



GAI-TRONICS®
A HUBBELL COMPANY

Model 12599-001 Hot Standby Amplifier Module

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General Information

The Model 12599-001 Hot Standby Amplifier Module is designed for use in system cabinets equipped with central power amplifiers requiring hot (automatic) switching of a standby (backup) amplifier when any one of the primary power amplifiers fail.

This module provides prioritized switching for either six single channel power amplifiers, or three dual-channel amplifiers with up to 720 watts of output power per channel. Also, multiple modules can be cascaded using an in/out board control feature.

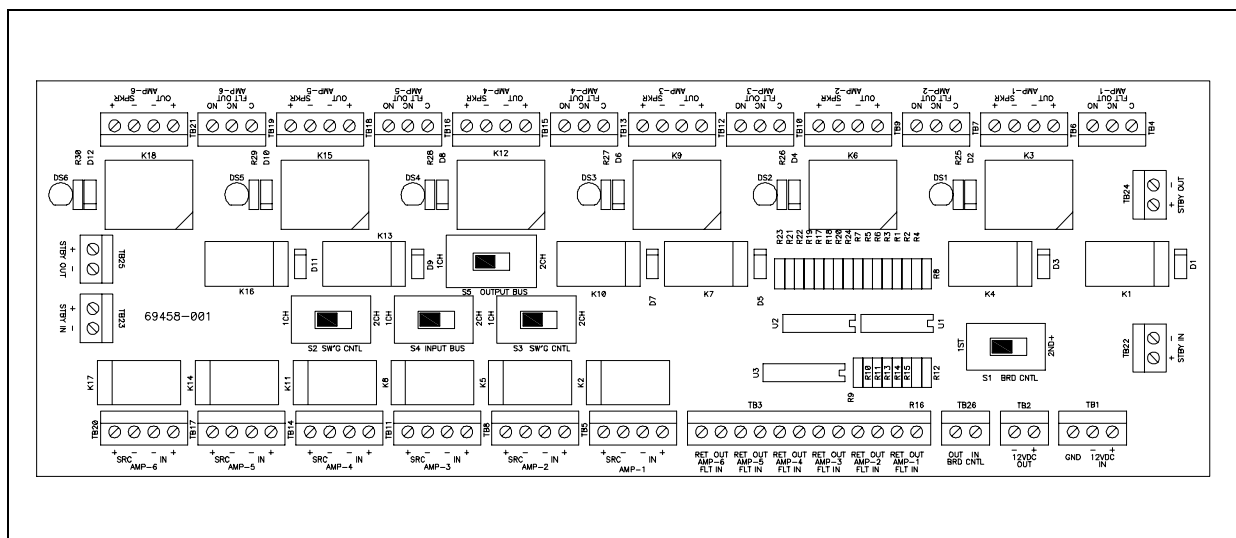


Figure 1. Model 12599-001 Hot Standby Amplifier Module
(Switches shown in factory default position)

Hardware Configuration

The Model 12599-001 Hot Standby Amplifier Module is a printed circuit board assembly (PCBA) equipped with plug-in type terminal blocks, six high current relays for switching amplifier outputs, and 12 low-power relays for switching amplifier inputs and providing dry contact status outputs.

The module is also equipped with five slide switches for mode select functions, and six LEDs to indicate actively switched circuits. The fault detection inputs are comprised of a Quad Comparator and Darlington Array for operating the relay switching circuits.

Installation

The Model 12599-001 Hot Standby Amplifier Module is designed for mounting on 4-inch Snap Trak[®] and measures 12 H × 4 W × 1.5 L inches (305 × 102 × 31.75 mm).

When installing or replacing this module, be sure to disconnect power for safety. When inserting the module in SnapTrak[®], exercise care when pressing the module edges into the SnapTrak[®] to avoid damage to the module's printed circuit board and/or components. Once installed in the SnapTrak[®], be sure the module edges are secured in the channels so that the module does not dislodge during transport or operation if subjected to vibration. Also, if this module is used with other (cascaded) modules, a one-inch (25.4-mm) spacing between modules will facilitate wiring at the edge mounted terminal blocks.

