



OPERATION MANUAL

3-PHASE PRECISION POWER METER



PA-600

Gopal Electronics

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PREFACE

PURPOSE OF THIS MANUAL

This manual contains most of the information required for proper installation and general use of the GOPAL make Precision Power Meter. To achieve maximum capability and to ensure proper use of the instrument, please read this manual deeply before operating the Instrument. Keep this manual in a safe place for quick reference whenever a question should arise.

WHO SHOULD USE THIS MANUAL?

This manual is intended for those operators who are planning to use GOPAL make Precision Power Meter for power measurement purposes either as a stand-alone instrument or in conjunction with Gopal Data transfer tool Software with RS-232 serial interface to a computer.

SAFETY PRECAUTIONS

- [1.] Make sure that there must be presence of proper ground in your power supply system.
- [2.] Make sure that GOPAL make Precision Power Meter is earth-grounded, to ensure personal safety and proper operation.
- [3.] Check line voltage (it must be within the limit of 210V to 250V) before operating the instrument.
- [4.] Make sure that any machine under test is equipped with appropriate safety guards.
- [5.] Don't turn the Instrument on and off instantly. It is a micro-controller-based instrument so it causes harm to the performance of the Instrument.
- [6.] Warmup the Instrument for at least 30 minutes to get proper measurement & specified accuracy.
- [7.] Make proper wiring before use. Wiring diagrams are given on the top of the Instrument.

NOTE:-

[1.] While every precaution has been exercised in the compilation of this document to ensure the accuracy of its contents, Gopal Electronics assumes no responsibility for errors or omissions. Additionally, no liability is assumed for any damages that may be the result of the use of the information contained within this Publication.

[2.] Word 'GPPM' is used for "Gopal Precision Power Meter" throughout this manual.

MANUAL ORGANIZATION

This section gives a brief overview of the structure of the manual and the information it contains.

The structure of the manual is as follows:

Chapter 1: Introduction - Brief Introduction about GPPM and it's accessories and technical data sheet which describes it's electrical characteristics.

Chapter 2: Functional Description - Description of all parts of GPPM and their functional use.

Chapter 3: Protecting Your GPPM - How to protect GPPM from damage.

Chapter 4: Different Modes of Testing - Different wiring connection, mode of testing.

Chapter 5:GPPM with computer- How to establish communication between GPPM & Computer, and how to read and save data in Memory card.

Chapter 6: Frequently Asked Questions- Frequently asked questions about GPPM and it's use.

1. INTRODUCTION

1.1 UNPACKING YOUR GPPM

Make sure that the carton contains following:

[1.] Gopal Precision Power Meter	= 1	[5.] User's Manual	= 1
[2.] Mains cord	= 1	[6.] Test Report	= 1
[3.] RS-232 Serial interface wire.	= 1	[7.] Software CD	= 1
[4.] Current terminal nuts	= 6		

1.2 USE OF ALL ITEMS PROVIDED INCLUDING GPPM

- [1.] GPPM is used for measurement and testing of AC machines.
- [2.] Main's cord is given to plug in GPPM to Auxiliary power supply.
- [3.] RS-232 Cable is given to connect GPPM with computer for communication.
- [4.] Nut set of 80A is provided to make permanent connection of 3-phase power supply to current input terminal of GPPM and power supply connection of a load.
- [5.] User's Manual is necessary as a guide for proper operation of GPPM.
- [6.] Test Report is provided for reference.
- [7.] Software CD is provided with free demo software (**Data Transfer Tool**) in order to communicate GPPM with Computer.

1.3 FEATURES

Single/Three Phase Capabilities	For single & three phase power measurements.
Interface	RS-232 serial interface.
Data Transfer Rate	115200 bps.
Liquid Crystal Display	High-quality, easy to read four lines with 20 alphanumeric character
Seven Segment Display	Seven digits high glow type Red/Blue/Green display for long distance
Four Extra Inputs(10V DC)	To measure any parameter which is of 10V DC like Flow, Pressure
RPM/SLIP RPM Input(5Volt)	To measure RPM of Motor or Slip RPM of Submersible
Inbuilt Memory Card (M-125)	It is a memory card which can be used to store 125 test results (of all parameters).
Measurement	Continuous
Input power of an Instrument	AC 230V / 50Hz (110V /60Hz on request)
Isolation	1000 Vrms input to Earth
Special Features	1.Upto potential difference of 1000V , between input terminal to ground, you can directly measure current upto specified range. 2. It can be used as a Table top or Rack mounting.

1.4 APPLICATIONS

- [1.] Testing of single phase & three phase AC transformer and motor.
- [2.] Testing & calibration of Instruments like Energy meter, Volt meter, Ammeter, Watt-meter, PF-meter etc.
- [3.] Testing of Household appliances such as Heaters, Microwave Ovens, TV, Blenders, Mixers, Lamps, Ballasts, Fans, Air Conditioners, Refrigerators etc.

1.5 DESCRIPTION

- [1.] The GPPM is user - friendly instrument and ideal for numerous power measurement applications.
- [2.] The instrument is equipped with latest technology for bidirectional measurement, so you can measure parameter in both directions. Bidirectional means it can take measurement of a watt in both cases: like change of wiring direction or change in power factor i.e. lead to lag or lag to lead.
- [3.] It measures and displays True RMS Volt, True RMS Current, Active Power, Reactive Power, Apparent Power, Power Factor, Frequency of V1, Mean/Rectified/Peak Value/Crest Factor/Form Factor of Voltage and Current Input.
- [4.] You can measure 10 volt DC through it's four Extra input viz. M1, M2, M3, M4 & RPM/Slip RPM through Extra Input Terminals which are provided at a rear panel.
- [5.] It has separate ADC to measure all basic parameters of each phase simultaneously.
- [6.] You can also see all basic parameters simultaneously on your computer by using RS-232 serial interfacing wire and software "Data Transfer Tool".
- [7.] It is a portable instrument so you can easily handle it.

1.6 SYSTEM CONFIGURATION

One basic configuration is given below. Working of complete system can be understood by following Diagram.

