lug to the digital meter terminal.
4. Place the terminal screw back in the terminal and tighten the terminal screw.
5. Place the protective cover back and tighten the protective cover.

NOTE: The above example explains connection for only one terminal. In order to connect the other terminals, repeat the steps 2 and 3 for as many numbers of terminals. Then proceed to the remaining steps.

Auxiliary Supply (Control Power)

The DM6000 series digital meter requires a single-phase AC/DC auxiliary (control) power supply to power up its internal electronic circuitry. External surge suppressors are necessary in the auxiliary supply circuit for proper operation during extreme surge conditions, where voltage surges exceed the auxiliary supply limits (e.g., rural areas and outlying areas prone to lightning strikes).

Range:

- 44 to 277 Vac/dc.
- Burden (load) < 3 VA at 240 V, 5 VA Max.
- The control power may be derived from the voltage signals.
- If you have a 440 V 3-wire delta system, and a reliable neutral is not available, use a 440 V: 240 V supply transformer to provide the standard 240 V auxiliary supply.

NOTE: It is much easier to set up the meter before you mount the meter on the panel. See "Quick Setup" for more information.

PTs (VTs) and CTs

Large electrical installations have high voltages and currents, which may exceed the direct connection rating of the digital meter. In this case, potential transformers (PTs) and current transformers (CTs) are used to precisely **step down** or reduce the voltage and current levels to suit the digital meter rating. Potential transformers usually have a full scale output of 110 Vac RMS line-line and current transformers usually have a full scale output of 5 A or sometimes 1 A.

The PTs (VTs) and CTs must be planned, installed, and tested by a qualified electrical contractor before wiring the digital meter. The accuracy of the measurement also depends on the accuracy and phase angle error of the PTs (VTs) and CTs. Instrument class 1 or better PTs and CTs are recommended. Do not use protection class (10P10, etc.) CTs to feed the digital meters; they have poor accuracy and phase characteristics.

Ensure that the CT primary rating has been selected so that your normal load variation lies between 40% and 80% of its full scale. If your CT is over-rated, if the load is always less than 10% of the CT primary rating, accuracy suffers. On the other hand, if the CT is under-rated, you may exceed its full scale and burn out both the CT and the digital meter.

PT (VT), CT Wiring

The PTs (VTs) and CTs must have adequate VA rating to support the burden (loading) on the secondaries. You may want to support the auxiliary supply burden from one of the PTs (VTs). CT wiring can impose additional burden (loading) on the CT. For example, if the CT has a 5 A secondary and the wire resistance is 1.0 Ω, then the CT has to support an additional burden

of 5 VA. If the wiring distance from the CT secondary is greater than stated in Table 5-5, then the CT could get over-burdened and give large errors. Choosing a 1 A CT secondary can reduce this error. The CT secondary value must be user programmed into the digital meter.

The digital meters should be conveniently located for easy connections of voltage (PT), current (CT) signals, and auxiliary (control) supply.

NOTE: The digital meters user programmable PT and CT primary or secondary settings may be utilized to calibrate out the PT and CT amplitude error, for improved accuracy.

Voltage Signal Connections

For proper digital meter operation, the voltage connection must be maintained. The voltage must correspond to the correct terminal. The cable required to terminate the voltage sense circuit should have an insulation rating greater than 480 Vac and a current rating greater than 0.1 A. There are four input voltage terminals marked V1, V2, V3 and Vn. See the "Connection Diagrams" that follow, for details. For Delta connection, the Vn terminal should be left unconnected.

PT Connections

The digital meters directly accept LV voltage inputs of up to 480 Vac RMS line-to-line (277 VLN). Voltages greater than this, typically HV systems, must be connected through potential transformers (PTs). The digital meters allow user programming of both PT primary and secondary voltages.

- User programmable PT primary range: 0.1 to 999 kVac RMS LL
- User programmable PT secondary range: 80 to 481 Vac RMS LL
- Digital meters voltage input burden: 0.2 VA per input

NOTE: The PT primary and secondary values must be user programmed before using the digital meter. Otherwise, the readings will be wrong.

Selecting the voltage fuses

We strongly recommend using fuses on each of the sense voltages (except for neutral) and the control / auxiliary power.

Table 5-4: Fuse recommendation

Power Source	Source voltage	Fuse (A)
Line voltage	80 to 480 VLL	0.25
Auxiliary supply (Control power)	44 to 300 VAC/DC	0.25

Current Signal Connections

The digital meter accepts up to 6 A AC RMS per channel directly. Above that, a current transformer must be interposed to scale down the current. There are three pairs of current input terminals marked A1, A2, and A3. Each pair of input terminals is labeled as (S1, S2) and has an arrow indicating the direction of current flow. For proper measurements, the phase identification and the polarity of the current signals must be correct. The forward flow (import by consumer) current direction must be into the S1 terminal and the exit from the S2 terminal. Maintain the correct sequence and polarity to avoid wrong readings.

Any unused current input terminals must be shorted together, e.g., in Delta connection, the terminals A2 (S1, S2) must be shorted together. The shorted terminals do not need to be grounded.

The wiring used for the current inputs should have an insulation rating greater than 480 Vac. The cable connection should be rated for 7.5 A or greater and have a cross-sectional area of 1.5-2.5 mm^2 /16-14 AWG minimum.

CT Connections

Mount the current transformers (CTs) as close as possible to the digital meter for best accuracy. The following table illustrates the maximum recommended distances for various CT sizes, assuming the connection is via 1.5-2.5 mm^2 /16-14 AWG cable.

Table: 5-5: CT size and maximum distance

5 A CT size	Maximum Distance in meters (in feet/inch) (CT to DM6000 Digital meter)
2.5 VA	3.05 m (10 ft/ 120 in.)
5.0 VA	4.6 m (15 ft/ 181 in.)
7.5 VA	9.15 m (30 ft/ 360 in.)
10.0 VA	12.2 m (40 ft/ 480 in.)
15.0 VA	18.3 m (60 ft/ 720 in.)
30.0 VA	36.6 m (120 ft/ 1441 in.)

- User programmable CT primary range: 1 A to 99 kA AC.
- CT secondary: 1 A or 5 A AC (programmable)
  Other values are also programmable to compensate CT errors if desired.
- Digital meters CT burden: 0.2 VA maximum per input.

See the “Setup Menu” for more information.

NOTE:
The PT primary and secondary values must be user programmed before using the digital meter. Otherwise, the readings will be wrong.
With dual-range CTs; select the best range for programming the digital meter. If you change the range thereafter without re-programming the digital meter, the digital meter will display erroneous values.

CT Polarity

When the digital meter is connected using the CTs, you must maintain correct CT polarities. CT polarities are dependent upon correct connections of CT leads, and upon the direction the CTs are facing when clamped around conductors. The dot on the CT must face the line side; the corresponding secondary connection must connect to the appropriate input on the digital meter.

