RISH Master 3440 0.2S
(as per IEC62053-22)

INDEX

## Multi-function Digital Meter
Installation & Operating Instructions

1. Introduction

The 3440 is a panel mounted 96 x 96mm DIN Quadratic Digital metering system for the measurement important electrical parameters like AC voltage, AC Current, Frequency, Power, Energy(Active / Reactive / Apparent) . The instrument integrates accurate measurement technology (All Voltages & Current measurements are True RMS up to 31th Harmonic) with 3 line 4 digits Ultra high brightness LED display.

Down Key   Up Key
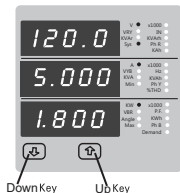
3440 can be configured and programmed at site for the following :
PT Primary, PT Secondary, CT Primary, CT Secondary (5A or 1A) and 3 phase 3W or 3 Phase 4W system.
The screen shown on left is of 3 Phase Meter.

The screen shown further is of 1 Phase Meter. The front panel has two push buttons through which the user may scroll through the available measurement readings, reset the energy (Import/Export) Min/Max (System Voltage and System Current) and configure the product.

Down Key   Up Key
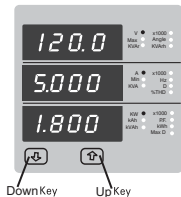
An operation via standard RS485 is possible. Through this optional interface all the above mentioned parameters can be configured and programmed. For bus service it is essential that device address, baud rate and parity should be configured properly.

This document specifies only the interface between a master device and this instrument for electrical variable through MODBUS over RS485.

2 Communication Parameter Selection :

2.1 Address Setting : This screen applies to the RS 485 output only.
This screen allows the user to set RS485 parameter for instruments.
The range of allowable address is 1 to 247 .

Enter Address, prompt for first digit.
(* Denotes that decimal point will be flashing).
Press the " ⬇ Down" key to scroll the value of the first digit
Press the " ⬆ Up" key to advance to next digit.
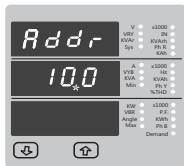
Enter Address, first digit entered, prompt for second digit
(* Denotes that decimal point will be flashing).
Use the " ⬇ Down" key to scroll the value of the second digit.
Press the " ⬆ Up" key to advance to next digit.
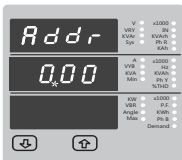
Enter Address, second digit entered, prompt for third
digit (* Denotes that decimal point will be flashing).
Use the " ⬇ Down" key to scroll the value of the third digit
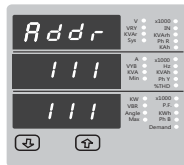
Address confirmation Screen.
This Screen confirms the Address set by user .
Press the " ⬆ Up" key to advance to next Screen
"Rs485 Baud Rate" (See Section 2.2)
Pressing the " ⬇ Down" key will reenter the "Address Edit" mode.

2.2 RS 485 Baud Rate :

This screen allows the user to set Baud Rate of RS 485 port. The values displayed on screen are in kbaud ..

Pressing "⬆ Up" key accepts the present value and advance to the Parity Selection (See Section 2.3)

Pressing the "⬇ Down" key will enter the "Baud Rate Edit" mode and scroll the value through 4.8, 9.6,19.2, 38.4, 57.6 and back to 4.8
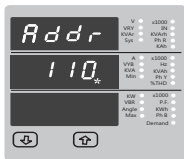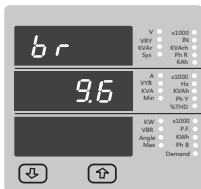
RS 485 Baud Rate confirmation :

Pressing "⬇ Down" key will be re-enter into the. Baud Rate Edit mode

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

2.3 RS 485 Parity Selection :

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

Pressing "⬆ Up" key accepts the present value and advance to Menu selection.

Pressing the "⬇ Down" key will enter the "Parity & stop bit Edit" mode and scroll the value through

odd : odd parity with one stop bit

no 1 : no parity with one stop bit

no 2 : no parity with two stop bit

E : even parity with one stop bit

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RS 485 Parity confirmation :

Pressing " ⬇ Down" key will be re-enter into Parity Edit mode.

Pressing the "⬆ Up" key will set the value.

Pressing the "⬆ Up" key again will jump back to the communication parameter selection menu
(See Section 2).

3. RS 485 (ModBus) Output :

This instrument 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 bothends 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 instrumentis between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

The maximum latency time for the instrument 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.

Each byte in RTU mode has following format:

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

Communication Baud Rate is user selectable from the front panel between 4800,9600,19200,38400,57600 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

9.1 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 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: 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)	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: 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 in querry.
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

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30001	40001	1	V1	00	00	00	00
30003	40003	2	V2	00	02	00	02
30005	40005	3	V3	00	04	00	04
30007	40007	4	I1	00	06	00	06
30009	40009	5	I2	00	08	00	08
30011	40011	6	I3	00	0A	00	0A
30013	40013	7	W1	00	0C	00	0C
30015	40015	8	W2	00	0E	00	0E
30017	40017	9	W3	00	10	00	10
30019	40019	10	VA1	00	12	00	12
30021	40021	11	VA2	00	14	00	14
30023	40023	12	VA3	00	16	00	16
30025	40025	13	VAR1	00	18	00	18
30027	40027	14	VAR2	00	1A	00	1A
30029	40029	15	VAR3	00	1C	00	1C
30031	40031	16	PF1	00	1E	00	1E
30033	40033	17	PF2	00	20	00	20
30035	40035	18	PF3	00	22	00	22
30037	40037	19	Angle1	00	24	00	24
30039	40039	20	Angle2	00	26	00	26
30041	40041	21	Angle3	00	28	00	28
30043	40043	22	Volt Avg	00	2A	00	2A
30045	40045	23	Volt Sum	00	2C	00	2C
30047	40047	24	Current Avg	00	2E	00	2E
30049	40049	25	Current Sum	00	30	00	30
30051	40051	26	Watt Avg	00	32	00	32
30053	40053	27	Watt Sum	00	34	00	34
30055	40055	28	VA Avg	00	36	00	36
30057	40057	29	VA Sum	00	38	00	38
30059	40059	30	VAr Avg	00	3A	00	3A

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30061	40061	31	VAr Sum	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	00	42	00	42
30069	40069	35	Phase Angle Sum	00	44	00	44
30071	40071	36	Freq	00	46	00	46
30073	40073	37	Wh import	00	48	00	48
30075	40075	38	Wh export	00	4A	00	4A
30077	40077	39	VArh Capacitive	00	4C	00	4C
30079	40079	40	VArh Inductive	00	4E	00	4E
30081	40081	41	---	00	50	00	50
30085	40085	43	kW imp demand	00	54	00	54
30087	40087	44	max kW imp demand	00	56	00	56
30089	40089	45	kW exp demand	00	58	00	58
30091	40091	46	max kW exp demand	00	5A	00	5A
30093	40093	47	kVAr Cap. demand	00	5C	00	5C
30095	40095	48	max kVAr Cap. demand	00	5E	00	5E
30097	40097	49	kVAr Ind. demand	00	60	00	60
30099	40099	50	max kVAr Ind. demand	00	62	00	62
30101	40101	51	KVA demand	00	64	00	64
30103	40103	52	max KVA demand	00	66	00	66
30105	40105	53	current demand	00	68	00	68
30107	40107	54	max current demand	00	6A	00	6A
30109	40109	55	Wh import Overflow count	00	6C	00	6C
30111	40111	56	Wh Import	00	6E	00	6E
30113	40113	57	Wh export Overflow count	00	70	00	70
30115	40115	58	Wh export	00	72	00	72
30117	40117	59	VArh Cap. Overflow count	00	74	00	74
30119	40119	60	VArh Capacitive	00	76	00	76
30121	40121	61	VArh Ind. Overflow count	00	78	00	78

TABLE 1 : Continued...

