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GAI-TRONICS® CORPORATION
A HUBBELL COMPANY

Model 4512-001, 4512-001FR, 4514-001 and 4514-001FR 6-Channel Radios User and Installation Manual

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Models 4512-001, 4512-001FR, 4514-001 and 4514-001FR 6-Channel Radio User and Installation Manual

Confidentiality Notice

General Information

Scope of Manual

This manual provides descriptive data and service information for the following models of the GAI-Tronics 6-Channel Radio:

- 4512-001 270 V dc
  Frequencies programmed by customer
- 4514-001 110/220 V ac
  Frequencies programmed by customer
- 4512-001FR 270 V dc
  Frequencies programmed at the factory
- 4514-001FR 110/220 V ac
  Frequencies programmed at the factory

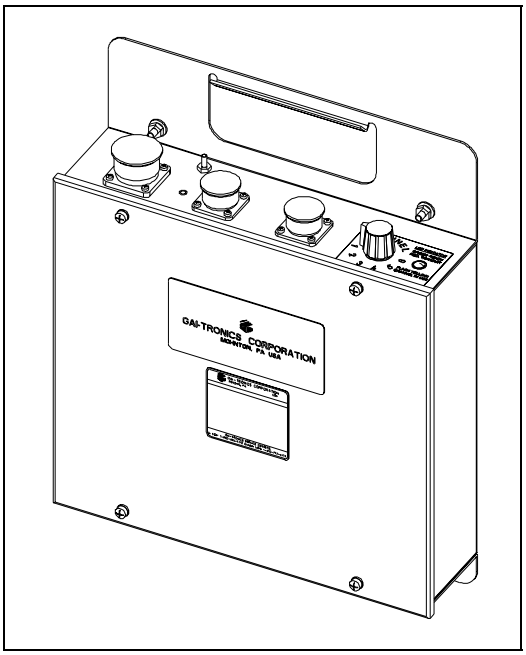


Figure 1. GAI-Tronics 6-Channel Radio

Features and Functions

- Easy installation and maintenance
- Portability with integral handle
- Programmable CTCSS and DPL provided as standard
- Heavy-duty industrial power supply and power line filter eliminates the need for external filtering
- Selection of power sources, speakers, and antennas provides system configuration flexibility
- High power receive audio and noise canceling microphone for noisy environments
- Standby/emergency battery option (integral to the chassis) providing continuous operation during temporary power interruptions

Description

The GAI-Tronics 6-Channel Radio is a stationary-mounted UHF transceiver suited for industrial complexes, especially in cranes or other mobile equipment. It has a heavy-duty housing and includes a choice of power sources (270 V dc or 110/220 V ac), microphones, speakers, and antennas. It has a 2-watt RF output and CTCSS for private communications is selectable.

The radio measures 11.25 W × 14.14 H × 3.00 D inches. The housing is also a mounting bracket, and includes an integral handle. The mounting bolts double as support feet when the unit is placed horizontally on a flat surface such as on a desktop.

The channel selector switch and the power, speaker, and microphone connectors are located on the top of the unit. The antenna connection is on the underside of the unit and remains easily accessible when the unit is mounted. Refer to the outline drawings below.

The standard power supply is nominal 120 V ac. There are 110/220 V ac or 270 V dc power supply options available. Added filtering is standard for the 270 V dc option. The radio transceiver module is easily replaceable in the field, but must be reprogrammed by a qualified technician.

