

Figure 1.

## Introduction

The mobile rooftop antenna is supplied with a coaxial lead-in cable and a connector. In the completed installation, the cable is concealed between the headlining and the roof of the vehicle, with a minimum disturbance to the headlining and the upholstery. Figure 11. provides a pictorial drawing of the disassembled antenna complete with component part numbers. Figure 1 shows an antenna assembled and mounted.

### CAUTION

Advise the radio owner to unscrew the upper antenna assembly at the knurled section before entering an automatic car wash to prevent damage to the antenna or the roof of vehicle. When unscrewing the antenna, be sure only the upper section, not the coupling nut is removed. If the coupling nut should loosen, retighten it securely against the mounting surface.

## Installation

See Table 1 for recommended antenna location for various vehicles. The installation procedure which follows is for a typical passenger car. The procedure may vary slightly with the type of vehicle on which the antenna is to be installed. Generally speaking, however, the procedures outlined are of a "universal" nature.

### CAUTION

Observe the safety precautions given in this instruction manual. Never adjust antenna whip length while the radio is being keyed.

This antenna is factory tuned for 835 MHz.

### NOTE

The antenna should be mounted on a flat metal roof of .020 to .040 inch thickness.

First, select a location for the antenna as near the center of the roof as possible (see Step 1 of the installation procedure following).

### IMPORTANT

When installing the lead-in cable, the cable should *not be shortened*.

The headlining may be probed with the fingers to make sure that all points of obstruction will be avoided.

1. Drill a pilot hole at selected location then, drill a 3/4-inch hole from the top (outside the vehicle only) with the Motorola 01-80382A25 holecutting saw (or equivalent) until it bottoms. Clean the roof metal in a neat circle to assure good contact with the mounting base and its locking nut.

### NOTE

In installations involving a double roof with no dome light, a second 3/4-inch hole must be drilled. However, a deep-well type of 3/4-inch hole saw (with pilot drill bit) must be used to cut the second (or bottom) roof section. This provides access to the area where the coaxial cable is routed, between the second roof section and headlining.

2. Drill the second 3/4-inch hole if required. Use extreme caution, though, to prevent puncturing the head lining.
3. For proper seating of the mounting base and locking nut, remove any burrs and/or foreign matter from above and below the (top) 3/4-inch mounting hole. This should be done for at least 1/8-inch out from the hole edge. For double roof construction vehicles (without dome light), clear the second (or bottom) 3/4-inch hole of any burrs also.
4. Determine the routing of the cable from the antenna mounting base to the radio set; then remove the molding and trim necessary to facilitate pulling the cable through.

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#### NOTE

To ensure ease of assembly, thread the locking nut on the end of the mounting base a couple of times before installing. This removes any burrs that may be present.

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#### NOTE

Refer to Figure 2. Be sure to apply a generous amount of silicone grease (supplied) to the inner and outer threads of the locking nut. In addition, be sure there is some silicone grease applied to the rubber "O" ring washer and the groove in the locking nut in which it is seated.

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5. Refer to Figure 3. Insert the end of the coaxial cable into the mounting hole as shown; then route the cable between the roof and headlining to the radio set.

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#### NOTE

If difficulty is experienced with cable routing, use an electrician's fishtape to perform Step 6.

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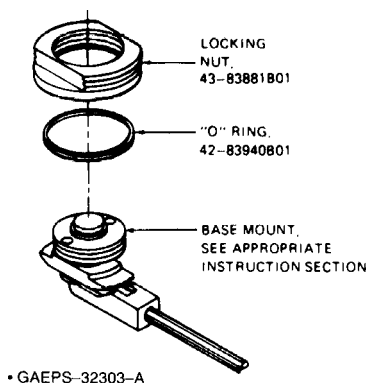


Figure 2. Parts Identification

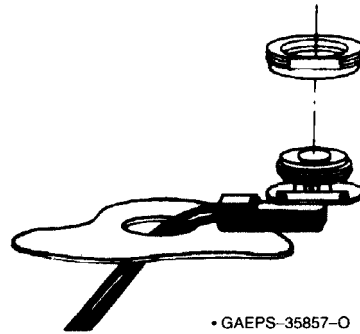


Figure 3.