Address (3X)	Address (4X)	Para. No.	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30123	40123	62	VARh Inductive	00	7A	00	7A
30125	40125	63	VAh Overflow count	00	7C	00	7C
30127	40127	64	VAh	00	7E	00	7E
30133	40133	67	System Voltage Max	00	84	00	84
30135	40135	68	System Voltage Min	00	86	00	86
30137	40137	69	RPM	00	88	00	88
30139	40139	70	Impulse Rate	00	8A	00	8A
30141	40141	71	System Current Max	00	8C	00	8C
30143	40143	72	System Current Min	00	8E	00	8E
30145	40145	73	Wh imp. depending on update rate*	00	90	00	90
30147	40147	74	Wh exp. depending on update rate*	00	92	00	92
30149	40149	75	VARh cap. depending on update rate*	00	94	00	94
30151	40151	76	VARh ind. depending on update rate*	00	96	00	96
30153	40153	77	VAh depending on update rate*	00	98	00	98
30157	40157	79	Wh imp OFC depending on update rate*	00	9C	00	9C
30159	40159	80	Wh exp OFC depending on update rate*	00	9E	00	9E
30161	40161	81	VARh Cap. OFC depending on update rate *	00	A0	00	A0
30163	40163	82	VARh Ind. OFC depending on update rate *	00	A2	00	A2
30165	40165	83	VAh OFC depending on update rate*	00	A4	00	A4
30169	40169	85	---	00	A8	00	A8
30171	40171	86	---	00	AA	00	AA
30173	40173	87	---	00	AC	00	AC
30175	40175	88	---	00	AE	00	AE
30177	40177	89	---	00	B0	00	B0
30179	40179	90	---	00	B2	00	B2
30181	40181	91	---	00	B4	00	B4
30183	40183	92	---	00	B6	00	B6

*Note:The values are updated depending on update rate which is settabe by user. For example, if user set update rate 15 min, then the values on these registers (marked with *) will get updated on every 15 min.

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30201	40201	101	V12	00	C8	00	C8
30203	40203	102	V23	00	CA	00	CA
30205	40205	103	V31	00	CC	00	CC
30207	40207	104	VTHD-R	00	CE	00	CE
30209	40209	105	VTHD-Y	00	D0	00	D0
30211	40211	106	VTHD-B	00	D2	00	D2
30213	40213	107	ITHD-R	00	D4	00	D4
30215	40215	108	ITHD-Y	00	D6	00	D6
30217	40217	109	ITHD-B	00	D8	00	D8
30219	40219	110	System V-THD	00	DA	00	DA
30221	40221	111	System I-THD	00	DC	00	DC
30225	40225	113	Neutral Current	00	E0	00	E0
30227	40227	114	Run hour	00	E2	00	E2
30229	40229	115	On Hour	00	E4	00	E4
30231	40231	116	No. of interrupts	00	E6	00	E6
30251	40251	126	---	00	FA	00	FA
30255	40255	128	---	00	FE	00	FE
30263	40263	132	---	01	06	01	06
30267	40267	134	Relay 1 status	01	0A	01	0A
30269	40269	135	Relay 2 status	01	0C	01	0C
30271	40271	136	---	01	0E	01	0E
30273	40273	137	---	01	10	01	10
30275	40275	138	---	01	12	01	12
30277	40277	139	---	01	14	01	14
30279	40279	140	---	01	16	01	16
30281	40281	141	---	01	18	01	18

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30293	40293	147	---	01	24	01	24
30295	40295	148	---	01	26	01	26
30297	40297	149	---	01	28	01	28
30299	40299	150	---	01	2A	01	2A
30301	40301	151	---	01	2C	01	2C
30303	40303	152	---	01	2E	01	2E
30305	40305	153	---	01	30	01	30
30307	40307	154	---	01	32	01	32
30333	40333	167	Phase indicate	01	4C	01	4C
30337	40337	169	---	01	50	01	50
30345	40345	173	---	01	58	01	58
30347	40347	174	---	01	5A	01	5A
30349	40349	175	---	01	5C	01	5C
30351	40351	176	---	01	5E	01	5E
30353	40353	177	---	01	60	01	60
30355	40355	178	---	01	62	01	62
30357	40357	179	---	01	64	01	64
30359	40359	180	---	01	66	01	66
30361	40361	181	---	01	68	01	68
30363	40363	182	---	01	6A	01	6A
30365	40365	183	---	01	6C	01	6C
30367	40367	184	---	01	6E	01	6E
30401	40401	201	VR Harmonic-1	01	90	01	90
30403	40403	202	IR Harmonic-1	01	92	01	92
30405	40405	203	VR Harmonic-2	01	94	01	94

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30407	40407	204	IR Harmonic-2	01	96	01	96
30409	40409	205	VR Harmonic-3	01	98	01	98
30411	40411	206	IR Harmonic-3	01	9A	01	9A
30413	40413	207	VR Harmonic-4	01	9C	01	9C
30415	40415	208	IR Harmonic-4	01	9E	01	9E
30417	40417	209	VR Harmonic-5	01	A0	01	A0
30419	40419	210	IR Harmonic-5	01	A2	01	A2
30421	40421	211	VR Harmonic-6	01	A4	01	A4
30423	40423	212	IR Harmonic-6	01	A6	01	A6
30425	40425	213	VR Harmonic-7	01	A8	01	A8
30427	40427	214	IR Harmonic-7	01	AA	01	AA
30429	40429	215	VR Harmonic-8	01	AC	01	AC
30431	40431	216	IR Harmonic-8	01	AE	01	AE
30433	40433	217	VR Harmonic-9	01	B0	01	B0
30435	40435	218	IR Harmonic-9	01	B2	01	B2
30437	40437	219	VR Harmonic-10	01	B4	01	B4
30439	40439	220	IR Harmonic-10	01	B6	01	B6
30441	40441	221	VR Harmonic-11	01	B8	01	B8
30443	40443	222	IR Harmonic-11	01	BA	01	BA
30445	40445	223	VR Harmonic-12	01	BC	01	BC
30447	40447	224	IR Harmonic-12	01	BE	01	BE
30449	40449	225	VR Harmonic-13	01	C0	01	C0
30451	40451	226	IR Harmonic-13	01	C2	01	C2
30453	40453	227	VR Harmonic-14	01	C4	01	C4
30455	40455	228	IR Harmonic-14	01	C6	01	C6
30457	40457	229	VR Harmonic-15	01	C8	01	C8
30459	40459	230	IR Harmonic-15	01	CA	01	CA
30461	40461	231	VR Harmonic-16	01	CC	01	CC
30463	40463	232	IR Harmonic-16	01	CE	01	CE
30465	40465	233	VR Harmonic-17	01	D0	01	D0

