

# Android™ Application for the Power & Energy Logger PEL 100 Series



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PowerPad<sup>®</sup> III Model 8435



PowerPad<sup>®</sup> III Model 8333



PowerPad<sup>®</sup> III Model 8336

# Monitoring Electrical Quality with AEMC® PowerPad® III Instruments

By JP Martin

As with other products, electricity can be monitored for quality. High-quality electricity is consistent, reliable, and free of distortions, interruptions voltage transients, and other anomalies that can interfere with the safe, efficient, and economical operation of equipment.

The AEMC® PowerPad® III family of power analyzers is designed to help monitor the quality of the electricity in your facility. These instruments, which include the Model 8435, Model 8333, and Model 8336, provide the latest technological advancement in power quality analysis and are designed to succeed the earlier PowerPad® family of products.

In this article, we briefly look at the issue of electrical power quality. We then describe some of the ways PowerPad® III instruments can monitor your power quality. We also review a few key enhancements the PowerPad® III Model 8333 provides over its predecessor, the PowerPad® Model 3945-B. These enhancements can help make monitoring power quality in your facility even more informative and easy to set up and perform.

## Power Quality Primer

To help understand the need for power quality monitoring, consider the nature of power sources. Simply put, a lot can happen to electricity on its way from the power station to the supply terminals. Although the electricity produced by the energy plant may be of high quality, factors such as lightning and other weather phenomena, various forms of electromagnetic pollution and disturbances, and other influences can introduce degradations such as supply interruptions and voltage dips. In addition, electrical equipment operated by you or by other customers on the network can introduce electrical disturbances such as harmonic distortion, voltage fluctuations, and so on. These and other factors can have a profound impact on the quality of the electricity being delivered at the supply terminal.

Unfortunately, the nature of electricity can make it challenging to counter and eliminate these types of disturbances. However closely the energy producer may monitor quality at the generation facility, it is virtually impossible to completely eliminate all possible sources of electrical anomalies from the distribution network. On the network, the use of electricity is essentially simultaneous with its generation and distribution. This means that disturbances have an instantaneous impact on electrical quality, without allowing a time interval for the distributor to take potential corrective action. Thus it is often up to consumers to monitor electrical quality to ensure the power source meets the requirements of their facilities and equipment.

## AEMC® PowerPad® III Instruments

To help monitor the quality of electricity being supplied to a facility, AEMC® offers the PowerPad® III family of products. These include the following:

**Model 8435** is a three-phase power quality analyzer that is easy to use, compact, and shock resistant. It enables technicians and engineers to measure and carry out diagnostics and power quality work on one-, two- or three- phase networks. Four voltage and four current inputs are provided. It is IP67 waterproof rated while recording with cover closed when using AmpFlex® A193-18-BK, making it suitable for outdoor use.



PowerPad® III Model 8435

**Models 8333 and 8336** are portable three-phase network analyzers designed to:

- Measure RMS, powers, and disturbances of electric distribution networks
- Deliver a snapshot of the principal characteristics of a three-phase network
- Track variations of specified parameters over time.

Each instrument enables you to measure three-phase networks and perform diagnostics and power quality work.



PowerPad® III Model 8336

Note that the Model 8435 is ruggedized and designed for field work in potentially harsh conditions, while the Models 8333 and 8336 are more compact and designed primarily (although not necessarily exclusively) for interior use.

## PowerPad® III Monitoring Case Study

To illustrate how a PowerPad® III instrument can monitor electrical quality, consider the following example: A manufacturing company is experiencing intermittent shutdowns on a critical production line due to a conveyor randomly stopping several times a week. An inspection rules out mechanical problems, so management decides to monitor electrical quality – with the caveat that this monitoring must disrupt the manufacturing operation as minimally as possible.

PowerPad® III instruments are ideally suited for this type of monitoring, due to (1) their ability to monitor multiple variables simultaneously, and (2) the ease with which a user can set up a monitoring session.

To record faults (however minor or brief), three monitoring modes are used:

- Trend mode monitors and records user-selected parameters such as voltage and current. The PowerPad® III can store measurement results obtained during a recording session of up to one month or more for up to 40 different variables. This data can then be downloaded to a PC and analyzed in detail with AEMC's DataView® data analysis software.
- Alarm mode monitors for conditions that fall outside of specified ranges. These can be set to a standard such as EN50160 (see sidebar). Each measurement that exceeds its defined threshold is recorded to an events list. Thousands of events, some lasting less than half a period (8 to 10mS), can be captured this way.
- Transient mode can capture very brief voltage and current events as short as 65 microseconds in duration.

