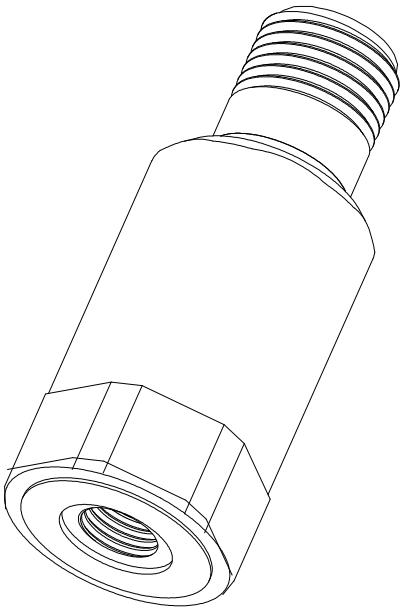
GE
Energy
Operating Guide



177230 Series Industrial Transmitter, with Dynamic Signal Sensor

imagination at work

Part Number 37543
Rev. C December 2007

Contact Information

The following contact information is provided for those times when you cannot contact your local representative:

Mailing Address	1631 Bently Parkway South Minden, Nevada USA 89423 USA
Telephone	1.775.782.3611 1.800.227.5514
Fax	1.775.215.2873
Internet	http://www.ge-energy.com/oc

Additional Information

Seismic Transmitter Datasheet (Part Number 177232-01)
Seismic Transmitter Approval Drawing (Doc 177234)

Product Disposal Statement

Customers and third parties, who are not member states of the European Union, who are in control of the product at the end of its life or at the end of its use, are solely responsible for the proper disposal of the product. No person, firm, corporation, association or agency that is in control of product shall dispose of it in a manner that is in violation of any applicable federal, state, local or international law. GE Energy is not responsible for the disposal of the product at the end of its life or at the end of its use.

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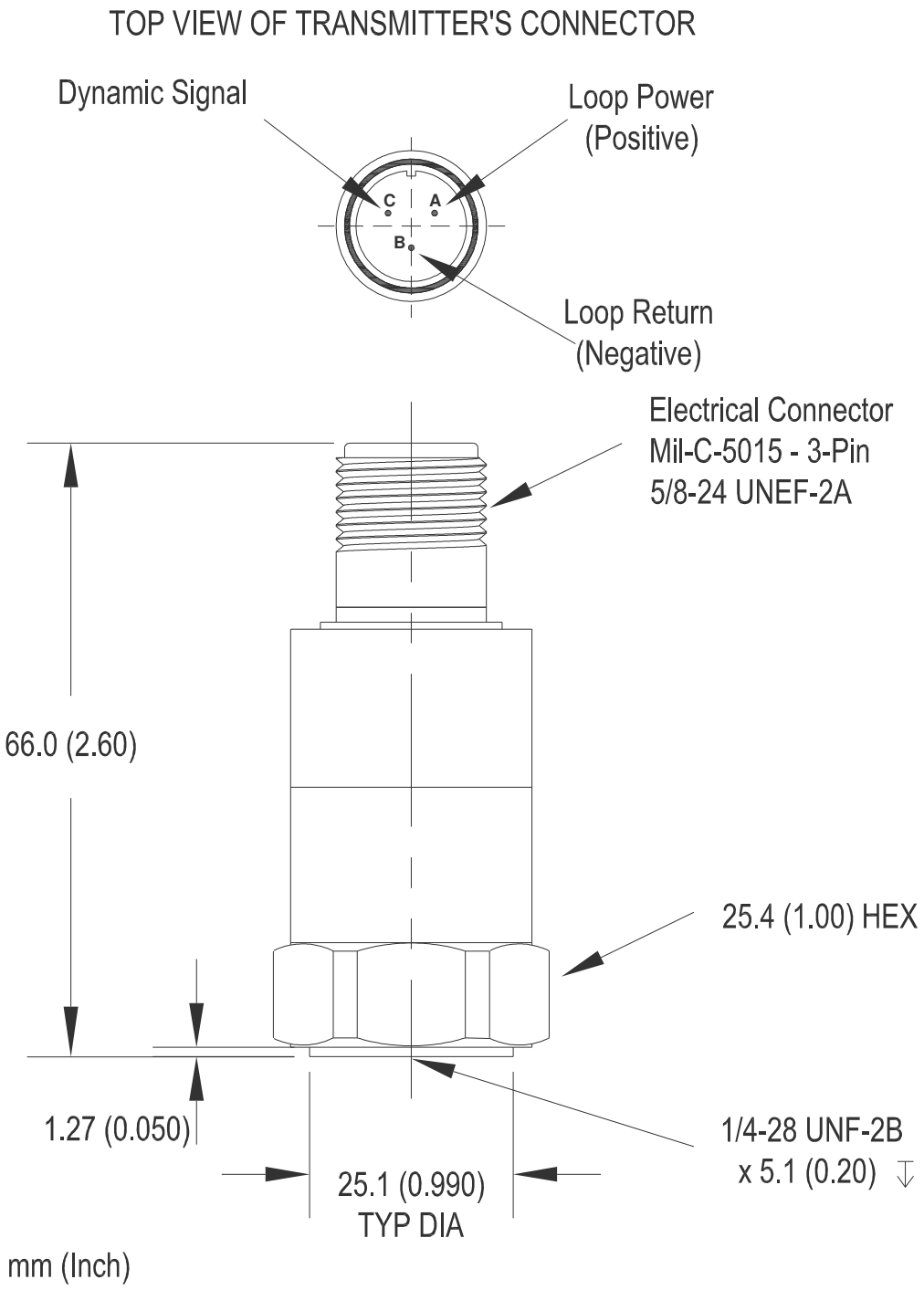
Introduction