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30467	40467	234	IR Harmonic-17	01	D2	01	D2
30469	40469	235	VR Harmonic-18	01	D4	01	D4
30471	40471	236	IR Harmonic-18	01	D6	01	D6
30473	40473	237	VR Harmonic-19	01	D8	01	D8
30475	40475	238	IR Harmonic-19	01	DA	01	DA
30477	40477	239	VR Harmonic-20	01	DC	01	DC
30479	40479	240	IR Harmonic-20	01	DE	01	DE
30481	40481	241	VR Harmonic-21	01	E0	01	E0
30483	40483	242	IR Harmonic-21	01	E2	01	E2
30485	40485	243	VR Harmonic-22	01	E4	01	E4
30487	40487	244	IR Harmonic-22	01	E6	01	E6
30489	40489	245	VR Harmonic-23	01	E8	01	E8
30491	40491	246	IR Harmonic-23	01	EA	01	EA
30493	40493	247	VR Harmonic-24	01	EC	01	EC
30495	40495	248	IR Harmonic-24	01	EE	01	EE
30497	40497	249	VR Harmonic-25	01	F0	01	F0
30499	40499	250	IR Harmonic-25	01	F2	01	F2
30501	40501	251	VR Harmonic-26	01	F4	01	F4
30503	40503	252	IR Harmonic-26	01	F6	01	F6
30505	40505	253	VR Harmonic-27	01	F8	01	F8
30507	40507	254	IR Harmonic-27	01	FA	01	FA
30509	40509	255	VR Harmonic-28	01	FC	01	FC
30511	40511	256	IR Harmonic-28	01	FE	01	FE
30513	40513	257	VR Harmonic-29	02	00	02	00
30515	40515	258	IR Harmonic-29	02	02	02	02
30517	40517	259	VR Harmonic-30	02	04	02	04
30519	40519	260	IR Harmonic-30	02	06	02	06
30521	40521	261	VR Harmonic-31	02	08	02	08
30523	40523	262	IR Harmonic-31	02	0A	02	0A
30525	40525	263	---	02	0C	02	0C

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TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X High Byte	Start Address Hex 3X Low Byte	Start Address Hex 4X High Byte	Start Address Hex 4X Low Byte
30527	40527	264	---	02	0E	02	0E
30529	40529	265	VY Harmonic-1	02	10	02	10
30531	40531	266	IY Harmonic-1	02	12	02	12
30533	40533	267	VY Harmonic-2	02	14	02	14
30535	40535	268	IY Harmonic-2	02	16	02	16
30537	40537	269	VY Harmonic-3	02	18	02	18
30539	40539	270	IY Harmonic-3	02	1A	02	1A
30541	40541	271	VY Harmonic-4	02	1C	02	1C
30543	40543	272	IY Harmonic-4	02	1E	02	1E
30545	40545	273	VY Harmonic-5	02	20	02	20
30547	40547	274	IY Harmonic-5	02	22	02	22
30549	40549	275	VY Harmonic-6	02	24	02	24
30551	40551	276	IY Harmonic-6	02	26	02	26
30553	40553	277	VY Harmonic-7	02	28	02	28
30555	40555	278	IY Harmonic-7	02	2A	02	2A
30557	40557	279	VY Harmonic-8	02	2C	02	2C
30559	40559	280	IY Harmonic-8	02	2E	02	2E
30561	40561	281	VY Harmonic-9	02	30	02	30
30563	40563	282	IY Harmonic-9	02	32	02	32
30565	40565	283	VY Harmonic-10	02	34	02	34
30567	40567	284	IY Harmonic-10	02	36	02	36
30569	40569	285	VY Harmonic-11	02	38	02	38
30571	40571	286	IY Harmonic-11	02	3A	02	3A
30573	40573	287	VY Harmonic-12	02	3C	02	3C
30575	40575	288	IY Harmonic-12	02	3E	02	3E
30577	40577	289	VY Harmonic-13	02	40	02	40
30579	40579	290	IY Harmonic-13	02	42	02	42
30581	40581	291	VY Harmonic-14	02	44	02	44
30583	40583	292	IY Harmonic-14	02	46	02	46
30585	40585	293	VY Harmonic-15	02	48	02	48

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30587	40587	294	IY Harmonic-15	02	4A	02	4A
30589	40589	295	VY Harmonic-16	02	4C	02	4C
30591	40591	296	IY Harmonic-16	02	4E	02	4E
30593	40593	297	VY Harmonic-17	02	50	02	50
30595	40595	298	IY Harmonic-17	02	52	02	52
30597	40597	299	VY Harmonic-18	02	54	02	54
30599	40599	300	IY Harmonic-18	02	56	02	56
30601	40601	301	VY Harmonic-19	02	58	02	58
30603	40603	302	IY Harmonic-19	02	5A	02	5A
30605	40605	303	VY Harmonic-20	02	5C	02	5C
30607	40607	304	IY Harmonic-20	02	5E	02	5E
30609	40609	305	VY Harmonic-21	02	60	02	60
30611	40611	306	IY Harmonic-21	02	62	02	62
30613	40613	307	VY Harmonic-22	02	64	02	64
30615	40615	308	IY Harmonic-22	02	66	02	66
30617	40617	309	VY Harmonic-23	02	68	02	68
30619	40619	310	IY Harmonic-23	02	6A	02	6A
30621	40621	311	VY Harmonic-24	02	6C	02	6C
30623	40623	312	IY Harmonic-24	02	6E	02	6E
30625	40625	313	VY Harmonic-25	02	70	02	70
30627	40627	314	IY Harmonic-25	02	72	02	72
30629	40629	315	VY Harmonic-26	02	74	02	74
30631	40631	316	IY Harmonic-26	02	76	02	76
30633	40633	317	VY Harmonic-27	02	78	02	78
30635	40635	318	IY Harmonic-27	02	7A	02	7A
30637	40637	319	VY Harmonic-28	02	7C	02	7C
30639	40639	320	IY Harmonic-28	02	7E	02	7E
30641	40641	321	VY Harmonic-29	02	80	02	80
30643	40643	322	IY Harmonic-29	02	82	02	82
30645	40645	323	VY Harmonic-30	02	84	02	84

