



Removable Car Window Antenna with Cross Over Connector

Operate from any vehicle without a need to drill holes.

Jean-Yves Morin, VE2MHZ

It is often difficult to install a transceiver and its associated antenna in a modern motor vehicle. In many cases a challenge is establishing a connection between the antenna on the outside of the vehicle and the radio inside, without drilling holes in the vehicle body. This article describes a removable UHF/VHF antenna that uses no fastening devices, neither magnet nor adhesive, while respecting the integrity of the vehicle.

Application

This mount is designed to provide a quickly removable antenna system. That, combined with a V/UHF transceiver equipped with a plug designed for what used to be called a cigarette lighter socket, should be all it takes to set up temporary operation in a rental or leased car for casual or emergency operations.

The antenna element may be a quarter or half wave UHF, VHF or lightweight multiband antenna designed for mounting on a UHF type SO-239 coax jack. The connection to the radio is made through a coaxial jumper cable with a BNC plug on one end and a plug to match the radio's antenna connection on the other. For safety's sake, leave enough of that cable to allow opening the door without pulling on the cable. Secure the coaxial cable to the inner headrest support with an elastic cord. The hook will hold it to avoid the cable dangling down in front of the window.

Construction Details

Figures 1 through 5 illustrate the fabrication and construction details. The required standard fasteners are listed in Table 1. The fabricated parts are described in Table 2, which is keyed to the part designators in each figure. Use slightly oversize drill bits for machine screw clearance holes and slightly undersized bits for sheet metal screw holes.

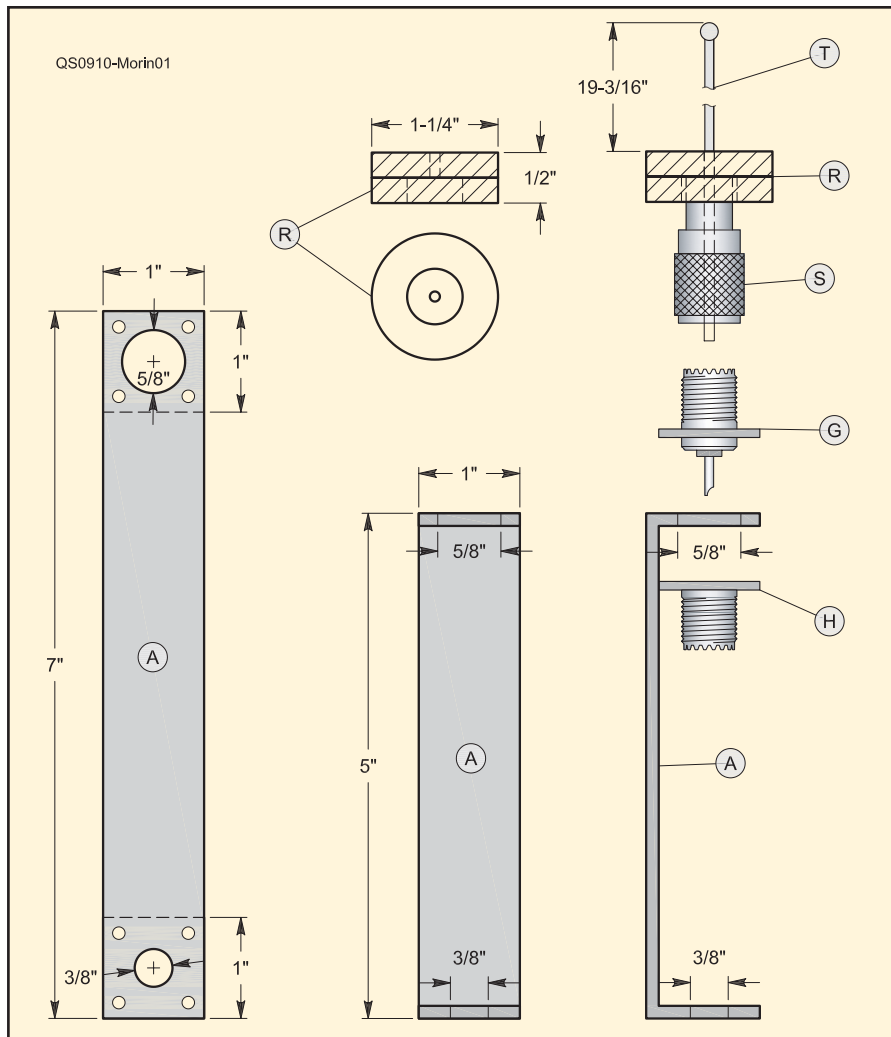


Figure 1 — Fabrication and assembly details of antenna supports. See Tables 1 and 2 for details of pieces keyed to Figures 1 through 5.

