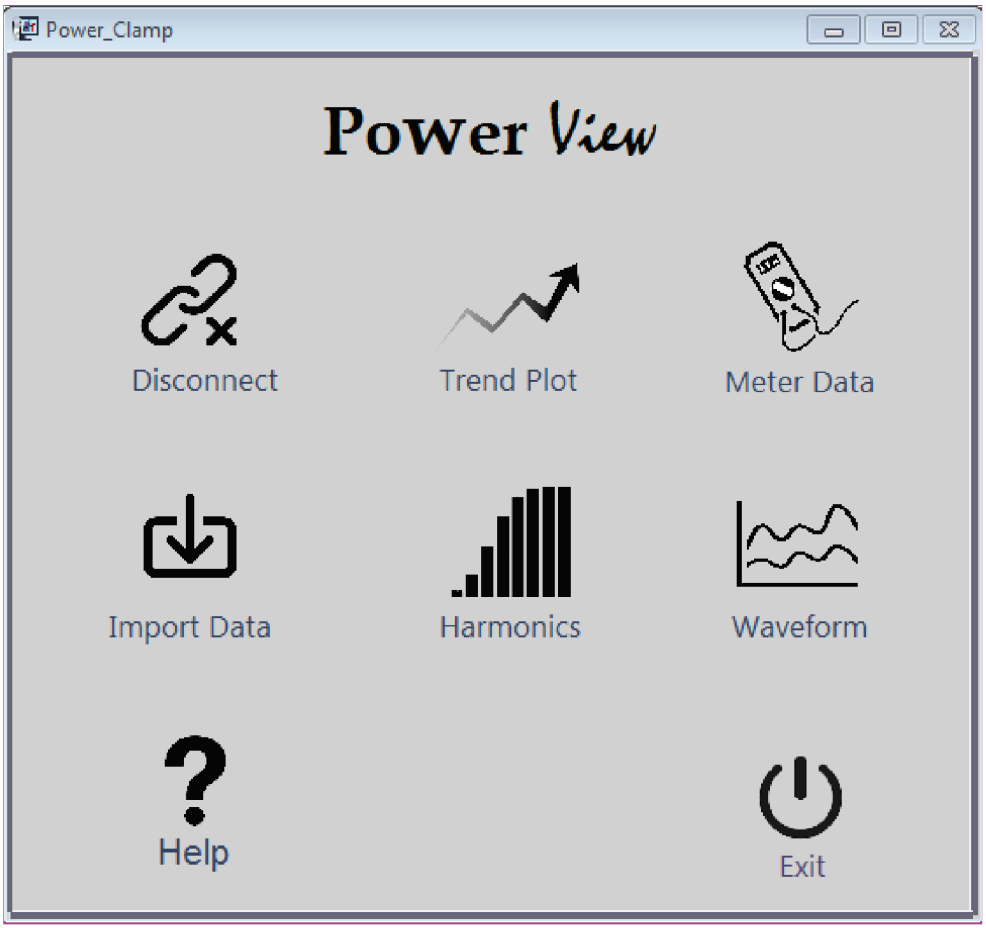
Power View Manual

Power View



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**Subject to change without Notice

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1. Specification, Installation of Software, Starting Program, Closing Program & Uninstalling the Software

1.1 Specification

Power view is a program for recording, visualizing and documenting measured values with reference to time for Power clamp 1000A or Power Clamp 400A. Power view represent the power clamp meter data on computer as well as it gives additional features than meter such as trend plot, harmonics graph and waveforms. For communication, Power clamp meter has to paired with computer via a bluetooth link.

1.2 Installation of Software

Refer Software Installation Manual

1.3 Starting Program

In order to start the program:

- Double click the Power View.exe icon on the Windows desktop.

or

- Select the program from the Windows start menu:

Start : Programs : Power View : Power View.exe
The program is started.

1.4 Closing Program

In order to close the program:

- Click on Exit ⏻

1.5 Uninstalling the Software

If desired, the program can be uninstalled by selecting
Window XP: Control Panel : Add or Remove Program : Power View: Remove

or

Window 7: Control Panel : Uninstall Program : Power View: Uninstall

2. Software Home Screen:

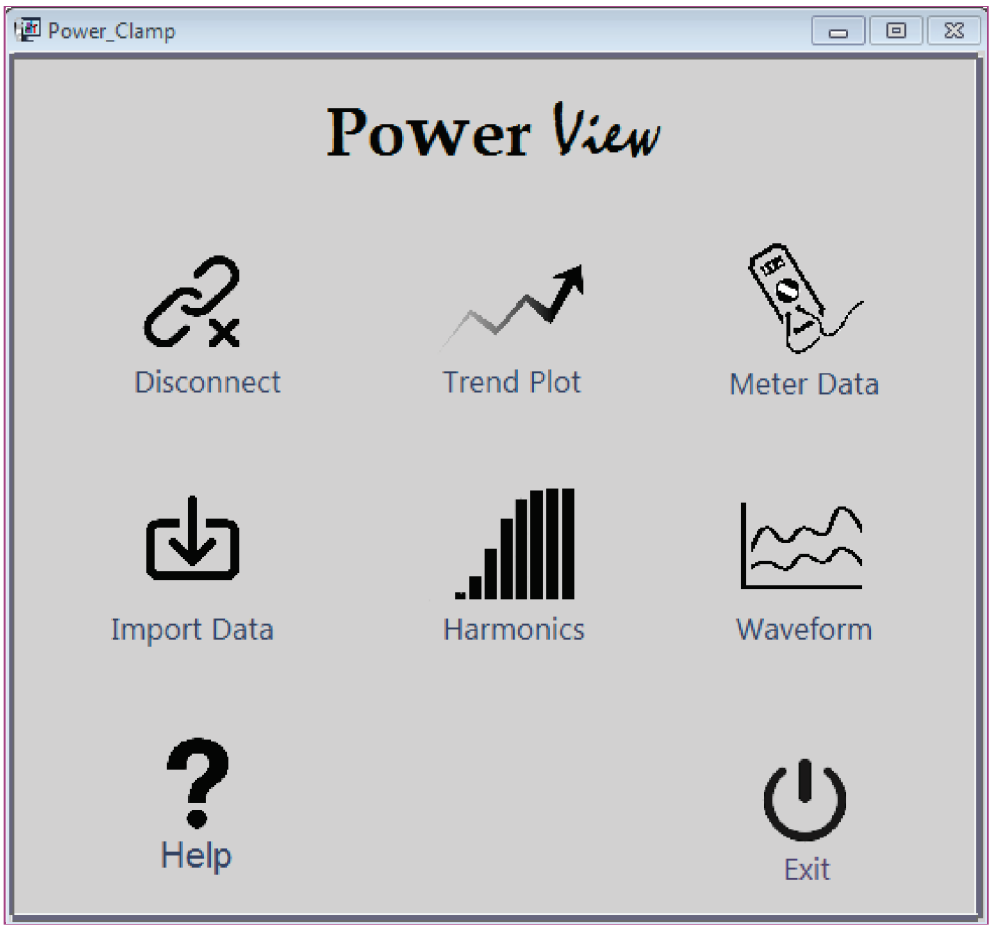


Figure 1. Home screen of power view

Connect :
Used to setup communication with available power clamp meter.

Disconnect*:
Used to disconnect the communication between power clamp meter and software.

Trend Plot#:
Used to view Trend of electrical parameters.

Meter Data#:
Used to view values of electrical parameters in tabular format.

Import Data#:
Used to download data from Power Clamp meter.

Harmonics#:
Used to view Harmonic data.