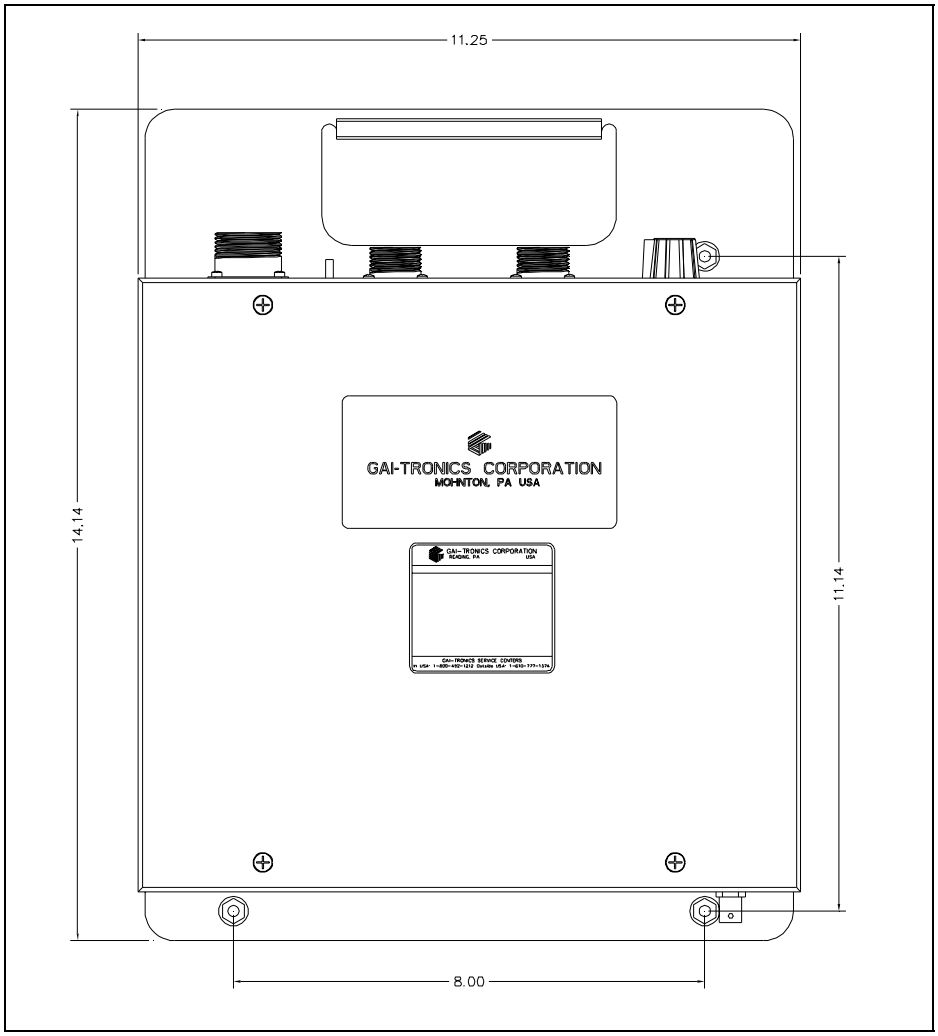


Figure 2. Outline of 6-Channel Radio

Connectors

Refer to the figure below for the location of the connectors and channel selector switch.

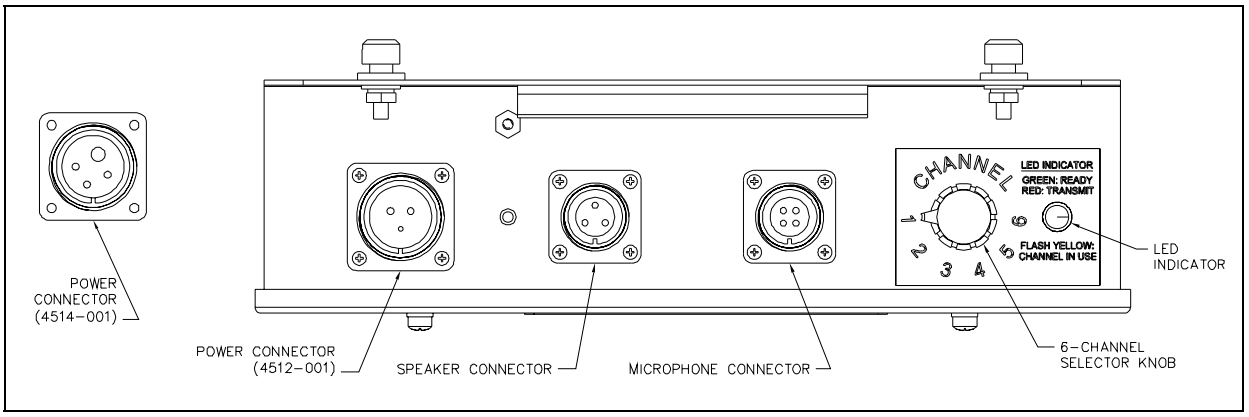
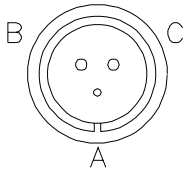
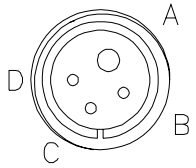


Figure 3. Top View of the 6-Channel Radio

Power Connector

Refer to the Figure 3 for the locations of the connectors. The pinout for the power connector is as follows:

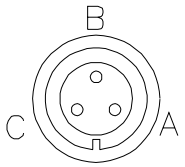
4512-001		
Pin No.	Function	
A	Spare	
B	270 V dc pos	
C	270 V dc neg	

4514-001		
Pin No.	Function	
A	Line hot	
B	Line neutral	
C	Spare	
D	Spare	

Speaker Connector

The speaker connector pinout is as follows:

Pin No.	Function
A	Common
B	Carrier detect output
C	8-ohm speaker

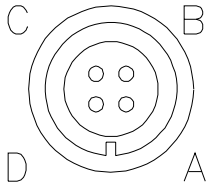


⚠**WARNING** ⚠ **Do not ground any speaker line as damage may occur to the speaker and/or radio. Jumper P6 must be in position 2-3 to activate the carrier detect output. See the Jumper Table on page 5. See Figure 7.**

Microphone Connector

The microphone pinout is as follows:

Pin No.	Function
A	Mic high
B	PTT (Transmit key)
C	Mic Lo
D	15 V dc power



Antenna Connector

The antenna connector is a coax cable connector.

