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User Manual

EM 6400 DigitAN ™ v03.03
Multifunction Load Manager

Consulting
Training
Products

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General

Customer Service and Support

Customer service and support is available via email at contact@conzerv.com. Please include the model, serial number and a description with which we can re-create the problem at our Support Centre. You can shorten this time by also including necessary settings, the wiring diagram and the particular readings, which uniquely identify the problem.

Toll free phone support is available in some countries. For the latest phone number list please visit www.conzerv.com

Product Warranty

Schneider Electric Conzerv warrants all products to be free from defects in material, workmanship and title and will be of the kind and quality specified in Schneider Electric Conzervs written description in the manual. The foregoing shall apply only to failures to meet said warranties, which appear within three years from the date of shipping. During the warranty period, Schneider Electric Conzerv will, at its option, either repair or replace any product that proves to be defective. Please see the LIMITED WARRANTY CERTIFICATE provided with the product for further details.

Limitation of Warranty

This warranty does not apply to defects resulting from unauthorized modification, misuse or use for any reason other than electrical power monitoring.

OUR PRODUCTS ARE NOT TO BE USED FOR PRIMARY OVER-CURRENT PROTECTION. ANY PROTECTION FEATURE IN OUR PRODUCTS IS TO BE USED FOR ALARM OR SECONDARY PROTECTION ONLY.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SCHNEIDER ELECTRIC CONZERV SHALL NOT BE LIABLE FOR ANY PENAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING FROM ANY AUTHORIZED OR UNAUTHORIZED USE OF ANY SCHNEIDER ELECTRIC CONZERV PRODUCT. LIABILITY SHALL BE LIMITED TO THE ORIGINAL COST OF THE PRODUCT SOLD.

Statement of Calibration

Our instruments are inspected and tested in accordance with specifications published by an independent testing facility.

The accuracy and calibration of our instruments are traceable to the National Institute of Standards and Technology through equipment that is calibrated at planned intervals by comparison to certified standards.

Disclaimer

The information presented in this publication has been carefully checked for reliability; however, no responsibility is assumed for inaccuracies. The information contained in this document is subject to change without notice.

Before installation and operation of the EM 6400 DigitAN™ series meters, we suggest you to take a few moments to review this user manual in order to get best out of your investment.

Have a quick look at the list of safety symbols used in meter and manual.

Symbol	Description
	Caution, Risk of danger. Documentation should be considered wherever the symbol is used.
	Caution, Risk of electric shock which can cause serious injury or death.
	User accessible area is protected throughout by DOUBLE INSULATION
CAT III	Measurement category III
	Direct and alternating currents

 Building installation shall be included with a disconnecting device like switch or circuit breaker, with clear ON/OFF markings and within close proximity to equipment and the reach of operator, to cut-off the supply mains in case of any hazardous voltages.

 The protection provided by the manufacturer will be impaired, if the equipment is not used in the specified manner.

Table of contents

1. EM 6400 DigitAN™ – Product Description

The EM 6400 series of meters are digital Power meters that offer comprehensive three-phase electrical instrumentation and load management facilities in a compact and rugged package.

This chapter contains the main operating instructions. The remaining chapters explain the installation and setup steps before the meter is ready for use.

The EM 6400 series of meters are universal meter. Before use, please program the SYS (measurement system configuration), 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 Conzerv stands behind your EM 6400 series of meters with complete User Support and Service. If the need arises, please do not hesitate to contact us at contact@conzerv.com.

Intended Use: EM 6400 series is designed for use in Industrial and Commercial Installations by trained and qualified professionals, not for Domestic use.

Figure 1.1: The EM 6400 DigitAN - multi-function load manager

1.1. Physical Description

FRONT: The front panel has 3 rows of 4 digits / characters each, with auto scaling “K” kilo, “M” Mega and “-” minus indications. The “kilo” and “Mega” indications lit together 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 (Setup) of the EM 6400 series of meters.

REAR: The voltage and current terminals and the communication port are located on the back of the meter.

These contain hazardous voltages during operation and must be operated only by qualified and authorized technicians. For details refer section 1.3. Rear Panel

1.2. Front Panel

The front panel contains the following indicators and controls:

- Three rows of alphanumeric displays, 4 digits each that display three RMS parameters simultaneously, or one energy parameter. The displayed readings update every second.
- For each row: Kilo, Mega (Kilo + Mega = Giga) indicator and a Negative (-) indicator.
- Load bar, which gives a unique analog indication of % loading (% FS CT Pri).
- Five keys to scroll through the display page.

The EM 6400 DigitAN series of meters 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. The name will be displayed for 2 seconds as well as each time you press a key and then the value for 8 seconds. This method also allows

programmable phase soft-Labels in the EM 6400 DigitAN series of meters. You can choose from 123 (Factory setting), ABC, RYB, PQR or RST.

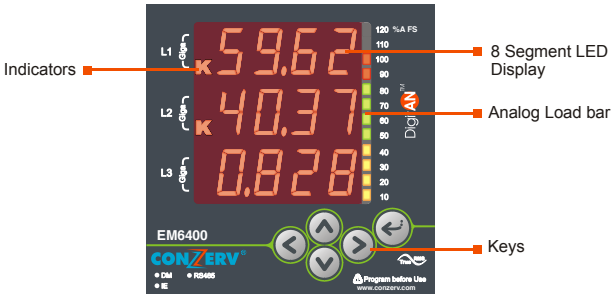


Fig.1.2: The EM 6400 front panel with display and keypad

1.2.1. The Indicators

Table 1.1: Kilo, Mega and Negative Indicators

K	**Kilo:** When lit, indicates that the reading is in Kilo (10^3). 10,000 is displayed as 10.00 K and 1.0 K as 1000.
M	**Mega:** When lit, indicates that the reading is in Mega, (10^6). 10,000 K is shown as 10.00 M. and 1.0 M as 1000 K.
M K	**Giga:** When **Kilo** and **Mega** are both glowing, the reading is in Giga (10^9). 10,000 M is shown as 10.00 G and 1.0 G as 1000 M.
-	**Negative:** When lit, indicates that the reading is **negative** as Per IEEE 100 and industry standard practice by meter-men: When PF (Power factor) is lead (Capacitive load): Both PF and VAR (reactive power) sign will be negative. When current is reversed: W (active power) is negative.

Table 1.2: Giga, Mega (M), Kilo (K) & Decimal Point Scaling

RMS Reading	Indicator
Less than 0.001	K, M OFF, displays “0.000”
Less then 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)
Upto 9999G	Giga
Above 9999G	Display shows “Hi” for positive numbers, “Lo” for negative numbers

RMS readings are four digits. Energy readings have eight digits, including four additional fractional digits. The maximum number the meter handles is 9,999G for RMS and energy values.

This means that the energy readings of the meter will overflow at 3 values of Wh (active energy) or VAh (Apparent energy) (selectable through PROG menu - Setup) depending upon the PT (VT) and CT ratios programmed.

1.2.2. The Keys

Operating the meter is easy, using the five smart keys to navigate through the Keypad Operations Table. The display pages "expand" as you go right, much like the directory or explorer "tree" displayed on any computer. The display shows where you're headed.

Table 1.3: The Keypad operation table

	**Right Key:** ▪ Go **forward** into sub-parameter pages. ▪ Going right past " "EDIT" in "SET" and CLR" requires code entry to enter PROG menu (Setup and Clear) ▪ During Edit Setup values, select **next** (right side) digit.
	**Left Key:** ▪ The Opposite of the right key. ▪ Go **back** towards to the main parameter pages. ▪ During Edit Setup, selects **previous** (left side) digit ▪ Exits from Edit mode, back to the PROG menu – Setup.
	**Up Key:** ▪ Scroll **up** through display pages at the same level, **within the same function.** ▪ Continuous pressing for 3 seconds initiates **limited auto-scroll (within the same function).** Press any key to return to manual scrolling. Refer section 1.2.2.2. Auto scroll: ▪ **While editing, increases** the value of the blinking digit during edit. Typically while changing the meter setup settings.
	**Down Key:** ▪ The opposite of the up key. ▪ Scroll **down** through other display pages at the same level, through **all functions**. ▪ Continuous pressing for 3 seconds initiates **the full auto-scroll mode,** through all functions. Press any key to return to manual scrolling. Refer section 1.2.2.2. Auto scroll: ▪ **While editing, decreases** the value of the blinking digit.
	**TURBO Key:** TURBO key is the simple one touch access to the most commonly used parameters pages. The TURBO pages for EM 6400 series are given below. **EM 6400: RMS (home page),** VLL, A, PF VLN, A, F VA, W, PF VA, W,VAR W, VAR, PF PF1, PF2, PF3, V% 1 2 3, A % 1 2 3, VAd RD TR, MD HR, VAh, Wh, RVAh, RWh, tVAh, tWh. This gives simple one-touch access to the most commonly used parameters, even for unskilled operators. **EM6433: RMS (home page),** A W, Wh. **EM 6459: RMS (home page),** V LL A PF, V LN A F. **EM 6434: RMS (home page)**, 'VA, W, PF' 'VA, W, VAR' 'W, VAR, PF' 'PF1, PF2, PF3' VAh and Wh. **EM 6436: RMS (home page)**, 'VLL, A, PF' 'VLN, A, F', 'A, W, PF', 'PF1, PF2, PF3', Wh and Run.h **If you're lost, the TURBO key is a quick way to get back to the RMS home page.** Continuous pressing for 3 seconds initiates auto-scrolling through the above TURBO pages. Refer section 1.2.2.2. Auto scroll: **During the power up, if the TURBO key is pressed, meter will go in to PROG menu - Setup. This is the simplest way to enter in to the setup.** **For further details refer Section 2.1.1.** Quick setup – While powering ON**.**

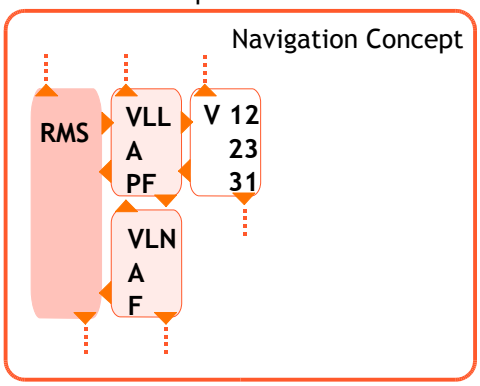
The parameter name is displayed every 8th second for 2 seconds, as well as the first time you press a key. **At this point press the next key immediately to scroll to the next page you want to see. If you are not sure which page you're watching, one press of any key will immediately identify the name. Pressing the key again immediately takes you to the next page.**

The meter menus and displays are organized as below. Navigating with the EM 6400 series of meters is very easy and intuitive. Press the key in the direction you want to go. **Display shows where you're headed.** Press the key that takes you in the desired direction.

1.2.2.1. Keypad Operation

Follow these simple steps:

- First take a quick look at what the Keys do.



Let us take an example to understand the actions of the front panel keys in the RMS menu. This example will explain how you can navigate from the 'RMS' page to the 'VLN A F' page, back to 'RMS' in EM 6400

Step1: From the RMS page use the RIGHT key . The display shows 'VLL A PF'.
The RIGHT key can be used to go forward into sub-parameter pages.

Step2: Now press the DOWN key .
You can scroll down through other pages at the same level using the DOWN key. The display shows 'VLN A F'. Congratulations you have successfully navigated from 'RMS' to 'VLN A F'.

Step3: To return to 'RMS' press the LEFT key .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". For details refer 1.2.1.The Indicators.
- You cannot go right into CLR, to clear INTG and MD 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 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

1.2.2.2. Auto scroll:

Auto-Scroll allows you to monitor a group of Display Pages sequentially, every 5 seconds, without constant key pressing. This is convenient for viewing from a distance. Since the EM 6400 series of meters display the Parameter Name (1 sec) followed by the Value (4 sec) on the same large displays, both are equally readable from a distance. No more squinting at a clutter of parameter indicators.

- **To auto scroll within a page group (e.g. With in RMS group):**

  Go to a particular page in the desired page group. Then press Up key continuously for 3 sec and then release. The display will flash "AUTO" and start auto scroll within the page group.

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

  Go to the desired page. Then press Down key continuously for 3 sec and then release. The display will flash "AUTO" and start auto scroll down the entire column of pages.

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

  Press of TURBO key continuously for 3 seconds and then release. The display will flash "AUTO" and start auto scroll through the TURBO pages.

Press any key to revert to Manual Scrolling.

1.2.2.3. Default display (View) page

You can select any page as "User-Set" default display page. You can scroll to other display pages. The "User-Set" page is displayed 2 minutes after manual scrolling was stopped by the user.

How to lock?

- Go to the page you want to set as default page.
- Press and keys together.

How to unlock?

- Once Default Display Page is active, press and simultaneously to unlock the Key page meter displays "ULOC".

Note: Entry into set up (PROG) is allowed when the "Display Page" is unlocked.

1.3. Rear Panel

The meter terminals are located on the rear panel. 14 terminals are provided, 7 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 meter auxiliary power supply and
- Two terminals for the RS485 communications port.

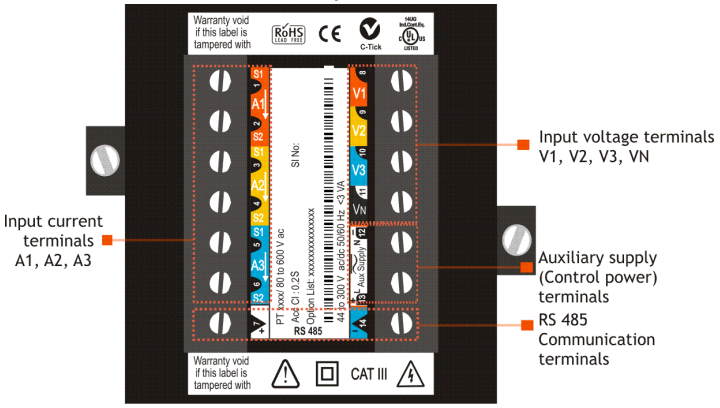


Figure 1.3: Rear Panel

1.4. Models and parameters with DigitAN Series

The EM 6400 DigitAN series can measure, locally display and remotely transfer over MODBUS RTU, the following parameters.

Table 1.4: Models and Parameters

Parameter		EM 6459	EM 6433	EM 6434	EM 6436	EM 6400
RMS	VLL V12, V23, V31 VLN V1, V2, V3	•			•	•
	A A1 A2 A3	•	•		•	•
	An Neutral current	C				C
	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	•				•
	W W1 W2 W3		⊙	•	⊙	•
	VA VA1 VA2 VA3		⊙	•	⊙	•
	VAR VAR1 VAR2 VAR3			•		•
DM	Demand VA/ W/ A					DM ☐
	Rising demand					
	Time remaining					
	MD Maximum demand					
	Hr MD occurred					
INTG FWD	Wh		⊙	•	⊙	•
	VAh		⊙	•	⊙	•
	VARh			•		•
	-VARh			•		•
	Run hours		•	•	•	•
	ON hours	•	•	•	•	•
	INTR	•	•	•	•	•
INTG REV	R.Wh					I/E ☐
	R.VAh					
	R.VARh					
	-R.VARh					
	Run hours					
OLD FWD	Wh		⊙	•	⊙	•
	VAh		⊙	•	⊙	•
	VARh			•		•
	-VARh			•		•
	Run hours		•	•	•	•
OLD REV	R.Wh					I/E ☐
	R.VAh					
	R.VARh					
	-R.VARh					
	Run hours					
	RS 485	☐	Built-in	Built-in	☐	☐

Note: • = standard option, ☐ = Option to be specified while ordering,
C = only through communication, ⊙ = Selectable through setup.

The EM 6400 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 and three current phase angles ($A^0 1$, $A^0 2$, $A^0 3$) w.r.t. 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:** Measured from whichever phase is active.
- **RPM:** Measures the speed of the generator.
- **Power:** VA, W, VAR, per phase and total. PF per phase and average. Per-Phase W readings provide a quick CT Polarity Check. A negated W phase reading indicates CT reversal.
- **Energy:** VAh, Wh, +VARh (Ind), -VARh (Cap), Run hours, On Hrs, Supply interruptions (outage).
- **Energy (OLD):** VAh, Wh, +VARh (Ind), -VARh (Cap), Run hours.
- **% Amperes Load Bar graph:** Load bar graph indicates consumption in terms of %Amperes total. Now 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. Refer section 1.2.1. The Indicators

1.5. EM 6400 Technical Specs

The EM 6400 DigitAN series is a high-accuracy, low cost, ultra-compact, power and energy meter series. 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 cutout and conforms to UL and CE safety requirements.

EM 6400 DigitAN series is designed for retrofit application such as replacement of analog meters and used as stand alone meter in Electrical control panels, power distribution unit (PDU), switch boards, Uninterrupted power supply (UPS), generator sets and Motor control center (MCC) systems. It also provides easy communication to Program logic control (PLC), Distributed control system (DCS), Building management system (BMS) and other systems.

The following table gives the briefed technical specs of EM 6400 DigitAN series. For details refer **Appendix A - Technical Data**

Table 1.5: Technical Specifications

Sensing/ Measurement	True RMS, 1 Sec update time 4 Quadrant Power & Quadrant Energy
Accuracy	Class 1.0 as per IEC 62052-11 and IEC 62053-21 Class 0.5S, 0.2S(Optional) as per IEC 62052-11, 62053-22 and ANSIC12.20
Aux supply (Control power)	44 to 300 Vac/dc
Burden	Voltage and Current Input < 0.2VA per phase Aux supply (Control Power) < 3VA
Display	Patented alpha numeric display
Resolution	RMS 4 digit, INTG 8 digit
Input voltage	4 Voltage inputs (V1, V2, V3, VN) 110 or 415 VacLL nominal (Range 80 to 600Vac LL)
Input current (Energy measurement)	Current inputs (A1, A2, A3) 5A Class 1.0 I 0.5: 5mA (Starting) to 6A* 5A Class 0.5S I 0.2S: 5mA (Starting) to 6 A 1A Class 0.5S I 0.2S: 1mA (Starting) to 1.2A
Frequency	45 to 65 Hz
Overload	5A meter: 10A max continuous 1 A meter: 2A max continuous
Environmental	Operating Temperature: -10ºC to 60ºC (14ºF to 140ºF); Storage Temperature : -25ºC to +70ºC (13ºF to 158ºF) Humidity 5% to 95% non condensing
Safety	CAT III - Measurement category III, Pollution Degree 2, ⧈ - Double insulation at user accessible area
Weight	400 gms approx. Unpacked 500 gms approx. Shipping

Communication	RS 485 serial channel connection Industry standard Modbus RTU protocol
Isolation	2k Vac isolation for one min between all isolated circuits including communication port
Warranty	3 Years from date of invoice
EM 6400 DigitAN Conforms to	Emission - CISPR22; Fast Transient - 4kV IEC 61000-4-4; Surge withstand – 4 kVIEC 61000-4-5; ESD – 15 kV Air discharge, 8 kV Contact discharge IEC 61000-4-2; Impulse voltage - 6kV, IEC 60060, 1.2/50µSec
Protection against dust & water	Front – IP 51; Rear – IP 40

NOTE: For 5 A universal meter additional error of 0.05% of full scale, for meter input current below 100 mA*

2. Quick start guide

2.1. PROG menu - Setup

The meter must be set (programmed/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, upon entering "SET" However, the settings: SYS (Star (wye)/Delta/ 1 Phase / 2 Phase), Vpri, Vsec, Apri, Asec critically determine the scaling of measured readings. While the scaling may be used to tune out Instrument Transformer errors, wrong settings will upset the readings of running systems.

CAUTION: The meter does NOT lock out these settings – it allows professional tuning of these settings on a running meter. It is the user's responsibility to ensure that only qualified personnel correctly Setup the Meter.