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30647	40647	324	IY Harmonic-30	02	86	02	86
30649	40649	325	VY Harmonic-31	02	88	02	88
30651	40651	326	IY Harmonic-31	02	8A	02	8A
30653	40653	327	---	02	8C	02	8C
30655	40655	328	---	02	8E	02	8E
30657	40657	329	VB Harmonic-1	02	90	02	90
30659	40659	330	IB Harmonic-1	02	92	02	92
30661	40661	331	VB Harmonic-2	02	94	02	94
30663	40663	332	IB Harmonic-2	02	96	02	96
30665	40665	333	VB Harmonic-3	02	98	02	98
30667	40667	334	IB Harmonic-3	02	9A	02	9A
30669	40669	335	VB Harmonic-4	02	9C	02	9C
30671	40671	336	IB Harmonic-4	02	9E	02	9E
30673	40673	337	VB Harmonic-5	02	A0	02	A0
30675	40675	338	IB Harmonic-5	02	A2	02	A2
30677	40677	339	VB Harmonic-6	02	A4	02	A4
30679	40679	340	IB Harmonic-6	02	A6	02	A6
30681	40681	341	VB Harmonic-7	02	A8	02	A8
30683	40683	342	IB Harmonic-7	02	AA	02	AA
30685	40685	343	VB Harmonic-8	02	AC	02	AC
30687	40687	344	IB Harmonic-8	02	AE	02	AE
30689	40689	345	VB Harmonic-9	02	B0	02	B0
30691	40691	346	IB Harmonic-9	02	B2	02	B2
30693	40693	347	VB Harmonic-10	02	B4	02	B4
30695	40695	348	IB Harmonic-10	02	B6	02	B6
30697	40697	349	VB Harmonic-11	02	B8	02	B8
30699	40699	350	IB Harmonic-11	02	BA	02	BA
30701	40701	351	VB Harmonic-12	02	BC	02	BC
30703	40703	352	IB Harmonic-12	02	BE	02	BE
30705	40705	353	VB Harmonic-13	02	C0	02	C0

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30707	40707	354	IB Harmonic-13	02	C2	02	C2
30709	40709	355	VB Harmonic-14	02	C4	02	C4
30711	40711	356	IB Harmonic-14	02	C6	02	C6
30713	40713	357	VB Harmonic-15	02	C8	02	C8
30715	40715	358	IB Harmonic-15	02	CA	02	CA
30717	40717	359	VB Harmonic-16	02	CC	02	CC
30719	40719	360	IB Harmonic-16	02	CE	02	CE
30721	40721	361	VB Harmonic-17	02	D0	02	D0
30723	40723	362	IB Harmonic-17	02	D2	02	D2
30725	40725	363	VB Harmonic-18	02	D4	02	D4
30727	40727	364	IB Harmonic-18	02	D6	02	D6
30729	40729	365	VB Harmonic-19	02	D8	02	D8
30731	40731	366	IB Harmonic-19	02	DA	02	DA
30733	40733	367	VB Harmonic-20	02	DC	02	DC
30735	40735	368	IB Harmonic-20	02	DE	02	DE
30737	40737	369	VB Harmonic-21	02	E0	02	E0
30739	40739	370	IB Harmonic-21	02	E2	02	E2
30741	40741	371	VB Harmonic-22	02	E4	02	E4
30743	40743	372	IB Harmonic-22	02	E6	02	E6
30745	40745	373	VB Harmonic-23	02	E8	02	E8
30747	40747	374	IB Harmonic-23	02	EA	02	EA
30749	40749	375	VB Harmonic-24	02	EC	02	EC
30751	40751	376	IB Harmonic-24	02	EE	02	EE
30753	40753	377	VB Harmonic-25	02	F0	02	F0
30755	40755	378	IB Harmonic-25	02	F2	02	F2
30757	40757	379	VB Harmonic-26	02	F4	02	F4
30759	40759	380	IB Harmonic-26	02	F6	02	F6
30761	40761	381	VB Harmonic-27	02	F8	02	F8
30763	40763	382	IB Harmonic-27	02	FA	02	FA
30765	40765	383	VB Harmonic-28	02	FC	02	FC

TABLE 1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start Address Hex 3X		Start Address Hex 4X	
				High Byte	Low Byte	High Byte	Low Byte
30767	40767	384	IB Harmonic-28	02	FE	02	FE
30769	40769	385	VB Harmonic-29	03	00	03	00
30771	40771	386	IB Harmonic-29	03	02	03	02
30773	40773	387	VB Harmonic-30	03	04	03	04
30775	40775	388	IB Harmonic-30	03	06	03	06
30777	40777	389	VB Harmonic-31	03	08	03	08
30779	40779	390	IB Harmonic-31	03	0A	03	0A
30781	40781	391	---	03	0C	03	0C
30783	40783	392	---	03	0E	03	0E

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

2. Relay Output 1/ 2 Status shows whether relay is Energized or De-energized.

1 :- Relay Energized   0:- Relay De-energized

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

Address (3X)	Address (4X)	Parameter	Start Address Hex 3X		Start Address Hex 4X	
			Hi Byte	Lo Byte	Hi Byte	Lo Byte
30801	40801	Active Energy Import	03	20	03	20
30803	40803	Active Energy Export	03	22	03	22
30805	40805	Reactive Energy Capacitive	03	24	03	24
30807	40807	Reactive Energy Inductive	03	26	03	26
30809	40809	Apparent Energy	03	28	03	28
30813	40813	Active Energy Import Overflow Count	03	2C	03	2C
30815	40815	Active Energy Export Overflow Count	03	2E	03	2E
30817	40817	Reactive Energy Cap. Overflow Count	03	30	03	30
30819	40819	Reactive Energy Ind. Overflow Count	03	32	03	32
30821	40821	Apparent Energy Overflow Count	03	34	03	34
30825	40825	Active Energy Import on time*	03	38	03	38
30827	40827	Active Energy Export on time*	03	3A	03	3A
30829	40829	Reactive Energy Cap. on time*	03	3C	03	3C

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

Address (3X)	Address (4X)	Parameter	Start Address Hex 3X		Start Address Hex	
			Hi Byte	Lo Byte	Hi Byte	Lo Byte
30831	40831	Reactive Energy Imp. on time*	03	3E	03	3E
30833	40833	Apparent Energy on time*	03	40	03	40
30837	40837	Active Energy Imp Overflow Count on time*	03	44	03	44
30839	40839	Active Energy Exp Overflow Count on time*	03	46	03	46
30841	40841	Reac. Energy Cap. Overflow Count on time*	03	48	03	48
30843	40843	Reac. Energy Ind. Overflow Count on time*	03	4A	03	4A
30845	40845	Apparent Energy Overflow Count on time*	03	4C	03	4C
30849	40849	---	03	50	03	50
30851	40851	---	03	52	03	52
30853	40853	---	03	54	03	54
30855	40855	---	03	56	03	56
30857	40857	---	03	58	03	58
30859	40859	---	03	5A	03	5A
30861	40861	---	03	5C	03	5C
30863	40863	---	03	5E	03	5E
30865	40865	---	03	60	03	60
30867	40867	---	03	62	03	62

*Note:
1. The values are updated depending on update rate which is settable by user.
For example, if user set update rate 15 min, then the values on these registers (marked with *) will get updated on every 15 min.

