A Subsidiary of Northrop Corporation

INSTALLING MOBILE CITIZENSBAND RADIOS

INSTALLING MOBILE CB RADIOS

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Contents

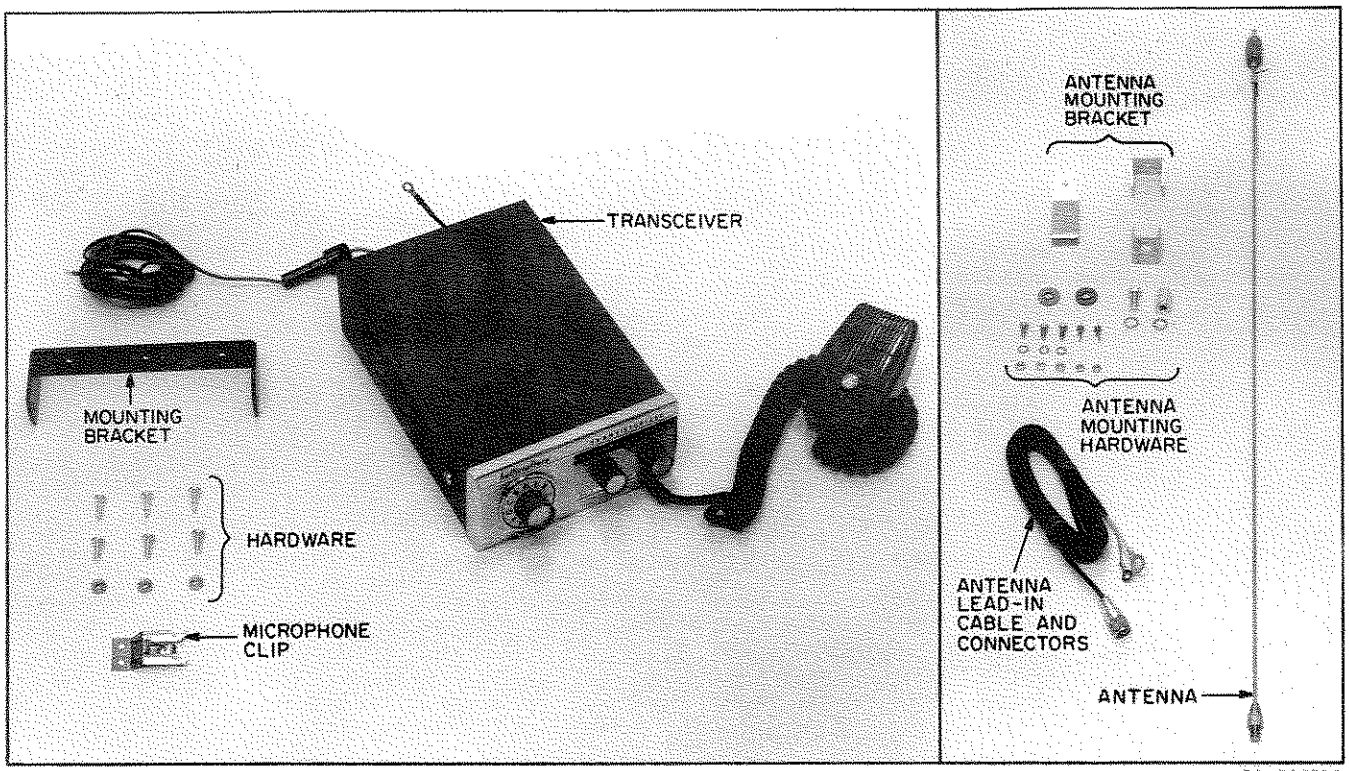


Figure 1. Components Required for Mobile CB Installation.

INTRODUCTION

This manual provides instructions for installing mobile citizensband equipment. Because CB transceivers can be installed in a variety of vehicles, no definite cut-and-dry installation procedure is possible; however, a set of general instructions, which this manual provides, and good common sense will prove helpful when installing the equipment. It should be noted that this manual, being general in nature, presents the most common mounting methods, which are universal to all mobile CB transceivers, and the problems which may be encountered. For specific information, the manual provided with the owner's particular CB equipment should be consulted.

Every mobile radio installation, no matter how simple, involves some planning beforehand. It is therefore most important that the following points be considered prior to installation.

TOOLS REQUIRED. Tools which should be on hand for making a mobile CB installation are assorted screwdrivers (standard and phillips head), socket wrenches, pliers, electric drill, soldering iron, and some rosin core solder.

LOCATION OF TRANSCEIVER. When selecting a location for the transceiver, remember to place it in a position which will not only be convenient for the operator, but also for safety sake, in a location which will not impair normal operation of the vehicle.

ANTENNA. The antenna type may be either a bumper, a rear deck, a top mounted or a combination CB-AM type. The antenna cable should follow as short a path as possible, and yet be routed away from items which might induce noise such as the engine, gauges, switches, relays, etc. For temporary installation, a small clamp-on type antenna fastened to the drain trough above the car door will generally permit reliable communications up to several miles, depending upon terrain, etc.

mounting bracket, holes will have to be drilled into the underside of the dash corresponding to the holes in the mounting bracket, or vice versa. In using existing automobile screws, insure that they will hold both the automobile times and the mounting bracket.

CAUTION

When drilling into the dash, care should be taken so as not to drill into existing automobile wiring, support brackets, etc.

When drilling holes into the underdash, self-tapping screws (NO. 10 recommended) may be used to hold the mounting bracket in place. Then, the transceiver may be installed in the mounting bracket using the necessary hardware (refer to transceiver's instruction manual).

NOTE

If space behind the transceiver is limited, it is advisable not to permanently secure the transceiver until all connections have been made.

