

USER'S MANUAL

EMPOWER-PLUS

Electrical Power Meter

This document contains the latest technical information about EMPOWER-PLUS which is a micro-controller based Electrical Power Meter. The product EMPOWER-PLUS is sophisticated electronic equipment, and the user is advised to read this User's Manual carefully before attempting to install or operate the equipment.

Trinity Energy Systems Pvt. Ltd.

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Warranty statement

Trinity warrants to the original retail purchaser of the Trinity product enclosed with this limited warranty statement that the product, if purchased new and used in the India conforms to the manufacturer's specifications and will be free from defects in workmanship and materials for a period of one year from the date of original purchase, unless expressly stated otherwise by Trinity, in a written format.

Should your Trinity product prove defective during the warranty period, please bring the product securely packaged in its original container or an equivalent, along with proof of the date of original purchase, to our Trinity Dealer or Factory. You are responsible for all costs (shipping, insurance, travel time) in getting the product to the service location. Trinity will, at its option, repair or replace on an exchange basis the defective unit, without charge for parts or labor. When warranty service involves the exchange of the product or of a part, the item replaced becomes Trinity property. The replacement unit may be new or refurbished to the Trinity standard of quality, and at Trinity's option, the replacement may be another model of like kind and quality. Trinity's liability for replacement of the covered product will not exceed the original retail selling price of the covered product. Exchange or replacement products or parts assume the remaining warranty period of the product covered by this limited warranty.

What This Warranty Does Not Cover:

This warranty does not apply to refurbished or reconditioned products. This warranty covers only normal use in India. This warranty does not cover damage to the Trinity product caused by parts or supplies not manufactured, distributed or certified by Trinity. This warranty is not transferable. This warranty does not cover third party parts, components or peripheral devices added to the Trinity product after its shipment from Trinity. Trinity is not responsible for warranty service should the Trinity label or logo or the rating label or serial number be removed or should the product fail to be properly maintained or fail to function properly as a result of misuse, abuse, improper installation, neglect, improper shipping, damage caused by disasters such as fire, flood, and lightning, improper electrical current, interaction with non-Trinity products, or service other than by an Trinity Authorized Service.

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Introduction

The electrical power meter, EMPOWER-PLUS is a micro-controller based unit which measures various electrical parameters, and sequentially displays on a 4x3 7-Segment display.

The unit is meant for use in three phase four wire systems. In three phase four wire LT systems, it requires four wires from R, Y, B & N, in addition to six wires from the three current transformers mounted on the three phases. It thus uses the three wattmeter method to arrive at the system KVA and KW.

The unit measures the three phase voltages, currents and individual power factors, KW, KVA, KVAR and THD for voltage and Current for all three phases. Based on these inputs, the system KVA, KW and KVAR can also be calculated. Unit also measure System KWh, KVAh, KVARh(Lag side KVARh, Lead side KVARh and Total).

For the correct operation of the unit, the only basic care required is to ensure that the phase sequence of the three phases is R-Y-B and the polarity of the CT secondary is correct. The S1 terminal in every CT will go to the M terminal of unit. Similarly, the S2 end of the CT will go to the L terminal of the unit.

EMPOWER-PLUS also logs Date & Time stamp for 10 Power Fail Interruption & restore events. Power fail Interruptions and restore data available only on the RS485 (not available on display). EMPOWER-PLUS Provide two types of the Power fail interruption. 1) Total Power fail and 2) Partial power fail. User can select one of the types from the programming mode.

The unit is fully solid state and will give years of trouble-free service once installed correctly.

The Main features Available in this Model

- All readings are true RMS measurements
- Site selectable 1A or 5A CT secondary
- CT and PT Ratio site selectable
- Three phase current, Phase to Neutral and Phase to Phase Voltages.
- Measurement of all individual Power parameter as well as System parameter.
- Indication of system PF including individual PF in three phases at lead and lag side
- Voltage and current THD.
- *Computed Neutral current.
- *Voltage Phase Angle (Angle between R to Y and Angle between R to B).

- *Current Phase Angle (Angle between R to Y and Angle between R to B).
- *Voltage unbalance percentage (%VR, %VY, %VB).
- *Current unbalance percentage (%IR, %IY, %IB).
- ON Hour and Run Hour.
- *Power Fail Interruption for 10 Events.
- Real Time Date and Time.
- RS-485 port for connection to SCADA/EMS
- All parameters with default accuracy class 1.0s

Note: * indicate these parameters only available on the RS485 (not available on display pages).



