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User's Manual

Multifunction Transducer - MFT20

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Table of Contents

1. INTRODUCTION

Foreword

Thank you for purchasing Multifunction Transducer.
MFT (Multifunction Transducer)

This manual describes the basic functions and operation methods. Please read through this user's manual carefully before using the product.

Purpose of manual

How to read this manual?

Installer: Read Chapters 3, 4, 5, 6, 10, 11
System designer and new user: Read All Chapters
Expert user: Read Chapters 2, 4, 5, 6, 7, 8, 9

Regarding this user manual

- This manual should be provided to the end user. Keep an extra copy or copies of the manual in a safe place.
- Read this manual carefully to gain a thorough understanding of how to operate this product before starting operation.
- Refer Chapter 7 if your device has LCD display or refer chapter 8 if your device has LED display.

Notice

The contents of this manual are subject to change without notice as a result of continuous improvements to the instrument's performance and functions.

This manual describes the functions of this product. MASIBUS does not guarantee the application of these functions for any particular purpose.

Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform MASIBUS Sales office or sales representative. Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

Trademarks

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Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact our sales representative.

Product overview

The MFT is a solid-state TRANSDUCER Which accurately measures all quantities of the supply including all types of energies and gives corresponding Analog output 4-20mA or 0-10V w.r.t. electrical parameter measured except energies. It also has fully programmable Pulse output for all energies. The MFT is based on Microcontroller, with a high degree of programmability.

The MFT meets the Accuracy requirements of IEC 60688.
The MFT has been programmed to operate as an intelligent front end measuring and storing device and to communicate continuously to a Master, all the data relevant for the purpose of SCADA, through isolated RS-485 port using MODBUS-RTU protocol.
The MFT is normally supplied readily pre-programmed for operation and can be directly installed in the usual manner. The MFT can be read manually or through a Master using MODBUS-RTU Protocol.

Features

- Accuracy class 0.5 / 0.2 as per IEC 60688 standard
- Field programmable CT/PT Ratio
- True RMS, Microcontroller based
- 28 Electrical parameters can be mapped to Analog O/P
- Field programmable up to two analogue output
- Long range, site-configurable inputs and outputs
- Four quadrant measurement
- RS-485 Modbus-RTU communication protocol
- User assignable Modbus registers
- Energy pulse output
- Maximum demand & THD measurement up to 31st harmonics
- Old register to store the previously cleared energy values
- Last day energy & min. max. value measurement
- Finger touch proof terminals
- DIN-Rail & wall mount
- Front panel LED output for calibration & measurement of selected type of energy
- Four Quadrant measurement for Power factor, Power & Energy (Active & Reactive)
- life timer for energy
- ON hours, RUN hours & Auxiliary Power Interruption monitoring
- Easy configuration of different parameter through front fascia key. (optional)
- GUI based site configuration software

Product Ordering Code

Model	Accuracy		Analog Output				Power Supply		Display	
			Output type		No. of Output					
MFT20	X		X		X		X		X	
	1	Class 0.5	N	None	N	None	U1	Aux. Powered 85-265VAC/ 100-300VDC	N	None
	2	Class 0.2	1	4-20mA	1	One			LCD	LCD
			2	0-20mA	2	Two			LED	LED
			3	0-5V			U2	Aux. Powered 20-60VDC		
			4	1-5V						
			5	0-10V			U3*	Self Powered 57.5V AC to 520VAC		
			S	Special▾						

▾Consult Factory

Note*: Analog output option is not applicable in case of self-powered model

The unit has a nameplate affixed to the one side of the enclosure. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered

List of Accessories

The product is provided with the following accessories according to the model and suffix codes (see the table below). Check that none of them are missing or damaged.

Sr. No.	Description of accessory	Quantity
1	User manual	1

Safety Precautions

The product and the instruction manual describe important information to prevent possible harm to users and damage to the property and to use the product safely.

Understand the following description (signs and symbols), read the text and observe descriptions.

⚠ WARNING	***This indicates a danger that may result in death or serious injury if not avoided.***
	This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.

2. SPECIFICATIONS

System type

3Ph4W/ 3Ph3W (Site selectable)

Input

Voltage

Direct Measuring Voltage	20VL-N to 300VL-N (34VL-L to 520VL-L)
PT Secondary (Nominal Voltage)	63.5VL-N to 240VL-N
Measurement Method	True RMS
Burden	<0.2VA per phase
PT Ratio	Programmable on site
Max continuous input voltage	1.3 x nominal value
Overload Withstand	2 x Nominal value for 5 s
Accuracy Range	10% - Vn - 120%

Current

Direct Measuring Current	0.01A to 6A
Secondary Current	1 to 5A
Measurement Method	True RMS
Burden	<0.2VA per phase
CT Ratio	Programmable on site
Max continuous input current	2 x nominal value
Overload	20 x Nominal value for 1 s
Accuracy Range	10% - In - 120%

Starting current	0.1% of Nominal Current (5A Sec.) 0.2% of Nominal Current (1A Sec.)
Frequency	45 to 65Hz
Display	
Display (LCD)	16x2 Backlight LCD
Display(LED)	1 line 4 digit 0.32” RED 7-segment LED Display
Keys	UP, Down
Measured Parameters	
Voltage	L1-L2, L2-L3, L1-L3 and Average (3Ph3W & 3Ph4W)
	L1-N, L2-N, L3-N & average (1Ph & 3Ph4W)
Current	All phase currents, average, sum Neutral Current (3P4W)
Frequency	System Frequency
Power Factor	Phase wise PF & Average PF
Phase Angle	Phase wise
Power (Phase wise & Total)	Active Power (W, KW & MW)
	Reactive Power (VAR, KVAR & MVAR)
	Apparent Power (VA, KVA & MVA)
Energy (Phase wise & Total)	Active Energy for Import & Export (Separate) (KWh, MWh & GWh)
	Reactive Energy for Import & Export (Separate) (KVARh, MVARh & GVARh)
	Apparent Energy (KVAh, MVAh & GVAh)
Energy Update Rate	500 mSec
Demand	Maximum Power Demand on KW/KVA Maximum Current Demand (Block/Sliding for 15/30 minutes window)
Power Quality	THD & Harmonics for each Voltage and Current (3rd to 31st odd) Phase wise DPF & Average DPF (Displacement Power Factor)

Percentage Voltage & Current Unbalance (Amplitude method)
ON hour ,RUN hour (up to 65000 hours Recording)
Auxiliary Power Interruption count (up to 65000 counts)
Last day Energy for Total, Old Energy for Total, Old Overflow Count & Old Load Hours, **Min-Max Value (V, I, PF, Frequency, Total w, Total VAR, Total VA)**
15 minute values (configurable 5 minute/15 minute/1 hour) of Active Energy Import, Active Energy Export, Reactive Energy Import and Reactive Energy Export

Output

Communication Output

Interface	RS485
Baud rate	2400, 4800, 9600, 19200, 38400 (Selectable)
Parity bit	None ,with 1 or 2 stop bit Odd or Even, with 1 or 2 stop bit
Protocol	Modbus-RTU

Pulse output

Assigned Energy Parameter	WH / VARH / VAH
Pulse rate	Programmable from 1 to 60000 pulses per KWh[I] / 10KWh[I] / 100KWh[I] / MWh[I] / KWh[E] / 10KWh[E] / 100KWh[E] / MWh[E] / KVARh[I] / 10KVARh[I] / 100KVARh[I] / MVARh[I] / KVARh[E] / 10KVARh[E] / 100KVARh[E] / MVARh[E] / KVAh / 10KVAh / 100KVAh / MVAh of total.
Pulse Duration	20 mSec ± 10%
Output Type	Open collector
Ratings	24VDC,20mA

Analog output (Optional)

No. of Outputs	Upto 2
Output type	4-20mA, 0-20mA, 0-10V, 0-5V, 1-5V DC
Response time	<600mS
Mapping	Field Selected from inputs parameters
O/P Impedance	<550 Ω for mA O/P >2 KΩ for V O/P
Ripple	<0.4% Peak to Peak
External magnetic field	0.5 mT
Common Mode Voltage	100 Vrms

Auxiliary Power Supply

Power Supply	Standard: 85-265VAC, 50/60Hz or 100-300VDC Optional: 20-60 VD
Power Consumption	< 3VA (Without Analog o/p) < 7VA (With Analog o/p)

Standards Compliance

Standard	IEC 60688
	IEC 61326-1

Electromagnetic Interference / Compatibility (EMI/EMC)

Electrostatic Discharge Test (ESD) [IEC 61000-4-2]
Electromagnetic Field [IEC 61000-4-3, Level-1]
Power Frequency Magnetic Field [IEC 61000-4-8]
Voltage Dip and Short Interruptions [IEC 61000-4-11]
Burst Test [IEC 61000-4-4]
Surge [IEC 61000-4-5]
Conducted RF [IEC 61000-4-6]
Conducted Emission [CISPR 11]
Radiated Emission [CISPR 11]

Isolation (Withstanding voltage)

- Between primary terminals* and secondary terminals**:
  At least 3000 V AC for 1 minute
- Between primary terminals*:
  At least 3000 V AC for 1 minute
- Between secondary terminals**:
  At least 500 V AC for 1 minute

* Primary terminals indicate Aux power terminals, Voltage Input terminals and CT Input terminals.
** Secondary terminals indicate pulse O/P, Communication O/P, Analog O/P-1 and Analog O/P-2.
Insulation resistance: 200MΩ or more at 500 V DC between power terminals and grounding terminal

Environmental

Operating temperature	–10 to 60 °C
Storage temperature	-40º to 85ºC
Usage Group	I as per IEC60688
Relative humidity	Up to 95% non-condensing
Warm up time	5 minutes
Installation Category	CAT III for < 300V AC
Protection Class	II
Pollution Degree	2
Ingress protection	Housing IP40, Terminals IP20

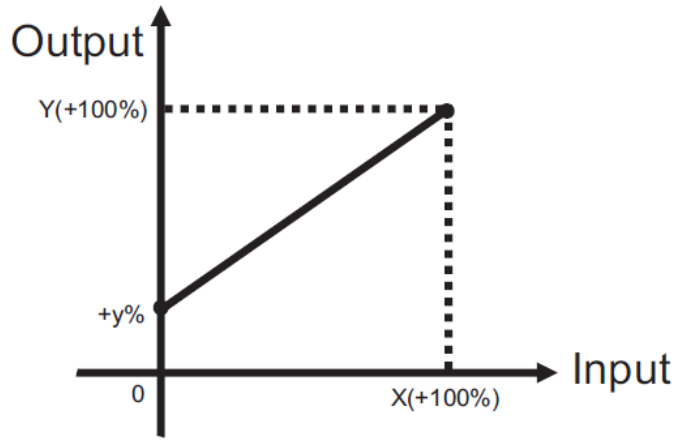
Physical

Mounting Type	DIN-Rail mounting / Wall mounting
Dimension (in mm)	70H x 100W x 112D
Case Material	ABS
Weight	0.5 Kg
Terminations	Metal Screw can accept up to 2.5 mm^2 wire or Single 4.0 mm^2

Configuration and View Software for programming the transducer at Site:
Windows based software; it is possible to configure the transducer on site through RS-485(MODBUS) interface

Input - Output Signal Curve:

(Linear with live zero)



Example: Output 4-20 mA corresponding to input 0-100 A

2.1 List of available Features

Parameters	Features	On Display	On Modbus
BASIC	Voltage (L-N)	✓	
	Voltage (L-L)	✓	
	Current	✓	
	Frequency	✓	
	%V Unbalance	✓	
	%A Unbalance	✓	
Power	Active Power	✓	
	Reactive Power	✓	
	Apparent Power	✓	
	Power Factor	✓	
	Phase Angle	✓	
Energy	Active Energy Import & Export	✓	
	Reactive Energy Import & Export	✓	
	Apparent Energy	✓	
	Overflow Energy Count For System Energy	✓	
	Old Energy for total	✓	
Data Logging	Last Day Energy	✓	
	Min-Max (Low-High) Value	✓	
Demand (Power & Current)	Maximum Demand(W/VA & I) with Date & Time	✓	
	Rising Demand (W/VA & I)	✓	
Harmonics (Voltage & Current)	% THD	✓	
	% Harmonics [Up to 31st Odd]	C	
Hour & Interruption	ON Hour	✓	
	RUN Hour, OLD RUN Hour (Total)	✓	
	Auxiliary Power Interruption Count	✓	
Communication	Modbus on RS485	✓	
Output	Pulse Output for Energy	✓	
	Two Analog o/p	O	

NOTE:
In above table:

- '**C**' means available only on **communication**
- '**O**' means based on **Ordering Code**

3. FRONT PANEL PICTURE

3.1 Front Panel Picture

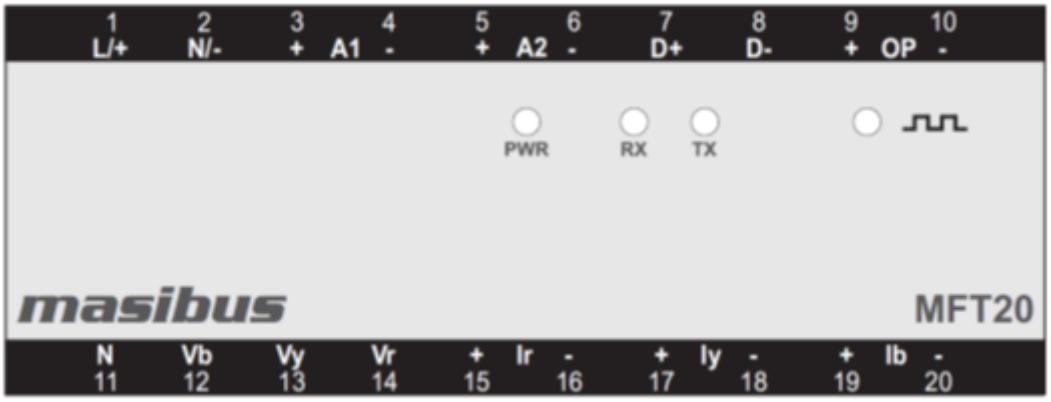


Fig-3.1 Detail of front panel – Without LCD display

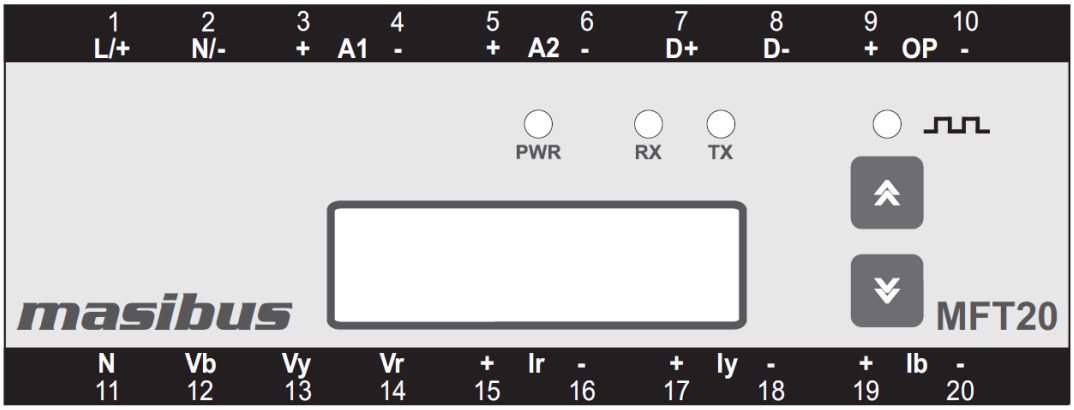


Fig-3.2 Detail of front panel – With LCD and Keypad

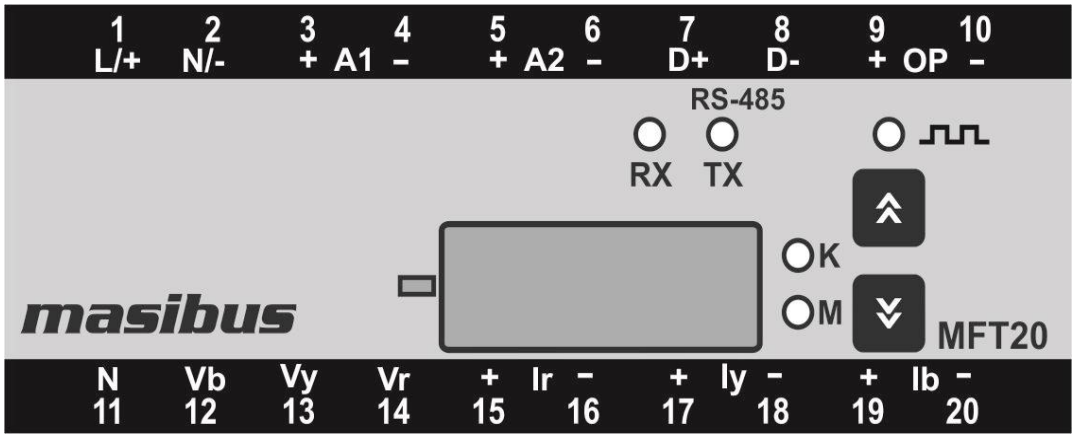


Fig-3.3 Detail of front panel – With LED and Keypad

3.2 Key Functions

3.2.1 Key Functions for LCD Display

 **UP** key

RUN mode:
- To scroll pages in upward direction to look at different parameters.

