PowerMonic

PM35

USER'S MANUAL

Edition 1.1 – November 2010

PowerMonic PM35 User Manual

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Printed in Australia

AUSTRALIA / NEW ZEALAND EMC NOTES	
	N3207
	This is a CISPR 22 Class A product. In a domestic environment this product may cause radio interference, which the user may need to take steps to prevent.

LIMITED WARRANTY

The PowerMonic is guaranteed to be free of mechanical and electrical defects when dispatched from our store. Provided that the PowerMonic has been operated within its normal ratings as specified, it will be repaired or replaced free of charge if, within a period of twelve (12) months from date of our invoice to the original purchase it is proven, upon examination by our engineers, to be defective in material or workmanship. This warranty is void if the unit has been tampered with, abused or if the defect is related to service not performed by CHK GridSense Pty Ltd.

Responsibility of CHK GridSense Pty Ltd: Under this guarantee, the responsibility of CHK GridSense Pty Ltd is limited to the repairing or replacing of any defective part provided the instrument is returned freight paid to and from our Testing and Service office in Sydney, NSW Australia.

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1. THE POWERMONIC PM35

The PowerMonic PM35 is a robust power quality analyser and disturbance analyser. This manual describes the installation and operation of the PM35.

The PM35 is intended to log three channels of AC voltage and four channels of AC current in accordance with IEC 61000 standards. The PM35 measures and logs:

- phase to neutral and phase to phase voltages up to 520 V;
- phase and neutral currents;
- frequency and power factor;
- apparent power S, real power P and reactive power Q;
- voltage and current imbalance;
- short term and long term flicker;
- distortion, harmonic magnitude & angle and interharmonics;
- sag/swell events versus ITC curve;
- transient waveform and RMS events.

This manual covers the PM35. Other products in the PowerMonic suite are described in other manuals.

GridSense places the highest emphasis on safety. Ensure that only qualified personnel use the PM35.

This manual uses the following International Safety Symbols:

	CAUTION, risk of danger: documentation must be consulted in all cases where this symbol is marked.
	Equipment protected throughout by Double Insulation or Reinforced Insulation.
	Alternating current.

Where the  (CAUTION) symbol appears on the PM35 or accessories, the operator must consult the manual in order to determine the nature of the potential hazard and any actions which need to be taken.

The table below provides a cross reference to the sections in this manual where the  symbol is used. Refer to the relevant sections of this manual for further information.

2. WHAT'S NEW WITH THE POWERMONIC PM35

The PowerMonic PM35 includes the following enhancements over previous PowerMonic Power Quality Analysers:

- Rated phase to neutral input voltage 520 VRMS;
- Rated phase to phase input voltage 520 VRMS;
- Maximum phase to ground/earth voltage 300 VRMS;
- Three voltage channels;
- USB data cable now allows configuration and data downloads without an external power supply;
- Up to 4 times faster data downloads;
- New configuration wizard in PowerView.
- 2 vertical cursor bars on graphs, with time difference display
- On-line monitor for backup and real time clock battery voltages
- Right click on any table to export that table in CSV format.

3. POWERMONIC PM35 KIT OVERVIEW

The PowerMonic PM35 is normally supplied in a kit which includes the following components:

Part No.	Description
PM35	PowerMonic PM35 power quality recorder and protective holster, mounting plate and nylon safety strap
PM35 Calibration Certificate	Calibration certificate
USBCABLE	Data and power supply cable
VL4C2	3 channel voltage lead - measures A, B & C phase voltages with respect to Neutral using 4 fused voltage clamps.
AC4TE	Fused tinned end voltage connectors
AC4BC	Fused banana plug / small crocodile clamp voltage connectors
PC4	Single phase voltage lead - measures Phase A with respect to Neutral. Power cable for GPO connection.
PM35 User Manual	PM35 User Manual (this document)
PowerView	PowerView Software CD
CBP3	Black nylon carry bag

Note: Accessory part numbers have additional suffix “-2” for USA region.

- The use of any other manufacturer's accessories with the PM35, will void the warranty and may cause safety hazards.

3.1 Liquid Crystal Display (LCD)

Figure 1 shows the PM35 front panel and liquid crystal display (LCD) location. The LCD is an 8 line by 20 character alphanumeric and graphical display.

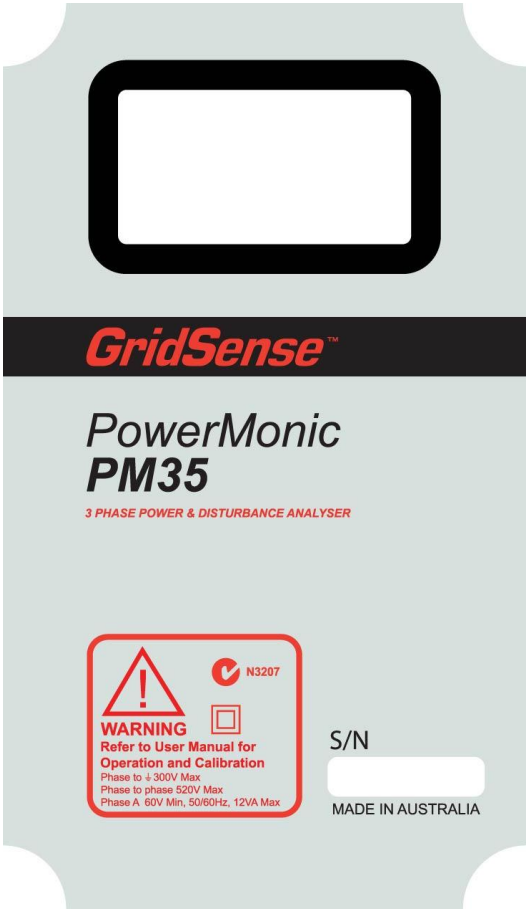


Figure 1: PowerMonic PM35 front panel

The screens displayed on an operating PM35 are selected using the PowerView software. Nine distinct displays are provided:

1. welcome screen
2. voltage and current values, voltage and current unbalance
3. true power factor, displacement power factor and frequency
4. kW, kVA, kVAR and total power
5. total harmonic distortion
6. phasor diagram
7. flicker
8. Current probe information
9. Log progress and status

3.2 Connectors

Figure 2: PowerMonic connector receptacles

Figure 2 Shows the PM35 connector receptacle locations. The connector functions are listed below.

Connector	Description
Voltage	8 pin Voltage Probe connector
Data	8 pin data connector
Current “A”	4 pin Current Probe (“A” Channel) connector
Current “B”	4 pin Current Probe (“B” Channel) connector
Current “C”	4 pin Current Probe (“C” Channel) connector
Current “N”	4 pin Current Probe (“N” Channel) connector

3.3 Voltage leads

The voltage leads connect the PM35 to the equipment under test. Several lead types are available:

- PC4 single phase (Phase A to Neutral) 3 wire fused lead terminating in a standard general purpose outlet (GPO) plug.
- VL4 three channel (Phase A to Neutral, Phase B to Neutral & Phase C to Neutral) 4 wire lead.
- VL6 three channel (Phase A to Neutral A, Phase B to Neutral B & Phase C to Neutral C) 6 wire lead terminating in fused banana plugs. The VL6 is an optional accessory.

The VL4 and VL6 leads can also be fitted with AC4TE fused tinned ends or AC4BC fused banana plugs and small crocodile clamps.

3.4 PC4 Single phase power lead

The PC4 single phase lead is supplied for use in the office for single phase measurements.

Figure 3: PC4 Single phase lead (Australia and New Zealand version shown)

The PC4 lead measures the Phase A to Neutral voltage.

During measurements, the PM35 is powered directly from the Phase A to Neutral connection.

⚠	The PC4 lead is designed for indoor use only The PC4 lead connects via a standard general purpose outlet (GPO).

3.5 VL4 Three-phase 4-wire lead with voltage clamps

The VL4 three-phase 4 wire lead connects to three-phase circuits using 4 fused clamps. The lead has a common neutral (N) shared by all phases.

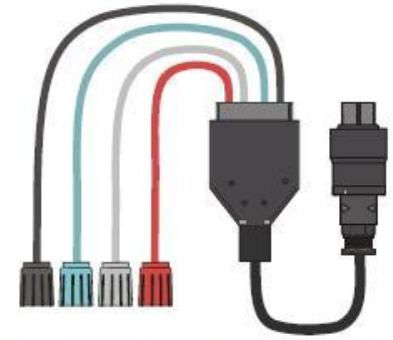


Fig 4 - Three phase lead to fuse (VL4)

Figure 4: VL4 Three-phase lead

The VL4 lead measures the Phase A to Neutral, Phase B to Neutral & Phase C to Neutral voltages, and is intended for use on three-phase star/wye connected power systems.

During measurements, the PM35 is powered directly from the Phase A to Neutral connection.

The four VL4 leads are fused with 2A, high rupture capacity (HRC) fuses.

The VL4 lead measures the Phase A, Phase B & Phase C voltages with respect to a common neutral connection.

The A, B and C channels can measure voltages up to 520 V.

- The VL4 lead connects to live power systems using clamps. Connections should only be made by appropriately qualified operators. Appropriate personal protective equipment must be used when making live connections.
- The working voltage between any phase and ground must not exceed 300 V RMS
- The working voltage between any two phases must not exceed 520 V RMS.
- If the clamps are wet or are installed or removed in rainy conditions, it is recommended that extra safety precautions are followed. As a minimum, this includes the use of appropriately rated insulated gloves.
- If the VL4 shows any sign of damage or broken insulation, the VL4 should not be used. Return it to GridSense or your supplier for repair or replacement.
- Never connect the Active or Neutral leads to ground/earth.

3.6 VL6 Three-phase 6-wire lead with voltage clamps (optional accessory)

The VL6 three-phase 6 wire lead connects to three-phase circuits using 6 fused clamps.

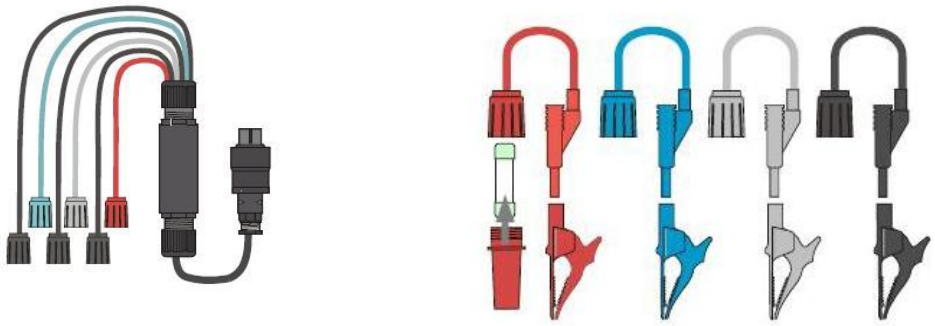


Figure 5: VL6 Three-phase lead and small crocodile clamps

The VL6 lead measures the Phase A to Neutral A, Phase B to Neutral B & Phase C to Neutral C and is intended as a general connection lead for use on all types of power systems.

During measurements, the PM35 is powered directly from the Phase A to Neutral A connection.

The six VL6 leads are fused with 2A, high rupture capacity (HRC) fuses.

The three voltage channels provided by the VL6 lead are totally isolated from one another, so this lead may be used to monitor voltage sources that are floating with respect to each other.

The A, B and C channels can measure voltages up to 520 V.

- The VL6 lead connects to live power systems using clamps. Connections should only be made by appropriately qualified operators. Appropriate personal protective equipment must be used when making live connections.
- The working voltage between any phase and ground must not exceed 300 V RMS
- The working voltage between any two phases must not exceed 520 V RMS.
- If the VL6 shows any sign of damage or broken insulation, the VL6 should not be used. Return it to GridSense or your supplier for repair or replacement.
- Never connect the Phase A or Neutral A leads to ground/earth.

3.7 Current probe connections (optional accessories)

The current probe connections allow current probes to be connected to the PM35.

The PM35 continuously detects the current rating of the current probes while they are attached and scales the measured current accordingly.

The following types of current probes are available:

- CR100S clip on substation current probe – 100 A full scale
- CR100 clip on current probe – 100 A full scale
- CR500 clip on current probe – 500 A full scale
- CR1000 clip on current probe – 1000 A full scale
- CF3000 flexible current probe – 3000 A full scale

3.8 CR100S Clip on substation current probes (optional accessory)

The CR100S current probe is intended for use in substations measuring the output of substation CTs. Full scale is 100 A.

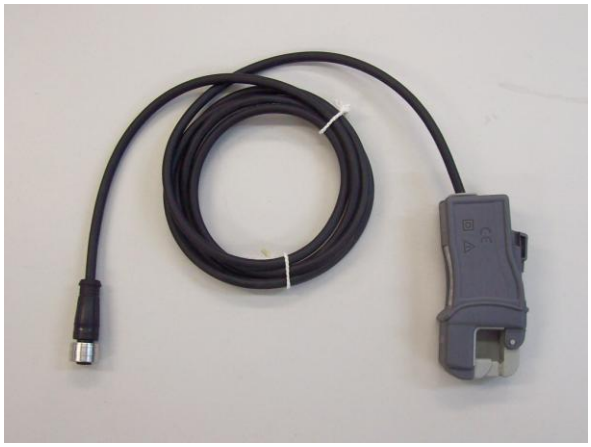


Figure 6: CR100S clip on current probe

- The CR100S has no protection against a short circuit between hazardous live wires or busbars during clamping. This current sensor is intended to be applied to or removed from uninsulated hazardous live conductors only when they are de-energised.
- When installing the CR100S current probe, appropriate safe operating procedures and use of personal protective equipment is required. Refer to your employer or responsible body for safe procedures:
  1. If installing on uninsulated conductors make sure they are de-energised and are not hazardous live, or
  2. If installing on insulated conductors, appropriate safe operating procedures and use of personal protective equipment is required.
- If there is visible damage to the housing, flexible lead or connector, do not use the probe. Return it to GridSense or your supplier for repair or replacement.
- The current probe inputs should only be connected to GridSense current probes.
- To install the CR100S current probe, open the clamp by pushing the locking clip (if present) forwards and pressing down on the operating lever, place the probe around the conductor, allow the probe to shut and then close the locking clip by allowing it to move backwards.
- Current probe arrows should point to the load to ensure accurate power measurement.
- There are no user serviceable parts contained within the CR100S.

3.9 CR100 Clip on current probes (optional accessory)

The CR100 current probe full scale is 100 A.