### EN50160

To help ensure the quality of electrical sources, the standard EN50160 has been developed. This standard, originally published in 1994, is designed to promote a common understanding and definition of core quality characteristics among electricity distributors. EN50160 has been widely adopted in Europe, and also has applicability in other parts of the world including the Americas.

EN50160 defines a set of specifications and allowable tolerances for characteristics including frequency, slow voltages variations, rapid voltage changes, harmonic distortion, unbalance, and other conditions. These variables are set forth in the EN50160 standard, which can be viewed and downloaded from a number of online sources.

Note that in addition to these specifications, EN50160 also defines a number of allowable exceptions and exclusions, in acknowledgement of the fact that current technology makes it infeasible to completely prevent all possible types of electrical disturbance from affecting the distribution network. Note also that EN50160 is narrowly focused on the quality of the energy produced, not how it is produced. For example, it does not cover environmental factors such as emissions.

An upcoming update to DataView® will support EN50160 monitoring through the enhanced PowerPad® III Control Panel. This program, which is provided free in North America, will enable you to use your PowerPad® III instrument to check your electrical distribution system for compliance with EN50160 specifications. Supported instruments include the Model 8435, 8333, and 8336.

## PowerPad® III Model 8333 vs PowerPad® Model 3945-B

As we mentioned earlier in this article, the PowerPad® III family is the successor to the original PowerPad® family of products. To illustrate some of the new features and enhancements provided in PowerPad® III instruments, this section compares the PowerPad® III Model 8333 with the instrument it replaces, the discontinued PowerPad® Model 3945-B:

- **Enhanced THD measurement:**  
For example, one new feature of the Model 8333 is its ability to measure and display total harmonic distortion both in terms of percent relative to the signal's RMS value, or THDr, and percent relative to the fundamental, or THDf. This provides additional data and detail for analyzing total harmonic distortion issues in a system.
- **Multiple (and higher) ranges for flexible probes:** The Model 8333 lets you select multiple ranges for flexible probes, including the AmpFlex® and MiniFlex® probes. You can also use these probes, along with the MN193 probe, to measure data with a significantly higher maximum voltage (as well as lower voltages typically found on neutral conductors) and with higher resolution than was possible with the Model 3945-B.
- **Support for additional probes:**  
The Model 8333 supports two additional probes. One is the SL261, a portable 100A peak current probe with insulated BNC output cable designed to accurately measure AC or DC currents. The SL261 probe connects to the Model 8333 via a BNC adapter (Cat. #2140.40), which you can order here [on the AEMC storefront](#). Another supported probe is the J93, a clamp-on probe designed to measure high DC and AC currents without opening the circuit. The instrument also provides support for 2-element (Aron's Method) distribution system connection methods, using only two current sensors.

**NOTE:** All supported probes can be purchased directly on the AEMC® Storefront: [www.aemc.com/store](http://www.aemc.com/store).

- **Enhanced LCD display with TFT technology:** The Model 8333 offers two new features related to the instrument's LCD display. The first is Night Mode, which provides better visibility in low-light conditions. Another feature is Auto Power OFF, which allows you to configure the instrument so that it automatically turns off the display after a period of inactivity.
- **Enhanced IP rating:**  
An important consideration is mechanical safety. The Model 8333 carries a mechanical rating of IP53 compared to the Model 3945-B's IP50 rating. This indicates the Model 8333's improved resistance to water ingress.
- **Enhanced memory and storage:**  
The Model 8333 provides a significant advantage over the Model 3945-B in terms of memory and storage of measurement data. The Model 8333 features 256 megabytes of available memory, compared to the Model 3945-B's 4 megabytes of memory. This enables the Model 8333 to store nearly two orders of magnitude more data. And for downloading data, the Model 8333 connects to a computer via a USB cable connector, instead of the RS-232 serial port used by the Model 3945-B. Note that like its predecessor, the Model 8333 is fully supported by AEMC's DataView® data analysis software.
- **Physical features:** The Model 8333 also offers some new physical features. For example, it includes a handy stand for viewing the instrument in an upright and stable position. And the Model 8333 connector plug-in outlets accept color-coded ID markers, so you can customize the color-coding for each phase of voltage and current.

