

Installation Instructions
for
VHF-251A
Communications Transceiver



S-TEC

NOTICE TO THE INSTALLER

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article on or within a specific type or class of aircraft to determine that the aircraft operating conditions are within the TSO standards. The article may be installed only if further evaluation by the user/installer documents an acceptable installation and is approved by the Administrator.

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VHF-251A

Communications Transceiver

1.1 GENERAL

The following paragraphs provide instructions for unpacking and visual inspection, preparation for installation, installation, and post-installation test of the VHF-251A Communications Transceiver.

1.2 UNPACKING AND VISUAL INSPECTION

Carefully unpack the unit and installation kit from the shipping container and perform a visual inspection of the contents for shipping damage. File all claims for damage with the transportation company involved. If filing claims for damage, save the original packing carton and materials. If no defects are detected, replace the packing materials in the original shipping container and save for future uses such as storage or re-shipment.

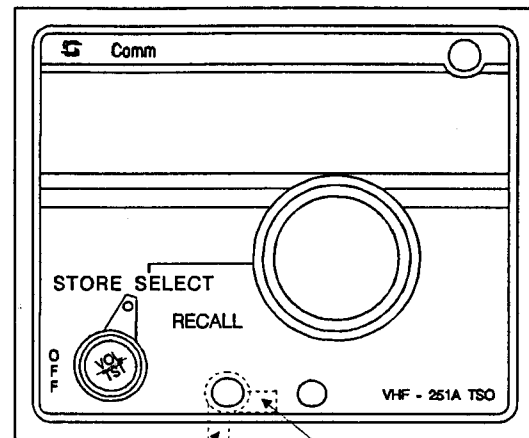
1.3 PREPARATION FOR INSTALLATION

The following are special instructions which must be followed to ensure proper installation of the VHF-251A. Damage to equipment may occur if these instructions are not followed.

CAUTION

Turn lock must be in unlocked position prior to unit insertion in tray. Refer to figure 1.

- When inserting the VHF-251A in its mounting tray, do not push on the electronic display panel. To insert, place thumbs on bottom corners and gently apply pressure until the rear connectors are properly mated. Using an Allen wrench, twist the turnlock into position.
- When removing the VHF-251A from its mount, do not pull on top of the panel. Grasp the unit by the frequency selector knobs and carefully pull out.
- Wires carrying +13.75/+27.5 VDC including power ground must be 20 AWG or larger, all others must be 24 AWG or larger.



Engaged (Locked Position)

Disengaged (Unlocked Position)

ROTATE 90 DEG. CCW TO DISENGAGE
TURNLOCK USING 5/64-INCH ALLEN WRENCH

Figure 1, Turnlock Positioning

- Read all notes on drawings and interconnects before installing units.
- Wires carrying alternator ripple current or 400 Hz current, if dressed close to the transceiver, may produce audible interference due to synthesizer modulation.
- Speaker wire, if dressed close to transceiver, may produce feedback howl due to synthesizer modulation.

1.4 INSTALLATION

WARNING

In the interest of personal safety, it is recommended that the aircraft battery master switch be turned off to disconnect power to the equipment mount before any electronic equipment is removed from or installed in the aircraft.

The following installation procedures must be performed as described to ensure proper operation and performance. Any deviation from these instructions may result in reduced performance and/or damage to the equipment.

1.4.1 VHF-251A Communications Transceiver

a. An installation kit, S-TEC Part Number 690202-1, is required to install the VHF-251A. Refer to table 1 for special tools required.

b. The VHF-251A is rigidly mounted in the aircraft instrument panel. There are two methods that may be used for installing the mounting tray provided in the installation kit. Both methods position the tray with front edges extended through the panel cutout, but flush with the aircraft instrument panel. Refer to figure 3 for panel cutout dimensions.

c. Avoid mounting close to external heating sources. If it is unavoidable, use blower or ram air cooling. Under normal installation conditions, ram air or blower cooling will increase reliability of the VHF-251A.

d. Secure the mounting tray to the instrument panel mounting rails, using four #6-32, 100-degree flathead screws. It is recommended that the rear mounting straps be used for added support. Figure 5 illustrates typical system installations.

e. After the mounting tray has been secured in position, slide the rear connector assembly into place and secure by tightening four screws. Snap into place the protective shroud provided in the installation kit and tie in place to prevent accidental removal due to shock or vibration. Holes are provided in the shroud and rear plate assembly for this purpose.

CAUTION

Do not force turnlock into position. If difficulty is experienced, remove VHF-251A and check rear connector assembly for proper positioning.

f. Carefully slide the VHF-251A into the mounting tray. Using your thumbs, apply pressure to the bottom corners of the VHF-251A until the connectors are mated. Using a 5/64-inch Allen wrench, secure the VHF-251A in place by twisting the turnlock into position.

After tightening, pull the frequency selector knobs to be certain the turnlock is in the locked position. Refer to Figure 1.

NOTE

The following steps pertain to dual installations only.

g. Dual installations are accomplished by joining two mounting trays together, using the hardware provided in the installation kit. Connecting screws should be varnished to prevent loosening due to vibration. Included in every installation kit are two straps and two screws. To join two mounting trays together, four straps and four screws are required. (Refer to figure 2).

h. Dual installation cutout dimensions are shown in figure 3 for both behind-the-panel and front panel mounting installations.