PROGRAM mode:
- To select the value and accept the value (it act as shift key in programming mode)

 **DOWN** key

RUN mode:
- To scroll pages in downward direction to look at different parameters.

PROGRAM mode:
- To edit the value / system types downward in edit mode and scroll through the parameters.

3.2.1 Key Functions for LED Display

 **UP** key

RUN mode:
- To enter into the run mode groups.

PROGRAM mode:
- To scroll the value upward in edit mode and also work as shift key.

 **DOWN** key

RUN mode:
- To scroll pages in downward direction to look at different parameters.

PROGRAM mode:
- To edit the value downward in edit mode and scroll through the parameters and also work as back key.

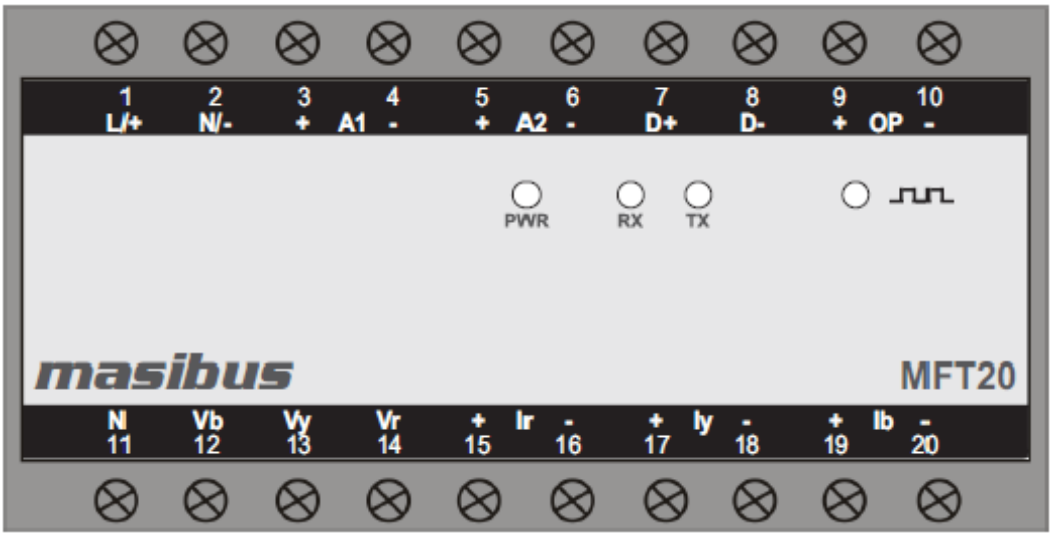
 **UP + DOWN** key

RUN mode:
- To enter into the configuration mode.

PROGRAM mode:
- To save the value in EEPROM.

4. TERMINAL CONNECTIONS

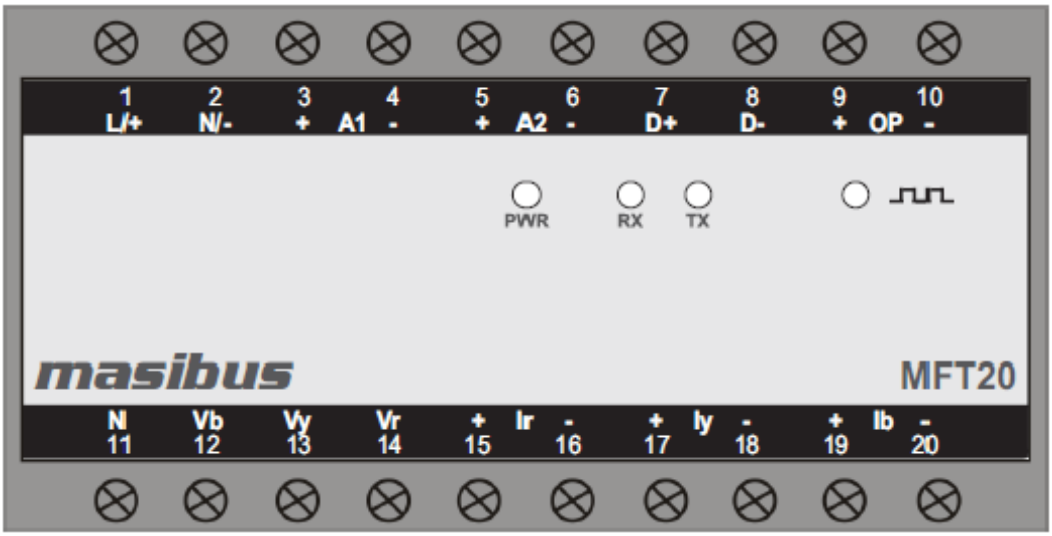
4.1 Front Panel Terminal Connections



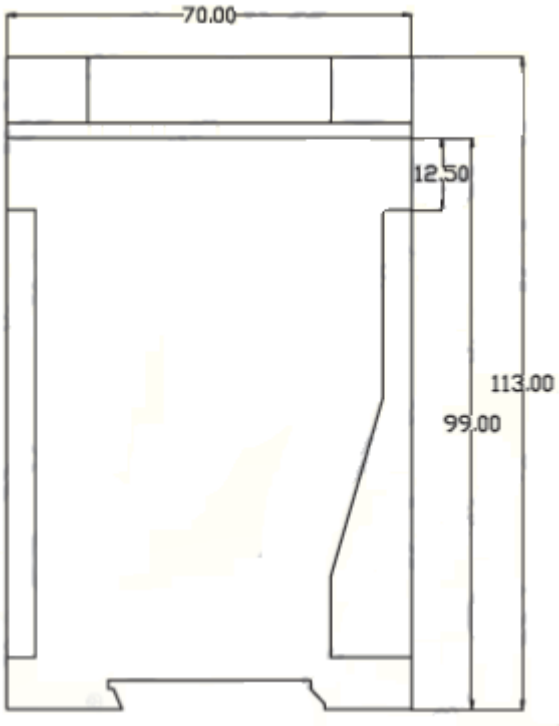
Terminal No.	Description	
1	L/+ [Line]	Aux. Power Supply Input
2	N/- [Neutral]	
3	A1+ [Analogue O/P1+]	Analogue Output A1 Connection
4	A1- [Analogue O/P1-]	
5	A2+ [Analogue O/P2+]	Analogue Output A2 Connection
6	A2- [Analogue O/P2-]	
7	D+ [RS-485]	RS-485 Connection
8	D- [RS-485]	
9	OP+ [Pulse o/p+]	Pulse Output Connection
10	OP- [Pulse o/p-]	
11	N [Neutral for Voltage input]	Three Phase Voltage Inputs
12	Vb[Voltage B-Phase]	
13	Vy [Voltage Y-Phase]	
14	Vr [Voltage R-Phase]	
15	IR+ [Current In R-Phase]	Three Phase Current Inputs
16	IR- [Current Out R-Phase]	
17	IY+ [Current In Y-Phase]	
18	IY- [Current Out Y-Phase]	
19	IB+ [Current In B-Phase]	
20	IB- [Current Out B-Phase]	

5. MECHANICAL GUIDELINE

5.1 Front View



5.2 Side View



6. INSTALLATION GUIDELINE

6.1 Safety/Warning Precautions

Safety Precautions

Dangerous voltages capable of causing death are sometimes present in this instrument. Before installation or beginning of any troubleshooting procedures the power to all equipment must be switched off and isolated. Units suspected of being faulty must be disconnected and removed first and brought to a properly equipped workshop for testing and repair. Component replacement and interval adjustments must be made by a company person only.

Warning Precautions

Read the instructions in this manual before performing installation and take note of the following precautions:

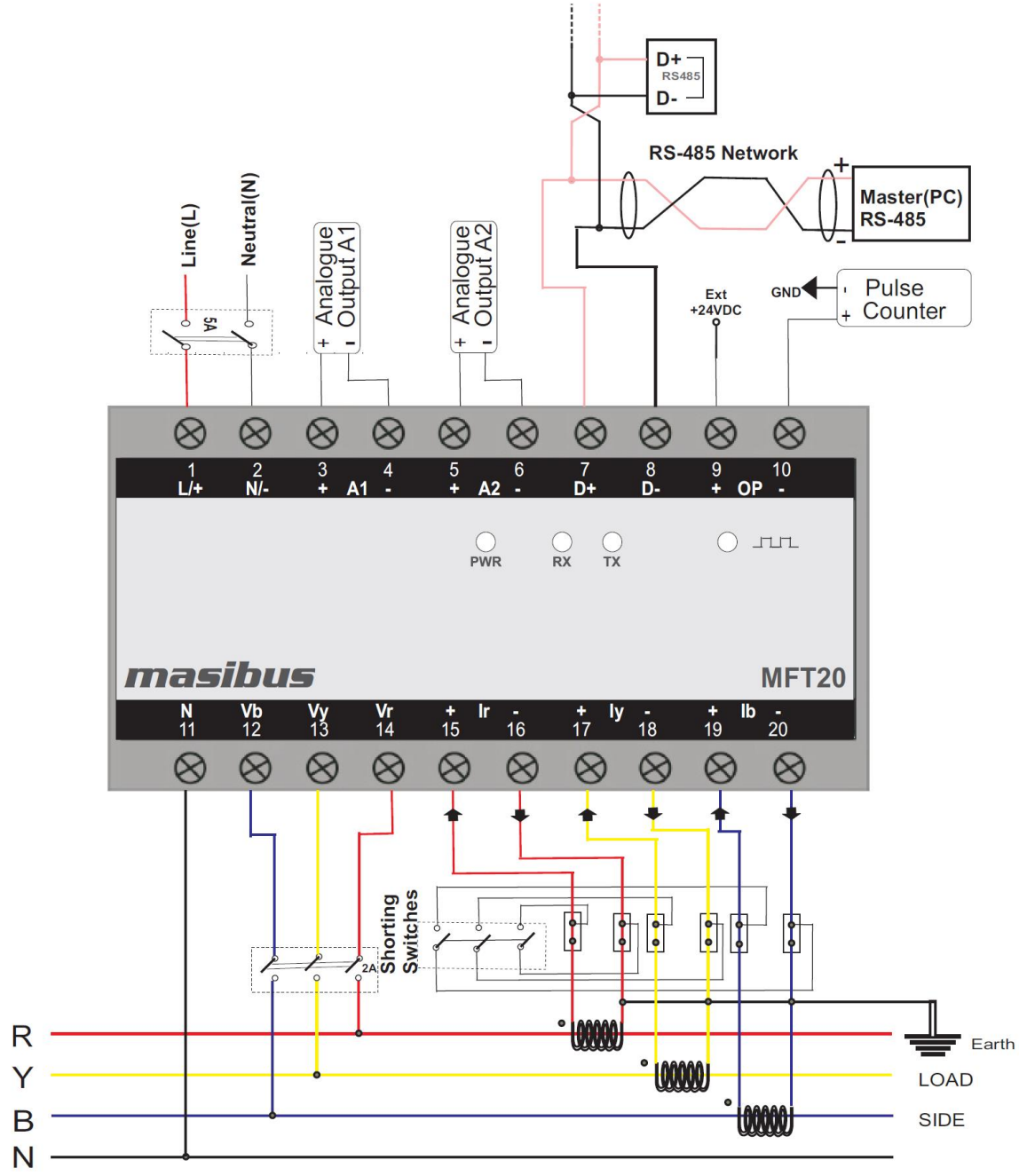
- *All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for voltage, current, and temperature rating of the system.*
- *Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the instrument. Protect the measurement AC Inputs voltage (V1, V2, V3) with 2A external over current protection device and the power supply source inputs with 5A external over current protection device, located close to the equipment.*
- *Before connecting the instrument to the power source, check the labels on the instrument to ensure that your instrument is equipped with the appropriate power supply voltage, input voltages and currents. Failure to do so may result in serious or even fatal injury and/or equipment damage.*
- *Under no circumstances don't connect instrument a power source if it is damaged.*
- *To prevent potential fire or shock hazard, do not expose the instrument to rain or moisture.*
- *The secondary of an external current transformer must never be allowed to be open circuit when the primary is energized. An open circuit can cause high voltages, possibly resulting in equipment damage, fire and even serious or fatal injury. Ensure that the current transformer wiring is secured using an external strain relief to reduce mechanical strain on the screw terminals, if necessary.*
- *Only qualified personnel familiar with the instrument and its associated electrical equipment must perform setup procedures.*
- *Beware not to over-tighten the terminal screws.*
- *Read this manual thoroughly before connecting the device to the current carrying circuits. During operation of the device, hazardous voltages are present on input terminals. Failure to observe precautions can result in serious or even fatal injury or damage to equipment.*
- *Upon receipt of the shipment remove the unit from the carton and inspect the unit for shipping damage. If any damage due to transit, report and claim with the carrier. Write down the model number and serial number for future reference when corresponding with our Customer Support Division.*

- *Do not use this instrument in areas such as excessive shock, vibration, dirt, moisture, corrosive gases or rain. The ambient temperature of the areas should not exceed the maximum rating specified.*

6.2 Common Wiring with RS-485 Connections

Recommended wiring for Aux Supply, Voltage input & Current Input along with RS-485 Connections

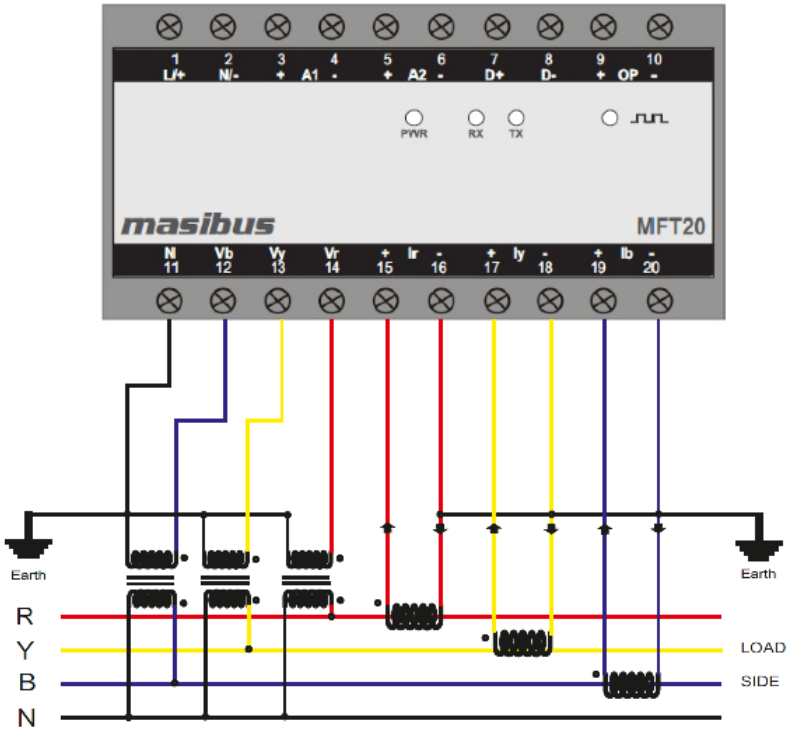
Also note correct polarity for Current Input & Phase wise Voltage & Current Input combination is essential