The Model 177230 Series Industrial 4-20 mA with Dynamic Signal Output Sensor combines the capabilities of a piezoelectric vibration sensor and a 4-20 mA vibration transmitter. The sensor outputs a 4-20 mA signal that is proportional to the overall velocity of the machinery. Ideal for monitoring the vibration of process equipment such as fans, motors and pumps, the output of the sensor is used for process control or predictive maintenance.

General Features

- Embedded Piezoelectric Accelerometer for improved accuracy and frequency response.
- Primary vibration in Velocity with units of RMS.
- Dynamic vibration in Acceleration for conducting frequency analysis and machinery diagnostics.
- Allows for continuous vibration monitoring of essential and auxiliary assets.
- Reduces need for sophisticated vibration data collection programs.
- Readily interfaces to existing process control and predictive maintenance equipment.
- Rugged stainless steel construction for applications in harsh environments.
- Flexible design allows for various custom requirements.

Dimension Drawing

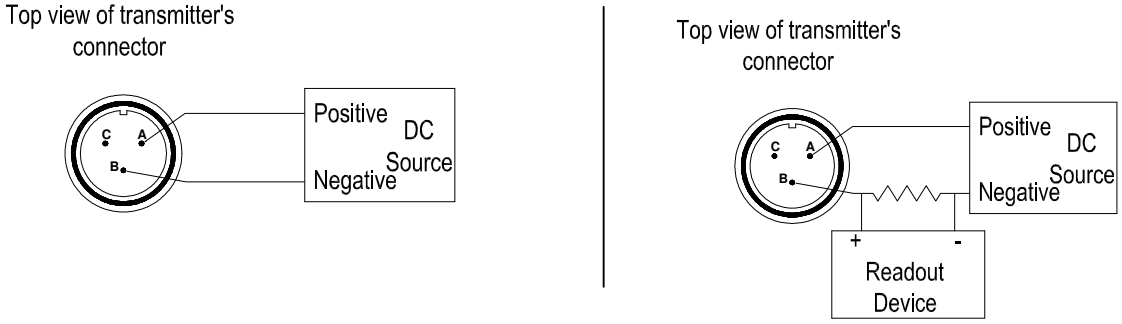


Operation and Wiring

Standard Wiring for 4 to 20 mA Loop

The Model 177230 Series operates from a standard 2-wire, 4-20mA loop. If using a loop powered unit, attach the positive (+) input from the power supply to Pin A and the negative (-) input from the power supply to Pin B of the sensor. The use of Pin C will be described later.