Channel Selector Switch

The channel selector switch on the top of the unit provides the capability to easily select among the six labeled channels. In addition, a lighted LED provides indication of the state of the radio.

Radio Transceiver Module

The radio transceiver module's range is 450–470 MHz, and the six channel frequencies can be programmed in steps of 12.5 kHz at the factory to the customer's specifications. The radio transceiver can also be programmed for CTCSS.

NOTE: When the radio transceiver module is programmed for CTCSS or DPL it can only communicate with other radios that have the same CTCSS or DPL programming.

Interface PCBA

The Interface PCBA provided as standard equipment maintains regulation per a wide range of input voltages, and in addition to the internal protection, it is further protected from transients on the external power source by the optional surge filter PCBA. The power supply provides regulated 12.5 V dc to the radio circuits. It contains four jumper settings, which can be configured in accordance with the table below.

Jumper Table

Jumper Name	Function	Position	Default (as shipped)
P1	Receive Audio Level Select	1 - 2 = High level 2 - 3 = Low level attenuated 14 dB	1 - 2 2 - 3
P4	Audio Amp Enable	1-2 = Enable 2-3 = Disable	1-2
P5	Dynamic Mic/Carbon Mic Enable	1-2 = Enable 2-3 = Disable	1-2
P6	Optional Carrier Detect Output	1-2 = Disable 2-3 = Enable*	1-2

*Carrier detect output must be enabled (2-3) when used with the Model 1931888-3011 Page/Party® to Radio Coupler.

Pot R7

R7 is used to adjust the speaker level. Refer to Figure 4 on page 6 for the location of the pot. Refer to the Installation section for instructions for speaker output adjustment.

Wide Range (110/220 V ac/270 V dc) Power Supply PCBA

This switch-mode power supply features high-efficiency operation over an 85 to 300 V ac or dc input range. The output is adjustable to provide proper float charging voltage to the optional standby battery.

Pot 2

The power supply PCBA contains a pot adjustment, Pot 2. It is used to adjust the charging current into the optional standby/emergency battery. Refer to Figure 4 on page 6 for the location of the pot. Refer to Installation section for instructions for the charging current adjustment.

Surge Filter PCBA

This module provides additional power input filtering for noisy industrial 270 V dc power. It is standard on the Models 4512-001 and the 4512-001FR only.

Optional Standby/Emergency Battery

Each radio model is designed to operate with a rechargable battery. When installed, the standby/emergency battery supplies power for up to 15 minutes during maximum power drain, and longer at the average power drain. The GAI-Tronics 40201-004 battery is sold separately. For locations of internal components, refer to the diagram shown below:

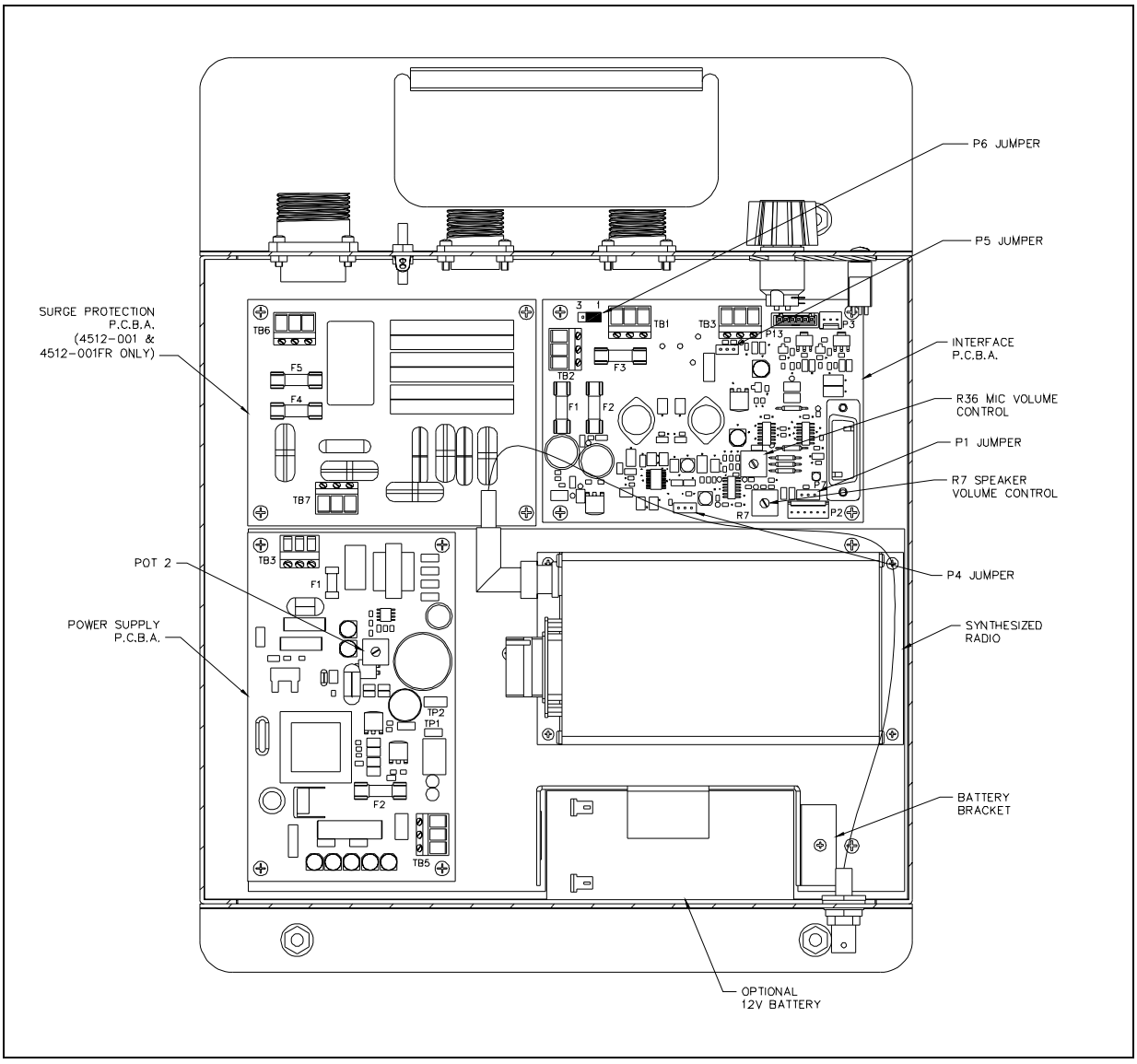


Figure 4. Internal Components of the 6-Channel Radio

Installation

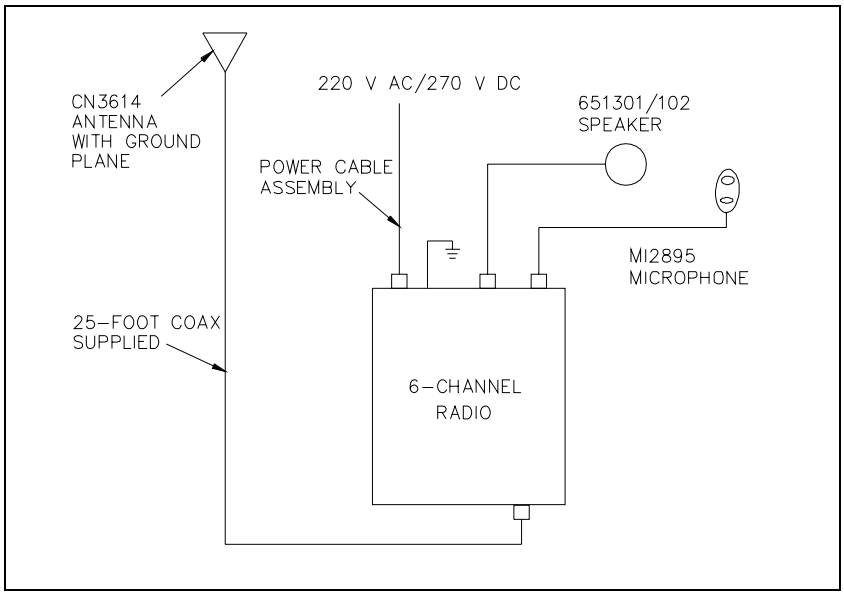


Figure 5. Sample Installation Diagram

Mounting

The radio can be placed horizontally on a desk or mounted vertically on a wall. To wall mount the radio, remove the four bolts/support feet from the back of the housing. Mark the position of the housing, and reinstall the bolts through the housing to a base plate or other suitable support.

FCC Interference Warning

The FCC requires that manuals pertaining to Class A and Class B computing devices must contain warnings about possible interference with local residential radio and TV reception. This warning reads as follows:
NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Safe Handling of CMOS Integrated Circuit Devices

Many of the integrated circuit devices used in communications equipment are of the Complementary Metal Oxide Semiconductor (CMOS) type. Because of their high open circuit impedance, CMOS integrated circuits are vulnerable to damage from static charges. Care must be taken handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS integrated circuit inputs, the protection is effective only against overvoltage in the hundreds of volts range such as is encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules, even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal, earth-grounded surface. This will discharge any static charge that may have accumulated on the person doing the servicing.
   NOTE: Wearing a conductive wrist strap will minimize static build-up during servicing.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.

3. Power down the unit before installing or removing the circuit module.

4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static build-up. Similarly, disconnect the test probe prior to removing the ground lead.

5. All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe.

6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) that is connected to ground through 100k of resistance.

7. When soldering, be sure the soldering iron is grounded with a grounded tip.

8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static build-up as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

9. When replacing a CMOS integrated circuit device, leave the device in its conductive rail container or conductive foam until it is to be inserted into the printed circuit module.