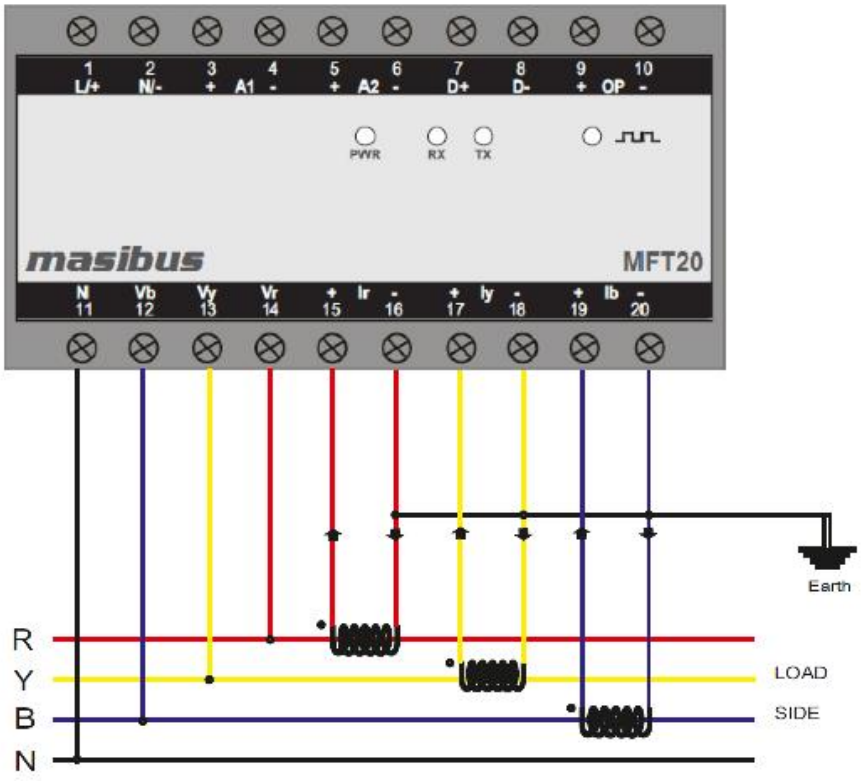
6.3 Terminal Wiring Details

6.3.1 Three Phase Four Wire System

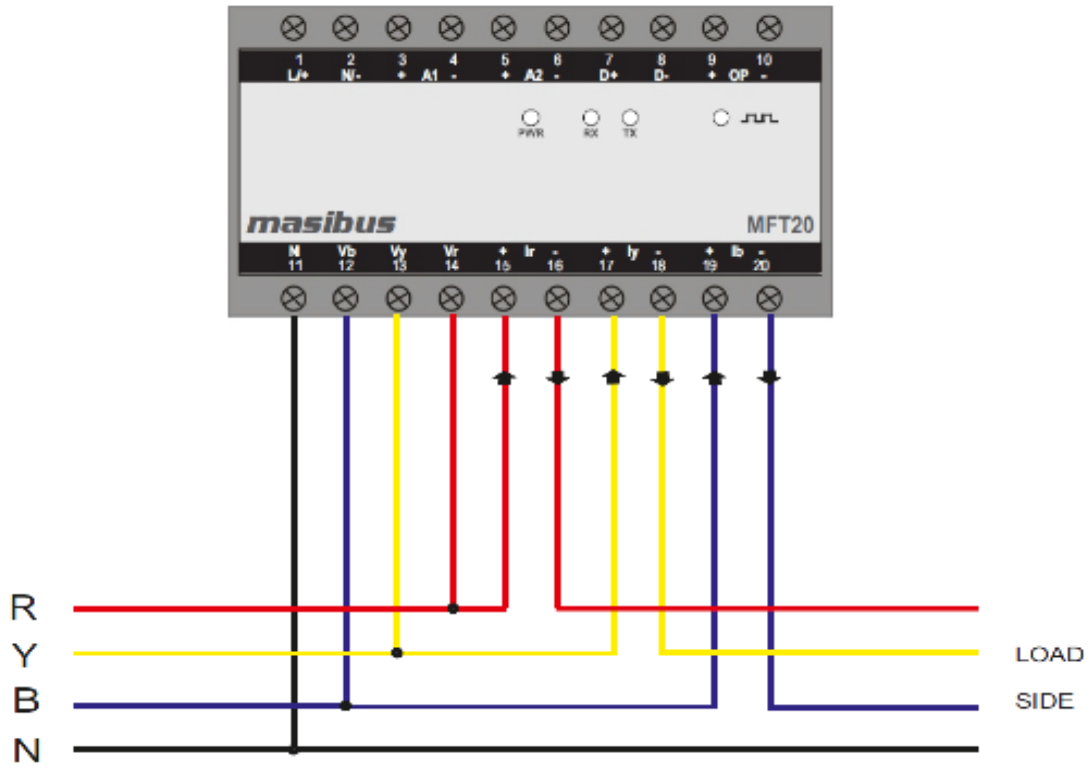
a) 4-Wire Wye-3 Element Connection Using 3PTs, 3CTs



b) 4-Wire Wye-3 Element Direct Connection Using 3CTs

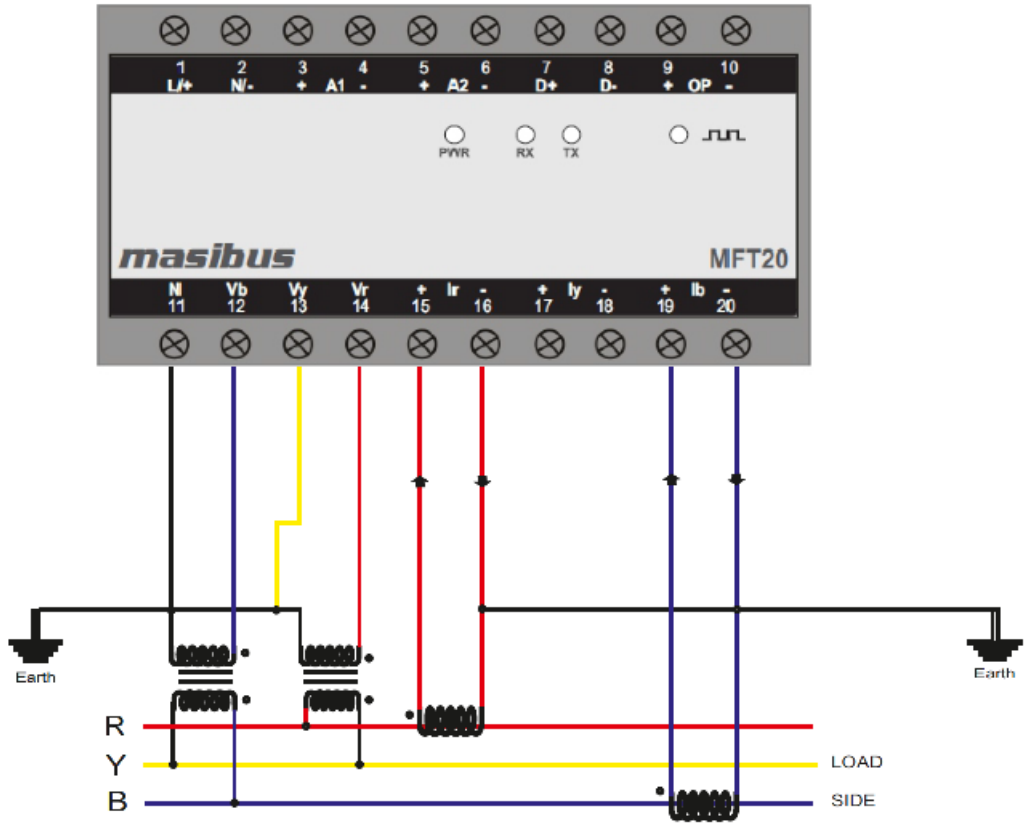


a) 4-Wire Direct Connection

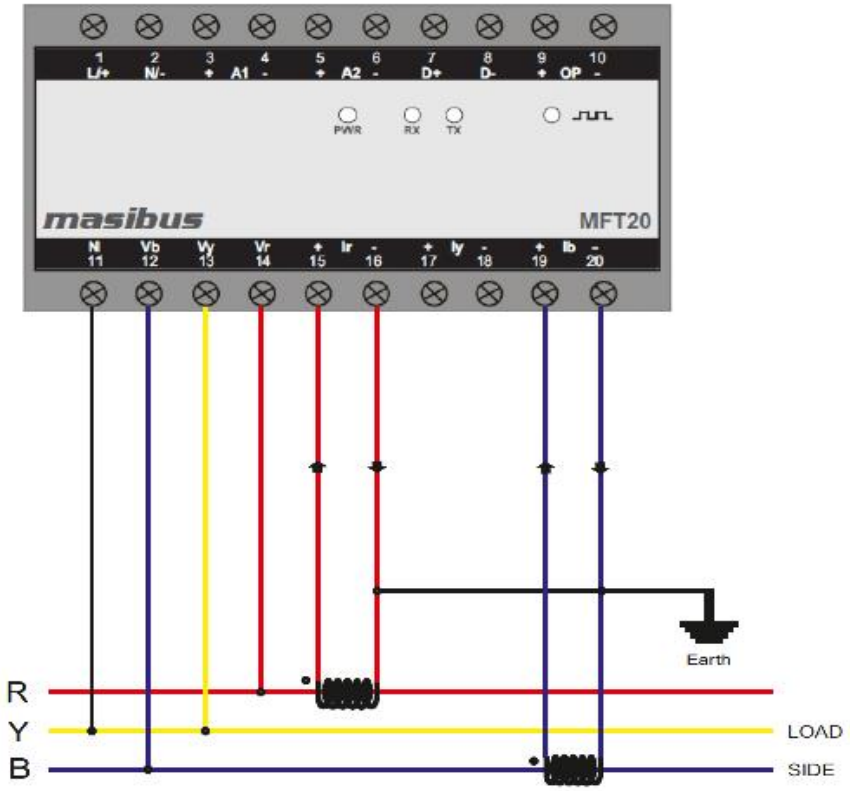


6.3.2 Three Phase Three Wire System

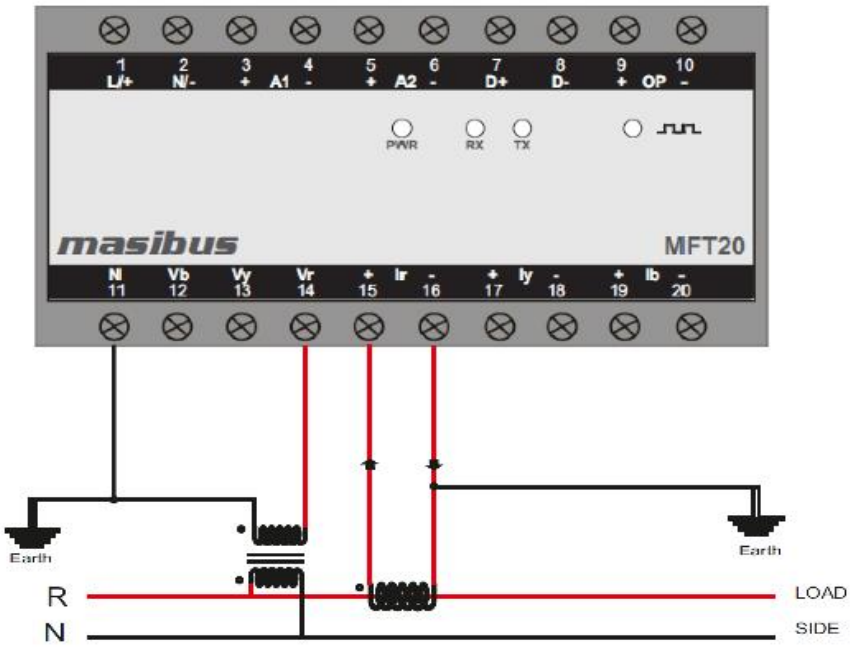
a) 3-Wire 2- Element Open Delta Connection Using 2PTs, 2CTs



b) 3-Wire 2- Element Direct Connection Using 2CTs



6.3.3 Single Phase Two Wire Configuration



Note: -*For Single Phase Two Wire, system should be 3P4W and Do not consider Average Voltage, Average Current & Average PF on the display or MODBUS.*

6.4 PTs and CTs

Large electrical installations have high voltages and currents, which may exceed the direct connection rating of the MFT. 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 Transducer 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 (Potential Transformers) and CTs (Current Transformers) must be planned, installed and tested by a qualified electrical contractor before wiring the transducer. The accuracy of the measurement also depends on the accuracy and phase – angle error of the PTs and CTs. Instrument Class 1 or better PTs and CTs are recommended. Do not use protection class CTs to feed the MFT; as 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.

6.4.1 PT, CT Wiring

The PTs and CTs must have adequate VA rating to support the burden (loading) on the secondary. You may want to support the auxiliary supply burden from one of the PTs. CTs 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. The wiring distance from the CT secondary to instrument should be such that, VA of wire path between MFT and CT along with VA of MFT should not exceed the VA rating of CT, otherwise the CT could get over-burdened and give large errors.

MFT should be conveniently located for easy connections of voltage (PT) and Current (CT) signals.

7. CONFIGURATION GUIDELINES FOR LCD DISPLAY

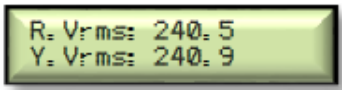
7.1 Modes of Operation

MFT has three mode of operation:

- PGM Mode (Edit Mode)
- Reset Registers
- Run Mode

7.2 Run Mode Detail

At power ON, the unit by default goes into RUN Mode. The following frame (if 3p4w) is displayed in Enable Auto mode, just after flash of MASIBUS introduction frame.



In Disable Auto mode, it will display stored page, if it is programmed.