Figure 7: CR100 clip on current probe

- The CR100 has no protection against a short circuit between hazardous live wires or busbars during clamping. This current sensor is intended to be applied to or removed from uninsulated hazardous live conductors only when they are de-energised.
- When installing the CR100 current probe, appropriate safe operating procedures and use of personal protective equipment is required. Refer to your employer or responsible body for safe procedures:
  1. If installing on uninsulated conductors make sure they are de-energised and are not hazardous live, or
  2. If installing on insulated conductors, appropriate safe operating procedures and use of personal protective equipment is required.
- If there is visible damage to the housing, flexible lead or connector, do not use the probe. Return it to GridSense or your supplier for repair or replacement.
- The current probe inputs should only be connected to GridSense current probes.
- To install the CR100 current probe, open the clamp by pressing simultaneously on both sides of the probe, place the probe around the conductor, and then allow the probe to shut.
- Current probe arrows should point to the load to ensure accurate power measurement.
- There are no user serviceable parts contained within the CR100.

3.10 CR500 Clip on current probes (optional accessory)

The CR500 current probe full scale is 500 A.

Figure 8: CR500 clip on current probe

- The CR500 has no protection against a short circuit between hazardous live wires or busbars during clamping. This current sensor is intended to be applied to or removed from uninsulated hazardous live conductors only when they are de-energised.
- When installing the CR500 current probe, appropriate safe operating procedures and use of personal protective equipment is required. Refer to your employer or responsible body for safe procedures:
  1. If installing on uninsulated conductors make sure they are de-energised and are not hazardous live, or
  2. If installing on insulated conductors, appropriate safe operating procedures and use of personal protective equipment is required.
- If there is visible damage to the housing, flexible lead or connector, do not use the probe. Return it to GridSense or your supplier for repair or replacement.
- The current probe inputs should only be connected to GridSense current probes.
- To install the CR500 current probe, open the clamp by pressing simultaneously on both sides of the probe, place the probe around the conductor, and then allow the probe to shut.
- Current probe arrows should point to the load to ensure accurate power measurement.
- There are no user serviceable parts contained within the CR500.

3.11 CR1000 Clip on current probes (optional accessory)

The CR1000 current probe full scale is 1000 A.

Figure 9: CR1000 clip on current probe

- The CR1000 has no protection against a short circuit between hazardous live wires or busbars during clamping. This current sensor is intended to be applied to or removed from uninsulated hazardous live conductors only when they are de-energised.
- When installing the CR1000 current probe, appropriate safe operating procedures and use of personal protective equipment is required. Refer to your employer or responsible body for safe procedures:
  1. If installing on uninsulated conductors make sure they are de-energised and are not hazardous live, or
  2. If installing on insulated conductors, appropriate safe operating procedures and use of personal protective equipment is required.
- If there is visible damage to the housing, flexible lead or connector, do not use the probe. Return it to GridSense or your supplier for repair or replacement.
- The current probe inputs should only be connected to GridSense current probes.
- To install the CR1000 current probe, open the clamp by pressing simultaneously on both sides of the probe, place the probe around the conductor, and then allow the probe to shut.
- Current probe arrows should point to the load to ensure accurate power measurement.
- There are no user serviceable parts contained within the CR1000.

3.12 CF3000 Current Probes (optional accessory)

The CF3000 current probe full scale is 3000 A.

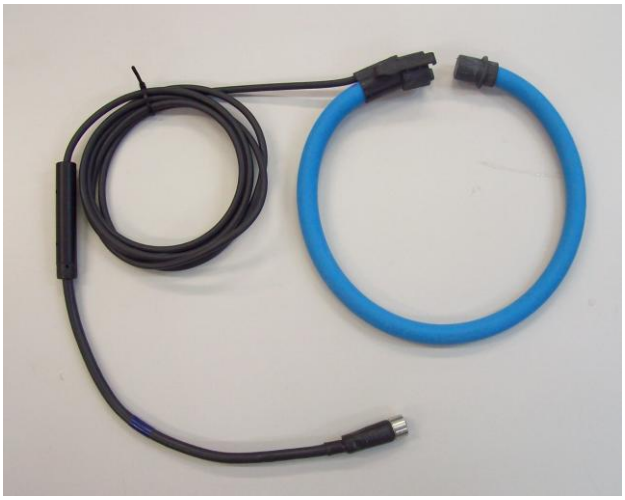


Figure 10: CF3000 Flexible Current Probe

- The CF3000 has protection against a short circuit between wires or busbars during clamping but it has no defined hand-held or hand-manipulated parts which provide protection against electronic shock from hazardous live conductors which cannot be de-energised during application or removal of the current sensor.
- When installing the CF3000 appropriate safe operating procedures and use of personal protective equipment is required. Refer to your employer or responsible body for safe procedures:
  1. Ensure conductors are de-energised and are not hazardous live, or
  2. If installing on hazardous live conductors appropriate safe operating procedures and use of personal protective equipment is required.
- If the inner contrasting colour of the insulation of the flexible cord is visible, or the lead is damaged, do not use the probe. Return it to GridSense or your supplier for repair or replacement.
- The current probe inputs should only be connected to GridSense current probes.
- To install the CF3000 flexible probe, release the retaining clamps and open the probe, place it around the current conductor, and then close the retaining clamps. Current probe arrows should point to the load to ensure accurate power measurement.
- There are no user serviceable parts contained within the CF3000 Flexible Current Probe.

3.13 Data Cable

The data cable allows connection of the PM35 to a PC USB port. PowerView software is used to configure the PM35 and to download recorded data.

Figure 11: Data cable

The 5 V DC power provided by the USB port is also used to power up the PM35, avoiding the need to connect a voltage lead to configure and download data from the PM35. Note that the standby battery is not charged when the PM35 is powered from the USB port.

> The data cable is intended to connect to a standard PC data port. The cable should only be connected to non hazardous live circuits (insulated from hazardous live circuits by reinforced or double insulation or equivalent)

3.14 Standby Battery:

The PM35 uses a sealed lead acid standby battery to power the unit for two minutes when loss of AC supply occurs. This allows normal and event logging to continue.

The performance of the standby battery will degrade if it is exposed to long periods of high temperature and/or it is allowed to discharge excessively. As a safety measure, the PM35 battery is protected by a thermal switch that operates when the temperature of the battery exceeds 50°C. If the thermal switch disconnects the battery, battery powered operation and battery charging will not be possible. Other circuitry in the PM35 will continue to operate normally. When the battery temperature falls to 35°C, the thermal switch will reconnect the battery.

The battery life of the PM35 can be extended by following a few simple precautions as outlined below:

- When the PM35 is not in use it should be stored at ambient temperatures below 30°C.
- When the PM35 is not in use it should be stored with a fully charged battery. This can be achieved by energising the PM35 for 24 hours before storage.
- Recharge the battery after every three months of non use. The battery is recharged when the PM35 is powered from the any of the voltage leads. It is NOT recharged when the PM35 is powered from the USB cable
- The battery is not user serviceable. If you suspect the battery is faulty, return the PM35 to GridSense or your supplier.

4. EQUIPMENT RATING

The PM35 is meant to operate under the following conditions. A full set of specifications is provided in Section 12 of this manual.

4.1 Absolute Maximum Voltages

- The nominal voltage which can be applied between any 2 voltage leads is 520 VRMS.
- The nominal phase to ground/earth voltage is 300 VRMS.

4.2 Operating Voltage Range

- Minimum operating voltage for A phase 60 VRMS
- Rated phase to neutral voltage is 520 VRMS.
- Rated phase to phase voltage is 520 VRMS.

4.1 Operating frequency

- 50 or 60 Hz

4.2 Operating power

- 12 VA maximum

4.3 Environmental

- IP65 environmental protection rating, in accordance with AS 6059-2004: Degrees of protection provided by enclosures (IP Code). No ingress of dust; complete protection against contact. Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
- Operating temperature -20°C to +60°C. Standby battery -20°C to +50°C

5. EQUIPMENT MAINTENANCE

The PM35 equipment should be regularly tested and maintained to make sure the equipment and leads are in good order.

5.1 Periodic maintenance and testing

The PM35 and accessories should be inspected, tested and tagged as per the normal procedures of your employer or responsible body.

5.2 Equipment faults

If the equipment is found to be faulty in any way, including suspected blown fuses, it should be returned to your supplier for service.

5.3 Calibration

The PM35 and current probes should be calibrated every 12 months. CHK GridSense offers this service.

5.4 Cleaning

The PM35, voltage leads, and current probes should be cleaned with a soft, moist cloth using only a mild detergent.

After cleaning, ensure that all equipment is thoroughly dry before use. Double check that all connectors and connector receptacles are completely dry.

6. SAFE USE OF THE PM35

If you do not understand any instructions in this manual, please contact GridSense.

The PM35 is intended to be used on energised lines or equipment. Personnel using equipment on energised lines must be authorised by the relevant regulatory bodies to carry out such work and must have appropriate training.

The information given in this document is given as a guide only. It is the user's responsibility to ensure that correct and safe procedures are followed at the actual work site. GridSense offers no warranty or indemnity for accidents that may occur when following these instructions.

Prior to using a PM35, you should note the following:

- The voltage leads have internal field replaceable HRC fuses. Refer to Section 10.6 on troubleshooting if you suspect a blown fuse.
- If the PM35 and accessories are used in a manner not specified in this manual, the protection provided by the equipment may be impaired.
- The PM35 unit should not be immersed in water or other fluids. The unit should not be used in explosive atmospheres.
- When any voltage clamp/plug is connected to a hazardous live conductor, the other voltage clamp/plugs should also be treated as live, due to the internal measurement impedance of the PM35.
- Connectors should be properly connected to their receptacles, using their screw or push fastener.
- The outer sheath of all leads should be free from damage, with no inner insulation showing. There should be no breakages or cracks in the PM35 enclosure, the voltage clamps, banana plugs or connectors.
- The PM35 is suitable for outdoor measurements only when used with the VL4 or VL6 voltage leads. When other voltage leads are used, the unit is suitable for indoor measurements.
- When used outdoors with the VL4 or VL6 voltage leads, the unit will withstand exposure to rain and fog.
- All voltage leads and current probes should be connected to the PM35 before connection to mains conductors.
- Any equipment showing signs of damage should not be used. Return it to GridSense or your supplier.

7. INSTALLING YOUR PM35

7.1 Pre-installation check

- Verify that the nominal voltage to be tested is within the operating range of the PM35 as indicated on the front label.
- The A phase supplies power to the PM35 (12 VA maximum).
- Identify the ground (earth), neutral and all phases.
- Ensure the unit will be physically secured against movement;
- Ensure that leads will not be damaged when shutting enclosure doors;
- Internal mounting locations should be chosen so that the temperature limits are not exceeded.
- External mountings should be such that there can be no access by the public.

7.2 Hazard assessment

Prior to using the PM35, the operator must carry out a work site, pre-job hazard assessment to identify the safety and environmental needs. This must be done prior to commencing work and prior to recommencing work after leaving and returning to the work site. Refer to the safety procedures provided by your employer or responsible body.

7.3 Live low voltage work

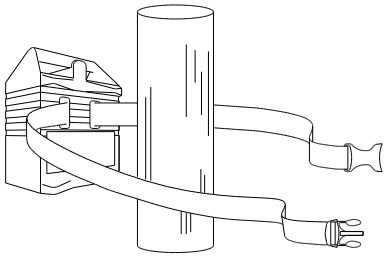
For the correct and safe use of this equipment, it is essential that all operating personnel follow appropriate safety procedures.

Check your relevant employer or responsible body's rules for working with live equipment.

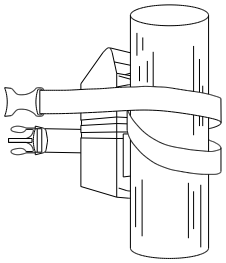
7.4 Pole Mounting

When installing a PM35 on a pole, hang the instrument in a suitable location and ensure that it is safely secured using the holster and strap provided.

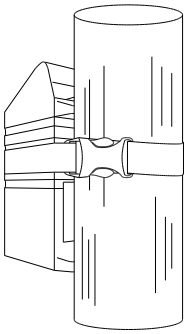
Step 1. The strap is first fed through the holster slats and wrapped around the pole.



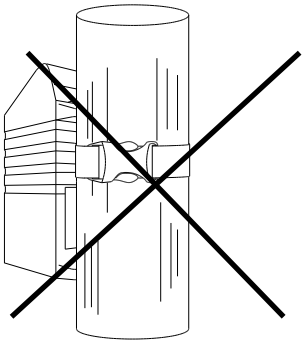
***Step 2*.** Bring the strap forward to embrace the PM35.



Step 3. Wrap the strap around the post and secure the PM35 with the quick release clip at the rear.



Do not connect the PM35 to the pole without embracing the unit with the strap, as this may weaken the holster over time.



7.5 Connecting the PM35

Connect the appropriate voltage lead to the PM35. The voltage connector is keyed. Screw up the locking ring to ensure the connector does not inadvertently become disconnected.

Connect the appropriate current probes to the PM35. These connectors are keyed. Screw on the locking rings to ensure that the connectors do not become inadvertently disconnected.

- When any voltage clamp/plug is connected to a hazardous live conductor, the other voltage clamp/plugs should also be treated as live, due to the internal measurement impedance of the PM35.
- When attaching the connectors to the PM35, ensure the connectors and receptacles on the PM35 are completely dry.

To ensure accurate power measurements, it is important that the current probes are connected to the same phases as the voltage leads. For example, the A phase voltage must be measured by the A phase voltage clamp and the A phase current probe must measure the A phase current. Current probe arrows should point to the load to ensure accurate power measurement.

Connect the current probes first, making sure that:

- They are connected to the appropriate phase
- The arrow markings point towards the load

Connect the voltage clamps in the following order:

PC4	Insert the plug in the GPO and switch it on
VL4:	Neutral, Phase C, Phase B, Phase A
VL6:	Neutral C, Phase C, Neutral B, Phase B, Neutral A, Phase A.

The PM35 is powered from the Phase A to Neutral connection, and will commence logging once the A phase connection is made. It will draw power (12 VA maximum) from the A phase.

A full set of connection diagrams is provided in section 14.

7.6 Post-installation checks

- Ensure that voltage clamps and current probes are secure and not likely to move or dislodge.
- Check that all leads are secure and will not be damaged when equipment doors are closed.
- The PM35 is powered by the A phase voltage. You must connect this phase for the PM35 to begin logging.
- Unused voltage clamps should be connected to neutral. (Do not leave the unit unattended with unconnected voltage clamps).
- Before leaving the installation site, check that the voltages and currents displayed on the LCD are reasonable.
- Check that the PM35 is logging data by checking that an asterisk is shown on the bottom right hand corner of the LCD.
- If the bottom right hand corner of the display is blank, the PM35 is NOT logging data.

