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Quick User Guide
MFM2160

masibus

Multifunction Meter

INTRODUCTION

The MFM2160 Multifunction Meter is a device used in electrical systems to measure and monitor various electrical parameters (voltage, current, power, frequency, Energy etc.) Meters are widely used across commercial and industrial sectors, providing critical data for energy management and system optimization. Its four-digit seven-segment display allows the simultaneous display of three parameters.

MFM2160 provides RS485 port supporting Modbus-RTU protocol for communication with THD, Individual Harmonics measurements, Maximum Demand, Min-Max readings.

The MFM2160 can interface with **mLogiView** software, enabling users to configure system parameters and view data values such as voltage, current, power, and more.

Features

- Available in Accuracy Class 1.0 and Class 0.5s and Class 0.2s
- True RMS measurement
- Field Programmable CT/PT Primary & Secondary
- Isolated RS485 Modbus Communication (Modbus-RTU protocol)
- Available front Pulse LED for site calibration for selected type of energy
- THD measurement for voltage and current, up to 31st odd harmonics
- Current and power demand monitoring
- Display of minimum and maximum values
- 'OLD' register to store previously cleared energy value
- Monitors Run hours & On hours
- Auto Scrolling feature for easy readability for all parameters
- Favorite page Store feature
- User programmable password protection for Configuration mode
- User Assignable Modbus registers for ease of integration

Specification

Type of Measurement	TRUE RMS
Sampling rate	82 Samples/Cycle
Connection type	3P4W / 3P3W / 1P2W (Site selectable)

Measuring Voltage range	20V_{L-N} to 300V_{L-N} (34V_{L-L} to 520V_{L-L})
PT(VT) Rating Primary	100 V to 1000 KV AC (L-L) (Programmable)
Nominal Voltage range (Un) (PT/VT Secondary)	57.5V_{L-N} to 240V_{L-N} (100V_{L-L} to 415V_{L-L})
Burden	<0.2VA per phase
Over Voltage	120% of Un Continuous

Input Current

Measuring Current range	5mA to 6A
CT Ratings Primary	1A/5A to 15000 A (Programmable)
Nominal Current range (In) (CT Secondary)	1A / 5A
Burden	1A: <0.1 VA per phase, 5A: <0.2VA per phase
Overload	150% of In Continuous
Short-time over current	20 x Imax for 1 sec., 10 x Imax for 3 sec., 7 x Imax for 10 sec.

Frequency	45 to 65Hz

Auxiliary Power Supply

Power Supply	Standard: 85-265VAC, 50/60Hz or 100-300VDC Optional: 20-60 VDC
Burden	< 3.5VA / <1.5W

Measurement Accuracy

Voltage	±0.5% for Class 1.0 / 0.5s and ±0.2% for Class 0.2s
Current	±0.5% for Class 1.0 / 0.5s and ±0.2% for Class 0.2s
Frequency	±0.05% for Class 1.0 / 0.5s / 0.2s
Power Factor	±0.01 for Class 1.0 and ± 0.005 for Class 0.5s / 0.2s
Active Power	±1.0% for Class 1.0 and ± 0.5% for Class 0.5s and ± 0.2% for Class 0.2s
Reactive & Apparent Power	±1.0% for Class 1.0 and ± 0.5% for Class 0.5s / Class 0.2s
Active Energy	Class 1.0 as per IEC 62053-21 and Class 0.5s / 0.2s as per IEC 62053-22
Reactive Energy	Class 1.0 & Class 0.5s as per IEC 62053-24

Display

LED Display	3 line 4-digit Red LED Display with 0.56" [14.2mm] height, LED Display - 12 digit for energy & 4 digit for Instantaneous parameters
Keypad	3 buttons for navigation to performing configuration setup & Operation
Protection features	Password protected for set-up & clearing energy and Min / Max data
Green LED	RS485 Communication Activity Indication
Red ⌐¬ LED	Energy Pulse Indication

Modbus Communication

Interface & Protocol	RS485 Port and Modbus RTU: 2 Wires, Half-duplex
Baud rate	2400, 4800, 9600, 19200, 38400 bps (default 9600 bps)
Parity bit & Stop bit	None, Odd and Even with 1 or 2 stop bit
Firmware update	Firmware update through communication port