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 System type

System type: Start address = 177A (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	7A (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	E4 (Hex)
CRC High	09 (Hex)

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

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

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

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

Example : Writing System type

System type :   Start address = 177A (Hex)
Number of registers = 02

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

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	17 (Hex)
Starting Address Lo	7A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
Byte Count	04 (Hex)
Data Register-1High Byte	40 (Hex)
Data Register-1 Low Byte	00(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)
CRC Low	66 (Hex)
CRC High	10 (Hex)

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

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	17 (Hex)
Start Address Low	7A(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
CRC Low	61 (Hex)
CRC High	CA (Hex)

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

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3.3 Accessing 4 X register for Long Energy Reading & Writing

For setting Energy start count in long energy format following Querry format should be used .
for writing energy start count
first send query to unlock the parameter

Query:(Query For Unlock to enter Active energy import)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	03(Hex)
Starting Address Lo	20(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
Byte Count	04 (Hex)
Data Register-1High Byte	00 (Hex)
Data Register-1 Low Byte	00(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	01(Hex)
CRC Low	66 (Hex)
CRC High	10 (Hex)

Byte Count : Total number of data bytes transmitted.
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	03 (Hex)
Start Address Low	20(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
CRC Low	61 (Hex)
CRC High	CA (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.

Once the unlock Query is sent, send query for writing Enery start count.
For Example: Query for writing energy start count of 999999999 for Active Import Energy
Note: refer TABLE 8 for energy parameter selection.

Query:(Query enter Active energy import)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	03(Hex)
Starting Address Lo	20(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
Byte Count	04 (Hex)
Data Register-1High Byte	3B (Hex)
Data Register-1 Low Byte	9A(Hex)
Data Register-2 High Byte	C9(Hex)
Data Register-2 Low Byte	FF(Hex)
CRC Low	66 (Hex)
CRC High	10 (Hex)

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

Value(3B ,9A, C9,FF) reperesents 999999999.

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	03 (Hex)
Start Address Low	20(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02(Hex)
CRC Low	61 (Hex)
CRC High	CA (Hex)

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

TABLE 3 : 4 X register addresses

Address (Register)	Parameter No.	Parameter	Read/ Write	Modbus Start Addr. Hex High Byte	Low Byte	Default Value
46003	1	Demand integration time	R/Wp	17	72	8
46005	2	Energy Resolution / unit	R/Wp	17	74	2
46007	3	---		17	76	
46009	4	---		17	78	
46011	5	System type	R/Wp	17	7A	3
46013	6	Pulse width	R/Wp	17	7C	100
46015	7	Reset parameters	R/Wp	17	7E	0
46017	8	No. of poles	R/Wp	17	80	2
46019	9	RS485 setup code	R/Wp	17	82	4
46021	10	Node address	R/Wp	17	84	1
46023	11	Pulse divisor	R/Wp	17	86	1
46029	14	Analog Out 1 - Para Select	R/Wp	17	8C	0
46031	15	Analog Out 2 - Para Select	R/Wp	17	8E	0
46033	16	PT primary	R/Wp	17	90	415
46035	17	CT primary	R/Wp	17	92	5
46037	18	---		17	94	
46039	19	Energy digit reset count	R/Wp	17	96	8
46041	20	Register Order/Word Order	R/Wp	17	98	0
46043	21	CTSecondary	R/Wp	17	9A	5
46045	22	PTSecondary	R/Wp	17	9C	415
46047	23	Relay1 output select	R/Wp	17	9E	0
46049	24	Pulse1/Limit1 Parameter select	R/Wp	17	A0	0
46051	25	Limit1 Trip point	R/Wp	17	A2	100
46053	26	Hysteresis(Limit1)	R/Wp	17	A4	0.5
46055	27	Limit1 delay(On)	R/Wp	17	A6	1
46057	28	Limit1 delay(Off)	R/Wp	17	A8	1
46059	29	Relay2 output select	R/Wp	17	AA	0
46061	30	Pulse2/Limit2 Parameter select	R/Wp	17	AC	0
46063	31	Limit2 Trip point	R/Wp	17	AE	100
46065	32	Hysteresis(Limit2)	R/Wp	17	B0	0.5

TABLE 3 : continued...

Address (Register)	Param-eter No.	Parameter	Read/Write	Modbus Start Addr. Hex High Byte	Low Byte	Default Value
46067	33	Limit2 delay(On)	R/Wp	17	B2	1
46069	34	Limit2 delay(Off)	R/Wp	17	B4	1
46071	35	Password	R/Wp	17	B6	0000
46073	36	Limit1 Configuration select	R/Wp	17	B8	0
46075	37	Limit2 Configuration select	R/Wp	17	BA	0
46077	38	Auto scroll	R/Wp	17	BC	0
46079	39	30mA Noise cutoff	R/Wp	17	BE	0
46081	40	Update rate on MODBUS	R/Wp	17	C0	15
46083	41	Factory Reset Mode	R/Wp	17	C2	0
46087	43	System Frequency selection	R/Wp	17	C6	50
46089	44	Impulse on Energy Selection	R/Wp	17	C8	1
46091	45	EnergyPara Select	R/Wp	17	CA	0
46093	46	Enter Energy Start Count	R/Wp	17	CC	0
46095	47	---	R/Wp	17	CE	0
46097	48	---	R/Wp	17	D0	0
46127	63	---	R/Wp	17	EE	-
46129	64	---	R/Wp	17	F0	-
46131	65	---	R	17	F2	0
46133	66	---		17	F4	
46135	67	---		17	F6	
46137	68	---	R/Wp	17	F8	0
46139	69	---	R/Wp	17	FA	1
46141	70	---	R/Wp	17	FC	2
46143	71	---	R/Wp	17	FE	3
46145	72	---	R/Wp	18	00	4
46147	73	---	R/Wp	18	02	5
46149	74	---	R/Wp	18	04	6
46151	75	---	R/Wp	18	06	7
46153	76	---	R/Wp	18	08	8

TABLE 3 : continued...

Address (Register)	Param-eter No.	Parameter	Read/Write	Modbus Start Addr. Hex High Byte	Low Byte	Default Value
46155	77	---	R/Wp	18	0A	9
46157	78	---	R/Wp	18	0C	10
46177	88	---	-	18	0E	-
46179	89	---	-	18	22	-
46181	90	Version no.	R	18	24	-
46183	91	---	-	18	26	-
46185	92	---	R/Wp	18	28	0
46187	93	---	R/Wp	18	2A	0
46189	94	---	R/Wp	18	2C	1
46191	95	---	R/Wp	18	2E	1
46193	96	---	R/Wp	18	30	0
46195	97	---	R/Wp	18	32	0
46197	98	---	R/Wp	18	34	0
46199	99	---	R/Wp	18	36	0
46201	100	---	R/Wp	18	38	0
46203	101	---	R/Wp	18	3A	0
46205	102	---	R/Wp	18	3C	0
46207	103	---	R/Wp	18	3E	0
46209	104	---	R/Wp	18	40	0
46211	105	---	R/Wp	18	42	0
46213	106	---	R/Wp	18	44	0
46215	107	---	R/Wp	18	46	0
46217	108	---	R/Wp	18	48	0
46219	109	---	R/Wp	18	4A	0
46221	110	---	R/Wp	18	4C	0
46223	111	---	R/Wp	18	4E	0
46225	112	---	R/Wp	18	50	0
46227	113	---	R/Wp	18	52	0
46229	114	---	R/Wp	18	54	0
46231	115	------	R/Wp	18	56	0

TABLE 3 : continued...