1.4.2 ANT-251 VHF Comm Antenna

a. Select a suitable location for antenna mounting using the template shown in the outline and mounting dimensions drawing, figure 4. The ANT-251 may be installed on either the top or bottom of the aircraft where ground clearance warrants.

NOTE

Keep comm antennas as far as possible from VHF nav antennas. Isolation between comm and nav antennas should be at least 30 db.

b. The mounting area selected must provide a stable base for the antenna as well as clearance for the connector. An unobstructed area providing line of sight between antenna and intended receiving stations is desirable.

c. The surface selected should provide continuous metal contact between the antenna and the aircraft. Adapter plates or shims, when used, must be metallic and shaped to interface the antenna base to the aircraft contour. Mating surfaces must be clean of paint, primer, dirt and oxidation. Inner mounting hardware such as doublers and stop nuts also must maintain direct electrical grounding to the airframe.

d. After location has been selected, drill the antenna mounting holes and secure in place using four #8 screws.

e. If sealant or aerodynamic smoother is used around the antenna base, ensure application is made after antenna is fastened securely in position.

1.5 CABLING

The VHF-251A mating connector part number is shown on the outline and mounting diagram. Figure 6 lists mating connector pin assignments.

During preparation of the interconnect wiring cables, observe the following precautions:

a. Bond and shield all parts of the aircraft electrical system, such as generator and ignition systems.

b. Keep the interconnect cables away from circuits carrying heavy current, pulse transmitting equipment, and other sources of interference.

c. Figure 6 presents the VHF-251A mating connector pin assignments. Refer to that illustration and the

VHF-251A interconnect wiring diagrams figure 9 or 10, when preparing the interconnect cable.

d. Leave slack in the cable to allow for movement due to vibration.

e. After installation of the cables in the aircraft and before installation of the equipment, a check should be made to ensure that the aircraft power is applied only to the pins specified. Refer to figure 6 for connector pin assignments.

Table 1. Special Tools

DESCRIPTION	MANUFACTURER AND TYPE	PART NUMBER
Crimping tool	Cannon, CCT-D*C-1	371-0382-010
Insertion/extraction tool - plastic	Cannon, CIET-20HDB	371-8445-010
Insertion/extraction tool - metal	Cannon, CIET-22	371-8445-020

f. Remove and install connector contacts in accordance with steps g through i. Table 1 list the special tools required to perform the following steps.

g. During installation of the mating connector, the connecting wire must be crimped in the contact so that the crimped portion of the contact can enter the connector shell and provide a positive lock of the contact in the shell. Use crimping tool (Cannon P/N CCT-D*C-1) and crimp each interconnect wire in a contact. Using the insertion/extraction tool(Cannon P/N CIET-20HBD) insert the contact into the proper connector shell hole from the rear and press until locked. Refer to figure 7.

h. Do not dress speaker wire, wires carrying alternator ripple current, or wires carrying 400 Hz current alongside the transceiver. Ignoring this caution may result in synthesizer modulation that produces degraded audio quality or feedback howl.

i. During removal of a contact, use the insertion/extraction tool to unlock the contact, and pull the contact out of the connector from the rear.

j. Refer to figure 8 for installation of antenna cable connector. Use RG-58A/U coaxial cable in the installation.

k. Do not bundle comm or nav antenna cables together. If possible, route the cables on opposite sides of the aircraft.

1.6 POSTINSTALLATION CHECKS

WARNING

The potential exists for a significant reduction in, or the complete cancellation of, the received audio output signal of two VHF communications transceivers (regardless of manufacturer) in the same aircraft if all of the following conditions exists:

- a. Two transceivers are tuned to ground stations that simultaneously transmit the same message.

NOTE

Ordinarily this occurs when both transceivers are tuned to the same frequency. However, it can also occur when more than one ground station transmitter is used to transmit a single voice message.

- b. Audio outputs are adjusted to approximately the same level.
- c. The audio output phase shifts of the two communications systems (including the audio panel) are approximately 180 degrees apart.
- If the phase shift through both transceivers is the same (in phase) and the audio panel does not introduce phase differentials, no attenuation or cancellation of the received signal will occur.
- All users of VHF communications transceivers should be aware of this potential situation and take the following precautions to prevent this problem from occurring.
- d. Make a habit of avoiding simultaneous tuning of two transceivers to the same frequency or to two frequencies that carry the same voice message.
- e. Test the transceiver and audio panel as described in the following procedures to determine whether or not the problem of incompatible phasing exists.

After installation of the equipment in the aircraft, perform a system check to ensure that cancellation or attenuation is not a problem.

- f. Tune both transceivers to the same frequency. (In aircraft with three transceivers, each combination of

two units must be tested.)

- g. Set the audio panel so that both transceiver outputs are heard through the same speaker or headset.
- h. Set one transceiver volume control approximately to its midpoint.
- i. Slowly adjust the other transceiver volume control through its midpoint position and listen for a reduction in the level of the combined audio output.

If the transceiver phase shifts are incompatible, the audio signal will be completely canceled or appreciably reduced as the audio output level of the two transceivers approach equality. If the transceiver phase shifts are compatible, the audio output will be at least as loud as that of a single unit. The preceding test should be performed after any change of VHF communications transceiver or audio equipment.