Technical Specifications

Parameters			
Type	Name	Statistics	
INPUT	Supply	Three Phases and Neutral of a 3P4W system	
	Voltage	Direct Voltage Input : 25 to 500V L-L, 25 to 300V L-N PT Ratio : Site Selectable Burden : 0.5VA	
	Current	Secondary Current Input : 5A or 1A (Site Selectable) CT Ratio : Site Selectable Range of Reading : 5 – 5000A Burden : < 1.0VA Overload : 5A CT → 6A RMS Continuous 1A CT → 1.2A RMS Continuous	
	*Power Supply	Auxiliary Supply(AC)(Optional) : 60 - 480 VAC/DC, 50-60 Hz. Auxiliary Supply(DC) (Optional) : 8 - 32 VDC	
MEASUREMENT	True RMS Basic Parameters	Voltage (Volts L-N & L-L)	VL-N - Accuracy : 0.5% of Reading VL-L - Accuracy : 1.0% of Reading
		Current (Amps IR, IY, IB)	Accuracy : 0.25% of Reading
		Line Frequency	45 to 65 Hz, Accuracy : 0.3% of Reading
	Power	Active Power (P)	Accuracy (For IPFI>0.5) : 1% of Reading
		Reactive Power (Q)	Accuracy : 1.5% of Reading (Between 0.5 Lag to 0.8 Lead)
		Apparent Power (S)	Accuracy : 1% of Reading
		Power Factor	For Individual phases and System Accuracy : 1.0% of Reading (IPFI≥0.5) Range of Reading : 0.05 to 1.00 Lag/Lead
	Energy	Total Active Energy (KWh)	Range of Reading : 0 to 9999999.9 Accuracy : class 1.0s as per IS13779
		Total Apparent Energy (KVAh)	Range of Reading : 0 to 9999999.9 Accuracy : 1.0% of Reading
		Total Reactive Energy (KVARh – LG & LD)	Range of Reading : 0 to 9999999.9 Accuracy : 1.5% of Reading
	Power Quality	THD for each phase current	
		THD for each phase voltage	
MISCELLANEOUS	Dimensions	Bezel	96 X 96 mm
		Panel Cutout	92 X 92 mm
		Depth of installation	55 mm
		Display	4x3 7-Segment
		Operating temp	10°C to 50°C
		Weight	0.29 Kgs (Approx.)
		Min. Operating Current	0.4% to 120% of CT primary
	Comm.	RS485	Modbus-RTU protocol

***Note : Ordering Time need to mention type of Auxiliary Supply.**

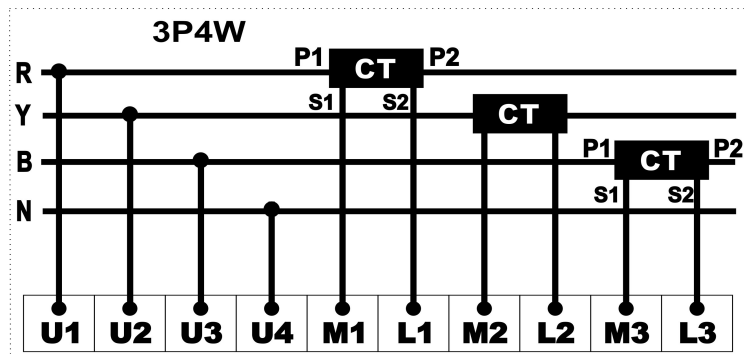
Installation and Commissioning

The unit supports 3P4W type of electrical installation.

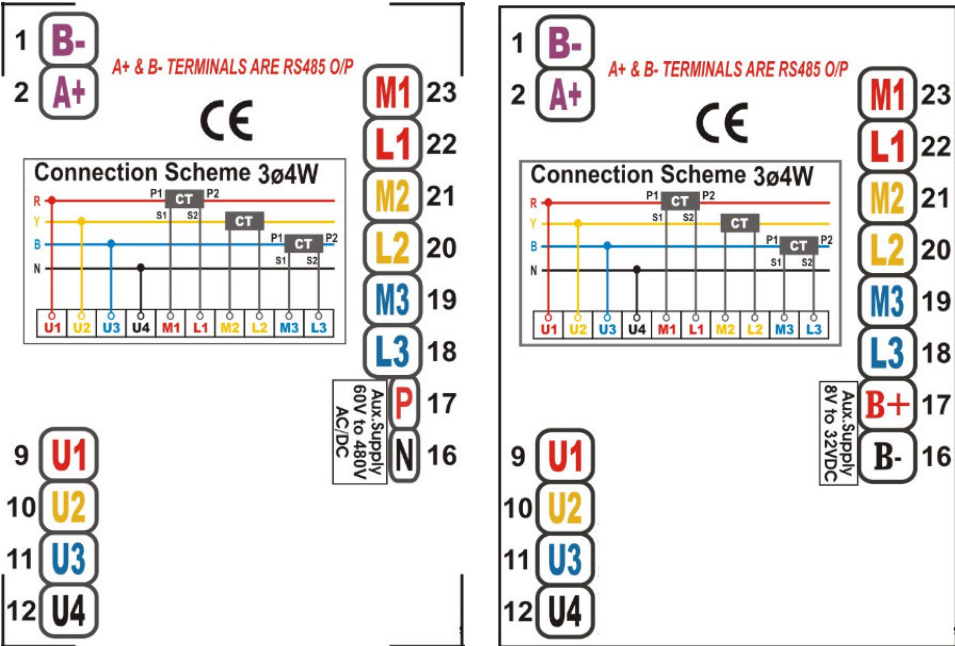
3P4W Mode Installation

For Installation and Commissioning, proceed the following instructions.

1. Push the unit into the panel and mount it by using the clamps provided. Connect the Auxiliary supply (60 VAC/DC to 480 VAC/DC) to the terminals marked P and N.



