

Interface Definition

RISH EM DC 6000



DIGITAL MULTIFUNCTION INSTRUMENT

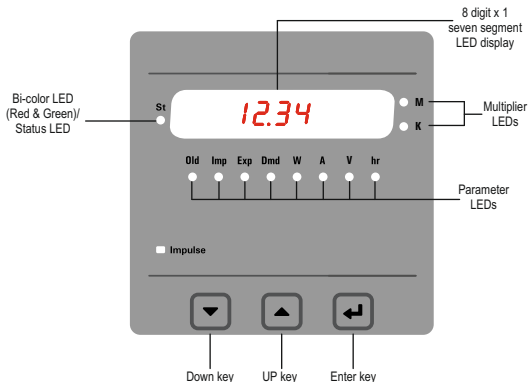
Programmable Multi-function DC Energy Meter

Installation & Operating Instructions

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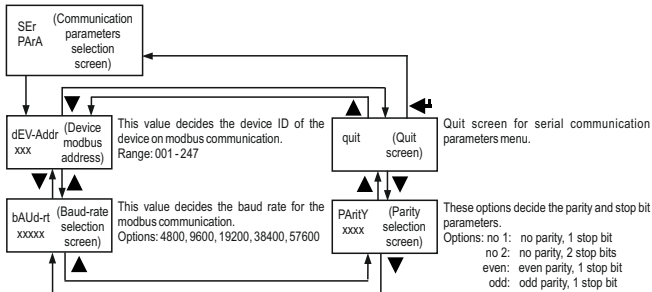
1. Introduction

The Multifunction DC Energy Meter is a panel mounted 96 x 96mm DIN Quadratic Digital Panel Meter, which measures important electrical parameters in DC Network and replaces the multiple analog panel meters. It measures electrical parameters like DC voltage, Current, Power, Energy (Import & Export), Demand & many more. It integrates accurate measurement technology with bright LED display (8 digit x 1). The meter can be configured on site for various parameters including Nominal Voltage, Current Full Scale, Current Shunt, Demand Integration, Time etc. The front panel has three push buttons using which the user can scroll through different screens & configure the product. It also includes 12 LEDs which in conjunction with LED display, provides information in different units and gives overview of system status.



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 Screen



The parameter values set here are only applicable for modbus communication.
While using the USB port on the meter these values are as following and non-editable.

Device address: 1
Baud Rate: 57600
Parity: No
Stop bits: 1

Parameter Editing Guide

Use these points to change any value in setup screens.

- 1) Use **←** key to enter editing mode. A blinking decimal point will be displayed as cursor.
- 2) Use **▲** & **▼** keys to increase or decrease the digit values respectively, or cycle through options.
- 3) Use **→** key to go to the next cursor position.
- 4) Use **↵** key to confirm the value and finish editing.
- 5) Longpress **▲** & **▼** together to go to the previous menu.
The same can be achieved by going to quit screen and pressing **↵** key.
- 6) If user inputs values out of the limits specified, they are brought to the limit values automatically by the meter and showed at value confirmation.
- 7) Number of 'x's denote displayed digits on the screen which the user can edit.

3. RS 485 (ModBus) Output :

The Multifunction DC 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

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,

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

Power from 4X: Start address= 10 04 Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 40 parameters or less. Exceeding the 40 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)	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

3X Response: Current Ch2 (219.254 A)

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)	10 (Hex)	04(Hex)	00 (Hex)	02(Hex)	E0 (Hex)	C9 (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: Power Ch1 (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

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 : 3X and 4X register addresses for measured parameters

Address (3X)	Address (4X)	Parameter Number	Parameter	Hex Address		Hex Address	
				High Byte	Low Byte	High Byte	Low Byte
30001	44097	0	Voltage	00	00	10	00
30003	44099	1	Current	00	02	10	02
30005	44101	2	Power	00	04	10	04
30007	44103	3	Import Energy	00	06	10	06
30009	44105	4	Import Energy OF	00	08	10	08
30011	44107	5	Export Energy	00	0A	10	0A
30013	44109	6	Export Energy OF	00	0C	10	0C
30015	44111	7	Import Ampere Hour	00	0E	10	0E
30017	44113	8	Import Ampere Hour OF	00	10	10	10
30019	44115	9	Export Ampere Hour	00	12	10	12
30021	44117	10	Export Ampere Hour OF	00	14	10	14
30023	44119	11	Import Power Demand	00	16	10	16
30025	44121	12	Export Power Demand	00	18	10	18
30027	44123	13	Import Current Demand	00	1A	10	1A
30029	44125	14	Export Current Demand	00	1C	10	1C
30031	44127	15	Max Voltage	00	1E	10	1E
30033	44129	16	Min Voltage	00	20	10	20
30035	44131	17	Max Current	00	22	10	22
30037	44133	18	Min Current	00	24	10	24
30039	44135	19	Max Import Power Demand	00	26	10	26
30041	44137	20	Max Export Power Demand	00	28	10	28
30043	44139	21	Max Import Current Demand	00	2A	10	2A
30045	44141	22	Max Export Current Demand	00	2C	10	2C
30047	44143	23	Import Energy on update rate	00	2E	10	2E
30049	44145	24	Import Energy on update rate OF	00	30	10	30
30051	44147	25	Export Energy on update rate	00	32	10	32
30053	44149	26	Export Energy on update rate OF	00	34	10	34
30055	44151	27	On Hour	00	36	10	36
30057	44153	28	Run Hour	00	38	10	38
30059	44155	29	No. of Interruptions	00	3A	10	3A