7.7 Disconnecting the PM35

When any voltage clamp/plug is connected to a hazardous live conductor, the other voltage clamp/plugs should also be treated as live, due to the internal measurement impedance of the PM35

Disconnect the voltage leads in the following order:

PC4	Switch off the GPO and remove the plug
VL4:	Phase A, Phase B, Phase C, Neutral
VL6:	Phase A, Neutral A, Phase B, Neutral B, Phase C, Neutral C,

Disconnect the current probes.

8. CONFIGURING THE PM35 BEFORE USE

8.1 Introduction

The PM35 is configured using a PC running PowerView software for Microsoft Windows™. To install this software, insert the CD supplied with the PM35 into a CD drive.

If the installer does not start automatically, browse to the PowerView directory on the CD and run the PVSetup program.

Note that you must install the USB driver when the PM35 is first connected to your computer.

The USB driver must be installed for each USB port that you will use.

8.2 Connecting the PM35 to the PC

- Connect the USB data cable to the PM35.
- Connect the USB cable to one of the USB ports on the computer.
- This will power up the PM35. The operating system will then detect the PM35.
- If you have not connected the PM35 to that USB port before, you will need to install the USB driver.

8.3 PM35 Status

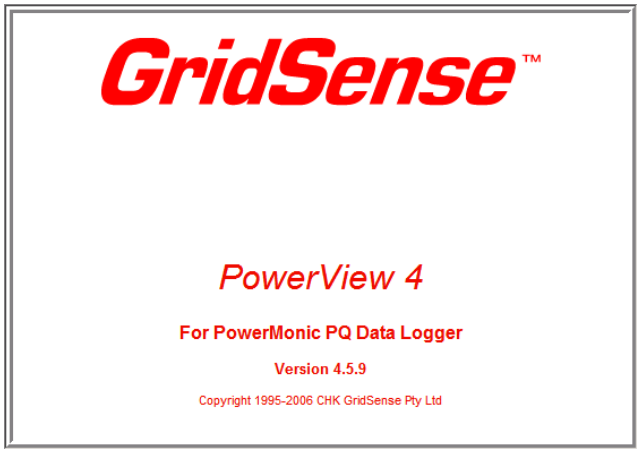
PM35 status is indicated in the bottom right hand corner of the display.

The three main modes of operation are shown as follows:

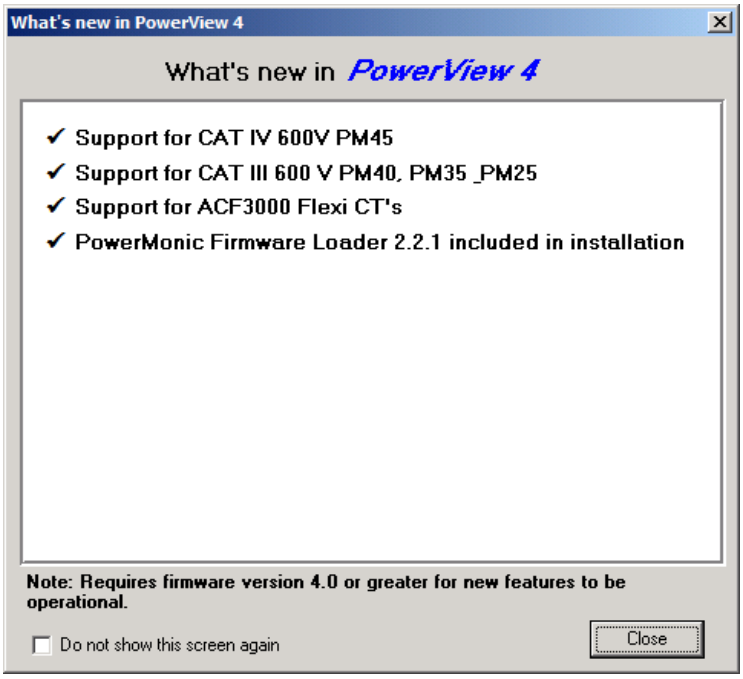
- * (asterisk) indicates that the PM35 is logging data.
- If the bottom right hand corner of the screen is blank, the PM35 is not logging data.
- P indicates that the PM35 is in power down mode. This means that no power is applied to the A channel voltage input, and the PM35 is running from the internal battery. The PM35 will shut down within 2 minutes.
- U indicates that a firmware upgrade is in progress.

8.4 Starting PowerView

Start PowerView by clicking on the desktop icon. The splash screen will appear for 5 seconds.

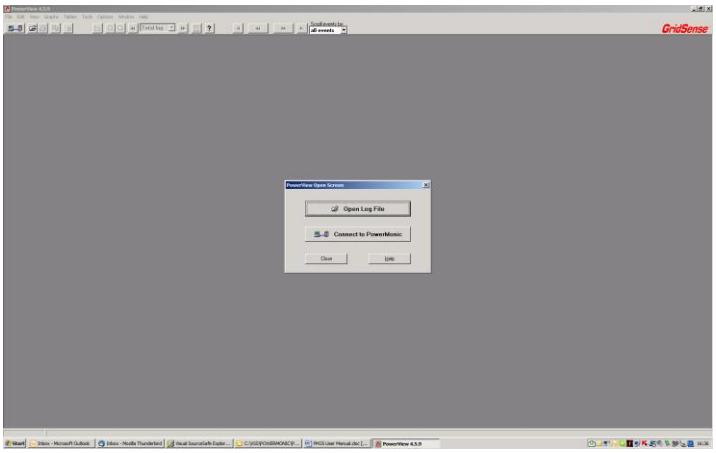


You can exit this early by clicking on the GridSense logo. If not disabled, the What's New screen will appear next.

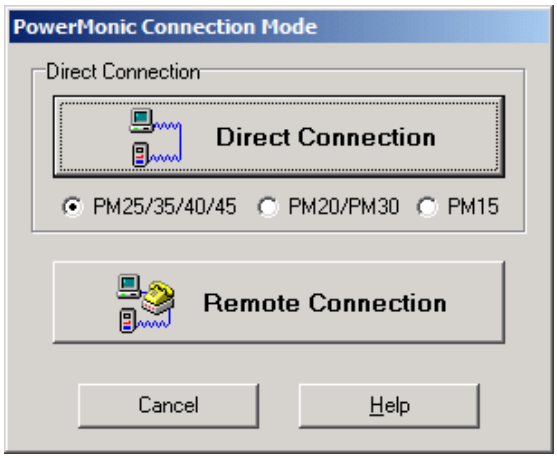


To prevent this screen from appearing again, tick the box in the the bottom left hand corner. The What's New screen can be accessed at any time from the File menu.

The next screen to appear is the PowerView Open screen.

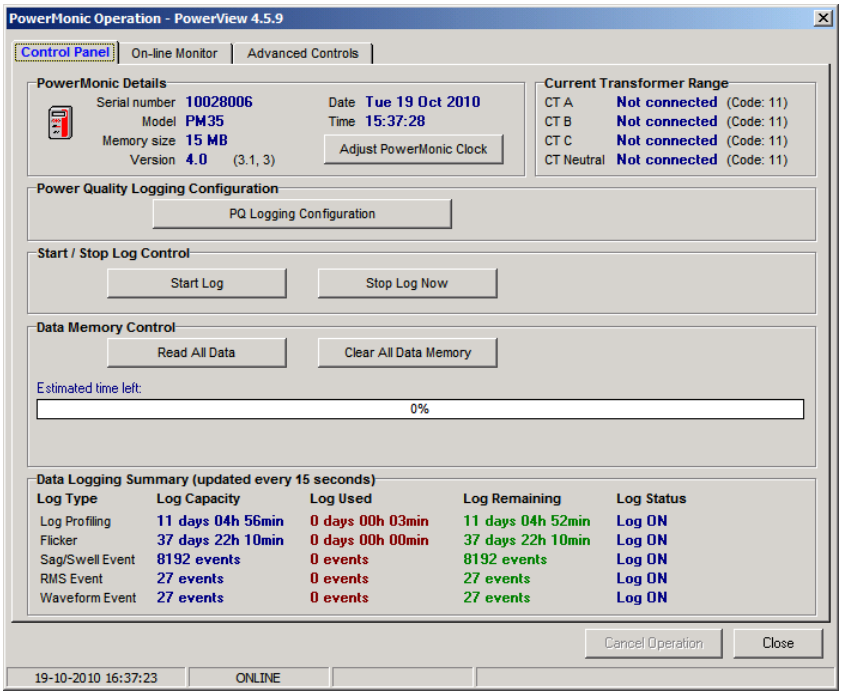


Connect to the PM35 and the Connection Mode screen will appear.

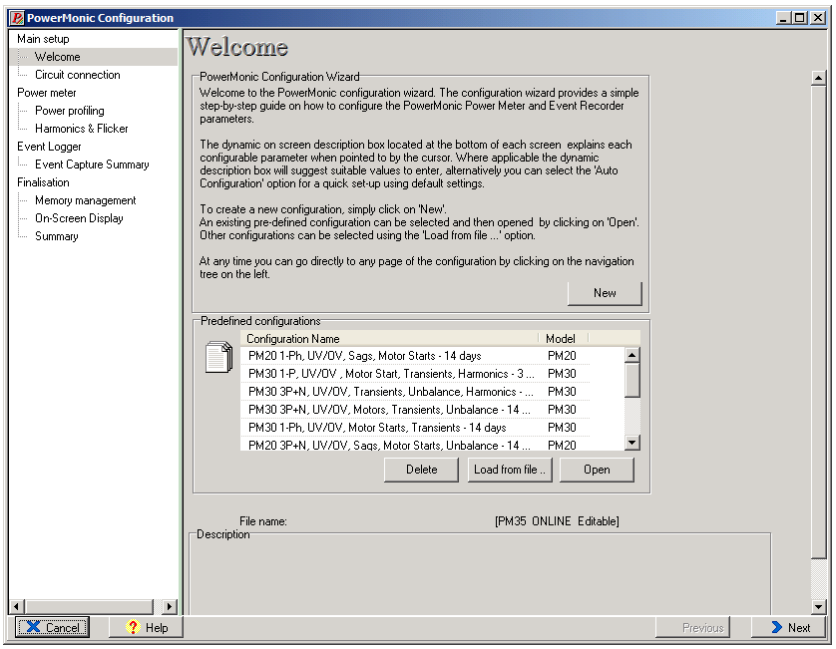


8.5 Configuring the PM35 using the Configuration Wizard

Select “PM25/35/40/45” and click on Direct Connection. The Operations Control Panel screen will appear.



Now select “PQ Logging Configuration” and the Configuration Welcome screen will appear. Note: You may be asked to update the PM35 clock, stop logging and clear the PM35 memory before you are able to configure the PM35.



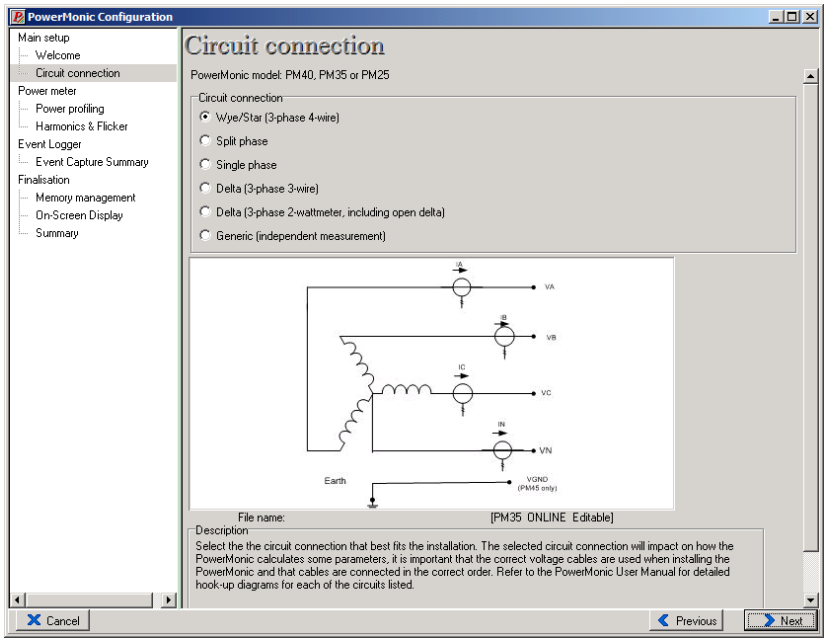
This is the first screen of the Configuration Wizard, and is divided into two panes.

The left hand pane shows the stages of the configuration process, with the current stage highlighted. This pane will change as options are selected.

Configuration options are entered into the right hand pane. At the conclusion of each option, click on the “Next” button in the bottom right hand corner. The “Previous” button allows you to return to the previous screen. The “Help” button displays contect sensitive help. The “Cancel” button allows you to exit the Configuration Wizard.

The Configuration Welcome screen allows an existing configuration file to be loaded.

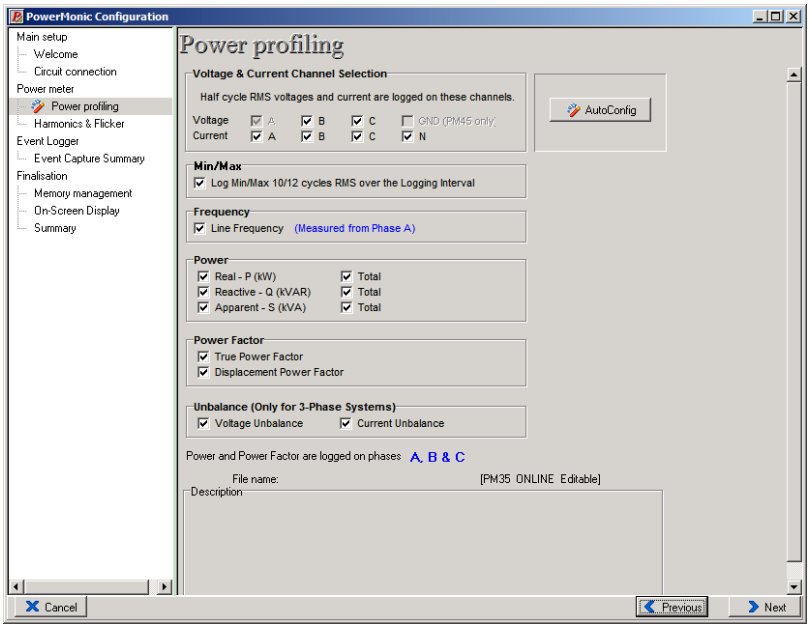
Clicking on the “Next” button brings up the Circuit Connection screen.



