

# Interface Definition

## EC43XX / ER43XX





# DIGITAL ENERGY METER

## Installation & Operating Instructions

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# 1. INTRODUCTION

The Energy Meter is a DIN Rail mounted Quadratic Digital 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.

The PT Primary, PT Secondary, CT Primary, CT Secondary and System Type can be configured & Programmed at the site only in first 15 minutes after entering into setup menu and get locked as per MID standard & if still need to change, user have to press reset key for 3 second & then it allows user for next 15 minutes to edit the same.

The front panel has four push buttons using which the user can scroll through different screens & 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 Meter for electrical variable through MODBUS over RS485.

## 2. Communication Parameter Selection Screen

### 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.**

Press "▲" key to advance to "RS 485 Baud Rate" screen (see Section 2.2)



Press "◀" to enter into edit mode, prompt for first digit. (Flashing digit indicates cursor position).

Press the "▲" and "▼" keys 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, pressing "◀" key confirms the selection and shows "Address Setting" screen (see Section 2.1).

### 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 "RS 485 Parity Selection" screen (see Section 2.3) and pressing the "▼" key accepts the present value and advance to the "Address Setting" screen (see Section 2.1).

Pressing the "◀" key advances to the "Baud Rate Edit" mode and "▲" & "▼" keys scrolls the value through 4.8, 9.6, 19.2, 38.4 and 57.6 kbaud.

Pressing the "◀" key sets the value and shows the "RS 485 Baud Rate" screen (see Section 2.2).

## 2.3 RS 485 Parity

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



pressing "▼" key accepts the present value and advances to "RS 485 Baud Rate" screen (see section 2.2).

Pressing the "◀▶" key advances to the "Parity & Stop bit Edit" mode & keys "▲" and "▼" scrolls the value through:

**non1** : no parity with one stop bit      **non2** : no parity with two stop bit  
**EVEn** : even parity with one stop bit      **odd** : odd parity with one stop bit

Pressing "◀▶" key sets the value and advances to "RS 485 Parity Selection" screen (see Section 2.3).

## 3. RS 485 ( ModBus ) Output :

The 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 a Meter is 300 ms 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 300ms of time to elapse before assuming that the Meter is not going to respond. If slave does not respond within 300 ms, Master can ignore the previous query and can issue fresh query to the slave.

Each byte in RTU mode has following format:

|                             |                                                                                                                                                      |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | 8-bit binary, hexadecimal 0-9, A-F<br>2 hexadecimal characters contained in each 8-bit field of the message                                          |
| <b>Format of Data Bytes</b> | 4 bytes (32 bits) per parameter.<br>Floating point format ( to IEEE 754)<br>Most significant byte first (Alternative least significant byte first)   |
| <b>Error Checking Bytes</b> | 2 byte Cyclical Redundancy Check (CRC)                                                                                                               |
| <b>Byte format</b>          | 1 start bit,<br>8 data bits, least significant bit sent first<br>1 bit for even/odd parity<br>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 4800,9600,19200,38400,57600 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 3X and 4X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 1** for the addresses of 3X and 4X registers used for parameters measured by the instrument. Each parameter is held in the 3X as well as 4X registers. Modbus Code 04 and 03 are used to access all parameters in 3X and 4X registers respectively.

**Example :**

To read parameter,

Voltage2 from 3X: Start address= 00 02      Number of registers = 02

Watt2 from 4X: Start address= 00 0E      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 for 3X read:**

|                |               |                    |                   |                        |                        |         |          |
|----------------|---------------|--------------------|-------------------|------------------------|------------------------|---------|----------|
| 01 (Hex)       | 04 (Hex)      | 00 (Hex)           | 02(Hex)           | 00 (Hex)               | 02(Hex)                | D0(Hex) | 0B (Hex) |
| Device Address | Function Code | Start Address High | Start Address Low | Number of Registers Hi | Number of Registers Lo | CRC Low | CRC High |

**3X Response: Voltage 2 (219.254V)**

|                |               |            |                          |                         |                          |                         |          |          |
|----------------|---------------|------------|--------------------------|-------------------------|--------------------------|-------------------------|----------|----------|
| 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.

**Query for 4X read:**

|                |               |                    |                   |                        |                        |         |          |
|----------------|---------------|--------------------|-------------------|------------------------|------------------------|---------|----------|
| 01 (Hex)       | 03 (Hex)      | 00 (Hex)           | 0E(Hex)           | 00 (Hex)               | 02(Hex)                | A5(Hex) | C8(Hex)  |
| Device Address | Function Code | Start Address High | Start Address Low | Number of Registers Hi | Number of Registers Lo | CRC Low | CRC High |

**4X Response: Watt2 (2000 W)**

|                |               |            |                          |                         |                          |                         |          |          |
|----------------|---------------|------------|--------------------------|-------------------------|--------------------------|-------------------------|----------|----------|
| 01 (Hex)       | 03 (Hex)      | 04 (Hex)   | 44 (Hex)                 | FA (Hex)                | 00 (Hex)                 | 00 (Hex)                | CE (Hex) | F2 (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 : No. of Bytes Demanded by user in query.

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.

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 and 4 X register addresses for measured parameters****TABLE 1.1 : 3 X and 4 X register addresses for Regular Parameters**