30061	44157	30	Old Import Energy	00	3C	10	3C
30063	44159	31	Old Import Energy OF	00	3E	10	3E
30065	44161	32	Old Export Energy	00	40	10	40
30067	44163	33	Old Export Energy OF	00	42	10	42
30069	44165	34	Old Import Ampere Hour	00	44	10	44
30071	44167	35	Old Import Ampere Hour OF	00	46	10	46
30073	44169	36	Old Export Ampere Hour	00	48	10	48
30075	44171	37	Old Export Ampere Hour OF	00	4A	10	4A
30077	44173	38	Old Max Import Power Demand	00	4C	10	4C
30079	44175	39	Old Max Export Power Demand	00	4E	10	4E
30081	44177	40	Old Max Import Current Demand	00	50	10	50
30083	44179	41	Old Max Export Current Demand	00	52	10	52
30085	44181	42	Old On Hour	00	54	10	54
30087	44183	43	Old Run Hour	00	56	10	56
30089	44185	44	Old No. of Interruptions	00	58	10	58
30091	44187	45	Relay 1 Status	00	5A	10	5A
30093	44189	46	Relay 2 Status	00	5C	10	5C
30099	44195	49	Timer 1 On Delay	00	62	10	62
30101	44197	50	Timer 2 On Delay	00	64	10	64
30107	44203	53	Timer 1 Off Delay	00	6A	10	6A
30109	44205	54	Timer 2 Off Delay	00	6C	10	6C
30115	44211	57	Timer 1 No of Cycles	00	72	10	72
30117	44213	58	Timer 2 No of Cycles	00	74	10	74
30123	44219	61	RTC Min	00	7A	10	7A
30125	44221	62	RTC Hour	00	7C	10	7C
30127	44223	63	RTC Day of Week	00	7E	10	7E
30129	44225	64	RTC Date	00	80	10	80
30131	44227	65	RTC Month	00	82	10	82
30133	44229	66	RTC Year	00	84	10	84
30135	44231	67	RTC Complete Date*	00	86	10	86
30137	44233	68	RTC Complete Time*	00	88	10	88
30139	44235	69	Impulse Constant	00	8A	10	8A

* RTC complete date is shown in "ddmmyy" format & RTC complete time is shown in "hh.mm" format.

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

Address (3X)	Address (4X)	Parameter number	Parameter	Hex Address		Hex Address	
				High Byte	Low Byte	High Byte	Low Byte
30769	44865	0	Import Energy	03	00	13	00
30771	44867	1	Import Energy OF	03	02	13	02
30773	44869	2	Export Energy	03	04	13	04
30775	44871	3	Export Energy OF	03	06	13	06
30777	44873	4	Import Energy on update rate*	03	08	13	08
30779	44875	5	Import Energy on update rate OF*	03	0A	13	0A
30781	44877	6	Export Energy on update rate*	03	0C	13	0C
30783	44879	7	Export Energy on update rate OF*	03	0E	13	0E
30785	44881	8	Import Ampere Hour	03	10	13	10
30787	44883	9	Import Ampere Hour OF	03	12	13	12
30789	44885	10	Export Ampere Hour	03	14	13	14
30791	44887	11	Export Ampere Hour OF	03	16	13	16
30793	44889	12	On Hour	03	18	13	18
30795	44891	13	Run Hour	03	1A	13	1A
30797	44893	14	Old Import Energy	03	1C	13	1C
30799	44895	15	Old Import Energy OF	03	1E	13	1E
30801	44897	16	Old Export Energy	03	20	13	20
30803	44899	17	Old Export Energy OF	03	22	13	22
30805	44901	18	Old Import Ampere Hour	03	24	13	24
30807	44903	19	Old Import Ampere Hour OF	03	26	13	26
30809	44905	20	Old Export Ampere Hour	03	28	13	28
30811	44907	21	Old Export Ampere Hour OF	03	2A	13	2A
30813	44909	22	Old On Hour	03	2C	13	2C
30815	44911	23	Old Run Hour	03	2E	13	2E

*These values are updated depending on update rate which can be changed by user. For example, if user has set update rate 10 minute, then the values on these registers will be updated every 10 min.

3.2 Accessing 4X 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 Nominal Voltage

Nominal Voltage: Start address = 1A (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	1A (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	E5 (Hex)
CRC High	CC (Hex)

Response (Nominal voltage 24V):

Device Address	01 (Hex)
Function Code	03 (Hex)
Byte Count	04 (Hex)
Data Register1 High Byte	41 (Hex)
Data Register1 Low Byte	C0 (Hex)
Data Register2 High Byte	00 (Hex)
Data Register2 Low Byte	00(Hex)
CRC Low	44 (Hex)
CRC High	C6 (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.

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 Nominal Voltage

Nominal Voltage: Start address = 1A (Hex) Number of registers = 02

Query:(Change Nominal Voltage to 48 V)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	00 (Hex)
Starting Address Lo	1A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
Byte Count	04 (Hex)
Data Register-1High Byte	42 (Hex)
Data Register-1 Low Byte	40(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)
CRC Low	67 (Hex)
CRC High	70 (Hex)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	00 (Hex)
Start Address Low	1A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
CRC Low	60 (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.

StartAddress High : Most significant 8 bits of starting address of the parameter requested.

StartAddress 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 3 : 4X register addresses

Address (Register)	Parameter No.	Parameter	Read/ Write	Modbus Start Addr. Hex		Default Value
				High Byte	Low Byte	
40003	1	Demand Period	R/Wp	00	02	1
40005	2	Reset parameters	R/Wp	00	04	0
40007	3	RS485 Setup Code	R/Wp	00	06	4
40009	4	Modbus address	R/Wp	00	08	1
40027	5	Nominal Voltage	R/Wp	00	1A	48*
40029	6	Auto Detect Nominal Voltage	R/Wp	00	1C	0
40033	7	Current - Full Scale	R/Wp	00	20	5
40041	8	Current - Shunt	R/Wp	00	28	75
40053	9	Energy update rate	R/Wp	00	34	15
40061	10	Energy Output	R/Wp	00	3C	2
40069	11	Noise Current Cutoff	R/Wp	00	44	0
40073	12	Register order	R/Wp	00	48	0
40075	13	Auto Scroll	R/Wp	00	4A	0
40077	14	Reverse Lock	R/Wp	00	4C	0
40085	15	Energy Digit Reset Count	R/Wp	00	54	8
40093	16	Factory Reset	R/Wp	00	5C	0
40095	17	Password	R/Wp	00	5E	0
40097	18	Serial Number	R/Wp	00	60	-
40099	19	Model Number	R/Wp	00	62	6000
40101	20	Version Number	R/Wp	00	64	-
40103	21	User Assignable Screen On/OFF	R/Wp	00	66	0
40105	22	User Screen 1	R/Wp	00	68	1
40107	23	User Screen 2	R/Wp	00	6A	2
40109	24	User Screen 3	R/Wp	00	6C	3
40111	25	User Screen 4	R/Wp	00	6E	6
40113	26	User Screen 5	R/Wp	00	70	7
40115	27	User Screen 6	R/Wp	00	72	10
40117	28	User Screen 7	R/Wp	00	74	11

