AEMC® INSTRUMENTS
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Issue 10 **"WATTS CURRENT" TECHNICAL BULLETIN** *Fall 2016*

PEL 105 IRD Server Connection

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Featured Product:

PEL 105 IRD Server Connection

Starting with DataView® Version 3.15, users now have the option of establishing a connection from a computer to a PEL 105 via the IRD (Internet Relay Device) server. The IRD server facilitates communication between a PEL 105 and a computer running the DataView® PEL Control Panel on a private network connected to the internet. This enables you to connect your computer to instruments located on different private networks. The IRD server is hosted by AEMC® Instruments and is made available as a free service to all PEL 105 owners.

By default, a PEL 105 is automatically registered with the IRD server when it is connected to a network that has internet access. During this process, the instrument provides the IRD server with the following information:

- Instrument serial number (a "factory" setting that cannot be changed)
- Instrument password (an original password is provided with the instrument; this can be changed by the user)
- Private network IP and port

The IRD server also identifies the public IP and port being used for communication with the instrument. Note that IRD server access can be disabled via an option in the Communication tab of the Configure dialog box in the PEL Control Panel (see "Setting up the IRD Server Connection" below).

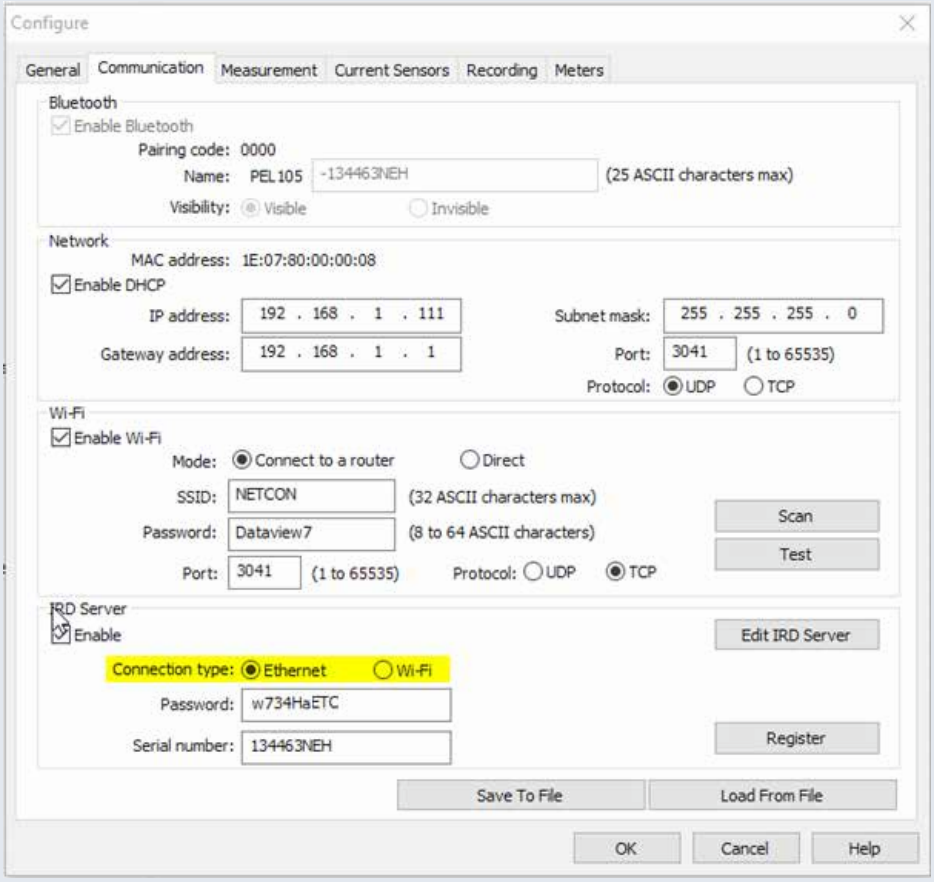
This article explains how to set up an IRD server connection. It also explains the basics of how IRD connections work. We assume you have installed DataView® with the PEL Control Panel on your computer.

***NOTE**: IRD connections are only available for PEL 105 instruments that can access the internet without being blocked by a firewall or similar system. Otherwise the IRD server will not be able to access the PEL 105, and attempts to communicate to the instrument via the IRD server will fail. Consult your network administrator to ensure that any firewall on your PEL 105's private network allows the instrument to access the internet.*

Setting up the IRD Server Connection

If you plan to use the default IRD server connection settings, you can skip this section and proceed to "Connecting an Instrument via IRD Server." If you need to make changes to these settings, do the following:

1. Connect the PEL 105 to your computer via a USB cable connection.
2. In the PEL Control Panel, highlight the instrument in the navigation frame. Then select **Instrument** in the menu bar, and click **Configure** (or click the icon in the toolbar) to display the Configure dialog box.
3. Open the Communication tab.
4. In the IRD Server section, ensure the Enable field is checked. If not, check it now. When this option is checked, the Password and Serial number fields appear. (To disable IRD server connection capability, remove the check from the Enable field.)