For a full review of all the capabilities of the PowerPad® III Model 8333 instrument, please consult the [AEMC® website](#).



*About the Author:*

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## Featured New Product:

# Android App for the AEMC<sup>®</sup> Power & Energy Logger Model 100 Series

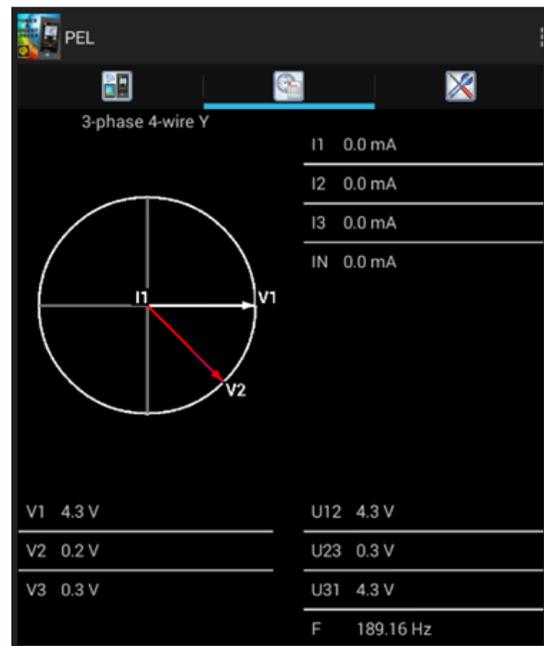
Users of the AEMC Power & Energy Logger (PEL) Models 102 and 103 can now work with their instruments from an Android device. The Power & Energy Logger app, distributed through the Google Play Store, provides a quick, convenient, and mobile option for working with a PEL. Through a simple, easy-to-learn interface, the app provides a substantial subset of the features and functionality offered in AEMC's DataView<sup>®</sup> data analysis software, without requiring a PC. And it allows you to easily connect to PEL instruments placed in hard-to-access locations.

The Power & Energy Logger app enables users to connect to the PEL via Bluetooth. And if the PEL is connected to a LAN network, you can also communicate with the instrument over Wi-Fi. Once connected, you can:

**View data currently being measured by the instrument in real-time.** This includes the type of distribution system (electrical setup) currently being measured, and (for AC systems) the phasor diagram appropriate for this setup. Real-time data is organized in tables of related measurements for quick navigation and reference, and updated continuously from the instrument.



Power & Energy Logger app running on an Android device, with a PEL 102 in the background

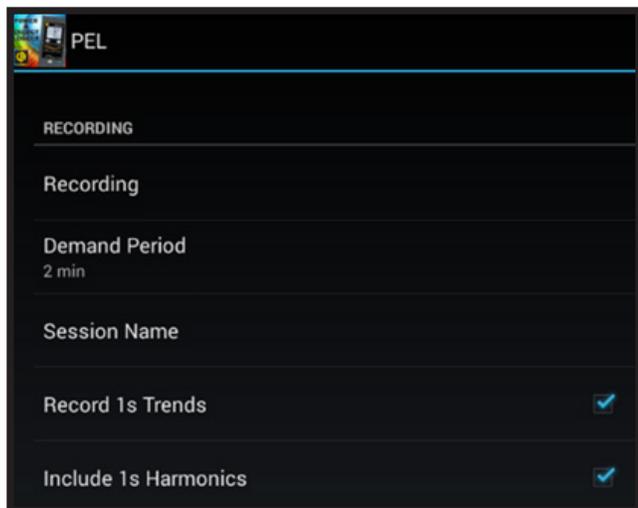


PEL app Real-Time Data screen, showing phasor diagram and measurement data

Android is a platform for "touch screen" mobile devices such as tablets and smartphones. Introduced in 2007, Android has grown to become the most popular mobile operating system in the world, with an estimated one billion devices (and counting) sold globally.

These data tables, which can require several pages to display, depend on the current distribution system. Different data appears for different distribution systems; the above example shows the first page of real-time data for a 3-phase 4-wire system.