Normally this problem is extremely rare in a pure VHF-251A system; however, extra attention should be given in a mixed system check-out. Keep in mind that any equipment interfacing with the transceiver (audio panel, line buffers, another VHF COMM transceiver, or auxiliary amplifiers) may influence the audio phase and contribute to attenuation/cancellation.

After cabling has been installed and the equipment has been mounted in the aircraft, make the operational check outlined below to ensure correct operation of the equipment in the aircraft. These test may be made using the aircraft power supply with the engine running or with auxiliary power applied to the aircraft.

- j. Apply power to the VHF-251A by turning the ON/OFF switch.
- k. Check the squelch disable circuit by pulling out the OFF/VOL/TST control. Noise from the receiver should be applied to the aircraft audio system.
- l. Select the operating frequency of a known station in the immediate area. Press the microphone push-to-talk switch and obtain a signal check. Repeat this procedure with other stations on different frequencies if possible.

m. The VHF-251A automatically dims the display in low light. The lower limit of the dimming circuit is set by adjusting a pot (located under the frequency selector knobs) with a screwdriver. This adjustment must be done at night or in a completely dark hangar. Adjust the pot for a comfortable fully dimmed display brightness level.

WARNING

Incorrect adjustment of the dimmer control may cause the display to go completely dark at night. Adjusting the pot does not change the brightness in the daylight. All adjustments must be made under conditions no brighter than a night-lighted cockpit.