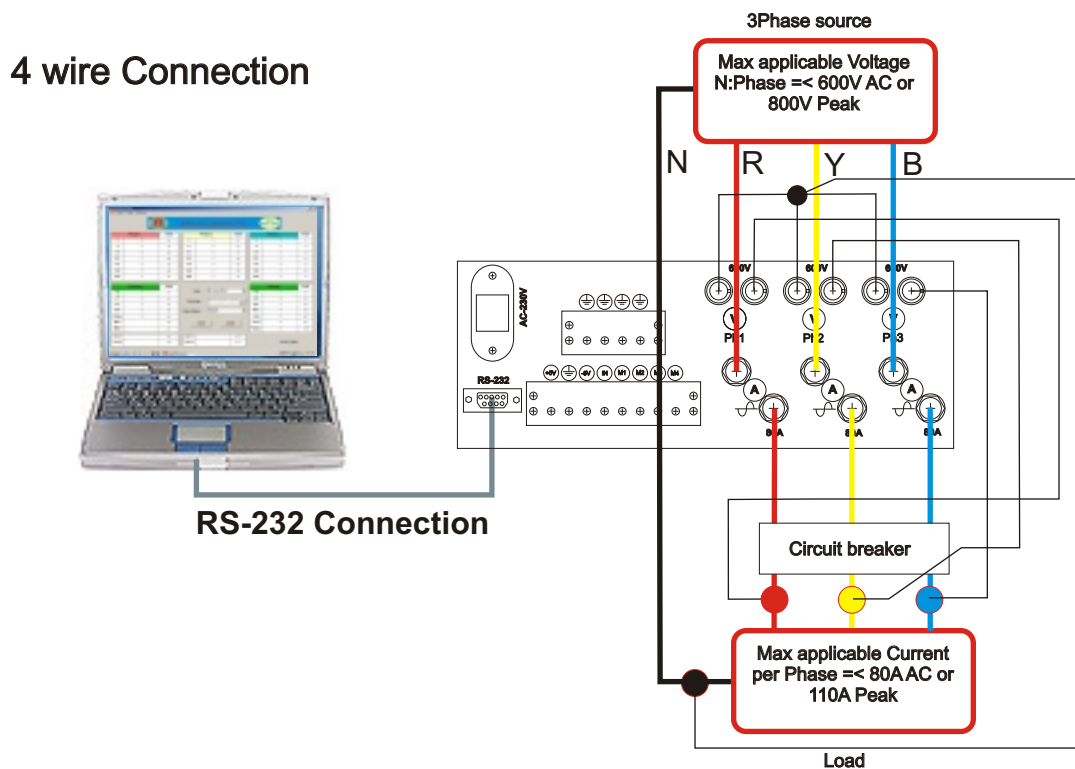


Figure 1

1.7 SPECIFICATION OF MODEL PA-600 [AT 25°C ± 5°C AFTER 30 MINUTES WARM-UP]

GENERAL SPECIFICATIONS	
Warm up time	30 minutes
Operating temperature	20° to 45° C
Operating humidity	20% to 75% RH (non condensation)
Storage temperature	25° to 50° C
Insulation resistance	40M Ω or higher at 600V all of the following area Voltage input terminal to case Current input terminal to case Voltage input terminal to Current input terminal Case to power supply
Insulation withstand voltage	2000V for 1minute at 50 Hz across all of the following area Voltage input terminal to case Current input terminal to case Voltage input terminal to Current input terminal
Power supply	210V - 250V / 50Hz
Power consumption	15VA maximum
Size	280 x 260 x 130 mm (l x b x h) including projection
Panel mounting cut out size	280 x 115 mm
Weight	3.5 kg approximate.

INPUT SPECIFICATIONS		
Parameter	Voltage	Current
Input type	Resistance voltage divider	Current to voltage converter
Rated Values	600Vrms for PA-600 & 140Vrms for PA-140	80Arms for PA-600, 8Arms for PA-600 - 8A & 5A for PA-140
Measuring instrument loss (Input resistance)	Approx. 2M Ω	Approx. 1m Ω
Maximum Instantaneous allowed input	Peak value - 1.5 kV for PA-600 & 350 V for PA-140 RMS value - 1.1 kV for PA-600 & 250 V for PA-140 (Whichever is less)	Peak value:-200A for PA-600,20A for PA-600-8A & 12A for PA-140 RMS value:-150A for PA-600,15A for PA-600-8A & 9A for PA-140 (Whichever is less)
Maximum instantaneous allowed input	Peak value:-1.4 kV for PA-600 & 195V for PA-140 RMS value:-1.0 kV for PA-600 & 230V for PA-140 (Whichever is less)	Peak value:-150A for PA-600,15A for PA-600-8A & 9A for PA-140 RMS value:-100A for PA-600,10A for PA-600-8A & 6A for PA-140 (Whichever is less)
Maximum continuous	Peak value:-850V for PA-600 & 200V for PA-140 RMS value:-600V for PA-600 & 140V for PA-140	Peak value:-120A for PA-600,12A for PA-600-8A & 9A for PA-140 RMS value:-80A for PA-600,8A for PA-600-8A & 5A for PA-140
Input terminal type	Banana socket (wire fit type)	Direct input: large binding Post (with 1/4" BSW copper stud with insulated nut)

CALCULATION FUNCTIONS			
Parameter	3 Wire	V * 1.73205 mode	4 Wire
Volt V	$V = (V1 + V2) / 2$	$V1 = \sqrt{3} \cdot V1$ $V2 = \sqrt{3} \cdot V2$ $V3 = \sqrt{3} \cdot V3$ $V = (V1 + V2 + V3) / 3$	$V = (V1 + V2 + V3) / 3$
Current I	$I = (I1 + I2) / 2$	$I = (I1 + I2 + I3) / 3$	
Active Power P	$P = P1 + P2$	$P = P1 + P2 + P3$	
Power Factor PF	$PF = (PF1 + PF2) / 2$	$PF = (PF1 + PF2 + PF3) / 3$	
Apparent Power S	$S1 = V1 \times I1$ $S2 = V2 \times I2$ $S = S1 + S2$	$S1 = V1 \times I1$ $S2 = V2 \times I2$ $S3 = V3 \times I3$ $S = S1 + S2 + S3$	
Reactive Power Q	$Q = \sqrt{S^2 - P^2}$		
Mean Volt	$V_{mean} = 1.11072 \times \text{Voltage rectified}$		
Crest Factor cf	$cf = \text{Peak Value} / \text{RMS Value}$		
Form Factor ff	$ff = \text{RMS Value} / \text{Average Value}$		
Notes:-			
1. If the input contains distorted wave, the calculation based parameters may not match to those of other measuring instruments based on different measuring principles. 2. If either voltage or current falls to 10% of the range rating or less, then the apparent Power (S), power factor (PF) and reactive power (Q) may be displayed with errors. 3. No sign of power factor is displayed when current lags the voltage and negative Sign is displayed when current leads the voltage.			

MEASUREMENT FUNCTIONS		
Parameter	Voltage / Current / Active power	
System	Digital sampling, Sum of average method	
Conditions: - Accuracy (within one year after calibration) Temperature: 25°± 5° C Humidity: 30 - 75% RH Input waveform: Sine wave power factor: 1.0 Display digits: 5 / 6 digits AVG: 8 sample mode	Frequency range	Accuracy
	30 Hz to 44 Hz 45 Hz to 65 Hz 66 Hz to 800 Hz	± (0.2 % of rdg + 0.2% of rng) ± (0.1% of rdg + 0.1% of rng) ± (0.2% of rdg + 0.2% of rng) Peak/Mean above x2
	Additional power factor effect on active power measurement At 50Hz 0.035 or time delay errors 2.5 uS	
Effective input range	10-100% of Voltage, 1-100% current range rating	
Display updating value	1/ 2/ 3/ 4/ 5/ 6/ 7/ 8 seconds selectable by sample Average menu	
Frequency Measurements	Conditions: Input > 30% of V1 from 30 to 800Hz Accuracy ± 0.1% Frequency measured at input of V1 to Neutral	

EXTRA INPUT SPECIFICATIONS - M1,M2,M3,M4,RPM		
Input	L type terminal at rear	Accuracy / Remark
Input type	DC	± 0.25 % FSD
Maximum Input	10V	Withstand up to 20V peak
RPM CARD Input	Compatible with Gopal make rpm and slip card for measurement of motor and pump rpm	
Note	External inputs are useful for any converter connectivity and useful to measure Temperature, Torque, Flow, pressure etc.	

Note:- Specifications are subject to change without prior notice for further improvement of products.