Terminations

The Model 12599-001 Hot Standby Amplifier Module is equipped with modular (plug-in type) terminal blocks. These modular terminal blocks simplify external wire connections during installation, and provide quick disconnect if replacement is ever required.

The following is a breakdown of each terminal block and its function(s):

TB1 – is the 12 V dc power input to the module.

TB2 – is a 12 V dc power output to another (cascaded) module or another 12 V dc powered device.

TB3 – is where the Amp-1 through Amp-6 fault inputs connect. The OUT terminal is dc common and connects to the input side of the amplifier's internal fault circuit. The RET terminal connects to the output of the amplifier's internal fault circuit. Refer to Figure 2.

TB4, TB7, TB10, TB13, TB16 and TB19 – are dry output contacts for Amp-1 through Amp-6 faults respectively. Each contact set is a form "C" type. The maximum switching capacity for each contact set is 24 V dc @ 1 amp and can be used for triggering a remote status indicator or an input at a supervised system device for visual text display.

TB5, TB8, TB11, TB14, TB17 and TB20 – are the audio source and input connections for Amp-1 through Amp-6. The SRC (source) terminals are where the amplifier's audio source is connected. The IN (input) terminals are where the amplifier's input is connected. Be sure to observe polarity markings at these terminals for proper operation and audio performance. Refer to Figure 3.

TB6, TB9, TB12, TB15, TB18 and TB21 – are the audio output and speaker line connections for Amp-1 through Amp-6. The OUT (output) terminal is the where the active amplifier output (e.g., 4-ohm, 8-ohm, 16-ohm, 25 V, 70 V or 100 V) is connected. The SPKR (speaker) terminals are where the designated speaker(s) or speaker line connects to the module. Be sure to observe polarity markings at these terminals for proper operation and audio performance. Refer to Figure 4.

TB22 – is where the standby amplifier input connects if using a single channel amplifier. If using a dual-channel amplifier, connect the channel 1 input to these terminals. See Note 1 and Figure 5 and Figure 6.

TB23 – is for busing the standby amplifier input to another (cascaded) module when using a single channel amplifier. However, if a dual-channel amplifier is used with the module, the channel 2 input of the standby amplifier should connect to these terminals. See Note 2 and Figure 5 and Figure 6.

TB24 – is where the standby amplifier output connects if using a single channel amplifier. If using a dual-channel amplifier connect the channel 1 output to these terminals. See Note 2 and Figure 5 and Figure 6.

TB25 – is for busing the standby amplifier input to another (cascaded) module when using a single channel amplifier. However, if a dual channel amplifier is used with the module, then the channel 2 output of the standby amplifier should connect to these terminals. See Note 3 and Figure 5 and Figure 6.

TB26 – is the **BRD CNTL** (Board Control) IN (input) and OUT (output), which is used if/when cascading multiple modules. In a cascade arrangement, no connection is made at the IN terminal at the first module. For the second module in the cascade, connect the OUT terminal of the first module to IN terminal of the second module, and continue this wiring scheme across subsequent modules in the cascade. See Note 4 below and refer to Figure 5 and Figure 6.

NOTES:

1. A jumper must be installed across the all unused OUT and RET input terminals at TB3 to prevent false activation of unused circuits.
2. To use both inputs of a dual-channel standby amplifier across multiple (cascaded) modules, wire TB22 and TB23 in parallel (respectively) across all modules.
3. To use both outputs of a dual-channel standby amplifier across multiple (cascaded) modules, wire TB24 and TB25 in parallel (respectively) across all modules.
4. Most central amplifier system applications usually employ or specify a ratio of one standby amplifier for every five or six primary amplifiers to minimize the risk of lost coverage. Be sure to check the specified system requirements for the ratio of standby (backup) amplifiers to primary amplifiers.