2. Connect the three phases with the phase sequence being R-Y-B to the terminals marked U1, U2 and U3 respectively. Make sure that the three phases coming to the unit come through control fuses of 1.0 Amp rating. This will protect the electronic inside from damage due to severe over voltages or phase faults in the system.
3. Connect the neutral wire to the terminal marked U4.
4. Connect the two wires from the R-Phase CT to the terminals marked M1 and L1 such that S1 from CT goes to M1 on the unit. Connect the two wires from the Y-phase CT to the terminals marked M2 & L2 such that S1 from the Y-phase CT goes to M2 on the unit. Connect the two wires from the B-phase CT to the terminals marked M3 & L3 such that S1 from CT goes to M3 on the unit.
5. Switch on the three phases supply as well as the auxiliary supply. The unit will come alive and display such as E_r in it $YESPL$, $[E_r]$ (CT Ratio), $P[E_r]$ (PT Ratio) and $Addr$ (Device ID) and then, the unit enters into Run Mode displaying the first page.
6. The unit should be programmed for all the required parameters which are field programmable and therefore, for selecting the various options supported, refer *Operational Details* in next section.
7. Now, the unit is ready for operation.



AUX.Supply – (60 to 480 VAC/DC)

AUX.Supply – (8 to 32 DC)

Connection Scheme

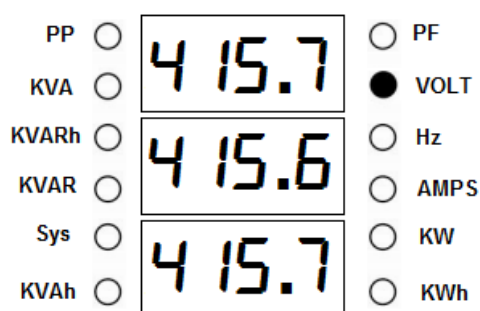
Operational Details




The electrical power meter, EMPOWER-PLUS is a versatile meter with all the features needed to implement for a robust electrical power system.

The unit has two types of modes such as




1. Programming Mode
2. Run Mode.

After supplying power (60 VAC/DC to 480 VAC/DC) the unit displays immediately power receiving information such as I_r in $IE5PL$, CT_r (CT Ratio), PT_r (PT Ratio) and $Addr$ (Device ID) and then, the display comes into the first page of Run Mode by default such as shown below.



Now, the unit can be operated by using the keys provided such as ,  and  for both Programming Mode and Run Mode.


Programming Mode

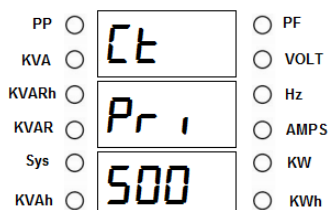
The unit can be programmed by use of the three keys provided on the front of the unit, i.e. ,  and  keys. If on entering the programming mode, no keys are operated for one minute the unit will automatically revert to Run Mode.







Setting CT Primary

CT Primary should be selected at site so as to give the actual current for CT operated meters. The CT Primary can be selected from 5 to 5000.

To retrieve the CT Primary, precede the following instructions.

1. In Run Mode, press  key for about four seconds and then the unit display will prompt CT PRIMARY such as shown below.





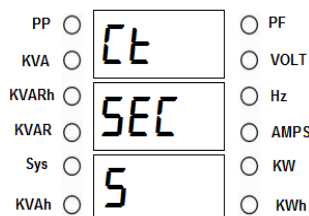
2. Press  key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select the CT PRIMARY by pressing  and  keys according to your desire and then press  key to save the parameter.
3. If the setting is completed, press  key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press  key to enter into next programmable parameter and configure.







Setting CT Secondary

CT Secondary should be selected at site so as to give the actual current for CT operated meters. CT Secondary can be selected to either 1 or 5.

To retrieve the CT Secondary, precede the following instructions.

1. In Run Mode, press  key for about four seconds and then the unit displays will prompt CT Primary and then, Press  key till you get display of CT Secondary such as shown below.





2. Press  key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select the CT SECONDARY by pressing  and  keys according to your desire and then press  key to save the parameter.
3. If the setting is completed, press  key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press  key to enter into next programmable parameter and configure.

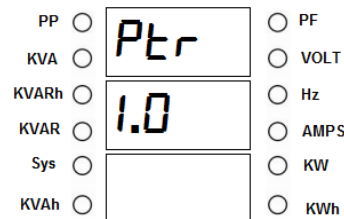
Selecting PT Ratio







The PT Ratio is the ratio of PT Primary and PT Secondary which is also selectable at site. The PT Ratio should be selected so as to give the actual voltage in your PT operated meter with the following table.

PT Primary	PT Secondary	PT Ratio
No multiply factor		1
2200	110	20
3300	110	30
6600	110	60
11000	110	100
22000	110	200
33000	110	300
66000	110	600
415	110	3.7727
440	110	4.0000

To select the PT Ratio, precede the following instruction

1. In Run Mode, press  key for about four seconds and then the unit display will prompt CT Primary and then, Press  key till you get display of PT Ratio such as shown below.