Waveform#:
Used to view Voltage and Current waveform.

Exit:
Used to close the software.

Help:
Used to open user manual for help.

Note:
**: Key will be visible after communication setup.*
#: Key is disabled and grayed out if communication is not established with meter.

3. Communication Setup

3.1. Procedure

Following are the steps to establish communication between power clamp meter and software.

Step 1: Left click on Connect button. New window will pop-up and software will start searching of bluetooth devices.

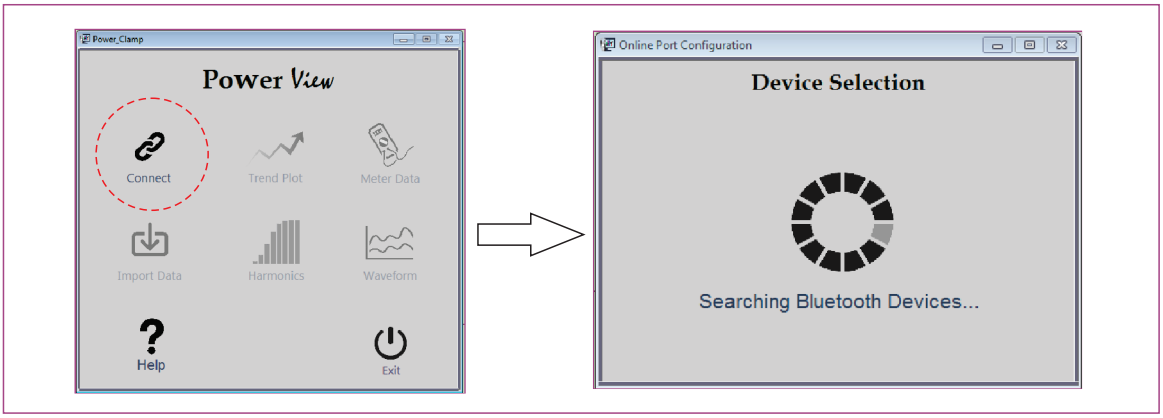


Figure 2. Communication setup process (Device Searching)

Step 2: Double click on PCLAM_XXXX for establishing bluetooth communication. If meter name is not found please click on refresh button to search again.

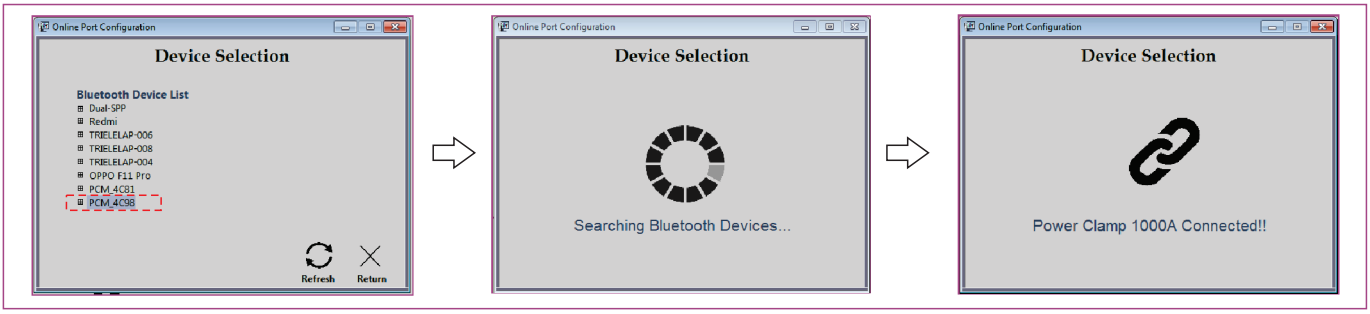


Figure 3. Communication setup process (device selection and pairing)

After successful communication a window will pop-up showing which meter is connected (Power Clamp 1000A/ 400A). If there is a communication error or pairing unsuccessful message, please check both computer bluetooth and Clamp meter bluetooth is properly discoverable and click on retry option to setup communication again.

3.2. Tools and keys used in communication setup:

Refresh:
Used to refresh Bluetooth device list.

Return:
Used to cancel communication setup process.

Note:
1. Make sure bluetooth peripheral connected to your computer is properly installed.
2. Make sure Power clamp meter is in discoverable mode. For that refer Power Clamp manual.

4. Trend Plot:

Trend Plot is used to view a trend of electrical parameters. This function has features like report generation, excel file generation and trend graph generation. Update rate of graph is 1sec.

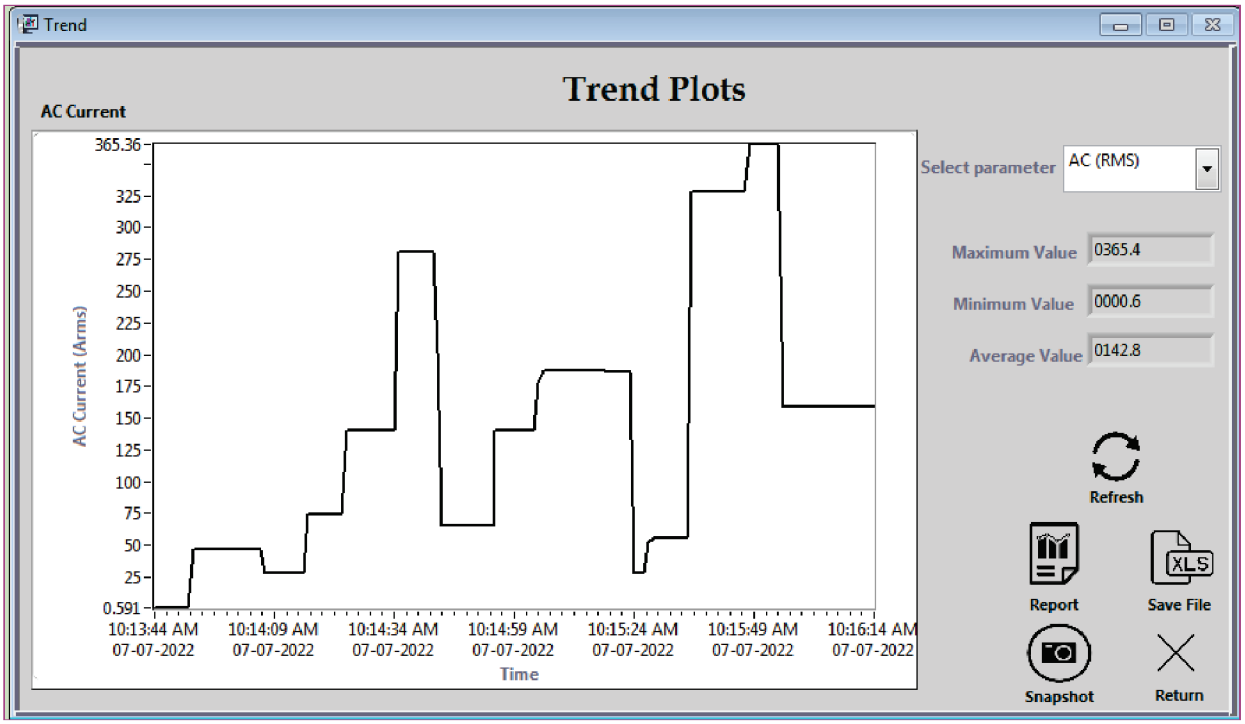
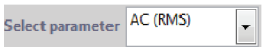


Figure 4. Trend Plot window

4.1. Tools and keys in Trend Plot:



Select Parameter:
Used to select a parameter to plot a trend.