Setup — System Type

The digital meter needs to know the type of system to which it is connected. This information is programmed in the setup procedure, before using the digital meter. The digital meter does allow you to change this setting while it is running; however, this capability is meant for correcting a gross error, or for training or educational purposes; it is not to be changed on regular basis. The options are:

- **Wye/Star:** For 3-phase 4-wire, **three watt-meter** or **three element** circuits. Here, all three voltage phase signals, the neutral voltage connection, and all three current input signals need to be wired in. This means all the four voltage terminals, and six current terminals described in the following section, need to be wired. For Wye/Star wiring configuration, see “3-phase 4-wire WYE connection with 3 CTs and 3 PTs” for more information.
- **Delta:** For 3-phase 3-wire, **two watt-meter** or **two element** circuits. For delta and open delta wiring configuration, see “3-phase 3-wire Delta connection with 3 CTs and 3 PTs” and “3-phase 3-wire open delta connection with 3 CTs and 2 PTs” for more information.
- **2-Phase:** For 2-phase 3-wire, **two watt-meter** or **two element** circuits. Here, all two voltage phase signals, the neutral voltage connection, and all two current input signals need to be wired in. This means all the three voltage terminals, and four current terminals described in the following section, need to be wired. For two phase wiring configuration, see “2-phase 3-wire connection with 2 CTs” for more information.
- **Single-phase:** For single-phase 2-wire, **one watt-meter** or **one element** circuits. Here a single voltage phase signal, the neutral voltage connection, and a single current input signal need to be wired in, means the two voltage terminals, and one current terminal described in the following section need to be wired. For single-phase wiring configuration, see “Single-phase connection with 1 CT” for more information.

Phase Labels

The phase labels shown on the display are programmable via the digital meter's front panel Setup menu. You can set up the meter to display phase labels convenient to your practice. The choices available are: 123 (factory set), RYB, RST, PQR, ABC.

Connection Diagrams

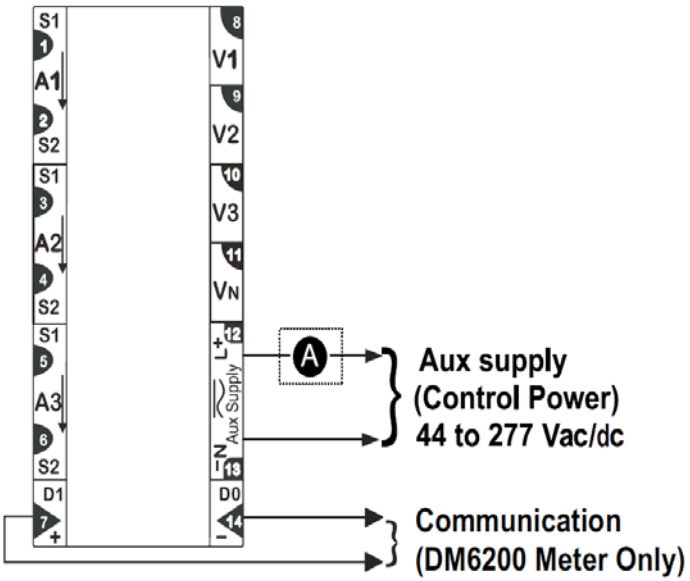
Choose the diagram below that best describes your application. You must ensure that the CT phase and corresponding PT phase are identical and that the CT polarity is correct. Follow the outlined procedure to verify correct connection.

Connection Diagram Symbols

Table 5-6: Connection diagrams symbols

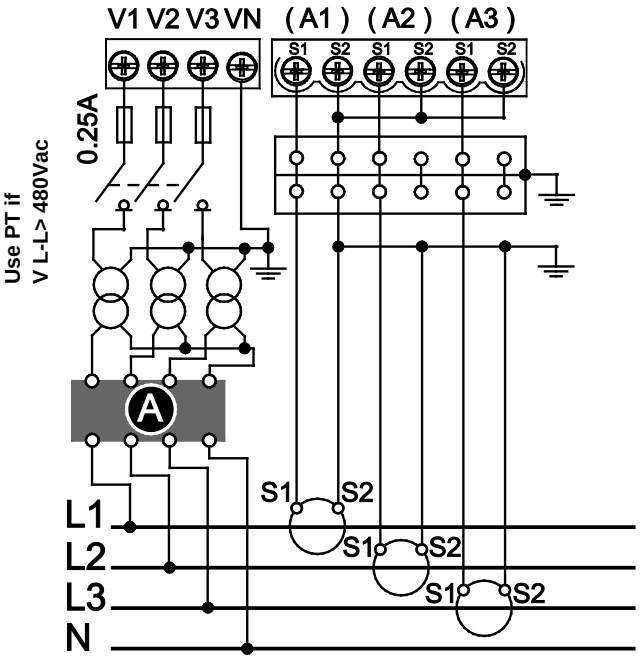
Symbol	Description
	Fuse
	Current transformer
	Shorting block
	Potential transformer
	Protection (to be adapted to suit the short-circuit current at the connection point)

Figure 5-3: Terminal Block Label



3-phase 4-wire WYE connection with 3 CTs and 3 PTs
Direct voltage connections for the input voltages L-L up to 480 Vac.

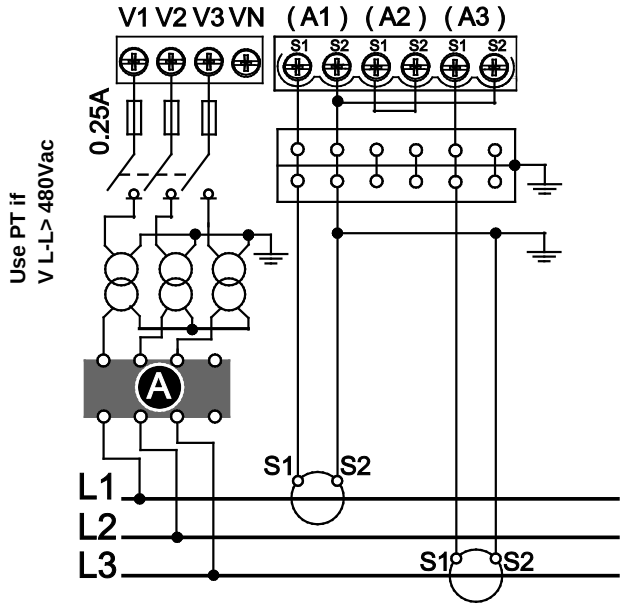
Figure 5-4: 3-phase 4-wire WYE connection



NOTE:
Make sure WYE/Star is programmed in the digital meter Setup menu.
For High-leg (US connection)
L1 – N = 120 V
L2 – N = 208 V
L3 – N = 120 V

3-phase 3-wire delta connection with 2 CTs and 3 PTs
Direct voltage connections for the input voltages L-L up to 480 Vac.

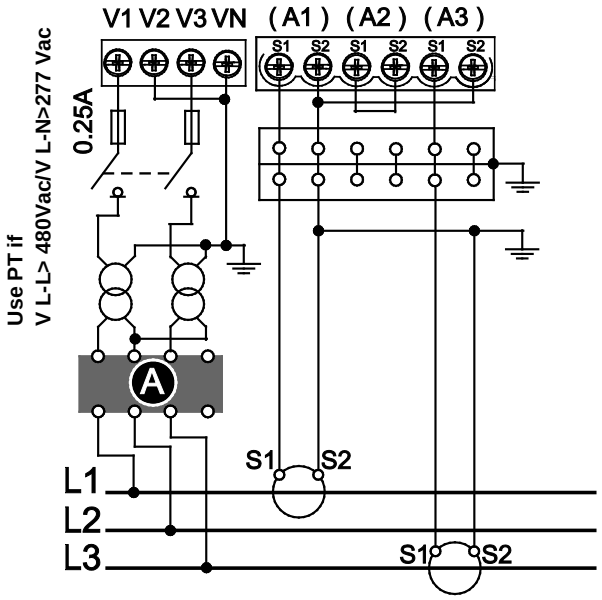
Figure 5-5: 3-phase 3-wire delta connection



NOTE: Make sure Delta is programmed in the digital meter Setup menu. Leave the Vn terminal disconnected.

