# Megger.



Baker NetEP
On-line Motor
Analysis System

# Baker NetEP
## Online Motor Analysis System

## Installation Guide

# Contents

# Safety and General Operating Information

## General Safety Precautions

The general safety information presented here is for operating and service personnel.

NOTICE:  If the equipment is used in any manner not specified by Megger the safety protection provided by the equipment may be impaired.

### Symbols and Labels Used on Equipment

*Table 1:  NetEP safety labels.*

| Symbol/Label | Description |
|---|---|
|  | Earth (ground) terminal. |
|  | Warning about hazardous voltage and risk of severe electrical shock or death.  Located beside each red test lead on front panel of instrument. |
|  | Danger notice and label warns of the hazards associated while working with high voltages.  Care must be taken to avoid risk of injury or death. |

## Additional Safety Alerts

**WARNING:  The NetEP must not be exposed to water or moisture, even with the cabinet securely closed.  This instrument is not water resistant with its door either open or closed.  Do not allow the instrument to be exposed to water, especially if the cabinet is open.  Any water that comes in contact with electronics inside the instrument can harm or destroy the device, and can also result in serious injury and/or death to people working in or around the instrument.**

CAUTION:  This product conforms to UL/CSA 61010-1 up to a maximum voltage of 600VAC at 50/60Hz with a main line voltage of 100–240VAC with a current draw of less than 2A.

This product conforms to IEC/EN 61010-1 up to a maximum voltage of 1000VAC at 50/60Hz with a main line voltage of 100–240VAC with a current draw of less than 2A.

Maximum input voltage is determined by the applicable standards for the environment where the unit is being installed as allowed by the Authority Having Jurisdiction (AHJ) as either 600V or 1000V.

Under no circumstances should the voltage sensing circuit be connected to higher voltage levels.  This will cause severe damage to the instrument.

## Operational Safety Warnings

Any installer or operator of this equipment must adhere to the following safety precautions:

- Comply with all of your organization's mandated safety practices at all times.
- Ensure that the physical setup of the NetEP unit does not interfere with site (or facility) power current or adversely impact any site operations.

**To avert or avoid dangerous shock hazards:**

1. Use all mandated safety equipment required of your organization for performing installations of electrical equipment, including eye protection, high voltage gloves, arc-flash rated masks, hoods and any required PPC (personal protective clothing).

2. Ensure that the site organization's appropriate lockout /tag-out procedures are properly understood and implemented by all personnel involved in this installation.

3. Ensure each rotating system to be monitored IS POWERED DOWN (OFF) and inoperable before installation of this instrument begins. Each and every connection at the motor control center (MCC) must be connected ONLY when the rotating system is powered down/off and inoperable.

4. Ensure that phase connections are made such that they prevent phase-to-phase or phase-to-ground shorting.

5. Install an external disconnect switch for AC power to the NetEP (this is required). This disconnect switch should be within three feet of the NetEP's permanent mounting position. This is necessary because there is no internal fusing or disconnect for AC power with the NetEP.

## Positioning Equipment

Maintain a clearance of 36 inches in front of the NetEP to allow for opening the door for installation/removal of internal components, and for maintenance and connections. All connections to the NetEP are through the bottom of the cabinet, so it must be mounted with at least 36 inches of vertical free/clear space below the unit. The NetEP does not require any additional air to keep the unit cool, so airflow at the mounting location is not of concern.

Do not position equipment in such a way that it is difficult to operate the power disconnection device(s).

## Cleaning and Decontamination

Keep the NetEP clean and in a dry environment. To clean the unit, power it down (off) and de-energize all voltage bus connections, including the AC power to the unit. Wipe with a clean, water-dampened cloth. Do not submerge in water or other cleaners or solvents. Use a soft cotton cloth dampened with water to clean the computer screen and gently wipe the surface. Products designed specifically to clean LCD screens or monitors may be used as well.

## Unpacking the Unit

Carefully remove the following items from the shipping boxes:

- NetEP Device
- CTs
- Installation Manual (includes software license documentation)
- Termination operating tools (2EA)
- Installation and calibration checklist

# Installing the NetEP

The NetEP requires a suitable location to permanently mount the instrument's cabinet.  The location must allow safe installation of voltage and current lines to the unit in accordance with applicable electrical codes.

The location must be readily accessible to 100 –240 V AC power, and an Ethernet Local Area Network (LAN) connection.  It should be mounted on a vertical surface approximately 36 inches above the floor (36 inches from the bottom of the cabinet).  The surface to which the cabinet will be mounted should be more than capable of permanently supporting a 40-pound, 20-inch by 30-inch cabinet without obstructing or being obstructed by other equipment.

The location must also be within 1000 feet of the current transformers (CTs) to be used to monitor motor currents.  To facilitate wiring of the CTs and voltage connections, there must be a minimum 36-inch clearance in front of the NetEP cabinet.  One foot (12 inches) of clearance is needed on each side of the cabinet to adequately route cables.  The ambient temperature of the location should be between 32–120 degrees Fahrenheit (0–49 degrees Celsius).  Vibration should be minimal.

There should also be enough space available to mount the voltage bus disconnect in close proximity to the unit.
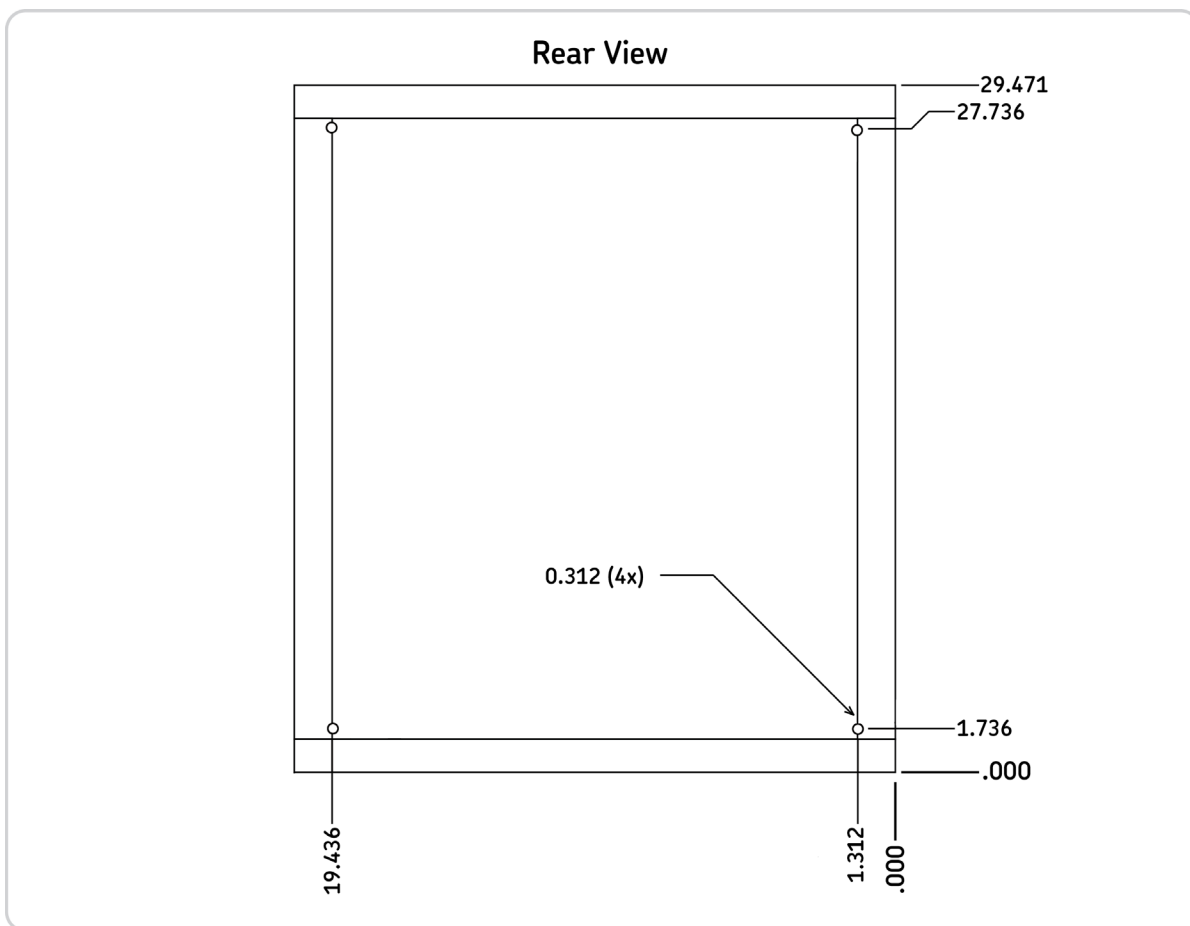


*Fig 1:  Rear view illustration of mounting holes for the Net EP.  Dimensions in inchdes.*

## Voltage Bus and Disconnection Requirements

AC power is wired through the bottom of the NetEP cabinet, and must be wired using established or mandated electrical codes.

NOTICE:  A breaker or disconnect outside the NetEP cabinet is required to safely remove the NetEP from its power source; the NetEP itself has no fuses or breakers inside the cabinet for the AC power circuit/supply.

The NetEP has a universal input power system, and should be supplied with a 100–240-volt source, and at 50/60 Hz with ground. The unit draws less than two amps. The connections should be made at the input supply filter as seen in the example below.
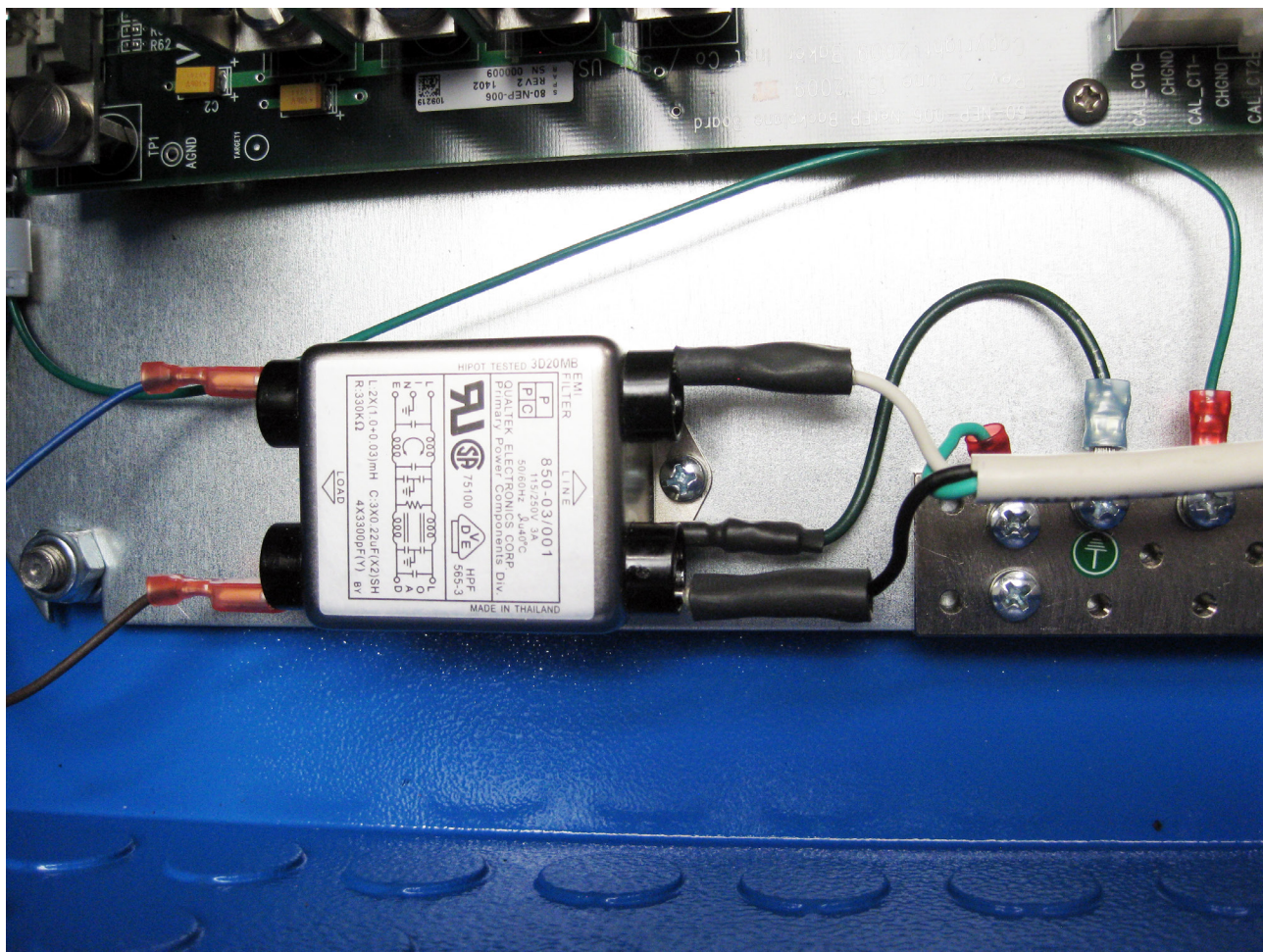


*Fig 2:  NetEP 100–240V power supply connection (AC power supply input filter).*

NOTICE:  There are no user-serviceable parts inside the unit.

## Interior Overview

The figure below shows the interior of the NetEP.  Note the gray cable routing channel used for the current transformer (CT) cables along the right side of the unit.  Voltage bus cables are routed along the left side of the cabinet.

NOTICE:  It is important to route the voltage bus leads as far from the printed circuit boards as possible to minimize any potential EMI disturbances.

Voltage bus cables can enter from the bottom of the unit or through the conduit knockouts on the left side of the unit.  Appropriately sized and rated compression connectors should be used to pass the cables through the provided knockouts.
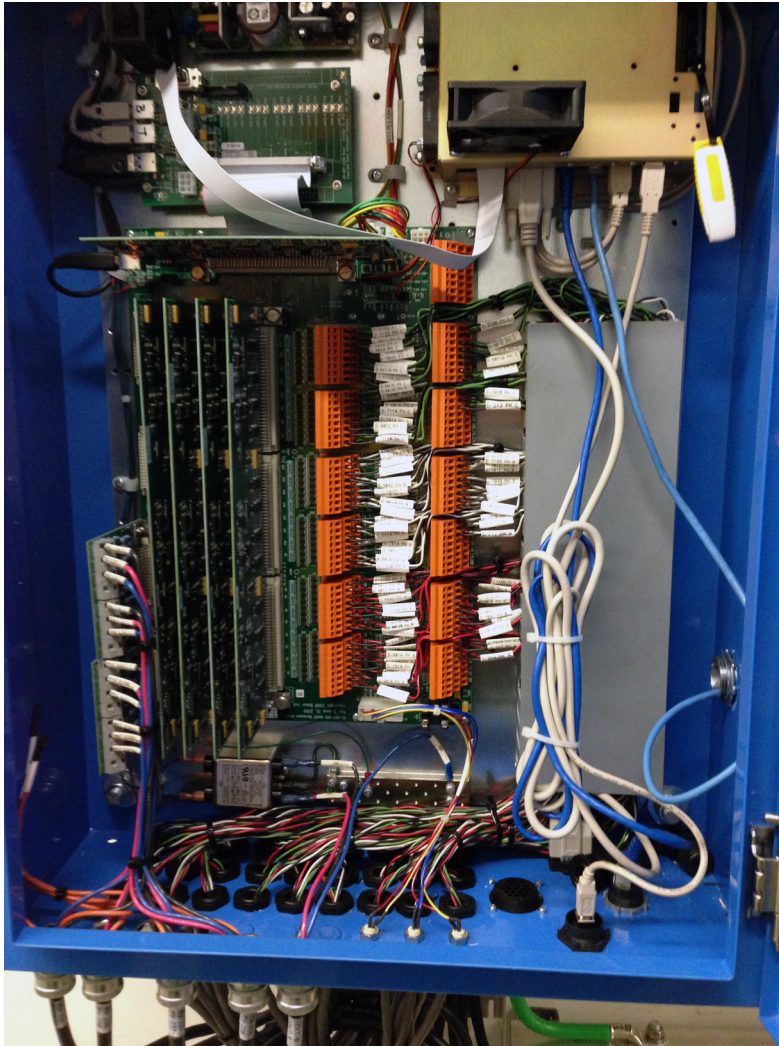


*Fig 3:  NetEP cabinet interior.*

**WARNING:  In most cases, AC power and the measurement voltage buses to the NetEP should be disconnected before the cabinet door is opened.  Even with the AC power disconnected, dangerous voltage may exist on the NetEP voltage input cards that can cause serious injury or death.**

**The circuit boards inside the NetEP are sensitive to static electricity, and may contain live voltage heat sinks.  Do not touch any component except the connectors for the CT and voltage bus connections.  In addition to potential circuit damage, electric shock and severe injury or death may occur if these components are touched.**

## NetEP Internal Components
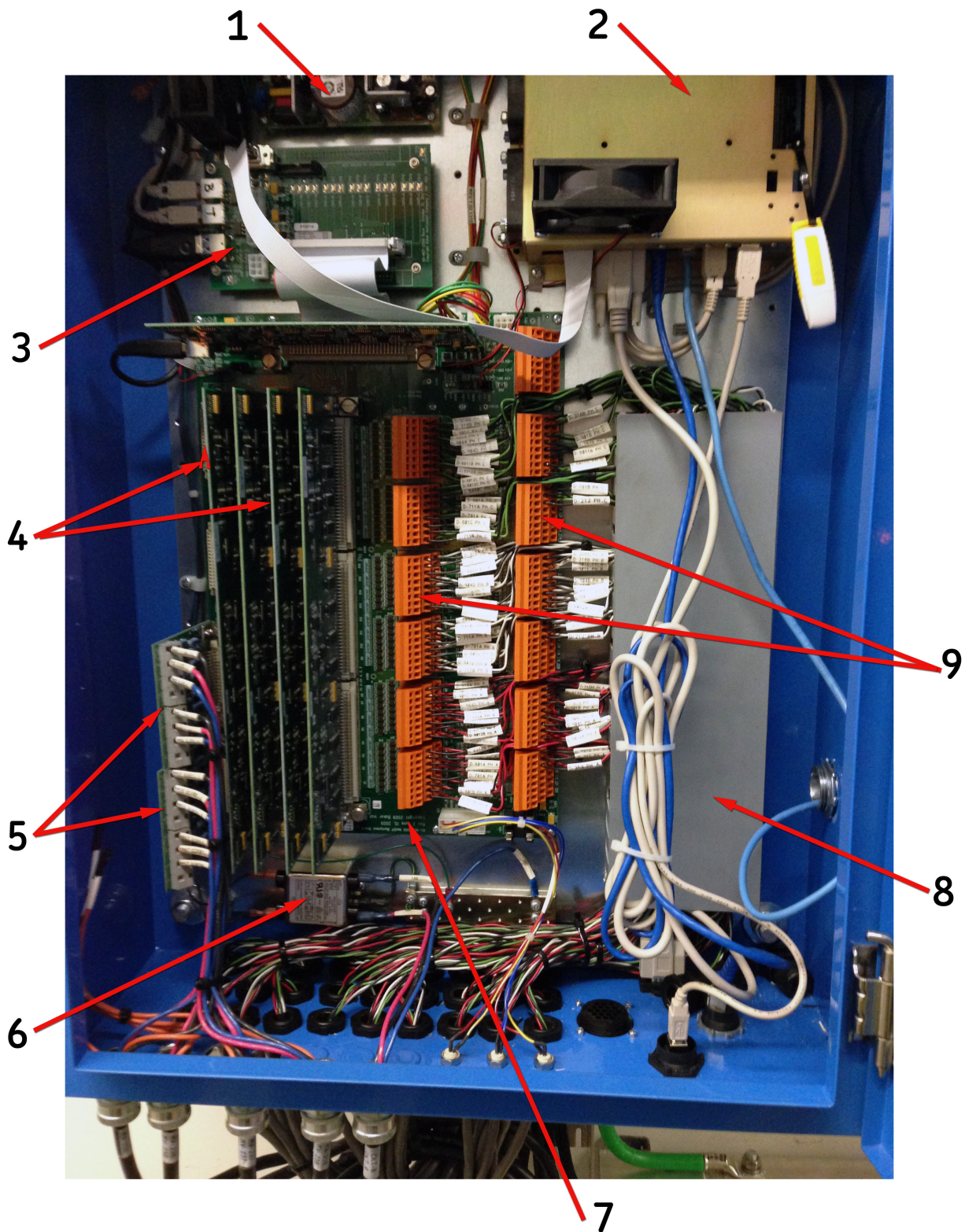


*Fig 4:  NetEP internal components.*

*Table 2:  The basic internal components of the NetEP are listed below, correlating to the labeled diagram.*

| Item | Description |
|------|-------------|
| 1 | DC Power supply |
| 2 | Computer |
| 3 | Digital-to-analog converter (USB controller card and acquisition card) |
| 4 | CT MUX cards |
| 5 | Voltage bus input cards |
| 6 | AC power supply input filter |
| 7 | Backplane board |
| 8 | CT cable routing box |
| 9 | CT connection terminal blocks |

## Voltage Bus Ratings

The following two sections describe procedures for making voltage bus connections to systems with motor output voltages that are either less than or greater than the maximum rated voltage.  This maximum is determined by the applicable standards for the environment where the unit is being installed as allowed by the Authority Having Jurisdiction (AHJ) as either 600V or 1000V.

NOTICE:  This product conforms to UL/CSA 61010-1 up to a maximum voltage of 600VAC at 50/60Hz with a main line voltage of 100–240VAC with a current draw of less than 2A.

This product conforms to IEC/EN 61010-1 up to a maximum voltage of 1000VAC at 50/60Hz with a main line voltage of 100–240VAC with a current draw of less than 2A.

## Voltage Bus Connections—Less than Maximum Rate Voltage

Each voltage bus to be monitored must be connected to the NetEP's three-phase voltage bus input cards.   The graphic below illustrates voltage bus connections for systems with motor output voltages that are less than the maximum rated voltage.

The graphic also shows the voltage routed through a disconnect switch installed within the system.

CAUTION:  A voltage disconnect switch must be installed within the prescribed industry standard distance of the NetEP; in-line 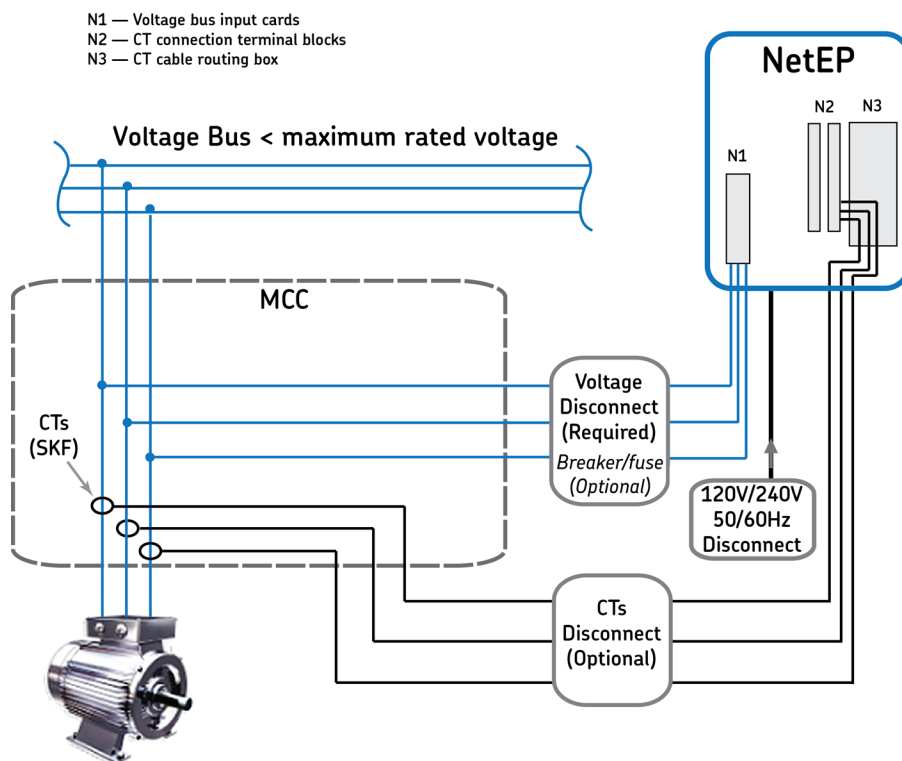between the unit and the voltage source.  You should also consider installing a breaker or fuse to guard against inadavertent shorts.

