Phase Rotation Meter Model 6610

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Phase Rotation Meter Model 6610

Correct phase rotation in 3-phase AC electrical networks is critical for many applications, such as motor control, radar and telecommunication systems, servo mechanisms, and demodulators. Incorrect rotation can severely damage and even destroy equipment, creating safety issues for facilities and personnel.

There are a variety of available products designed to test phase rotation and identify potential problems. These generally require attaching the instrument directly to live conductors, which can be hazardous to operators unless all safety measures are strictly followed.

To help address this issue, AEMC Instruments offers the Phase Rotation Meter Model 6610. This instrument uses static induction to identify rotation on 3-phase systems and detect live and open/de-energized phases. This makes it ideal for installing rotating machinery or motors, and for checking generator phase rotation direction.

Sidebar: Phase Rotation and Pump Motors

A good example of the importance of correct phase rotation involves pump motors. These typically incorporate curved blades for moving liquid.

If a pump motor rotates backward, it propels the liquid in the wrong direction – potentially catastrophic when pumping wastewater or other dangerous liquids. In addition, if the curved blades rotate in reverse, they can hit the motor's internal housing and snap its drive shaft.

Traditionally, pump motor rotation is verified by turning the motor on briefly, a process known as "bumping." Although the motor only runs for a short time, bumping still causes some internal damage every time it is performed.

The Model 6610 eliminates the need for bumping. This may significantly prolong the life of the pump motor.

The Model 6610 features three color-coded voltage sensing detector clips that can connect to a network by clipping onto the conductor's insulation, without making direct contact with live conductors.

Phase order is determined as soon as the leads are connected. LEDs and an audible buzzer indicate the presence of live wires and phase sequence.

The Model 6610 is safety rated for 1000 V in CAT III and 600 V in CAT IV. Other features include:

- Correct phase wiring verification
- Open or de-energized phase detection
- Operating voltage range from 75 to 1000 V_{AC}
- Frequency range from 45 to 65 Hz
- Magnetic mounting system for easy attachment to the AC distribution panel under measurement
- LED brightness control
- Low battery indicator

> ### *Quick note about safety:*
> Although the Model 6610 can detect voltage in a conductor, it is not designed specifically to ensure personal safety. We recommend verifying the voltage detection feature using an instrument with dedicated voltage detection, such as the AEMC Digital Multimeter Model 5212, before handling any conductors identified as de-energized.

Using the Model 6610 is very simple:

1. Start by pressing the red ON/OFF button. The instrument performs a quick self-check, during which the LEDs on the front panel briefly light. After two seconds, all LEDs except the battery indicator turn off.

2. Connect the leads to the network under test. Leads are color coded, to ensure correct connection. The black clip is marked L1, the red clip L2, and the blue clip L3.
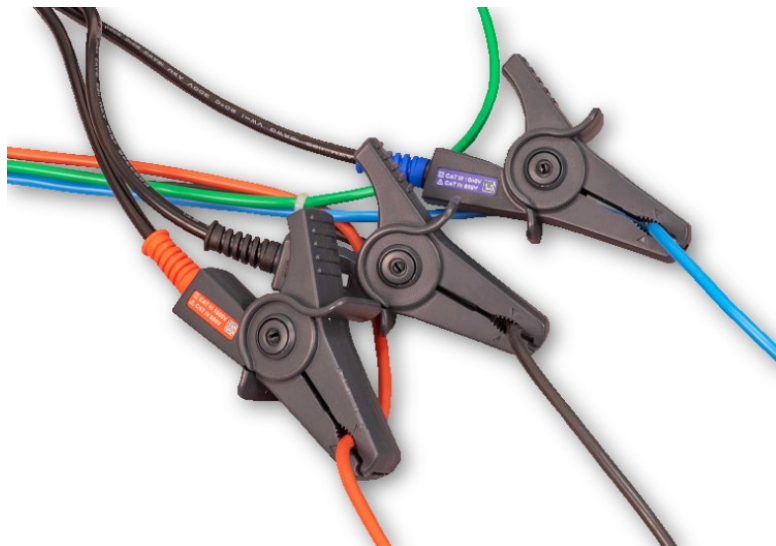
The clip on each lead should be placed around the conductor's insulation; direct contact with the live conductor is unnecessary.

Position the clip on each conductor so that the point of the triangle mark on the jaw is centered on the conductor. Note that the clip orientation has no effect.

3. After the three leads are connected, check the phase LEDs. Each LED should be lit, indicating the conductor to which the associated lead is connected is live. If the LED fails to light, this indicates the conductor is de-energized. This allows you to confirm the presence or absence of voltage within the conductor.

   Note that if the network to which you are connected is a Delta-type hookup, the LED connected to the ground/earth phase blinks.

4. When all three leads are connected, the instrument checks phase rotation.

   If rotation is present and in the expected clockwise direction – in other words, the phase sequence is black, then red, then blue -- the green ABC LED lights and the audible alarm beeps repeatedly.

   If the detected rotation is in the opposite direction, the red BAC LED lights and the alarm emits a continuous sound.

5. When the test is complete, disconnect the leads and turn off the instrument.

This concludes our brief demonstration of the Model 6610. For more information about this and all other AEMC products, please visit our web site.