3-phase 3-wire open delta connection with 2 CTs and 2 PTs
Direct voltage connections for the input voltages L-L up to 480 Vac.

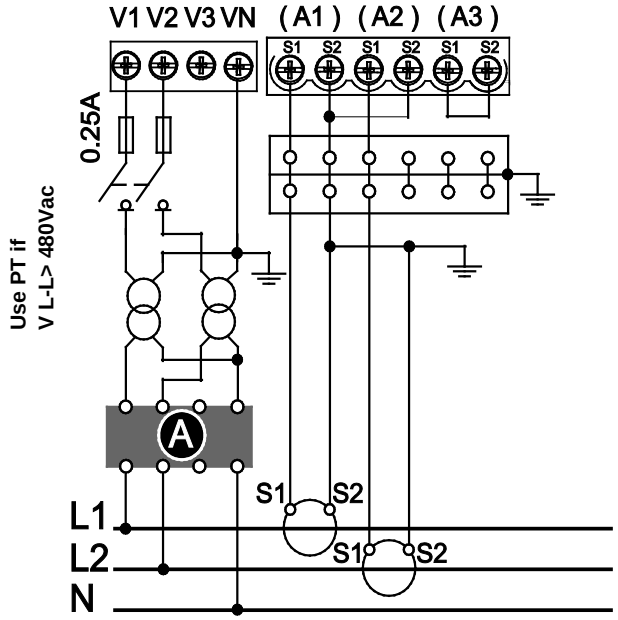
Figure 5-6: 3-phase 3-wire open delta connection



NOTE: Make sure Delta is programmed in the digital meter Setup menu.

2-phase 3-wire connection with 2 CTs
Direct voltage connections for the input voltages L-L up to 480 Vac.

Figure 5-7: 2-phase 3-wire connection



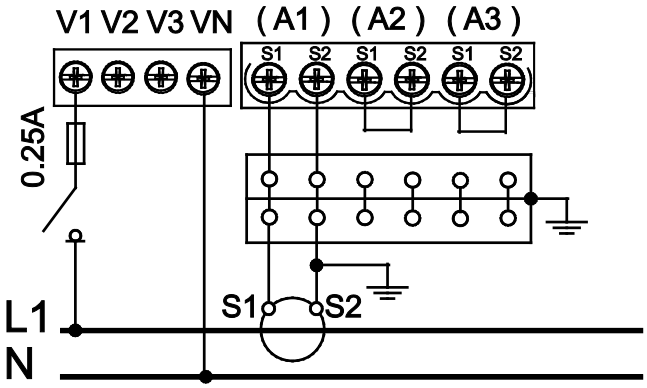
NOTE: Make sure 2-Phase is programmed in the digital meter Setup menu.

Single-phase connection with 1 CT

Direct voltage connections for the input voltages L-L up to 480 Vac. Otherwise, use one PT.

1. Program the digital meter in single-phase mode.
   However, voltages primary and secondary need to be programmed as Line to Line.
2. Connect the voltage and current inputs only to the V1 and A1 voltage and current terminals of the digital meter.
3. The unused current terminals (A2 and A3) must be shorted together to reduce noise picked up in the digital meter.

Figure 5-8: Single-phase connection



Chapter 6: Data Communication

This section is applicable only for DM6200 digital meter.

Float Byte Register

Float Byte Characteristics:

- Block wise access.
- If Read and Write values are matching, then it means the float byte sequence is in sync with the master.
- The float byte number is fixed.

Table 6-1: Float Byte Test Sequence Register

Addr: 320-321 (2 registers)	Data Type	Description	Property
4030201.0	Float	Before starting the communication, you must write this number and read.	Normal Read and Write.

NOTE:

- *If any other write value is given as input other than the mentioned write value in the above table, then the meter will give a data exception response.*
- *If you do not want the default value, you can always set the desired values in the Edit page.*

Health Check Register

Health Check Register Characteristics:

- Normal Read Only.
- 16bit UNIT.
- Identifies the meter existence in the network.

Table 6-2: Health Check Register

Addr: 0304 (1 register)	Data Type	Description	Property
Model Type	UNIT16	To identify the meter presence in the network.	Normal Read.

Float Byte Order Detection

Float Byte Order Detection Characteristics:

- Normal Read Only.
- 16bit UNIT.
- Identifies the float byte order in the meter.

Table 6-3: Float Byte Order Detection

Addr: 0306 (1 register)	Data Type	Description	Property
Model Type	UNIT16	To identify the float byte order in the meter.	Normal Read.

RS-485 Data Port

Data Port Advantages:

- Rapid, on-line, real time readings into:
- Your own SCADA software or PLC.
- Schneider Electric Energy Management software products such as Vijeo Citect, PowerLogic SCADA for pinpointing the energy usage and waste.
- It supports ION™ enterprise.
- Data port has built-in impedance matched design for low reflectance on long data cables at high Baud rates. Eliminates need for complicated impedance matching resistors at the ends of long data cables.
- Fast 16 ms digital meter response, average time to read 10 parameters is 90 to 100 ms (9600 Baud, Even parity, One stop bit).
- Direct readings, pre-scaled float readings. Accurate, full precision low and high readings. No need for additional scaling factors or decimal adjustment.
- Fast, easy-to-use grouping of parameters tuned for field requirements.
- TURBO area for single point polling (upto 50 per query)
- Block area for even faster access to pre-configured data blocks

Installation

Figure 6-1: 2-wire half duplex communication connection

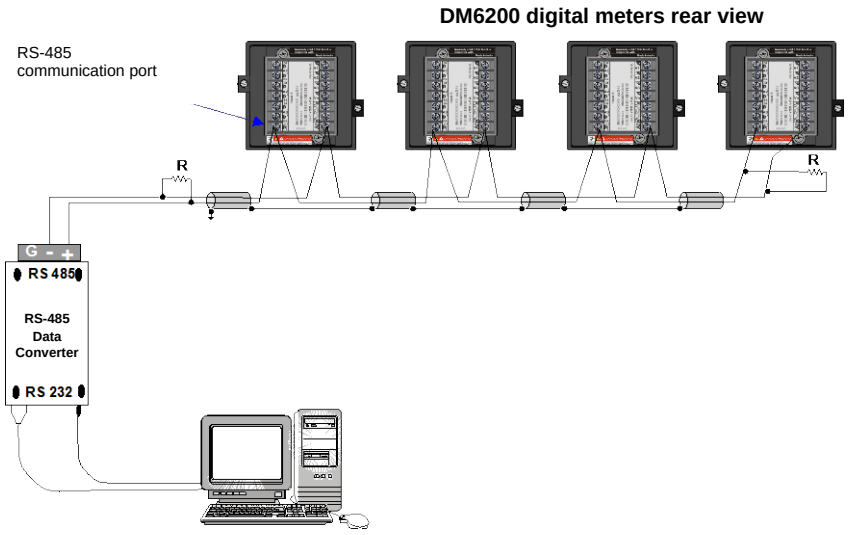
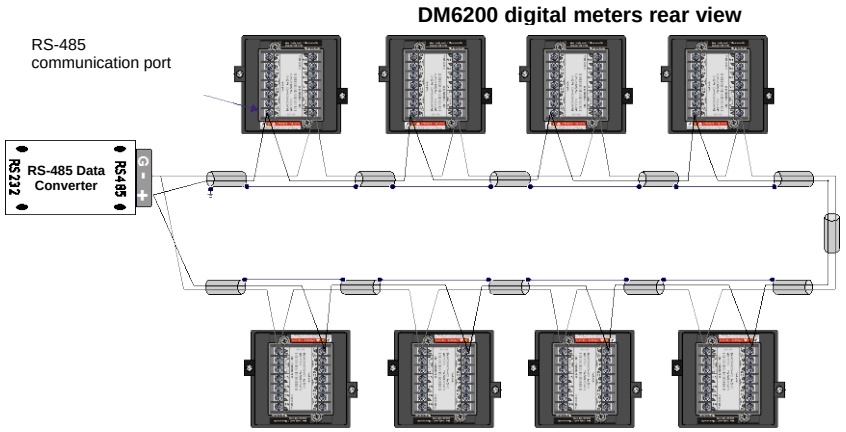