| Address<br>(3X) | Address<br>(4X) | Parameter<br>Number | Parameters                        | Units | Start Address Hex 3X |          | Start Address Hex 4X |          |
|-----------------|-----------------|---------------------|-----------------------------------|-------|----------------------|----------|----------------------|----------|
|                 |                 |                     |                                   |       | High Byte            | Low Byte | High Byte            | Low Byte |
| 30001           | 40001           | 1                   | Voltage L1 (Voltage L12 for 3P3W) | Volts | 00                   | 00       | 00                   | 00       |
| 30003           | 40003           | 2                   | Voltage L2 (Voltage L23 for 3P3W) | Volts | 00                   | 02       | 00                   | 02       |
| 30005           | 40005           | 3                   | Voltage L3 (Voltage L31 for 3P3W) | Volts | 00                   | 04       | 00                   | 04       |
| 30007           | 40007           | 4                   | Current L1                        | Amp   | 00                   | 06       | 00                   | 06       |
| 30009           | 40009           | 5                   | Current L2                        | Amp   | 00                   | 08       | 00                   | 08       |
| 30011           | 40011           | 6                   | Current L3                        | Amp   | 00                   | 0A       | 00                   | 0A       |
| 30013           | 40013           | 7                   | Watt L1                           | Watt  | 00                   | 0C       | 00                   | 0C       |
| 30015           | 40015           | 8                   | Watt L2                           | Watt  | 00                   | 0E       | 00                   | 0E       |
| 30017           | 40017           | 9                   | Watt L3                           | Watt  | 00                   | 10       | 00                   | 10       |
| 30019           | 40019           | 10                  | VA L1                             | VA    | 00                   | 12       | 00                   | 12       |
| 30021           | 40021           | 11                  | VA L2                             | VA    | 00                   | 14       | 00                   | 14       |
| 30023           | 40023           | 12                  | VA L3                             | VA    | 00                   | 16       | 00                   | 16       |
| 30025           | 40025           | 13                  | VAR L1                            | VAR   | 00                   | 18       | 00                   | 18       |
| 30027           | 40027           | 14                  | VAR L2                            | VAR   | 00                   | 1A       | 00                   | 1A       |
| 30029           | 40029           | 15                  | VAR L3                            | VAR   | 00                   | 1C       | 00                   | 1C       |
| 30031           | 40031           | 16                  | Power Factor L1                   | -     | 00                   | 1E       | 00                   | 1E       |
| 30033           | 40033           | 17                  | Power Factor L2                   | -     | 00                   | 20       | 00                   | 20       |
| 30035           | 40035           | 18                  | Power Factor L3                   | -     | 00                   | 22       | 00                   | 22       |
| 30037           | 40037           | 19                  | Phase Angle L1                    | Deg   | 00                   | 24       | 00                   | 24       |
| 30039           | 40039           | 20                  | Phase Angle L2                    | Deg   | 00                   | 26       | 00                   | 26       |
| 30041           | 40041           | 21                  | Phase Angle L3                    | Deg   | 00                   | 28       | 00                   | 28       |
| 30043           | 40043           | 22                  | Voltage Avg                       | Volts | 00                   | 2A       | 00                   | 2A       |
| 30045           | 40045           | 23                  | Voltage Sum                       | Volts | 00                   | 2C       | 00                   | 2C       |
| 30047           | 40047           | 24                  | Current Avg                       | Amp   | 00                   | 2E       | 00                   | 2E       |
| 30049           | 40049           | 25                  | Current Sum                       | Amp   | 00                   | 30       | 00                   | 30       |
| 30051           | 40051           | 26                  | Watt Avg                          | 00    | 00                   | 32       | 00                   | 32       |
| 30053           | 40053           | 27                  | Watt Sum                          | Watt  | 00                   | 34       | 00                   | 34       |
| 30055           | 40055           | 28                  | VA Avg                            | VA    | 00                   | 36       | 00                   | 36       |
| 30057           | 40057           | 29                  | VA Sum                            | VA    | 00                   | 38       | 00                   | 38       |

**TABLE 1.1 Continued...**

| Address<br>(3X) | Address<br>(4X) | Parameter<br>Number | Parameters           | UnitsParam<br>eters | Start Address Hex 3X |          | Start Address Hex 4X |          |
|-----------------|-----------------|---------------------|----------------------|---------------------|----------------------|----------|----------------------|----------|
|                 |                 |                     |                      |                     | High Byte            | Low Byte | High Byte            | Low Byte |
| 30059           | 40059           | 30                  | VAR Avg              | VAR                 | 00                   | 3A       | 00                   | 3A       |
| 30061           | 40061           | 31                  | VAR Sum              | VAR                 | 00                   | 3C       | 00                   | 3C       |
| 30063           | 40063           | 32                  | PF Avg               | -                   | 00                   | 3E       | 00                   | 3E       |
| 30065           | 40065           | 33                  | PF Sum               | -                   | 00                   | 40       | 00                   | 40       |
| 30067           | 40067           | 34                  | Phase Angle Avg      | Deg                 | 00                   | 42       | 00                   | 42       |
| 30069           | 40069           | 35                  | Phase Angle Sum      | Deg                 | 00                   | 44       | 00                   | 44       |
| 30071           | 40071           | 36                  | Freq                 | Hz                  | 00                   | 46       | 00                   | 46       |
| 30073           | 40073           | 37                  | Wh import            | kWh                 | 00                   | 48       | 00                   | 48       |
| 30075           | 40075           | 38                  | Wh export            | kWh                 | 00                   | 4A       | 00                   | 4A       |
| 30077           | 40077           | 39                  | VARh import          | kVARh               | 00                   | 4C       | 00                   | 4C       |
| 30079           | 40079           | 40                  | VARh export          | kVAh                | 00                   | 4E       | 00                   | 4E       |
| 30081           | 40081           | 41                  | VAh                  | kVAh                | 00                   | 50       | 00                   | 50       |
| 30085           | 40085           | 43                  | W imp demand         | W                   | 00                   | 54       | 00                   | 54       |
| 30087           | 40087           | 44                  | Max W imp demand     | W                   | 00                   | 56       | 00                   | 56       |
| 30089           | 40089           | 45                  | W exp demand         | W                   | 00                   | 58       | 00                   | 58       |
| 30091           | 40091           | 46                  | Max W exp demand     | W                   | 00                   | 5A       | 00                   | 5A       |
| 30093           | 40093           | 47                  | VAR Imp. demand      | VAR                 | 00                   | 5C       | 00                   | 5C       |
| 30095           | 40095           | 48                  | max kVAR Imp. demand | VAR                 | 00                   | 5E       | 00                   | 5E       |
| 30097           | 40097           | 49                  | VAR Exp. demand      | VAR                 | 00                   | 60       | 00                   | 60       |
| 30099           | 40099           | 50                  | Max VAR Exp. demand  | VAR                 | 00                   | 62       | 00                   | 62       |
| 30101           | 40101           | 51                  | VA demand            | VA                  | 00                   | 64       | 00                   | 64       |
| 30103           | 40103           | 52                  | max VA demand        | VA                  | 00                   | 66       | 00                   | 66       |
| 30105           | 40105           | 53                  | current demand       | Amp                 | 00                   | 68       | 00                   | 68       |
| 30107           | 40107           | 54                  | Max current demand   | Amp                 | 00                   | 6A       | 00                   | 6A       |
| 30111           | 40111           | 56                  | Wh Import            | kWh                 | 00                   | 6E       | 00                   | 6E       |
| 30115           | 40115           | 58                  | Wh export            | kWh                 | 00                   | 72       | 00                   | 72       |
| 30119           | 40119           | 60                  | VARh Import          | kVARh               | 00                   | 76       | 00                   | 76       |