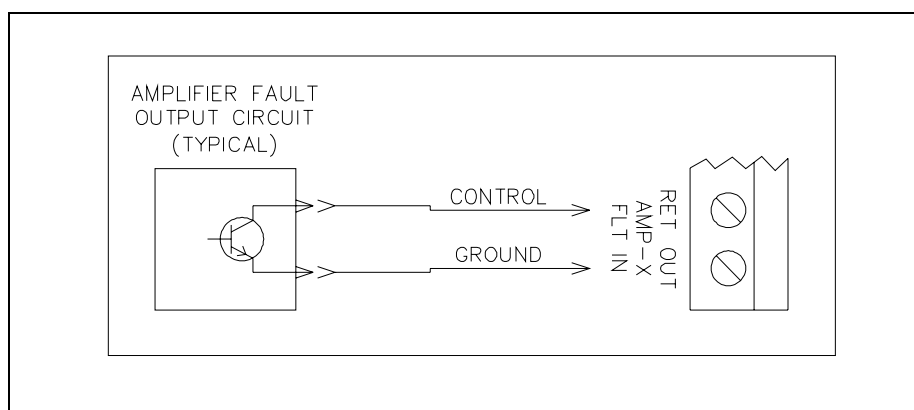


Figure 2. Typical fault input connection

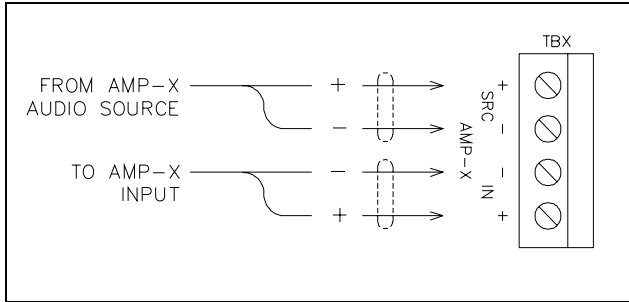


Figure 3. Input Connections

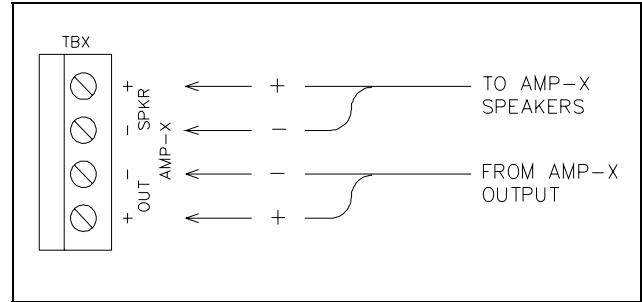


Figure 4. Output Connections

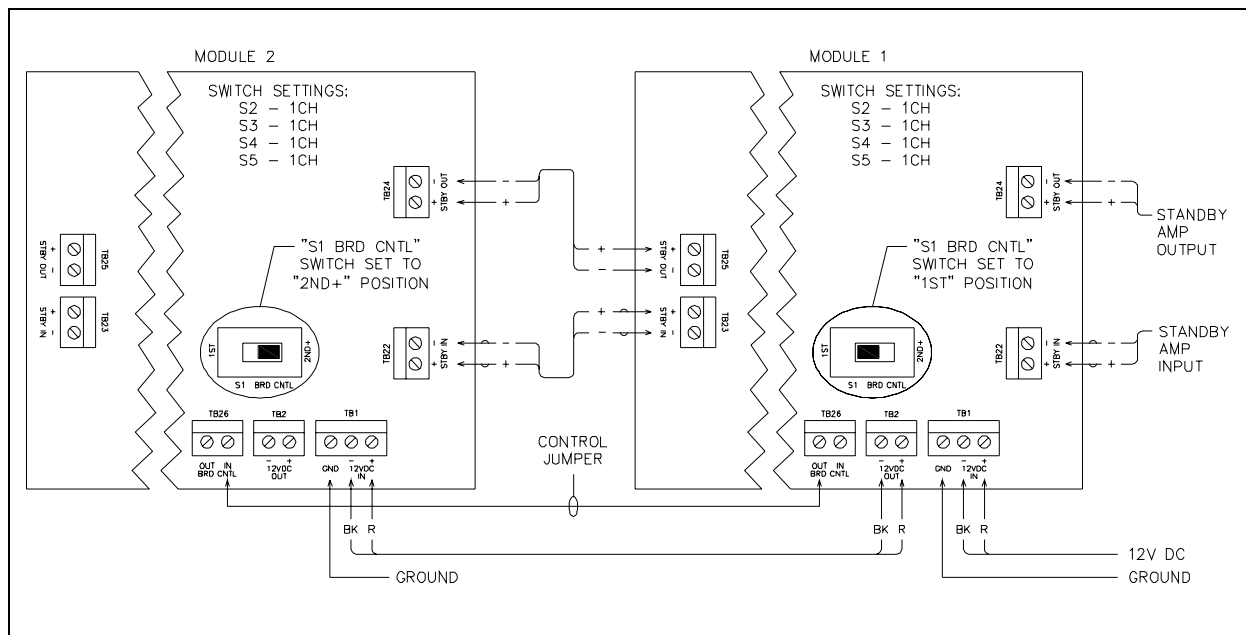


Figure 5. Cascaded modules operated in single channel mode

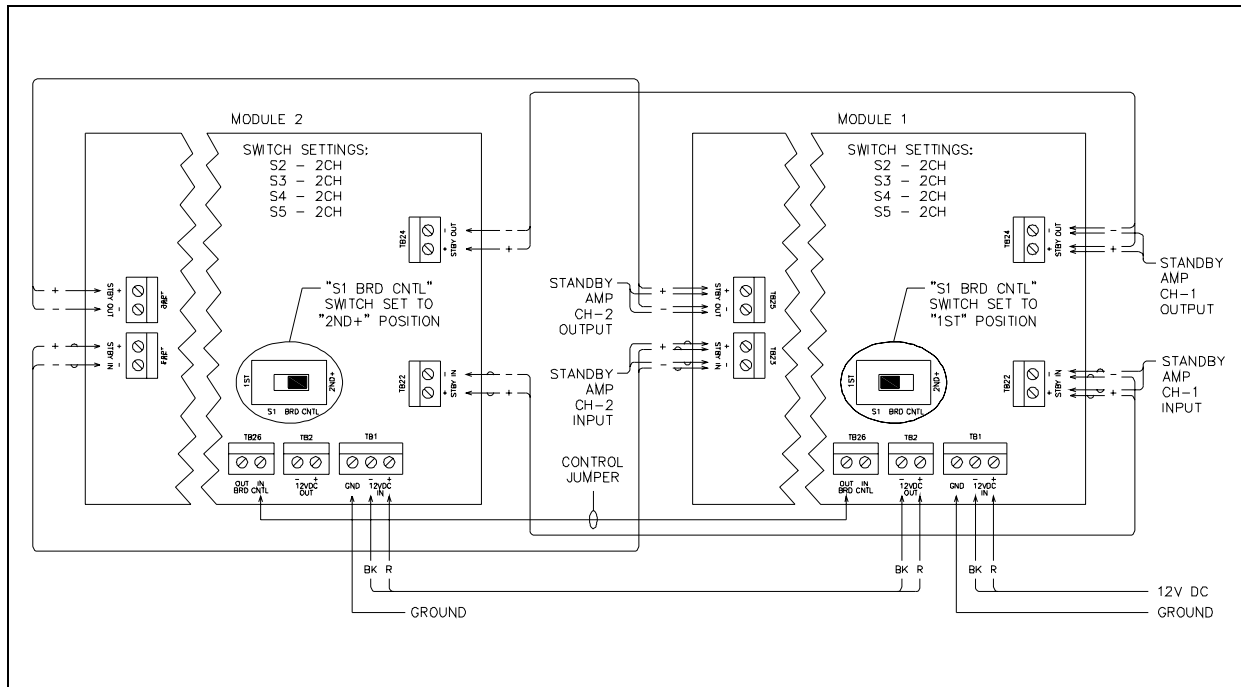


Figure 6. Cascaded modules operated in dual-channel mode

Operation

The Model 12599-001 Hot Standby Amplifier Module operates from a 12 V dc power source. With power applied, all switches properly set and all inputs properly connected, no circuits should be active until an amplifier fault occurs. The block diagrams below depict typical circuit functions when the module is operated in either single or dual channel modes.