Environmental

Operating temperature	-10°C to +60°C
Storage temperature	-25°C to +70°C
Relative humidity	Up to 95% non-condensing
IP degree of Protection	IP51 front side, IP30 meter body
Isolation	4 kV RMS for 1 minute
Impulse withstands	6 kV
Pollution Degree	2

Mechanical

Mounting Type	Panel mount
Size	100(W) x 100(H) x 55(D) mm
Panel Cutout	92(W) x 92(H) mm
Material	ABS
Accessory	2 Panel mount clamps
Weight	0.4 kg (approx.)
Terminal & Cable Size	Barrier type terminal U-type / ring-type termination: maximum up to 4 mm^2 Cable

Demand Parameters

Total Active Power Demand	Rising and Maximum Demand
Total Reactive Power Demand	Rising and Maximum Demand
Total Apparent Power Demand	Rising and Maximum Demand
Average Current Demand	Rising and Maximum Demand
Demand Intervals	Programmable from 1 to 60 minutes.
Demand Calculation Method	Block & Sliding

Min - Max Values

Parameters	V, A, PF, Hz, KW, KVAR, KVA
Values can be reset through configuration mode.	

RPM & User assignable Modbus Registers

RPM	Field Programmable pole (2-48) and slip (0.0 to 99.99%)
Modbus registers	User Assignable 60 Modbus addresses via software

Suppression Current

A minimum current detection threshold of 1 to 99 mA can be configured to ignore induced or insignificant current flowing in the circuit; 5 mA is the default

Electromagnetic compatibility (as per IEC 61326-1)

Electrostatic Discharge	IEC 61000-4-2
Immunity to Fast transient	IEC 61000-4-4
Immunity to surge waves	IEC 61000-4-5
Immunity to magnetic fields	IEC 61000-4-8
Immunity to voltage dips and interruptions	IEC 61000-4-11
Conducted emissions	CISPR 11
Radiated emissions	CISPR 11

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

All wiring must confirm 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 an instrument to a power source if it is damaged. To prevent a 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 an 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.

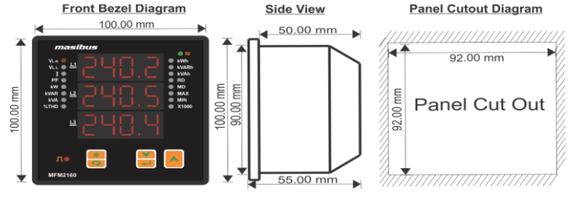
Upon receipt of the shipment remove the unit from the carton and inspect the unit for shipping damage. If any damage due to transit, report and claim with the carrier. Write down the model number and serial number for future reference when corresponding with our Customer Support Division.

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.

Mechanical Installation

For installing the meter: -

- Cut the panel according to the specified dimensions shown below.
- Insert the meter into the panel cutout and secure it by attaching clamps on the rear side. Ensure the clamps are placed diagonally opposite for a firm fit.
- Tighten the screws evenly with the appropriate torque to achieve proper sealing.



Terminal Description

Terminal details

AUX Supply: -

- L/ + (Line): Aux. Power Supply Input
- N/ – (Neutral): Aux. Power Supply Input

Voltage Input: -

- VR: R Phase voltage terminal
- VY: Y Phase voltage terminal
- VB: B Phase voltage terminal
- VN: Neutral voltage terminal

RS 485: -

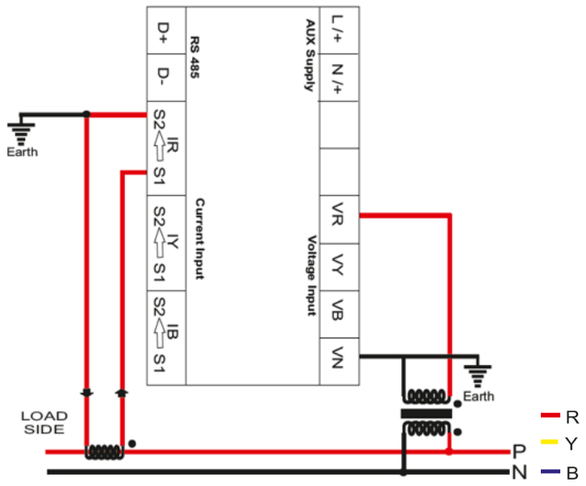
- D+: Positive data line
- D –: Negative data line

