GENERAL SAFETY PRECAUTIONS
ELECTRONIC EQUIPMENT

1. GENERAL

1.01 This practice tells how to work safely on radio, television, carrier and other electronic equipment. It is reissued because of extensive changes.

1.02 REMEMBER: This practice — or any practice — can not tell you about all the hazards of working on radio and electronic equipment. But this practice does tell you about many of the kinds of hazards to look for. So follow it wherever it applies. And watch for the unexpected. Remember too, the safety of others working with you — and bystanders — may depend on how safely you work.

1.03 A man's training, experience, job knowledge, physical condition, and attitude have a lot to do with how safely he'll work. Physical working conditions, weather and unfamiliar equipment can affect safety too. So, keep these things in mind when you plan your work.

1.04 Most radio and other electronic equipment uses dangerous voltages. Inexperienced people should not be allowed to work on it. Training inexperienced people on electronic equipment should be done under the direct supervision of a competent person familiar with the possible hazards.

1.05 It's a good idea for those who work on radio and electronic equipment to review this practice every six months or so.

2. PRECAUTIONS APPLYING GENERALLY TO ALL WORK

2.01 The Bell System Practices covering radio and electronic equipment usually warn you about safety hazards. Or where there's only a Manufacturer's Instruction covering the equipment, it will have warnings too. Look for them before you work on the equipment. Then follow them. If the warnings in the Manufacturer's Instruction conflict with the Bell System Practice, follow the Bell System Practice.

2.02 Everyone who works on electronic equipment should be trained in artificial respiration. They should also be familiar with rescue methods covered in Sections 010-100-012 and 010-100-013.

2.03 Don't depend on safety interlock switches as your only protection against high voltage. Here are some other safety precautions you should take:

(a) Turn off primary power at the main switch.

(b) If you can get to them safely, test the primary power leads to be sure they're dead. Use a voltmeter or test lamp.

(c) Ground high voltage supplies. Short out all high voltage capacitors. Paragraphs 3.07 and 3.08 tell how to do this.

3. RADIO TRANSMITTER INSTALLATIONS — IN BUILDINGS

3.01 Keep unattended transmitter rooms locked. And put a sign on the entrance reading "DANGER — HIGH VOLTAGE."

3.02 Cover the floors around transmitter cabinets with an insulating material — linoleum or rubber matting. But remember, this ***won't guarantee*** you're insulated from the floor should you touch high voltages. And if the floor covering is damp it can be a good conductor to ground. So be careful!

3.03 Put a warning sign on all cabinet doors that give access to high voltage. See Paragraph 14.01.

3.04 It is very dangerous to disable safety interlock switches. Don't do it unless it becomes absolutely necessary. (These occasions

should be very rare.) Then, if you must, be sure to disable the interlock so you can't replace the cover or close the door without first removing the blocking or shorting device. This way you won't forget to restore the interlock. ***Never use wire strapping to short out the interlock circuit.***

3.05 When you open a main power switch, tie tag E-4747 on it (see Fig. 1). The tag states "DO NOT CLOSE THIS SWITCH — MAN WORKING ON TRANSMITTER". Then put your name on the tag. Only the man who places the tag should remove it.

3.06 Don't work on transmitting equipment while the power is on unless it is absolutely necessary. If you must, be sure to have your supervisor's approval.

(a) You should never take voltage readings by touching test probes to high voltage circuits.

(b) If you must take a voltage reading, do it like this:

(1) Turn off and de-energize the equipment. (Paragraphs 3.07 and 3.08 tell how to do this.)

(2) Connect the voltmeter. Then set the meter where you can see it — don't hold it. Stand clear.

(3) Turn on the equipment and read the voltage.

(4) Turn off and de-energize the equipment as you did in Step (1).

(5) Disconnect the meter.

3.07 High voltage filter capacitors normally discharge through bleeder networks. But these networks may open at any time and leave the capacitors fully charged. This can happen without giving you an outward indication of trouble. So short the terminals of all filter capacitors with the Grounded Insulated Test Probe described in Paragraph 3.10(e).