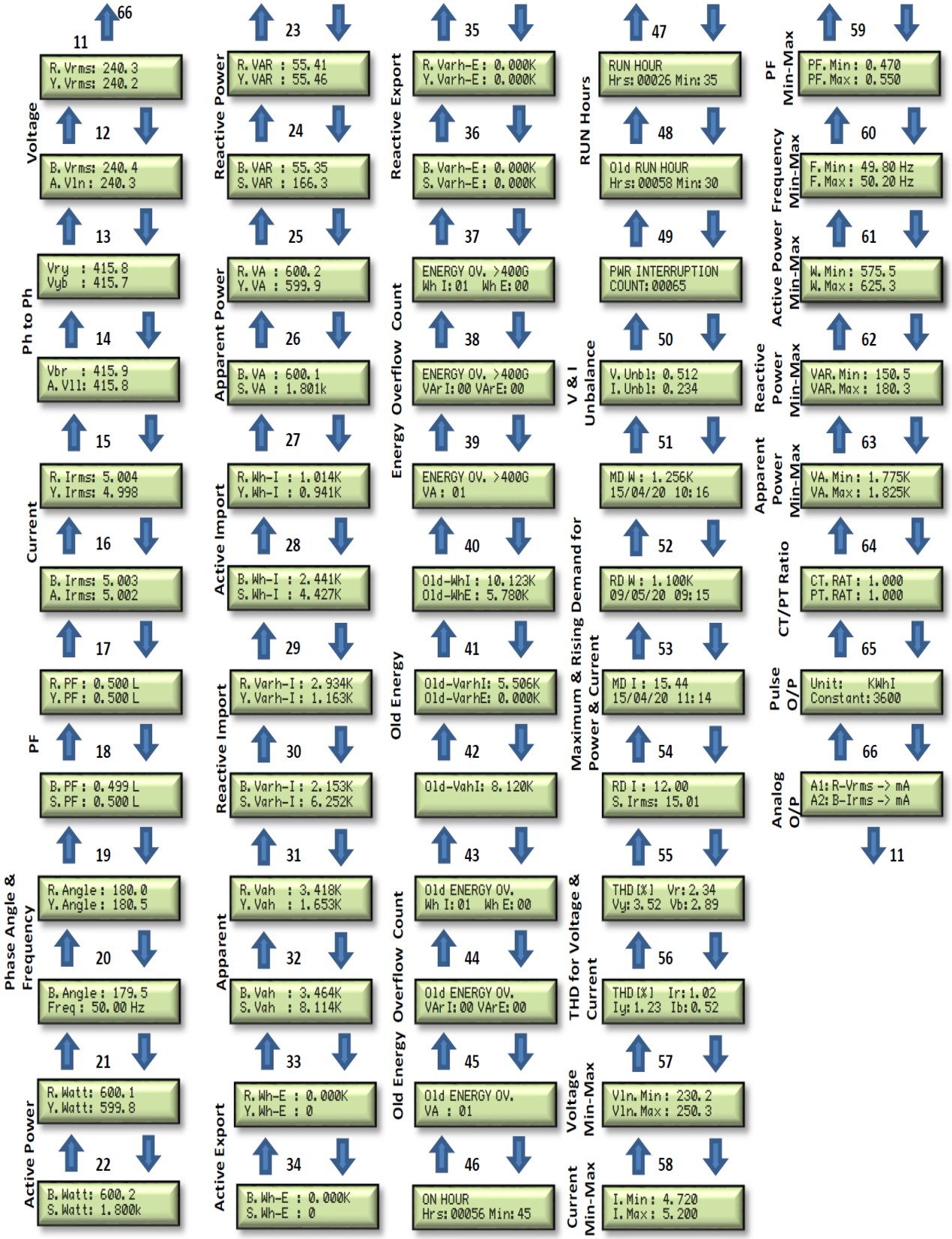
Enabling and Disabling Auto Scrolling

Enabling Auto Scrolling: Press Down key continuously for 5 seconds or display shows "**Enable Auto**" for scrolling. (Every 8 Seconds page will be scrolling)
Disabling Auto Scrolling: Press any key (UP/DOWN), display show "**Disable Auto**" and return to run mode

For Vertical movement of frame to frame, use  or  key.

The sequence of frames, which can be observed in RUN Mode, is shown in below fig. There are two types of display menu: For 3P4W and for 3P3W.

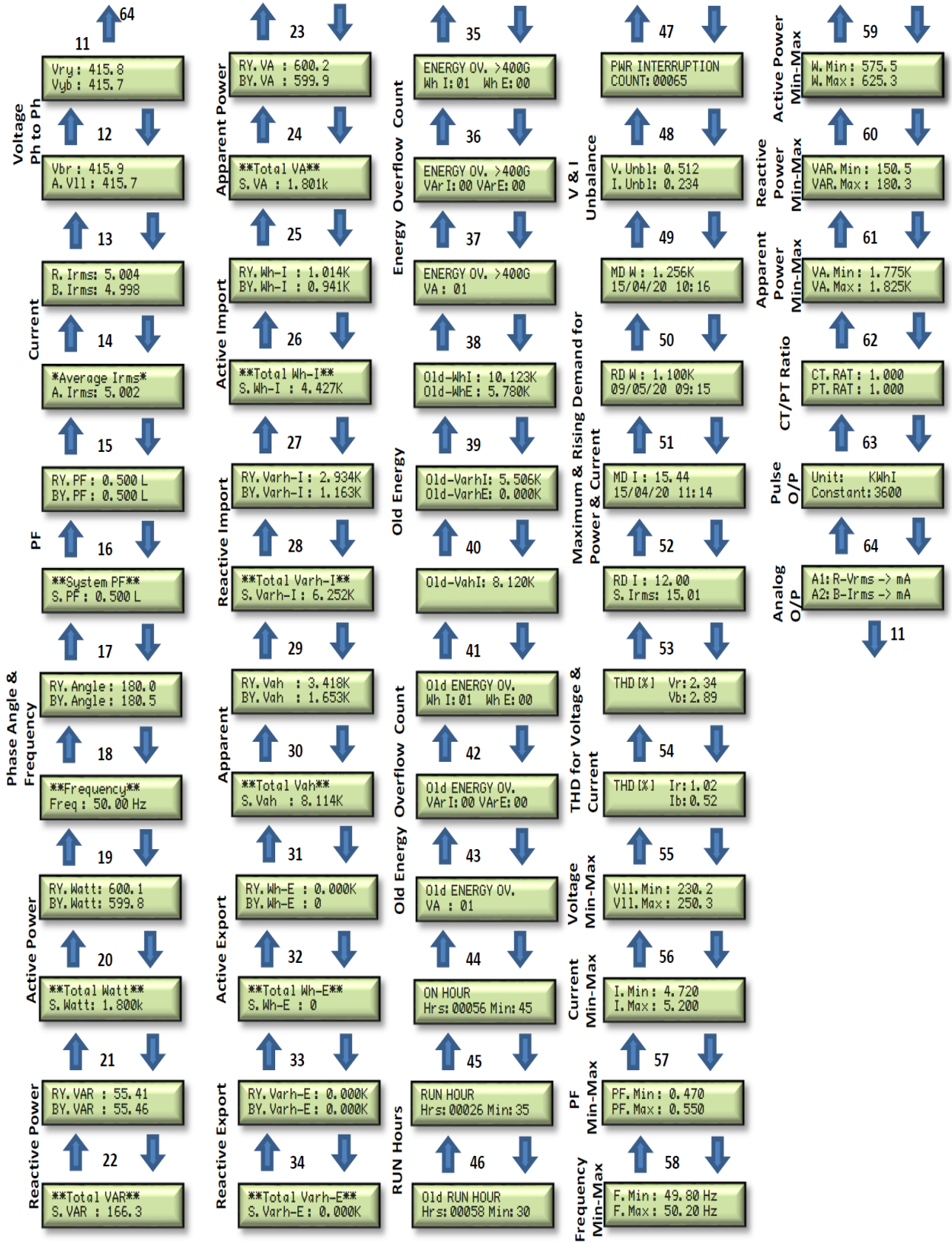
7.2.1 Display Page Matrix for 3 Phase 4 Wire System



3-Phase 4-Wire

Note:-Above screens are only for information of RUN MODE pages, values inside the screens are not actual.
When ordering code is w/o LCD then Chapter – 7 will not be useful.

7.2.2 Display Page Matrix for 3 Phase 3 Wire System



3-Phase 3-Wire

Note: - Above screens are only for information of RUN MODE pages, values inside the screens are not actual.
When ordering code is w/o LCD then Chapter – 7 will not be useful.

7.3 Program Mode Detail

The PROGRAM Mode can be entered by continuously pressing the UP key for 4 seconds. Once the key is pressed, the unit prompts for four digit password as shown below.

Factory default password is 0001.If you have configured this password as per your choice then apply that password by setting blinking cursor position using two keys: UP key to shift cursor position, DOWN to change the digit value. When the blinking cursor position is reaches at left most position and then press the UP key to enter in to programming mode if the password is correct. If applied password is incorrect, it will show incorrect password message as shown in below screen and automatically comes out from program mode to normal mode.

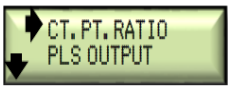
If the entered password is correct, it will flash as below:

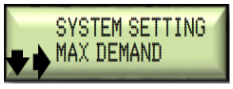
And then the following screen is displayed:

Here arrow is a pointer at default position. By moving the pointer you can select the mode. By using DOWN key, you can set arrow position and hence selection is made upon pressing UP key. To get back to the previous menu press DOWN key until the menu is finished, as it is now functioning as ESCAPE key. Before starting this, see the flow diagram so you will have whole idea for where you want to go and which parameter you want to update or see. In PROGRAM mode you can enter from anywhere by pressing UP key and you can escape from anywhere of PROGRAM mode by pressing DOWN key until the menu is finished and then press DOWN key for one step back.

7.4 Edit Mode Detail

By Pressing UP key on EDIT MODE, below screen will be shown:



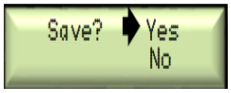


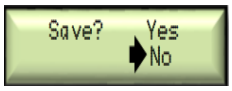
To enter in to any option you have to apply same procedure as applied as at EDIT MODE i.e. set the arrow position and press UP key.

7.4.1 CT.PT.RATIO

For this, screen will be shown like below:

Now here two parameters are available: CTR and PTR. To change any parameter, set arrow and press UP key, so blinking cursor will be on right most digits. Use UP key to change position of blinking cursor digit by digit and update the digit by DOWN key only. When the blinking cursor position is reaches at left most position and then press the UP key then prompt below screen for saving of updated parameter as per below screen.





If you want save the updated parameter then set arrow at "Yes" and press UP key otherwise set arrow at position "No" using DOWN key and then press UP key for not saving changed parameter.

7.4.2 PLS OUTPUT

For this, screen will be shown like below:

Suppose you have set 3600 with its unit KWh-I, so it means that for 1 KWh consumption of Active-Import Energy by load, it will generate 3600 pulses in 1 hour. Here in unit many options are available as per below Note2. Now to set the value and its unit, to change any parameter, set arrow and press UP key, so blinking cursor will be on right most digits. Use UP key to change position of blinking cursor digit by digit and update the digit by DOWN key only. When the blinking cursor position is reaches at left most position and then press the UP key again for saving of updated parameter as same explain in previously. Finally by pressing DOWN key until the menu is finished and then press DOWN key again for one step back. Here arrow will be at where you entered.

Note1: *Energy Pulse output must be between 1 to 60000.*
Note2: *Pulse output Unit display as per below.*

0 – KWhI (Active-Import)
1 – 10KWhI (Active-Import)
2 – 100KWhI (Active-Import)
3 – MWhI (Active-Import)
4 – KWh-E (Active-Export)
5 – 10KWh-E (Active-Export)
6 – 100KWh-E (Active-Export)
7 – MWh-E (Active-Export)
8 – KVArI (Reactive-Import)
9 – 10KVArI (Reactive-Import)
10 – 100KVArI (Reactive-Import)
11 – MVArI (Reactive-Import)
12 – KVArE (Reactive-Export)
13 – 10KVArE (Reactive-Export)
14 – 100KVArE (Reactive-Export)
15 – MVArE (Reactive-Export)
16 – KVAh (Apparent)
17 – 10KVAh (Apparent)
18 – 100KVAh (Apparent)
19 – MVAh (Apparent)

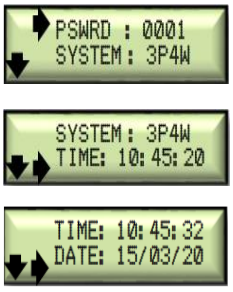
7.4.3 SERIAL COMM.

For this, screen will be shown like below:

Here five parameters are available: BAUD, SLV ID, DATA TYPE, PARITY and STOP BIT. BAUD is for Baud-Rate, SLV ID is for Slave Address, PARITY for parity bit and STOP BIT for stop bit of transducer for Modbus-RTU (Master-Slave) communication while DATA TYPE decides the data type in which the MFT sends data on RS-485 line. BAUD has five options like 2400, 4800,9600,19200 and 38400, SLV ID should be between 1 and 247, PARITY has three option like None, Odd and Even, STOP BIT has two option like 1 and 2, DATA TYPE has two option REAL and LONG .To change the value of BAUD, set the arrow and press UP key, it will show blinking cursor before left most digit of present value of BAUD. Now just press DOWN key to set required value and press UP key for saving of updated parameter in EEPROM as same explain in previous.(To change the PARITY and STOP BIT same as BAUD) For SLV ID, blinking cursor will be at right most digit of value, set the value as per previous explanation and save it. For DATA TYPE using DOWN key select the required data type and press UP key to store this value in to EEPROM. Finally by pressing DOWN key until the menu is finished and then press DOWN key again for one step back. Here arrow will be at where you entered.

7.4.4 SYSTEM SETTING

For this, screen will be shown like below:



Here four parameters are available like: PSWRD, SYSTEM & REAL TIME CLOCK setting PSWRD is for four digit password to security purpose. SYSTEM is used to whether meter is for 3 phase 4 wire AC Power supply or for 3 phase 3 wire AC power supply.

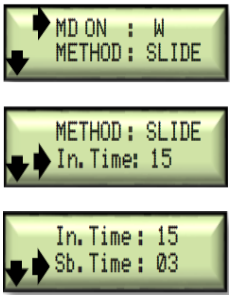
Note: Wiring for 3P4W and 3P3W are different so, change/check the wiring also if you are changing this parameter in installed device.

To change PSWRD value, apply same procedure as applied as in previous and save it.
To program/update Real Time & Real Date, apply same procedure as applied as in previous and save it. TIME and DATE format as per below
TIME: HH:MM:SS
DATE: DD/MM/YY
Finally by pressing DOWN key until the menu is finished and then press DOWN key again for one step back. Here arrow will be at where you entered.

NOTE: While entering time & date take care of not entering wrong date & time, specially date.

7.5 Maximum Demand

For this, screen will be shown like below:

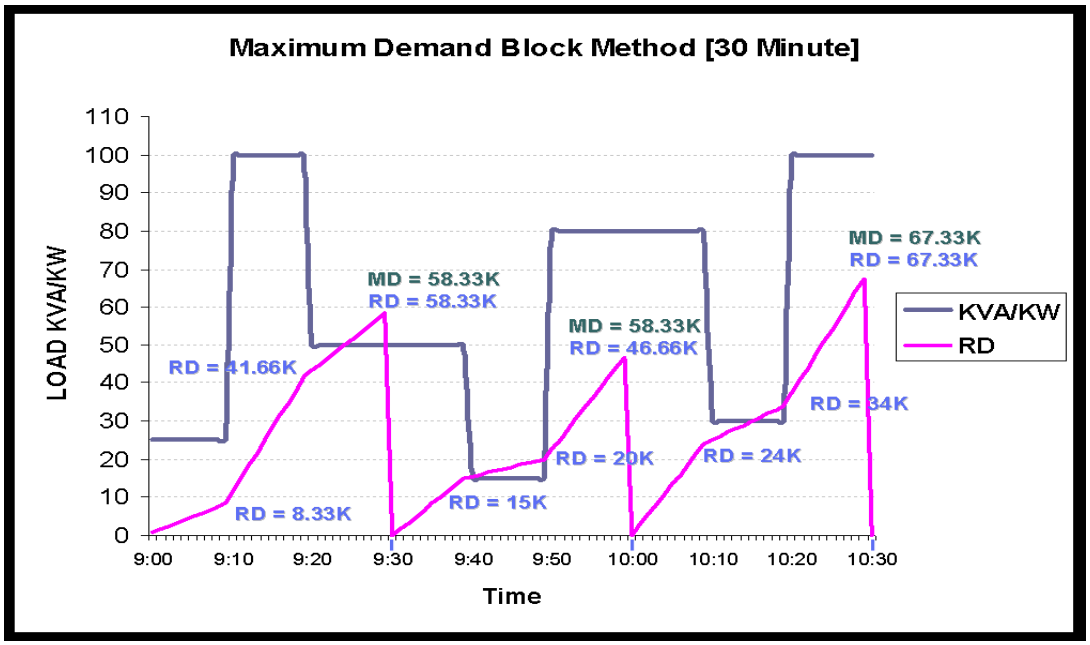


Here Max Demand parameters are available like: Max Demand ON, Demand calculation method, Interval Time **[In. Time]** and Sub Interval Time **[Sb. Time]**.
MD is calculated on: for KW / KVA.
MD calculation method / Demand type (dtyp): BLOCK / SLIDE.
Interval time for MD calculation: 15 / 30 minutes.
When MD calculation method is SLIDE than need to select Sub Interval time (Sb. Time) for MD calculation, so in SLIDE method every selected Sb. Time, Unit will calculate MD with consideration of previous demands up to In. Time.
Enter in it using UP key and use DOWN keys to select the options and after that use UP key to store that option as per previous explanation.