1.8 FRONT PANEL

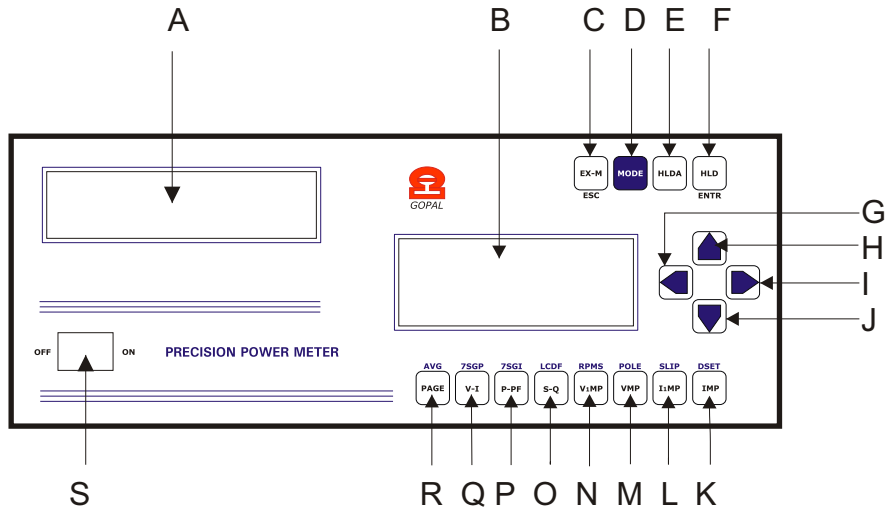


Figure 2

A	7 digit Seven Segment High Glow Display
B	20 x 4 LCD Display
C	Push Button EX-M to measure M1,M2,M3,M4,RPM/SLIP,F etc.
D	Push Button MODE to Enter mode function.
E	Push Button HLDA for Measure all and Hold.
F	Push Button HLD for Instant Hold.
G	Push Button Backward.
H	Push Button Increment.
I	Push Button Forward.
J	Push Button Decrement.
K	Push Button IMP to measure I,Irect,Imean,Ipeak,Icf and Iff
L	Push Button I1MP to display I1,Irect1,Imean1,Ipeak1,Icf1 and Iff1
M	Push Button VMP to display V, Vrect,Vmean,Vpeak,Vcf and Vff & F
N	Push Button V1MP to display V1,Vrect1,Vmean1,Vpeak1,Vcf1,Vff1 & F
O	Push Button S-Q to display S1, S2, S3, S, Q1, Q2, Q3 and Q.
P	Push Button P-PF to display P1, P2, P3, P, Pf1, Pf2, Pf3 and Pf.
Q	Push Button V-I to display V1, V2, V3, V, I1, I2, I3 and I.
R	Push Button PAGE
S	Instrument Power On/Off switch

1.9 REAR PANEL

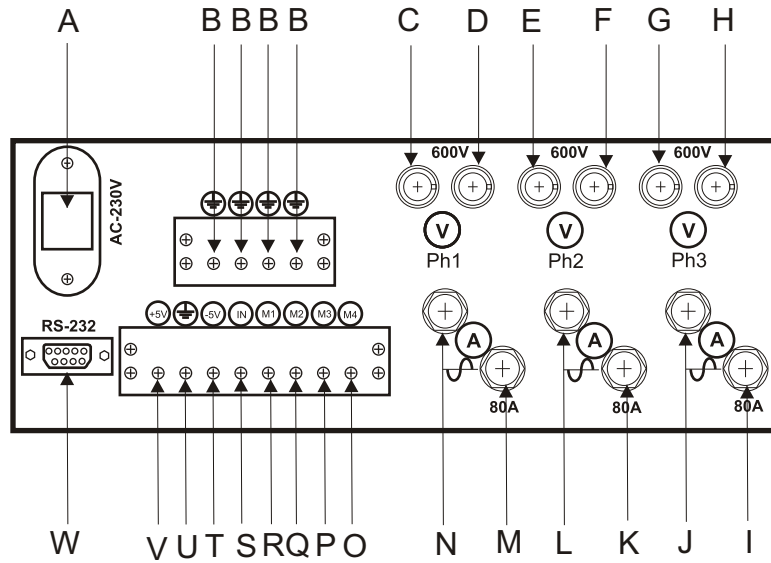


Figure 3

A	AC 230V/50Hz mains power supply socket
B	Common Ground input of 10 V DC meter M1,M2,M3,M4
C	Banana terminal to input Neutral of Phase 1
D	Banana terminal to Volt input of Phase1
E	Banana terminal to input Neutral of Phase 2
F	Banana terminal to Volt input of Phase2
G	Banana terminal to input Neutral of Phase 3
H	Banana terminal to Volt input of Phase3
I	Binding post stud of Ammeter to be connect to Load of Phase 3
J	Binding post stud of Ammeter to be connect to Phase 3
K	Binding post stud of Ammeter to be connect to Load of Phase 2
L	Binding post stud of Ammeter to be connect to Phase 2
M	Binding post stud of Ammeter to be connect to Load of Phase 1
N	Binding post stud of Ammeter to be connect to Phase 1
O	Input of external meter M4 applicable maximum voltage = 10V DC
P	Input of external meter M3 applicable maximum voltage = 10V DC
Q	Input of external meter M2 applicable maximum voltage = 10V DC
R	Input of external meter M1 applicable maximum voltage = 10V DC
S	Clock/Pulse Input of external Gopal Make RPM Card
T	-5 V DC output of external Gopal Make RPM Card
U	Common Ground input/output of external Gopal Make RPM Card
V	+5 V DC output of external Gopal Make RPM Card
W	9Pin D socket for RS-232 serial interface

2. FUNCTIONAL DESCRIPTION

2.1 DISPLAY GUIDE

ABBREVIATION	MEANING	ABBREVIATION	MEANING
V1,V2,V3	True RMS AC Volt	Rect	Rectified
I1,I2,I3	True RMS AC Current	cf	Crest Factor
P1,P2,P3	Watt (Active Power)	ff	Form Factor
PF1,PF2,PF3	Power Factor	M1	Extra meter 1
S1,S2,S3	Apparent Power	M2	Extra meter 2
Q1,Q2,Q3	Reactive Power	M3	Extra meter 3
F	Frequency of V1	M4	Extra meter 4
V	Average Volt	RPM	Revolution per minute
I	Average Current	RPM÷	RPM Divisor
P	Total Watt	%S	Percentage Slip
PF	Average Power Factor	Pole	Pole of motor
S	Total Apparent Power	Int	Intensity of 7seg. Display
Q	Total Reactive Power	- - - -	No measurement
LO	Low	OL	Over Load

2.1 FUNCTION OF PUSH BUTTON SWITCHES

Sr. No.	Button Name	Primary Function of Button
1	EX-M	To Display Extra Parameter Page.
2	MODE	To Enter Mode Function.
3	HLDA	To measure all parameters and hold after storing in RAM.
4	HLD	To hold the measurement.
5	PAGE	To display Default set page.
6	V- I	To display Volt and Current.
7	P-PF	To display Active Power(Watt) and Power Factor.
8	S-Q	To display Apparent and Rective Power.
9	V1MP	To display V1, Vmean1, Vrect1, Vpeak1, Vcf1, Vff1, F.
10	VMP	To display V, Vmean, Vrect, Vpeak, Vcf, Vff, F.
11	I1MP	To display I1, Imean1, Irect1, Ipeak1, Icf1, Iff1.
12	IMP	To display I, Imean, Irect, Ipeak, Icf,
13	▶	To display incremented parameter in 7seg LED.
14	◀	To display decremented parameter in 7seg LED.
15	▲	To Increment Page to be displayed.
16	▼	To Decrement Page to be displayed.
Sr. No.	Button Name	Secondary Function of Button
1	ESC	To Exit from mode or other setting function.
2	ENTR	To save setting which you have set.
3	AVG	To set Sample Average menu.
4	7SGP	To set parameter to be displayed in 7seg display.
5	7SGI	To set Intensity of 7Segment LED Display.
6	LCDF	To set default page to be displayed in LCD.
7	RPMS	To set Divisor of RPM.
8	POLE	To set Slip Pole which is used to calculate SLIP RPM.
9	SLIP	To enable/disable SLIP RPM/ RPM mode.
10	DSET	To do Default setting of mode menu.
11	▶	To shift cursor forward for setting of any parameter of related menu.
12	◀	To shift cursor backward for setting of any parameter of related menu.