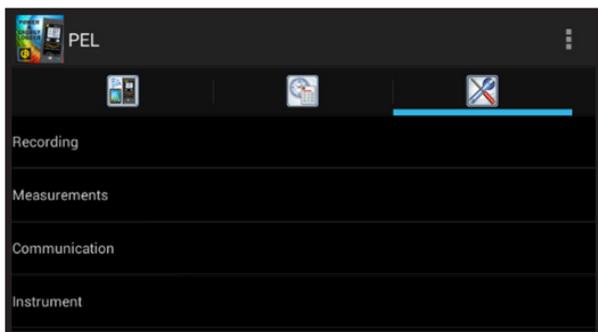
**Schedule and stop a recording session on the PEL.** You can set parameters to schedule a recording session and specify what data will be recorded. This can be a recording that starts immediately, or at a future date and time. You can also choose which data to record.



*Recording screen for scheduling and setting up a recording session on the PEL.*

Recorded data is stored on the PEL instrument, where it can subsequently be downloaded to a PC and analyzed in detail using DataView®.

**View and/or set configuration variables on the PEL instrument.** The PEL Android app enables you to review the current configuration settings on your PEL, and change these settings as required. You can change the type of distribution system being measured, voltage ratios, nominal frequency, current sensors options, communication-related settings, and other information related to the instrument and its operation.



*Configuration screen for reviewing and changing settings for data recording, instrument measurements, communication between the PEL and the device, and instrument status.*

The Power & Energy Logger app helps make PEL instruments more readily accessible, especially while you are on the road. You can use your Android device to check on any PEL instrument connected to a network, however remote, from any location with Wi-Fi coverage. And you can work with instruments installed in environments where it may be otherwise difficult or dangerous to gain access. The PEL app makes communicating with these instruments easy, convenient, and safe; via the world's most popular mobile device platform.

The Power & Energy Logger app can be downloaded free from the [Google Play Store](https://play.google.com/store/apps/details?id=com.aemc.pel100), and is available in multiple languages. AEMC® also provides complete online Help for the app, which can be viewed independently at: <http://www.pel100.us/help-en/index.html>. Consult this Help system for a complete description of the PEL app and all its capabilities.

# OLE Objects in DataView®

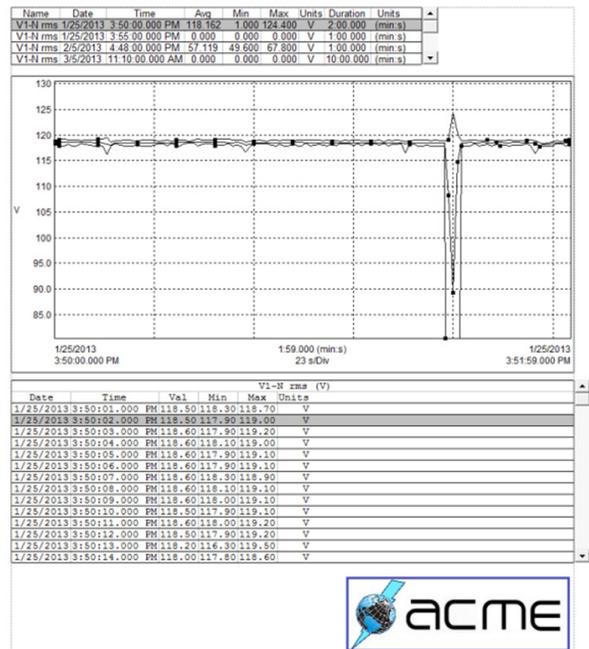
Object Linking and Embedding (OLE) is a proprietary Microsoft technology that enables you to link to and "embed" content from one file into another. The embedded or linked content can be from a file type different from the file into which the OLE object is being placed. For example, you can embed or link a bitmap created with a graphical editing application into a text processing document. This allows you to create documents that include content you cannot otherwise create with the document's editing application.

The difference between linking and embedding is that linked objects reflect any subsequent changes made to the original, while embedded objects do not. For example, if you place a linked graph object into a text document and then change the original copy of the graph file, the changes will also be displayed within the text document. But if instead you embed a graph and later make changes to the original, the embedded object in the text document will not reflect these changes -- it will still appear as it did when you originally created the embedded object.

DataView® supports OLE and several associated features. These features include:

- Create an OLE object and place it in the report. This can be an existing file, or one created "on the fly" specifically for this report. The object can also be a Microsoft Word document.
- Edit the content of an OLE object.
- Edit links to objects.
- Convert an object from one file type to another.
- Paste the contents of the Windows clipboard into the report as an OLE object.
- Change the icon that represents the object.