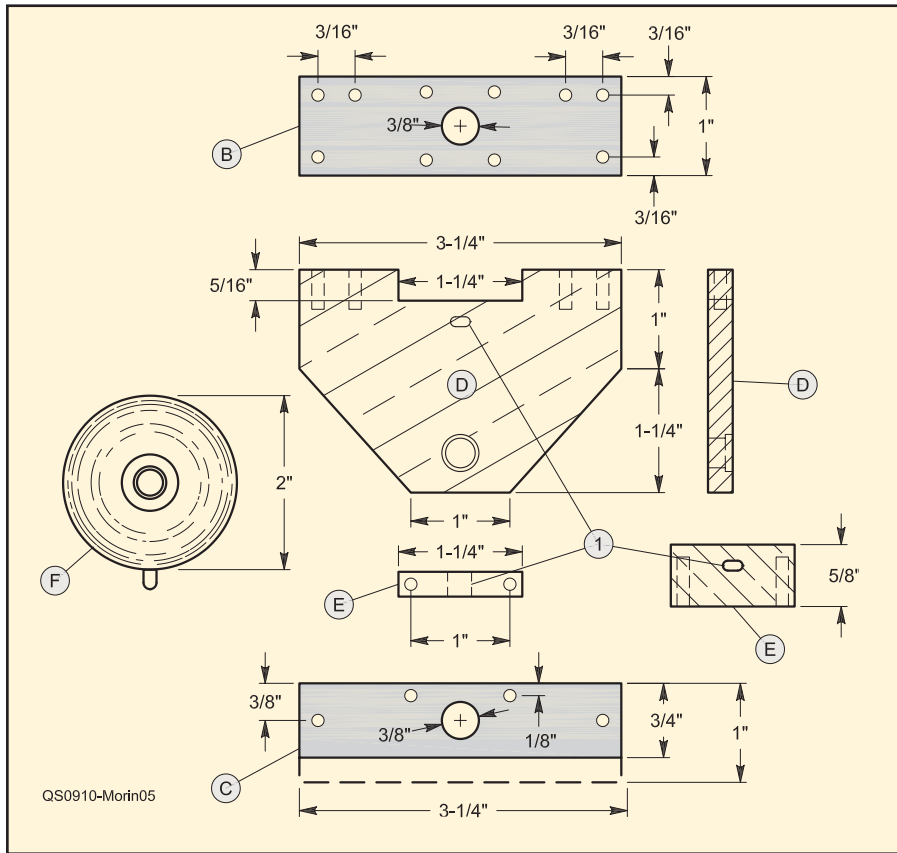


Figure 2 — Fabrication and assembly details of suction cup supports.