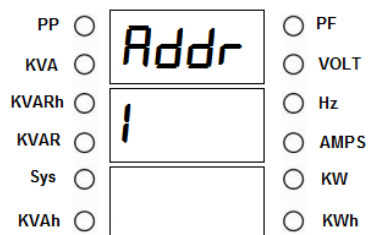
2. Press  key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select the PT Ratio by pressing  and  keys according to your desire and then press  key so to save the parameter.
3. If the setting is completed, press  key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press  key to enter into next programmable parameter and configure.

Setting Meter Address

The unit also supports RS485 communication port and it should therefore be set the Meter Address from 1 to 255 for communication of it.

To select the Meter address, precede the following instructions.

1. In Run Mode, press  key for about four seconds and then the unit display will prompt CT Primary and then, Press  keys till you get display of Meter address such as shown below.

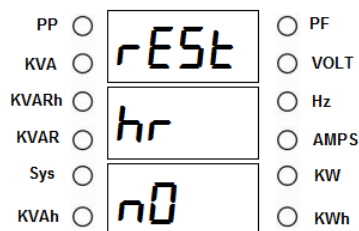


2. Press key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select the Meter address by pressing and keys according to your desire and then press key to save the parameter.
3. If the setting is completed, press key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press key to enter into next programmable parameter and configure.

Resetting On Hour and Run Hour

This Parameter is used to reset time of ON Hour and RUN Hour.
To Reset ON and RUN Hour, precede the following instructions.

1. In Run Mode, press key for about four seconds and then the unit display will prompt CT Primary and then, Press keys till you get display of Reset Hour such as shown below.





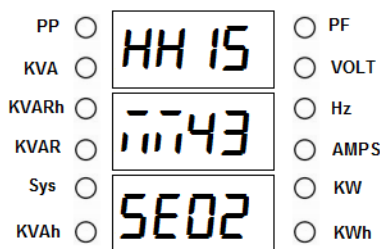
2. Press key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select "rEst" by pressing and keys and then press key for resetting time of ON Hour and RUN Hour.
3. If the setting is completed, press key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press key to enter into next programmable parameter and configure.













Setting RTC Hour, Minute, Second

This Parameter is used to set RTC Hour, Minute and Second.

To Set RTC Hour, Minute and Second, precede the following instructions.

1. In Run Mode, press  key for about four seconds and then the unit display will prompt CT Primary and then, Press  keys till you get display of such as shown below.





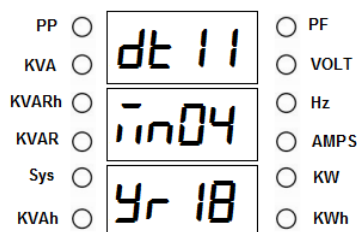
2. Press  key again. Immediately 'P' and "HH" starts blinking which means that you can now program Hour. Using  and  keys user can set desire Hour. Hour can be set between 0 to 23. After completing setting of Hour, Press  key again. Now "HH" stop blinking and "11" starts blinking which means that user can now program Minute. Using  and  keys user can set desire Minute. Minute can be set between 0 to 59. After completing setting of Minute, Press  key again. Now "11" stop blinking and "5E" starts blinking which means that user can now program Second. Using  and  keys user can set desire second. Second can be set between 0 to 59. After completing setting Press  key to save RTC Hour, Minute and Second.
3. If the setting is completed, press  key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press  key to enter into next programmable parameter and configure.

Setting RTC Date, Month, Year

This Parameter is used to set RTC Date, Month and Year.

To Set RTC Date, Month and Year, precede the following instructions.

1. In Run Mode, press  key for about four seconds and then the unit display will prompt CT Primary and then, Press  keys till you get display of such as shown below.



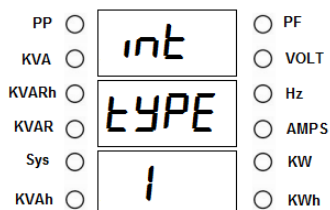
2. Press key again. Immediately 'P' and "dt" starts blinking which means that you can now program Date. Using and keys user can set desire Date. Date can be set between 1 to 31. After completing setting of Date, Press key again. Now "dt" stop blinking and "11n" starts blinking which means that user can now program Month. Using and keys user can set desire Month. Month can be set between 1 to 12. After completing setting of Month, Press key again. Now "11n" stop blinking and "yr" starts blinking which means that user can now program Year. Using and keys user can set desire Year. Year can be set between 0 to 99. After completing setting Press key to save RTC Date, Month and Year.
3. If the setting is completed, press key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press key to enter into next programmable parameter and configure.







Changing Interruption Event Type:

Using this parameter user can select Power fail interruption event type. If user selecting "1" from the programming mode means Power fail Interruption event occurs only when all Phase voltage below the 25 Volt. If user selecting "2" from the programming mode means Power fail Interruption event occurs when any phase below the 25 Volt.

For changing Power fail interruption event type follow the below mention procedure:


1. In Run Mode, press key for about four seconds and then the unit display will prompt CT Primary and then, Press keys till you get display such as shown below.