**TABLE 1.1 Continued...**

| Address<br>(3X) | Address<br>(4X) | Para.<br>No. | Parameters            | Units | Start Address Hex 3X |          | Start Address Hex 4X |          |
|-----------------|-----------------|--------------|-----------------------|-------|----------------------|----------|----------------------|----------|
|                 |                 |              |                       |       | High Byte            | Low Byte | High Byte            | Low Byte |
| 30123           | 40123           | 62           | VARh Export           | kVArh | 00                   | 7A       | 00                   | 7A       |
| 30127           | 40127           | 64           | VAh                   | kVAh  | 00                   | 7E       | 00                   | 7E       |
| 30133           | 40133           | 67           | System Voltage Max    | Volts | 00                   | 84       | 00                   | 84       |
| 30135           | 40135           | 68           | System Voltage Min    | Volts | 00                   | 86       | 00                   | 86       |
| 30139           | 40139           | 70           | Impulse Rate          | -     | 00                   | 8A       | 00                   | 8A       |
| 30141           | 40141           | 71           | System Current Max    | Amp   | 00                   | 8C       | 00                   | 8C       |
| 30143           | 40143           | 72           | System Current Min    | Amp   | 00                   | 8E       | 00                   | 8E       |
| 30145           | 40145           | 73           | Wh Import Resetable   | kWh   | 00                   | 90       | 00                   | 90       |
| 30147           | 40147           | 74           | Wh export Resetable   | kWh   | 00                   | 92       | 00                   | 92       |
| 30149           | 40149           | 75           | VARh import Resetable | kVArh | 00                   | 94       | 00                   | 94       |
| 30151           | 40151           | 76           | VARh export Resetable | kVArh | 00                   | 96       | 00                   | 96       |
| 30153           | 40153           | 77           | Wh Total Resetable    | kWh   | 00                   | .98      | 00                   | .98      |
| 30155           | 40155           | 78           | VARh Total Resetable  | kVArh | 00                   | 9A       | 00                   | 9A       |
| 30201           | 40201           | 84           | V12                   | Volts | 00                   | C8       | 00                   | C8       |
| 30203           | 40203           | 85           | V23                   | Volts | 00                   | CA       | 00                   | CA       |
| 30205           | 40205           | 86           | V31                   | Volts | 00                   | CC       | 00                   | CC       |
| 30207           | 40207           | 87           | VTHD-R                | %THD  | 00                   | CE       | 00                   | CE       |
| 30209           | 40209           | 88           | VTHD-Y                | %THD  | 00                   | D0       | 00                   | D0       |
| 30211           | 40211           | 89           | VTHD-B                | %THD  | 00                   | D2       | 00                   | D2       |
| 30213           | 40213           | 90           | I THD-R               | %THD  | 00                   | D4       | 00                   | D4       |
| 30215           | 40215           | 91           | I THD-Y               | %THD  | 00                   | D6       | 00                   | D6       |
| 30217           | 40217           | 92           | I THD -B              | %THD  | 00                   | D8       | 00                   | D8       |
| 30219           | 40219           | 93           | System V-THD          | %THD  | 00                   | DA       | 00                   | DA       |

**Note :** Resetable energy is partial energy.

TABLE 1.1 Continued...

| Address (3X) | Address (4X) | Parameter Number | Parameters                  | Units | Start Address Hex 3X |          | Start Address Hex 4X |          |
|--------------|--------------|------------------|-----------------------------|-------|----------------------|----------|----------------------|----------|
|              |              |                  |                             |       | High Byte            | Low Byte | High Byte            | Low Byte |
| 30221        | 40221        | 94               | System I-THD                | %THD  | 00                   | DC       | 00                   | DC       |
| 30225        | 40225        | 95               | Neutral Current (3P4W only) | Amp   | 00                   | E0       | 00                   | E0       |
| 30227        | 40227        | 96               | Run hour                    | Hr    | 00                   | E2       | 00                   | E2       |
| 30229        | 40229        | 97               | On Hour                     | Hr    | 00                   | E4       | 00                   | E4       |
| 30231        | 40231        | 98               | No. of interrupts           | -     | 00                   | E6       | 00                   | E6       |

TABLE 1.2 : 3 X and 4 X register addresses for Energies

| Address (3X) | Address (4X) | Para No. | Parameters                 | Units | Start Address Hex 3X |          | Start Address Hex 4X |          |
|--------------|--------------|----------|----------------------------|-------|----------------------|----------|----------------------|----------|
|              |              |          |                            |       | High Byte            | Low Byte | High Byte            | Low Byte |
| 31801        | 41801        | 1        | Sys Active Energy Import   | kWh   | 07                   | 08       | 07                   | 08       |
| 31803        | 41803        | 2        | Sys Active Energy Export   | kWh   | 07                   | 0A       | 07                   | 0A       |
| 31805        | 41805        | 3        | Sys Reactive Energy Import | kVArh | 07                   | 0C       | 07                   | 0C       |
| 31807        | 41807        | 4        | Sys Reactive Energy Export | kVArh | 07                   | 0E       | 07                   | 0E       |
| 31809        | 41809        | 5        | Sys Apparent Energy        | kVAh  | 07                   | 10       | 07                   | 10       |
| 31849        | 41849        | 13       | Sys Total Active Energy    | kWh   | 07                   | 38       | 07                   | 38       |
| 31851        | 41851        | 14       | Sys Total Reactive Energy  | kVArh | 07                   | 3A       | 07                   | 3A       |
| 31853        | 41853        | 15       | Sys Total Apparent Energy  | kVAh  | 07                   | 3C       | 07                   | 3C       |
| 31873        | 41873        | 19       | Active Energy Import L1    | kWh   | 07                   | 44       | 07                   | 44       |
| 31875        | 41875        | 27       | Active Energy Import L2    | kWh   | 07                   | 52       | 07                   | 52       |
| 31877        | 41877        | 28       | Active Energy Import L3    | kWh   | 07                   | 54       | 07                   | 54       |
| 31879        | 41879        | 29       | Active Energy Export L1    | kWh   | 07                   | 56       | 07                   | 56       |
| 31881        | 41881        | 30       | Active Energy Export L2    | kWh   | 07                   | 58       | 07                   | 58       |
| 31883        | 41883        | 31       | Active Energy Export L3    | kWh   | 07                   | 5A       | 07                   | 5A       |
| 31885        | 41885        | 32       | Reactive Energy Import L1  | kVArh | 07                   | 5C       | 07                   | 5C       |
| 31887        | 41887        | 33       | Reactive Energy Import L2  | kVArh | 07                   | 5E       | 07                   | 5E       |
| 31889        | 41889        | 34       | Reactive Energy Import L3  | kVArh | 07                   | 60       | 07                   | 60       |

**TABLE 1.2 Continued...**

| Address<br>(3X) | Address<br>(4X) | Para<br>No. | Parameters                | Parameter | Start Address Hex3X |          | Start Address Hex4X |          |
|-----------------|-----------------|-------------|---------------------------|-----------|---------------------|----------|---------------------|----------|
|                 |                 |             |                           |           | High Byte           | Low Byte | High Byte           | Low byte |
| 31891           | 41891           | 35          | Reactive Energy ExportL1  | kVArh     | 07                  | 62       | 07                  | 62       |
| 31893           | 41893           | 36          | Reactive Energy ExportL2  | kVArh     | 07                  | 64       | 07                  | 64       |
| 31895           | 41895           | 37          | Reactive Energy Export L3 | kVArh     | 07                  | 66       | 07                  | 66       |
| 31897           | 41897           | 38          | Apparent Energy L1        | kVAh      | 07                  | 68       | 07                  | 68       |
| 31899           | 41899           | 39          | Apparent Energy L2        | kVAh      | 07                  | 6A       | 07                  | 6A       |
| 31901           | 41901           | 40          | Apparent Energy L3        | kVAh      | 07                  | 6C       | 07                  | 6C       |
| 31909           | 41909           | 41          | Total Active Energy L1    | kWh       | 07                  | 74       | 07                  | 74       |
| 31911           | 41911           | 42          | Total Active Energy L2    | kWh       | 07                  | 76       | 07                  | 76       |
| 31913           | 41913           | 43          | Total Active Energy L3    | kWh       | 07                  | 78       | 07                  | 78       |
| 31915           | 41915           | 44          | Total Reactive Energy L1  | kVArh     | 07                  | 7A       | 07                  | 7A       |
| 31917           | 41917           | 45          | Total Reactive Energy L2  | kVArh     | 07                  | 7C       | 07                  | 7C       |
| 31919           | 41919           | 46          | Total Reactive Energy L3  | kVArh     | 07                  | 7E       | 07                  | 7E       |
| 31921           | 41921           | 47          | Total Apparent Energy L1  | kVAh      | 07                  | 80       | 07                  | 80       |
| 31923           | 41923           | 48          | Total Apparent Energy L2  | kVAh      | 07                  | 82       | 07                  | 82       |
| 31925           | 41925           | 49          | Total Apparent Energy L3  | kVAh      | 07                  | 84       | 07                  | 84       |