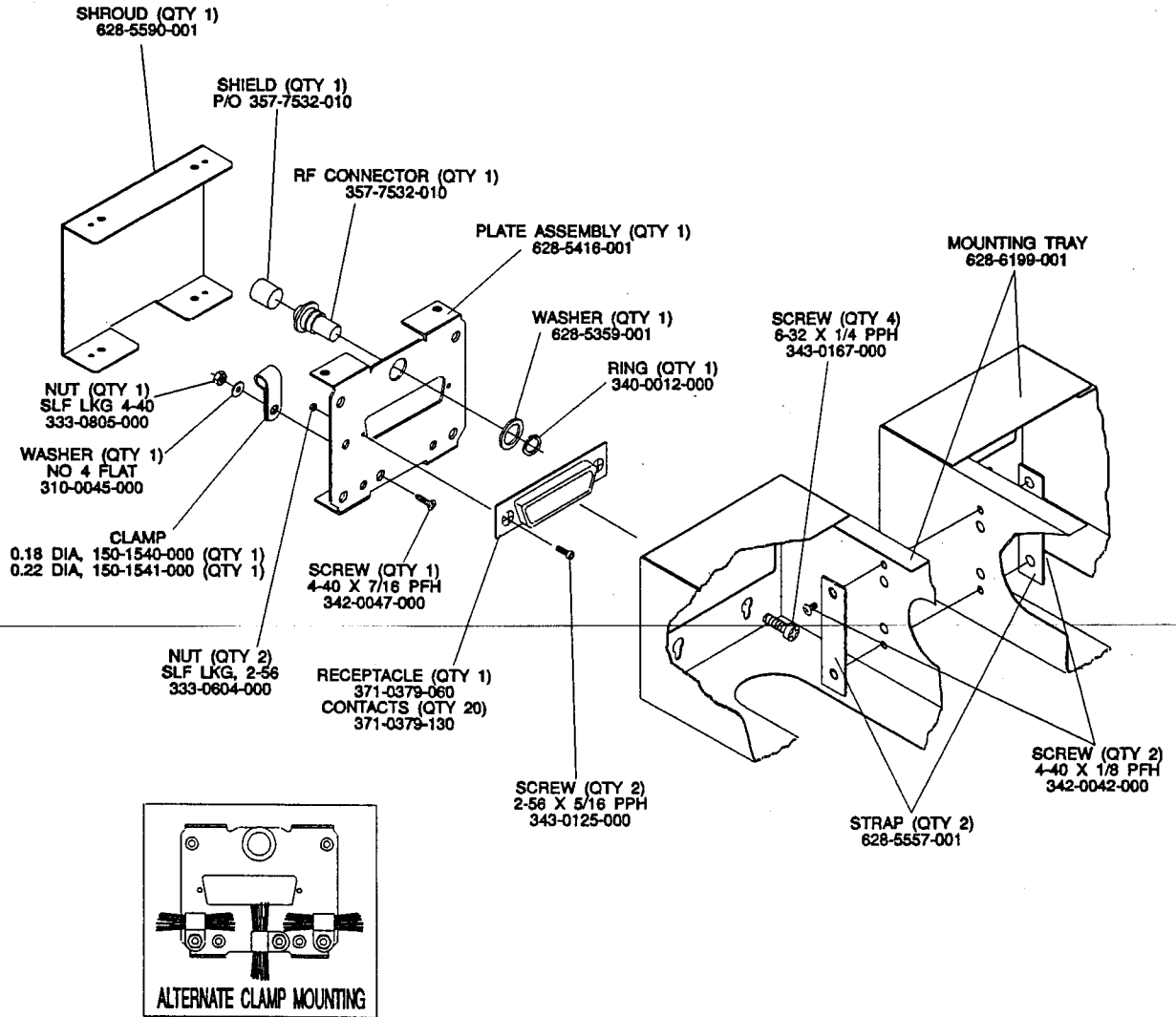


Figure 2, VHF-251A Installation Kit, P/N 690202-1

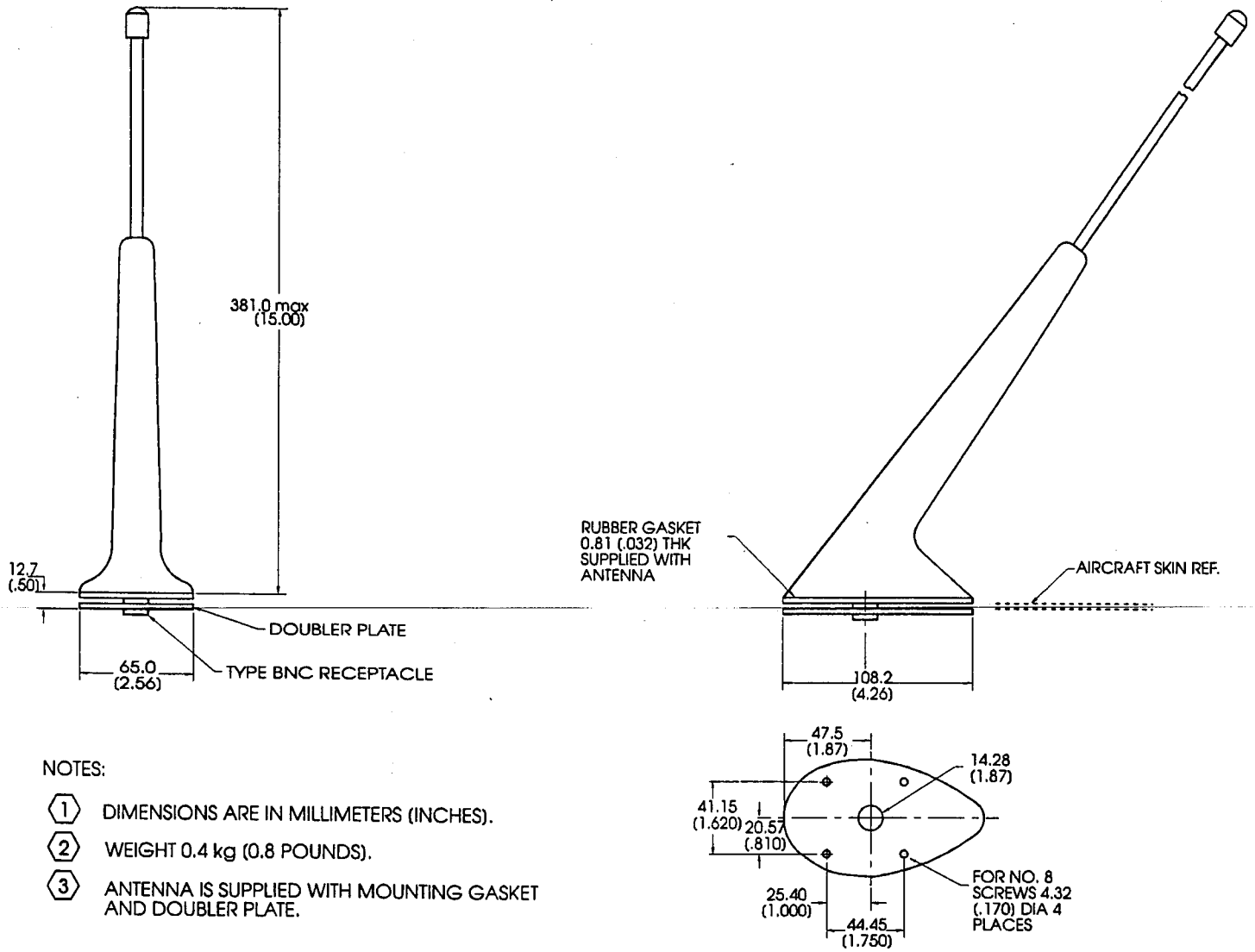


Figure 4, ANT-251 Antenna, Outline and Mounting Dimensions

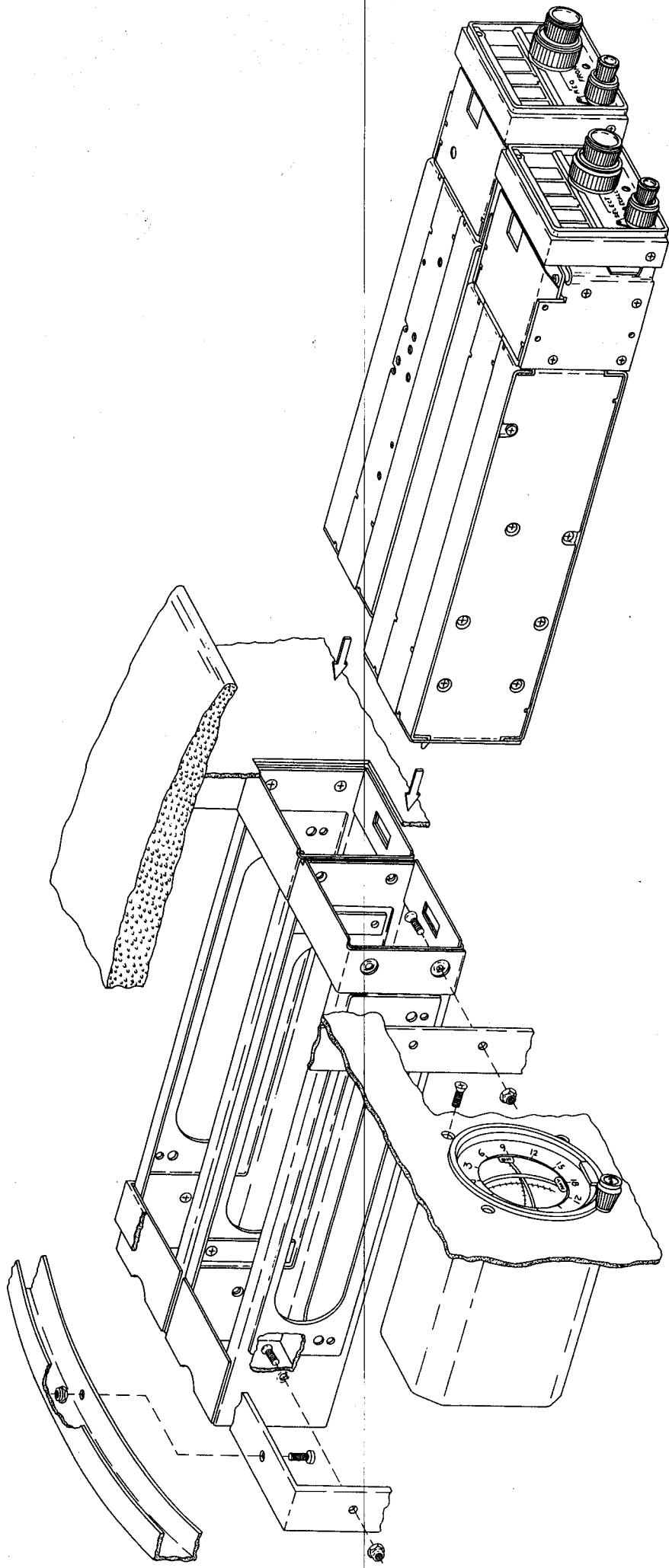
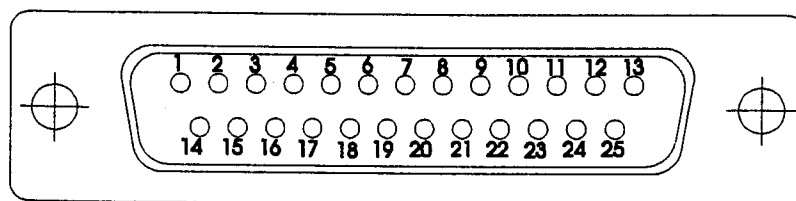


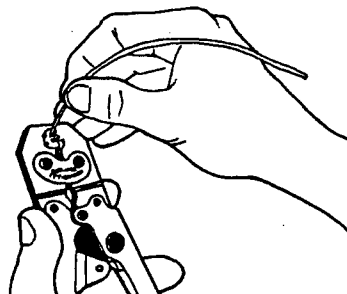
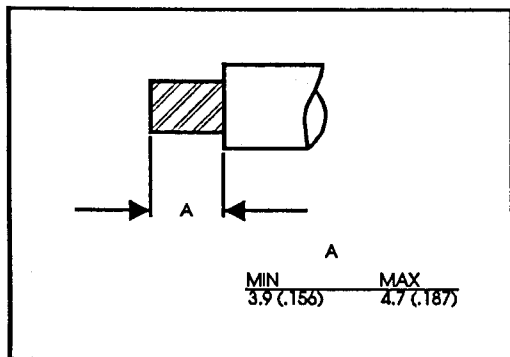
Figure 5. Typical System Installation



VHF-251A MATING CONNECTOR PIN ASSIGNMENTS

- | | |
|-------------------------|---------------------------|
| 1. ICS | 14. NC |
| 2. MEMORY DOWN | 15. NC (FUTURE EXPANSION) |
| 3. MEMORY UP | 16. AGC TEST POINT |
| 4. SPEAKER SIDETONE | 17. AUX AUDIO 1 |