You can enter the PROG menu - setup in

View only mode - to view the set parameters – Refer section 2.1.2. Enter setup menu in View (read – only) mode

Edit mode – to view or edit set parameters.

2.1.1. Quick setup – While powering ON

To make connections Refer section 4.2. MECHANICAL INSTALLATION. Here are few tips.

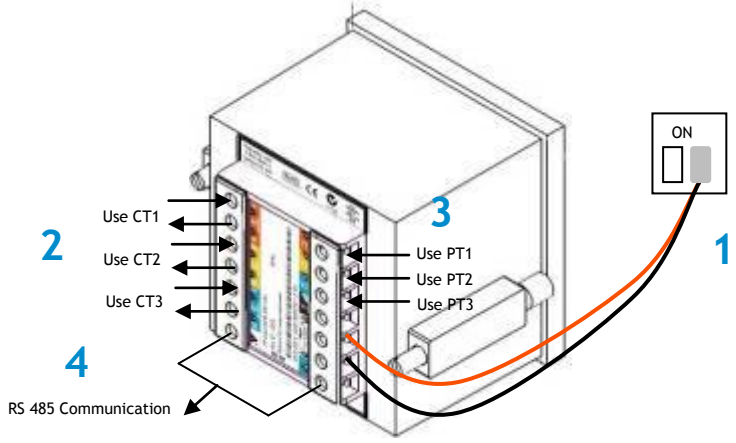


Figure 2.1: Quick Setup - Connections

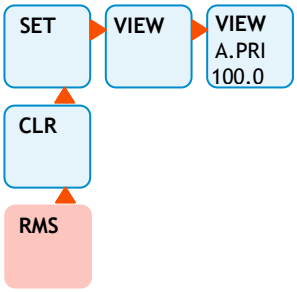
1. Connect Auxiliary Supply (Control Power) 44 – 300 Vac/dc to Terminals 12 and 13 in order to power ON the meter.
2. **Quick Set up when input voltage < 600 Vac LL**
   - Keep the TURBO key pressed, during the power up of the meter. The meter will directly enter PROG menu setup and display "EDIT A.PRI 100.0".
     This is the simplest way to enter PROG menu setup.
   - Program the following in your meter for accurate readings.
     - A.pri, A.sec values match your CT Primary and Secondary values respectively. E.g: If your CT Ratio is 200:5, the Apri = 200.0 and Asec = 5.000
   - **Use potential Transformer (PT/VT) if input voltage >600 Vac LL.**
     - Program the V.Pri and V.Sec to primary and secondary of the PT(VT) respectively. E.g: if your PT (VT) ratio is 11kV:110V, V.Pri=11.00k and V.Sec=110.0.
     - If input voltage< 600 Vac LL, program the V.Pri and V.Sec values in the PROG Menu to input voltage VLL of the circuit. E.g: if input voltage = 300 Vac LL, V.Pri=300.0 and V.Sec=300.0.
   - Program the following in your system setup as per your wiring configuration
     - SYS – DLTA for 3 Ph 3 wire system
     - SYS - STAR for 3 Ph 4 wire
     - SYS – 2 Phase for 2 Ph 3 wire
     - SYS – 1 Phase for 1 Ph 2 wire system.
3. Use CT1 CT2 CT3

Terminals 1,2 3,4 5,6

4. Use PT1(VT1) PT2(VT2) PT3(VT3) if voltage exceeds 600 Vac LL
   Terminals 8 9 10 (11 for Neutral)
5. RS 485 Terminals 7 (+ve), 14 (- ve)

Have you followed 1,2,3 from above? Congratulations, **you have successfully completed the steps for Quick Start up and you are now ready to start using your EM 6400 DigitAN™.**

2.1.2. Enter setup menu in View (read - only) mode



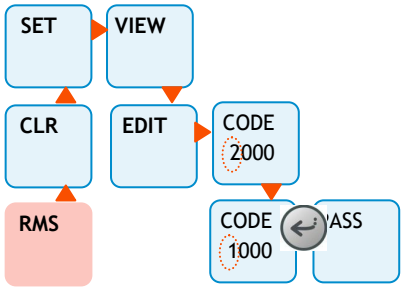
Step1: From "RMS" go ^ the display shows "CLR".

Step2: Press ^. The display shows "SET"

Step3: Go >, the display shows "VIEW"

Step4: Press >, you can view the setup parameters

2.1.3. Enter setup menu in edit mode



Note: ( ) means blinking/editable
(1) means blinking 1

Step1: From "RMS" go ^ the display shows "CLR".

Step2: Go ^ . The display shows SET.

Step3: Go >. The display shows VIEW.

Step4: Go v . The display shows EDIT.

To continue with code entry scroll use > key for more than 2 sec.

The factory set code is 1000.

To change the existing code 2000 to 1000.

The value at the blinking position can be edited. You need to shift the blinking position to enter 1000.

Step5: The display will show "CODE 2000" with 2 blinking.

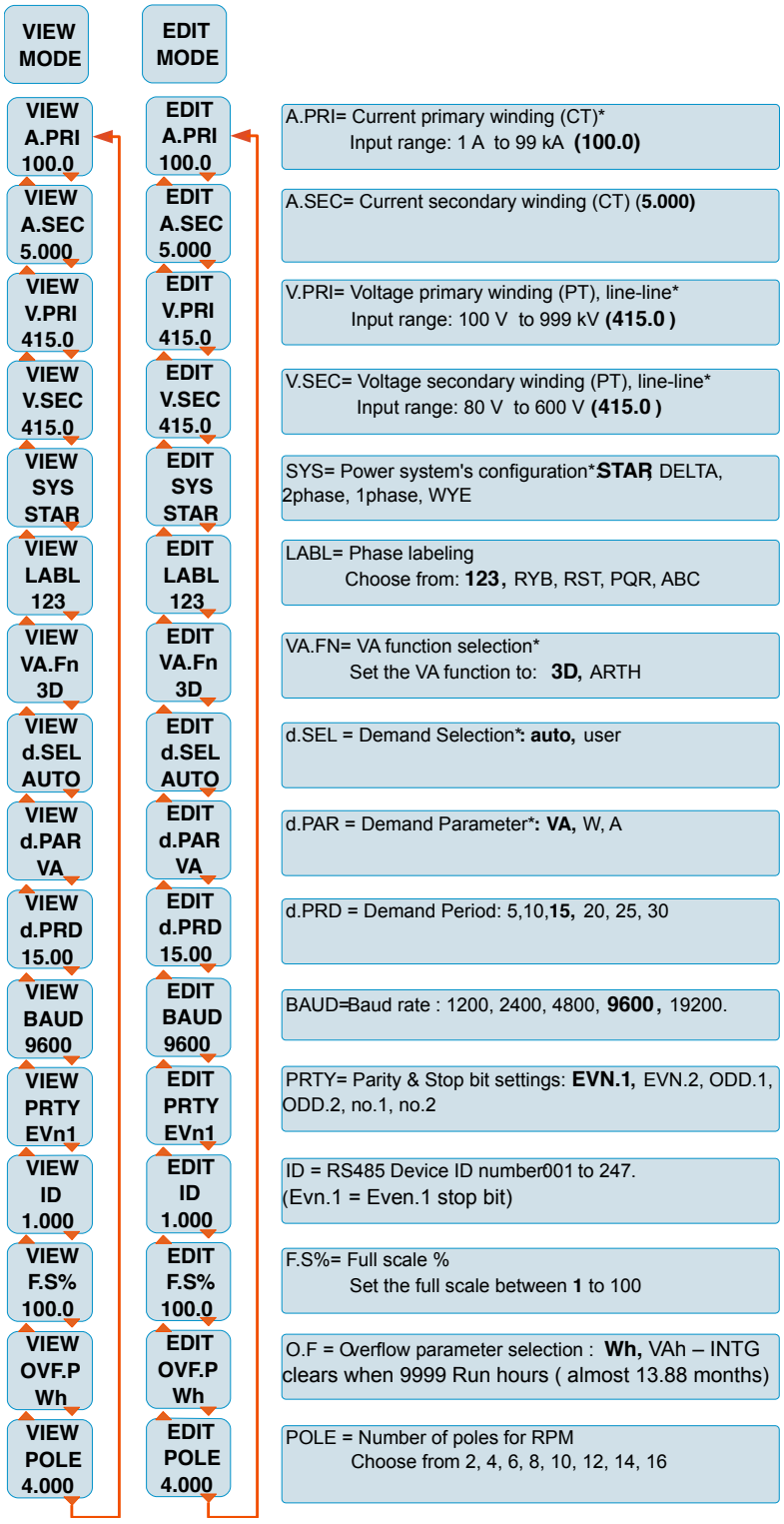
Step6: Press v to change the blinking 2 to 1.

Now press ↵ once

The display shows "PASS" and then "EDIT".

"EDIT" indicates that you have successfully entered the code and entered Setup Menu.

2.1.4. Setup parameters in View & Edit modes



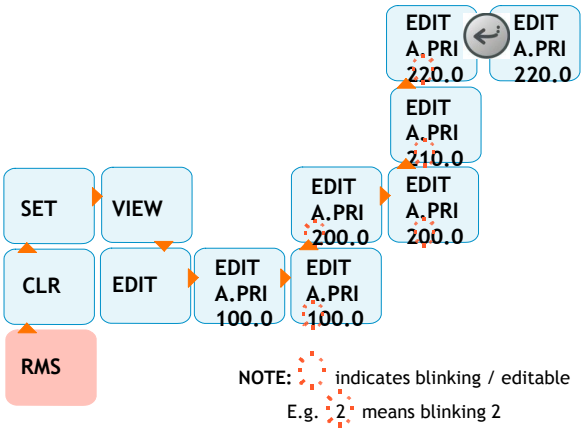
Default setup values are given in BOLD
*** Changing these values while device in use is not recommended**

2.1.5. Edit Set Parameters in PROG Menu

This example explains how to edit the value of A.PRI from “100.0” to “220.0” in the Edit PROG menu – Setup of EM 6400 DigitAN series of meter.

For easy understanding we have explained edit PROG Menu in 2 parts.

2.1.5.1. Edit and accept Setup



Step 1: From “RMS', go ^ until “SET” is displayed.

Step 2: Go > . The display will show “VIEW”

Step 3: Go v. The display will show “EDIT”. Refer section 2.1.3. Enter setup menu in edit mode for password entry.

Step 4: Go > .The display shows “EDIT A.PRI 100.0”. (100.0 is the factory set default value for A.PRI. For details refer section Installation in Appendix C FAQs.

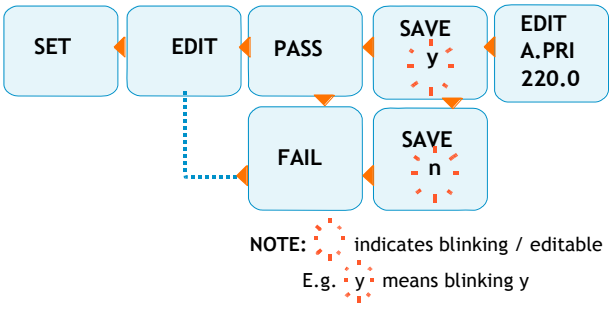
Go > .The display shows “1” blinking. This means that the parameter value can be edited now.

Step 5: Press ^. The display shows “2” blinking. Now press the > Key the display shows “0” blinking. Now press the ^ key twice, the display shows “2” blinking. To accept the new value, press once ↵.

Step 6: “220.0” is now being displayed. This means that the new value for A.PRI has been accepted.

Step 7: If you want to edit next parameter, press v and follow the step 1 to step 6.

2.1.5.2. To save the new value to Setup



Step 8: After completing the above steps of sec , go <. The display shows “SAVE Y” with “Y” blinking

Step 9: If you want to save the edited settings, press the ↵ or the < . The display will flash “PASS” for sometime and then “EDIT”

Note: If you do not want to save the edited settings, after step 8 go v.
The display shows “SAVE N” with “N” blinking.

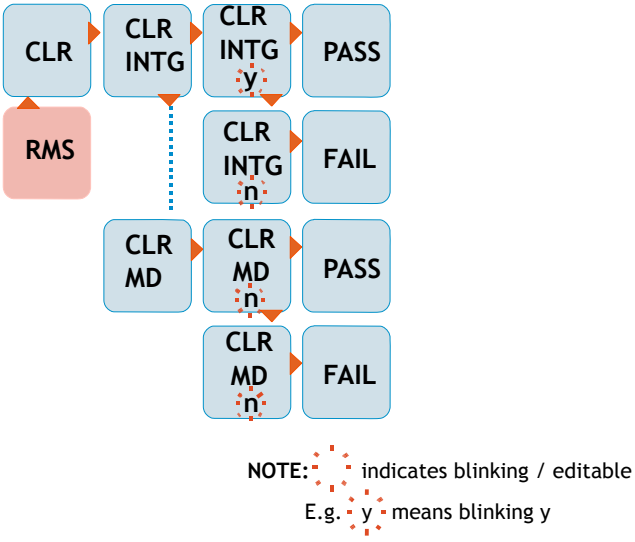
Now press the ↵ , the display flashes “FAIL” for sometime and then “EDIT”.

2.2. Clear INTG & MD

EM 6400 series products are equipped with Energy Integrator INTG, where the energy parameters are accumulated

INTG CLR – Clear both INTG and MD values

INTG MD – Clear only MD values



INTG Clear:

Step1: From "RMS" go the display will show "CLR"

Step2: Go . The display shows "CLR INTG". Code entry is required in order to go through "CLR". Procedure for code entry is similar to code entry required to gain access in to set up. Refer section 2.1.3. Enter setup menu in edit mode

Step3: Go to proceed with INTG clear. The display shows "INTG Y" with blinking "Y". This is to prompt you that you are about to Clear the data stored in INTG.

Step4: **If you do not want to clear INTG**, go. The display shows "INTG N" with blinking "N". Press . The display shows "FAIL" which indicates failure in clearing INTG. Now go to step6

Step5: **If you want to clear INTG**, from step 3 press to clear INTG "PASS" flashes on the display followed by "CLR INTG".
INTG is cleared and data is transferred to OLD register.

Step6: Press key. The display shows "CLR" means exit. Press key. The display will show "RMS"

MD Clear:

MD is an ordering option to be specified at the time of purchase

Step1: From "RMS" go the display will show "CLR"

Step2: Go . the display shows "CLR INTG". Code entry is required in order to go through "CLR". Procedure for code entry is similar to code entry required to gain access in to set up. Refer section 2.1.3. Enter setup menu in edit mode

Step3: Go the display shows "CLR MD"

Step4: Go to proceed with MD clear. The display shows "MD Y" with blinking "Y". This is to prompt you that you are about to Clear the data stored in MD.

Step5: **If you do not want to clear MD**, go. The display shows "MD N" with blinking "N". Press . The display shows "FAIL" which indicates failure in clearing MD. Now go step7.

Step6: **If you want to clear MD**, from step 4 press to clear MD "PASS" flashes on the display followed by "CLR MD".

Step7: Press key. The display shows "CLR" means exit. Press key. The display will show "RMS".

2.3. Energy Integrator

Your EM 6400 DigitAN series meters is equipped with an Energy Integrator function which provides several parameters for Energy Management: VAh, Wh, VARh (Ind), -VARh (Cap), run.h (run hours), on.h (on hours), INTR (Interruptions / outages).

A few of these need explanation:

run.h: Indicates the period the Load is ON and has run. This counter accumulates as long as the load is greater than the starting current set.

on.h: The period for which the meter (supply) is ON

INTR: Number of Supply Outages, means the number of Auxiliary Supply interruptions. If the meter Auxiliary Supply is from a UPS then the INTR (number of interruptions) will be zero (as long as the UPS stays ON), even if the Voltage Signals did die out from time to time.

Note: CT Reversal: auto - correction for Energy Integration in Star (Wye) mode. In Star (Wye) mode energy integration always be in forward direction irrespective of the direction of current flow or sign of the per phase power reading (not applicable IE models).

2.3.1. Integrator Overflow

Your EM 6400 DigitAN series meters contains a comprehensive "Integrator" to support Energy Management. It accumulates several parameters over time, as explained above. All values are Direct Reading and have a high resolution. This is necessary for accurate energy analysis over short intervals of time. It also means that the readings max out and reset sooner or later as given below. Since the Integrator contains counters for several parameters (VAh, Wh, VARh, -VARh, Run Hours, On Hours, Interruptions), they all reset together whenever any one of them overflows (usually Wh – but can be changed to VAh via the OF Setup). This makes energy management calculations such as Average PF very easy.

The maximum number that the Meter handles is 9,999 Giga for RMS and Energy values. The value at which the meter overflows is given below.

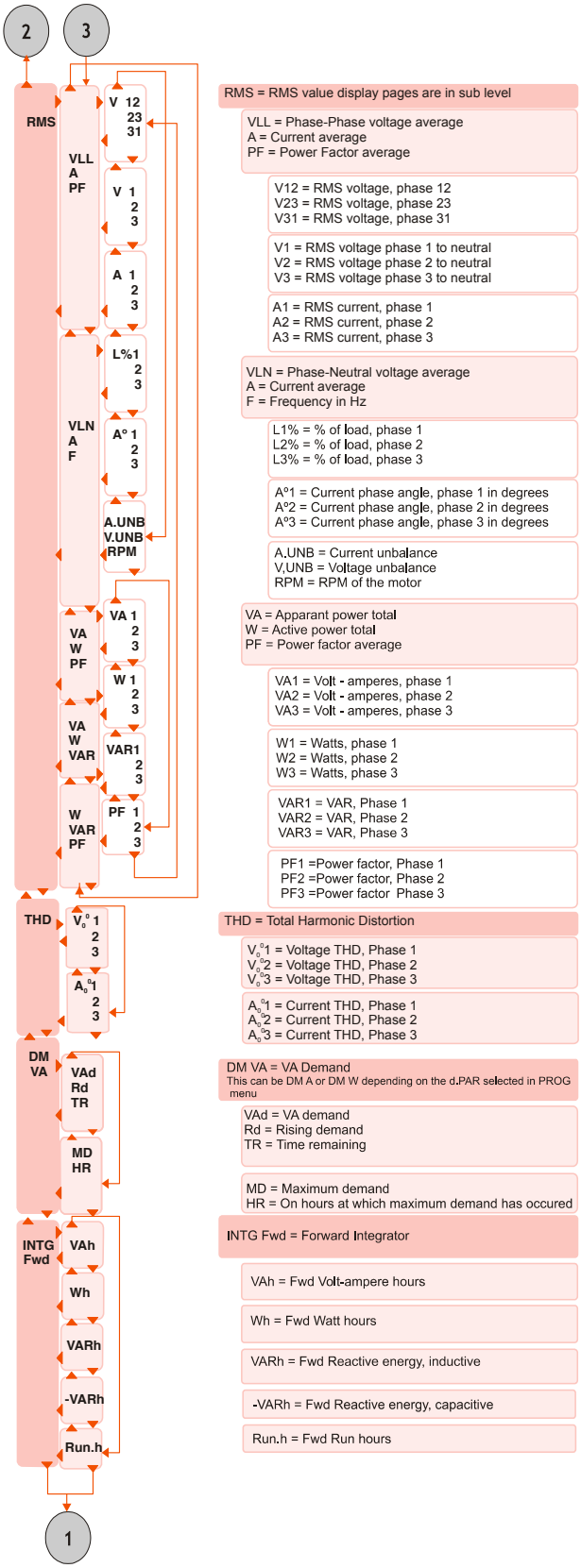
The Overflow value depends on the product of the primary voltage and current rating.