**TABLE 1.3 : 3 X and 4 X register addresses for Tariff Energies**

| Address<br>(3X) | Address<br>(4X) | Parameter<br>Number | Parameters                   | Units | Start Address Hex 3X |          | Start Address Hex 4X |          |
|-----------------|-----------------|---------------------|------------------------------|-------|----------------------|----------|----------------------|----------|
|                 |                 |                     |                              |       | High Byte            | Low Byte | High Byte            | Low Byte |
| 34001           | 44001           | 1                   | Tariff 1 Total KWh Energy    | Kwh   | 0F                   | A0       | 0F                   | A0       |
| 34003           | 44003           | 2                   | Tariff 1 Import KWh Energy   | Kwh   | 0F                   | A2       | 0F                   | A2       |
| 34005           | 44005           | 3                   | Tariff 1 Export KWh Energy   | Kwh   | 0F                   | A4       | 0F                   | A4       |
| 34007           | 44007           | 4                   | Tariff 1 Total KVArh Energy  | KVArh | 0F                   | A6       | 0F                   | A6       |
| 34009           | 44009           | 5                   | Tariff 1 Import KVArh Energy | KVArh | 0F                   | A8       | 0F                   | A8       |
| 34011           | 44011           | 6                   | Tariff 1 Export KVArh Energy | KVArh | 0F                   | AA       | 0F                   | AA       |
| 34025           | 44025           | 13                  | Tariff 2 Total KWh Energy    | Kwh   | 0F                   | B8       | 0F                   | B8       |
| 34027           | 44027           | 14                  | Tariff 2 Import KWh Energy   | Kwh   | 0F                   | BA       | 0F                   | BA       |
| 34029           | 44029           | 15                  | Tariff 2 Export KWh Energy   | Kwh   | 0F                   | BC       | 0F                   | BC       |
| 34031           | 44031           | 16                  | Tariff 2 Total KVAr Energy   | KVAr  | 0F                   | BE       | 0F                   | BE       |
| 34033           | 44033           | 17                  | Tariff 2 Import KVAr Energy  | KVAr  | 0F                   | C0       | 0F                   | C0       |
| 34035           | 44035           | 18                  | Tariff 2 Export KVAr Energy  | KVAr  | 0F                   | C2       | 0F                   | C2       |

**TABLE 2 : 3X and 4X register addresses for 32-bit Integer Energy**

| Address (3X) | Address (4X) | Para No. | Parameters                            | Units | Start Address Hex 3X |         | Start Address Hex 4X |         |
|--------------|--------------|----------|---------------------------------------|-------|----------------------|---------|----------------------|---------|
|              |              |          |                                       |       | Hi Byte              | Lo Byte | Hi Byte              | Lo Byte |
| 30801        | 40801        | 1        | Sys Active Energy Import              | kWh   | 03                   | 20      | 03                   | 20      |
| 30803        | 40803        | 2        | Sys Active Energy Export              | kWh   | 03                   | 22      | 03                   | 22      |
| 30805        | 40805        | 3        | Sys Reactive Energy Export            | kVArh | 03                   | 24      | 03                   | 24      |
| 30807        | 40807        | 4        | Sys Reactive Energy Import            | kVArh | 03                   | 26      | 03                   | 26      |
| 30809        | 40809        | 5        | Sys Apparent Energy                   | kVAh  | 03                   | 28      | 03                   | 28      |
| 30825        | 40825        | 14       | Sys Active Energy Import Resettable   | kWh   | 03                   | 38      | 03                   | 38      |
| 30827        | 40827        | 15       | Sys Active Energy Export Resettable   | kWh   | 03                   | 3A      | 03                   | 3A      |
| 30829        | 40829        | 16       | Sys Reactive Energy Import Resettable | kVArh | 03                   | 3C      | 03                   | 3C      |
| 30831        | 40831        | 17       | Sys Reactive Energy Export Resettable | kVArh | 03                   | 3E      | 03                   | 3E      |
| 30833        | 40833        | 19       | Sys Apparent Energy Resettable        | kVAh  | 03                   | 40      | 03                   | 40      |
| 30835        | 40835        | 20       | Sys Apparent Energy Resettable        | kVAh  | 03                   | 42      | 03                   | 42      |
| 30849        | 40849        | 26       | Sys Total Active Energy               | kWh   | 03                   | 50      | 03                   | 50      |
| 30851        | 40851        | 27       | Sys Total Reactive Energy             | kVArh | 03                   | 52      | 03                   | 52      |
| 30853        | 40853        | 28       | Sys Total Apparent Energy             | kVArh | 03                   | 54      | 03                   | 54      |
| 30861        | 40861        | 32       | Sys Total Active Energy Resettable    | kWh   | 03                   | 5C      | 03                   | 5C      |
| 30863        | 30863        | 33       | Sys Total Reactive Energy Resettable  | kVArh | 03                   | 5E      | 03                   | 5E      |
| 30865        | 30865        | 34       | Sys Total Apparent Energy Resettable  | kVAh  | 03                   | 60      | 03                   | 60      |
| 30873        | 40873        | 38       | Active Energy Import L1               | kWh   | 03                   | 68      | 03                   | 68      |
| 30875        | 40875        | 39       | Active Energy Import L2               | kWh   | 03                   | 6A      | 03                   | 6A      |
| 30877        | 40877        | 40       | Active Energy Import L3               | kWh   | 03                   | 6C      | 03                   | 6C      |
| 30879        | 40879        | 41       | Active Energy Export L1               | kWh   | 03                   | 6E      | 03                   | 6E      |
| 30881        | 40881        | 42       | Active Energy Export L2               | kWh   | 03                   | 70      | 03                   | 70      |
| 30883        | 40883        | 43       | Active Energy Export L3               | kWh   | 03                   | 72      | 03                   | 72      |
| 30885        | 40885        | 44       | Reactive Energy Import L1             | kVArh | 03                   | 74      | 03                   | 74      |
| 30887        | 40887        | 45       | Reactive Energy Import L2             | kVArh | 03                   | 76      | 03                   | 76      |
| 30889        | 40889        | 46       | Reactive Energy Import L3             | kVArh | 03                   | 78      | 03                   | 78      |
| 30891        | 40891        | 47       | Reactive Energy Export L1             | kVArh | 03                   | 7A      | 03                   | 7A      |
| 30893        | 40893        | 48       | Reactive Energy Export L2             | kVArh | 03                   | 7C      | 03                   | 7C      |
| 30895        | 40895        | 49       | Reactive Energy Export L3             | kVArh | 03                   | 7E      | 03                   | 7E      |
| 30897        | 40897        | 50       | Apparent Energy L1                    | kVAh  | 03                   | 80      | 03                   | 80      |