Figure 6-2: closed loop, 2-wire half duplex
Advantage — Reliable communications, tolerant to one break in the cable.



Communication Capabilities

Table 6-4: RS-485 Communication Distances

Baud Rate	Maximum communication distances 1 to 32 devices
	Meters (Typical with Belden 3105A cables)
9600	1200
19200	900

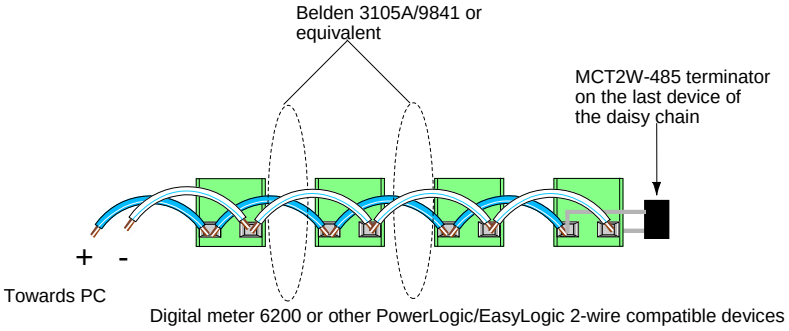
NOTE: Distances listed should be used as guide only and cannot be guaranteed for non-EasyLogic devices. Above distances subject to vary based on the quality of the cable.

Daisy-chaining Devices to the Digital meter

The RS-485 slave port allows the digital meter to be connected in a daisy

chain with up to 31 2-wire devices. In this bulletin, *communications link* refers to a chain of devices that are connected by a communications cable. See Figure 6-3.

Figure 6-3: Daisy-chaining 2-wire devices



NOTE: Belden 3105A/9841 colors: Blue (+), White (-)

- If the digital meter is the first device on the daisy chain, connect it to the host device using a RS-232 to RS-422/RS-485 converter or RS-485 to Ethernet converter.
- If the digital meter is the last device on the daisy chain, terminate it with the terminator provided.
- See Table 6-4 for the maximum daisy-chain communications distances for 2-wire devices.
- The terminal's voltage and current ratings are compliant with the requirements of the EIA RS-485 communications standard.

Data Formats and Settings

Your SCADA software must be configured for Modbus RTU communication, before integrating the Schneider Electric DM6200 digital meter.
The mode of transmission is defined in the following, which is compatible with Modbus RTU mode:

Table 6-5: Digital meter communication and protocol settings

Digital meter Communication Settings	
Protocol	Modbus RTU
Data bits	8
Baud rate	9600 Baud, User set 4800 to 19200 Range: 4800, 9600, 19200 Normal use: 19200 Baud Noisy, EMI, RFI, long data cable: 4800 Baud Short cable (<300 meters or 975 feet): 19200 Baud
Parity	Even
Device Address	1
Stop bit	1
Modbus Protocol	
Device Address	1 to 247 Upto 247 meters per COM Port with Repeaters
Function Code	03 (Read)
Data Address	Refer to "Data Address" for more information.

Data type	32-bit float (real) : • All parameters. • Direct reading, little-endian float, big-endian float, no scaling required 32-bit unsigned integer • INTR (number of interruptions (outages) - RMS Blocks) • RunSec (Run seconds – Integ Block)
No of Registers	2 to 50 (optional) per DM6200 data block of 10 x 32 bit values must be configured to suit the digital meter

NOTE: The polling interval to poll the data from DM6200 will depend on baud rate. We recommend polling interval of one second at 9600 Baud rate.

Modbus Standard Device Identification

Addressing the Modbus standard device identification

You can use Modbus command 0x2B/0x0E on these device identification parameters.

Table 6-6: Modbus standard device identification parameters

Object ID	Object Name	Format	Access
00	Manufacturer name	String	R
01	Product code	String	R
02	FW Version	String	R

NOTE:

- *The Read device identification can be read as stream access and as individual access.*
- *The product code is the same file name without version number.*

Parameter Settings for Different SCADA Software

The following table explains how to read the parameter PF average (See “Individual parameter address” for more information) in different Modbus master software/PLC’s.

Table 6-7: Parameter settings

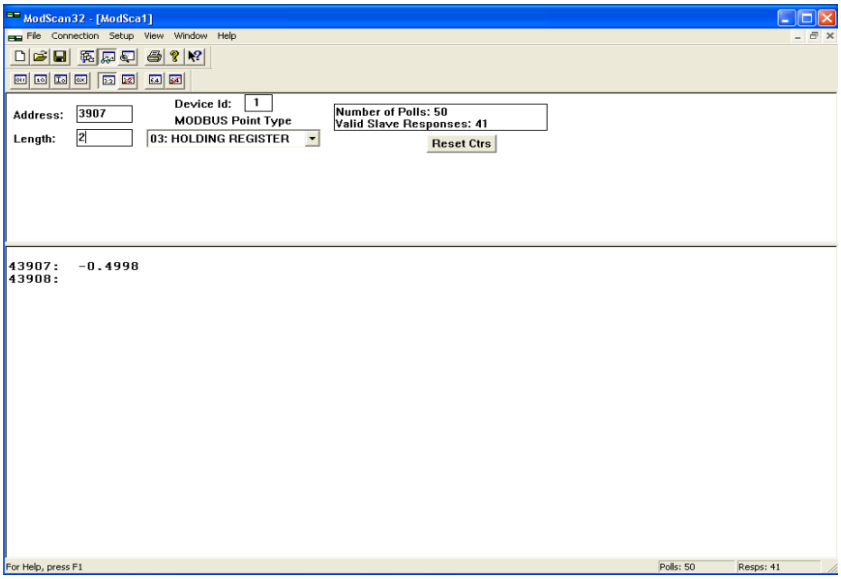
SL. No	SCADA software	Start Address	Function Code	No. of Register	Data Type	Remarks
1	ION™ Enterprise	43907	Internally Configured	2	Swapped Float	Direct conversion
2	PowerLogic SCADA	43907	Internally configured	2	Real	Direct conversion
3	Vijeo Citect	43907	Internally configured	2	Real	Direct conversion
4	Intouch	43907 F	Nil	2	Float	Direct conversion
5	Modscan (Master)	3907	03 – HOLDING REGISTERS	2	Floating point	Unswapped FP mode
6	MODTEST	43907	03 – Rosemount	Points -1	Float-Rosemount	
7	CIMPLICITY	43907	Nil	100	Real	Direct conversion. The array concept can be used here to poll all the data in single scan.
8	Allenbradly – Micrologix PLC (Slave/Master)	43907	03-HOLDING REGISTERS	2	Floating point	Direct
9	GE Fanuc PLC	43907	03-HOLDING REGISTERS	2	Real	Direct
10	ABB RTU 560 (Mater)	Index-3906	03- Read HOLDING REGISTERS	Query Range - 2	MFI – Analog measured Floating value	Under sub parameters, “Sign and Exponent in First Register” should be disabled (Unchecked)
11	SEIMENS PLC (Master)	3906	03-HOLDING REGISTERS	2	Real	Direct
12	MOVICON	43907	Nil	2	Real	Direct
13	RSVIEW	43907	03-HOLDING REGISTERS	2	Real	Direct
14	ABB Microscada	3906	Format – 9	Interval – 2	Real	Direct

