

RA-150 TR-3/4 PLUG-IN RELAY MODIFICATION KIT v2.1

INSTALLATION INSTRUCTIONS

WARNING: Voltages inside the radio CAN & WILL KILL YOU! You MUST know how to work around HIGH VOLTAGE safely. If you do not, get assistance from someone who does. You MUST also be able to read your specific radio schematic and understand the design, theory and wiring of your radio to properly perform this upgrade.

Connections to the relay are different in the TR-3 and TR-4 transceivers. Please note that steps required for each radio are prefixed by (TR-3) or (TR-4) in bold type. Perform only the steps required for your particular radio. Steps without a (TR-3) or (TR-4) designation will be performed on both radios.

RA-150 TR-3/4 PLUG-IN RELAY MODIFICATION KIT INSTALLATION

- Read, re-read and fully understand these instructions prior to beginning this upgrade.** Make sure to perform the steps in the order they are listed. Also, be sure to label wires and/or connections as they are disconnected from various points inside the radio. This will help when the time comes to re-attach the wires and/or connections that will be disconnected during installation of the kit.
- Go through the Bill of Materials (BOM) and compare that list with the parts in the kit to make sure all parts are present. If you are missing any parts, please contact Harbach Electronics, LLC.
- Remove the top and bottom covers from the chassis.
- (TR-3)** Remove two (2) sheet metal screws and one (1) 6-32 nut securing the power amplifier (PA) cage.
- (TR-4)** Remove seven (7) screws securing the power amplifier (PA) cage.
- Loosen the setscrews closest to the PA cage on the PLATE and LOAD shaft couplings and slide the shafts slightly forward to allow the PA cage to be removed.
- Remove the PA cage.
- (TR-3)** Unsolder the wire from the SO-239 coax connector.
- (TR-3)** Unsolder the spaghetti-covered wire from the stator connection lug on the rear-most section of the load capacitor and the lead from the large RF choke (RFC7) from the relay contact.
- (TR-3)** Unsolder the center conductor of the small coax from the relay contact and the shield from ground.
- (TR-3)** Unsolder the lead of the small RF choke (RFC8) from the relay contact.
- (TR-4)** Remove the #12 fuse lamp from the socket. **CAUTION: Pull the lamp straight out of the socket, DO NOT twist!**
- (TR-4)** Unsolder the large RF choke (RFC7) from the LOAD capacitor frame and from the center conductor of SO-239 connector.
- (TR-4)** Unsolder the center conductor of small coax from terminal #6 of the #12 fuse lamp socket and the shield from ground. **BE CAREFUL, the lamp socket is very fragile.**
- Clip the remaining wires attaching the original T/R relay to the feedthrough capacitors and ground. Remove two (2) #4 screws, washers and grommets securing the original T/R relay to the chassis. **NOTE:** The small RF choke (RFC8) will be removed and is not re-installed as it will no longer be needed due to a direct connection between the new relay and feed-through capacitor C90.