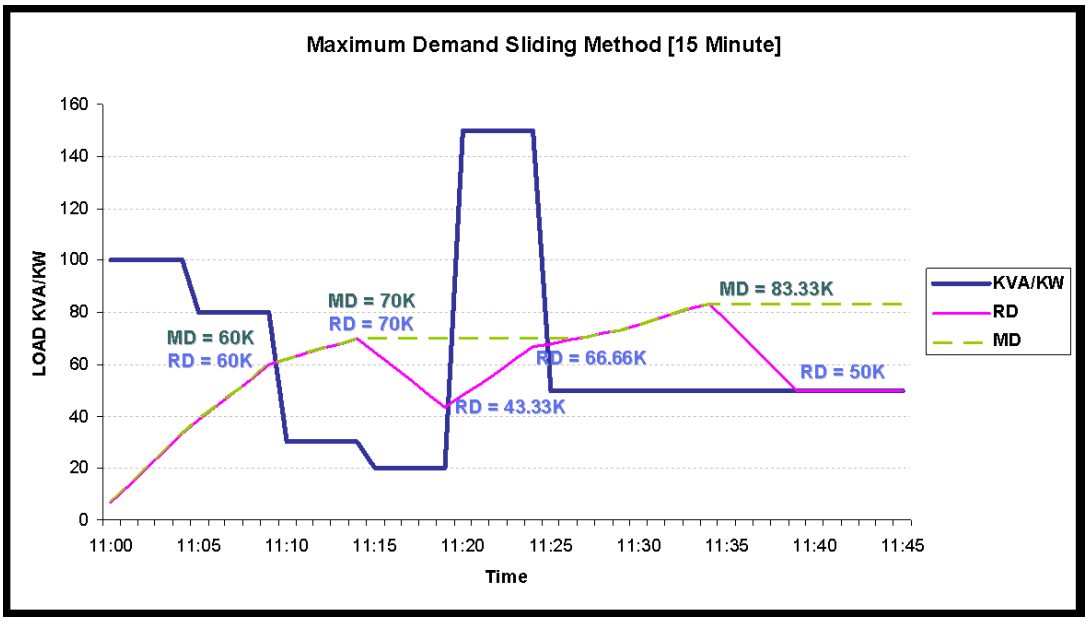
In **BLOCK WINDOW,** Say if the integration time is 15 minutes then value of max demand will be updated at every 15 minutes. Demand is calculated by accumulating power every second. That is called Rising Demand. Rising Demand is calculated at every second and stored to FRAM, Maximum Demand is calculated every 15 minutes in sync with Real Time, if power fails and at the next power ON, if 15 min window has changed than it will calculate Max Demand.

In **SLIDDING WINDOW,** Say if the interval time is 30 minutes and Sb. Time is 2 min, then value of max demand will be updated at every 2 minutes. Demand is calculated by accumulating power every 2 minutes. Power for Demand will be averaged based on Sb.Time it means it will be averaged for 120 seconds and then it will be taken in to demand array. Rising Demand is calculated at every 2 minutes averaging last 15 values from Demand array and stored to FRAM. If power fails and at the next power ON, It will start from initial values so Rising Demand will stabilize after 30 minutes in this case.

E.g.
1. Block Method [30 Minute Window]



2. Sliding Method [15 Minute Window]



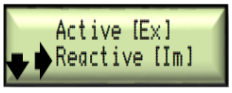
For Constant KVA, RD will get stable after 15 minutes.

7.6 RESET REGS

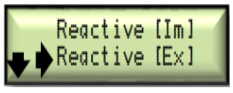
MANUAL RESET

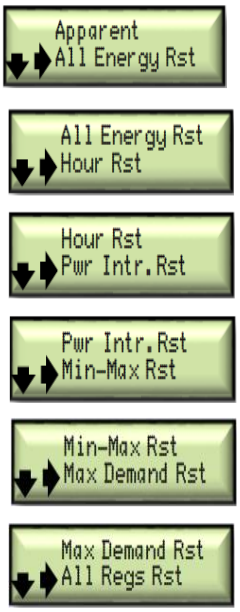
In this mode you can reset energy registers and Overflow Count of that particular energy register. There are five types of registers reset for Energy, common reset for all Hours and reset for MD like,
Active [Im] for Active Import Energy and WH-I Ov.count reset,
Active [Ex] for Active Export Energy and WH-E Ov.count reset,
Reactive [Im] for Reactive Import Energy and VARH-I Ov.count reset,
Reactive [Ex] for Reactive Export Energy and VARH-E Ov.count reset,
Apparent for Apparent Energy and VAH Ov.count reset,
All Energy Rst for Apparent Energy and VAH Ov.count Including all above 4 type of Energy.
Hour Rst for ON Hour, LOAD Hour and IDLE Hour register reset.
Pwr Intr. Rst for power interruption count.
Min – Max Rst for Minimum & Maximum value reset.
Max Demand Rst for Maximum Demand reset.
All Regs Rst for all above registers reset at the same time.
It is indicated as

At a same time only two registers can be shown. For other registers, there is an indication of ▼ . So you can set arrow by using DOWN key. In above screen first two registers are shown, having ▼ indication .i.e. these shown registers are up the list. Now suppose you are pressing DOWN key up to arrow is for Reactive [Im]. Now press DOWN key only once, screen will be shown like below:

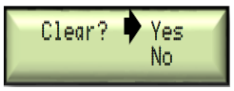


At every one time press DOWN key, screen sequences will be shown like below:





So you can set arrow as per this and press UP key to enter where screen shows like below:



Here is the confirmation that whether you are sure or not to erase energy data to reset it. If you set arrow before YES and pressed UP key, all registers (phase wise plus total) of this kind, energy will start from zero and you will come back one step where you entered, so you can go for another. If you set arrow before NO and pressed UP key, you will come back one step where you entered without any reset. By this way you can reset any register.

8. CONFIGURATION GUIDELINES FOR LED DISPLAY

8.1 Modes of Operation

MFT has two mode of operation:

- Run Mode
- Configuration Mode

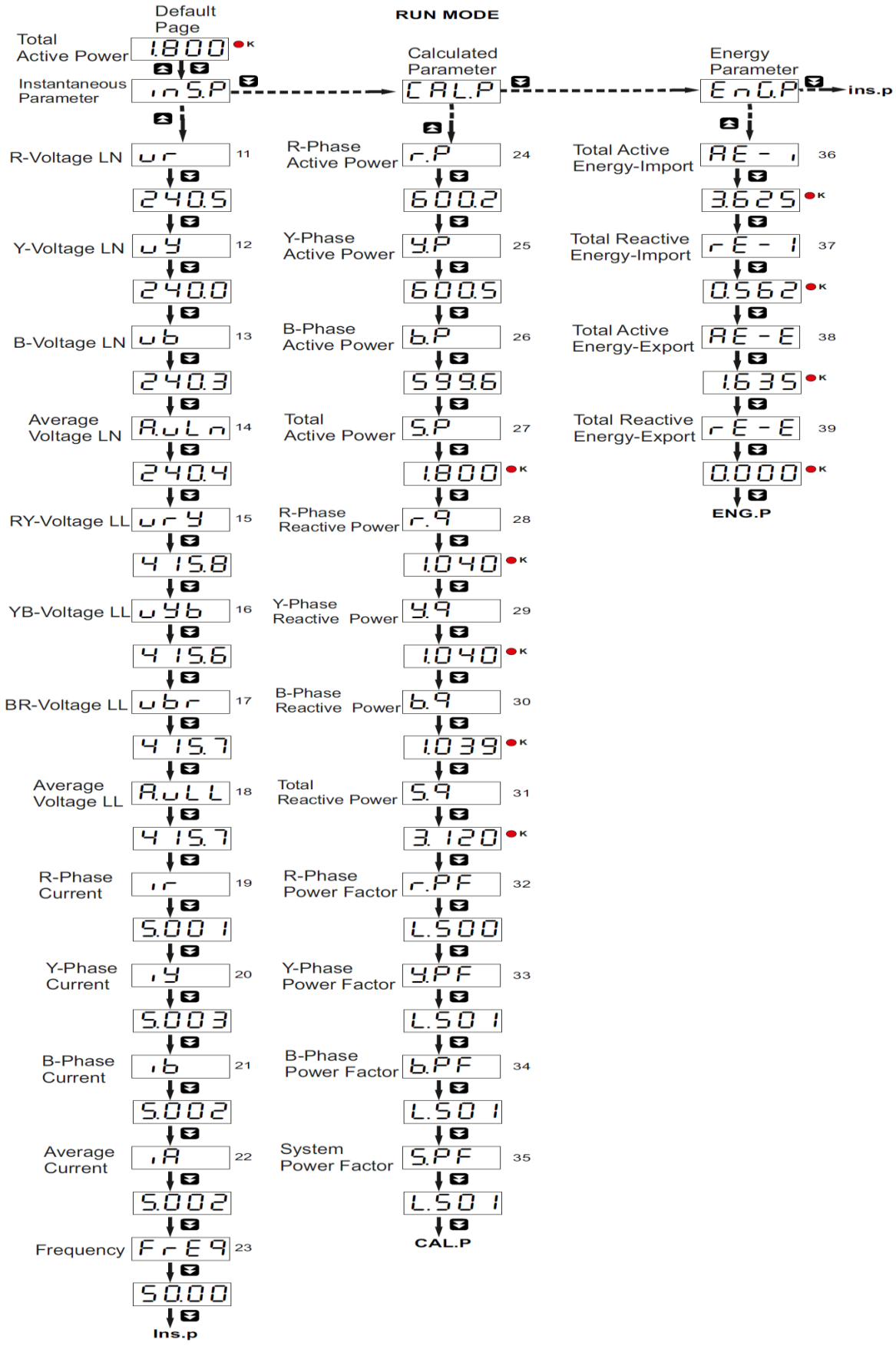
8.2 Run Mode Detail

At power ON, the unit by default goes into RUN Mode. The Default page (Value of Total Active Power) is displayed, just after flash of MT20 display.

When the user presses any key, it will enter in run mode parameters. Run mode parameter distinguishes between three groups. ins.p (instantaneous parameters), cal.p (calculated parameters), eng.p (energy parameters).

These groups include various parameters as shown in the below fig. Users can see three groups one by one by pressing DOWN key. User want to go to a particular group, press the UP key. Groups contain parameters names and their values like (Vr, Vr value etc.). Users can see the parameter name and its value by pressing the DOWN key (refer below fig.). User can only exit from that group only by pressing down key until the last parameter value comes and then again pressing DOWN key, going back to where the user entered. By pressing both keys at a same time, the user can directly go into the configuration mode from the RUN mode.

The sequence of pages, which can be observed in RUN Mode, is shown in below fig.

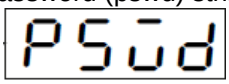


3-Phase 4-Wire

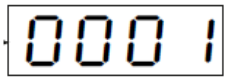
Note1:-Above screens are only for information of RUN MODE pages, values inside the screens are not actual.
Note2:- In the **3-Phase 3-Wire** system below Run pages are not displayed.
Page no. 15, 16, 17, 18, 20, 25, 29, 33 are not displayed in Run mode.

8.3 Configuration Mode Detail

The Configuration Mode can be entered by pressing the INC & DEC key both at same time. Once the key is pressed, the unit prompts for password (pswd) string as shown below.

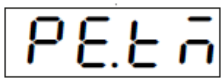


After pressing INC key, the unit prompts 0001 as shown below.



Factory default password is 0001.If you have configured this password as per your choice then apply that password by setting blinking cursor position using two keys: INC key to shift cursor position, DOWN to change the digit value. When the value is set and then press both the key at same time to enter in to configuration mode if the password is correct. If applied password is incorrect, it will show false message and automatically comes out to Run mode.

If the entered password is correct, it will flash as True message and following screen is displayed.

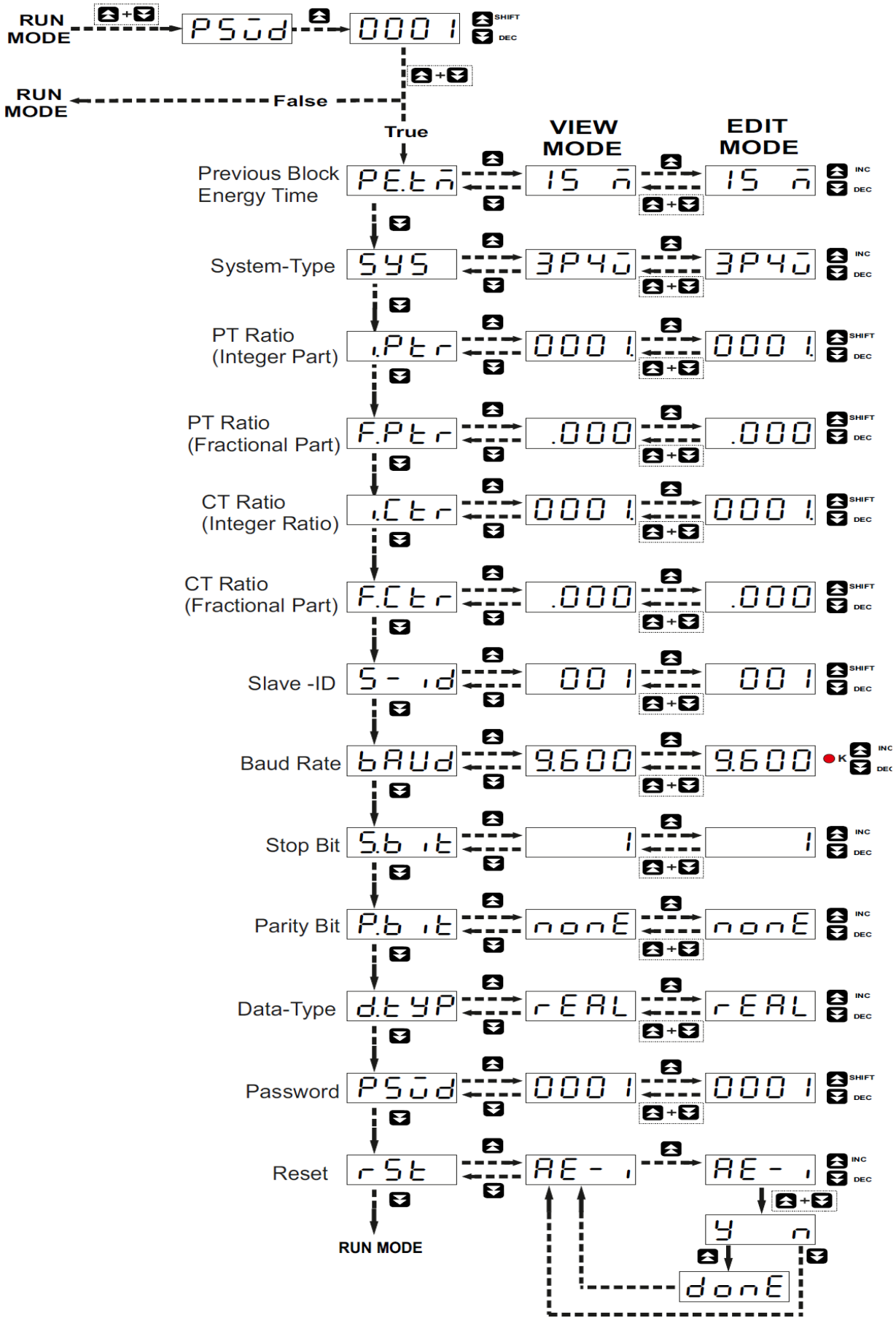


The sequence of pages, which can be observed in Configuration Mode, is shown in below fig.
List of configuration parameters is shown by pressing DEC key still the last RST parameter, After that once by press DEC key its goes to RUN mode, from where was you entered.