| 5. MICROPHONE | 18. AUX AUDIO 2 |
| 6. AUDIO GROUND | 19. AUX AUDIO 3 |
| 7. NC | 20. AUX AUDIO 4 |
| 8. NC | 21. AUDIO GND |
| 9. KEYLINE | 22. COMM POWER IN |
| 10. NC | 23. COMM POWER IN |
| 11. NC | 24. POWER GND |
| 12. SPEAKER | 25. POWER GND |
| 13. COMM AUDIO 500 ohms | |

Figure 6, VHF-251A Mating Connector Pin Assignments



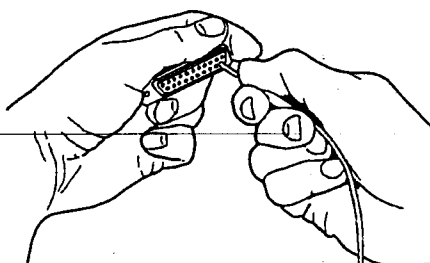
WIRE STRIPPING

1. CUT WIRES TO LENGTH. STRIP INSULATION PER ABOVE ILLUSTRATION. CHECK FOR BROKEN OR FRAYED WIRES.

CONTACT CRIMPING

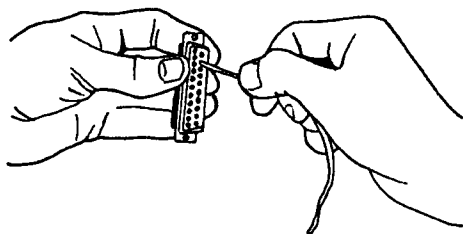
2. INSERT CONTACT AND WIRE INTO PROPER CRIMPING TOOL (AND LOCATOR, IF REQUIRED) CRIMP CONTACT TO WIRE, INSPECT CRIMP.

