# Voltech

# Printer (parallel) and RS232 (serial) interface for the Voltech PM100 and PM300 Power analyzers.

# User Manual

**Version 3.**

# TABLE OF CONTENTS

# CHAPTER 1
# INTRODUCTION

## 1.1 Welcome

Welcome to the Voltech range of interface cards for the PM100 and PM300 power analysers.

The power analysers can only be operated manually using the keyboard and display without an interface card. Voltech has produced a variety of interface cards for the PM100 and PM300 power analysers to enhance their flexibility and use. Each carries its own processor to handle all communications

The range of interface cards include :

- The IEEE488.2 Interface
  This allows full remote control of the power analyser with a personal computer with daisychain possibilities. It uses the IEE488.2 bus communication standard using up to date National Instruments circuitry.

- The printer (parallel) and RS232 (serial) Interface.
  The parallel interface connects to most printers : matrix, jet, and lasers. It uses a 25 way D-type connector.
  The RS232 interface may be used to connect a serial printer, or to allow full remote control of the analyser using the IEEE488.2 command set. It is a 9 way D-type connector.

- Chart Recorder and Alarms interface.
  12 measurements may be output via a 15 way D type connector to a chart recorder or data logger. Each measurement is scaled for Max. and Min. level from the front panel.
  2 isolated alarm relay contacts are also provided for plant control. The relays may be programmed to operate on receiving a Max. or Min. signal.

## 1.2 Overview of interface card

## The Printer (parallel) Port

The parallel port is an output only device. Its operation is specified via the keyboard and display. It connects up to the majority of standard printers (an Epson compatible printer is recommended). Using a 25 pin D-type connector, it transfers ASCII data to its peripheral device. The interface prints user selected information from the analysers in a 40 (PM100) or 80 (PM300) column format.

## The RS232 Serial Port

The RS232 allows full remote control of the analyser to be possible. Using the IEEE488.2 command set, a PC can control the analyser by addressing this 9 pin D-type port.

The serial port may also be configured for as a printer driver port. These options would be set up from the menus on the screen on the front face of the analyser.

The baud rate is variable (1200 - 19200) and can be selected from a menu on the screen. It does not require resetting when the power is turned off as it remains in memory.

# CHAPTER 2
# INSTALLATION

## 2.1 Hardware Installation

1. Turn off the power analyzer. Disconnect any test voltages and power leads.

2. Place the analyzer front panel downwards onto a flat surface.

3. Undo the two screws on the protection panel on the left of the rear face of the power analyser.

4. Hold the interface card with its connector towards the bottom of the analyzer. Fit the interface cards carefully into the guides and slide firmly home. If the card is located properly in the guides, the card will slide vertically and easily.

5. Screw in the two screws to keep the card firmly in place.

## 2.2 Software Set Up

The Software will recognise the inserted card once it is connected. As a result, the user will be able to view a new menu,: menu 0.

Menu 0 has the following format:

PARALLEL PRINT
>X< ✓

SERIAL PRINT
>X< ✓

RS232 CONTROL
X > ✓<

If this menu is not available, turn off the power, disconnect all peripheral connections and make sure the plug-in card is in the connector socket. On continued failure, contact your local distributor.

# CHAPTER 3
# OPERATION

## 3.1 Starting up

When the card is inserted and the user presses the MENU key on the key pad, the first menu encountered is menu 0. The user may scroll through the menu using the ↵ key. The full menu looks like this:

PARALLEL PRINT
>X< ✓

SERIAL PRINT
>X< ✓

RS232 CONTROL
X >✓<

Each option in menu 0 is mutually exclusive to the others. Therefore once an option is chosen, the remaining are disabled and the appropriate menu appears. By default the RS232 port is enabled.