Communication Test

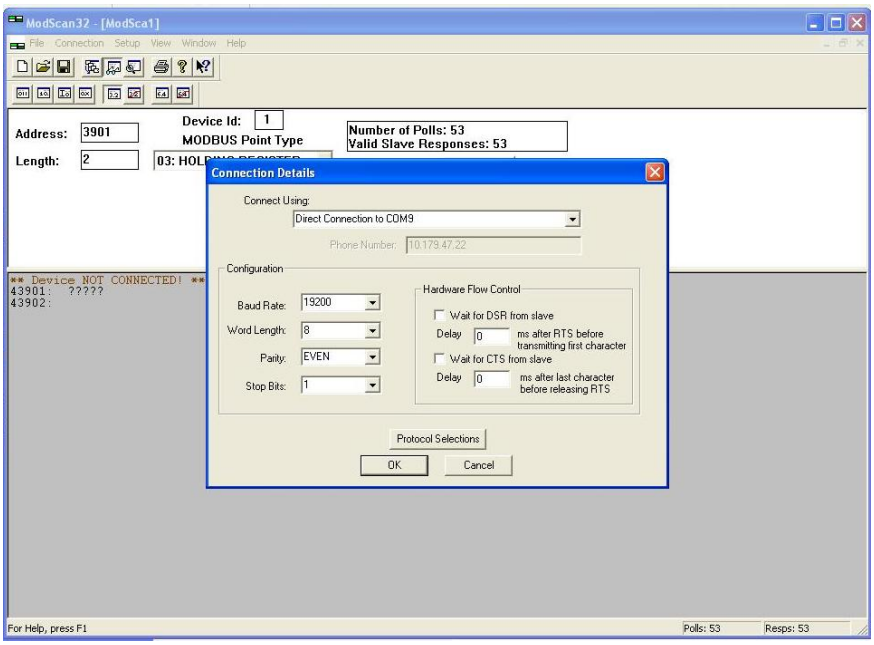
Communication test: DM6200 digital meter can be successfully used for communication using Modscan software as Modbus master in PC. Details of the settings in Modscan are given below.

Settings in Modscan v3.D05-00 software to establish communication with DM6200 digital meters:

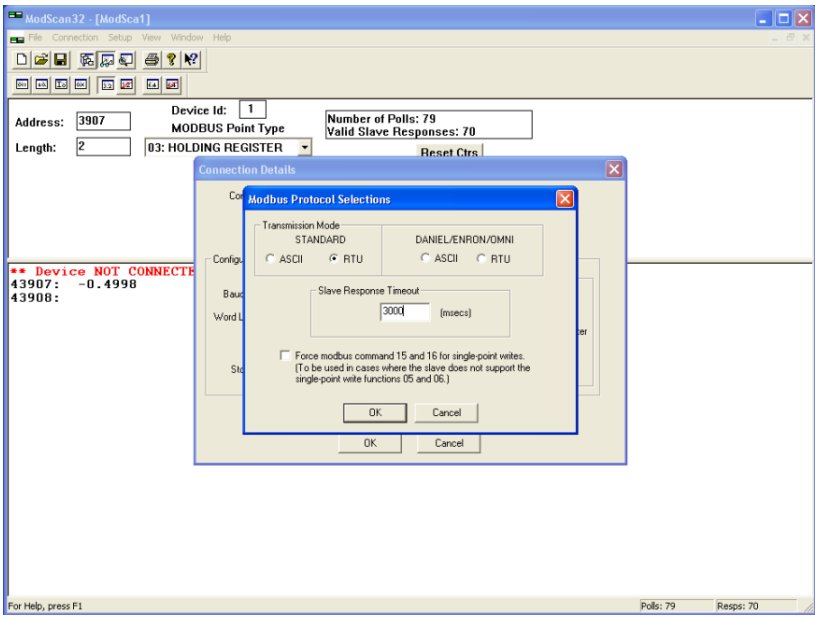
- Free download demo Modscan software from http://www.win-tech.com.
- The following explains how to read the power factor average PF avg from register 3907.



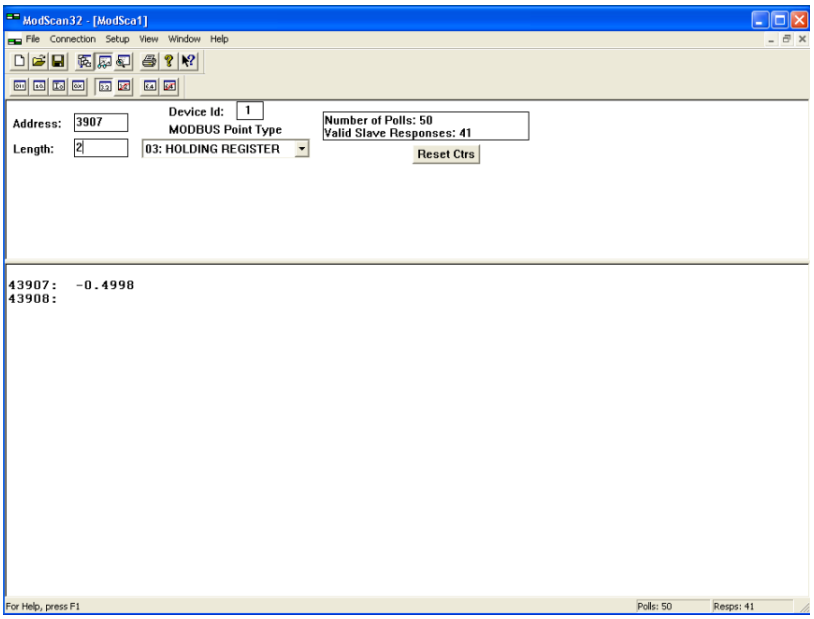
1. After starting the Modscan, to read power factor average (PF AVG), enter address as 3907 (decimal), length as 2, device ID as 1, Modbus point type as 03, and HOLDING REGISTER.
2. **Modify the connection details:** Click connection >connect to display the **connection detail window**. Change all the settings to match the following screen. These are the default settings for the DM6200 digital meter.



3. Set the Modbus protocol selections: On **"Connection details"** window (shown in previous step), click **Protocol Selections.** Enter the protocol settings as shown below and click **OK** in all the windows.