2.3 WORKING WITH GPPM

When you switch ON the Instrument, it shows messages on LCD as shown in adjacent figure. After few seconds, display will become blank. Now measurement gets start related to parameters of LCD Default Page and LCD shows parameter of that page, where as 7seg LED display shows parameter which has been set for it.

GOPAL POWER METER
MODEL:- PA - 600
SR. NO:- PAXXXXX
HELP:- 079-22820927

2.4 PARAMETERS ON LCD

- [1.] You can see almost all useful parameters like V, I, P, PF, S, Q, F in Page 1,2,3 and 12. Extra parameters like M1, M2, M3, M4, RPM/Slip RPM, F in Page 13 and other parameters like Mean, Rect, Peak, cf, ff, F of Volt and current in Page 4,5,6,7,8,9,10,11. At last you can see status of some setting in Page 14 called Status Page.
- [2.] You can see a page which has been set in menu of Set LCD as Default Page on starting measurement. By default Page 12 has been set in factory default setting.
- [3.] You can see all pages one by one by pressing **Up** and **Down arrow** Button.
- [4.] You can see any parameter one by one in 7seg LED by pressing **Forward** and **Backward** Button.

Page- 1:-

Line 1:- V1 & I1, RMS Volt and Current of phase1.
 Line 2:- V2 & I2, RMS Volt and Current of phase2.
 Line 3:- V3 & I3, RMS Volt and Current of phase3.
 Line 4:- V & I, Average of RMS Volt and Current of all phases.

V1	600.00	I1	80.000
V2	600.00	I2	80.000
V3	600.00	I3	80.000
V	600.00	I	80.000

Page- 2:-

Line 1:- P1 & PF1, Active Power and Power factor of phase1.
 Line 2:- P2 & PF2, Active Power and Power factor of phase2.
 Line 3:- P3 & PF3, Active Power and Power factor of phase3.
 Line 4:- P & PF, Total Active Power & Average PF of all phases.

P1	48000	PF1	1.0000
P2	48000	PF2	1.0000
P3	48000	PF3	1.0000
P	144000	PF	1.0000

Page- 3:-

Line 1:- S1 & Q1, Apparent and Reactive power of phase1.
 Line 2:- S2 & Q2, Apparent and Reactive power of phase2.
 Line 3:- S3 & Q3, Apparent and Reactive power of phase3.
 Line 4:- S & Q, Average Apparent & Reactive power of all phases.

S1	48000	Q1	48000
S2	48000	Q2	48000
S3	48000	Q3	48000
S	144000	Q	144000

Page- 4:-

Line 1:- V1 & cf, RMS Volt and Volt Crest Factor of phase1.
 Line 2:- mean & ff, Mean Volt and Volt Form Factor of phase1.
 Line 3:- rect & F, Rectified Volt and Freq of V1.
 Line 4:- Peak Volt of phase1.

V1	600.00	cf	1.414
mean	600.00	ff	1.110
rect	600.00	F	50.00
peak	850.00		

Page- 5:-

Line 1:- V2 & cf, RMS Volt and Volt Crest Factor of phase2.
 Line 2:- mean & ff, Mean Volt and Volt Form Factor of phase2.
 Line 3:- rect - Rectified Volt of phase2.
 Line 4:- Peak Volt of phase2.

V2	600.00	cf	1.414
mean	600.00	ff	1.110
rect	600.00		
peak	850.00		

Page- 6:-

Line 1:- V3 & cf, RMS Volt and Crest Factor of phase-3.
 Line 2:- mean & ff, Mean Volt and Form Factor of phase-3.
 Line 3:- rect - Rectified Volt of phase-3.
 Line 4:- Peak Volt of phase -3.

V3	600.00	cf	1.414
mean	600.00	ff	1.110
rect	600.00		
peak	850.00		

Page- 7:-

Line 1:- V & cf, RMS Volt and Volt Crest Factor Average.
Line 2:- mean & ff, Mean Volt and Volt Form Factor Average.
Line 3:- rect & F, Rectified Volt Average & Freq of V1.
Line 4:- Peak Volt Average.

V	600.00	cf	1.414
mean	600.00	ff	1.110
rect	600.00	F	50.00
peak	850.00		

Page- 8:-

Line 1:-I1 & cf, RMS Current & Current Crest Factor of phase1.
Line 2:-mean & ff, Mean Current & Current Form Factor of phase1.
Line 3:-rect - Rectified Current of phase1.
Line 4:-Peak Current of phase1.

I1	80.000	cf	1.414
mean	80.000	ff	1.110
rect	80.000		

Page- 9:-

Line 1:-I2 & cf, RMS Current & Current Crest Factor of phase2.
Line 2:-mean & ff, Mean Current & Current Form Factor of phase2.
Line 3:-rect - Rectified Current of phase2.
Line 4:-Peak Current of phase2.

I2	80.000	cf	1.414
mean	80.000	ff	1.110
rect	80.000		
peak	115.00		

Page- 10:-

Line 1:-I3 & cf, RMS Current & Current Crest Factor of phase3.
Line 2:-mean & ff, Mean Current & Current Form Factor of phase3.
Line 3:-rect - Rectified Current of phase3.
Line 4:-Peak Current of phase3.

I3	80.000	cf	1.414
mean	80.000	ff	1.110
rect	80.000		
peak	115.00		

Page- 11:-

Line 1:-I & cf, RMS Current and Current Crest Factor Average.
Line 2:-mean & ff, Mean Current & Current Form Factor Average.
Line 3:-rect - Rectified Current Average.

I	80.000	cf	1.414
mean	80.000	ff	1.110
rect	80.000		
peak	115.00		

Page- 12:-

Line 1:- V & I, RMS Volt and Current Average.
Line 2:- P & PF, Total Active Power & Power Factor Average.
Line 3:- S & Q, Total Apparent and Reactive Power.
Line 4:- F & M1, Frequency of V1 and Extra meter M1.

V	600.00	I	80.000
P	144000	PF	1.0000
S	144000	Q	144000
F	50.00	M1	10.00

Page- 13A:- (when RPM Mode is enabled)

Line 1:- M1 & RPM, Extra Meter1 and RPM meter.
Line 2:- M2 & RPM ÷, Extra Meter2 and RPM Divisor.
Line 3:- M3 & F, Extra Meter3 and Frequency of V1.
Line 4:- M4, Extra meter M4.