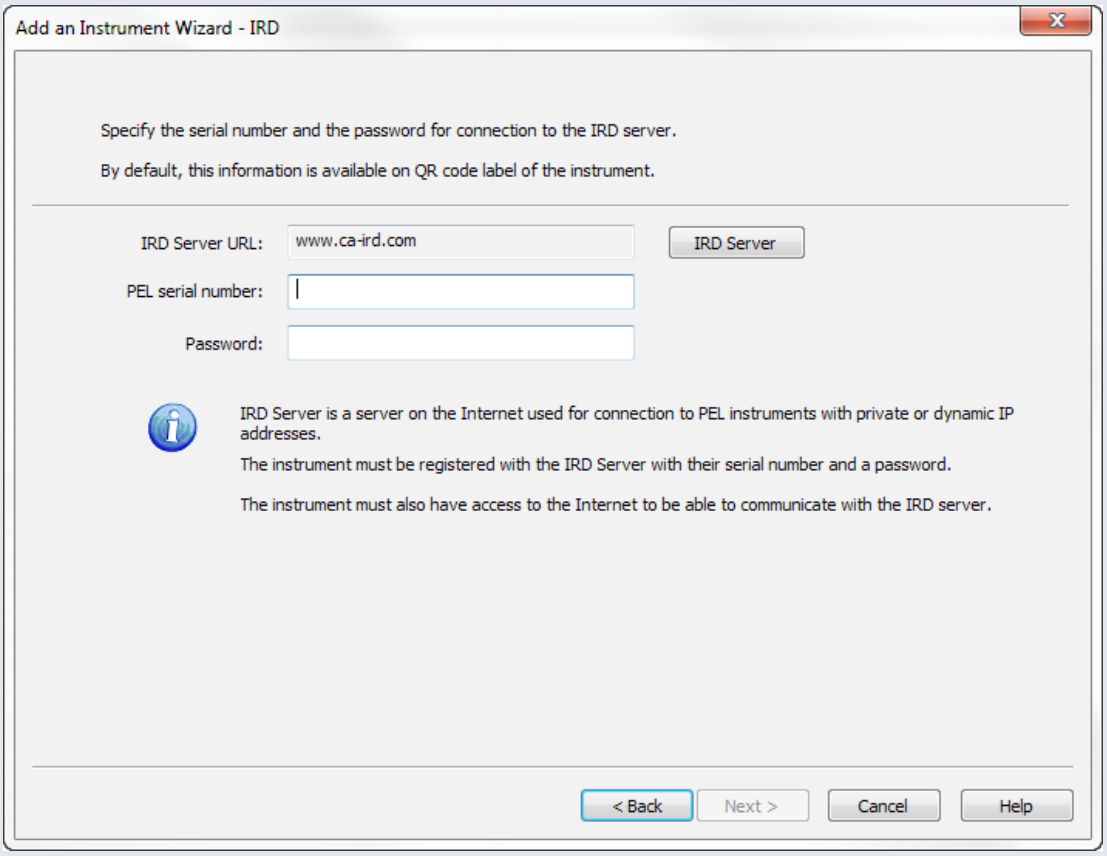


5. Connection type identifies the connection medium (Ethernet or Wi-Fi) through which the PEL 105 communicates with its private network. Ensure this setting matches the connection type used by your instrument.
6. To change the password, enter the new password in the Password field.
7. Clicking the Edit IRD Server button displays the IRD Server Settings dialog box. This lets you change the IRD server URL and port number. The U.S. default settings for these are as follows and in normal operation should not be changed:

   URL: www.ca-ird.com
   Port number: 80
8. If you have made any changes to the IRD server settings, you must re-register the instrument with the server. To do this, click the Register button. Then click OK to save your changes and exit the Configure dialog box.

Connecting an Instrument via IRD Server

When setting up a connection to a PEL105 in the Control Panel (via **Instrument** -> **Add an Instrument**) users have the option of choosing "**IRD server**" as the connection type in the Add an Instrument Wizard dialog box shown here:



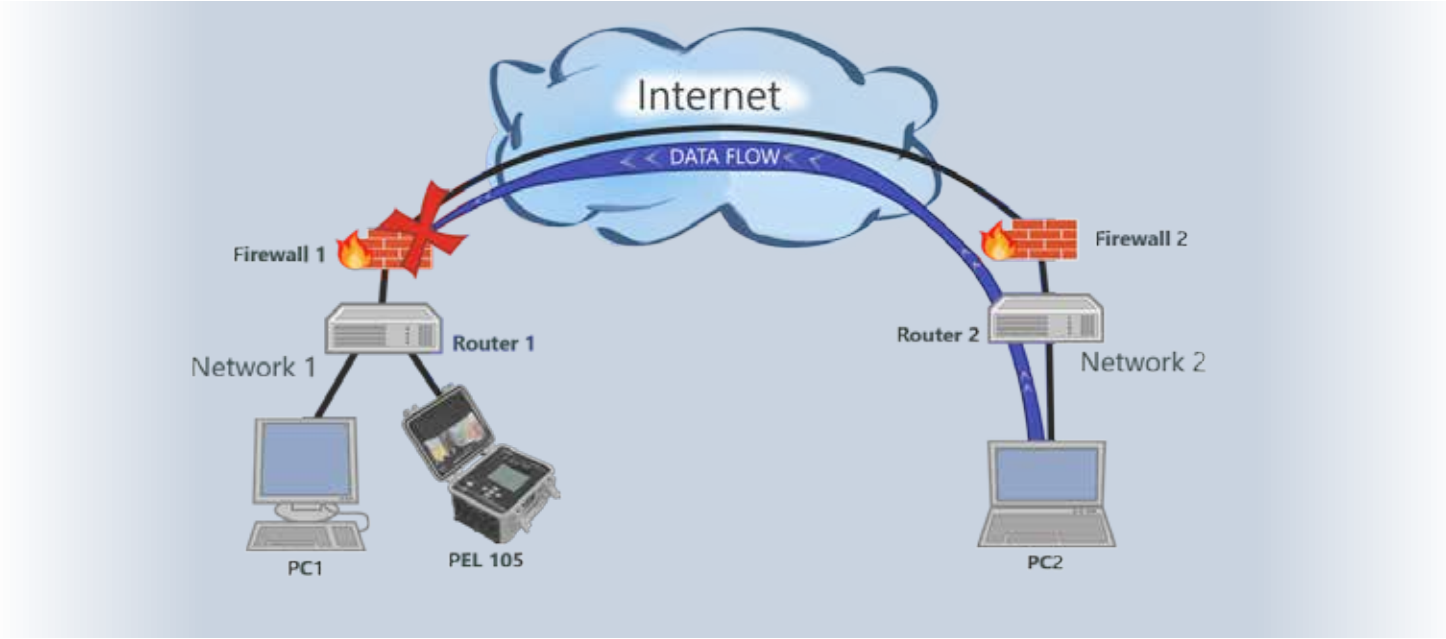
This dialog box displays the IRD server address, which is www.ca-ird.com for North America, South America, and Australia; and www.ca-ird.eu for the rest of the world. To complete this dialog box, fill in the PEL serial number and Password fields. These identify the instrument to which you want to connect. This information is provided with the PEL105 when you receive it. You can change the password from its original setting via the PEL Control Panel. If this has been done, be sure to enter the correct password here.

After you complete these fields, click Next. The IRD server then attempts to find the specified instrument, which by default was registered with the IRD server when the instrument was first connected to its network. When finished, a message appears indicating whether or not the connection was successful. If the connection has been made, click Finish.