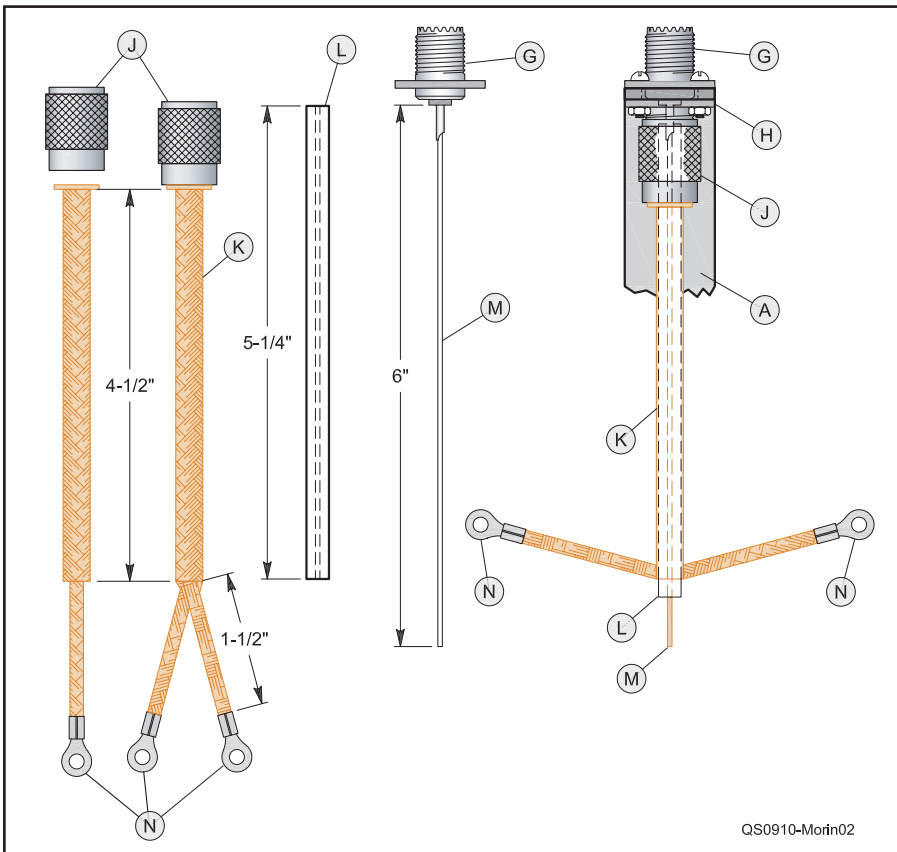


Figure 3 — Details of antenna connection cable.

Installation

It is time to install your antenna on the edge of the window glass. It is generally supported between the completely closed window pane and its frame on any vertical displacement window either electric or manual, or even on a swing-out window. If the glass is curved, don't try to shape the supports on the window; rather, bend in a vise until it fits smoothly to the glass contour and the antenna mount is vertical.

The recommended installation spot is on the window situated behind the driver of the car. In a two door car or a tractor cab, however, the best place may be opposite the driver or operator. The antenna should be placed close to the door hinge side of the door. The inside coaxial cable needs a loop long enough to allow the door to open, but short enough not to entangle a foot in it. Use an elastic cord to tie the coaxial cable with a hook to the inner headrest support to avoid it dangling down. Prepare the window by cleaning the glass and moistening the area where the suction cup will attach. Figures 6 through 8 show the antenna mounted on the car, while Figure 9 shows the operating position.

For final adjustments, avoid anything that might cause antenna detuning. I have found that open car doors or proximity to objects in the garage can result in unexpected readings.

Conclusion

This antenna has been designed with an eye toward durability and efficiency and to provide safe and dependable operation. Use the material recommended and you should have years of enjoyment.

Photos by the author.

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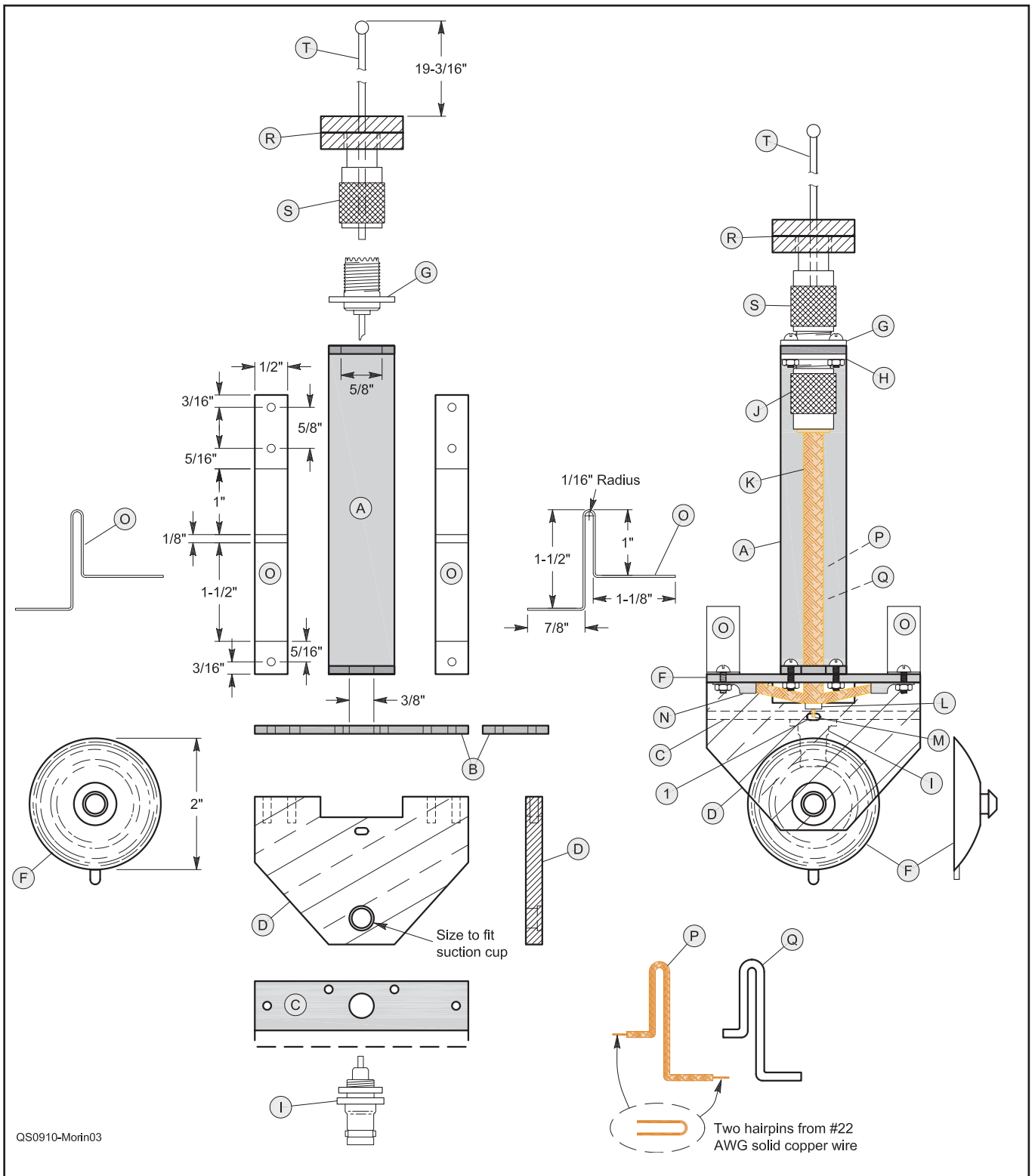