M1	10.00	RPM	65535
M2	10.00	RPM ÷	1000
M3	10.00	F	50.00
M4	10.00		

Page- 13B:- (when SLIP Mode is enabled)

Line 1:- M1 & RPM, Extra Meter1 and SLIP RPM meter.
Line 2:- M2 & %S, Extra Meter2 and %Slip.
Line 3:- M3 & F, Extra Meter3 and Frequency of V1.
Line 4:- M4 & Pole, Extra meter M4 and Slip Pole.

M1	10.00	RPM	65535
M2	10.00	%S	100.00
M3	10.00	F	50.00
M4	10.00	Pole	2

Page- 14:-

Line 1:- Status Page
Line 2:- Name of 7seg parameter, status of Intensity of 7seg.
Line 3:- Wiring Connection mode.
Line 4:- Status of meas. On/HLDA/HLD & Sample Average.

Status Page	
LED->V	Int -> High
Mode->4Wire	
ON	Sample->8

2.5 BRIEF EXPLANATION OF SOME IMPORTANT PUSH BUTTONS

2.5.1 HLD:- It is used to hold a processor after taking measurement of all parameters. By use of this button you can hold measurement, save and read all parameters inside storage memory. Press this button again to release hold.

2.5.2 HLD:- It is used to hold a processor for instant. By use of this button you can hold the measurement, save and read all parameters in storage memory. Press this button again to release hold.

2.5.2.1 SAVE IN STORAGE MEMORY

Q. How can you save parameters Inside Storage Memory in Hold condition?

Ans.

- [1.] Press **HLD** or **HLDA** button, so measurement will get hold after few seconds.
- [2.] Now you can see a message "**hld**" on 7segment LED Display. So Instrument is "hold".
- [3.] Press **MODE** Button, so you can see "**Save Data**" & "**Select Address XXX**" on LCD .
- [4.] Set appropriate address No. (From 1 to 125) at whichever memory field you want to save all parameters by using four arrow buttons and then press **ENTR** to save them.
- [5.] After saving in memory it shows a message on LCD "**Data has been saved**".
- [6.] After some moments you can see another message "**Read Data**" and "**Select Address XXX**".
- [7.] If you want to read any data then proceed further other wise press **ESC** button to exit .

2.5.2.2 READ FROM STORAGE MEMORY

Q. How can you read parameters from Storage Memory in Hold condition?

Ans.

- [1.] Press **HLD** or **HLDA** button so measurement will get hold after few seconds.
- [2.] Now you can see a message "**hld**" on 7segment LED Display. so, Instrument is "hold".
- [3.] Press **MODE** button two times, so you can see "**Save Data**" & "**Select Address XXX**" on LCD
- [4.] Now set appropriate address No. (From 1 to 125) from whichever memory field you want to read all the parameters by using four arrow buttons and then press **ENTR** to read them.
- [5.] After reading, it displays a message on LCD "**Data has been read**". At the same time data will be transferred to PC if the software "**Data transfer tool**" is opened and RS-232 wire is connected to PC.
- [6.] After few minutes, you can see another message "**Incremental Save**" and "**Select Address XXX**".
- [7.] If you want to set Incremental save then proceed further other wise press **ESC** to exit.

2.5.2.3 INCREMENTAL SAVE IN STORAGE MEMORY

Q. What does it mean by Incremental Save Mode, it's use and how can you set incremental save mode and enable or disable it?

Ans. It is a mode in which you can set starting address of data saving data in storage memory. You can enable or disable Incremental save mode after setting address.

Usefulness of Incremental Save Enable:-

If you wish to take measurement of so many AC machines on this GPPM and want to store all measuring data in storage memory automatically. What to do for that? You enable Incremental save and give starting address from which you want to start storing. After setting it once, whenever you hold measurement, your data will be stored at particular address one by one. You don't have to do the process of saving them individually. After storing into the memory a counter will automatically be incremented by one so, every time data will be stored in next address. When whole memory will be filled up by data, a message "Memory Full" will be displayed on LCD. So, this mode is useful for bulk testing.

Procedure to select address in Incremental save mode and Enable/Disable Incremental Save Mode:-

- [1.] Press **HLD** or **HLDA** button so measurement will get hold after few seconds.
- [2.] Now you can see message "**hld**" on 7segment LED Display so, measurement is "hold".
- [3.] Press **Mode** Button three times so, You can see "**Incremental Save**" & "**Select Address xxx**" on LCD .
- [6.] Now set appropriate address No. (From 1 to 125) from whichever memory field you want to save the parameters by use of four arrow buttons and then press **ENTR**.
- [7.] After setting it, press **MODE** so, you can see a message on LCD "**Incremental save Enable?**" or "**Incremental save Disable?**". If you see "**Incremental save Enable?**" then press **ENTR** so Incremental save will be enabled. If you see "**Incremental save Disable?**" then don't press **ENTR** otherwise it will disable Incremental save function.
- [8.] If you want to do any other function then proceed further otherwise press **ESC** to exit.

2.5.3 FORWARD AND BACKWARD:- In measurement mode, these buttons are used to increase or decrease No. of displaying 7segment parameter from 1st parameter to last parameter. Forward is to increase and Backward is to decrease parameter no. In mode function these buttons are used to shift cursor left and right in LCD.

2.5.4 MODE:- This is used to get entry in the mode function. In mode function we can do some important settings in the instrument as per our requirement. In Hold condition, you can go to Save Data & Read Data mode by pressing **MODE** push button.

2.5.4.1 HOW TO ENTER THE MODE FUNCTION?

Ans.

- [1.] Press mode button to enter the mode function.
- [2.] Now you can see first menu "**Set Mode**" on LCD screen .
- [3.] You can go to another function menu by pressing mode button again and again.
- [4.] All scroll menus in mode function are described here under: -

1. Set Mode
2. Set Average Sample
3. Set 7Seg Parameter
4. Set 7Seg Intensity
5. Set LCD Default Page
6. Set RPM ÷
7. Set Pole
8. Enable RPM/SLIP Mode
9. Default Setting
10. Set CT Ratio (Only for model - PA-140)
11. Set PT Ratio (Only for model - PA-140)

2.5.4.2 HOW TO EXIT FROM THE MODE FUNCTION?

Ans. If you wish to exit from any where in the mode function, then simply press **ESC** Button which leads you to measurement mode and you will see parameters related to LCD Default page on LCD screen.

2.6 DIFFERENT TYPES OF MENUS IN MODE FUNCTION OF GPPM

2.6.1 Set Mode

Q. What does it mean by Set Mode and how can it be useful to the user?

Ans. GPPM is designed in such a way that users can do testing by three different methods as per their wish. This is the function which is useful to set wiring connection for different test method in the

Instrument. At the same time connection must be made as per selected wiring mode. You can take reference from connection diagram to do connection. Three types of wiring modes are given below.

- [1.] 4 Wire (for phase to neutral measurement)
- [2.] 3 Wire Mode (for two watt meter type measurement)
- [3.] $V \times 1.73205$ Mode (for phase to neutral measurement and voltage channel will be multiplied by $\sqrt{3}$).

Users can set any of above wiring mode as per their requirement of testing.

Q. How can you set Wire Connection Mode?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu on LCD.
- [3.] Select any of three connection mode by using **UP & DOWN** arrow buttons.
- [4.] Press **ENTR** to save your selected connection mode.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set connection mode.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set connection mode every time until and unless you wish to change it.