6. Refer to Figure 4. Insert the mounting base into the mounting hole as shown, tilted slightly. Be sure that all of the cable has been pulled through to the radio set. The threaded portion of the mounting base will not fall through the mounting hole.

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#### IMPORTANT

In double roof vehicles, which have no dome light, DO NOT attempt to secure the base mount to both roof layers. Secure it to the top, outer roof layer only.

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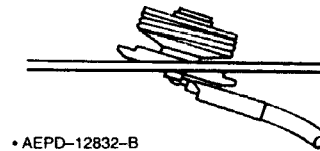


Figure 4. Inserting the Mount Base

7. Refer to Figure 5. While holding the mounting base down, thread the locking nut onto it. When the nut is well onto the mounting base, pull up on the entire assembly as shown in Figure 6. Make sure the mounting base is centered in the hole, and seated properly with both shoulders inside the mounting hole. Use a 15/16-inch open-end wrench to tighten the locking nut until it bottoms firmly against the roof top.

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#### IMPORTANT

Refer to Figure 11. If the mounting base should slip or rotate for any reason while tightening, insert the tips of a long-nose pliers or a spanner wrench into the two holes on top of the mounting base. Apply enough force to prevent slippage until the locking nut is tight. The locking nut *must* come in contact with the vehicle roof to ensure the proper antenna radiation pattern. This can only be accomplished when the rubber "O" ring washer is fully compressed.

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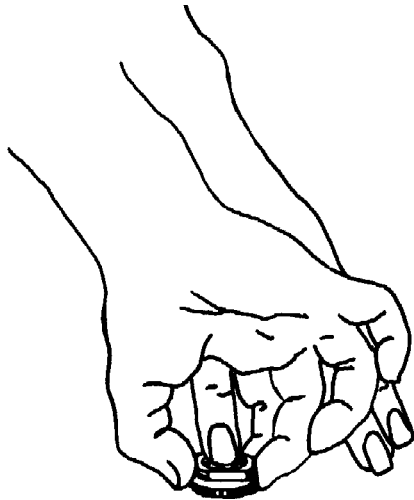


Figure 5.

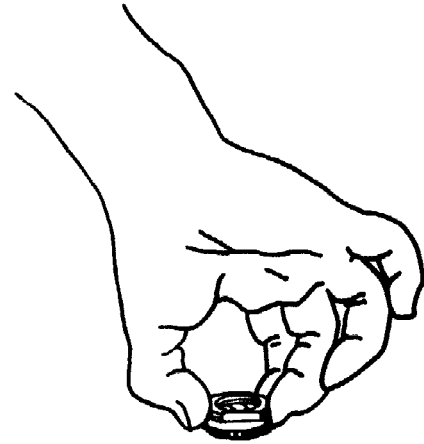


Figure 6.

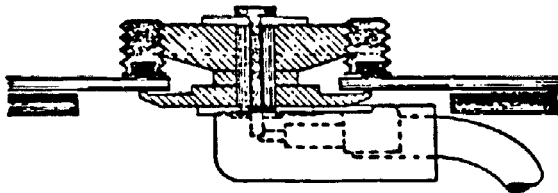


Figure 7. Double Roof (with Dome Light) Installation

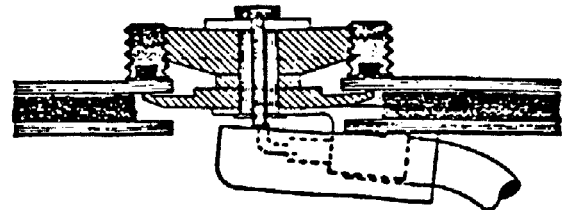


Figure 8. Double Roof (No Dome Light) Installation

**NOTE**

Figure 7 shows how the base mount should be installed in a vehicle with double roof construction and a dome light. Figure 8 shows how the base mount should be installed in a vehicle with double roof construction and no dome light. Single roof installations will be similar to Figure 7 except there is no second roof layer present.