10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). **Never use non-conductive material** for packaging these modules.

Equipment Required

Test Equipment

- RF service monitor
- AC voltmeter with dB ranges for measuring audio levels
- #1 Phillips screwdriver
- 1/8-inch flat blade screwdriver

Documentation

- these installation instructions
- the manual for the radio transceiver module, Pub. DTX-MRMe-142/442

Cable Installation Safety Considerations

Interconnecting, communications, and Class 2 dc power cables should be separated from electrical light or other Class I circuits by at least 2 inches. The exception is where Class I wiring or power circuits are run in a raceway, or are metal-sheathed or metal-clad, or are permanently separated from the conductors of the other circuitry by a continuous and firmly fixed nonconductor such as porcelain tubes or flexible tubing in addition to the insulation on the wire. Communications cables and in-building wiring should be listed and marked for the purpose according to NEC Article 800.

Surge Protection

The Model 4514-001 and 4514-001FR 6-Channel Radios (110/220 V ac) incorporate standard agency-approved surge protection. The power line fuse on the power supply module must be replaced with the same type fuse to maintain agency approval and safety protection.

Additional surge protection is available on the 4512-001 and 4512-001FR modules with additional safety fusing. These fuses must also be replaced with the same type to maintain agency approval and safety protection. See the Field Replacement Items section.

Antenna Connection

Select a Model CN3614 or similar antenna. Connect the antenna to the underside of the radio unit using the 25-foot coax antenna cable. Refer to Figure 6 and Figure 7 for the Models 4512-001 and 4514-001 respectively.

Select an area for antenna mounting that gives the antenna an unobstructed view of the surrounding area. Without proper line of sight to other antenna(s), TX and RX may be hindered. Antennas should be mounted at least 3 feet from I-beams and metal bulkheads.

NOTE: Check the antenna with a wattmeter for proper standing wave ratio (SWR).