To set-up the interface for use with a printer, select parallel or serial printer as appropriate. Then select the parameter to print as in section 3.2. Pressing the ↵ key causes data to the printer once all the selected measurements are available. "PRINTER ERROR" is displayed if printer is not connected or is off line

## 3.2 The Printer Menu

This menu is displayed if SERIAL PRINT or PARALLEL PRINT from menu 0 is selected. The user may scroll through a list of printable parameters using the ↵ key. The menu is as follows :

If you are using the PM300 the following options will initially be available:

PRINT Ch1
X >✓<

PRINT Ch2
>X< ✓

PRINT Ch3
>X< ✓

PRINT SUM
>X< ✓

PRINT NEUTRAL
>X< ✓

The rest of the menu is available to both the PM100 and the PM300 in the following order:

| | |
|---|---|
| PRINT | WATTS |
| X | >✓< |
| PRINT | VA |
| >X< | ✓ |
| PRINT | VAr |
| >X< | ✓ |
| PRINT | Vrms |
| >X< | ✓ |
| PRINT | Arms |
| >X< | ✓ |
| PRINT | PF |
| >X< | ✓ |
| PRINT | Frequency |
| >X< | ✓ |
| PRINT | FUND. |
| >X< | ✓ |
| PRINT | peaks |
| >X< | ✓ |
| PRINT | thd |
| >X< | ✓ |
| PRINT | Harmonics |
| >X< | ✓ |

The last three options have sub menus:

PRINT peaks
X >✓<

PRINT Vpk
>X< ✓

PRINT Apk
>X< ✓

PRINT Vcf
>X< ✓

PRINT Acf
>X< ✓

PRINT thd
X >✓<

PRINT Vthd
>X< ✓

PRINT Athd
>X< ✓

PRINT harmonics
X >✓<

PRINT Vh
>X< ✓

PRINT Ah
>X< ✓

PRINT Wh
>X< ✓

MAX HARMONIC
>5<

ONLY ODD H
>X< ✓

Each of the PRINT options chosen will be passed to the configured output port. The harmonics menu prompts the user to input a maximum harmonic to appear on the printout. It also allows the user to opt for an even harmonics exclusion from the printout.

**Note that the printing baud rate is set under the RS232 menu (see next section).**

## 3.3 The RS232 menu

If RS232 CONTROL is enabled in menu [0], the following menu appears :

RS232 BAUD RATE
>1200<

The baud rate is selected by numerical entry but must be one of the following :

1200, 2400, 4800, 9600, 19200

The baud rate is stored in EEPROM and is not changed with the PROG key. It is also not affected by a power off.

The baud rate for the printer is set under this menu. The most common baud rate for printers is 9600.

The RS232 interface uses the following parameters:

| | |
|---|---|
| No of bits: | 8 |
| Parity: | None |
| Stop bits: | 1 |
| Terminators: | CR |

# CHAPTER 4
# The IEEE488 Command Set

## 4.1 Command structure

Commands and replies are passed as a sequence of ASCII letters and numbers terminated by a carriage return.

Upper and lower case letters are treated equally and all white-space characters are ignored. Thus to set manual voltage range 6:

:RNG:VLT:FIX 6
:RNG:VLT:FIX6
:RNG :VLT :FIX 6

all have exactly the same effect (although it takes longer to transmit strings with more characters).

Commands may be of one of three types - common, device, or system.

Common commands (and common queries) apply universally to all instruments and are preceded by an '*' character eg.

*TRG

Device commands are defined by the manufacturer of each instrument, and Voltech instruments' device commands are preceded by a ':' character eg.

:RNG:VLT:FIX 6

Commands may be cascaded if separated by ';' eg.

```
:FNC:VLT? ; :FNC:AMP? ; :FNC:WAT?
1.111E02
2.222E-02
3.333E01
```

Data replies may only be sent in response to a query message which ends with a question mark. The data is returned either as an integer (NR1 numeric response type) or in scientific format with 4½ digit signed mantissa and 2 digit signed exponent (NR3 numeric response type). Data may be entered as integer, integer with decimals, or scientific eg. to set wiring configuration, the following commands have the same effect:

```
:CFG 2, 1
:CFG 2, 1.00
:CFG 2, 1.0000E+00
```

A query message generates a single reply string terminated with a line-feed character.