As with other DataView® report content, OLE objects are contained within frames specifically designed to create them. These frames can be moved in the same way as other DataView® report frames. They cannot, however, be resized from within DataView®.



An example of an OLE object in a DataView® report. The custom "ACME" logo in the bottom right corner of the page (enclosed in a blue box) is an OLE object that has been added to a standard DataView® report template.

## Creating an OLE Object in DataView®

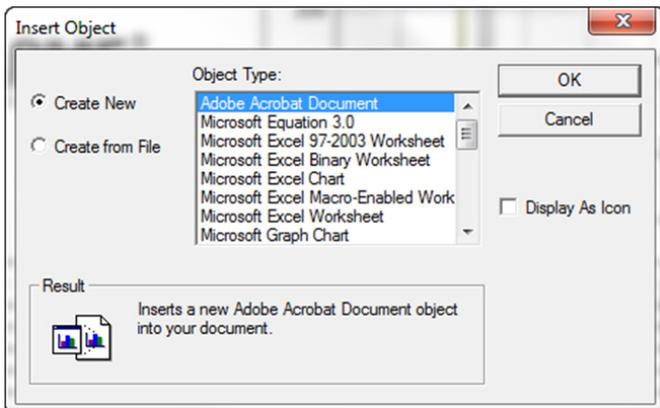
DataView® provides a number of ways to create an OLE frame within a report. These include clicking the:

-  **OLE toolbar icon.** This lets you create any type of OLE object. The steps for doing this are explained below.
-  **Word OLE icon** in the toolbar. This creates a Microsoft Word-compatible OLE object. (Note that you can also create this type of object via the OLE icon; however the Word OLE icon streamlines the process.)
- **Frame menu.** This includes two options through which you can create OLE frames: Place OLE (for creating any type of OLE object), and Place Word OLE (specifically for creating a Microsoft Word-compatible object). Both options function similarly to creating OLE objects using the toolbar icons described above.

- Edit menu.** This includes the option Paste Special, which allows you to create OLE objects from the current content in the Clipboard.

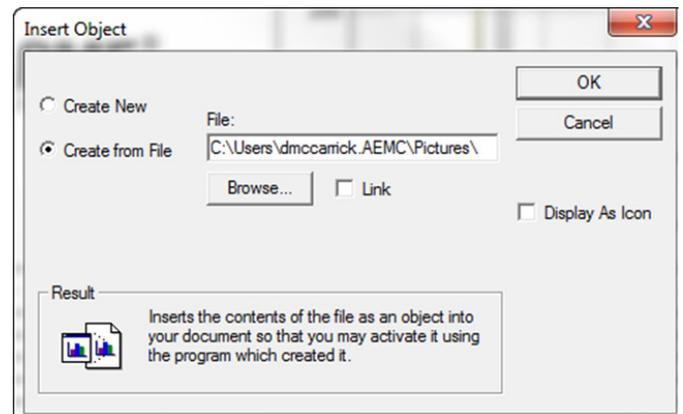
For example, to create an OLE object using the OLE icon, follow these steps:

1. Left-click the mouse pointer on the OLE icon. The mouse pointer changes to the  OLE cursor while it is positioned within the margins of the page.
2. Move the cursor to the location on the page where the upper left corner of the frame is to be placed.
3. Click and hold the left mouse button, then drag the cursor to the location on the page where the lower right corner of the frame is to be located. As you move the cursor, a dotted box is displayed. This dotted box shows the size and location of the frame being created.
4. Release the mouse button. The Insert Object dialog box will be displayed.



This dialog box includes two radio buttons. The default selection is Create New. When this button is selected, the Object Type list is displayed. From this list, you can select the type of application-specific object that is to be created "on the fly." Use the scroll bar to view additional types. When the Create New option is selected, selecting one of the Object Type options and clicking OK starts up the application appropriate for the selected object type. (The application is defined by your operating system's default editor setting for the selected file type.)

If instead you select Create from File, a dialog box appears prompting you to select an existing file in which the object is currently stored.



You can click Browse to locate the file within your computer's directories and folders. If you select the Link checkbox, the object will be linked rather than embedded. This means that any changes made to the original linked file will also be reflected within the OLE frame inserted in the DataView report. If this option is unchecked, the OLE object will remain unchanged in the report, even if the file from which it was created is subsequently modified.