Recording Alarms on the PowerPad® III Model 8336

In the Spring 2019 issue of the *Tech Bulletin*, we discussed performing a transient search on the PowerPad® III Model 8336. This instrument is a three-phase power quality analyzer that enables technicians and engineers to perform diagnostics and power quality analysis on one-, two- or three- phase networks.

An important feature of the Model 8336 is alarm mode. This enables you to capture measurements that fall outside user-defined thresholds. Alarms can be used for applications such as recording network blackouts with half-cycle resolution (V_{RMS}, A_{RMS}, U_{RMS}), determine energy consumption overages, and monitor compliance with a power supply quality contract. Up to 40 alarm settings capturing up to 16,000 separate alarm events s can be configured.

In this article, we explain the basic steps for setting up, running, and viewing an alarm search on the instrument. This includes downloading alarms to a computer and viewing them in DataView®. We assume the instrument is powered ON and connected to the distribution system under test. We also assume DataView® with the PowerPad III Control Panel has been installed on your computer. For instructions on how to perform these tasks, consult the instrument's User Manual.

Alarm Configuration and Scheduling

You can configure and schedule alarms either through the instrument's front panel interface, or through the DataView PowerPad III Control Panel. Both methods are described below.

Instrument Front Panel

1. Press the △ button.

   - If there are no recordings stored in the instrument, the Detection Schedule screen appears.
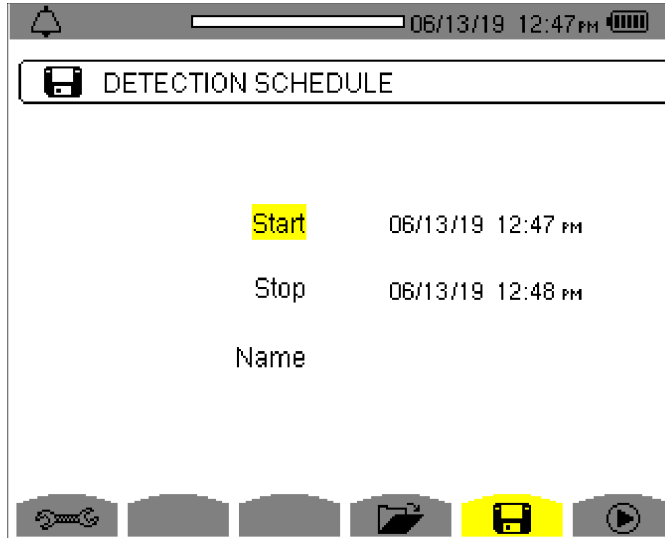
   - If there are recordings in the instrument, the Detection List screen is displayed. In this case, press the 🖫 button to display the Detection Schedule screen.

2. Press the ⬭ function button under the 🔧 icon to display the Alarm Mode screen. This defines the alarms used by the Alarm mode function.
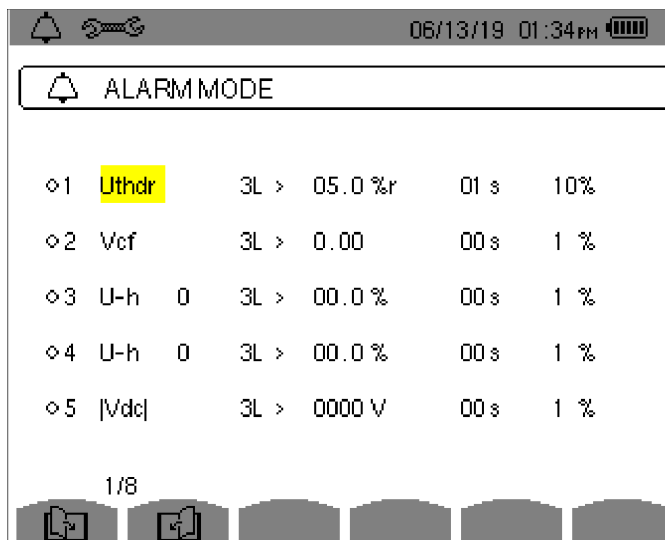
   Unassigned alarms are identified by a question mark.

3. To edit an alarm field, highlight it using the up and down arrow buttons, then confirm the selection by pressing ⬎.

4. To activate an alarm, highlight its number in the left-most column and press ⬎. A red dot indicates the alarm is active. The other fields (left to right) are as follows:

   - Type (42 types of alarms can be configured)
   - Harmonic order (for alarms that include harmonics data)
   - Target (4L, 3L, N, Σ)
   - Direction (> or <)
   - Trigger threshold
   - Trigger delay
   - Hysteresis *(see Sidebar)*

   The Alarm Mode screen consists of 8 pages, each listing 5 alarms. Use the [🗏] and [🗏] buttons to browse through the pages.

5. When you finish changing alarm settings, press ↩ to return to the Detection Schedule screen (see Step 1 above). This screen displays three input fields:

   - **Start** defines the time and date when the recording starts.
   - **Stop** specifies when the recording ends.
   - **Name** allows you to name the test. This can be 8 characters long.

6. Use the arrow and ⬎ buttons to highlight, select, and edit the **Start**, **Stop**, and **Name** fields.

7. Press the [▶] button to write the settings to the instrument.

8. If not enough memory is available, an error message appears informing you of this. Otherwise, the alarm detection session will begin at the scheduled start time and date. If a session is scheduled but not yet started, the message DETECTION ON STANDBY appears on the screen until the start time is reached, at which point the message changes to DETECTION IN PROGRESS.

