GAI-TRONICS®
A HUBBELL COMPANY

Speaker/Horn Installation for GAI-Tronics Communication Systems

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General Information

Correct mounting and orientation of speakers are critical to the performance of GAI-Tronics communication systems. Paging speakers used in these systems fall into one of three categories:

- Horns supplied with separate drivers and separate, optional mounting assemblies (for the most accurate orientation)
- Horns with internal drivers and optional mounting assemblies
- Cone speaker assemblies for wall or ceiling mounting

Speaker Mounting and Wiring

Correct speaker location and orientation are crucial to ensure comprehensive sound distribution in operating areas. The following are some guidelines:

1. Mount horn-type speakers approximately 8 to 10 feet (2.5 to 3 meters) above the floor and fasten to a suitable support structure.

2. Do not position speakers so that they are facing each other unless they are more than 50 feet apart.

3. Orient the speaker so that a person standing in the center of the coverage area can sight directly along its axis of projection. Adjust the orientation of horn-type speakers installed with GAI-Tronics speaker mounting assemblies vertically and horizontally after the entire assembly is permanently mounted and wired. Adjust the vertical orientation using the two locking nuts on the U-bracket of the speaker. Adjust the horizontal orientation using the locknut on the pipe nipple assembly supporting the mounting bracket adapter.

4. If two speakers are connected to GAI-Tronics SmartSeries and ICS SmartSeries stations, the speakers should be located in areas with the same ambient noise level.

5. Adjust the speaker output to be 6 to 10 dB louder than the surrounding noise level. It is critical that the speaker be placed as close as possible to the noise source for the following reasons:

    - As you move away from a sound source, the sound pressure level drops (attenuates) approximately 6 dB each time you double your distance from the source. Therefore, if the loudspeaker and the noise source are close together, both loudspeaker output and noise source will attenuate at the same rate, maintaining the proportional signal-to-noise ratio.
    - If the loudspeaker is mounted in an area away from the noise source, the audio will be too loud near the loudspeaker but not loud enough near the noise source.

GAI-Tronics drivers and mounting assemblies are shipped separately from the horns. See the accompanying Figure 1, Figure 2, and Figure 3 for mounting assembly details. Also refer to Table 2, "Mounting Assembly Application Chart" for the correct assembly to be used with each GAI-Tronics speaker horn.

General Wiring Guidelines

GAI-Tronics recommends its 60021-301 cable where No. 18 AWG wire is acceptable for speaker wiring. With a maximum outside diameter of 0.285 inches (7.3 mm), it is suitable for conduit, duct, and cable tray use. It contains a BK/W insulated conductor for the (common) connection and a W/BK insulated conductor for the 8- or 16-ohm connection.

The 60028-101 3-conductor cable is recommended where the Model 13314 series speaker driver is used in order to take advantage of the driver's ground connection.

Positive voltage applied on the positive loudspeaker terminal will move the diaphragm forward. Wire all speakers in a system so that all diaphragms move in the same direction. To simplify wiring, each loudspeaker terminal is labeled. Some speakers are labeled 8 COM or 16 COM. These labels correspond to the labels inside the speaker amplifiers. For those loudspeaker terminals labeled differently, use the following wiring guideline:

- If marked with L1 and L2: L1 is the common terminal. L2 is positive and is connected to either 8 or 16, depending on the speaker rating.
- If the loudspeaker has attached cables: The white conductor is common. The black conductor is positive and is connected to either 8 or 16, depending on the speaker rating.

Normally, only one high power horn-type speaker is connected to a GAI-Tronics Page/Party® amplifier. If two 16-ohm speakers are to be operated from one amplifier, wire them in parallel and connect them to the 8-ohm output.

In many applications, multiple cone-type or smaller horn-type speakers may be driven from one GAI-Tronics Page/Party® amplifier. Figure 1 illustrates how two, three, or four 8-ohm units may be wired to one amplifier. Figure 2 illustrates 16-ohm unit connections to one amplifier.