Current Input: -

- IR(S1): Current In R phase
- IR(S2): Current Out R phase
- IY(S1): Current In Y phase
- IY(S2): Current Out Y phase
- IB(S1): Current In B phase
- IB(S2): Current Out B phase

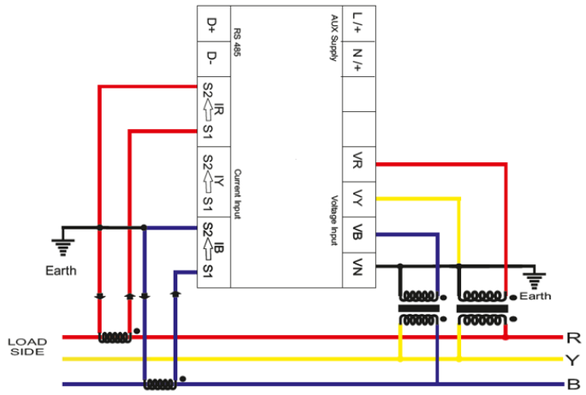
Wiring Diagram

1) Single Phase Two Wire System

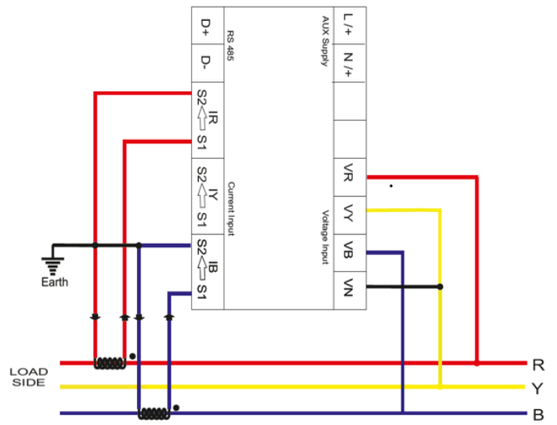


2) Three Phase Three Wire System

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

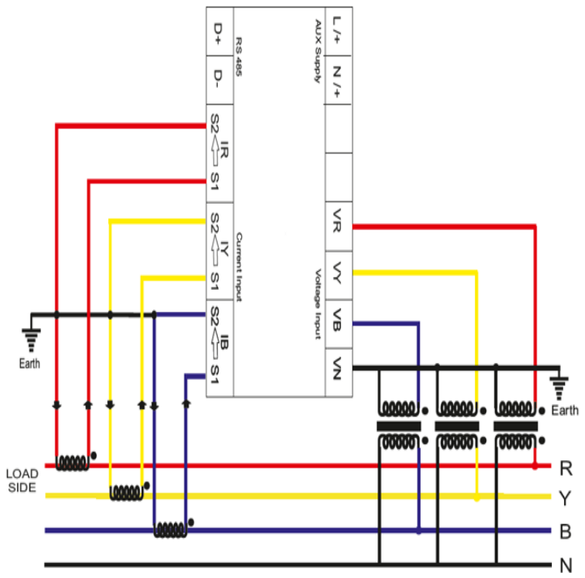


2B) 3-Wire 2- Element Direct Connection Using 2CTs

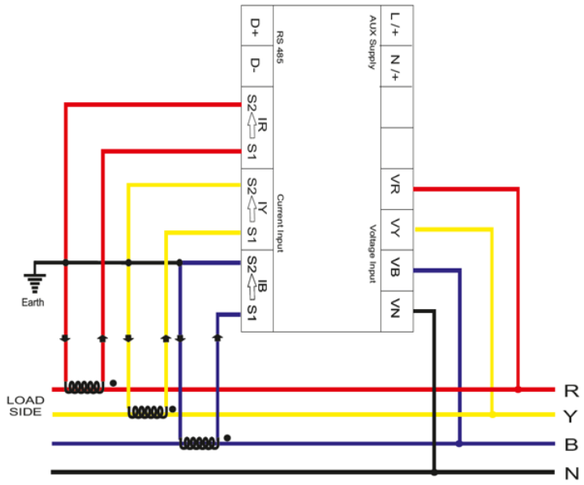


3) Three Phase Four Wire System

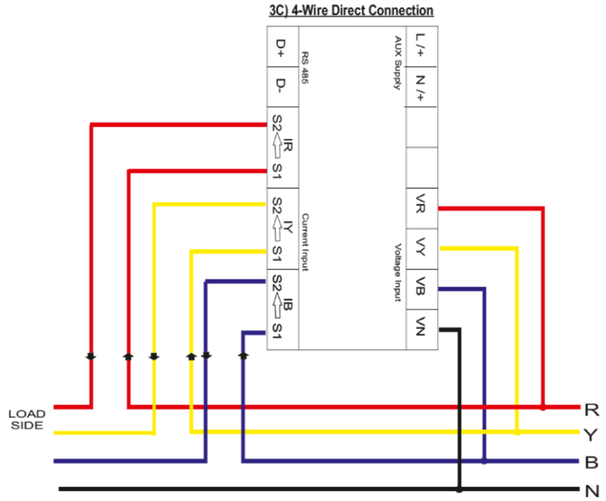
3A) 4-Wire Wye-3 Element Connection Using 3PTs, 3CTs



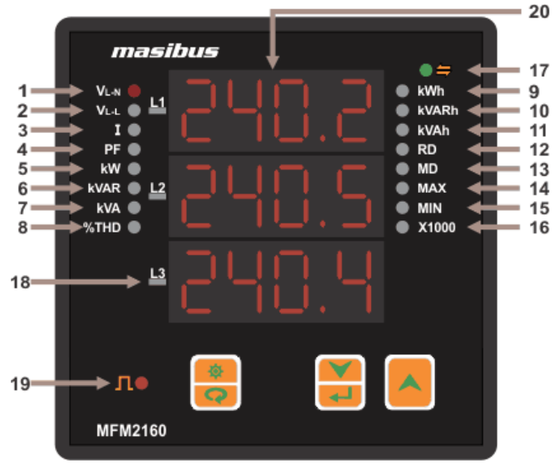
3B) 4-Wire Wye-3 Element Direct Connection Using 3CTs



3C) 4-Wire Direct Connection



Front Panel Description



Key Functions: -

Enter Key

Run Mode:

- Press & hold the key for 5 seconds to enter into Configuration Mode.

Configuration Mode:

- Press the key to view values of parameters.
- Press the key to edit values of parameters.
- Press the key to save the final value entered by the user.

DEC Key

Run Mode:

- Press the key to move to the next page in the upward direction.
- Press & Hold the key for 5 seconds to navigate to the Maximum-Minimum pages.