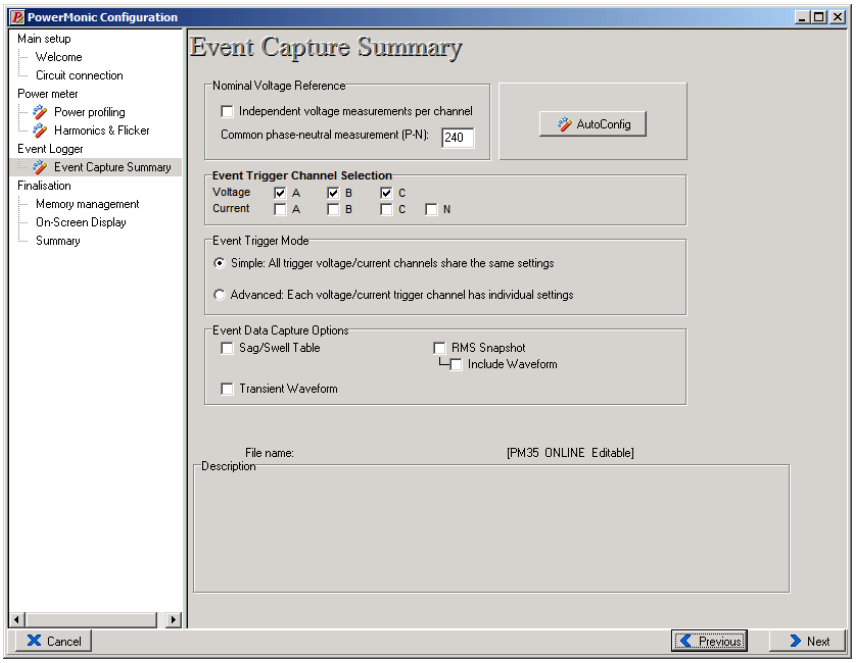
This window shows the available connection types, with details of the logged parameters for specific voltage connection leads shown in the bottom sub-pane.

Select the appropriate connection.

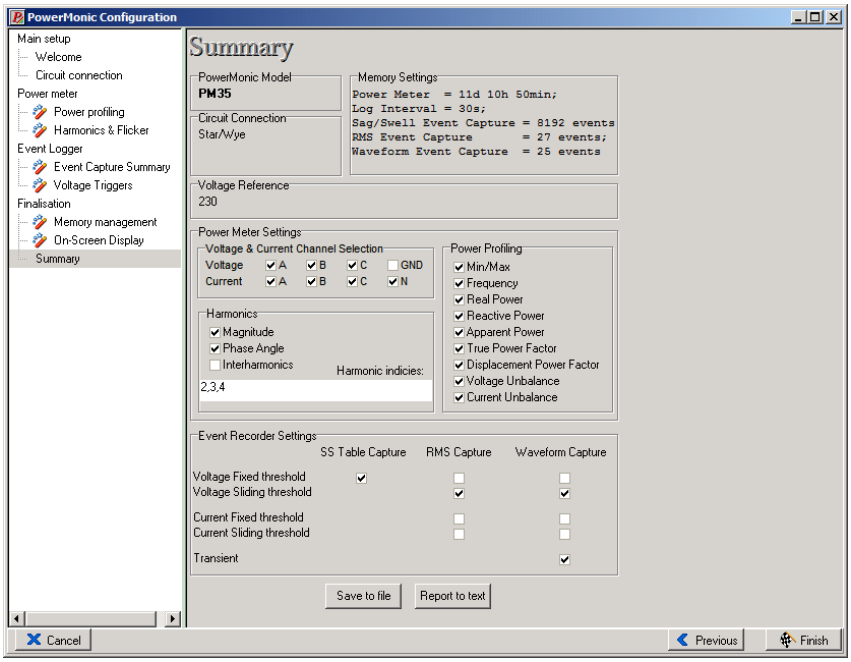
Clicking on the “Next” button brings up the Power Profiling screen.



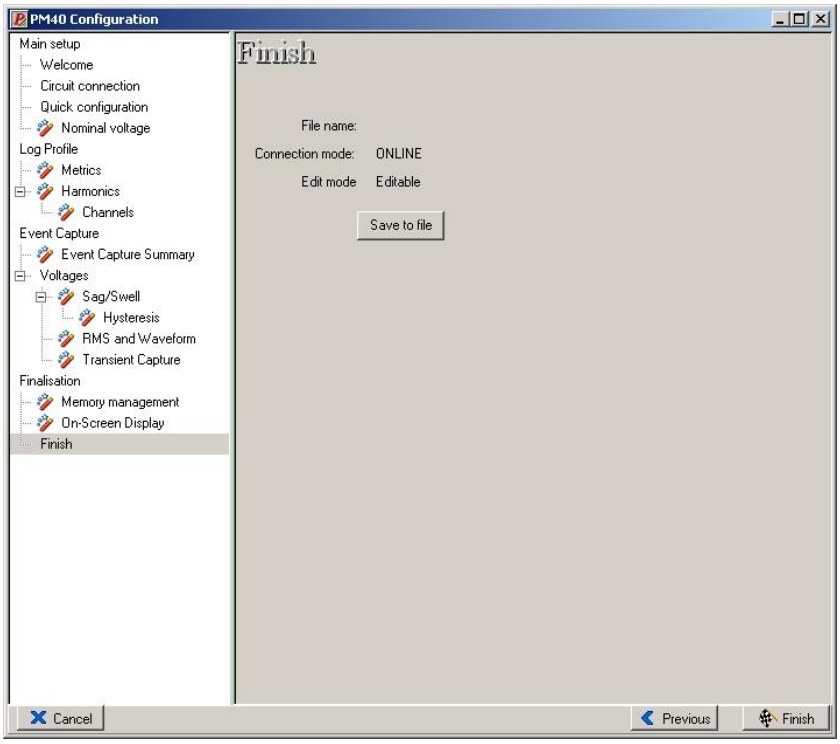
Clicking on the AutoConfig button will allow you to quickly configure the PM35 with GridSense recommended settings, and will automatically move you to the Event Capture Summary screen.



Again, clicking on the AutoCongfig button will allow you to quickly configure the PM35 with GridSense recommended settings, and will automatically move you to the Summary screen:



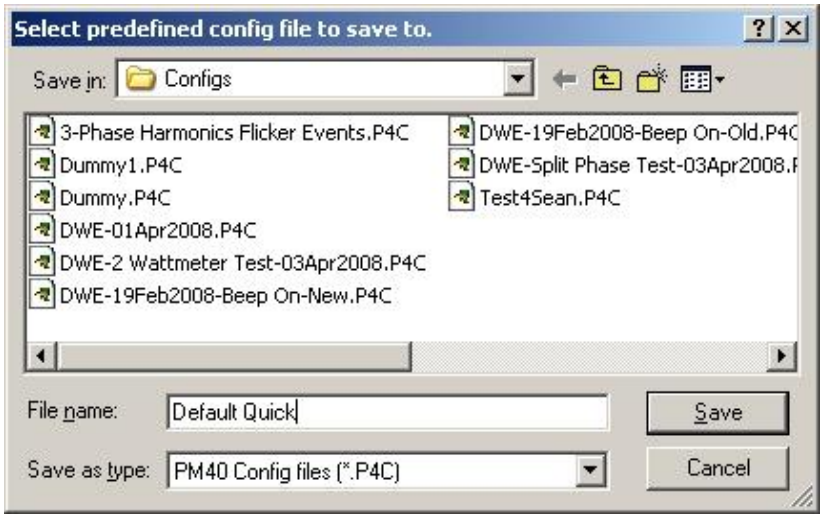
Review the configuration settings. If you need to make changes, you can use the Previous button to access earlier screens and make appropriate changes.



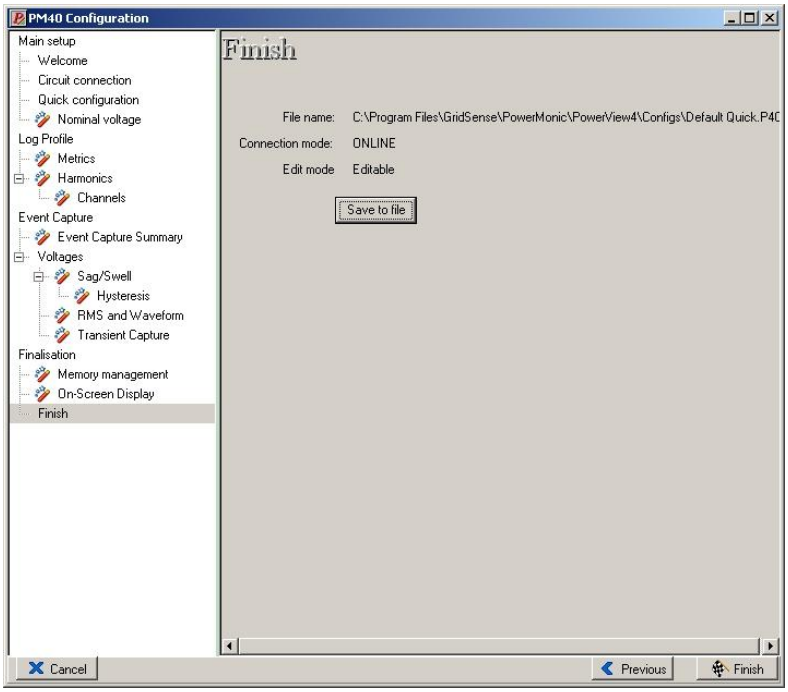
The configuration can now be saved using the “Save to File” button.

The default configuration file extension is .P4C.

A default location to save configuration files is assumed. Type a suitable name into the dialog box.

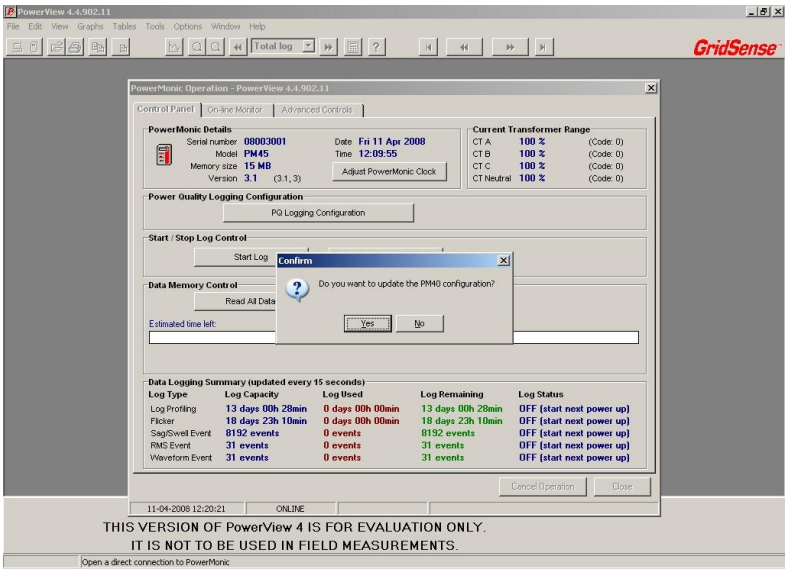


Then click on the “Save” button to save this configuration.



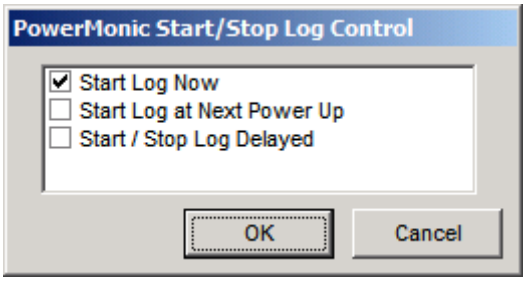
The complete path and file name will be shown.

Then click on “Finish” to exit the Configuration Wizard. This will return you to the Control Panel and bring up a dialog box asking if you want to apply this configuration to the PM35.



Click on the “Yes” button, and a confirmation screen will appear.

Click on OK to continue. Then click on the “Start Log Options” button, and select the appropriate option.

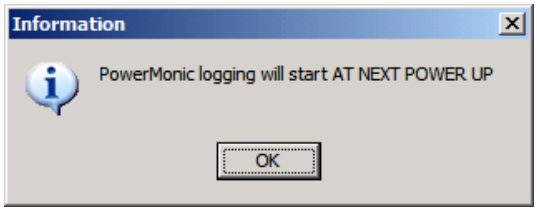


Three options are available:

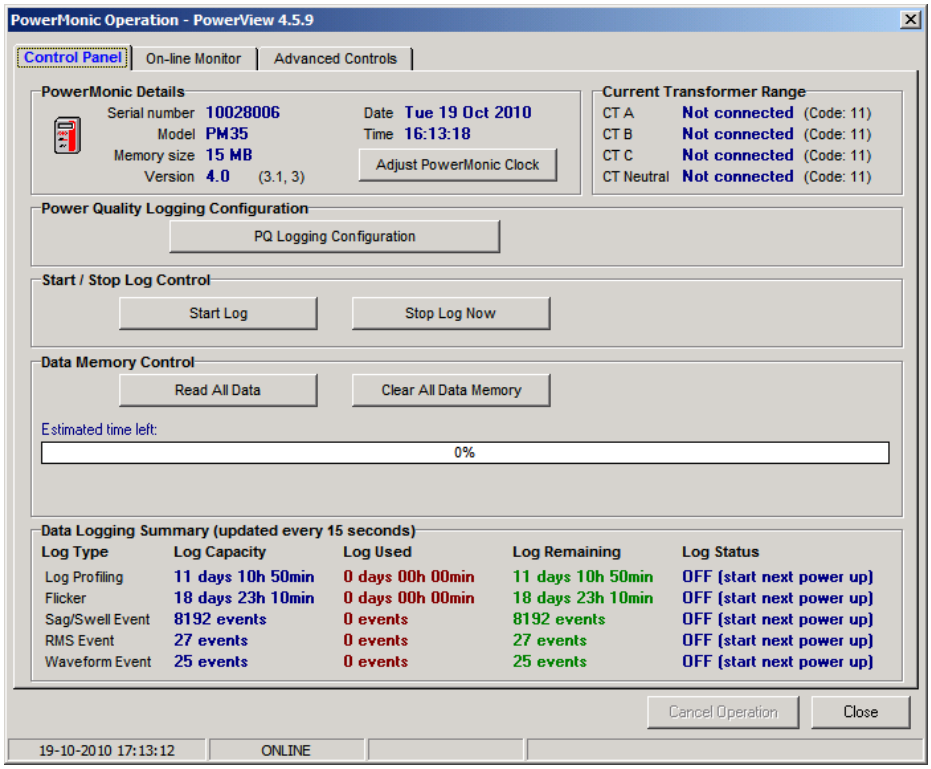
- Start logging immediately
    - If this option is selected, the PM35 will commence logging immediately.
    - This option is most useful if the configuration is being changed while the PM35 is installed and sufficient power is present at the A phase voltage input.
    - This option is unavailable (greyed out) if the PM35 is not powered up - i.e. the USB cable is connected but power is not available at the A phase voltage input.
- Start Log at Next Power Up
    - If this option is selected, the PM35 will commence logging at the next power up.
    - If the Log Interval has been configured to be less than 1 minute, the PM35 will commence logging at the start of the next minute. For example, if a 5 second log interval is configured, logging will commence at HH:MM:00.
    - If the Log Interval has been configured to be greater than 1 minute, the PM35 will commence logging when the internal clock reaches the selected Log Interval. For example, if a 15 minute Log Interval is configured, logging will commence at HH:00:00, HH:15:00, HH:30:00 or HH:45:00, whichever comes first.
    - This option is most useful if the PM35 is being configured in an office situation for later field installation.
- Start / Stop Log Delayed
    - If this option is selected, the PM35 will commence logging at the specified date and time provided sufficient power is available at the A phase voltage input.
    - If there is insufficient power at the specified date and time, the PM35 will commence logging when sufficient power is first available at the A phase voltage input after the specified date and time.