Do not connect loudspeakers in series when installing them in critical broadcast areas as the failure of one speaker renders the remaining speakers inoperable. Parallel speaker wiring installations are preferred ensuring that if a single speaker fails, the remaining speakers connected to that amplifier will continue to operate.

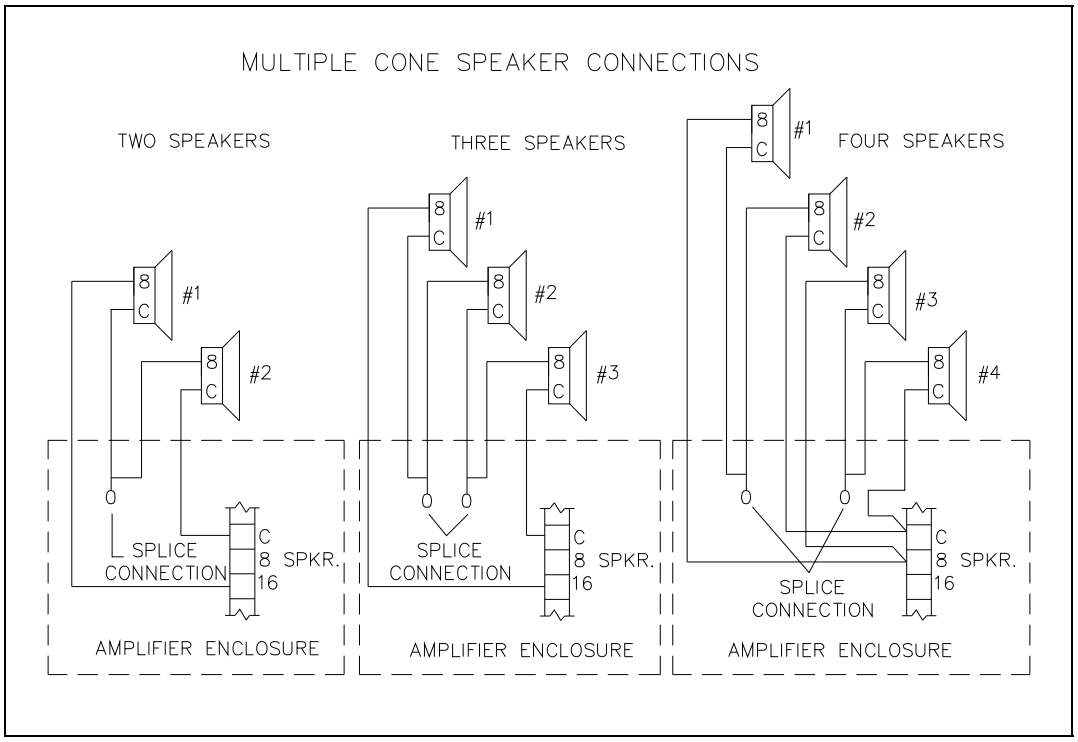


Figure 1. Cone Speaker Connections

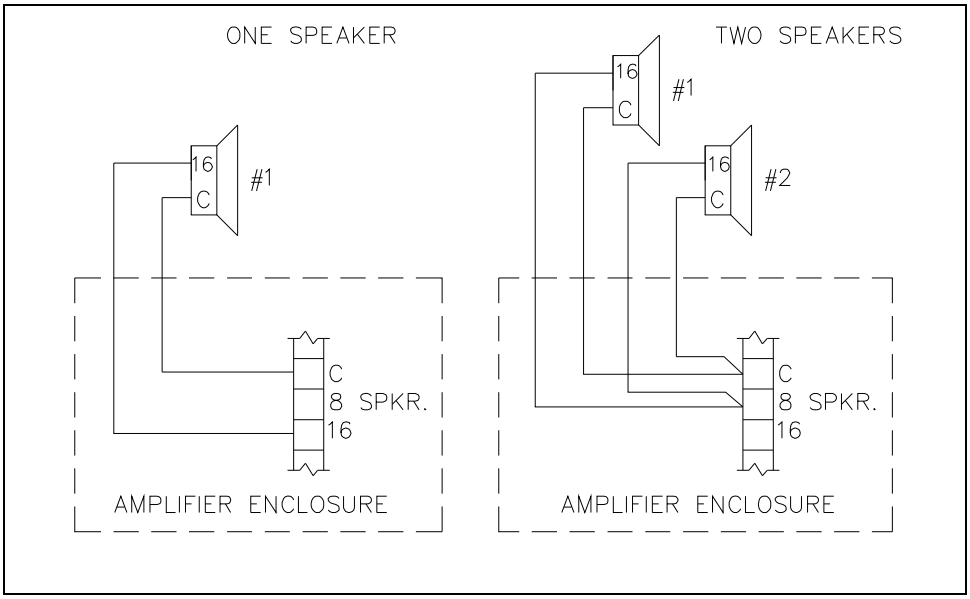


Figure 2. 16-ohm Speaker Connections

Distributed Amplifier Systems

GAI-Tronics Page/Party® and SmartSeries systems do not use speakers with line matching transformers. The voltage on the wiring between the speaker(s) and the associated amplifiers is less than 15 V_{RMS}, which qualifies as National Electrical Code Class II wiring. Therefore, conduit is not required except for physical protection. Cable distance should be as short as possible to reduce power loss. GAI-Tronics recommends that the cable distance between a speaker and its associated amplifier not exceed 30 feet (9.14 meters).

Indoor Cone Speakers

Depending on the amplifier and speaker combination used, an indoor cone speaker's volume control and speaker can be damaged due to the application of excessive power. In order to minimize the possibility of such an occurrence, use the following set-up procedure:

1. Turn the amplifier volume control to its lowest output level before applying power to the system. Set the speaker volume control (if applicable) to its maximum output position.

2. Measure the dc resistance of the speaker using a volt-ohm meter. Read the wattage rating of the speaker and perform the following calculation:

   Multiply the resistance of the speaker (*Rspkr*) by the speaker's wattage rating (*Wspkr*), and find the square root.
   This number is the voltage (rms) limit from the amplifier to the speaker that should not be exceeded.

$$\sqrt{Rspkr \times Wspkr} = Vrms \text{ limit}$$

3. Apply power to the unit, and connect a 1 kHz @ 1.5 Vrms signal into the amplifier via the page line with a voltmeter across the speaker terminals. Adjust the amplifier volume control until the voltage limit is reached.

