Interface Definition

RISH EM 2340/1320/30/40

2-60-006-00-00494_Rev. D - 8/2016

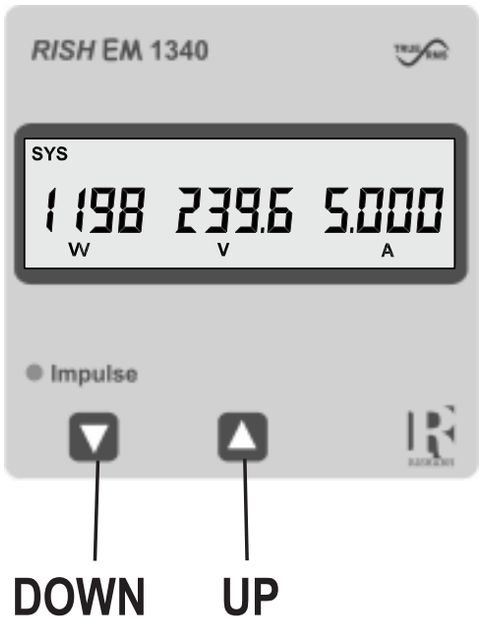
DIGITAL MULTIFUNCTION INSTRUMENT

Programmable Multi-function Energy Meter

Installation & Operating Instructions

1. Introduction

The Multifunction Energy Meter is a panel mounted 96 x 96mm DIN Quadratic Digital Panel Meter, which measures important electrical parameters in 3 ph 4 wire / 3 wire / 1ph Network and replaces the multiple analog panel meters. It measures electrical parameters like AC voltage, Current, Frequency, Power, Energy(Active / Reactive / Apparent), phase angle, power factor & many more. The instrument integrates accurate measurement technology (All Voltages & current measurements are True RMS upto 15th Harmonic) with LCD display with backlit.



It can be configured & Programmed at site for the following :
PT Primary, PT Secondary, CT Primary, CT Secondary 3 phase 3W, 3 Phase 4W, 1Phase 2W system.

The front panel has two push buttons using which the user can scroll through different screens, reset the energy & configure the product. The front panel also has Impulse red led, flashing at rate proportional to measured power.

Operation via standard Rs485 is also possible. Through this optional interface all the above mentioned parameters can be configured and programmed. For modbus service, it is essential that device address, baud rate and parity should be configured properly.
This document specifies only the interface between a Master device and Energy Meter for electrical variable through MODBUS over RS485.

2. Communication Parameter Selection

2.1 Address Setting :

This screen applies to the RS 485 output only. This screen allows the user to set RS 485 address for the meter.

The allowable range of addresses is 1 to 247. When entering new address, it will prompt for first digit.

(* Denotes that decimal point will be flashing).
Press the "⇩" key to scroll the value of the first digit
Press the "⇧" key to advance to next digit.

Similarly, Enter second and third digits of address.
After entering third digit, press "⇧" key to advance to Address Confirmation screen.

Address confirmation Screen

This Screen confirms the Address set by user.
Press the "⇧" key to advance to next Screen "Rs485 Baud Rate" (See Section 2.2)

Pressing the "⇩" key will re-enter the "Address Edit" mode.

2.2 RS 485 Baud Rate :

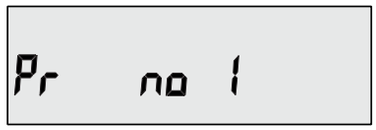
This screen allows the user to set Baud Rate of RS 485 port. The values displayed on screen are in kbaud.
Pressing "⇧" key accepts the present value and advance to the Parity Selection.
(See Section 2.3)

Pressing the "⇩" key will enter the "Baud Rate Edit" mode and scroll the value through 4.8, 9.6 19.2, 38.4 & back to 4.8.

Pressing the "⇧" key will select the value and advances to the Parity Selection
(See Section 2.3).

2.3 RS 485 Parity Selection:

This screen allows the user to set Parity & number of stop bits of RS 485 port.



Pressing "⇧" key accepts the present value and advance to Communication Parameter selection screen. (see section 2)

Pressing the "⇩" key will enter the "Parity & Stop bit Edit" mode & scroll the value through

odd : odd parity with one stop bit
no 1 : no parity with one stop bit
no 2 : no parity with two stop bit
E : even parity with one stop bit

Pressing the "⇧" key will set the value.

Pressing the "⇧" key again will jump back to the Communication Parameter selection menu (see section 2).

3. RS 485 (ModBus) Output :

THE MULTIFUNCTION ENERGY METER supports MODBUS (RS485) RTU protocol(2-wire) .

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained together. The screens should also be connected to the “Gnd” terminal. To avoid the possibility of loop currents, an Earth connection should be made at one point on the network.Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for The Meter is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

The maximum latency time of an Meter is 200ms i.e. this is the amount of time that can pass before the first response character is output.

After sending any query through software (of the Master), it must allow 200ms of time to elapse before assuming that the Meter is not going to respond. If slave does not respond within 200 ms, Master can ignore the previous query and can issue fresh query to the slave.

The each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754) Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)
Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable from the front panel between 4800, 9600, 19200, 38400 bps.

Function code :

03	Read Holding Registers	Read content of read /write location (4X)
04	Read input Registers	Read content of read only location (3X)
16	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Meter receives ModBus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be “Function code” ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Meter
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal DataValue	Attempt to set a floating point variable to an invalid value

3.1 Accessing 3 X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 1** for the addresses of 3X registers (Parameters measured by the instruments). Each parameter is held in the 3X registers. Modbus Code 04 is used to access all parameters.

Example :

To read parameter ,

Volts 3 : Start address= 04 (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameter limit will cause a ModBus exception code to be returned.

Query :

01 (Hex)	04 (Hex)	00 (Hex)	04(Hex)	00 (Hex)	02(Hex)	30 (Hex)	0A (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: Volt3 (219.25V)

01 (Hex)	04 (Hex)	04 (Hex)	43 (Hex)	5B (Hex)	41 (Hex)	21 (Hex)	6F (Hex)	9B (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 1 : 3 X register addresses (measured parameters)

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30001	1	Volts 1	00	0	✓	✓	✓
30003	2	Volts 2	00	2	✓	✓	✗
30005	3	Volts 3	00	4	✓	✓	✗
30007	4	Current 1	00	6	✓	✓	✓
30009	5	Current 2	00	8	✓	✓	✗
30011	6	Current 3	00	A	✓	✓	✗
30013	7	W1	00	C	✓	✗	✓
30015	8	W2	00	E	✓	✗	✗
30017	9	W3	00	10	✓	✗	✗
30019	10	VA 1	00	12	✓	✗	✓
30021	11	VA 2	00	14	✓	✗	✗
30023	12	VA 3	00	16	✓	✗	✗
30025	13	VAR 1	00	18	✓	✗	✓
30027	14	VAR 2	00	1A	✓	✗	✗
30029	15	VAR 3	00	1C	✓	✗	✗
30031	16	PF 1	00	1E	✓	✗	✓
30033	17	PF 2	00	20	✓	✗	✗
30035	18	PF 3	00	22	✓	✗	✗
30037	19	Phase Angle 1	00	24	✓	✗	✓
30039	20	Phase Angle 2	00	26	✓	✗	✗
30041	21	Phase Angle 3	00	28	✓	✗	✗
30043	22	Volts Avg	00	2A	✓	✓	✓
30045	23	Volts Sum	00	2C	✓	✓	✓
30047	24	Current Avg	00	2E	✓	✓	✓
30049	25	Current Sum	00	30	✓	✓	✓