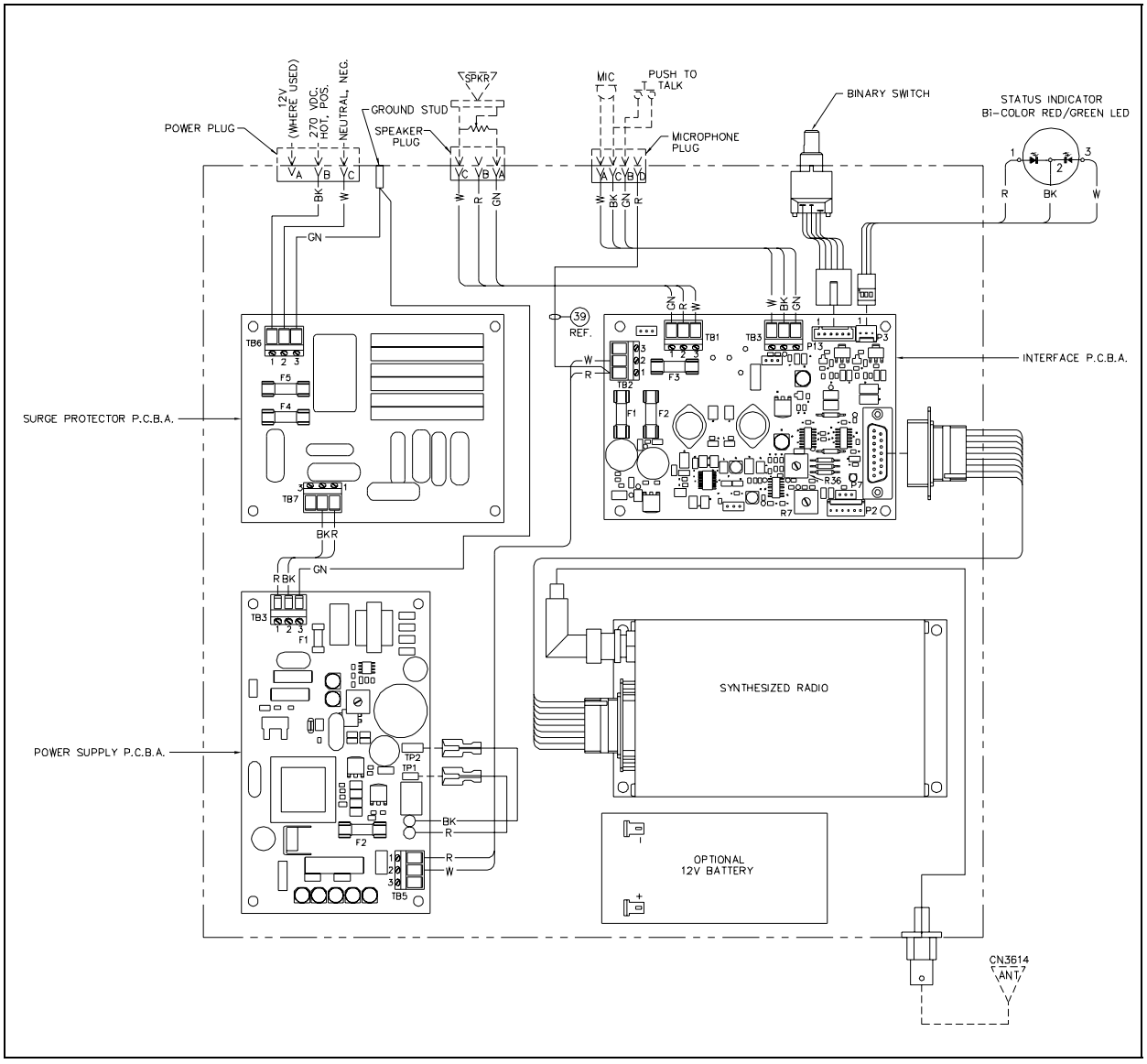


Figure 6. Model 4512-001 Connection Diagram

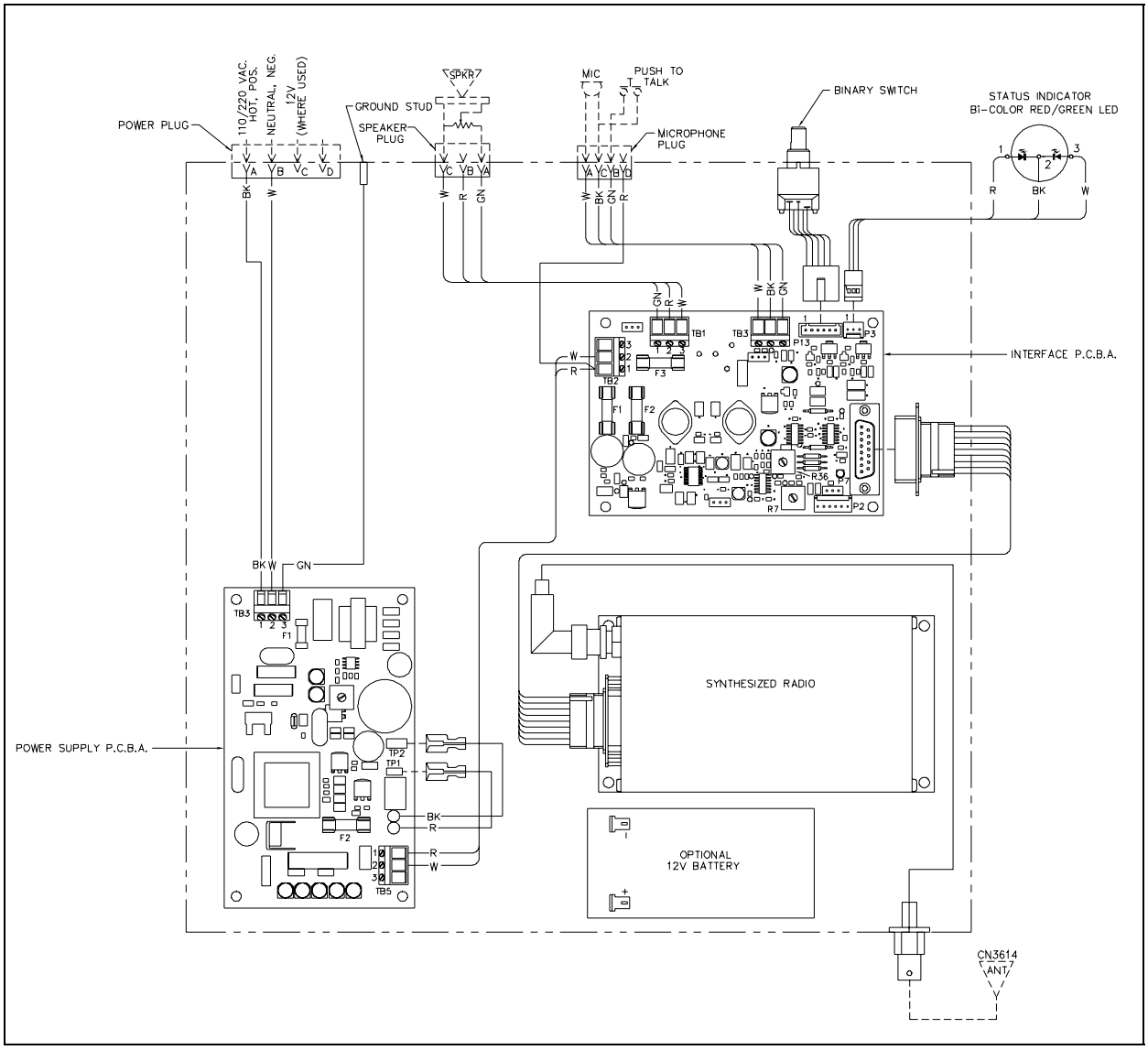


Figure 7. Model 4514-001 Connection Diagram

Power Connections

The power connections for all voltage options connect to the same MS connector on the top end of the chassis. The power cord is not included. Refer to Figure 6 and Figure 7 for the respective models above.