In the configuration mode, from that you want to view the parameter then you need to press INC key for viewing particular parameter value.

If you are in Configuration mode and more than 1 minute you have not pressing any keys then automatically it's goes to RUN mode from where you entered.

CONFIGURATION MODE



8.4 Edit Mode Detail

It is goes into the EDIT mode (Blinking ON) by pressing INC key from the VIEW mode.

1. **Previous block energy time (PE.TM) :**
   There are three option 5 minute (05 M), 15 minute (15 M) and 1 hour (1 Hr) for the previous block energy measurement.
   By pressing INC and DEC key, you can select any one from that after by pressing both the keys it is saved in EEPROM.
   Previous block energy time parameter calculation always start from zero when powered ON. Same for the changes made to edit mode of previous block energy time.

2. **System type (SYS) :**
   There are two option 3 phase 4 wire (3P4W) and 3 phase 3 wire (3P3W) for the System type.
   By pressing INC and DEC key, you can select any one from that after by pressing both the keys it is saved in EEPROM.

3. **PT Ratio - Integer part (I.PTR) :**
   PT Ratio – Fractional part (F.PTR):
   It is PT Ratio (Potential Transformer ratio). Its value are separated in two parts one is integer part (means value before the decimal point) and another is fractional part (means value after the decimal point).
   By setting blinking cursor position using two keys: INC key to shift cursor position, DEC key to change the digit value. When the value is set and then press both the key at same time to save in EEPROM.
   e.g.1
   PT Primary = 66KV, PT Secondary = 110V
   Therefore **PTR** = 66KV / 110V = 600.000
   In this PTR value is separated in two parts
   I.PTR = 600 and F.PTR=.000
   e.g.2
   PT Primary = 15.6KV, PT Secondary = 110V
   Therefore **PTR** = 15.6KV / 110V = 141.818
   In this PTR value is separated in two parts
   I.PTR = 141 and F.PTR=.818
4. **CT Ratio - Integer part (I.CTR) :**
   CT Ratio – Fractional part (F.CTR):
   It is CT Ratio (Current Transformer ratio). Same as PTR.

5. **Slave Address (S-Id) :**
   Slave Address should be between 1 and 247.
   By setting blinking cursor position using two keys: INC key to shift cursor position, DEC key to change the digit value. When the value is set and then press both the key at same time to save in EEPROM.

6. **Baud rate (baud) :**
   There are five options like 2400, 4800, 9600, 19200 and 38400. By pressing INC and DEC key, you can select any one from that, after by pressing both the keys it is saved in EEPROM.

7. **Stop bit (S.bit) :**
   There are two options like 1-stop bit & 2-stop bit. By pressing INC and DEC key, you can select any one from that, after by pressing both the keys it is saved in EEPROM.

8. **Parity bit (P.bit) :**
   There are three options like none, odd & even parity bit. By pressing INC and DEC key, you can select any one from that, after by pressing both the keys it is saved in EEPROM.

9. **Data type (d.typ) :**
   There are two options like Float (Real) & Long. By pressing INC and DEC key, you can select any one from that, after by pressing both the keys it is saved in EEPROM.

Note: If data type is **Real** in multifunction transducer then set **float** in Modbus master. If data type is **long** in Multifunction transducer then set **long** in Modbus master.

10. **Password (pswd) :**
    Password should be between 1 and 9999.
    By setting blinking cursor position using two keys: INC key to shift cursor position, DEC key to change the digit value. When the value is set and then press both the key at same time to save in EEPROM.

11. **Reset (rst) :**
    There are ten options for Reset as per below table. By pressing INC and DEC key, you can select any one from that, after by pressing both the keys, it will show the option for Yes(Y) & No (N) for user confirmation. If the user want to reset, for that press the INC key it will flash the done message and automatically goes to view mode. If the user does not want to reset then press the DEC key to goes in view mode.

RESET OPTION	DESCRIPTION
AE-I	ActiveEnergy Import
RE-I	Reactive Energy Import
AE-E	Active Energy Export
RE-E	Reactive Energy Export
ENGY	All Energy
HOUR	Hours
LO.HI	Low-High Value
MD	Maximum Demand
PB-E	Previous Block Energy
ALL	All Reset

8.5 Maximum Demand

For maximum demand please refer 7.5 section of this manual.

9. MODBUS DETAILS

RS – 485 interface is provided to communicate with the MFT. The interface is available at the terminals. (Refer Wiring Details)

When controllers are setup to communicate on a Modbus network using RTU (Remote Terminal Unit) mode, each 8–bit byte in a message contains two 4–bit Hexadecimal characters. The main advantage of this mode is that, it's greater Character density allows better data throughput than ASCII for the same baud rate.
Use only following function codes for data read/write purpose

CODE	MEANING	ACTION
03	Read holding registers	Obtains current binary value in one or more holding registers.
04	Read Input registers	Obtains current binary value in one or more Input registers.
06	Preset single register	Place a specific binary value into a holding register.
16	Preset multiple register	Place a specific binary value into a multiple holding register.

9.1 Modbus Register Map for 3P4W & 3P3W parameters

Data read Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No. of data word, High], [0 x No. of data word. Low] [0 x CRC Low] [0 x CRC High]

Function Code = 0X04
Address – between 30001 to 30119
No. of data word ≤ 120 & in multiple of 2 as all data are of 4 Bytes [Long & Real]. Enter only Even value (data word length).

Response = [0 x Slave Id], [0 x Fun. Code], [Byte count], [Data High], [Data Low] …... [Data. High], [Data. Low] [0 x CRC Low] [0 x CRC High]
***[Data Format:** Long & Real]*

Sr. No.	Address	Measured parameter		words	Multiplication Factor (if data type is long)
		3P4W	3P3W		
1	30001	Frequency	Frequency	2	0.01
2	30003	R. PF	RY. PF	2	0.001
3	30005	Y. PF	Reserved	2	0.001
4	30007	B. PF	BY. PF	2	0.001
5	30009	S. PF	S. PF	2	0.001
6	30011	R. Vrms	Vrms RY	2	0.1
7	30013	Y. Vrms	Vrms BR	2	0.1
8	30015	B. Vrms	Vrms YB	2	0.1
9	30017	A. Vrms	A_Vrms LL	2	0.1
10	30019	Vrms RY	Reserved	2	0.1
11	30021	Vrms YB	Reserved	2	0.1
12	30023	Vrms BR	Reserved	2	0.1
13	30025	R. Irms	R. Irms	2	0.001
14	30027	Y. Irms	Y. Irms	2	0.001
15	30029	B. Irms	B. Irms	2	0.001
16	30031	A. Irms	A. Irms	2	0.001
17	30033	I_neutral	Reserved	2	0.001
18	30035	R. Watt	RY. Watt	2	1
19	30037	Y. Watt	Reserved	2	1
20	30039	B. Watt	BY. Watt	2	1

21	30041	S. Watt	S. Watt	2	1
22	30043	R. Var	RY. Var	2	1
23	30045	Y. Var	Reserved	2	1
24	30047	B. Var	BY. Var	2	1
25	30049	S. Var	S. Var	2	1
26	30051	R. VA	RY. VA	2	1
27	30053	Y. VA	Reserved	2	1
28	30055	B. VA	BY. VA	2	1
29	30057	S. VA	S. VA	2	1
30	30059	R. KWh-Import	RY. KWh-Import	2	0.1
31	30061	Y. KWh-Import	Reserved	2	0.1
32	30063	B. KWh-Import	BY. KWh-Import	2	0.1
33	30065	T. KWh-Import	T. KWh-Import	2	0.1
34	30067	R. KWh-Export	RY. KWh-Export	2	0.1
35	30069	Y. KWh-Export	Reserved	2	0.1
36	30071	B. KWh-Export	BY. KWh-Export	2	0.1
37	30073	T. KWh-Export	T. KWh-Export	2	0.1
38	30075	R. KVarh-Import	RY. KVarh-Import	2	0.1
39	30077	Y. KVarh-Import	Reserved	2	0.1
40	30079	B. KVarh-Import	BY. KVarh-Import	2	0.1
41	30081	T. KVarh-Import	T. KVarh-Import	2	0.1
42	30083	R. KVarh-Export	RY. KVarh-Export	2	0.1
43	30085	Y. KVarh-Export	Reserved	2	0.1
44	30087	B. KVarh-Export	BY. KVarh-Export	2	0.1
45	30089	T. KVarh-Export	T. KVarh-Export	2	0.1
46	30091	R. KVah	RY. KVah	2	0.1
47	30093	Y. KVah	Reserved	2	0.1
48	30095	B. KVah	BY. KVah	2	0.1
49	30097	T. KVah	T. KVah	2	0.1
50	30099	A.Vrms_LL	Reserved	2	0.1
51	30101	Sum. Irms	Sum. Irms	2	0.001
52	30103	R. Phase Angle	RY. Phase Angle	2	0.01
53	30105	Y. Phase Angle	Reserved	2	0.01
54	30107	B. Phase Angle	BY. Phase Angle	2	0.01
55	30109	R. DPF	RY. DPF	2	0.001
56	30111	Y. DPF	Reserved	2	0.001
57	30113	B. DPF	BY. DPF	2	0.001
58	30115	S. DPF	S. DPF	2	0.001
59	30117	V. Unbalance	V. Unbalance	2	0.01
60	30119	I . Unbalance	I. Unbalance	2	0.01

Current Harmonics:

Function Code = 0X04
Address – between 30301 to 30397
No. of data word ≤ 98 & in multiple of 2 as all data are of 4 Bytes [Long & Real].
Enter only Even value (data word length).
[Data Format: *long & Real* ***]***

S. No.	Address	Measured parameter		words	Multiplication Factor (if data type is long)
		3P4W	3P3W		
1	30301	3rd IrHar	3rd IrHar	2	0.01
2	30303	5th IrHar	5th IrHar	2	0.01
3	30305	7th IrHar	7th IrHar	2	0.01
4	30307	9th IrHar	9th IrHar	2	0.01
5	30309	11th IrHar	11th IrHar	2	0.01
6	30311	13th IrHar	13th IrHar	2	0.01
7	30313	15th IrHar	15th IrHar	2	0.01
8	30315	17th IrHar	17th IrHar	2	0.01
9	30317	19th IrHar	19th IrHar	2	0.01
10	30319	21th IrHar	21th IrHar	2	0.01
11	30321	23th IrHar	23th IrHar	2	0.01
12	30323	25th IrHar	25th IrHar	2	0.01
13	30325	27th IrHar	27th IrHar	2	0.01
14	30327	29th IrHar	29th IrHar	2	0.01
15	30329	31th IrHar	31th IrHar	2	0.01
16	30331	3rd IyHar	Reserved	2	0.01
17	30333	5th IyHar	Reserved	2	0.01
18	30335	7th IyHar	Reserved	2	0.01
19	30337	9th IyHar	Reserved	2	0.01
20	30339	11th IyHar	Reserved	2	0.01
21	30341	13th IyHar	Reserved	2	0.01
22	30343	15th IyHar	Reserved	2	0.01
23	30345	17th IyHar	Reserved	2	0.01
24	30347	19th IyHar	Reserved	2	0.01
25	30349	21th IyHar	Reserved	2	0.01
26	30351	23th IyHar	Reserved	2	0.01
27	30353	25th IyHar	Reserved	2	0.01
28	30355	27th IyHar	Reserved	2	0.01
29	30357	29th IyHar	Reserved	2	0.01
30	30359	31th IyHar	Reserved	2	0.01
31	30361	3rd IbHar	3rd IbHar	2	0.01
32	30363	5th IbHar	5th IbHar	2	0.01
33	30365	7th IbHar	7th IbHar	2	0.01
34	30367	9th IbHar	9th IbHar	2	0.01
35	30369	11th IbHar	11th IbHar	2	0.01
36	30371	13th IbHar	13th IbHar	2	0.01
37	30373	15th IbHar	15th IbHar	2	0.01
38	30375	17th IbHar	17th IbHar	2	0.01
39	30377	19th IbHar	19th IbHar	2	0.01
40	30379	21th IbHar	21th IbHar	2	0.01
41	30381	23th IbHar	23th IbHar	2	0.01
42	30383	25th IbHar	25th IbHar	2	0.01
43	30385	27th IbHar	27th IbHar	2	0.01
44	30387	29th IbHar	29th IbHar	2	0.01
45	30389	31th IbHar	31th IbHar	2	0.01
46	30391	Total Irthd	Total Irthd	2	0.01

47	30393	Total Iythd	Total Iythd	2	0.01
48	30395	Total Ibthd	Total Ibthd	2	0.01
49	30397	Avg. Ithd	Avg. Ithd	2	0.01

Voltage Harmonics:

Function Code = 0X04
Address – between 30401 to 30497
No. of data word ≤ 98 & in multiple of 2 as all data are of 4 Bytes [Long & Real].
Enter only Even value (data word length).
[Data Format: *long & Real* ***]***

S. No.	Address	Measured parameter		words	Multiplication Factor (if data type is long)
		3P4W	3P3W		
1	30401	3rd VrHar	3rd VrHar	2	0.01
2	30403	5th VrHar	5th VrHar	2	0.01
3	30405	7th VrHar	7th VrHar	2	0.01
4	30407	9th VrHar	9th VrHar	2	0.01
5	30409	11th VrHar	11th VrHar	2	0.01
6	30411	13th VrHar	13th VrHar	2	0.01
7	30413	15th VrHar	15th VrHar	2	0.01
8	30415	17th VrHar	17th VrHar	2	0.01
9	30417	19th VrHar	19th VrHar	2	0.01
10	30419	21th VrHar	21th VrHar	2	0.01
11	30421	23th VrHar	23th VrHar	2	0.01
12	30423	25th VrHar	25th VrHar	2	0.01
13	30425	27th VrHar	27th VrHar	2	0.01
14	30427	29th VrHar	29th VrHar	2	0.01
15	30429	31th VrHar	31th VrHar	2	0.01
16	30431	3rd VyHar	Reserved	2	0.01
17	30433	5th VyHar	Reserved	2	0.01
18	30435	7th VyHar	Reserved	2	0.01
19	30437	9th VyHar	Reserved	2	0.01
20	30439	11th VyHar	Reserved	2	0.01
21	30441	13th VyHar	Reserved	2	0.01
22	30443	15th VyHar	Reserved	2	0.01
23	30445	17th VyHar	Reserved	2	0.01
24	30447	19th VyHar	Reserved	2	0.01
25	30449	21th VyHar	Reserved	2	0.01
26	30451	23th VyHar	Reserved	2	0.01
27	30453	25th VyHar	Reserved	2	0.01
28	30455	27th VyHar	Reserved	2	0.01
29	30457	29th VyHar	Reserved	2	0.01
30	30459	31th VyHar	Reserved	2	0.01
31	30461	3rd VbHar	3rd VbHar	2	0.01
32	30463	5th VbHar	5th VbHar	2	0.01
33	30465	7th VbHar	7th VbHar	2	0.01
34	30467	9th VbHar	9th VbHar	2	0.01
35	30469	11th VbHar	11th VbHar	2	0.01
36	30471	13th VbHar	13th VbHar	2	0.01
37	30473	15th VbHar	15th VbHar	2	0.01
38	30475	17th VbHar	17th VbHar	2	0.01
39	30477	19th VbHar	19th VbHar	2	0.01
40	30479	21th VbHar	21th VbHar	2	0.01
41	30481	23th VbHar	23th VbHar	2	0.01
42	30483	25th VbHar	25th VbHar	2	0.01