TABLE 1 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30051	26	Watt Avg	00	32	✓	✓	✗
30053	27	Watt Sum	00	34	✓	✓	✓
30055	28	VA Avg	00	36	✓	✓	✗
30057	29	VA Sum	00	38	✓	✓	✓
30059	30	VAR Avg	00	3A	✓	✓	✗
30061	31	VAR Sum	00	3C	✓	✓	✓
30063	32	PF Avg	00	3E	✓	✓	✓
30065	33	PF Sum	00	40	✓	✗	✗
30067	34	Phase Angle Avg	00	42	✓	✓	✓
30069	35	Phase Angle Sum	00	44	✓	✗	✗
30071	36	Freq	00	46	✓	✓	✓
30073	37	Wh Import / Utility	00	48	✓	✓	✓
30075	38	Wh Export / Gen	00	4A	✓	✓	✓
30077	39	Capacitive / Utility VARh	00	4C	✓	✓	✓
30079	40	Inductive / Gen VARh	00	4E	✓	✓	✓
30081	41	VAh / Vah Utility	00	50	✓	✓	✓
30083	42	VAh Gen (Only 2340)	00	52	✓	✓	✓
30085	43	W Demand (Import / Utility / Gen)	00	54	✓	✓	✓
30087	44	W Max Demand (Import / Utility)	00	56	✓	✓	✓
30089	45	W Demand (Export)	00	58	✓	✓	✓
30091	46	W Max Demand (Export / Gen)	00	5A	✓	✓	✓
30093	47	Old W Max Demand (Import / Utility)	00	5C	✓	✓	✓
30095	48	Old W Max Demand (Export / Gen)	00	5E	✓	✓	✓
30097	49	Old VA Utility Max Demand	00	60	✓	✓	✓
30099	50	Old A Utility Max Demand	00	62	✓	✓	✓
30101	51	VA Demand (Utility / Gen)	00	64	✓	✓	✓
30103	52	VA Max Demand (Utility)	00	66	✓	✓	✓
30105	53	A Demand (Utility / Gen)	00	68	✓	✓	✓
30107	54	A Max Demand (Utility)	00	6A	✓	✓	✓
30109	55	Wh Import / Utility Overflow count	00	6C	✓	✓	✓
30111	56	-	-	-			

TABLE 1 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30113	57	Wh Export / Gen Overflow count	00	70	✓	✓	✓
30115	58	-	-	-	✓	✓	✓
30117	59	Capacitive / Utility VARh Overflow count	00	74	✓	✓	✓
30119	60	-	-	-			
30121	61	Inductive / Gen VARh Overflow count	00	78	✓	✓	✓
30123	62	-	-	-			
30125	63	Vah / VAh Utility Overflow count	00	7C	✓	✓	✓
30127	64	-	-	-			
30129	65	VAh Gen Overflow count (only 2340)	00	80	✓	✓	✓
30131	66	-	-	-			
30133	67	System Max Voltage	00	84	✓	✓	✓
30135	68	System Min Voltage	00	86	✓	✓	✓
30137	69	RPM	00	88	✓	✓	✓
30141	71	System Max Currrent	00	8C	✓	✓	✓
30143	72	System Min Current	00	8E	✓	✓	✓
30145	73	Wh Import / Utility depending on update rate	00	90	✓	✓	✓
30147	74	Wh Export / Gen depending on update rate	00	92	✓	✓	✓
30149	75	Capacitive / Utility VArh depending on update rate	00	94	✓	✓	✓
30151	76	Inductive / Gen VArh depending on update rate	00	96	✓	✓	✓
30151	77	VAh / VAh Utility depending on update rate	00	98	✓	✓	✓
30155	78	VAh Gen depending on update rate (only 2340)	00	9A	✓	✓	✓
30157	79	Wh Import / Utility Overflow count depending on update rate	00	9C	✓	✓	✓
30159	80	Wh Export / Gen Overflow count depending on update rate	00	9E	✓	✓	✓
30161	81	Capacitive / Utility VArh Overflow count depending on update rate	00	A0	✓	✓	✓
30163	82	Inductive / Gen VArh Overflow count depending on update rate	00	A2	✓	✓	✓
30165	83	VAh Utility Overflow count depending on update rate	00	A4	✓	✓	✓
30167	84	VAh Gen Overflow count depending on update rate (only 2340)	00	A6	✓	✓	✓

TABLE 1 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30169	85	Old Wh Import / Utility Overflow count	00	A8	✓	✓	✓
30173	87	Old Wh Export / Gen Overflow count	00	AC	✓	✓	✓
30177	89	Old Capacitive / Utility VArh Overflow count	00	B0	✓	✓	✓
30179	90	Old Capacitive / Utility VArh	00	B2	✓	✓	✓
30181	91	Old Inductive / Gen VArh Overflow count	00	B4	✓	✓	✓
30183	92	Old Inductive / Gen VArh	00	B6	✓	✓	✓
30185	93	Old VAh / VAh Utility Overflow count	00	B8	✓	✓	✓
30187	94	Old VAh / VAh Utility	00	BA	✓	✓	✓
30189	95	Old VAh Gen Overflow count (only 2340)	00	BC	✓	✓	✓
30191	96	Old VAh Gen (only 2340)	00	BE	✓	✓	✓
30193	97	VA Max Demand (Gen)	00	C0	✓	✓	✓
30195	98	A Max Demand (Gen)	00	C2	✓	✓	✓
30197	99	Old VA Max Demand (Gen)	00	C4	✓	✓	✓
30199	100	Old A Max Demand (Gen)	00	C6	✓	✓	✓
30201	101	VL 1 - 2 (Calculated)	00	C8	✓	✗	✗
30203	102	VL 2 - 3 (Calculated)	00	CA	✓	✗	✗
30205	103	VL 3- 1 (Calculated)	00	CC	✓	✗	✗
30207	104	V1 THD (%)	00	CE	✓	✓	✓
30209	105	V2 THD (%)	00	D0	✓	✓	✗
30211	106	V3 THD (%)	00	D2	✓	✓	✗
30213	107	I1 THD (%)	00	D4	✓	✓	✓
30215	108	I2 THD (%)	00	D6	✓	✓	✗
30217	109	I3 THD (%)	00	D8	✓	✓	✗
30219	110	System Voltage THD (%)	00	DA	✓	✓	✓
30221	111	System Current THD (%)	00	DC	✓	✓	✓
30225	113	I Neutral	00	E0	✓	✗	✗
30227	114	Run Hour Utility	00	E2	✓	✓	✓
30229	115	On Hour Utility	00	E4	✓	✓	✓
30231	116	No. of Interruptions Utility	00	E6	✓	✓	✓
30237	119	Run Hour Gen (only 2340)	00	EC	✓	✓	✓

TABLE 1 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30239	120	On Hour Gen (only 2340)	00	EE	✓	✓	✓
30241	121	No. of Interruptions Gen (only 2340)	00	F0	✓	✓	✓
30243	122	Total Run Hour (only 2340)	00	F2	✓	✓	✓
30245	123	Total On Hour (only 2340)	00	F4	✓	✓	✓
30247	124	Old Wh Import / Utility	00	F6	✓	✓	✓
30249	125	Old Wh Export / Gen	00	F8	✓	✓	✓
30251	126	Old Run Hour Utility	00	FA	✓	✓	✓
30253	127	Old Run Hour Gen (only 2340)	00	FC	✓	✓	✓
30255	128	Old On Hour Utility	00	FE	✓	✓	✓
30257	129	Old On Hour Gen (only 2340)	01	00	✓	✓	✓
30259	130	Old Total Run Hour (only 2340)	01	02	✓	✓	✓
30261	131	Old Total On Hour (only 2340)	01	04	✓	✓	✓
30263	132	Old No. of Interruptions Utility	01	06	✓	✓	✓
30265	133	Old No. of Interruptions Gen (only 2340)	01	08	✓	✓	✓
30267	134	Relay Output 1 Status	01	0A	✓	✓	✓
30269	135	Relay Output 2 Status	01	0C	✓	✓	✓

Note : 1. Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.
2. Energy Overflow count feature is applicable to modbus only.
3. Relay Output 1/ 2 Status shows whether relay is Energized or De-energized.
1 :- Relay Energized 0:- Relay De-energized

TABLE 2 : 3X register addresses for 32-bit Integer Energy

Address (Register)	Parameter no.	Parameter	Modbus Start Address Hex	
			High Byte	Low Byte
30769	1	Active Energy Import / Utility	03	00
30771	2	Active Energy Export / GEN	03	02
30773	3	Reactive Energy Import / Utility	03	04
30775	4	Reactive Energy Export / GEN	03	06
30777	5	Apparent Energy Utility	03	08
30779	6	Apparent Energy GEN (only 2340)	03	0A
30781	7	Active Energy Import / Utility Overflow Count	03	0C
30783	8	Active Energy Export / GEN Overflow Count	03	0E
30785	9	Reactive Energy Import Overflow Count	03	10
30787	10	Reactive Energy Export / GEN Overflow Count	03	12

TABLE 2 : Continued...