N1 — Voltage bus input cards
N2 — CT connection terminal blocks
N3 — CT cable routing box

*Fig 5:  Voltage bus and CT connections for systems < maximum rated voltage.*

Additionally, the graphic illustrates where CTs are typically attached to (clamped around) the motor leads.  These connections are also commonly run through a disconnect box.

NOTE:  Potential transformers (PTs) are optional in this type of system.  If PTs are used, CTs may be connected directly to motor leads as shown above, or they can be connected to secondaries as illustrated in the next section.

Make sure the Phase A, Phase B, and Phase C phasing is correct and maintained between the voltage bus and the voltage bus input cards in the NetEP.

If connected directly to a three-phase bus, make the following connections:

- The voltage bus input card phase A to voltage bus phase A
- The voltage bus input card phase B to voltage bus phase B
- The voltage bus input card phase C to voltage bus phase C
- The voltage bus input card N = voltage bus ground

## Voltage Bus Connections—Greater than Maximum Rated Voltage

As noted above, each voltage bus to be monitored must be connected to the NetEP's three-phase voltage bus input cards.   The graphic below illustrates voltage bus connections for systems with voltages greater than the maximum rate voltage.  In this case, secondary output voltages from user-installed potential transformers (PTs) are acceptable as long as output voltages are less than the maximum rated voltage.

The graphic also shows the voltage routed to protection within the MCC and through a disconnect switch installed between the MCC and the NetEP.

CAUTION:  A voltage disconnect switch must be installed within the prescribed industry standard distance of the NetEP; in-line between the unit and the voltage source.  You should also consider installing a breaker or fuse to guard against inadavertent shorts.

N1 — Voltage bus input cards
N2 — CT connection terminal blocks
N3 — CT cable routing box
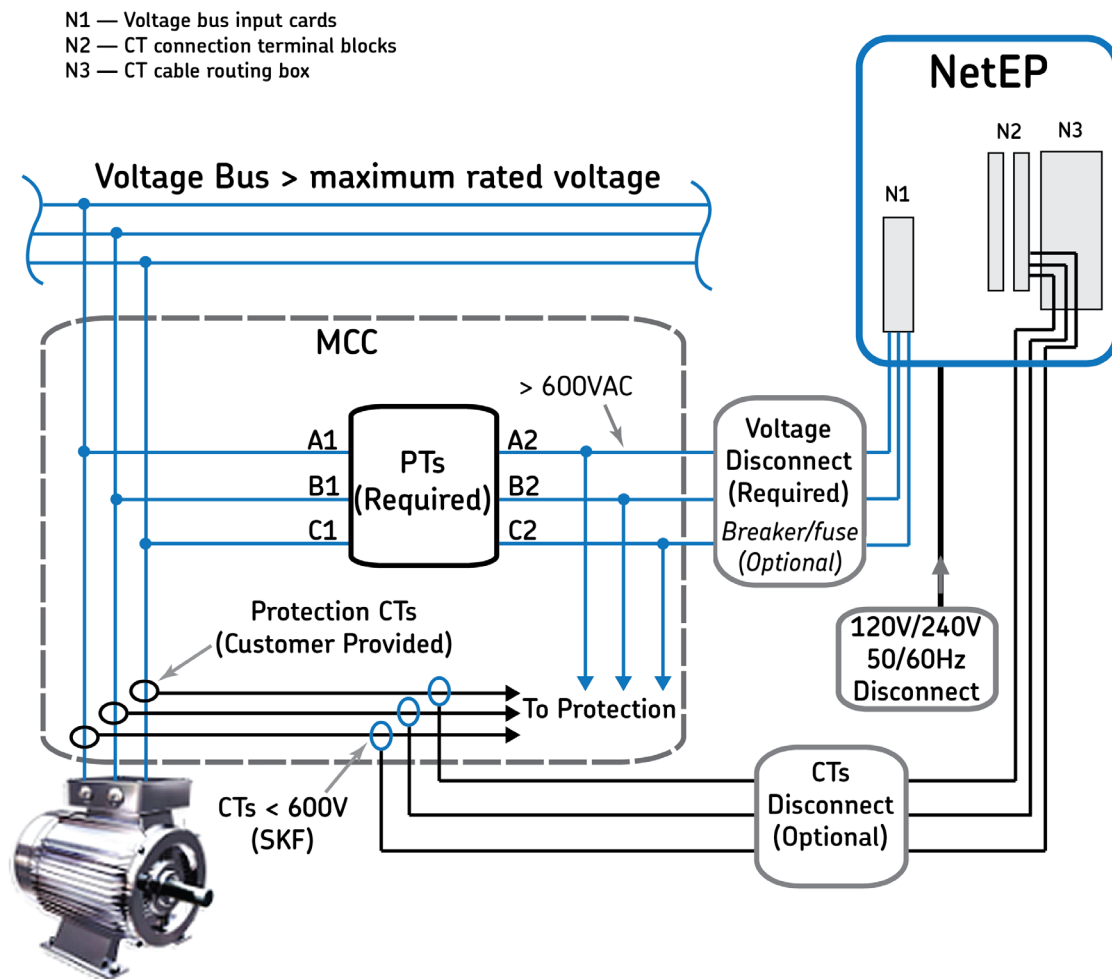
*Fig 6:  Voltage bus and CT connections for systems > maximum rated voltage.*

Make sure the Phase A, Phase B, and Phase C phasing is correct and maintained between the voltage bus and the voltage bus input cards in the NetEP.

Confirm that the potential transformer (PT) input connection is properly phased and the PT output connection is properly connected to the voltage bus input card as stated below.

**Primary Connections**

- Voltage bus phase A to A1
- Voltage bus phase B to B1
- Voltage bus phase C to C1

**Secondary Connections**

- The voltage bus input card phase A to A2
- The voltage bus input card phase B to B2
- The voltage bus input card phase C to C2
- The voltage bus input card N = no connection

NOTICE: The secondary ground requires an appropriate station ground somewhere near the PT itself. Do not tie the secondary ground to the NetEP ground or neutral. The secondary ground will not be the same potential as station ground. If a ground connection is made, a ground loop will be formed and possibly a very high current will flow in the ground conductor.

## Physical Connections to the NetEP Voltage Bus Input Cards

1. De-energize the voltage inputs at the voltage disconnect.

2. Turn off the NetEP by shutting down the computer and disconnecting input AC power from the unit via the input disconnect.

3. Run the voltage conductors, appropriately rated, through the bottom of the unit or to the left side of the unit where knockouts are provided.  The knockouts provided are 7/8 (.875) inch diameter and are sized for a 1/2 (.5) inch trade size conduit fitting.

4. Run the voltage cables along the left wall of the box.

5. Select the next sequential voltage channel that is available for the bus and connect the conductors to the terminal blocks on the voltage input cards using the provided operating tool.  Make sure all strands are captured inside the terminal block.

CAUTION:  Confirm the voltage input wiring for each phase is completely captured by its corresponding phase in the unit voltage connector; that is, no frayed wire strands poke out.

The backplane board has printed and numbered labels that identify the NetEP voltage bus connections as shown below.
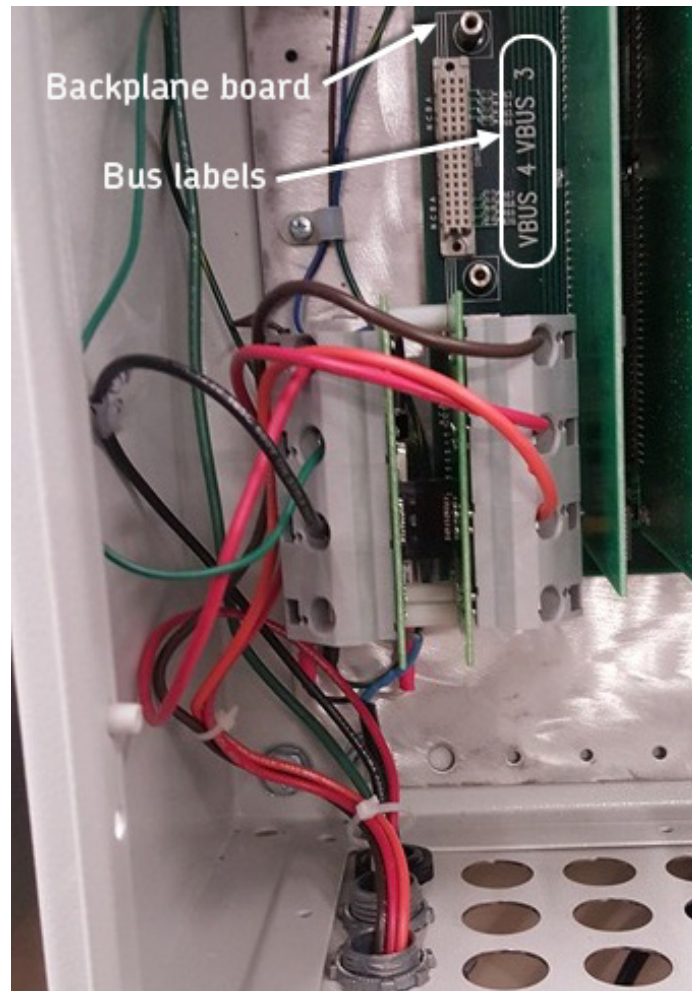


*Fig 7:  Backplane board.*

If necessary, the voltage bus input card may be removed to make connections.  Use a long flat blade screwdriver to unscrew the voltage bus input card from the backplane board.  Gently remove the voltage bus input card from the backplane board connector.

When connecting directly to the voltage bus ( < maximum rate voltage), the voltage bus ground should be connected to the

N (neutral) terminal of the voltage bus input card.  Voltmeter measurements will be made from each leg's input connector to neutral (N) terminal—not  to chassis ground.
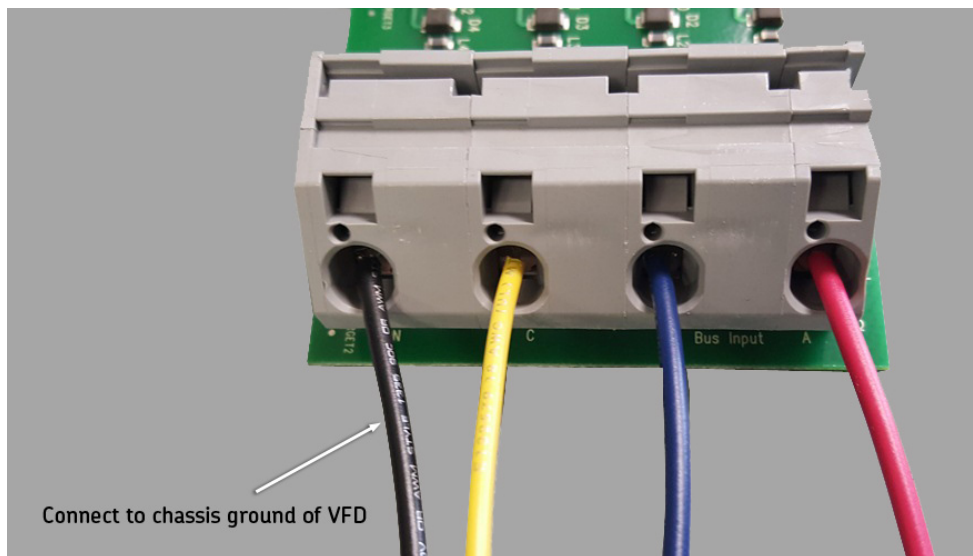


*Fig 8:  Example of direct connection to VFD drive.*

When connecting to PT secondaries, ensure that nothing is connected to the "N" neutral terminal.
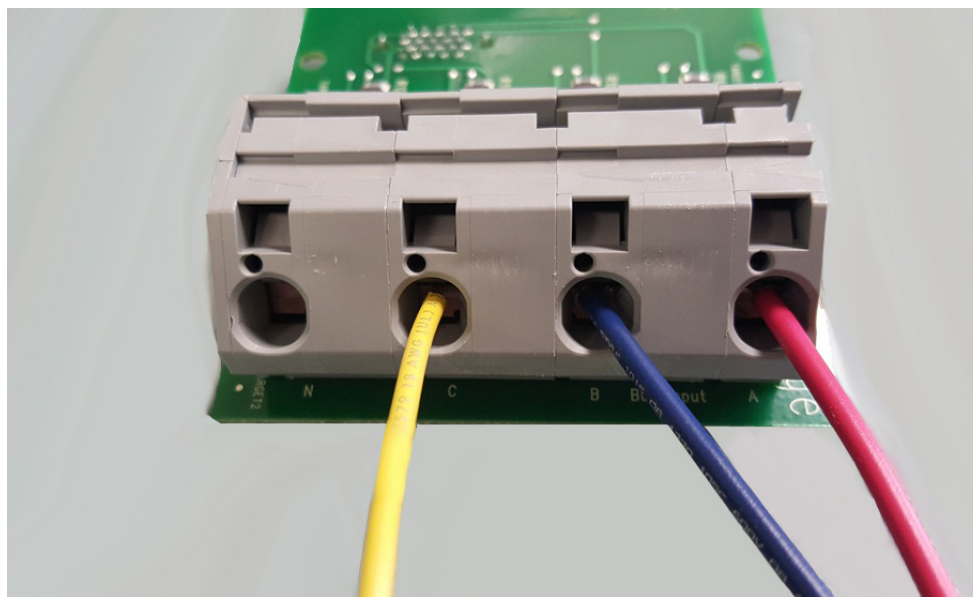


*Fig 9:  Properly installed voltage bus input leads*
*(PT secondaries configuration with no connection to the neutral (N) terminal.*

To replace the board, align and firmly press the connectors together, then tighten the screws on the brackets.
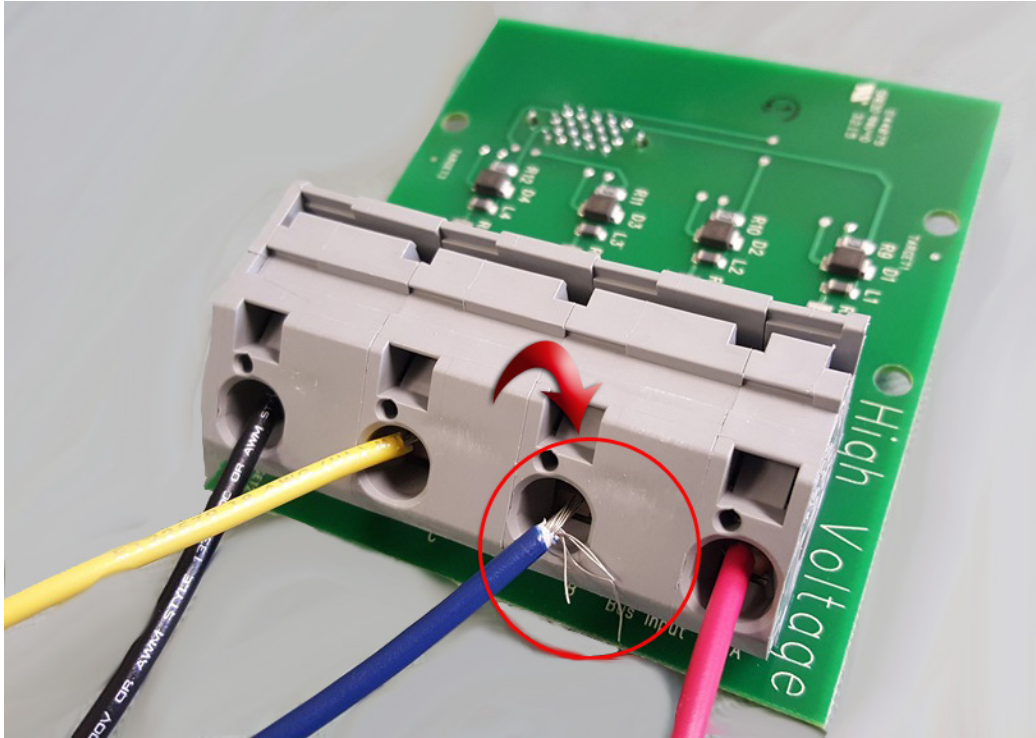


*Fig 10:  Improperly installed voltage bus input leads—note the frayed strands.*

CAUTION:  Improper connection of voltage bus input leads could lead to equipment damage and personal injury.

## Current Transformers (CTs) and Their Connection

Using the correct current transformer (CT) for each motor is important for acquisition of precise data.  The normal operating current of the motor should fall between 10 and 90 percent of the CT's current rating.  For example, 200-amp CTs should be used for motors with a normal operating current (per phase) of 20 –180 amps.

After installation of the voltage bus inputs as described above, install each supplied set of three CTs for each motor being monitored.  Be sure the appropriate CT rating is used for each motor connector.

Install the supplied CTs either directly on the motor leads themselves or on the secondary circuit of a user-installed meter/relay CT.

### Installing CTs Directly on Motor Leads

> **WARNING:  Make sure all equipment and voltage disconnects are in the OFF position prior to proceeding with this operation; dangerous voltages may be present and pose a hazard than can cause serious injury or death.**

> NOTE:  If monitoring several motors, it may prove useful to pull several cables at the same time, preferably in different colors).

If the supplied CTs will be installed directly on the motor leads, follow these instructions.

1.  Place the CTs on the load-side of line protection devices (circuit breakers).  Confirm that the CTs all face the same direction.
2.  CTs are connected to a burden resistor board as shown in the image below.
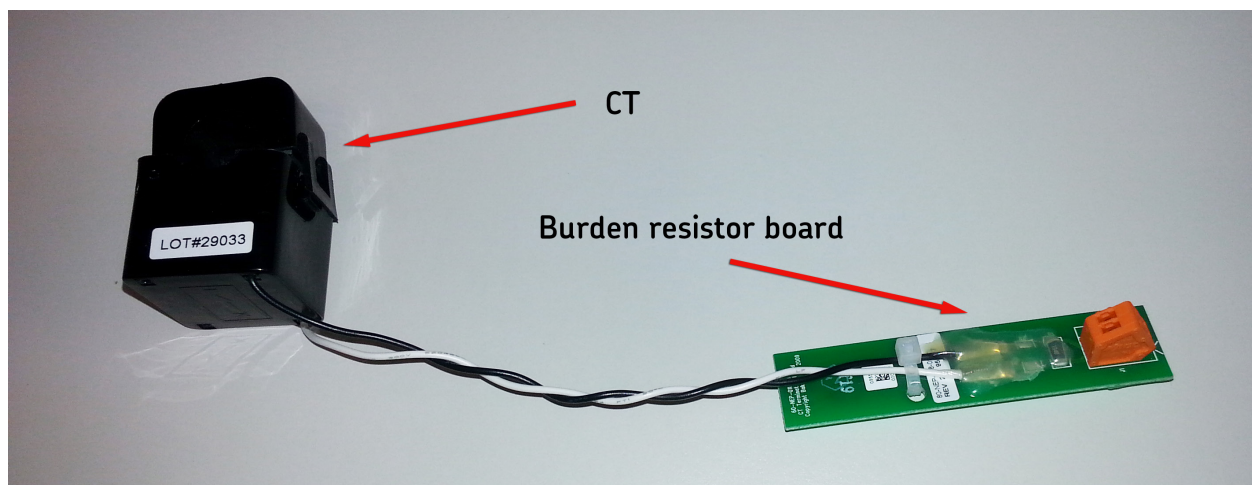


*Fig 11:  CT and burden resistor board.*

3.  Connect  the twisted-pair CT cable (AWG 28-18 gauge with 1–2 twists per inch) to the burden resistor board and route the CT cable to the NetEP.

4. The image below shows CTs clamped around motor leads in the MCC and mounted to a panel ready for wiring to CT cables.
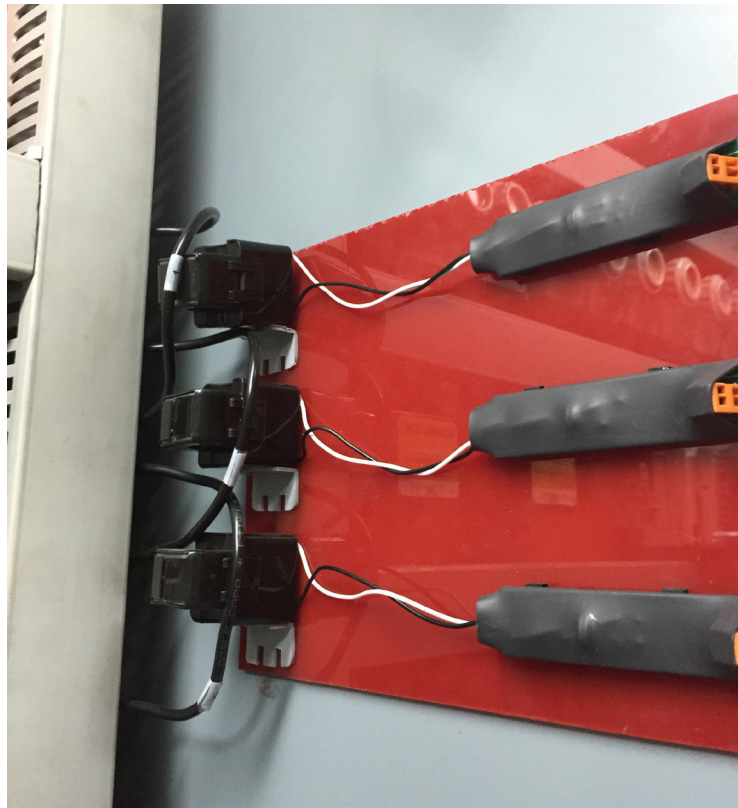


*Fig 12: CTs with burden resistor boards in shrink wrap; mounted and ready for wiring.*

5. Ensure that the CT cable is long enough to connect to the NetEP unit.

6. Route the CT cables in a tray or conduit to the NetEP unit.

7. Using the supplied cable strain reliefs, route the CT cable through the bottom panel of the NetEP and along the right side of the box inside the cable routing channel. Be sure to leave enough length on the CT cable to make connections to the terminal blocks.

8. Cut to length, and connect each phase CT, wiring to the corresponding motor and phase on the CT connection terminal block. Do so by carefully opening the connector contact with the tool provided, and inserting the wire. Each connector has the motor number printed on the board next to the connector.
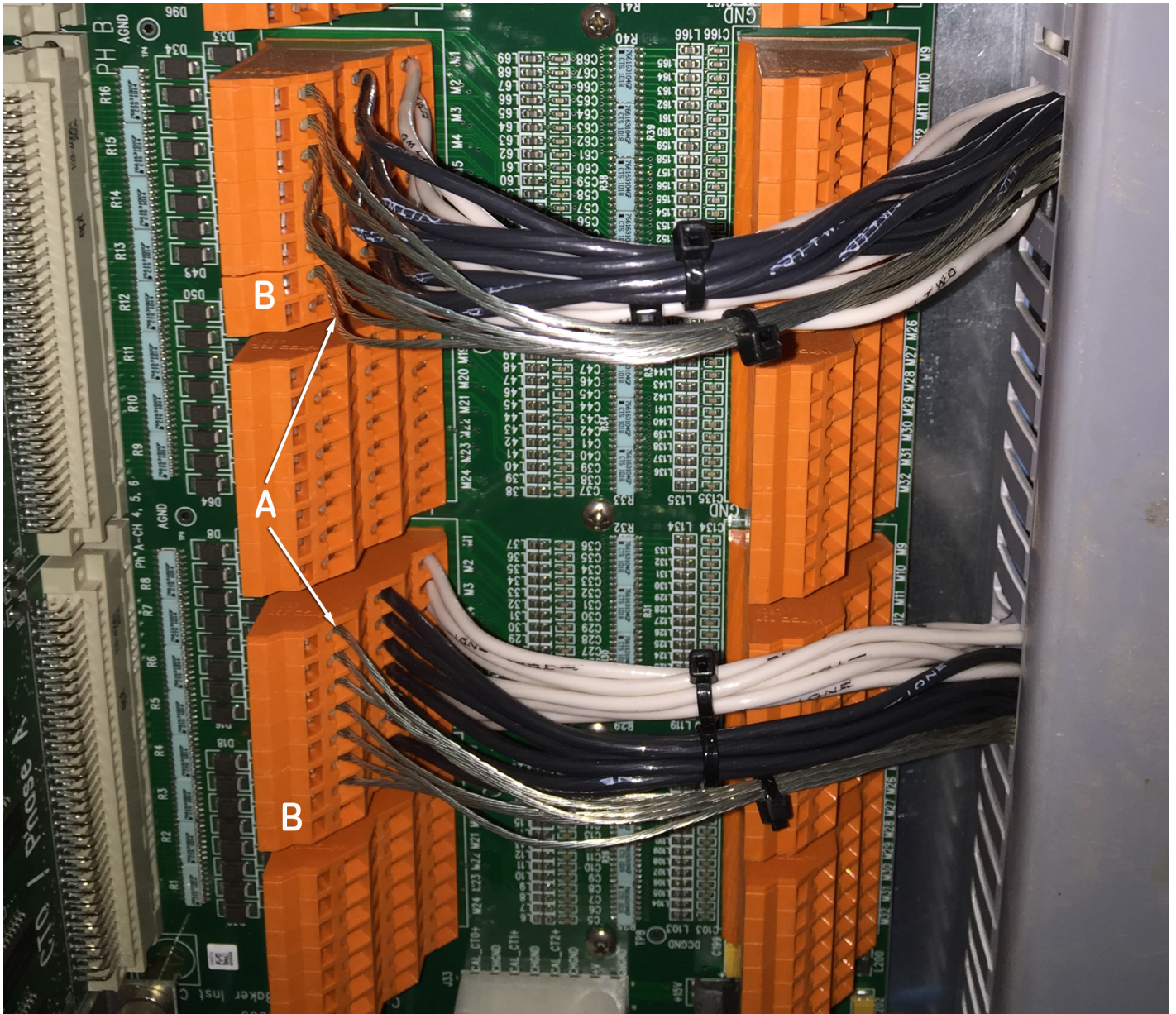


*Fig 13: CT connection block in NetEP.*

In the example above, the silver leads are cable shield leads (A), connected to the uppermost ground terminals (B). The white and black leads are live CT leads connected to the lower terminals. Cable shield leads are not required in all installations.