## 4.2 The IEEE Command set

## Implemented common commands

| function | command | reply (if any) |
|---|---|---|
| identify | *IDN? | VOLTECH,PM300,1234,v120<br>VOLTECH,PM100,1234,v131 |
| operation control | *OPC | |
| | *OPC? | 1 |
| | *WAI | |
| reset | *RST | |
| self test | *TST? | 1 |
| status reporting | *CLS | |
| | *ESE | |
| | *ESE? | NR1 |
| | *ESR? | NR1 |
| | *SRE | |
| | *SRE? | NR1 |
| | *STB? | NR1 |
| trigger | *TRG | |

# Voltech defined commands

| function | command | reply (if any) |
|---|---|---|
| **averaging** | :AVG:FIX X | |
| | :AUT | |
| **ballast mode** | :BAL:50H | |
| | :60H | |
| **calibration** | :CAL:VLT X, Y | |
| | :AMP | |
| | :EXT | |
| | :CAL? | PM100 : Vflag, Aflag, Xflag |
| PM300 : | $V_{ch1}$flag, $A_{ch1}$flag, $X_{ch1}$flag | |
| | $V_{ch2}$flag, $A_{ch2}$flag, $X_{ch2}$flag | |
| | $V_{ch3}$flag, $A_{ch3}$flag, $X_{ch3}$flag | |
| | :CAL:VLT?X | NR3 |
| | :AMP | |
| | :EXT | |
| | :CAL:END X | |
| **configure** | :CFG? X | NR1 OR NR3 |
| | :CFG X, Y | |
| **data status** | :DSE? | NR1 |
| | :DSE X | |
| | :DSR? | NR1 |
| **device clear** | :DVC | |
| **read data** | :FNC:WAT? | NR3 |

| | |
|---|---|
| :VAS | :VAR |
| :VLT | :AMP |
| :PWF | :VPK |
| :APK | :VCF |
| :ACF | :WHR |
| :VAH | :VRH |
| :AHR | :APF |
| :VHM | :AHM |
| :VDF | :ADF |
| :FRQ | :VDC |
| :ADC | :VHA |
| :AHA | |

:FND :WAT? NR3

| | |
|---|---|
| :VAS | :VAR |
| :VLT | :AMP |
| :PWF | :WHR |
| :VAH | :VRH |
| :AHR | :APF |

| | | |
|---|---|---|
| **read data selection** | :FRD? | NR3, NR3, NR3.... |
| **frequency source** | :FSR:VLT<br>:AMP | |
| **single harmonic** | :HRM X | |
| **series harmonic** | :HMX:ODD X<br>:ALL | |
| **integrator** | :INT:ENB<br>:DIS | |
| **range selection** | :RNG:VLT:AUT X<br>:AMP:FIX X | |
| **reset averaging** | :RAV | |

| | | |
|---|---|---|
| **scaling** | :SCL:VLT X | |
| | :AMP | |
| **select data** | :SEL:CLR | :CH1 |
| | :CH2 | :CH3 |
| | :CHN | :SUM |
| | :FND | :SER |
| | :WAT | :VAS |
| | :VAR | :VLT |
| | :AMP | :PWF |
| | :VPK | :APK |
| | :VCF | :ACF |
| | :WHR | :VAH |
| | :VRH | :AHR |
| | :APF | :VHM |
| | :AHM | :VDF |
| | :ADF | :FRQ |
| | :VDC | :ADC |
| | :VHA | :AHA |
| | :WHM | |
| **current shunt** | :SHU:INT | |
| | :EXT | |
| **wiring** | :WRG:1P2 | |
| | :1P3 | |
| | :3P3 | |
| | :3P4 | |
| | :CH3 | |
| | :CH2 | |
| | :CH1 | |

# :AVG set averaging

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :AVG:FIX depth<br>AUT |
| Options | :FIX set fixed averaging<br>:AUT set auto averaging<br>depth1-16 |
| Example | :AVG:FIX 16 |