Note that in addition to creating a new IRD connection from scratch, you can change an existing connection to an IRD connection. To do this, connect to the instrument. Then click the Modify Connection Setting  button in the data frame. This displays the Add an Instrument Wizard dialog. Choose IRD Server as the connection type and proceed as instructed above.

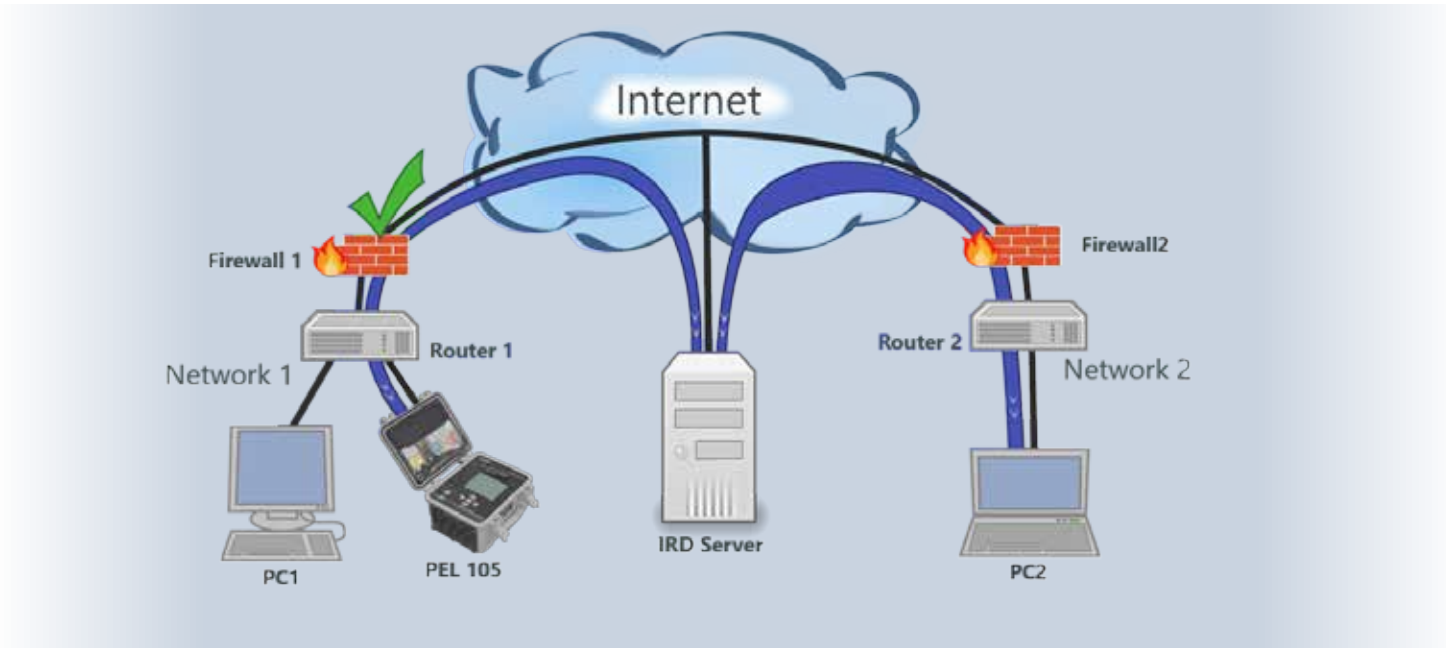
How IRD Server Connections Work

To understand how the IRD server enables connections between different private networks, consider the following typical network topography:



In the preceding example there are two private networks, each connected to the internet through a firewall. In this setup, the "PC2" computer cannot directly access the PEL105 because Firewall 1 prevents public access to Private Network 1. Without an IRD server, the typical way PC2 can access the PEL105 is for the network administrator to configure Router 1 to perform port forwarding. This can be a complicated procedure, especially when a single computer attempts to connect to multiple PEL105 instruments on different private networks – the router for each of these networks must be appropriately configured to allow access.

The IRD server significantly streamlines this process:



Now, assuming that:

- The IRD server option is enabled for this PEL105
- A connection of type "IRD" has been configured for this instrument via the Add an Instrument Wizard dialog in the PEL Control Panel
- Any firewall (if present) allows access between the internet and the PEL105

PC2 can now communicate with the PEL105 without any special configuration of Router1. The basic steps in this process are as follows:

1. When PC2 attempts to connect to the PEL105, the computer requests a directory lookup by the IRD server to find a PEL105 with the serial number and password supplied by the user in the Add an Instrument Wizard dialog box.
2. If a PEL105 matching the serial number and password is located, the IRD server returns the instrument's public and private network information to PC2. (Note that unlike some other connection types, the IRD server does not provide a list of connected instruments from which to choose; it only informs the user whether or not a match is found for the requested serial number/password. This helps maintain the security of other instruments registered with the IRD server.)
3. PC2 attempts to directly connect to the PEL105 using the network information provided by the IRD server. Since the PEL105 is not on PC2's private network, the computer cannot make a direct connection to the PEL105; therefore the direct connection attempt will be unsuccessful. When this happens, the connection request is automatically relayed to the IRD server, asking the server to forward the data to the PEL105.
4. The IRD server passes the data to the PEL105. The IRD server can communicate with the PEL105 because the instrument maintains a connection with the server through Firewall 1. This connection remains in place as long as the "IRD Server" feature is enabled in the PEL105. Without this connection, Firewall 1 would block all access to the PEL105.
5. The PEL105 sends the response to the IRD server, which forwards it back to PC2.

If the computer and PEL105 are on the same private network, a direct connection is established. For example, if PC1 in the preceding illustration attempts to connect to the PEL105, the process starts as described in steps 1 and 2 above. However, using the private network information returned by the IRD server, the computer can connect directly to the instrument. The user does not need to know the IP address assigned to the PEL105. And even if the IP address assigned to the PEL105 changes in the future, the IRD server lookup will resolve the change and allow a direct connection. (The IRD server is not used beyond the directory lookup.)

Conclusion

This concludes our overview of IRD connections for the PEL105. For more information about this instrument, visit its product page at http://www.aemc.com/

Three-Phase Dual-Voltage Motor Insulation Resistance Testing

In a previous issue of the AEMC® *Technical Bulletin*, we introduced you to insulation resistance testing with AEMC® Megohmmeters. In this article, we examine three-phase dual-voltage motors, a frequent issue for insulation resistance testing. Three-phase dual-voltage motors are used for most day-to-day operations in today's industrial plants. These motors run conveyor belts, pumps, fans, and many other applications.