Should the unit be large enough to require additional support a perforated strap may be installed at the rear of the transceiver. Some manufacturers supply this strap with their units. No single procedure for securing the perforated strap can be outlined because of the dissimilarities in vehicles. In many cases the strap can be fastened to a threaded stud usually contained at the rear of the transceiver and used for negative connection. When there is no obstruction between the transceiver and firewall, bend the strap from its secured position on the transceiver to point towards the firewall. Then bend or bough the top end of the strap so that it is parallel to the firewall. Drill a hole into the firewall and align it with a hole on the bent or boughed portion of the strap. A self tapping screw may be used to hold the strap to the firewall.

CAUTION

Before drilling into the firewall make certain no vehicle components will be damaged.

When an obstruction between the transceiver and firewall exists (heater, defroster-ducts, etc.), the strap may be bent around the lip of the transceiver, bringing it to the transceiver front, to be connected to one of the screws securing the mounting bracket to the dash; to eliminate any overlap, cut off any excess strap at the front of the mounting bracket.

If it is impractical to mount the transceiver under the dash, it may be mounted on the center hump in the vehicle floorboard. Large self tapping screws are generally used to secure the transceiver, as the transmission located directly beneath the hump makes the use of nuts and bolts impractical. The microphone hanger can then be secured to the dash within easy and safe reach of the operator.

POWER SOURCES

With the transceiver properly installed, the next step is to connect the power cable to the voltage source. Before making the connection, the following should be considered:

1. Cable length should be kept as short as possible to prevent any excessive loss of source voltage by the resistance in the wire of the power cable. When a long length of cable is necessary, the cable should be sufficiently heavy to handle the current.

2. Battery polarity is especially important with transistorized equipment, as damage can occur to it with an improper ground connection. Therefore, it's important to know which terminal of the battery is connected to ground. Since the 12-volt battery was adopted, most domestic vehicles use the negative-ground electrical system. Prior to 1956 however, the majority of vehicles used the 6-volt, positively-grounded battery.

3. Protective fuse should be used with the CB transceiver. This fuse should be either on the hot lead or in a fuse holder on the equipment itself. Knowledge of this fuse's location will help should any trouble occur.

Three points at which the transceiver may be connected to the automobile power source are directly to the battery, to the starter solenoid, and to the ignition switch (see figure 4). When the hot lead is connected directly to the battery, the current path is made from the battery through the vehicle's metal framework to the transceiver. When the starter solenoid is nearer the transceiver than the battery, the hot lead may be connected to the battery's hot side at one of the solenoid terminals. The starter solenoid can be

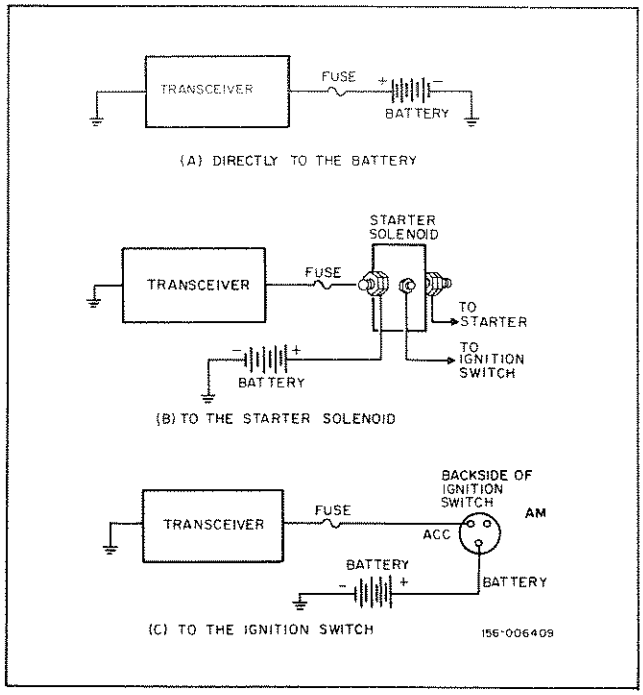


Figure 4. Three Methods of Connecting a CB Unit to the Vehicle's DC Power Source.

found by following the battery cables; one cable (usually braided) will be connected to ground (usually some point on the engine) and the other will lead to the starter solenoid. If neither of these methods is satisfactory, the transceiver may be connected to the ignition switch, that is, if the transceiver does not require excessive power. In this method the hot lead can be connected to either terminal. When connected to the accessory terminal, the transceiver will only operate when the ignition switch is on. When connected to the ammeter terminal, transceiver operation will be allowed at all times. Of the two ignition switch terminal connections, the former is more advisable to prevent battery drainage should the transceiver unknowingly be left on for a length of time.

If the transceiver is designed to operate from a 115-volt AC power source only, this transceiver may still be used for mobile operation by means of a DC to AC inverter, which will convert the 6- or 12-volt DC battery voltage to 115 volts AC at 60 cycles, standard household power. Inverters are not restricted to 6- and 12-volt DC voltages but are available in models which cover a variety of DC voltages. In automobile installations the inverter may be placed in several places, depending upon available space, car type, etc. A smaller inverter may be placed on the front seat or on the floorboard, and if space is available, it may be mounted under the dash alongside the transceiver. If these locations are outruled, the trunk normally contains enough space. Suitable mounting brackets are available as accessories to secure the inverter under the dash or in the trunk. Also, for the trunk-mounted inverter a remote control unit will permit complete control of the inverter from within the vehicle.

