# SERVICE BULLETIN

Original Issue Date: **4/04**
Model: **20–2800 kW Generator Sets with the 550 Controller**
Market: **Industrial**
Subject: **Warranty Claims Involving Controller Circuit Board Failures on Units Using RS-232 Communications**

The generator set manufacturer has received reports of 550 controller failures using the RS-232 communication port in some types of installations. The incidents reported occurred where the generator set is installed outdoors and the RS-232 connects to a remote communication device, such as a PC. The controller failure may be linked to areas experiencing frequent lightning strikes.

If controller circuit board replacement is needed, verify if the unit has some type of external communication using the RS-232 port. If RS-232 communication is used, verify physical damage to circuit board components, particularly integrated circuits U28, U55, and U58. See Figure 1.

If circuit board damage to the integrated circuit is present, the failure was likely caused by some type of electrical voltage surge such as a lightning strike. The distributor should inform the customer that voltage surges caused by lightning strikes are NOT covered under the generator set warranty.

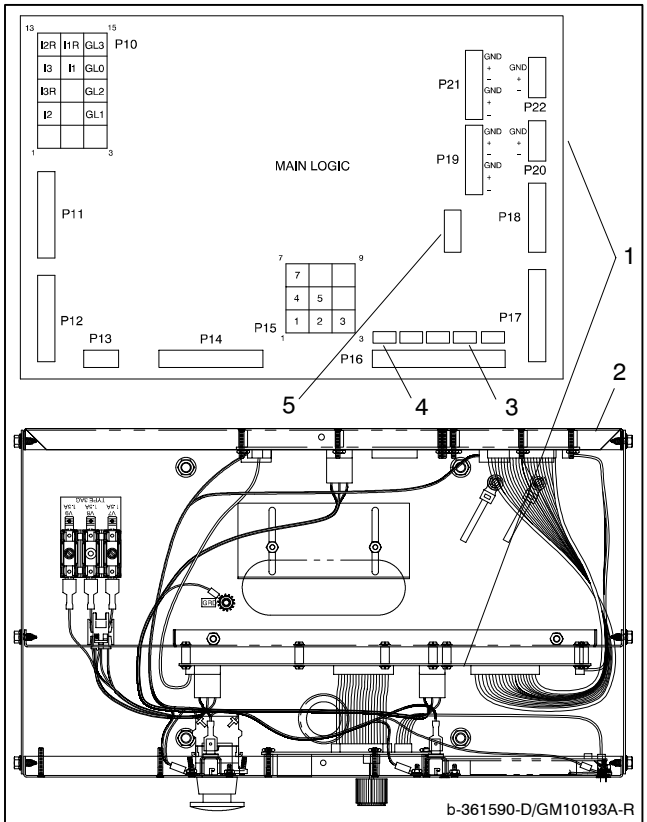
The generator set manufacturer has developed an RS-232 isolation kit **(part number GM32967-KP)** to help reduce the likelihood of voltage surge damage. The kit contains optical isolator GM32968 and a 152 mm (6 in.) connection cable GM32969. Install the isolation kit if the RS-232 port is used in conjunction with a remote communication device.

Distributors encountering installations using RS-232 communications should make the customer aware of the reports stated in this bulletin and recommend installation of the RS-232 isolation kit GM32967-KP. This kit when installed will reduce the likelihood of controller circuit board failure caused by voltage surges.

Follow the recommendations in Noise and Wiring Practices. A copy is shown on page 2.

**Generator Set Warranty Provisions**

Controller failure due to the conditions stated in this bulletin is NOT a defect in material or workmanship and should NOT be submitted for reimbursement under the Generator Set Warranty Policy. The RS-232 isolation kit and installation costs are the responsibility of the equipment owner for protection of their equipment.




1. Main logic (microprocessor)/communication) circuit board
2. Controller top view
3. U58 integrated circuit
4. U55 integrated circuit
5. U28 integrated circuit

**Figure 1** Main Circuit Board

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Electrical noise is an unwanted electrical signal that can cause errors in measurement, loss of control, malfunctions in microprocessor-based control systems, errors in data transfer between systems over communication links, or reductions in system performance.

Good system design and wiring practices can minimize noise levels and the effects of noise.

Noise, because of its random nature, is typically characterized by frequency distribution. Many noise sources are broad-spectrum, that is, they produce many frequencies distributed over a wide range. Broad-spectrum noise is particularly troublesome because it cannot be removed easily by filtering, and because it can affect a variety of systems in unpredictable ways. One common source of broad-spectrum noise is a switch, which can produce voltage and current changes when an electrical circuit is connected and disconnected.

Coupling is the transfer of signals between separate circuits. Signals from one circuit become noise in another. The amount of coupling is cumulative and is a function of the proximity of the circuits, their orientation, exposed area, and length of run. Minimize coupling by the following:

- Isolating circuits from each other by using separate raceways or conduit
- Separating circuits from each other by locating them as far apart as possible
- Enclosing circuits with a grounded metallic shield such as an enclosure, metallic conduit, or cable shield
- Running conductors perpendicular, rather than parallel, to each other
- Running wires loosely and randomly rather than bundling them tightly together
- Twisting a circuit's wires together in pairs

In an industrial environment, there are typically five types of circuits with different noise emission and rejection capabilities. The five types of circuits are as follows:

- **High-Power Distribution.** Circuits to high-power loads such as large electric motors and heaters can emit transient high levels of broad-spectrum noise. Loads on high-power distribution circuits are nearly immune to noise.
- **General Purpose Power Distribution.** Circuits to medium-power loads such as lighting, offices, light-duty equipment, and small motors such as fans and pumps can emit transient, medium levels of broad-spectrum noise. Some electronic equipment, such as computers, emits constant levels of broad-spectrum noise in addition to transient broad-spectrum noise. Loads on general-purpose circuits, except for sensitive electronic equipment, are nearly immune to noise.
- **Control.** Control circuits include DC circuits and 120 VAC maximum AC circuits that operate at a low power level (less than 1 W). Typical circuits include circuits to switches, actuators, and dry-contact relays, including the generator engine-start circuit. Control circuits emit transient low levels of broad-spectrum noise and are fairly immune to noise.
- **Analog.** Analog circuits are low-voltage DC circuits that convey measurement information as relatively small changes in current or voltage. Typical circuits include those connected to the controller's analog inputs. Analog circuits create the lowest noise levels and are the most sensitive to noise.
- **Communication and Signaling.** Communication and signaling circuits are low-voltage circuits that convey information. Typical circuits include RS-232 and RS-485 serial communication lines, telephone lines, and computer network lines. These circuits create noise with frequencies related to the communication signaling rate. These circuits have some level of built-in noise immunity. Typical systems will detect or correct errors caused by noise below certain levels, but with a corresponding reduction in the data transfer rate.

When planning an installation, separate all of these types of circuits as much as possible to minimize the hazards of insulation failure, accidental miswiring, and noise coupling. For best results, install control circuits, analog circuits, and communication and signaling circuits separately. Combining circuit types is unavoidable in the controller's enclosure and some other areas.

**Note:** It is very important to isolate high- and medium-power circuits in raceways or conduit separate from the other types of circuits.