Address (Register)	Param-eter No.	Parameter	Read/Write	Modbus Start Addr. Hex		Default Value
				High Byte	Low Byte	
46233	116	—----	R/Wp	18	58	0
46235	117	---	R/Wp	18	5A	0
46237	118	---	R/Wp	18	5C	0
46239	119	---	R/Wp	18	5E	0
46241	120	---	R/Wp	18	60	0
46243	121	---	R/Wp	18	62	0
46245	122	---	R/Wp	18	64	0
46247	123	---	R/Wp	18	66	0
46249	124	---	R/Wp	18	68	0
46251	125	---	R/Wp	18	6A	0
46253	126	---	R/Wp	18	6C	0
46255	127	---	R	18	6E	0
46265	132	---	-	18	78	-

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

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	Demand Integration Time	Demand period represents demand time in minutes. The applicable values are 8,15,20 or 30.
46005	Energy Output	This address is used to set energy output in Wh,kWh & MWh. Write one of the following value to this address. **1:** Energy in Wh.　　**2:** Energy in KWh. **3**: Energy in MWh.
46007	------	------
46009	------	------
46011	System Type	This address is used to set the System type. Write one of the following value to this address. **1**: 1 Phase 2 Wire **2**: 3 Phase 3 Wire **3**: 3 Phase 4 Wire.
46013	Pulse Width of Relay	This address is used to set **pulse width** of the Pulse output. Write one of the following values to this address: **60** :　60 ms **100** :　100 ms **200** :　200 ms
46015	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. **1:** Energy Reset　　　　　　**2:** Demand Reset **3:** System Min Values Reset　**4:** System Max Values Reset **5:** Run hour & On hour Reset　**6:** No of Interruptions Reset **7:** Reset All data　　　　　　**8:** Time Datalog **9:** Load Profile Datalog
46017	Number of Poles	This address is used to set the no. of poles of generator of which RPM is to be measured. The value must be between 2 to 40 and a multiple of 2.
46019	Rs485 Set-up Code	This address is used to set the baud rate, Parity and Number of stop bits. Refer to **TABLE 4** for details.
46021	Node Address	This register address is used to set Device address between 1 and 247 .

Address	Parameter	Description
46023	Pulse Divisor	This address is used to set **pulse divisor** of the Pulse output. Write one of the following values to this address **for Wh**: **1** : Divisor 1 **10** : Divisor 10 **100** : Divisor 100 **1000** : Divisor 1000 & In **kWh** or **MWh** divisor will be **1 default.**
40025	——-	——-
40027	——-	——-
40029	Analog Out 1-Para Set	This address is used to set the parameter for Analog Output 1. Write one of the parameter no. As per the options given in Table 2 for Analog & Limit Output Parameters. Writing any other value will return an error.
40031	Analog Out 2-Para Set	This address is used to set the parameter for Analog Output 2.. Write one of the parameter no. As per the options given in Table 2 for Analog & Limit Output Parameters. Writing any other value will return an error.
46033	PT Primary	This address allows the user to set PT Primary value (in terms of VL-L). The settable range is 100 VL-L to 692.8 kVL-L for all system types & also depends on the per phase 666.6 MVA Restriction of power combined with CT primary.
46035	CT Pimary	This address allows the user to set CT Primary value. The settable range is 1 to 1157. It also depends on the per phase 666.6 MVA Restriction of power combined with PT primary.
46037	——-	——-

Address	Parameter	Description
46039	Energy Digit Reset Count	This address is used to set Energy Digit Reset Count value. Energy count can be configured to reset in between 7 to 9.
46041	Word Order	Word Order controls the order in which Multifunction Meter receives or sends floating - point numbers:- normal and 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.
46043	CT secondary	This address is used to read and write the CT secondary value. Write one of the following values to this address. **1:** 1A CT secondary **5:** 5A CT secondary Note: For External CT model CT Secondary is not settable from modbus.
46045	PT secondary	This address is used to read and write the PT secondary value. The settable range is 100-600VLL.
46047	Relay 1 output select	This address is used to select the Relay operation as Pulse/Timer/RTC Relay/Limit Write one of the following values to this address. **0:** Pulse output on Relay **128** (Decimal)**:** Limit output on Relay.
46049	Relay 1 Para select	This address is used to assign the Parameter to Relay. Pulse relay: Refer **TABLE 5** Limit relay: Refer **TABLE 6**
46051	Limit 1 Trip Point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo- alarm & 10 to120 for Hi-alarm can be written to this address.(refer **TABLE 6**).
46053	Limit 1 Hysteresis	This address is used to set the hysteresis between 0.5 to 50.0%.
46055	Relay 1 On (Energize) Delay	This address is used to set the Energizing delay or On delay in seconds in range of 1 to 10.

Address	Parameter	Description
46057	Relay 1 Off (De-Energize) Delay	This address is used to set the De-energizing delay or Off delay in seconds in range of 1 to 10.
46059	Relay 2 output select	Same as Relay 1.
46061	Relay 2 Para select	
46063	Limit 2 Trip Point	
46065	Limit 2 Hysteresis	
46067	Relay 2 On (Energize) Delay	
46069	Relay 2 Off (De-Energize) Delay	
46071	Password	This address is used to set & reset the password. Valid Range of Password can be set is 0000 - 9999 . 1) If password lock is present & if this location is read it will return **zero**. 2) If Password lock is absent & if this location is read it will return **One**. 3) If password lock is present & to disable this lock first send valid password to this location then write "0000" to this location 4) If password lock is present & to modify 4X parameter first send valid password to this location so that 4X parameter will be accessible for modification. 5) If for in any of the above case invalid password is send then meter will return exceptional error 2.
46073	Relay 1 Configuration Select	This address is used to set the Configuration for Relay 1 Refer **TABLE 7**.
46075	Limit 2 Configuration Select	This address is used to set the Configuration for Relay 2 Refer **TABLE 7**.