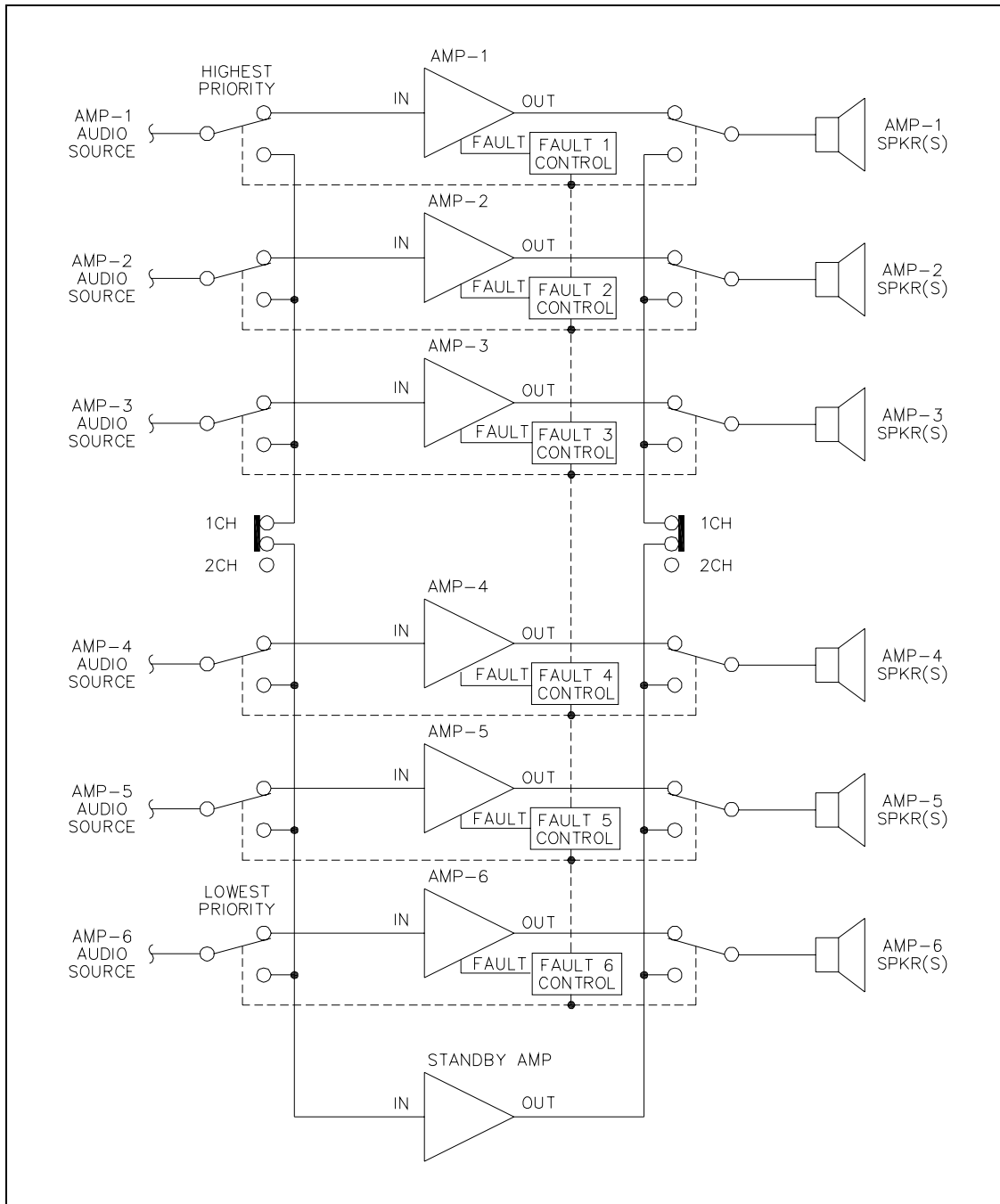


Figure 7. Block Diagram - Single Channel Operation

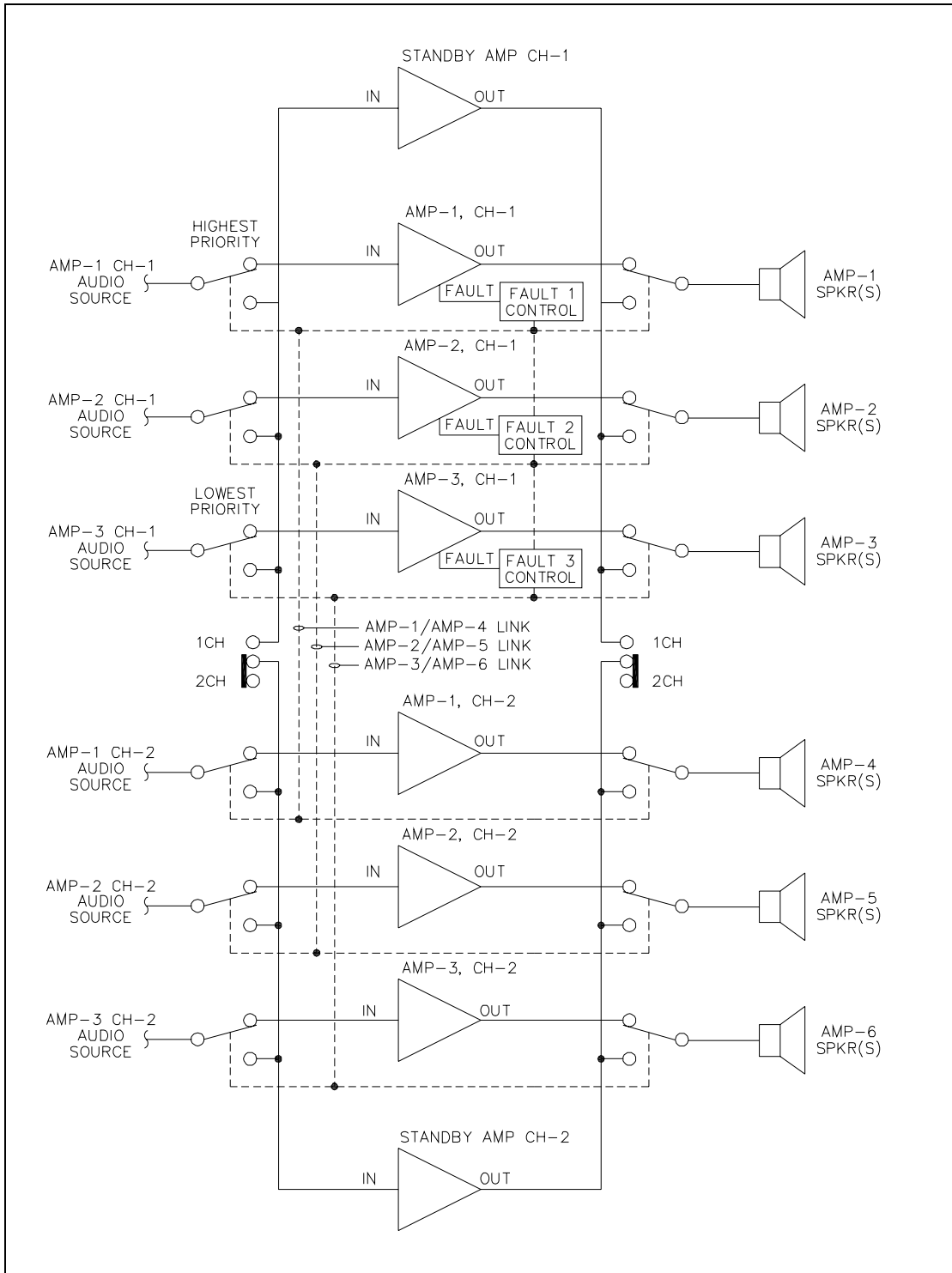


Figure 8. Block Diagram - Dual-Channel Operation

Theory of Operation

The Amp-1 through Amp-6 fault inputs at TB3 on the Model 12599-001 Hot Standby Amplifier Module provide a single connection point for each amplifier fault output. The OUT (output) terminal provides dc common to the amplifier's internal fault circuit and the RET (return) terminal ties to the output side of the amplifier's internal fault circuit.

When the connected power amplifier is functioning properly, the amplifier fault output control signal to the RET terminal must be an active Low (below 6 volts; a dc level at or near zero volts is optimum).