Figure 1 – wiring: loop powered Figure 2 – wiring: loop powered/DC source



If using a standard DC power supply (with a current limit of 40 mA), install either an ammeter and/or load resistor in line with the output, Pin B.

The resistor will generate a DC voltage that is proportional to current by:

$$V = IR$$

$$If\ R = 500\ ohms\ and\ I = 6\ mA, then\ V = 3\ VDC$$

Note:

- Resistor value must be less than: (Vsupply – 12) x 50.

Taking Measurements

When measuring the current output from the unit, use the following formula to calculate the vibration level:

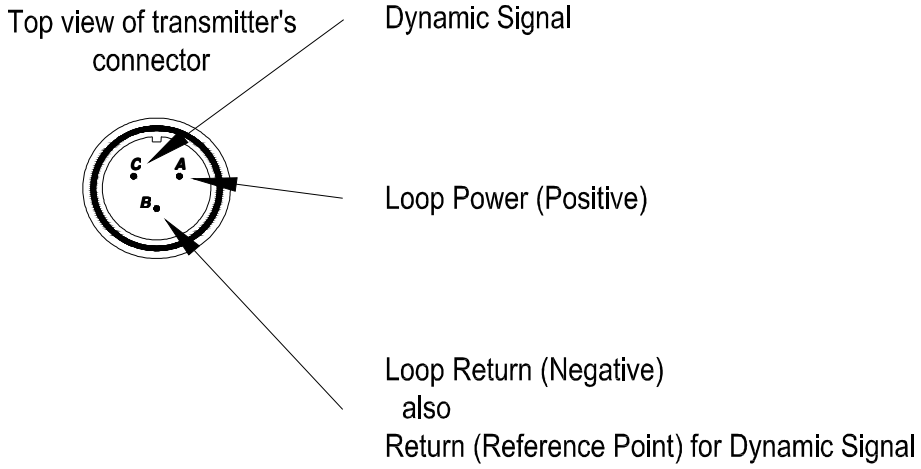
Vibration Output = (Measured Output – 4mA) x (Full Scale Vibration Output /16mA)

4 to 20 Loop Output (mA)	Actual
4.00	0.0 ips, rms
8.00	0.25 ips, rms
12.00	0.5 ips, rms
15.75	0.73 ips, rms
20.00	1.0 ips, rms

Dynamic Signal Output

The Dynamic Signal Output has a scale factor of 100 mV/g ±20% and is the secondary output signal. The accelerometer frequency range is 1 Hz-10 kHz, maximum amplitude of 20 g-pk with a bias point of 2.5 volts. Data collectors or analyzers can use this vibration signal for more in-depth analysis.

Figure 3 – Wiring point



The Dynamic Signal Output (Pin C) is relative to the loop power return line (Pin B). When the 4 to 20 mA is typically connected, the voltage level at loop return line will be at some point above ground. So taking Pin B and connecting it to a grounded input terminal will short out the 4 to 20 mA signal. During installation please follow the directions in Critical Issues list below and installation details in the following section to get the best results.

Critical Issues (with regards to the use of the Dynamic Signal Output):

Special details regarding the use of the dynamic signal without affecting the 4 to 20 mA loop signal is described here. The dynamic signal gets its power from the 4 to 20 mA loop power. The output signal is unbuffered and requires the following details are followed for the 4 to 20 mA to indicate the correct value.

- Input Impedance: (the equipment the dynamic signal is connected to):
    - Needs to be above 1 M ohms (10^6 ohms) [See the detail information in the "Loading Effects" section below].
    - The Dynamic Signal Negative (Pin B) must be isolated from ground. If this terminal is grounded, the 4-20 mA loop will short to ground.

  CAUTION - Attaching any AC-powered equipment with a different ground to two-wire transmitters can affect the loop signal, causing possible missed or false trips.

  NOTE – We recommend using the 990 test adapter, available from GE Energy, when measuring the dynamic output from the transmitter. The dynamic signal is not isolated from the 4 – 20 mA signal/power loop. This can cause a potential ground loop when attaching any AC-powered diagnostic equipment, which can affect the loop signal resulting in a possible missed or false trip.