Table 2.1: Integrator Overflow table

V.PRI x A.PRI x 1.732	Max Reading (Wh/VAh)	Max time to reset the integrator in Run Hours	Max time to overflow in months at full scale
1VA to 1000VA	9999k	9999	13.88
1kVA to 1000kVA	9999M	9999	13.88
1MVA to 1000MVA	9999G	9999	13.88
>> 1000MVA		<<9999	<<1 year

2.4. Meter Display

Display Map - EM 6400



NOTE: THD values are indicative only

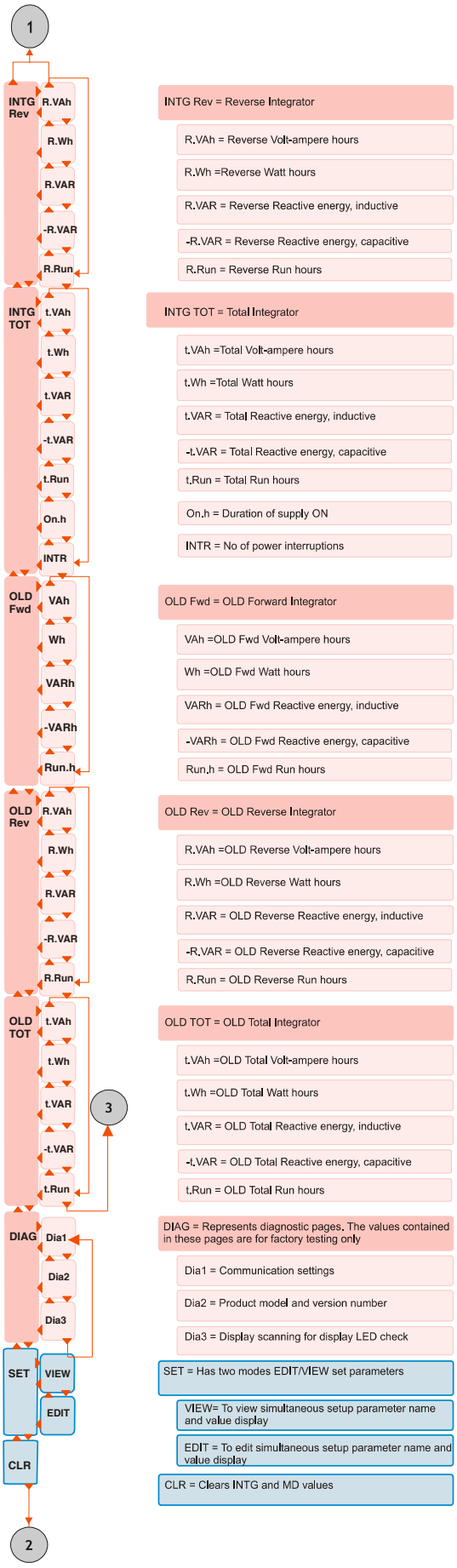
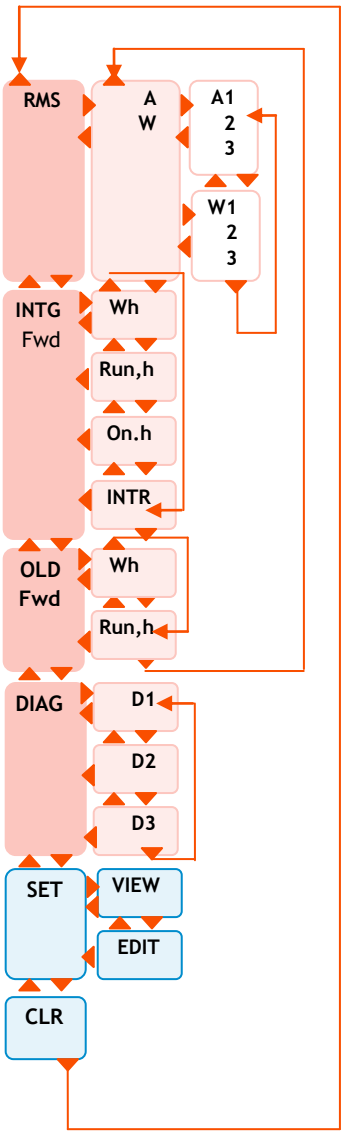


Fig 2.2: EM 6400 Display Map

Display Map - EM 6433



RMS = RMS value display pages are in sub level

A= Current Average
W = Watts total

A1 = RMS current, Phase 1
A2 = RMS current, Phase 2
A3 = RMS current, Phase 3

W1 = Watts, Phase 1
W2 = Watts, Phase 2
W3 = Watts, Phase 3

INTG FWD = Forward Integrator

Wh = Forward Watt hours. Wh integrates always in the forward direction irrespective of the direction of flow of current for Star (WYE) mode

Run.h = Forward run hours, Total hours the load was ON accumulates when the load current is present

On.h = Duration of supply ON

INTR = Number of Power interruptions

OLD FWD = The Energy values in the integrator will be transferred to the OLD register when the integrator is cleared (manually or due to overflow)

Wh = Old forward Watt hours

Run.h = Forward Run hours

DIAG = Represents diagnostic pages. The values contained in these pages are for factory testing only

D1 = Communication settings

D2 = Product model and version number

D3 = Display scanning for display LED check

SET = has two mode EDIT/VIEW set parameters

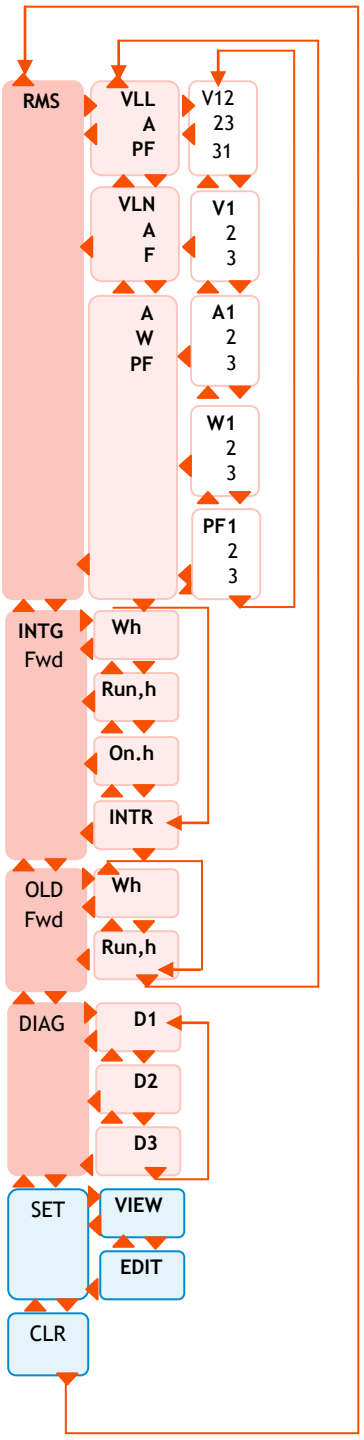
VIEW = To view simultaneous Setup parameter name and value display

EDIT = To Edit simultaneous Setup parameter name and value display

CLR = Clears INTG and MD values

Fig 2.3: EM 6433 Display Map

Display Map - EM 6436



RMS = RMS value display pages are in sub level

VLL = Phase - Phase voltage average
A = Current average
PF = Power factor average

VLN = Phase - Neutral voltage average
A = Current average
F = Frequency in Hz

A = Current average
W = Active power total
PF = Power factor average

V12 = RMS voltage phase 12
V23 = RMS voltage phase 23
V31 = RMS voltage phase 31

V1 = RMS voltage phase 1 to neutral
V2 = RMS voltage phase 2 to neutral
V3 = RMS voltage phase 3 to neutral

A1 = RMS current, Phase 1
A2 = RMS current, Phase 2
A3 = RMS current, Phase 3

W1 = Watts, Phase 1
W2 = Watts, Phase 2
W3 = Watts, Phase 3

PF1 = Power factor, Phase 1
PF2 = Power factor, Phase 2
PF3 = Power factor, Phase 3

INTG FWD = Forward Integrator

Wh = Forward Watt hours. Wh integrates always in the forward direction irrespective of the direction of flow of current for Star (WYE) mode

Run.h = Forward run hours, Total hours the load was ON accumulates when the load current is present

On.h = Duration of supply ON

INTR = Number of Power interruptions

OLD FWD = The Energy values in the integrator will be transferred to the OLD register when the integrator is cleared (manually or due to overflow)

Wh = Old forward Watt hours

Run.h = Forward Run hours

DIAG = Represents diagnostic pages. The values contained in these pages are for factory testing only

D1 = Communication settings

D2 = Product model and version number

D3 = Display scanning for display LED check

SET = has two mode EDIT/VIEW set parameters

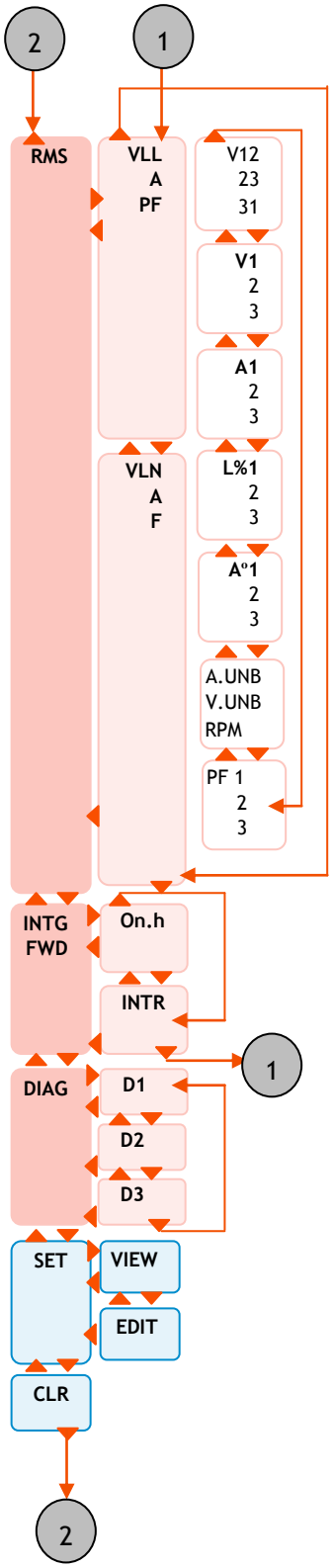
VIEW = To view simultaneous Setup parameter name and value display

EDIT = To Edit simultaneous Setup parameter name and value display

CLR = Clears INTG and MD values

Fig 2.4: EM 6436 Display Map

Display Map – EM 6459



RMS = RMS value display pages are in sub level

VLL = Phase - Phase voltage average
A = Current average
PF = Power factor average

VLL = Phase - Neutral voltage average
A = Current average
F = Frequency in Hz

A = Current average
W = Active power total
PF = Power factor average

V12 = RMS voltage phase 12
V23 = RMS voltage phase 23
V31 = RMS voltage phase 31

V1 = RMS voltage phase 1 to neutral
V2 = RMS voltage phase 2 to neutral
V3 = RMS voltage phase 3 to neutral

A1 = RMS current, Phase 1
A2 = RMS current, Phase 2
A3 = RMS current, Phase 3

L%1 = % of load phase 1
L%2 = % of load phase 2
L%3 = % of load phase 3

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.UNB = Current unbalance
V.UNB = Voltage unbalance
RPM = RPM of the motor

PF1 = Power factor, Phase 1
PF2 = Power factor, Phase 2
PF3 = Power factor, Phase 3

INTG FWD = Forward Integrator

On.h = Duration of supply ON

INTR = Number of Power interruptions

DIAG = Represents diagnostic pages. The values contained in these pages are for factory testing only

D1 = Communication settings

D2 = Product model and version number

D3 = Display scanning for display LED check

SET = has two mode EDIT/VIEW set parameters

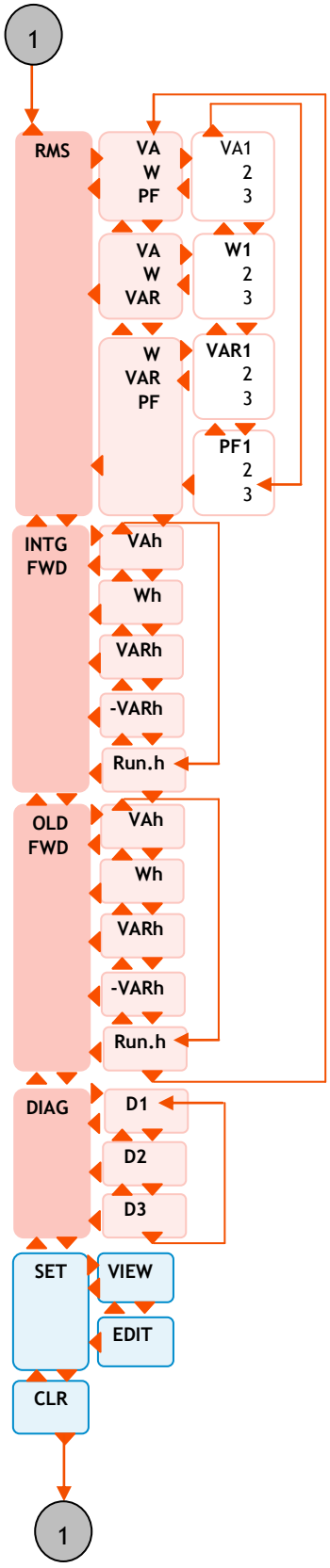
VIEW = To view simultaneous Setup parameter name and value display

EDIT = To Edit simultaneous Setup parameter name and value display

CLR = Clears INTG values

Figure 2.5: EM 6459 Display map

Display for EM 6434



RMS = RMS value display pages are in sub level

VA = Apparent power total
W = Active power total
PF = Power factor average

VA = Apparent power total
W = Active power total
VAR = Reactive power total

W = Active power total
VAR = Reactive power total
PF = Power factor average

VA1 = Volts-amperes, phase 1
VA2 = Volts-amperes, phase 2
VA3 = Volts-amperes, phase 3

W1 = Watts, phase 1
W2 = Watts, phase 2
W3 = Watts, phase 3

VAR1 = VAR, phase 1
VAR2 = VAR, phase 2
VAR3 = VAR, phase 3

PF1 = Power factor, Phase 1
PF2 = Power factor, Phase 2
PF3 = Power factor, Phase 3

INTG FWD = Forward Integrator

VAh = FWD Volt-amperes hours

Wh = FWD Watt hours

VARh = FWD Reactive energy, inductive

-VARh = FWD Reactive energy, capacitive

Run.h = FWd Run hours

OLD FWD = OLD Forward Integrator

VAh = OLD FWD Volt-amperes hours

Wh = OLD FWD Watt hours

VARh = OLD FWD Reactive energy, inductive

-VARh = OLD FWD Reactive energy, capacitive

Run.h = OLD FWD Run hours

DIAG = Represents diagnostic pages. The values contained in these pages are for factory testing only

D1 = Communication settings

D2 = Product model and version number

D3 = Display scanning for display LED check

SET = has two mode EDIT/VIEW set parameters

VIEW = To view simultaneous Setup parameter name and value display

EDIT = To Edit simultaneous Setup parameter name and value display

CLR = Clears INTG values

Figure 2.6: EM 6434 Display map

2.5. Summary

We have now learnt

1. To operate the EM 6400 Series products.
2. To configure its Setup and
3. To clear its Demand and Integrator readings.

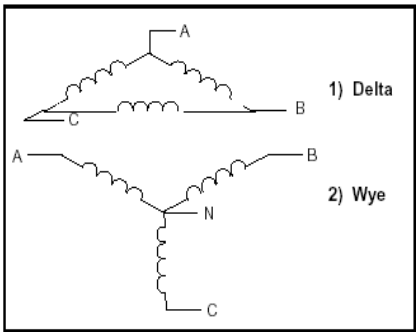
3. AC Power Measurement

3.1. Three-Phase Systems

A three-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.

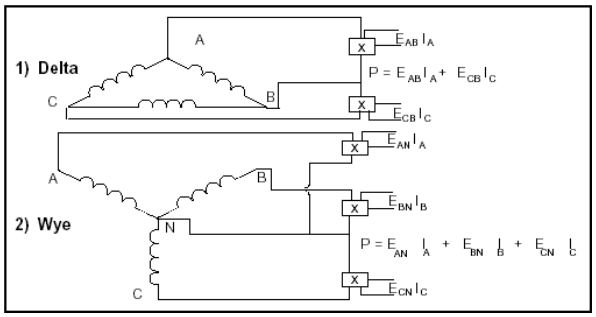
A typical configuration has either a Delta connection or a Wye (Star) connection

In a three-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).



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 poly phase system has either a Delta connection or a Star (Wye) 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.

3.2. Consumption & Poor PF

CONSUMPTION: Wh = W x T, where W = instantaneous power T = time in hours

The total electric energy usage over a time period is the consumption of Wh.

Typically, the unit in which consumption is specified is the kilowatt-hour (kWh): one thousand watts consumed over one hour. Utilities use the Wh equation to determine the overall consumption in a billing period.

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.

3.3. "3D" kVA Measurement

The EM 6400 series meters is equipped with 3D Measurement of kVA. This advanced method provides the most accurate and predictable measurement under unbalanced as well as distorted waveform conditions.

However, in case the EM 6400 series meters needs to match the reading of older or simpler meters, which use the Arithmetic kVA definition, this too is available as a Setup option.

kVA Function	Formula	Other Names	Which one?
3D Factory setting	$kVA_{3D} = \sqrt{\sum W^2 + \sum VAR^2 + \sum D^2}$ Where D = Distortion Power per IEEE 100	U, Apparent, Vector kVA	Best, all around
Arth	$kVA_{Arth} = kVA_1 + kVA_2 + kVA_3$	Arithmetic, Scalar kVA	Good under Low unbalance, to match simpler meters without 3D capability

4. Installation

4.1. Safety Precautions ⚠

Go through this chapter thoroughly before EM 6400 series installation and follow all the mentioned safety measures to avoid any serious personnel or equipment damages.

1. All Installation, wiring and periodic maintenance of the EM 6400 series of meters as well as its associated circuits should be carried out by only qualified and trained personnel following the standard safety procedures. Neither Schneider Electric Conzerv nor its agents may be held responsible for damage or death arising out of the wiring and / or PT (VT), CT or other external circuits.
2. De-energize the connected circuits before meter installation or disconnection.
3. Do not feed the EM 6400 series of meters auxiliary power supply terminals with a voltage greater than the rating marked on the label. The EM 6400 series of meters will be permanently damaged and Schneider Electric Conzerv's Warranty shall be void.
4. Never dismantle or open the covers of the EM 6400 series of meters. There are no user-serviceable parts inside. The EM 6400 series of meters contains high-precision components which require special handling available only at authorized Schneider Electric Conzerv service locations. High voltages are likely to be present inside even after the EM 6400 series of meters has been switched off. Opening the covers of the EM 6400 series of meters and/or any attempts to dismantle, service, repair or modify the unit by unauthorized persons may cause severe injury, will damage the unit and will also render Schneider Electric Conzerv's warranty void.
5. Improper wire-man-ship will damage the terminals and require factory replacement. This does not indicate defective manufacture and is not covered by product warranties.
6. Before wiring, de-energize the CT secondary by shorting it via a shorting block. Under no circumstances must the CT secondary be left open-circuited, even momentarily, when primary current is flowing. This causes high voltages that will overheat and explode the secondary of the CT and damage the instruments as well.
7. Before wiring, de-energize the PT secondary by opening the circuit or removing the fuse. Do not short the PT secondary.

4.2. MECHANICAL INSTALLATION ⚠

The EM 6400 series of meters is panel-mounted and has reliable, rear-mounted terminal strips rated at 600V. The 92 x 92 mm cut-out and 96 x 96 mm bezel dimensions adhere to DIN IEC 61554 and DIN 43700.

Please read this and the following chapter completely, before proceeding

Depth required behind the Bezel is 80 mm, plus space for wiring. Two side clamps are provided for firm mounting.