⚠ CAUTION ⚠ Connect the power cable to the correct power source. Follow all the appropriate National Electric Code as well as local county and city electric codes.

Models 4514-001 and 4514-001FR

- The black wire (pin A) is hot in the case of 110/220 V ac.
- The white wire (pin B) is neutral or negative.

Models 4512-001 and 4512-001FR

- The black wire (pin B) is positive in the case of 270 V dc.
- The white wire (pin C) is negative.

Battery Connections

Install the GAI-Tronics 40201-004 Battery as follows. Refer to Figure 4 on page 6.

1. Loosen the mounting screw on the right of the 63069-013 battery bracket and lift it out of the key hole slot. Slide the battery into place. Replace the bracket and tighten the bracket screw.

2. The battery wire connections are parked on terminals TP1 and TP2 on the power supply board.

3. Unplug the black wire from the power supply board and slide onto (-) negative terminal of the battery.

4. Unplug red wire from the power supply board and slide onto (+) positive terminal of the battery. **NOTE:** If the battery is already charged a small spark may occur when connecting the red wire. This is normal.

Microphone Connection

Select a Model MI2895 or similar microphone. Install the microphone by plugging it in using the appropriate connector on the top of the radio. R36 is the microphone volume adjustment.

Speaker Connection

Select a Model 651301/102 or similar cast speaker. Install the cast speaker by plugging it into the appropriate connector on the top of the radio.

⚠**WARNING** ⚠

Do not ground any speaker line as damage may occur to the speaker and/or radio.

Programming

The radio transceiver module contains programmable features, such as CTCSS and frequency selection, which can be set at the factory to the customer's specifications.

Any changes should be made by a qualified technician. The software programming kit (Part No. 19101-024) is required.

Power Supply Adjustment

The power supply PCBA is factory-adjusted for a float voltage of 13.8 V dc at 11.5 mA charging current into the optional standby/emergency battery. The charging current can be adjusted using Pot 2 on the power supply PCBA. Refer to Figure 4 on page 6 for location of Pot 2. If field adjustment becomes necessary, the procedure is as follows:

1. Disconnect the battery terminals and substitute a 1200-ohm, 5% resistor connected across the 'fast-on' terminals that are disconnected from the battery.

2. Measure across the resistor, and adjust the float level, Pot 2, for 13.8 $\pm$0.1 V dc.

3. Disconnect the load resistor and re-connect the leads of the battery.

Speaker Output Adjustment

The speaker output volume is adjustable using R7 on the interface PCBA. Refer to Figure 4 on page 6 for the location of R7. The adjustment procedure is as follows:

1. With the speaker in place, initiate a radio conversation with a second radio user.

2. Adjust R7 for the desired maximum speaker volume.

Operation

Use the microphone to operate the radio in a standard push-to-talk/release-to-listen mode. Choose among the six channels by rotating the channel selector switch. Keep transmissions short to avoid tying up the channel. Continuous transmissions longer than 30 seconds will be terminated by a built-in transmit limit timer (TOT).
NOTE: This setting can be factory adjusted.

Note that units programmed with the CTCSS or DPL can only carry on two-way communications with units which have identical CTCSS or DPL programming. Refer to the transceiver module manual, Ritron Pub. DTX-MRM, for details.

Initiating Calls

1. To initiate a call, press the microphone button. Always allow a short delay before speaking to allow time for the radio channel to be established.

2. Speak directly into the microphone held approximately 1/2 inch from the mouth. The microphone button must be held down while talking to the radio user and released to listen.
   NOTE: The speaker is muted during transmission. To unmute, move the shorting jumper P4 from P4-1/P4-2 to P4-2/P4-3.

3. When the transmission is completed, the radio returns to the receive mode.

Receiving Calls

When power is applied, the radio is in the receive mode, allowing receive audio to be heard through the speaker. The radio is always in receive mode unless the user presses the microphone button. To reply to a call, wait until the caller has finished speaking; then press the microphone button and reply.

Controls

The rotary frequency switch on the top of the unit selects the radio channel. The multi-color LED indicates the radio channel status.

- Green: Indicates power is on/idle condition
- Flashing yellow: Indicates channel activity (in use)
- Red: Indicates transmitter on (PTT active)

Maintenance

Ordering Replacement Parts

When ordering replacement parts or requesting equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part and sufficient description of the desired component to identify it. Order parts from:

Customer Service
GAI-Tronics Corporation
400 E. Wyomissing Ave.
Mohnton, PA 19540
US: 800-492-1212
Outside US: 610-777-1374

Service and Repair

Inoperative or malfunctioning equipment should be returned to the factory for repair. Please call **1-800-492-1212** or **610-777-1374** to obtain a Return Authorization number, published repair prices, and shipping instructions.