Figure 4 — Fabrication details showing the suspender straps attached to the antenna support.

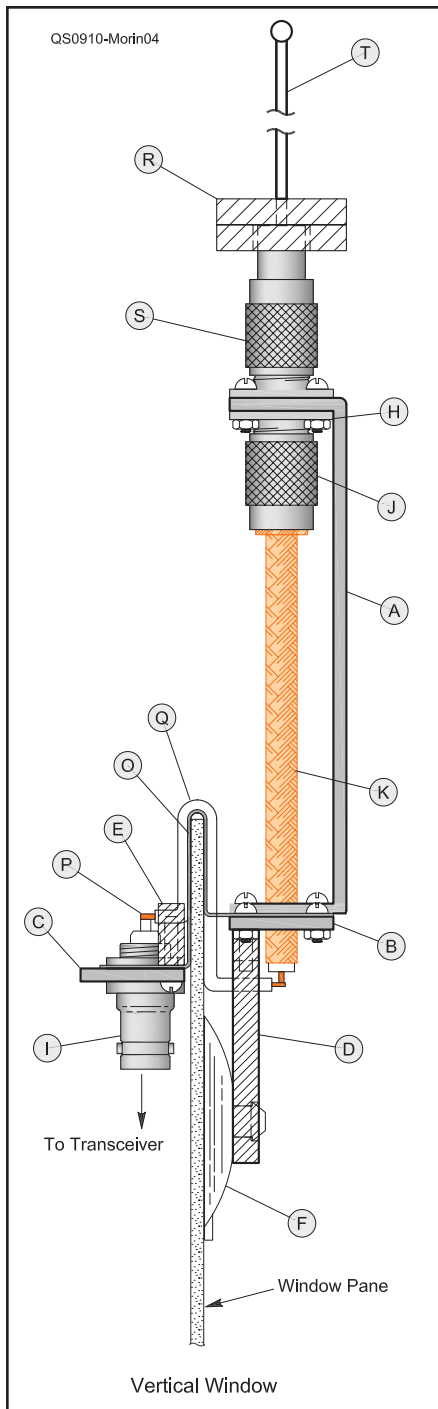


Figure 5 — Side view of completed mount as installed on straight window glass. For curved glass bend in a vise to fit and bend antenna support outward to clear.

Table 1 — Required Fasteners

Quantity	Description
12	Machine screws, #6-32 × 1/2" stainless steel or brass
12	Self-locking (nylon insert) nuts, #6-32
6	Sheet metal screws #4 × 1/2" stainless steel
2	Hex nuts, #6-32 brass



Figure 6 — Side view photo of completed mount installed on window.