4. The speaker volume control may then be used to reduce the speaker level to the proper listening level as changing conditions warrant.

NOTE: Using this procedure does not guarantee that damage will not occur to the volume control or speaker since there are other variables, but it does minimize the possibility.

Central Amplifier Systems

Central or power amplifier systems are generally designed to use a driver with a 70 or 100 volt, line matching transformer. The speaker's power level is determined by the tap settings on the transformer. Use of these transformers allows the speakers to be placed at long distances from the amplifier without significant power loss (see Table 1 below).

The number of speakers connected to a central amplifier system is limited by the power available from the central amplifier. The sum of the speaker power settings must not exceed the total available from the amplifier. For example, a 250-watt central amplifier can drive 30 speakers tapped at 7.5 watts.

Table 1 illustrates the correlation between the wire size and the distance that speakers with integral drivers or horns with separate drivers can be placed from a central amplifier.

Table 1.

Typical Central Amplifier @ 20% Loss	
Wire size	70.7 V Line
No. 18 AWG (0.82 mm^2)	6250 feet (1903 m)
No. 16 AWG (1.31 mm^2)	9900 feet (3017 m)
No. 14 AWG (2.08 mm^2)	15,800 feet (4816 m)

Table 2.

Mounting Assembly Application Chart		
	Speaker Drivers	
Speaker Horns	13310 (Note 1)	13314
13302-002	415A	411A
13304-002	415A	411A
13305-101	413A	413A
13306-101 (See Note 2)	415A	411A
13340	415A	411A
HP15-8	Has integral driver—use 412B	
13328-001	Has integral driver—use 412-002	

NOTES:

1. When using any Division 1 speaker or driver unit, the speaker mounting assembly may be used only to support and orient the speaker. Division 1 fittings must be used for electrical connections.
2. When mounting the GAI-Tronics part # 13306-101 speaker horn in an upright orientation, the 411A mounting assembly can be used with either the 13310 or 13314 Driver. See Figure 5.