ROUTING OF ANTENNA LEAD-IN

With the transceiver mounted and connected to the power source, the next step is to mount the antenna and connect it to the transceiver. Bear

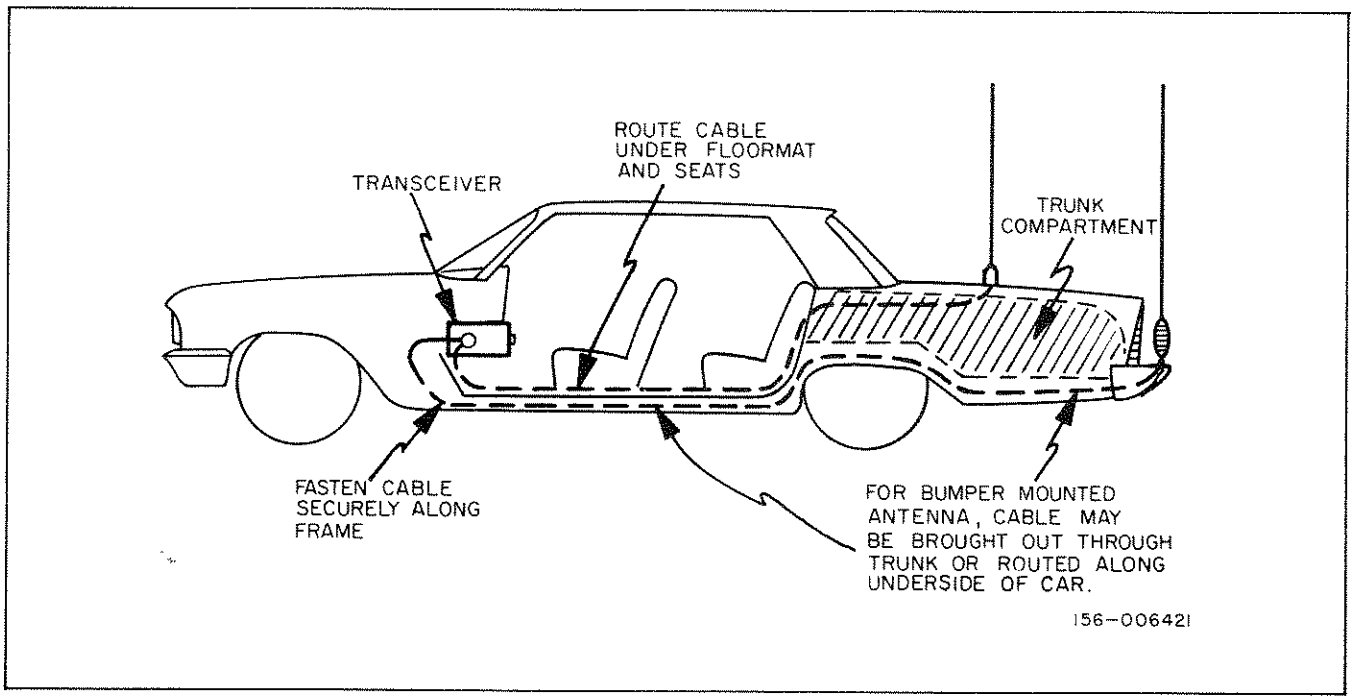
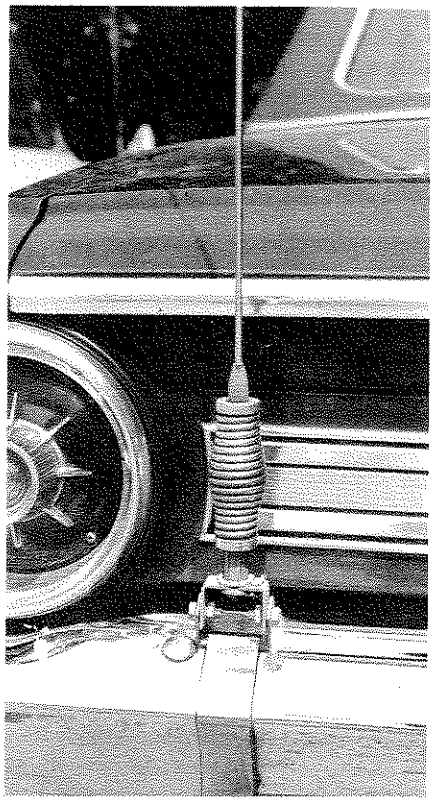
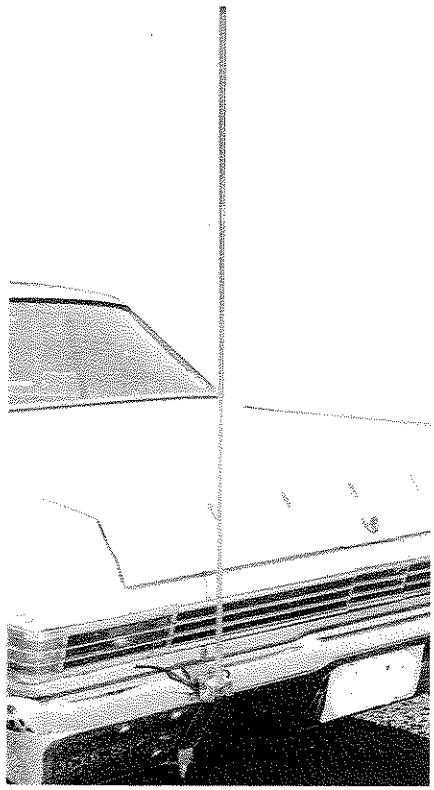


Figure 5. Two Methods of Routing Antenna Lead-in From Rear of Vehicle.

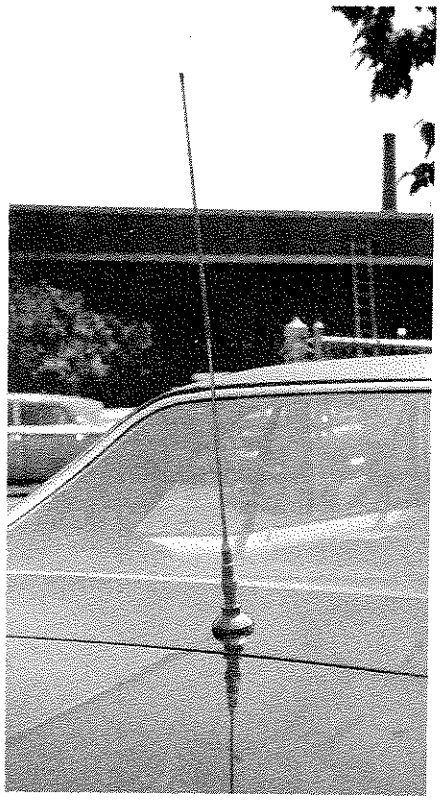


(A) Bumper Mounted Stainless Steel Whip with Spring Base.