- If already in the Maximum-Minimum pages, press & hold the key for 5 seconds will return to Run Mode.

Configuration Mode:

- Press the key to move the selection bar to the next parameter in the upward direction.
- Press the key to Shift to the side digit in Edit Mode.
- Press the key to exit from Edit Mode and return to Configuration Mode.

INC Key

Run Mode:

- Press the key to move to the next page in the downward direction.
- Press & Hold the key for 5 seconds to navigate to the first page of Run Mode, which displays Voltage.

Configuration Mode:

- Press the key to move the selection bar to the next parameter in the downward direction.
- Press the key to increment the value in Edit Mode.

LED Indication description:-

No	Parameter	Description
1	VL-N	Line to neutral voltage
2	VL-L	Line to line voltage
3	I	Current
4	PF	Power factor
5	KW	Active power
6	KVAR	Reactive power
7	KVA	Apparent power
8	%THD	Total harmonics distortion (%)
9	kWh	Active energy
10	kVARh	Reactive energy
11	kVAh	Apparent energy
12	RD	Rising demand
13	MD	Maximum demand
14	MAX	Maximum value
15	MIN	Minimum value
16	X1000	X 1000 multiplier
17		RS – 485 Communication
18	Negative sign	Negative sign
19		Energy Pulse
20	L1, L2, L3	Seven segments for data