8. Refet to Figure 9. Slide the metal cap (coupling nut) over the antenna rod assembly until it is in place over the plastic insulator of the whip assembly. Put the whip assembly in place over the locking nut and secure the metal cap to the external threads of the locking nut. With the antenna rod in a perfectly vertical position, tighten the metal cap *by hand* as tight as possible. Then, with 10" adjustable wrench or a 1" open end wrench, tighten no more than an additional 1/2-turn.
9. Replace the headlining and dome light if removed.

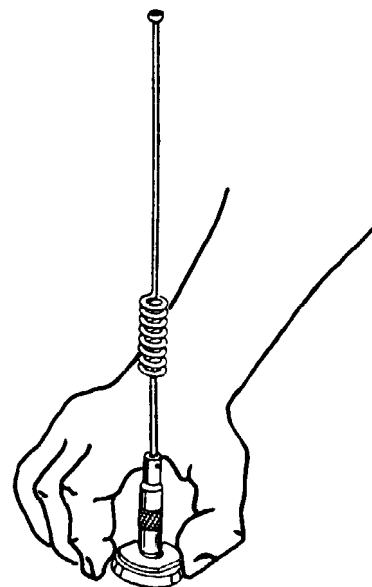


Figure 9.

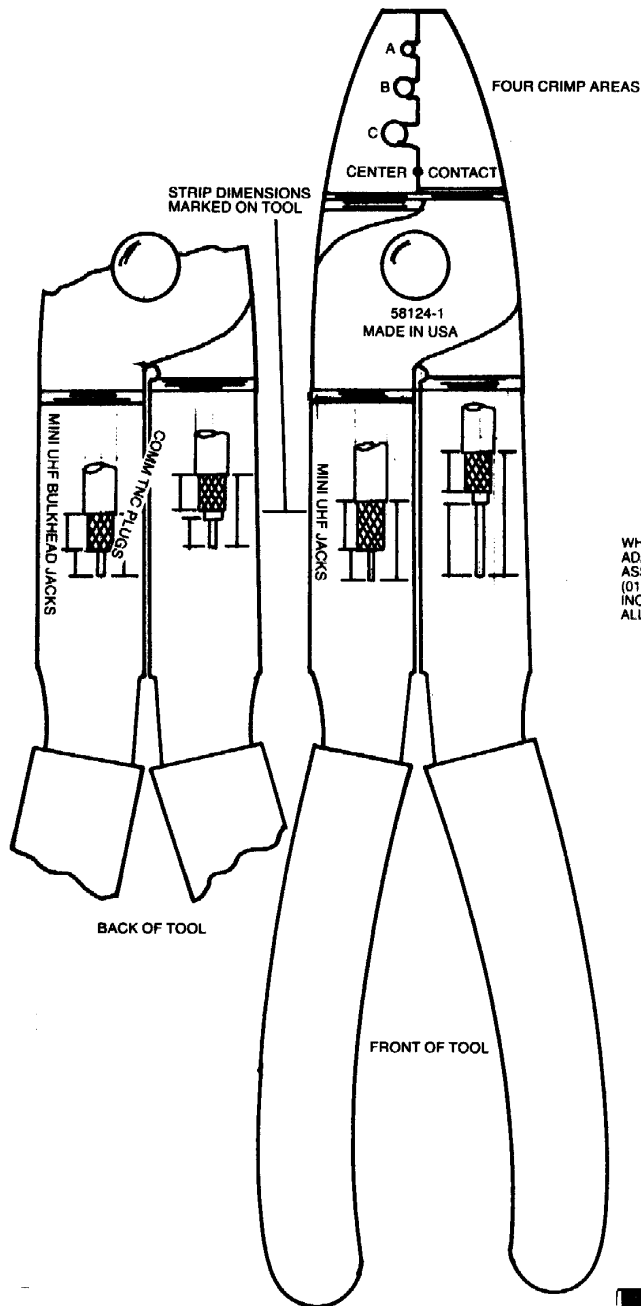


Figure 10.