2.6.2 Set Average Sample

Q. What does it mean by Set Average Sample and how can it be useful to the user?

Ans. GPPM is designed in a way that user can set sample average from 1 to 8 sample. If user sets 8 sample average then it will give best result. Accuracy is specified on 8 sample average. Processor takes sample of all parameters as per selection of sample then displays them after doing average.

Q. How can you set Average Sample ?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** switch one time.
- [3.] Select any of sample average by using **UP & DOWN** arrow buttons.
- [4.] Press **ENTR** to save selected sample average.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set sample average.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set Sample Average every time until and unless you wish to change it.

2.6.3 Set 7Seg Parameter

Q. What does it mean by Set 7Seg Parameter and how can it be useful to the user?

Ans. By this mode user can set parameter no. which will be displayed by 7segment LED display which has been given as big long distance view display. You can see any one of all the parameters in this display which has been measured by the Instrument.

Q. How can you set 7seg Parameter?

Ans.

- [1.] First press **MODE** button to enter the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** switch two times.
- [3.] Select any of all 7seg parameter by use of four arrow buttons.
- [4.] Press **ENTR** to save selected 7seg Parameter.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set 7segment parameter.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set 7seg Parameter every time until and unless you wish to change it.

Note:- If you want to set any 7segment parameter in measurement mode means when measurement is going on then you can set it by pressing **FORWARD & BACKWARD** arrow button on temporary basis. It will not be saved in ROM so, it is temporary setting. On every time when You switch on the Instrument you see only the parameter which has been set by you in mode function.

2.6.4 Set 7Seg Intensity

Q. What does it mean by Set 7Seg Intensity and how can it be useful to the user?

Ans. By this mode users can set Intensity of 7segment LED display as per their wish up to three level.

Q. How can you set 7seg Intensity?

Ans.

- [1.] First press **MODE** button to enter the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** button three times or pressing **P-Pf** button once.
- [3.] Select any of three Intensity level i.e. High, Med. or Low by using **UP, DOWN** arrow buttons.
- [4.] Press **ENTR** to save selected 7Segment Intensity.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set 7segment Intensity.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set 7segment Intensity every time until and unless you wish to change it.

2.6.5 Set LCD Default Page

Q. What does it mean by Set LCD Default Page and how can it be useful to the user?

Ans. By this mode user can set a page which is most important to see on LCD and after selecting it he will have this page on LCD whenever Instrument Power supply gets on or by pressing **PAGE** Button.

Q. How can you Set LCD Default Page?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** button four times or pressing **S-Q** button.
- [3.] Select any of page by use of **UP & DOWN** arrow buttons.
- [4.] Press **ENTR** to save selected page as a Default page for LCD.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set LCD Default Page.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set LCD Default Page every time until and unless you wish to change it.

2.6.6 Set RPM ÷

Q. What does it mean by Set RPM ÷ and how can it be useful to the user?

Ans. This function is useful for RPM measurement in motor testing. By this mode you can set Divisor value for RPM meter. Some times for high speed motor or some special types of motor user makes some arrangement to sense rpm by use of geared wheel or proximity sensor etc. So, he has to set rpm divisor as per gear teeth to measure rpm very accurately.

Q. How can you Set RPM Divisor?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** five times or pressing **V1MP** button.
- [3.] Set RPM Divisor by use of four arrow buttons.
- [4.] Press **ENTR** to save setting of RPM Divisor.

- [5.] Press **ESC** to exit from mode function or proceed further for another setting.
- [6.] In this way you can set RPM Divisor.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set RPM Divisor every time until and unless you wish to change it.

2.6.7 Set Pole

Q. What does it mean by Set Pole and how can it be useful to the user?

Ans. Set pole means setting of No. of Pole as per Pole of submersible pump. A Value of Pole is used for testing of Slip RPM of Submersible pump. This value is essential in calculation of Slip RPM.

Q. How can you Set Pole?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** button six times or pressing **VMP** button.
- [3.] Set Pole value by pressing **UP**, **DOWN** arrow buttons.
- [4.] Press **ENTR** to store setting of Pole.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set Pole.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to set Pole every time until and unless you wish to change it.

2.6.8 Enable RPM/SLIP Mode?

Q. What does it mean by Enable RPM/SLIP Mode?

Ans. What do you want to enable, RPM or SLIP mode? If you want to measure RPM of motor then you have to enable RPM mode and if you want to measure SLIP RPM of Submersible pump then you will have to enable Slip mode. Related parameter will be shown in EX-M page as per setting.

Q. How can you Enable RPM/SLIP mode?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu by pressing **MODE** button seven times or by pressing **I1MP** button.
- [3.] If RPM mode is set in the Instrument then LCD shows "**Enable SLIP Mode?**" and if SLIP mode is set then LCD shows "**Enable RPM Mode?**".
- [4.] Press **ENTR** to change and store mode.
- [5.] Press **ESC** to exit from mode function or proceed further for another setting.
- [6.] In this way you can set RPM/SLIP mode in the Instrument.
- [7.] Once this setting is done then it will be stored in the Instrument so there is no need to change setting every time until and unless you wish to change it.

Note:- You must have to connect Gopal Make SLIP module between Slip coil and Slip input terminal provided (+5V,Gnd, In, -5V) at rear panel of GPPM to measure SLIP RPM.

2.6.9 Default Setting

Q. What does it mean by Default Setting?

Ans. Default setting means default factory setting of all mode function. This mode will set all functions as per factory default value which are given below.

- [1.] Wire connection mode:- 4 Wire mode.
- [2.] Average Sample:- 8
- [3.] 7Seg Parameter:-04:-V
- [4.] 7Seg Intensity:-High
- [5.] LCD Default Page:-No.12 System

- [6.] RPM Divisor:- $RPM \div :- 0001$
- [7.] Pole:- 2 Pole
- [8.] RPM mode is enabled.
- [9.] CT Ratio :- 1.00 (Only for model PA-140)
- [10.] PT Ratio :- 1.00 (Only for model PA-140)

Q. How can you do Default Setting?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu by pressing **MODE** button eight times or by pressing **IMP** button.
- [3.] Press **ENTR** to make default setting.
- [4.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [5.] In this way you can do default setting.
- [6.] Once this mode is selected then this setting will be stored in the Instrument so there is no need to change setting every time until you have changed any value of above function.

2.6.10 Set CT Ratio [for model PA-140 only]

Q. What does it mean by Set CT Ratio and how can it be useful to the user?

Ans. This function is useful for testing of AC machines like Power Transformer at high voltage and current like 11 KV and 200Amp. PA-140 is having only 5A current capacity so, if user wants to test 100 amp current then what to do? He has to use appropriate CT for that and have to set CT ratio in GPPM according to primary and secondary turns of CT.

Q. How can you Set CT Ratio?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu by pressing **MODE** button nine times.
- [3.] Set CT Ratio by use of four arrow buttons.
- [4.] Press **ENTR** to store CT Ratio.
- [5.] Press **ESC** to exit from mode function or you can proceed further for another setting.
- [6.] In this way you can set CT Ratio.
- [7.] Once this mode is selected then this setting will be stored in the Instrument so there is no need to set CT Ratio every time until and unless you wish to change it.