Run Mode - Meter Navigation

Page no	Parameter	Parameter description
1	Voltage (VL-N)	Displays line to neutral Voltage of three phases.
2	Voltage (VL-L)	Displays line to line voltage of three phases.
3	Current (A)	Displays phase current of three phases.
4	Neutral Current (A)	Displays neutral current.
5	Frequency(Hz)	Displays system frequency.
6	Power factor (PF)	Displays Power factor of Three phases.
7	Active Power (kW)	Displays active power of three phases.
8	Reactive Power (kVAR)	Displays reactive power of three phases.
9	Apparent Power (kVA)	Displays apparent power of three phases.
10	AVG Voltage (VL-N)	Displays Average of line to neutral Voltage.
11	AVG Voltage (VL-L)	Displays Average of line-to-line voltage.
12	AVG Ampere (I)	Displays Average of line current.
13	AVG Power factor (PF)	Displays Average of Power factor.
14	Total Active Power (kW)	Displays Total of Active power.
15	Total Reactive Power(kVAR)	Displays Total of Reactive power.
16	Total Apparent Power(kVA)	Displays Total of Apparent power.
17	P,Q,S Total power	Displays Total of Active power, Reactive power, Apparent power.
18	Active import energy (kWh)	Displays total import active energy of three phases.
19	Active export energy (kWh)	Displays total export active energy of three phases.
20	Reactive import energy (kVARh)	Displays total import reactive energy of three phase.
21	Reactive export energy (kVARh)	Displays total export reactive energy of three phase.
22	Reactive Lag energy (kVARh)	Displays total Lag reactive energy of three phase.
23	Reactive Lead energy (kVARh)	Displays total Lead reactive energy of three phase.
24	Apparent import energy (kVAh)	Displays total import apparent energy of three phase.
25	Apparent export energy (kVAh)	Displays total export apparent energy of three phase.
26	% THD (Voltage)	Displays Total harmonics distortion of voltage of three phases.
27	% THD (Current)	Displays Total harmonics distortion of Current of three phases.
28	Rising Demand (RD)	Displays Rising Demand of Total active power, reactive power and apparent power.
29	Maximum Demand (MD)	Displays Maximum Demand of Total active power, reactive power and apparent power.
30	Rising & Maximum Demand (A)	Displays Rising Demand and Maximum Demand of Average Current.
31	Voltage unbalance	Displays Percentage of Voltage unbalance.
32	Current unbalance	Displays Percentage of Current unbalance.
33	On hour	Displays on hour.
34	Run hour	Displays Run hour.
35	Power interruption count	Displays power interruption Count.
36	RPM	Displays RPM which is based on System frequency.

NOTE:

- If device is operating in a 3p3w system then Voltage(L-N) , Y phase current, Neutral current, Phase wise PF will not show on display.
- If the device is operating in a 1P2W system, Voltage (L-L) and Neutral Current will not be displayed. Only the single-phase values will be shown on the display.

In PF pages: -

- If the **first digit** of the 3 lines shows **"L"**, it indicates the power factor is **Inductive (Lagging)**.
- If the **first digit** of the 3 lines shows **"C"**, it indicates the power factor is **Capacitive (Leading)**.

Maximum – Minimum Pages: -

- Press and hold the DEC key for 5 seconds to display the parameter values.
- To exit, press and hold the DEC key again for 5 seconds.