Motors are susceptible to the gradual failure of their insulation resistance. The primary causes of insulation failure include:

- electrical stress (current flow)
- mechanical stress (vibrations)
- chemical stress (corrosives)
- thermal stress (heating/cooling)
- environmental contamination (moisture/grime/oil)

Monitoring insulation resistance over time can be a valuable tool in predicting when a motor is headed toward failure and/or requires maintenance. A program of regularly scheduled insulation testing with a megohmmeter can increase motor safety by minimizing the risk of electric shock and electrical fire. Testing can also help manage motor downtime.

This article reviews insulation testing for three-phase dual-voltage motors. We look at different motor types, methods for testing them, which megohmmeters to use for which types of testing, and questions to consider when setting up your own insulation testing program.

Three-phase Dual-Voltage Motor Primer

Three-phase dual-voltage motors come in three basic configurations:

- "Delta" connected, 9-lead
- "Wye" (Y) connected, 9-lead
- "Wye" connected, 12-lead

All three types can be wired for either 240 or 480VAC. In addition, all three have six internal coils, although their internal connections differ widely.

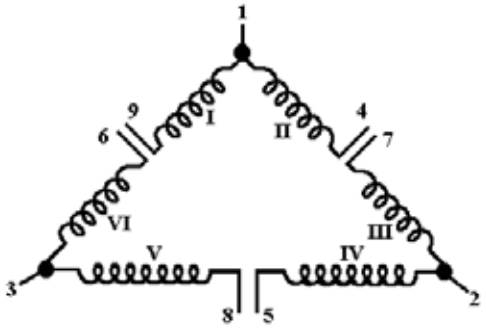
Delta Connected, 9-Lead Motor

This is probably the most common type of motor in factories, lumber mills, and other industrial plants. These motors have nine leads, numbered to aid the electrician when connecting the motor. To guide connection, the manufacturer's nameplate for this type of motor typically contains information such as the following:

	L1	L2	L3	Join
Low Voltage	1,6,7	2,4,8	3,5,9	---
High Voltage	1	2	3	4&7, 5&8, 6&9

According to the preceding table, for a high-voltage connection the electrician connects:

- L1 to lead 1
- L2 to lead 2
- L3 to lead 3
- Wire-nut 4 and 7 together
- Wire-nut 5 and 8 together
- Wire-nut 6 and 9 together



Delta connected 9-lead wiring diagram

In the preceding illustration, coils are identified by Roman numerals and leads by regular numbers. Note that some coils are permanently connected (I to II, II to IV, and V to VI) and cannot be separated. This prevents testing coil-to-coil insulation resistance for all six coils and their combinations.

To effectively test the motor, you must disconnect the field coils where possible. To do this for delta connected 9-lead motors, remove the wire-nuts from 4 and 7, 5 and 8, and 6 and 9. This enables you to perform the following insulation tests:

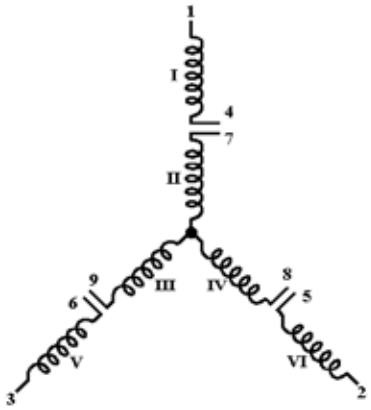
Megohmmeter – Connection	**Megohmmeter + Connection**	**Insulation Resistance Tested**
Lead 1	Motor Frame	Coils I & II to Frame
Lead 2	Motor Frame	Coils III & IV to Frame
Lead 3	Motor Frame	Coils V & VI to Frame
Lead 1	Lead 2	Coils I & II to III & IV
Lead 1	Lead 3	Coils I & II to V & VI
Lead 2	Lead 3	Coils III & IV to V & VI

Wye Connected, 9-Lead Motor

As with delta motors, the manufacturer's nameplate for wye connected 9-lead motors explains how the leads should be connected. The following table provides a typical example:

	L1	L2	L3	Join
Low Voltage	1,7	2,8	3,9	4&5&6
High Voltage	1	2	3	4&7, 5&8, 6&9

In this case, high-voltage connections are the same as for delta motors.



Wye connected 9-lead wiring diagram

Note that the wye-connected 9-lead motor's internal connections vary from the delta motor. Coils II, III, and IV are permanently connected and cannot be separated.

To properly test this type of motor, remove the wire-nuts joining leads 4 and 7, 5 and 8, and 6 and 9. You can then perform the following insulation resistance tests:

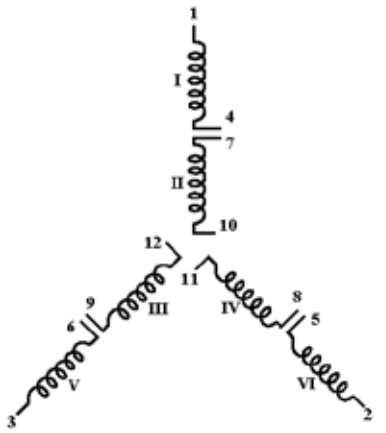
Megohmmeter – Connection	**Megohmmeter + Connection**	**Insulation Resistance Tested**
Lead 1	Motor Frame	Coil I to Frame
Lead 2	Motor Frame	Coil VI to Frame
Lead 3	Motor Frame	Coil V to Frame
Lead 7	Motor Frame	Coils II, III, and IV to Frame
Lead 1	Lead 2	Coils I to IV
Lead 1	Lead 3	Coils I to V
Lead 1	Lead 7	Coil I to II, III, and IV
Lead 2	Lead 3	Coil V to VI
Lead 2	Lead 7	Coil V to II, III, IV
Lead 3	Lead 7	Coil VI to II, III, IV

Wye Connected, 12-Lead Motor

The manufacturer's nameplate for this type of motor appears similar to the following:

	L1	L2	L3	Join
Low Voltage	1, 7	2, 8	3, 9	4&5&6, 10&11&12
High Voltage	1	2	3	4&7, 5&8, 6&9, 10&11&12

As this table shows, the connections required for a high-voltage connection are similar to those for delta and wye 9-lead motors. In addition, the 12-lead motor requires connecting wire-nut 10, 11, and 12 together.