Sidebar: Hysteresis

On PowerPad III instruments, hysteresis defines a "lag" in alarm deactivation. To understand how this works, consider a ">" alarm with no hysteresis. The instant the trigger threshold is exceeded the alarm activates, and deactivates the instant the measurement falls below the threshold. In this situation, multiple alarms may be recorded if the measurement is very close to the threshold – each time the measurement fluctuates slightly above and below the trigger, a separate alarm is reported. This can result in multiple alarms being detected for a single spike event.

Hysteresis filters out these alarms by introducing a measurement lag into the process. In our example, if we set hysteresis to 5%, an alarm will remain active until the measurement falls 5% below the trigger threshold. This also applies to < alarms: if the threshold is passed, the alarm remains active until the measurement exceeds the threshold by the hysteresis percentage.

By adjusting hysteresis, we can control the sensitivity of the alarm trigger. If your recording session results in a high number of alarms, you can set hysteresis higher. If the recording captures few alarms, you can lower the setting to ensure actual fast, short-lived events are not being missed.

9. When the session is active, the ▶ icon blinks at the top of the screen, along with a status bar showing the progress of the session. In addition, the 🤚 (stop) button appears in place of ▶. The session will continue until the memory is full, you press 🤚, or until the stop time/date is reached.

10. When the alarm detection session is finished, it appears in the Detection List screen. You can now open the session and view its contents, as explained later in this article.

Alarm Configuration: DataView

For instructions about installing DataView, consult the instrument's user manual. Then proceed as follows:

1. Turn ON the instrument and connect the instrument to the computer using the supplied USB cable.

2. Start the PowerPad III Control Panel by opening the DataView folder on your desktop and clicking the PowerPad III 📱 icon.

3. Click **Instrument** in the Control Panel menu bar and select the option **Connect an Instrument**. Then complete the connection process (press F1 if you need assistance.)

4. With the instrument connected, click **Instrument**, then click **Configure**. This displays the Configure Instrument dialog box.

5. Open the **Alarm Conditions** tab.
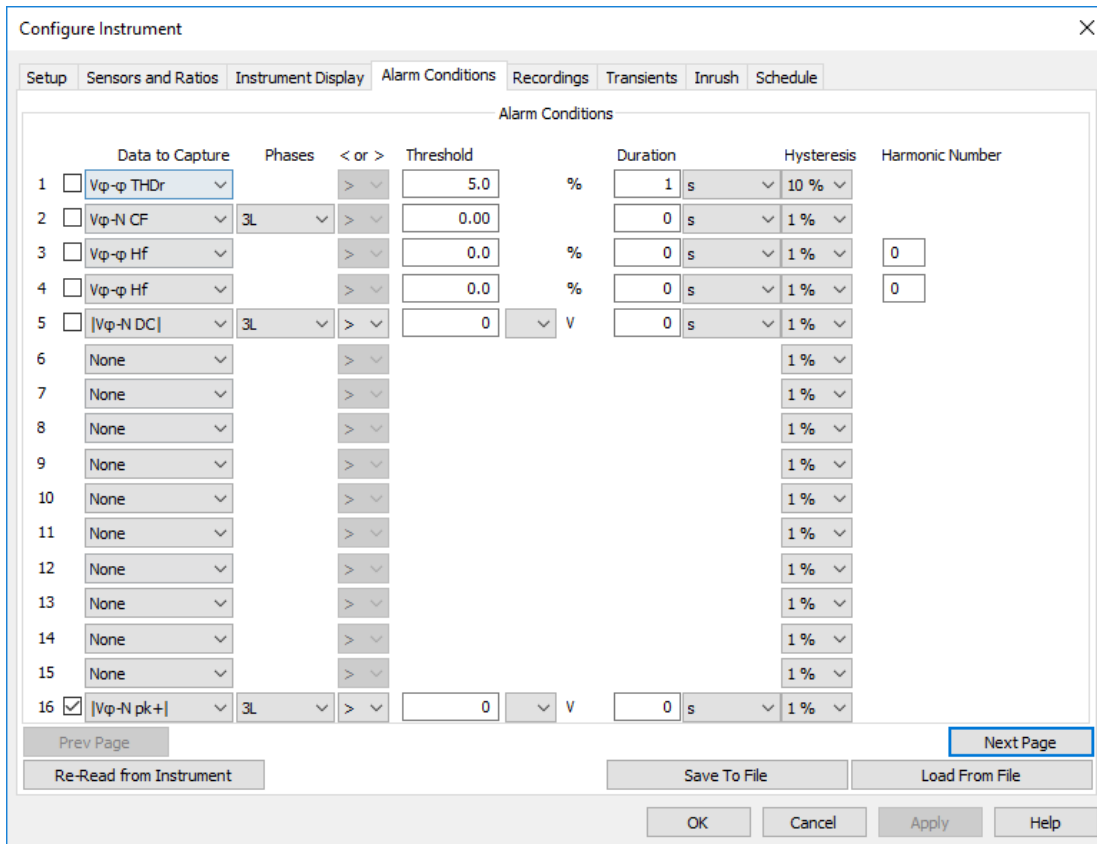
This tab lets you configure up to 40 alarms. For each alarm you can set the following (not all these fields apply to each type of alarm):

- **Data to Capture** is a drop-down list of all the choices of quantities (including None) for which an alarm can be set. After you select a quantity, you can enable/disable its alarm by selecting the check box that appears to the right of the measurement's name.

