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GAI-TRONICS®
A HUBBELL COMPANY

Extended Range Page/Party® Systems

Confidentiality Notice

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Introduction

The GAI-Tronics Page/Party® system is a modular industrial communication system incorporating from two to possibly hundreds of stations. Available in several forms, each station includes a handset, two amplifiers (one for the handset and the other to drive one or more paging speakers), associated controls, and a paging speaker (usually mounted separately). All stations are wired in parallel and additional stations may be added at any time.

A GAI-Tronics Page/Party® system layout should be planned in advance of installation. Handset station locations should be carefully selected, taking convenience, accessibility, and personal safety into account. The quantity and location of paging speakers must be carefully considered, particularly in areas of high ambient noise or reverberation.

The speaker amplifier built into each station will drive one horn-loaded paging speaker. If additional paging speakers are needed, separate speaker amplifiers can be added to the system. In quiet areas such as offices, several paging speakers can be connected to a single station. Refer to Publication 42004-135 Speaker Installation, or consult with a GAI-Tronics sales representative for additional system planning information.

All stations are wired in parallel. Good planning will minimize cable requirements for each installation. GAI-Tronics can supply multi-conductor cable designed specifically for this application. The number, size and color-coding of conductors are listed in the accompanying system connection diagrams. GAI-Tronics standard cable has 600 volt insulation and is UL-rated for power cable tray use. Additionally, for ease of installation GAI-Tronics' cable is color-coded to match the termination points in our enclosures.

The maximum system cable length is 10 miles (16 km) end-to-end with the system's Line Balance Assembly located at the electrical center, i.e., cabling from the Line Balance may extend up to 5 miles to the last station in any direction.

The cable described above includes conductors to supply ac operating power to each station. All stations operate from a common power source, enhancing reliability, particularly if no other ac load is placed on the circuit, or branch line feeding the system. This configuration also allows easy transfer to a back-up power source in the event of power failure. However, if preferred, each station may be individually powered from a nearby nominal 120 volt, 50 or 60 Hz single-phase outlet.

Installation Procedure

STEP 1 — Electrical Noise Considerations

When planning your system, consider the following suggestions to avoid electrical noise caused by slip rings and silicon control rectifier (SCR) power supplies.

Slip Rings - Use a Radio Frequency (RF) alternative and avoid using slip rings as audio conductors. Slip rings are a source of electrical noise and are not reliable.

SCR Power Supplies - The Page/Party® system will be installed in areas where SCR power supplies are used to power motors or other heavy equipment, consider using one or all of the following four recommendations to reduce electrical noise.

1. *Separation*—Locate the Page/ system cables as far as possible from the SCR power supply input or output cables. Electrical coupling between cables is reduced by the square of the distance between the cables.

2. *Shielding*—Use shielded (Armored) system cables if the cable must be run in the same bundle or cable tray with the SCR power supply cables. Shielded cables reduce capacitive coupling between SCR power supply cables and Page/Party® audio cables.

3. *Isolation*—Two methods of power source isolation can be used to avoid electrical noise:

A. Use a low capacitance (primary to secondary) isolation transformer between the Page/Party® system and the ac supply to the SCRs. This will electrically isolate the Page/Party® system's ac power from the noise generated by the SCR on the ac power feed. Also use an isolation transformer to isolate the Page/Party® ac power from an ungrounded ac power source. Note: The neutral side of the transformer output must be grounded in all instances.

   The size of the isolation transformer should be based on the number of amplifiers used in the system. If 10 or less amplifiers are used in the system, a 500 VA transformer is sufficient. If 11 to 20 amplifiers are used in the system, select a 1000 VA transformer. For systems with more than 20 amplifiers, the transformer should be sized to accommodate a load of 50 VA per amplifier.

B. A battery-powered 24 V dc Page/Party® system can be used as an alternative to the standard 120 V ac system. In this instance, the battery/battery charger provides isolation from the SCR noise on ac power systems. Cable shielding and separation as mentioned above still apply.

   Note: Avoid battery chargers that utilize SCRs in their design.

STEP 2 - Mounting of Station and Speaker Amplifier Enclosure

Each Page/Party® system station includes a plug-in amplifier that mates with a fabricated steel, cast aluminum, or molded reinforced non-metallic enclosure. Each enclosure provides terminal blocks for connecting inter-station cabling. Enclosures are packed separately from the plug-in amplifiers at the factory, allowing the amplifiers to remain protected while the enclosures are installed and wired — particularly important during system installation in areas under construction.