* This value differs according to meter range. It is 48, 110 & 1000 for 10-60 V, 61-200 V & 201-1000 V meters respectively.

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Read/ Write	Modbus Start Addr. Hex		Default Value
				High Byte	Low Byte	
40119	29	User Screen 8	R/Wp	00	76	14
40121	30	User Screen 9	R/Wp	00	78	15
40123	31	User Screen 10	R/Wp	00	7A	18
40125	32	Pulse Divisor for pulse output 1	R/Wp	00	7C	1
40127	33	Pulse Divisor for pulse output 2	R/Wp	00	7E	1
40133	34	Pulse Width for pulse output	R/Wp	00	84	100
40219	35	Relay 1 Output Select	R/Wp	00	DA	0
40221	36	Para Select / No of cycles / Weekly Repeat	R/Wp	00	DC	
40223	37	Relay 1 Configuration Select	R/Wp	00	DE	
40225	38	Relay 1 Trip point	R/Wp	00	E0	
40227	39	Relay 1 Hysteresis	R/Wp	00	E2	
40229	40	Relay 1 / Timer 1 On Delay (Energize)	R/Wp	00	E4	
40231	41	Relay 1 / Timer 1 Off Delay (De-energize)	R/Wp	00	E6	
40233	42	Relay 2 Output Select	R/Wp	00	E8	
40235	43	Para Select / No of cycles / Weekly Repeat	R/Wp	00	EA	
40237	44	Relay 2 Configuration Select	R/Wp	00	EC	
40239	45	Relay 2 Trip point	R/Wp	00	EE	
40241	46	Relay 2 Hysteresis	R/Wp	00	F0	
40243	47	Relay 2 / Timer 2 On Delay (Energize)	R/Wp	00	F2	
40245	48	Relay 2 / Timer 2 Off Delay (De-energize)	R/Wp	00	F4	
40303	49	Relay 1 Status & Trip	R/Wp	01	2E	
40305	50	Relay 2 Status & Trip	R/Wp	01	30	
40311	51	Timer 1 Start / Stop	R/Wp	01	36	
40313	52	Timer 2 Start / Stop	R/Wp	01	38	
40319	53	Import Energy Starting Count	R/Wp	01	3E	
40327	54	Export Energy Starting Count	R/Wp	01	46	
40337	55	RTC Min	R/Wp	01	50	-
40339	56	RTC Hour	R/Wp	01	52	-
40341	57	RTC Day of Week	R	01	54	-

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Read/ Write	Modbus Start Addr. Hex		Default Value
				High Byte	Low Byte	
40343	58	RTC Date	R/Wp	01	56	
40345	59	RTC Month	R/Wp	01	58	
40347	60	RTC Year	R/Wp	01	5A	
40349	61	RTC Complete Date	R/Wp	01	5C	
40351	62	RTC Complete Time	R/Wp	01	5E	
40353	63	Current Screen No	R	01	60	1
40361	64	Password for Energy Starting Count	R/Wp	01	68	
40365	65	Event-based Datalog Select	R/Wp	01	6C	
40367	66	Time-based Datalog Select	R/Wp	01	6E	
40369	67	Time-based Datalog Interval Selection	R/Wp	01	70	
40371	68	Logging Parameter Count	R/Wp	01	72	
40373	69	Datalog Parameter 1	R/Wp	01	74	
40375	70	Datalog Parameter 2	R/Wp	01	76	
40377	71	Datalog Parameter 3	R/Wp	01	78	
40379	72	Datalog Parameter 4	R/Wp	01	7A	
40381	73	Datalog Parameter 5	R/Wp	01	7C	
40383	74	Datalog Parameter 6	R/Wp	01	7E	0
40385	75	Datalog Parameter 7	R/Wp	01	80	
40387	76	Datalog Parameter 8	R/Wp	01	82	
40389	77	Datalog Parameter 9	R/Wp	01	84	
40391	78	Datalog Parameter 10	R/Wp	01	86	
40393	79	Datalog Parameter 11	R/Wp	01	88	
40395	80	Datalog Parameter 12	R/Wp	01	8A	
40397	81	Datalog Parameter 13	R/Wp	01	8C	
40399	82	Datalog Parameter 14	R/Wp	01	8E	
40401	83	Datalog Parameter 15	R/Wp	01	90	
40403	84	Datalog Parameter 16	R/Wp	01	92	
40405	85	Datalog Parameter 17	R/Wp	01	94	
40407	86	Datalog Parameter 18	R	01	96	

TABLE 3 : Continued...