Select the “Start Log at Next Power Up” option, and click on OK. A confirmation screen will appear.

Click on “Yes” to confirm this. A small confirmation message will appear:



You will then be returned to the Control Panel Operations screen, which indicates that logging will commence on the next power up.



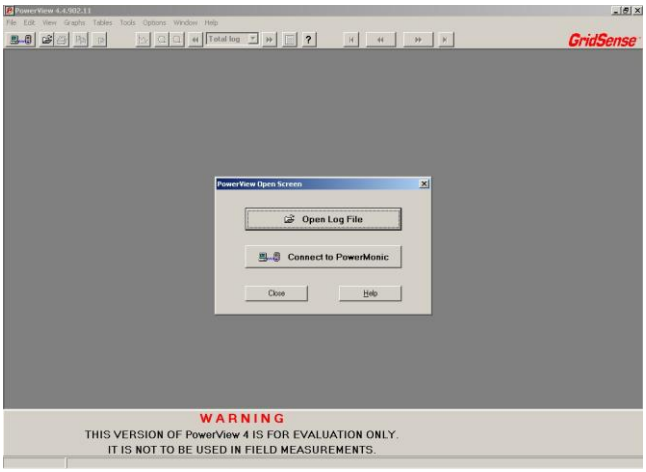
Click on “Close” to disconnect from the PM35.

Remove the data cable from the PM35.

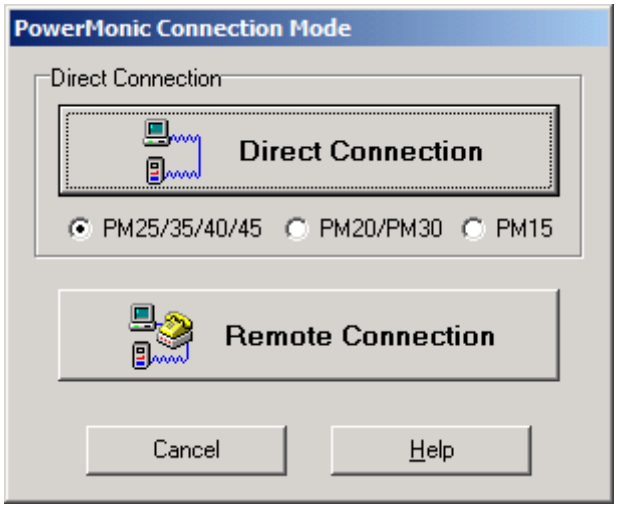
9. DOWLOADING AND VIEWING DATA

PowerView is used to download and view logged power quality data.

Run PowerView to allow communications between the PC and the PM35, via the USB data cable. Select “Connect to PowerMonic” as shown below.

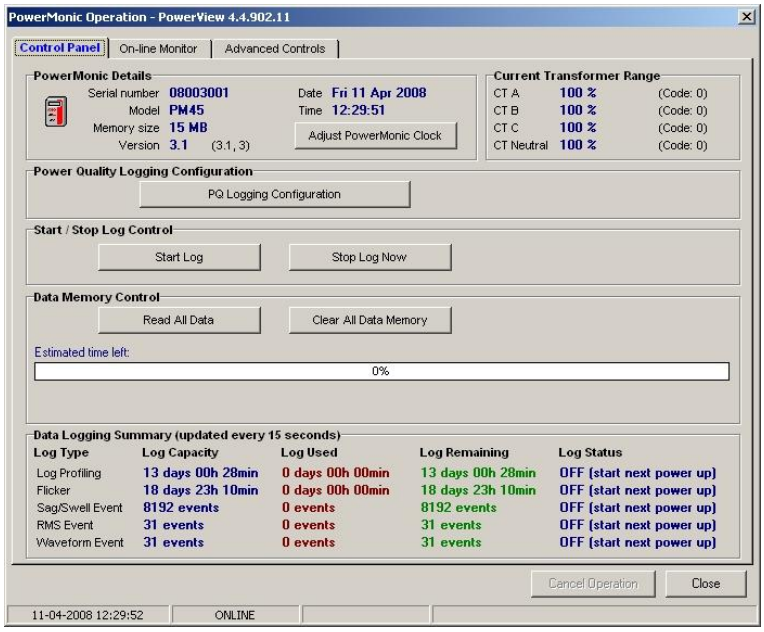


You will then see this screen:



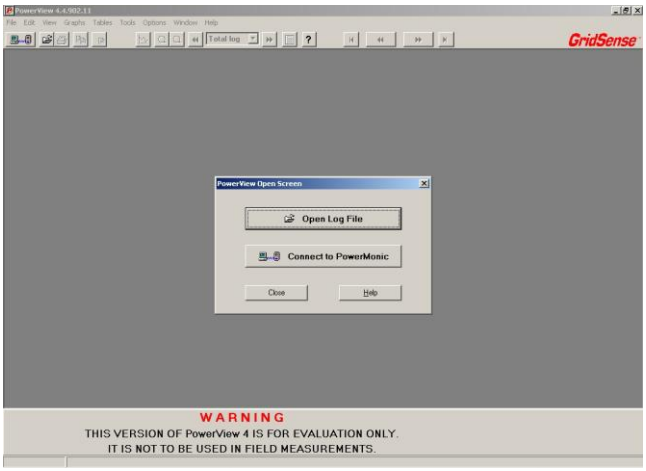
Select PM25/35/40/45 Series, then click on direct connection. You will see the following screen. To save the log data, click on “Read All Data”. You can then save the log data to a .PM4 file.

You will then be asked if you want to view the log data. GridSense recommend that the data is viewed immediately in order to verify the download integrity. If the data does not appear as expected, down load the data again, and save it with a different file name.



To view the log data you have two options:

Option 1: Run PowerView and select “Open Log File” from the following screen.



Option 2: Double click the .PM4 filename you have saved previously.

Data can be examined in both tabular and graphical form.

The configuration information of the PM35 which was used to record the data is also stored in the data file.

Tabular data can be exported in Comma Separated Variable (CSV) format, and can then be analysed in spreadsheets and other software.

10. TROUBLESHOOTING

10.6 The PM35 does not start up after applying power

When powered up, the PM35 LCD should show the instrument date/time and the log status. If the LCD remains off, check that the voltage lead is connected to the voltage connector and that the voltage lead is connected to a suitable power source.

Check the fuses on the voltage leads. Remove the voltage lead from all mains power and then disconnect the voltage lead connector from the PM35. Check the fuses using a continuity tester, referring to the voltage lead wiring diagrams provided in Section 14.10.

Note that the PM35 is powered from the A phase. At least 60 V is required for start-up.

10.7 The PM35 does not display voltage and/or current values

If the values of voltages and/or currents do not display, you must configure the PM35 to do so using the PowerView software. If this is not configured, the PM35 displays only the date/time and log status.

Log status is shown in the bottom right hand corner of the display. * means logging is in progress, P indicates power down mode, and a blank indicates that logging is not in progress. U indicates that a firmware upgrade is is progress.

10.8 The PM35 displays incorrect voltage/current values

Ensure that the voltage clamps and current probes are connected to the correct inputs and phases.

Check the connectors on the voltage lead and current probes for broken, loose, or dislodged pins. If damage is found, do not use the unit. Return the faulty unit to GridSense or your supplier.

Check the fuses on the voltage leads. Remove the voltage lead from all mains power and then disconnect the voltage lead connector from the PM35. Check the fuses using a continuity tester, referring to the voltage lead wiring diagrams provided in Section 14.10.

Check that the current probe pole faces are free of dirt or rust. Poorly-maintained current probes may cause measurement errors.

Check for faulty signal inputs on the PM35 by swapping the voltage or current inputs and checking the displayed value.

Check for faulty current probes by swapping the current inputs and checking the displayed value.

The PM35 may need recalibrating. GridSense recommends that PM35 units should be recalibrated every 12 months.

10.9 The PM35 LCD shuts down immediately after removing power

When the power is removed from the PM35 , the LCD should remain active for two minutes.

The PM35 has an internal battery that maintains power during this power-off period. This battery normally discharges gradually over time.

To recharge the internal battery, connect the PM35 to power for 24 hours. If the problem persists, the battery may need replacing and you should return the PM35 to your supplier for service.

10.10 The PM35 does not communicate with the PC using PowerView software

Check if the data cable is connected to the PM35 data connector and to the PC USB port. Check that no pins on the PM35 data cable are broken, loose, or dislodged.

Check that the PM35 is powered on and functioning. If the USB data cable is connected but the PM35 is not powered up, connect the PC4 power lead.

Check that you have installed the USB driver for the USB port you are using.

10.11 The PM35 date and time are not correct

The PM35 clock can be set using the PowerView software. The internal clock is maintained during power-off periods by an internal battery. If this is not functioning properly, return the unit to your supplier for repair.

10.12 Verifying internal battery voltages

With the PM35 powered up, the Real Time Clock (RTC) battery voltage is displayed in the bottom right of the On-line Monitor screen, as shown below.

To display the Backup battery voltage, remove the AC power from the PM35. The Backup battery voltage will be displayed during the 2 minute power down period, as shown below:

11. CHK GRIDSENSE SUPPORT SERVICES

11.1 Operational problems

If you have any questions about the operation of the PM35 or the PowerView software, first look in the User Manual or consult the on-line help file included with PowerView software.

11.2 Firmware and software upgrades

The PM35 is a complex instrument which utilises embedded firmware and PC based software (PowerView).

GridSense occasionally releases firmware upgrades for the PM35 and new versions of PowerView, and recommend that these should be installed.

Updated firmware and software can be downloaded from the GridSense web site at: http://www.gridsense.com/

11.3 Technical sales and assistance

The PM35 is manufactured by CHK GridSense Pty Ltd, Unit 3 Ground Floor, 20-36 Nancarrow Avenue, Meadowbank, NSW 2114. If you are experiencing any technical problems, or require any assistance with the proper use or application of this instrument, please call our technical hotline:

NORTH AMERICA		OTHER COUNTRIES	
Phone:	**+1 916 372 4945**	**Phone:**	**+61 2 8878 7700**
Fax:	**+1 916 372 4948**	**Fax:**	**+61 2 8878 7788**
Email:	**support_na@gridsense.com**	**Email:**	**support@gridsense.com**
Web:	**http://www.gridsense.com/**	**Web:**	**http://www.gridsense.com/**

11.4 Calibration

To guarantee that your instrument complies with factory specifications, we recommend that the PM35 be submitted for recalibration to our factory service center at a minimum of one-year intervals.

Return the PM35, including all accessories (current probes and voltage leads etc) to:

NORTH AMERICA	OTHER COUNTRIES
GridSense Inc	CHK GridSense Pty Ltd
2568 Industrial Blvd	Unit 3 Ground Floor
Suite 110	20-36 Nancarrow Avenue
West Sacramento CA 95691	Meadowbank NSW 2114
USA	AUSTRALIA

12. POWERMONIC PM35 SPECIFICATIONS

	Voltage	Current
Input Channels	3 (isolated)	4
Measuring Range (RMS)	A, B & C channels: 0-600 VAC	0-3000 Amp
Frequency Range	50Hz nominal (42.5Hz - 57.5Hz) 60Hz nominal (51.0Hz – 69.0Hz)	50Hz nominal (42.5Hz - 57.5Hz) 60Hz nominal (51.0Hz – 69.0Hz)
Instrument Accuracy	A, B & C channels: ±0.4% reading ±1 lsd	±0.4% reading ±1 lsd
System Accuracy	±0.4% reading ± 1 lsd	1% reading ±1lsd (0.5M Current probes)
Resolution Logged Data	0.01 Volt	0.01 Amp
Resolution Display	0.1 Volt	0.1 Amp
Instrument Type	Class B (IEC 61000-4-30)	
Samples / Cycle	204 @ 50Hz, 170 @60Hz	
Samples rate	PLL synchronised	
Logged Parameters	IEC61000-4-30 V, A, Min/Max, Freq, TPF, DPF, kW, KVA, kVAR	
Frequency	IEC61000-4-30 (+/- 0.02Hz)	
Total Harmonic Distortion	IEC61000-4-7 (THD-F & THD-R)	
Harmonics	IEC61000-4-7 (Up to 48th, Magnitudes & Angles)	
Interharmonics	IEC61000-4-7 (Up to 48th)	
Flicker (Pst & Plt)	IEC61000-4-15 (10min Pst, 2hr Plt, logged every 10min)	
Voltage & Current Unbalance	IEC61000-4-30	
Waveform Capture	Duration: 400ms Triggers: Half Cycle RMS, dV/dt	
RMS Capture	Half Cycle RMS 50Hz - 5s to 30s configurable 60Hz - 5s to 25s configurable	
Sag / Swell Capture	Half Cycle RMS	
Circuit Connections	Star/Wye, Delta, Delta, Split Phase, Single Phase, Generic Independent Measurement.	

MECHANICAL & POWER

Display	Graphic LCD 128 x 64bits
Memory	15MB FLASH
Communications	USB1.1 for Local operation
Power Consumption	Maximum 12 VA (10 W typical) from Phase A
Power Source Main	Phase A to Neutral 60 – 520 Volts AC 50 or 60 Hz
Power Source Backup	6 V 0.5 Ah Rechargeable Sealed Lead Acid (not user replaceable)
RTC Battery	3 V 950 mAh Li-Manganese Dioxide / Organic Electrolyte (not user replaceable)
Dimensions	230 mm (l) x 120 mm (w) x 90 mm (d) or 9.1” (l) x 4.72” (w) x 3.6” (d)
Weight	3 kg (7 lbs) instrument only, 7kg (16 lbs) typical with accessories in carry case

ENVIRONMENTAL & SAFETY

Ambient Temperature	-20°C to +60°C (-4°F to +130°F). Note: standby battery is disabled when ambient temperature exceeds +45°C (113°F)
Protection Class	AS 60529-2004 - IP65

ABSOLUTE MAXIMUM RATINGS

Nominal AC Phase to Phase Voltage	**520 Volts**
Nominal AC Phase to Neutral Voltage	**520 Volts**
Nominal AC Phase to Ground (earth) Voltage	**300 Volts**

Note: voltage specifications allow for a mains voltage tolerance of ± 10% of nominal.