Report:
Used to generate a report. Report contains all reading from start of trend plot till report generation.

Snapshot:
Used to take snapshot of the trend plot screen. Snapshot will be stored on user defined location.

Save File:
Used to get value of selected parameters in excel format. File will be saved on user defined location in excel format.

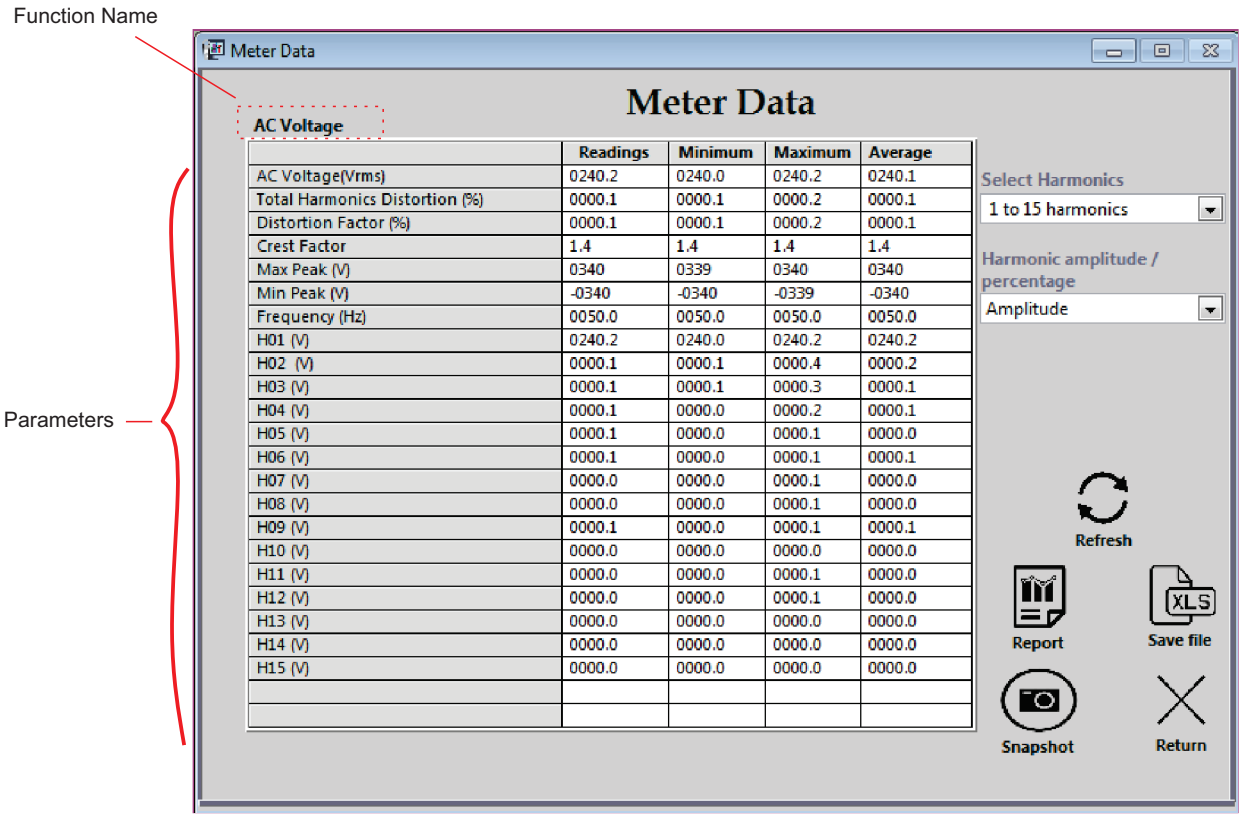
Return:
Used to go back to home screen.

Refresh:
Used to refresh the Trend plot.

Note:
Minimum, maximum and average value reset on function change or parameter changed or trend plot reopened. Trend Plot will not work for 3p4w Unbalance, 3p3w unbalance, NCV, reserved position(empty position) and inrush current.

5. Meter Data:

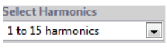
Meter data is used to view values of electrical parameters in tabular format. This function has tools like report generation, excel file generation and Snapshot of instantaneous reading. Simultaneously multiple parameters are displayed on screen as well as minimum and maximum values among the received value is shown. Minimum and Maximum value calculation start as soon as meter data function is opened. Average value shown in meter data is the mean of the values received from start of meter data function to instance of observing.



	Readings	Minimum	Maximum	Average
AC Voltage(Vrms)	0240.2	0240.0	0240.2	0240.1
Total Harmonics Distortion (%)	0000.1	0000.1	0000.2	0000.1
Distortion Factor (%)	0000.1	0000.1	0000.2	0000.1
Crest Factor	1.4	1.4	1.4	1.4
Max Peak (V)	0340	0339	0340	0340
Min Peak (V)	-0340	-0340	-0339	-0340
Frequency (Hz)	0050.0	0050.0	0050.0	0050.0
H01 (V)	0240.2	0240.0	0240.2	0240.2
H02 (V)	0000.1	0000.1	0000.4	0000.2
H03 (V)	0000.1	0000.1	0000.3	0000.1
H04 (V)	0000.1	0000.0	0000.2	0000.1
H05 (V)	0000.1	0000.0	0000.1	0000.0
H06 (V)	0000.1	0000.0	0000.1	0000.1
H07 (V)	0000.0	0000.0	0000.1	0000.0
H08 (V)	0000.0	0000.0	0000.1	0000.0
H09 (V)	0000.1	0000.0	0000.1	0000.1
H10 (V)	0000.0	0000.0	0000.0	0000.0
H11 (V)	0000.0	0000.0	0000.1	0000.0
H12 (V)	0000.0	0000.0	0000.1	0000.0
H13 (V)	0000.0	0000.0	0000.0	0000.0
H14 (V)	0000.0	0000.0	0000.0	0000.0
H15 (V)	0000.0	0000.0	0000.0	0000.0

Figure 5. Meter Data window

5.1 Tools and keys in Meter Data:



Select Parameter:
Used to select a particular range of harmonics to display. Available for only AC Voltage and AC current function.

Select Parameter:
Used to select a percentage or amplitude value of harmonics. Available for only AC Voltage and AC current function.

Report:
Used to generate a report. Report contains all captured readings from start of meter data till report generation (Click on report).

Snapshot:
Used to take snapshot of the meter data screen. Snapshot will be stored on location.

Save File:
Used to get instantaneous value of all parameters in excel format. File will be auto saved on location.

Return:
Used to go back to home screen.

Refresh:
Used to Meter Data parameter values.

Note:
Minimum, maximum, average and energy value reset on function change or meter data reopened. Meter Data will not be available in NCV and Reserved function.

6. Import data:

Import data is used to download datalogging data stored in the meter. This Window also provides memory occupied details with complete erase function.