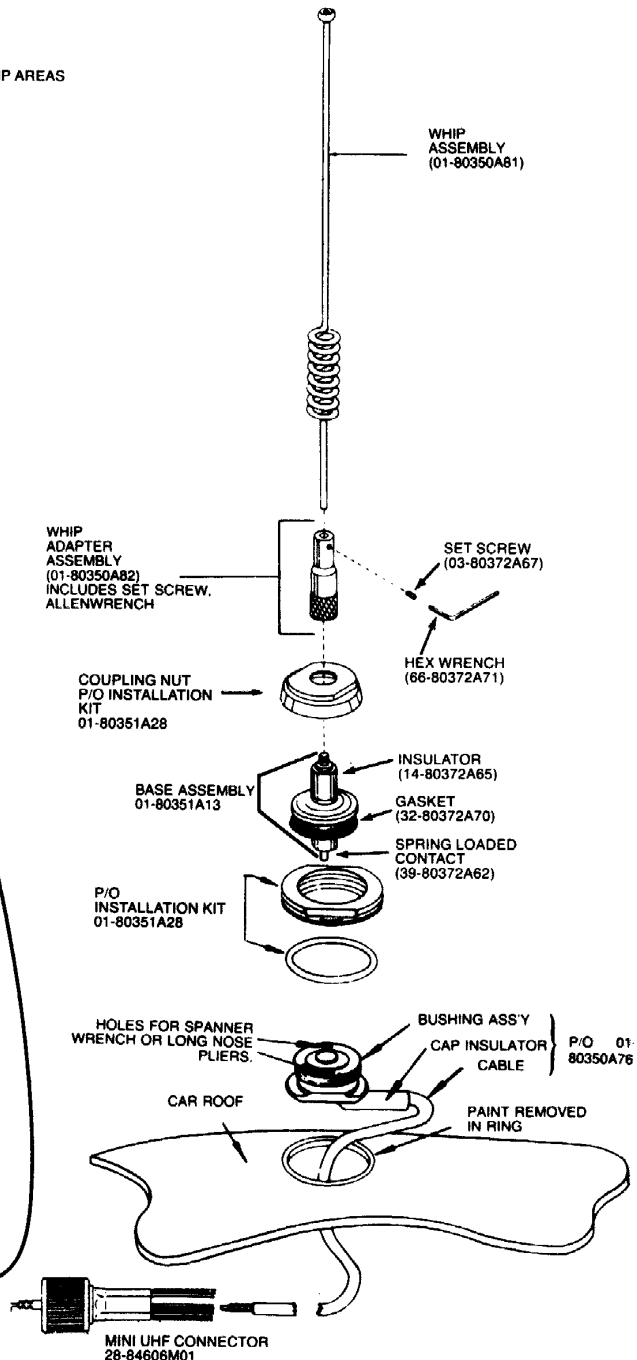


Figure 11. Model shown is a complete antenna RRA-4914

## Connector Installation (Mini-UHF)

Use Motorola hand tool part #66-80388A26. Refer to Figure 10. A deluxe ratchet type tool is available; order part #66-80334B40.

1. Slip the ferrule and collar onto the cable. Refer to Figure 12.
2. Prepare the cable to strip dimensions per Figure 13 which is also marked on handtool.

### NOTE

RRA-4916 is similar to RRA-4914 but includes 18' of RG58A/u rather than 14' of cable. RRA-4983 is similar to RRA-4914 but includes Lower Loss cable.

3. Insert the stripped cable into the plug body until the conductor is exposed (front end) and dielectric bottoms inside body. Refer to Figure 12.