# set ballast/ultrasonic mode :BAL

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :BAL:H50<br>H60 |
| Options | :H50 set ballast mode for lock to 50Hz<br>:H60 set ballast mode for lock to 60Hz |
| Return format | none |
| Example | :BAL:H50 |

# :CAL calibrate

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :CAL:VLT range, value<br>:AMP<br>:EXT<br><br>:CAL:END password |
| Options | :VLT calibrate voltage<br>:AMP calibrate current<br>:EXT calibrate external shunt<br>:END end calibration and save values in EEPROM<br>pass calibration password 0-9999<br>range to be calibrated 1-8<br>value measured value |
| Return format | none |
| Examples | :CAL:VLT 3, 1.2345<br>:CAL:END 1234 |

# read calibration values :CAL?

Class device query

Return type NR1 or NR3 numerical response data

Valid PM300, PM100

Format :CAL?

:CAL:VLT? range
:AMP
:EXT

Options :VLT read voltage calibration
:AMP read current calibration
:EXTread external shunt calibration
range 1-8

Return format 4½ digit signed mantissa with 2 digit exponent

Example :CAL:VLT? 3
1.0673E0, 9.987E-1, 1.0298E0

Notes This represents the calibration correction for the given channel. The calibrated value of an input is given by:
actual value = measured value x calibration
In the case of PM100, 1 value is returned

Example 2 :CAL?
0,0,0,0,0,0,0,0,0

Notes The returned data is the flags for each range for each channel, voltage, current and external.
In the case of PM100, 1 value is returned

# :CFG configure

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :CFG prog, data |
| Options | prog integer program location 0-49<br>data appropriate integer or floating point data |
| Return format | none |
| Example | :CFG 21, 1 |

# read configuration :CFG?

| | |
|---|---|
| Class | device query |
| Return type | NR1 numerical response data or<br>NR3 numerical response data |
| Valid | PM300, PM100 |
| Format | :CFG? prog |
| Options | prog integer program location 0-49 |
| Return format | integer or floating point data as appropriate |
| Example | :CFG? 21<br>1 |

# *CLS clear event status register and data status register

| | |
|---|---|
| Class | common command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | *CLS |
| Options | none |
| Return format | none |

# set data status enable register :DSE

Class device command

Return type none

Valid PM300, PM100

Format :DSE data

Options none

Data format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | OVA | OVV | AVF | NDV | DVL |

DVL - data available enable
NDV - new data available enable
AVF - averaging full enable
OVV - voltage overflow enable
OVA - current overflow enable

Example :DSE 2

Notes The DAS bit in the serial poll status byte is set according to the logical bitwise AND of the data status register and the data status enable register.

# :DSE? read data status enable register

Class device query

Return type NR1 numerical response data

Valid PM300, PM100

Format :DSE?

Options none

Return format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | OVA | OVV | AVF | NDV | DVL |

DVL - data available enable
NDV - new data available enable
AVF - averaging full enable
OVV - voltage overflow enable
OVA - current overflow enable

Example :DSE?
2

Notes The DAS bit in the serial poll status byte is set according to the logical bitwise AND of the data status register and the data status enable register.

## read data status register :DSR?

Class device query

Return type NR1 numerical response data

Valid PM300, PM100

Format :DSR?

Options none

Return format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | OVA | OVV | AVF | NDV | DVL |

DVL - data available
NDV - new data available
AVF - averaging full
OVV - voltage overflow has occurred
OVA - current overflow has occurred

Example :DSR?
7

Notes This command clears the data status register
The DAS bit in the serial poll status byte is set according to the logical bitwise AND of the data status register and the data status enable register.

# *ESE set standard event status enable register

Class common command

Return type none

Valid PM300, PM100

Format *ESE flags

Data format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | CME | EXE | | QRE | | OPC |

OPC - operation complete
QRE - unterminated query error
EXE - execution error
CME - command error

Example *ESE 32

Notes The ESB bit in the status byte is set according to the logical bitwise AND of the standard event status register and the standard event status enable register.

# read standard event status enable register *ESE?

Class common query

Return type NR1 numeric response data

Valid PM300, PM100

Format *ESE?