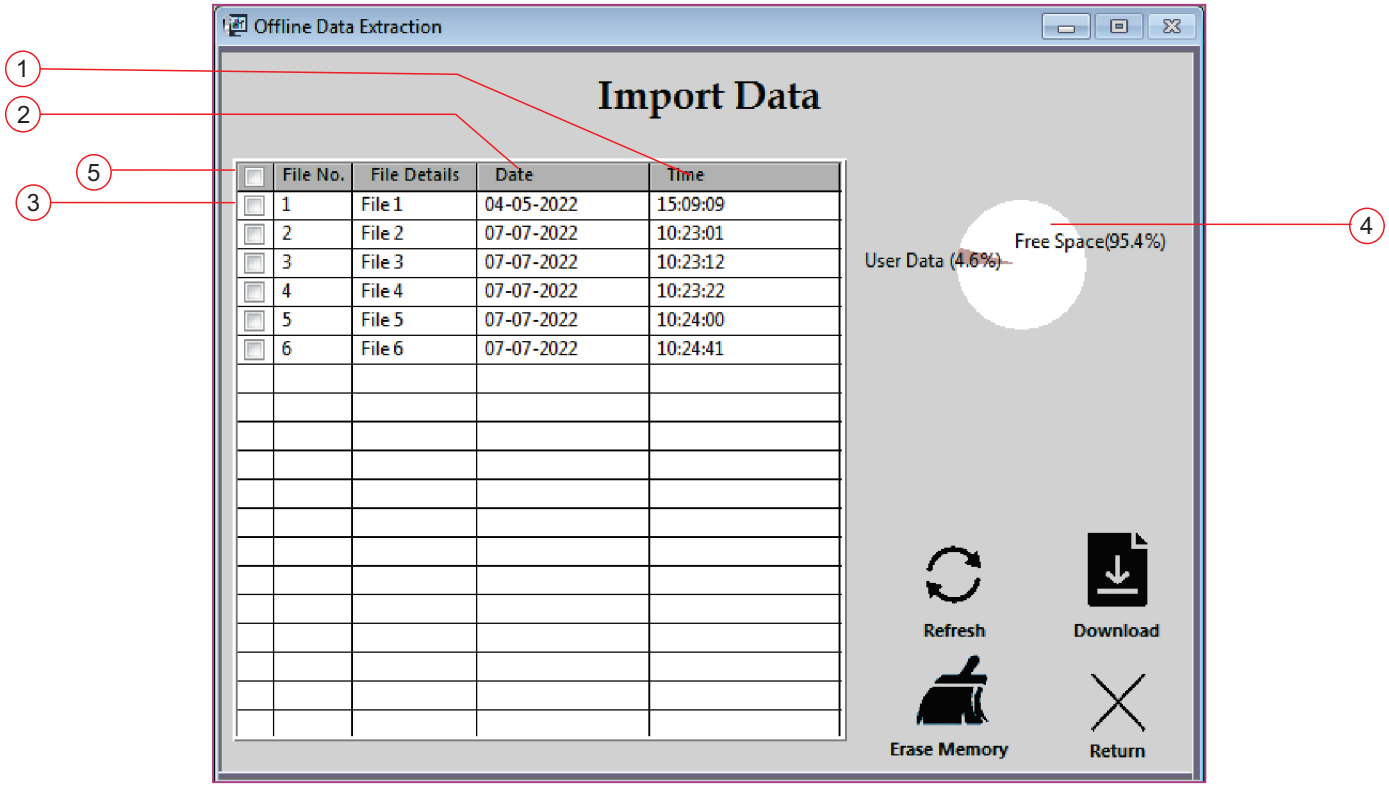


Figure 6. Import data window

1. Time: Saving time of recorded file.
2. Date: Shows the file recording date.
3. Checkbox: Select it, to Download particular file.
4. Pie chart: Shows the memory status of meter.
5. Select all: Select it, to select all files.

6.1 Tools and keys:

Download: Used to start downloading of selected file.

Erase: Used to Erase complete memory of meter.

Return: Used to go back to home screen.

Refresh:
Used to refresh the File list.

6.2. Download Process:

Step 1: Select the file that you want to download by using checkbox as shown in figure 7.

	File No.	File Details	Date	Time
☐	1	File 1	15-12-2021	11:05:21
☐	2	File 2	15-12-2021	14:21:14
☐	3	File 3	15-12-2021	14:21:31
☐	4	File 4	15-12-2021	14:21:34
☑	5	File 5	15-12-2021	14:21:51
☑	6	File 6	15-12-2021	16:20:10
☑	7	File 7	17-12-2021	19:00:29
☐	8	File 8	17-12-2021	19:10:48

Figure 7. File selection for download

Step 2: Click on download button

Step 3: Select folder path where you want to download files and click on select Folder button.

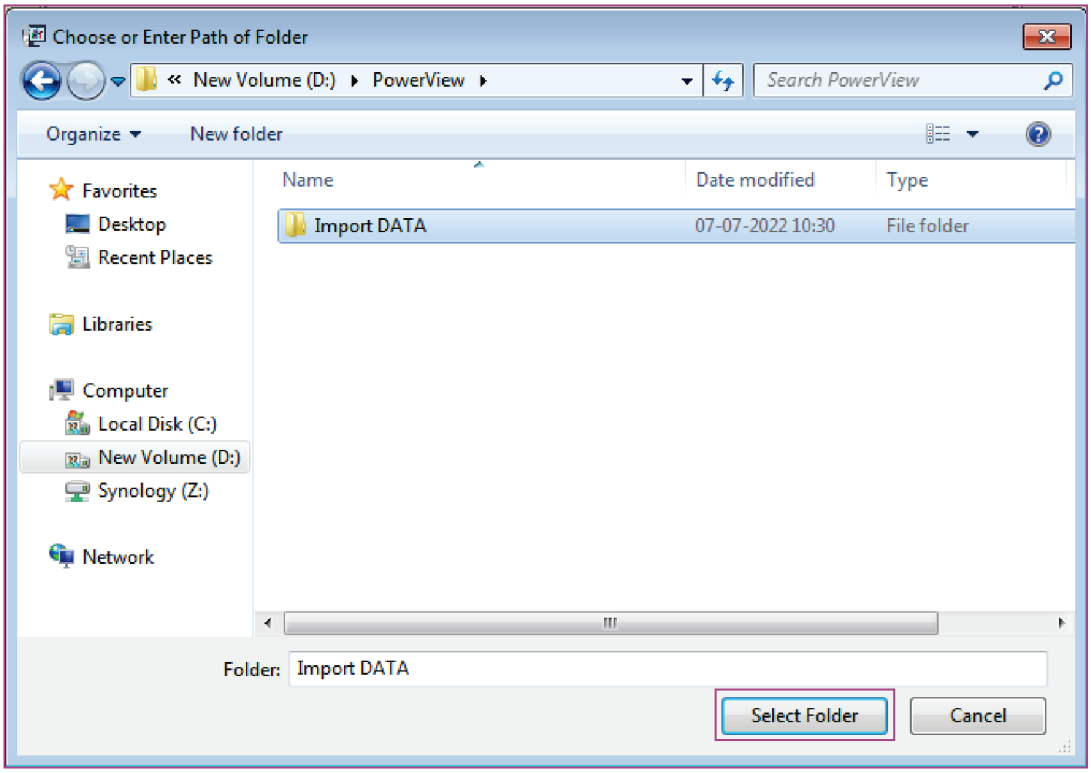


Figure 8. Folder path selection for Downloading

3. Memory Erase Process:

Step 1: Click on erase button

Step 2: Click on Proceed button to erase or cancel button to terminate.

Step 3: Click on done button.

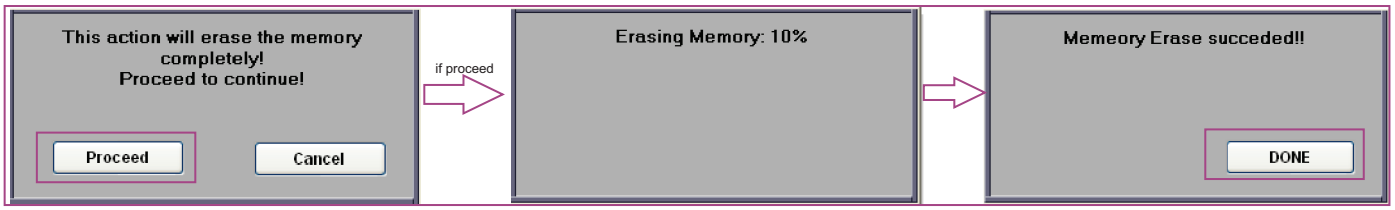


Figure 8. Memory Erase process

Note: Once the memory is erased it can not be recovered again.