- **Phases** specifies the phase to be monitored. Options are 3L, N, and 4L.

- **< or >** specifies whether the alarm activates when a quantity exceeds a defined threshold, or activates when it falls below that threshold.

- **Threshold** defines the limit that activates the alarm.

- **Duration** sets the period the condition must exist before it is recorded as an alarm.

- **Hysteresis** selects the hysteresis percentage for the quantity. Options are 1%, 2%, 5% and 10%.

6. With configuration complete, you can now schedule the alarm session. To do this, click the **Schedule** tab. This controls when different types of recording sessions in the instrument start and stop, including alarms.
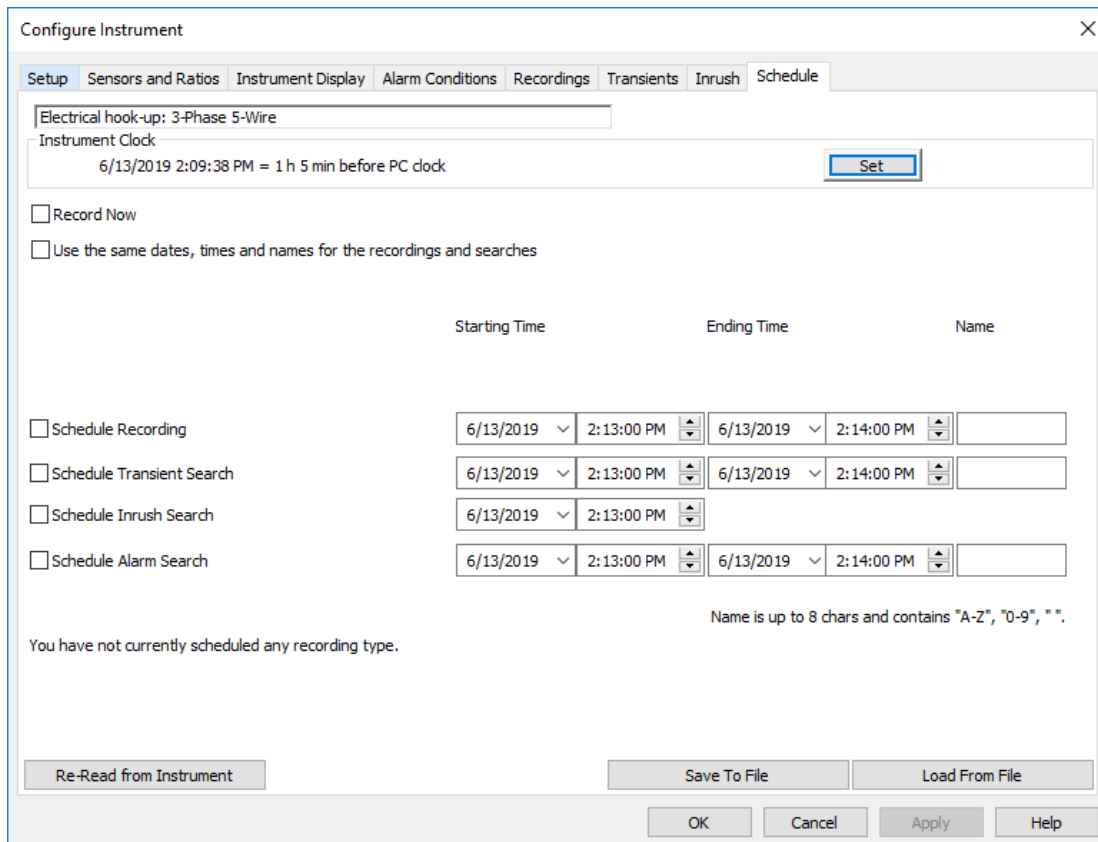
7. At the top of this tab is a read-only field that displays the electrical hook-up, as defined in the General tab of the Configure Instrument dialog box. The remaining fields on this tab are as follows:

- **Instrument Clock** displays the current time of the instrument's system clock. You can change this by clicking the **Set** button and completing the Date/Time dialog box.

- **Record Now** when checked starts a recording immediately when the configuration is written to the instrument. When you select this option, the **Duration** field is displayed to allow you to set the length of the alarm detection session. Options range from 30 minutes (default) up to 8 weeks. Selecting **Record Now** also automatically checks the **Use the same dates, times, and names for the recordings** and searches and **Schedule Recording** options.

- **Use the same dates, times, and names for the recordings and searches** specifies that any selected recording sessions start and stop at the same date and time, and also are stored under the same session name. If both this field and the **Record Now** field are checked, all **Starting Time** and **Ending Time** fields on this tab are disabled; all selected sessions will start and end in accordance with the specified duration. If this field is checked and the **Record Now** field is not checked, the top row of **Starting Time**, **Ending Time**, and **Name** fields is enabled; and the date/time/name fields that individually apply to transients, inrush, and alarm searches are inactive and grayed out. Session names can be up to eight alphanumeric characters long. If this field is unchecked, you must enter an individual start and stop date/time and session name for each selected recording.