Table 2**Description of Part Fabrication and Key to Figures 1 Through 5**

<i>Key</i>	<i>Description</i>	<i>Material</i>
A	Vertical support	Aluminum strip 7" x 1" x 1/8"
B	Outside antenna horizontal support	Aluminum strip 3 1/4" x 1" x 1/8"
C	Inside horizontal support	Aluminum strip 3 1/4" x 1 or 3/4" x 1/8"
Two aluminum pieces for the antenna support and one for the transceiver cable support yoke are cut from a piece of aluminum strip 1/8" x 1 or 1/8" x 3/4". Sand the anodized contact surfaces between the aluminum pieces and between connectors G and F that will later fit on top. Paint, if used, must be applied after A and B are fastened together.		
D	Anti-sway suction cup support	Lexan (ABS) piece from 1/4" sheet
The fastening face must be plane and side surface perpendicular to the metal piece. The size of the hole for the suction cup (F) will depend on the available suction cup.		
E	Middle conductor wire support	Lexan piece from 1/4" sheet
The fastening face must be plane and the side surface perpendicular to the metal piece of the yoke.		
F	Suction cup	2" diameter vinyl As available, tailor mounting hole to fit
This also serves as an anti-sway anchoring device. This is not of an absolute necessity as the antenna will work without it but it does help to stabilize the whip.		
G	UHF SO-239 socket	
H	Modified UHF SO-239 socket	Inner contact assembly removed by sawing off the protruding connection and filing the non-threaded portion flush.
I	BNC panel jack, nut type	Use lug as lockwasher only
J	Backshell from a PL-259	Solder around the crown by leaving a half-round bead of solder.
K	Cable shield	Tinned braid from a piece of RG-58 coaxial cable
Form the braid on a wood pencil fan the conductors evenly in a radial fashion. Then cut around slightly larger than the connector shell (J). Tin to form a hard washer that will facilitate soldering later on. Trim after based on shell diameter. Pass the braid through the lower hole where the two aluminum pieces meet, then screw the shell on top of piece H.		
L	Cable insulation	Solid polyethylene coaxial cable insulation
Remove the center conductor, then make a 1/8" deep, 1/8" diameter hole on top at the spot where the soldered joint between connector G and wire M will be hidden.		
M	Solid tinned 14 gauge wire	Measure about one 1" longer than needed
Screw J over H temporarily to measure the length of insulation needed. L should protrude 3/8" from the lower aluminum part and wire M will be 1/8" lower than the insulation at this spot. Solder to connector G and use solder sparingly on these temporarily steadied pieces to insure reliable solder joint. Screw the connector shell supported by a piece of wood in a vise and proceed to solder the braid (K) to the shell (J). Do not cut the braid (K) yet. Slide the polyethylene (L) inside K and take measurements.		
N	2 each #6 solder or crimp lugs	Barrel to fit over half of the cable braid
Measured 1/4" above the end of the insulation and mark the braid with a temporary nylon strap or a twisted wire. This spot will mark the location of a 90° bend for each braid wire. Divide the braid into two equal braids. Comb out the wires and twist each slightly. Cut just long enough so that each lug (N) will reach the screw protruding from the installed nut. Before the final connection, protect the coaxial cable by slipping a length of clear heat shrink tubing or RTV rubber tape from the braid bending point up to and including connector barrel (J).		
O	Two each 1/2" wide "suspenders"	Cut from 6" diameter stainless hose clamp
Remove the parts having elongated holes and cut to proper length before bending in a bench vise. A piece of plate glass, thin plywood or aluminum may be used as a bending form simulating the window pane. After final bending proceed to piercing using a good sharp self-centering drill bit in a press drill. Tin the stainless steel surfaces coming in contact with aluminum using no-lead copper pipe solder and zinc chloride as flux. Wipe clean with a piece of cloth. The zinc chloride should make the stainless steel as easy to solder as copper. When each piece is finished install on aluminum piece. The sheet metal screws will be screwed in plastic under the back hole of each suspender. You may hold that part in a vise using a piece of scrap aluminum, plywood or anything similar to the thickness of auto window glass.		
P	Braid	Ready-made, or from a piece of RG-174 coax Flatten with fingers and tin 1/4" at each end with electronic solder.
Q	Teflon insulation	From an insulating sleeve or the insulation of a 14 or 12 gauge stranded wire
Slip the piece P inside and measure the insulation to keep 1/8" of the braid free at each end. A 1/2" hairpin wire loop will be inserted through the braid. The two small loops are sized to fit the 14 gauge wire (M) and the center terminal of the BNC connector (I). Hook the first loop around wire M and solder, shape the insulated conductor over that window glass piece held in the vise after which you solder the other loop to BNC connector. Clean and make continuity and short tests with a VOM.		
R, S and T	Whip antenna	A commercial antenna may be used, or fabricate your own
R	Antenna support	Two pieces of 1/4" Lexan sheet each 1 1/2" square
One piece will have a tight fitting hole to receive the antenna whip and the other a hole 1/16" larger than the PL-259 sleeve diameter. Both are glued together with ABS drain pipe cement and dried 24 hours under pressure in the vise. Clean the excess glue from lower part with a sharp object such as a small blade screw driver, then drill the hole to receive the antenna whip. Then shape the part to become a circular 1 1/4" disc.		
S	Antenna base	PL-259 UHF plug for the antenna element
T	Antenna whip	Piece of 3/32" diameter stainless steel rod
Make correct length to be a lambda/4 whip for desired band. Add a ball on the end in the interest of eye safety. Tin at least 1/2" of the lower end with solder. Stainless steel is very easy to solder if you use copper pipe no-lead solder with zinc chloride as flux. Then solder that rod to the connector pin with electronic solder. Fill all empty space between rod and connector with non-conductive epoxy adhesive while the antenna is vertical. After the epoxy has set, clean with hot water, turn the antenna upside down and partially fill the antenna insulator plate with the same epoxy adhesive, then slide up to contact the connector sleeve. The glue should reach all inside space and all excess must be wiped out before it hardens.		