NOTE: DIMENSIONS ARE IN MM (IN.)

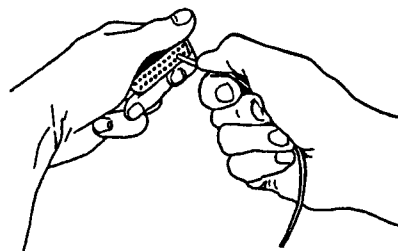


CONTACT INSERTION

3. CENTER WIRED CONTACT IN GROOVE OF INSERTION TOOL, WITH TOOL TIP BUTTING CONTACT SHOULDER. INSERT CONTACT INTO CAVITY UNTIL A POSITIVE STOP IS FELT. INSPECT INSERTION.



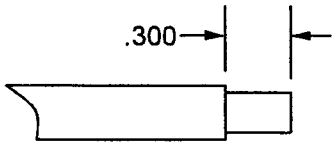
4. TO BE SURE CONTACT IS LOCKED SECURELY, PULL BACK LIGHTLY ON WIRE. REPEAT FOR BALANCE OF CONTACTS, WORKING ROW BY ROW ACROSS THE INSULATOR.



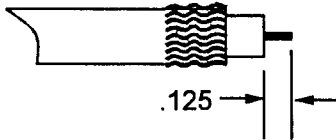
CONTACT EXTRACTION

5. PLACE WIRE INTO EXTRACTION TOOL TIP. INSERT TOOL TIP INTO CONTACT CAVITY UNTIL TIP BOTTOMS AGAINST CONTACT SHOULDER, RELEASING TINES. HOLD WIRE AGAINST TOOL WITH FINGER AND REMOVE TOOL AND CONTACT. REPEAT FOR BALANCE OF CONTACTS.

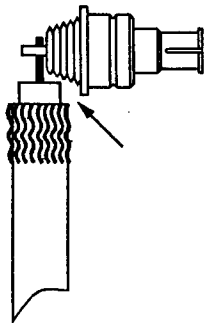
Figure 7, Use of Crimping and Insertion/Extracting Tools



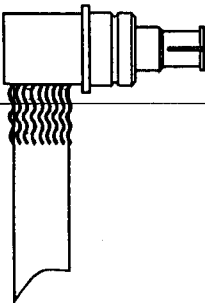
TRIM COAX CABLE OUTER INSULATION AS SHOWN.



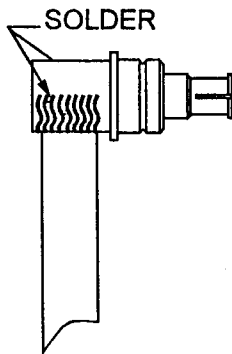
FOLD BRAID BACK OVER OUTER INSULATION OF COAX. DO NOT CROSS STRANDS.



SOLDER CENTER CONDUCTOR TO CENTER PIN OF CONNECTOR. ENSURE FRONT END OF BRAID IS EVEN WITH BOTTOM OF CONNECTOR. (SHOWN BY ARROW).



SLIDE CONNECTOR CAP, WITH CLEARANCE HOLE IN POSITION TO CLEAR DIELECTRIC, ON TO CONNECTOR UNTIL IT SNAPS INTO PLACE.