Address (Register)	Parameter No.	Parameter	Read/ Write	Modbus Start Addr. Hex		Default Value
				High Byte	Low Byte	
40409	87	Datalog Parameter 19	R/Wp	01	98	0
40411	88	Datalog Parameter 20	R/Wp	01	9A	0
40413	89	Datalog Parameter 21	R/Wp	01	9C	0
40415	90	Datalog Parameter 22	R/Wp	01	9E	0
40417	91	Datalog Parameter 23	R/Wp	01	A0	0
40419	92	Datalog Parameter 24	R/Wp	01	A2	0
40421	93	Datalog Parameter 25	R/Wp	01	A4	0
40423	94	Datalog Parameter 26	R/Wp	01	A6	0
40425	95	Datalog Parameter 27	R/Wp	01	A8	0
40427	96	Datalog Parameter 28	R/Wp	01	AA	0
40429	97	Datalog Parameter 29	R/Wp	01	AC	0
40431	98	Datalog Parameter 30	R/Wp	01	AE	0
40433	99	Load Profile Datalog Select	R/Wp	01	B0	0
40435	100	Start Date of Load Profile Datalog	R	01	B2	0
40477	101	Restart Meter	R/Wp	01	DC	0
40479	102	EEPROM Error	R	01	DE	0
40481	103	RTC Error	R	01	E0	0
40483	104	Flash Error	R	01	E2	0
40485	105	Write in Process	R	01	E4	0
40487	106	RTC Battery Low	R	01	E6	0

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

TABLE 4: Explanation for 4X register:

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

Address	Parameter	Description
40003	Demand Integration Time	Demand integration time represents demand time in minutes. The applicable values are 1-30.
40005	Reset parameters	This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Refer Table 5.
40007	RS485 Setup Code	This address is used to set the baud rate, Parity, Number of stop bits. Refer Table 6.
40009	Modbus address	This value is used to read and write device address of the device. Valid values are 1-247.
40027	Nominal Voltage	This address is used to read and write nominal voltage of the system. Valid values ranges are as following and change with order code. 10 - 60V 61 - 200V 201 - 1000V
40029	Auto Detect Nominal Voltage	Writing 1 here will change the value of nominal voltage of the meter to a preset value according to the input voltage at that time irrespective of voltage polarity. Refer Table 7.
40033	Current - Full Scale	This address is used to read and write full scale current values in ampere. Valid value range is 1-20000 A.
40041	Current - Shunt	This address is used to read and write the shunt voltage drop for full scale current in millivolts. Valid value range is 50-150 mV.
40053	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.
40061	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 (only valid when nominal power is less than 60kW) 2: Energy in KWh 3: Energy in MWh

Address	Parameter	Description
40069	Noise Current Cutoff	This address is used to activate or de-activate the noise current elimination. Noise current is in percentage of nominal current. Valid values 0-30. 0: deactivate 1-30: noise current is cut off below this percent of nominal current.
40073	Register order	Word Order controls the order in which 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.
40075	Auto Scroll	This address is used to activate or de-activate the auto scrolling. 0: Deactivate 1: Activate
40077	Reverse Lock	This address is used to read and write the reverse locking parameter. Reverse locking is when the current or power is in the opposite direction of the desired direction, the energy and ampere-hour accumulation is stopped. Valid values are: 0: No reverse locking 1: Positive/ Import locking 2: Negative/ Export locking
40085	Energy Digit Reset Count	This address is used to set Energy Digit Reset Count value. Energy count can be configured to reset on 6,7 or 8.
40093	Factory Reset	This address allows the user to reset the instrument to factory settings. Refer the Default Values in Table 3 for factory settings. Write 100 at this address to reset the instrument.
40095	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 in any of the above case invalid password is sent then meter will return exceptional error 2.
40097	Serial Number	This address is read only and displays the serial number of the meter.

Address	Parameter	Description
40099	Model Number	This address is read only and displays the Model number of the meter.
40101	Firmware Version Number	This address is read only and displays the firmware version of the meter.
40103	User Assignable Screen On/OFF	This address is used to read and write if the user assignable screens are on or off and how many user screens are shown. Valid values are: 0: Deactivate 1-10: This many user screens are shown
40105	User Screen 1	These addresses are used to assign the screen numbers to user screens 1 to 10 respectively. Refer to Table 15 for screen numbers.
40107	User Screen 2	
...	...	
40123	User Screen 10	
40125	Pulse Divisor for pulse output 1	This address is used to set pulse divisor of the Pulse output. Refer Table 8.
40127	Pulse Divisor for pulse output 2	
40133	Pulse Width for pulse output	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
40219	Relay 1 Output Select	This address is used to select the Relay operation. Write one of the following values to this address. 0: None 1: Limit 2: Pulse 3: Timer 4: Remote 5: Reverse Lock 6: RTC relay

Address	Parameter	Description
40221	Para Select / No of cycles / Weekly Repeat	This address is used to assign the Parameter to Relay. Limit relay: Refer Table 9 Pulse relay: Refer Table 10 Timer relay: Refer Table 11 RTC relay: Refer Table 13
40223	Relay 1 Configuration Select	This address is used to read and write the relay configuration. Refer Table 14.
40225	Limit 1 trip point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo-alarm & 10 to 120 for Hi-alarm can be written to this address. For energy and ampere hour parameters the valid range range is 10-9999999. (refer Table 9)
40227	Hysteresis (Limit 1)	This address is used to set the hysteresis percentage. Valid values are between 0.5 to 50.0
40229	Relay 1 / On Delay (Energize) / On time	This address is used to set the Energizing delay in seconds in range of 1-9999. For RTC relay this range is 00.00 to 23.59.
40231	Relay 1 / Off Delay (De-energize) / Off time	This address is used to set the De-energizing delay in seconds in range of 1-9999. For RTC relay this range is 00.00 to 23.59.
40233	Relay 2 Output Select	Same as relay 1.
40235	Para Select / No of cycles / Weekly Repeat	
40237	Relay 2 Configuration Select	
40239	Limit 2 trip point	
40241	Hysteresis (Limit 2)	
40243	Relay 2 / On Delay (Energize) / On time	
40245	Relay 2 / Off Delay (De-energize) / Off time	