NOTE: A purchase order or credit card number is required prior to processing non-warranty repairs.

Troubleshooting the 6-Channel Radio

The following is a list of potential problems you may encounter and possible solutions.

Problem	Possible Solution
The radio does not transmit.	1. Check to determine if logic low is reaching the radio via P7 pin 14.
	2. Check to determine if power and ground are reaching the radio via P7 pin 6 and pin 15.
Radio is getting power, ground, and PTT, but still does not transmit.	Replace radio module. Replacement and any necessary reprogramming must be made by a licensed technician.
There is no receive audio.	1. Ensure the P4 jumper is installed between pins 1 - 2
	2. Check for audio signal at TB2 (speaker terminals).

Fuse Replacement

⚠ **CAUTION** ⚠ **For continued safe operation, replace fuses with the same type (See Field Replacement Items):**

- **Power supply PCBA fuse F1 is a Bussman C515S 1.25A SB 2AG**
- **Power supply PCBA fuse F2 is a Bussman Slo-Blo GMA 5A 250 V**
- **Surge filter PCBA fuses F4 and F5 is a Bussman Slo-Blo GMA 2A**
- **Interface PCBA fuses F1 and F3 are Bussman Slo-Blo GMC 1.0A 250 V**
- **Interface PCBA fuse F2 is a Bussman Slo-Blo GMC 0.1A 250 V**

Battery Replacement

The optional standby/emergency battery is designed to have a shelf life of approximately two years, but battery life may be reduced depending on use. The battery is automatically re-charged during normal radio usage. If the battery fails to operate the radio during a brief power interruption, the battery may need to be replaced.

Replace the battery (Part No. 40201-004) as follows:

1. Disconnect the cable connectors at the top of the battery, by sliding them off.
2. Remove the screw on the right of the battery mounting bracket.
3. Slide the bracket up and lift it out of the keyhole slot.
4. Reverse the process to install the new battery.

Performance Specifications

Color ..... Black
Construction ..... Dust-resistant steel enclosure
Physical size ..... 14.125 H × 11.250 W × 3.00 D inches
Weight ..... 10 lbs.
Temperature range ..... -30º C to +60º C
Humidity ..... 90% non-condensing

270 V dc Option

Supply voltage range ..... 200 to 350 V dc range, (270 V dc nominal)
Power consumed ..... 8 W Standby/30 W maximum
Supply voltage filtering ..... Two stage LC, RES, MOV

110/220 V ac Option

Supply voltage range ..... 85 to 260 V ac range, (50/60 Hz; 110/220 V ac nominal)
Power consumed ..... 8 W Standby/30 W maximum
Channel frequencies 1 through 6 ..... As specified by customer
Speaker amplifier ..... 8 watts maximum into 8 ohm
450–470 MHz Radio Transceiver ..... See Pub. DTX-MRMe-142/442
Microphone ..... No. MI2895 dynamic, amplified, noise-canceling
Speaker ..... No. 651301/102 Cast aluminum, 16-ohm with volume control
Antennas ..... No. CN3614 1/4 wave whip antenna
Connections ..... MS Series connectors
Standby/Emergency Battery Option ..... 15 minutes under maximum power drain
longer with average current drain

Model Numbers

4512-001 ..... 270 V dc; Frequencies programmed by customer
4514-001 ..... 110/220 V ac; Frequencies programmed by customer
4512-001FR ..... 270 V dc; Frequencies programmed at factory
4514-001FR ..... 110/220 V ac; Frequencies programmed at the factory

NOTE: Customers are to supply frequencies to GAI-Tronics at the time of order

Accessories

Description	Part No.
Microphone, Noise-Canceling	MI2895
Cast Aluminum Speaker	651301/102
Antenna with 25-foot Coax Cable and Connector	CN3614
UHF Ground Plate	CH3272
6-Channel Radio to GAI-Tronics Page/Party® Coupler	1931888-3011
Radio Programming Kit	19101-024
Battery, 1.3 AH, 12 V sealed rechargeable, lead-acid	40201-004

Field Replacement Items

Description	Part No.
Fuse F1 (Power Supply PCBA) Bussman C515S 1.25A SB 2AG	4612-23015-25
Fuse F2 (Power Supply PCBA) Bussman SB GMA 5 amp 250 V	51808-007
Fuse F4 and F5 (Surge Filter PCBA) Bussman SB GMA 2 amp	51809-008
Fuse F1 and F3 (Interface PCBA) Bussman SB GMC 1.0 amp 250 V	51809-006
Fuse F2 (Interface PCBA) Bussman SB GMC 0.1 amp 250 V	51809-001
PCBA, 6-Channel Radio Power Supply	69316-202
PCBA, 6-Channel Radio Interface	69317-003
PCBA, 6-Channel Radio Surge Protector	69318-001
Protective Cap, 7/8-inch	MC3761
Protective Cap, 1-1/8 inches	MC3762
Synthesized UHF Transceiver Module	19101-019

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.