13. ACCESSORY SPECIFICATIONS

13.1 Voltage leads

Cat. No.	PC4	VL4	VL6 (optional accessory)
Termination	3 pin Australian GPO plug	Fused clamps	Fused clamps
No of channels	1	3	3
No of wires	1	4 (Phase A, Phase B, Phase C & Neutral)	6 (Phase A, Neutral A, Phase B, Neutral B, Phase C, Neutral C)
Length from connector	2 m	2 m	2 m
Maximum span	Not applicable	1.5 m	1.5 m
Current rating	0.2A ~	0.2A ~	0.2A ~
Fuses		2A High rupture capacity (HRC)	2A High rupture capacity (HRC)

13.2 Current Probes

Cat. No.	CR100S (optional accessory)	CR100 (optional accessory)	CR500 (optional accessory)	CR1000 (optional accessory)	CF3000 (optional accessory)
Input Range	0 – 100 A	0 – 100 A	0 – 500 A	0 – 1000 A	0 – 3000 A
Output Range	200 mA at full scale	200 mA at full scale	200 mA at full scale	200 mA at full scale	100 uV per A at 50 Hz 120 uV per A at 60 Hz
Accuracy Class	2M	2M	2M	2M	2M
Window size	15 mm x 15 mm	52 mm dia. circle	52 mm dia. circle	52 mm dia. circle	100 mm x 128 mm

Note: Accessory part numbers have additional suffix “-2” for USA region.

14. CIRCUIT CONNECTIONS

The table below provides a summary of the circuit connections suitable for use with the PM35.

The table highlights which voltage lead assembly can be used, the voltage connection type and Nominal RMS Voltage settings used in the PM35 configuration parameters.

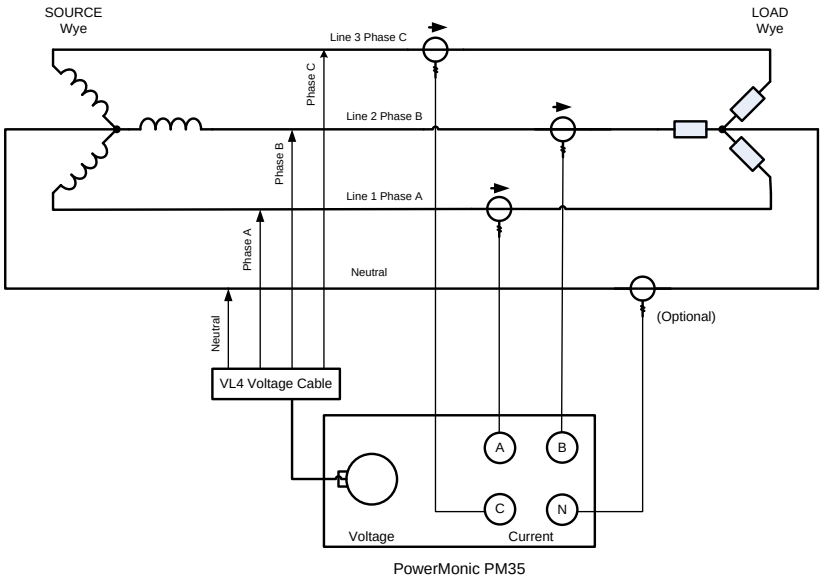
Detailed connection diagrams for each circuit are found on the following pages.

Ref.	Source Type	Load Type	Voltage Cable	Voltage Connection	Nominal Voltage
14.1	3 Phase, 4 Wire (Wye)	Star (Wye)	VL4, VL6	Star (Wye)	Phase-Neutral
14.2	3 Phase, 3 Wire, 3 WattMeter (Delta)	Delta	VL6	Delta	Phase-Phase
14.3	3 Phase, 3 Wire, 2 WattMeter (Delta)	Delta	VL6	Delta	Phase-Phase
14.4	Split Phase	2 Single Phase	VL4, VL6	Star (Wye)	Phase-Neutral
14.5	Single Phase	Single Phase	PC4, VL4, VL6	Start (Wye)	Phase-Neutral
14.6	Generic	3 Single Phase	VL6	Star (Wye)	Phase-Neutral
14.7	3 Phase, 3 Wire (Wye)	Delta	VL6	Delta	Phase-Phase
14.8	3 Phase, 3 Wire (Wye)	3 Single Phase	VL6	Delta	Phase-Phase
14.9	Delta Mid-Tap	2 Single Phase	VL4, VL6	Star (Wye)	Phase-Neutral

The circuit connections fall into two categories:

- **Neutral line connection**. This includes connections 14.1, 14.4, 14.5, 14.6 and 14.9. The phase-neutral voltages and line currents are measured.
- **Non-neutral line connection**. This includes connections 14.2, 14.3, 14.7 and 14.8. The phase-phase voltages and line currents are measured. The phase-phase voltages are converted to phase-neutral voltages and processed so that the centre of the phase-phase voltage triangle becomes the neutral point. This conversion is done point by point in the time domain so there is no assumption that the three-phase system is balanced.

14.1 Three-Phase 4-Wire Wye Source with Wye Load



Connection Diagram using 4-Wire Voltage Cable (VL4)

Circuit Summary Source	3-Phase Star/Wye
Load	Star/Wye
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

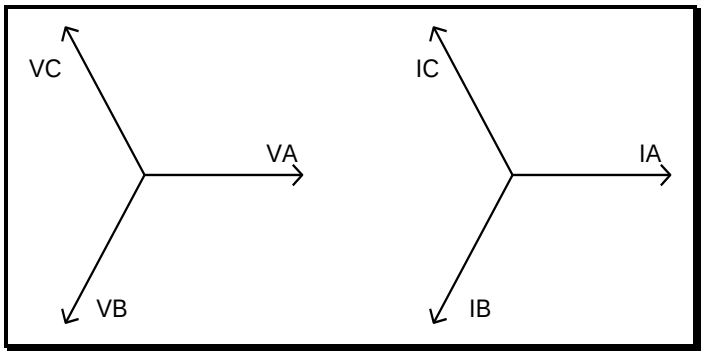
Voltage Lead Connection for VL5 or VL5-2

Wire Label	**Connection Point**
Phase A	Phase A
Phase B	Phase B
Phase C	Phase C
Neutral	Neutral

Voltage Lead Connection for VL6

Wire Label	**Connection Point**
Phase A	Phase A
Neutral A	Neutral
Phase B	Phase B
Neutral B	Neutral
Phase C	Phase C
Neutral C	Neutral

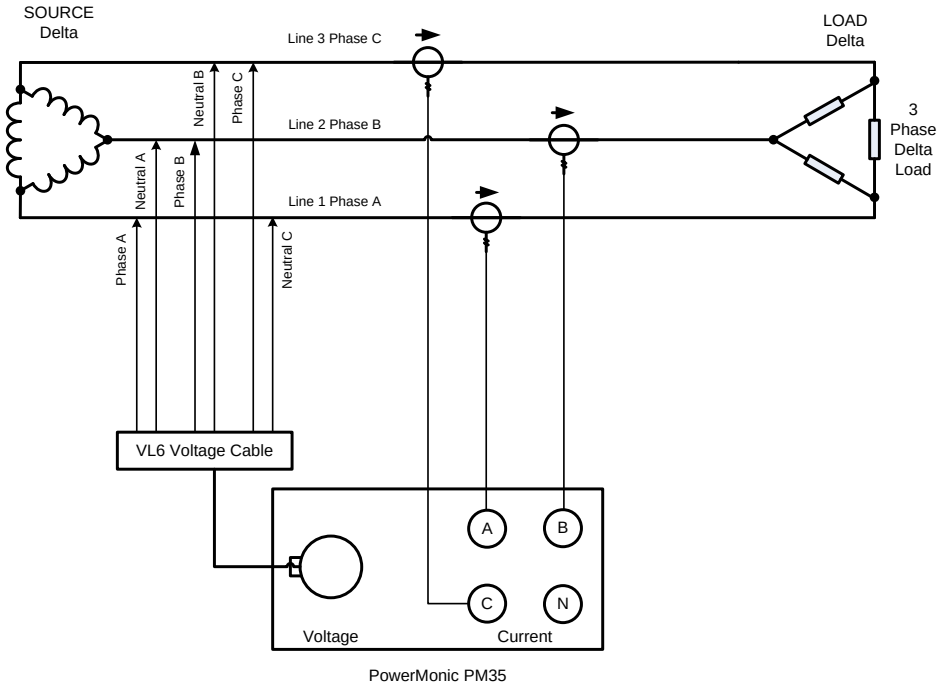
Phasor Diagram



Notes:

- This connection should be configured as Star/Wye (3-phase, 4-wire) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.2 Three-Phase 3-Wire Delta Source with Delta Load



Connection Diagram using 6-Wire Voltage Cable (VL6)

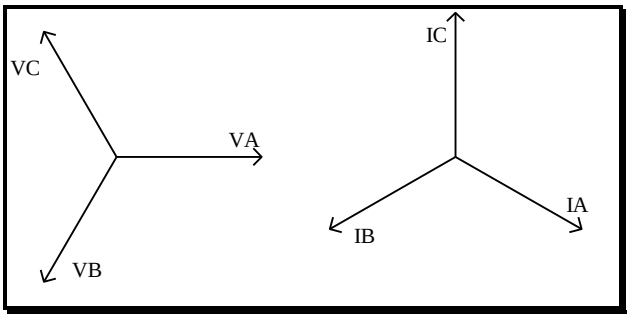
Circuit Summary Table

Source	3-Phase Delta
Load	Delta
Connection	Delta
Nominal RMS Voltage	Phase-Phase

Voltage Lead Connection for VL6

Wire Label	**Connection Point**
Phase A	Phase A
Neutral A	Phase B
Phase B	Phase B
Neutral B	Phase C
Phase C	Phase C
Neutral C	Phase A

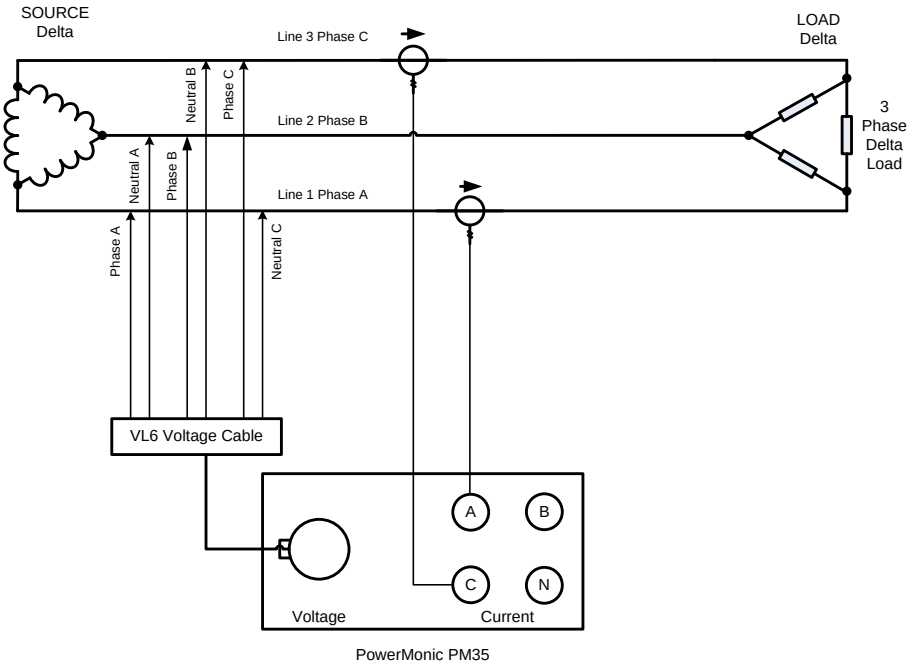
Phasor Diagram



Notes:

- This connection should be configured as Delta (3-phase, 3-wire) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.3 Three-Phase 2-WattMeter Delta Source with Delta Load – Standard



Connection Diagram using 6-Wire Voltage Cable (VL6)

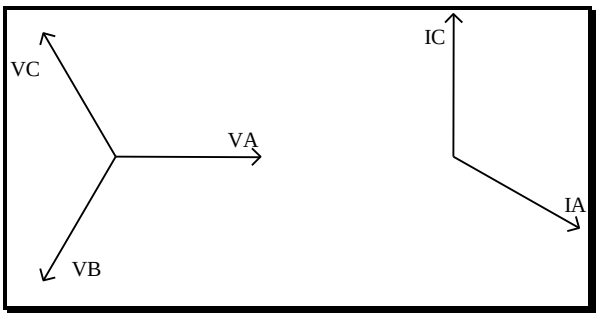
Circuit Summary Table

Source	3-Phase Delta
Load	Delta
Connection	Delta
Nominal RMS Voltage	Phase-Phase

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Phase A
Neutral A	Phase B
Phase B	Phase B
Neutral B	Phase C
Phase C	Phase C
Neutral C	Phase A

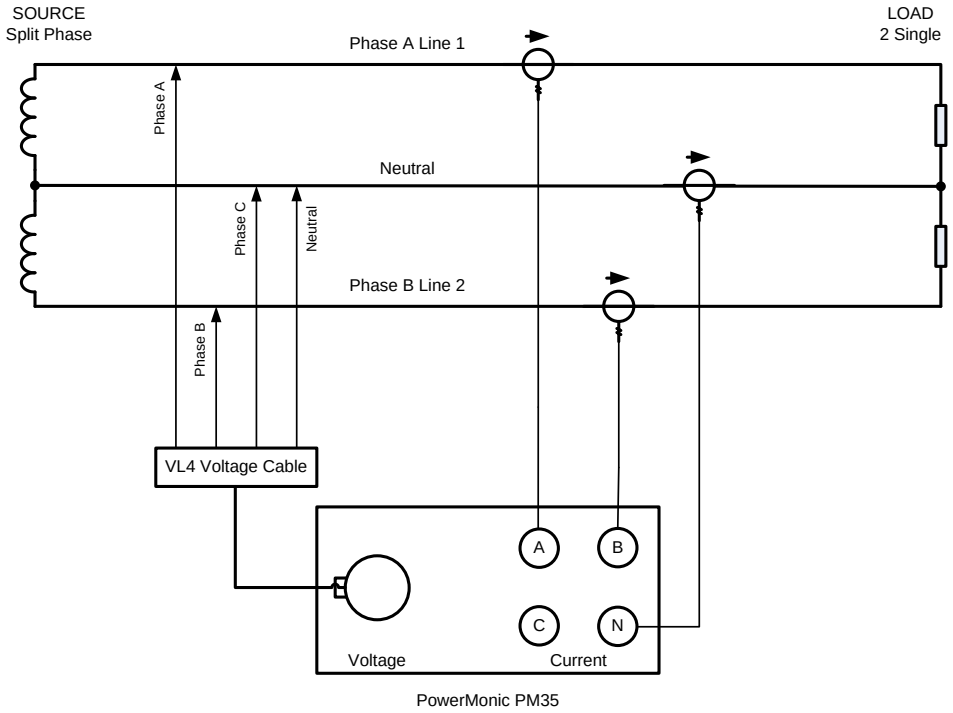
Phasor Diagram



Notes:

- This connection should be configured as Delta (3-phase, 2-wattmeter) in PowerView.
- The same type of Current probes should be used for Phase A and Phase C.
- For a system with only two loads connected, configure the PM35 as Delta (3-phase, 2-wattmeter) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.4 Split Phase with 2 Single Phase Loads



Connection Diagram using 4-Wire Voltage Cable (VL4)

Circuit Summary Table

Source	Split Phase
Load	2 Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

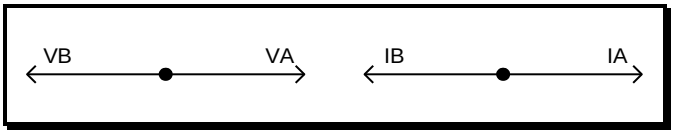
Voltage Lead Connection for VL4

Wire Label	Connection Point
Phase A	Phase A
Phase B	Phase B
Phase C	Neutral
Neutral	Neutral

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Phase A
Neutral A	Neutral
Phase B	Phase B
Neutral B	Neutral
Phase C	Neutral
Neutral C	Neutral

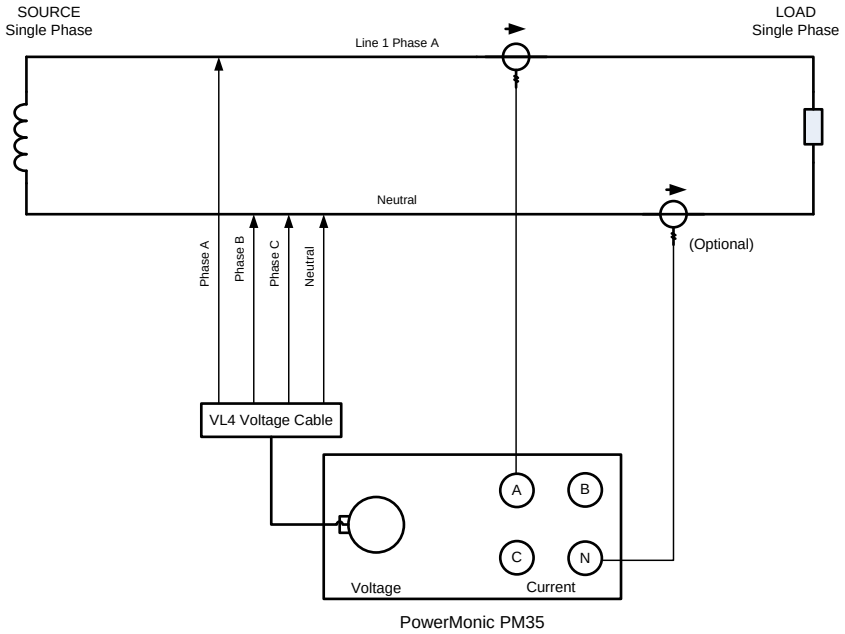
Phasor Diagram



Notes:

- This connection should be configured as Split Phase in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.5 Single Phase



Connection Diagram using 4-Wire Voltage Cable (VL4)

Circuit Summary Table

Source	Single Phase
Load	Single Phase
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

Voltage Lead Connection for VL4

Wire Label	Connection Point
Phase A	Phase A
Phase B	Neutral
Phase C	Neutral
Neutral	Neutral

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Phase A
Neutral A	Neutral
Phase B	Neutral
Neutral B	Neutral
Phase C	Neutral
Neutral C	Neutral

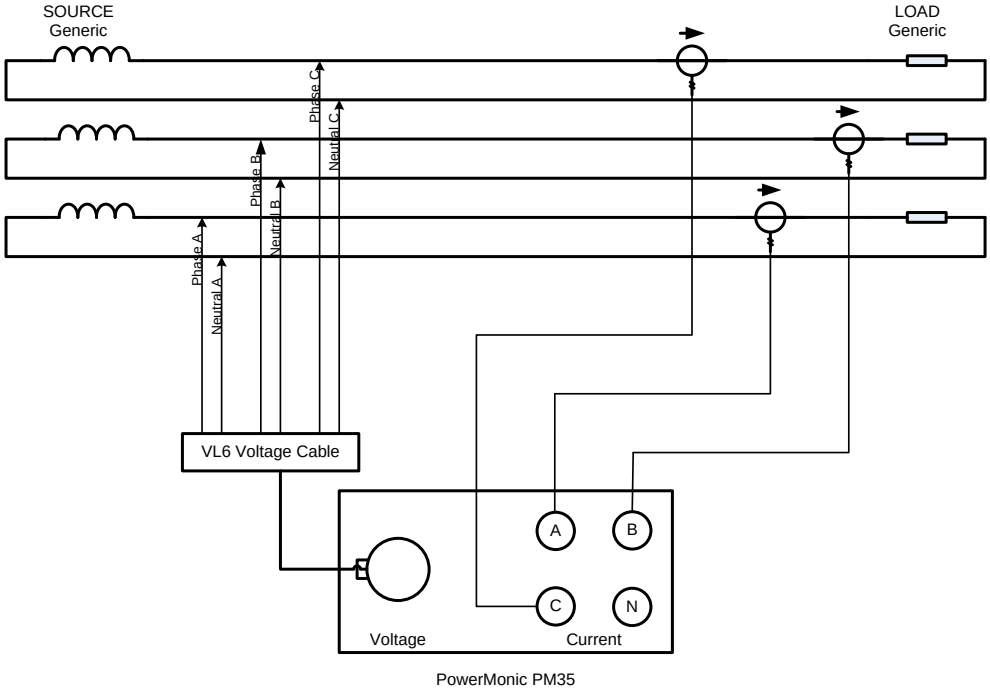
Note: The PC4 may also be used to log A phase voltages.

Phasor Diagram

Notes:

- this connection should be configured as Single Phase in PowerView.
- The return current on the neutral is the same as the Phase A current.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.6 Generic, 3 Independent Circuits



Connection Diagram using 6-Wire Voltage Cable (VL6)

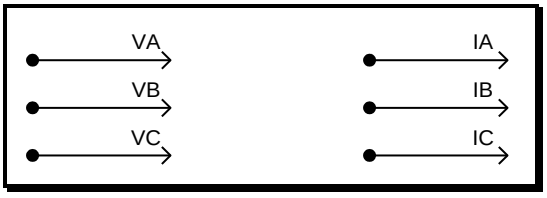
Circuit Summary Table

Source	Generic
Load	4-Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Active 1
Neutral A	Neutral 1
Phase B	Active 2
Neutral B	Neutral 2
Phase C	Active 3
Neutral C	Neutral 3

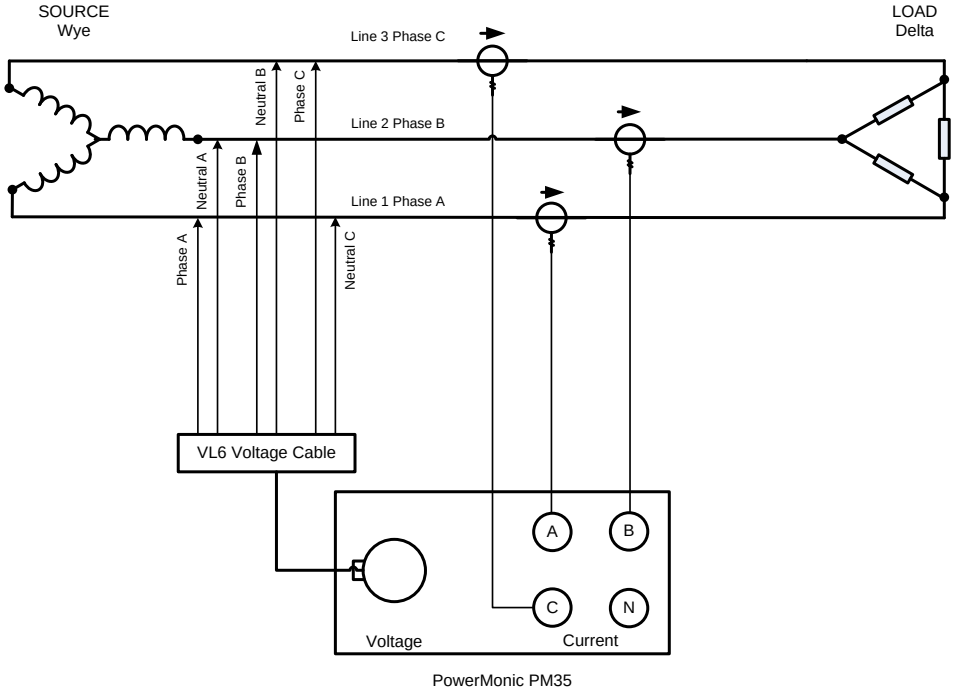
Phasor diagram



Notes

- This connection should be configured as Generic (independent measurement) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.7 Three-Phase 4-Wire Wye Source with Delta Load



Connection Diagram using 6-Wire Voltage Cable (VL6)

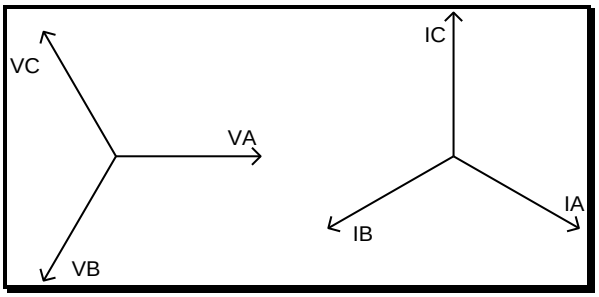
Circuit Summary Table

Source	3-Phase Star/Wye
Load	Delta
Connection	Delta
Nominal RMS Voltage	Phase-Phase

Voltage Lead Connection VL6

Wire Label	**Connection Point**
Phase A	Phase A
Neutral A	Phase B
Phase B	Phase B
Neutral B	Phase C
Phase C	Phase C
Neutral C	Phase A

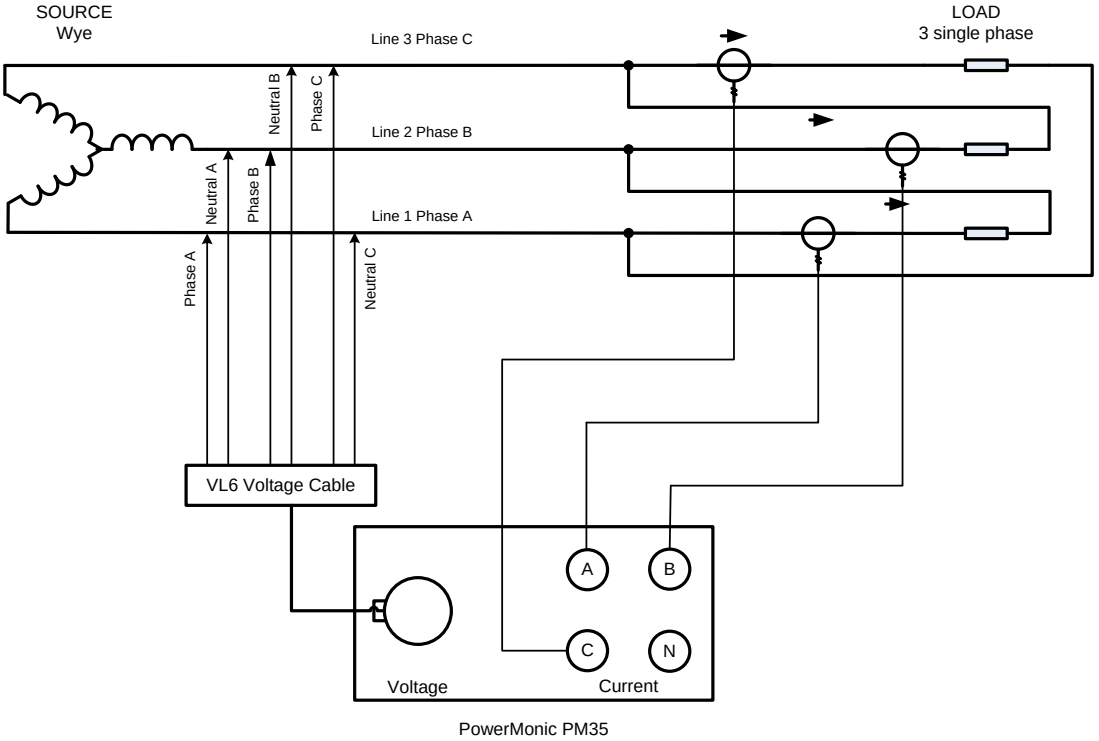
Phasor Diagram



Notes:

- This connection should be configured as Delta (3-phase, 3-wire) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.8 Three-Phase 4-Wire Wye Source with 3 Single Phase Loads



Connection Diagram using 6-Wire Voltage Cable (VL6)

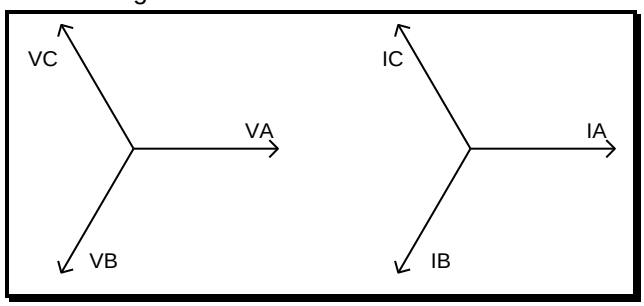
Circuit Summary Table

Source	3-Phase Star/Wye
Load	3 Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase-Phase

Voltage Lead Connection VL6

Wire Label	Connection Point
Phase A	Phase A
Neutral A	Phase B
Phase B	Phase B
Neutral B	Phase C
Phase C	Phase C
Neutral C	Phase A