The 16-gauge steel enclosures do not provide any openings for conduits or cables because the location of these will vary with each installation. Drill or punch the necessary conduit openings before mounting the enclosure. Locate the openings on either the top or bottom of the enclosure, and toward the rear of the box. Avoid the top center because of possible interference with the plug-in amplifier receptacle. A drill template is supplied with each enclosure.

Cast aluminum enclosures are drilled and tapped on the top and bottom for specially-designed hub plates. Unless special arrangements are made, these enclosures include plates for single 1¼-inch conduit. Plates for single ½-inch or 1½-inch, or dual 1¼ inch are available.

Molded (non-metallic) enclosures are supplied without any conduit openings. Sealed threaded hubs, such as Myers "Scru-tite," are recommended. A drill template is supplied with each enclosure.

⚠ CAUTION ⚠
Use caution when drilling holes to avoid damaging internal electrical components and wiring.

The suggested mounting height for all station enclosures is 54 inches (137 cm). Subsets used with remote amplifiers are supplied with 8-foot (244 cm) cables. Enclosures for remote subset amplifiers must be mounted within reach of the 8-foot cable. Desktop or desk-edge stations enclosures are often mounted in the knee-well of the desk.

STEP 3 - Mounting of Line Balance Assembly

Each GAI-Tronics Page/Party® system requires one Model 305-002 Line Balance Assembly. Its function is to properly load the page and party line circuits. When using GAI-Tronics standard cable, select a location that is:

- near the electrical center of the system
- adjacent to an indoor station in a relatively quiet area
- no more than 5 miles from the most distant station

The line balance assembly has one electrical adjustment that must be made while using a station (see below). The following is the preferred method for mounting the line balance assembly:

1. Suspend the assembly from the lower side of the indoor wall station using a 1-inch conduit nipple (not supplied).
2. Connect one twisted pair wire for the page circuit and another for each of the party lines between the terminal blocks of the line balance assembly and the associated indoor wall station.
3. Make the wiring connections between the Model 305-002 Line Balance Assembly and the Model 702 and 703 Indoor Wall Station Enclosures in accordance with the wiring diagrams at the end of this publication.

STEP 4 - Installation of Inter-station Conduit and Cable

Inter-station cables are generally installed in cable trays or conduit. To assist in determining the conduit sizes required, the outside diameters of the GAI-Tronics Corporation cables discussed in this publication are listed below. Size and installation of conduit and cable must meet the requirements of applicable electrical codes.

Cable	Conductors	O.D.
60038-101	8	0.60 in. (15.1 mm)
60029-101	16	0.68 in. (17.2 mm)

A ground conductor with green/yellow insulation, should be included with cable in any area where no conduit, or non-metallic conduit is used. Non-metallic enclosures used with metallic conduit and cable without a ground conductor require a bond between the conduit(s) and the ground terminal (terminal 3) within the enclosure.

When using GAI-Tronics cable, attach wire lugs to each conductor and connect to the appropriate terminal in accordance with either the color code shown on the applicable accompanying diagram or with special drawings provided for this purpose.

Exception: Some cables have a spare orange conductor. Unless otherwise instructed, this should be taped and not connected to the terminal strip(s) in the enclosures.

GAI-Tronics cable is considered to be a Class 1 cable (maximum voltage is less than 600 V). In a cable tray, Class 1 cable may only be grouped with other Class 1 cables. However, long runs of GAI-Tronics cable in proximity of 600 volt cables may cause an undesirable amount of hum to be induced onto the Page/Party® system's audio lines. To reduce undesired hum, separate the Page/Party® system cable from the 600 volt cables by a minimum of 12 inches.

STEP 5 - Installation of Amplifiers and Subsets

One of the many features of GAI-Tronics Page/Party® system equipment is automatic speaker muting. When the Push-to-Page switch is pressed at a particular station, the paging speaker connected to that station is silenced, preventing acoustic feedback to the handset microphone. However, while the handset is in use for the party line conversations, the paging speaker is "live" to permit broadcasts of page calls from other stations.

For cases where the muting feature is not necessary or may be a disadvantage, it can be defeated as outlined below.

1. Locate the lugged violet wire attached to terminal point 7 (MUTE) on the terminal block within the enclosure of station to be modified.
2. Move the lugged violet wire to terminal point 8 (PAGE L1).