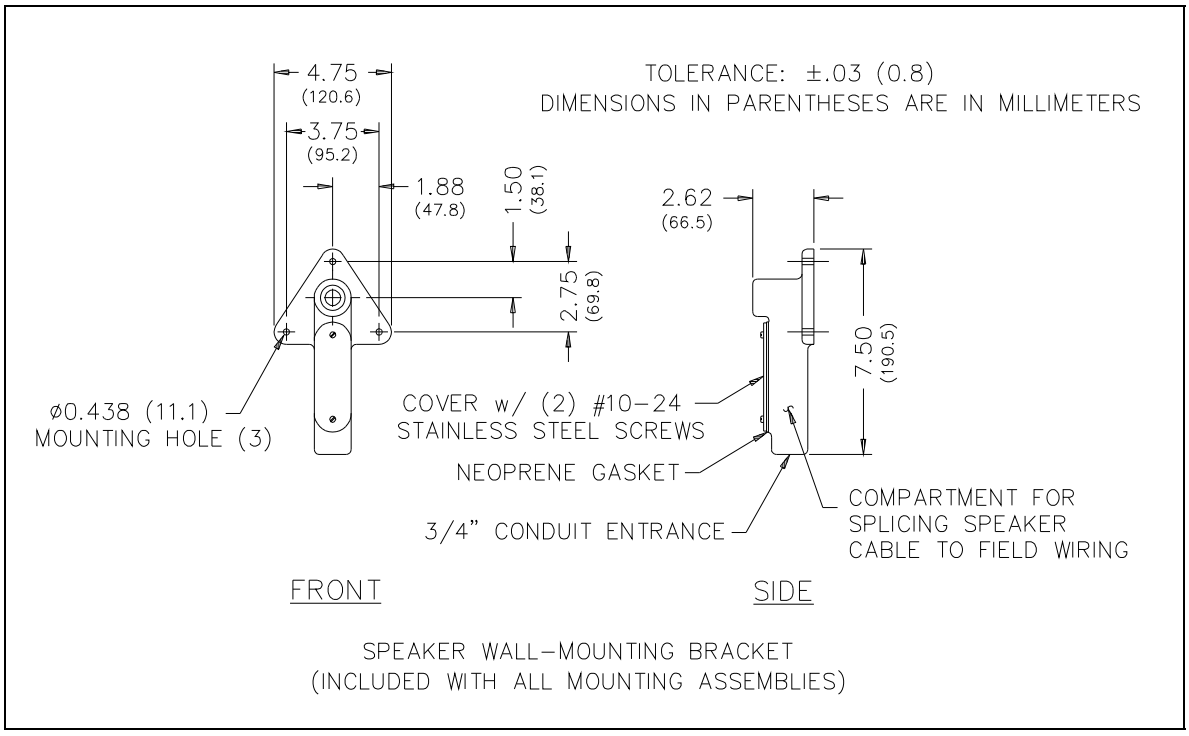
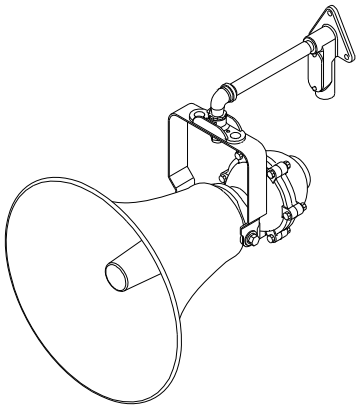
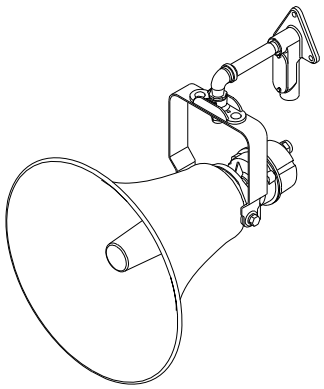