Diagram below displays the various dimensions of mechanical installations.

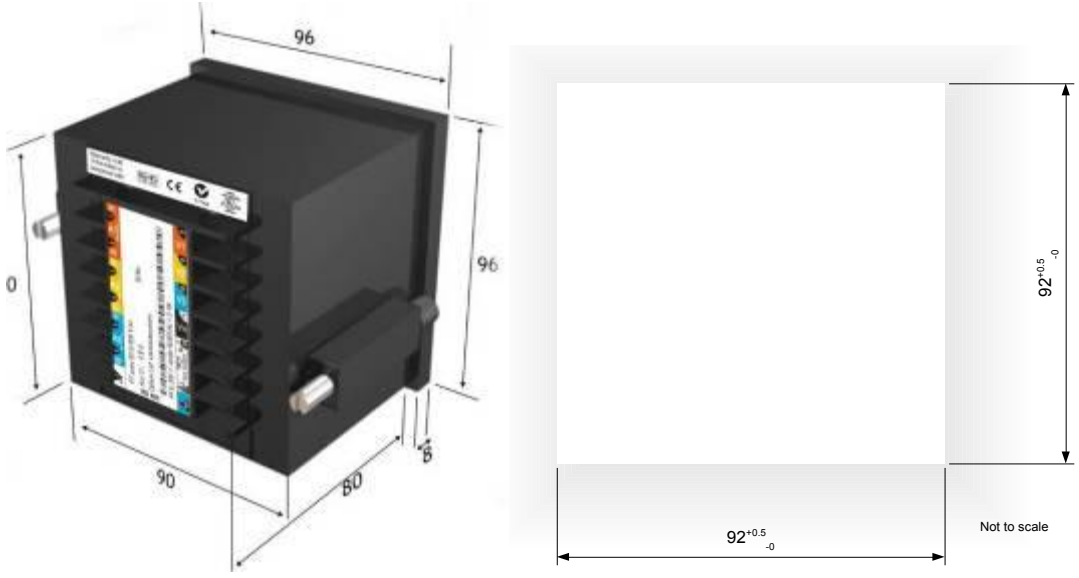


Fig 4.1: Mechanical dimensions & RECOMMENDED PANEL CUT-OUT 92 X 92 mm

4.2.1. Installation Procedure

4.2.1.1. Usage

First, decide on how the EM 6400 series of meters is going 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. Else decide the location of the meter and install it. For best performance, choose a location, which provides all the required signals with minimum wiring lengths.

4.2.1.2. Panel Considerations and Environment

The EM 6400 series of meters 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 the heat sources and strong electromagnetic fields. To operate reliably, the following conditions must be met:

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

The EM 6400 series of meters 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 EM 6400 series of meters is mounted, should protect it from dust, moisture, oil, corrosive vapours, etc.

The panel doors must be easily opened to provide easy access to the EM 6400 series of meters wiring for trouble-shooting. 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 contractors and other necessary components.

4.2.1.3. Viewing

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

4.2.1.4. Mounting

Before mounting and wiring, the Setup procedure (Refer Section 2.1. PROG menu - Setup) should have been completed.

The EM 6400 series of meters is panel mountable.

Panel cut-out	$92^{+0.5}_{-0}$ mm (w) x $92^{+0.5}_{-0}$ mm(h) DIN IEC 61554 and DIN 43700
Panel Thickness	0.5 to 4.0 mm
Instrumental Bezel dimension	96 x 96 mm
Depth behind Bezel	80 mm (82 mm with terminal cover. Leave clearance for wires)
Mounting Clamps Screws	Slotted, 2 nos
Terminal Screws	Combination Phillips & Slotted head

The cutout should be punched with the proper tool and should be free from burrs. Before wiring, insert the meter into the cutout from the front. Then, fasten the two side clamps from the rear. While supporting the 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.

4.3. ELECTRICAL INSTALLATION ⚠

This Chapter describes the following:

- The Need and selection of potential transformers (PTs) and current transformers (CTs).
- Auxiliary Supply (Control power), PT (VT) and CT Connections.

NOTE: For best wiring results with the terminals, please ensure the following specs:

- Power driver preferred, hand screwdriver OK.
- TIP: Phillips preferred, DO NOT USE POZIDRIV TIPS. Flat OK.

Screw Head Diameter = 3.5mm, TIP Shaft Diameter < 5mm.
IMPORTANT - Driver Shafts inserted angularly or of diameter = 5mm or more WILL GET STUCK in the Safety Cover
Tightening Torque: 25 to 60 N-cm
Loosening Torque: 55 to 60 N-cm
Screw Travel: 6 mm less wire thickness
Torque greater than 60 N-cm may strip the screw or break the safety cover.
Worn-out bits and insufficient hold-down pressure while tightening will cause the bit to ride on the screw head thus stripping and damaging it.

4.3.1. Auxiliary Supply (Control Power)

The EM 6400 series of meters requires a single-phase ac / dc Auxiliary (control) power supply to power up its internal electronic circuitry. The Setup procedure (Section 3.5) must first be completed, with only the auxiliary supply connected.
External surge suppressors are necessary in the auxiliary supply circuit for proper operation during extreme surge conditions, where the voltage surges exceed the auxiliary supply limits (E.g. Rural areas and outlying areas prone to lightning strikes).
Auxiliary Supply Range:

- 44 to 300 Vac / dc.
- Burden (load) < 3VA.

NOTE 1: The auxiliary power (control power) supply may be derived from the voltage signals.
NOTE 2: If you have a 440V three-wire delta system and a reliable neutral is not available, a 440V: 240V Supply transformer should be used to provide the standard 240V auxiliary supply.

4.3.2. PTs (VTs) and CTs

Large electrical installations have high voltages and currents, which may exceed the direct connection rating of the meter. In this case, Potential Transformers (PTs) and Current Transformers (CTs) are used to precisely “step down” or reduce the voltage and current level to suit the meter rating. Potential Transformers usually have a full-scale output of 110V ac RMS line-line and Current Transformers, a full-scale output of 5A or sometimes 1A.
The PTs (VTs) and CTs must be planned, installed and tested by a qualified electrical contractor before wiring the 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 EM 6400 series of 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, say 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, then you may exceed its full-scale and burn out both the CT and the meter.

4.3.2.1. 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 5A secondary and the wire resistance is 1.0 Ω, then the CT has to support an additional burden of 5VA. If the wiring distance from the CT secondary is greater than stated in Table 8.1, then the CT could get over-burdened and give large errors. Choosing a 1A CT secondary can reduce this error. The CT Secondary value must be user programmed into the meter.

The EM 6400 should be conveniently located for easy connections of voltage (PT) and Current (CT) signals, the auxiliary (control) supply.

NOTE: The EM 6400 series of 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.

4.3.3. Voltage Signal Connections

For proper 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 600 Vac and a current rating greater than 0.1A.

There are 4 input voltage terminals marked V1, V2, V3 and Vn. See the wiring diagrams that follow, for details. For Delta connection, the Vn terminal should be left un-connected.

4.3.3.1. PT Connections

The EM 6400 series of meters directly accepts LT voltage inputs of up to 600 Vac RMS Line to Line (347 VLN). Voltages greater than this, typically HT systems, must be connected through Potential Transformers (PTs). The EM 6400 series of meters allows 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 601 Vac RMS LL.

EM 6400 Voltage Input burden : 0.2 VA per input.

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

4.3.3.2.Selecting the Voltage Fuses

We strongly recommend using fuses on each of the sense voltages and the control / auxiliary power, although connection diagrams often do not show them. Use a 0.25 A fuse on each voltage input.

4.3.4. Current Signal Connections

The meter accepts up to 6A 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 terminal is labeled as (S1, S2) and has an arrow indicating the direction of current flow. For proper measurements, the phase identification as well as 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. Please maintain the correct sequence and polarity to avoid wrong readings.

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

Install the wiring for the current circuit at 600 Vac insulation as a minimum. The cable connection should be rated for 7.5A or greater and have a cross-sectional area of 16AWG minimum.

4.3.4.1. CT Connections

Mount the current transformers (CTs) as close as possible to the meter for best accuracy. The following table illustrates the maximum recommended distances for various CT sizes, assuming the connection is via 16AWG cable.

Table: 4.1: CT Size and Maximum Distance

5A CT size	Maximum Distance in meters (in feet) (CT to EM 6400 Meter)
2.5 VA	3.05 metres (10 feet)
5.0 VA	4.6 metres (15 feet)
7.5 VA	9.15 metres (30 feet)
10.0 VA	12.2 metres (40 feet)
15.0 VA	18.3 metres (80 feet)
30.0 VA	36.6 metres (120 feet)

User programmable CT Primary range : (1A to 99kA) ac.
CT Secondary : (1A or 5A) ac (programmable)
Other values are also programmable to compensate CT errors if desired.
EM 6400 series of meters CT burden : 0.2VA maximum per input.
See the Setup (User programming) section for programming details.
IMPORTANT: The CT Primary and Secondary values must be User Programmed before using the Meter. Otherwise, the readings will be wrong.
NOTE 1: With dual - range CTs; select the best range for programming the EM 6400. Do not change the range thereafter without re-programming the EM 6400; the EM 6400 will read erroneous values.

4.3.4.2. CT Polarity

When the meter is connected using the CTs, you must maintain the 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 meter.
Failure to connect CTs properly results in inaccurate power readings. If your meter is not reading power properly, it is more than likely that the CT is incorrectly wired. If one or two CTs are reversed, then energy parameters accumulate only one phase value. If two or all the phases of the CT are reversed, energy will not accumulate. (Energy import will not be measured).

4.3.4.3. CT Connection Reversal

To check the polarity of the CT after the meter has been installed, simply look at the phase-wise W (Watt) readings to see that each of the readings are positive (assuming you are consuming power). If one of the W readings is negative, that particular phase CT is reversed and must be corrected. On the other hand if you are exporting power, all three phase-wise W readings must be negative.

4.3.5. Setup – System Type

The EM 6400 series of meters needs to know what type of system it is connected to. This is programmed in the Setup procedure (Section 3.5), before using the meter. The 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, not to be changed regularly. The options are:

- Star (Wye): For three phase four 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, means all the 4 voltage terminals and 6 current terminals described in the following section, need to be wired. For Star / Wye wiring configuration refer section 4.3.7.3. Three Phase 4 Wire Star
- Delta: For three phase, three wire, “Two Watt-meter” or “Two Element” circuits. For delta and open delta wiring configuration refer section 4.3.7.1. Three Phase 3 Wire Delta, 4.3.7.2. Three Phase 3 Wire Open Delta.
- 2 Phase: For two phase three 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, means all the 3 voltage terminals and 4 current terminals described in the following section, need to be wired. For two phase wiring configuration refer section 4.3.7.4. Two Phase three wire connection.
- 1 Phase: For single phase two 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 2 voltage terminals and 1 current terminal described in the following section need to be wired. For Single phase wiring configuration refer section 4.3.7.5. Single Phase connection.

4.3.6. Phase Labels

The phase labels shown on the display are programmable via the EM 6400 series of meters front panel PROG menu. You can setup the meter to display phase labels convenient to your practice. The choices available are: 123 (factory set), RYB, RST, PQR, ABC. The factory setting is 1, 2, and 3.

Factory Default = 1 2 3

4.3.7. 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 as explained in "CT Polarity" above. Follow the outlined procedure to verify correct connection.

4.3.7.1. Three Phase 3 Wire Delta

With 2 CTs. Direct voltage connections if the input voltage L-L is less than 601V ac. Otherwise, 3 PTs for Closed Delta or 2 PTs for Open Delta.

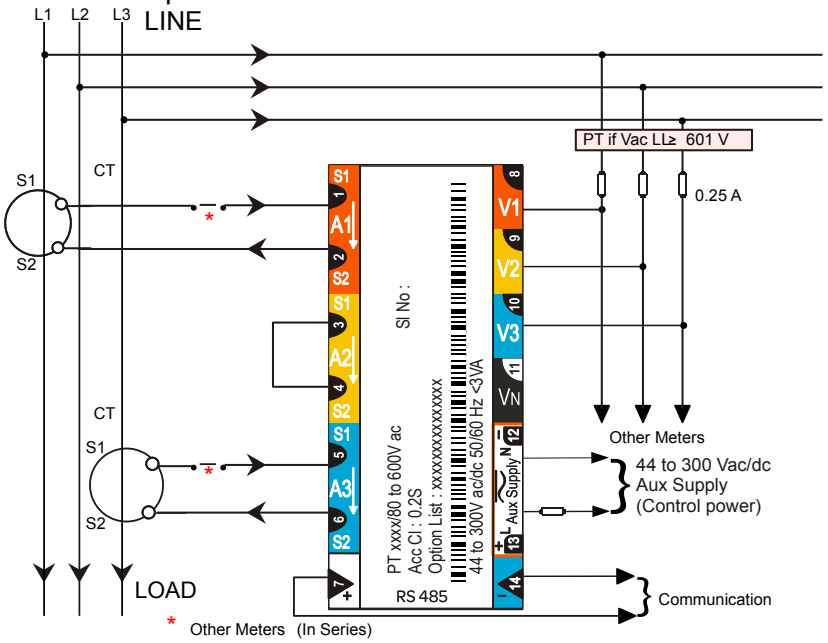


Fig.4.2: The Delta Connection

Note 1: Remember to make sure Delta is programmed in the meter PROG menu- Setup. Leave the Vn terminal un-connected.

4.3.7.2. Three Phase 3 Wire Open Delta

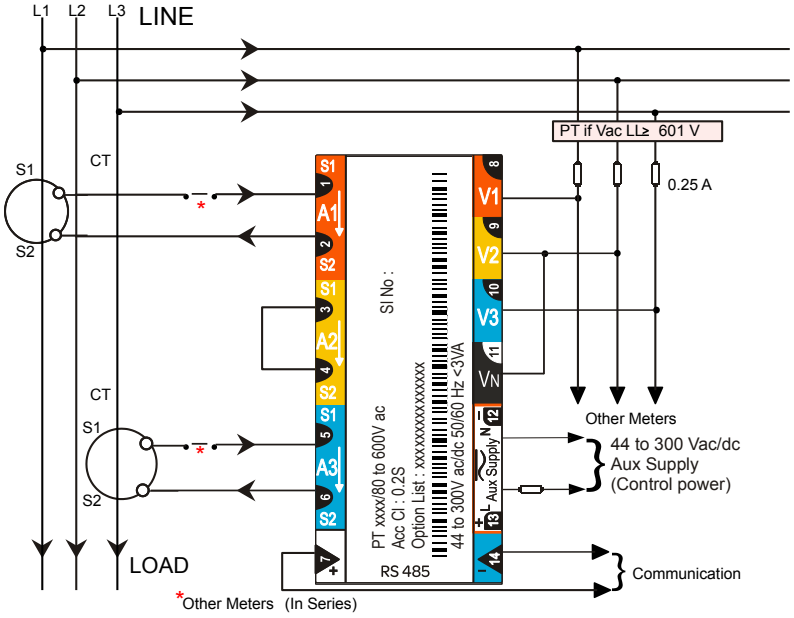


Fig.4.3: The open Delta Connection

Note: Remember to make sure Delta is programmed in the meter PROG menu- Setup.

4.3.7.3. Three Phase 4 Wire Star

3 CTs. Direct Voltage Connections if the input voltage L-L is less than 601V ac. Otherwise 3 PTs.

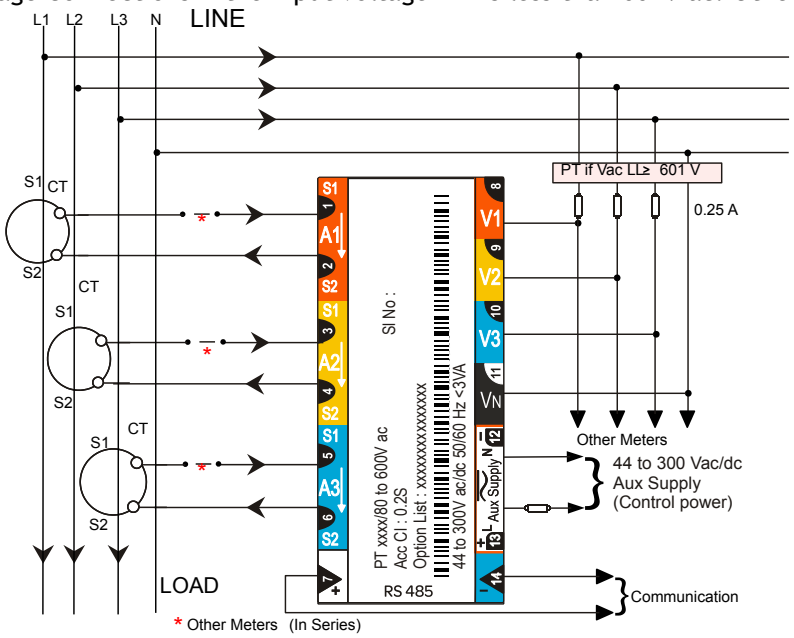


Fig.4.4: The Star (Wye) 3 Phase 4wire Connection

Note 1: Remember to make sure Star is programmed in the meter PROG menu- Setup.

Note 2: For High – leg (US connection)

L1 – N = 120V

L2 – N = 208V

L3 – N = 120V

4.3.7.4. Two Phase three wire connection

2 CTs. Direct Voltage Connections if the input voltage L-L is less than 601 Vac. Otherwise 2 PTs.

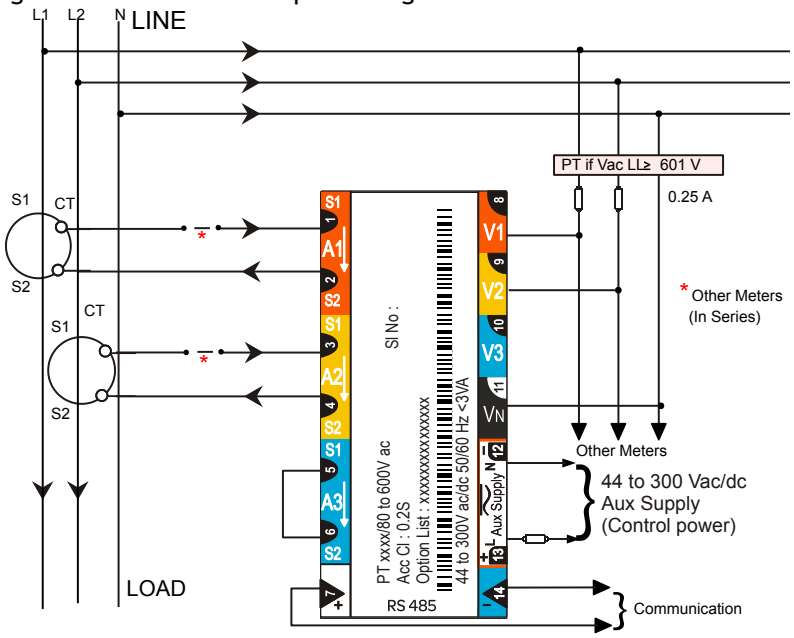


Fig.4.5: The two phase three wire connection

Note: Remember to make sure 2 Phase is programmed in the meter PROG menu- Setup.

4.3.7.5. Single Phase connection

Direct Voltage Connections if Voltages are less than 601 Vac LL. Otherwise use one PT.

1.) Program the meter in single phase (1 Phase) mode.

However Voltage primary and secondary needs 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 meter.

3.) The unused current terminals (A2 and A3) must be shorted together to reduce noise picked up in the meter.

4.) However, the energy parameter readings will be accurate.