After making any necessary muting changes, unpack and install the amplifier for each station. Also, unpack remote subsets (for desktop, desk-edge or flush-panel mount stations) and plug each into the bottom of their respective amplifier enclosure.

STEP 6 - Checkout and Adjustment

Verify all field-wiring connections (e.g., page line, party lines, mute, ac power and speaker) between stations, and complete the line balance assembly installation before checkout begins. Ensure that all handsets are on-hook.

1. Apply ac power, and check the station located next to the line balance assembly.
2. Press the PUSH-TO-PAGE switch on the handset and speak directly into the microphone. The broadcast should be heard at all paging speakers in the system except those associated with the station under test. If working properly, very little or none of your own voice (sidetone) is heard from the handset earpiece. If the line balance assembly is not connected properly, there will be a high level of sidetone, perhaps enough to cause feedback. Adjust the line balance assembly to optimize sidetone rejection on the page line. If the system is complete when the first station is checked, adjust the line balance assembly as noted below. **Do not adjust station (amplifier) controls until the line balance assembly is adjusted.**
3. Release the PUSH-TO-PAGE switch and check the party line(s) sidetone level by speaking into the microphone of the handset. If working properly, very little or none of your own voice is heard from the handset earpiece. This sidetone rejection will only occur if the line balance assembly is properly connected because it contains a fixed resistor load for each party line. In addition, no party line adjustments are provided. Check party line operation by conversing between two or more stations.

Adjustment of the Line Balance Assembly

To set the control for proper page circuit loading:

1. Remove the line balance assembly cover to expose the line balance control.
2. Lift the handset from the station located next to the line balance assembly and press the push-to-page button.
3. From the normal speaking distance (approximately ½-inch), blow steadily into the handset microphone and adjust the line balance control to minimize side tone in the handset receiver. This adjustment needs to be made only at the initial installation of the system. However, if in the future more than 10 speaker amplifiers are added or deleted, repeat adjustment of page circuit loading.
4. After final adjustment, replace and secure the cover with the four mounting screws to discourage tampering by unauthorized personnel and prevent entry of contaminants.

Each amplifier has a paging speaker volume control. It is accessible from the front panel with a screwdriver, but is concealed behind the metal nameplate. To access it, simply loosen (but do not remove) the two nameplate screws and pivot the nameplate around the left screw. This control is pre-set at the factory to produce a moderate page level of approximately 4 watts of output power.

Each handset/speaker station amplifier has two additional internal controls: receiver volume control and receiver sidetone control. Both controls are accessible from the rear using a small screwdriver through holes provided on the chassis. A third hole allows similar access from the rear for the paging speaker volume control. All controls are factory-adjusted for optimum performance in most industrial applications. Do not readjust these controls to solve system problems until other possible faults are checked, such as a missing, defective, or improperly connected line balance assembly. There is very little drop in receiver (handset earpiece) volume level due to system cable losses. Generally, the only reason to reset the receiver volume control is to compensate for extremely high ambient noise levels (up to 110 dB) or to meet particular personnel needs.

For stations with cable lengths of 26,400 feet (5 miles or 8 km) or more from the line balance assembly, receiver sidetone rejection is noticeably affected by cable impedance. Use the receiver sidetone control to compensate for this by rotating the control clockwise.

STEP 7 - Troubleshooting the System

Hum or Buzz

If hum or buzz is present on the page line, or on one or more of the party line(s), it is usually due to either one of the inter-station cable conductors for the circuit being shorted to ground, or an unbalanced leakage path to ground. Therefore, if the page and party line audio conductors are twisted pairs and there are no leakage paths or short circuits to ground, induced voltages cancel-out across the paired conductors and do not appear across the line.

To correct the problem, locate the source of the ground. Using an ohmmeter, check various junction points of the system wiring to determine which direction the ground can be located. Locate the ground by going from one junction point to another and disconnecting the affected circuit. Please note that the fault can be within a plug-in amplifier. However, most ground faults occur due to improper terminations or from small wire strands protruding from an improperly lugged wire.

Another source of grounds or near-grounded circuits is junction boxes filled or partially filled with water. In many cases, dust or dirt deposits in the boxes can produce conductive and/or corrosive solutions when combined with water. Thus, these deposits cause leakage between circuits and can corrode the wire and terminals.

Isolation of field wiring may be necessary for test purposes. If such isolation removes the line balance assembly from the operating portion of the system, connect a 560-620 ohm, ½-watt resistor across L1 and L2 of the affected page and party line circuits. Remove these resistors after completion of the tests.