You can also choose to display the object as an icon rather than as content. Clicking the icon will display the object in a separate window. To do this, select the Display as Icon check box. When this option is selected, the Change Icon button appears. This allows you to change or modify the icon after you create it.

Note the Result field at the bottom of the dialog box. This displays a brief description of what will happen if you link or embed the selected object type.

5. After you make your selections, click OK. This creates the OLE object frame.

**For More Information:** The preceding procedure describes one method for inserting an OLE object to a DataView report. For complete instructions explaining other ways for adding and modifying OLE objects in DataView, see the online Help that comes with the DataView software. In addition, visit the [AEMC® YouTube channel](#) for instructional videos about working with DataView®.

# AEMC® Interview:

*Mike McCarrick,  
Manager of Firmware and Software  
Development*



*Two critical components of AEMC's technology portfolio are firmware (the on-board programming that controls how instruments operate) and software (programs that allow users of PCs and mobile devices to interact with instruments and analyze the measurement data they provide).*

*For the past 16 years, Mike McCarrick has been a key member of the team responsible for developing firmware and software for AEMC®/Chauvin-Arnoux Group.*

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## **Q. What are your chief responsibilities at AEMC/Chauvin-Arnoux?**

**A.** I manage the development of firmware and software done at our Dover (NH) and Foxborough (MA) facilities.

My team also develops software for the Chauvin-Arnoux group in Paris, France.

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## **Q. What are some of the current projects for which your group is responsible?**

**A.** We've developed, or are currently developing, firmware for the PEL 100 series of instruments. This includes the PEL 102 and 103, as well as the upcoming PEL 105.

We also developed the firmware for the Simple Logger® II family of instruments, and are in

the process of developing the firmware for the upcoming Simple Logger® III.

On the software side, my team is responsible for the development of DataView®, our data analysis program. This includes what we refer to as "core" DataView®, the report generation component of the product. We also develop the individual Control Panels for interacting with the instrument. In addition to the PEL and Simple Logger families I already mentioned, this includes developing Control Panels for the PowerPad® and PowerPad® III families of quality analyzers, megohmmeters, micro-ohmmeters, digital turn ratiometers, and ground testers, including the recently released Clamp-on Ground Tester Model 6417.

We're also developing apps that will enable users to interact with our instruments from mobile devices running the Android and iOS platforms.

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## **Q. What is your role in the development of DataView?**

**A.** I became involved with DataView almost as soon as I started at AEMC. For a number of years it was just another software engineer and myself who worked on it. My primary focus was the report generation component of DataView®, along with some Control Panels.

Recently we hired two additional developers. At that time I was made Manager of the group. Going forward, I will be doing less actual development and will assume more managerial responsibilities, including coordinating with Paris for defining products and future software development.

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## **Q. How has DataView evolved over the years? What major features and capabilities have been added since its first release?**

**A.** When DataView® was originally released, the analysis and review of measurement data was done in the DataView® core. At that time the Control Panels had minimal capability, limited to configuration, real-time data display, and downloading recorded data. This has gradually changed to where the typical Control

Panel now has much more functionality. Users can still use the Control Panel to configure and download data. But they can also review the downloaded data directly in the Control Panel. This leaves the DataView® core to focus primarily on report generation.

This app is most useful where the PEL is in a permanent installation where it is connected to an Ethernet network and is accessible via the internet. In this situation the user can monitor the measured network from anywhere in the world provided they have access to the internet.

For more local wireless communication, users can also use the app to interact with the PEL through a Bluetooth connection.

**Q. AEMC® recently released a PEL app for Android mobile devices. What can users do with this app, and in what situations do you see the app being especially useful?**

**A.** The user can connect to the PEL, configure settings on the instrument, and view real-time measurement data, all from an Android device.



## Customer Support Tip

### Adding a Trend Summary List to a DataView® Report

The *trend summary* list frame is a child frame linked to a channel graph frame or channel list frame in a DataView® report. The trend summary list frame displays a textual list summary of the sample points for a given channel. Each summary line contains the minimum, maximum, and average values of a group of sample points. You can specify the number of samples to be summarized, and customize the text displayed using the Trend Summary List Properties dialog box. The displayed text is obtained from the combined sample points in the recorded data contained within the parent frame.