7. Harmonics Plot:

Harmonics Plot is used to view harmonics readings. Up to 49th harmonics user can see the readings. This Function is available only for AC voltage and AC current.

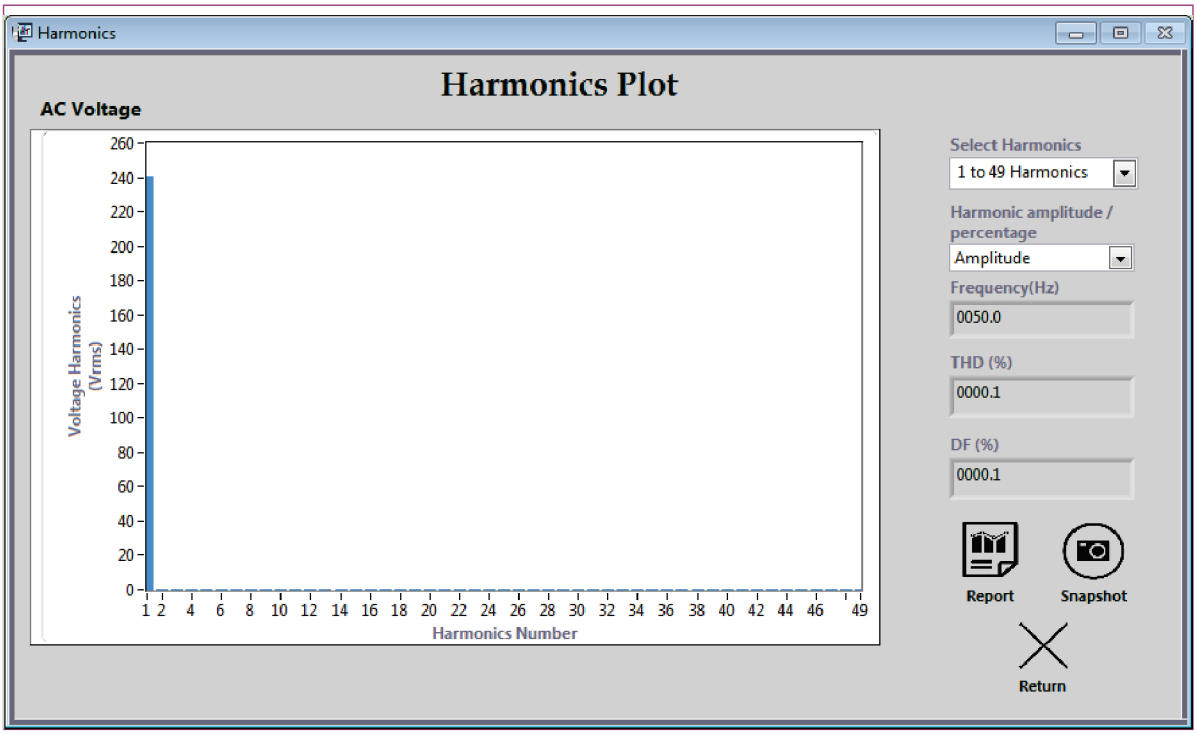
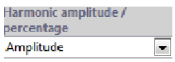


Figure 10. Harmonics window

7.1. Tools and keys in Harmonics:

Select Parameter:
Used to select a particular range of harmonics to display on graph.



Select Parameter:
Used to select a percentage or amplitude value of harmonics to display on graph.

Report:
Used to generate a report. Report contains all Harmonics readings till report generation.

Snapshot:
Used to take snapshot of the harmonics plot screen. Snapshot will be stored on user defined location.

Save File:
Used to get instantaneous value of selected harmonics plot in excel format. File will be saved on user defined location in excel format.

Return:
Used to go back to home screen.

8. Waveform:

Waveform is used to view the actual wave shape of measured voltage and current signal.

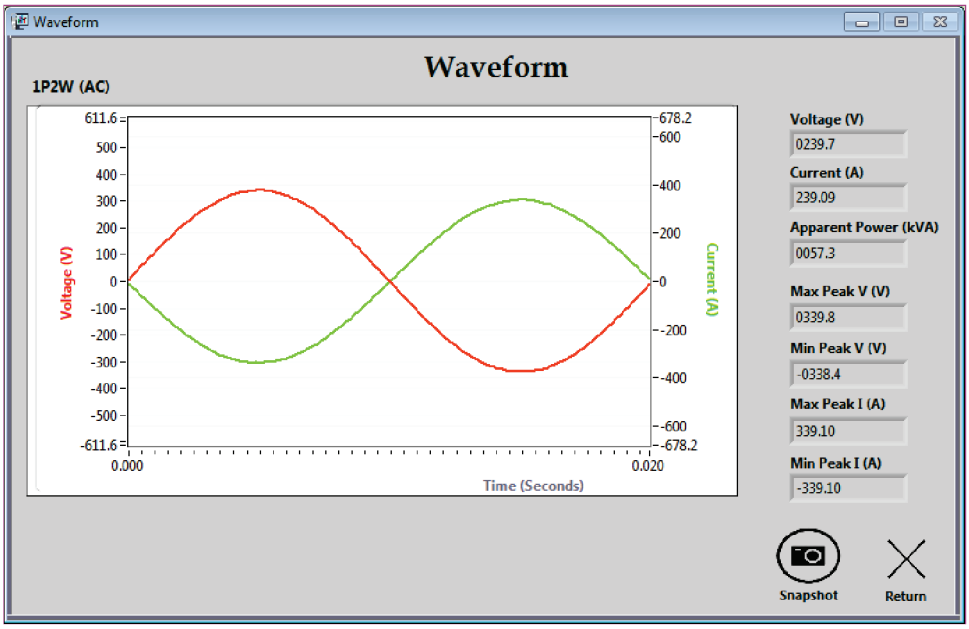


Figure 11. Waveform window

8.1. Tools in Waveform:

Snapshot:
Used to take snapshot of the Waveform screen. Snapshot will be stored on user defined location.

Note:
Frequency and time axis is available in AC Voltage and AC current for 45 to 65 hz only.

9. Indications used in power view:

HOLD

Hold:
Used to indicate the value on meter is on hold i.e. hold key is pressed.

REL

REL:
Used to indicate the Relative key is pressed.

Ah

Ah:
Used to indicate the Ah mode is activated.

Kwh

Kwh:
Used to indicate the Kwh mode is activated.

Battery:
Used to indicate that battery level is low.

Note:
Indications are available only in Meter Data, Trend Plot and Harmonics.

10. Tool for Automation, Protocol

10.1 Formatting and Function codes information

Note: All the value are in Hexadecimal Format $()_H$
In Protocol, the frame length is of not same for various functions.
1st Byte: is always Start of frame
Query From system contains : $(0x5E)_H$
Response from meter : $(0x24)_H$

10.1.1 Readings and calibration data Formatting*:

All the readings received in response are of 4 Byte length need to convert it in to float type to get actual value.
Procedure to convert Received Data into actual data:
step 1: For any reading Collect respective 4 byte data (For data location refer response frames)
step 2: Cascade all 4 bytes in reverse order
step 3: Convert data in to float

example:
Received data

D0	D1	D2	D3
0x31	0x32	0x33	0x34

Step 1: Data collection
$D0=(0x31)_H$, $D1=(0x32)_H$, $D2=(0x33)_H$, $D3=(0x34)_H$
Step 2: Cascade data in reverse order
x=<D3D2D1D0>
$=(0x34333231)_H$
Step 3: Convert data in to float
y=Float (x)
=1.66889e-07

So y is the final and actual value of particular parameter.
For Time and Date information Respective received data need to convert into BCD form I.e Hex to BCD.