2. Press  key again. Immediately 'P' starts blinking which shows that the parameter can now be selected. Select the Interruption Event type by pressing  and  keys according to your desire and then press  key to save the parameter.
3. If the setting is completed, press  key for about four seconds on the Program mode display. After this the unit will reset and return into Run Mode. Otherwise, press  key to enter into next programmable parameter and configure.

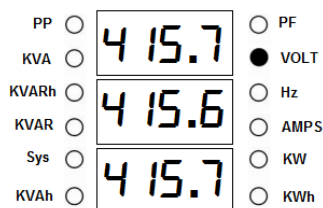
Run Mode

In the run mode, the various parameters measured & calculated by the meter are displayed on different pages using 4x3 7-Segment display.

In the Run Mode user can freeze and Scroll pages by Pressing  key. In the Scroll mode, page auto scroll after every 8 seconds. Freeze mode indicated by the blinking led in the Run Mode. In the freeze mode, it shows the same display page as was before the power fail.

Run Mode Display Pages

In case, the pages are frozen, each page can be altered by pressing  and  keys so as to display such as below pages.



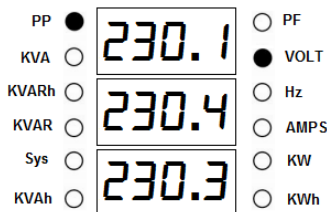
The 1st page shows phase to phase voltage. This page indicated by “**VOLT**” LED glow.

1st Row shows phase to phase voltage between R & Y phase.

2nd Row shows phase to phase voltage between Y & B phase.

3rd Row shows phase to phase voltage between B & R phase.

In case, PT ratio >10.0, Phase to Phase voltage readings will be converted to KV by dividing 1000 and then shows on the display.



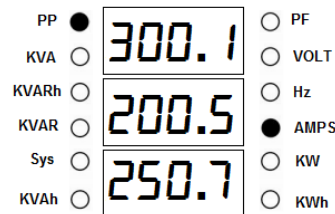
The 2nd page shows Phase to Neutral Voltage for R,Y and B phase. This page indicated by “**VOLT**” and “**PP**” LEDs glow. “**PP**” Stands for Per Phase.

1st Row shows phase to Neutral voltage for R phase.

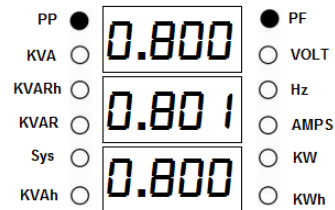
2nd Row shows phase to Neutral voltage for Y phase.

3rd Row shows phase to Neutral voltage for B phase.

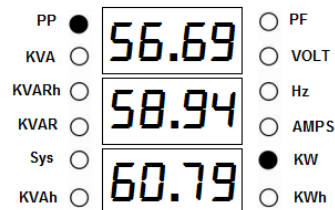
In case, PT ratio > 10.0, Phase to neutral voltage readings will be converted to KV by dividing 1000 and then shows on the display.



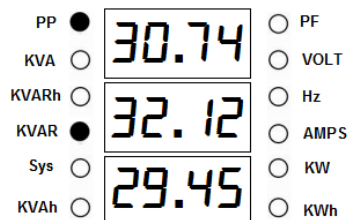
The 3rd page shows Phase wise current for R, Y and B phase. This page indicated by “**AMPS**” and “**PP**” LEDs glow. “**PP**” Stands for Per Phase.



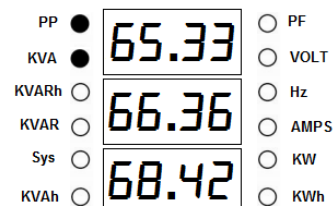
The 4th page shows Phase wise PF for R, Y and B phase. In case of leading PF, the unit will show “-” sign for all three individual phases. This page indicated by “**PF**” and “**PP**” LEDs glow.



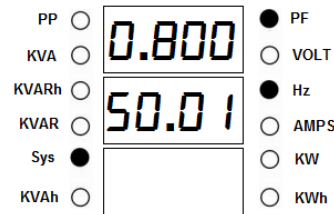
The 5th page shows Phase wise KW for R, Y and B phase. This page indicated by “**KW**” and “**PP**” LEDs glow.



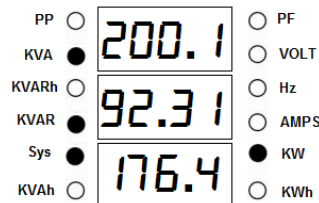
The 6th page shows Phase wise KVAR for R, Y and B phase. This page indicated by “**KVAR**” and “**PP**” LEDs glow.



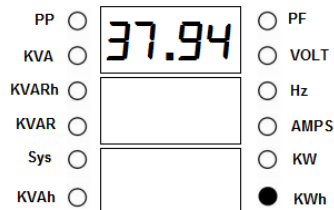
The 7th page shows Phase wise KVA for R, Y and B phase.
This page indicated by “**KVA**” and “**PP**” LEDs glow.