NOTE – The power supplied by the 4 – 20 mA loop is not enough to drive the dynamic signal over long cable lengths. The 990 test adapter allows the dynamic signal to be driven over cables up to 305 meters (1000 feet) from the 990 test adapter to the diagnostic equipment.

NOTE – The 990 test adapter switches the phase 180º, changing it to a negative bias in line with out conventional monitoring systems. This is done to ensure any dynamic plot involving two vibration channels are in phase, for instance when looking at Orbits. This isn't normally done on case mounted seismic signals. If continuous dynamic data is necessary then Trendmaster DSM, 1900/65, 3700, 3500 or 3300 monitoring systems should be used with standard transducer systems.

Loading Effects:

This goes against industry standard, best practices and we strongly recommend against connecting the dynamic signal to equipment with input impedance below 1 M ohms. The acceleration output signal is ideally suited for use with portable, battery powered data collectors or analyzers (with isolated front ends).

- When the dynamic signal is connected to equipment that has less than 1M ohm input impedance the following error can be expected.

Input Impedance	Error in 4 to 20 mA
1M ohms	0.0%
100k ohms	0.3%
50k ohms	1.0%
20k ohms	2.5%
10k ohms	5.0%

- When the input impedance falls below 10 k ohms, the 4 to 20 mA will becomes erratic.

Installation

Since the frequency response of the 177230 dynamic signal goes to 10 kHz, the stub mount method is the most preferred manner of installation.

Complete Cable Assemblies

*We offer complete cable assemblies that can be ordered to custom lengths between 12 and 99 feet. These cable assemblies provide the connector and strain-relief installed on 22 AWG gauge cable. Option **AA** of the part number describes the length of the cable in feet.*

Interconnect Cable without Armor

16925-AA

Option Description

AA: Length in feet (order in increments of 1 foot (0.3 m))

Minimum length: 12 Feet (3.7 m)
Maximum length: 99 Feet (30.2m)

Interconnect Cable with Armor

16710-AA

Option Description

AA: Length in feet (order in increments of 1 foot (0.3 m))

Minimum length: 12 Feet (3.7 m)
Maximum length: 99 Feet (30.2m)

Generic Listing of Accessories and Support Hardware

Accessories (generic vendors are called out in this section) and the parts list below are possible vendor sources for the supporting hardware. The customer can use this information as reference to purchase these parts from a vendor or their choice.

Connectors and shells:

Generic Description:

3–pin connector receptacle MIL-C-5015

Vendors:

Cannon (ITT industries)
www.ittcannon.com

Sunbank Co.
www.sunbankcorp.com

Glenair, Inc.
www.glenair.com

Possible part numbers (for reference only):

CA3106R-10SL-3S F97 or MS3106R-10SL-3S

Wire:

Generic Description:

3 conductor cable – 18 to 22 AWG cables with a minimum of a 0.01" thick outer jacket and inner wire, and shield with a minimum of 80% coverage. Insulation should be rated for a minimum of 600v.

Mil-W-16878/4 (Type E)

Vendors:

Sonic/Thermax
www.thermaxcdt.com

Standard Wire and Cable Co.
www.std-wire.com

Belden
www.belden.com

Possible part numbers (for reference only):

18 AWG

- P/N: 18-TE-1930 (3) SXE (Sonic/Thermax)
- P/N: 1100-88T (Standard Wire and Cable)
- P/N: 83336 (Belden)

22 AWG

- P/N: 22-TE-1934 (3) SXE (Sonic/Thermax)
- P/N: 1100-66T (Standard Wire and Cable)
- P/N: 83334 (Belden)

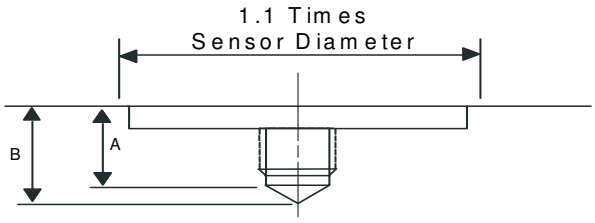
Standard Stud Mount Procedure

This mounting technique requires smooth, flat contact surfaces for proper operation and is recommended for permanent and/or secure installations. Stud mounting is also recommended when testing at high frequencies.