2.6.11 Set PT Ratio [for model PA-140 only]

Q. What does it mean by Set PT Ratio and how can it be useful to the user?

Ans. This function is useful for testing of AC machines like Power Transformer at high voltage and current like 11 KV and 200Amp. PA-140 is having only 140V capacity so, if user wants to test at 11KV voltage then what to do? He has to use appropriate PT for that and have to set PT ratio in GPPM according to primary and secondary turns of PT.

Q. How can you Set PT Ratio?

Ans.

- [1.] First press **MODE** button to enter in the **MODE** function.
- [2.] Now, You can see this menu after pressing **MODE** switch ten times.
- [3.] Set PT Ratio by use of four arrow buttons.
- [4.] Press **ENTR** to save PT Ratio.
- [5.] Press **ESC** to exit from mode function or proceed further for another setting.
- [6.] In this way you can set PT Ratio.
- [7.] Once this mode is selected then this setting will be stored in the Instrument so there is no need to set PT Ratio every time until and unless you wish to change it.

3. PROTECTING YOUR GPPM

Before GPPM is used for power measurement, guidelines to prevent transient overload, current overload, surge protection and circuit breakers must be followed.

3.1 TRANSIENT OVERLOAD

- [1.] Connect appropriate transient suppressor in parallel with all inductive loads.
- [2.] Consult the suppressor vendor's application literature for proper selection and sizing.

Caution:

- [1.] Damage to GPPM can result from excessive voltage transient generated by unsuppressed inductive load.
- [2.] This damage is not within the scope of normal instrument service and is not covered in the Gopal Electronics's warranty.

3.2 CURRENT OVERLOAD

- [1.] There is no fuse in GPPM's measuring circuits.
- [2.] Excessive current passing through the load terminals will cause excessive internal heating and may damage the Instrument.
- [3.] You must know your load condition.
- [4.] Double check all connections.
- [5.] If an overload occurs, immediately switch off power supply and remove all power connections, locate that place and correct the problem before re-energizing your circuit.
- [6.] If a circuit breaker is installed, it should be installed on the load side of GPPM. This will keep the low impedance of the input line connected to GPPM for surge suppression.
- [7.] If the line side contains a breaker, it should be delayed in operation to open, after the load side breaker is opened.

Caution: This overload abuse is not covered by the Gopal Electronics's Warranty.

3.3 SURGE PROTECTION

Connect MOV between Phase and Neutral terminal of voltage at rear side of GPPM.

3.4 CIRCUIT BREAKERS

- [1.] Proper use of the overload circuit breaker removes all load during an over-current condition.
- [2.] The voltage sense lines should be connected at the line side of the circuit breaker to prevent inductive transients from entering into the GPPM as the circuit breaker opens.
- [3.] Make sure that connections from the circuit breaker to the load are heavy conductors and as short as possible. (recommended MCB = 80 Amp)

3.5 NOISE CAUSED BY MAGNETIC LOOPS

If you are taking measurements near magnetic fields, you should take necessary precautions to avoid inducing voltages in the measurement connections. You should be especially careful when working near conductors carrying large currents. Use twisted-pair connections to the GPPM (if possible) to reduce the noise pickup loop area, or dress the test leads as close together as possible. Loose or vibrating test leads will also induce error voltages. Make sure that your test leads are tied down securely when operating near magnetic fields. Whenever possible, use magnetic shielded material or physical separation to reduce problem in magnetic field sources.

3.6 NOISE CAUSED BY GROUND LOOPS

When measuring voltage in circuit where the GPPM and the device-under-test are both referenced to common earth ground, a ground loop is formed. Any voltage difference between the two ground reference points (V_{ground}) causes the current to flow through the measurement leads. This cause errors, such as noise and offset voltage (usually power-line related), which are added to the measured voltage.

4. DIFFERENT MODE OF TESTING

4.1 TESTING INSTRUMENTATION SETUP

Before GPPM can be utilized, it must be configured and connected to appropriate devices which are intended for power measurement. All connections must be proper.

4.2 WIRING MODE

The GPPM has the ability to support testing up to 3-phase, so there are different ways in which the unit can be wired up.

4.3 HARDWARE CONNECTIONS

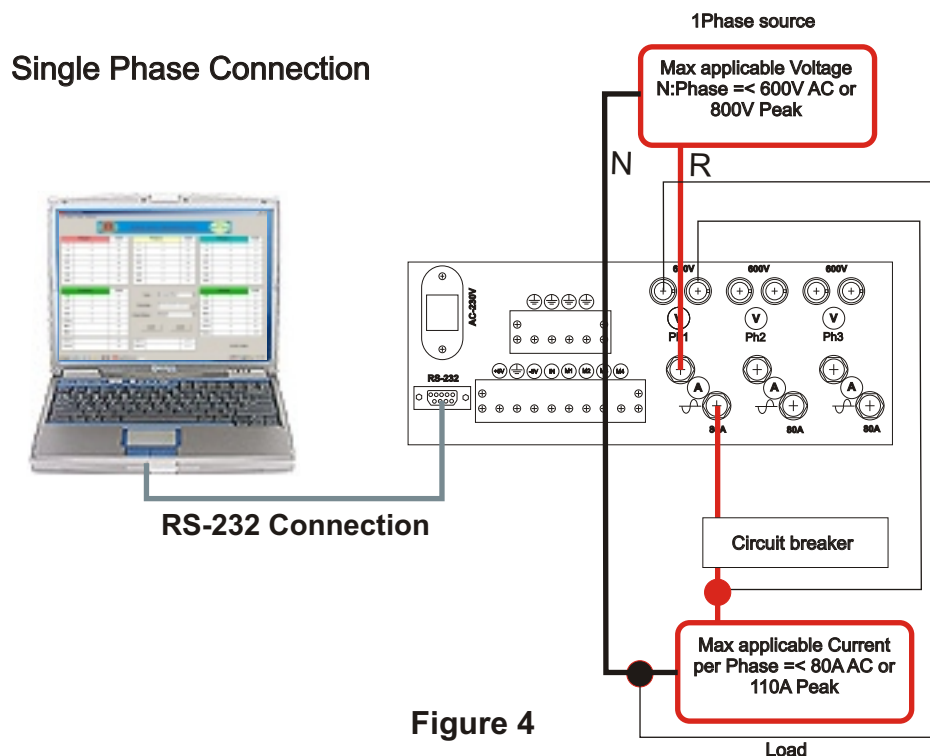
The wiring mode selections include:

- 1) 1 - Phase, 2 - Wire mode (Select 4 wire connection mode)
- 2) 2 - Phase, 3 - Wire mode (Select 3 wire connection mode)
- 3) 3 - Phase, 4 - Wire mode (Select 4 wire connection mode) See Figure 1 for this mode.

