



# 489 Generator Management Relay FAQ

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## **1. I have a two-wire transducer. Can I connect it to the 489 Digital Inputs?**

Yes. Connect the +24 V DC of the 489 to the positive terminal of the transducer. Connect the negative terminal of the transducer to Analog Input 1+, 2+, 3+, or 4+. Do not connect anything to the Analog Input COM– terminal.

## **2. What is the difference between Firmware and Software?**

Firmware is the program running inside the relay, which is responsible for all relay protection and control elements. Software is the program running on the PC, which is used to communicate with the relay and provide relay control remotely in a user friendly format.

## **3. The 489 indicates the generator is running at unity power factor, yet the 489 phasor readings indicate a 30° phase shift in voltage and current. Why?**

If the relay is connected in an open-delta configuration, the phasor indicates a 30° phase difference in voltage and current. This is because the  $V_a$  phasor is actually measuring  $V_{ab}$  in an open delta configuration, thus 30° shifted from  $I_a$ . In Wye configuration, the voltage and the current phasors should be in-line with each other at unity power factor.

## **4. What causes these 489PC problems: General Protection Faults (GPFs), system lockup, popup window missing?**

Older versions of 489PC (version 0.5 or lower) require a system file named `threed.vbx`. When 489PC is installed, this file is placed in the `\GEPM\489pc` directory. Copy this file into the `\windows` or `\windows\system` directory. If an older version of `threed.vbx` is present in the `\windows` or `\windows\system` directory, then backup this copy (e.g. save as `threed.bak`) and copy the current one provided. Restart Windows for these changes to take full effect.

**5. Are the 489 Digital Inputs dry or wet contact inputs?**

The Digital Inputs on the 489 are DRY contacts only. Do not apply live voltage to these inputs under any circumstances. Live voltage will permanently damage the inputs!

**6. How can I obtain copies of the latest manual and PC software?**

- I need it now!: Visit the GE Multilin website at <http://www.GEindustrial.com/multilin>.
- I guess I can wait: Fax a documentation request to the GE Multilin Literature department at (905) 201-2113.

**7. What protection elements are compromised when neutral end CTs are not present?**

The following protection elements rely on neutral end current inputs.

- Distance Element
- Off Line Overcurrent
- Phase Differential

**8. I cannot communicate through the front port (RS232).**

Check the following settings:

- Communication Port (COM1, COM2, COM3 etc.).
- Parity settings must match between the relay and the master (PC or PLC).
- Baud rate setting on the master (PC or PLC) must be 9600.

Check the following hardware connections:

- The communications cable must be a straight through cable – do not use null modem cables where pins 2 and 3 are transposed.
- Check the pinouts of RS232 cable (TX: Pin 2; RX: Pin 3; Ground: Pin 5).
- Check the RS232 LED. The LED should be solidly lit when communicating properly. The LED blinks on and off when the relay has communication difficulties.

**9. I cannot communicate with RS485.**

Check the following settings:

- Communication Port (COM1, COM2, COM3 etc.).
- Parity settings must match between the relay and the master (PC or PLC).
- Baud rate must match between the relay and the master.
- Slave address polled must match between the relay and the master.

Check the following hardware connections:

- Ensure that the terminating filter circuit is present.

- Ensure you are communicating in half-duplex mode. The 489 Generator Management Relay communicates in half-duplex mode only.
- Ensure that the wiring is correct; that is, double-check that the "+" wire is attached to the "+" terminal of the relay and that the "-" wire is attached to the "-" terminal.
- Ensure that the RS485 cable shield is grounded. Shielding diminishes noise from external EM radiation.
- Check the RS485 LED. The LED should be solidly lit when communicating properly. The LED will blink on and off when the relay has communication difficulties

**10. Can 4-wire RS485 (full-duplex) be used with 489?**

No, the 489 communicates in 2-wire half duplex mode only. However, there are commercial RS485 converters that will convert 4-wire RS485 to 2-wire RS485.

**11. How does the 489 calculate power?**

All power quantities are calculated from the average phase-to-phase voltages and currents measured at the output CTs. Generation of power is displayed in positive Watts. By convention, an induction generator normally requires reactive power from the system for excitation. This is displayed as negative Vars. A synchronous generator has its own source of excitation and can be operated with either lagging or leading power factor. This is displayed as positive Vars and negative Vars, respectively.

**12. I am testing the Undervoltage element and it will not trip.**

The Undervoltage element will only operate when the generator is online. Ensure that the breaker is closed (the front faceplate LEDs indicate this) and the average phase current is greater than 7.5% of CT.

**13. I have forgotten my passcode for the 489. Can I override the passcode?**

No. The passcode cannot be overwritten. You can send the encrypted passcode to GE Multilin via e-mail at [info.pm@indsys.ge.com](mailto:info.pm@indsys.ge.com) or call the technical support center at 905.294.6222 (toll free: 800.547.8629) to obtain the original passcode. To determine the encrypted passcode, go to the **SETPOINTS** ⇒ **S1 489 SETUP** ⇒ **PASSCODE** ⇒ **ENTER PASSCODE FOR ACCESS** message and press the HELP key.

**14. My ground current readings are not correct. Why?**

The 489 measures up to 5 A secondary current if the 1 A / 5 A tap is used. Since the conversion range is relatively small, the 1 A or 5 A option is field-programmable. Proper selection of the **SETPOINTS** ⇒ **S2 SYSTEM SETUP** ⇒ **CURRENT SENSING** ⇒ **GROUND CT** setpoint ensures a proper reading of the primary ground current. The selected 1 A / 5 A Ground CT must be capable of driving the 489 Ground CT burden (see the Specifications section of the manual for burden ratings). The 489 measures up to 25 A of primary ground current if this tap is used in conjunction with the GE Multilin core-balance CT.

The zero-sequence connection is recommended. Unequal saturation of CTs, size and location of the generator, the resistance of the power system, and the generator core saturation density are some factors which may cause false readings in the residually connected GF circuit.

Only one ground input should be wired – the other input should be left unconnected.

Ensure that the 1 A / 5 A Ground CT has not been wired into the 50:0.025 CT input of the 489, or vice-versa. This will cause the 489 to read incorrect ground currents and may potentially damage the inputs.

**15. What is the purpose of the Voltage Restraint feature of the Phase Over-current element?**

The voltage restraint feature lowers the pickup value of each individual Phase Time Overcurrent element in a fixed relationship with the corresponding input voltage, to a minimum pickup of 0.15 x CT. Refer to Section 4.6.5 of the 489 Instruction Manual for additional information.

**16. What protection elements are compromised when neutral-end CTs are not present?**

The following protection elements rely on neutral-end current inputs:

- Distance
- Off-Line Overcurrent
- Phase Differential

**17. Which Modbus functions are supported by the 489?**

The following Modbus functions are supported by the 489:

- Function Code 03: Read Setpoints and Actual Values
- Function Code 04: Read Setpoints and Actual Values
- Function Code 05: Execute Operation
- Function Code 06: Store Single Setpoint
- Function Code 07: Read Device Status
- Function Code 08: Loopback Test
- Function Code 16: Store Multiple Setpoints

Refer to Section 6.3 of the 489 Instruction Manual for additional information.

**18. Why does the wiring diagram in the 489 manual show the neutral and phase CTs in opposite polarities?**

This configuration is required by the 489 Phase Differential element. The differential current is derived from the vector sum of the neutral and output currents. As such, the neutral current injected into the 489 must be 180° out-of-phase from the output current, so that under normal conditions, the two currents will sum to zero.