**TABLE 2 Continued...**

| Address (3X) | Address (4X) | Para No. | Parameters               | Units | Start Address Hex 3X |         | Start Address Hex 4X |         |
|--------------|--------------|----------|--------------------------|-------|----------------------|---------|----------------------|---------|
|              |              |          |                          |       | Hi Byte              | Lo Byte | Hi Byte              | Lo Byte |
| 30899        | 40899        | 51       | Apparent Energy L2       | kVAh  | 03                   | 82      | 03                   | 82      |
| 30901        | 40901        | 52       | Apparent Energy L3       | kVAh  | 03                   | 84      | 03                   | 84      |
| 30909        | 40909        | 53       | Total Active Energy L1   | kWh   | 03                   | 8C      | 03                   | 8C      |
| 30911        | 40911        | 54       | Total Active Energy L2   | kWh   | 03                   | 8E      | 03                   | 8E      |
| 30913        | 40913        | 55       | Total Active Energy L3   | kWh   | 03                   | 90      | 03                   | 90      |
| 30915        | 40915        | 56       | Total Reactive Energy L1 | kVArh | 03                   | 92      | 03                   | 92      |
| 30917        | 40917        | 57       | Total Reactive Energy L2 | kVArh | 03                   | 94      | 03                   | 94      |
| 30919        | 40919        | 58       | Total Reactive Energy L3 | kVArh | 03                   | 96      | 03                   | 96      |
| 30921        | 40921        | 59       | Total Apparent Energy L1 | kVAh  | 03                   | 98      | 03                   | 98      |
| 30923        | 40923        | 60       | Total Apparent Energy L2 | kVAh  | 03                   | 9A      | 03                   | 9A      |
| 30925        | 40925        | 61       | Total Apparent Energy L3 | kVAh  | 03                   | 9C      | 03                   | 9C      |
| 31105        | 41105        | 86       | Run Hour                 | Hr    | 04                   | 50      | 04                   | 50      |
| 31107        | 41107        | 87       | On Hour                  | Hr    | 04                   | 52      | 04                   | 52      |
| 31113        | 41113        | 88       | No of Interruption       | -     | 04                   | 54      | 04                   | 54      |

**TABLE 2.1 ... 3X and 4X register addresses for 32-bit Integer Tariff Energy**

| Address (3X) | Address (4X) | Para No. | Parameters                | Units | Start Address Hex 3X |         | Start Address Hex 4X |         |
|--------------|--------------|----------|---------------------------|-------|----------------------|---------|----------------------|---------|
|              |              |          |                           |       | Hi Byte              | Lo Byte | Hi Byte              | Lo Byte |
| 33001        | 41301        | 1        | Tariff1 Total KWh Energy  | Kwh   | 0B                   | B8      | 0B                   | B8      |
| 33003        | 41303        | 2        | Tariff1 Imp KWh Energy    | KWh   | 0B                   | BA      | 0B                   | BA      |
| 33005        | 41305        | 3        | Tariff1 Exp KWh Energy    | KWh   | 0B                   | BC      | 0B                   | BC      |
| 33007        | 41307        | 4        | Tariff1 Total KVAr Energy | KVAr  | 0B                   | BE      | 0B                   | BE      |
| 33009        | 41309        | 5        | Tariff1 Imp KVAr Energy   | KVAr  | 0B                   | C0      | 0B                   | C0      |
| 33011        | 41311        | 6        | Tariff1 Exp KVAr Energy   | KVAr  | 0B                   | C2      | 0B                   | C2      |
| 34025        | 41343        | 13       | Tariff2 Total KWh Energy  | KWh   | 0B                   | D0      | 0B                   | D0      |
| 34027        | 41345        | 14       | Tariff2 Imp KWh Energy    | KWh   | 0B                   | D2      | 0B                   | D2      |
| 34029        | 41347        | 15       | Tariff2 Exp KWh Energy    | KWh   | 0B                   | D4      | 0B                   | D4      |
| 34031        | 41349        | 16       | Tariff2 Total KVAr Energy | KVAr  | 0B                   | D6      | 0B                   | D6      |
| 34033        | 41351        | 17       | Tariff2 Imp KVAr Energy   | KVAr  | 0B                   | D8      | 0B                   | D8      |
| 34035        | 41353        | 18       | Tariff2 Exp KVAr Energy   | KVAr  | 0B                   | DA      | 0B                   | DA      |

## 3.2 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 3** for 4X Register addresses.

### Example: Reading Demand Integration Time

Demand integration time : Start address = 1782 (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       | 17 (Hex) |
| Start Address Low        | 82 (Hex) |
| Number of Registers High | 00 (Hex) |
| Number of Registers Low  | 02 (Hex) |
| CRC Low                  | 61 (Hex) |
| CRC High                 | 97 (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 High** : Most significant 8 bits of Number of registers requested.

**Number of register Low** : Least significant 8 bits of Number of registers requested.

**(Note : Two consecutive 16 bit register represent one parameter.)**

### Response: Demand Integration Time ( 8 Minutes)

|                            |          |
|----------------------------|----------|
| Device Address             | 01 (Hex) |
| Function Code              | 03 (Hex) |
| Byte Count                 | 04 (Hex) |
| Data Register- 1 High Byte | 41 (Hex) |
| Data Register- 1 Low Byte  | 00 (Hex) |
| Data Register- 2 High Byte | 00 (Hex) |
| Data Register- 2 Low Byte  | 00 (Hex) |
| CRC Low                    | EE (Hex) |
| CRC High                   | 0F (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 Demand Integration Time

Demand Integration Time : Start address = 1782 (Hex)

Number of registers = 02

**Note: Number of registers = Number of Parameters x 2**

**Query:( Change Demand Integration Time = 7 Minutes )**

|                            |          |
|----------------------------|----------|
| Device Address             | 01 (Hex) |
| Function Code              | 10 (Hex) |
| Starting Address High      | 17 (Hex) |
| Starting Address Low       | 82 (Hex) |
| Number of Registers High   | 00 (Hex) |
| Number of Registers Low    | 02 (Hex) |
| Byte Count                 | 04 (Hex) |
| Data Register- 1 High Byte | 40 (Hex) |
| Data Register- 1 Low Byte  | E0 (Hex) |
| Data Register- 2 High Byte | 00 (Hex) |
| Data Register- 2 Low Byte  | 00 (Hex) |
| CRC Low                    | 85 (Hex) |
| CRC High                   | D0 (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       | 17 (Hex) |
| Start Address Low        | 82 (Hex) |
| Number of Registers High | 00 (Hex) |
| Number of Registers Low  | 02 (Hex) |
| CRC Low                  | E4 (Hex) |
| CRC High                 | 54(Hex)  |

**StartAddress 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 High** : Most significant 8 bits of Number of registers requested.