Page no	Parameter	Parameter description
1	Max Voltage (VL-N)	Displays Maximum line to neutral Voltage of three phases.
2	Min Voltage (VL-N)	Displays Minimum line to neutral Voltage of three phases.
3	Max – Min Avg Voltage (VL-N)	Displays Maximum and Minimum of average line to neutral voltage.
4	Max Voltage (VL-L)	Displays Maximum line to line voltage of three phases.
5	Min Voltage (VL-L)	Displays Minimum line to line voltage of three phases.
6	Max - Min Avg Voltage (VL-L)	Displays Maximum and Minimum of average line-to-line voltage.
7	Max Current (A)	Displays Maximum phase current of three phases.
8	Min Current (A)	Displays Minimum phase current of three phases.
9	Max - Min Avg Current (A)	Displays Maximum and Minimum of average current.
10	Max - Min Frequency (Hz)	Displays maximum and Minimum of system frequency.
11	Max – Min Avg Capacitive Power factor (PF)	Displays Maximum and Minimum average Capacitive Power factor
12	Max – Min Avg Inductive Power factor (PF)	Displays Maximum and Minimum average Inductive Power factor
13	Max Active Power(KW)	Displays Maximum active power of three phases.
14	Min Active Power(KW)	Displays Minimum active power of three phases.
15	Max – Min Total Active Power(KW)	Displays Maximum and minimum of Total active power.
16	Max Reactive Power(KVAR)	Displays Maximum reactive power of three phases.
17	Min Reactive Power(KVAR)	Displays Minimum reactive power of three phases.
18	Max – Min Total Reactive Power(KVAR)	Displays Maximum and minimum of Total Reactive power.
19	Max Apparent Power(KVA)	Displays Maximum apparent power of three phases.
20	Min Apparent Power(KVA)	Displays Minimum apparent power of three phases.
21	Max – Min Total Apparent Power(KVA)	Displays Maximum and minimum of Total Apparent power.

NOTE: If the ×1000 LED is on, multiply the display value by 1000.

Configuration Mode

Press & Hold the ENTER key to 5 sec to enter into Configuration Mode.

The password screen will appear, where you need to enter the password. If the password is correct, you will access to Configuration Mode; otherwise, you cannot proceed.

Once in Configuration Mode, a selection bar will appear. You can use the INC and DEC keys to navigate between Parameters.

- Below listed parameters you can edit into configuration mode.

S.NO	Display	Function	Range or selection	Default
1	SYS .t	System type	1p2w,3p3w,3p4w	3p4w
2	Ct .Pr	CT Primary	1A /5A -15000A	5A
3	Ct .SE	CT Secondary	1A or 5A	5A
4	Pt .Pr	PT Primary	100V - 1000KV	415V
5	Pt .SE	PT Secondary	100V - 415V	415V
6	S- Id	Slave ID	1 - 247	1
7	bAUd	Baud rate	2400,4800,9600, 19200,38400	9600
8	PrtY	Parity Bit	None, odd, even	None
9	S .b it	Stop Bit	1 or 2	1
10	dmd .t	Demand type	Block, Slide	Block
11	IN-t	Interval Time	1-60	15
12	Sb-t	Sub Interval Time	1-60	1
13	POLE	Pole	2 - 48	2
14	SL IP	Slip	00.00 – 99.99	00.00
15	uA .CL	VA Calculation Method	Arithmetic or Vector	Arithmetic
16	L .PLS	Pulse Constant	100 - 60000	3600
17	U .PLS	Pulse Unit	Wh / VARh / VAh	Kwh (Imp)
18	PASS	Password change	0001-9999	1
19	SCrL	Display Scroll	Auto / Manual	Manual
20	rSt	Reset		
20.1	EnGY	Reset energy*	No / Yes	No
20.2	HoUr	Reset on and load hour	No / Yes	No
20.3	PUr i	Reset Power interruption count	No / Yes	No
20.4	H iLo	Reset Max – Min Values	No / Yes	No
20.5	md	Reset Maximum demand	No / Yes	No
20.6	PArA	Reset Parameters**	No / Yes	No
20.7	ALL	Reset ALL***	No / Yes	No
21	QU it	QUIT		