Address (Register)	Parameter no.	Parameter	Modbus Start Address Hex	
			High Byte	Low Byte
30789	11	Apparent Energy Utility Overflow Count	03	14
30791	12	Apparent Energy GEN Overflow Count (only 2340)	03	16
30793	13	Active Energy Import / Utility on update rate*	03	18
30795	14	Active Energy Export / GEN on update rate*	03	1A
30797	15	Reactive Energy Import / Utility on update rate*	03	1C
30799	16	Reactive Energy Export / GEN on update rate*	03	1E
30801	17	Apparent Energy Utility on update rate*	03	20
30803	18	Apparent Energy GEN on update rate (only 2340)*	03	22
30805	19	Active Energy Import / Utility Overflow Count on update rate*	03	24
30807	20	Active Energy Export / GEN Overflow Count on update rate*	03	26
30809	21	Reactive Energy Import / Utility Overflow Count on update rate*	03	28
30811	22	Reactive Energy Export / GEN Overflow Count on update rate*	03	2A
30813	23	Apparent Energy Utility Overflow Count on update rate*	03	2C
30815	24	Apparent Energy GEN Overflow Count on update rate (only 2340)*	03	2E
30817	25	Old Active Energy Import / Utility Overflow Count	03	30
30819	26	Old Active Energy Import / Utility	03	32
30821	27	Old Active Energy Export / GEN Overflow Count	03	34
30823	28	Old Active Energy Export / GEN	03	36
30825	29	Old Reactive Energy Import / Utility Overflow Count	03	38
30827	30	Old Reactive Energy Import / Utility	03	3A
30829	31	Old Reactive Energy Export / GEN Overflow Count	03	3C
30831	32	Old Reactive Energy Export / GEN	03	3E
30833	33	Old Apparent Energy Utility Overflow Count	03	40
30835	34	Old Apparent Energy Utility	03	42
30837	35	Old Apparent Energy GEN Overflow Count (only 2340)	03	44
30839	36	Old Apparent Energy GEN (only 2340)	03	46

***Note:**

1. The values are updated depending on update rate which is settable by user.
For example, if user set update rate 15 min, then the values on these registers
(marked with *) will get updated on every 15 min.
2. For models 1320/30/40, energy is in terms of Import and Export.
3. For model 2340, energy is in terms of Utility and Generator.
4. For models 1320 & 1330, addresses 30207 to 30221 and 44303 to 44317 are not applicable.

3.2 Accessing 4 X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 3** for the addresses of 4X registers (Parameters measured by the instruments). Each parameter is held in the 4X registers. Modbus Code 03 is used to access all parameters.

Example :

To read parameter,

Volts 3 : Start address = 04 (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameter limit will cause a ModBus exception code to be returned.

Query :

01 (Hex)	03 (Hex)	10 (Hex)	04(Hex)	00 (Hex)	02(Hex)	81 (Hex)	0A (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: Volt3 (219.25V)

01 (Hex)	03 (Hex)	04 (Hex)	43 (Hex)	5B (Hex)	40 (Hex)	1B (Hex)	EF (Hex)	AF (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 3 : 4 X register addresses (measured parameters)

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44097	1	Volts 1	10	00	✓	✓	✓
44099	2	Volts 2	10	02	✓	✓	✗
44101	3	Volts 3	10	04	✓	✓	✗
44103	4	Current 1	10	06	✓	✓	✓
44105	5	Current 2	10	08	✓	✓	✗
44107	6	Current 3	10	0A	✓	✓	✗
44109	7	W1	10	0C	✓	✗	✓
44111	8	W2	10	0E	✓	✗	✗
44113	9	W3	10	10	✓	✗	✗
44115	10	VA 1	10	12	✓	✗	✓
44117	11	VA 2	10	14	✓	✗	✗
44119	12	VA 3	10	16	✓	✗	✗
44121	13	VAR 1	10	18	✓	✗	✓
44123	14	VAR 2	10	1A	✓	✗	✗
44125	15	VAR 3	10	1C	✓	✗	✗
44127	16	PF 1	10	1E	✓	✗	✓
44129	17	PF 2	10	20	✓	✗	✗
44131	18	PF 3	10	22	✓	✗	✗
44133	19	Phase Angle 1	10	24	✓	✗	✓
44135	20	Phase Angle 2	10	26	✓	✗	✗
44137	21	Phase Angle 3	10	28	✓	✗	✗
44139	22	Volts Avg	10	2A	✓	✓	✓
44141	23	Volts Sum	10	2C	✓	✓	✓
44143	24	Current Avg	10	2E	✓	✓	✓
44145	25	Current Sum	10	30	✓	✓	✓

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44147	26	Watt Avg	10	32	✓	✓	✗
44149	27	Watt Sum	10	34	✓	✓	✓
44151	28	VA Avg	10	36	✓	✓	✗
44153	29	VA Sum	10	38	✓	✓	✓
44155	30	VAR Avg	10	3A	✓	✓	✗
44157	31	VAR Sum	10	3C	✓	✓	✓
44159	32	PF Avg	10	3E	✓	✓	✓
44161	33	PF Sum	10	40	✓	✗	✗
44163	34	Phase Angle Avg	10	42	✓	✓	✓
44165	35	Phase Angle Sum	10	44	✓	✗	✗
44167	36	Freq	10	46	✓	✓	✓
44169	37	Wh Import / Utility	10	48	✓	✓	✓
44171	38	Wh Export / Gen	10	4A	✓	✓	✓
44173	39	Capacitive / Utility VARh	10	4C	✓	✓	✓
44175	40	Inductive / Gen VARh	10	4E	✓	✓	✓
44177	41	VAh / Vah Utility	10	50	✓	✓	✓
44179	42	VAh Gen (Only 2340)	10	52	✓	✓	✓
44181	43	W Demand (Import / Utility / Gen)	10	54	✓	✓	✓
44183	44	W Max Demand (Import / Utility)	10	56	✓	✓	✓
44185	45	W Demand (Export)	10	58	✓	✓	✓
44187	46	W Max Demand (Export / Gen)	10	5A	✓	✓	✓
44189	47	Old W Max Demand (Import / Utility)	10	5C	✓	✓	✓
44191	48	Old W Max Demand (Export / Gen)	10	5E	✓	✓	✓
44193	49	Old VA Utility Max Demand	10	60	✓	✓	✓
44195	50	Old A Utility Max Demand	10	62	✓	✓	✓
44197	51	VA Demand (Utility / Gen)	10	64	✓	✓	✓
44199	52	VA Max Demand (Utility)	10	66	✓	✓	✓
44201	53	A Demand (Utility / Gen)	10	68	✓	✓	✓
44203	54	A Max Demand (Utility)	10	6A	✓	✓	✓
44205	55	Wh Import / Utility Overflow count	10	6C	✓	✓	✓
44207	56	-	-	-			

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44209	57	Wh Export / Gen Overflow count	10	70	✓	✓	✓
44211	58	-	-	-			
44213	59	Capacitive / Utility VARh Overflow count	10	74	✓	✓	✓
44215	60	-	-	-			
44217	61	Inductive / Gen VARh Overflow count	10	78	✓	✓	✓
44219	62	-	-	-			
44221	63	Vah / VAh Utility Overflow count	10	7C	✓	✓	✓
44223	64	-	-	-			
44225	65	VAh Gen Overflow count (only 2340)	10	80	✓	✓	✓
44227	66	-	-	-			
44229	67	System Max Voltage	10	84	✓	✓	✓
44231	68	System Min Voltage	10	86	✓	✓	✓
44233	69	RPM	10	88	✓	✓	✓
44237	71	System Max Currrent	10	8C	✓	✓	✓
44239	72	System Min Current	10	8E	✓	✓	✓
44241	73	Wh Import / Utility depending on update rate	10	90	✓	✓	✓
44243	74	Wh Export / Gen depending on update rate	10	92	✓	✓	✓
44245	75	Capacitive / Utility VArh depending on update rate	10	94	✓	✓	✓
44247	76	Inductive / Gen VArh depending on update rate	10	96	✓	✓	✓
44249	77	VAh / VAh Utility depending on update rate	10	98	✓	✓	✓
44251	78	VAh Gen depending on update rate (only 2340)	10	9A	✓	✓	✓
44253	79	Wh Import / Utility Overflow count depending on update rate	10	9C	✓	✓	✓
44255	80	Wh Export / Gen Overflow count depending on update rate	10	9E	✓	✓	✓
44257	81	Capacitive / Utility VArh Overflow count depending on update rate	10	A0	✓	✓	✓
44259	82	Inductive / Gen VArh Overflow count depending on update rate	10	A2	✓	✓	✓
44261	83	VAh Utility Overflow count depending on update rate	10	A4	✓	✓	✓
44263	84	VAh Gen Overflow count depending on update rate (only 2340)	10	A6	✓	✓	✓