**Number of register Low** : Least significant 8 bits of Number of registers requested.

**(Note : Two consecutive 16 bit register represent one parameter)**

**TABLE 3 : 4 X register addresses**

| Address<br>(Register) | Parameter<br>No. | Parameter                       | Read/<br>Write | Modbus Start Addr. Hex |          | Default<br>Value |
|-----------------------|------------------|---------------------------------|----------------|------------------------|----------|------------------|
|                       |                  |                                 |                | High Byte              | Low Byte |                  |
| 46003                 | 1                | System Type                     | Read           | 17                     | 72       | 3                |
| 46005                 | 2                | PT Primary                      | Read           | 17                     | 74       | 415              |
| 46007                 | 3                | CT Primary                      | Read           | 17                     | 76       | 5                |
| 46009                 | 4                | PT Secondary                    | Read           | 17                     | 78       | 415              |
| 46011                 | 5                | CT Secondary                    | Read           | 17                     | 7A       | 5                |
| 46019                 | 6                | Demand Integration Time         | R/Wp           | 17                     | 7C       | 8                |
| 46031                 | 7                | Impulse Rate                    | Read           | 17                     | 82       | -                |
| 46037                 | 8                | Reset Parameters                | R/Wp           | 17                     | 84       | 0                |
| 46039                 | 9                | Password                        | R/Wp           | 17                     | 86       | 0                |
| 46047                 | 10               | Auto Scroll                     | R/Wp           | 17                     | 8A       | 0                |
| 46051                 | 11               | Node Address                    | R/Wp           | 17                     | 8C       | 1                |
| 46053                 | 12               | RS485 Setup Code                | R/Wp           | 17                     | 8E       | 4                |
| 46055                 | 13               | Register Order/Word Order       | R/Wp           | 17                     | 90       | 0                |
| 46057                 | 14               | Pulse Width                     | R/Wp           | 17                     | 92       | 100              |
| 46059                 | 15               | Pulse Divisor                   | R/Wp           | 17                     | 94       | 1                |
| 46063                 | 16               | Pulse Output 1 Parameter Select | R/Wp           | 17                     | 96       | 0                |
| 46105                 | 17               | Pulse Output 2 Parameter Select | R/Wp           | 17                     | 98       | 0                |
| 46357                 | 18               | Version No                      | R/Wp           | 18                     | D4       | -                |
| 46365                 | 19               | Backlit                         | R/Wp           | 18                     | DC       | 5                |
| 46696                 | 20               | CRC High byte                   | Read           | 1A                     | 27       | -                |
| 46697                 | 21               | CRC Low Byte                    | Read           | 1A                     | 28       | -                |
| 46698                 | 22               | Error Status                    | Read           | 1A                     | 29       | -                |

### Explanation for 4 X register :

**NOTE:** Writing any invalid values (non-applicable values) to any of the following locations will result in modbus error.

| Address | Parameter               | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46003   | System Type             | This address is used to Read the System type.<br>Read one of the following value to this address.<br><b>1</b> : 1 Phase 2 Wire<br><b>2</b> : 3 Phase 3 Wire<br><b>3</b> : 3 Phase 4 Wire.                                                                                                                                                                                                                                    |
| 46005   | PT Primary              | This address allows the user to Read PT Primary value (in terms of VL-L).<br>The range is <b>100 VL-L to 1200 kVL-L</b> for all system types & also depends on the per phase 1250MVA Restriction of power combined with CT primary.                                                                                                                                                                                          |
| 46007   | CT Primary              | This address allows the user to Read CT Primary value.<br>The range is <b>1 to 9999</b> . It also depends on the per phase 1250 MVA Restriction of power combined with PT primary.                                                                                                                                                                                                                                           |
| 46009   | PT Secondary            | This address is used to read the PT secondary value.<br>The Readable range is <b>100-600VLL</b> .                                                                                                                                                                                                                                                                                                                            |
| 46011   | CT Secondary            | This address is used to read the CT secondary value. Read one of the following values to this address for 1A/5A Model<br><b>1</b> : 1A CT secondary <b>5</b> : 5A CT secondary<br><b>Note</b> : For RJ12 Model, CT Secondary is not applicable.                                                                                                                                                                              |
| 46019   | Demand Integration Time | Demand Period Represents Demand time in Minutes. The Applicable values are ranging from 5 to 60                                                                                                                                                                                                                                                                                                                              |
| 46031   | Impulse Rate            | This address allows the user to read the impulse rate                                                                                                                                                                                                                                                                                                                                                                        |
| 46037   | Reset Parameters        | This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Following are the values to reset various data.<br><b>1</b> : Partial Energy Reset <b>2</b> : Demand Reset<br><b>3</b> : System Min Values Reset <b>4</b> : System Max Values Reset<br><b>5</b> : Run hour & On hour Reset <b>6</b> : No of Interruptions Reset<br><b>7</b> : Reset All data |

| Address | Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46047   | Auto Scroll       | This address is used to activate or de-activate the auto scrolling.<br>Write <b>0</b> : Deactivate <b>1</b> : Activate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 46051   | Node Address      | This register address is used to set Device address between <b>1 to 247</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 46053   | RS 485 Setup Code | This address is used to set the baud rate, Parity and Number of stop bits. Refer to <b>TABLE 4</b> for details.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 46055   | 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 & set that order for all ModBus transaction involving floating point numbers.                                                                                                                                 |
| 46039   | Password          | This address is used to set & reset the password.<br>Valid Range of Password can be set is <b>0000 - 9999</b> .<br>1) If password lock is present & if this location is read it will return <b>zero</b> .<br>2) If password lock is absent & if this location is read it will return <b>one</b> .<br>3) If password lock is present & to disable this lock first send valid password to this location then write " <b>0000</b> " to this location<br>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.<br>5) If for in any of the above case invalid password is send then meter will return exceptional error 2. |
| 46057   | Pulse width       | This address is used to set pulse width of the Pulse output. Write one of the following values to this address:<br><b>60</b> : 60 ms <b>100</b> : 100 ms <b>200</b> : 200 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 46059   | Pulse Divisor     | This address is used to Read /Write pulse divisor of the Pulse output. Write one of the following values to this address: 1,10,100,1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Address | Parameter                       | Description                                                                                                                                    |
|---------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 46063   | Pulse Output 1 Parameter Select | This address is used to assign the Parameter to Digital Output as per <b>TABLE 5</b> .                                                         |
| 46105   | Pulse Output 2 Parameter Select | This address is used to assign the Parameter to Digital Output.as per <b>TABLE 5</b>                                                           |
| 46365   | Backlit                         | This Address is used to set off-delay time in Minutes<br><b>Default &amp; Lowest Value is 5 Minutes It can set From 5,10,30,60,120 Minutes</b> |
| 46696   | HCRC                            | This address is read-only and displays the CRC High Byte                                                                                       |
| 46697   | LCRC                            | This address is read-only and displays the CRC Low Byte                                                                                        |
| 46698   | Error Status                    | This address is read-only and displays the Error Status                                                                                        |