Options none

Return format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | CME | EXE | | QRE | | OPC |

OPC - operation complete
QRE - unterminated query error
EXE - execution error
CME - command error

Example *ESE?
32

Notes The ESB bit in the status byte is set according to the logical bitwise AND of the standard event status register and the standard event status enable register.

# *ESR? read standard event status register

Class common query

Return type NR1 numeric response data

Valid PM300, PM100

Format *ESR?

Options none

Return format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | CME | EXE | | QRE | | OPC |

OPC - operation complete
QRE - unterminated query error
EXE - execution error
CME - command error

Example *ESR?
1

Notes The ESB bit in the status byte is set according to the logical bitwise AND of the standard event status register and the standard event status enable register.

# read function data :FNC?

Class device query

Return type NR3 numerical response data

Valid PM300, PM100

Format :FNC:WAT?

| | |
|---|---|
| VAS | VAR |
| VLT | AMP |
| PWF | VPK |
| APK | VCF |
| ACF | WHR |
| VAH | VRH |
| AHR | APF |
| VHM | AHM |
| VDF | ADF |
| FRQ | VDC |
| ADC | VHA |
| AHA | |

Return format 4½ digit mantissa with 2 digit exponent
±x.xxxE±xx
±1.xxxxE±xx

Example :FNC:VLT?
+2.395E+02

Notes Data read can be synchronised to new data values by using the NDV bit in the data status register (see :DSR?), or via the status byte register if the appropriate enable register is set (see :DSE)

# :FND? read fundamental data

| | |
|---|---|
| Class | device query |
| Return type | NR3 numerical response data |
| Valid | PM300, PM100 |
| Format | :FND:WAT?<br>VAS<br>VAR<br>VLT<br>AMP<br>PWF<br>WHR<br>VAH<br>VRH<br>AHR<br>APF |
| Return format | 4½ digit mantissa with 2 digit exponent<br>±x.xxxE±xx<br>±1.xxxxE±xx |
| Example | :FND:VLT?<br>+2.395E+02 |
| Notes | Data read can be synchronised to new data values by using the NDV bit in the data status register (see :DSR?), or via the status byte register if the appropriate enable register is set (see :DSE) |

# read foreground data :FRD?

| | |
|---|---|
| Class | device query |
| Return type | multiple NR3 numerical response data separated by commas. |
| Valid | PM300, PM100 |
| Format | :FRD? |
| Options | none |
| Return format | NR3,NR3,NR3..... |
| Example | :FRD?<br>2.395E02,6.789E-01,1.2345E01 |
| Notes | The data to be sent is determined by the previously stored selection (see :SEL).<br>The data is sent when NDV is set and NDV is then cleared again. In this way, repeated :FRD? commands return subsequent measurements and do not repeat the same data. |

# :FSR set frequency source

| | | |
|---|---|---|
| Class | device command | |
| Return type | none | |
| Valid | PM300, PM100 | |
| Format | :FSR:AUT<br>FIX :AMP<br>FIX :VLT | |
| Options | :AUT | set auto frequecy source |
| | :FIX | set fixed frequency source |
| | :VLT | set voltage frequency source |
| | :AMP | set current frequency source |
| Return format | none | |
| Example | :FSR:FIX:VLT | |

# set single harmonic :HRM

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :HRM harm |
| Options | harm integer harmonic number 0-50 |
| Return format | none |
| Example | :HRM 3 |

# :HMX set maximum harmonic for series

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :HMX:ODD harm<br>ALL |
| Options | :ODD only odd harmonics<br>:ALLuse both odd and even harmonics<br>harm integer maximum harmonic 1-50 |
| Return format | none |
| Example | :HMX:ODD 39 |

# identify *IDN?

| | |
|---|---|
| Class | common query |
| Return type | arbitrary ASCII response data |
| Valid | PM300, PM100 |
| Format | *IDN? |
| Options | none |
| Return format | VOLTECH,PM300,serial,version |
| Example | *IDN?<br>VOLTECH,PM300,1234,v120 |