4. The Modscan software starts polling the configured COM port for the Device ID 1.
   Modscan demo software will stop polling after 3.5 minutes.



This shows that the digital meter is communicating with the Modbus Modscan master software successfully on the PC. The digital meter is Modbus RTU compliant.

Data Address

The DM6200 digital meter supports the transfer of whole block and also of individual data values (two registers are used for storing single data values).

- In the transfer of individual data values, it treats two registers as an object, with the starting address (e.g., 3900) considered as the object name. This enables you to transfer required data values for energy management.
- In the transfer of a whole block, it treats each block as an object with the starting address (e.g., 3000) considered as the object name. This enables fast block transfers, since energy management usually requires a block of related readings for the same point of time. This method also eliminates time-skew within readings of that block.
- The device address, block start address, and the number of registers, must be configured to suit the digital meter. You must also make the related SCADA settings for polling priority, logging, and viewing data. Refer to your SCADA software instructions to learn how to do this.

Individual Parameter Address:

- Function Code: 03 Read
- No scaling required
- Read as block or individual parameters

Table 6-8: Individual parameter address

Parameter	Description	Address	Type	DM6200
Metering				
Metering – Current				
A	Current average	3913	Float	✓
A1	Current, phase 1	3929	Float	✓
A2	Current, phase 2	3943	Float	✓
A3	Current, phase 3	3957	Float	✓
Metering – Voltage				
VLL	Line to line average voltage	3909	Float	✓
VLN	Line to neutral voltage	3911	Float	✓
V12	Voltage phase 1 to phase 2	3925	Float	✓
V23	Voltage phase 2 to phase 3	3939	Float	✓
V31	Voltage phase 3 to phase1	3953	Float	✓
V1	Voltage phase 1 to neutral	3927	Float	✓
V2	Voltage phase 2 to neutral	3941	Float	✓
V3	Voltage phase 3 to neutral	3955	Float	✓
Metering – Power Factor				
PF	Power factor average	3907	Float	✓
PF1	Power factor, phase 1	3923	Float	✓
PF2	Power factor, phase 2	3937	Float	✓
PF3	Power factor, phase 3	3951	Float	✓
Metering – Frequency				
F	Frequency, Hz	3915	Float	✓
Integrator				
On hours	On hours	3993	Long	✓
INTR	Number of power interruptions	3999	Long	✓
Percentage of Load parameters				
% Avg Load	Average load percentage	3881	Float	✓
%L1	Percentage of phase 1 load	3883	Float	✓
%L2	Percentage of phase 2 load	3885	Float	✓

Parameter	Description	Address	Type	DM6200
Percentage of Load parameters				
%L3	Percentage of phase 3 load	3887	Float	✓
Unbalanced %Load	Unbalanced % load	3889	Float	✓
Unbalanced % Voltage	Unbalanced % voltage	3891	Float	✓

Block Parameter Address:

Total RMS Block:
- Function Code: 03H Read
- Number of registers: 20
- No scaling required
- Read as block only

Table 6-9: Total RMS block

Parameter	Description	Address	Type	DM6200
Reserved	Reserved	3001	Float	-
Reserved	Reserved	3003	Float	-
Reserved	Reserved	3005	Float	-
PF	Average PF	3007	Float	✓
VLL	Average line to line voltage	3009	Float	✓
VLN	Average line to neutral voltage	3011	Float	✓
A	Average current	3013	Float	✓
F	Frequency, Hz	3015	Float	✓
Reserved	Reserved	3017	Long	-
Intr	Number of interruption	3019	Long	✓

R phase RMS Block:
- Function Code: 03H Read
- Number of registers: 20
- No scaling required
- Read as block only

Table 6-10: R phase RMS block

Parameter	Description	Address	Type	DM6200
Reserved	Reserved	3031	Float	-
Reserved	Reserved	3033	Float	-
Reserved	Reserved	3035	Float	-
PF1	Power factor, phase1	3037	Float	✓
V12	Voltage phase1 to phase2	3039	Float	✓
V1	Voltage phase1 to neutral	3041	Float	✓
A1	Current, phase1	3043	Float	✓
F1	Frequency, Hz	3045	Float	✓
Reserved	Reserved	3047	Long	-
Intr1	Number of interruption	3049	Long	✓

Y phase RMS Block:

- Function Code: 03H Read
- Number of registers: 20
- No scaling required
- Read as block only

Table 6-11: Y phase RMS block

Parameter	Description	Address	Type	DM6200
Reserved	Reserved	3061	Float	-
Reserved	Reserved	3063	Float	-
Reserved	Reserved	3065	Float	-
PF2	Power factor, phase 2	3067	Float	✓
V23	Voltage phase 2 to phase 3	3069	Float	✓
V2	Voltage phase 2 to neutral	3071	Float	✓
A2	Current, phase 2	3073	Float	✓
F2	Frequency, Hz	3075	Float	✓
Reserved	Reserved	3077	Long	-
Intr2	Number of interruption	3079	Long	✓

B phase RMS Block:

- Function Code: 03H Read
- Number of registers: 20
- No scaling required
- Read as block only

Table 6-12: B phase RMS block

Parameter	Description	Address	Type	DM6200
Reserved	Reserved	3091	Float	-
Reserved	Reserved	3093	Float	-
Reserved	Reserved	3095	Float	-
PF3	Power factor, phase 3	3097	Float	✓
V31	Voltage phase 3 to phase1	3099	Float	✓
V3	Voltage phase 3 to neutral	3101	Float	✓
A3	Current, phase 3	3103	Float	✓
F3	Frequency, Hz	3105	Float	✓
Reserved	Reserved	3107	Long	-
Intr3	Number of interruption	3109	Long	✓

Phase Angle Block:

- Function Code: 03H Read
- Number of registers: 18
- No scaling required
- Read as block only

Table 6-13: Phase angle block

Parameter	Description	Address	Type	DM6200
Neutral voltage	Neutral voltage	3701	Float	✓
An	Neutral current	3703	Float	✓
V1	Voltage phase angle, phase 1	3705	Float	✓
V2	Voltage phase angle, phase 2	3707	Float	✓
V3	Voltage phase angle, phase 3	3709	Float	✓
A1	Current phase angle, phase 1	3711	Float	✓
A2	Current phase angle, phase 2	3713	Float	✓
A3	Current phase angle, phase 3	3715	Float	✓
RPM	Rotations per minute	3717	Float	✓

NOTE: The parameters V1, V2, V3 (Voltage phase angles, and neutral voltage are available only through communication.