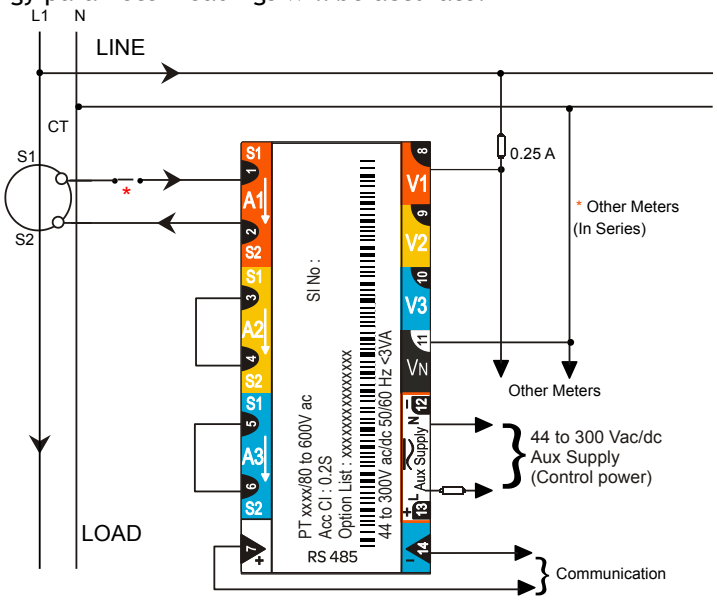


Fig.4.6: The Single Phase Connection

5. Data communication

This section is applicable only for those EM 6400 series meters that have RS 485 data port included in it.

5.1. RS 485 Data Port

If you didn't order the RS 485 port, please contact your supplier to check the availability of an upgrade.

Data Port advantages:

- Rapid, on-line, real time readings into
  - Your own SCADA software or PLC.
  - Schneider Electric Conzerv Energy Management software products such as eLAN and ueLAN, for pinpointing energy usage and wastage.
  - Schneider Electric Conzerv ConPAD – meter programming and basic data reading utility.
- 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 16mS meter response, average timing to read 10 parameters is of 90 to 100mS (9600 baud, Even parity, One stop bit).
- Direct reading, 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

5.2. Installation

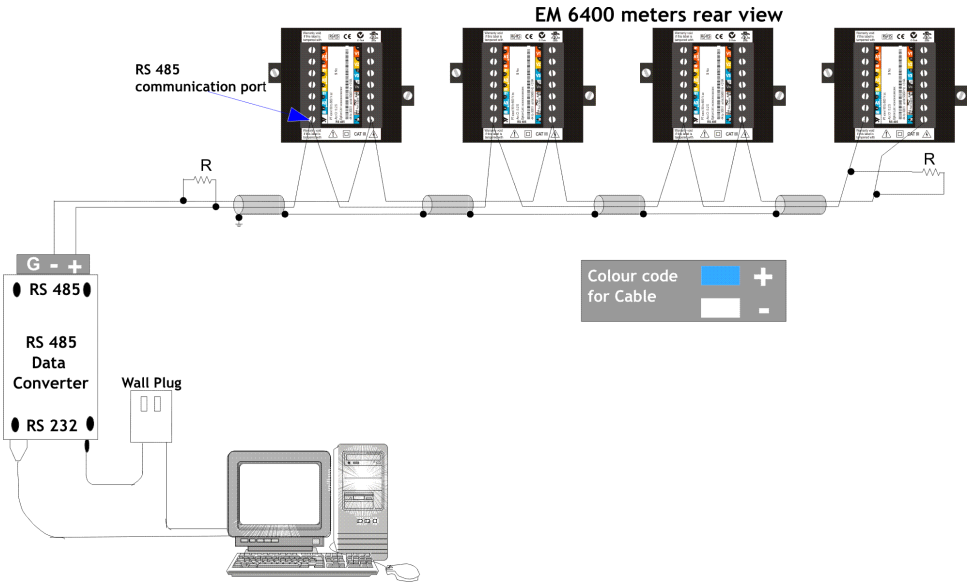


Figure 5.1: 2 Wire Half Duplex Communication Connection

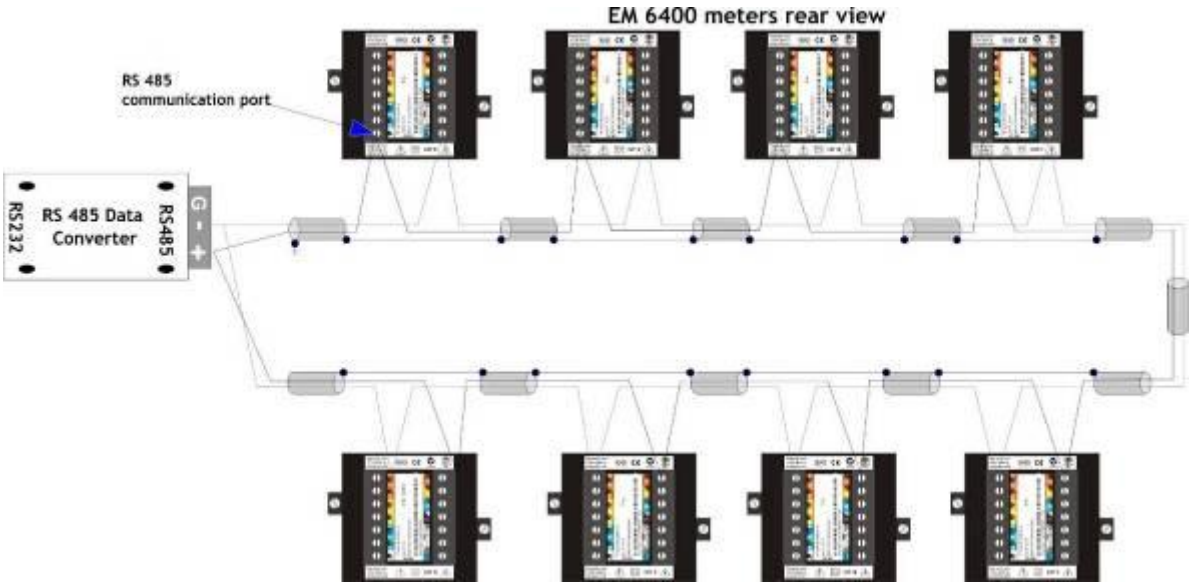


Figure 5.2: Closed Loop, 2 Wire Half Duplex.
Advantage - Reliable communications, Tolerant to one break in the cable.

5.3. RS 485 Repeaters

Schneider Electric Conzerv can supply RS 485 repeaters for large networks of meters.

- One RS 485 segment can accommodate only 32 meters.
- The Repeater
  - Allows additional segments to be added, up to a max of 247 instruments on one COM port of the PC.
  - Allows the cable to be extended by another km, up to a max of 3 repeaters cascaded, 4km of cable in all.

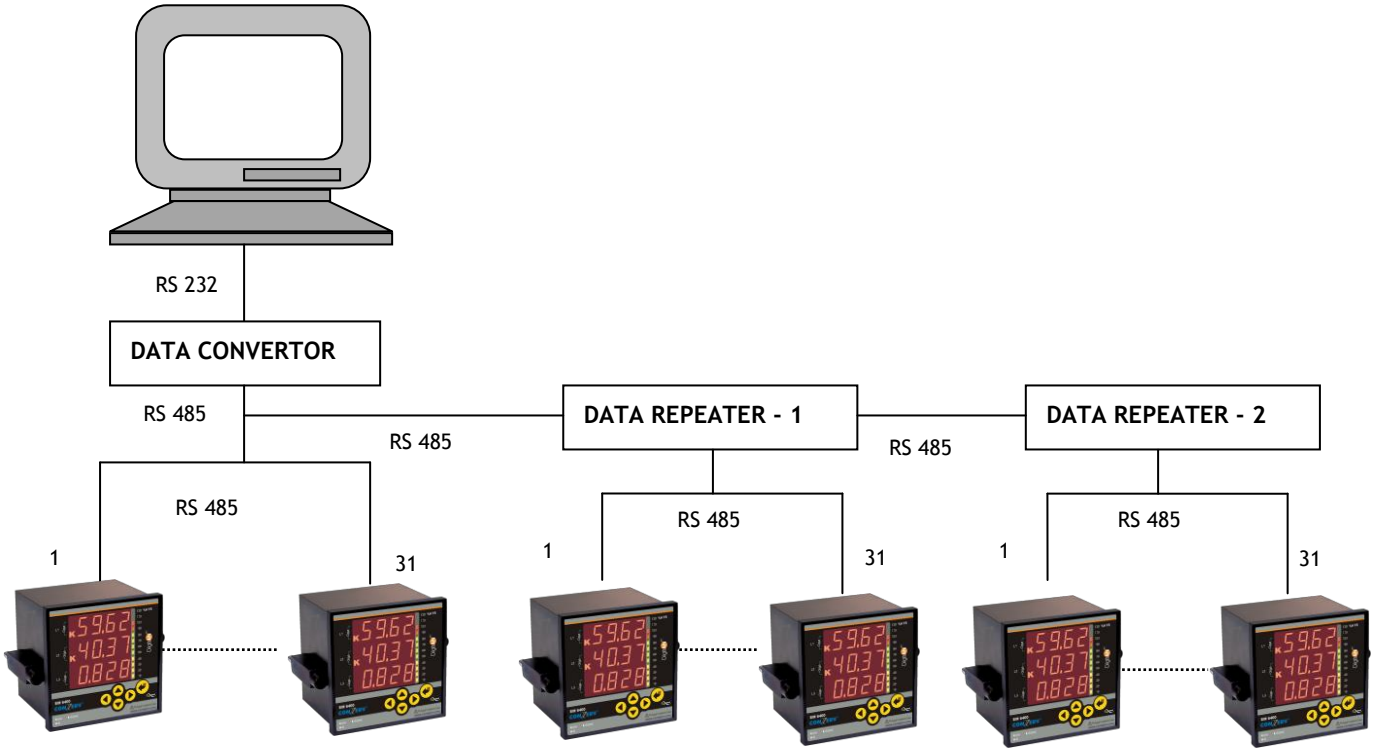


Fig5.3: RS-485 Communication Installation Connection with Repeaters

Note: For better performance, Schneider Electric Conzerv recommends to use SWG 100% shielded cable with low resistance

5.4. Data Formats and Settings

Your SCADA software must be configured for Modbus RTU communication, before integrating the Schneider Electric Conzerv EM 6400 series of meters.

The mode of transmission is defined in the following which is compatible with Modbus RTU Mode:

Meter Communication Settings	
Protocol	Modbus RTU
Data bits	8
Baud rate	9600 bps, User set 1200 to 19200 Range:1200, 2400, 4800, 9600, 19200 Normally use: 9600 baud Noisy, EMI, RFI, long data cable: 4800/2400 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 Section 5.4.3
Data type	32-bit float (real) : ■ All parameters. ■ Direct reading, Little 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 EM 6400 data block of 10 x 32 bit values must be configured to suit the meter

5.4.1. Parameter Settings for different SCADA software

E.g.: To read VA from TURBO BLOCK in different MODBUS Master Software / PLC's

SL. No	SCADA software	Start Address	Function Code	No. of Register	Data Type	Remarks
1	Intouch	43901 F	Nil	2	Float	Direct conversion
2	MODSCAN (Master)	3901	03 – Holding Registers	2	Floating point	Unswapped FP mode
3	MODTEST	43901	03 – Rosemount	Points -1	Float-Rosemount	
4	CIMPLICITY	43901	Nil	100	Real	Direct conversion. The array concept can be used here to poll all the data in single scan
5	Allenbradly – Micrologix PLC (Slave/Master)	43901	03-Holding Registers	2	Floating point	Direct
6	GE Fanuc PLC	43901	03-Holding Registers	2	Real	Direct
7	ABB RTU 560 (Mater)	Index-3900	03- Read Holding Registers	Query Range - 2	MFI – Analog measured Floating value	Under Sub parameters "Sign and Exponent in First Register" should be disabled

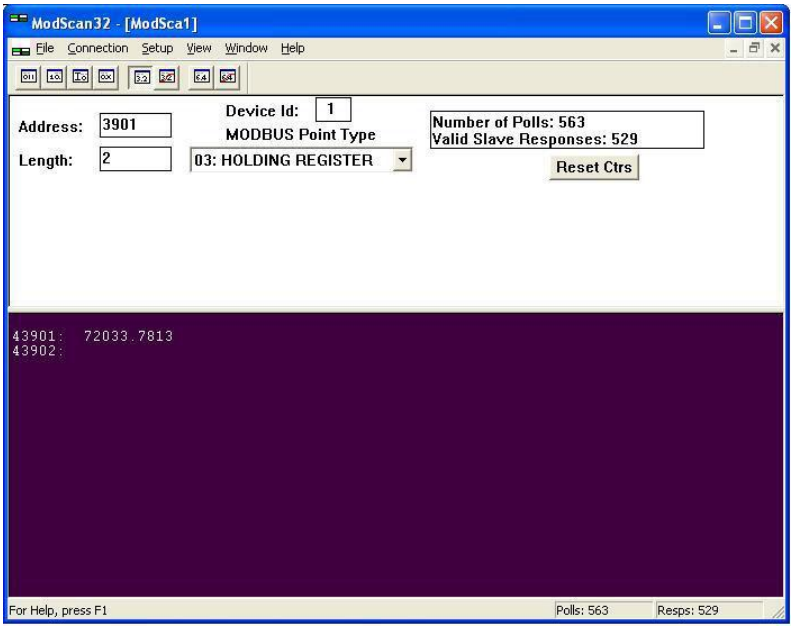
						(Unchecked)
8	SEIMENS PLC (Master)	3900	03-Holding Registers	2	Real	Direct
9	MOVICON	43901	Nil	2	Real	Direct
10	RSVIEW	43901	03-Holding Registers	2	Real	Direct
11	ABB Microscada	3900	Format - 9	Interval - 2	Real	Direct

5.4.2. Communication Test

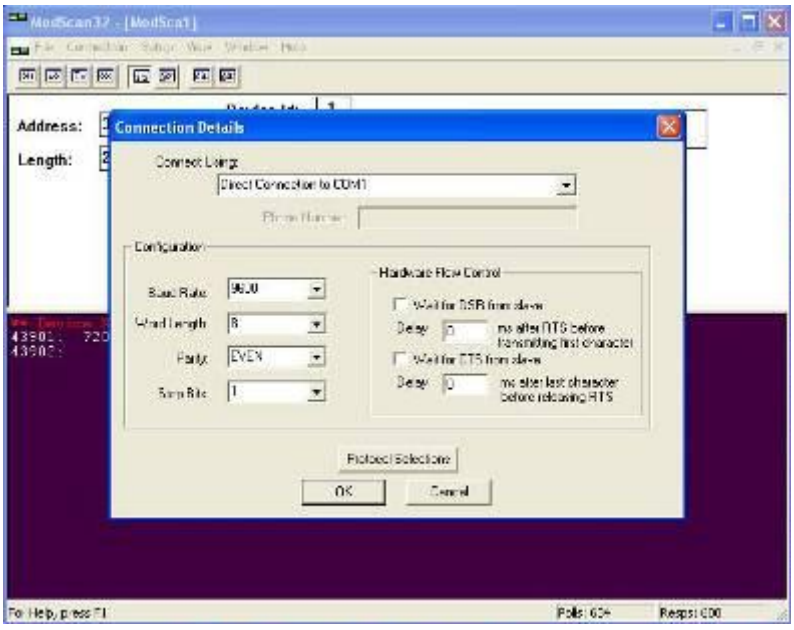
Communication test: EM 6400 meter can be successfully used for communication using MODSCAN Software as Modbus master in PC. Details of the settings in MODSCAN are given below.

Settings in MODSCAN v3.D05-00 Software to establish communication with EM 6400 series of meters: Free download Demo MODSCAN Software from http://www.win-tech.com. E.g. To read the voltage V1 from 0131H Register, follow the instructions-

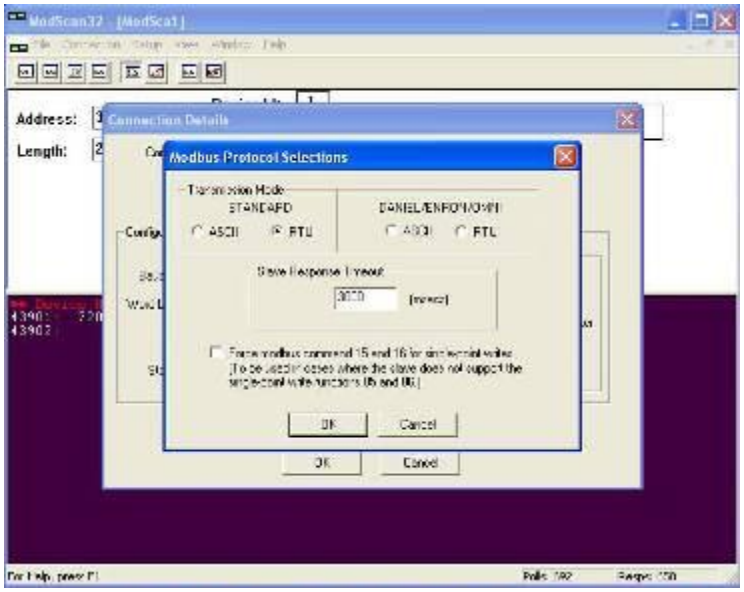
Step1: After starting the Modscan, to read Apparent power total (VA total), enter Address as 3901 (decimal) Length as 2; Device ID as 1; Modbus Point type as 03: HOLDING REGISTER as shown below.



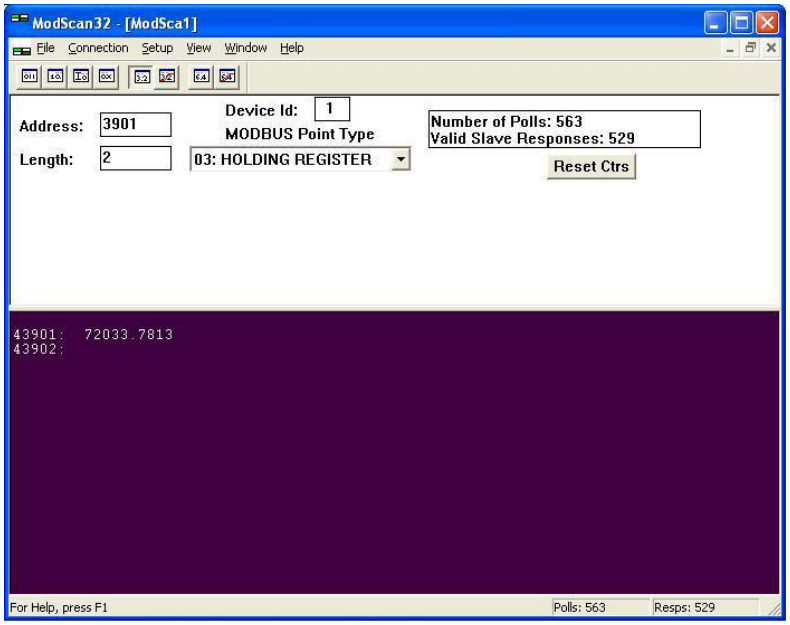
Step 2: Modify the connection details: Click on the connection->Connect, you will see the Connection Detail Window. Change all the settings to match with the below shown screen which are default settings of EM 6400 DigitAN series of meters



Step3: Set the Modbus protocol selections: **On "Connection details"** window (shown in previous step), click on **"Protocol Selections"**. Set the settings of the protocol as shown below and click 'OK' in all the windows.



Step 4: Click 'OK', the MODSCAN Software starts polling the configured COM port for the Device ID 1. Modscan Demo software will stop polling after 3.5 minutes on successful communication.



This shows that the meter is communicating with the MODBUS MODSCAN Master Software successfully on the PC. The meter is MODBUS RTU compliant.