Wye connected 12-lead wiring diagram

Wye connected 12-lead motors differ from 9-lead three-phase dual-voltage motors in that none of the coils is permanently connected and therefore all can be tested separately. Although this increases the time required to test every possible combination; it does allow you to better pinpoint exactly where a failure may occur in the motor. The following table lists the tests that can be performed on this motor, after ensuring all wire-nuts joining leads are removed:

Megohmmeter – Connection	Megohmmeter + Connection	Insulation Resistance Tested
Lead 1	Motor Frame	Coil I to frame
Lead 2	Motor Frame	Coil VI to frame
Lead 3	Motor Frame	Coil V to frame
Lead 7	Motor Frame	Coil II to frame
Lead 8	Motor Frame	Coil IV to frame
Lead 9	Motor Frame	Coil III to frame
Lead 1	Lead 2	Coils I to VI
Lead 1	Lead 3	Coils I to V
Lead 1	Lead 7	Coils I to II
Lead 1	Lead 8	Coils I to IV
Lead 1	Lead 9	Coils I to III

Megohmmeter – Connection	Megohmmeter + Connection	Insulation Resistance Tested
Lead 2	Lead 3	Coils VI to V
Lead 2	Lead 7	Coils VI to II
Lead 2	Lead 8	Coils VI to IV
Lead 2	Lead 9	Coils VI to III
Lead 3	Lead 7	Coils V to II
Lead 3	Lead 8	Coils V to IV
Lead 3	Lead 9	Coils V to III
Lead 7	Lead 8	Coils II to IV
Lead 7	Lead 9	Coils II to III
Lead 8	Lead 9	Coils IV to III

Insulation Resistance Testing Methods

There are several types of insulation resistance tests in use today. Most can be classified as spot reading (short-time) tests, time-resistance tests, or step voltage tests. Whichever test you choose, we recommend you measure resistance both phase-to-phase and phase-to-frame if possible.

Spot Reading Test

This type of test is typically of very short duration (often 30 to 60 seconds). Spot reading tests are generally performed periodically and their results compared to identify possible trends. Note that this is a resistance test, not to be confused with the pass/fail tests electricians often perform to test new installations for short-circuits.

One limitation of spot-reading is that all tests must be carefully normalized, since factors such as temperature (motor and air) and ambient humidity can affect and in some cases invalidate your measurements.

Time-Resistance Tests

A major advantage of time-resistance tests is that they are fairly independent of temperature and humidity. They can also provide conclusive information without records of past tests. The test duration can be up to 10 minutes or longer depending on the size of the motor. In general, good insulation shows a continual increase in resistance as test time increases.

There are two time-resistance tests that are used today:

- **Polarization Index (PI)** test is the most commonly used. It normally involves taking readings at 1 minute and 10 minutes. Other testing times are also sometimes used.
- **Dielectric Absorption Ratio (DAR)** test is no longer commonly performed, but may be useful for smaller motors. This test involves calculating the ratio of the insulation resistance measured after 60 seconds divided by the measurement at 30 seconds.

Step Voltage Test

The step voltage test creates electrical stresses on internal insulation cracks, identifying potential problems that may not be revealed by testing at lower voltages. This involves testing at least two (and more often five) test voltages and comparing the results. The test begins at an initial test voltage. At a specified interval, typically one minute, a measurement is recorded, after which the test voltage is increased. This increase is usually to double the initial voltage for each step. This process may be repeated through several steps, with measurements taken after one minute and the test voltage increased at a two-to-one ratio over the previous voltage.

Choosing a Megohmmeter

AEMC® Instruments offers a complete line of megohmmeters designed for insulation testing, ranging from 100V handheld instruments to heavy-duty models providing test voltages up to 15,000V. And with some models, you can download and analyze the results on a computer running AEMC®'s DataView® software.

AEMC® megohmmeters are DC testers. The advantages of DC measurements include:

- Smaller and lighter instrument
- Non-destructive tests (will not damage insulation)
- Historical data accumulation and comparison

Which megohmmeter to choose depends on several factors, including the instrument's:

Voltage range. The type of equipment to be tested determines this. As a general rule of thumb, the megohmmeter should be able to generate at least twice the equipment operating voltage.

Resistance range. Consult the manufacturer of the equipment to be tested. On 3-phase motors, coil-to-coil resistances are in the 10MΩ to 1000 MΩ range, with coil-to-frame resistance 10GΩ+.

Power source. Megohmmeter power can be supplied by hand-crank, battery, or line current. Hand-cranking instruments may not be practical for testing with long time durations.

Insulation Resistance Testing FAQs

At what voltage should I test my equipment?

The general rule of thumb is to test at 2x the boiler plate rating up to 1000V. Beyond 1000V, test at the normal operating voltage.

My reading is (X). Is this good?

Consult the manufacturer of the equipment under test for a definitive answer.

How often should I test?

For critical equipment we recommend monthly testing if possible. Other equipment can be tested every 6 to 12 months during regularly scheduled shut-down.

What's the difference between the MΩ and kΩ positions on megohmmeters?

The MΩ setting is for insulation resistance tests (high voltage/low current); kΩ is for regular resistance tests (low voltage/higher current).

What kind of test should I perform on my motor?

Generally the PI and step voltage tests are better suited for larger motors, while the DAR test and spot readings of 60 seconds or shorter are valuable for smaller motors.

What is the purpose of the megohmmeter's built-in Voltmeter function?

Safety. The megohmmeter itself is not dangerous; but the equipment under test may present a potential hazard. The Voltmeter function measures and displays any voltage on the equipment to be tested. Equipment voltage should be below 25V for safe testing. AEMC® megohmmeters feature automatic test inhibition if voltages higher that 25V are present. Some models offer a user-programmable setting for this voltage level.

How long should I discharge?

A discharge period of 5x the test duration is recommended.

Conclusion

This concludes our quick review of performing insulation testing on three-phase dual-voltage motors. For more information about insulation resistance testing basics, see our article "An Introduction to Insulation Resistance Testing" in the Summer 2015 issue of our Technical Bulletin. You can also visit our web site at www.aemc.com, or call us at 800-343-1391.