Setup Block:

- Function Code: 03H Read, 10H Write
- Number of registers: 40/42
- No scaling required
- Read and write as block only

Table 6-14: Setup block

Parameter	Description	Address	Type	Range	Default value	DM6200
A.Pri	Current Primary	0101	Float	1.0 to 99 k	100.0	✓
A.Sec	Current Secondary	0103	Float	1.0 to 6.5	5.000	✓
V.Pri	Voltage Primary	0105	Float	100.0 to 999 k	415.0	✓
V.Sec	Voltage Secondary	0107	Float	50.00 to 601.0	415.0	✓
SYS	System Configuration	0109	Float	2.0 to 6.0 2.0 – Delta 3.0 – Star 4.0 – Wye 5.0 – 2 Ph 6.0 – 1 Ph	3.000	✓
LABL	Phase Labeling	0111	Float	0.0 to 4.0 0.0 – 123 1.0 – ABC 2.0 – RST 3.0 – PQR 4.0 – RYB	0.000	✓
VA Fn	VA Function selection	0113	Float	0.0 to 1.0 0.0 – 3D 1.0 – Arth	0.000	✓
Reserved	Reserved	0115	Float			-
Reserved	Reserved	0117	Float			-
Reserved	Reserved	0119	Float			-

BAUD	Baud rate	0121	Float	3.0 to 5.0 3.0 – 4800 4.0 – 9600 5.0 – 19200	5.000	✓
PRTY	Parity and Stop bit	0123	Float	0.0 to 5.0 0.0 – Even 1 1.0 – Even 2 2.0 – Odd 1 3.0 – Odd 2 4.0 – No 1 5.0 – No 2	0.000	✓
ID	Unit ID	0125	Float	1.0 to 247.0	1.000	✓
F.S%	% Full scale	0127	Float	1 to 100	100.0	✓
Reserved	Reserved	0129	Float			-
POLE	Number of poles for RPM	0131	Float	1.0 to 8.0 1.0 – 2 2.0 – 4 3.0 – 6 4.0 – 8 5.0 – 10 6.0 – 12 7.0 – 14 8.0 – 16	2.000	✓
PWD	Password	0133	Float	1000	1000	✓
Reserved	Reserved	0135	Float	-	2.0	-
Reserved	Reserved	0137	Float	-	4126	-
Parameter	**Description**	**Address**	**Type**	**Range**	**Default value**	**DM6200**
Reserved	Reserved	0139	Float	-	0.0	-
F.Seq	Float byte sequences	0141	Float	1.0 to 2.0 1.0 – 4321 2.0 – 2143	2.0	✓

NOTE: For efficient setup read the setup parameters first and then edit the required setup parameter value.

Clear Block:

- Function Code: 10H Write
- Number of registers: 2
- No scaling required
- Write as block only

Table 6-15: Clear block

Parameter	Description	Address	Type	Range	DM6200
CLR_INTG_ _SETDEFAULT	INTG clearing and setting up the setup default	0311	Long	1 - INTG Clear 256 - setup default	✓

NOTE: For setup default, meter will send an exception for values other than 256.

Model Info Block:

- Function Code: 03H Read
- Number of registers: 14
- No scaling required
- Read as block only

Table 6-16: Model info block

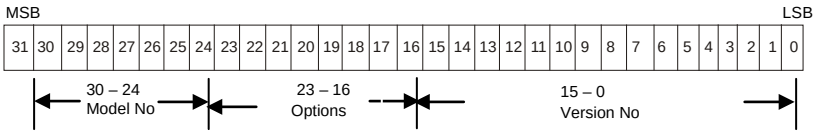
Parameter	Description	Address	Type	Range	DM6200
Reserved	Reserved	0081	Long		-
Reserved	Reserved	0083	Long		-
Model Version	Model, options and version numbers	0085	Long	Bits 30 to 24 for model number; 23 to 16 for options; 15 to 0 for version number; e.g., DM6200 model number is 23	✓
Reserved	Reserved	0087	Long		-
Reserved	Reserved	0089	Long		-
Reserved	Reserved	0091	Long		-
Reserved	Reserved	0093	Long		-

Model Register Details

This section explains about the model register and helps you to understand the model number, version number, and options.

The following figure explains how the bits are organized in the model register.

Figure 6-4: Bits in model register



Meter Model and Number: The following table provides the bitwise explanation for digital meter model and number.

Table 6-17: Meter model and number

Meter Model	Model Number 5A Meter	Option bit wise
DM6200	23(0x17)	-
DM6000	25(0x19)	-

Model Options Description: DM6200 meter does not have any options; hence the bits from 23 to 16 will be zero, as shown in the following table.

Table 6-18: Model options description

Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16	Remarks
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	No options available

Interpretation of Firmware Version Number: The following steps explain how to interpret the firmware (FW) version number.

1. Convert the hexadecimal values both MSB and LSB into decimal values.
2. Apply the formula ((MSB*256) +LSB).
3. The resulting value will be 30400 for the hexadecimal value 0x76 0xC0.
4. Insert a **0** before the result and parse it from the right with two digits each.
5. The result will be the FW version = 03.05.01.

Table 6-19: Firmware version interpretation

	MSB	LSB
Hexadecimal	0x76	0xC0
Decimal	118	192
VALUE=((MSB*256)+LSB)	30400	
FW Version	03.05.01	

NOTE: Firmware version representation only. To determine your digital meter's present firmware version, refer the diagnostic page in the digital meter. See "DM6000 digital meter menu hierarchy", to navigate through the diagnostic page.

NOTE:

- *Most of the reserved and unavailable parameters return zero value.*
- *The SCADA software must support register blocks consisting of different data types (integers and floats) to transfer the whole block.*
- *Each Modbus register size is 16 bits. All DM6200 readings are 32 bits. Therefore, each DM6200 reading occupies **two** consecutive Modbus registers. For example, PF average parameter absolute address is 3907. It occupies both 3907 and 3908 Modbus registers.*
- *Address configuration: All addresses are in decimal. Some SCADA software supports Modbus register address instead of absolute register address. In this case add 40000 to the above address and use it. For example PF average parameter absolute address is 3907. Modbus address can be 43907 (40000+3907).*
- *Phase Angle Block: Voltage phase angles (0,120,240) are hard coded (not measured). Hence, these values are also available in communication in the absence of input signals; however, these voltage phase angles are not available in the digital meter display.*
- *TURBO, and percentage of load blocks: These parameters can be read individually or as a block*
- *TURBO block: 50 parameters maximum*
- *Percentage of Load block: 5 parameters maximum*
- *All digital meter addresses should be set between 1 and 247.*
- *All digital meters should have uniform communication settings like Baud rate, parity, and stop bit.*
- *Use diagnostic mode display in the digital meter to analyze the problem in communication.*
- *Error: u – Invalid unit ID*
  A – Invalid Address
  c – CRC error (cyclic redundancy checking)
  t – Transmitting
  r – Receiving
  F – Invalid function code
  o – Parity, framing, or overrun error
  O- Buffer overflow

Chapter 7: Maintenance and Troubleshooting

Introduction

This chapter describes information related to maintenance of your digital meter.

The digital meter does not contain any user-serviceable parts. If the digital meter requires service, contact your local sales representative. Do not open the digital meter. Opening the digital meter voids the warranty.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not perform a Dielectric (Hi-Pot) or Megger test on the digital meter, test voltages may damage the digital meter.
- Before performing Hi-Pot or Megger testing on any equipment in which the digital meter is installed, disconnect all input and output wires to the digital meter.

Failure to follow these instructions will result in equipment damage.

Troubleshooting

The information in Table 7–1 describes potential problems and their possible causes. It also includes possible checks to perform or solutions to the problem. After referring to this table, if you cannot resolve the problem, contact your local Schneider Electric sales representative for assistance.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical practices. For example, in the United States, see NFPA 70E.
- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Use caution while removing or installing panels so that they do not extend into the energized bus; avoid handling the panels, which could cause personal injury.

Failure to follow these instructions will result in death or serious injury.