Note that the trend summary list frame is not available for all DataView® databases. To create a trend summary list frame, open the DataView® report in which you want to add the list. The DataView® online Help explains how to do this. Then proceed as follows

1. Select the frame to be linked by clicking the Select Frame icon  in the toolbar and then clicking on the frame. The selected frame will be displayed with resize handles.
2. Select either the Link Frame option from the Frame menu or the Link Frame icon  from the toolbar. The Child Frame Type dialog box will be displayed.
  3. The Child Frame Type dialog box allows you to specify the type of frame to be created and linked to the previously selected parent frame. The Frame Type list contains only the child frame types that can be linked to the selected parent frame.
  3. Select Trend Summary List Frame from the Frame Type list. After the child frame type is specified, click OK to proceed with the creation and linking of the frames. (If you decide not to create the frame, click Cancel.) After you select OK the pointer will change to the Link Frame  cursor.
  4. Move the cursor to the location on the page where the upper left corner of the frame is to be placed.
  5. Click and hold the left mouse button; then drag the cursor to the location on the page where the lower right corner of the frame is to be located. As you move the cursor, a dotted box is displayed. This dotted box shows the size and location of the frame being created.
  6. Release the mouse button. The Trend Summary List Properties dialog box appears. This consists of two tabs:
    - **Channels** tab lets you to specify what channels to display in the trend summary list frame
    - **Parameters** tab enables you to select which parameters will be listed in the trend summary list frame, and how they are formatted and displayed
  7. Once the properties have been specified, click OK. The trend summary list frame is created and linked to the parent frame selected in step 1.

# New AEMC® Instruments' Products

The following are brief descriptions for recently released products from AEMC Instruments. For more information about these and all other AEMC products, see [www.aemc.com](http://www.aemc.com).

## Clamp-on Ground Testers Models 6416 and 6417

The Ground Resistance Tester Models 6416 and 6417 measure ground rod and grid resistance without the use of auxiliary rods. Clamp-on ground resistance testers can be used in multi-grounded systems without disconnecting the ground system under test or de-energizing them. Models 6416 and 6417 simply clamp around the ground conductor or rod and measure the resistance to ground. By performing measurements on intact ground systems, the user also verifies the quality of the grounding connections and bonds. Resistance and continuity of grounding loops around pads and buildings may also be measured.

Three new features unique to AEMC® are:

- Test frequency selection
- Loop detection
- Ground voltage indication

The ability to select the test frequency provides more accurate results in inductive environments. The inductance can also be measured and displayed. Identifying a loop vs. resistance measurement assists the operator in identifying the correct measurement result, and not just resistance of a wire path.

Displaying voltage derived from current and resistance measurements provides an extra level of safety for the user, indicating a potentially dangerous ground voltage condition. Both models include a current measurement function. The probe's high sensitivity enables measurement of leakage current flowing to ground or circulating in ground loops from 0.2mA to 40A and resistances from 0.01 to 1500Ω.

Both models offer battery life information at power-up and Auto Power OFF for power management. Additional features are also displayed on the large OLED display to ensure precise measurements. The buzzer and Auto Power OFF features may be disabled from the push-buttons at any time



Clamp-on Ground Testers Model 6416 (left) and Model 6417

## PowerPad® III Model 8336

The AEMC PowerPad® III Model 8336 is a portable three-phase network analyzer designed to measure RMS (root mean square) values, powers, and disturbances of electric distribution networks; deliver a snapshot of the principal characteristics of a three-phase network; and track variations of specified parameters over time. This instrument enables technicians and engineers to measure three-phase networks, and perform diagnostics and power quality work.



PowerPad® III Model 8336

The Model 8336 is equipped with four current inputs and five voltage inputs. It includes 2GB of memory for storing a variety of measurement data. Data is viewed on the instrument's color LCD display in up to six different modes:

- **Waveforms** displays volts, amps, THD, and Crest Factor by phase or for all phases.
- **Harmonics** displays harmonics out to the 50th for volts, amps, and VA.

- **Transients or Inrush Current** sets, captures, and displays transients.
- **Trend** records and displays trend data at user selectable sample rates and user programmable recording periods.
- **Alarm Events** provides a list of the alarms recorded according to the thresholds programmed during configuration. Up to 40 different alarms can be programmed.
- **Power/Energy** records and displays power levels and associated parameters (power factor, displacement, and tangent).

The Model 8336 measurement accuracy is better than 1% (excluding any uncertainties due to the current sensors). A choice of sensors allows measurements ranging from a few milliamperes (MN93) to several kiloamperes (AmpFlex®).



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