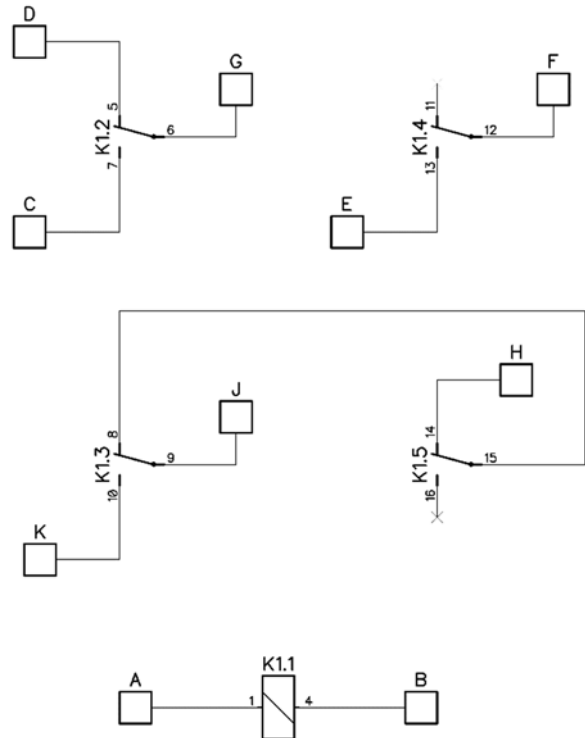
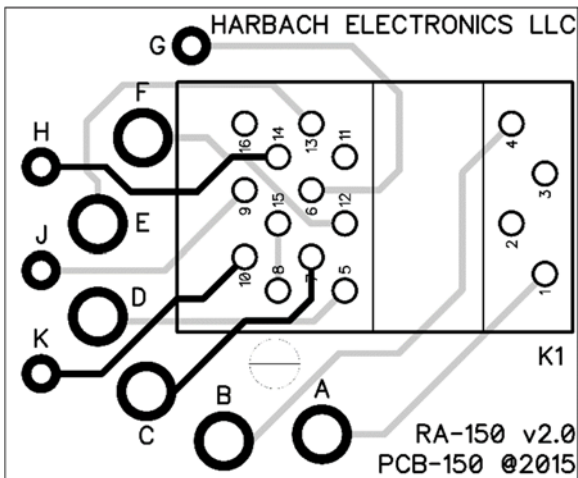
- Remove the SO-239 connector.
- Carefully** unsolder all connections from the feed-through capacitor terminal posts and remove excess solder. **CAUTION: The bodies of the feed-through capacitors are made from ceramic and will not withstand excessive pressure or abuse.**
- Install the relay socket on the top (silk screened) side of the new relay PC board (PCB) and solder on the bottom of the PCB.
- Route the small coaxial cable that was unsoldered earlier up through the access hole from the bottom of the new relay PCB near pads A and B.
- Align the new relay PCB over the feed-through capacitor terminals and check for proper alignment. NOTE: It may be necessary to bend the terminal posts slightly for proper alignment.
- Slide the new relay PCB over the feed-through capacitor terminal posts and position so that the PC board lays on the flats of the terminal posts. NOTE: Some terminal posts are crimped, thereby enabling the PC board to rest on the crimps. In these units, position the relay board down upon the crimps. **DO NOT attempt to go beyond the crimps on the terminal posts.**
- After checking for proper alignment of the relay board, solder all terminal posts to the corresponding pads labeled A-F. NOTE: It may be necessary to maintain slight pressure on top of the relay board to maintain alignment during soldering.
- Re-install the SO-239 connector.
- (TR-3)** Solder the center conductor of the small coaxial cable to hole H on the new relay PCB, and the shield to ground.
- (TR-4)** Solder the center conductor of the small coaxial cable from the hole in the new relay PCB to terminal #6 of the #12 fuse lamp socket and solder the shield to ground. Terminal #6 of the fuse lamp holder is furthest away from the SO-239 connector.
- (TR-4)** Connect hole H on the new relay PCB to terminal #5 of the #12 fuse lamp socket using a piece of the supplied #22 bare hookup wire and spaghetti tubing. Solder both connections. Terminal #5 of the fuse lamp holder is closest to the SO-239 connector.
- Connect hole J on the new relay PCB to the center conductor of the SO-239 using a piece of the supplied #22 bare hookup wire and #19 spaghetti tubing. Solder both connections.
- (TR-3)** Connect hole G on the new relay PCB to a convenient ground location using a piece of the supplied #22 black hookup wire. Solder both connections.
- (TR-4)** Connect hole G on the new relay PCB to the ground lug on the #12 fuse lamp using a piece of the supplied #22 black hookup wire. Solder both connections. NOTE: If there isn't a ground lug on the #12 fuse lamp bulb, any convenient ground will suffice.
- (TR-3)** Connect hole K on the new relay PCB to the stator connection lug on the rear-most section of the load capacitor using a piece of the supplied #22 bare hookup wire and #19 spaghetti tubing. Solder both connections.
- (TR-4)** Connect hole K on the new relay PCB to the junction of a 10 pF disc capacitor and the LOAD capacitor terminal using a piece of the supplied #22 bare hookup wire and #19 spaghetti tubing. Solder both connections. NOTE: On some units there will be a 2.2 MΩ resistor at this junction.
- Solder the RF choke (RFC7) attached to the LOAD capacitor frame to the center conductor of the SO-239 connector.

- Install the plug-in relay into the socket.
- Install the relay retainer clip over the relay body if desired. NOTE: It will be a tight fit and difficult to get the clip in its proper position.
- (TR-4)** Replace #12 fuse lamp in socket.
- (TR-3)** Reattach the PA cage to the chassis using two screws and a 6-32 nut.
- (TR-4)** Reattach the PA cage to the chassis using seven (7) screws.
- Slide the PLATE and LOAD shafts toward the PA cage and slide the shaft couplings over the short shafts protruding from the PA cage and tighten the setscrews. Make sure the shafts are connected in the correct orientation.
- Remove the wire from pin 1 of the 6EV7 tube socket.
- Solder one end of the 1.5 k Ω 2-watt resistor to pin 1 of the 6EV7 tube socket.
- Solder the wire removed from pin 1 of the 6EV7 socket to the free end of the 1.5 k Ω resistor. Insulate the flying connection as required.
- Recheck all solder connections and dress all wire leads as needed.
- Replace the top and bottom covers.

This completes the installation of the RA-TR3/4 Plug-In Relay Modification Kit.

RA-150 BILL OF MATERIALS (BOM)

Verification	Part Number	Quantity	Description	Designation
[]	PCB-150	1	TR-3/4 Plug-In Relay PCB v2.0	N/A
[]	RES-800	1	1.5KΩ 2W Resistor	N/A
[]	RY-TR4C	1	4PDT Plug-In Relay	K1
[]	SKT-150	1	4PDT Relay Socket	N/A
[]	SKT-151	1	Relay Retainer Clip	N/A
[]	TUB-160	12	#19 Spaghetti Tubing	N/A
[]	WIR-102	6	#22 Stranded Black Wire	N/A
[]	WIR-116	12	#22 Solid Bare Wire	N/A



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