# :INT set up integrator

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :INT:ENB<br>DIS<br><br>:INT:RUN time |
| Options | :ENB enable integrator<br>:DIS disable integrator<br>:RUN enable integrator and set stop time<br>time run time in integer minutes |
| Return format | none |
| Example | :INT:ENB |

# initialise operation complete function *OPC

| | |
|---|---|
| Class | common command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | *OPC |
| Options | none |
| Return format | none |

# *OPC? flag when operation complete

| | |
|---|---|
| Class | common query |
| Return type | NR1 numeric response data |
| Valid | PM300, PM100 |
| Format | *OPC? |
| Options | none |
| Return format | 1 |
| Example | *OPC<br>*OPC?<br>1 |

# reset averaging :RAV

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :RAV |
| Options | none |
| Return format | none |

Notes This command can be used to speed up the response of the instrument to step changes especially when in fixed averaging.

# :RNG set ranging

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :RNG:VLT:FIX range<br>AMP<br><br>:RNG:VLT:AUT<br>AMP |
| Options | :VLTset voltage ranging<br>:AMP set current ranging<br>:FIX fixed ranging<br>:AUT autoranging<br>rangeinteger range 1-8 |
| Return format | none |
| Example | :RNG:AMP:FIX 5 |

# reset device *RST

| | |
|---|---|
| Class | common command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | *RST |
| Options | none |
| Return format | none |

# :SCL set scaling

| | | |
|---|---|---|
| Class | device command | |
| Return type | none | |
| Valid | PM300, PM100 | |
| Format | :SCL:VLT scale<br>AMP | |
| Options | :VLT | set voltage scaling |
| | :AMP | set current scaling |
| Return format | none | |
| Example | :SCL:AMP 99.34 | |

# select function list :SEL

Class device command

Return type none

Valid PM300, PM100

Format :SEL:CLR CH1
CH2 CH3
CHN SUM
WAT VAS
VAR VLT
AMP PWF
VPK APK
VCF ACF
WHR VAH
VRH AHR
APF VHM
AHM WHM
VDF ADF
FRQ VDC
ADC VHA
AHA FND
SER (series of harmonics)

Options
:CLR clears entire selection
:FND selects return of fundamentals as well others set selection for that function/ channel

Return format none

Example
:SEL:CLR
:SEL:CH1
:SEL:VLT; :SEL:WAT; :SEL:AMP

Notes CH2, CH3, CHN, SUM not valid for PM100
This functions selects the list of parameters to be returned by the :FRD? command.

# :SHU set internal/external shunt

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | :SHU:INT<br>EXT |
| Options | :INT use internal shunt<br>:EXTuse external shunt |
| Return format | none |
| Example | :SHU:EXT |

# read status byte *STB?

Class common query

Return type NR1 numeric response data

Valid PM300, PM100

Format *STB?

Options none

Return format 0-255

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | MSS | ESB | MAV | | | | DAS |

DAS - data available summary (see :DSR?)
MAV - message available
ESB - standard event status summary (see *ESR?)
MSS - master summary status

Example *STB?
enter 10
65

# *TRG trigger

| | |
|---|---|
| Class | common command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | *TRG |
| Options | none |
| Return format | none |

Notes *TRG has the same effect as a Group Execute Trigger and resets averaging

# wait for operation *WAI

| | |
|---|---|
| Class | common command |
| Return type | none |
| Valid | PM300, PM100 |
| Format | *WAI |
| Options | none |
| Return format | none |

Notes The operation complete flag is set when new data is available. *WAI will then effect a delay until data is available.