CAUTION: Connect live CT leads only to the lower terminals. Never connect live CT leads to the uppermost ground terminals. Connecting the live CT leads to the ground terminals could cause equipment damage or personal injury.

NOTE:  Ensure the CTs are rated for the voltage of the circuit they will be monitoring.

Three CTs are required for current monitoring; two CTs are not enough.

CTs currently come in current ratings ranging from 5 to 2000 amps and are available in either solid core or split core configurations. The range and type of CTs available are subject to change based on customer needs and technology advancements.

Contact Megger Customer Support for current information on CT options to ensure you obtain the equipment best suited to your needs.

## Installing CTs on Existing Secondaries

If your installation requires or prefers connecting the NetEP CTs to the secondaries of existing (customer installed) metering or protection CTs due to proximity of high voltage or CT location, use the following instructions.

1. Pull a twisted-pair CT cable (AWG 28-18 gauge with 1–2 twists per inch)  from the NetEP box to the interior of the motor instrumentation and control panel.

> NOTE:  If monitoring several motors, it may prove useful to pull several cables at the same time, preferably in different colors).

2. Route the CT cable inside the cabinet, ensuring adherence to appropriate or mandated industrial codes and industry practices.

3. Strip the outer jacket of the CT cable back 6–12 inches and insert the twisted pairs into the ends of the CT wiring as in the photo below.  Use consistent color coding when wiring CTs.

4. Install the CT around the secondary of the user-installed relay/meter CT cable.  If using a split core CT, make sure the CT is clamped shut.  Confirm that the CTs all face the same direction.

5. Wire up and attach the phase A, phase B, and the phase C pairs to CTs and clamp them around the appropriate secondary circuit cables.

6. We recommend that you attach a label with the name of the motor or MCC at the unit end of each cable as shown in the example.
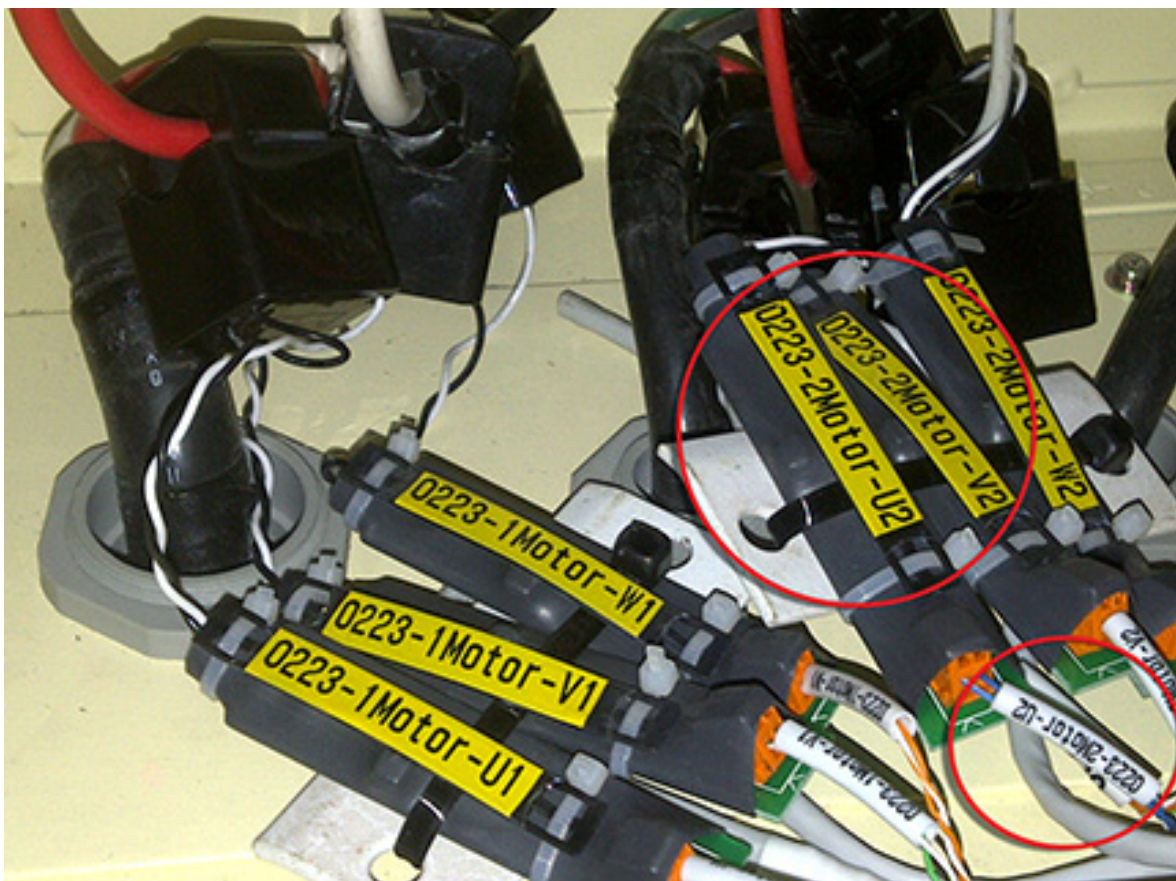


*Fig 14:  CT installation example; labeled connections over shrink wrapped burden resistor boards.*

7. Using a cable strain relief, route the CT cable through the bottom panel of the NetEP and along the right side of the box in the cable routing channel.  Be sure to leave enough cable length to connect to the CT connection terminal blocks.

8. Strip the outer jacket of the cable and split the blue, green and orange pairs apart.  Again, do not cut off the brown pair in case damage occurs to other pairs and the brown pair is needed.

9. Choose a motor number to install the cable into, and then insert the CT twisted wires into the middle row and lower rows on the three-deck CT connection terminal block.

> NOTICE:  Do not connect to a motor channel for which a license has not been purchased; it will not function.

In the example below, the silver leads are cable shield leads (A), connected to the uppermost ground terminals (B).  The white and black leads are live CT leads connected to the lower terminals.  Cable shield leads are not required in all installations.

> CAUTION:  Connect live CT leads only to the lower terminals.  Never connect live CT leads to the uppermost ground terminals. Connecting the live CT leads to the ground terminals could cause equipment damage or personal injury.

10. Wire motors starting with the lowest numbered channels available.  Use the legend on the backplane board to identify the motor number and the row to insert the cable.  Use the supplied CT connection terminal operating tool to manipulate the terminal block connector.  A normal flat blade screw driver will not work well.



*Fig 15:  CT terminations.*

11. Wire to phase A, phase B, and phase C using consistent color coding for all motors.

12. Note the motor number used for each specific set of CTs.  The example table shown below has proven useful when wiring up a NetEP cabinet.

13. Tape the blank spreadsheet provided to the outside of the cabinet and fill out the sheet as motors are installed.  Also record the voltage bus the motor is connected to.

| Channel | Description | Voltage Bus | Calibration | Sequence |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10–32 | | | | |

| Voltage | Description | Calibration |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

14. Repeat steps for connecting all CTs on remaining motors.

# NetEP Software Setup

The NetEP software setup process involves performing seven general steps in the following order:

1. Specify the database in which the NetEP will store data.

2. Calibrate the voltage buses.

3. Map each voltage bus to a NetEP channel.

4. Calibrate the installed CTs.

5. Define the sequence of the CTs for proper phase.

6. Map the CTs to a motor.

7. Installing and configuring the filtering program.

The first six steps are addressed in this chapter.  The last step is addressed in the "Filtering software setup" chapter that follows.

**WARNING:  The voltage calibration process requires that the front door of the NetEP be open.  Follow all appropriate safety practices when working with the door open.**

**Hazardous live voltages are present and can present a shock hazard that can result in injury or death.  In particular, exercise caution when taking voltage bus measurements.  Dangerous voltage levels may exist on the NetEP voltage input cards.**

**Additionally, circuit boards inside the NetEP cabinet are sensitive to static electricity, and may contain live voltage heat sinks.  Avoid contact with any component other than those required to complete the process.**

NOTE:  Current versions of software are shipped with each new device.  You can check for and download updated versions at any time by visiting www.cmcbaker.com/Downloads.aspx and selecting the product needed from the list provided.

A download key is not required to download current software updates for the NetEP Device Client,  Surveyor NetEP,  or Surveyor Server software.

## NetEP Pre-setup Checklist

Use the following checklists to ensure that your system is ready for proper setup.  Having all of these items in place and issues addressed will ensure a smooth setup process.

### SQL Server Related Items

- *An SQL login with administrator rights on the SQL database will be required during the setup process.*
- On the NetEP server (the SQL Server system), administrator privileges are required to set up the filtering task in the Windows scheduler.
- Ensure that the SQL Server to be used with the NetEP is installed and configured.
  - If possible, provide network connection outside the building or room containing the NetEP for remote terminal capability.
  - Ensure the SQL port is open on the server firewall.  This is port 1433 by default; instructions are available if required.
- If using SQL Server Express (10 GB maximum database), ensure there is no more than one NetEP assigned to the database.
- SQL Server Authentication is required for NetEP database connectivity.
- If using a separate Windows account or domain for the NetEP service (this is a custom Windows configuration), the service properties will need to be updated manually to set the password after all (future) NetEP software updates.  Each update will reconfigure the service and cannot read or re-write any existing password.
- When possible, to minimize disruptions to other applications, use a dedicated subnet for the NetEP to SQL server network traffic and physical disk drive(s) for the NetEP database that is not used by other databases or applications.
- Allow TCP connections and remote users.
- Ensure access can be gained through existing firewalls.

### Minimum Server Hardware Requirements

- 2 GHz Pentium, Core 2 Duo or equivalent
- > 4GB RAM
- >10GB free disc space for each NetEP connected
- Windows 7, Windows 8, Windows 10 or Windows Server 2010, 2012
- 10/100 LAN connection
- Microsoft SQL Server or SQL Server Express
- Static IP address
- Uninterruptible  power supply recommended
- Dedicated LAN and hardware for NetEP use (not shared with multiple applications/devices)

### General and IT Related Items

- Display, keyboard, mouse available for (temporary) connection to NetEP for setup and commissioning.
- Motor voltage bus access, with external disconnect, must be provided at the NetEP.
- CT signal levels: the output of the NetEP CTs is <10V and current <10mA.

### Calibration Related Items

- SQL database connectivity is recommended to do calibration.
- During calibration, the displayed measurements will start out using the existing calibration values.  You can use a "Reset Calibration" button to change those to default values or you can update the values by the normal calibration process..
- It is difficult for all motors to be completed in the two or three days scheduled for commissioning.  Plan on at least 1 day for every 10 motors to be added.
- Megger Baker Instruments recommends purchasing the calibration kit for installations with more than 10 motors.

**VFD Setup Issues**

■ Motors should be running and under typical load, but with as little variation over time as possible (for stability) to ensure accurate calibration.

## NetEP Pre-Energization Steps

Prior to energizing the NetEP device for the first time, the following items shall be completed.

1. SQL Server or SQL Server Express must be installed and configured on the networked computer/server to be used to handle all data storage.

2. Network connectivity must have been established through a wired ethernet connection to the NetEP and the server computer.

3. Establish a username and password with system administrator access rights. This is required for the initial calibration and setup only to establish the initial database on SQL Server.

4. SQL Server should be configured for remote access.

5. All IP addresses, ports, and such shall be available to configure the device client for proper server communications. (Port 1433 should be open on the server to all NetEP communications.)

6. Surveyor desktop software installed on a computer with network connectivity to SQL Server.

NOTE: Optionally, the Surveyor desktop software may be installed on the NetEP device itself for convenience (verifying operation after calibration).

## NetEP Calibration Procedure

1.  Connect a keyboard, mouse, and monitor to the NetEP device.

2.  Turn on the NetEP device.

3.  Start the NetEP Calibration Wizard by clicking on the NetEP Calibration icon installed on your desktop.

4.  Depending on you operating system, alternative methods can be used to start the device client.  For example, some Windows systems use the process of clicking on Start --> All Programs --> Device Client --> NetEP Calibration.

5.  The Calibration Wizard starts with the page as shown below.  Enter your name in the Technician performing NetEP Calibration field then click on the Right Arrow button.



*Fig 16:  Entering technician name in the setup wizard.*

> NOTE:  The Settings link found near the bottom left of the window is used only under special circumstances.  Refer to the Appendix for more information.

6.  A message dialog appears notifying you that the NetEP service will be stopped for part of the calibration process.  Click OK to continue.

**Specifying the Database**

NetEP Software Setup

1. The Database Connection Settings page is used to configure the SQL Server and database in which the NetEP will store the data collected.

NOTE: The connection settings are used during the calibration process to create the database and the named voltage buses and motors (if necessary). It will thereafter be used by the background software in normal operation for storing data to the database.
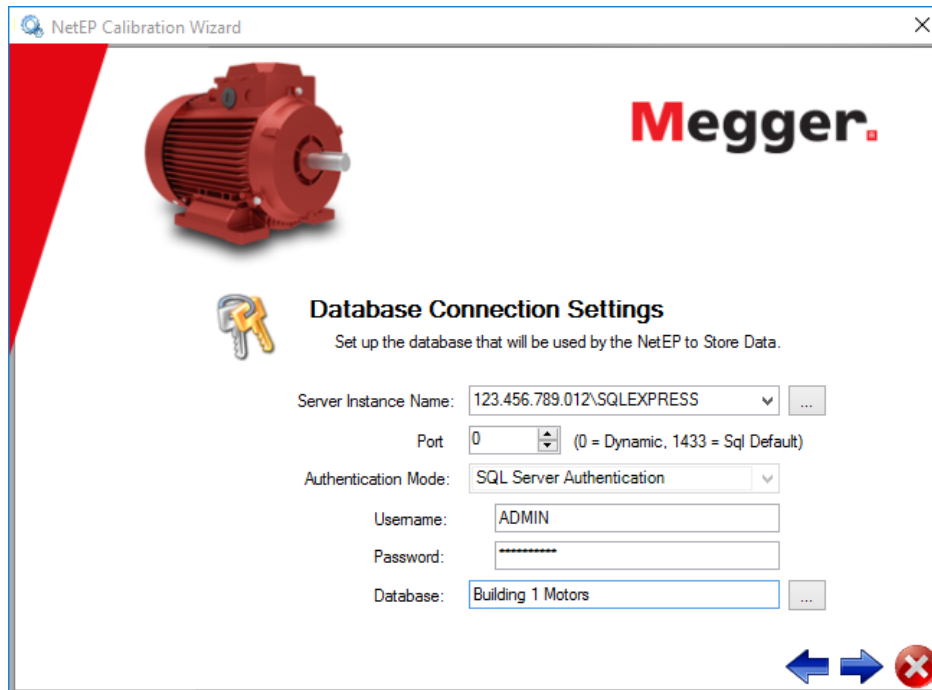


*Fig 17: Configuring the database settings.*

2. Enter the name of the SQL Server in the Server Instance Name field. Click on the button to the right of the field to browse for SQL Servers installed on the local network.

3. Enter the port to be used in the Port field. (Port 0 is dynamic, use this setting unless you have specifically configured SQL Server to run on another port; port 1433 is the port SQL Server uses by default).

4. Because The NetEP runs as a service, it cannot use windows authentication. The mode shown in the Authentication Mode field (SQL Server Authentication) will always be used. (This is an information only field).

5. Enter your username and password in the appropriate fields.

NOTICE: During the system commissioning process, the account that is configured here should have system administrator (SA) privileges on the target server.

6. After a valid server has been selected, click on the button next to the Database field to search for available databases.

7. A dialog box appears like the one shown below, which you will use to select the database to be used. Using this dialog, you

can also create a new database.  The databases that are visible in this dialog may not represent all of the databases that are present on the server, but only those databases that you have permission to access.
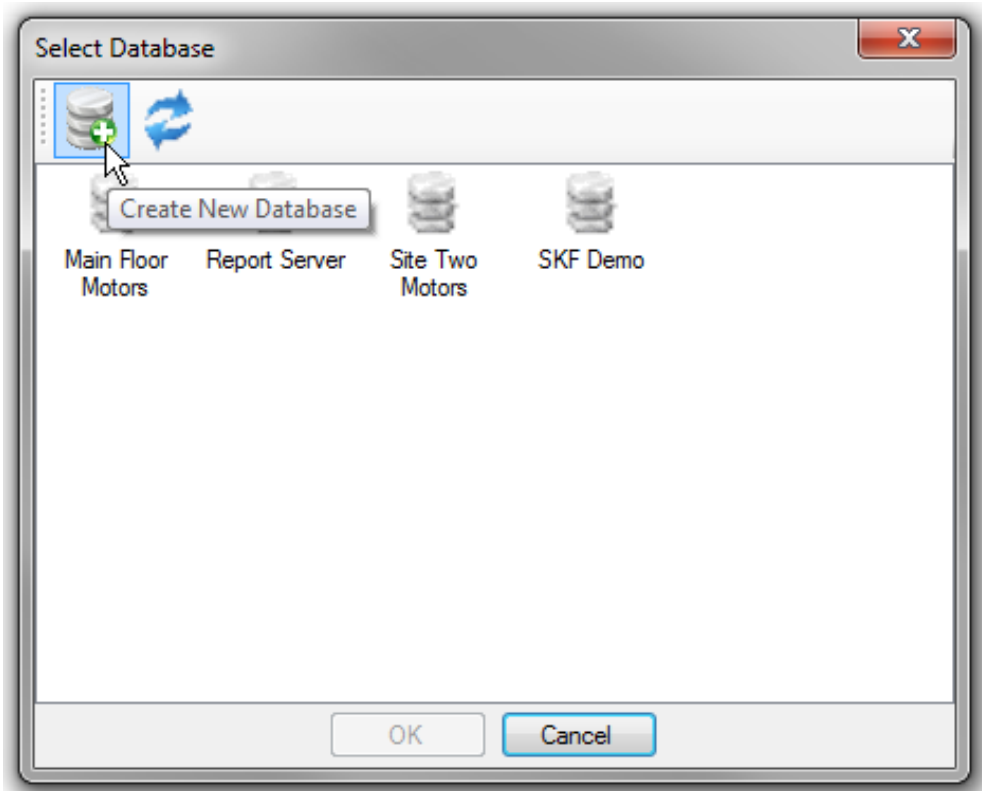


*Fig 18:  Select Database dialog.*

8.  To create a new database, click on the database icon with the plus sign at the top of the dialog as shown in the example above.

NOTICE:  To create a database, you must be logged in to NetEP setup with an account for a database administrator that includes one of the following pre-defined SQL roles: sa, sysadmin, serveradmin, or setupadmin.  Proper permissions are required to create a new database.

9.  A small dialog box appears so you can provide a name for the new database.  Enter the name then click OK.
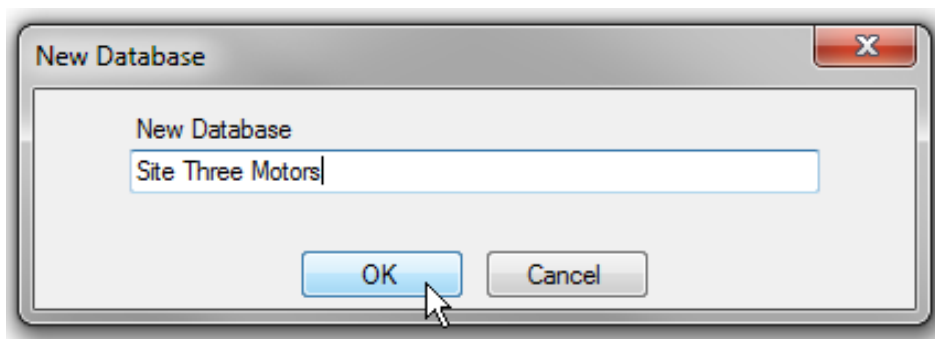


*Fig 19:  Dialog box used to define new database name.*

10.  The new database is created with the proper tables and keys automatically.  The database is then added to the selection dialog as shown in the example below.

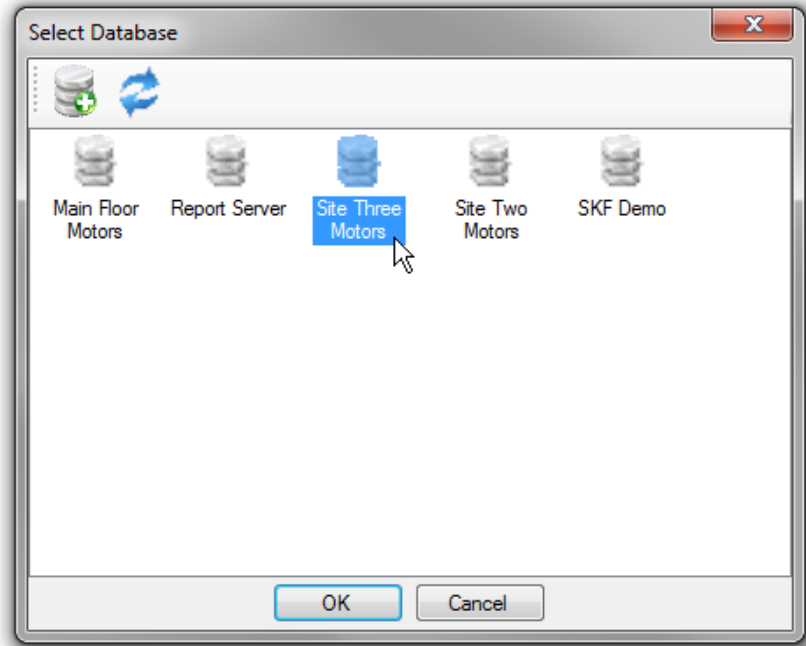11. Select the database that you want to use for this process then click on OK.