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44265	85	Old Wh Import / Utility Overflow count	10	A8	✓	✓	✓
44269	87	Old Wh Export / Gen Overflow count	10	AC	✓	✓	✓
44273	89	Old Capacitive / Utility VArh Overflow count	10	B0	✓	✓	✓
44275	90	Old Capacitive / Utility VArh	10	B2	✓	✓	✓
44277	91	Old Inductive / Gen VArh Overflow count	10	B4	✓	✓	✓
44279	92	Old Inductive / Gen VArh	10	B6	✓	✓	✓
44281	93	Old VAh / VAh Utility Overflow count	10	B8	✓	✓	✓
44283	94	Old VAh / VAh Utility	10	BA	✓	✓	✓
44285	95	Old VAh Gen Overflow count (only 2340)	10	BC	✓	✓	✓
44287	96	Old VAh Gen (only 2340)	10	BE	✓	✓	✓
44289	97	VA Max Demand (Gen)	10	C0	✓	✓	✓
44291	98	A Max Demand (Gen)	10	C2	✓	✓	✓
44293	99	Old VA Max Demand (Gen)	10	C4	✓	✓	✓
44295	100	Old A Max Demand (Gen)	10	C6	✓	✓	✓
44297	101	VL 1 - 2 (Calculated)	10	C8	✓	✗	✗
44299	102	VL 2 - 3 (Calculated)	10	CA	✓	✗	✗
44301	103	VL 3- 1 (Calculated)	10	CC	✓	✗	✗
44303	104	V1 THD (%)	10	CE	✓	✓	✓
44305	105	V2 THD (%)	10	D0	✓	✓	✗
44307	106	V3 THD (%)	10	D2	✓	✓	✗
44309	107	I1 THD (%)	10	D4	✓	✓	✓
44311	108	I2 THD (%)	10	D6	✓	✓	✗
44313	109	I3 THD (%)	10	D8	✓	✓	✗
44315	110	System Voltage THD (%)	10	DA	✓	✓	✓
44317	111	System Current THD (%)	10	DC	✓	✓	✓
44321	113	I Neutral	10	E0	✓	✗	✗
44323	114	Run Hour Utility	10	E2	✓	✓	✓
44325	115	On Hour Utility	10	E4	✓	✓	✓
44327	116	No. of Interruptions Utility	10	E6	✓	✓	✓
44333	119	Run Hour Gen (only 2340)	10	EC	✓	✓	✓

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44335	120	On Hour Gen (only 2340)	10	EE	✓	✓	✓
44337	121	No. of Interruptions Gen (only 2340)	10	F0	✓	✓	✓
44339	122	Total Run Hour (only 2340)	10	F2	✓	✓	✓
44341	123	Total On Hour (only 2340)	10	F4	✓	✓	✓
44343	124	Old Wh Import / Utility	10	F6	✓	✓	✓
44345	125	Old Wh Export / Gen	10	F8	✓	✓	✓
44347	126	Old Run Hour Utility	10	FA	✓	✓	✓
44349	127	Old Run Hour Gen (only 2340)	10	FC	✓	✓	✓
44351	128	Old On Hour Utility	10	FE	✓	✓	✓
44353	129	Old On Hour Gen (only 2340)	11	00	✓	✓	✓
44355	130	Old Total Run Hour (only 2340)	11	02	✓	✓	✓
44357	131	Old Total On Hour (only 2340)	11	04	✓	✓	✓
44359	132	Old No. of Interruptions Utility	11	06	✓	✓	✓
44361	133	Old No. of Interruptions Gen (only 2340)	11	08	✓	✓	✓
44363	134	Relay Output 1 Status	11	0A	✓	✓	✓
44365	135	Relay Output 2 Status	11	0C	✓	✓	✓

Note : 1. Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.
2. Energy Overflow count feature is applicable to modbus only.

TABLE 4 : 4X register addresses for 32-bit Integer Energy

Address (Register)	Parameter no.	Parameter	Modbus Start Address Hex	
			High Byte	Low Byte
44865	1	Active Energy Import / Utility	13	00
44867	2	Active Energy Export / GEN	13	02
44869	3	Reactive Energy Import / Utility	13	04
44871	4	Reactive Energy Export / GEN	13	06
44873	5	Apparent Energy Utility	13	08
44875	6	Apparent Energy GEN (only 2340)	13	0A
44877	7	Active Energy Import / Utility Overflow Count	13	0C
44879	8	Active Energy Export / GEN Overflow Count	13	0E
44881	9	Reactive Energy Import Overflow Count	13	10
44883	10	Reactive Energy Export / GEN Overflow Count	13	12
44885	11	Apparent Energy Utility Overflow Count	13	14
44887	12	Apparent Energy GEN Overflow Count (only 2340)	13	16
44889	13	Active Energy Import / Utility on time*	13	18

TABLE 4 : Continued...

Address (Register)	Parameter no.	Parameter	Modbus Start Address Hex	
			High Byte	Low Byte
44891	14	Active Energy Export / GEN on update rate*	13	1A
44893	15	Reactive Energy Import / Utility on update rate*	13	1C
44895	16	Reactive Energy Export / GEN on update rate*	13	1E
44897	17	Apparent Energy Utility on update rate*	13	20
44899	18	Apparent Energy GEN on update rate (only 2340)*	13	22
44901	19	Active Energy Import / Utility Overflow Count on update rate*	13	24
44903	20	Active Energy Export / GEN Overflow Count on update rate*	13	26
44905	21	Reactive Energy Import / Utility Overflow Count on update rate*	13	28
44907	22	Reactive Energy Export / GEN Overflow Count on update rate*	13	2A
44909	23	Apparent Energy Utility Overflow Count on update rate*	13	2C
44911	24	Apparent Energy GEN Overflow Count on update rate (only 2340)*	13	2E
44913	25	Old Active Energy Import / Utility Overflow Count	13	30
44915	26	Old Active Energy Import / Utility	13	32
44917	27	Old Active Energy Export / GEN Overflow Count	13	34
44919	28	Old Active Energy Export / GEN	13	36
44921	29	Old Reactive Energy Import / Utility Overflow Count	13	38
44923	30	Old Reactive Energy Import / Utility	13	3A
44925	31	Old Reactive Energy Export / GEN Overflow Count	13	3C
44927	32	Old Reactive Energy Export / GEN	13	3E
44929	33	Old Apparent Energy Utility Overflow Count	13	40
44931	34	Old Apparent Energy Utility	13	42
44933	35	Old Apparent Energy GEN Overflow Count (only 2340)	13	44
44935	36	Old Apparent Energy GEN (only 2340)	13	46

3.3 Accessing 4 X register for Reading & Writing Settings:

Each setting is held in the 4X registers. ModBus code 03 is used to read the current setting & code 16 is used to write/change the setting. Refer **TABLE 5** for 4X Register addresses.

Example: Reading System type
System type: Start address = 0A (Hex)
Number of registers = 02
Note: Number of registers = Number of Parameters x 2

Query :

Device Address	01 (Hex)
Function Code	03 (Hex)
Start Address High	00 (Hex)
Start Address Low	0A (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	E4 (Hex)
CRC High	09 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: System Type (3phase 4 wire = 3)

Device Address	01 (Hex)
Function Code	03 (Hex)
Byte Count	04 (Hex)
Data Register1 High Byte	40 (Hex)
Data Register1Low Byte	40 (Hex)
Data Register2 High Byte	00 (Hex)
Data Register2 Low Byte	00(Hex)
CRC Low	EE (Hex)
CRC High	27 (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Example : Writing System type

System type : Start address = 0A (Hex)
Number of registers = 02

Query:(Change System type to 3phase 3wire = 2)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	00 (Hex)
Starting Address Lo	0A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
Byte Count	04 (Hex)
Data Register-1High Byte	40 (Hex)
Data Register-1 Low Byte	00(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)
CRC Low	66 (Hex)
CRC High	10 (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	00 (Hex)
Start Address Low	0A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
CRC Low	61 (Hex)
CRC High	CA (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 5 : 4 X register addresses