- **Schedule Recording**, **Schedule Transient Search**, and **Schedule Inrush Search** when checked enable you to schedule a recording session, transient search, and inrush search respectively. Consult the PowerPad III Control Panel Help for instructions on how to complete these fields.

- **Schedule Alarm Search** when checked schedules an alarm recording session, using the settings configured in the Alarm Conditions tab of the Configure Instrument dialog box.

8. When you are finished selecting settings, click **OK**. The recording will run immediately or at the scheduled time, depending on the selected settings.

Viewing an Alarm Detection Session on the Instrument

When your alarm detection session is finished, you can view it in the instrument's recording list.
To do this:

1. If the Detection Schedule screen is displayed, press the 🗁 button. Otherwise press the 🔔 button.

2. If more than one recording is stored, use the arrows to select the desired recording, and then press ⏎ to open it.
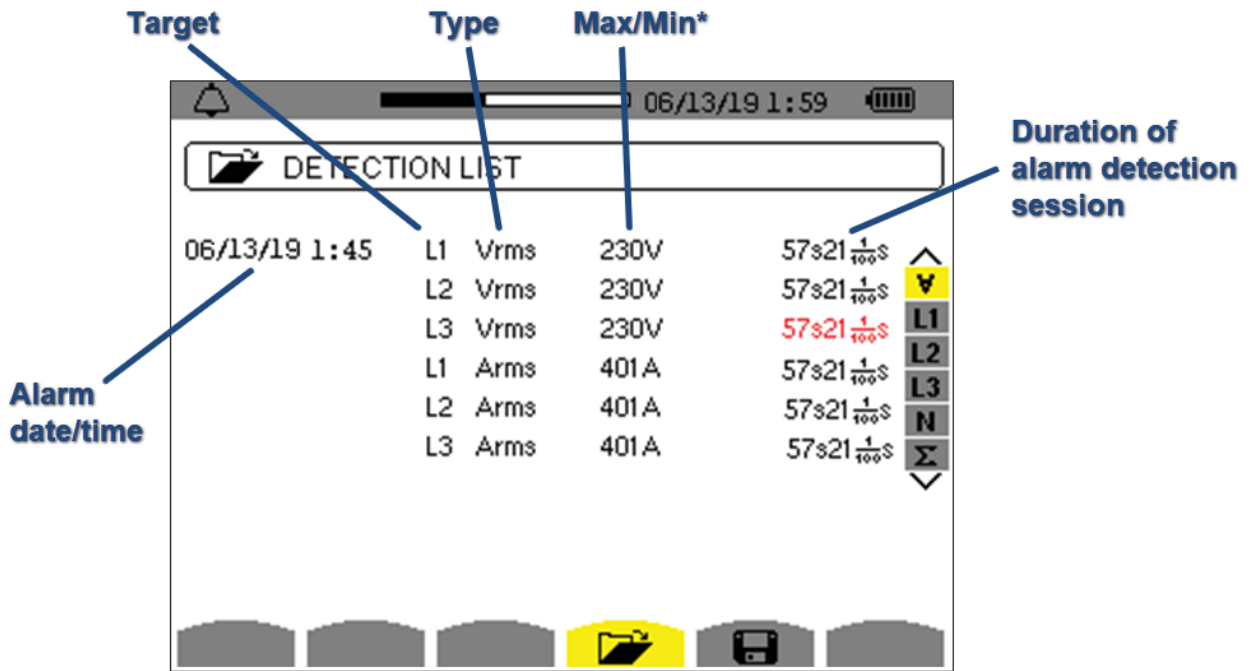

*This field displays the maximum or minimum value, depending on alarm type

Downloading and Viewing Alarms in DataView

Ensure the instrument is powered ON and connected to the Control Panel. Then proceed as follows.