Note: DO NOT attempt mounting on curved, rough, uneven, or dirty surfaces, as the potential for misalignment and limited contact surface may significantly reduce the sensor's upper operating frequency range.

Figure 4 – mounting surface preparation

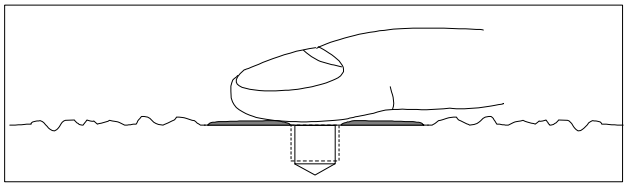
	M6x1 Stud	***1/4-28 Stud***
A (mm / in)	*6.35*	*0.250*
B (mm / in)	*8.89*	*0.350*
Torque (N-m / ft-lb)	*4 to 7*	*3 to 5*



STEP 1 First, prepare a smooth, flat mounting surface, and then drill and tap a mounting hole in the center of this area as shown in Figure 4. A precision-machined mounting surface with a minimum finish of 0.00016 mm [63 µin] is recommended. Inspect the area, checking that there are no burrs or other foreign particles interfering with the contact surface.

STEP 2 Wipe clean the mounting surface and spread on a light film of grease, oil or similar coupling fluid prior to installation.

Figure 5 – mounting surface lubrication



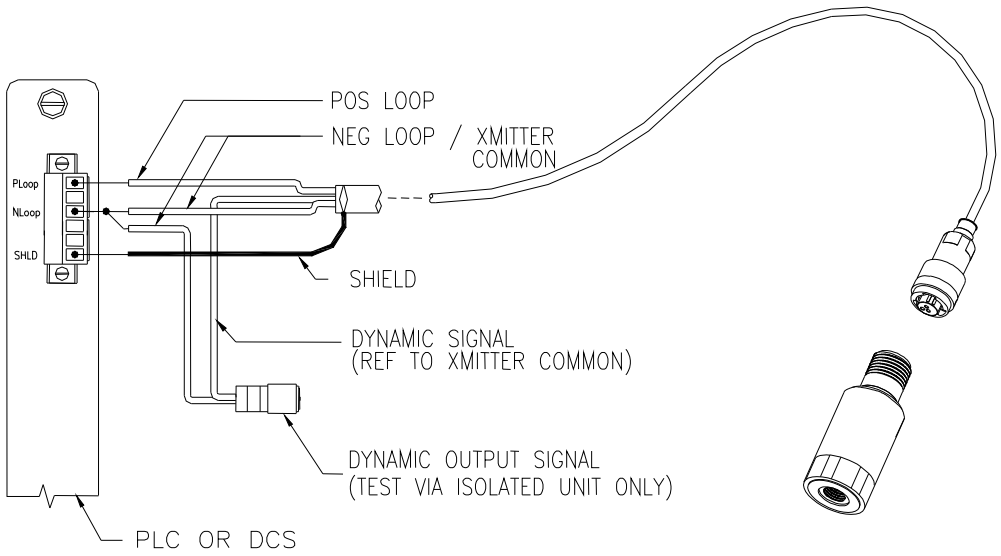
Adding a coupling fluid improves vibration transmissibility by filling small voids in the mounting surface and increasing the mounting stiffness. For semi-permanent mounting, substitute epoxy or another type of adhesive.

STEP 3 HAND-tighten the sensor/mounting stud to the machine, then secure the sensor with a torque wrench to the mounting surface by applying the recommended mounting torque (see specification for proper mounting torque). It is important to use a torque wrench during this step. An under-torque condition may not adequately couple the sensor to the asset; an over-torque condition may result in stud failure and possibly permanent damage.

Typical Wiring Hookup

Figure 6 is a possible wiring hook-up to use both the 4 to 20 mA control loop and Dynamic Signal Output. The 4 to 20 mA is connected to the PLC or control system, and the dynamic signal is available for connection to a portable data collector or diagnostics instrument. The DCS & diagnostics instruments typically do not share a common ground and the diagnostic instrument should be floating or isolated form the DCS ground.