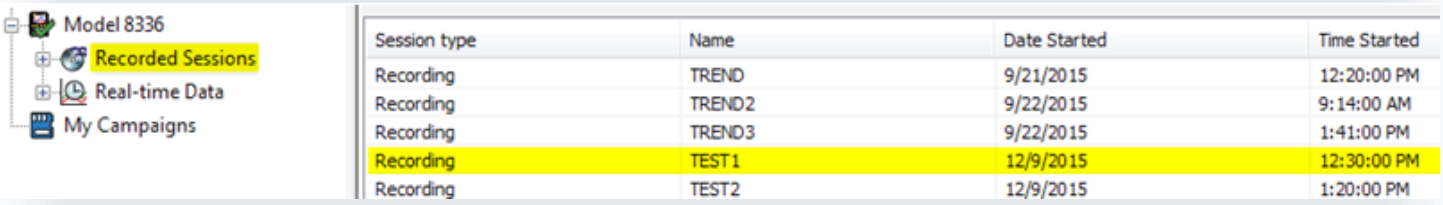
Downloading Data with the DataView® PowerPad® III Control Panel

By Mike Van Dunk

All data sessions stored on a PowerPad III® instrument can be downloaded to a computer running DataView® with the PowerPad III® Control Panel. In addition to recorded measurements, this data can consist of:

- **Photographs** are "snapshots" taken using the CAMERA button on the instrument. Each contains the data being measured by the instrument at the moment the CAMERA button was pressed.
- **Alarms** are events in which the instrument records a measurement that meets the criteria that define an alarm condition.
- **Transients** are similar to alarms. These are short-lived events in which the instrument records a measurement that meets the criteria defined in the Transients tab of the Configure Instrument dialog box.
- **Inrush** is data associated with inrush events, such as starting a motor, as defined in the Inrush tab of the Configure Instrument dialog box. Note that Inrush is not available for the Model 8333.
- **Monitoring** is data recorded to monitor the system under test for compliance with EN 50160, a European-based standard designed to specify acceptable voltage characteristics of electricity supplied by public distribution systems.

Downloaded data files are saved on the computer's hard drive with the file extension .icp. To view a list of data sessions currently stored on the connected instrument, open the Control Panel and select **Recorded Sessions** under the instrument's name in the navigation frame. A list of stored data sessions is displayed in the data frame.



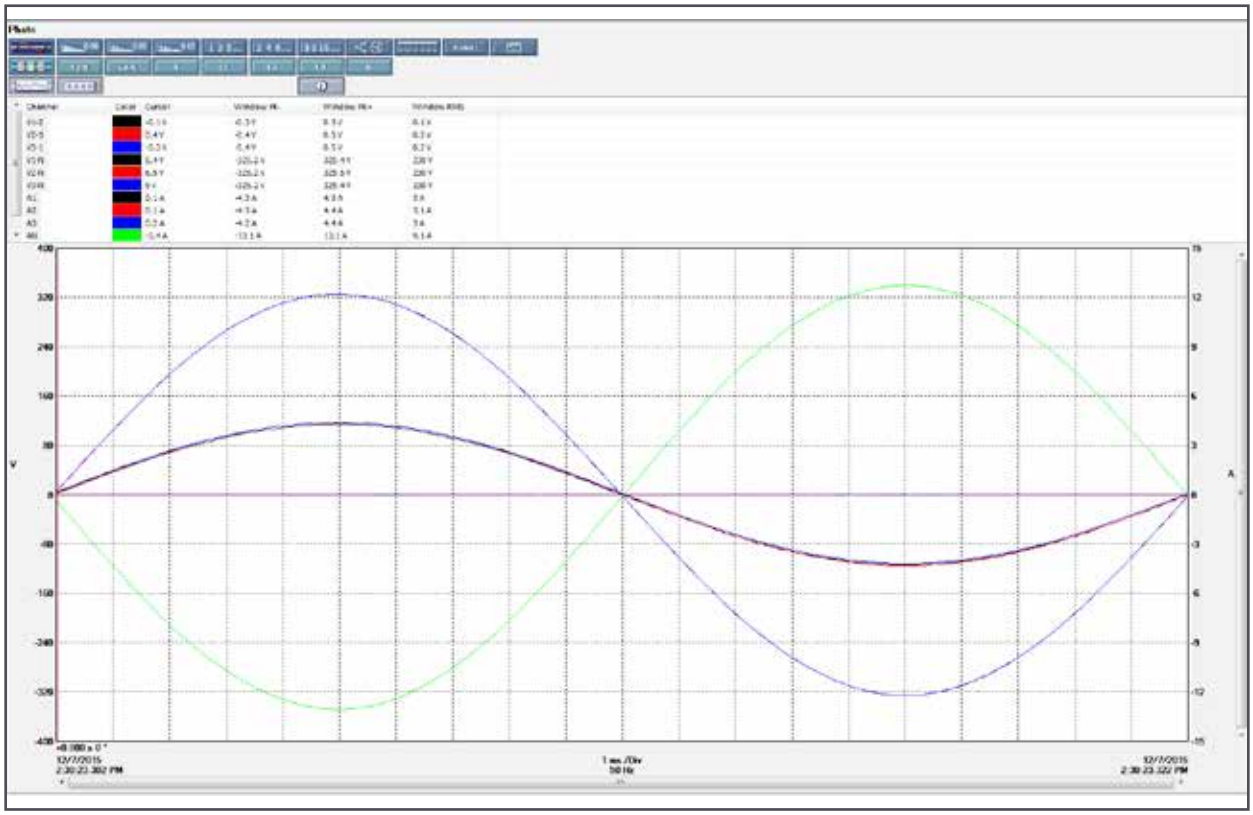
Session type	Name	Date Started	Time Started
Recording	TREND	9/21/2015	12:20:00 PM
Recording	TREND2	9/22/2015	9:14:00 AM
Recording	TREND3	9/22/2015	1:41:00 PM
Recording	TEST1	12/9/2015	12:30:00 PM
Recording	TEST2	12/9/2015	1:20:00 PM

There are multiple ways to download data sessions from the instrument:

- Download an individual session.
- Download all sessions of a specific type (recordings, alarms, and so on).
- Download all sessions via the Control Panel.
- Download all recorded data directly from the instrument's SD card (this option is not available for the Model 8435).