1. **To download all data on the instrument**:
   (a) Highlight the name of the instrument in the navigation pane.
   (b) Click **Instrument**, and then click the option **Download Recorded Data**.
   (c) A message appears asking whether or not you want to download all data. Click **Yes**.
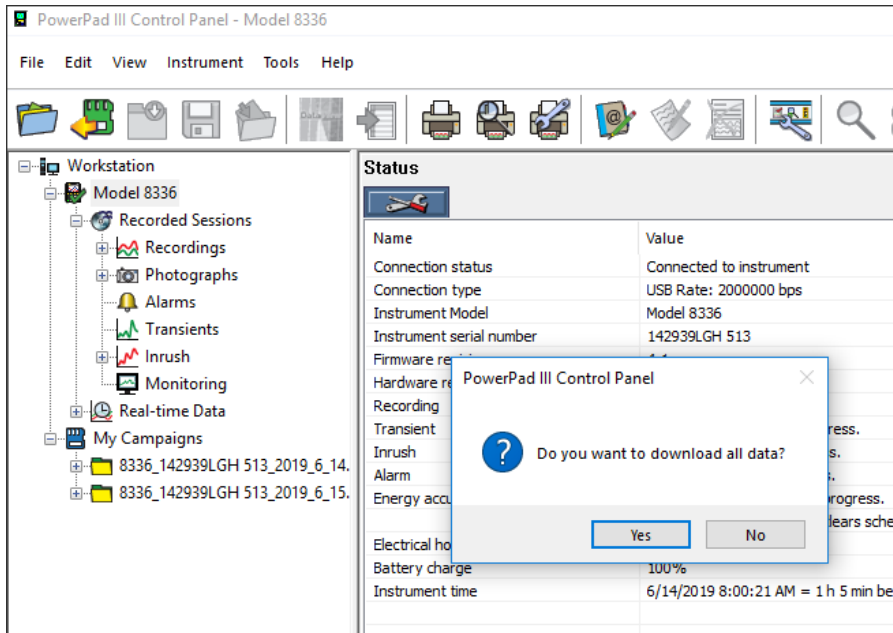
To download only alarms:
(a) Highlight Alarms in the navigation pane.
(b) Click **Instrument > Download Recorded Data.**
(c) Click **Yes** in response to the confirmation prompt.
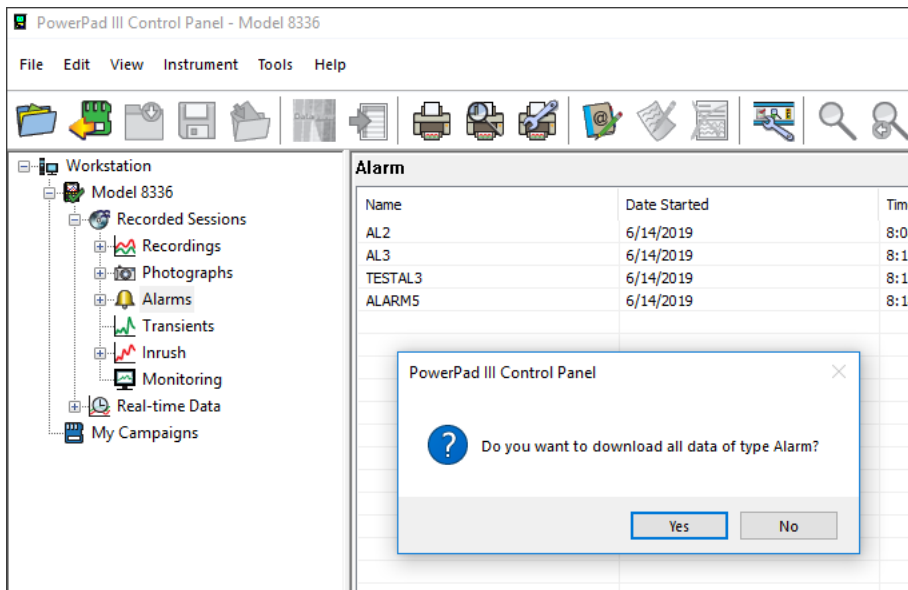
2. The Downloads dialog box appears. This shows all the recordings that have previously been downloaded from the instrument and stored in the computer the last time the **Clear/End all downloads** button was selected (see below). It also lists any downloads that are currently in progress.
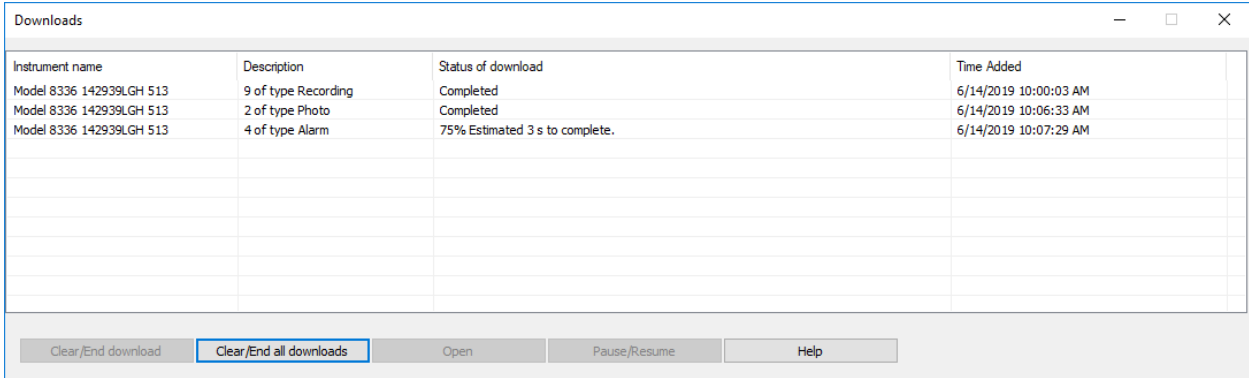

3. In the Downloads dialog box, highlight the download and click **Open**. The recording session will appear in the My Campaigns branch in the navigation frame.