Figure 6 – typical wiring hookup



Improving the Moisture Barrier

The seismic transmitter is hermetically sealed and therefore unaffected by moisture. The connector interface can possibly leak leading to corrosion so we recommend the use of Dow Corning, or similar, electrical grease to prevent moisture from corroding the connector. Working with this material may be messy and care must be taken when using it. Additionally, the environment that this product is being installed in may not allow the use of this product. Verify this material is approved prior to the use of this grease. The grease can be placed in the transmitter connector and when the mating connector is installed the void is filled with the grease. When the two parts are put together some grease may seep out. This indicates that the connector has enough grease filling the void. Wipe off any excess grease.

Grounding the Shield

The cable has a shield that needs to be grounded correctly. The cable's shield should never be grounded on both ends at the same time. This will induce noise into the system. The typical configuration is to ground the shield at the rear of the host equipment (like: the PLC, control system that connects to the transmitter). This is our best practice, but there is another configuration that might be a better fit for

your installation. If the installation site has a potential for lighting strikes, which would most likely damage the seismic transmitter in either configuration, the better choice is to ground the shield at the transmitter. The lighting is routed away from the PLC and control system, saving the more expensive equipment. This is not to guarantee that no damage will occur, but will improve the chances of the equipment surviving a lightning strike.

Warning 1 – Shock Hazard

The seismic transmitter should not be installed or maintained by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

Warning 2 – ESD sensitivity

This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.

Warning 3 – Installation Shock

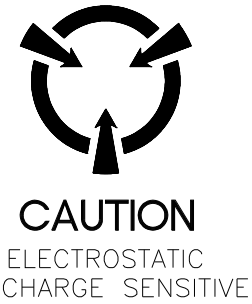
Typically this part is permanently mounted directly to the machine via a mounting adapter. This device can be used with a mag-base, but care must be taken to ensure that the unit is not “snapped” on to the machine. This snapping action can create a very large shock impulse that can damage the internal components. Rolling the mag-base onto the machine greatly reduces this destructive impulse and should not result in any damage to the device.

CAUTION – Dropping the transmitter or “snapping” in place when using with a magnetic mount can cause damage to the device.

Caution 1 – ESD sensitivity

Cables can kill your equipment. High voltage electrostatic discharge (ESD) can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- *Laying on and moving across a rug,*
- *Any movement through air,*
- *The action of rolling out a cable, and/or*
- *Contact with a non-grounded person.*



Best practices:

- *Connect the cables only with the AC power off.*
- *Temporarily "short" the end of the cable before attaching it to any signal input or output.*

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should only be done at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

Caution 2 – Power Source should be Current Limited

PLCs and control systems (DCS and SCADA systems) typically have built-in power supplies that are current limited in the range of 30 mA to 35 mA. The pins of the seismic transmitter have limited protection to ensure that the units are not damaged during hook-up and installation. The power supply should be current limited to less than 40 mA. The main concern is to avoid connecting power or ground to the Dynamic Signal Output (Pin C).

Warranty

The product is warranted against defective material and workmanship during the warranty period; unless expressly specified otherwise. Damage to instruments caused by incorrect installation, wiring, or misapplication, is not covered under this warranty. *If there are any questions regarding power, intended application, or general usage, please contact your local GE Energy sales office.* Batteries and other expendable hardware items are not covered by this warranty.

Service

Because of the sophisticated nature of the instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the "Return Procedure" stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge within the warranty period.* Before returning the unit, please consult our technical support group concerning the situation as certain problems can often be corrected with simple on-site procedures.

Contact our Technical Support Staff at +1 775 215-1818 or
Toll-free in US +1 800 488-1915
Fax +1 775 215-2890
Or e-mail us at techsupport@ge.com

Return procedure

To expedite returned parts, contact GE Energy product repair for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have product information available such as part number, model and serial number. Also, to ensure efficient service, *send a written description of the symptoms and problems with the equipment returned to GE Energy.*

Customer Service

This product is guaranteed for **Total Customer Satisfaction**. If, at any time, for any reason, you are not completely satisfied with the product, the company will repair, replace, or exchange it at no charge as long as the product is still under the warranty period.

Customer service is very important to us and so we offer to all customers Technical Support and Product Repair Services. These services make product or application support available to our customers, day or night, seven days a week.