5.4.3. Data Address

The EM 6400 series of meters supports the transfer of whole block and also of individual Data values (2 registers are used for storing single data value)

- In transfer of individual data values, it basically treats 2 registers as an object with the starting address (e.g. 3900) considered as the object name. This enables to transfer required data values for energy management.
- In transfer of whole block, it basically 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 as of the same point of time. This method also eliminates time-skew within readings of that block.
- The Device Address, Block Start Address, number of registers, must be configured to suit the

meter. Additionally, related SCADA settings for polling priority, logging and viewing the data must also be made. Refer your SCADA software instructions on how to do this.

5.4.3.1. Individual Parameter Address

TURBO Parameters: Function Code: 03 Read

No Scaling Required

Read as Block or Individual Parameters

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
VA Apparent Power, Total	3901	Float	●		●	●	●
W Active Power, Total	3903	Float	●		●	●	●
VAR Reactive Power, Total	3905	Float	●		●		
PF Avg PF	3907	Float	●	●	●	●	
VLL Line to Line Avg Voltage	3909	Float	●	●		●	
VLN Line to neutral voltage	3911	Float	●	●		●	
A Avg Current	3913	Float	●	●		●	●
F Frequency, Hz	3915	Float	●	●		●	
VA1 Apparent Power, phase1	3917	Float	●		●	●	●
W1 Active Power, phase1	3919	Float	●		●	●	●
VAR1 Reactive Power, phase1	3921	Float	●		●		
PF1 PF, phase1	3923	Float	●	●	●	●	
V12 Voltage phase1 to phase2	3925	Float	●	●		●	
V1 Voltage phase1 to neutral	3927	Float	●	●		●	
A1 Current, phase1	3929	Float	●	●		●	●
VA2 Apparent Power, phase2	3931	Float	●		●	●	●
W2 Active Power, phase2	3933	Float	●		●	●	●
VAR2 Reactive Power, phase2	3935	Float	●		●		
PF2 PF, phase2	3937	Float	●	●	●	●	
V23 Voltage phase2 to phase3	3939	Float	●	●		●	
V2 Voltage phase2 to neutral	3941	Float	●	●		●	
A2 Current, phase2	3943	Float	●	●		●	●
VA3 Apparent Power, phase3	3945	Float	●		●	●	●
W3 Active Power, phase3	3947	Float	●		●	●	●
VAR3 Reactive Power, phase3	3949	Float	●		●		
PF3 PF, phase3	3951	Float	●	●	●	●	
V31 Voltage phase3 to phase1	3953	Float	●	●		●	
V3 Voltage phase3 to neutral	3955	Float	●	●		●	
A3 Current, phase3	3957	Float	●	●		●	●
FwdVAh Forward Apparent Energy	3959	Float	●		●	●	●
FwdWh Forward Active Energy	3961	Float	●		●	●	●
FwdVARh Forward Reactive Inductive Energy	3963	Float	●		●		
FwdVARh Forward Reactive Capacitive Energy	3965	Float	●		●		
RevVAh Reverse Apparent Energy	3967	Float	●				
RevWh Reverse Active Energy	3969	Float	●				
RevVARh Reverse Reactive Inductive Energy	3971	Float	●				
RevVARh Reverse Reactive Capacitive Energy	3973	Float	●				
Present Demand	3975	Float	●				
Rising Demand	3977	Float	●				
Max MD	3979	Float	●				
Max DM Occurrence Time	3981	Float	●				
Reserved 41	3983	Float					
Reserved 42	3985	Float					
Reserved 43	3987	Float					
Reserved 44	3989	Float					
Reserved 45	3991	Float					
On hrs	3993	Long	●	●	●	●	●

FwdRun secs	3995	Long	●		●	●	●
RevRun secs	3997	Long					
Intr Number of power interruption	3999	Long	●	●	●	●	●

Total harmonic distortion (THD) block: Function Code: 03H Read

No Scaling Required

Read as Block or Individual Parameters

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
%V1 Voltage THD, phase 1	3861	Float	●				
%V2 Voltage THD, phase 2	3863	Float	●				
%V3 Voltage THD, phase 3	3865	Float	●				
%A1 Current THD, phase 1	3867	Float	●				
%A2 Current THD, phase 2	3869	Float	●				
%A3 Current THD, phase 3	3871	Float	●				

NOTE: THD values are indicative only

Percentage of Load Parameters: Function Code: 03H Read

No Scaling Required

Read as Block or Individual Parameters

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
% Avg Load Average Load percentage	3881	Float	●	●			
%L1 Percentage of phase1 load	3883	Float	●	●			
%L2 Percentage of phase2 load	3885	Float	●	●			
%L3 Percentage of phase3 load	3887	Float	●	●			
Unbalanced %Load	3889	Float	●	●			

5.4.3.2. Block Parameter Address

Total RMS Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
VA Apparent Power, Total	3001	Float	●		●	●	●
W Active Power, Total	3003	Float	●		●	●	●
VAR Reactive Power, Total	3005	Float	●		●		
PF Avg 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	3017	Long					
Intr Number of interruption	3019	Long	●	●	●	●	●

R phase RMS Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
VA1 Apparent power, phase1	3031	Float	●		●	●	●
W1 Active power, phase1	3033	Float	●		●	●	●
VAR1 Reactive power, phase1	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	3047	Long					
Intr1 Number of interruption	3049	Long	●	●	●	●	●

Y phase RMS Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
VA2 Apparent power, phase2	3061	Float	●		●	●	●
W2 Active power, phase2	3063	Float	●		●	●	●
VAR2 Reactive power, phase2	3065	Float	●		●		
PF2 Power factor, phase2	3067	Float	●	●	●	●	
V23 Voltage phase2 to phase3	3069	Float	●	●		●	
V2 Voltage phase2 to neutral	3071	Float	●	●		●	
A2 Current, phase2	3073	Float	●	●		●	●
F2 Frequency, Hz	3075	Float	●	●		●	
Reserved	3077	Long					
Intr2 Number of interruption	3079	Long	●	●	●	●	●

B phase RMS Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
VA3 Apparent power, phase3	3091	Float	●		●	●	●
W3 Active power, phase3	3093	Float	●		●	●	●
VAR3 Reactive power, phase3	3095	Float	●		●		
PF3 Power factor, phase3	3097	Float	●	●	●	●	
V31Voltage phase3 to phase1	3099	Float	●	●		●	
V3 Voltage phase3 to neutral	3101	Float	●	●		●	
A3 Current, phase3	3103	Float	●	●		●	●
F3 Frequency, Hz	3105	Float	●	●		●	
Reserved	3107	Long					
Intr3 Number of interruption	3109	Long	●	●	●	●	●

Forward Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
FwdVAh Forward Apparent Energy	3121	Float	●		●	●	●
FwdWh Forward Active Energy	3123	Float	●		●	●	●
FwdVARh Forward Reactive Inductive Energy	3125	Float	●		●		
Reserved	3127	Float					
Reserved	3129	Float					
FwdVARh Forward Reactive Capacitive Energy	3131	Float	●		●		
Reserved	3133						
Reserved	3135	Float					
Reserved	3137	Long					
FwdRunsecs Forward Run Seconds	3139	Long	●		●	●	●

Reverse Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
RevVAh Reverse Apparent Energy	3151	Float	●				
RevWh Reverse Active Energy	3153	Float	●				
RevVARh Reverse Reactive Inductive Energy	3155	Float	●				
Reserved	3157	Float					
Reserved	3159	Float					
RevVARh Reverse Reactive Capacitive Energy	3161	Float	●				
Reserved	3163						

Reserved	3165	Float					
Reserved	3167	Long					
RevRunsecs Reverse Run Seconds	3169	Long	•				

Total Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
TotVAh Total Apparent Energy	3181	Float	•				
TotWh Total Active Energy	3183	Float	•				
TotVARh Total Reactive Inductive Energy	3185	Float	•				
Reserved	3187	Float					
Reserved	3189	Float					
TotVARh Total Reactive Capacitive Energy	3191	Float	•				
Reserved	3193						
Reserved	3195	Float					
Reserved	3197	Long					
TotRunsecs Total Run Seconds	3199	Long	•				

Demand Block: Function Code: 03H Read, No of Registers: 22

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
Reserved	3721	Long					
Reserved	3723	Float					
Reserved	3725	Float					
Reserved	3727	Float					
Reserved	3729	Float					
Reserved	3731	Float					
Reserved	3733	Float					
Present demand	3735	Float	•				
Rising demand	3737	Float	•				
Time remaining	3739	Long	•				
Reserved	3741	Float					

Max Demand Block: Function Code: 03H Read, No of Registers: 36

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
MaxDM Maximum demand	3741	Float	•				
MaxDMTime Maximum demand occurrence time	3743	Long	•				
Reserved	3745	Float					
Reserved	3747	Long					
Reserved	3749	Float					
Reserved	3751	Long					
Reserved	3753	Float					
Reserved	3755	Long					
Reserved	3757	Float					
Reserved	3759	Long					
Reserved	3761	Float					
Reserved	3763	Long					
Reserved	3765	Float					
Reserved	3767	Long					
Reserved	3769	Float					
Reserved	3771	Long					
Reserved	3773	Float					
Reserved	3775	Long					

Old Forward Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
OldFwdVAh Old forward Apparent Energy	3122	Float	•		•	•	•
OldFwdWh Old Forward Active Energy	3124	Float	•		•	•	•
OldFwdVARh Old Forward Reactive Inductive Energy	3126	Float	•		•		
Reserved	3128	Float					
Reserved	3130	Float					
OldFwdVARh Old Forward Reactive Capacitive Energy	3132	Float	•		•		
Reserved	3134	Float					
Reserved	3136	Float					
Reserved	3138	Long					
OldFwdRunsecs Old Forward Run Seconds	3140	Long	•		•	•	•

Old Reverse Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
OldRevVAh Old Reverse Apparent Energy	3152	Float	•				
OldRevWh Old Reverse Active Energy	3154	Float	•				
OldRevVARh Old Reverse Reactive Inductive Energy	3156	Float	•				
Reserved	3158	Float					
Reserved	3160	Float					
OldRevVARh Old Reverse Reactive Capacitive Energy	3162	Float	•				
Reserved	3164	Float					
Reserved	3166	Float					
Reserved	3168	Long					
OldRevRunsecs Old Reverse Run Seconds	3170	Long	•				

Old Total Integrated Block: Function Code: 03H Read, No of Registers: 20

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
OldTotVAh Old Total Apparent Energy	3182	Float	•				
OldTotWh Old Total Active Energy	3184	Float	•				
OldTotVARh Old Total Reactive Inductive Energy	3186	Float	•				
Reserved	3188	Float					
Reserved	3190	Float					
OldTotVARh Old Total Reactive Capacitive Energy	3192	Float	•				
Reserved	3194	Float					
Reserved	3196	Float					
Reserved	3198	Long					
OldTotRunsecs Old Total Run Seconds	3200	Long	•				

Phase Angle Block: Function Code: 03H Read, No of Registers: 18

No Scaling Required

Read as Block only

Par	Addr	Type	EM 6400	EM 6459	EM 6434	EM 6436	EM 6433
Neutral voltage	3701	Float	•	•			
Neutral current	3703	Float	•	•			

V1 Voltage Phase Angle, phase1	3705	Float	●	●			
V2 Voltage Phase Angle, phase2	3707	Float	●	●			
V3 Voltage Phase Angle, phase2	3709	Float	●	●			
A1 Current Phase Angle, phase1	3711	Float	●	●			
A2 Current Phase Angle, phase2	3713	Float	●	●			
A3 Current Phase Angle, phase3	3715	Float	●	●			
RPM Rotations per minute	3717	Float	●	●			

Note:

- ● = Available
- Most of the reserved and unavailable parameters return zero value.
- Your SCADA software must support Register Blocks consisting of different Data Types (Integers and Floats) to transfer of Whole Block.
- Each Modbus register size is 16-bits. All EM 6400 readings are 32 bits. Therefore, each EM 6400 reading occupies TWO consecutive 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. E.g. VA parameter absolute address is 3901. Modbus address can be 43901 (40000+3901).
- **Phase Angle Block:** Voltage Phase angles (0,120,240) are hard coded (Not measured). Hence, these values are available in communication in the absence of input signals; however, these Voltage phase angles are not available in the meter display.
- **TURBO & Percentage of Load Blocks**: These parameters can be read individually or as a block
  TURBO block: 50 parameters max
  Percentage of Load block: 5 parameters max
- The “On Hours" parameter is available in the Meter display, and also available for Meter communication (only in TURBO block).
- All meters address should be set between 1 and 247.
- All meters should have uniform communication settings like baud rate, parity and stop bit.
- Use Diagnostic mode display in the 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

5.5. Parameters not available on Display

Voltage phase angle parameters and neutral current are not available on the front panel display but available on the RS 485 communication port:

S. No.	Parameters not available on Front Panel Display
1.	Voltage Phase Angle Phase – 1
2.	Voltage Phase Angle Phase – 2
3.	Voltage Phase Angle Phase – 3
4.	Neutral Current

Appendix

Appendix A – Technical Data

Accuracy

Measurement	Accuracy % of Reading		
	Class 1.0	Class 0.5S	Class 0.2S
Voltage LN per phase & Avg	1.0	0.5	0.2
Voltage LL per phase & Avg	1.0	0.5	0.2
Amp per phase & Avg	1.0	0.5	0.2
Amp, phase angle per phase	2°	1°	1°
Frequency	0.1	0.1	0.1
Active power, (kW) per phase & total	1.0	0.5	0.2
Reactive power, (kVAR) per phase & total	2.0	1.0	0.5
Apparent power, (kVA) per phase & total	1.0	0.5	0.2
Active energy (kWh) Import/Export	1.0	0.5	0.2
Reactive energy (kVARh) (Inductive / Capacitive)	2.0	1.0	0.5
Apparent energy (kVAh)	1.0	0.5	0.2
RPM	1.0	0.5	0.2

- Note 1: 5A meter - Additional error of 0.05 % of full scale for meter input current below 100 mA.
  1A meter - Additional error of 0.05 % of full scale for meter input current below 20 mA.
- Note 2: PF error limit is same as W error limit in %.

Auxiliary Power Supply (Control power)

The meter needs a single-phase ac or dc control supply to power its internal electronics.
Auxiliary power supply range: 44 to 300 Vac/dc.
Burden (load): 0.2VA max for each phase input voltage and current 3 VA max on Auxiliary supply.

Front Panel Display

- Brilliant 3 lines 4 digit (digit height 14.2 mm) per line, patented 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), Watts, VARs, VA, Power Factor, Frequency, kWh, kVAh and kVARh.
- The EM 6400 DigitAN series of meters displays average volts, amps and frequency simultaneously.
- Load bar graph for the indication of the consumption in terms of % Amperes total.
- Set of 4 red LED's in the load bar start blinking when the load is greater than 120% indicating overload.
- Easy setup through keys located on the faceplate for common configuration parameters.
- Password protection for setup parameters.
- User selectable default display page through key pad lock.

Installation & Input Ratings

- Auto – ranging voltage inputs should allow direct connection up to 347VLN/600VLL ac systems (no PTs (VTs) required up to 600 VLL phase to phase).
- Supports (field configurable) direct 4-Wire Star (Wye), 3-Wire Star (Wye), 3-Wire Delta configurations, two Phase three wire (2 Phase) and single phase (1 Phase).
- 3 – phase voltage and current inputs
  - Volts : 46 to 347 Vac Phase-Neutral, 80 to 600 Vac Phase-Phase, Overload – Continuous 600 VLL with full accuracy, 750 VLL Max, Hz. 50 / 60
  - Amps: 5 mA to 6 A, Overload: 10 A continuous, 50 A for 3 seconds

- User programmable for 5 A or 1 A secondary CTs
- Burden (Load): Less than 0.2 VA per Volt / Ampere input
- Frequency: 50 / 60 Hz 45 to 65 Hz

Environmental Conditions

- Sealed dust – proof construction. Meets IP51 for the front panel and IP40 for rear panel.
- Temperature operating : -10 to 60^0 C, (14 to 140^0 F)
  Storage : -25 to 70^0 C, (-13 to 158^0 F)
- Humidity : 5% to 95%, non-condensing

Safety Construction

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

Dimensions & Shipping

- Basic unit installed depth 82 mm with the protected cover with 92x92 mm panel cutout, flush mount.
- Bezels dimension 96x96 mm. Panel Cut out 92x92 mm.
- Weight 400 gms approx Unpacked, 500 gms approx shipping.

Refer section 4.2. MECHANICAL INSTALLATION.

Appendix B: Key factor for success

All Installation, wiring and periodic maintenance of the EM 6400 as well as its associated circuits involve high voltages and currents. While this document suggests several safety and reliability steps, it must be used in conjunction with the safety codes in force at your location. Failure to practice safe working procedures is likely to cause damage to the installation, severe injury and/or death. Only qualified personnel must perform all activities including handling of electrical circuits during Installation, wiring and periodic maintenance.

Neither Schneider Electric Conzerv nor its agents may be held responsible for damage or death arising out of the wiring and / or PT, CT or other external circuits.

The covers of the EM 6400 should never be dismantled or opened. There are no user-serviceable parts inside. The EM 6400 contains high-precision components, which require special handling available only at authorized Schneider Electric Conzerv service locations. High voltages are likely to be present inside even after the EM 6400 has been switched off. Opening the covers of the EM 6400 and/or any attempts to dismantle, service, repair or modify the unit by unauthorized persons may cause severe injury, will damage the unit and will also render Schneider Electric Conzerv's warranty void.

S.No	Installation Steps		Recommended	Effects if not allowed
1.1	Unpacking		Ensure that the packaging of your EM 6400 is not damaged.	This will render Schneider Electric Conzerv's warranty void
			Ensure that the seal at the back of the meter is not tampered. Do not try to open / repair the meter.	This will render Schneider Electric Conzerv's warranty void
			Do not remove the protective plastic cover of your new Meters until the time of installation. Preserve the packing material.	You will need the packing material if the meter needs to be shipped to Schneider Electric Conzerv for servicing or calibration.
2.1	Panel Component Selection	External CT	The meter accepts up to 6A ac RMS per channel directly. Above that, a Current Transformer must be used to scale down the current.	If the input current is greater than 6A, direct current connection could damage the instrument.
			Use Instrument Class 1 or better CT's. These will have better accuracy compared to Protection Class CT's.	Protection Class (10P10, etc.) CTs have poor accuracy and phase characteristics. If these CT's are used to feed the EM 6400 the accuracy of measurements might be poor.
			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 the CT is over-rated, say if the load is always less than 10% of the CT Primary rating and accuracy suffers. If the CT is under-rated, then you may exceed its full-scale and burn out both the CT and the meter.