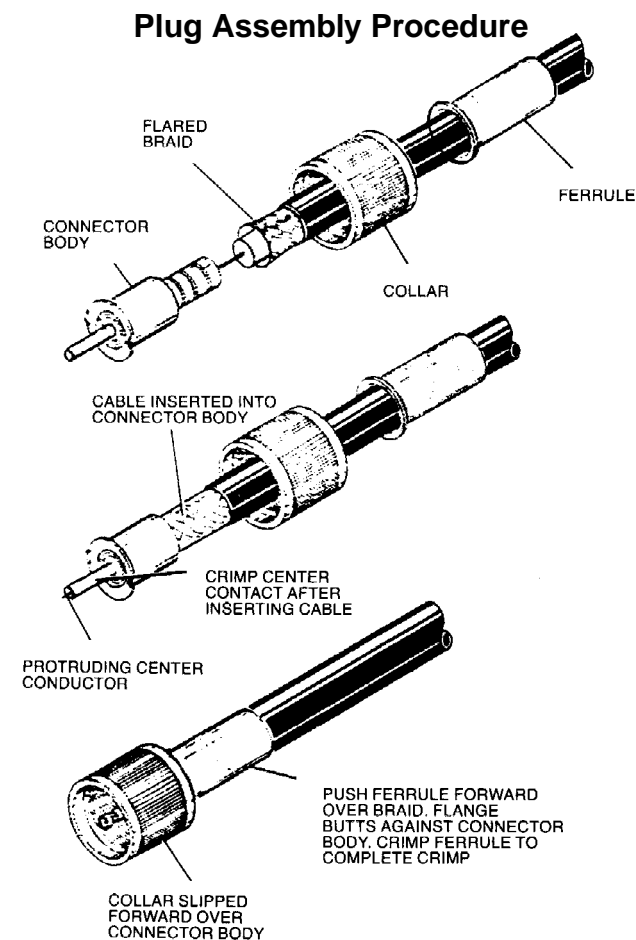


Figure 12.

4. Crimp center contact using proper crimp section of tool. Refer to Figure 10 marked "CENTER CONTACT".
5. Push collar forward onto plug assembly. Fit cable braid over support sleeve of connector. Refer to Figure 12.
6. Push ferrule over braid until flange butts against connector body. Refer to Figure 12. Using correct crimp area of tool, crimp ferrule close to plug body. See Figure 10 crimp location "C". Crimp ferrule a second time close to cable end, using "C" crimp area of tool.
7. Protruding center conductor should be trimmed flush with end of center contact.

## Antenna Test/Fine Tuning

This antenna is factory tuned for 835 MHz, the center frequency of the U.S. Cellular band.

For use on Part 90 SMR frequencies, the antenna may be checked and fine tuned using an in-line Wattmeter. Tune for minimum reflected power at 813.5 MHz by

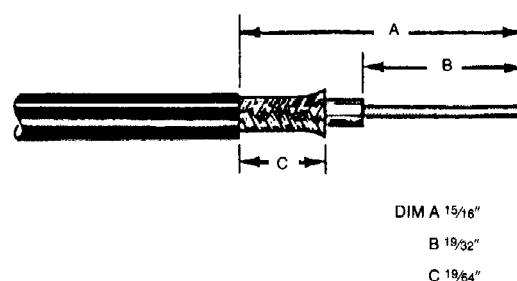


Figure 13.

loosening the set screw and adjusting the length of the whip. Retighten the set screw. Check for VSWR less than 2:1 at 806 MHz and 821 MHz.

Refer to Figure 14 for appropriate antenna length.

## Motorola Recommendations for Mobile Antenna Location

Motorola recommends that mobile antennas be located as follows. Refer to Table 1.

### Antenna Location

#### Mobile Antenna Installation

##### Mobile Radio Operation and EME Exposure

Observe the following caution and electromagnetic energy exposure (EME) statements when installing antennas:

#### CAUTION

Use caution when installing antennas with mobile radio equipment using transmitter power of 7 W or greater. Install antennas only on metal bodied vehicles.

#### NOTE

For low-power mobile radios (less than 7 W) there are no antenna type or installation restrictions.

To assure optimal radio performance and that human exposure to radio frequency electromagnetic energy is within the guidelines referenced in this document, transmit *only* when people inside and outside the vehicle are at least the minimum distance away from a properly installed, externally-mounted antenna.

Table 2 lists the minimum distance for several different ranges of rated radio power.

#### Selecting an Antenna Site

1. Install the vehicle antenna *external* to the vehicle and in accordance with the requirements contained in this manual.