3.08 When you start work on the wiring side of equipment, momentarily ground all terminals and wiring around where you intend to work. This will bleed off any voltage or static charge that may be present.

3.09 REMEMBER: The precautions in Paragraphs 3.07 and 3.08 are to protect you. Follow them before you touch any terminal or component with your bare hands or uninsulated tool.

3.10 The following equipment and tools should be located near the transmitter.

(a) ***Power Switch:*** Install a main power switch ("Square D" or equivalent), or an outlet and polarized plug close to the transmitter. Use Form E-4748 to mark the switch or outlet so that in an emergency anyone could identify it and cut off all power. See Fig. 2.

(b) ***Rubber Gloves:*** Provide a pair of standard lineman's rubber gloves. Mark the glove container and place it in a handy location.

(c) ***Asbestos Gloves:*** Provide a pair of asbestos gloves for removing hot tubes. Mark the glove container and place it in a handy location.

(d) ***Tube Pullers:*** Provide tube pullers for the types of small tubes being used.

(e) ***Grounded Insulated Test Probe:*** The test probe can be obtained in either of two ways:

(1) You can make it. If you do this, Fig. 5 gives some instructions you'll need. Store the probe so it will be near the equipment where it will be used.

(2) You can buy a probe from the Western Electric Company. Here is the ordering information:

"Ground Stick Assembly EP288275"

Mark the order "Attention Single Sideband Radio Shop, Greensboro, North Carolina".

(f) ***Insulated Tuning Tools:*** You'll need insulated tuning tools for the types of transmitters in your area. Clips on the inside of the transmitter cabinet front door provide a good way of storing these tools.

(g) ***Fuse Extractor:*** Provide fibre fuse extractors for removing and replacing fuses. Clips on the inside of the transmitter cabinet rear door provide a good way of storing these tools.

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(a) ***Power Switch:*** Install a main power switch (Square D or equivalent) or an outlet and polarized plug close to the transmitter. Use Form E-4748 to mark the switch or outlet so that in an emergency anyone could identify it and cut off all power. (See Fig. 2.)

(b) ***Insulating Gloves AT6697:*** Provide a pair of standard insulating rubber gloves. Mark the glove container and place it in a convenient location.

(c) ***Asbestos Gloves:*** Provide a pair of asbestos gloves for removing hot tubes. Mark the glove container and place it in a convenient location.

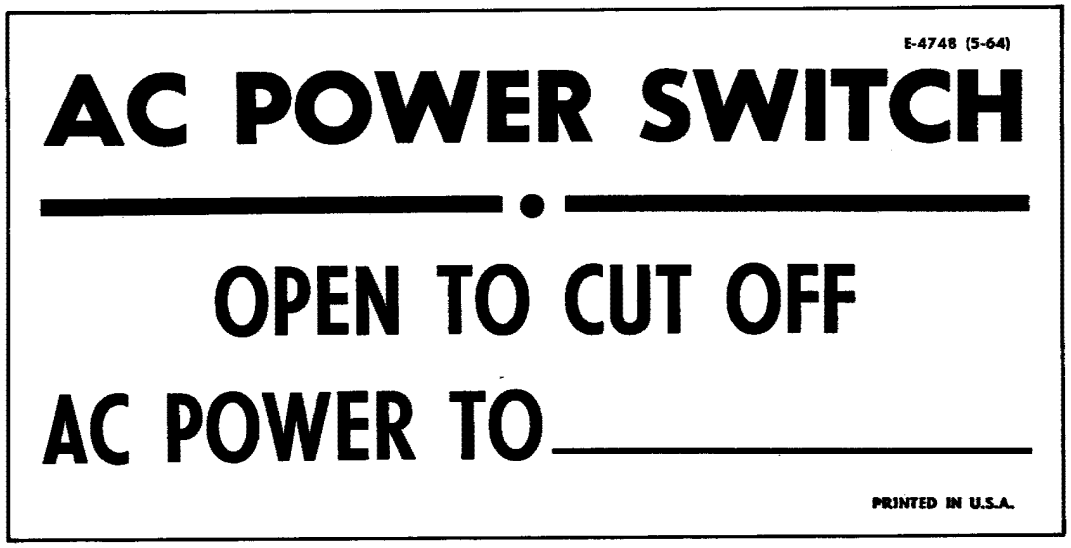
(d) ***Tube Pullers:*** Provide tube pullers for the types of small tubes being used.