4.3.1 1-PHASE 2- WIRE SYSTEM (Select 4 wire connection mode) :

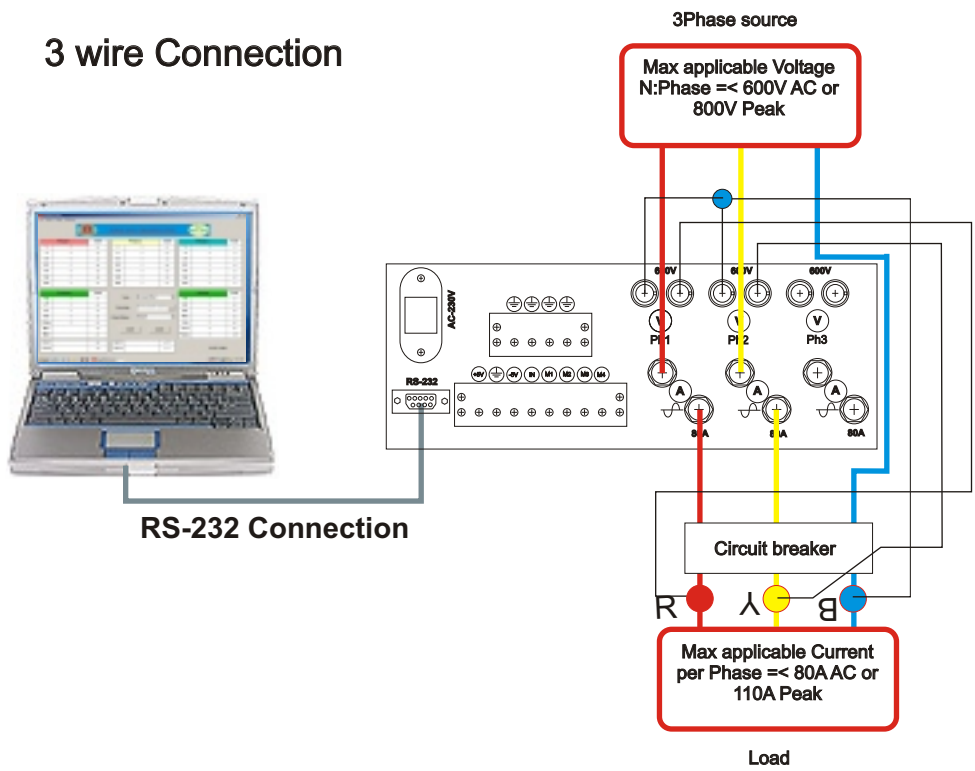
- [1.] Used For Measurement of 1-phase power.
- [2.] Can be wired on any input channel, most commonly used for single phase AC load applications.
- [3.] The following diagram shows connections for single phase two wire measurement.

Note:- Here V1 and Ph1 is used in connection just for explanation. You can connect single phase Machine in any pair like V1-Ph1, V2-Ph2, V3-Ph3.



4.3.2 TWO PHASE THREE WIRE SYSTEM:- (THREE WIRE CONNECTION MODE OR SAY TWO WATT METER METHOD)

- [1.] It Measures 2- phase power.
- [2.] Utilizes phase 1 and phase 2 for measurement.
- [3.] Utilizes phase 3 as a common wire.
- [4.] All parameters related to phase 3 becomes zero.



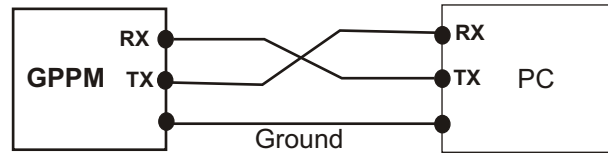
5. GPPM WITH COMPUTER

5.1 SHAKEHAND WITH COMPUTER

Using the GPPM with a computer enables the unit to perform at its full capacity. GPPM is equipped with RS-232 (serial) interface.

Pin configuration of Cable connector is given as below.

End 1	End 2
Pin2 : RX	Pin2 : TX
Pin3 : TX	Pin3 : RX
Pin5 : GND	Pin5 : GND



5.2 CONNECTION WITH COMPUTER

- [1.] Connect RS-232 Interface cable from GPPM to Computer at serial communication Port.
- [2.] Connect male type connector of cable to GPPM and female type connector to Computer.

5.3 COMMUNICATION PARAMETERS

No parity bit, 8 data bit, 1 stop bit, Baud rate 115200 bps

Free of cost one Demo software viz. “**Gopal Data Transfer Tool**” is provided in CD with GPPM to communicate it with Computer.

Important Note:-

Gopal Electronics doesn't take any responsibility for any erratic operation by use of this software & is not liable for any unexpected result comes out by use of these free demo software.

5.4 Minimum System Requirement for Software :-

- [1.] Operating system compatibility: Windows 95, 98, NT, 2000, ME, XP, 2003
- [2.] 128 MB RAM
- [3.] 100 MB free space on hard Disk drive
- [4.] Celeron or Pentium series processor with minimum speed of 850 MHz.

5.5 GOPAL DATA TRANSFER TOOL : A tool to communicate Instrument with computer.

If you have your own test report format in Excel and wish to get test results of GPPM in that Excel sheet then this is very useful. Here, you can send results of all testing parameters to your selected addresses of selected sheet in selected Excel file.

5.6 Installation of Software:-

- [1.] Insert CD of software (Gopal Data Transfer Tool) in CD drive, Open CD & select setup.exe
- [2.] Click at appropriate option which is given in software.
- [3.] Click on Finish and restart your computer.
- [4.] You will have software in folder of Data Transfer Tool in program files folder.
- [5.] Shortcut Gopal.exe will also be created on desktop.

5.7 How does Gopal Data Transfer Tool work?

- [1.] Click on Icon Gopal.exe on Desktop of Computer.
- [2.] Click on Setting menu on menu bar in software if first time.
- [3.] Click on Port setting & select appropriate communication port at which communication cable is connected. Select bit rate of 115200
- [4.] Click on OK Button and then click on Connect menu on menu bar.
- [5.] All basic parameters comes in the software in separated phase which you can see.
- [6.] Enter addresses of required parameters for Excel sheet.
- [7.] Browse File in the Text Box of File Path and select appropriate sheet of the Excel file.
- [8.] Press **HOLD**, then press send button so all selected parameters will go to browsed sheet.
- [9.] In this way you can use this software for your easiness to create report.

6. FREQUENTLY ASKED QUESTIONS

Q.1. When we apply voltage and current it shows Volts, Currents and W2 properly but show W1 and W3 improperly?

Ans.1. Check connection of Voltage and current. You must connect V1 -A1, V2 -A2, V3 -A3 otherwise this problem may occur.

Q.2. We have made connection of three phases to GPPM and switch on supply but three phase variac is at its lowest position means almost 0V Position although V1, V2, V3 in GPPM shows some Volt. Here we checked it by multi meter, there is no voltage between any two phases but between phase and neutral it shows some volts and we haven't connected Neutral?

Ans.2 There is a possibility in your Variac that there is no connection of neutral at center tapping so, connect neutral at its center tapping and properly earth its body.

Q.3. Connected GPPM with cable through RS-232, opened Data Transfer Tool and clicked on connect but it didn't get any data from GPPM?

Ans.3. Check RS-232 cable it may be damaged. There are two connectors one is male and another is female connector. Check continuity of the pin.

First connector

Second connector

2nd pin	with	3rd pin
3rd pin	with	2nd pin
5th pin	with	5th pin

If continuity is ok then there may be some fault in serial port of the computer. If serial port is ok and your problem continues then contact to Gopal Electronics.

Q. 4. From where can we purchase RS-232 cable?

Ans. 4. It is standard RS-232 cable so you can purchase it from any local PC supplier.

Q.5. When we switch on, GPPM is doesn't Turn on?

Ans.5. Make sure that the power source you plugged in the Instrument is energized or not. If it is not energized then energize it first. After that if it does not turn On then check continuity of Power Cable. If continuity is ok and GPPM does not turn On yet, then there may be some problem in GPPM so contact to Gopal Electronics.



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