*Fig 20: Selecting the database to use.*

NOTE:  More information on user management including roles and their abilities can be found in the *Net EP User Manual.*

12. You will return to the Database Connection Settings page as shown below.
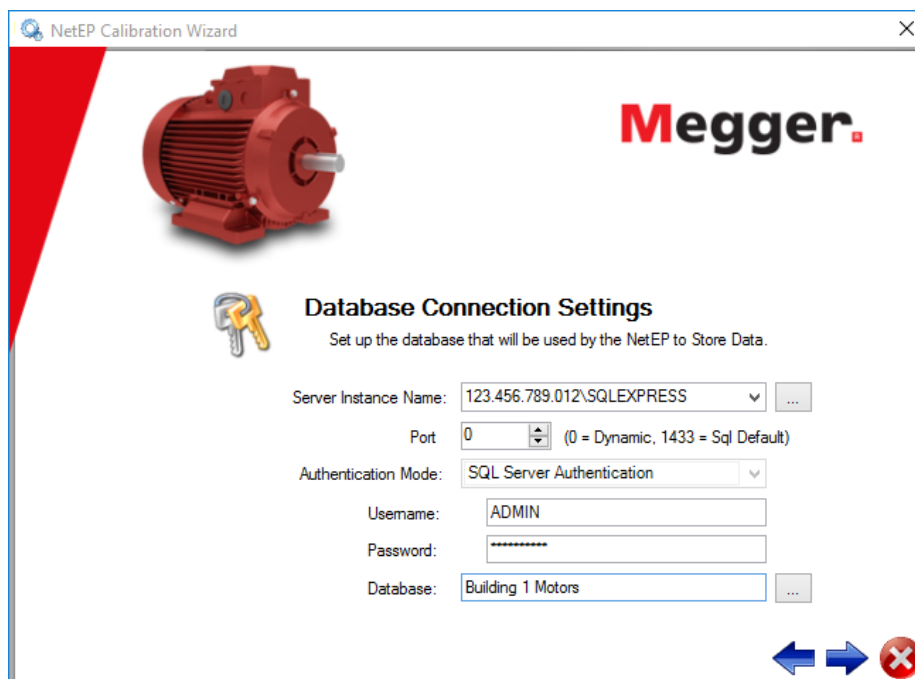


*Fig 21:  Completed Database Connection Settings.*

13. If you are satisfied with your selections, click on the Right Arrow button to continue.

14. If you need to make changes, you can do so in this page.  Click on the Left Arrow button only if you need to change the

name of the technician performing the setup.

15. After you have completed your selections, click the Right Arrow button to continue.  The database connection will be validated along with the permissions on the SQL account that will be used.

If all is well, the software will automatically and silently register the NetEP device into that database (by its serial number) for later use by other NetEP software.

**Calibrating Without a Database**

If it is ever necessary to perform calibration without a database, you may leave the Server Instance Name, Username, Password, and Database fields blank.  When you click on the right arrow to move to the next screen, you can verify that you want to perform calibration without a database.

You may find this helpful if the database is unreachable during the time period that has been scheduled for doing the calibration process.  For example, if the database server happens to be in scheduled maintenance shutdown or is undergoing some last-minute provisioning.  Another example might be that the network itself is not functioning and will not be fixed during the calibration process.

At a later time, when the database is reachable, you can use the Calibration wizard to fill in the correct information on this page, and then simply skip over the calibration steps that have already been performed to get to the mapping steps skipped during the first run.

Similarly, you might want to perform the creating and mapping of voltage buses and motors in the Surveyor desktop application instead of here.  In that case, it will still be necessary for the NetEP to have registered itself to the database before any such mappings can be performed, so you will need to enter the necessary information here at least once before mappings can be performed in Surveyor.

The calibration data itself is stored within the NetEP hardware, so the database is not actually required for that.  However, you must ensure that you take thorough written notes during calibration for what the voltage bus and motor mappings should be so that you can complete them at a later time when the database is reachable.

If for any reason you choose to calibrate without a database, you will not have the opportunity at this time to create named voltage buses and motors in the database.  Nor will you be able to map the input channels to those entities.  The database connection settings will eventually need to be set up correctly here so the NetEP can register itself to the database and to perform its normal operation.

For these reasons, it is recommended that you calibrate with the database connected, whenever possible.

**Calibrating the Voltage Buses**

> WARNING:  The voltage calibration operation requires you to work with the door of the NetEP cabinet open.  Follow all appropriate safety practices when working with the NetEP door open.  Hazardous live voltages are present and can present a shock hazard that can result in injury or death.
>
> Turn off AC input voltage and power to voltage buses and allow sufficient time to discharge devices if you need to work inside the unit for any other reason.

The instructions for calibrating the voltage buses differ slightly depending on whether you are using direct connections to motor leads or open delta connections (secondary side of potential transformers).  For this reason, a separate section follows for each connection type.

**Voltage Bus Calibration for Direct Connections to the Voltage Bus**

Using this page, you will define whether you have directly connected your voltage bus to the NetEP (less than maximum rated voltage).

The following section addresses voltage bus calibration when connecting through secondaries/PTs.

The beginning of the NetEP Installation Manual discusses in depth how to properly make these connections.



*Fig 22:  Selecting the connection type.*

1. Use the Connection Type dropdown menu to select your connection type.

2. For this process, click on "Directly Connected to Voltage Bus."

3. The Skip this Bus button is used to jump from the current bus calibration process (for example "1 of 7") to the next one in sequence.

4. The Skip to CTs button is used to jump directly to the CT calibration process.

> NOTE:  Skipping bus or CT configuration steps typically occurs when not all buses are used, or if you have intervals in your work process where you have some sort of break between calibrating one bus/CT and another (for example, when the process occurs over multiple days or shifts.)

5.  After you define your connection type, click on the Right Arrow button to continue.

6.  The next page is used to calibrate the amplitudes of the voltage buses.

7.  Open the NetEP cabinet door and locate the terminal block for the selected voltage bus.

8.  Use a digital voltmeter to measure the voltage between the phase A input on the voltage bus input card and the neutral (N) terminal on the voltage bus input card.  (Follow the instructions provided in each page when taking your measurements.)

9.  Enter the value in the Measured [V] field.

10. Click the Update button to update the calibration.

> NOTE:  After you enter the value you measure in the Measure (V) field and click Update, the system uses your value to calibrate the bus and adjusts the value displayed in the NetEP Measured (V) field accordingly.
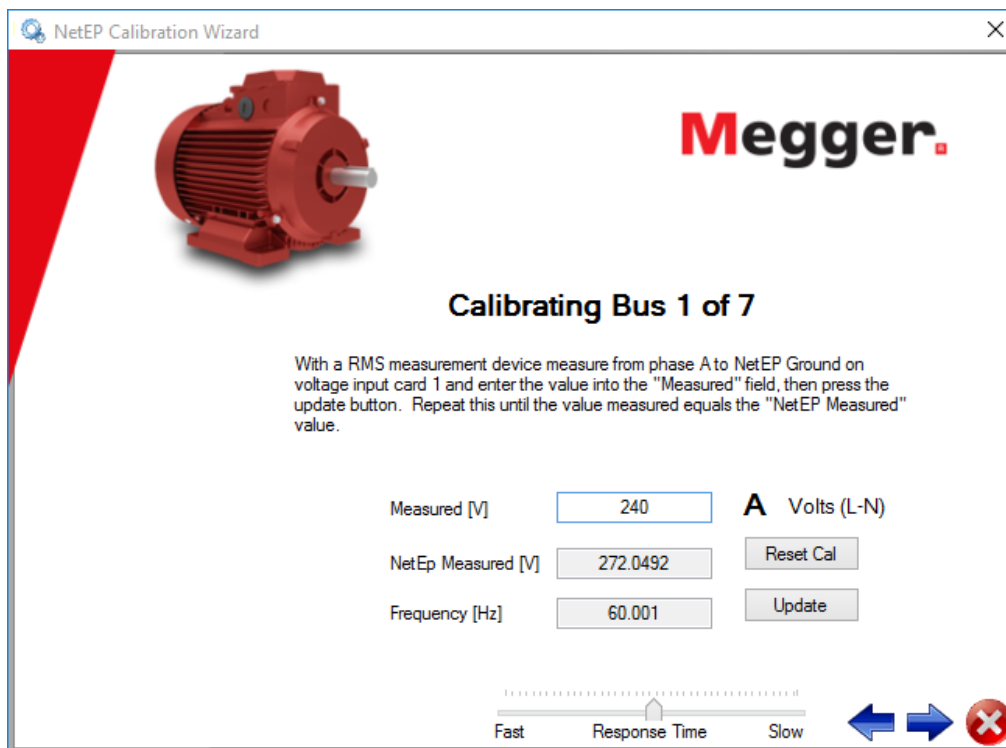


*Fig 23:  Calibrating voltage bus amplitudes—direct connection to motor leads.*

> NOTICE:  Before you click on the Update button, the two values might not match.  If the values are off considerably, there could be a connection problem.  Click on the Reset Cal button to revert to a default gain setting.  The resulting value should be reasonably close.  If it is still off by a large amount, double check the instructions to ensure that you are measuring properly.

> CAUTION:  It is possible that there might be a bad connection between the voltage bus and the NetEP, or the voltage bus input card might have been damaged or is not fully seated.  Do not try to correct any such connection problems at this time because dangerous voltage is present.  Rather, take a note of the issue and continue.  If problems arise later that suggest the measurements are incorrect, it could be due to a common cause that needs further investigation.  Repairs should be completed only when power is removed to the NetEP and the voltage bus input cards.

11. After you click on the Update button, the NetEP measured value should match the entered value (plus or minus small real-time variations).

12. Click the Right Arrow button to continue.

13. This page will appear three times during the process; once for each phase (A, B, and C) for each voltage bus.  Repeat the measure and update steps for phase B to ground then phase C to ground calibration.

14. After you have completed the process for all three phases, click the Right Arrow button to continue.

For direct connection, you measure and enter the line-to-ground voltages (for example, VAN), so you will verify values for line-to-ground values displayed in the next page.



Measure V$_A$ to V$_N$ example
(Direct connection)
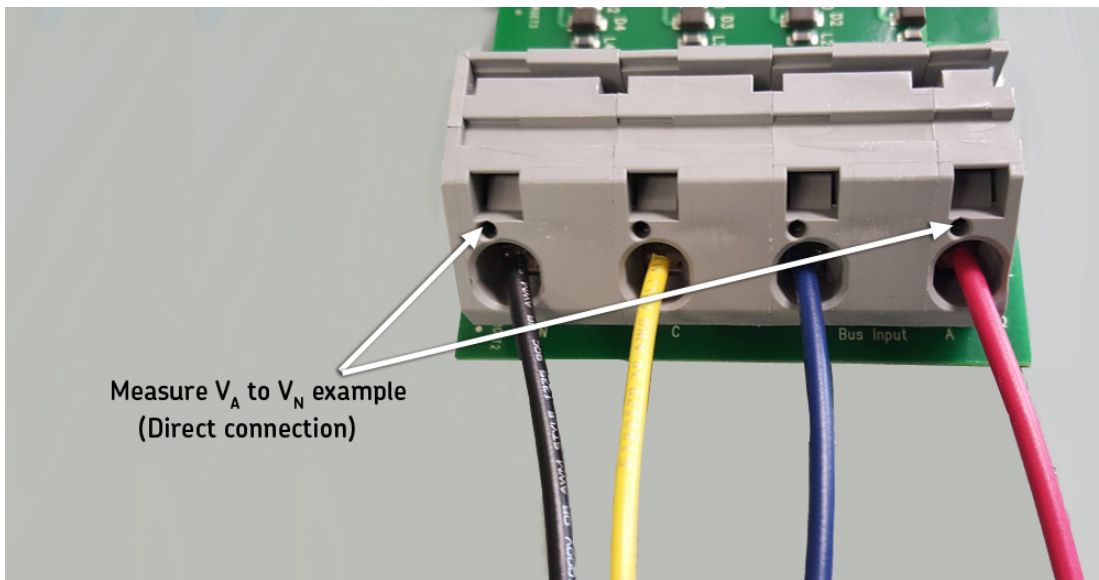
*Fig 24:  Example measurement taken for direct connection.*

You will want to verify that the line-to-ground values match what you know that voltage bus to be from your measurements taken for line-to-ground. The line-to-ground values can be useful for direct connections because they show you exactly what the NetEP is measuring.

The line-to-line values are calculated to provide you with a comparison of the standard rating. The line-to-ground values displayed are derived from your measurements with calibration adjustments applied.
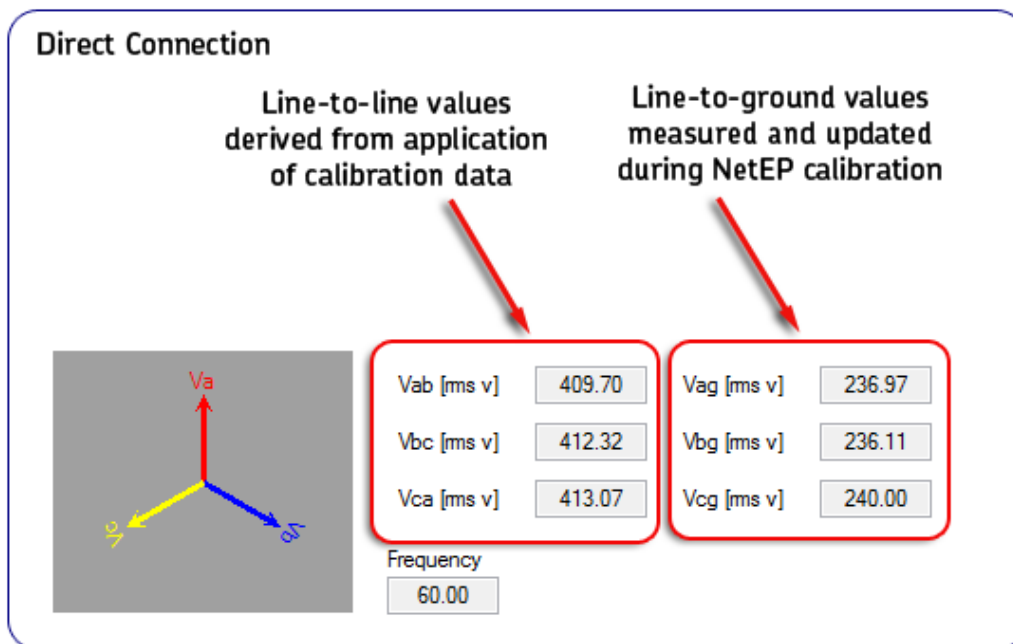


*Fig 25:  Line-to-ground values are known measurements taken for direct connection.*

The next page is used to verify the amplitudes of the measured voltage.

15. Confirm that the values shown in this page are what you expect to see.  If they are not, go back to the previous page to recalibrate as needed.

16. If the voltage values are as expected, click on the Right Arrow button to proceed.  The values are automatically saved.

NOTE:  Writing the calibration information can take a couple of minutes.
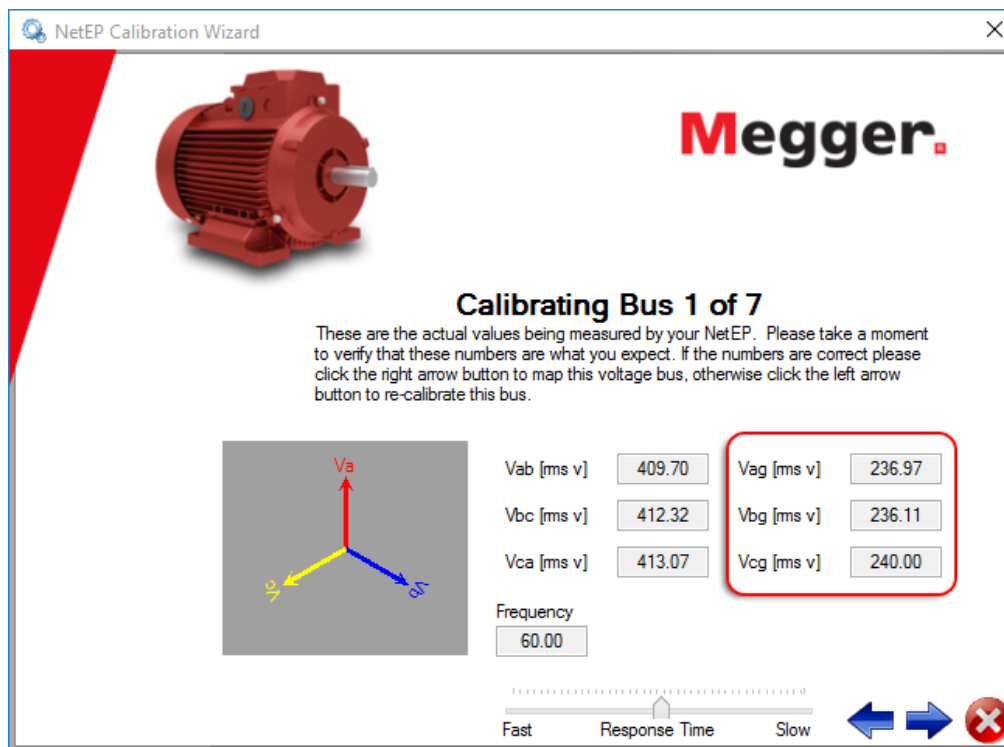


*Fig 26:  Verifying measured voltage amplitudes.*

In the next page, you need to map the input channel to a voltage bus in the database.

17. Select that voltage bus that you want to map to the input channel being calibrated so that you can review the data later.
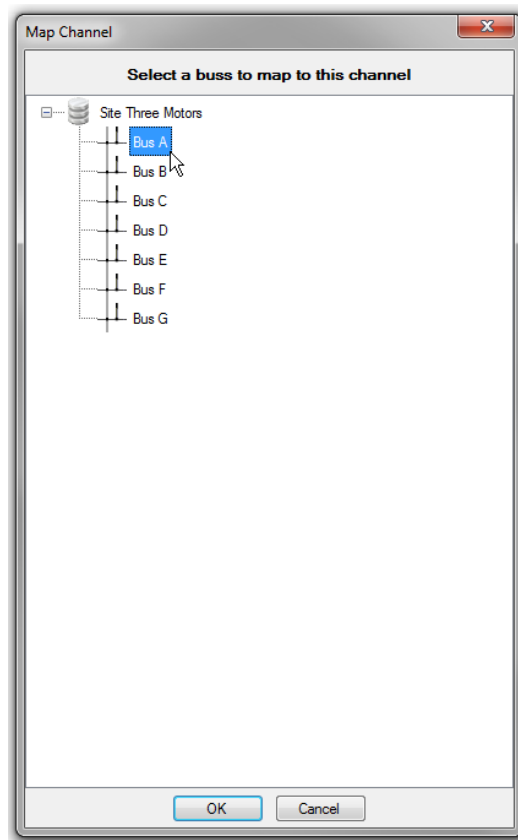


*Fig 27:  Assigning a bus to the calibration step.*

18. Create new voltage buses if needed by right clicking on the database name at the top of the dialog.  A menu appears to help you in the process.

19. Select the voltage bus you want to assign to the input channel, then click on OK.

20. After this assignment is made, the wizard will start the calibration process over, continuing on to the next bus.  At that time, you can skip a bus calibration by clicking on the Skip this Bus button, or move on the CT calibration by clicking the Skip to CTs button.

**Voltage Bus Mapping Notes**

If you are calibrating without a database, this step will be skipped.

If you want to defer the mapping of this newly-calibrated channel to a named voltage bus, click the Cancel button and the mapping step will be skipped.

If the voltage bus is not represented and mapped in the database when calibrating CTs, you will not be able to map motors to this voltage bus; you will need to defer mapping until proper assignments have been completed.

Do not forget to map buses later (either by getting back to these same pages in the Calibration wizard, or by using the Surveyor desktop application).  The NetEP device will not be able to perform its normal measurement operations until the voltage buses and motors have been mapped.

**Voltage Bus Calibration for Open Delta Connections (Secondary Side of PTs)**

Using this page, you will begin the process for calibrating voltage buses connected through secondaries/PTs (greater than maximum rated voltage).

Connecting directly to the voltage bus is covered in the preceding section.

The beginning of the NetEP Installation Manual discusses in depth how to properly make these connections.



*Fig 28: Selecting the connection type.*

1. Use the Connection Type dropdown menu to select your connection type.

2. For this process, click on "Connected through Secondaries/PTs."

3. The Skip this Bus button is used to jump from the current bus calibration process (for example "1 of 7" to the next one in sequence).

4. The Skip to CTs button is used to jump directly to the CT calibration process.

NOTE: Skipping bus or CT configuration steps typically occurs when not all buses are used, or if you have intervals in your work process where you have some sort of break between calibrating one bus/CT and another (for example, when the process occurs over multiple days or shifts.)

5. After you define your connection type, click on the Right Arrow button to continue.

The next page is used to calibrate the amplitudes of the voltage buses.

6. Open the NetEP cabinet door and locate the terminal block for the selected voltage bus.

7. Use a digital voltmeter to measure the voltage between channel A and channel B on the voltage bus input card. (Follow the instructions provided in each page when taking your measurements.)

8. Enter the value in the Measured [V] field.

9. Click the Update button to update the calibration then click on the Right Arrow button.

NOTE: After you enter the value you measure in the Measure (V) field and click Update, the system uses your value to calibrate the bus and adjusts the value displayed in the NetEP Measured (V) field accordingly.
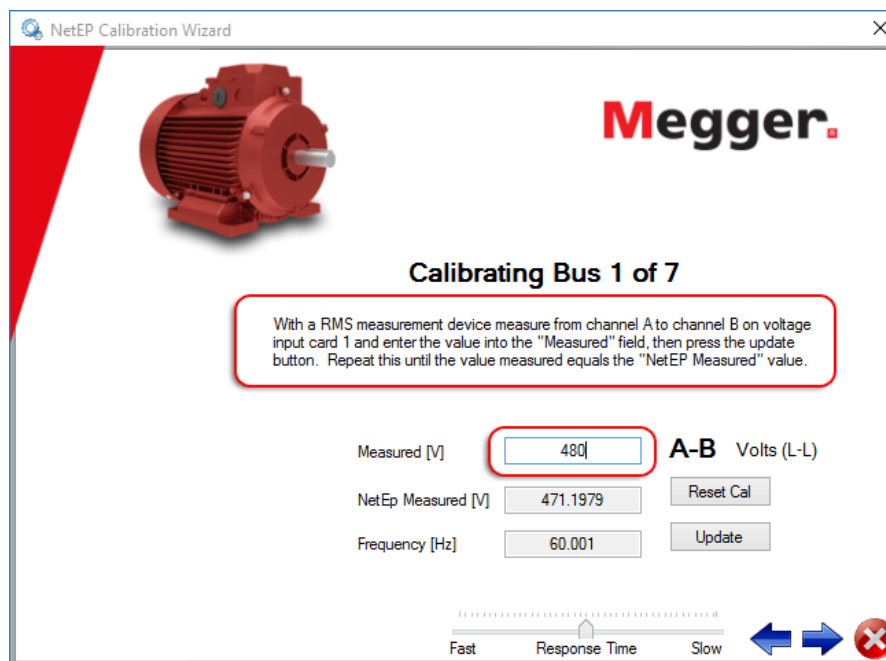


*Fig 29: Calibrating voltage bus amplitudes—connection via PTs/secondaries.*

NOTICE: Before you click on the Update button, the two values might not match. If the values are off considerably, there could be a connection problem. Click on the Reset Cal button to revert to a default gain setting. The resulting value should be reasonably close. If it is still off by a large amount, double check the instructions to ensure that you are measuring properly.

CAUTION: It is possible that there might be a bad connection between the voltage bus and the NetEP, or the voltage bus input card might have been damaged or is not fully seated. Do not try to correct any such connection problems at this time because dangerous voltage is present. Rather, take a note of the issue and continue. If problems arise later that suggest the measurements are incorrect, it could be due to a common cause that needs further investigation. Repairs should be completed only when power is removed to the NetEP and the voltage bus input cards

10. After you click on the Update button, the NetEP measured value should match the entered value (plus or minus small real-time variations).

11. Click the Right Arrow button to continue.

12. This page will appear three times during the process; once for each measurement needed (A to B, B to C, and C to A) for each voltage bus. Repeat the measure and update steps for each channel pairing.

13. After you have completed the process for all three phases, click the Right Arrow button to continue.

14.  Enter the sensor ratios associated with your specific secondaries.  Note that the numerator value cannot be zero.

This value represents the step-down ratio of the transformer.  For example, on a 4160 V bus, you might be measuring voltages between the NetEP voltage bus input card inputs as around 833 volts each, which is approximately 1 volt higher than nominal. In this case, you would enter the step down as a ratio of 75 (motor side) to 15 (NetEP side).  Then when you get to the final page, you would see values for L-L at approximately 4167 volts, and values for L-G at approximately 2406 volts.