4. Click the **+** symbol next to the downloaded folder in My Campaigns to expand it.

5. Click the **+** symbol next to the Alarms folder. The downloaded alarm detection sessions appears in the folder.

6. Click the alarm detection session. The data contained within the session is displayed on the right in the data frame.
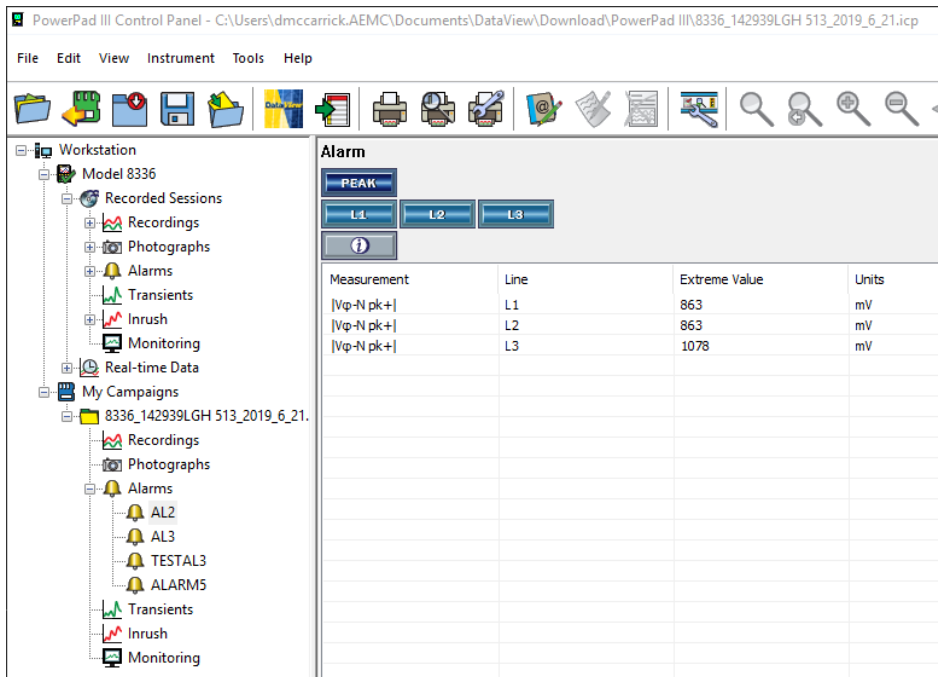
You can now view the session as a DataView report or Excel-compatible spreadsheet. See the PowerPad III Control Panel Help for instructions.

New DataView® Installation

Starting with DataView® 3.60, you now have the option of installing individual Control Panels independent of the rest of DataView. Previously, at a minimum you were required to install the core DataView code along with at least one Control Panel.

For example, suppose you installed DataView with the PEL and PowerPad III Control Panels. If you later wanted to update the PEL Control Panel to take advantage of a new feature, you needed to update the DataView and PowerPad III Control Panel software as well, even if they were unchanged from the previous release.

The installation procedure now allows you to update the PEL Control Panel separately, without requiring you to install other software that has not been updated.

The updated installation procedure also allows more download flexibility. You can now download DataView without any Control Panels, and download one or more Control Panels without installing DataView. This allows you to download only the programs you need, saving storage space in environments where computer resources are limited.

As always, we recommend always updating your software whenever a newer version becomes available.

Note that if you install a Control Panel without DataView, you cannot design or generate reports. All report-related options, such as Create DataView Report, will be grayed out. This includes viewing existing DataView reports, databases, or templates (.dvw, .dvb, or dvt files respectively) created with previous DataView releases. (You can, however, still export this data to a spreadsheet.)

Introducing the Simple Logger® (SL) Series

The new Simple Logger® (SL) Series are easy-to-use single-channel data loggers designed for recording measurements over time. These instruments measure voltage (5 V_{AC} or 0.1, 1, 10, and 50 V_{DC}), current (4 to 20 mA_{DC}), pulse, event, or temperature (RTD and thermocouple), depending on model.

SL Series instruments feature one-button operation for starting and stopping data recordings, and erasing data from memory. Measurements are recorded and saved in the instrument's internal 8 MB flash memory. An LED indicates the instrument mode (Standby, Recording, Data in Memory, Armed to erase, and Erasing memory).

Applications include:

- Battery monitoring
- Process control monitoring
- Event monitoring
- Temperature monitoring

All models are configured from a computer running the dedicated Simple Logger Control Panel software, downloaded free from the AEMC web site. The instrument connects to the computer via the supplied USB cable. (NOTE: Only a partial Control Panel screen is shown below.)
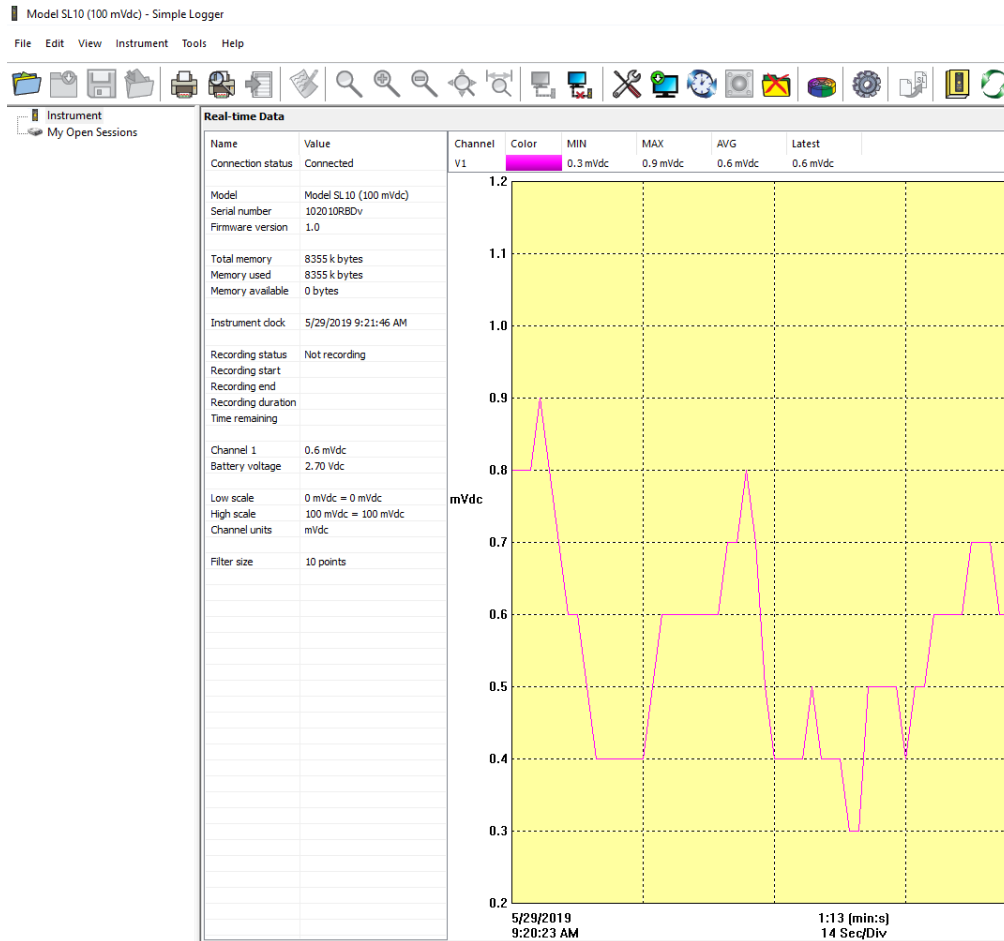
This program also enables you to connect to the instrument, view measurement data in real time, download a recording, print this data as a report, and export it as a Microsoft Excel-compatible spreadsheet.