Feedback or Distortion on the System

Each page and party circuit must be loaded to the optimum 600 ohms using the line balance assembly. If the line balance is not connected, or is defective, the system will have excessive gain and will break into feedback quite easily. Speech will also be distorted, and there will be a high level of sidetone in handset receivers.

Each party line is terminated with fixed a 620-ohm resistor in the line balance assembly. However, an adjustment is provided for the page line to compensate for the number of speaker amplifiers connected to the system page line. Improper adjustment will affect gain and increase the level of sidetone. Please refer to specific instructions above for adjusting the line balance assembly.

Very Low Audio Level on One or More Lines at all Stations

It is possible for the system, or part of the system, to function with a short across the page or party line circuits. If this occurs, the level of the system will be extremely low, decreasing to nearly zero in the vicinity of the short circuit. Locate the short circuit in the same manner as locating a ground, by checking junction points with an ohmmeter.

Cross Talk

Accidental crossing of circuits in a junction box will cause cross talk or interference. To check for this condition, measure resistance between circuits of the interfering channels. The resistance should be infinite or a very high value. Leakage or shorts to ground in two or more circuits can also result in cross talk on those circuits.

In a multi-party line system, it is possible to have a small amount of cross talk between channels if line balance resistors are opened or not connected. This condition can be detected by the presence of high sidetone at handset receivers.

Static Charges

In many installations, it is normal to read (measure) a static ac voltage from the conductors of the page and party line circuits to ground. In many cases, this voltage may be as high as 50 volts or more. This voltage is induced into the circuits by capacitance to the ac power circuit generally carried in the same cable or from power cables paralleling communication cables. This voltage is inconsequential and can be ignored. Problems will only occur if one side of the page or party circuit becomes grounded.

Audio Voltage

In a properly operating system, audio voltage read across any of the page or party circuits (L1 and L2) will be approximately 0.5 to 0.75 volts ac on peaks when an audio signal is present, i.e., someone speaking into a handset. The voltage will be proportional to the loudness of the person's voice using the handset.

One Inoperative Station in a Working System

Except for a wiring error, an inoperative station indicates a defect in the amplifier at the station. This is checked quickly by installing either a spare amplifier, or exchanging amplifiers from a known operating station.

Special Note Regarding Installation

GAI-Tronics Corporation 600-ohm Page/Party® system equipment is NOT approved for use in classified areas, although under normal operation it does **not** produce arcs, sparks or heat that would ignite industrial gases or dusts.

Proper installation is defined as (1) mounting and wiring per factory directions without unauthorized modification, and (2) following all requirements set-forth by the U.S. National Electric Code (NEC), articles 500-503, the National Fire Protection Agency (NFPA - 70), or Canadian Standards Association (CSA) Electrical Code per CSA Standard C22.1. Installers must be familiar with the applicable codes, and observe all established requirements. The most applicable parts of the Canadian Standards code are in Section 18. Some, but not all, significant points are:

1. Conduits in a Class I, Division 2 area to or from a non-hazardous area or an adjacent Class I, Division 1 area must have approved seals in the boundary.
2. Conduits or raceways in a Class II, Division 2 or Class III area must have dust seals at entrances to dust-tight equipment and at boundaries to other areas unless such conduits or raceways are also dust-tight.
3. Explosion-proof (Division 1) equipment may be installed in a Division 2 area but must have the same conduit and cable seals as if installed in the corresponding Division 1 area.
4. Sealing of multi-conductor cables or conduits containing multi-conductor cables in Class I, Division 1 or 2 areas must be around each conductor of the cable - except where type MI cable is used.

Safe Power Connection/Disconnection

In order to satisfy Division 2 requirements, equipment must not create arcs or sparks during normal operation, when completely installed and powered. Installing or removing an amplifier or connecting to a live enclosure is not normal operation and can create arcs. To ensure personal safety, adhere to the following cautionary note:

⚠ CAUTION ⚠
Do not insert or remove equipment from live enclosures, unless the area is known to be non-hazardous.

A separate power disconnect is highly recommended. It can be installed and safely used in either of two ways:

1. An explosion-proof disconnect switch can be located in the Division 2 area.
2. An ordinary disconnect switch can be located in a non-hazardous area (outside the Division 2 area).

Either method will allow the use of the switch at all times. Connect field wiring as detailed in instructions for the same equipment mounted in non-hazardous areas.