# :WRG set wiring configuration

| | |
|---|---|
| Class | device command |
| Return type | none |
| Valid | PM300 |
| Format | :WRG:1P2<br>1P3<br>3P3<br>3P4<br>CH3<br>CH2 |
| Options | :1P2 set 1 phase 2 wire<br>:1P3 set 1 phase 3 wire<br>:3P3 set 3 phase 3 wire<br>:3P4 set 3 phase 4 wire<br>:CH3 set channel 3 only mode<br>:CH2 set channel 2 only mode<br>:CH1 set channel 1 only mode |
| Return format | none |
| Example | :WRG:3P4 |

# 4.3 Example Program

This program is written in a Quick BASIC environment. In this example, the com2 communications port is connected to the RS232 interface of a PM300. The voltage and current readings from channel 1 and channel 2 are being tested.

```
OPEN "com2:9600,n,8,2,ds" FOR RANDOM AS #1
PRINT #1:WRG:3P4        Select 3 phase 4 wire layout
PRINT #1:SEL:AMP        select to read :    amps,
PRINT #1:SEL:VLT                            volts
PRINT #1:SEL:CH1                from:       channel 1
PRINT #1:SEL:CH2                            channel 2
PRINT #1*TRG                    reset averaging
DO
        PRINT #1:DSR?
        I = INPUT #1
        J = I AND 4             Check that Data Set Ready bit is set
LOOP WHILE  J <> 4
PRINT #1:FRD?       get selected values
INPUT#1             output them.
```

The program first configures com2 to be addressable as #1 and for two way communication.

# APPENDIX A
# PRINTOUT

## Printout Format

Data is printed out as 4½ digits, expressed in engineering notation (i.e. M, k, m).

Data is printed in ASCII in a 40 column format for the PM100 and an 80 column format for the PM300. (The degree symbol uses ASCII code 248 which will print correctly to most printers set to an international font table).

### A sample printout

```
**************************************
VOLTECH PM100  serial 1234  version 1.00
External shunt
Current scaling = 50A/V
Voltage scaling = 2
**************************************
W    +13.824 W
W. f +5.234 W
VA   13.824 VA
VA. f     5.234 VA
.
.
.
Freq 50 Hz
**************************************
V dc 1.0367 V
VH01 238.4 V                0.000°
VH03 20.12 V    7.654%       -56.78°
Vthd 2.4%
**************************************
A dc -876.5❍A
AH01 23.45mA                0.000°
AH03 5.123mA    25.12%       -56.78°
Athd 102.24%
**************************************
W dc -908.7❍W
WH01 +5.678W
WH03 -253.2mW    -5.125%
**************************************
```

# APPENDIX B

## RS232 Pin Layout

(9pin D connector)

| Pin | Function |
|---|---|
| 1 | No connection |
| 2 | Rx (input) |
| 3 | Tx (output) |
| 4 | Connected to 6 |
| 5 | 0V |
| 6 | Connected to 4 |
| 7 | RTS (output) |
| 8 | CTS (input) |
| 9 | NC |

# Appendix C

## Configuration Commands

The IEEE command set allows you to configure the instrument using the :cfg command. Below is a list of parameters relating to this command and enabling configuration. Those commands whose number is enclosed in {} parenthesis apply only to the PM300.