(e) ***Insulated Grounding Stick:*** Make the insulated grounding stick, following instructions in Fig. 3. Store the probe so it will be near the equipment where it will be used.

(f) ***Insulated Tuning Tools:*** Insulated tuning tools are needed for the types of transmitters in your area. Clips on the inside of the transmitter cabinet front door provide a good method of storing test tools.

(g) ***Fuse Extractor:*** Provide fibre fuse extractors for removing and replacing fuses. Clips on the inside of the transmitter cabinet rear door provide a good method of storing these tools.

(h) ***High Voltage Test Leads:*** A special pair of leads is needed for testing high voltage circuits. Be sure to make them from high voltage cable. Place a spade or pin tip on one end for connecting to the test meter. On the other end of the lead, place a small, rubber protected battery or alligator clip. Store the leads in a marked container near the transmitter.



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RED PRINTING
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Fig. 2

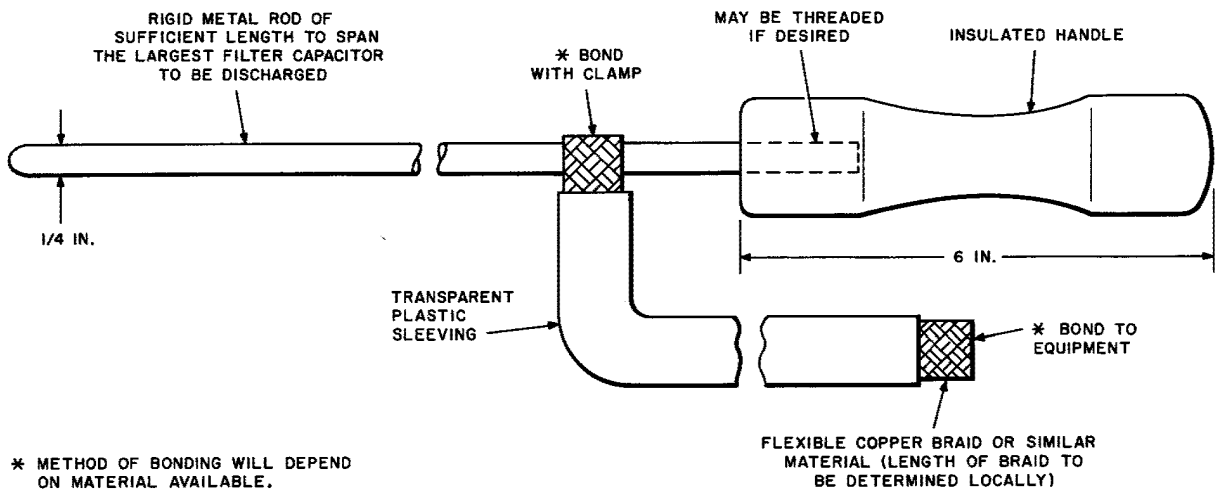


Fig. 3

4. RADIO TRANSMITTER AND RECEIVER INSTALLATIONS—POLE-MOUNTED

4.01 In addition to the safety precautions already described, observe the following special ones for pole-mounted installations.

4.02 Keep the equipment and power distribution cabinet locked. This will prevent unauthorized persons from tampering with the equipment or contacting high voltage.

4.03 Place "DANGER — HIGH VOLTAGE" sign on the inside and outside of the cabinet doors.

4.04 It is recommended that a wooden platform be used for ease in reaching the equipment → when working on it. Place a folded insulating → blanket (blanket insulating B AT7707) on the platform. This will help protect against shock. Be sure to wear rubber gloves when conditions warrant their use.

4.05 When climbing poles, follow the safety practices covering body belts, safety straps, and climbers.

5. MICROWAVE INSTALLATIONS

5.01 The safety practices for high voltage on other electronic equipment also apply to microwave equipment.

5.02 Microwave radiation produces heat in body tissues; therefore, it is dangerous to life. → (Refer to Section 010-150-001.)