**TABLE 3.1** : The bit-wise allocation of Error field is as below:

|       |                                |
|-------|--------------------------------|
| Bit 0 | Code CRC Error                 |
| Bit 1 | Cal CRC Err                    |
| Bit 2 | EEPROM Full                    |
| Bit 3 | EEPROM CRC error or Corruption |

**TABLE 4 : RS 485 Set-up Code**

| Baud Rate | Parity | Stop Bit | Decimal value |
|-----------|--------|----------|---------------|
| 4800      | NONE   | 1        | 0             |
| 4800      | NONE   | 2        | 1             |
| 4800      | EVEN   | 1        | 2             |
| 4800      | ODD    | 1        | 3             |
| 9600      | NONE   | 1        | 4             |
| 9600      | NONE   | 2        | 5             |
| 9600      | EVEN   | 1        | 6             |
| 9600      | ODD    | 1        | 7             |
| 19200     | NONE   | 1        | 8             |
| 19200     | NONE   | 2        | 9             |
| 19200     | EVEN   | 1        | 10            |
| 19200     | ODD    | 1        | 11            |
| 38400     | NONE   | 1        | 12            |
| 38400     | NONE   | 2        | 13            |
| 38400     | EVEN   | 1        | 14            |
| 38400     | ODD    | 1        | 15            |
| 57600     | NONE   | 1        | 16            |
| 57600     | NONE   | 2        | 17            |
| 57600     | EVEN   | 1        | 18            |
| 57600     | ODD    | 1        | 19            |

**NOTE :** Codes not listed in the **TABLE 4** may **give rise to** unpredictable results including loss of **communication**. Exercise caution when attempting to **change mode via** direct Modbus writes.

**TABLE 5 : Parameters for Pulse Output**

| Parameter Number | Parameter                 | 3P4W | 3P 3W | 1P 2W |
|------------------|---------------------------|------|-------|-------|
| 0                | Sys Wh import             | ✓    | ✓     | ✓     |
| 1                | Sys Wh export             | ✓    | ✓     | ✓     |
| 2                | Sys VARh import           | ✓    | ✓     | ✓     |
| 3                | Sys VARh export           | ✓    | ✓     | ✓     |
| 24               | Total Sys Active Energy   | ✓    | ✓     | ✓     |
| 25               | Total Sys Reactive Energy | ✓    | ✓     | ✓     |

**TABLE 6 : Measurement & Energy/Counter Screens****TABLE 6.1 System Parameters Screens :**

| Parameter No. | Parameters                            | On Display |       |       | On Modbus |       |       |
|---------------|---------------------------------------|------------|-------|-------|-----------|-------|-------|
|               |                                       | 3P 4W      | 3P 3W | 1P 2W | 3P 4W     | 3P 3W | 1P 2W |
| 1             | System Active Power/ Voltage/ Current | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 2             | System Watt-VAR-VA                    | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 3             | System-Power Factor-Frequency         | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 4             | System Frequency                      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 5             | System %THD Voltage-Current           | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 6             | System Max VA-A Demand                | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 7             | System Max Import -Export VAR Demand  | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 8             | System Max Import Watt Demand         | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 9             | System Max Export Watt Demand         | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 10            | System VA-A Demand                    | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 11            | System Import-Export VAR Demand       | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 12            | System Import Watt Demand             | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 13            | System Export Watt Demand             | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |

**NOTE :** The Display screens of TABLE 6.1 can be scrolled through **UP Key**

**TABLE 6.2 Energy Parameters Screens :**

| Parameter No. | Parameters                      | On Display |       |       | On Modbus |       |       |
|---------------|---------------------------------|------------|-------|-------|-----------|-------|-------|
|               |                                 | 3P 4W      | 3P 3W | 1P 2W | 3P 4W     | 3P 3W | 1P 2W |
| 1             | System Active Energy Import     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 2             | System Active Energy Export     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 3             | System Reactive Export energy   | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 4             | System Reactive Import energy   | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 5             | System Apparent energy          | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 6             | L1-L2-L3 Active Energy Import   | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 7             | L1-L2-L3 Active Energy Export   | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 8             | L1-L2-L3 Reactive Export energy | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 9             | L1-L2-L3 Reactive Import energy | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 10            | L1-L2-L3 Apparent energy        | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 11            | L1-L2-L3 Total Active Energy    | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 12            | L1-L2-L3 Total Reactive Energy  | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 13            | System -Total Active Energy     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 14            | System Total Reactive Energy    | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 15            | On Hour                         | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 16            | Run Hour                        | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 17            | No of Interrupts                | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 18            | Tariff 1 Total KWh Energy       | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 19            | Tariff 1 Import KWh Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 20            | Tariff 1 Export KWh Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 21            | Tariff 1 Total KVar Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 22            | Tariff 1 Import KVar Energy     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 23            | Tariff 1 Export KVar Energy     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 24            | Tariff 2 Total KWh Energy       | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 25            | Tariff 2 Import KWh Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 26            | Tariff 2 Export KWh Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 27            | Tariff 2 Total KVar Energy      | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 28            | Tariff 2 Import KVar Energy     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |
| 29            | Tariff 2 Export KVar Energy     | ✓          | ✓     | ✓     | ✓         | ✓     | ✓     |

**NOTE :** The Display screens of TABLE 6.2 can be scrolled through **E Key**

**TABLE 6.3 Power Parameters Screens :**

| Parameter No. | Parameters            | On Display |       |       | On Modbus |       |       |
|---------------|-----------------------|------------|-------|-------|-----------|-------|-------|
|               |                       | 3P 4W      | 3P 3W | 1P 2W | 3P 4W     | 3P 3W | 1P 2W |
| 1             | L1 Watt-VAr-VA        | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 2             | L2 Watt-VAr-VA        | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 3             | L3 Watt-VAr-VA        | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 4             | L1-L2-L3 Power Factor | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |

**NOTE :** The Display screens of TABLE 6.3 can be scrolled through **Down Key**.

**TABLE 6.4 Voltage/Current Parameters Screens :**

| Parameter No. | Parameters            | On Display |       |       | On Modbus |       |       |
|---------------|-----------------------|------------|-------|-------|-----------|-------|-------|
|               |                       | 3P 4W      | 3P 3W | 1P 2W | 3P 4W     | 3P 3W | 1P 2W |
| 1             | L1-L2-L3 Voltage      | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 2             | L12-L23-L31 Voltage   | ✓          | ✓     | ✗     | ✓         | ✓     | ✗     |
| 3             | L1-L2-L3 Current      | ✓          | ✓     | ✗     | ✓         | ✓     | ✗     |
| 4             | Neutral Current       | ✓          | ✗     | ✗     | ✓         | ✗     | ✗     |
| 5             | L1-L2-L3 Voltage %THD | ✓          | ✓     | ✗     | ✓         | ✓     | ✗     |
| 6             | L1-L2-L3 Current %THD | ✓          | ✓     | ✗     | ✓         | ✓     | ✗     |
| 7             | Current Reversal      | ✓          | ✗     | ✓     | ✓         | ✗     | ✓     |

**NOTE :** The Display screens of TABLE 6.4 can be scrolled through **V/A Key**

### 3.3 User Assignable Modbus Registers:

The Multifunction Instrument contains 20 user assignable registers in the address range of 0x1450 (35201) to 0x1476 (35239) for 3X registers (see TABLE 7) and address range of 0x1450 (45201) to 0x1476 (45239) for 4X registers (see TABLE 7).