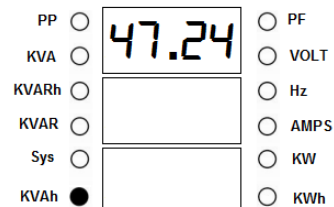
The 8th page shows System PF and Frequency.
1st row display System PF.
2nd row display Frequency.
This page indicated by “**Sys**”, “**PF**” and “**Hz**” LEDs glow. “**Sys**” Stands for System.



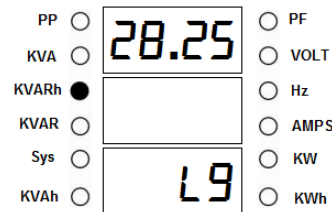
The 9th page shows System KVA, KVAR and KW.
1st row display System KVA.
2nd row display System KVAR.
3rd row display System KW.
This page indicated by “**Sys**”, “**KVA**”, “**KVAR**” and “**KW**” LEDs glow.



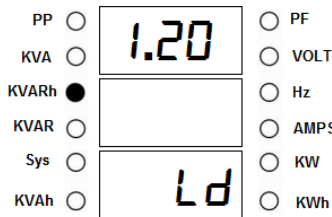
The 10th page shows System KWh.
This page indicated by “**KWh**” LED glow.



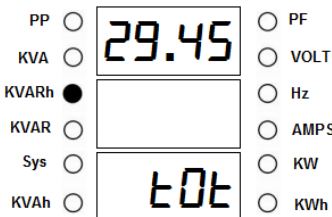
The 11th page shows System KVAh.
This page indicated by “**KVAh**” LED glow.



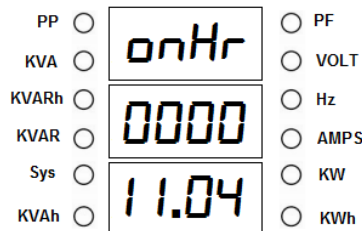
The 12th page shows Lag side System KVARh.
This page indicated by “**KVARh**” LED glow and also show “**L 9(LAG)**” on the display.



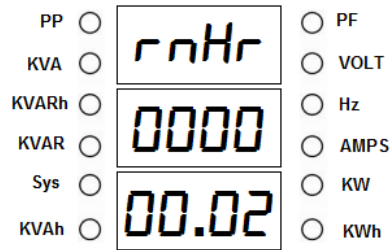
The 13th page shows Lead side System KVARh.
This page indicated by “**KVARh**” LED glow and also show “**L d(LEAD)**” on the display.



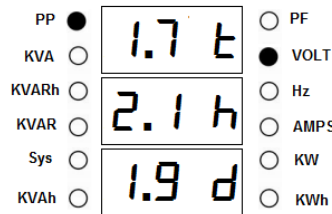
The 14th page shows System KVARh - TOTAL.
This page indicated by “**KVARh**” LED glow and also show “**L 0L(TOTAL)**” on the display.



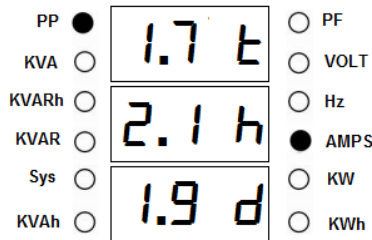
The 15th page shows ON Hour.
This page indicated by “**onHr**” on the display.



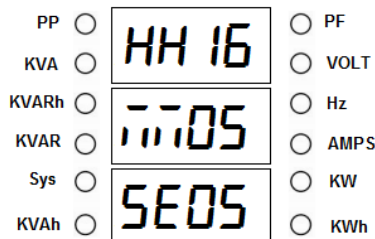
The 16th page shows RUN Hour.
This page indicated by “**r n Hr**” on the display.



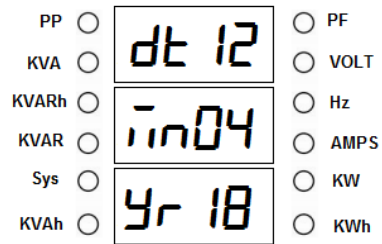
The 17th page shows Phase wise Voltage THD for R, Y and B phase.
This page indicated by “**VOLT**” and “**PP**” LEDs glow and also shows “**t h d**” on the display.



The 18th page shows Phase wise Current THD for R, Y and B Phase.
This page indicated by “**AMP**” and “**PP**” LEDs glow and also shows “**t h d**” on the display.



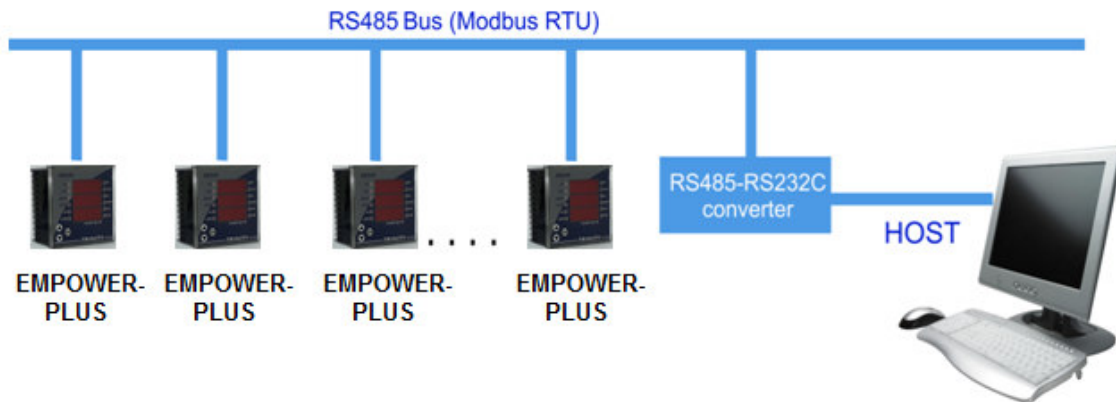
The 19th page shows RTC Hour, Minute and Second.
This page indicated by “**HH** (Hour)”, “**mm** (Minute)” and “**SE** (second)” on the display.