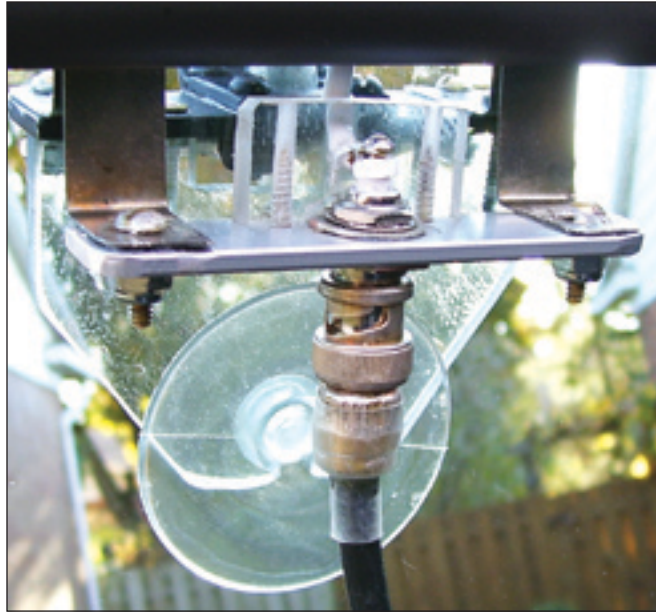


Figure 7 — Antenna mount as seen from inside the vehicle.

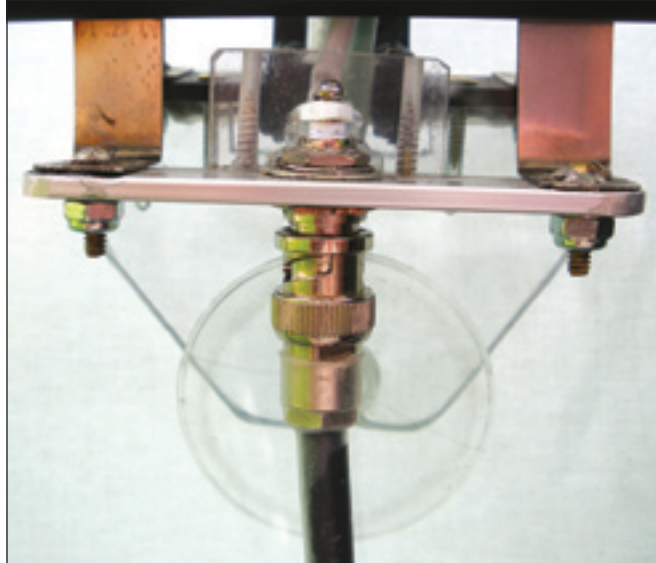


Figure 8 — Close-up of mount from inside.



Figure 9 — Mobile operating position — all removable without leaving a scratch.