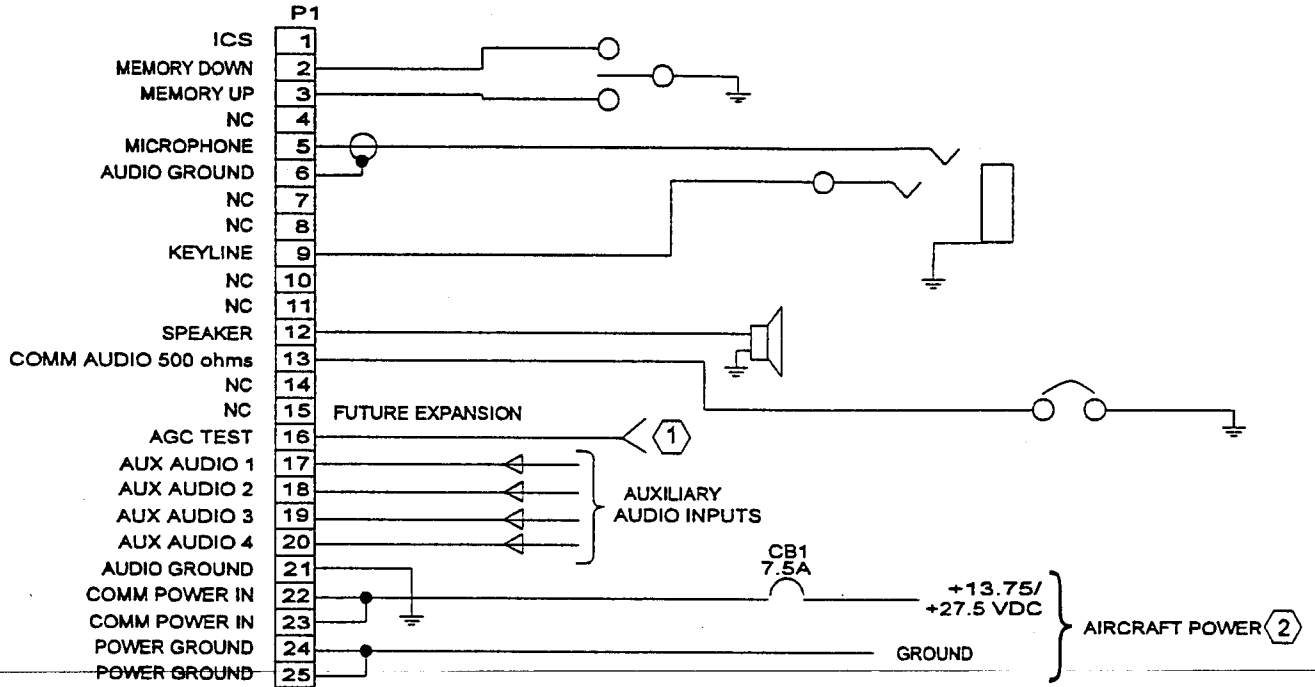
PUSH BRAID FORWARD AND FLATTEN AGAINST CONNECTOR CAP AND SOLDER 360° AROUND. SOLDER CONNECTOR CAP TO CONNECTOR IN AT LEAST THREE PLACES TO INSURE GOOD ELECTRICAL CONTACT.

357-7532-010 RF CONNECTOR

NOTE: CLOSE ADHERANCE TO THIS PROCEDURE IS NECESSARY FOR AN INTERFERANCE FREE INSTALLATION.

Figure 8, Antenna Connector Preparation

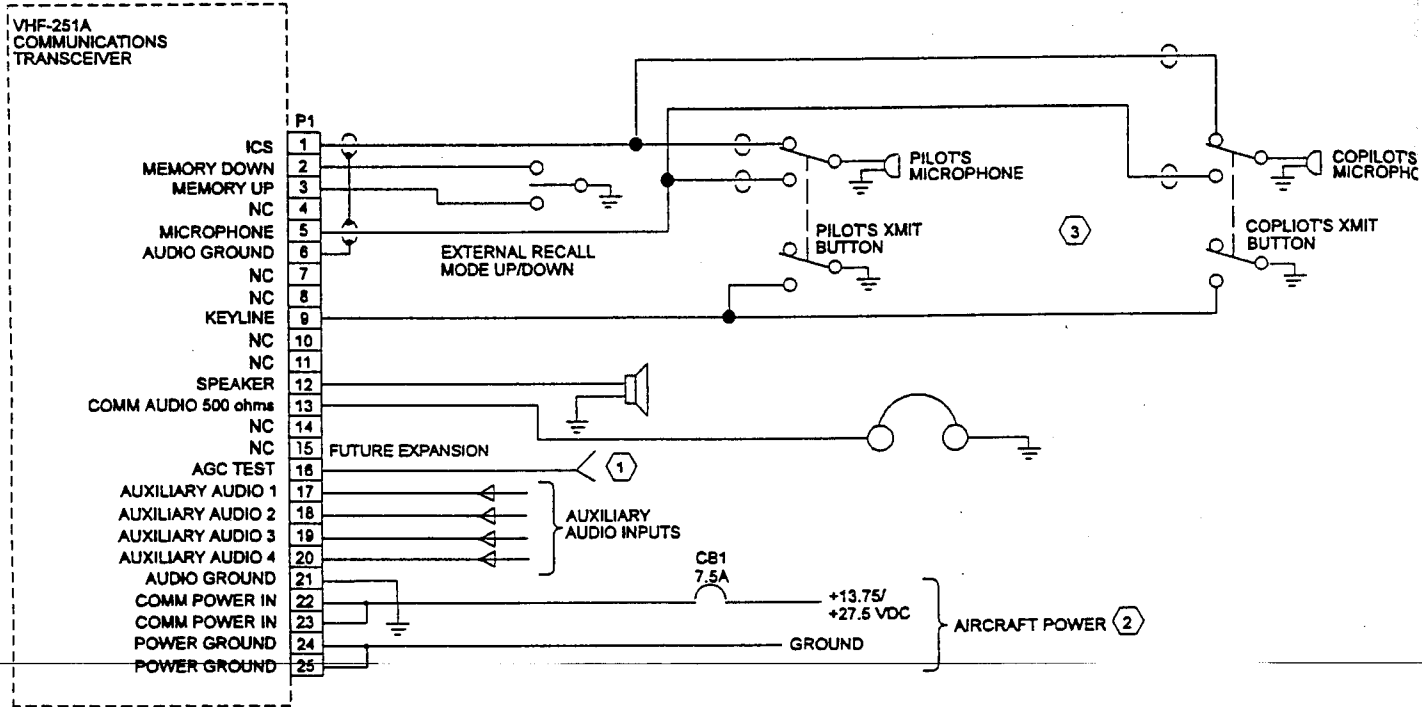
VHF-251A
COMMUNICATIONS
TRANSCEIVER



NOTES:

- ① AGC IS BROUGHT OUT TO PI-16 FOR TEST PURPOSES ONLY.
- ② WIRES CARRYING +13.75/+27.5 VDC INCLUDING POWER GROUND MUST BE 20 AWG OR LARGER. ALL OTHERS MUST BE 24 AWG OR LARGER.