Note:
All the values are in Hexadecimal Format $()_H$
** Formatting is required for all reading only, not for hold and battery indication data*
For DATE and Time information Formatting is not required.

10.1.2. Function code:
Following are the Functions and Respective Function codes used in response:

Function code (FC) (Decimal)	Function name	Number of byte (n) in Response
1	AC voltage	257
2	DC voltage	25
3	1p2W	50
4	DC power	29
5	3p3w unbalance	107
6	3p4w unBal	139
7	AC current	257
8	dc current	25
9	Resistance	17
10	ACDC voltage	17
11	ACDC Current	17
12	NCV	13
13	LPF voltage	17
14	LPF current	17
15	3p3w Balance	50
16	3p4w Bal	50
17	inrush current	13
18	Diode	13
19	Continuity	17
23	Reserved positon	13

Table 1: Function code Table

10.2 Queries and Response

10.2.1 Query and Response for meter details

To get the information about meter this query is used, response for this query contain the meter type (1000A/400A) connected to Bluetooth.

Query:

-18 byte frame for both query and response.

D0	D1	D2-D17
5E	0x06	00

Response:

D0	D1	D2	D3...D15	D16	D17
40	23	M	00	Y	X

- 40 and 23 is start of frame bit.
- M: Power Clamp Model
  - $(0x11)_H$: $(17)_D$:Power Clamp 400A
  - $(0x12)_H$: $(18)_D$: Power Clamp 1000A
- Y: Gives the year value set in the power clamp RTC.
  - Eg. Year set in meter is 2016
  - then response is, y=$(0x16)_H$

10.2.2 Query and Response for online data

To get the current reading from meter this query is used.

Query:

-18 byte frame

D0	D1	D2-D17
5E	0x01	00

Response:

D0	D1	D2	D3	D4	D5	D6	D7	D8 to Dn-2	Dn-2	Dn-1
$(SOF)	FC	HH	MM	SS	DD	mm	YY	DATA	KEY STATUS	HB

- $:$(0x24)_H$: Start of frame
- FC: Function code *for details refer function code table*
- HH: Hour
- MM: Minutes
- SS: Seconds
- DD: Date
- mm: month
- YY: Year
- HB: Hold and Battery indication (Common for all functions)
  - $(0x01)_H$:Low battery
  - $(0x10)_H$:Hold key pressed
  - $(0x11)_H$: Both indication battery is also low and Hold key is also pressed.
- DATA : Data is readings for that function in hex format. data length is different for each functions for the final length of frames refer function code table.

-KEY STATUS: Mode Indication ((0x01)Relative, (0x02)Ah, (0x02)Kwh).

DATA frame (function code vise)

For Function code: 1

D8-D11	Rms Voltage
D12-D15	THD
D16-D19	DF
D20-D23	CF
D24-D27	Max Peak
D28-D31	Min Peak
D32-D35	Frquency
D36-D39	H01
D40-D43	H02
.	.
.	.
.	.
D232-D235	H49
D236-D239	Don't Care
D240-D243	Don't Care
D243-D247	REL Value
D248-D251	-
D252-D255	-
D256	Key Status
D257	H/B

Function code: 7

D8-D11	Rms Current
D12-D15	THD
D16-D19	DF
D20-D23	CF
D24-D27	Max Peak
D28-D31	Min Peak
D32-D35	Frquency
D36-D39	H01
D40-D43	H02
.	.
.	.
.	.
D232-D235	H49
D236-D239	Don't Care
D240-D243	Don't Care
D243-D247	REL Value
D248-D251	Ah
D252-D255	Ah Counter in Seconds
D256	Key Status
D257	H/B

For Function code: 6

D8-D11	Apparent Power	L1-n
D12-D15	Power Factor	
D16-D19	Horse Power	
D20-D23	Reactive power	
D24-D27	Active power	
D28-D31	Phase angle	
D32-D35	Voltage	
D36-D39	Current	
D40-D43	Apparent Power	L2-n
D44-D47	Power Factor	
D48-D51	Horse Power	
D52-D55	Reactive power	
D56-D59	Active power	
D60-D63	Phase angle	
D64-D67	Voltage	
D68-D71	Current	
D72-D75	Apparent Power	L3-n
D76-D79	Power Factor	
D80-D83	Horse Power	
D84-D87	Reactive power	
D88-D89	Active power	
D92-D91	Phase angle	
D96-D99	Voltage	
D100-D103	Current	
D104-D107	Apparent Power	System
D108-D111	Power Factor	
D112-D115	Horse Power	
D116-D119	Reactive power	
D120-D123	Active power	
D124-D127	Phase angle	
D128-D135	Don't care	
D136-D137	load Type	
D138	H/B	

Data Bytes	Parameter	Received Data	Load Type
D136	L2 load Type	0x01	capactitive
		0x02	inductive
	L1 Load Type	0x10	capactitive
		0x20	inductive
d137	sys Load Type	0x01	capactitive
		0x02	inductive
	L3 Load Type	0x10	capactitive
		0x20	inductive

For Function code: 5

D8-D11	Apparent Power	L1-2
D12-D15	Power Factor	
D16-D19	Horse Power	
D20-D23	Reactive power	
D24-D27	Active power	
D28-D31	Phase angle	
D32-D35	Voltage	
D36-D39	Current	
D40-D43	Apparent Power	L2-3
D44-D47	Power Factor	
D48-D51	Horse Power	
D52-D55	Reactive power	
D56-D59	Active power	
D60-D63	Phase angle	
D64-D67	Voltage	
D68-D71	Current	
D72-D75	Apparent Power	System
D76-D79	Power Factor	
D80-D83	Horse Power	
D84-D87	Reactive power	
D88-D89	Active power	
D92-D91	Phase angle	
D96-D103	Don't care	
D104-D105	load type	
D106	H/B	

Data Bytes	Parameter	Received Data	Load Type
D104	L1-2 load type	0x10	capactitive
		0x20	inductive
D105	sys load type	0x01	capactitive
		0x02	inductive
	I2-3 load type	0x10	capactitive
		0x20	inductive

For Function code: 3,15,16

D8-D11	Apparent Power
D12-D15	Power Factor
D16-D19	Horse Power
D20-D23	Reactive power
D24-D27	Active power
D28-D31	Phase angle
D32-D35	Voltage
D36-D39	Current
D240-D43	Kwh
D44-D47	Kwh Counter in Seconds
D40	Load type
D49	Key Status
D50	H/B

Data Bytes	Received Data	Load type
D40	0x01	Capacitive
	0x02	Inductive

For Function code: 4

Data Bytes	Parameters
D8-D11	DC Power
D12-D15	Voltage
D16-D19	Current
D20-D23	Kwh
D24-D27	Kwh Counter in seconds
D28	Key Status
D29	Hold and Battery indication

For Function code: 8

Data Bytes	Data
D8-D11	DC Current
D12-D15	Rel Value
D16-D19	Ah
D10-D23	Ah Counter in seconds
D24	Key Status
D25	Hold and Battery indication

For Function code: 2,9,10,11,13,14,17,18,19

Data Bytes	Data
D8-D11	Reading Acording to Function
D12-D15	Rel Value
D16-D19	-
D10-D23	-
D24	Key Status
D25	Hold and Battery indication

For Function code: 12

D8-D11	Don't care
D12	Hold and Battery indication

There is no data for NCV So only response will get only function code, battery info and Hold indication.