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex		Default Value
				High Byte	Low Byte	
40003	1	Demand Integration Time	R/Wp	00	02	8
40005	2	Energy Output	R/Wp	00	04	2
40007	3	System Voltage	R	00	06	As per order
40009	4	System Current	R	00	08	5
40011	5	System Type*	R/Wp	00	0A	3
40013	6	Pulse Width	R/Wp	00	0C	100
40015	7	Reset Parameters	Wp	00	0E	0
40017	8	Number of Poles	R/Wp	00	10	2
40019	9	RS 485 Set-up Code	R/Wp	00	12	4
40021	10	Node Address	R/Wp	00	14	As per set
40023	11	Pulse Divisor	R/Wp	00	16	1
40033	16	PT Primary	R/Wp	00	20	System Voltage
40035	17	CT Primary	R/Wp	00	22	System Current
40037	18	System Power	R	00	24	System voltage *current*1.732
40039	19	Energy Digit Reset Count	R/Wp	00	26	8

***NOTE: System type can be changed in 3 Phase system only.**

TABLE 5 : continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex		Default Value
				High Byte	Low Byte	
40041	20	Register Order/Word Order	R/Wp	00	28	0
40043	21	CT Secondary	R/Wp	00	2A	5
40045	22	PT Secondary	R/Wp	00	2C	System Voltage
40047	23	Relay 1 output select	R/Wp	00	2E	0
40049	24	Pulse 1 / Limit 1 Parameter select	R/Wp	00	30	0
40051	25	Limit 1 Trip point	R/Wp	00	32	100
40053	26	Limit 1 Hysteresis	R/Wp	00	34	50
40055	27	Limit 1 Delay (On)	R/Wp	00	36	1
40057	28	Limit 1 Delay (Off)	R/Wp	00	38	1
40059	29	Relay 2 output select	R/Wp	00	3A	0
40061	30	Pulse 2 / Limit 2 Parameter select	R/Wp	00	3C	0
40063	25	Limit 2 Trip point	R/Wp	00	3E	100
40065	26	Limit 2 Hysteresis	R/Wp	00	40	50
40067	27	Limit 2 Delay (On)	R/Wp	00	42	1
40069	28	Limit 2 Delay (Off)	R/Wp	00	44	1
40071	35	Password	R/W	00	46	1
40073	36	Limit 1 Configuration select	R/Wp	00	48	0
40075	36	Limit 2 Configuration select	R/Wp	00	4A	0
40077	38	Auto Scroll	R/Wp	00	4C	0
40079	39	30mA Noise Current Elimination	R/Wp	00	4E	0
40081	40	Energy Update Rate	R/Wp	00	50	15
40083	41	Factory Reset	Wp	00	52	0
40085	42	Backlit ON/OFF	R/Wp	00	54	0
40087	43	Impulse Selection	R/Wp	00	56	1
40089	44	System VA Calculation method	R/Wp	00	58	0
40097	48	Serial Number	R	00	60	
40099	49	Model Number	R	00	62	

TABLE 5 : continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex		Default Value
				High Byte	Low Byte	
40101	50	Version Number	R	00	64	
40103	51	User Assignable Screen ON/OFF	R/Wp	00	66	0
40105	52	User Screen 1	R/Wp	00	68	8
40107	53	User Screen 2	R/Wp	00	6A	9
40109	54	User Screen 3	R/Wp	00	6C	10
40111	55	User Screen 4	R/Wp	00	6E	11
40113	56	User Screen 5	R/Wp	00	70	12
40115	57	User Screen 6	R/Wp	00	72	8
40117	58	User Screen 7	R/Wp	00	74	9
40119	59	User Screen 8	R/Wp	00	76	10
40121	60	User Screen 9	R/Wp	00	78	11
40123	61	User Screen 10	R/Wp	00	7A	12

NOTE: Wp - Write protected , R - Read only , R/Wp - Read & Write protected

Explanation for 4 X register :

Address	Parameter	Description
40003	Demand Integration Time	Demand period represents demand time in minutes. The applicable values are 8,15,20 or 30. Writing any other value will return an error.
40005	Energy Output	This address is used to set energy output in Wh,kWh & MWh. Write one of the following value to this address. **1:** Energy in Wh. **2:** Energy in KWh. **3**: Energy in MWh.
40007	System Voltage	This address is read only and displays System Voltage
40009	System Current	This address is read only and displays System Current
40011	System Type	This address is used to set the System type. Write one of the following value to this address. **1**: 1 Phase 2 Wire **2**: 3 Phase 3 Wire **3**: 3 Phase 4 Wire. Writing any other value will return error .

Explanation for 4 X register :

Address	Parameter	Description
40013	Pulse Width of Relay	This address is used to set **pulse width** of the Pulse output. Write one of the following values to this address: **60** : 60 ms **100** : 100 ms **200** : 200 ms Writing any other value will return error .
40015	Reset Paramters	This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Writing any other value will return an error. Following are the values to reset various data. **0:** Energy Reset **1:** Demand Reset **2:** System Min Values Reset **3:** System Max Values Reset **4:** Run hour & On hour Reset **5:** No of Interruptions Reset **6:** Reset All data
40017	Number of Poles	This address is used to set the no. of poles of generator of which RPM is to be measured. The value must be between 2 to 40. Writing any other value will return an error.
40019	Rs485 Set-up Code	This address is used to set the baud rate, Parity, Number of stop bits. Refer to **TABLE 8** for details.
40021	Node Address	This register address is used to set Device address between 1 to 247 .
40023	Pulse Divisor	This address is used to set **pulse divisor** of the Pulse output. Write one of the following values to this address **for Wh**: **1** : Divisor 1 **10** : Divisor 10 **100** : Divisor 100 **1000** : Divisor 1000 & In **kWh** or **MWh** divisor will be **1 default.** Writing any other value will return an error.
40033	PT Primary	This address allows the user to set PT Primary value (in terms of VL-L). The settable range is 100 VL-L to 1200 kVL-L for all system types & also depends on the per phase 1000 MVA Restriction of power combined with CT primary.
40035	CT Pimary	This address allows the user to set CT Primary value. The settable range is 1 to 9999. It also depends on the per phase 1000 MVA Restriction of power combined with PT primary.

40037	Sys Power	System Power (Read Only) is the Nominal system power based on the values of Nominal system volts and Nominal system current.
40039	Energy Digit Reset Count	This address is used to set Energy Digit Reset Count value. Energy count can be configured to reset in between 7 to 9.
40041	Word Order	Word Order controls the order in which Multifunction Meter receives or sends floating - point numbers:- normal or reversed register order . In normal mode, the two registers that make up a floating point numbers are sent most significant bytes first. In reversed register mode , the two registers that make up a floating point numbers are sent least significant bytes first. To set the mode, write the value ' 2141.0' into this register-the instrument will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.
40043	CT secondary	This address is used to read and write the CT secondary value. Write one of the following values to this address. **1:** 1A CT secondary **5:** 5A CT secondary writing any other value will return an error.
40045	PT secondary	This address is used to read and write the PT secondary value. Ref **TABLE 11** for the range of PT secondary settable values.
40047	Relay output select	This address is used to select the Relay operation as pulse or Limit. Write one of the following values to this address. **0:** Pulse output on Relay **128** (Decimal)**:** Limit output on Relay. Writing any other value will return an error.
40049	Pulse 1 / Limit 1 parameter select	This address is used to assign the Parameter to Relay If Limit option is selected refer **TABLE 7** for parameter number & if Pulse option is selected then refer **TABLE 9**.
40051	Limit 1 Trip Point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo- alarm & 10 to120 (refer **TABLE 7**) for Hi-alarm can be written to this address. Writing any other value will return an error.
40053	Limit 1 Hysteresis	This address is used to set the hysteresis between 0.5 to 50.0%. Writing any other value will return an error.
40055	Limit 1 Energizing Delay	This address is used to set the Energizing delay between 1 to 10 . Writing any other value will return an error.
40057	Limit 1 De-energizing Delay	This address is used to set the De-Energizing delay between 1 to 10 . Writing any other value will return an error.