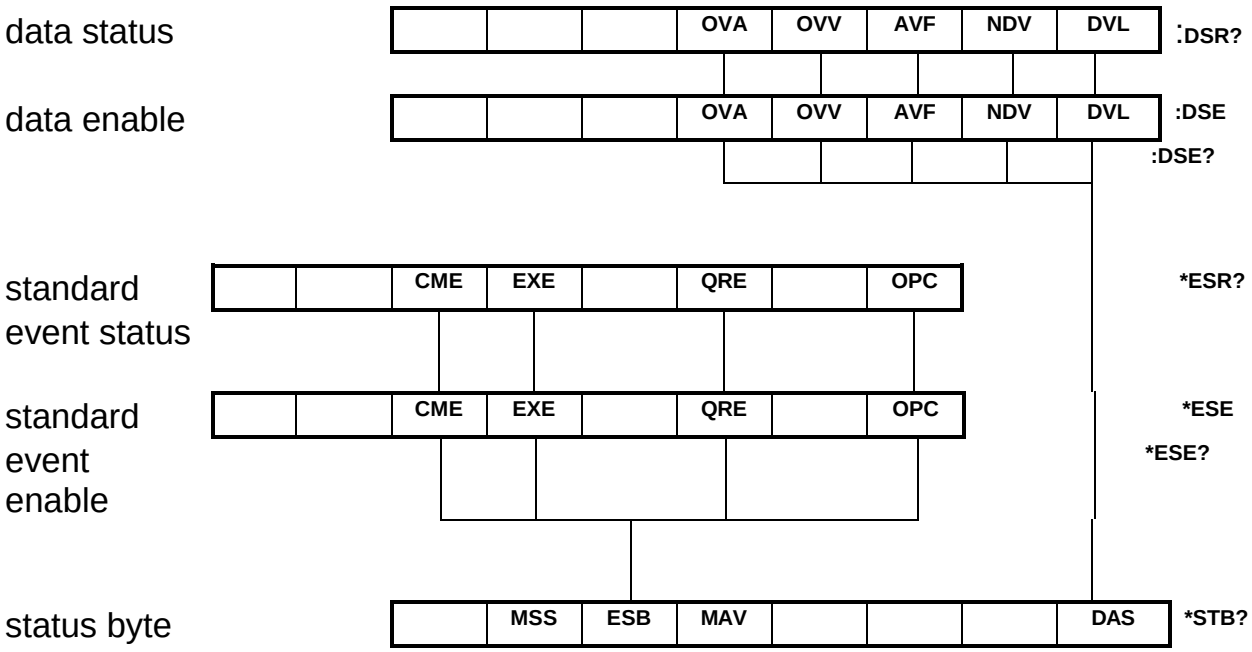
| | | |
|---|---|---|
| 1. | operating mode | 0-7 |
| {2.} | wiring | 0-7 |
| 3. | | |
| 4. | averaging | auto/manual |
| 5. | averaging depth | 0-15 |
| 6. | current shunt | internal/external |
| 7. | sample pre-filter | 0-255 |
| 8. | number of samples | 100-8000 |
| 9. | sample rate | auto/manual |
| 10. | voltage range | auto/manual |
| 11. | current range | auto/manual |
| 12. | voltage range | 0-7 |
| 13. | current range | 0-7 |
| 14. | frequency source | auto/manual |
| 15. | frequency source | V/A |
| 16. | jitter generator | auto/manual |
| 17. | jitter generator | on/off |
| 18. | fundamentals | on/off |
| 19. | V harmonic | on/off |
| 20. | A harmonic | on/off |
| 21. | harmonic series | on/off |
| 22. | harmonic number | 0-50 |
| 23. | maximum harmonic | 1-50 |
| 24. | harmonic series | odd/odd+even |
| 25. | harmonic reference | h1/rms |
| 26. | harmonic display | percentage/absolute |
| 27. | dc included in series | on/off |
| 28. | integrator enable | on/off |
| 29. | integrator run time | floating point |
| 30. | display function | 0-63 |

| | | |
|---|---|---|
| 31. | top function | 0-63 |
| 32. | middle function | 0-63 |
| 33. | display fundamentals | 0-63 |
| 34. | single display | on/off |
| 35. | low value banking | on/off |
| 36. | peak display | peak/crest factor |
| 37. | power factor sign | normal/reverse |
| 38. | voltage scaling | floating point |
| 39. | current scaling | floating point |
| 40. | thd formula selection | on/off |
| 41. | thd formula | difference/series |
| {42.} | display option | 0-4 |
| 43. | language | 0/1 |
| 44. | | |
| 45. | peak current | floating point |
| 46. | waveform | off/on |
| 47. | barchart | off/on |
| 48. | display mode | off/on |
| 49. | display parameter | 1-6 |

# Appendix D

## Status Byte table

The IEEE488.2 status byte contains the mandatory MSS, ESB and MAV bits with two instrument specific summary bits, BAS and DAS. The enable registers are set by the user, and act as a mask to reflect chosen elements of the appropriate status registers to the Status Byte Register. Transparency is set by setting the appropriate bit of the enable register to 1. If any of the status registers are read, the register is reset to zero.



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