43	30485	27th VbHar	27th VbHar	2	0.01
44	30487	29th VbHar	29th VbHar	2	0.01
45	30489	31th VbHar	31th VbHar	2	0.01
46	30491	Total Vrthd	Total Vrthd	2	0.01
47	30493	Total Vythd	Total Vythd	2	0.01
48	30495	Total Vbthd	Total Vbthd	2	0.01
49	30497	Avg. Vthd	Avg. Vthd	2	0.01

Energy Overflow Count:
Function Code = 0X04
Address – between 30501 to 30517
No. of data word ≤ 17 & in multiple of 1 as all data are of 2 Bytes [Decimal].
***[Data Format:** Only in Decimal]*

S. No.	Address	Measured parameter	words	Multiplication Factor (if data type is long)
1	30501	Wh I –ovcnt	1	-
2	30502	Wh E-ovcnt	1	-
3	30503	VARh I-ovcnt	1	-
4	30504	VARh E-ovcnt	1	-
5	30505	VAh –ovcnt	1	-
6	30506	Old Wh I -ovcnt	1	-
7	30507	Old Wh E-ovcnt	1	-
8	30508	Old VARh I-ovcnt	1	-
9	30509	Old VARh E-ovcnt	1	-
10	30510	Old VAh -ovcnt	1	-
11	30511	ON HOUR	1	-
12	30512	ON MIN	1	-
13	30513	RUN HOUR	1	-
14	30514	RUN MIN	1	-
15	30515	Old RUN HOUR	1	-
16	30516	Old RUN MIN	1	-
17	30517	PWR INTR. COUNT	1	-

Min Max Value: It will log Min Max from Last Reset
Function Code = 0X04
Address – between 30151 to 30253
No. of data word ≤ 104 & in multiple of 2 as all data are of 4 Bytes [Long & Real].
***[Data Format:** long & Real]*

S. No.	Address	Measured parameter		words	Multiplication Factor
		3P4W	3P3W		(if data type is long)
1	30151	R.Vrms Max	Vrms RY Max	2	0.1
2	30153	Y.Vrms Max	Vrms BR Max	2	0.1
3	30155	B.Vrms Max	Vrms YB Max	2	0.1
4	30157	A.Vrms Max	A.Vrms LL Max	2	0.1
5	30159	R.Vrms Min	Vrms RY Min	2	0.1
6	30161	Y.Vrms Min	Vrms BR Min	2	0.1
7	30163	B.Vrms Min	Vrms YB Min	2	0.1
8	30165	A.Vrms Min	A.Vrms LL Min	2	0.1
9	30167	R.Irms Max	R.Irms Max	2	0.001
10	30169	Y.Irms Max	Reserved	2	0.001

11	30171	B.Irms Max	B.Irms Max	2	0.001
12	30173	A.Irms Max	A.Irms Max	2	0.001
13	30175	R.Irms Min	R.Irms Min	2	0.001
14	30177	Y.Irms Min	Reserved	2	0.001
15	30179	B.Irms Min	B.Irms Min	2	0.001
16	30181	A.Irms Min	A.Irms Min	2	0.001
17	30183	R.PF Max	RY.PF Max	2	0.001
18	30185	Y.PF Max	Reserved	2	0.001
19	30187	B.PF Max	BY.PF Max	2	0.001
20	30189	S.PF Max	S.PF Max	2	0.001
21	30191	R.PF Min	RY.PF Min	2	0.001
22	30193	Y.PF Min	Reserved	2	0.001
23	30195	B.PF Min	BY.PF Min	2	0.001
24	30197	S.PF Min	S.PF Min	2	0.001
25	30199	Frequency Max	Frequency Max	2	0.01
26	30201	Frequency Min	Frequency Min	2	0.01
27	30203	S.Watt Max	S.Watt Max	2	1
28	30205	S.Watt Min	S.Watt Min	2	1
29	30207	S.VAR Max	S.VAR Max	2	1
30	30209	S.VAR Min	S.VAR Min	2	1
31	30211	S.VA Max	S.VA Max	2	1
32	30213	S.VA Min	S.VA Min	2	1
33	30215	Old T. KWh-Import	Old T. KWh-Import	2	0.1
34	30217	Old T. KWh-Export	Old T. KWh-Export	2	0.1
35	30219	Old T. KVarh-Import	Old T. KVarh-Import	2	0.1
36	30221	Old T. KVarh-Export	Old T. KVarh-Export	2	0.1
37	30223	Old T. KVah	Old T. KVah	2	0.1
38	30225	Day KWh-Import	Day KWh-Import	2	0.1
39	30227	Day KWh-Export	Day KWh-Export	2	0.1
40	30229	Day KVarh-Import	Day KVarh-Import	2	0.1
41	30231	Day KVarh-Export	Day KVarh-Export	2	0.1
42	30233	Day KVah	Day KVah	2	0.1
43	30235	Real Date	Real Date	2	1
44	30237	Real Time	Real Time	2	1
45	30239	Rising Demand	Rising Demand	2	0.1
46	30241	Max Demand	Max Demand	2	0.1
47	30243	Md Date	Md Date	2	1
48	30245	Md Time	Md Time	2	1
49	30247	Rising Demand	Rising Demand	2	0.001

		Current	Current		
50	30249	Max Demand Current	Max Demand Current	2	0.001
51	30251	Md Date Current	Md Date Current	2	1
52	30253	Md Time Current	Md Time Current	2	1
52	30253	Md Time Current	Md Time Current	2	1
53	30255	Previous block T. KWh-Import*	Previous block T. KWh-Import*	2	0.1
54	30257	Previous block T. KVarh-Import*	Previous block T. KVarh-Import*	2	0.1
55	30259	Previous block T. KWh-Export*	Previous block T. KWh-Export*	2	0.1
56	30261	Previous block T. KVarh-Export*	Previous block T. KVarh-Export*	2	0.1
57	30263	Date Previous block Energy*	Date Previous block Energy*	2	1
58	30265	Time Previous block Energy*	Time Previous block Energy*	2	1

Note: * Serial no 53(30255) to 58(30265) Address are for LED display. In this address, Energy values are available as per the configuration of 5 min/15 min/1 hr.
Note: If data type is **long** in multifunction Transducer then set **Swapped long** in Modbus master. If data type is **Real** in Multifunction Transducer then set **Swapped Float** in Modbus master.
Note: Energy will be in Kilo for Real data type and for Long data type multiply with constant stated to get energy in Kilo unit.
Note: *Ignore address which are not mentioned in the memory map as they are useful in 3P4W mode.*
Note: For Time & Date
Real Date & MD Date: DDMMYY *e.g. If it is 250112 than Date: 25/01/12*
Real Time: HHMMSS *e.g. If it is 135015 than Time: 13:50:15*
MD Time: HHMM *e.g. If it is 1350 than Time: 13:50*
Note: Rising Demand and Max Demand will be in Kilo for float & Long value.
Note: Ignore value for **Reserved** in Modbus Memory Map.

9.2 User Assignable Registers

The MFT20 contains the 60 user assignable registers in the address range of 2001 to 2119 (see Table 8-1), any of which you can map to either register address accessible in the instrument. Registers that reside in different locations may be accessed by a single request by re-mapping them to adjacent addresses in the user assignable registers area.

The actual addresses of the assignable registers which are accessed via addresses 2001 to 2119 are specified in the user assignable register map (see Table 8-2). This map occupies addresses from 301 to 360, where map register 301 should contain the actual address of the register accessed via assignable register 2001, register 302 should contain the actual address of the register accessed via assignable register 2003, and so on.

To build your own register map, write to map registers (301 to 360) the actual addresses you want to read from via the assignable area (2001 to 2119).
By default, register address 1 to 119 is mapped to registers 301 to 360.

For example, if you want to read registers 17 (A. Vrms - Average Voltage, float / long) and 65 (T.KWh Import - Total Active energy import, float / long) via registers 2001-2003, then do the following:
- write 17 to register 301
- write 65 to register 302

Reading from registers 2001-2003 will return the Voltage reading in registers 2001, and the KWh reading in register 2003.
Default data type is float (Real).

Table 9-1 User Assignable Registers
Function Code = 0X04
Address – between 32001 to 32119
No. of data word ≤ 120 & in multiple of 2 as all data are of 4 Bytes [Float (Real) / Long]. Enter only Even value (data word length).

Address	Register Contents	Type
32001	Assigned register #2001	Float / Long
32003	Assigned register #2003	Float / Long
32005	Assigned register #2005	Float / Long
…	…	…
32119	Assigned register #2119	Float / Long

Table 9-2 User Assignable Register Map
Function Code = 0X06
Address – Any Single Register between 40301 to 40360
Data = Data of 1 word, as all data are of 2 Bytes [Decimal].

Address	Register contents	Type	R/W	Range
40301	Mapped address for register #2001	Decimal	R/W	1 to 119 , 151 to 265, 301 to 397, 401 to 497
40302	Mapped address for register #2003	Decimal	R/W	1 to 119 , 151 to 265, 301 to 397, 401 to 497
40303	Mapped address for register #2005	Decimal	R/W	1 to 119 , 151 to 265, 301 to 397, 401 to 497
…	…	…	…	…
40360	Mapped address for register #2119	Decimal	R/W	1 to 119 , 151 to 265, 301 to 397, 401 to 497

9.3 Modbus Register Map for configuration parameters

Read Holding Register

Data read Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No. of data word, High], [0 x No. of data word. Low] [0 x CRC Low] [0 x CRC High]

Function Code = 0X03
Address – between 40001 to 40007
No. of data word ≤ 8 & in multiple of 2 as all data are of 4 Bytes [Swapped Float].

Function Code = 0X03
Address – between 40101 to 40153
No. of data word ≤ 53 & in multiple of 1 as all data are of 2 Bytes [Decimal].

Response = [0 x Slave Id], [0 x Fun. Code], [Byte count], [Data High], [Data Low] …... [Data. High], [Data. Low] [0 x CRC Low] [0 x CRC High]

Preset Single Register

Data write Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Function Code = 0X06
Address – Any Single Register between 40101 to 40153
Data = Data of 1 word, as all data are of 2 Bytes [Decimal].

Response = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Preset Multiple Register

Data write Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No.of Reg.High], [0 x No.of Reg.Low], [0 x No.of Byte], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Function Code = 0X16
Address – Any Multiple Register between 40001 to 40007
Data = Data of 2 word, as all data are of 4 Bytes [Swapped Float].

Response = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No.of Reg.High], [0 x No.of Reg.Low], [0 x CRC Low] [0 x CRC High]

S. No.	Address	Measured parameter	Words	Minimum value	Maximum value
1	40001	A1 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
2	40003	A1 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
3	40005	A 2 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
4	40007	A 2 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
5	40101	Password	1	1	9999
6	40102	Slave address	1	1	247
7	40103	Baud rate (2400,4800,9600, 19200,38400)	1	2400	38400
8	40104	Energy type (see Table 2)	1	0	19
9	40105	System type (see Table 3) (see note 4)	1	0	1
10	40106	PF1 type (read only value) (see Table 4)	1	0	2
11	40107	PF2 type (read only value) (For 3P4W only) (see Table 4)	1	0	2
12	40108	PF3 type (read only value) (see Table 4)	1	0	2
13	40109	System PF type(read only value) (see Table 4)	1	0	2
14	40110	CT Ratio – High byte(see note 2)	1	0	152
15	40111	CT Ratio – low byte(see note 2)	1	1000	65535
16	40112	PT Ratio – high byte(see note 2)	1	0	152
17	40113	PT Ratio – low byte(see note 2)	1	1000	65535
18	40116	Pulse constant	1	1	60000
19	40117	Stop bit	1	1	2
20	40118	Parity bit (0-none, 1-odd, 2-even)	1	0	2
21	40119	Previous block energy time (0 -15 min, 1 - 01Hr, 2 - 05 min)	1	0	2

22	40121	Data type(see Table 6) (see note 3)	1	0	1
23	40122	Demand Type (0-KW, 1-KVA)	1	0	1
24	40123	Demand Method (0-BLOCK, 1-SLIDE)	1	0	1
25	40124	Interval Time (15/30)	1	15	30
26	40125	Sub Interval Time (see note 7)	1	1	10
27	40126	Real Sec& Min [SSMM]	1	0	5959
28	40127	Real Hour & Date [HHDD]	1	1	2331
29	40128	Real Month & Year[MMYY]	1	100	1299
30	40130	Reset All/Individual Energy Reg.(Write only)(see Table 5)	1	80	90
31	40133	A1 o/p Parameter selection (see Table 7)	1	3	30
32	40134	A2 o/p Parameter selection (see Table7)	1	3	30
33	40137	A1 Output Type (see Table 8) (see note 6)	1	0	4
34	40138	A2 Output Type (see Table 8) (see note 6)	1	0	4
35	40141	Firmware version	1	-	-
36	40142	A1 PF Type Low(see Table 9)	1	1	2
37	40143	A1 PF Type High(see Table 9)	1	1	2
38	40144	A2 PF Type Low(see Table 9)	1	1	2
39	40145	A2 PF Type High(see Table 9)	1	1	2
40	40150	A1 PF direction(see Table 10)	1	0	1
41	40151	A2 PF direction(see Table 10)	1	0	1
42	40154	Low Current noise cutoff (between 2 to 10mA) (see note 8)	1	2	10

Note 1: For writing to this Register Address use Function code 16 and select data type Swapped float. Also take care measurand range low should not equal or greater than measurand range High.

Note 2: Maximum CT & PT Ratio value is 9999999 i.e. maximum values is 9999.999 & minimum value is 1000 i.e. 1.000

For entering CT and PT ratio refer the below example.

Example:

For entering CTR value 1234.567, convert 1234567 in to hexadecimal i.e. 12D687.
Now enter lower four byte (D687) at 40111 and higher four byte (0012) at 40110 addresses respectively.

Note 3: If data type is **long** in MFT then set **Swapped long** in Modbus master.
If data type is **float** MFT then set **Swapped Float** in Modbus master.

Note 4: ignore address which is not mentioned in the memory map as they are useful in 3P4W mode, do proper wiring as stated in Wiring detail section. Also Check the AO Parameters as mapping and Availability of particular Parameter is different for 3p4w and 3p3w; see Table 7 for more detail.

Note 5: Energy will be in Kilo for float value and for Long data type multiply with constant stated to get energy in Kilo unit.

Note 6: For changing the O/P type one also need to change the (J4, J6 for AO-1 and J7, J8 for AO-2) jumper on AO card. Put female jumper between pin 1&2 for current o/p and 2&3 for Voltage o/p.