When the amplifier's internal fault circuitry detects a problem, such as a shorted or overloaded output, excessive temperature, etc., or ac power is removed from the amplifier, the amplifier's fault output floats high to a positive (+) polarity. The associated RET input circuit detects this voltage change, and activates the associated relay group to switch the standby amplifier in place of the faulty amplifier. The circuit will remain active until the amplifier fault condition remedied.

Priority Switching

The 12599-001 Hot Standby Amplifier Module prioritizes the switching of the standby amplifier for two reasons, which are:

1. To avoid excessive loading of the standby amplifier in the event of multiple amplifier failures, and
2. To ensure that critical facility areas receive alarm and voice audio broadcasts during emergencies.

The order of priority switching from highest to lowest is Amp-1 to Amp-6 respectively. This means that Amp-1 has the highest priority and Amp-6 has lowest priority. This prioritization scheme applies if the board is operated in either 1-channel or 2-channel modes. If cascaded with other modules, module 1 has a higher priority than module 2, and module 2 has higher priority than module 3, etc.

While it is difficult to determine which area of a facility is the most critical (as in item 2 above), an example is an offshore oil platform system with multiple amplifiers. In this case, the living quarters (LQ) are usually considered such an area. In this type of system/cabinet design, the LQ amplifier should be connected to the Amp-1 terminals to ensure that personnel (sleeping in the LQ) will be alerted during emergencies.

Dry Contact Outputs

The Model 12599-001 Hot Standby Amplifier Module provides six, form "C" dry contact outputs (one per amplifier circuit), which can be used for triggering either a remote status indicator, or an input at a supervised system device for visual text display. Each output contact operates in conjunction with its respective fault detection circuit so that the status of all connected amplifiers can be monitored at all times, regardless of their priority assignment.

Cascading Modules

The Model 12599-001 Hot Standby Amplifier Module can be operated with a series of other modules in a cascade. This feature is useful in cabinet/system applications when the following criteria must be met:

- A higher ratio of primary (active) amplifiers to a standby amplifier is needed, or
- In particular, when dual-channel amplifiers are employed.

When using the cascade feature, the IN/OUT control at TB26 must be used between modules. For the cascade to function properly, connect the OUT terminal of the first module to the IN terminal at the second module. Do not make any connections to the IN terminal at the first module. For subsequent modules in the cascade, this In/Out wiring arrangement must continue across all modules.

In addition to In/Out control across modules, the mode switches S1 through S5 must also be set to the proper operating position. See the Mode Switches (S1-S5) section below for information on the function and settings of these switches.

Mode Switches (S1 – S5)

The Model 12599-001 Hot Standby Amplifier Module is equipped with five mode control switches. The function of each is switch is described below:

S1 Brd Cntl (Board Control) – Since relay switching on this module is prioritized, this switch determines if the module is operated as standalone, the first of multiple modules, or is operating behind another module. If the module is used standalone, or is the first of multiple modules, the switch must be set to the 1ST position. However, if the module operates behind another module in a cascaded control path, the switch must be set to the 2ND+ position.

S2/S3 Sw'g Cntl (Switching Control) – Since this module is designed to switch either six single-channel amplifiers or three dual-channel amplifiers, these two switches must be set to the appropriate position for the type of amplifier being switched, e.g., 1CH (1-channel) or 2CH (2-channel) respectively. (See the note below.)

When the switches are set to the 1CH position, all six relay circuit groups operate independently via control from their respective fault input circuits. When the switches are set to the 2CH position, the Amp-1/Amp-4 circuits, Amp-2/Amp-5 circuits, and Amp-3/Amp-6 circuits are linked for switching both channels of the amplifier simultaneously.

S4 Input Bus – This switch allows the input signal bus to function across all six relay circuits for six single-channel amplifiers, or be split for three dual-channel amplifiers. Thus, if switches S2 and S3 are set to either 1CH or 2CH, this switch must also be set to the same operating mode. See the note below.

S5 Output Bus – This switch allows the output signal bus to function across all six relay circuits for six single channel amplifiers, or be split for three dual-channel amplifiers. Thus, if switches S2, S3 and S4 are set to either 1CH or 2CH, this switch must also be set to the same operating mode. See the note below.