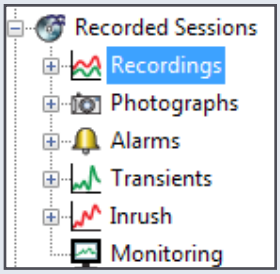
Downloading Individual Sessions

1. In the Control Panel, select **Recorded Sessions** in the navigation frame.
2. In the data frame, double-click the session to be downloaded.
3. A status bar appears indicating the progress of the download. When complete, the session's data appears in the data frame



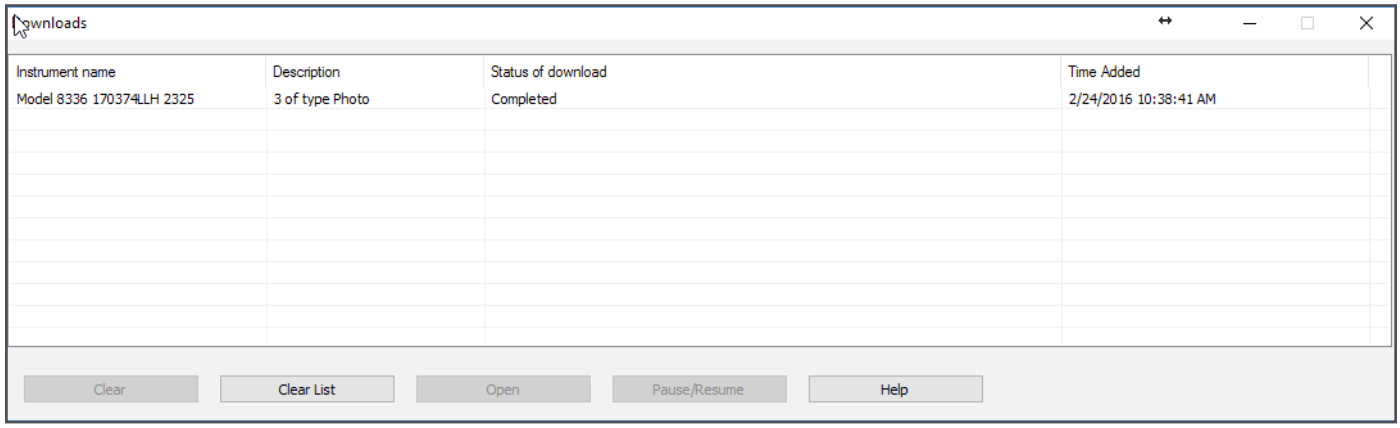
NOTE: You can also download an individual session by opening the Recordings, Photographs, Alarms, Transients, Inrush, or Monitoring sub-folders in the Recorded Sessions folder.

Each of these folders may contain recorded sessions of a specific type.



Downloading Sessions by Type

1. Select the sub-folder containing the session type you want to download. For example, to download all photos, highlight the Photographs sub-folder in the navigation frame.
2. Click **Instrument** from the menu bar and select **Download Recorded Data**.
3. The message Do you want to download all data of type Photo? appears. Click **Yes** to confirm. (If you select a different session type, its name appears in place of "Photo" in the previous message.)
4. The recordings are downloaded. When finished, the Downloads screen appears.



Downloading All Sessions

1. Select the Recorded Sessions folder in the navigation frame.
2. Click **Instrument** from the menu bar and select **Download Recorded Data**.
3. The message, "*Do you want to download all data of type Recorded Sessions?*" appears. Click **Yes** to confirm.
4. The sessions are downloaded. When finished, the Downloads screen appears.

Downloading from the SD Card

For PowerPad III® instruments (except the Model 8435) running firmware version 4.1 or later, the Read SD Card option in the Control Panel lets you download the contents of the SD card directly into a computer equipped with an SD card reader. This can save a significant amount of time, since downloading via USB cable can require many hours for large amounts of data.

NOTE: The SD card contains recorded measurement data only. Snapshot, alarm, transient, inrush, and certain parameters of monitoring data are stored in the instrument's Flash memory, and must be downloaded via a USB connection.

This procedure does not apply to the Model 8435. Removing the SD card from the Model 8435 requires sending the instrument to AEMC® or an authorized repair facility.

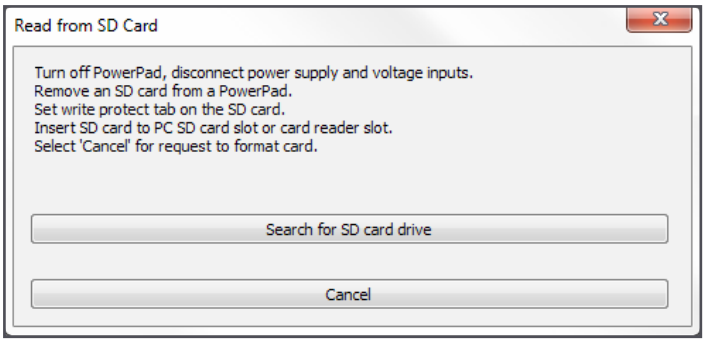
1. Remove the SD card from the instrument.

Detailed instructions for removing the SD card can be found on page 10 of our Spring 2015 Technical Bulletin. You can also view a video on our YouTube Channel.

2. Set the write protect lock tab of the SD card into the lock position, then insert the card into an available SD card reader slot on your computer. After a few moments, a prompt appears asking whether or not you want to format the SD card. Click **Cancel** in response to this prompt. **If you format the card, you will lose all data stored on it.**

3. In the Control Panel, click **File** in the menu bar and then click the option **Read SD Card**. This displays the Read from SD Card dialog box.

4. Click **Search for SD card drive**. The Control Panel searches the computer for any removable media, and displays a drop-down list of any it finds.



5. Select the drive letter of the SD card, and click **Read from SD card**. The Control Panel copies the contents of the SD card into a Control Panel (.icp) file, and opens the file in the My Campaigns folder.

6. If the SD card data includes a Monitoring/EN50160 test, you are now asked whether or not you want to download the complete test. If you answer yes, the next time the Control Panel is connected to the same instrument; it will download the part of the monitoring test data that is not on the SD card, and combine it with the part that is on the SD card. If you answer no, it will open the recording as if it were a simple trend, without the rest of the Monitoring/EN 50160 test data.

7. Remove the card from the computer.

8. Move the card's write protect lock tab back to the unlocked position (towards the metal tabs).

9. Slide the card back into SD card slot of the instrument until it clicks and locks in place.

For more information about the PowerPad III® product family go to: www.aemc.com

About the Author:

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Customer Support Tip:

DataView® Report Design Tools

By Ray Brady

The DataView® report design interface includes a toolbar.