			With Dual - Range CTs, select the best range for programming the EM 6400.	For dual range CTs do not change the range of CTs without re-programming the EM 6400, as the EM 6400 will read erroneous values.
			Program the selected CT ratio before you start measurements using EM 6400.	If the CT ratio that you have selected is not programmed before using the meter, the readings may be wrong.
			Load current of the circuit should be 40-80% of the CT rating	CTs contribute more error when operated lower than 20% of their rating.
2.2	Panel Component Selection	External PT	For input voltage above 600 V ac Line-Line an external PT connection is necessary.	If the input voltage is greater than 600 V, direct voltage connection could damage the instrument
			Use Instrument Class 1 or better PT's. These will have better accuracy compared to Protection Class PT's.	Protection Class (10P10, etc.) PTs have poor accuracy and phase characteristics. If these PT's are used to feed the EM 6400 the accuracy of measurements might be poor.
			Program the selected PT ratio before you start measurements using EM 6400.	If the PT ratio that you have selected is not programmed before using the meter, the readings may be wrong.
2.3	Panel Component Selection	Connection Wires for CT	The cable connection should be rated for 7.5A or greater and have a cross-sectional area of 16AWG minimum. Install the wiring for the current circuit at 600V ac insulation minimum.	EM 6400 has input current rating between 50mA to 6A. Thus the cable used for connecting the external CT to the meter terminals should be rated for a minimum of 7.5A.
2.4	Panel Component Selection	Connection Wires for PT	The cable required to terminate the voltage sense circuit should have an insulation rating greater than 600V ac and a current rating greater than 0.1A.	EM 6400 has input voltage rating between 100v to 600v ac. Thus the cable used for connecting the external PT to the meter terminals should be rated for a minimum of 600V ac. If the cable selection is wrong this could cause damage to the instrument.
2.5	Panel Component Selection	Fuse	Use a 0.25 A fuse on each voltage input. MCB to Voltage terminals to protect against short circuit	Safety of operation. Affect meter circuitry – voltage circuit may not function

			Use external surge suppressors in the Auxiliary Supply Circuit.	Transients, Surges, Voltage swells affect the components of the meter lead to malfunctioning (test severity is over and above the specified limits). External surge suppressors should be used in order to ensure proper operation when the voltage surges exceed the Auxiliary Supply limits.
			Use fuse across auxiliary terminals - 500mA to protect against short circuit	Affect meter circuitry - display goes off.
3.1	Programming Setup	CT ratio programming	The CT Primary and Secondary values must be User Programmed before using the Meter according to the external circuitry connected to EM 6400.	If the CT ratio is not programmed according to the circuit connected to the meter, the readings might be wrong.
3.2	Programming Setup	PT ratio programming	The PT Primary and Secondary values must be User Programmed before using the Meter. The EM 6400 allows Field Programming of both PT Primary and Secondary voltages.	If the PT ratio is not programmed according to the circuit connected to the meter, the readings might be wrong.
3.3	Programming Setup	Selection of System type	For three phase four wire circuits, select the "STAR" mode. For three phase three wire circuits, select the "DELTA" mode. For two phase circuits, select "2 Phase" mode. For Single phase circuits, select "1 Phase" mode.	If the system type (Star/Delta/2 Phase/1Phase) is not programmed according to the external circuit, the readings might be wrong.
3.4	Programming Setup	Selection of %FS	Select the full-scale load percentage setting as per your circuit.	If you do not select the correct %FS, the load bar indication might not be correct.
4.1	Mounting	Panel cut-out, bezel, depth behind bezel	Mechanical dimensions Panel cut-out dimensions are 92 x 92 mm Bezel dimensions are 96 x 96 mm Depth required behind the bezel is 80 mm	a.) If the panel dimensions are not maintained; you will not be able to mount your EM 6400 successfully.
4.2	Mounting	Panel Spacing	The panel doors must be easily opened to provide easy access to the EM 6400 wiring for trouble-shooting.	Sufficient spacing will allow ease during troubleshooting or change in wiring.

			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 contractors and other necessary components.	Sufficient spacing will allow ease during troubleshooting or change in wiring.
4.3	Mounting	Mounting clamps	Mounting clamps shall be tightened using screwdriver to ensure accurate mounting of the meter on the panel.	If mounting clamps are not sufficiently tightened, the meter position may shift and terminals may come in contact with other instruments on the panel. This could result in erroneous readings, short circuit.
			For the last few turns – alternate between the two clamps and tighten two turns each (i.e. Tighten 2 turns on one clamp and then 2turns on the other and so on).	If clamps are not alternately tightened, the meter might be mounted slanted on the panel.
			Do not over-tighten.	Over-tightening could result in breaking of the clamps.
4.4	Mounting	Air circulation and temperature	The EM 6400 should be separated from other equipment and sufficient space must be provided all around for cooling air to rise vertically past the instrument.	Lack of sufficient air for cooling, cooling temperature higher than the specified operating temperature may result in over-heating of your EM 6400.
			The temperature of operation should lie within (-10°C to 60°C).	If the operating temperature exceeds the specified range adjacent circuit/ instrument will fail and may affect the meter functionality.
			The cooling air temperature must be below the specified operating temperature	Sufficient cooling of the meter might not be possible.
4.5	Mounting	Dust free	EM 6400 should be mounted in a panel that provides protection from dust, moisture, oil, corrosive vapors etc.	a.) Protection of meter.

5.1	Wiring	CT wiring connection polarity and sequence	Before wiring, de-energize the CT secondary by shorting it via a shorting block.	If you leave the CT terminals open even momentarily when primary current is flowing, this causes high voltages that will overheat and damage the secondary of the CT and the instruments as well.
			There are three pairs of Current Input terminals marked A1, A2 and A3. Each pair of input terminal is labeled as (S1, S2) and has an arrow indicating the direction of current flow.	Failure to connect CTs properly results in inaccurate power readings.
			For proper measurements, the phase identification as well as the polarity of the current signals must be correct.	If your meter is not reading power properly, it is more than likely that the CT is incorrectly wired Or If one of the W readings is negative, that particular phase CT is reversed and must be corrected.
			The Forward flow (Import by consumer) current direction must be into the S1 terminal and the exit from the S2 terminal.	During the Export Mode, S1 and S2 connections should be reversed or meter should be with I/E to record both the Import/Export values.
			CT Mounting direction in line with current flow	Negative kW, improper energy registration due to CT reversal.
			Rating of panel CT and meter CT programming must be same	Variation in Current, Power and Energy
			Short the unused current terminals (S1, S2) together.	The noise picked up by the meter may increase if the unused current terminals are not shorted together.
			Shorting links of the CT to be left opened when meter is in operating condition. Short the link during maintenance, service and wiring check.	Shorting of links bypass the current inputs to the meter and measurement will not take place.
			Do not install selector switch on current circuit.	Selector switch will interrupt energy accumulation.
5.2	Wiring	PT wiring connection polarity	Before wiring, de-energize the PT secondary by opening the circuit or removing the fuse.	Change of wiring connections in Power-ON condition, may result in shock, fire hazards.

		and sequence	There are 4 Voltage input terminals marked V1, V2, V3 and Vn. For proper meter operation, the voltage connection must be maintained. The voltage must correspond to the correct terminal.	Incorrect voltage connections might result in incorrect readings.
			For Delta connection, the Vn terminal should be left un-connected.	Vn can be grounded or left unconnected
			Use a 0.25 A fuse on each voltage input.	Safety of operation
			Do not short the PT secondary.	Shorting of PT secondary may cause Short circuit.
			Do not install selector switch on voltage circuit.	Selector switch will interrupt energy accumulation.
5.3	Wiring	Auxiliary supply	The auxiliary supply voltage for EM 6400 should not exceed the rating marked on the label.	If the auxiliary supply voltage for EM 6400 exceeds the marked rating on the label, the meter will be permanently damaged and Schneider Electric Conzerv's warranty shall be void.
			In order to ensure accurate readings of the time of occurrence of Maximum Demand (hr), power the auxiliary of EM 6400 with uninterrupted power supply.	The "hr"(time of occurrence of Maximum Demand) is accumulated as long as the auxiliary of the meter is powered ON. If the power supply to the auxiliary is interrupted, hr will stop accumulating until the auxiliary is powered up again.
			Use external surge suppressors in the Auxiliary Supply Circuit to ensure proper operation when the voltage surges exceed the Auxiliary Supply limits.	High input voltage due to surges can cause damage the internal circuitry.
5.4	Wiring	Tools/equipment	Use a power driver or a hand screwdriver for making wiring connections.	Do not use POZIDRIV Tips.
			Screw Head Diameter = 3.5mm, TIP Shaft Diameter <5mm	Torque greater than 60 N-cm may strip the screw or break the Safety Cover.
			Tightening Torque: (25 to 60) N-cm Loosening Torque: (55 to 60) N-cm Screw Travel: 6 mm less wire thickness	Worn-out bits and insufficient hold-down pressure while tightening may cause the bit to ride on the screw head thus stripping and damaging it.

5.5	Wiring	Loosened screws / wiring connections	No loose contact or over tightening of screws for the input voltage, current and auxiliary supply terminals.	Loose wiring/open connections can cause spark, arcing across meter terminals and adjacent circuitry, affect meter functionality. Over tightening of screws leads to erosion of screw heads.
5.6	Wiring	Wiring Check	Do a wiring check. For details on wiring, refer the product user manual and FAQ on our website www.conzerv.com	Wrong wiring could result in erroneous readings.
6.1	Usage tips	EM 6400 with demand parameters	If demand is being monitored/controlled in LT side - consider HT/LT transformer losses, cable loss, meter error, CT error etc., (in the upstream). Always keep 5% to 10% below the contract demand for best results.	The demand between EB meter and Schneider Electric Conzerv's meter may be different.
6.2	Usage tips	Integrated parameters	Periodic clearance of integrated parameters (once in a two month).	Loss of data when automatically reset due to overflow of Registers
7.1	Maintenance	Calibration	a.) Periodic Calibration once a year is recommended.	Ensure accurate readings.
		Wiring	a.) Look for loose/disconnected live wires	Loose contact may cause wrong readings, damage to the installation (burning of cables), short circuit, malfunctioning of meter

Appendix C: FAQs

NOMENCLATURE

Parameter	Description
V12, V23, V31	Line to line Voltages
V1, V2, V3	per phase voltages
A1, A2, A3	per phase currents
V LL	Average of line to line voltages
PF1, PF2, PF3	Power factor for each phase
V LN	Average of line to neutral voltages
F	Frequency of the measurement circuit
L%1, L%2, L%3	Percentage of load per phase based on C.T. primary
A°1, A°2, A°3	Current phase angle per phase
V.Unb	Voltage Unbalance
A.Unb	Current Unbalance
RPM	Revolution per Minute (for DG application)
VA, W, VAR	3 phase power parameters total
VA1, VA2, VA3	Apparent power per phase
W1, W2, W3	Active power per phase
VAR1, VAR2, VAR3	Reactive power per phase
V%1,V%2,V%3	Voltage total harmonic distortion for each phase
A%1,A%2,A%3	Current total harmonic distortion for each phase
VA.d	VA demand
R.d	Rising demand
t.r	Time remaining
Md	Maximum demand
Hr	On-hour at which the maximum demand has occurred
VAh	Volt – Ampere hours
Wh	Watt hours
VARh	VAR hours Inductive
-VARh	VAR hours Capacitive
Run.h	Total hours the load was ON
R.VAh	Volt-Ampere hours (export)
R.Wh	Watt-hours (export)
R.VAR	VAR-hours inductive (export)
-R.VAR	VAR-hours capacitive (export)
R.run	The total hours the meter was run with reverse energy flow (export)
t.VAh	Total Volt-Ampere hours (Import + Export)
t.Wh	Net watt-hours (Import + Export)
t.VAR	Net VAR hours inductive (Import - Export)
-t.VAR	Net VAR hours capacitive (Import + Export)
t.run	Total hours the meter was run with current input signals
On.h	Total hours the meter was ON. Accumulates if auxiliary supply is present
Intr	Auxiliary interruption. Accumulates the auxiliary interruptions
Star, Dlta, 1 Ph, 2 Ph	System configurations

ABBREVIATIONS

PT	Potential transformer
CT	Current transformer
VT	Voltage transformer
V.PRI	Voltage primary winding
V.SEC	Voltage secondary winding
A.PRI	Current primary winding
A.SEC	Current secondary winding
%A FS	% Amperes full scale
W	Active power
VA	Apparent power
VAR	Reactive power
Wh	Active energy
VAh	Apparent energy
VARh	Reactive energy (Inductive)
-VARh	Reactive energy (Capacitive)
INTG	Integrator
PF	Power factor
mS	Milli seconds

INSTALLATION

1. What are the factory default settings of the meter and how to change it?

If there is no instruction from the customer while ordering, meter will be dispatched with the following default settings.

SET Parameter	Default value
A.PRI	100
A.SEC	5.000 (5A meter)
V.PRI	415.0
V.SEC	415.0
SYS	StAR
LAbL	123
VA.Fn	3d
d.SEL	Auto (optional)
d.PAR	VA (optional)
d.Prd	15.00 (optional)
bAUd	9600
Prty	Evn 1
Id	1.000
$F.S^{0}_{0}$	100.0
O.F	Wh
POLE	4.000

In order to change the default settings, refer section 2.1.5. Edit Set Parameters in PROG Menu in this manual.

2. How to enter the setup mode?

During power on, keep the TURBO key pressed continuously till meter display SET. (Refer section 2.1.1. Quick setup – While powering ON)

3. What are the wiring configurations possible in DigitAN?

STAR 4V3A, DELTA 3V2A, 2 Phase and 1 Phase which are selectable through the setup.

4. What is the meaning of Star and Delta in the setup table?

STAR means for STAR 3E, 4V3A (means for 3 phase 4 wire applications) and

Dlta means for DELTA 3E, 3V2A (for 3phase 3 wire applications).

Star is also called Wye in some countries.

5. Can I use DigitAN for single phase applications?

Yes, provided you select 1 Phase for system (sys) in the prog menu - Setup

7. When do I need to connect an external CT/PT?

External CT is required when the current to be measured is greater than 6A.

An external PT is required when voltage greater than 600V.

8. Is it possible to use DigitAN without CT application (i.e. load <5A in 415/440V applications 3 phase or single phase)?

Yes for input current upto 6A maximum, the DigitAN meter can be used without connecting an external CT.

9. What is the range for input current and voltage of DigitAN?

4 Voltage inputs (V1, V2, V3, Vn) 110 to 415VLL nominal (Range 80 to 600VLL)

Current: 5mA to 6A for 5A meter, 1mA to 1.2A for 1A meter.

10. What is the range for auxiliary supply for DigitAN?

Auxiliary supply voltage range: 44 to 300 Vac/dc.

11. What are the climatic conditions for DigitAN?

Temperature range for operation of DigitAN™	- 10 to 60 °C, (14 to 140 °F)
Temperature range for storage of DigitAN™	- 25 to 70 °C, (-13 to 158 °F)
Humidity	Below 5% to 95%, non-condensing

DISPLAY

1. How are KILO, MEGA and GIGA ranges shown?

Range	7 segment Display	"K" LED	"M" LED
0.000 to 9999	Number	OFF	OFF
10 x 10^3 to 9999x10^3	Number	ON	OFF
10 x 10^6 to 9999x10^6	Number	OFF	ON
10 x 10^9 to 9999x10^9	Number	ON	ON

2. How is Lead and Lag shown for the PF parameter?

Check the Minus LED ("-" LED) to the left of the reading, between "K" LED and "M" LED.
Minus LED ON: PF is LEAD or Minus LED OFF: PF is LAG

3. What are VARh and -VARh under the INTG page?

VARh shows Reactive Energy- Inductive.
-VARh shows Reactive Energy-Capacitive.

If you have the IE (Import Export) option, then
RVAR shows Reactive Energy-Inductive.
-RVAR shows Reactive Energy-Capacitive.

4. How do I know which is the parameter value currently displayed?

Press any one of the 5 keys once; meter will display the parameter name of the current page under display.

Or

If none of the keys are pressed and if the auto scroll is also not enabled, then the meter repeatedly displays the current page parameter name (2sec) and value (8sec).

Or

If the auto scroll is enabled, then the meter will display the current parameter name (1sec) and value (4sec) and moves to the next page. See the QSG for more details on auto scroll.

5. What is the purpose of LED's (12 nos) on the right side of the display?

These LED's are provided to indicate the total load % with respect to the full scale, which is editable through setup. This is bar graph where Each LED indicates 10% of load, to find the total load count all glowing LED's in this bar graph and multiply the number of glowing LED's * 10

Load Percentage	Bar Graph Display
Less than 10%	No LED's will glow
Above 10% and less than 50%	Only Green LED's will glow
Above 50% and less than 90%	Green and Amber LED's will glow
Above 90% and less than 120%	Green, Amber and Red LED's will glow
120% and above	All the LED's will glow and RED LED's will start blinking indicating overload.

6. Why 3 colors of LED in the bar graph?

This is similar to a vehicle speedometer,
If the **load is below 50%** it is safe, which is indicated by the **green LED's**.
Loads between 50% and 90% are acceptable. (The user should ensure that the load does not exceed this and hence it is indicated using **amber LED's**).
Load above 90% may exceed the sanctioned limit, which is dangerous and hence indicated using the red LED.

7. The meter display went blank abruptly. What could be the reason and how to rectify it?

Check whether meter communication still works. Don't be panic, if the communication doesn't work.
This may be due to over voltage/temperature.
DigitAN has inbuilt over voltage/temperature protection which will interrupt the functioning of the meter temporarily, when the voltage/temperature rise beyond the specified limit, as a pre-cautionary measure. To make the meter to function again, interrupt the power supply or reduce the voltage/temperature within the limit.
Still the problem persists call our customer care for further assistance.

8. What are DIA 1 and DIA 2 under DIAG page?

DIA1

First 3 digits of 1st row display the unit id.
4th digit displays the status as given below.
r - Receiving the data.
t - Transmitting the data.
u - Wrong unit id.
o - Any one of the following error (parity, over run or framing error)
F – Wrong function which MODBUS does not supports.
A – Wrong address.
2nd row displays the baud rate of the communication.

3rd row displays parity and no of stop bits

DIA2

Gives information on the model no and the version no.

For details refer FAQ 3 in General section.

SETUP

1. What is "SET" page? How to edit the setup table and clear the integrator?

The steps to edit the set-up table and clear integrator are listed below:

1.) Enter into the HOME page (RMS). Press "UP" key twice, "SET" is being displayed.
2.) Press the "RIGHT" key once, the display will show "VIEW", Now press the down key. "EDIT" is now being displayed on the meter.
3.) Now, keep the right key pressed for 2 sec. The meter will prompt for a password entry. Change the code to 1000 in order to gain access in to setup.
4.) See the EM 6400 v3.03 QSG to edit the setup or to clear the Integrators.
5.) By pressing the TURBO key during the meter power-on it is possible to enter setup.

2. Can I restore the OLD parameter, while editing the setup?

Yes, two steps are explained below.

Partially edited set up parameter: While editing the parameter if you want to restore the old set up data press the "LEFT" key continuously up to the blinking the first digit then press the "LEFT" key once again it will resume the old setup data.

Or

Save changes Y/N: After completing the set up table edit, when you are coming out of the set up table if "Y" is selected then the set up will save the new changes else if "N" is selected set up will restore the values before entering the set up.

3. How to set CT and PT ratio?

Refer Section 2.1.1. Quick setup – While powering ON in this manual.

4. Can I set my own password instead of 1000?

No. The password is always 1000, which is not editable.

5. What is LABL in the setup table?

The user can set the label as 123, AbC, rSt, Pqr and ryb, depending on the country and the requirement. These labeling options are to satisfy the international standards or requirements. In India normally people use ryb. These are used for identifying the phase wise parameters.

Example: If 123 is selected as label, then the phase wise current will be displayed as A1, A2, A3.

6. Explain d.Prd?

D.Prd stands for Demand Period, which is selectable by the user. In EM 6400 demand period is selectable ranging from 5 to 30minutes, in steps of 5minutes.

7. What is I.d?

This is a unique address called unit id, which is required for identifying the meter while communicating through RS 485 port. Unit id is editable from 001 to 255 through the meter set up.

8. What does $F.S^0_0$ stand for?

$F.S^0_0$ allows the user to set required full scale in % of CT Primary. While setting up a new factory or commercial complexes usually higher rated current transformer is selected than present requirement keeping the future expansion in mind. Ie: CT primary rating may be much higher than the sanctioned load. This may be as high as 10 times the present load. For Ex if the CT ratio is 500/5A, but the sanctioned load is only 100A, meter will indicate just 20% (bar graph and % load) even if the load is 100A. User may not

notice even if he is exceeding the sanctioned limit, which results in penalty from EB. With the programmable FS for the above condition the user can select the FS as 20% of CT primary (sanctioned load), so that the meter will show 100% when the load is 100A.