5.03 Most Bell System microwave transmitters use power so low that the energy radiated from the antennas (delay lenses, horn reflectors, parabolic dishes, or passive reflectors) is not concentrated enough to do any harm. The energy coming from the open end of a waveguide spreads out and decreases rapidly in intensity. At a short distance from the waveguide, the power density is already well below the danger level. Very close to the open end, however, the energy may be sufficiently concentrated to cause injury to body tissues. Therefore, avoid exposing any part of your body at close range to open waveguides which are connected to operating microwave transmitters. It is particularly important to avoid direct radiation into your eyes. Do not look into the end of a radiating waveguide or work in a position where direct radiation can reach your eyes.

5.04 Do not operate a microwave transmitter unless it is connected either to its antenna or to an appropriate resistive load. Do not operate a transmitter (including test oscillators) into an open-ended waveguide.

5.05 Telephone Company personnel are sometimes assigned to work at military or other installations where one or more high power radars

10.02 If you maintain antennas or their supporting structures, be sure you are aware of the hazards involved. Paragraph 5.06 tells some of the precautions you'll need to know.

10.03 It's a good idea to have a local practice describing the antenna supports in your area. It should tell you the safety precautions to take when you work on them. Here is a list of items you'll need to consider:

(a) ***Electrical Hazards***

(1) Be sure any electrical wiring on or adjacent to the structure is in good condition, and not liable to energize the structure.

(2) Will you be exposed to direct contact with an antenna?

(b) ***Climbing and Working on Antenna Supports***

(1) Review Sections R40.484.00, AG25.300, and 081-725-200.

(2) Is the structure safe to climb?

(3) After you climb about 25 feet, stop and rest before proceeding.

(4) Take only those tools with you that you actually need. Carry them in a canvas bucket or other good container. And be careful not to drop them.

11. MARITIME MOBILE TELEPHONE INSTALLATION AND MAINTENANCE

11.01 Mobile telephone installation on ships, small boats, barges, etc, present hazards with which you are probably not accustomed.

11.02 When you board the craft be sure not to slip on the gangplank. You ought to keep one hand free at all times to grab some handhold just in case you do slip. Where a handrail or line is provided — use it. And when you walk be extra cautious if the deck is wet and slippery.

11.03 When you walk along the edges of craft that have no protective railings try to avoid the side next to a dock or other craft. This minimizes the possibility of being crushed in case you do slip and fall.

11.04 Never use both hands to carry equipment. And never tie any equipment onto yourself. You want to be able to drop the equipment in case you fall into the water.

11.05 When boarding hazards warrant, wear a Coast Guard approved life preserver.

11.06 As soon as you board a craft let the Captain or person in charge know you're aboard. Tell him what you plan to do. Then tell him when you are finished. This makes him aware of your presence and safety.

11.07 If you have to move from one vessel to another — do it when they are stopped. Don't try boarding a moving vessel.

11.08 Water craft usually have ropes, towing bits, hatches, etc, on the deck. So watch where you walk to avoid falling.

11.09 The antennas on ships may be mounted high on the mast or other superstructure. So use the tower body belt and safety strap, or boatswain's chair when you work on such installations.

11.10 The engine rooms of boats or ships offer a variety of hazards. So be particularly careful. Be on the lookout for wet or greasy decks, steam pipes or moving machinery, and don't be thrown off balance by the rolling motion of the ship.

11.11 Many ships carry radar. Space is at a premium on shipboard and you can't stay far enough away from the radar antenna. So be sure it is off before working near it. Also, remember that if you are too near the radar antenna and someone starts it rotating, you can be knocked overboard.

12. L-TYPE CARRIER

12.01 The AC line voltage on the inner conductor of L1 and L3 carrier coaxials is dangerous to personnel. Review the Bell System Practices covering L-type carrier before you work on the cable conductors or power supply equipment.

13. MISCELLANEOUS

13.01 There are contacts which may arc in radio and other equipment. So don't carry flammable or explosive mixtures in the same compartment with such equipment. If in an emergency such mixtures must be carried, use an approved container.