NOTE

Switches S2, S3, S4 and S5 must be set to the same operating position. Do NOT operate any of the switches in opposite positions as this will result in improper operation of this module.

Maintenance

The Hot Standby Amplifier Module does not contain any user serviceable parts. Do **not** attempt to make any repairs to the module.

If the module requires service, contact your Regional Service Center for a return authorization number (RA#). The module should be shipped prepaid to GAI-Tronics with a return authorization number and a purchase order number. If the module is under warranty, repairs or a replacement will be made in accordance with GAI-Tronics' warranty policy. 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.

Troubleshooting

Problem	Solution
Module is damaged.	Do not attempt to repair the module. Contact GAI-Tronics service for repair or replacement of the module in accordance with the information provided on page 10.
Module does not switch to backup amplifier when any of the primary amplifiers fail or are powered-down.	Check polarity of wiring between fault inputs at the module, and the fault outputs at each amplifier. If using an amplifier equipped with a RJ-11 fault output connector, a reversal of the cable leads should correct the problem. Also, be sure the amplifier fault outputs are ground (dc common) referenced, and function as described on page 8.
Unused circuits are energized.	Install a jumper across any/all unused fault inputs, as described on page 2.
Relay switching activity can be heard on the module and output contacts are functioning. But the associated LED does not illuminate and the primary audio lines are not switching to the standby (back-up) amplifier.	If the module is used standalone or is the first in a cascade, set the BRD CNTL switch S1 to the 1ST position, as described on page 9.
Amplifier 4 switches when amplifier 1 fails. Likewise, amplifier 5 switches when amplifier 2 fails, and amplifier 6 switches when amplifier 3 fails.	Be sure switches S2 through S5 are set to the 1CH position when using single-channel (monaural) amplifiers, as described on page 9.
Both channels of the amplifiers are not switching simultaneously when faulted.	Be sure switches S2 through S5 are set to the 2CH position when using dual-channel (stereo) amplifiers, as described on page 9.

Problem	Solution
Amplifiers on the second (cascaded) module operate independent of the priority control scheme described on page 8.	In a cascade arrangement, switch S1 must be set to the 1ST position at the first module, and the 2ND+ position at the second module, and all subsequent modules, as described on page 9. Also, be sure wiring at the IN/OUT CNTL terminals at TB26 conforms to Figure 5 or Figure 6 on pages 4 or 5, respectively.
After performing all wiring checks, trouble-shooting, etc. as described in this section, the module still does not function properly.	Contact GAI-Tronics service for repair or replacement of the module in accordance with the information provided on page 10.

Specifications

Electrical

Power requirements	9.5 to 14 V dc (12 V dc nominal)
Current draw	300 mA maximum @ 12 V dc
Number of amplifier inputs.....	6-single channel or 3-dual channel
Fault input terminal voltage	6 V dc (nominal)
Fault input trigger voltages	6.01 V dc (active); 5.99 V dc (inactive)
Fault input circuit current	1.2 mA
Number of fault output contacts.....	6 (single channel mode) or 3 (dual-channel mode)
Fault output contact type	Single form "C"
Fault output contact rating	2 A maximum @ 30 V dc

Amplifier Audio Switching

Amplifier type.....	Single or dual-channel
Audio input levels (typical per circuit).....	600 ohm @ .775 Vrms (0 dBm) to 1.5 Vrms
Amplifier output power (maximum per circuit).....	720 watts (100% duty cycle)
Speaker load switching.....	Standard 4, 8 or 16-ohms, or 25 V, 70 V or 100 V constant voltage lines

Terminations

Type.....	Modular (plug-in) terminal blocks
Minimum conductor size	28 AWG (0.5 mm ²)
Maximum conductor size.....	12 AWG (3.0 mm ²)

Mechanical

Module dimensions	12.00 L × 4.00 W × 1.25 H inches (304.8 × 101.6 × 31.7 mm)
Module weight	1.1 lbs. (0.5 kg)

Environmental

Temperature range (operating/storage).....	32° to 140° F (0° to 60° C)
Humidity.....	85% non-condensing relative humidity

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.