Address	Parameter	Description
40303	Relay 1 Status & Remote Operation	These values show if the relay is Energized or De-energised. In remote operation mode The uses can write these values. 0: De-energized 1: Energized
40305	Relay 2 Status & Remote Operation	
40311	Timer 1 Start / Stop	These addresses can be used to start or stop the timers. 0: Stop 1: Start
40313	Timer 2 Start / Stop	
40319	Import Energy Starting Count	The user can set energy starting count in these registers (before the user can write values to these locations he/she needs to check register 40361 for password lock). Valid range is 0-9999999.
40327	Export Energy Starting Count	
40337	RTC Min	This address is used to read and write the minute part from RTC. Valid range 0-59.
40339	RTC Hour	This register decides the hour part from RTC. Valid range 0-23.
40341	RTC Day of Week	This register shows the day of week part from RTC. This address is read only.
		1: Sunday 2: Monday 3: Tuesday 4: Wednesday 5: Thursday 6: Friday 7: Saturday

Address	Parameter	Description
40343	RTC Date	This address is used to read and write the date part from RTC.
40345	RTC Month	This address is used to read and write the month part from RTC.
40347	RTC Year	This address is used to read and write the year part from RTC. Valid range 2000-2099.
40349	RTC Complete Date	This address is used to read and write full date in "ddmmyy" format from RTC.
40351	RTC Complete Time	This address is used to read and write complete time in "hh.mm" format from RTC.
40353	Current Screen No	This read only register shows the screen number of the screen currently being displayed.
40361	Password for Energy Starting Count	This address is used to set & reset the password for energy starting count. This is additional protection for Energy Starting Count. This address can only be modified after entering a valid password at address 40095. 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 "Energy Starting Count", first send valid password to this location so that "Energy Starting Count" will be accessible for modification. 5) In any of the above case if invalid password is sent, the meter will return exceptional error 2.
40365	Event-based Datalog Select	This register is used to enable or disable event based datalogging. 0: Disabled 1: Enabled
40367	Time-based Datalog Select	This register is used to enable or disable time based datalogging. 0: Disabled 1: Enabled
40369	Time-based Datalog Interval Selection	This address is used to read and write the interval between consecutive time log entries in minutes. Valid value range 1-60
40371	Logging Parameter Count	This value decides the number of parameters to be logged in time based datalogging.

Address	Parameter	Description
40373 to 40431	Datalog Parameter 1 to 30	These addresses are used to read and write the parameters to be logged in time based logging. Valid value range 0-44. Refer Table 1.
40433	Load Profile Datalog Select	This register is used to enable or disable load profile logging. 0: Disabled 1: Enabled
40435	Start Date of Load Profile Datalog	This value shows the starting date of Load Profile datalog. This address is read only.
40477	Restart Meter	This register can be used to restart the meter by writing 1.
40479	EEPROM Error	These values show the errors present if there are any (these registers are read only), 0: No Error 1: Error Present
40481	RTC Error	
40483	Flash Error	
40485	Write in Process	This value shows if the meter is busy in writing process (this register is read only). 0: Idle 1: Busy Writing
40487	RTC Battery Low	This value shows if the RTC battery is low (this register is read only). 0: Battery normal 1: Battery low

TABLE 5: Reset Parameters

Para No / Code	Parameter
0	None
1	All
2	Run Hour & On Hour
3	No of Interrupts
4	High V & A
5	Low V & A
6	Energy
7	Demand
8	AH
9	Time Based Log
10	Load Profile Log

TABLE 6: Communication Parameters

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

TABLE 7: Auto Detection of System Nominal Voltage

Nominal Voltage	Input Voltage
10 - 60V Meter	
12	< 18V
24	>= 18 & <36
48	>= 36 & < 56
60	> 56
61 - 200V Meter	
72	< 90
110	>= 90 & < 135
160	>= 135 & < 180
200	> 180
201 - 1000V Meter	
220	< 235
380	>= 235 & < 450
500	>= 450 & < 600
750	>= 600 & < 800
1000	> 800

TABLE 8: For energy output in Wh

Pulse Rate		
Divisor	Pulse	Channel Power
1	1per Whr	Up to 3600W
	1per kWhr	Up to 60kW
10	1per 10Whr	Up to 3600W
	1per 10kWhr	Up to 60kW
100	1per 100Whr	Up to 3600W
	1per 100kWhr	Up to 60kW
1000	1per 1000Whr	Up to 3600W
	1per 1000kWhr	Up to 60kW

For energy output in kWh

Pulse Rate		
Divisor	Pulse	Channel Power
1	1per kWhr	Up to 3600kW
	1per MWhr	above 3600kW

For energy output in MWh

Pulse Rate	
Divisor	Pulse
1	1per MWhr

TABLE 9: Parameter for Limit Output

Para No.	Parameter	Range
0	None	-----
1	Voltage	$\pm 10 - \pm 120\%$
2	Current	$\pm 10 - \pm 120\%$
3	Power	$\pm 10 - \pm 120\%$
4	Import Power Demand	10 - 120%
5	Export Power Demand	10 - 120%
6	Import Current Demand	10 - 120%
7	Export Current Demand	10 - 120%
8	Max Import Power Demand	10 - 120%
9	Max Export Power Demand	10 - 120%
10	Max Import Current Demand	10 - 120%
11	Max Export Current Demand	10 - 120%
12	Import Ampere Hour	10 - 9999999
13	Export Ampere Hour	10 - 9999999
14	Import Energy	10 - 9999999
15	Export Energy	10 - 9999999

TABLE 10: Parameter for Pulse Output

Code	Configuration
0	Import Energy
1	Export Energy

**TABLE 11: Number of Cycles
for Timer Relay**

Code	Description
0	Unlimited
1 to 9999	Fixed Cycles

TABLE 13: Weekly Repeat for RTC Relay

Code	Description
1XXXXXXX	Eg 11010000 means relay will operate only on Sun & Tue
	1 = Sunday, 7 = Saturday

TABLE 14: Relay Configuration

For Limit Relay

Code	Configuration
0	Hi - alarm & energised Relay
1	Hi - alarm & De-energised Relay
2	Lo - alarm & Energised Relay
3	Lo - alarm & De-energised Relay