13.02 Caution customers about carrying flammable or explosive mixtures in the same compartment as the radio equipment. Apply Form E-4746 to mobile sets installed in trunks or airtight compartments. See Fig. 4. If the customer must carry such liquids, suggest he use an approved container.

13.03 As far as we know there doesn't appear to be any appreciable hazard with using mobile transmitters near electrically operated blasting caps. However, follow the precautions described by the explosive industry. When mobile radio is installed in a vehicle used for highway construction, mining, drilling, etc, where blasting caps will normally be carried, caution the customer of the possible danger if manufacturers' recommendations are not followed.

13.04 Vehicles transporting bulk flammable explosive mixtures present hazards you don't usually have with the average mobile installation. These dangers can be reduced if you take precautions — such as:

(a) Don't work if excessive gasoline or other explosive fumes are present.

(b) Install and maintain such equipment in a well-ventilated location, preferably in the open.

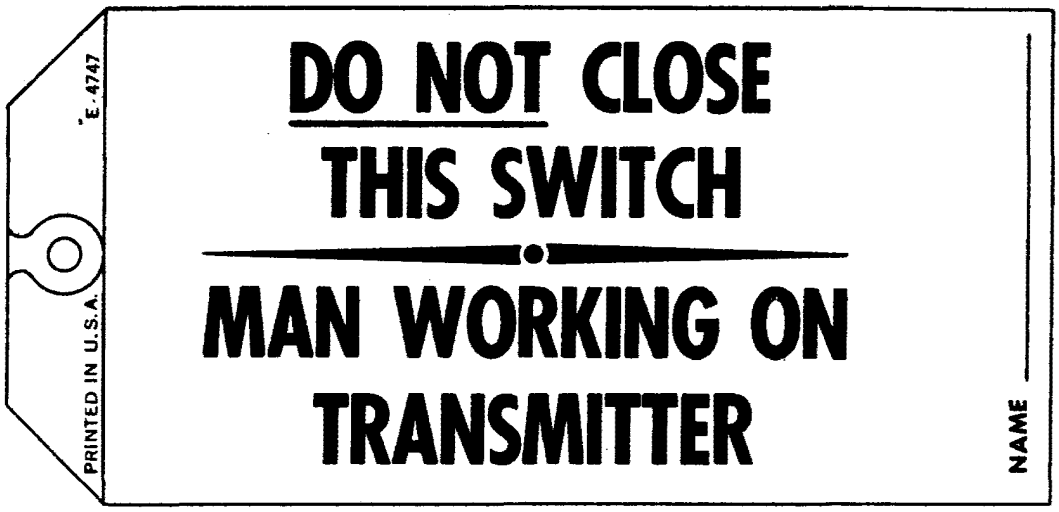
(c) Install the radio equipment as far as possible from the loading and dispensing valves. Provide an adequate circulation of air around the radio equipment. Don't mount it under the vehicle where fumes may accumulate.

(d) Since most oil companies require their drivers to turn off the ignition when loading or unloading, it's a good idea to wire the radio through the ignition switch.

14. WARNING SIGNS

14.01 Following is a list of the principal warning signs for which piece-part numbers have been assigned.

READING	PIECE-PART	MATERIAL	BACKGROUND	SIZE - INCHES
WARNING HAZARDOUS VOLTAGES UNDERNEATH	P-369197 P-414908 P-188807	ALUM. METAL DECAL.	BLACK RED RED	1-1/4 by 2-1/8 1-3/16 by 2-1/16 1-5/16 by 2-3/16
WARNING HAZARDOUS VOLTAGES	P-188597	DECAL.	RED	1-1/4 by 2-1/8
WARNING HAZARDOUS VOLTAGES UNDERNEATH REMOVAL OF COVER MAY INTERRUPT SERVICE	P-188613	DECAL.	RED	1-3/8 by 2-5/8