The verification page will apply the ratio, inverted, to show what the NetEP sees as the voltage at the motor.
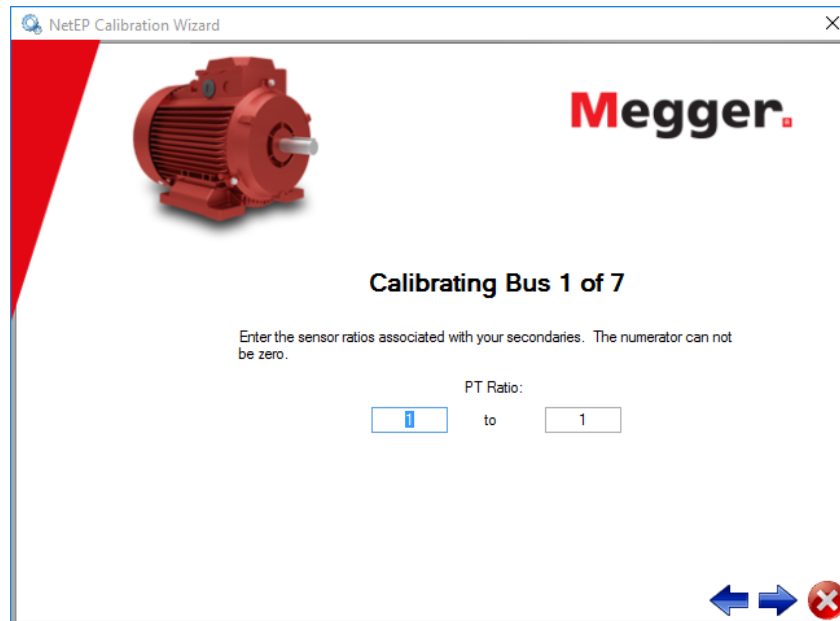


*Fig 30:  Entering sensor ratios for secondaries.*

15.  Click on the Right Arrow button to continue.

Typically, voltage bus rating refers to the line-to-line (L–L) measurement values (for example, from Va to Vb = Vab).  This is the case when your connection type is Open Delta (connecting to PT secondaries).  In this case, you measure and enter the line-to-

line voltage (for example, Vab), so you will verify the line-to-line values displayed.
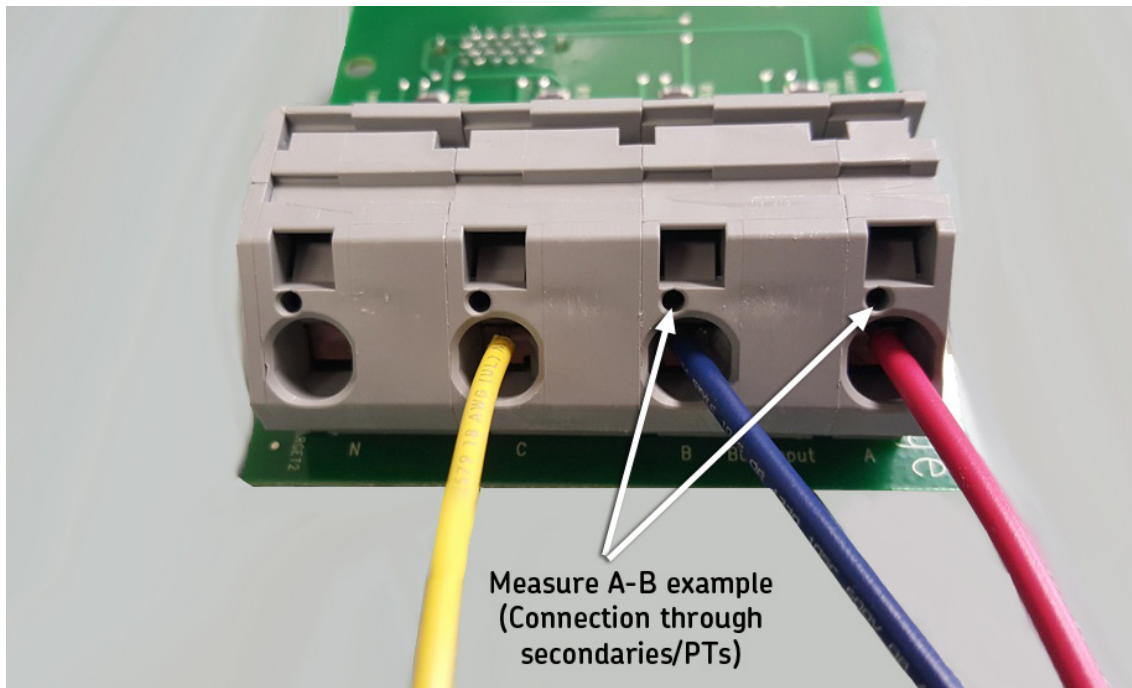


*Fig 31:  Example measurement taken for connection to secondaries/PTs.*

When connecting to PT secondaries, the NetEP software derives the line-to-ground values from the applied calibration data.
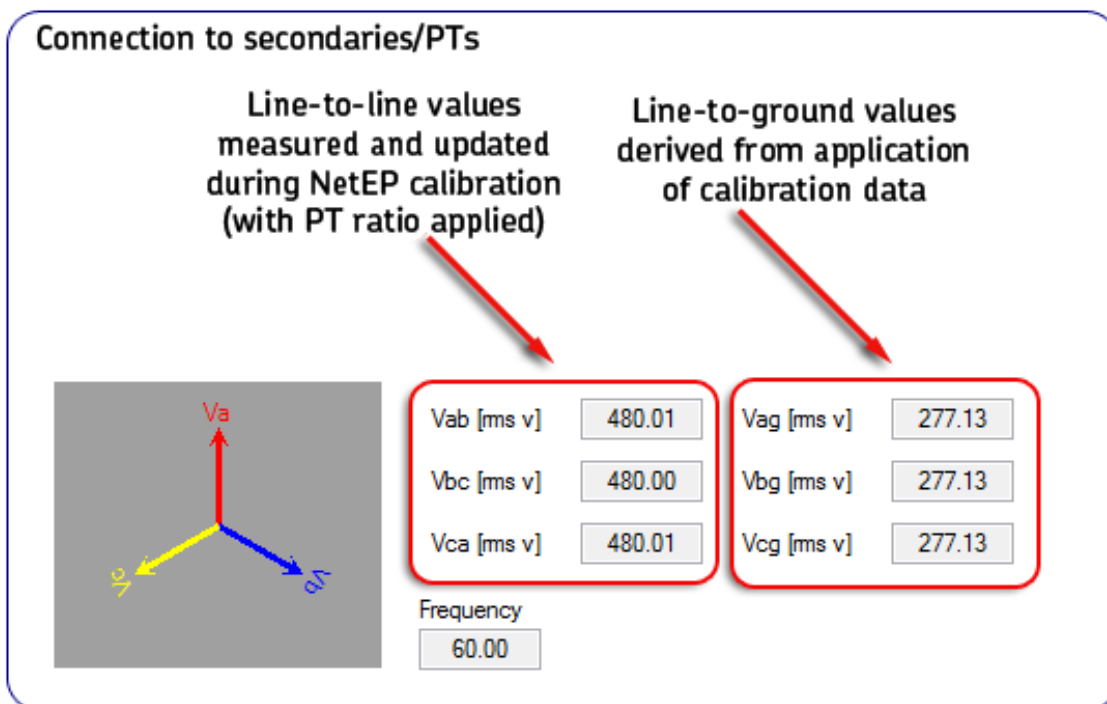


*Fig 32:  Line-to-line values are known measurements taken for connection to secondaries/PTs.*

The next page is used to verify the amplitudes of the measured voltage.

16. Confirm that the values shown in this page are what you expect to see.  If they are not, go back to the previous page to recalibrate as needed.

17. If the voltage values are as expected, click on the Right Arrow button to proceed.  The values are automatically saved.

NOTE:  Writing the calibration can take a couple of minutes.
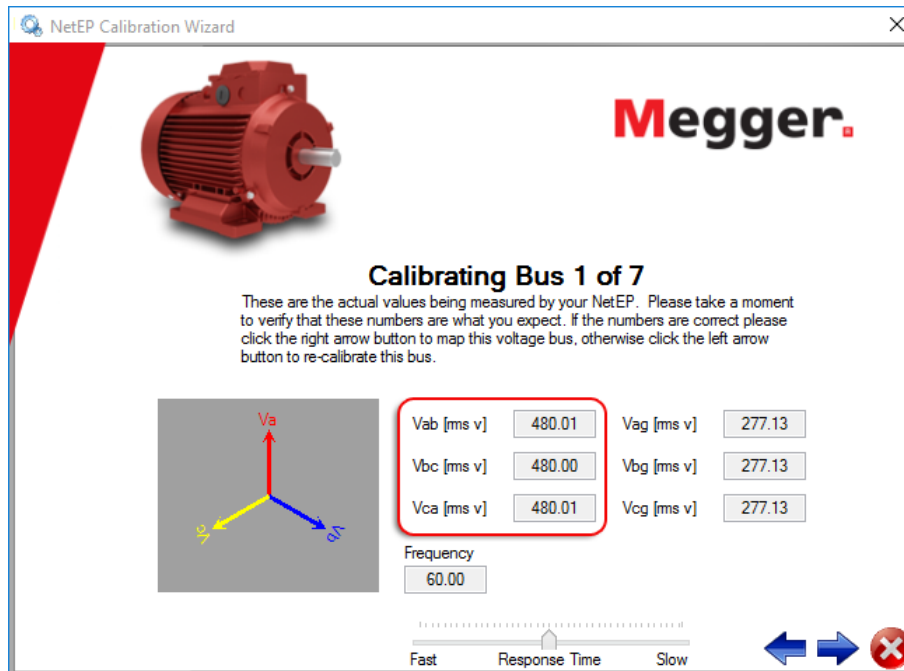


*Fig 33:  Verifying measured voltage amplitudes.*

In the next page, you need to map the input channel to a voltage bus in the database.

18.  Select that voltage bus that you want to map to the input channel being calibrated so that you can review the data later.
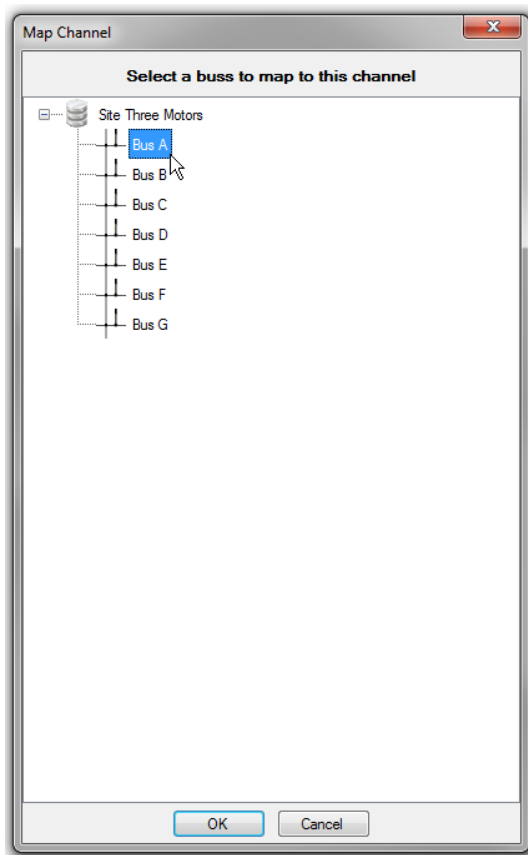


*Fig 34:  Assigning a bus to the calibration step.*

19.  Create new voltage buses if needed by right clicking on the database name at the top of the dialog.  A menu appears to help you in the process.

20.  Select the voltage bus you want to assign to the input channel, then click on OK.

21.  After this assignment is made, the wizard will start the calibration process over, continuing on to the next bus.  At that time, you can skip a bus calibration by clicking on the Skip this Bus button, or move on the CT calibration by clicking the Skip to CTs button.

**Voltage Bus Mapping Notes**

If you are calibrating without a database, this step will be skipped.

If you want to defer the mapping of this newly-calibrated channel to a named voltage bus, click the Cancel button and the mapping step will be skipped.

If the voltage bus is not represented and mapped in the database when calibrating CTs, you will not be able to map motors to this voltage bus; you will need to defer mapping until proper assignments have been completed.

Do not forget to map buses later (either by getting back to these same pages in the Calibration wizard, or by using the Surveyor desktop application).  The NetEP device will not be able to perform its normal measurement operations until the voltage buses and motors have been mapped.

## Calibrating CT Channels

The next step in configuring a NetEP is calibrating the CTs.  The motor to be calibrated should be running so the CTs are excited and producing a voltage measured by the NetEP.  If the Calibration Wizard is not running, start it now and click on Skip to CTs to get to this process.

NOTE:  The CT calibration process applies to both connection types—direct and open delta.

1.  Select proper range switch on the Cal CT for the current level being measured.

CAUTION:  Be sure to select the proper range switch before you attach the Cal CTs to the conductors.  Otherwise, you might send excessive voltage to the CT input on the NetEP, which could damage it.



*Fig 35:  Cal CT.*

NOTE:  During calibration, if you seem to be getting signals that are too strong or too weak for some of the current channels, it might be because you have accidentally bumped a switch like the one shown here, moving it to a different position.  Depending on the Cal CT model used, the protective gloves worn, and other factors this sort of accident can occur—possibly multiple times—when moving the Cal CTs to measure different motors.  For these reasons, check the switch setting both before and after placing the Cal CT, each time it is moved.

2.  Attach the clamp-on connectors of the Cal CTs to the same conductors as the installed CTs.

3.  Connect Cal CTs to the NetEP via BNC cables.  The mating BNC connectors on the bottom of the enclosure panel are shown in the figure below.
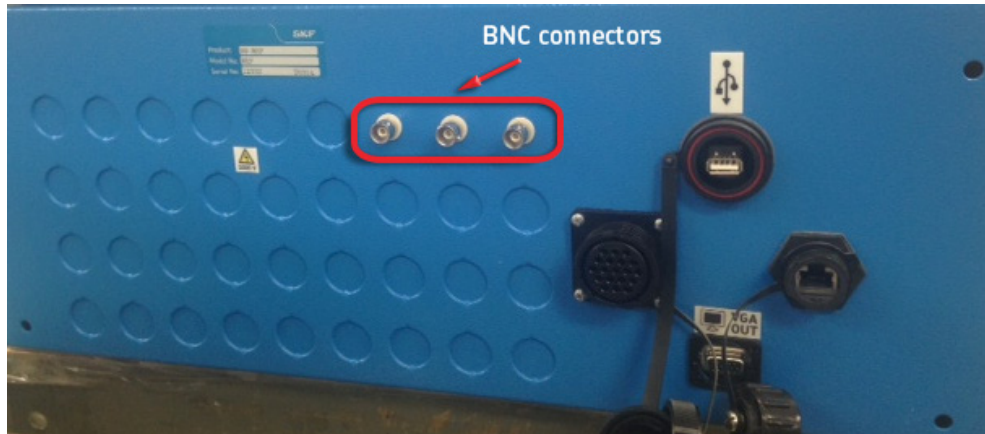


*Fig 36:  Bottom panel of NetEP showing BNC and other connectors.*

4.  Enter the mV/A AC rating that corresponds to the current range in the Calibrating CT Channel window as shown below.

5.  The phase shift is not likely to be a single fixed value, but rather a curve based on frequency and the setting selected on the calibration CT.  Refer to calibration CT documentation to look up a curve for the switch-selected sensitivity/rating of the calibration CT to find the range of the frequency being measured.  That should help identify what the phase shift should be. Enter that value here. (If you cannot locate that information, leave the value at 0).
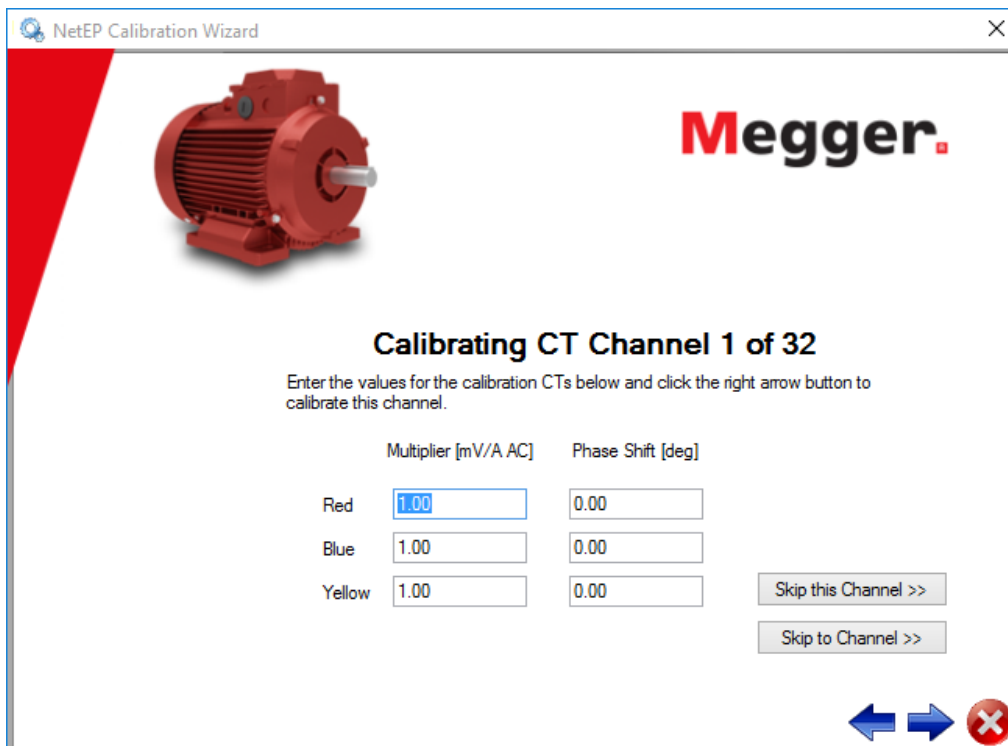


*Fig 37:  Defining Calibration CT values.*

6.  Click the Right Arrow button to continue.

> NOTE:  This page appears for any installed CT channel that you will calibrate, but the values entered here are not particularly concerned with the selected installed CT channel, but rather they are concerned with the Cal CTs.
>
> When you move to another installed CT channel, the prior values will be retained in these fields.  If the motors being calibrated fall into the same current range, the retained values may be used without editing.  However, if the new motor uses a different current range than the previous motor, the Cal CT switch settings must be altered between motors, and new values must be entered in this page.

7. Moving the BNC connectors as needed, physically sequence the calibration CTs to match the installed instrumentation CTs (installed CTs).

> NOTE: This step deals with ensuring that the calibration CTs are on the same channels as the installed CTs.  The process for sequencing installed CTs to the three motor voltages will be completed a little later.
>
> Note that this page does not display a standard voltage and current phasor diagram; no voltages are displayed.  Rather, the diagram compares the actual installed CT inputs with the Cal CT inputs.
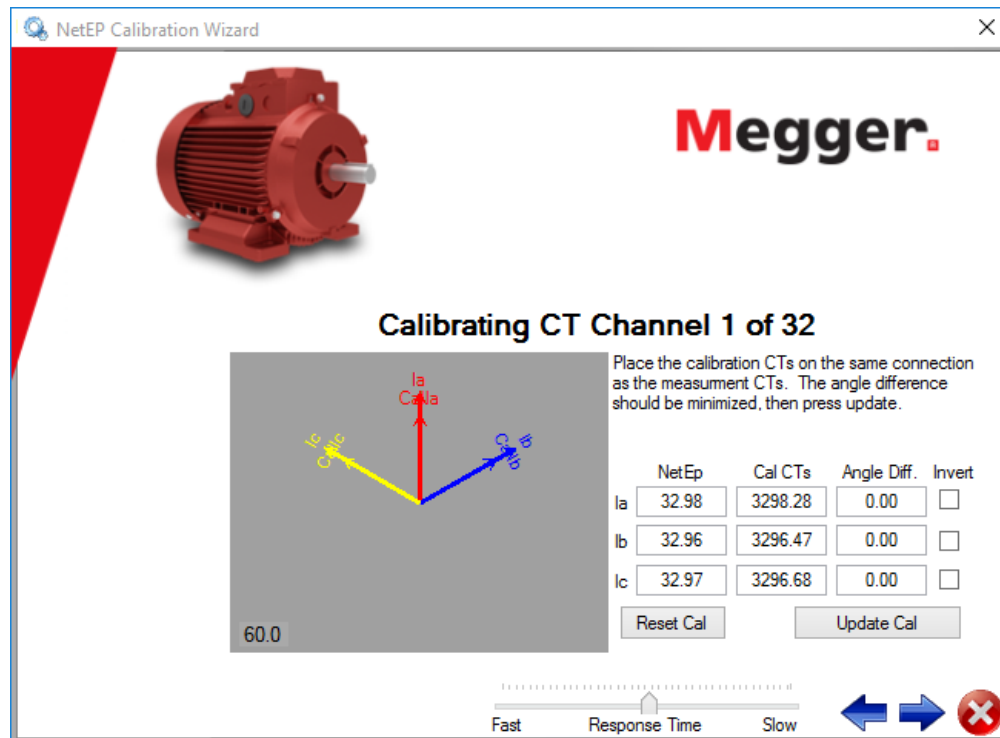


*Fig 38:  Calibrating CT channels.*

8. To match the calibration CTs to the installed CTs, you can make the following changes:

9. Swap the physical locations of the BNC connectors to re-position the phasors.

10. Use the Invert checkbox to rotate phasors by 180 degrees.

11. When properly sequenced, the phasors for both the NetEP and Cal CT channels should be in a similar position, even though they might not perfectly overlap each other yet because the installed CTs could impart a different phase shift than the Cal CTs.

12. Press the Update Cal button to perform the calibration operation.

> NOTE:  If one of the NetEP CTs has abnormally low readings compared to the others, it could be due to the calibration CT setting switch having been accidentally bumped into the wrong position.  To ensure accuracy, this should be corrected before proceeding.

13. At this point the measured readings of the installed CTs should match the readings of the clamp-on calibration CTs.  The amplitude should be calibrated at this point, and the phase variance of the installed CTs should also be corrected.  Any mismatch in the phasor diagram should now appear corrected such that each line's two vectors perfectly overlap.

NOTE:  Do not to be concerned if the diagram does not display the expected 120 degrees between vectors.  That can be corrected on the verification and re-sequencing page.

14. If necessary, enter a CT ratio.

NOTE:  The default 1:1 ratio will not require any change unless there is a transformer between the CTs and the motor, or the conductors being measured have been looped through their CTs multiple times to increase their output voltage.  The same ratio will apply to all three lines.



*Fig 39:  Defining CT ratios.*

15. Click the Right Arrow to continue.

## Sequence the Installed CTs for Proper Phase Progression

The next step in configuring a NetEP is sequencing the installed CTs to the measured voltages.  Because the installed CTs may have been installed in a random configuration, this step is required for the NetEP to accurately obtain motor data.

When properly sequenced, the phase current will lag the phase voltage (line to ground) by 5–90 degrees (most commonly 30–60 degrees).  The diagram below shows the proper location for the current phasors with respect to the phase voltage.
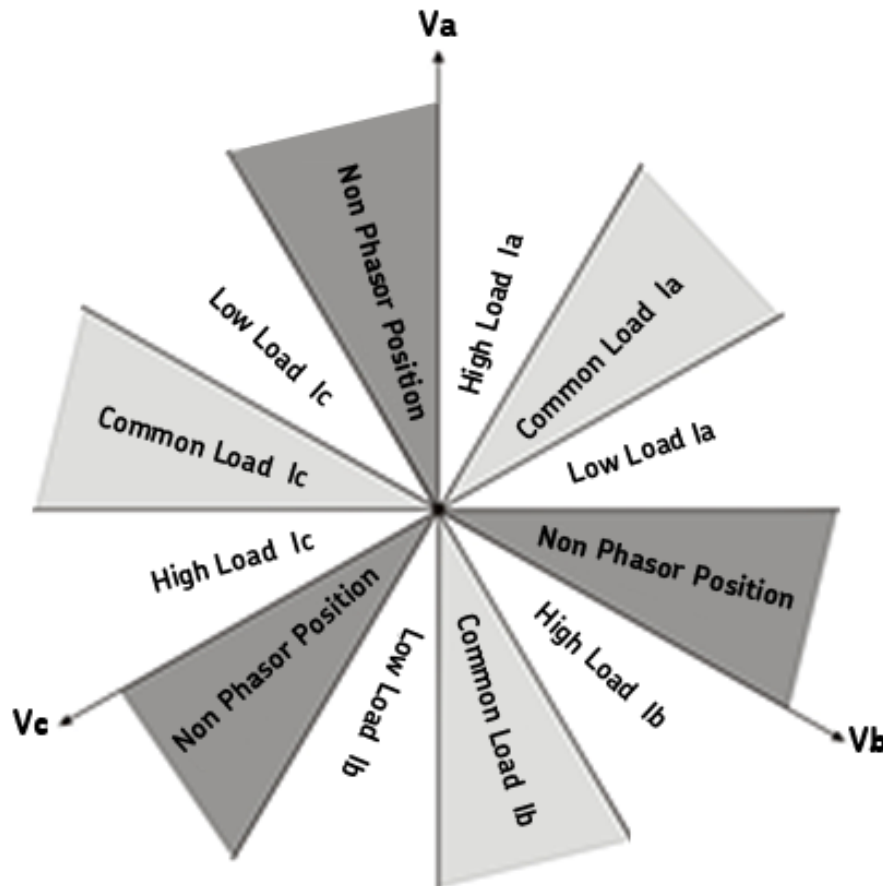
*Fig 40:  Phasor diagram.*

The Phasor diagram shows all phasor positions.  All three current phasors must be in the same load area of their respective phases for the setup to be correct.  For example if the Ia phasor is in the high load position, Ib and Ic must also be in the high load position.  The dark shaded areas are non-phasor positions.  Although this can be done mathematically, no phasors can physically reside in the dark shaded area (for three phase induction motors without PF correcting devices).