Any of the parameter addresses (3X register addresses and 4X register addresses of TABLE 1) 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 0x1450 to 0x1476 are specified in 4X Register 0x2710 to 0x2723 (see TABLE 8).

**TABLE 7 : User Assignable 3X Data Registers**

| Address<br>(3X) | Address<br>(4X) | Assignable Register    | Modbus Start Address (Hex) |          |
|-----------------|-----------------|------------------------|----------------------------|----------|
|                 |                 |                        | High Byte                  | Low Byte |
| 35201           | 45201           | Assignable Register 1  | 14                         | 50       |
| 35203           | 45203           | Assignable Register 2  | 14                         | 52       |
| 35205           | 45205           | Assignable Register 3  | 14                         | 54       |
| 35207           | 45207           | Assignable Register 4  | 14                         | 56       |
| 35209           | 45209           | Assignable Register 5  | 14                         | 58       |
| 35211           | 45211           | Assignable Register 6  | 14                         | 5A       |
| 35213           | 45213           | Assignable Register 7  | 14                         | 5C       |
| 35215           | 45215           | Assignable Register 8  | 14                         | 5E       |
| 35217           | 45217           | Assignable Register 9  | 14                         | 60       |
| 35219           | 45219           | Assignable Register 10 | 14                         | 62       |
| 35221           | 45221           | Assignable Register 11 | 14                         | 64       |
| 35223           | 45223           | Assignable Register 12 | 14                         | 66       |
| 35225           | 45225           | Assignable Register 13 | 14                         | 68       |
| 35227           | 45227           | Assignable Register 14 | 14                         | 6A       |
| 35229           | 45229           | Assignable Register 15 | 14                         | 6C       |
| 35231           | 45231           | Assignable Register 16 | 14                         | 6E       |
| 35233           | 45233           | Assignable Register 17 | 14                         | 70       |
| 35235           | 45235           | Assignable Register 18 | 14                         | 72       |
| 35237           | 45237           | Assignable Register 19 | 14                         | 74       |
| 35239           | 45239           | Assignable Register 20 | 14                         | 76       |

**TABLE 8 : User Assignable mapping register ( 4X registers)**

| Address<br>(4X) | Assignable Register                    | Modbus Start Address (Hex) |          |
|-----------------|----------------------------------------|----------------------------|----------|
|                 |                                        | High Byte                  | Low Byte |
| 410001          | Map Address for Assignable Register 1  | 27                         | 10       |
| 410002          | Map Address for Assignable Register 2  | 27                         | 11       |
| 410003          | Map Address for Assignable Register 3  | 27                         | 12       |
| 410004          | Map Address for Assignable Register 4  | 27                         | 13       |
| 410005          | Map Address for Assignable Register 5  | 27                         | 14       |
| 410006          | Map Address for Assignable Register 6  | 27                         | 15       |
| 410007          | Map Address for Assignable Register 7  | 27                         | 16       |
| 410008          | Map Address for Assignable Register 8  | 27                         | 17       |
| 410009          | Map Address for Assignable Register 9  | 27                         | 18       |
| 410010          | Map Address for Assignable Register 10 | 27                         | 19       |
| 410011          | Map Address for Assignable Register 11 | 27                         | 1A       |
| 410012          | Map Address for Assignable Register 12 | 27                         | 1B       |
| 410013          | Map Address for Assignable Register 13 | 27                         | 1C       |
| 410014          | Map Address for Assignable Register 14 | 27                         | 1D       |
| 410015          | Map Address for Assignable Register 15 | 27                         | 1E       |
| 410016          | Map Address for Assignable Register 16 | 27                         | 1F       |
| 410017          | Map Address for Assignable Register 17 | 27                         | 20       |
| 410018          | Map Address for Assignable Register 18 | 27                         | 21       |
| 410019          | Map Address for Assignable Register 19 | 27                         | 22       |
| 410020          | Map Address for Assignable Register 20 | 27                         | 23       |

### 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 8**) 0x2710 and 0x2711 respectively.

### Assigning Query:

|                            |          |
|----------------------------|----------|
| Device Address             | 01 (Hex) |
| Function Code              | 10 (Hex) |
| Start Address High         | 27 (Hex) |
| Start Address Low          | 10 (Hex) |
| Number of Registers High   | 00 (Hex) |
| Number of Registers Low    | 02 (Hex) |
| Byte Count                 | 04 (Hex) |
| Data Register- 1 High Byte | 00 (Hex) |
| Data Register- 1 Low Byte  | 02 (Hex) |
| Data Register- 2 High Byte | 00 (Hex) |
| Data Register- 2 Low Byte  | 1E (Hex) |
| CRC Low                    | 01 (Hex) |
| CRC High                   | EC (Hex) |

} Voltage  
2 \* (3X Address 0x0002)  
} Power Factor  
1 \* (3X Address 0x001E)

### Response:

|                          |          |
|--------------------------|----------|
| Device Address           | 01 (Hex) |
| Function Code            | 10 (Hex) |
| Start Address High       | 27 (Hex) |
| Start Address Low        | 10 (Hex) |
| Number of Registers High | 00 (Hex) |
| Number of Registers Low  | 02 (Hex) |
| CRC Low                  | 4A (Hex) |
| CRC High                 | B9 (Hex) |

\* Note : Upto 6 parameters can be assigned at a time but these parameters should be assigned in Multiple of two  
i.e. 2, 4 or 6.

### Reading Parameter data through User Assignable Registers:

In assigning query, Voltage 2 & Power Factor 1 parameters were assigned to 0x2710 & 0x2711 (**TABLE 8**) which will point to user assignable 3x registers 0x1450 and 0x1452 (**TABLE 7**). 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     | 14 (Hex) |
| Start Address Low      | 50 (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 Userassignable 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)

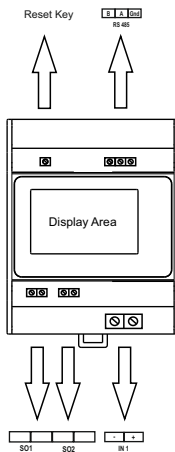
|                            |          |
|----------------------------|----------|
| Device Address             | 01 (Hex) |
| Function Code              | 04 (Hex) |
| Byte Count                 | 08 (Hex) |
| Data Register- 1 High Byte | 43 (Hex) |
| Data Register- 1 Low Byte  | 5B (Hex) |
| Data Register- 2 High Byte | 4E (Hex) |
| Data Register- 2 Low Byte  | 04 (Hex) |
| Data Register- 3 High Byte | 3F (Hex) |
| 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) |

} Voltage 2 Data

} Power Factor 1 Data

#### 4. Connection for Optional Pulse Output / Tariff Input / RS 485

**Location of Modbus, 2 Tariff Outputs, 1 Input  
& Reset Key**



## 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.