RED BACKGROUND
BLACK LETTERING

FIGURE 1

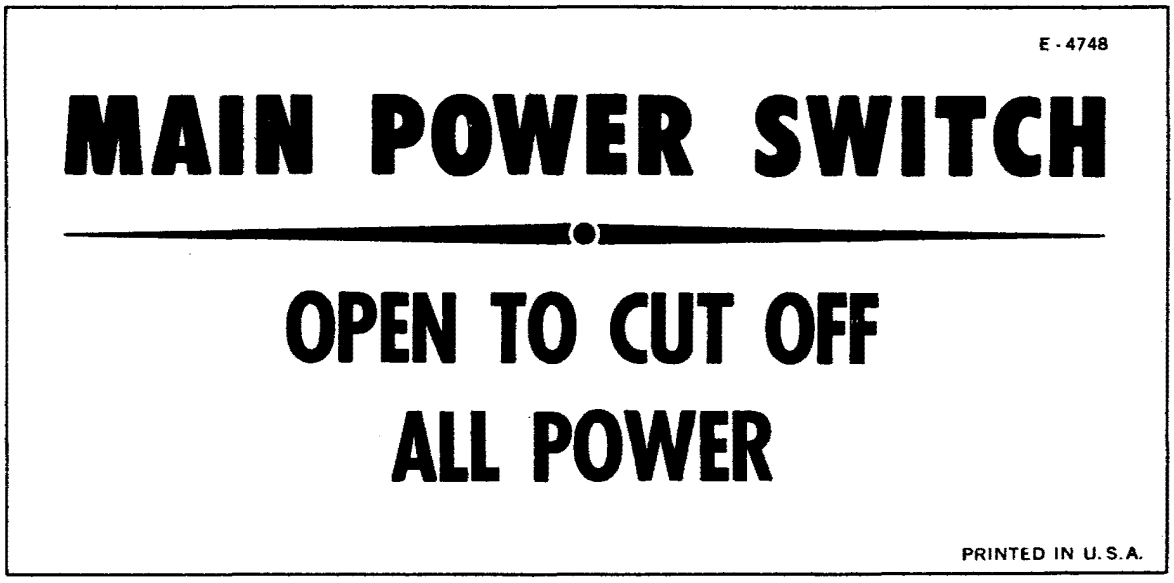


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FIGURE 2

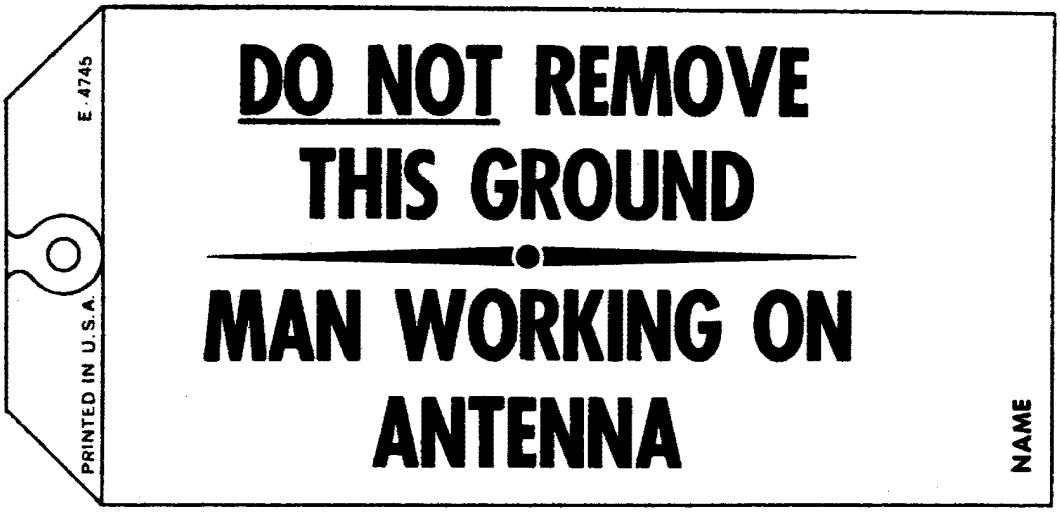

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FIGURE 3

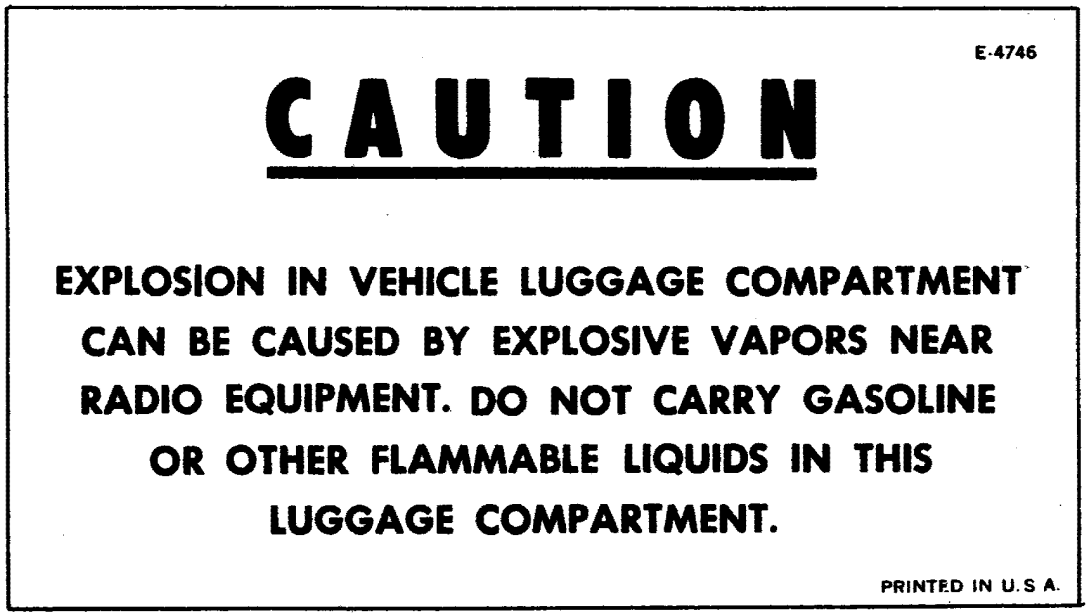