The 20th page shows RTC Date, Month and Year.

This page indicated by “dt (Date)”, “in (Month)” and “yr (Year)” on the display.

Communication



RS485 CONNECTION

The industrial standard RS-485 communication port option is also available in **EMPOWER-PLUS**. This option makes it possible for a user to select **EMPOWER-PLUS** to provide power and energy information into a variety of existing or new control systems and communication networks such as EMS/PLC/SCADA.

Modbus RTU on RS485 Port

In order to download live data for the various system parameters, user can use RS485 connecting to SCADA or EMS software. EMPOWER-PLUS supports an RS485 port with MODBUS-RTU protocol. The station ID for every meter is site selectable. The data which can be read using MODBUS query # 3 (Read Holding Registers) is provided in an address map, with the applicable multiplication factors, vide **Appendix**.

Communication line parameters: 9600/8/N/1.

The register map is described below. All addresses are in decimal. Some parameters are in Unsigned long format and other in the Unsigned integer format. If illegal address is sent in the query or the host tries to read more than 254 bytes of data in one query, exception message is generated. The parameters name, address and multiplication factor are also mentioned.

Appendix

ADDRESS	PARAMETER	FORMAT	MF
200	VRN	UNSIGNED LONG	100
202	VYN		100
204	VBN		100
206	AVG_VPN		100
208	VRY		100

210	VYB	100
212	VBR	100
214	AVG_VPP	100
216	IR	100
218	IY	100
220	IB	100
222	AVG_AMP	100
224	IN	100
226	PF_R	1000
228	PF_Y	1000
230	PF_B	1000
232	SYS_PF	1000
234	KW_R	100
236	KW_Y	100
238	KW_B	100
240	SYS_KW	100
242	KVA_R	100
244	KVA_Y	100
246	KVA_B	100
248	SYS_KVA	100
250	KVAR_R	100
252	KVAR_Y	100
254	KVAR_B	100
256	SYS_KVAR	100
258	SYS_FREQ	100
260	KWH	100
262	KVAH	100
264	KVARH-LG	100
266	KVARH-LD	100
268	TOTAL - KVARH	100
270	VOLTAGE R-Y ANGLE	100
272	VOLTAGE R-B ANGLE	100
274	CURRENT R-Y ANGLE	100
276	CURRENT R-B ANGLE	100
278	VOLTAGE UNBALANCE(%) R PHASE	100
280	VOLTAGE UNBALANCE(%) Y PHASE	100
282	VOLTAGE UNBALANCE(%) B PHASE	100
284	CURRENT UNBALANCE(%) R PHASE	100
286	CURRENT UNBALANCE(%) Y PHASE	100
288	CURRENT UNBALANCE(%) B PHASE	100
290	ON - MINUTE	1

292	ON - HOUR		1
294	RUN - MINUTE		1
296	RUN - HOUR		1
298	VR_THD		100
300	VY_THD		100
302	VB_THD		100
304	IR_THD		100
306	IY_THD		100
308	IB_THD		100
310	RTC - DATE	UNSIGNED INT	1
311	RTC - MONTH		1
312	RTC - YEAR		1
313	RTC - HOUR		1
314	RTC - MINUTE		1
315	RTC -SECOND		1
316	INT 1 ON - DATE		1
317	INT 1 ON - MONTH		1
318	INT 1 ON - YEAR		1
319	INT 1 ON - HOUR		1
320	INT 1 ON - MINUTE		1
321	INT 1 ON -SECOND		1
322	INT 1 OFF - DATE		1
323	INT 1 OFF - MONTH		1
324	INT 1 OFF - YEAR		1
325	INT 1 OFF - HOUR		1
326	INT 1 OFF - MINUTE		1
327	INT 1 OFF -SECOND		1
328	INT 2 ON - DATE		1
329	INT 2 ON - MONTH		1
330	INT 2 ON - YEAR		1
331	INT 2 ON - HOUR		1
332	INT 2 ON - MINUTE		1
333	INT 2 ON -SECOND		1
334	INT 2 OFF - DATE		1
335	INT 2 OFF - MONTH		1
336	INT 2 OFF - YEAR		1
337	INT 2 OFF - HOUR		1
338	INT 2 OFF - MINUTE		1
339	INT 2 OFF -SECOND		1
340	INT 3 ON - DATE		1
341	INT 3 ON - MONTH		1
342	INT 3 ON - YEAR		1
343	INT 3 ON - HOUR		1