Address	Parameter	Description
46077	Auto scroll	This address is used to activate or de-activate the auto scrolling. Write **0:** Deactivate **1:** Activate
46079	30mA Noise current Elimination	This address is used to activate or de-activate the 30 mA noise current elimination write **0:** Deactivate **30 (Decimal):** Activate
46081	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.
46083	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 **5555** at this address to reset the instrument.
46087	System Frequency Selection	This address is used to set the frequency of the input. Write **50:** For 50 Hz input **60:** For 60Hz input
46089	Impulse Selection	This address is used to select the energy to which impulse is to be assigned. Writing any other value will return an error. **0:** None **1:** Active Energy **2:** Reactive Energy **3:** Apparent Energy
46091	Energy Parameter Selection	This address is used to select the parameter whose start count (initial value) is to be set. Refer **TABLE 8**.
46093	Energy Start Count	This address is used to set the start count of the parameter selected in address 46091. The start count of the parameter should be in the range specified in **TABLE 8**.
46095	---	---
46097	---	---

Address	Parameter	Description
46127	-----	-----
46129	-----	-----
46131	-----	-----
46133	-----	-----
46135	-----	-----
46137	-----	-----
46139 to 46157	-----	-----
46159 to 46175	-----	-----
46177	-----	-----
46181	Version Number	This address is read only and displays the version number of the meter.
46183	-----	-----
46185	-----	-----
46187	-----	-----

Address	Parameter	Description
46189	------	------
46191	------	------
46193-46251	------	------
46253	------	------
46255	------	------
46265	------	------

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

TABLE 4 : RS 485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
4800	NONE	01	0
4800	NONE	02	1
4800	EVEN	01	2
4800	ODD	01	3
9600	NONE	01	4
9600	NONE	02	5
9600	EVEN	01	6
9600	ODD	01	7
19200	NONE	01	8
19200	NONE	02	9
19200	EVEN	01	10
19200	ODD	01	11
38400	NONE	01	12
38400	NONE	02	13
38400	EVEN	01	14
38400	ODD	01	15
57600	NONE	01	16
57600	NONE	02	17
57600	EVEN	01	18
57600	ODD	01	19

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

TABLE 5 : Pulse Configuration select

Code	Configuration
0	Active Energy Import
1	Active Energy Export
2	Capacitive Reactive Energy
3	Inductive Reactive Energy
4	Apparent Energy

TABLE 6 : Parameter for Analog & Limit Output

Sr. No.	Parameter	1P 2W	3P 4W	3P 3W	Range Analog Output	Range Limit Output
0	None	✓	✓	✓	–	–
1	INPUT VOLTAGE L1	✓	✓	✓	0 - 100 %	10 - 120 %
2	INPUT VOLTAGE L2	✗	✓	✓	0 - 100 %	10 - 120 %
3	INPUT VOLTAGE L3	✗	✓	✓	0 - 100 %	10 - 120 %
4	INPUT CURRENT IL1	✓	✓	✓	0 - 100 %	10 - 120 %
5	INPUT CURRENT IL2	✗	✓	✓	0 - 100 %	10 - 120 %
6	INPUT CURRENT IL3	✗	✓	✓	0 - 100 %	10 - 120 %
7	ACTIVE POWER L1	✓	✓	✗	0 - 120 %	10 - 120 %
8	ACTIVE POWER L2	✗	✓	✗	0 - 120 %	10 - 120 %
9	ACTIVE POWER L3	✗	✓	✗	0 - 120 %	10 - 120 %
10	APPARENT POWER L1	✓	✓	✗	0 - 120 %	10 - 120 %
11	APPARENT POWER L2	✗	✓	✗	0 - 120 %	10 - 120 %
12	APPARENT POWER L3	✗	✓	✗	0 - 120 %	10 - 120 %
13	REACTIVE POWER L1	✓	✓	✗	0 - 120 %	10 - 120 %
14	REACTIVE POWER L2	✗	✓	✗	0 - 120 %	10 - 120 %
15	REACTIVE POWER L3	✗	✓	✗	0 - 120 %	10 - 120 %
16	POWER FACTOR L1	✓	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
17	POWER FACTOR L2	✗	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
18	POWER FACTOR L3	✗	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
19	PHASE ANGLE L1	✓	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
20	PHASE ANGLE L2	✗	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
21	PHASE ANGLE L3	✗	✓	✗	$181^{0}/ 0 / -180^{0}$	10 - 90 % [2]
22	VOLTAGE AVG	✗	✓	✓	0 - 100 %	10 - 120 %
24	CURRENT AVG	✗	✓	✓	0 - 100 %	10 - 120 %

Sr. No.	Parameter	1P 2W	3P 4W	3P 3W	Range	
					Analog Output	Limit Output
27	ACTIVE POWER SUM	✗	✓	✓	0 - 120 %	10 - 120 %
29	APPARENT POWER SUM	✗	✓	✓	0 - 120 %	10 - 120 %
31	REACTIVE POWER SUM	✗	✓	✓	0 - 120 %	10 - 120 %
32	POWER FACTOR AVG	✗	✓	✓	181⁰/ 0 / -180 ⁰	10 - 90 % (2)
34	PHASE ANGLE AVG	✗	✓	✓	181⁰/ 0 / -180 ⁰	10 - 90 % (2)
36	FREQUENCY	✓	✓	✓	45 to 66 Hz	10 - 90 % (1)
43	WATT DEMAND IMPORT	✓	✓	✓	0 - 120 %	10 - 120 %
44	WATT MAX DEMAND IMP.	✓	✓	✓	0 - 120 %	10 - 120 %
45	WATT DEMAND EXPORT	✓	✓	✓	0 - 120 %	10 - 120 %
46	WATT MAX DEMAND EXP.	✓	✓	✓	0 - 120 %	10 - 120 %
47	VAR DEMAND IND.	✓	✓	✓	0 - 120 %	10 - 120 %
48	VAR MAX DEMAND IND.	✓	✓	✓	0 - 120 %	10 - 120 %
49	VAR DEMAND CAP.	✓	✓	✓	0 - 120 %	10 - 120 %
50	VAR MAX DEMAND CAP.	✓	✓	✓	0 - 120 %	10 - 120 %
51	VA DEMAND	✓	✓	✓	0 - 120 %	10 - 120 %
52	VA MAX DEMAND	✓	✓	✓	0 - 120 %	10 - 120 %
53	CURRENT DEMAND	✓	✓	✓	0 - 100 %	10 - 120 %
54	CURRENT MAX DEMAND	✓	✓	✓	0 - 100 %	10 - 120 %
101	INPUT VOLTAGE L12	✗	✓	✗	0 - 100 %	10 - 120 %
102	INPUT VOLTAGE L23	✗	✓	✗	0 - 100 %	10 - 120 %
103	INPUT VOLTAGE L31	✗	✓	✗	0 - 100 %	10 - 120 %
113	NEUTRAL CURRENT	✗	✓	✗	0 - 100 %	10 - 120 %

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

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

(2) For 3P 4W and 1P2W the nominal value is VLN and that for 3P 3W is VLL.