If the phasors reside in the high load position, measured current should be the same as the nameplate current.

In general, a lightly-loaded motor will have a current less than the full load current and will be at a phase lag of 30–60 degrees.

A highly-loaded motor will have a current near the full load current and a phase lag of about 5–30 degrees.

The graphic below identifies the Phasor diagram and shows how the Invert and Map To controls are used to properly sequence the installed CTs.
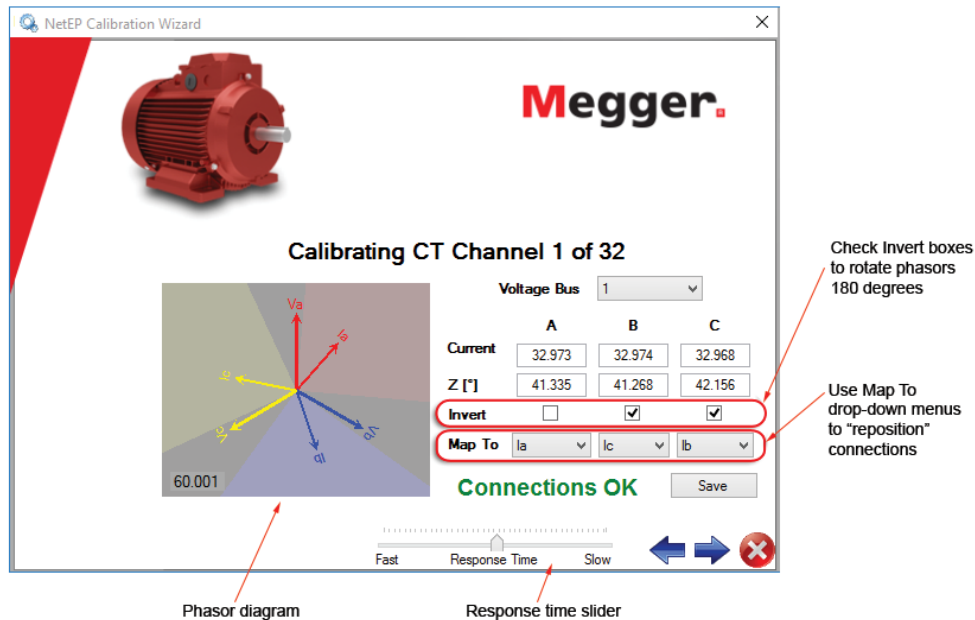


*Fig 41:  Features used to control CT sequencing.*

Trial and error is the only approach to performing the sequencing process.  Start by finding a phasor that makes a good candidate for phase A.

Select any mapping or inversion as required to get a good phase A.

Once proper mapping is done for a phase A, others will quickly follow.

The colored areas on the phasor diagram are guidelines for placing the current phasor.  The phasor should be somewhere within the shaded area to be a good choice.

The three columns (A, B, and C) represent the values measured from the actual input connections, while the pull-down options ("Map To") identify which role the software should consider that input channel as fulfilling.  For this reason, you can think of "Map To" as meaning "Move To."

Check the phasing for sensibility.  That is, if the motor is heavily loaded, the current phasor should be closer to its voltage phasor and the current should approach the full load current.  Lightly loaded motors will have a larger angle, but smaller current.

If the angles seem wrong, try inverting all channels to flip them to the other side, and then re-sequence as necessary to assign each input to the next phase.  Re-evaluate for sensibility.  If the situation is still ambiguous, it can be helpful to force a change in load to the motor to see whether the angles increase or decrease as expected.

NOTE:  Both the voltage bus and the CT channel should be fully calibrated before sequencing.

The Response Time slider is a low-pass filter on all of the measured values being displayed on a given page.  Sliding to Fast removes all filtering.  Sliding to Slow changes the displayed values slowly in response to changes in the measured values.  (It might take several seconds to stabilize after the levels of measured signals change.)

The slider provides dynamic averaging that is more stable than if the raw measured signal occasionally jumps around by significant amounts.  Consider the case of clicking on the Update button; you wouldn't want to capture the raw measured value at a time when it just happened to be anomalous.

Another example is calibration of motors using VFDs.  Because VFDs are more likely to provide variations, the slider can be used

to prevent such variations from taking the calibration process "by surprise."

To properly sequence the installed CTs:

1. Use the Voltage Bus dropdown menu to select the bus for the CT Channel identified.
2. Use the Map To dropdown menus to change phase to CT configuration (in effect, this re-positions the connections).
3. Use the Invert check boxes to rotate the phasors 180 degrees.
4. When CTs are correctly sequenced, the page will show Connections OK.

In the following example, the system senses that something is wrong with the B and C connections and displays the impedance angle values Z [o] in red. (The system will always display the impedance angle in red when it is greater than 90 degrees.) It also displays Check Connections in red near the bottom of the page.

To correct some conditions, you might only need to check the Invert box for that phase; but in this case, we needed to use the Map To dropdown menus to swap Ib and Ic.
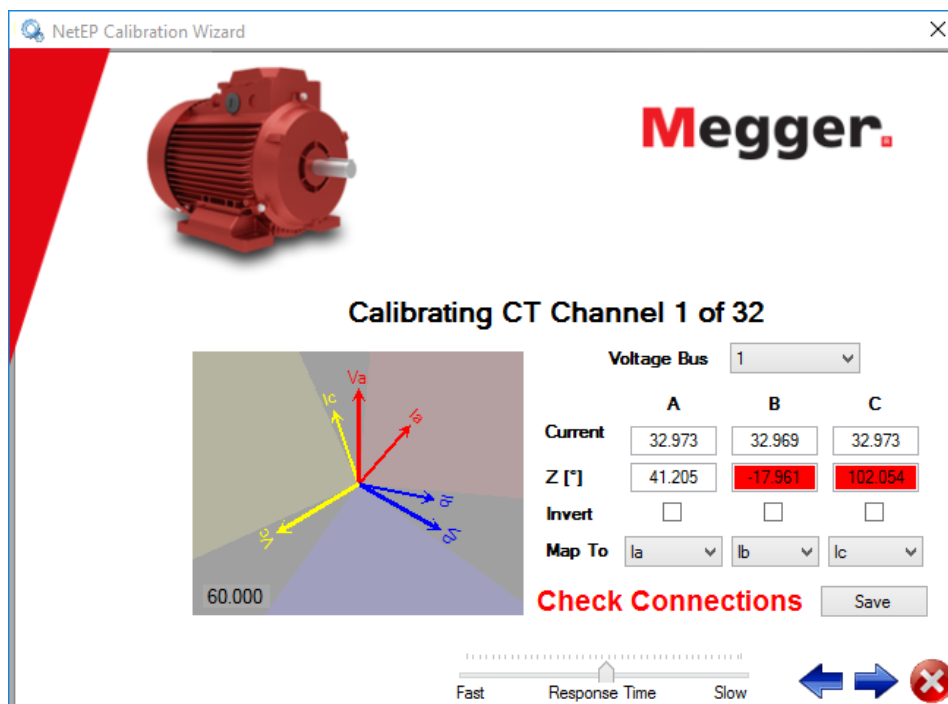


*Fig 42:  Display shows Phase B and C connection problem.*

NOTE:  The preceding explanation works if the motor is not under much load.  An alternate interpretation would be required if the motor is running under heavy load:  All three channels must be inverted first, and then B will be correct, but Ia and Ic would need to be swapped.

When the correction is made, the message near the bottom of the page changes to Connections OK and the current value shown in the Phasor diagram falls into the proper region.
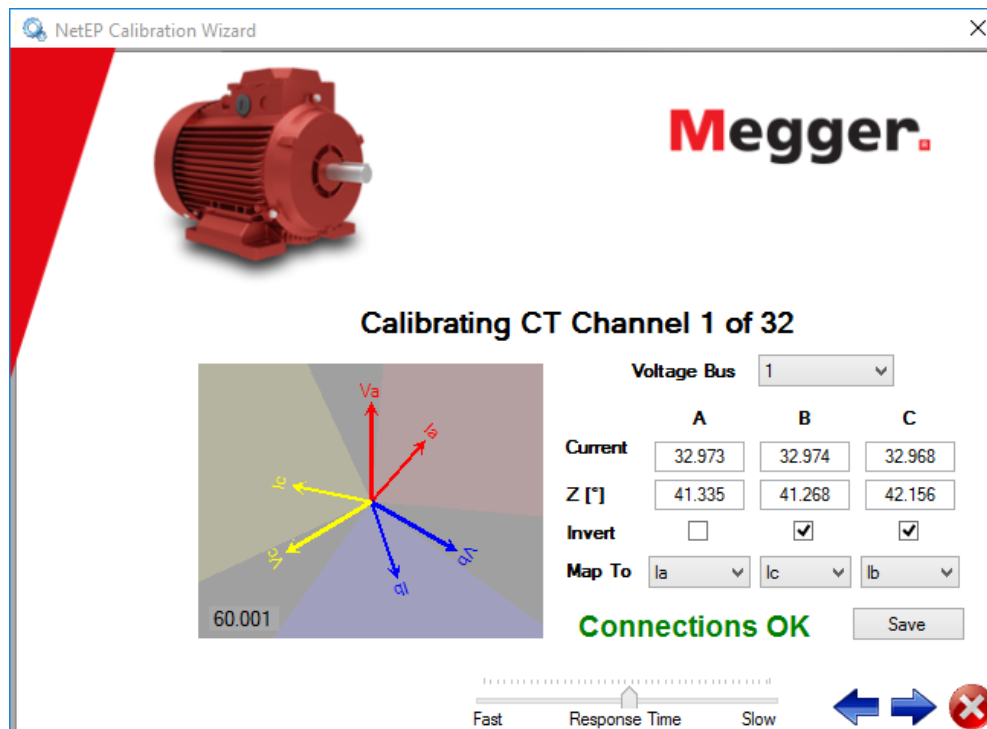


*Fig 43:  Changing Ib to Ic and Ic to Ib using the Map To dropdowns.*

Record that the CTs have been calibrated on a spreadsheet like the samples shown below.

| VBus | Description | Voltage | Type | PT Ratio | Calibration Complete |
|------|-------------|---------|------|----------|----------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

| CT | Motor Name | Voltage Bus | Calibration | Mapping | CT Ratio |
|-----|------------|-------------|-------------|---------|----------|
| M1 | | | | | |
| M2 | | | | | |
| M3 | | | | | |
| M4 | | | | | |
| M5 | | | | | |
| M6 | | | | | |
| M7 | | | | | |
| M8 | | | | | |
| M9 | | | | | |
| M10 | | | | | |
| M11 | | | | | |
| M12 | | | | | |
| M13 | | | | | |
| M14 | | | | | |
| M15 | | | | | |
| M16 | | | | | |
| M17 | | | | | |
| M18 | | | | | |
| M19 | | | | | |
| M20 | | | | | |
| M21 | | | | | |
| M22 | | | | | |
| M23 | | | | | |
| M24 | | | | | |
| M25 | | | | | |
| M26 | | | | | |
| M27 | | | | | |
| M28 | | | | | |
| M29 | | | | | |
| M30 | | | | | |
| M31 | | | | | |
| M32 | | | | | |

5. Click the Right Arrow button to continue.

6. A dialog box like the one shown below opens so you can select a machine to map to this channel.

7. Select a machine from the list if you see what you need; otherwise, right click on the top level to open the menu as shown below to create a new AC machine.
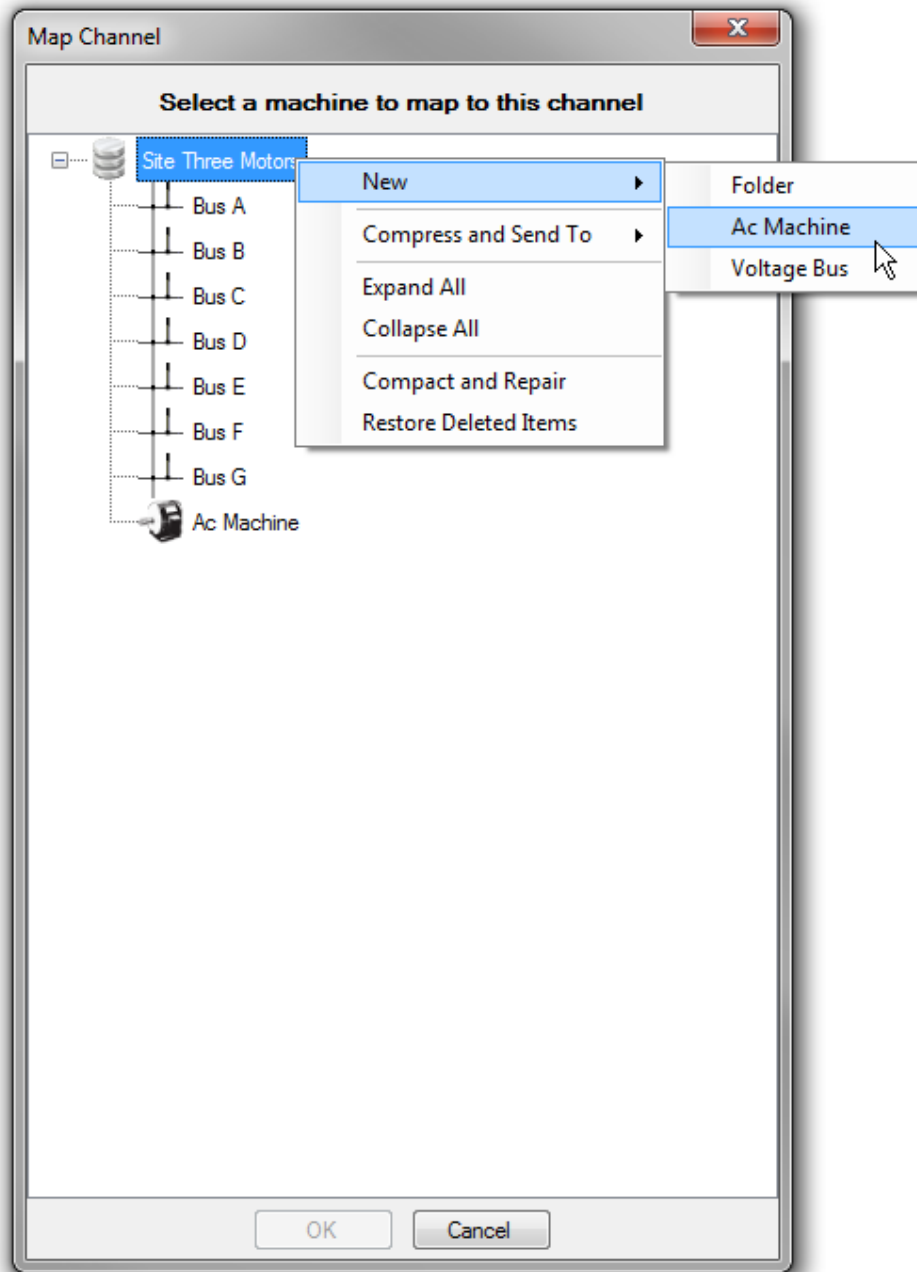


*Fig 44: Selecting AC machine or creating new one.*

8.  When you choose to create a new AC machine, you will see the dialog box shown below. For this process, you need only provide a new name in the Name field and enter the information in the Name Plate tab.
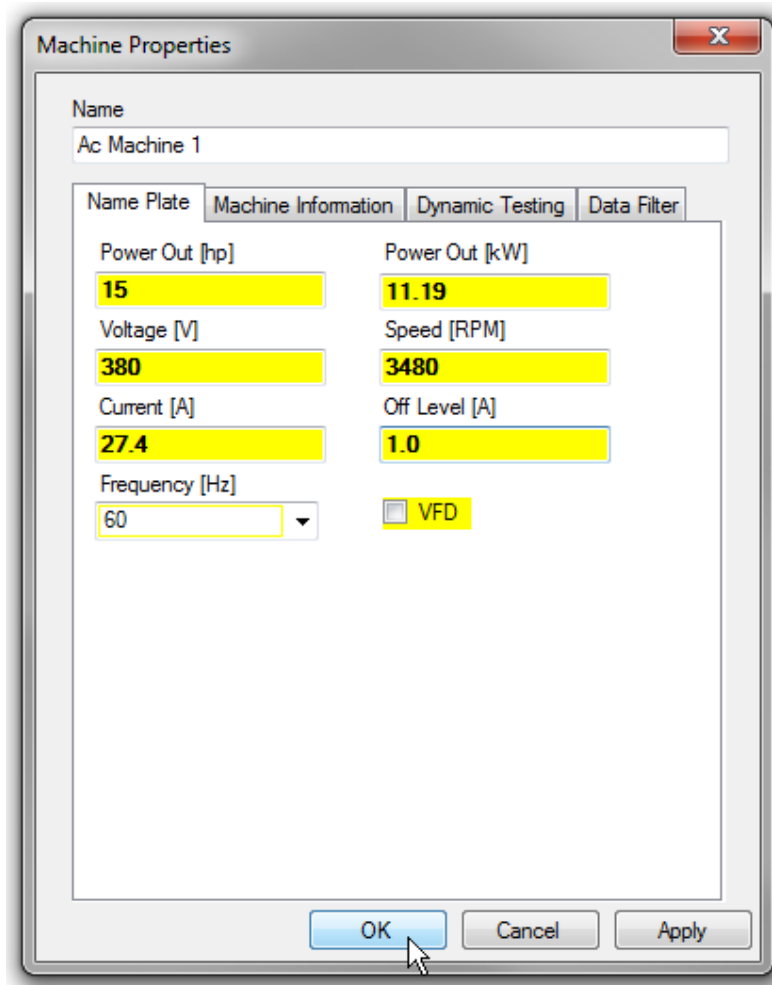


*Fig 45:  Creating a new AC machine.*

9.  Click OK when you have finished entering the necessary information.

10. Clicking OK cycles you back to first step in the Calibrating CTs process. After you have completed calibrating all channels, or you have reached the end of your current calibration goals, click on Exit to leave the NetEP Calibration wizard.

11. Check the VFD box if the motor is on a VFD.

## Starting and Stopping the NetEP Windows Service

The windows service must be stopped to perform the calibration process.  When the windows service has started, the NetEP will begin monitoring the motors and sending the data to the SQL server.

After completing the calibration process, try starting the service.

1. Right click on the My Computer icon on the desktop.

2. Click on Manage.

3. Click on Services and Applications.

4. Click on Services.

5. Highlight the line called "Baker NetEP Scheduler."

6. Click on Start Service or Stop Service as required.

7. Verify that the NetEP is working.  Using Surveyor is one option for doing so because you can confirm that new data is showing up in the databases for motors that are running.

8. If Surveyor is not yet installed anywhere, you can check the log files to ensure that the NetEP is not having serious and persistent errors (these would show up in the log files).

NOTE:  Refer to the "Troubleshooting" appendix for more information on potential issues with this service and for information on how log files can be used during this process.

## Calibration Settings Dialog Box

CAUTION:  This dialog is rarely used for normal operations and the values in the dialog should not be changed in most cases.  Generally, before you change any settings in this page, you should consult with Megger Baker Instruments support.

1.  The Calibration Settings dialog appears when you click on the Setting link on the main page pf the NetEP Calibration Wizard.
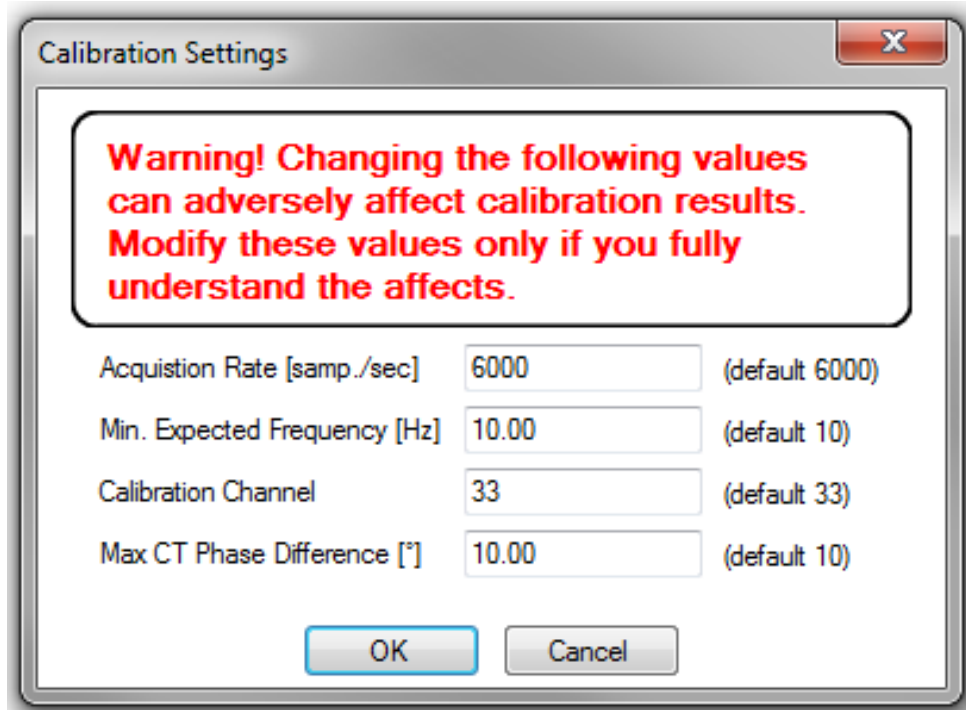


*Fig 46:  Calibration Settings dialog box.*

These values control both the method of acquisition and the acceptance criteria for the calibration.  In general you should not need to modify these values unless you have a specific reason.

Typically, changes are only made here when you are unable to calibrate a motor due to some unknown function or circumstance.

**Acquisition Rate**—This is the speed at which the acquisition system acquires data; 6Ks/s is considerable more than should be required for any situation.  If anything, you might want to lower this value to filter out switching frequencies and similar anomalies to stabilize frequency estimation.  The final value must be between 2000 and 20000.

**Min. Expected Frequency**—This setting controls the minimum frequency that can be estimated by the system.  The only reason to put a higher value into this box is if the current or voltage level is changing rather quickly and the system is not auto ranging correctly.  You may need to lower this value if the frequency is lower than 10, but this will require a "more stable" signal in order to calibrate.  Valid values between 0.1 and 200.

**Calibration Channel**—The default setting (33) is an internal channel used for calibration.  If this channel fails, you can use one of the other acquisition channels within the system to perform calibration.

**Max CT Phase Difference**—This setting specifies maximum difference between the phase of the calibration CTs and the measurement CTs before the system will allow them to be calibrated.

2.  When you have completed examining (or changing) the values in this page, click on OK to continue.

## Filtering Software Setup

### Installing the Filtering Program

The filtering program (Filtering.exe) is installed during the Surveyor Server software (SurveyorServer_Installer.exe) installation process on the server or another computer on the same network that has a persistent connection to the server. The filtering application applies the filtration settings—defined by the motor nameplate setup—to the data on the SQL server.

By default, the program is installed under C:\Program Files\SKF\Surveyor\Surveyor Server for a 32-bit system or C:\Program Files (x86)\SKF\Surveyor\Surveyor Server for a 64-bit system.

Configuring the database connection via NetEP Performance Monitor

Before Filtering will work, the NetEP Performance Monitor must be run to configure the database settings that will be used by the filtering program.

1. Run the NetEP Performance Monitor, using the desktop shortcut, the Start menu shortcut, or by double-clicking the file in a Windows File Explorer where it is found (normally in "C:\Program Files\SKF\Surveyor\Surveyor Server").