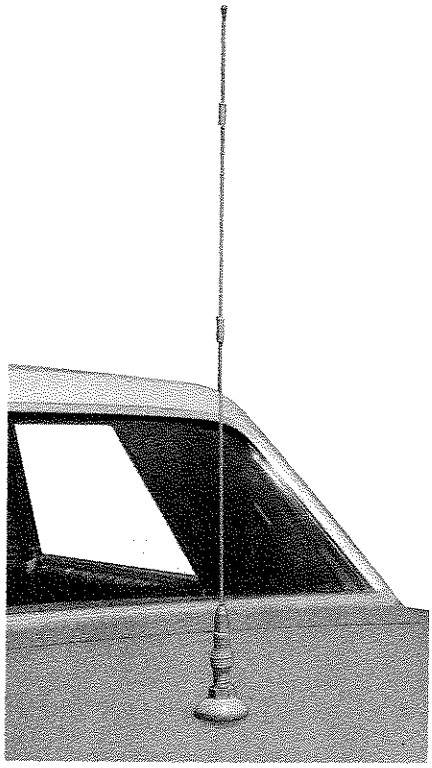


(B) Bumper Mounted Fiberglass Whip.

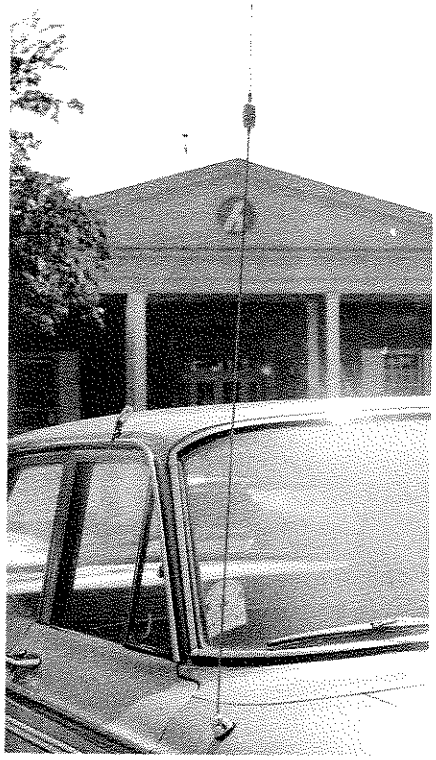
(C) Rear Deck Mounted Fiberglass Whip.



(D) Rear Deck Mounted Fiberglass Whip with Spring.



(E) Trunk Lid Mounted Fiberglass with Spring Base.



(F) Cowl Mounted Combination CB-AM Whip.

Figure 6. Typical Mobile CB Antenna Installations.

in mind that the antenna cable should follow as short a path as possible and be routed away from the engine, gauges, switches, relays, etc., which tend to induce noise.

1. Helical Wound or Whip Type Antenna (See Figures 5 and 6). — These antennas are normally mounted somewhere in the trunk area or on the rear bumper. Instructions supplied with the antenna should be used to mount the antenna. When making this type of installation the cable can be run either through the inside of the vehicle or along the underside. If the cable is run through the inside of the vehicle, route it along the edge of the floor beneath the carpeting. The rear seat cushion will have to be removed and, quite possibly, a hole will have to be drilled so as to feed the cable through to the trunk. If the antenna is mounted on the bumper, another hole will have to be drilled so that the cable may pass from the trunk area to the antenna. Always check for an existing hole before drilling one. If drilling a hole is necessary, fit the hole with a rubber grommet to prevent the cable from being damaged.

If the cable is to be run underneath the vehicle, securely clamp it along the frame and route it away from movable parts of the vehicle and also from the muffler or exhaust pipe. Suitable clips for securing the cable to the car frame may be obtained at most automotive supply stores.

2. Combination CB-AM Antenna (See Figures 6 and 7). — This type antenna is perhaps the most practical as it not only allows reception of standard AM broadcast as well as CB signals, but also it is easy to install and eliminates "cluttering" of antenna on the vehicle. If the AM broadcast antenna is presently installed on the front fender or cowl, it is recommended that the combination CB-AM antenna be installed in this same position. Rear fender installation is not recommended since an extension cable would have to be used.

Instructions supplied with the antenna should be used to mount the antenna. After the cable has been connected to the antenna, it should be dressed neatly under the dash, before connecting leads from the coupler to the transceiver and the AM radio. In certain cases a booster, supplied with the antenna, may have to be used. If used, the booster should be connected between the AM receiver and the pin plug coming from the coupler. After connection, the booster should be placed in a convenient position under the dash.