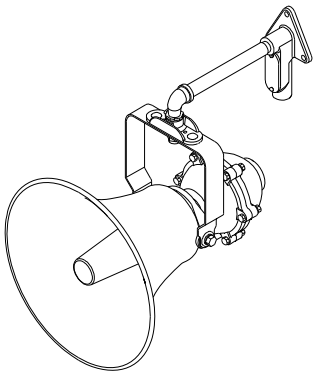
Figure 3. Wall Mounting Bracket



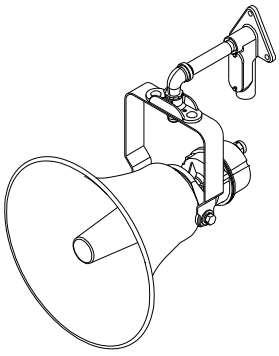
No. 13302–002 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 415A MTG. ASSY.



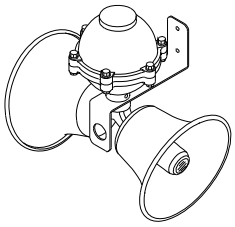
No. 13302–002 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 411A MTG. ASSY.



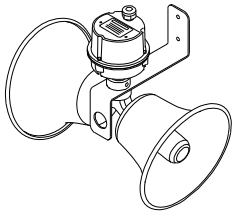
No. 13304–002 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 415A MTG. ASSY.



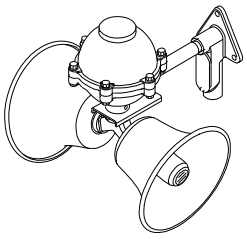
No. 13304–002 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 411A MTG. ASSY.



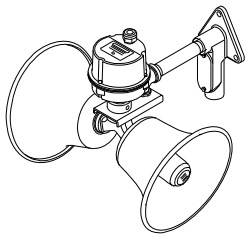
No. 13305–101 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO SUPPLIED "Z"–BRACKET



No. 13305–101 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO SUPPLIED "Z"–BRACKET

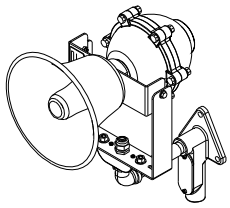


No. 13305–101 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 413A MTG. ASSY.

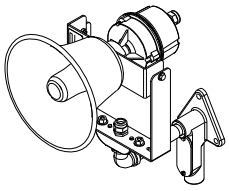


No. 13305–101 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 413A MTG. ASSY.

Figure 4.

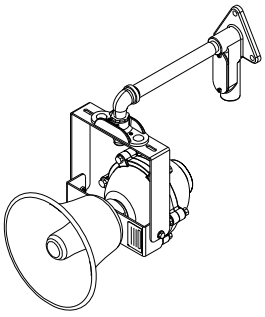


No. 13306–101 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 415A MTG. ASSY.

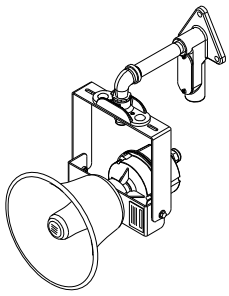


No. 13306–101 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 411A MTG. ASSY.

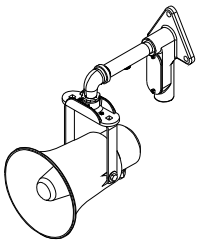
No. 13328–001 SPEAKER HORN
W/ INTEGRAL SPEAKER DRIVER &
MOUNTING HUB W/ 412–002 ASSY.



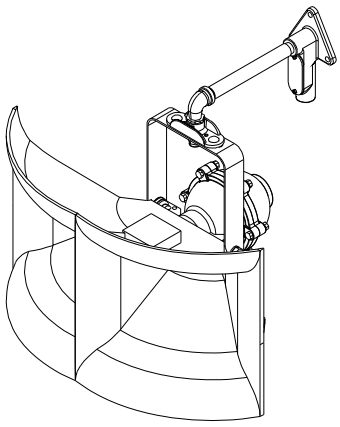
No. 13306–101 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 415A MTG. ASSY.