2. In the window that appears, you should find a database icon in the upper left corner.

3. Select the window and hover the pointer over the database icon. A tool tip saying "Set Database" appears to confirm the function. Click on the database icon.

4. The SQL Server Connections Settings dialog box will appear. Using this dialog, set the hostname for DBMS system (which should be this local server). If using SQL Express (the free version), you will also find it necessary to add "\SQLEXPRESS" to the end of the hostname.

5. Generally, you can leave the Port set to 0, but if you know your DMBS uses a different port, then change it as appropriate. The three settings for how the authentication should be done, the user name, and the password, should be set according to whatever user account should be used by the filtering program.

6. Click the button with ellipses at the lower right to open a display of the available databases to choose from. If you are unable to connect using the information provided, an error message will appear. Confirm that the proper information is used and re-enter information as needed.

When the connection is established, the main window will provide information regarding size and whether new data is coming from a connected NetEP. The connection data will be stored in a settings file shared by the Filtering program.

You can run the NetEpPerfMon program whenever you need to. You can even install and run it on a different system besides the server where the DBMS is hosted. In such cases, the physical memory information shown will have no relevance to the database server because they are taken from the local system.

### Running the filtering Program Manually

The Filtering program does not run automatically without setting up the Windows Task Scheduler (as described below), but you can run it manually for testing purposes if desired.

Ideally, you will want to see any error messages, so you should use a command prompt window.

1. Open a command prompt window (access process varies depending on the OS version you are running.)

2. Change directory to the location of the Filtering program.

3. Run the filtering program: Filtering.exe.

The program should not require much time to run if connected to a relatively new database (for an older database, it can run for several minutes). You will see messages identifying what the program is doing.

After the program completes, you might want to check the log file, which is located in the shared data folder for the application (C:\Documents and Settings\All Users\Application Data\SKF\Surveyor\Log by default; newer versions of Windows C:\Program Data\SKF\Surveyor\Log). The latest log file from running the Filtering program may contain messages similar to those issued in the command prompt window. If there were any errors, some investigation might be warranted. You can always look at the log

files there in the future to see whether problems have occurred when the filtering program runs.

**Scheduling the Filtering Program to Run Automatically**

The NetEP Surveyor Server software does not automatically set up any scheduled tasks, so this step needs to be done manually.

Different versions of Windows have different mechanisms for scheduling tasks to run automatically on a periodic basis. Regardless of which version of Windows you use, the task scheduling interface provided is fairly easy to use.

NOTE:  When setting up the scheduler, you should have administrator account privileges for the NetEP database because during setup the software will try to create stored procedures and views that it can use to do its job more quickly.

Thereafter, the user account only needs the ability to read and delete (and add an entry to one of the tables), and read the settings file that was prepared by the NetEpPerfMon program.

**Example Process Using Windows Server 2008 R2**

The following process  covers the steps to schedule the filtering program to run automatically via Windows Task Scheduler on a Windows Server 2008 operating system.  The process for setting up the scheduler on other  Windows operating systems will vary slightly, but are similar to the example process provided here.

1.  Opening the task scheduler

2.  Open the Task Scheduler by clicking the Start button. Control Panel , System and Security, then Administrative Tools.

3.  Double-click on Task Scheduler.

4.  If you are prompted for an administrator password or confirmation, type the password or provide confirmation.

5.  Creating the filtering Task

6.  Click on Create Basic Task.

7.  Enter the name of the task along with a description in the appropriate fields.

8.  Click on Next to continue.
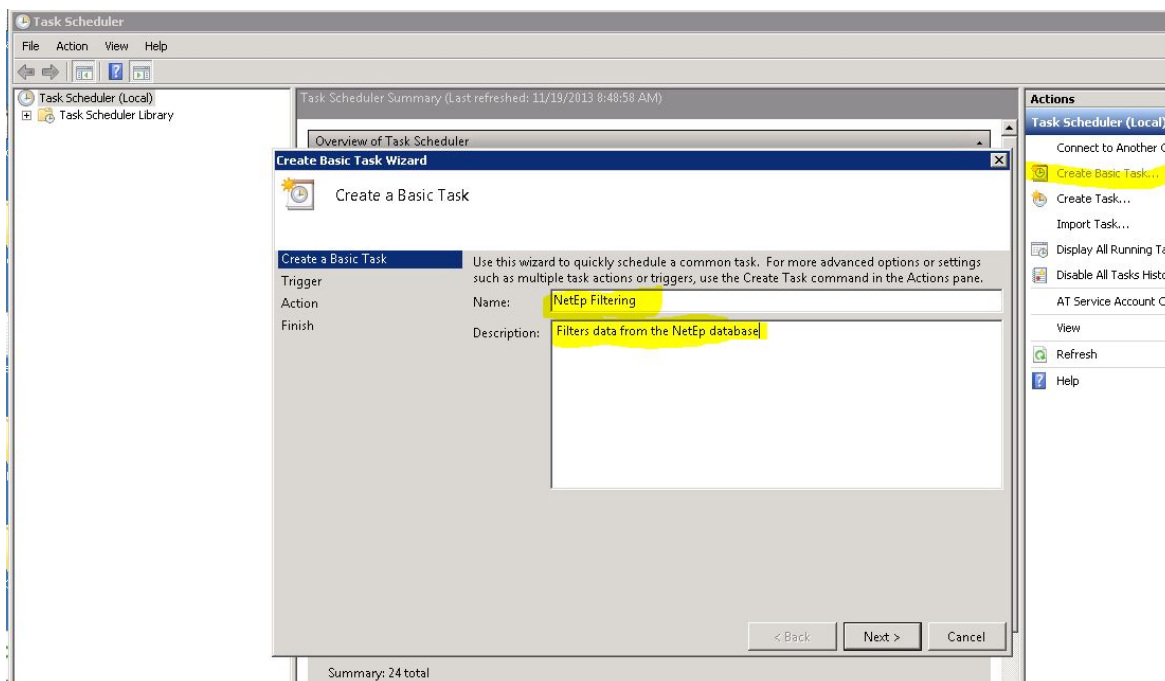


*Fig 47:  Creating basic task.*

www.megger.com                                                                                                                    59

> NOTE:  Optionally, (depending on version of Task Scheduler you are using) you can create multiple triggers to have the task performed more than once per day.

9.  Define the trigger for your task.  At a minimum, you should set filtering to run once a day every day.

10.  Click on the Daily radio button.

11.  Click Next.
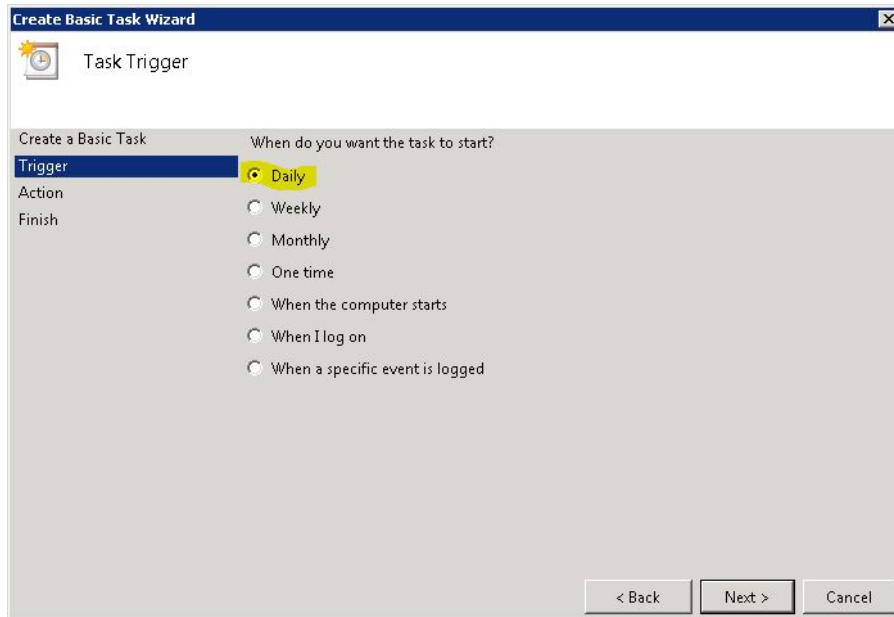


*Fig 48:  Specifying the task trigger.*

12.  Define the start date and time.  You might want to set it to start running after you have finished calibration and the NetEp is running.

13.  Click Next to continue.
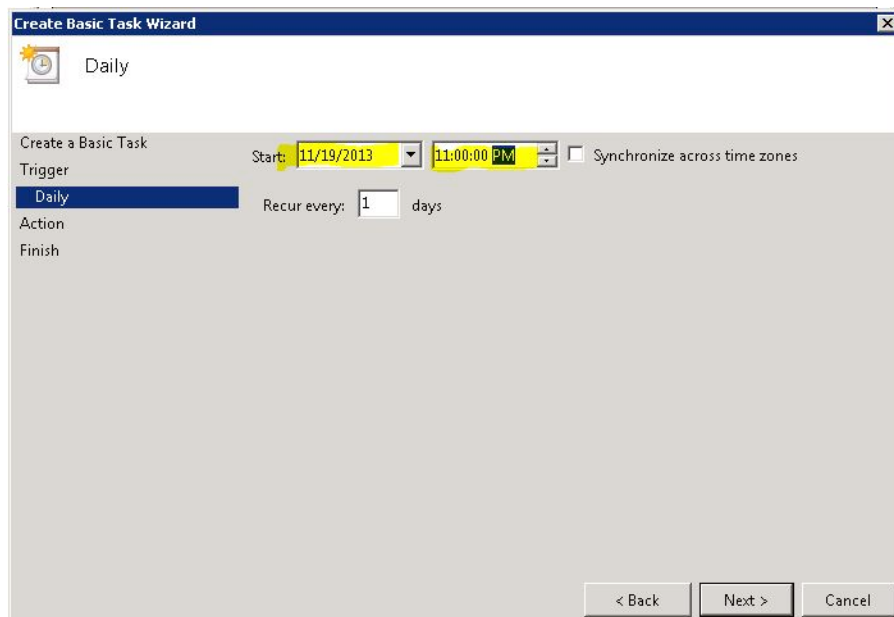


*Fig 49:  Specifying start date and time.*

14.  Select Start a program.

15.  Click Next.
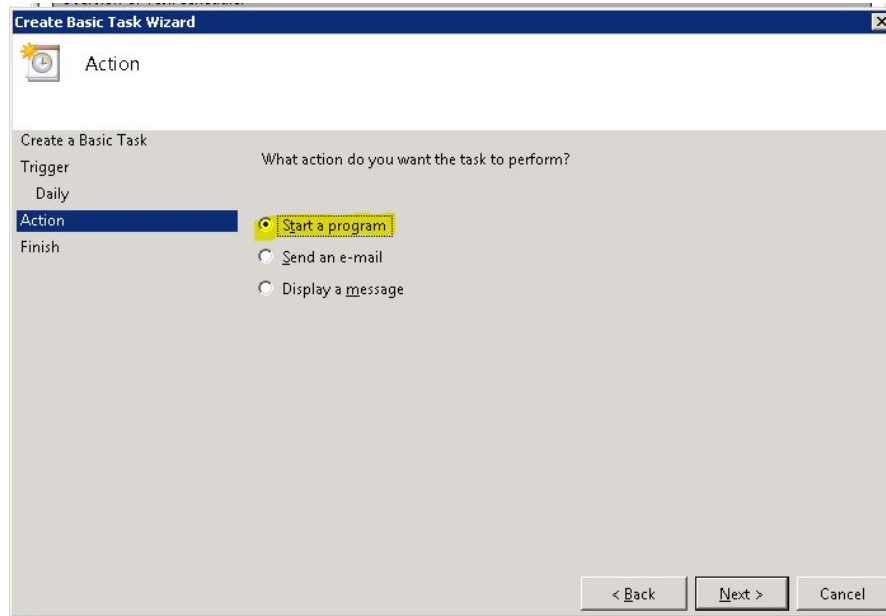


*Fig 50:  Specifying the action of the task.*

16.  Click on the Browse button to locate the file Filtering.exe.  Be sure to use the full path to the installed location of the Filtering.exe program

17.  The default location on a 64-bit OS is C:\Program Files (x86)\SKF\Surveyor\Surveyor Server\Filtering.exe.

18.  The default location on a 32-bit OS is C:\Program Files\SKF\Surveyor\Surveyor Server\Filtering.exe.
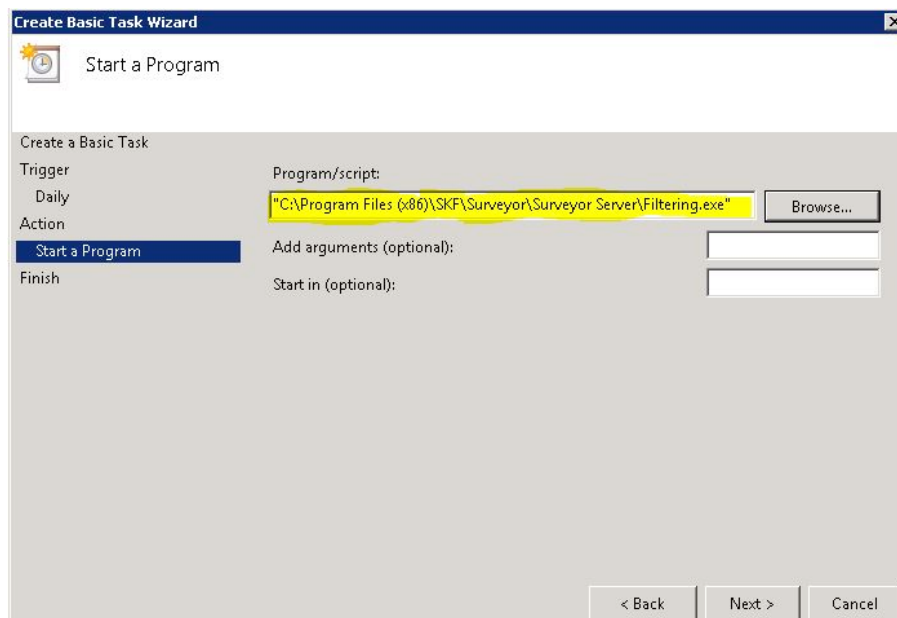