For Timer, Reverse lock or RTC relay

Code	Configuration
0	Energize On Start
1	De-energize On Start

TABLE 15 : Measurement Screens

Screen No.	Screen Name
1	Voltage
2	Current
3	Power
4	Import Energy
5	Import Energy OF
6	Export Energy
7	Export Energy OF
8	Import Ampere Hour
9	Import Ampere Hour OF
10	Export Ampere Hour
11	Export Ampere Hour OF
12	Import Power Demand
13	Export Power Demand
14	Import Current Demand
15	Export Current Demand
16	On - hrs
17	Run - hrs
18	Max Voltage
19	Min Voltage
20	Max Current
21	Min Current
22	Import Max Power Demand
23	Export Max Power Demand
24	Import Max Current Demand
25	Export Max Current Demand
26	No of interruptions
27	Old Import Energy
28	Old Import Energy OF
29	Old Export Energy
30	Old Export Energy OF

Screen No.	Screen Name
31	Old Import Amp Hour
32	Old Import Amp Hour OF
33	Old Export Amp Hour
34	Old Export Amp Hour OF
35	Old Max Import Power Demand
36	Old Max Export Power Demand
37	Old Max Import Current Demand
38	Old Max Export Current Demand
39	Old No of interruptions
40	Old On Hour
41	Old Run Hour
42 ¹	Timer 1 Number of Cycles
43 ¹	Timer 1 On Delay
44 ¹	Timer 1 Off Delay
45 ¹	Timer 2 Number of Cycles
46 ¹	Timer 2 On Delay
47 ¹	Timer 2 Off Delay
48 ²	RTC Complete Date
49 ²	RTC Complete Time

NOTE :

1. These screens will be available only with Relay Addon card.
2. These screens will be available only in the Datalogging variant.

3.3 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 16) and address range of 0x1E00 (47681) to 0x1E26 (47719) for 4X registers (see TABLE 17).

Any of the parameter addresses (3X register addresses and 4X register addresses 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 0x200 to 0x226 (or 0x1E00 to 0x1E26) are specified in 4X Register 0x200 to 0x213. (see TABLE 18)

TABLE 16 : 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

TABLE 16 : Continued...

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 17 : 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
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

TABLE 17 : Continued...

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
47715	Assignable Reg 18	1E	22
47717	Assignable Reg 19	1E	24
47719	Assignable Reg 20	1E	26

TABLE 18 : 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
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 Current (3X address 0x0002) and Power (3X address 0x0004) through user assignable register assign these addresses to 4x register (TABLE 18) 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)	} Current (3X Address 0x0002)
Data Register-1 Low Byte	02 (Hex)	
Data Register-2 High Byte	00 (Hex)	} Power (3X Address 0x0004)
Data Register-2 Low Byte	04 (Hex)	
CRC Low	CA (Hex)	
CRC High	CB (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 Current & Power parameters were assigned to 0x200 & 0x201 (TABLE 18) which will point to user assignable 3x registers 0x200 and 0x202 (TABLE 16). So to read Current and Power 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.

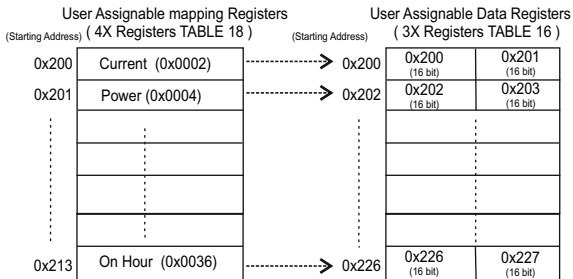
Number of register Hi : Most significant 8 bits of Number of registers requested.

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 : (Current = 1.2A / Power = 1.0 W)

Device Address	01 (Hex)	
Function Code	04 (Hex)	
Byte count	08 (Hex)	
Data Register-1 High Byte	3F (Hex)	} Current
Data Register-1 Low Byte	99 (Hex)	
Data Register-2 High Byte	99 (Hex)	
Data Register-2 Low Byte	9A (Hex)	
Data Register-3 High Byte	3F (Hex)	} Power
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 Current, Power & On Hour send query with starting address 0x200 with number of register 8 or individually parameters can be accessed.
(See section **Reading Parameter data through User Assignable Registers**).

4. Datalogging

Datalogging is a feature that allows the meter to store measured parameters based on time or on occurrence of a certain event. The user can retrieve the data later for further application.

This meter offers three types of datalogging

- 1) Event based
- 2) Time based
- 3) Load profile

4.1 Event Based Datalogging

This type of datalogging stores data when certain event is observed. This data is time stamped and last five occurrences of each type of event are stored based on first in first out queue. This meter offers event based logging for 8 parameters. This data can be observed on the modbus on the address table shown below. These registers can be accessed by the query explained in section 3.1 The user can turn this logging on and off through display as well as modbus by using address 40365.

Changing any setup parameter related to the logged parameters will reset the log.

Table 19: 3X addresses for event based datalog

Address	Logged Parameter	Log Details	Mod Start Address Hex	
			High Byte	Low Byte
312289	Max Voltage	Date 1	30	00
312291		Time 1	30	02
312293		Value 1	30	04
312295		Date 2	30	06
312297		Time 2	30	08
312299		Value 2	30	0A
312301		Date 3	30	0C
312303		Time 3	30	0E
312305		Value 3	30	10
312307		Date 4	30	12
312309		Time 4	30	14
312311		Value 4	30	16
312313		Date 5	30	18
312315		Time 5	30	1A
312317		Value 5	30	1C

Address	Logged Parameter	Log Details	Mod Start Address Hex	
			High Byte	Low Byte
312319	Min Voltage	Date 1	30	1E
312321		Time 1	30	20
312323		Value 1	30	22
312325		Date 2	30	24
312327		Time 2	30	26
312329		Value 2	30	28
312331		Date 3	30	2A
312333		Time 3	30	2C
312335		Value 3	30	2E
312337		Date 4	30	30
312339		Time 4	30	32
312341		Value 4	30	34
312343		Date 5	30	36
312345		Time 5	30	38
312347		Value 5	30	3A

Table 19: Continued..