For Function code: 23

Data Bytes	Data
D8-D12	Hold and Battery indication

There is no data for Reserved knob position. So only response will get only function code.

10.2.3 Query for time setup:

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9-d17
0x5E	0x04	0x02	HH	MM	SS	dd	mm	yy	00

-18 byte format
- Time sending in response must be in 24 hours format
- HH: Hours
- MM: Minutes
- SS: Seconds
- dd: Date
- mm: Month
- yy: Year

Eg: Date: 30/12/16 & Time: 09:42:10
$HH = (0x09)_H$, $MM = (0x42)_H$, $SS = (0x10)_H$, $DD = (0x30)_H$, $mm = (0x12)_H$, $YY = (0x16)_H$

10.2.4 Query and Response for waveforms:

Query:

D0	D1	D2	D3-D17
0x5E	0x01	0x01	00

Response:
Response can get in AC Voltage/ Current , DC Voltage/Current, ACDC Voltage/ Current, 1P2W function. Response is different for each funtion.

For Function code: 1,7

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	...	D262	D263	D264-D267	D268-D271	D272-D275	D276-D277
$	FC	HH	MM	SS	DD	mm	YY	s1,2	s1,1	s2,2	s2,1	...	s128,2	s128,1	C4...C1	F4...F1		
(SOF)		Time			Date			Sample1		Sample2		...	Sample128		Calibration Value	Frequency	Current/Voltage	Key status

Till the D7 byte the response is same as of online data after that all samples of signals are in the frame
samples value calculation:
Step1: make a group of 2 byte sequentially which makes a data of one sample.
<s1,2 s1,1> , <s2,2 s2,1>.....<sn,2 sn,1>
here **n=128;**
Step2: Swap the byte and covert it into integer.
x1=int (s1,1 s1,2); x2=int (s2,1 s2,2); .....xn =int (sn,1 sn,2);
Step3: Take a average of all samples i.e. sum(sample1 to sample 128)/ 128
Avg=(x1+x2...+xn)/128
Step4: Divide each sample by avg value
y1=x1/avg, y2=x2/avg ... yn=xn/avg
Step4: Multiple each samples by Calibration value received at D256-D259
*(For calibration value calculation refer **reading formatting** in 10.1 section)*
cal=calibration value, z1=y1*cal, z2=y2*cal.....zn=yn*cal;
Step5: Multiple value by 0.0008056640508585
v1= z1*0.0008056640508585,
v2= z2*0.0008056640508585,
.....
vn= zn*0.0008056640508585; Value of v is actual sample value.

For Function code: 2,8

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	...	D262	D263	D264-D327	D328-D331	D332-D335	D336-D339	D340-D343	D344-D347	D348-D349
$	FC	HH	MM	SS	DD	mm	YY	s1,2	s1,1	s2,2	s2,1	...	s128,2	s128,1	Don't care	P4...p1	N4...N1	I4...I1	Don't care	Current/Voltage	Key Status
(SOF)		Time			Date			Sample1		Sample2		...	Sample128			Cal_Pos	Cal_Neg	I_offset			

Till the D7 byte the response is same as of online data after that all samples of signals are in the frame
samples value calculation:
Step1: make a group of 2 byte sequentially which makes a data of one sample.
<s1,2 s1,1> , <s2,2 s2,1>.....<sn,2 sn,1> here **n=128;**
Step2: Swap the byte and covert it into integer.
x1= int (s1,1 s1,2); x2=int (s2,1 s2,2); .....xn =int (sn,1 sn,2);
Step3: Subtract 2078 from each value
y1=x1-2048, y2=x2-2048 ... yn=xn-2048;
Step4: Multiple value by 0.0008056640508585
z1= y1*0.0008056640508585,
z2= y2*0.0008056640508585,
.....
zn= yn*0.0008056640508585;
Step5: if z1>0 then v1= z1* Cal_Pos else v1=z1*Cal_Neg
if z2>0 then v2= z2* Cal_Pos else v2=z2*Cal_Neg
.....
if zn>0 then vn=zn* Cal_Pos else vn=zn*Cal_Neg
for current waveform, Add I_offset value in all samples
Step6: v1=v1+I_offset .... vn=vn+I_offset
*(For calibration value calculation (Cal_Pos, Cal_Neg and I_offset) refer **reading formatting** in 10.1 section as this values are needed in float format)*

For Function code: 10,11

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	...	D262	D263	D264-D267	D268-279	D280-D283	D284-D285
$	FC	HH	MM	SS	DD	mm	YY	s1,2	s1,1	s2,2	s2,1	...	s128,2	s128,1	C4...C1	Dont't care	Current/Voltage	Key Status
(SOF)		Time			Date			Sample1		Sample2		...	Sample128		Calibration Value			

Till the D7 byte the response is same as of online data after that all samples of signals are in the frame samples value calculation:

Step1: make a group of 2 byte sequentially which makes a data of one sample.
<s1,2 s1,1> , <s2,2 s2,1>.....<sn,2 sn,1>
here **n=128;**

Step2: Swap the byte and covert it into integer.
x1=int (s1,1 s1,2); x2=int (s2,1 s2,2); .....xn =int (sn,1 sn,2);

Step3: Multiple each samples by Calibration value received at D256-D259
*(For calibration value calculation refer **reading formatting** in 10.1 section)*
cal=calibration value;
y1=x1*cal, y2=x2*cal.....yn=xn*cal;

Step5: Multiple value by 0.0008056640508585
v1= y1*0.0008056640508585,
v2= y2*0.0008056640508585,
.....
vn= yn*0.0008056640508585;

Step6: if FC= 11 negate all samples and take it in reverse order
i.e. Sam1=-(vn), Sam2=-(vn-1),.....Sam128=-(v1).
if FC=10 take v values as it is for sample
i.e. Sam1=v1, Sam2=v2,.....Sam128=v128.
So Sam values are actual samples that we can correlate with actual signal.

For Function code: 3

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	...	D262	D263	D264	..	D267	D266	..	D269	...	D772	...	D775	D776..D779	D780..D783	D784..D787	D788-D791	D792-D795	D796-D799	D800-D803	D804-D805
$	FC	HH	MM	SS	DD	mm	YY	vs1,2	vs1,1	vs2,2	vs2,1	...	vs128,2	vs128,1	is1,4	..	is1,1	is2,4	..	is2,1	...	is128,4	...	is128,1	V4..V1	I4..I1	Don't care	I2,4..I2,1				
(SOF)		Time			Date			VSample1		VSample2		...	VSample128		ISample1			ISample2			...	ISample256			Vcal	Ical		I2cal	Voltage	Current	Apparent Power	Key Status

Till the D7 byte the response is same as of online data after that all samples of signals are in the frame samples value calculation:

For voltage samples:

Step1: make a group of 2 byte sequentially which makes a data of one sample.
<vs1,2 vs1,1> , <vs2,2 vs2,1>.....<vsn,2 vsn,1>
here **n=128;**

Step2: Swap the byte and covert it into integer.
x1=int (vs1,1 vs1,2); x2=int (vs2,1 vs2,2); .....xn =int (vsn,1 vsn,2);

Step3: Take a average of all samples i.e. sum(sample1 to sample 128)/ 128
Avg=(x1+x2...+xn)/128

Step4: Divide each sample by avg value
y1=x1/avg, y2=x2/avg ... yn=xn/avg

Step4: Multiple each samples by Calibration value received at D776-D779
*(For calibration value calculation refer **reading formatting** in 10.1 section)*
Vcal=calibration value, z1=y1*Vcal, z2=y2*Vcal.....zn=yn*Vcal;

Step5: Multiple value by 0.0008056640508585
v1= z1*0.0008056640508585,
v2= z2*0.0008056640508585,
.....
vn= zn*0.0008056640508585;

Value of v is actual voltage sample value.