Table 7-1: Trouble shooting

Potential Problem	Possible Causes	Possible Solution
The data being displayed is inaccurate or not what you expect.	Incorrect setup values	Check that the correct values have been entered for digital meter setup parameters (CT and PT ratings, system type, and so on). See “Setup Menu” for setup instructions.
	Usage of protection class (10P10 etc.) CTs/PTs	Use instrument class 1 or better CTs/PTs, which will have better accuracy than the protection class CTs/PTs.
	Improper wiring	Check whether all the PTs and CTs are connected properly (proper polarity is observed) and that they are energized. Check shorting terminals. See “Connection Diagrams “ for more information.
The display went blank suddenly.	Over voltage/temperature	Interrupt the power supply, or reduce the voltage or temperature within the limits.
	Fuse connection	Check whether fuse with a rating of 0.25 A is connected on each voltage input. If not, connect the 0.25 A rated fuse to the voltage input.
The digital meter stopped communication abruptly.	Communications lines are improperly connected.	Verify the digital meter communications connections. See “Chapter 6 – Data communication” for more information.
	Over voltage/temperature	Interrupt the power supply or reduce the voltage or temperature within the limits.
Wrong load bar indication	Incorrect F.S% selection	Select the full scale load

Potential Problem	Possible Causes	Possible Solution
		percentage setting as per your circuit.
The digital meter is over heated	Lack of sufficient air for cooling	Provide sufficient space all around the digital meter. Separate the digital meter from other equipment for cooling air.

Appendix A – Technical Data

Accuracy

Table A-1: Accuracy

Measurement	Accuracy % of Reading*
	Class 1.0
Voltage LN per phase and average	0.5
Voltage LL per phase and average	0.5
Amp per phase and average	0.5
Amp, phase angle per phase	2º
Frequency	0.1
Power factor PF	1.0
RPM	1.0

NOTE:

- *Additional error of 0.05 % of full scale for digital meter input current below 100 mA.*
- **In Delta mode configuration the accuracy will be 1.0% of reading.*

Auxiliary Supply (Control Power)

The digital meter needs a single-phase AC or DC control supply to power its internal electronics.
Range: 44 to 277 Vac/dc.
Burden (load): 3 VA max on auxiliary supply.

Front Panel Display

- Brilliant three lines four digit (digit height 14.2 mm/0.56 in.) per line, high readability alpha numeric LED display with auto scaling capability for Kilo, Mega, Giga.
- The display provides the user access to all phase voltages (phase to neutral and phase to phase), currents (per phase and average), power factor, and frequency.
- The digital meters displays average volts, amps, and frequency simultaneously.
- Load bar graph for the indication of consumption in terms of % amperes total.
- Set of four red LEDs in the load bar start blinking when the load is greater than 120%, to indicate the overload.
- Easy setup through keys located on the faceplate for common configuration parameters.
- Password protection for setup parameters.
- User-selectable default display page through keypad lock.

Installation and Input Ratings

- Auto-ranging voltage inputs should allow direct connection up to 277 VLN/480VLL AC systems (no PTs/VTs required up to 480 VLL phase to phase)
- Supports the following configurations (field configurable): Direct 4-wire Wye (Star); 3-wire Wye (Star); 3-wire Delta; 2-phase 3-wire (2-phase); and single-phase
- 3-phase voltage and current inputs
- Volts : 46 to 277 Vac phase-neutral, 80 to 480 Vac phase-phase, Overload: Continuous 480 VLL with full accuracy, 750 VLL Max, Hz. 50 / 60
- Amps: 50 mA to 6 A, Overload: 10 A continuous, 50 A for 5 sec/hr, 120 A for 1 sec/hr
- User programmable for 5 A or 1 A secondary CTs
- Burden (Load): Less than 0.2 VA per Volt / Ampere input
- Frequency (Both input and auxiliary): 45 to 65 Hz, 50/60 Hz

Environmental Conditions

- Sealed dust-proof construction. Meets IP51 for the front display and IP40 for meter body
- Operating temperature: -10 °C to 60 °C, (14 °F to 140 °F)
- Storage temperature: -25 °C to 70 °C, (-13 °F to 158 °F)
- Humidity: 5% to 95%, non-condensing
- Altitude $\leq$ 2000m

Construction

- Self-extinguishable V0 plastic, double insulation at accessible areas.
- Pollution Degree II.
- Measurement Category III.

Dimensions and Shipping

- Basic unit installed depth 83 mm (3.26 in.) with 92 x 92 mm (3.62 x 3.62 in.) panel cut-out, flush mount.
- Bezels dimension 96 x 96 mm (3.78 x 3.78 in.). Panel cut-out 92x92 mm (3.62 x 3.62 in.).
- Weight 400 gms (0.9 lb) approx unpacked, 500 gms (1.1 lb) approx shipping. See “Mechanical Installation” for more information.

Appendix B: SIM (Simulation) Mode

The digital meters are provided with SIM mode for demo and exhibition display, where the user can see the functioning of the digital meter without any input signals. The digital meter will show a fixed voltage, current, frequency, and 0.5PF.

To Enter SIM mode

- Keep pressed, while powering up the digital meter. The display shows **RUN**.
- Press . The display shows **SIM**.
- Press . The display sh**o**ws **RMS SIM**. You have successfully entered the SIM mode of the digital meters.

To Exit from SIM mode

- Press and hold the continuously until you reach the RMS page.
- Press once. The display shows **SIM**.
- Press . The display shows **RUN**.
- Press . The display shows **RMS** indicating the exit from SIM mode

Appendix C: Glossary

Terms

Baud rate: Specifies how fast data is transmitted across a serial network port.

Communications link: A chain of devices connected by a communications cable to a communications port.

Current Transformer (CT): Current transformers for current inputs.

Firmware: Operating system within the digital meter.

Float: A 32-bit floating point value returned by a register (Refer to “Data Address” for more information).

Frequency: Number of cycles in one second.

Line-to-line voltages: Measurement of the RMS line-to-line voltages of the circuit.

Line-to-neutral voltages: Measurement of the RMS line-to-neutral voltages of the circuit.

LOCK: Default display page lock (Refer to “Default display (View) page”).

Long: A 32-bit value returned by a register (Refer to “Data Address” on for more information).

Nominal: Typical or average.

Parity: Refers to binary numbers sent over the communications link. An extra bit is added so that the number of ones in the binary number is either even or odd, depending on your configuration. It is used to detect errors in the transmission of data.

Power factor: True power factor is the ratio of real power to apparent power using the complete harmonic content of real and apparent power.

RMS: Root mean square. The digital meters are true RMS sensing devices.

Run mode: This is the normal operating mode of the digital meter, where the readings are taken.

ULOC: Default display page unlock (Refer to “Default display (view) page”).

Abbreviations

%A FS	% Amperes full scale
A, Amps	Amperes
An	Neutral current
A.PRI	Current primary winding
A.SEC	Current secondary winding
Avg	Average
CLR	Clear
CT	Current transformer
Dia, DIAG	Diagnostic
ft	Feet/foot
F.Seq	Float Byte Sequence
FW	Firmware
FWD	Forward
Hz	Hertz
ID	Identity
in.	Inch
INTG	Integrator
IP	Ingress protection
LSB	Least significant bit
Min	Minimum
ms	Milliseconds
MSB	Most significant bit
PF	Power factor
PT	Potential transformer
RPM	Revolution per minute
SYS	System configuration
ULOC	Unlock
Unb	Unbalance
V	Voltage
V.PRI	Voltage primary winding
V.SEC	Voltage secondary winding
VT	Voltage transformer

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