Note 7: Sub interval Time

It is applicable for Sliding window only
For 15 minute Interval time it is limited to 1, 3 or 5
For 30 minute Interval time it is limited to 1, 2,3,5,6 or 10

Note 8: This parameter allows the user to set Low noise current cutoff in mA (2 to 10). Setting 5 will display measured currents as 0 below 5 mA. (Default Value is 5mA)

Table 1:

Parameter mapped to AO Channel	Min. Value	Max. Value
Frequency(Hz)	0.0	65.0
PF	-1.0	1.0
Phase Voltage(V)	0.0	10,00,000.0
Line Voltage(V)	0.0	10,00,000.0
Current(A)	0.0	10,000.0
Active Power(W)	-2,00,00,00,000.0	2,00,00,00,000.0
Reactive Power(Var)	-2,00,00,00,000.0	2,00,00,00,000.0
Apparent Power(VA)	0.0	2,00,00,00,000.0

Table 2:

Value	Energy type for Pulse Output
0	KWh Import
1	10 KWh Import
2	100 KWh Import
3	MWh Import
4	KWh Export
5	10 KWh Export
6	100 KWh Export
7	MWh Export
8	KVarh Import
9	10 KVarh Import
10	100 KVarh Import
11	MVarh Import
12	KVarh Export
13	10 KVarh Export
14	100 KVarh Export
15	MVarh Export
16	KVah
17	10 KVah
18	100 KVah
19	MVah

Table 3:

Value	System Type
0	3P4W
1	3P3W

Table 4:

Value(read only)	PF Type
0	Unity
1	Lag

2	Lead

Table 5:

Value(write only)	Reset Energy Register
79(For LCD)	Previous block energy
80	Active Import
81	Active Export
82	Reactive Import
83	Reactive Export
84	Apparent
85	All Energy
86	Hours Reset
87	Min - Max Reset
88	Power Interruption count
89	Max Demand Reset
90	All Reset

Table 6:

Value	Data Type
0	Swapped Long
1	Swapped Float

Table 7:

Value	AO Parameter mapping	
	3P4W	3P3W
3	System Frequency	System frequency
4	R Phase PF	-
5	Y Phase PF	-
6	B Phase PF	-
7	System PF	System PF
8	R Phase Voltage	RY Phase Voltage
9	Y Phase Voltage	BR Phase Voltage
10	B Phase Voltage	BY Phase Voltage
11	Average Voltage	Average Voltage
12	R_Y Phase Voltage	-
13	B_R Phase Voltage	-
14	B_Y Phase Voltage	-
15	R Phase Current	R Phase Current
16	Y Phase Current	-
17	B Phase Current	B Phase Current
18	Average Current	Average Current
19	R Phase Active Power	RY Phase Active Power
20	Y Phase Active Power	-
21	B Phase Active Power	BY Phase Active Power
22	Total Active Power	Total Active Power
23	R Phase Reactive Power	RY Phase Reactive Power
24	Y Phase Reactive Power	-
25	B Phase Reactive Power	BY Phase Reactive Power
26	Total Reactive Power	Total Reactive Power
27	R Phase Apparent Power	RY Phase Apparent Power
28	Y Phase Apparent Power	-
29	B Phase Apparent Power	BY Phase Apparent Power

30	Total Apparent Power	Total Apparent Power

Table 8:

Value	Output Type
0	Current 4-20mA
1	Voltage 0-10V
2	Current 0-20mA
3	Voltage 0-5V
4	Voltage 1-5V

Table 9:

Value	System Type
1	Lag
2	Lead

Table 10:

Value	System Type
0	Anticlockwise
1	Clockwise

9.4 Exception Responses

Exception response is a notification of an error. The exception response codes are listed in the table below. When a slave detects one of these errors, it sends a response to the master consisting of slave address, function code, error code and error check field.
To indicate that the response is a notification of an error, the high order bit of the function code is set to 1.

CODE	NAME	MEANING
01	Illegal Function	The message function received is not an allowable action for slave.
02	Illegal Data Address	The address referenced in the data field is not an allowable address for the addressed slave location.
03	Illegal Data Value	The value referenced in the data field is not allowable in the addressed slave location.
06	Slave Device Busy	The slave is engaged in processing a program command. The master should retransmit the message later when slave is free.

Example

Query Message

SLAVE ADDR	FUNCTION CODE	H.O START ADDR	L.O START ADDR	H.O NO OF REG	L.O NO OF REG	ERROR CHECK FIELD	ERROR CHECK FIELD
0x0A	0x01	0x00	0x24	0x00	0x02	0xFC	0xBB

The query requests the status of input 0036 in slave no. 10. Since the function is an invalid function for 2160-A, so the following error response will be generated.

Response Message

SLAVE ADDR	FUNCTION CODE	EXCEPTION CODE	ERROR CHECK	ERROR CHECK

0x0A	0x81	0x01	0xF0	0x52

The function field is the original function code with the high order bit set and exception code 01 indicates an illegal function field.
When slave device that is Multifunction transducer is in the PROGRAM mode, a busy state is transmitted indicating that slave device is busy and the master should retransmit the message later when the slave is free. So here exception code 0x06 is transmitted. Response message is shown below.

Response Message

SLAVE ADDR	FUNCTION CODE	EXCEPTION CODE	ERROR CHECK	ERROR CHECK
Device ID	Fun. Code + 0x80	0x06	0xC3	0x02

9.4.1 Read Holding Register (Function Code 03)

To get value of configuration parameters (CT Ratio, PT Ratio, Pls/KWh, Baud, Slave address etc.), you have to use function code **03.** Here the addressing allows up to Maximum **24** registers (Words) to be obtained at each request.

9.4.2 Preset Single Register (Function Code 06)

Function (06) will overwrite controller memory.

Function (06) allows the user to modify the contents of a holding register for configuration parameter. The values are provided in binary, up to the maximum capacity of the controller and unused higher bits must be set to zero.

Example

This example will set the CT Ratio value in slave number 17. Here CT Ratio and PT ratio requires 2 integer register for each. So you should write higher integer and lower integer value to get whole Ratio value. Suppose you want to write CT RATIO = 5,then you have to take 5000 to write because in unit side this 5000 will be divided by 1000 i.e. you will get 5.Now Hex value of 5000 is 0x1388,so you will take 0x00 for higher integer register and 0x1388 for lower integer register. The address of CT Higher integer is 0x6D and value to be programmed is 0x0000.

Similarly you can do for lower integer and also for PT RATIO. The normal response to a preset single register request is to transmit the query message after the register has been altered,

If the value is an illegal value then the response message will be an exception response (Error Message). For the details of maximum and minimum values of any parameter refer to manual.

9.4.3 Preset multiple Register (Function Code 16)

Function (16) will overwrite controller memory.

Function (16) allows the user to modify the contents of a multiple holding register for configuration parameter. The values are provided in binary, up to the maximum capacity of the controller and unused higher bits must be set to zero.

Example
This example will set the Analog channel measurand Low value in slave number 17. Select Data type Swapped float in PC based Modbus software. Write Value 100.0 in this register

Query Message

SLAVE ADDR	FUNC CODE	H.O START ADDR	L.O START ADDR	NO. OF REG. HIGH	NO. OF REG. LOW	NO. OF BYTE	DATA VALUE H.O.	DATA VALUE L.O.	ERROR CHECK FIELD	ERROR CHECK FIELD
0x11	0x10	0x00	0x00	0x00	0x02	0x04	0x42 C8	0x0000	0x66	0x29

Similarly you can write more than one float register at a time with this Function code.

Response Message

SLAVE ADDR	FUNC CODE	H.O START ADDR	L.O START ADDR	NO.OF REG. HIGH	NO.OF REG. LOW	ERROR CHECK FIELD	ERROR CHECK FIELD
0x11	0x10	0x00	0x00	0x00	0x02	0x89	0x84

If the value is an illegal value then the response message will be an exception response (Error Message). For the details of maximum and minimum values of any parameter refer to manual.

10. IMPORTANT NOTES

Before starting Installed Meter, Go through these notes:

General Setting & Condition for CT, PT ratio

- Confirm the connection configuration
- Confirm that all energy parameters, Hour parameters, MD parameters & Power Interruption counter are going to start from zero, if not, make them zero by **All Regs Rst**.
- Apply proper CT – PT Ratio as per requirement, which must pass the below mathematical conditions for 3P3W and 3P4W.
  For 3P4W
  3x1.2xVratedx1.2xIratedx CT Ratio x PT Ratio < 2,000,000,000
  For 3P3W
  2x1.2x√3xVratedx1.2xIratedx CT Ratio x PT Ratio < 2,000,000,000
- Select Energy type for LED Blinking as per your requirement.
- Confirm that Transducer is calibrated.
- For Serial communication, MODBUS-RTU, RS485, you will get float/long data from measurement.
- Factory set Password to access the Program mode is 0001.
- For 3p3w system, Display Menu will be changed and for Modbus communication, follow the address map for 3p3w.Program mode will be same.

ON Hour, RUN (LOAD) Hour & Power Interruption Count

- **ON Hour**: The period for which the Transducer (supply) is ON
- **RUN (LOAD) Hour**: 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.
- **Power Interruption Count**: Number of Supply Outages, means the number of Auxiliary Supply interruptions. If the transducer 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.

Last Day Energy & Min-Max Value

Last Day Energy Value: Transducer will store Last Day Energy on same register in Modbus and will maintain Last day Energy and update it at 00:00 every day.
Min Max [Low High] Value: Min Max Value will be available as standard feature for all Ordering Code and will be available only on Modbus. It will log Min Max [Low High] from Last Reset

Energy Pulse O/P Constant Setting

- For Front Blinking LED, select energy type (i.e.-import/KWh-export/KVARh-Import/KVARh-Export/KVAh/MWh-Import/MWh-Export/MVARh-Import/MVARh -Export/MVAh) as per your requirement using Program mode, from OUTPUT and set the value of constant. But here you can get maximum output pulse frequency (& LED Blinking rate) up to 50 msec. so whenever you are using this feature; you should set value of Meter-Constant such a way so it will not cross the limit of 50 ms pulse frequency.
- As pulse frequency is 50 msec, i.e. in one second maximum 20 pulses can be obtained, hence in one hour maximum 72000 pulses can be obtained.
  Total no of impulses/second can be calculated as below
  (Vrate * Irate * CTR * PTR * Pulse Constant in Wh)/3600 <= 20.
  - Example: Transducer specification
  - V rated = 240V, I rated = 5A, CT ratio = 40 and PT ratio = 100,
  - Above transducer can consume maximum of 4.8MWatt.

  I.e. For 3600 pulses/KWh [3.6 pulses/Wh], it will generate 4800 pulses/sec as per above equation, [240*5*40*100*3.6/3600 = 4800] so it will not work for the meter as it is more than 20 pulses/sec
  I.e. For 2000 pulses/MWh [0.002 pulses/Wh], it will generate 2.666 pulses/sec as per above equation, [240*5*40*100*0.002/3600 = 2.66] so it will work for the meter as it is **less than 20 pulses/sec**
  This is for single phase only, in case of three phases, energy will be multiplied by three in 3p4w and hence pulses should be calculated for three phase energy.

Energy Calculation

Below formula used for finding the Total Active Energy Import.

Total Active Energy = [Running Active Energy (Import) + (WH-I Ov.count * 400G)] (Import)

- **Example**:
  Let's WH-I Ov.count = 5, Active [Im] = 20.3268 GWh then

  Actually measured Total Active Energy (Import) = [20.3268 G + (5 * 400G)]
  = 2020.3268 GWh

  Above calculation is same for other energy (Active Export, Reactive Import, Reactive Export, and Apparent Energy) can be find out using respective Ov.count and running energy.

Energy Overflow Time Calculation

- When data type selected for Modbus is FLOAT, Total apparent Energy will overflow from 400GVAhr then auto reset Apparent Energy, but when the ov.count of this energy (VA Ov.count > 99) then meter will auto reset all energy parameter. This includes Active import and export energy, Reactive Import and Export energy and apparent energy. Such condition of overflow occurrence is depending on CT ratio and PT ratio.

Example:

For 110V V rated, and 1 A I rated multifunction meter is set for 100A and 66KV line with CT Ratio of 100 and PT Ratio of 600.

- PT Primary = 66KV, PT Secondary = 110V Therefore select Vrated = 110V.
  PTR = 66KV/110V=600 select.
  CT Primary=100A, CT Secondary=1A Therefore select Irated = 1A.
  CTR = 100A/1A=100 select in meter.
- Energy consumed per hour will be 66kV X 100Amps = 6600KVAHr.
- Time to overflow in Hr. = 400GVAhr / 6600KvaHr = 60606 Hr
- Days = 60606 /24 = 2525 Days
- Years = 2525 / 365 = 6.91 Years / Total of Three Phase.
- But our Apparent Energy Overflow Count Range are 1 to 99, therefore
  Total Time to overflow in Years = 6.91*99 = 684.09 Years / Total of Three Phase.
- User has to manually reset **All Regs Rst,** when installing the meter first time.
- As above for 100A and 66KV line, PT Primary = 66KV, PT Secondary = 110V Therefore Vrated = 110V select. PTR = 66KV/110V=600 select.
- CT Primary=100A, CT Secondary=1A Therefore Irated = 1A select. CTR = 100A/1A=100 select in meter.

Energy Resolution on Modbus

- Resolution of the energy parameter on the Modbus when data is transmitted in LONG format is 100VAhr/Whr/VARhr rather than 1VAhr/Whr/VARhr, which is possible when FLOAT data type is used. Because of the limitation of the Long Data type and to avoid frequent reset, Data is transmitted in with above-mentioned resolution.
- Due to this resolution on display of the Meter will not be same as ON ModBus data, when data is transmitted in LONG format. Multiplication factor given on master side is 0.0001.

Example:

Lets say on modbus data transmitted is 20098798 then on the master side it will be 20098798 * 0.0001 = 2009.8798 MWhr/MVAhr/MVARhr.
Which gives the resolution of the 0.1KWhr/KVAhr/KVARhr as described above.

11. TROUBLESHOOTING TIPS

The information in Table 11– 1 describes potential problems and their possible causes. It also describes checks you can perform or possible solutions for each. After referring to this table, if you cannot resolve the problem, contact our sales representative.

Table 11– 1: Troubleshooting

Potential Problem	Possible Cause	Possible Solution
The display is blank with black light OFF after applying control power to the MFT.	The MFT may not be receiving the necessary Power.	Verify that the MFT line (L) and neutral (N) terminals are Receiving the necessary power.
The data being displayed is inaccurate or not what you expect.	Incorrect setup values.	Check that the correct values have been entered for MFT setup parameters (CT and PT ratings, System Type).
	Incorrect voltage inputs.	Check MFT voltage input terminals to verify that adequate voltage is present.
	MFT is wired improperly.	Check that all CTs and PTs are connected correctly (proper polarity is observed) and that they are energized. Check shorting terminals.
Cannot communicate with MFT from a remote personal computer.	MFT address is incorrect.	Check to see that the MFT is correctly addressed.
	MFT baud rate (parity, stop bit) is incorrect.	Verify that the baud rate of the MFT matches the baud rate of all other devices on its communications link.
	Communications lines are improperly connected.	Verify the MFT communications connections interchange [D+] & [D-] lines

UNIT NOT TURNING ON

The problem can be bad connection / power of incorrect rating.
First check, power on terminal of the instrument itself if it is not present then the fault is in power chord.

⚠ **One must take care while dealing with Power wirings because it may create electrical shock.**

UNSTABLE READING

Check for loose connections.
First verify that all conventional instrumentation norms have been followed for wiring. Try using shielded cable for sensor input.
Check for ripple on power supplies of Input section and Output sections. If power supplies have ripples, input voltage may be low or there is some failure on power supply card.

⚠ **Please note that this is an isolator, and the Input and Output sections are electrically isolated from each other. Therefore, any power supply measurements should be done with respect to proper grounds.**

OUTPUT NOT MATCHING WITH THE EXPECTED VALUE

It is a normal tendency to doubt the instrument performance, when the Output is not matching the expected value. Kindly make sure that the output is really incorrect with respect to input signal, before attempting any re-calibration.
Account for measuring instrument's inaccuracies, lead errors and calibration errors. Care must be taken when measuring Output signal.

An ordinary 3½ digit multimeter is used it can show reading which deviates from what the instrument is showing as the accuracy of the multimeter may not be as good as the that of the instrument. So use calibrating instrument of accuracy better than 0.1% for purpose of calibration.
If the signal is still found to be out of tolerance, calibration should be attempted as described in the next section.

If these troubleshooting tips do not solve your problem then, please contact technical support at either nearest area office or Main Head Office as given on the first page.