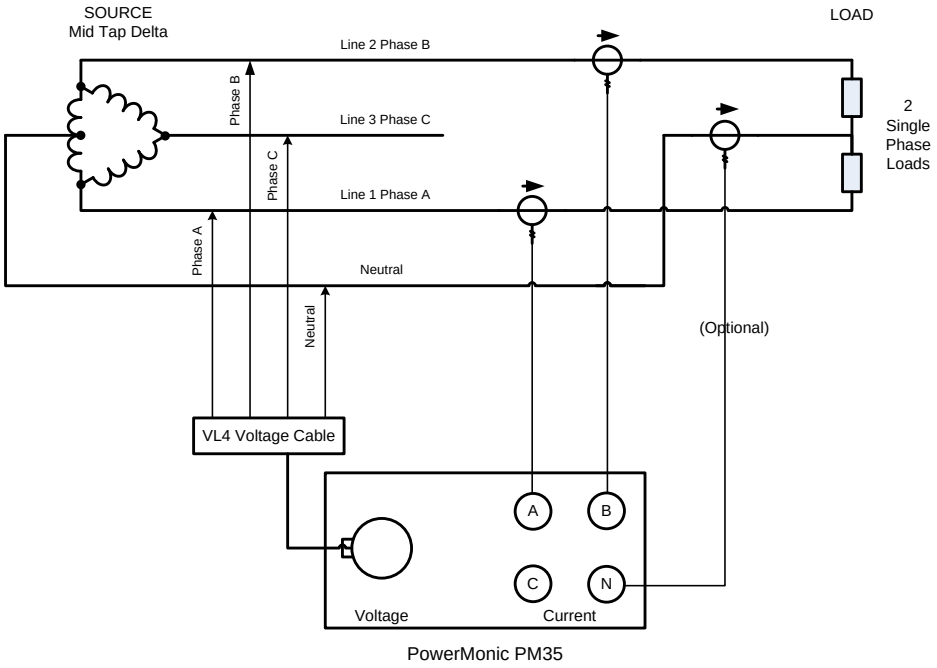
Phasor Diagram



Notes:

- This connection should be configured as Generic (independent measurement) in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.9 Delta Mid-Tap Source with 2 Single Phase Loads



Connection Diagram using 4-Wire Voltage Cable (VL4)

Circuit Summary Table

Source	Delta Mid Tap
Load	2 Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

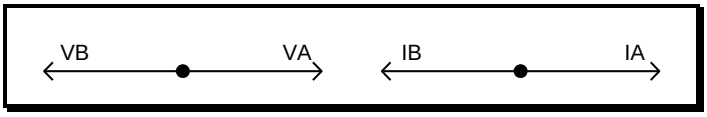
Voltage Lead Connection for VL4

Wire Label	Connection Point
Phase A	Phase A
Phase B	Phase B
Phase C	Neutral
Neutral	Neutral

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Phase A
Neutral A	Neutral
Phase B	Phase B
Neutral B	Neutral
Phase C	Neutral
Neutral C	Neutral

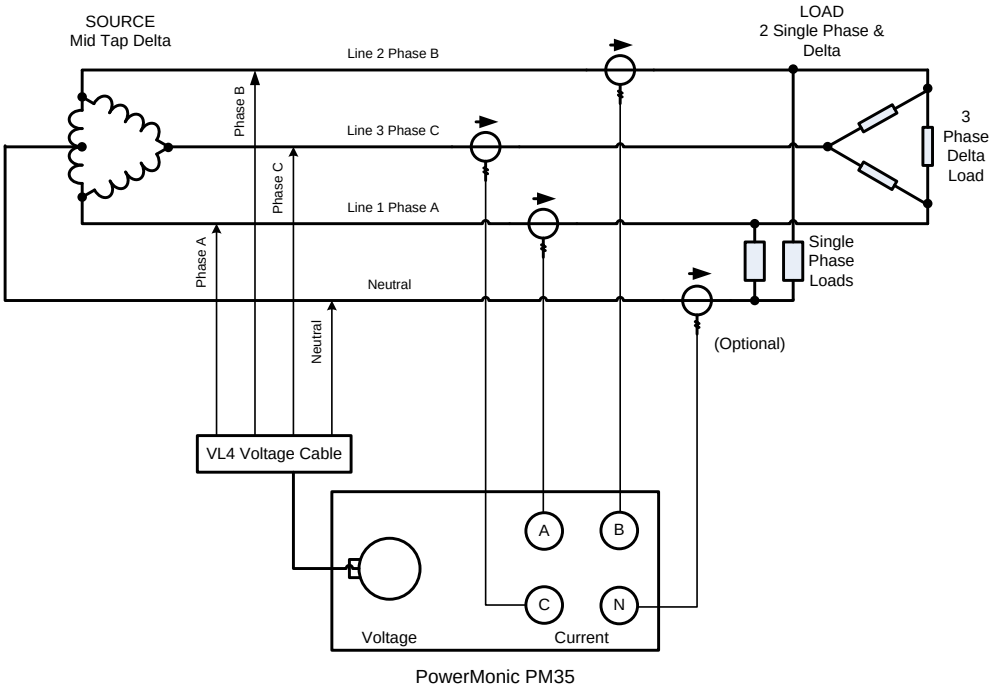
Phasor Diagram



Notes:

- This connection should be configured as Split Phase in PowerView.
- Channel N can be used for neutral current.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.10 Delta Mid-Tap Source with Delta Load and 2 Single Phase Loads (VL4 voltage cable)



Connection Diagram using 4-Wire Voltage Cable (VL4)

Circuit Summary Table

Source	Delta Mid Tap
Load	Delta & 2 Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase A - Neutral

Voltage Lead Connection for VL4

Wire Label	Connection Point
Phase A	Line 1 Phase A
Phase B	Line 2 Phase B
Phase C	Line 3 Phase C
Neutral	Neutral

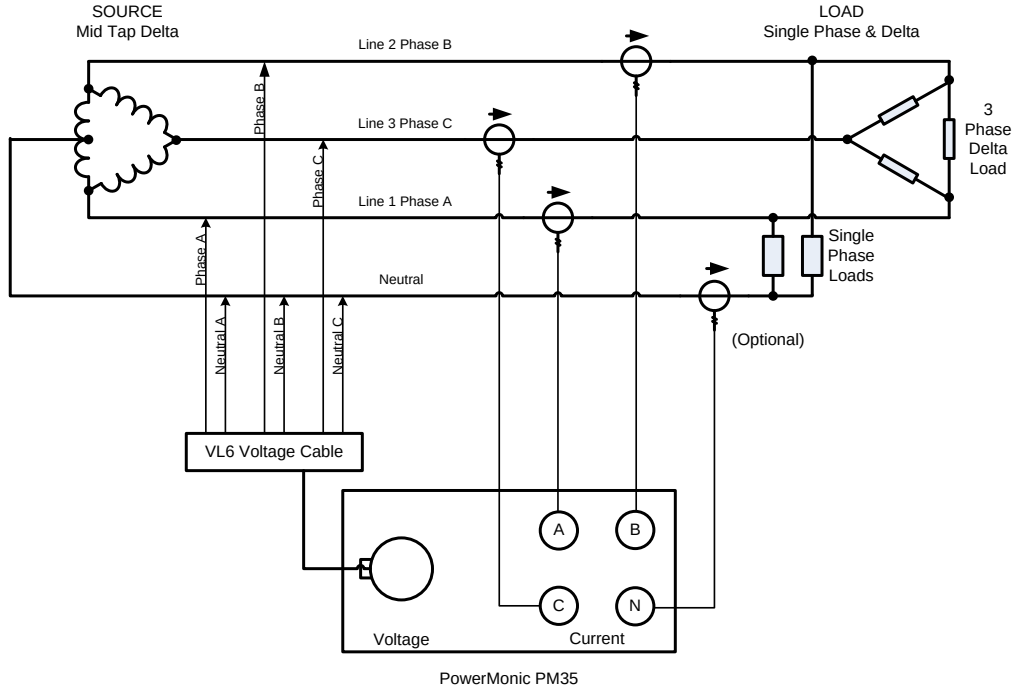
Phasor Diagram

(Not provided as the 2 single phase loads in combination with the Delta load make an unbalanced system)

Notes:

- This connection should be configured as Wye/Star in PowerView.
- Power calculations will be correct for total power only.
- Channel N can be used for neutral current.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.11 Delta Mid-Tap Source with Delta Load & 2 Single Phase Loads (VL6 Voltage cable)



Connection Diagram using 6-Wire Voltage Cable (VL6)

Circuit Summary Table

Source	Delta Mid Tap
Load	Delta & 2 Single Phases
Connection	Star/Wye
Nominal RMS Voltage	Phase-Neutral

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Line 1 Phase A
Neutral A	Neutral A
Phase B	Line 2 Phase B
Neutral B	Neutral B
Phase C	Line 3 Phase C
Neutral C	Neutral C

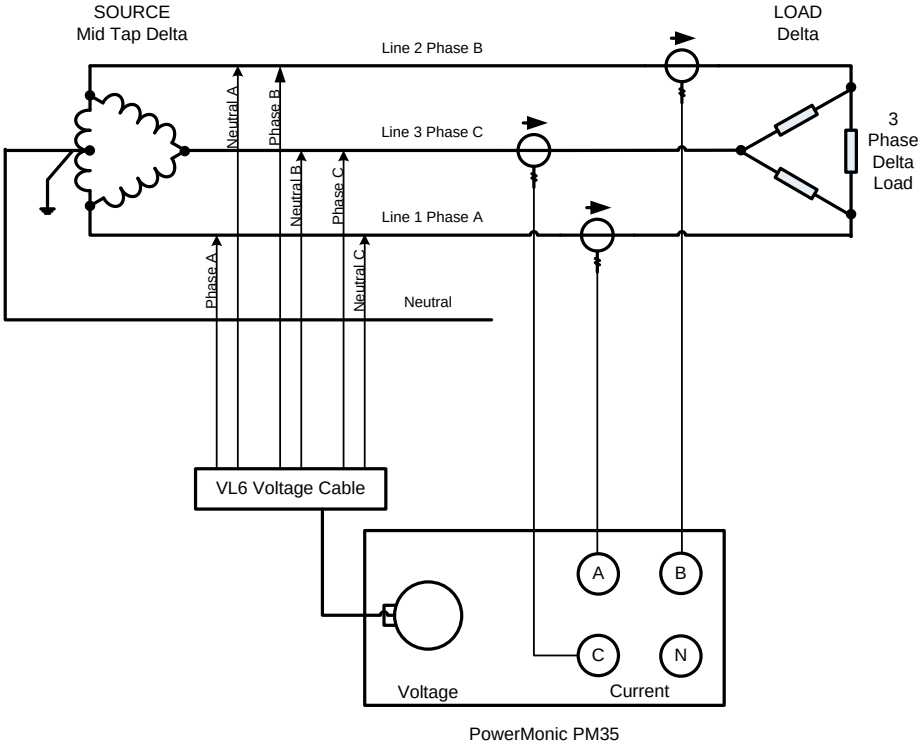
Phasor Diagram

(Not provided as the 2 single phase loads in combination with the Delta load make an unbalanced system)

Notes:

- This connection should be configured as Wye/Star in PowerView.
- Power calculations will be correct for total power only.
- Channel N can be used for neutral current.
- Current probe arrows should point to the load to ensure accurate power measurement.

14.12 Delta Mid-Tap Source with Delta Load (VL6 Voltage cable)



Connection Diagram using 6-Wire Voltage Cable (VL6)

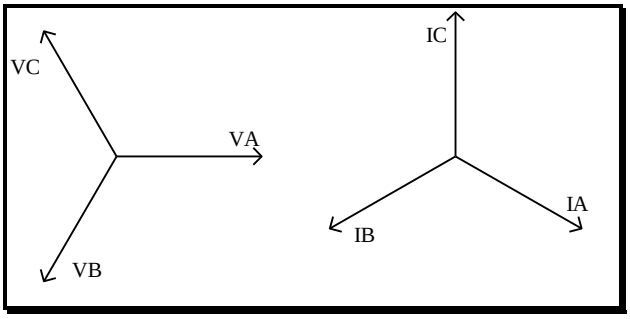
Circuit Summary Table

Source	Delta Mid Tap
Load	Delta
Connection	Delta
Nominal RMS Voltage	Phase-Phase

Voltage Lead Connection for VL6

Wire Label	Connection Point
Phase A	Line 1 Phase A
Neutral A	Line 2 Phase B
Phase B	Line 2 Phase B
Neutral B	Line 3 Phase C
Phase C	Line 3 Phase C
Neutral C	Line 1 Phase A

Phasor Diagram

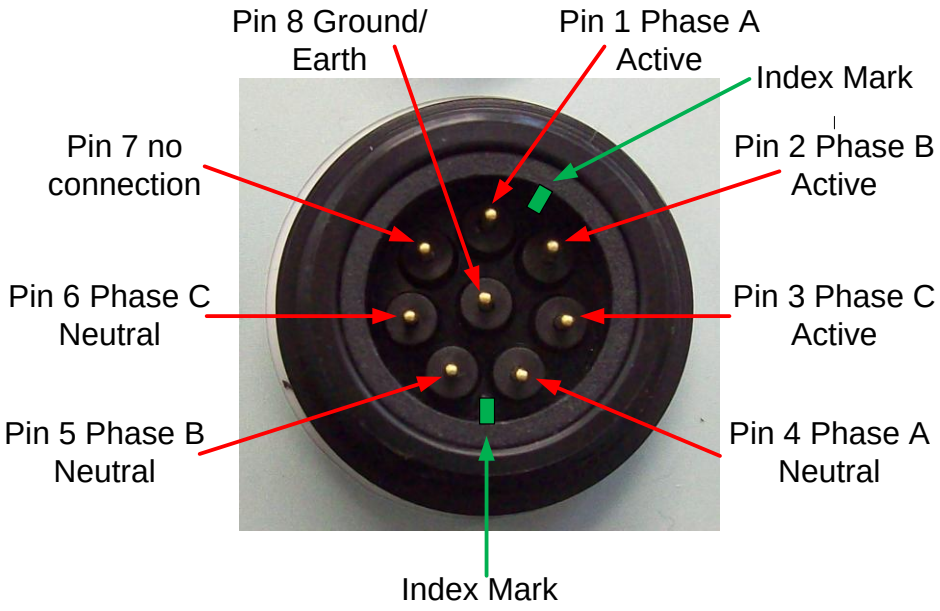


Notes:

- This connection should be configured as Delta in PowerView.
- Current probe arrows should point to the load to ensure accurate power measurement.

15. VOLTAGE LEAD PINOUTS

The voltage leads use an 8 way connector with pin numbers shown below:



The connection tables are given below:

VL4

Phase	Pin number
Phase A	1
Phase B	2
Phase C	2
Neutral	4,5 & 6

VL6

Phase	Pin number
Phase A	1
Neutral A	4
Phase B	2
Neutral B	5
Phase C	3
Neutral C	6

PC4

Phase	Pin number	Australasia GPO pins
Phase A	1	Active
Neutral A	4	Neutral
Ground	7	Earth

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