344	INT 3 ON - MINUTE	1
345	INT 3 ON -SECOND	1
346	INT 3 OFF - DATE	1
347	INT 3 OFF - MONTH	1
348	INT 3 OFF - YEAR	1
349	INT 3 OFF - HOUR	1
350	INT 3 OFF - MINUTE	1
351	INT 3 OFF -SECOND	1
352	INT 4 ON - DATE	1
353	INT 4 ON - MONTH	1
354	INT 4 ON - YEAR	1
355	INT 4 ON - HOUR	1
356	INT 4 ON - MINUTE	1
357	INT 4 ON -SECOND	1
358	INT 4 OFF - DATE	1
359	INT 4 OFF - MONTH	1
360	INT 4 OFF - YEAR	1
361	INT 4 OFF - HOUR	1
362	INT 4 OFF - MINUTE	1
363	INT 4 OFF -SECOND	1
364	INT 5 ON - DATE	1
365	INT 5 ON - MONTH	1
366	INT 5 ON - YEAR	1
367	INT 5 ON - HOUR	1
368	INT 5 ON - MINUTE	1
369	INT 5 ON -SECOND	1
370	INT 5 OFF - DATE	1
371	INT 5 OFF - MONTH	1
372	INT 5 OFF - YEAR	1
373	INT 5 OFF - HOUR	1
374	INT 5 OFF - MINUTE	1
375	INT 5 OFF -SECOND	1
376	INT 6 ON - DATE	1
377	INT 6 ON - MONTH	1
378	INT 6 ON - YEAR	1
379	INT 6 ON - HOUR	1
380	INT 6 ON - MINUTE	1
381	INT 6 ON -SECOND	1
382	INT 6 OFF - DATE	1
383	INT 6 OFF - MONTH	1
384	INT 6 OFF - YEAR	1
385	INT 6 OFF - HOUR	1
386	INT 6 OFF - MINUTE	1

387	INT 6 OFF -SECOND	1
388	INT 7 ON - DATE	1
389	INT 7 ON - MONTH	1
390	INT 7 ON - YEAR	1
391	INT 7 ON - HOUR	1
392	INT 7 ON - MINUTE	1
393	INT 7 ON -SECOND	1
394	INT 7 OFF - DATE	1
395	INT 7 OFF - MONTH	1
396	INT 7 OFF - YEAR	1
397	INT 7 OFF - HOUR	1
398	INT 7 OFF - MINUTE	1
399	INT 7 OFF -SECOND	1
400	INT 8 ON - DATE	1
401	INT 8 ON - MONTH	1
402	INT 8 ON - YEAR	1
403	INT 8 ON - HOUR	1
404	INT 8 ON - MINUTE	1
405	INT 8 ON -SECOND	1
406	INT 8 OFF - DATE	1
407	INT 8 OFF - MONTH	1
408	INT 8 OFF - YEAR	1
409	INT 8 OFF - HOUR	1
410	INT 8 OFF - MINUTE	1
411	INT 8 OFF -SECOND	1
412	INT 9 ON - DATE	1
413	INT 9 ON - MONTH	1
414	INT 9 ON - YEAR	1
415	INT 9 ON - HOUR	1
416	INT 9 ON - MINUTE	1
417	INT 9 ON -SECOND	1
418	INT 9 OFF - DATE	1
419	INT 9 OFF - MONTH	1
420	INT 9 OFF - YEAR	1
421	INT 9 OFF - HOUR	1
422	INT 9 OFF - MINUTE	1
423	INT 9 OFF -SECOND	1
424	INT 10 ON - DATE	1
425	INT 10 ON - MONTH	1
426	INT 10 ON - YEAR	1
427	INT 10 ON - HOUR	1
428	INT 10 ON - MINUTE	1
429	INT 10 ON -SECOND	1

430	INT 10 OFF - DATE	1
431	INT 10 OFF - MONTH	1
432	INT 10 OFF - YEAR	1
433	INT 10 OFF - HOUR	1
434	INT 10 OFF - MINUTE	1
435	INT 10 OFF -SECOND	1
436	IR DIRECTION STATUS	1
437	IY DIRECTION STATUS	1
438	IB DIRECTION STATUS	1

DEFINING MULTIPLICATION FACTOR

- Hz has a multiplication factor of 100.e.g. If Hz is 48.33, then it is sent as 4833 for providing resolution. In same fashion PF has a MF of 1000, instead of 100. Thus, a PF value of 0.987 is sent as 987.
- If an attempt is made to read some address other than the valid addresses, the exception response is sent.

EXPEPTION CODE

In the event that the query from the HOST has no communication error, but there is some error in specifying the address of registers to be read, the meter returns an exception message. The format of the exception message will be as under:

Unit Address	0X83	Exception code	CRC	CRC
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Exception Code can have only one value, 02: if the address is not a valid, start address or host has requested more than 254 bytes of data, this code is returned.

P.O No. :
Customer :
Sr. No. :
Result of Test :
Remarks :
Test engineer :
Date :