9. What does O.F represent?

O.F stands for the Overflow parameter, which is selectable through the set up. There are two options Wh (default) or VAh.

10. What does POLE mean?

This is required for calculating the generator RPM, user has to enter correct no of poles based on which the generator RPM is calculated.

11. What does Unbalance (Unb) mean?

This is a measure of unbalance between loads of 3phases.

12. What is EVN 1 in the setup table?

The 1st three letters shows the selected parity (Evn for even, odd for odd or no for no parity) and the last digit of the same row shows the selected stop bit of the communication.

13. What is 3d and Arithmetic in VA function and which is best under what conditions?

VA function display in the setup table	Formula	Other names	Which one?
3d (default)s	$kVA_{3D} = \sqrt{\sum W^2 + \sum VAR^2 + \sum D^2}$ where D = Distortion Power per IEEE 100	U, Apparent, Vectors	Best all round
Arth	$\mathrm{kVA_{Arth}} = \mathrm{kVA_1} + \mathrm{kVA_2} + \mathrm{kVA_3}$	Arithmetic, scalar	Good only under Low unbalance

14. How to terminate the setup table editing using TURBO key?

The TURBO key can be used for terminate the setup table editing mode as explained below.
Example: The current CT primary settings is 5000, and the user need to change it to 6000, the following steps alone can be used

1.) Press the right key 5 will blink
2.) Change to 6 by pressing the UP key
3.) Press the turbo key, 6 will stop blinking and sets the value as 6000
4.) Save the value by pressing the left key

15. Is it possible to reset all the set parameters at once?

No. The user can edit the set parameters one at a time by entering into the setup mode.

16. Is there any pre-set maximum time duration for storage of user set parameters?

No. Set parameters can be changed only by editing.

17. What happens in case of a power failure while editing the set up parameters?

The last saved values before interruption will be present. The meter display goes to RMS on restoration of power.

18. What happens if the set parameters are changed after the meter is connected to a load?

Meter continues measurement as per the new set-up values.

19. How to select the set-up parameter to be edited?

Refer QSG

20. Is AUTO SCROLL possible among the set parameter display pages?

No. AUTO SCROLL is not possible among set parameters.

SIM (simulation) MODE

1. What is SIM mode and why it is required?

Simulation mode is provided for the purpose of demonstration of the features of the meter and in exhibition displays. In this mode user can see the functioning of the meter without any input signals, meter shows fixed Frequency, voltage and current and 0.5PF. Power and Energy parameters calculated based on this V (240VLN), A (5000A) and PF (-0.5) are displayed.

2. How to enter into SIM mode for Demo?

Power up the meter with left key pressed, it will go to "RUN". Press the down key to go to "SIM". Now press the right key, the display shows "RMS SIM". Press the right key to continue with navigation like normal mode.

3. How to come out of SIM mode?

Please follow the steps below:

1.) Move to the home page "RMS" by pressing the TURBO key (Earlier called as Favourite key) repeatedly (depends on the models, up to 16 times in super set)
2.) Press "LEFT" key once to see "SIM".
3.) Press "UP" key, "RUN" is displayed.
4.) Now, press the right key the display shows "RMS" indicating exit from "SIM" mode.

NOTE: The mode can be changed only through the PROG Menu. Switching off will not change the mode, since switching off is often used to show the incrementing "Number of Interruptions" in the Integrator.

4. How to confirm whether the meter is in SIM or RUN mode?

In the SIM mode, meter does not display the actual value. It always displays fixed unchanging values.
Example: V= 415VLL, 240VLN, A=5000A, PF =-0.5, Frequency= 50Hz and the Power and Energy parameters are derived from this.
In the RUN (normal) mode meter displays the actual measured values based on the input signals.

5. Is it possible to edit set parameters in SIM mode? Will this affect the displayed values in SIM mode?

Yes the setup can be edited in SIM mode and the values displayed in SIM mode are updated as per the edited setup.

AUTO SCROLL

1. How to enable the auto scroll?

There are 3 modes of auto scroll.

1.) Scrolling with in the level. Keep pressing the down key for at least 3 seconds, the parameter name will be scrolled within the level (Refer QSG) and when the key is released meter will display "Auto" for a moment, which means the auto scrolling is enabled.
2.) Scrolling within the page. Keep pressing the UP key for at least 3 seconds, the parameter name will be scrolled within the page and when the key is released meter will display "Auto" for a moment, which means the auto scrolling is enabled. Here also the auto scroll is similar to the earlier one (down key). But within the page.
3.) TURBO Parameters (Favourite pages earlier) auto scroll Keep pressing the TURBO key (Earlier called FAVOURITE key) for at least 3 seconds, the parameter name will be scrolled as per the FAVOURITE page sequence (ref QSG) and when the key is released "Auto" will be displayed for a moment, which means the auto scroll of the TURBO parameters is enabled. It will start scrolling through the all the TURBO parameters.

2. How to disable the auto scroll?

Auto scroll can be disabled by pressing any one of the 5 keys or by interrupting the control power (auxiliary power).

3. What is the time duration between the displays of two consecutive parameters in auto scroll?

The time duration between parameter to parameter displays in the auto scroll is 5 seconds (Parameter name is displayed for 1 second + the corresponding value for 4 seconds).

TURBO PARAMETERS (FAVOURITE PAGES)

1. What are TURBO parameters?

TURBO parameters (earlier known as called as FAVOURITE parameters) are a list of commonly used pages, which are pre-set in EM6400, which can be accessed using the TURBO key (earlier called as FAVOURITE key) in the following sequence. RMS (home page), 'VLL, A, PF' 'VLN, A, F' 'VA, W, PF' 'VA, W, VAR' 'W, VAR, PF' 'PF1, PF2, PF3' 'V%1,V%2,V%3' 'A%1,A%2,A%3' 'VAd, Rd, Tr' 'Md.hr' VAh Wh R.VAh R.Wh t. VAh and t. Wh .

NOTE: THD values are indicative only

2. What parameters can be viewed using the TURBO key in EM6400?

Totally 16 pre-set pages are available (8 pages are optional and based on the models selected). Refer the FAQ 1 above for TURBO parameters in EM6400 model.

3. What parameters can be viewed using the TURBO key in EM6434?

Totally 7 pre-set pages namely 'RMS', 'VA, W, PF' 'VA, W, VAR' 'W, VAR, PF' 'PF1, PF2, PF3' VAh and Wh.

4. What parameters can be viewed using the TURBO key in EM 6459?

RMS, 'VLL, A, PF' 'VLN, A, F'.

5. What parameters can be viewed using the TURBO key in EM 6436?

RMS, 'VLL, A, PF' 'VLN, A, F', 'A, W, PF', 'PF1, PF2, PF3', Wh and Run.h

6. What parameters can be viewed using the TURBO key in EM 6433?

RMS, 'A, W', Wh and Run.h

7. How to enable TURBO (known as FAVOURITE earlier) auto scroll?

Keep pressing the TURBO key for at least 3 seconds; the parameter name will be scrolled as per the FAVOURITE page sequence (ref QSG) as mentioned. Thereafter, when the key is released, "AUTO" will be displayed and auto scroll of the TURBO parameters is enabled.

8. How to enter into Home page (RMS) if the user is stuck any where in the navigation (except setup and CLR mode)?

Press the TURBO key continuously till it reaches the RMS page.

9. Is there any time constraint for editing parameters in setup?

Yes, once access to setup is gained and if there is no key press for duration greater than 2 min then the EM 6400 series meter automatically exits from setup.

9. Can I set my own TURBO parameters (known as FAVOURITE pages earlier)?

No the TURBO parameters are pre-set for each model and cannot be defined by the user.

Default Display Page

1. What is Default Display Page?

Default Display Page means you can select any page as "User-set" display page. You can scroll to other display pages. The User-set page is displayed 2 minutes after manual scrolling was stopped by the user. Default Display Page is user selectable.

2. How do I lock default display page?

Go to the page you want to set as default page. Then press the RIGHT and LEFT key together. Meter displays "LOCK".

3. How do I unlock default display page?

Once Display lock is active, press the RIGHT and LEFT key simultaneously to unlock the Key page. Meter displays "ULOC".

INTEGRATORS

1. Which parameter is responsible for Integrator reset?

By default, the Integrators are reset when the value of Wh reaches the maximum allowable reading (Refer FAQ 2 below). However, the user can select VAh as the Overflow parameter by editing the SETUP.

2. When does the Integrator reset?

The Overflow value depends on the Product of V.PRI and A.PRI that you've programmed for your application. Whichever value that reaches maximum i.e. either Wh/VAh reaches 9999K or 9999M or 9999G based on primary setting or 9999 run hours.

3. When does the number of interruptions (Intr) accumulate?

Number of interruption accumulates only with the Auxiliary interruption. If the meter Aux is connected to the UPS or if there is no power interruption then the no of interruption may be zero always.

4. When does the Run.h accumulate?

Run.h is a measurement of load (Amp) ON time. It starts accumulating, only if the Amp is greater than 5mA (for 5A meter) and 1mA (for 1A meter) in any one of the phases. It does not accumulate when the Amp is less than above specified current levels, even if the voltage is present.

5. When does the On.h accumulate?

On.h just measures the total duration for which meter is on irrespective of the presence of input signals or not. If the Auxiliary supply is present On.h will begin to accumulate.

7. Under what conditions integrator (kVAh, kWh, kVARh and -kVARh) does not update?

EM6400 has in built reverse lock. In star mode two or all the phases of current is connected in the reverse direction the integrator may not accumulate in meters with I/E option enabled. However, due to auto CT reversal the above parameters will accumulate in star mode for EM 6400 meters which doesn't have I/E option. In the delta mode if any one of the phase current is in the reverse direction then the integrator may not accumulate. In short, if the total power is negative, then the integrator (INTG) parameters do not accumulate.

Note: If both the import and export energy are to be measured, then choose the model with IE option.

8. Does On.h reset with auxiliary power interruption?

No. The count in On.h stops with auxiliary power interruption and continues from the previous value once power is restored.

9. Are any integrated parameter values reset with power interruption?

None of the integrated parameters reset during the power interruptions, except the VA.d and R.d and t.r for EM 6400 with demand option enabled. Intr gets incremented with each power interruption.

10. What happens to t.run when only voltage circuit is energized and no current through current circuit?

t.run works only on the current in the current circuit and hence is not incremented when there is no current in current circuit.

11. What happens when the Integrator is cleared?

When Integrator is cleared, both the INTG and md registers are cleared to zero. The data available in INTG registers is stored in Old register.

12. What happens when md is cleared?

When md is cleared only the data in md register is cleared. The INTG registers are unaffected if md is cleared.

13. Is it possible to reset Intr to zero by the user?

Intr is a count of the number of interruptions to the auxiliary supply and reset to zero whenever the integrators are cleared.

FEATURES

1. What are the various Models and Options available for EM 6400?

EM 6400

EM 6400 + Demand

EM 6400 + IE

EM 6400 + Demand + IE

2. What is the difference in the Demand parameter between EM 3000 and EM6400?

Sl.No	EM3000	EM6400
1	Demand interval is selectable in steps of 1 min (1 to 30 min)	Demand interval is selectable through setup in steps of 5 min (5, 10,15,20,25 and 30).
2	Sliding window (Auto), Fixed window (RTC, User) can be selected through setup table.	Auto (sliding window) / User (Fixed window) can be selected through setup table. RTC sync is not commonly used and is not available.
3	Demand can be calculated for VA or W parameter, which can be selected through the setup table.	Same as EM3000 including Amps demand
4	When the Aux supply is OFF the demand starts from the corresponding data in Auto and RTC demand. User demand starts from zero.	When the meter Auxiliary supply is OFF the demand (both sliding and fixed) starts from zero.
5	Demand update is every 15seconds	Same as EM3000
6	Demand control and predictive demand is possible with EM 3460.	Only demand monitor is possible with EM 6400. Demand Control is not possible and No predictive demand.
7	Time of occurrence for the Maximum Demand is real time i.e. HH: MM:SS and DD: MM: YYYY.	The time of occurrence for the Maximum Demand is with respect to on hrs of the system, since there is no RTC.

8	CLR Maximum Demand Maximum Demand in version 5 can be cleared from the front panel CLR key while viewing the demand (not in auto mode) independent of integrator. Even though integrator reset will clear Max demand, profile will be available, in which H1 and L1 of the demand can be referred. Auto reset is optional.	CLR the Maximum Demand : Maximum demand can be cleared independently through the CLR function in the setup mode. When the Integrator is cleared, Maximum Demand also clears. Because the time of occurrence is based on the On.h Auto reset option not available.

3. Does EM 6400 have the IE option?

IE is an optional feature available with EM6400.

4. What is the difference between I/E feature of EM3000 and EM6400?

S.No	EM3000	EM6400
1	Import and Export is based on the total power parameters i.e. If total W and VAR is in the export side, energy will accumulate in the export side. Example: Wr=1200, Wy= -1200, Wb=1200 then Wt =1200 VARr=10, VARy= -8, VARb= -6, VARt = -4 which lies in 4th quadrant. So energy will accumulate in the Import side.	Same as EM3000
2	Inductive and capacitive option is not available in EM3000 EM3000 doesn't have separate inductive and capacitive VARh. Only net VARh is available.	KVARh inductive total will be the addition of 1st and 3rd quadrant kVARh. KVARh capacitive will be addition of 2nd and 4th quadrant kVARh.
3	No separate run.h for Import and Export, only total (Import + Export) is available.	Separate run.h for the Import and Export, i.e. when the meter is in the import separate run.h is accumulated and when the meter is in the Export separate run.h will be accumulated. Total run.h is calculated by the addition of import run.h and export run.h.
4	Over range indication (-HI-) is not required for EM 3000, because if any of the overflow parameters, including VAh total crosses the overflow limit meter overflows.	If the meter Import VAh is 9998G and the Export VAh is 9998G, the total VAh will be 19996G. Even though eLAN will transmit the correct value, this is out of range for the display. So it will be displayed as -HI-. But this is an extreme condition, not found in practice.

6. What does Maximum demand time mean?

Maximum demand time indicates the on-hour of the meter at which the maximum demand had occurred. To know the correct time of occurrence of maximum demand, it is important to connect uninterrupted power supply across auxiliary terminals.

7. Is it possible to reset all the stored values at once?

Yes. Clearing the integrator allows the user to reset all the saved INTG parameters.

8. When are the OLD values saved?

Values from INTG are saved in Old register in case

- Integrator is cleared (INTG Clear)
- Overflow of Wh/VAh parameters or when run hours reachs the value 9999 hours (13.88 months)

9. List the parameters whose old values get saved when INTG is cleared?

The INTG values getting stored in Old are: Wh, VAh, VARh, -VARh and Run.h.

COMMUNICATION

1. Can the meter be connected to the communication network?

Yes. DigitAN can be connected to the network through RS485 port, which is an optional feature.

2. What is the communication protocol for DigitAN?

Communication protocol is MODBUS RTU.

3. What is the meaning of Compatible Linear Map?

The compatible linear map starts from address 3900. All the parameters available in this block can be read individually or as a block.

4. How many parameters can be read in the single query from the compatible block?

The user can configure any number of parameters in between 1 and 50.

5. What will happen if any non available block is queried?

If any other non available block is queried, meter will transmit zero.

6. Are all the parameters displayed by the meter available for communication?

Yes, except the DIAG pages and the set up block.

7. Where can I get the Address Map?

NOTE: All queries related to Address Map to be transferred to EMS Group at Schneider Electric Conzerv. Or feel free to contact at Customer Help Desk.

8. The meter has stopped communication abruptly. What could be the reason and how to rectify it?

Check whether the display is ON. Don't be panic, if the display is OFF.

This may be due to over voltage/temperature.

DigitAN has inbuilt over voltage/temperature protection which will interrupt the functioning of the meter temporarily, when the voltage/temperature rise beyond the specified limit, as a pre-cautionary measure. To make the meter to function again, interrupt the power supply or reduce the voltage/temperature within the limit.

Still the problem persists call our customer care for further assistance.

GENERAL

1. How can we find the meter constant?

This is not applicable for EM 6400 series products.

Meter constant is just a relation between the blinking rate of the POP LED and energy consumption (display reading).

For Example: 1000 impulses/ kWh. Generally manufacturers provide POP LED which blink faster than the display / counter update and it is useful where the display is mechanical (impulse or stepper) counter.

But in case of EM 6400, meters displays instantaneous V, A and Power parameters along with energy parameters. Using this we can easily calculate the accuracy of any parameter. So there is no need of any POP LED and hence there is no meter constant.

An average of a minimum of 10 continuous display values needs to be taken for correct measurement of instantaneous parameters.

2. What is the benefit of instantaneous parameters over meter constant (POP)?

Generally, POP is provided to check the Accuracy of the meters with mechanical display. In this method approximately 400 pulses are counted and compared with respect to the reference meter pulse. Large number of pulses is required in this method to reduce the measurement error, i.e. 1/4th of accuracy. Higher the impulse / kWh, faster is the test. Mostly the tariff meters are with mechanical displays and the test benches at electricity boards do not have a very stable source. So the Electricity Board insists on the POP LED on every meter for the purpose of testing.

In the case of DigitAN, we can see the instantaneous parameter updating every second. This will directly show the accuracy of parameter and very useful for testing both at laboratory as well as in the field. Average of 10 display readings will give the correct accuracy. But using the POP is both time consuming and may not give the correct information under all the conditions.

Example: For meter constant 1600 (1600 pulses per kW):

At 100% load, measurement time for 400 pulse is 400/1600 hours = 15minutes as against 5 to 10 seconds in the case of EM 6400.

At 25% load, measurement time for 400 pulse is = 60minutes as against 5 to 10 seconds in the case of EM 6400.

At field it is not possible to check the accuracy of meter using the POP.

3. What does DIAG stands for and what is its purpose?

DIAG stands for diagnostic pages. The following table provides the different DIAG pages and its purpose in DigitAN.

S.No	DIAG	Available in EM6400
1	Communication unit id	Available in DIAG1 – Row1. This row is used to display the communication status also.
2	Communication baud rate	Available in DIAG1 – Row2.
3	Communication parity and stop bit.	Available in DIAG1 – Row3.
4	Model no	Available in DIAG2 – Row1
5	Version no	Available in DIAG2 – Row2 and 3
6	Display scanning	Available in DIAG3 to test the LEDs
7	No of times blocks fails to read	Available in DIAG4 – Row1
8	No of times 1st block failed to read	Available in DIAG4 – Row2
9	No of times 2nd block failed to read	Available in DIAG4 – Row3
10	Check Sum	Available in DIAG5 – Row1
11	Time taken for parameter calculation from 756 ms to x	Available in DIAG5 – Row2
12	Time taken for navigation max - 750 ms to y	Available in DIAG5 – Row3
13	Integrator Reset mode : 1 for manual clear. 2 for overflow according to the CT and PT ratio. 3 for Due to the internal error.	Available in DIAG6 – Row1.
14	If overflow due to which parameter: 1 for VAh forward. 2 for Wh forward. 3 for VARh inductive forward. 4 for VARh capacitive forward. 5 for VAh Reverse. 6 for Wh Reverse. 7 for VARh inductive Reverse. 8 for VARh capacitive Reverse.	Available in DIAG6 – Row2.
15	Value at which the overflow	Available in DIAG6 – Row3.

	occurred.	
16	Element selected in the setup table.	Available in DIAG7 – Row1.
17	VA Arithmetic or 3D selected in the setup table	Available in DIAG7 – Row2.
18	Label selected in the setup table.	Available in DIAG7 – Row3.

DIAG 4 and 5 are for internal QA purpose.

4. Can the user edit the values in the DIAG pages?

The values in DIAG pages cannot be edited by the user.

5. Does this meter function when connected with other meters?

Yes DigitAN can be used along with other meters (Connect the input currents in series and input voltages in parallel with the other meters).

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