Power Distribution Recommendations

The ac power input current for a 700 Series Station (handset/speaker amplifier or speaker amplifier) is 0.46 amperes (50 VA or 27 watts) RMS at full power (12 watt RMS output) with 120 V ac line voltage. The 14 AWG conductors used for power distribution in standard GAI-Tronics cable is rated at 15 amperes. This limits the number of speaker amp stations per ac power feed to 32 units or less. Systems with more than 32 stations will require splitting the ac power feeds into different branches.

Voltage drop must also be taken into consideration for long cable runs. The minimum operating voltage for a GAI-Tronics station is 90 V ac, and resistance of 14 AWG cable is 26.8 ohms per loop mile. Thus, length of the cable run must also be considered when designing and installing a system. Contact your nearest GAI-Tronics representative if you require assistance with a system layout.

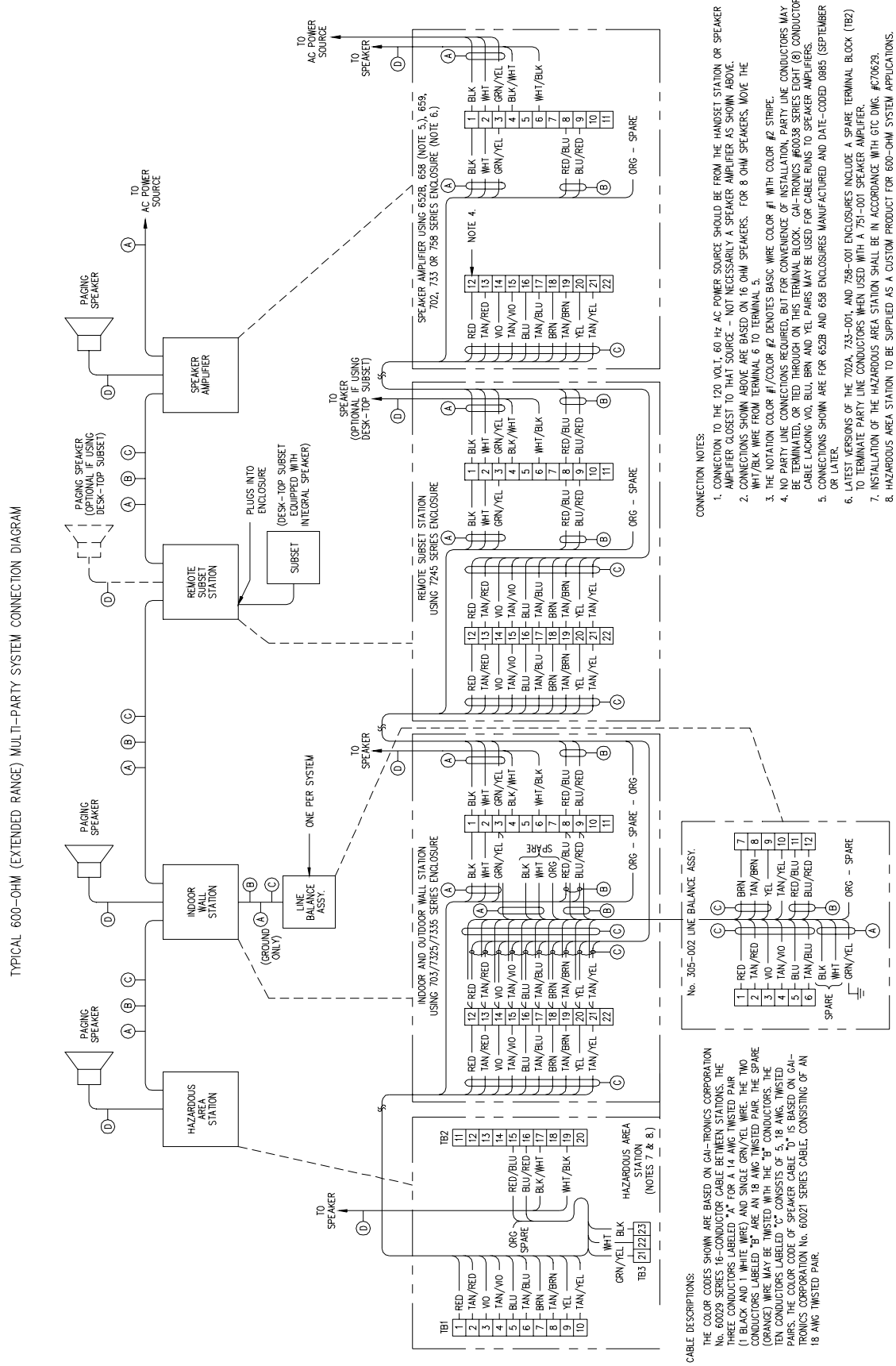

Figure 1. Typical Multi Party Connection Diagram

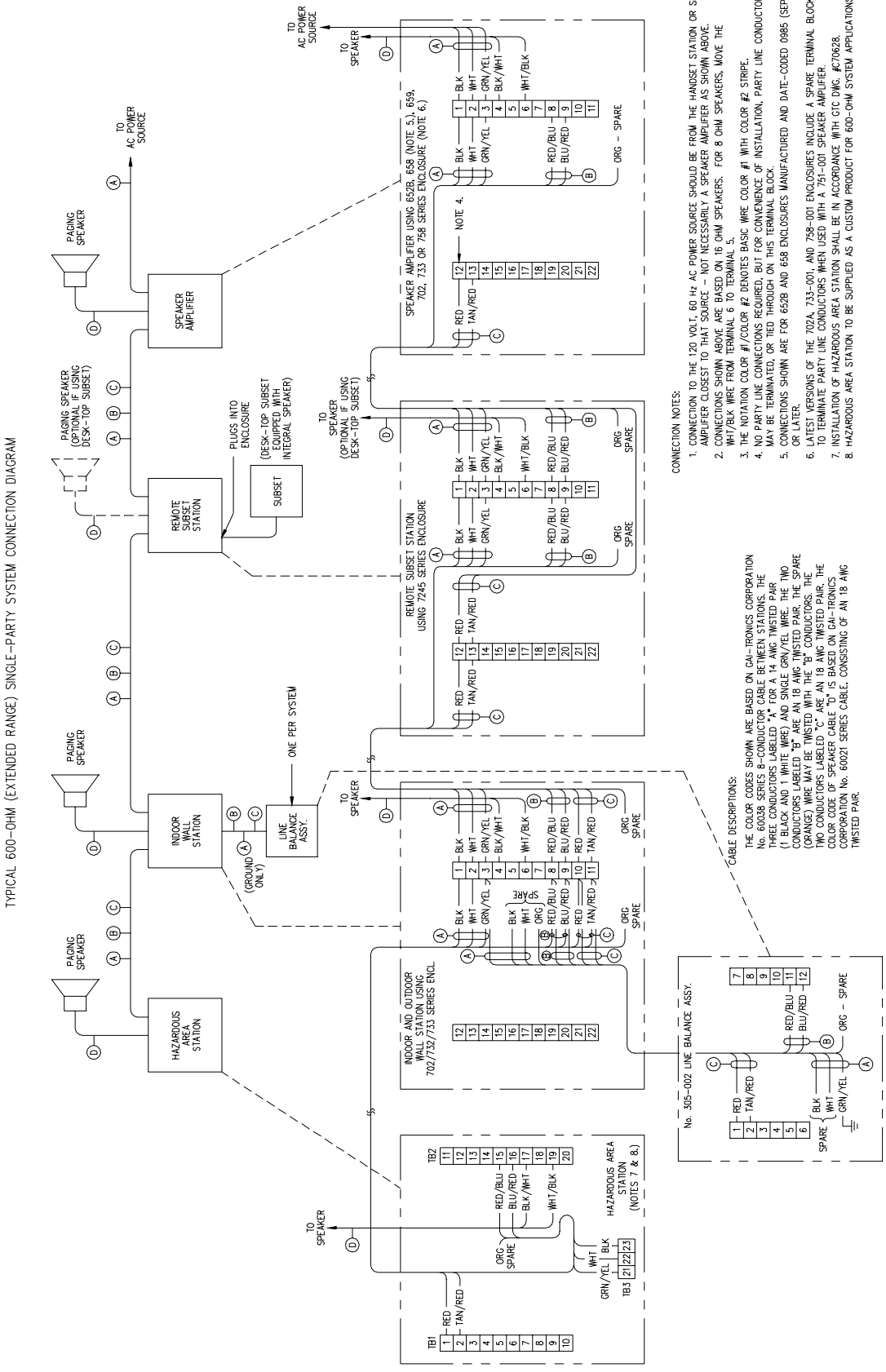

Figure 2. Typical Single Party Connection Diagram

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.