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

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

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

TABLE 7: 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

TABLE 8: Energy Parameter Selection and Start Count

Parameter Number	Parameter	Range
1	Imp Active Energy Start Count	1 to 999999999
2	Exp Active Energy Start Count	1 to 999999999
3	Capacitive Reactive Energy Start Count	1 to 999999999
4	Inductive Reactive Energy Start Count	1 to 999999999
5	Apparent Energy Start Count	1 to 999999999
7	Imp Active Energy Overflow Start Count	1 to 999999
8	Exp Active Energy Overflow Start Count	1 to 999999
9	Capacitive Reactive Energy Overflow Start Count	1 to 999999
10	Inductive Reactive Energy Overflow Start Count	1 to 999999
11	Apparant Energy Overflow Start Count	1 to 999999

3.4 User Assignable Modbus Registers:

The Multifunction Instrument contains 20 user assignable registers in the address range of 0x400 (31025) to 0x426 (31065) for 3X registers (**see TABLE 9**) and address range of 0x400 (41025) to 0x426 (41065) for 4X registers (**see TABLE 9**).

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 0x400 to 0x426 are specified in 4X Register 0x251C to 0x252F (**see TABLE 10**).

TABLE 9 : User Assignable 3X Data Registers

Address (3X)	Address (4X)	Assignable Register	Modbus Start Address (Hex)	
			High Byte	Low Byte
31025	41025	Assignable Reg 1	04	00
31027	41027	Assignable Reg 2	04	02
31029	41029	Assignable Reg 3	04	04
31031	41031	Assignable Reg 4	04	06
31033	41033	Assignable Reg 5	04	08
31035	41035	Assignable Reg 6	04	0A
31037	41037	Assignable Reg 7	04	0C
31039	41039	Assignable Reg 8	04	0E
31041	41041	Assignable Reg 9	04	10
31043	41043	Assignable Reg 10	04	12
31045	41045	Assignable Reg 11	04	14
31047	41047	Assignable Reg 12	04	16
31049	41049	Assignable Reg 13	04	18
31051	41051	Assignable Reg 14	04	1A
31053	41053	Assignable Reg 15	04	1C
31055	41055	Assignable Reg 16	04	1E
31057	41057	Assignable Reg 17	04	20
31059	41059	Assignable Reg 18	04	22
31061	41061	Assignable Reg 19	04	24
31063	41063	Assignable Reg 20	04	26

TABLE 10 : User Assignable mapping register (4X registers)

Address (4X)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49501	Mapped Add for register #0x0400	25	1C
49502	Mapped Add for register #0x0402	25	1D
49503	Mapped Add for register #0x0404	25	1E
49504	Mapped Add for register #0x0406	25	1F
49505	Mapped Add for register #0x0408	25	20
49506	Mapped Add for register #0x040A	25	21
49507	Mapped Add for register #0x040C	25	22
49508	Mapped Add for register #0x040E	25	23
49509	Mapped Add for register #0x0410	25	24

TABLE 10 : Continued...

Address (4X)	Assignable Register	Modbus Start Address (Hex) High Byte	Low Byte
49510	Mapped Add for register #0x0412	25	25
49511	Mapped Add for register #0x0414	25	26
49512	Mapped Add for register #0x0416	25	27
49513	Mapped Add for register #0x0418	25	28
49514	Mapped Add for register #0x041A	25	29
49515	Mapped Add for register #0x041C	25	2A
49516	Mapped Add for register #0x041E	25	2B
49517	Mapped Add for register #0x0420	25	2C
49518	Mapped Add for register #0x0422	25	2D
49519	Mapped Add for register #0x0424	25	2E
49520	Mapped Add for register #0x0426	25	2F

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 10**) 0x251C and 0x251D

Assigning Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	25 (Hex)
Starting Address Lo	1C (Hex)
Number of Registers Hi	00 (Hex)*
Number of Registers Lo	02(Hex)*
Byte Count	04 (Hex)
Data Register-1High 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	CB (Hex)
CRC High	07 (Hex)

Voltage 2 *(3X Address 0x0002)

Power Factor 1 *(3X Address 0x001E)

Response :

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	25 (Hex)
Start Address Low	1C (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	40 (Hex)
CRC High	70 (Hex)

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

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Reading Parameter data through User Assignable Registers:

In assigning query Voltage 2 & Power Factor 1 parameters were assigned to 0x251C & 0x251D (**TABLE 10**) which will point to user assignable 3x registers 0x400 and 0x402 (**TABLE 9**). 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	04(Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	04 (Hex)**
CRC Low	F0 (Hex)
CRC High	71 (Hex)

Start Address High : Most significant 8 bits of starting address of User assignable register.
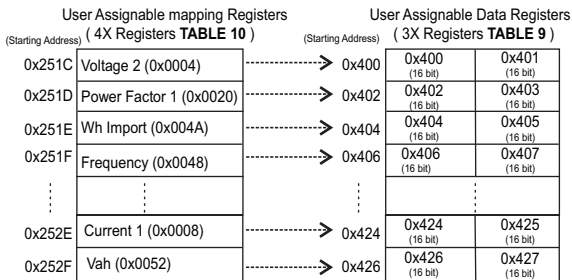**Start Address low** :Least significant 8 bits of starting address of User assignable register.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.

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

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

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

User Assignable mapping Registers (4X Registers **TABLE 10**)

User Assignable Data Registers (3X Registers **TABLE 9**)

(Starting Address)			(Starting Address)		
0x251C	Voltage 2 (0x0004)	------>	0x400	0x400 (16 bit)	0x401 (16 bit)
0x251D	Power Factor 1 (0x0020)	------>	0x402	0x402 (16 bit)	0x403 (16 bit)
0x251E	Wh Import (0x004A)	------>	0x404	0x404 (16 bit)	0x405 (16 bit)
0x251F	Frequency (0x0048)	------>	0x406	0x406 (16 bit)	0x407 (16 bit)
⋮	⋮		⋮	⋮	⋮
0x252E	Current 1 (0x0008)	------>	0x424	0x424 (16 bit)	0x425 (16 bit)
0x252F	Vah (0x0052)	------>	0x426	0x426 (16 bit)	0x427 (16 bit)

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"** of Section 3.3).
2) Once the parameters are mapped, data can be acquired by using "User assignable data register" Starting address . i.e to access data of Voltage2, Power factor1,Wh import, Frequency send query with starting address 0x0400 with number of register 8 or individually parameters can be accessed. For example, if current1 is to be accessed use starting address 0x0424. (see Section **Reading Parameter data through User Assignable Registers** of Section 3.3**).
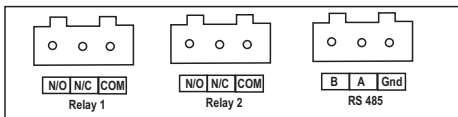
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4. Connection for Optional Pulse Output / RS 485 / Analog Output / Ethernet (rear view of the instrument) :

1. RS 485 Output + One Pulse (One Limit) + Two Analog Output

o o o o	o o o	o o o
Gnd A1 A2 Gnd	N/O N/C COM	B A Gnd
Analog Output	Relay 2	RS 485
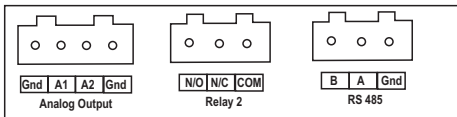
2. Two Pulse (Two Limit) + RS 485 Output

o o o	o o o	o o o
N/O N/C COM	N/O N/C COM	B A Gnd
Relay 1	Relay 2	RS 485

3. Ethernet