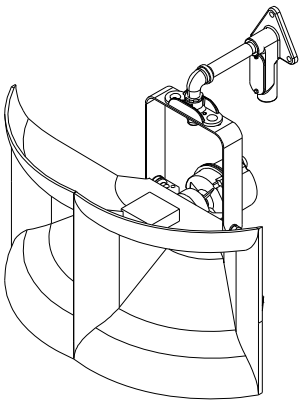
No. 13306–101 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 411A MTG. ASSY.



No. HP15–8 SPEAKER HORN
W/ INTEGRAL SPEAKER DRIVER
ATTACHED TO No. 412B MTG. ASSY.



No. 13340 SPEAKER HORN
W/ No. 13310–XXX SPEAKER DRIVER
ATTACHED TO No. 415A MTG. ASSY.



No. 13340 SPEAKER HORN
W/ No. 13314–XXX SPEAKER DRIVER
ATTACHED TO No. 411A MTG. ASSY.

Figure 5.

Warranty

Equipment. GAI-Tronics warrants for a period of one (1) year from the date of shipment, that any GAI-Tronics equipment supplied hereunder shall be free of defects in material and workmanship, shall comply with the then-current product specifications and product literature, and if applicable, shall be fit for the purpose specified in the agreed-upon quotation or proposal document. If (a) Seller's goods prove to be defective in workmanship and/or material under normal and proper usage, or unfit for the purpose specified and agreed upon, and (b) Buyer's claim is made within the warranty period set forth above, Buyer may return such goods to GAI-Tronics' nearest depot repair facility, freight prepaid, at which time they will be repaired or replaced, at Seller's option, without charge to Buyer. Repair or replacement shall be Buyer's sole and exclusive remedy. The warranty period on any repaired or replacement equipment shall be the greater of the ninety (90) day repair warranty or one (1) year from the date the original equipment was shipped. In no event shall GAI-Tronics warranty obligations with respect to equipment exceed 100% of the total cost of the equipment supplied hereunder. Buyer may also be entitled to the manufacturer's warranty on any third-party goods supplied by GAI-Tronics hereunder. The applicability of any such third-party warranty will be determined by GAI-Tronics.

Services. Any services GAI-Tronics provides hereunder, whether directly or through subcontractors, shall be performed in accordance with the standard of care with which such services are normally provided in the industry. If the services fail to meet the applicable industry standard, GAI-Tronics will re-perform such services at no cost to buyer to correct said deficiency to Company's satisfaction provided any and all issues are identified prior to the demobilization of the Contractor's personnel from the work site. Re-performance of services shall be Buyer's sole and exclusive remedy, and in no event shall GAI-Tronics warranty obligations with respect to services exceed 100% of the total cost of the services provided hereunder.

Warranty Periods. Every claim by Buyer alleging a defect in the goods and/or services provided hereunder shall be deemed waived unless such claim is made in writing within the applicable warranty periods as set forth above. Provided, however, that if the defect complained of is latent and not discoverable within the above warranty periods, every claim arising on account of such latent defect shall be deemed waived unless it is made in writing within a reasonable time after such latent defect is or should have been discovered by Buyer.

Limitations / Exclusions. The warranties herein shall not apply to, and GAI-Tronics shall not be responsible for, any damage to the goods or failure of the services supplied hereunder, to the extent caused by Buyer's neglect, failure to follow operational and maintenance procedures provided with the equipment, or the use of technicians not specifically authorized by GAI-Tronics to maintain or service the equipment. THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES AND REMEDIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Return Policy

If the equipment requires service, contact your Regional Service Center for a return authorization number (RA#). Equipment should be shipped prepaid to GAI-Tronics with a return authorization number and a purchase order number. If the equipment is under warranty, repairs or a replacement will be made in accordance with the warranty policy set forth above. Please include a written explanation of all defects to assist our technicians in their troubleshooting efforts.

Call 800-492-1212 (inside the USA) or 610-777-1374 (outside the USA) for help identifying the Regional Service Center closest to you.