A number of the icons in the toolbar represent tools for creating, modifying, and viewing DataView® reports. The following table provides a handy reference for these icons and the tools they represent. Note that these icons are shown as they appear in the upcoming DataView® 3.50; icons in earlier versions of DataView® may differ slightly in appearance (although they function as described below).

Icon	Tool	Description
	Select Frame	Changes the mouse pointer to the selection tool. Use this tool to select frames in the report to move, modify, and perform other actions upon.
	Value at Cursor	When the cursor is positioned on a graph frame, this tool displays the data associated with the point defined by the cursor. This data appears in a pop-up window next to the cursor.
	Edit Session Properties	Opens the Address Book dialog box. This lets you add information to the report about the operator who conducted the recording session and the site where the session took place. You can also use this dialog box to add custom fields to the report.
	Link Frame	Opens the Child Frame Type dialog box for creating a new frame linked to the currently selected frame. The available types of frames depend on the type of frame selected prior to issuing this command.
	New Frame	Changes the mouse pointer to the Create Frame  tool. With this tool displayed, you can right-click the mouse to display a menu of frame creation options.
	Place Graph	Changes the mouse pointer to the Create Graph Frame  tool. Holding down the left mouse with this tool displayed defines the size and location of the graph frame. Releasing the button displays the Channel Graph Properties dialog box for selecting the data to be included in the graph and how it will be displayed.
	Place Table of Contents	Changes the mouse pointer to the Table of Contents Frame  tool. Holding down the left mouse with this tool displayed defines the size and location of the Table of Contents. Releasing the button displays the Table of Contents Properties dialog box for defining the format and style of the TOC.
	Insert Text	Changes the mouse pointer to the Insert Text  tool. Holding down the left mouse with this tool displayed defines the size and location of the text box. Releasing the button displays the Text Box Properties dialog box for entering text and selecting text font, style, and other characteristics that affect the appearance of the text box.

	Place OLE	Changes the mouse pointer to the OLE Frame tool for creating an Object Linking and Embedding (OLE) object frame. Holding down the left mouse with this tool displayed defines the size and location of the OLE frame. Releasing the button displays the Insert Object dialog box for selecting the type of OLE object, whether or not the object is an existing file or will be created "on the fly," and other options.
	Place Word OLE	Changes the mouse pointer to the OLE Frame tool for creating a Microsoft Word OLE document. Holding down the left mouse with this tool displayed defines the size and location of the Word OLE frame. Releasing the button opens Microsoft Word for creating the text to be included in the report.
	Draw Arrow	Changes the mouse pointer to the Arrow tool for adding an arrow to the report. Holding down the left mouse with this tool displayed defines the size and location of the arrow. Releasing the button displays the Arrow Properties dialog box to define the arrow size, color, and other characteristics.
	Draw Line	Changes the mouse pointer to the Line tool for adding a line to the report. Holding down the left mouse with this tool displayed defines the size and location of the line. Releasing the button displays the Line Properties dialog box to define the line thickness and color.
	Draw Box	Changes the mouse pointer to the Box tool for adding a box to the report. Holding down the left mouse with this tool displayed defines the size and location of the box. Releasing the button displays the Box Properties dialog box to define the box color, style, and other characteristics.
	Zoom	When a graph frame is selected, changes the mouse pointer to the zoom selection tool. Holding down the left mouse with this tool displayed defines the area to be zoomed. Releasing the button zooms in on the selected area; the data within this area will fill the entire graph frame.
	Zoom Previous	Resets zooming to the previous zoom setting. For example, if you use Zoom to display a section of the original graph, clicking Zoom Previous displays the original graph frame.
	Zoom In	Zooms in on the report. Clicking this tool when a data frame is selected expands the data displayed in the frame. The remainder of the UI, including the list of worksheets on the left side of the screen, remains the same size. When a frame is not selected, clicking this tool expands the entire worksheet.
	Zoom Out	Zooms out of the report. As with Zoom In, when a data frame is selected clicking this tool affects only the data displayed in the frame. When a frame is not selected, clicking this tool reduces the entire worksheet.
	Zoom All	When a graph frame is selected, zooms to minimum magnification to allow the entire data duration to be displayed in the graph. When a graph frame is not selected, zooms to the maximum magnification that allows the report's left and right margins to fit on the screen.
	Pan Start	Sets the beginning of the displayed data in the selected graph frame to the start time of the data displayed in the graph. The zoom magnification remains the same.

	Pan Left	Pans the data displayed in the selected frame to the left. The interval panned equals 90% of the duration of the displayed data. For example, if the frame displays 10 seconds of data, clicking  once moves the data display 9 seconds to the left. Each subsequent press pans the data display one interval to the left, until the data start time is displayed (at which point this icon is grayed out and inactive). Note that this icon is only active if the selected frame is zoomed in. When not zoomed in, the frame shows the entire duration of the data and therefore panning is not possible.
	Step Left	Moves the data displayed in the selected frame one "step" to the left. Each step represents 10% of the time duration of the displayed data. For example, if the frame displays 10 seconds of data, clicking  once moves the data display one second to the left. Each subsequent press steps the data display one step to the left, until the data start time is displayed. This icon is inactive when (1) the data start time is displayed, or (2) the frame is not zoomed in.
	Step Right	Moves the data displayed in the selected frame one step to the right. This icon functions similarly to Step Left, with each step representing 10% of the total time duration of the displayed data. Each click steps the data display one step to the right, until the data end time is displayed. This icon is inactive when (1) the data end time is displayed, or (2) the frame is not zoomed in.
	Pan Right	Pans the data displayed in the selected frame to the right. Similar to Pan Left, the interval panned equals 90% of the duration of the displayed data. Each subsequent press pans the data display one interval to the right, until the data end time is displayed. This icon is inactive when (1) the data end time is displayed, or (2) the frame is not zoomed in.
	Pan End	Sets the end of the displayed data in the selected graph frame to the end time. The zoom magnification remains the same.
	Bring to Front	When two or more frames overlap, selecting one of the frames and clicking  moves the selected frame to the "front" of the overlapped frames. This enables you to more easily select a frame that overlaps one or more other frames.
	Send to Back	Selecting a frame that overlaps one or more other frames and then clicking  moves the selected frame to the "back" of the overlapped frames.

If you have any questions about this article or any AEMC® instrument, please contact our Technical Support staff at 800-343-1391 x351 or techsupport@aemc.com.

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