40059	Relay 2 output select	This address is used to select the Relay 2 operation as pulse or Limit. Write one of the following values to this address. **0:** Pulse output on Relay **128** (Decimal)**:** Limit output on Relay. Writing any other value will return an error.
40061	Pulse 2 / Limit 2 parameter select	This address is used to assign the Parameter to Relay If Limit option is selected refer **TABLE 7** for parameter number & if Pulse option is selected then refer **TABLE 9**.
40063	Limit 2 Trip Point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo- alarm & 10 to120 (refer **TABLE 7**) for Hi-alarm can be written to this address. Writing any other value will return an error.
40065	Limit 2 Hysteresis	This address is used to set the hysteresis between 0.5 to 50.0%. Writing any other value will return an error.
40067	Limit 2 Energizing Delay	This address is used to set the Energizing delay between 1 to 10 . Writing any other value will return an error.
40069	Limit 2 De-energizing Delay	This address is used to set the De-Energizing delay between 1 to 10 . Writing any other value will return an error.
40071	Password	This address is used to set & reset the password. Valid Range of Password can be set is 0000 - 9999 . 1) If password lock is present & if this location is read it will return **zero**. 2) If Password lock is absent & if this location is read it will return **One**. 3) If password lock is present & to disable this lock first send valid password to this location then write “0000” to this location 4) If password lock is present & to modify 4X parameter first send valid password to this location so that 4X parameter will be accessible for modification. 5) If for in any of the above case invalid password is send then meter will return exceptional error 2.
40073	Limit 1 Configuration Select	This address is used to set the Configuration for Relay 1 see **TABLE 10**. Writing any other value will return an error.
40075	Limit 2 Configuration Select	This address is used to set the Configuration for Relay 2 see **TABLE 10**. Writing any other value will return an error.
40077	Auto scroll	This address is used to activate or de-activate the auto scrolling. Write **0:** Deactivate **1:** Activate, Writing any other value will return an error.
40079	30mA Noise current Elimination	This address is used to activate or de-activate the 30 mA noise current elimination write **0:** Deactivate **30** (Decimal)**:** Activate Writing any other value will return an error.

40081	Energy Update Rate	This address is used to specify update rate of energy in corresponding 3X registers. The valid values for update rate are from 1 to 60 min. Writing any other value will return an error.
40083	Factory Reset	This address allows the user to reset the instrument to factory settings. Refer the **Default Values** in **TABLE 5** for factory settings. Write **5555** at this address to reset the instrument. Writing any other value will return an error.
40085	Backlit ON/OFF	This address is used to turn On or turn Off the backlit. **0:** Backlit On **1:** Backlit Off Writing any other value will return an error.
40087	Impulse Selection	This address is used to select the energy to which impulse is to be assigned. Writing any other value will return an error. **0:** None **1:** Active Energy **2:** Reactive Energy **3:** Apparent Energy
40089	System VA Calculation method	This address is used to select the method to be used to calculate System VA. **0:** Arithmetic method ($VA_{sys} = VA_1 + VA_2 + VA_3$) **1:** Vector method ($VA_{sys} = sqrt((W_{sys})^2 + (VAr_{sys})^2$) Writing any other value will return an error.
40097	Serial Number	This address is read only and displays the serial number of the meter.
40099	Model Number	This address is read only and displays the model number of the meter.
40101	Version Number	This address is read only and displays the version number of the meter.
40103	User Assignable Screen On/Off	This address is used to activate or deactivate the User Assignable Screen feature. This is applicable only to models **EM 1340** and **EM 2340**. **0:** Deactivate **10:** 10 User screens **5:** 5 User screens Writing any other value will return an error.
40105 to 40123	User Screens 1 to 10	These addresses are used to assign the screen numbers to user screens 1 to 10 respectively. Refer to **TABLE 6** for screen numbers. This is applicable only to models **EM 1340 and EM 2340**. Writing any other value will return an error.

NOTE:
Changing system type, PT/CT ratio, Energy Output, Energy Digit Reset Count will reset the energy.

TABLE 6 : Measurement Screens (Model wise)

Screen No.	Parameters	EM 1320	EM 1330	EM 1340	EM 2340
1	Sys Power / Voltage / Current	×	√	√	√
2	L-N Voltage	×	√	√	√
3	L-L Voltage	×	√	√	√
4	Current	×	√	√	√
5	RPM / Frequency	×	√	√	√
6	Sys W / VA / Phase Angle	×	×	√	√
7	Sys VAr / PF	×	only PF	√	√
8	Active Energy Import / Utility	√	√	√	√
9	Active Energy Export / GEN	√	√	√	√
10	Capacitive / Utility Reactive Energy	×	×	√	√
11	Inductive / GEN Reactive Energy	×	×	√	√
12	Apparent Energy (Utility)	×	×	√	√
13	Apparent Energy GEN	×	×	×	√
14	Min Sys Voltage & Current	×	×	√	√
15	Max Sys Voltage & Current	×	×	√	√
16	R Phase W/ VA / Phase Angle	×	only W	√	√
17	Y Phase W/ VA / Phase Angle	×	only W	√	√
18	B Phase W/ VA / Phase Angle	×	only W	√	√
19	R Phase VAr / PF	×	only PF	√	√
20	Y Phase VAr / PF	×	only PF	√	√
21	B Phase VAr / PF	×	only PF	√	√
22	W IMP / VA / Current Demand (Utility / GEN)	×	×	√	√
23	Max W IMP / VA / Current Demand (Utility)	×	×	√	√
24	W EXP / VA / Current Demand	×	×	√	×
25	Max W EXP / VA / Current Demand (GEN)	×	×	√	√
26	Per Phase Voltage THD	×	×	√	√
27	Per Phase Current THD	×	×	√	√
28	Sys Voltage / Current THD	×	×	√	√
29	Run Hour (Utility)	×	√	√	√
30	On Hour (Utility)	×	√	√	√
31	Run Hour GEN	×	×	×	√
32	On Hour GEN	×	×	×	√
33	Total Run Hour	×	×	×	√
34	Total On Hour	×	×	×	√

TABLE 6 : Continued...

Screen No.	Parameters	EM 1320	EM 1330	EM 1340	EM 2340
35	No of Interruptions (Utility)	×	√	√	√
36	No of Interruptions GEN	×	×	×	√
37	I neutral	×	×	√	√
38	Old Active Energy Import / Utility	×	×	√	√
39	Old Active Energy Export / GEN	×	×	√	√
41	Old Capacitive / Utility Reactive Energy	×	×	√	√
42	Old Inductive / GEN Reactive Energy	×	×	√	√
43	Old Apparent Energy (Utility)	×	×	√	√
44	Old Apparent Energy GEN	×	×	×	√
45	Old Run Hour (Utility)	×	×	√	√
46	Old On Hour (Utility)	×	×	√	√
47	Old Run Hour GEN	×	×	×	√
48	Old On Hour GEN	×	×	×	√
49	Old Total Run Hour	×	×	×	√
50	Old Total On Hour	×	×	×	√
51	Old No of Interruptions (Utility)	×	×	√	√
52	Old No of Interruptions GEN	×	×	×	√
53	Current Reversal	√	√	√	√
54	Phase Rotation Error	√	√	√	√
55	Phase Absent	√	√	√	√

NOTE :
In 2340 model, when Generator is ON, all marked Utility Screens will toggle between reading and "Utility" message and when Generator is OFF, all marked Generator screens will toggle between reading and "Generator" message.

TABLE 7 : Parameters for Limit output

Para-meter No.	Parameter	3P 4W	3P 3W	1P 2W	Trip Point Set Range	100% Value
0	None	✓	✓	✓	——	——
1	Volts 1	✓	✓	✓	10 - 120 %	Vnom (L-N)
2	Volts 2	✓	✓	✗	10 - 120 %	Vnom (L-N)
3	Volts 3	✓	✓	✗	10 - 120 %	Vnom (L-N)
4	IL1	✓	✓	✓	10 - 120 %	Inom
5	IL2	✓	✓	✗	10 - 120 %	Inom
6	IL3	✓	✓	✗	10 - 120 %	Inom
7	W1	✓	✗	✓	10 - 120 %	Nom (3)
8	W2	✓	✗	✗	10 - 120 %	Nom (3)
9	W3	✓	✗	✗	10 - 120 %	Nom (3)
10	VA1	✓	✗	✓	10 - 120 %	Nom (3)
11	VA2	✓	✗	✗	10 - 120 %	Nom (3)
12	VA3	✓	✗	✗	10 - 120 %	Nom (3)
13	VAr1	✓	✗	✓	10 - 120 %	Nom (3)
14	VAr2	✓	✗	✗	10 - 120 %	Nom (3)
15	VAr3	✓	✗	✗	10 - 120 %	Nom (3)
16	PF1	✓	✗	✓	10 - 90 %	90°
17	PF2	✓	✗	✗	10 - 90 %	90°
18	PF3	✓	✗	✗	10 - 90 %	90°
19	Pa1	✓	✗	✓	10 - 90 %	360°
20	Pa2	✓	✗	✗	10 - 90 %	360°
21	Pa3	✓	✗	✗	10 - 90 %	360°