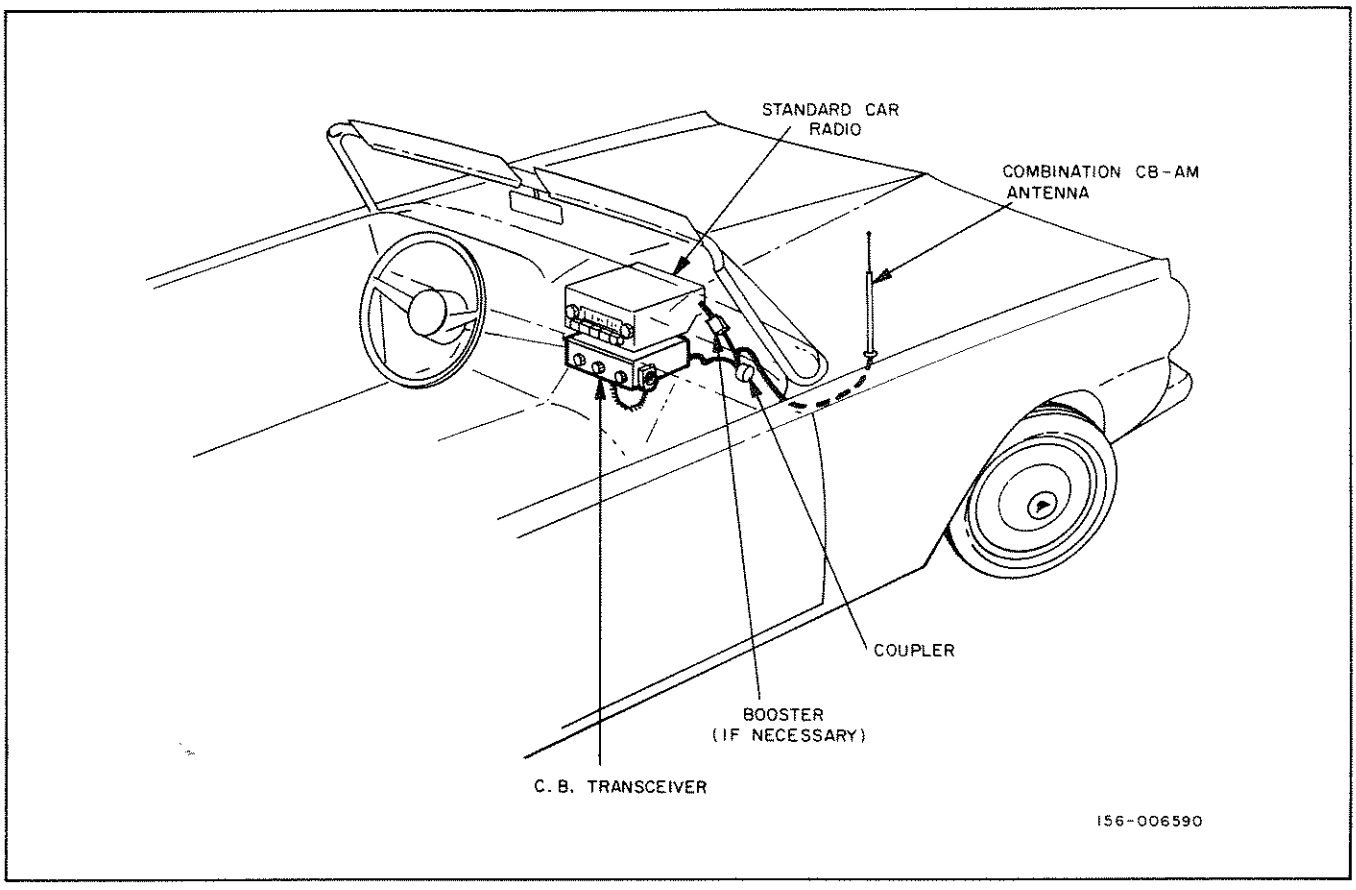


Figure 7. Typical Combination CB-AM Antenna Installation.

PA SPEAKER INSTALLATION

In some mobile CB installations a paging or public address (PA) capability may be desired. Certain CB transceivers provide an output jack and switch for this purpose. All that is necessary to complete the capability is a paging or coaxial projector type speaker, a length of hook-up or 2-lead wire and necessary connector.

The speaker may be mounted in any convenient location, such as in an open space under the hood or temporarily clipped to the rain trough. The wire from the speaker to the output jack on the transceiver should be routed away from the engine or any operating parts of the vehicle that may burn or damage the wire.

If a hole exists at the firewall which is readily accessible to the rear of the transceiver, it would be advantageous to use it. If no hole exists, one will have to be drilled through the firewall, again taking care not to damage any of the vehicle's parts. Use a rubber grommet at the firewall hole to protect the wire. Tie the wire to other wires located under the vehicle's hood to secure it along its path and to keep it away from the vehicle's movable parts.

Figure 8. Typical Underhood PA Horn Installation.

ELECTRICAL NOISE SUPPRESSION

GENERAL

Noise suppression requirements will vary quite widely with different vehicles, types of installation, and types of system operation. System usage and area coverage may often determine how much noise suppression may be necessary. Radio equipment installed in any motorized vehicle has to contend with electrical noise generated by various systems associated with the engine.

One of the first considerations is to determine whether or not the noise is caused by the vehicle in which the radio equipment is located. Drive the vehicle to a remote area (an area relatively free from local electrical noise) at the maximum effective range of the transmitting station. Set the receiver on the frequency of the transmitting station. Check the effect of operating the receiver with the vehicle's engine running and then with the engine off.

The next step is to determine how much noise is caused by the operation of the engine and how much noise is caused by outside sources. Disconnect the receiver antenna to eliminate any noise from an outside source. Most of the remaining noise can be considered to be originating from within the vehicle. This should indicate the amount of noise suppression necessary for the vehicle.

SOURCES OF ELECTRICAL NOISE

The most common types of noise interference in a vehicle are ignition noise, generator "whine," voltage regulator "hash," wheel and tire static, and noise caused by loose mechanical connections. The most effective way to suppress the noise is to identify and locate each noise source and to apply, in turn, a suppression component to each.

Ignition noise is characterized by regular "popping" or "snapping" heard at the speaker and will vary with the speed of the engine. This noise may be generated in the coil, distributor, generator, voltage regulator or spark plugs and can be radiated from any lead connecting these components.

Spark plug noise is characterized by a regular "popping" sound which increases with engine speed. Generator noise is identified by a whining sound which also increases with engine speed. Voltage regulator interference is caused by

sparking at the regulator points and appears as a distinct but irregular clicking sound which tends to be less steady than the noise from the ignition system.