312349	Max Current	Date 1	30	3C
312351		Time 1	30	3E
312353		Value 1	30	40
312355		Date 2	30	42
312357		Time 2	30	44
312359		Value 2	30	46
312361		Date 3	30	48
312363		Time 3	30	4A
312365		Value 3	30	4C
312367		Date 4	30	4E
312369		Time 4	30	50
312371		Value 4	30	52
312373		Date 5	30	54
312375		Time 5	30	56
312377		Value 5	30	58
312469	Min Current	Date 1	30	B4
312471		Time 1	30	B6
312473		Value 1	30	B8
312475		Date 2	30	BA
312477		Time 2	30	BC
312479		Value 2	30	BE
312481		Date 3	30	C0
312483		Time 3	30	C2
312485		Value 3	30	C4
312487		Date 4	30	C6
312489		Time 4	30	C8
312491		Value 4	30	CA
312493		Date 5	30	CC
312495		Time 5	30	CE
312497		Value 5	30	D0

312589	Max Import Power Demand	Date 1	31	2C
312591		Time 1	31	2E
312593		Value 1	31	30
312595		Date 2	31	32
312597		Time 2	31	34
312599		Value 2	31	36
312601		Date 3	31	38
312603		Time 3	31	3A
312605		Value 3	31	3C
312607		Date 4	31	3E
312609		Time 4	31	40
312611		Value 4	31	42
312613		Date 5	31	44
312615		Time 5	31	46
312617		Value 5	31	48
312709	Max Export Power Demand	Date 1	31	A4
312711		Time 1	31	A6
312713		Value 1	31	A8
312715		Date 2	31	AA
312717		Time 2	31	AC
312719		Value 2	31	AE
312721		Date 3	31	B0
312723		Time 3	31	B2
312725		Value 3	31	B4
312727		Date 4	31	B6
312729		Time 4	31	B8
312731		Value 4	31	BA
312733		Date 5	31	BC
312735		Time 5	31	BE
312737		Value 5	31	C0

Table 19: Continued..

312829	Max Import Current Demand	Date 1	32	1C
312831		Time 1	32	1E
312833		Value 1	32	20
312835		Date 2	32	22
312837		Time 2	32	24
312839		Value 2	32	26
312841		Date 3	32	28
312843		Time 3	32	2A
312845		Value 3	32	2C
312847		Date 4	32	2E
312849		Time 4	32	30
312851		Value 4	32	32
312853		Date 5	32	34
312855	Time 5	32	36	
312857	Value 5	32	38	

312949	Max Export Current Demand	Date 1	32	94
312951		Time 1	32	96
312953		Value 1	32	98
312955		Date 2	32	9A
312957		Time 2	32	9C
312959		Value 2	32	9E
312961		Date 3	32	A0
312963		Time 3	32	A2
312965		Value 3	32	A4
312967		Date 4	32	A6
312969		Time 4	32	A8
312971		Value 4	32	AA
312973		Date 5	32	AC
312975	Time 5	32	AE	
312977	Value 5	32	B0	

4.2 Time Based Datalogging

This type of datalogging stores data with a timestamp at a preset time interval. This can be used to take a snapshot of the system at regular time intervals. This data can be used to do in-depth analysis of the system. The number of parameters to be logged and which parameters to store can also be configured by the user through display as well as modbus. Configuration registers can be found on address 40367.

The number of entries stored varies according to the number of parameters logged i.e. more entries can be stored if less number of parameters are being logged. User can configure the meter to store 1 to 30 parameters. And the time interval can vary from 1 to 60 minutes. Editing of these parameters is not allowed while the logging is on.

Each entry consists of number of parameters selected by the user in addition to date and time of the entry log.

Max Memory Locations = 273030

Actual parameters stored in each Entry = Date + Time + User Selected Parameters

Actual parameters count = 1 + 1 + Time Log Parameter Count

Max Entries that can be stored = Max Memory Locations / (Parameter Count + 2)

= 273030 / (Parameter Count + 2)

For example,

Parameter count = 1

Max Entries = 273030 / (1+2)

= 91010

Parameter count = 30

Max Entries = 273030 / (30+2)

= 8532

Interval Setting (min) = 1

Entries in 1 day = (60 / Interval Setting) x 24

= (60 / 1) x 24 = 1440

Max Days = Max Entries / Entries in 1 day

= 8532 / 1440

= 5.92 days

After all memory allocated locations are filled with logging data, the meter will start shifting data by first in first out queue i.e. at any time after all the locations are used once, the user will have access to the latest logged maximum number of entries.

Query Format for Downloading the Time based datalog

The query format for downloading an entry of a time datalog is given below. Maximum number of register the user can access in 1 query are limited by 80 and corresponding to it maximum byte count is 160. The byte count should be logging parameter count multiplied by 4 and added to 8, where 8 is the byte count for date and time (4 bytes x 2 parameters).

$(\text{logging parameter count} \times 4) + (2 \times 4)$

e.g.
if logging parameter count is 10

$\text{byte count} = (10 \times 4) + 8 = 48$ (4 bytes per parameter)

$\text{number of registers} = (10 \times 2) + (2 \times 2) = 24$ (2 registers per parameter)

Starting address will be 01,CA for time datalog.

The entry number of the desired log need to be converted to IEEE format and sent as 4 bytes.

Query example:

Description	Decimal Value	Hex Value
Dev Addr	3	03
Func Code	16	10
Start Addr Hi		01
Start Addr Lo		CA
No of Reg Hi	00	00
No of Reg Lo	14	0E
Log Download Bytes	28	1C
Entry No Reg 1 Hi	25	41
Entry No Reg 1 Lo		C8
Entry No Reg 2 Hi		00
Entry No Reg 2 Lo		00
CRC Lo		CC
CRC Hi		A4

If a user wants to download 5 parameters logged at entry number 25, the query will be as following (Assuming device address 3). All the data in query is represented in hexadecimal float.