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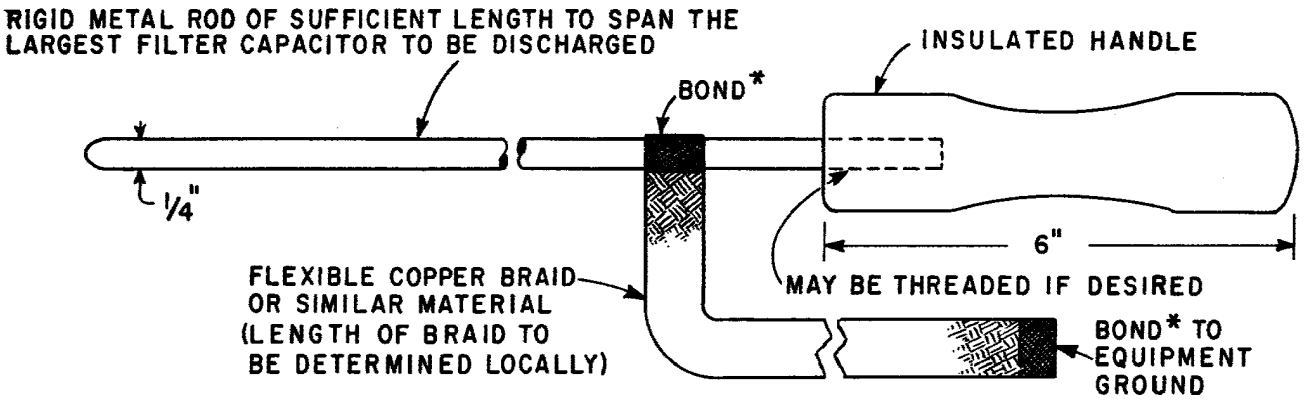
FIGURE 4



*METHOD OF BONDING WILL DEPEND ON MATERIAL AVAILABLE

FIGURE 5

U.S. GOVERNMENT SIGN POSTED IN AREAS WHERE HIGH POWER RADARS OPERATE

COLOR SCHEME

Legend, narrow lines and slant lines - Bright Red

All background - Bright Yellow

FIGURE 6