Wheel static is another source of radio interference. It is caused by the grease in the front wheel bearings insulating the wheels from the chassis of the vehicle. Wheel static appears as a steady "popping" in the receiver at speeds over 15 MPH on smooth roads. This noise will disappear when the brakes are applied. Tire static is still another cause of radio interference which causes a sharper "popping" sound and becomes much worse at 30-50 MPH.

In most modern cars and trucks, the vehicle body frame forms the ground return for the electrical circuits. Differences in conductivity, inadequate bonds between adjacent conductors, and unequal current distributions result in potential differences throughout the vehicle. Miniature arcs across these potential differences produce radio interference.

ELECTRICAL NOISE SUPPRESSION MEASURES

The vehicle's ignition system is the greatest cause of radio noise generation. Prior to installation of any suppression components, the entire ignition system should be checked to make sure it is in good operating condition. Check for spark plug breakdown under a compression test. Check ignition leads for continuity. It may be necessary to solder the clips on the ends of the ignition lead to insure that they are making a metal contact. Check the condition of the generator brushes, commutator, and armature. Check the distributor points for pitting and correct adjustments. Check the distributor cap for signs of cracking and clean contact points. Check the distributor rotor for signs of wear. It may be necessary either to install a new rotor or build up the rotor contact point with solder to insure a clean contact with the contacts inside the distributor cap. Even if the ignition system is in good condition mechanically, there still may exist many potential trouble spots (in terms of radio noise generation) that must be located and corrected before maximum noise suppression can be obtained. Suppressor kits are commercially available which contain all necessary parts for reducing noise generated by most vehicles. As detailed instructions are normally packed with the Suppressor Kit, only measures that can be taken to reduce noise will be discussed here. Refer to figures 9, 10, and 11.

1. Distributor. — Install a 10,000-ohm suppressor resistor in series with the ignition coil input lead.

2. Generator and Coil. — Capacitors mounted to the generator and coil should be replaced since they are ineffective at two-way radio communication frequencies. Install a 0.5-UF capacitor (Sprague 48P18) on the generator at the same location as the old capacitor. Install a 0.1-UF capacitor (Sprague 80P1) between the battery and ignition coil input.

3. Regulator. — Install two 0.1-UF capacitors (Sprague 80P1) at the regulator, one at the battery (BAT) terminal and one at the armature (ARM) terminal, and a regulator suppressor assembly (see figure 9) between the field (FLD) terminal and ground.

4. Coil. — Install a 0.1-UF capacitor (Sprague 80P1) between the battery and ignition coil.

5. Shielded Generator Leads. — Install shielded leads in place of existing leads between the generator and regulator.

a. The shielded leads may be prepared as follows:

NOTE

Alter sizes given, as required, in the following steps for each particular installation. Be certain to allow some extra lead length in the following steps so as to make proper connections to the terminals.

(1) Armature lead. — 5-foot length of NO. 10 AWG stranded wire inserted into 67 inches of 1/4" O.D. NO. 14 AWG tinned copper braid. Strip back the braid at each end of the cables approximately 2-1/2 inches to allow forming approximately 4-1/2-inch pigtails with the braid. Tape the shielded braid to the leads at both ends with either Scotch electrical or friction tape. This will prevent the shielded braids from sliding on the lead and touching the bare terminals.

(2) Field lead. — 5-foot length of NO. 14 AWG stranded wire prepared in the same way as the armature lead.

b. Strip off 3/8 inch of insulation and place NO. 10 flag type solder lugs on each end of the shielded armature lead (the larger of the two shielded leads). Crimp the flags on the lug tightly about the bare wires and solder.

c. Strip 3/8 inch of insulation off each end of the shielded field lead (the smaller of the two shielded leads). Place NO. 10 flag type solder lugs on each end of the field lead, crimp and solder. Some generators have 1/4-inch studs on their field terminals instead of NO. 10 studs.