For Current samples:

Step1: make a group of 4 byte sequentially which makes a data of one sample.
<is1,4 is1,3 is1,2 is1,1> , <is2,4 is2,3 is2,2 is2,1>.....<isn4, isn3,isn,2 isn,1>
here **n=128;**

Step2: Take byte in reverse order for particular group and covert it into float.
x1=Float (is1,1 is1,2 is1,3 is1,4); x2=int (is2,1 is2,2 is2,3 is2,4); .....xn =int (isn,1 isn,2 isn,3 isn,4);

Step3: Multiple each samples by Calibration value received at D780-D783
*(For Ical value calculation refer **reading formatting** in 10.1 section)*
y1=x1*Ical, y2=x2*Ical.....yn=xn*Ical;

Step5: Multiple value by I2cal
for I2cal value in float format refer reading formatting step given in section 10.1
I1= y1*I2cal,
I2= y2*I2cal,
.....
In= yn*I2cal,

Value of I is actual current sample value.

10.2.5 Query and Response for basic information of memory :

Query:

-18byte frame length

D0	D1	D2-D17
0x5E	0x02	00

Response:

-16 byte Frame length

D0	D1	D2	D3
P1	P2	F1	F2
Max. Page Number		Max. File Number	

-Max. Page Number (Max Page Number Can be $(7FF)_H$)

Pg.No. = (P1 * $(0x100)_H$)+P2

Eg: P1 = $(0x01)_H$ P2 = $(0x23)_H$ Pg.No = (($(0x01)_H$* $(0x100)_H$)+$(0x23)_H$ => $(0x123)_H$ => $(291)_D$

Memory Used Space in % = ((($(Pg.No)_D$ - $(39)_D$) / $(2009)_D$) *$(100)_D$

Pg. No. = (291) Memory Used Space in % = (($(291)_D$ - $(39)_D$) / $(2009)_D$)*$(100)_D$ => 12.54 %

P1 = P2 = $(0xFF)_H$ then there is no data in the memory, memory is empty.

-Max. File Number

File = (F1 * $(0x100)_H$)+F2

Eg: Suppose Max File Number = $(0x02)_H$ means there is total 3 file => File0 , File 1, & File 2

10.2.6 Query and Response for file Index:

Query:

-18byte frame length

D0	D1	D2	D3-D17
0x5E	0x02	0x02	00

Response:

The Response is of total byte $(2800)_H$ => $(10240)_D$

Out of (10240) First 256 byte of data is of no use because its information is already sent in Memory Initialization Query $_D$

After 256 byte of data, data is in following format:

D0	D1	D2	D3	D4	D5	D6	D7
P1	P2	HH	MM	SS	DD	mm	YY
End Pages Address of file		Time at file was recorded			Date of file recorded		

-8 Byte Frame Length

-File End Page Address (Max Page Address Can be $(7FF)_H$)

File End Page Address = (P1 * (0x100)H)+P2

Eg: P1 = (0x01) H P2 = (0x23) H

File End Page Address = ((0x01)H * (0x100)H)+(0x23) H => (0x123)H => (291) D

P1 = P2 = $(0xFF)_H$ then memory is empty.

-If there is continuously $(0xFF)_H$ for minimum of 8 Byte then Data is of no need (Don't Care)

-Above frame is repeated for maximum file number present in memory

10.2.7 Query and Response for Read Memory:

Query:

-18byte frame length

D0	D1	D2	D3	D4	D5	D6	D7-D17
0x5E	0x02	0x03	S1	S2	E1	E2	0
			Start Page		End Page		

-18 Byte Frame Length

- Start Page

S2 = Start Page % $(0x100)_H$

S1 = (Start Page / $(0x100)_H$) %$(0x100)_H$

-End Page

E2 = End Page % $(0x100)_H$

E1 = (End Page / $(0x100)_H$) %$(0x100)_H$

Eg: If you want to read certain file, Check which of the file detail should be read, in that file detail there is File End Page Number which should be used as End Page in case of data read.

If you are reading File 0 data then start page will always be $(0x28)_H$

If you are reading other than File 0 data the Start will be Previous . File End page Number + 1

Eg: There are total 3 File Details

File 0, File 1, File 2

File 0, P1 = File End Page Address

File 1, P2 = File End Page Address

File 2, P3 = File End Page Address

Now Suppose we want to read File 0

Then, Start Page = $(0x28)_H$ End Page = P1

Now suppose we want to read File 1

Then, Start Page = P1 + (0x01) End Page = P2

Response:
The response from meter of $(((\text{End Page Number})_D - (\text{Start Page Number})_D) * (256)_D)$ Byte.
The response time dependent on number of bytes requested from meter.
The Start of frame is always $\$:(0x24)_H$
From start of frame total byte length of data is depended on the function code

***Refer to Section 10.2.2 Online Data Query Response Frame, Only difference is that in Hold and battery indication is not send from the meter.

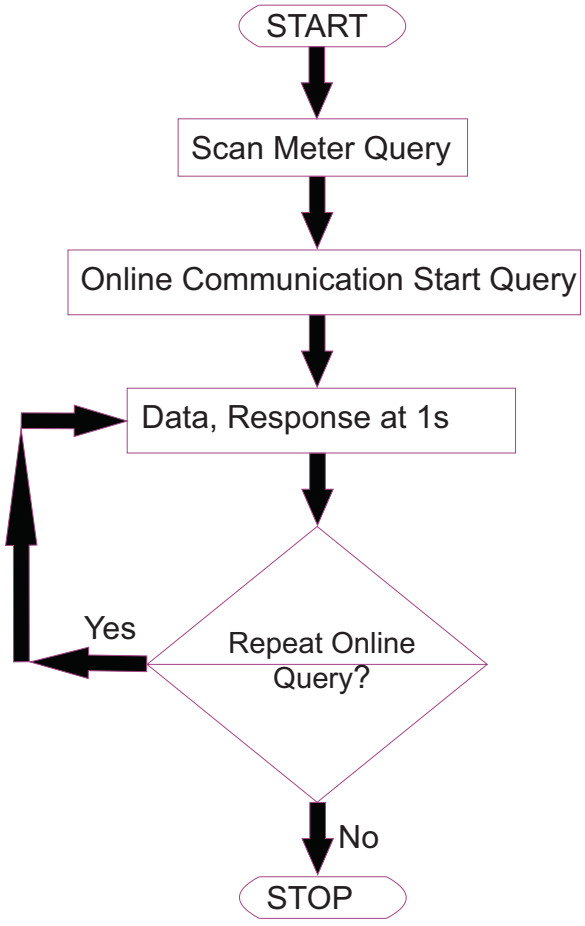
10.3 Memory distribution :

Page Number	Information	(Byte Length)D
00	Basic Data	256
01-39	File Index and Details	9984
40-2048	Data	514048

10.4 Communication Details :

Baud Rate:9600
Parity: None
Data bits: 8
Stop bits: 1
Flow Control: None

10.5. Flow chart
10.5.1 Online communication flow chart



10.5.2 Memory Read Flow chart