Figure 9, Interconnect Wiring Diagram w/o Intercom



NOTES:

- ① AGC IS BROUGHT OUT TO P1-16 FOR TESTING PURPOSES ONLY.
- ② WIRES CARRYING +13.75/+27.5 VDC INCLUDING POWER GROUND MUST BE 20 AWG OR LARGER. ALL OTHERS MUST BE 24 AWG OR LARGER.
- ③ ICS WILL ALWAYS BE "HOT" IN CONFIGURATION SHOWN ABOVE; ALSO OFTEN NOISY DUE TO TWO LIVE MICROPHONES. IF SEPARATE ICS AND TRANSMIT BUTTONS ARE DESIRED, WIRE AS SHOWN BELOW.

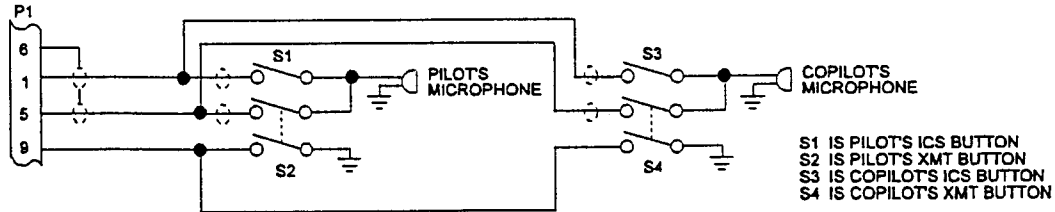
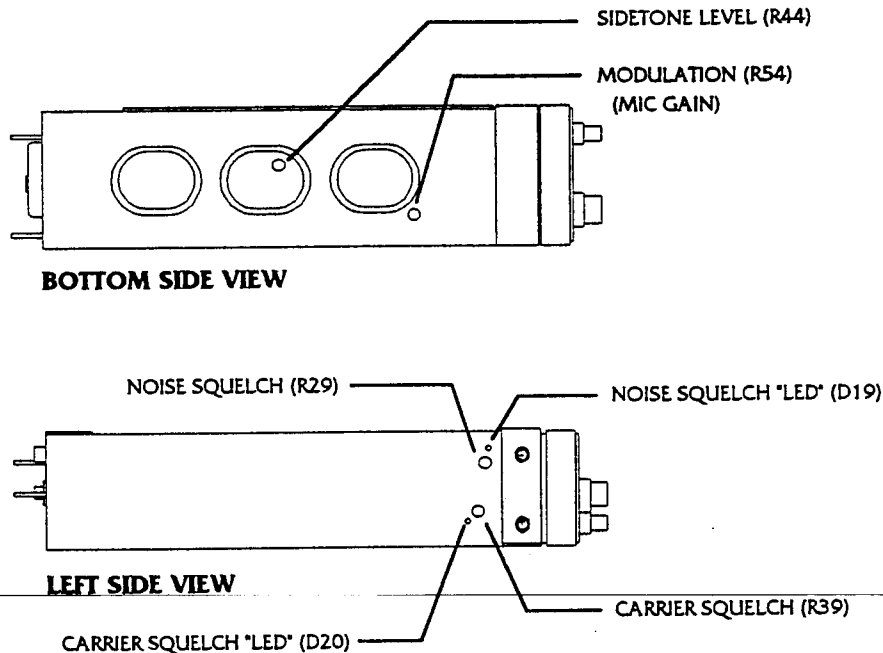


Figure 10, Interconnect Wiring Diagram w/Intercom

VHF-251A EXTERNAL ADJUSTMENTS

This procedure describes the adjustments that can be made to a VHF-251A Comm Transceiver before installation to set the appropriate levels.



NOISE AND CARRIER SQUELCH

Adjust R29 fully CW and R39 fully CCW, and push in the squelch knob located on the front of the unit. Select 128.00 MHz and apply a $1.5\mu\text{V}$ RF signal modulated at 30% by 1000 Hz. Observe the Noise Squelch "LED" (D19) and slowly adjust Noise Squelch Resistor R29 CCW until the "LED" goes off.

Set the RF signal level to $24\mu\text{V}$. Observe Carrier Squelch "LED" (D20) and slowly adjust Carrier Squelch resistor R39 CW until the "LED" goes on. Verify squelch operation for 127.60 MHz and 136.975 MHz. Verify that the noise "LED" comes back on at approximately $3.5\mu\text{V}$. Verify that the Carrier "LED" goes back off at approximately $5.6\mu\text{V}$.

TRANSMITTER MODULATION LEVEL

Tune the unit to 128.00 MHz. With no modulation, verify at least 10W output. Modulate the transmitter with a 0.5 V RMS 1000 Hz audio signal. Adjust the Modulation (MIC Gain) resistor R54 for 87% modulation.

SIDETONE (HEAD PHONE) LEVEL

Tune the unit to 128.00 MHz. Modulate the transmitter with a 0.5 V RMS 1000 Hz audio signal. Adjust the Sidetone Level resistor R44 for a comfortable level in the headset.