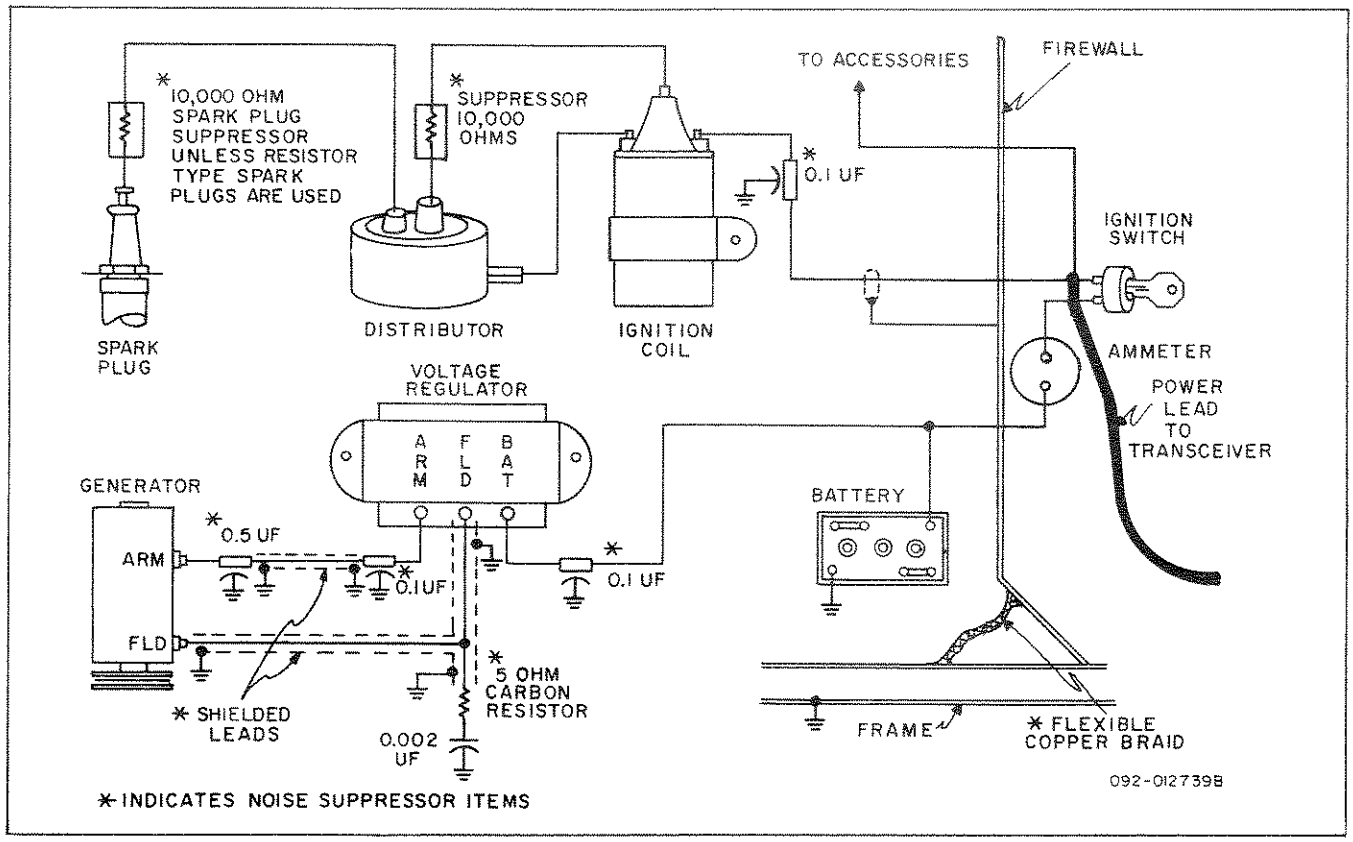


Figure 9. Electrical Noise Suppression Components Installation Diagram.

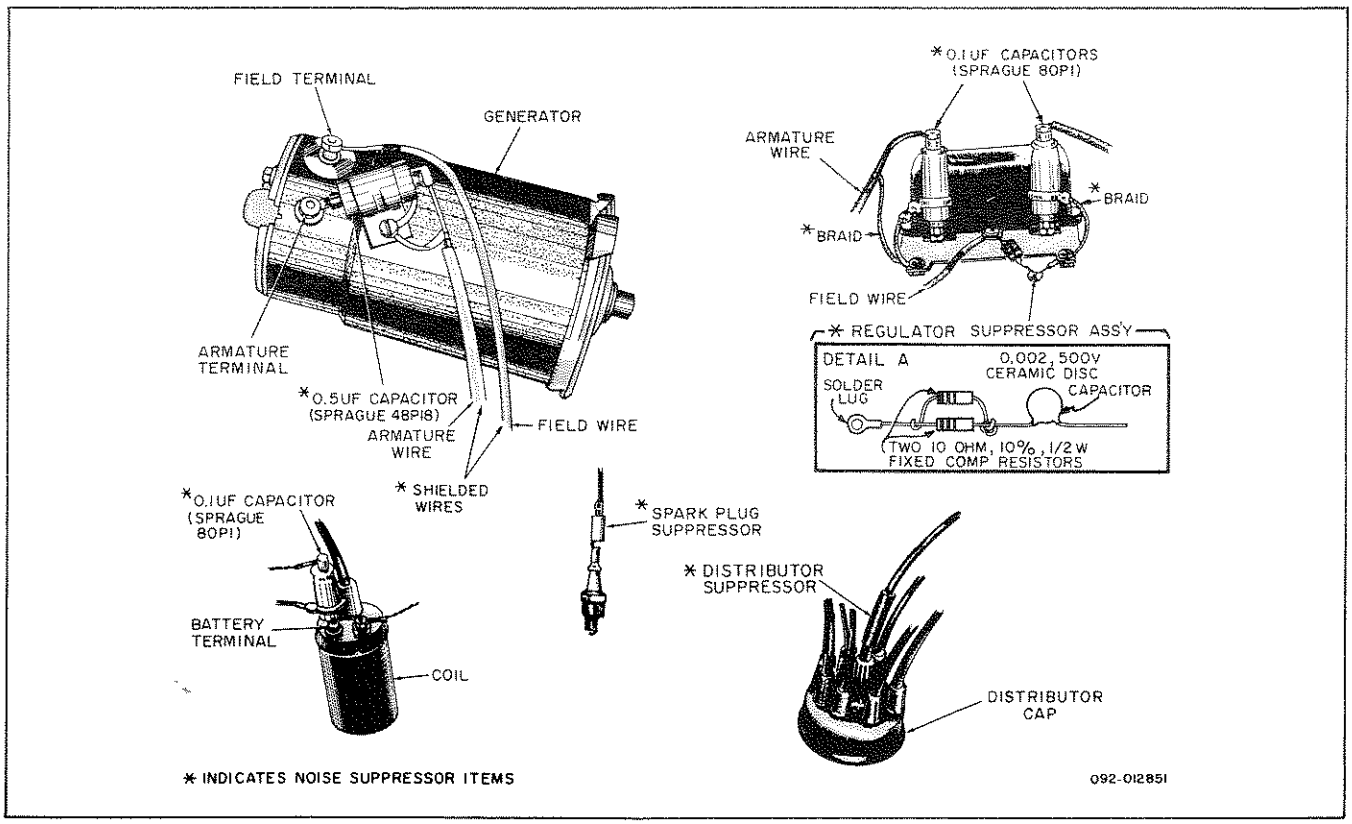


Figure 10. Illustrations Showing Noise Suppression Components Mounted on Automobile Items.