Para-meter No.	Parameter	3P 4W	3P 3W	1P 2W	Trip Point Set Range	100% Value
22	Volts Ave.	✓	✓	✗	10 - 120 %	Vnom (2)
24	Current Ave.	✓	✓	✗	10 - 120 %	Inom
27	Watts sum	✓	✓	✗	10 - 120 %	Nom (3)
29	VA sum	✓	✓	✗	10 - 120 %	Nom (3)
31	VAr sum	✓	✓	✗	10 - 120 %	Nom (3)
32	PF Ave.	✓	✓	✗	10 - 90 %	90°
34	PA Ave.	✓	✓	✗	10 - 90 %	360°
36	Freq.	✓	✓	✓	10 - 90 %	66 Hz (1)
43	Watt Demand Imp.	✓	✓	✓	10 - 120 %	Nom (3)
44	Watt Max Demand Imp.	✓	✓	✓	10 - 120 %	Nom (3)
45	Watt Demand Exp	✓	✓	✓	10 - 120 %	Nom (3)
46	Watt Demand Max Exp	✓	✓	✓	10 - 120 %	Nom (3)
51	VA Demand	✓	✓	✓	10 - 120 %	Nom (3)
52	VA Max Demand.	✓	✓	✓	10 - 120 %	Nom (3)
53	Current Demand.	✓	✓	✓	10 - 120 %	Inom
54	Current Max Demand.	✓	✓	✓	10 - 120 %	Inom
101	VL1-L2	✓	✗	✗	10 - 120 %	Vnom (L-L)
102	VL2-L3	✓	✗	✗	10 - 120 %	Vnom (L-L)
103	VL3-L1	✓	✗	✗	10 - 120 %	Vnom (L-L)
113	I Neutral	✓	✗	✗	10 - 120 %	Inom

Note : Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.

(1) For Frequency 0% corresponds to 45 Hz and 100% corresponds to 66 Hz.

(2) For 3P 4W and 1Ph the nominal value is V_{L-N} and that for 3P 3W is V_{L-L}.

(3) Nominal Value for power is calculated from Nominal Voltage and current values.

(4) Nominal Value is to be considered with set CT/ PT Primary values.

(5) For single phase L1 Phase values are to be considered as System values.

TABLE 8 : RS 485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
4800	NONE	01	0
4800	NONE	02	1
4800	EVEN	01	2
4800	ODD	01	3
9600	NONE	01	4
9600	NONE	02	5
9600	EVEN	01	6
9600	ODD	01	7
19200	NONE	01	8
19200	NONE	02	9
19200	EVEN	01	10
19200	ODD	01	11
38400	NONE	01	12
38400	NONE	02	13
38400	EVEN	01	14
38400	ODD	01	15

NOTE : Codes not listed in the table above may give rise to unpredictable results including loss of communication. Exercise caution when attempting to change mode via direct Modbus writes.

TABLE 9 : Pulse Configuration select

Code	Configuration
0	Active Energy Import / Utility
1	Active Energy Export / Gen
2	Capacitive / Utility Reactive Energy
3	Inductive / Gen Reactive Energy
4	Apparent Energy Utility
5	Apparent Energy Gen

TABLE 10:Limit 1 Configuration select

Code	Configuration
0	Hi- alarm & Energized relay
1	Hi- alarm & De-energized relay
2	Lo- alarm & Energized relay
3	Lo- alarm & De-energized relay

TABLE 11: PT Secondary Ranges

Input Voltage	PT Secondary Settable Range
110V L-L (63.5V L-N)	100V – 125V L-L (57V – 72V L-N)
230V L-L (133V L-N)	126V – 250V L-L (73V – 144V L-N)
415V L-L (239.6V L-N)	251V – 480V L-L (145V – 277V L-N)

3.4 User Assignable Modbus Registers:

The Multifunction Energy Meter contains 20 user assignable registers in the address range of 0x200 (30513) to 0x226 (30551) for 3X registers (**see TABLE 12**) and address range of 0x1E00 (47681) to 0x1E26 (47719) for 4X registers (**see TABLE 13**).

Any of the parameter addresses (3X register addresses **TABLE 1** and 4X register addresses **TABLE 3**) accessible in the instrument can be mapped to these 20 user assignable registers.

Parameters (3X and 4X registers addresses) that reside in different locations may be accessed by the single request by re-mapping them to adjacent address in the user assignable registers area.

The actual address of the parameters (3X and 4X registers addresses) which are to be accessed via address 0x200 to 0x226 (or 0x1E00 to 0x1E26) are specified in 4X Register 0x200 to 0x213.

(**see TABLE 14**)

TABLE 12 : User Assignable 3X Data Registers

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
30513	Assignable Reg 1	02	00
30515	Assignable Reg 2	02	02
30517	Assignable Reg 3	02	04
30519	Assignable Reg 4	02	06
30521	Assignable Reg 5	02	08
30523	Assignable Reg 6	02	0A
30525	Assignable Reg 7	02	0C
30527	Assignable Reg 8	02	0E
30529	Assignable Reg 9	02	10
30531	Assignable Reg 10	02	12
30533	Assignable Reg 11	02	14
30535	Assignable Reg 12	02	16
30537	Assignable Reg 13	02	18
30539	Assignable Reg 14	02	1A
30541	Assignable Reg 15	02	1C
30543	Assignable Reg 16	02	1E
30545	Assignable Reg 17	02	20
30547	Assignable Reg 18	02	22
30549	Assignable Reg 19	02	24
30551	Assignable Reg 20	02	26

TABLE 13 : User Assignable 4X Data Registers

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
47681	Assignable Reg 1	1E	00
47683	Assignable Reg 2	1E	02
47685	Assignable Reg 3	1E	04

TABLE 13 : Continued...

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
47687	Assignable Reg 4	1E	06
47689	Assignable Reg 5	1E	08
47691	Assignable Reg 6	1E	0A
47693	Assignable Reg 7	1E	0C
47695	Assignable Reg 8	1E	0E
47697	Assignable Reg 9	1E	10
47699	Assignable Reg 10	1E	12
47701	Assignable Reg 11	1E	14
47703	Assignable Reg 12	1E	16
47705	Assignable Reg 13	1E	18
47707	Assignable Reg 14	1E	1A
47709	Assignable Reg 15	1E	1C
47711	Assignable Reg 16	1E	1E
47713	Assignable Reg 17	1E	20
47715	Assignable Reg 18	1E	22
47717	Assignable Reg 19	1E	24
47719	Assignable Reg 20	1E	26

TABLE 14 : User Assignable mapping register (4X registers)

Address (Register)	Mapping Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
40513	Mapped Add for register #0x0200	02	00
40514	Mapped Add for register #0x0202	02	01
40515	Mapped Add for register #0x0204	02	02

TABLE 14 : Continued...

40516	Mapped Add for register #0x0206	02	03
40517	Mapped Add for register #0x0208	02	04
40518	Mapped Add for register #0x020A	02	05
40519	Mapped Add for register #0x020C	02	06
40520	Mapped Add for register #0x020E	02	07
40521	Mapped Add for register #0x0210	02	08
40522	Mapped Add for register #0x0212	02	09
40523	Mapped Add for register #0x0214	02	0A
40524	Mapped Add for register #0x0216	02	0B
40525	Mapped Add for register #0x0218	02	0C
40526	Mapped Add for register #0x021A	02	0D
40527	Mapped Add for register #0x021C	02	0E
40528	Mapped Add for register #0x021E	02	0F
40529	Mapped Add for register #0x0220	02	10
40530	Mapped Add for register #0x0222	02	11
40531	Mapped Add for register #0x0224	02	12
40532	Mapped Add for register #0x0226	02	13

Assigning parameter to User Assignable Registers:
To access the voltage2 (3X address 0x0002) and Power Factor1 (3X address 0x001E) through user assignable register assign these addresses to 4x register (**TABLE 14**) 0x0200 and 0x0201 respectively .