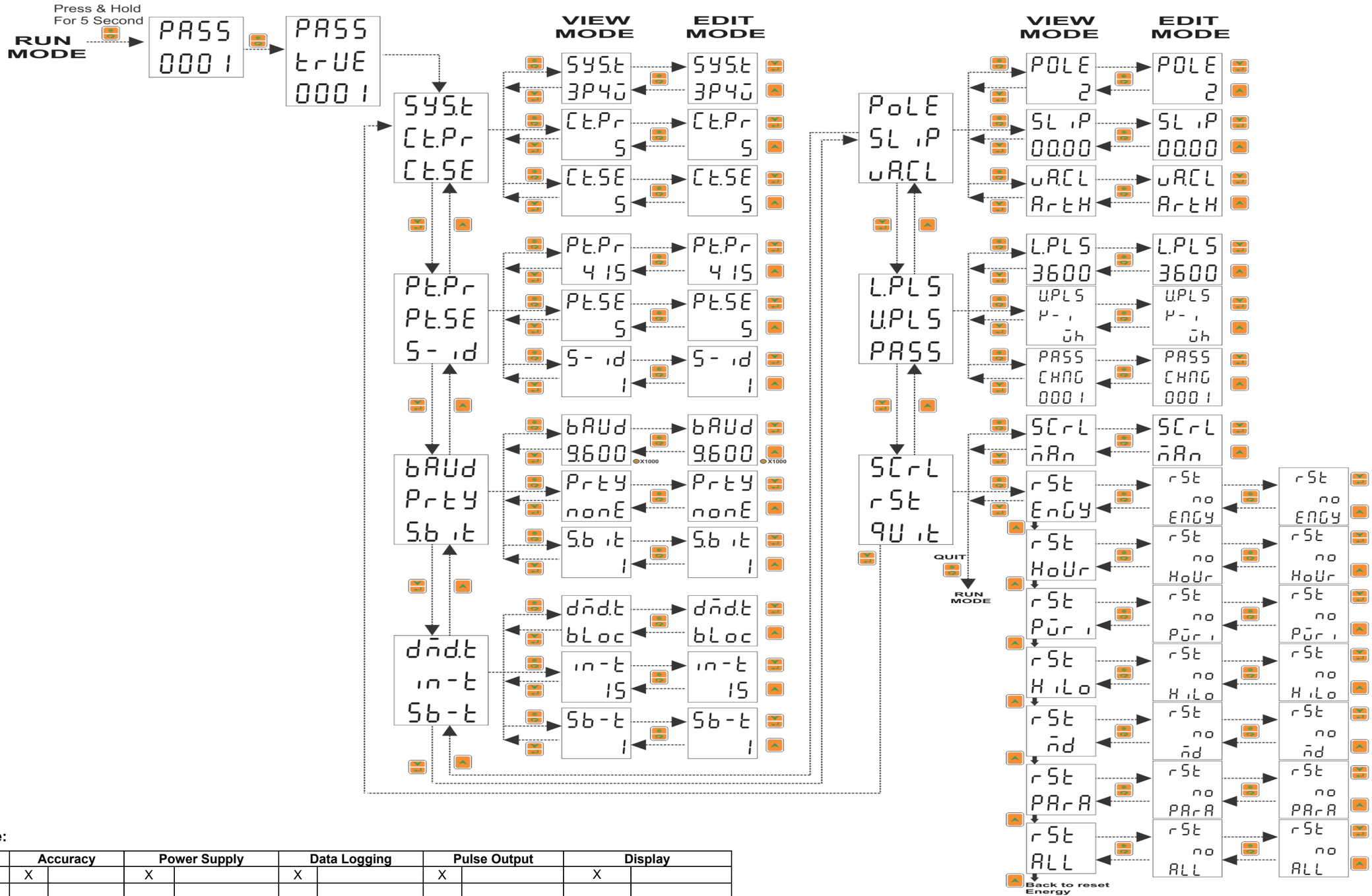
* After reset energy the current value of energy is reflected on old energy registers.

By selecting **'PARA', all configured parameters will be reset, and default settings will be restored.

***In Reset Mode, selecting **'All'** will reset Energy, Operating Hours, Power Interruption Count, and Maximum Demand.

Pressing the ENTER key on **'QUIT',** will return to run mode.

Configuration Menu:



Ordering Code:

Model	Accuracy		Power Supply		Data Logging		Pulse Output		Display	
MFM2160	X		X		X		X		X	
	S	Class 1.0	U1	Aux. Powered 85-265VAC/ 100-300VDC	N	None	N	None	LCD	LCD Display
	1	Class 0.5s	U2	Aux. Powered 20-60VDC	Y	Required#	Y	Required#	LED	LED Display
	2	Class 0.2s								

Note #: Data logging & Pulse output options are not applicable in LED Display

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For operation manual please visit www.masibus.com
Specifications are subject to change without notice due to Continuous improvements.

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