*Fig 51:  Locating the program to start.*

19.  Review your entries in the Summary window.  Click on the Back button if you need to make changes.

20.  Check the **Open the Properties dialog for this task when I Finish** box.

21. Click on the Finish button.
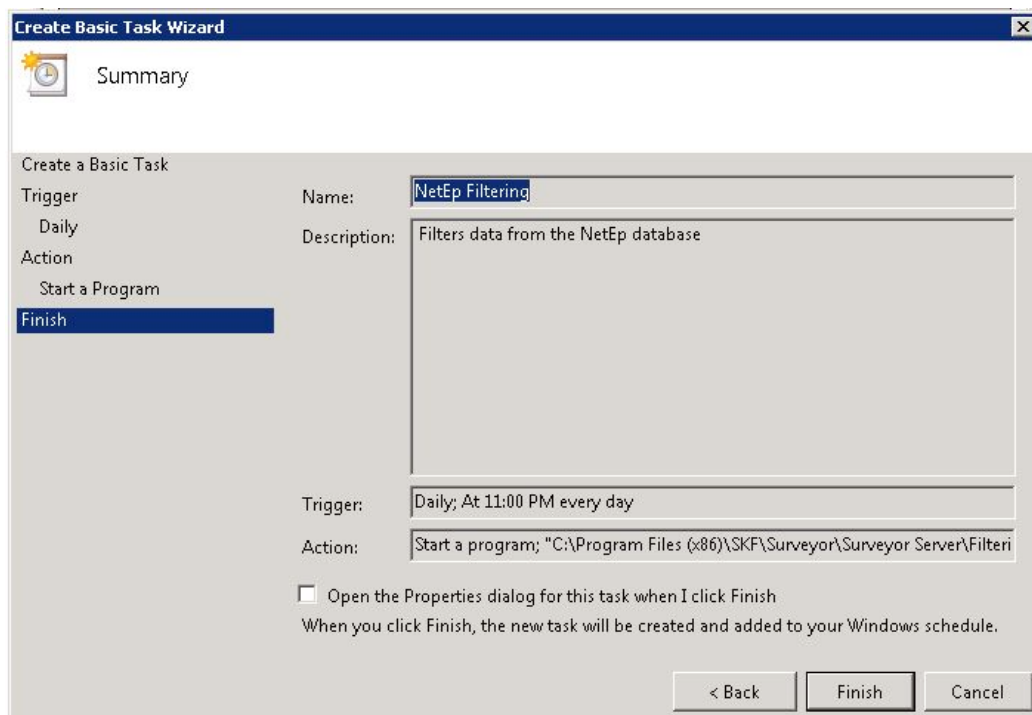


*Fig 52:  Reviewing entries and finishing the setup.*

22. In the Properties dialog, click on the Run whether user is logged on or not radio button.

23. Click OK to save your entry.
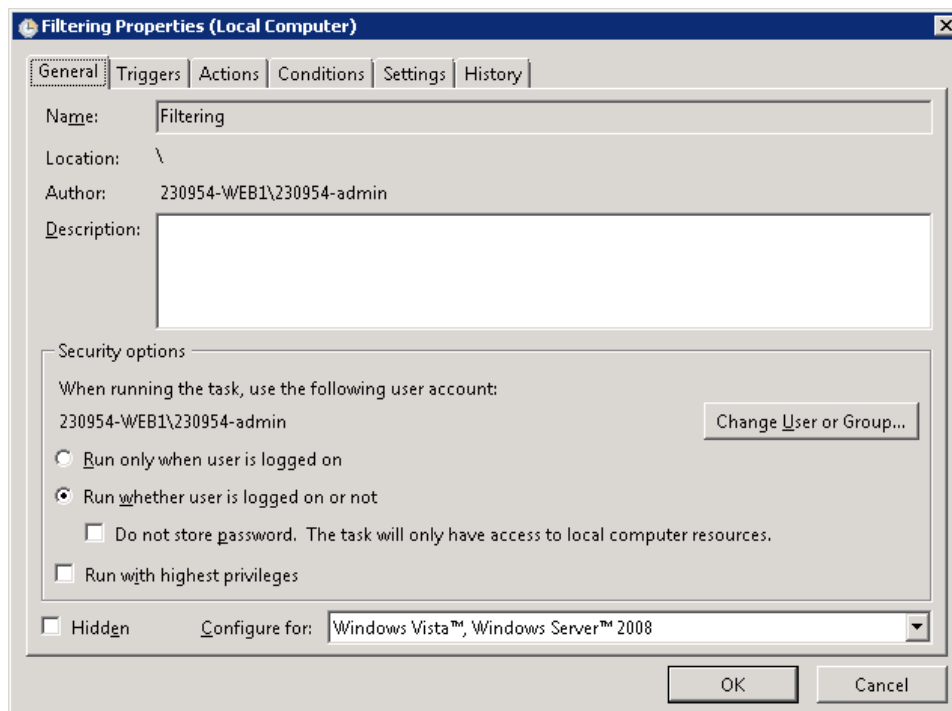


*Fig 53:  Defining run options.*

**Examples of Filtering Tasks**
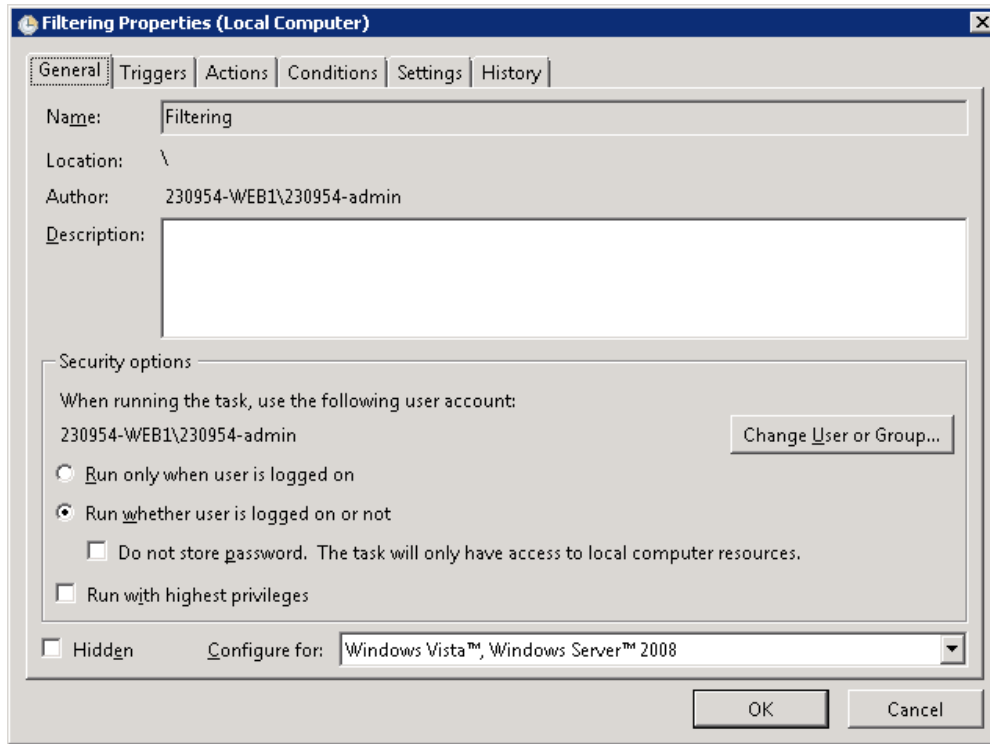


*Fig 54:  General tab example.*
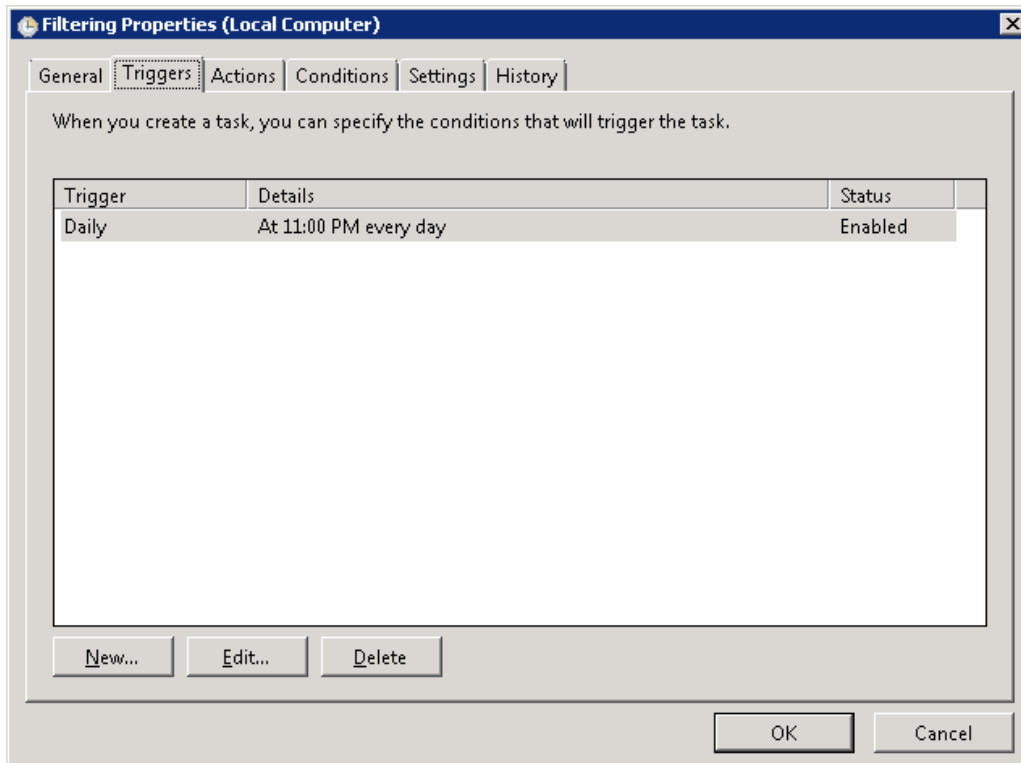


*Fig 55:  Triggers tab example.*
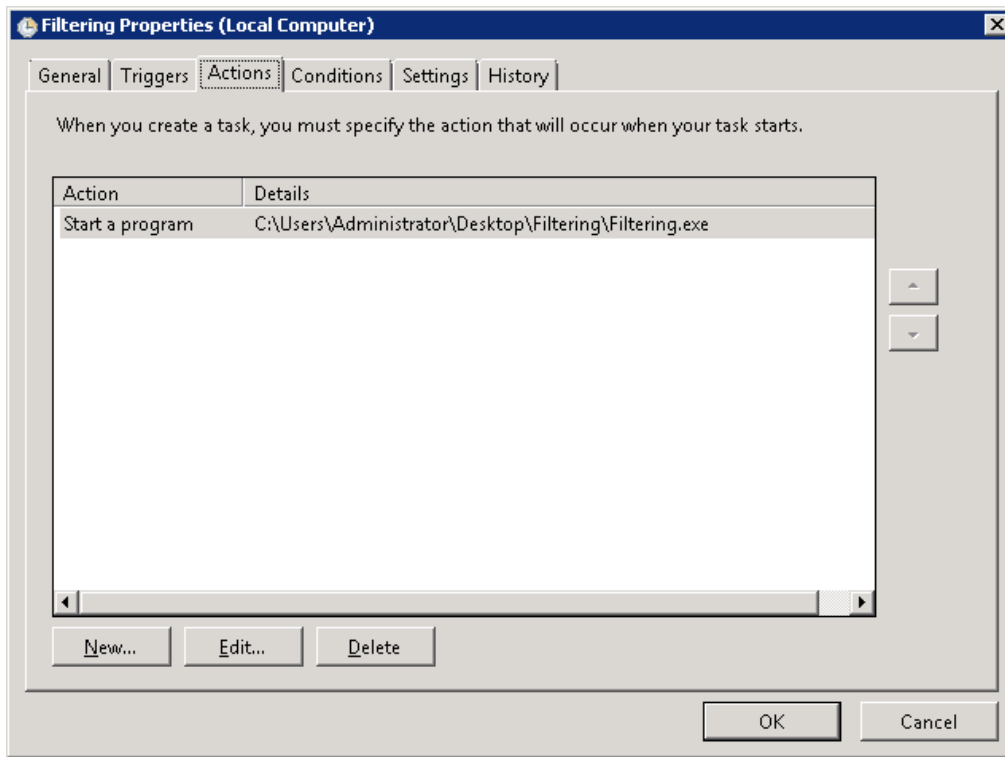
*Fig 56:  Actions tab example.*
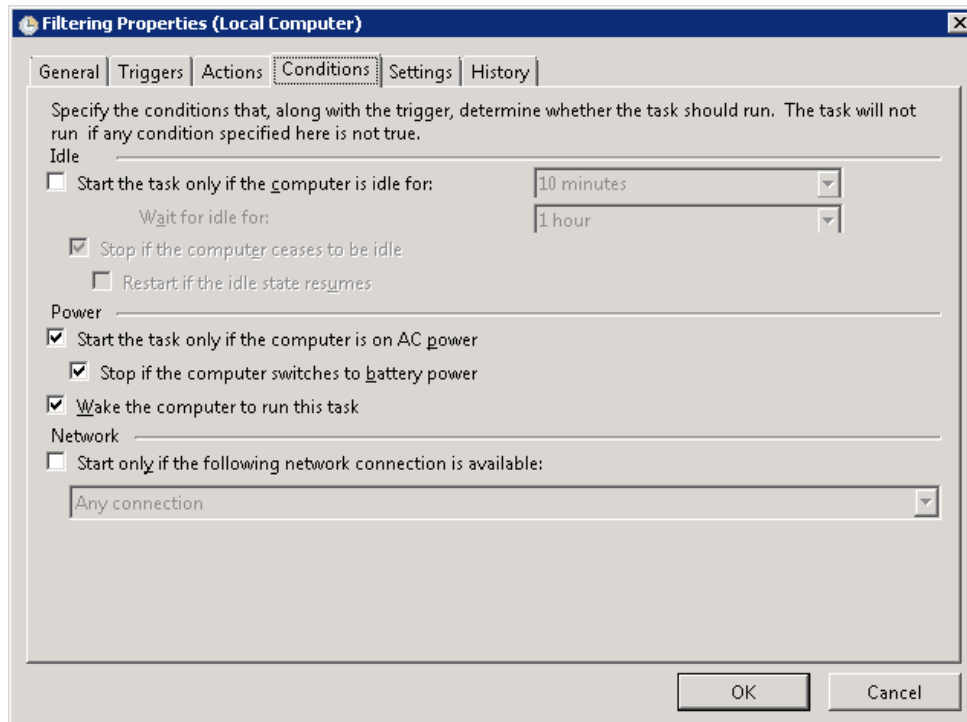


*Fig 57:  Conditions tab example.*

The maximum time you allow the program to run before it will be killed automatically is up to you, but the recommendation is to allow it to keep running for up to three days, and also select "Do not start a new instance" if this task is already running.
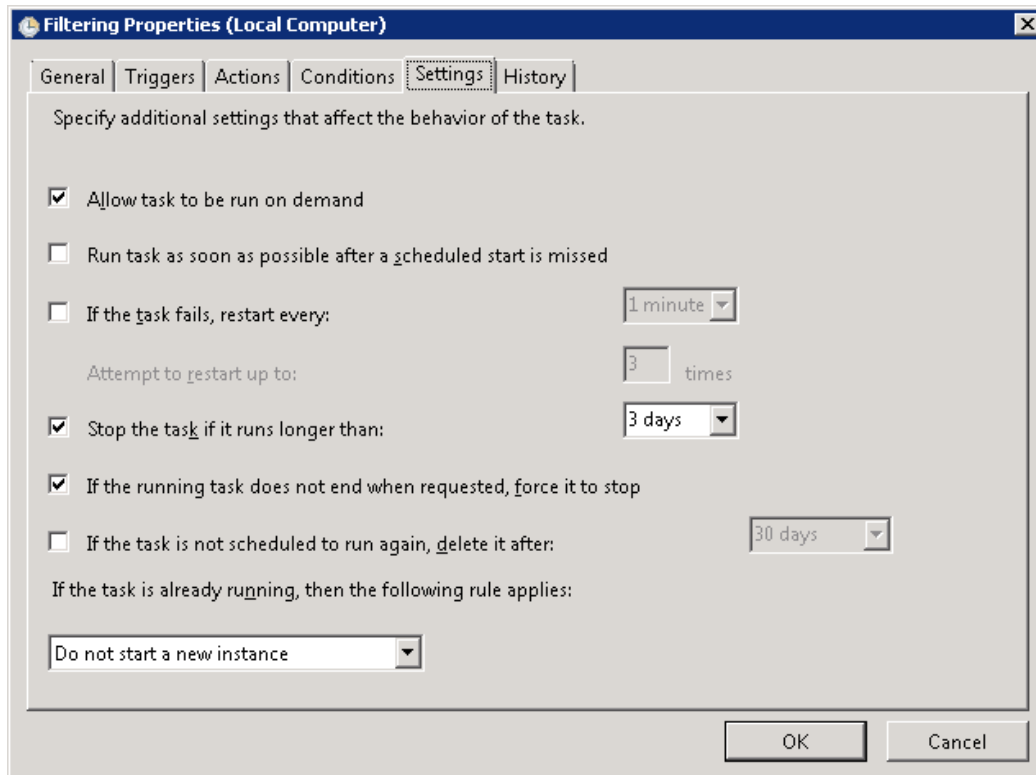


*Fig 58: Settings tab example.*

NOTE: If your database administrator requires it, you might need to change the database connection settings from using a database user account with full administrative rights to one in the NetEP database's "Analyst" role.

Similarly, access permissions for the user account already used in the connection settings could be changed afterwards by the database administrator to remove broad permissions that were required when initially creating the database.

# Appendix A—NetEP Configuration Utility

When you installed the NetEP software, the installer also creates an icon like this one on your desktop, which provides you access to a set of configuration tools that can be used to troubleshoot your NetEP system.
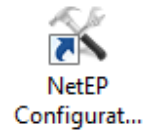
NOTE:  The NetEP Configuration tools are generally intended for field service personnel and will not typically apply to day-to-day usage of the NetEP.

1.  When you click on the icon, the Device Client dialog box appears as shown below.

2.  Clicking on the Tools item in the main toolbar opens a menu as shown in the example.  An overview of each menu item follows.
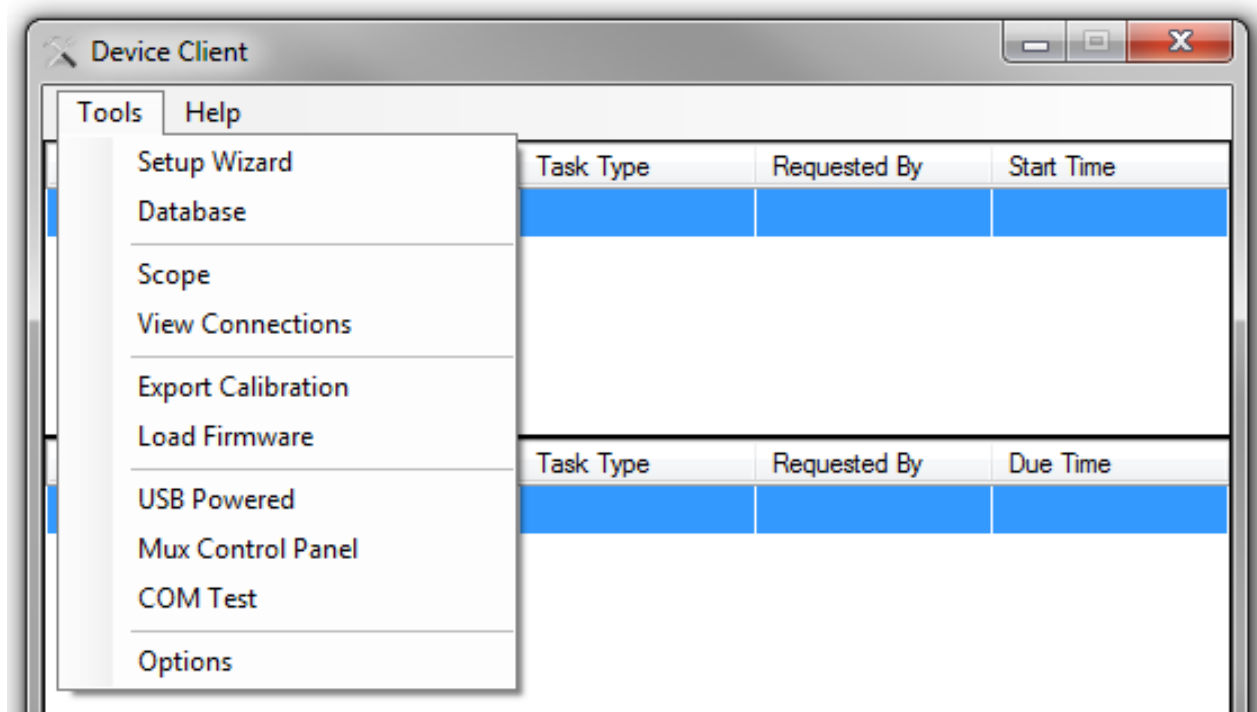


*Fig 59:  NetEP Configuration utility; Tools menu.*

**Setup Wizard**—Starts the NetEP Setup wizard.

**Database**—Opens a dialog that you can use to define the SQL Server connection settings.

**Scope**—Opens a scope utility in a separate window.

**View Connections**—Opens a separate dialog showing you the status for the current connections being monitored.

**Export Calibration**—Open a Save As page so you can specify the location where you want to save the calibration data.

**Load Firmware**—Used only by service technicians to upgrade firmware.

**USB Powered**—Manually forces an internal USB source to stay on.  Used only by technicians for diagnostic purposes.

**Mux Control Panel**—Used by technicians to test system multiplexing functionality.

**COM Tes**t—Used by technicians to test com ports.

**Options**—Internal Megger options presented to technicians when applicable.
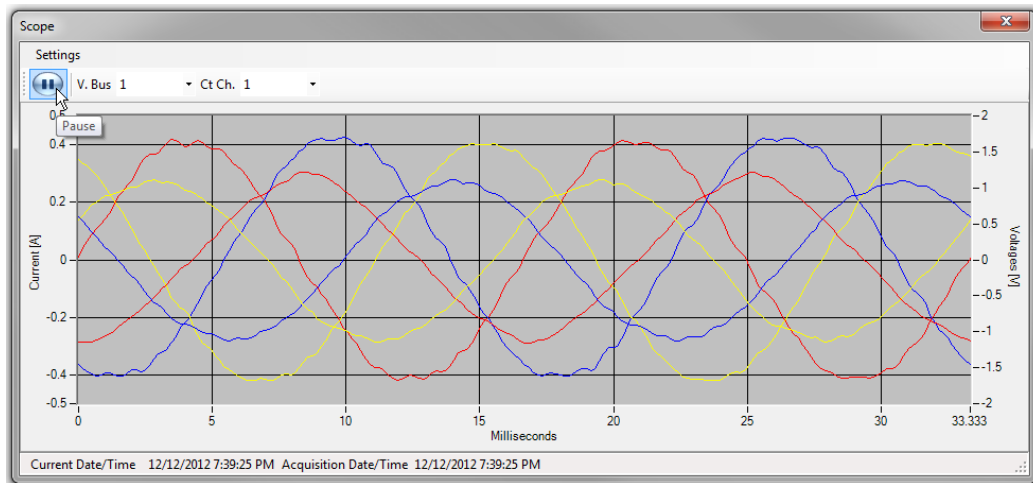
## Scope

The scope provides a live display of the time waveforms. It includes a Settings menu used to select a variety of standard scope display options.
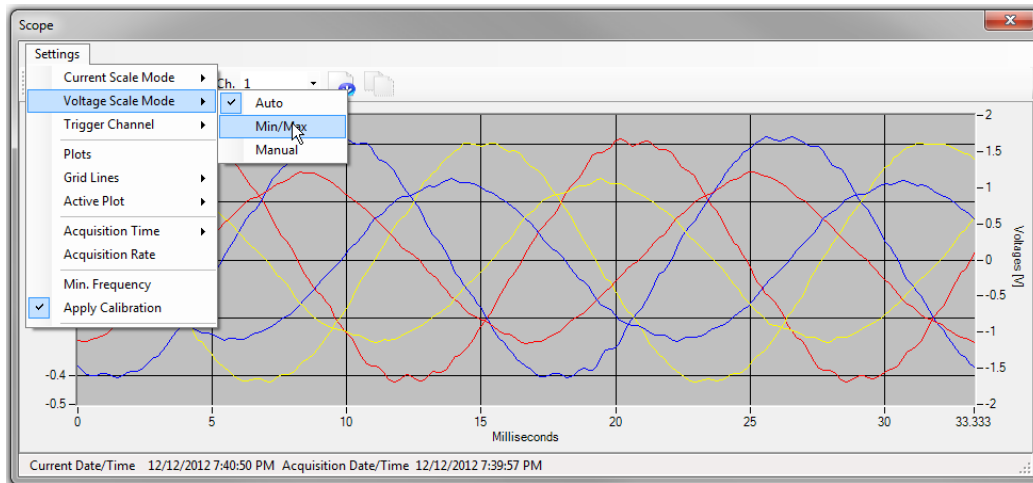


*Fig 60: Scope utility.*

Just below the Settings menu is a Play/Pause toggle button.



*Fig 61: Scope Play/Pause toggle button.*

When you click on the Play/Pause button, you will see new tools appear that you can use to export data or save a screen shot of the displayed information.
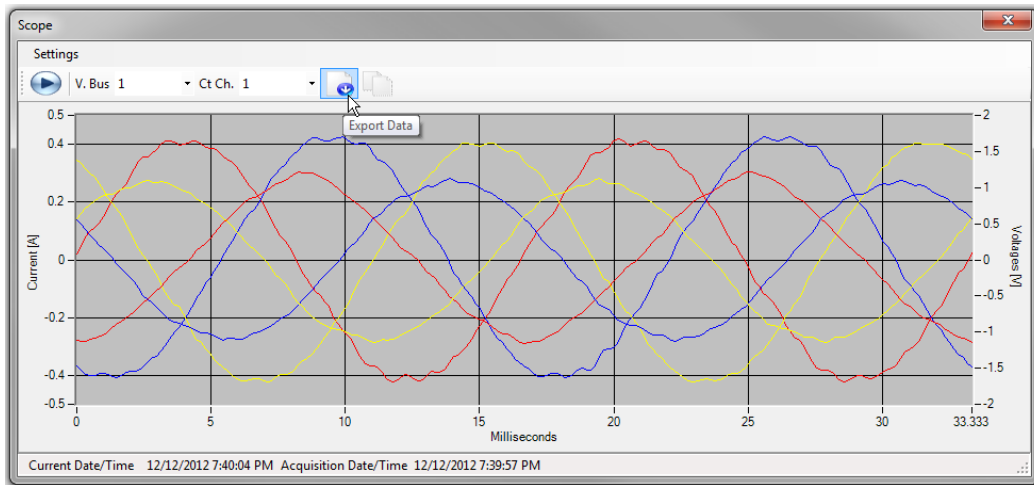


*Fig 62:  Tools to export data and save screen shot.*

## View Connections Utility

The View Connections utility allows you to monitor the same connections and state information that you see during the calibration process, but you cannot make any adjustments here.  The screen is for monitoring purposes only.
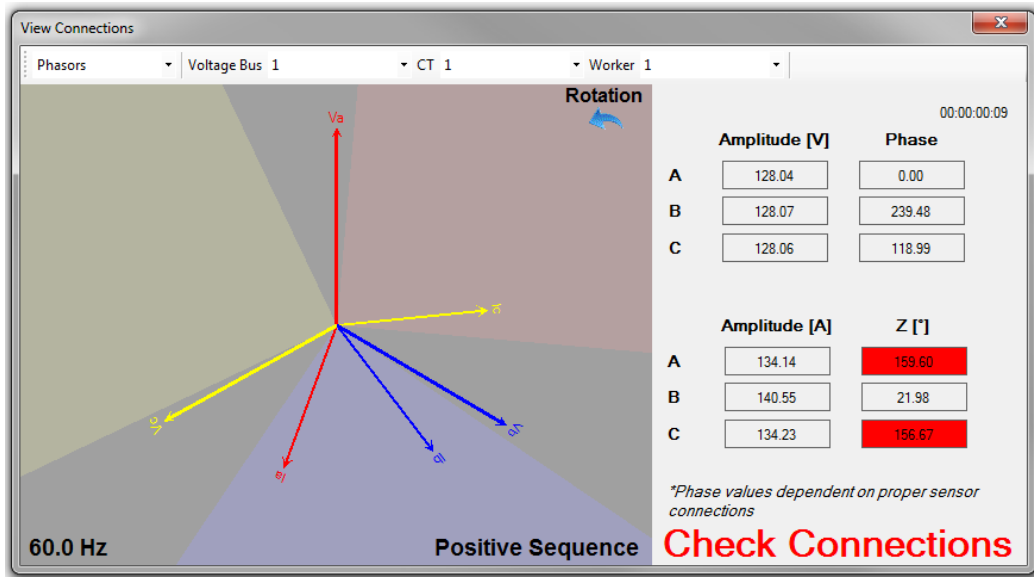


*Fig 63:  View connections utility.*

# Appendix B—Troubleshooting

## Reboot Cycling

If the NetEP Scheduler service (DeviceClientService.exe) keeps noticing fatal problems with the functioning of the actual measuring software (the DeviceClient.exe), it will restart multiple times within a short period of time to try clearing the problem. Failing that, it will then try rebooting the system.

This is a good way to ensure that the device keeps working as well as it can under a wide variety of different potential conditions, but it can be annoying if you are trying to log in to the system and use it.

If you notice that this happens while you need to investigate a problem, read the log files, adjust some settings, and so on, it is best to stop that service first when you login, and then read the log files or do other troubleshooting. After fixing a problem, restart the service before you log out.

The most common cause of this reboot cycling is a networking failure. Other common causes include invalid database connection settings, or the database service itself might be down.

It helps to be able to access the file system on the device remotely (as by CIFS to the C$ shared drive for C:\) in order to copy the relevant log files for off-line perusal, but sometimes you also need to log in (either remotely or at the NetEP itself) to check out the system, Event Viewer, or network settings.

## Using Log Files to Troubleshoot Verification of NetEP Operation

If no data arrives in the database (as viewed from the Surveyor desktop application), or if the NetEP occasionally reboots for unknown reasons, you might want check the log files on the NetEP device itself. The log files are created in the directory "C:\Documents and Settings\All Users\Application Data\SKF\Surveyor\Log" (when the software is installed on a newer operating system, it will be "C:\Program Data\AppData\SKF\Surveyor\Log").

The information in some log files can be dense with details, most of which are there for investigation by support personnel and not likely to be of particular interest. In these files, you can see error or warning messages (in bold) along with routine activity indicating normal behavior. Because the NetEP has software that runs in the background without a user interface, examining these log files is the best way to see what might be wrong when the device appears to be malfunctioning.

Each time an application runs, a new log file is written, eventually overwriting a previously-written log file so as to not use up too much storage space. The file will have a name based on the application's executable name. The most recent log file will have a name without a number (such as DeviceClient.log.htm) and will also exist by a different name with a number in it (such as DeviceClient.log.6.htm). Those numbers will be changed each time a new file is to be written, allowing you to review older log information (up to a limited number). Log files can be "rolled" to new numbers for other reasons besides distinct runs of the program, such as when the file becomes too large or when a boundary between time units (such as days) is crossed.

Two files in particular are likely to be relevant here:

```
C:\Documents and Settings\All Users\Application Data\SKF\Surveyor\Log\DeviceClient.log.htm
```

Information from the actual program (DeviceClient.exe) doing the work of measuring voltages and currents, analyzing the data, and storing it in the database. This is a good place to look to find problems (warnings or exception error messages) issued by the program. Be aware that the device client can also terminate and restart for normal conditions that are not errors. Any time the DeviceClient notices a change in the database to the information that it bases its scheduling and calculations upon, it will terminate with a successful exit code, and then the "Baker NetEP Scheduler" service will automatically and immediately restart it (for example, this is normal behavior when you edit a motor's properties in Surveyor).

```
C:\Documents and Settings\All Users\Application Data\SKF\Surveyor\Log\DeviceClientService.
log.htm
```

Information from the "Baker NetEP Scheduler" service ("DeviceClientService.exe") that runs the separate DeviceClient process

and watches to ensure it continues running and that it is sending data to the database.  The process will forcibly kill the DeviceClient program and restart it if it appears to be stuck or unable to do its job for some reason.  The service will also restart the DeviceClient program if it terminates for any reason (but if it exits with a successful exit code, this is not counted as a problem).

The service will connect to the database using the same connection settings as the DeviceClient, and verify that jobs are running and that measurements are being written.  If the database cannot be reached, you will see error messages about that in this log file.

The service counts how often any such problems occur, and if problems persist and become too numerous over a short period of time, then the service can also reboot the system as a last resort to clear up whatever might be wrong.  If you see that the system is rebooting, you will want to stop the service first, before trying to look at log files so that it does not reboot while you are logged on and trying to investigate the problem).  All such activities, along with periodic statistical metrics, will be written to this log file.

## Using Event Viewer Log Files

Beyond the NetEP's program-specific log files, it is often very revealing to investigate the system's Event Viewer log files.  They can reveal such issues as intermittent network connections (through notices about an interface being disconnected and reconnected, and so on), as well as other system-level problems that cannot be diagnosed by the NetEP software itself.

Accessing the Event Viewer log files varies depending on your operating system.  For example you can right click on the Start button then Event Viewer on some systems, or right click on the My Computer icon on the desktop then Manage to open a Computer Management window where the Event Viewer can be accessed.  Refer to the user help for your operating system for specific instructions as needed.

## Specifications

## Environmental Conditions

1. The NetEP is designed strictly for indoor use.  Testing of this unit has been completed for use up to 2000 meters of altitude.
2. This monitoring device operates in temperatures ranging from 32–120 degrees Fahrenheit (0°–48° C).
3. Installation for this instrument is an IEC Category III in a Pollution Degree II environment (refer to IEC 61010-1 3.6.6.2).
4. This instrument is NOT waterproof or sealed against water entry with the cabinet door open OR closed.
5. This system NOT approved for use in explosive environments.  Do not use or install this instrument in explosive environments. This instrument is NOT approved for use in any flammable or hazardous environments.

### Pollution Degree II

This device adheres to Pollution Degree II specifications sourced from IEC 61010-1 3.6.6.2.  Only non-conductive pollution occurs with this instrument.  However, temporary conductivity caused by condensation can be expected.

# Index

### A

# Megger.

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**This instrument is manufactured in the United Kingdom.**

**The company reserves the right to change the specification or design without prior notice.**

**Megger is a registered trademark.**

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