Setup is quick and easy: simply connect the logger to the signal input, and press the button to start a recording.

The recording runs until you press the button a second time or until the instrument's memory is full (up to 4 million samples, 45 days recording). This data can be saved to a computer via the Simple Logger Control Panel.

You can then enhance the data on the computer. For example, if the recording was started and stopped manually, you can add specific date/time information. You can also modify parameters such as scaling.

SL Series models are powered by two non-rechargeable AA batteries. The instrument can also run on USB power when connected to a computer or power supply.

Models available:

- Model SL01 (low voltage 5 V_{AC}, 50/60 Hz, scaling possible for voltage or current transducer, sample rate 256/second)
- Model SL10 (voltage 100 mV_{DC}, sample rate 16/second)
- Model SL11 (voltage 1 V_{DC}, sample rate 16/second)
- Model SL12 (voltage 10 V_{DC}, sample rate 16/second)
- Model SL13 (voltage 50 V_{DC}, sample rate 16/second)
- Model SL20 (current 4-20 mA_{DC}, sample rate 16/second)
- Model SL30 (pulse input, maximum 8 pulses per second)
- Model SL31 (event logger, maximum 8 pulses per second)
- Model SL40 (temperature RTD, sample rate 16/second)
- Model SL50 (temperature thermocouple J, K, N, T, E, R, S, sample rate 16/second)

We will discuss how to use individual SL models in further detail in future issues of the *Tech Bulletin*.

New Products:
Current Probe MiniFlex® Model MA114

The MiniFlex® MA114 single-phase 14" (35 cm) sensor converts alternating currents ranging from 3 to 3000 A into proportional AC voltages.

MiniFlex® sensors consist of a flexible coil connected by a shielded lead to a housing containing the signal processing electronics, powered by batteries. The flexibility of the sensors allows clamping around the conductor to be measured, whatever its shape (cable, bar, strand, etc.) and accessibility. The snap-locking coil opening/closing button allows handling while wearing protective gloves. The output can be connected to the mV_{AC} or V_{AC} input of a measuring instrument having an input impedance of ≥ 1 MΩ.

The MA114 sensor is based on the Rogowski coil principle. This provides:

- very good linearity and no saturation effect (and therefore no overheating)
- wide dynamic measurement, up to several kA
- insensitivity to DC (measurement of the AC component of any AC + DC signal)
- light weight (no magnetic circuit)

The MA114 can be powered by an internal battery or externally via a 5 V_{DC} USB power adapter. The external power adapter is ideal for conducting recordings over an extended period of time. The instrument's banana plug termination is compatible with multimeters, data loggers, and other instruments.

A new feature available with the MA 114 is the ability to power it from a USB connection. This makes it an ideal choice for long recording periods when used with data loggers.

Key features include:

- 14-inch flexible sensor capable of clamping around a 3.93" cable or bundle
- Waterproof sensor rated to IP 67
- User selectable ranges of 3, 30, 300 and 3000 Amps
- 600V CAT IV, 1000V CAT III rated
- Battery or USB powered for long-term use
- Positive click-locking sensor eliminates disconnection errors

AC Current Probes Models LM102/103

The Model LM102 (Cat. #2153.04) is the latest in compact AC current probes. Designed to meet the most stringent demands in industry and electrical contracting, it also meets the latest safety and performance standards. The probe has a measurement range of up to 200 A_{RMS} which make it the perfect tool for measurements with DMMs, recorders, power and harmonic meters.

The Model LM102 is compatible with any ammeter, multimeter, or other measurement instrument that is capable of displaying 1 mA of output per amp of measured current.

LM102

The Model LM103 is compatible instruments that display 1mV of output per amp of measured current. When used with an AC voltmeter, it enables you to read the measured directly on the voltmeter.