Assigning Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	02 (Hex)
Starting Address Lo	00 (Hex)
Number of Registers Hi	00 (Hex)*
Number of Registers Lo	02(Hex)*
Byte Count	04 (Hex)

Data Register-1High Byte	00 (Hex)	Voltage 2 * (3X Address 0x0002)
Data Register-1 Low Byte	02 (Hex)	
Data Register-2 High Byte	00 (Hex)	Power Factor 1 *(3X Address 0x001E)
Data Register-2 Low Byte	1E (Hex)	
CRC Low	CB (Hex)	
CRC High	07 (Hex)	

* Note : Parameters should be assigned in Multiple of two i.e. 2,4,6,8.....20.

Response :

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	02 (Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	40 (Hex)
CRC High	70 (Hex)

Reading Parameter data through User Assignable Registers:

In assigning query Voltage 2 & Power Factor 1 parameters were assigned to 0x 200 & 0x201 (**TABLE 14**) which will point to user assignable 3x registers 0x200 and 0x202 (**TABLE 12**). So to read Voltage2 and Power Factor1 data reading query should be as below.

Query:

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	02 (Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	04 (Hex)**
CRC Low	F0 (Hex)
CRC High	71 (Hex)

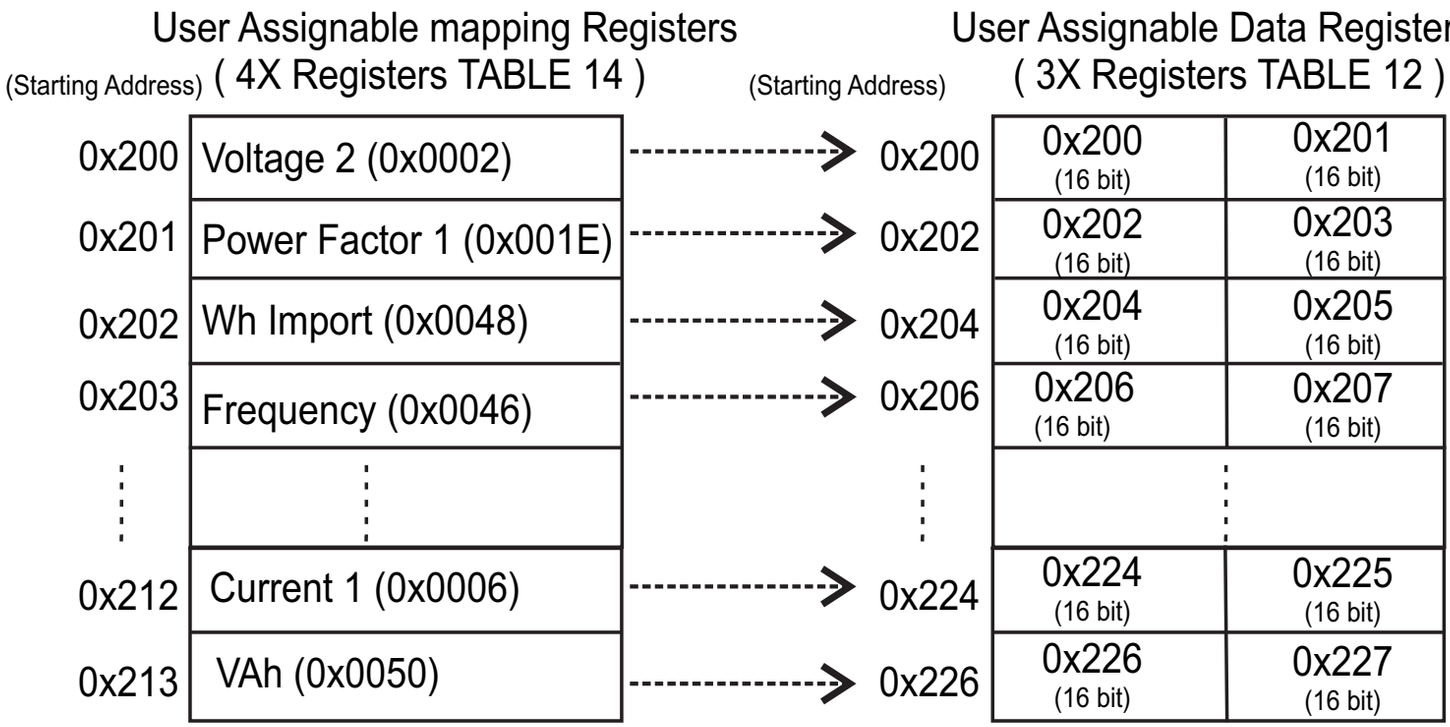
Start Address High : Most significant 8 bits of starting address of User assignable register.
Start Address low :Least significant 8 bits of starting address of User assignable register.

Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.

****Note : Two consecutive 16 bit register represent one parameter.**
Since two parameters are requested four registers are required

Response : (Volt2 = 219.30 / Power Factor1 = 1.0)

Device Address	01 (Hex)	
Function Code	04 (Hex)	
Byte count	08 (Hex)	
Data Register-1High Byte	43 (Hex)	**Voltage 2 Data**
Data Register-1 Low Byte	5B (Hex)	
Data Register-2 High Byte	4E (Hex)	
Data Register-2 Low Byte	04 (Hex)	
Data Register-3 High Byte	3F (Hex)	**Power Factor 1Data**
Data Register-3 Low Byte	80 (Hex)	
Data Register-4 High Byte	00 (Hex)	
Data Register-4 Low Byte	00 (Hex)	
CRC Low	79 (Hex)	
CRC High	3F (Hex)	

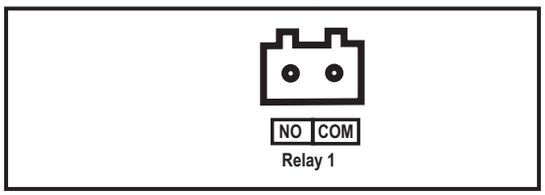


To get the data through User Assignable Register go through the following steps:

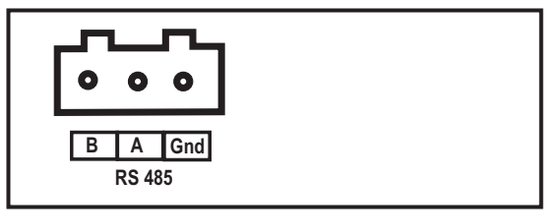
1) Assign starting addresses(**TABLE 1**) of parameters of interest to "User assignable mapping registers" in a sequence in which they are to be accessed (see section "**Assigning Parameter to User Assignable Registers"**).
2) Once the parameters are mapped, data can be acquired by using "User assignable data register" Starting address . i.e to access data of Voltage2, Power factor1,Wh import, Frequency send query with starting address 0x200 with number of register 8 or individually parameters can be accessed. For example, if current1 is to be accessed use starting address 0x212. (See section **Reading Parameter data through User Assignable Registers).**

4. Connection for Optional Pulse Output / RS 485 (rear view of Multifunction Meter):

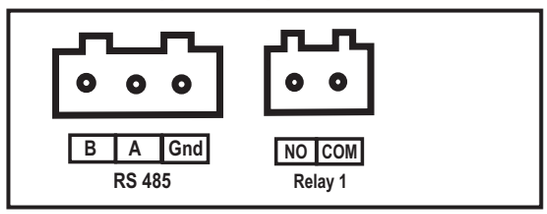
1. One Pulse Output (Limit Output)



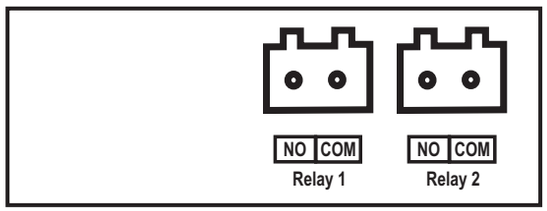
2. RS 485 Output



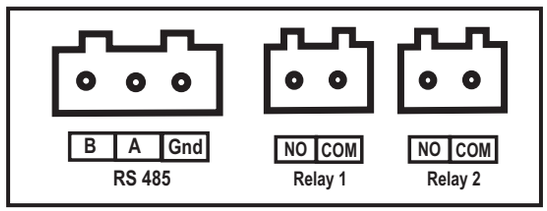
3. One Pulse (Limit) + RS 485 Output



4. Two Pulse / Limit Output



5. Two Pulse/ Limit + RS 485 Output



NOTE

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, 'manufacturer' has no control over the field conditions which influence product installation.

It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. 'manufacturer' only obligations are responsibility to determine the suitability of the installation method in the user's field conditions. 'manufacturer' only obligations are those in 'manufacturer' standard Conditions of Sale for this product and in no case will 'manufacturer' be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.