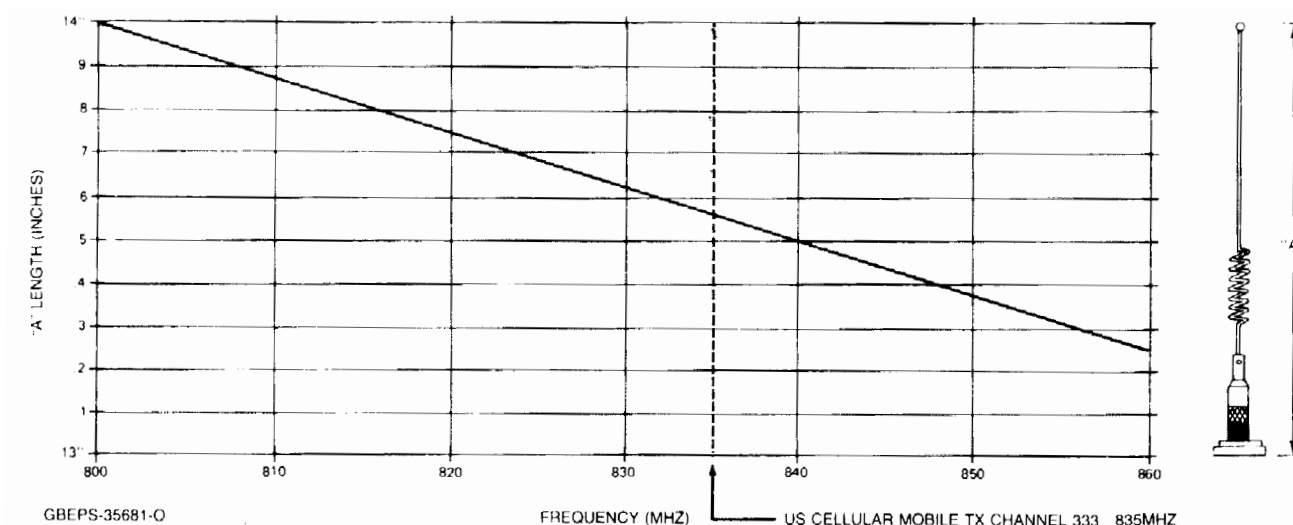


Figure 14. Antenna Tuning Chart

Table 1.

|  |  |
|--|--|
| Standard metal passenger vehicles  | Center roof or center trunk lid  |
| Vans, pickups, and other light trucks (metal roofs)  | Center roof  |
| Heavy duty equipment with metal roofs (heavy duty trucks, semi-tractors, heavy refuse trucks, cement mixer trucks) | Center cab roof  |
| Specialty vehicles (such as T-roofs, sun roofs, or convertibles)   | Center trunk lid – recommended only for transmitter output of less than 7 W.   |
| Other vehicles   | Contact your Motorola Field Technical Representative. Do not install closer than the distances shown in Table 2, for the relevant transmitter output power, from occupants or without proper antenna ground plane. |

Table 2. Rated Power and Distance

| Rated Power of Vehicle-installed Mobile Two-Way Radios | Minimum Distance from Transmitting Antenna |
|--|--|
| 7 to 15 W  | 1 Foot (30.5cm)                            |
| 16 to 50 W   | 2 Feet (61cm)                              |
| More than 50 W   | 3 Feet (91.5cm)                            |

- The best mounting location for the antenna is in the center of a large, flat conductive surface. In almost all vehicles, mounting the antenna in the center of the roof will satisfy these requirements. A good alternative location is in the center of the trunk lid. If you use the trunk lid, ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis.
- Ensure the antenna cable can be easily routed to the radio. Ensure that the antenna cable is routed separately and not in parallel to any other vehicle wiring or mobile radio cable wiring.
- Check the antenna location for any electrical interference.

**NOTE**

Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and hood lids, exhaust pipes, etc.) in close proximity to the antenna can cause severe receiver interference.

- If the vehicle is equipped with an electronic anti-lock braking system (ABS), mount the antenna at the center of the roof or trunk lid and do not route the antenna cable near the ABS Modulator Box. Mount the radio as far away from the Modulator Box as physically possible. This minimizes radio interference to the modulator box from the radio.
- Make sure the mobile radio antenna is installed at least one foot (30.48cm) away from any other antenna on the vehicle.