03,10,01,CA,00,0E,1C,41,C8,00,00,CC,A4

03 is device address;
10 is function code;
01 CA is the address that lets the user access the time datalog;
00 0E is number of registers to be accessed (actual parameter count x 2);
41 C8 00 00 is entry number converted to hex;
CCA4 is CRC calculated on query.

Response:

Description	Hex Value	Decimal Value
Dev Addr	03	03
Func Code	10	16
No of bytes	1C	28
Date	46,24,28,00	010506(May 1st 2006)
Time	40,CC,CC,CD	6.40 (06:40 am)
Parameter 1	41,78,1F,68	15.50
Parameter 2	46,AB,5A,12	21933.0
Parameter 3	46,AC,57,6A	22059.7
Parameter 4	46,AB,3C,58	21918.2
Parameter 5	46,A9,AD,9D	21718.8
CRC	BE,7C	

The response to time datalog query contains data in following structure.

First two bytes are device address and function code, followed by number of bytes data of 1 byte and then date and a time data of 4 bytes each.

Then requested parameters are received in order that is specified in timelog parameters settings, each of 4 bytes.

The response ends with 2 bytes of CRC.

4.3 Load Profile Datalogging

This type of datalogging stores data on each day at time 00:00. The parameters stored in this log include energy, maximum power demand and maximum current demand. This log stores data daily as well as monthly interval. Hence, daily and monthly energy consumption can be logged. Furthermore, maximum power demand and maximum current demand in during each day and each month is also logged.. This data can be used to study load behaviour over a period of time.

The daily data available to the user is maximum of one year interval and the monthly data for 14 years interval assuming the log requested is after the starting date (requesting data before the starting date will result in modbus exception message). 1 year after the starting date, the oldest logs of daily data are constantly replaced with latest logs. 14 years after the starting date, all the load profile logs is cleared and logging is started again.

This log can be selected or de-selected i.e. if it is selected to be load profile logged; energy, maximum power demand and maximum current demand will be logged. The starting date of this datalog is stored in read only memory location 40435.

The user can access different parameters in this log this log by sending queries using following addresses.

Note: Changing the meter date resets the load profile log.

Table 20: Addresses for Load Profile datalog access

Parameter	Modbus Start Address Hex	
	High Byte	Low Byte
Daily Energy Datalog Download Addr	01	CC
Daily Maximum Power Demand Datalog Download Addr	01	CE
Daily Maximum Current Demand Datalog Download Addr	01	D0
Monthly Energy Datalog Download Addr	01	D2
Monthly Maximum Power Demand Datalog Download Addr	01	D4
Monthly Maximum Current Demand Datalog Download Addr	01	D6

Table 21: Parameter number for Load Profile

Para No.	Description
1	Import
2	Export

Query Format for Downloading the Load Profile Datalog

The query format for downloading an entry of a daily load profile log is given below. Maximum number of register the user can access in 1 query are limited by 80.

Query example:

Description	Decimal Value	Hex Value
Dev Addr	03	03
Func Code	16	10
Start Addr Hi		01
Start Addr Lo		CC
No of Reg Hi	00	00
No of Reg Lo	20	14
Log Download Bytes	40	28
Parameter no	01	01
Date	04	04
Month	11	0B
Year	14	0E
CRC Lo		AD
CRC Hi		C3

Example: If a user wants to access daily energy load profile log for 10 days from 4 November 2014 to 13 November 2014, the query for this will be as following.

03,10,01,CC,00,14,28,01,04,0B,0E,AD,C3

03 is device address;

10 is function code;

01 CC is the starting address for accessing the daily energy load profile log. (refer table 20)

00 14 is the number of registers to be accessed. This value will be double of the number of parameters requested.

28 is the number of bytes requested in this query. This value will be 4 times the number of parameters requested.

01 is the parameter number for import data. (refer Table 21)

04 0B 0E is the starting date of the log to be accessed.

AD C3 is the CRC added at the end.

The load profile datalog access query consists of device address and function code followed by the starting address which is different for different parameters and mentioned in Table 20. Number of registers can vary in multiple of 2, but can not exceed 80 and corresponding to it, number of bytes can not exceed 160.

Parameter number decides the parameter within the log (Refer Table 21).

Date, month and year decides the date from which the data is to be downloaded.

All data in the query is represented in hexadecimal format.

At the end 2 byte CRC is calculated.

Response:

Description	Hex	Decimal
Dev Addr	03	03
Func Code	10	16
Number of bytes	28	40
Value 1 (Nov 4)	48,6A,B4,80	240338
Value 2 (Nov 5)	48,6A,AD,40	240309
Value 3 (Nov 6)	48,6A,AA,C0	240299
Value 4 (Nov 7)	48,6A,B6,40	240345
Value 5 (Nov 8)	48,6A,B1,40	240325
Value 6 (Nov 9)	48,6A,B4,80	240338
Value 7 (Nov 10)	48,6A,B7,40	240349
Value 8 (Nov 11)	48,6A,AF,C0	240319
Value 9 (Nov 12)	48,6A,B3,40	240333
Value 10 (Nov 13)	48,6A,BD,C0	240375
CRC	A9,2A	

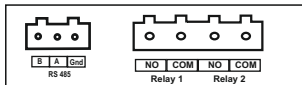
The response to the load profile query contains device address, function code and number of bytes data each of 1 byte, and then the requested parameters of 4 bytes each. Each parameter represents data over a period of a day when daily log is accessed and represents data over a period of a month when monthly log is accessed.

The response ends with 2 byte CRC.

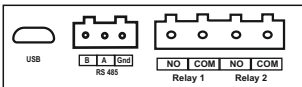
Note: If a user tries to access the data which is out of the range of the datalog i.e. more than 1 year before the present date for daily log and more than 14 years before the present date for monthly log, it will result in a modbus exception. The same will occur if a user tries to access the data before the starting date of the Load Profile log or a future date.

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

1. RS 485 Output with Relay1 & Relay2



2. USB and RS 485 Output with Relay1 & Relay2



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.