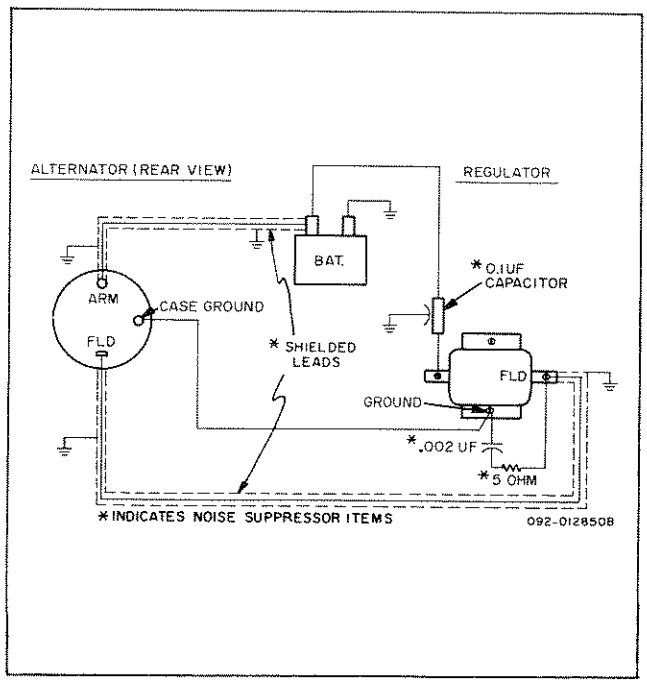


Figure 11. Typical Noise Suppression Installation for Automobile Alternator System.

In this case place a 1/4-inch solder lug with ears on the generator end of the field lead.

d. Crimp appropriate solder lugs on the ends of the shield braid pigtails and solder.

e. Install the two shielded leads using as many of the existing cable clamps as possible. Connect them to their proper terminals. Be sure the smaller field lead is connected between the field terminals of the generator and regulator, and the larger lead is connected to the armature terminals.

f. Connect the four shield braid pigtails to appropriate grounds. Make sure the ground points are clean and free of dirt and corrosion.

g. Reconnect the battery cable that was removed. Be certain that it is secure. The original wires which are no longer used and the new shielded leads should be secured by clamps, tape, or ties at various points along their route.

6. Spark Plugs. — Most modern day vehicles are factory equipped with either resistor spark plugs or resistance type spark plug wire to reduce radio interference. Spark plug suppressors are not recommended for use in these systems. On vehicles not already equipped with a means of spark plug suppression (either resistance wire or plugs), installation of suppressors at each spark plug will materially reduce radio noise.

7. Additional Measures. — In some vehicles it may be necessary to bond various parts of the vehicle to one another to insure good electrical contact. Good electrical bonding exists when all major metal parts are interconnected by clean metal-to-metal connections. Although the specific bonding each vehicle requires cannot be stated without experimenting, there are a few key locations which generally require bonding. These are: (1) frame to body, (2) engine hood to body, frame, or engine, (3) tailpipe to frame, and (4) trunk lid to body. Lengths of 11/16-inch wide copper braid and NO. 10 thread forming screws with lockwashers can be used for this purpose. The braid must be cut to the lengths dictated by the application and prepared by forming a hole in each end to accept the NO. 10 screws or existing bolts when used. Flow solder into the braid around the holes to give strength to the area. Holes required for the NO. 10 thread forming screws in sheet metal may be drilled with a 24 drill (0.152 inch).

a. In cases of stubborn generator whine, a carbon brush (mounted on a spring steel bracket) riding on the end of the generator shaft usually will reduce interference.

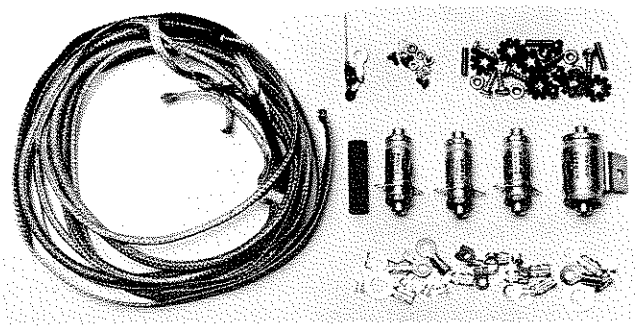
b. Interference sometimes can be caused by the lighting systems, electric wipers, heater blowers, and other accessories. In cases such as these, the troublesome interference can be reduced by installing bypass capacitors (0.001-UF to 0.01-UF mica or ceramic disc type capacitor) from the terminals of the offending accessories directly to ground (car frame, firewall, or dash).

c. In cases where severe power lead noise pick-up is experienced, power for the radio equipment should be obtained directly from the battery. When connecting directly to the battery instead of the starter key, the battery acts as a large capacitor and bypasses noise to ground. Shielding this lead and keeping it as short as possible will also help to reduce interference.

d. Tire static noise can be eliminated by injecting an anti-static powder into the tires.

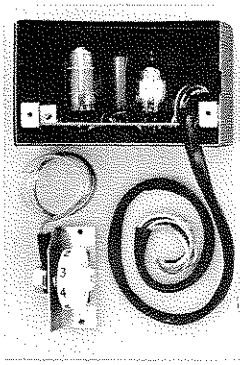
e. For wheel static noise, use wheel static eliminators (available at auto service shops).

ACCESSORIES



HA-3

NOISE SUPPRESSION KIT
Provides necessary filter capacitors, ground braid, etc., to minimize automotive electrical system noise. (Does not include spark plug suppressors.)
Shipping wt. — 1 lb. $ 13.95



HA-11

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"Racket buster" supreme! Two-tube unit effectively suppresses external interference. Easily installed on any tube-type CB unit with 2 or more IF stages. Shipping wt. 1 lb. $15.95

SP-3

SPARK PLUG SUPPRESSOR
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