



do's - and a few don'ts

HAM RADIO VHF/UHF MOBILE INSTALLATION



Narrated by

Rich Koch, KG6MXP

Hi!

*Thanks for
joining us!*

Tonight, let's learn about installing
mobile VHF/UHF radios!

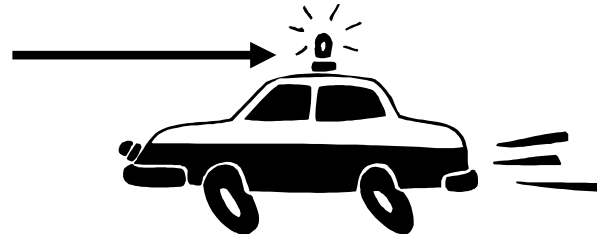


Three categories:

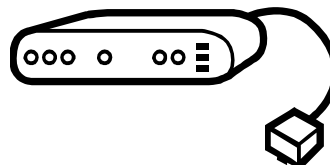
1. DC power



2. Antenna



3. Radio



INSTALLING THE DC POWER IS LOTS OF FUN –



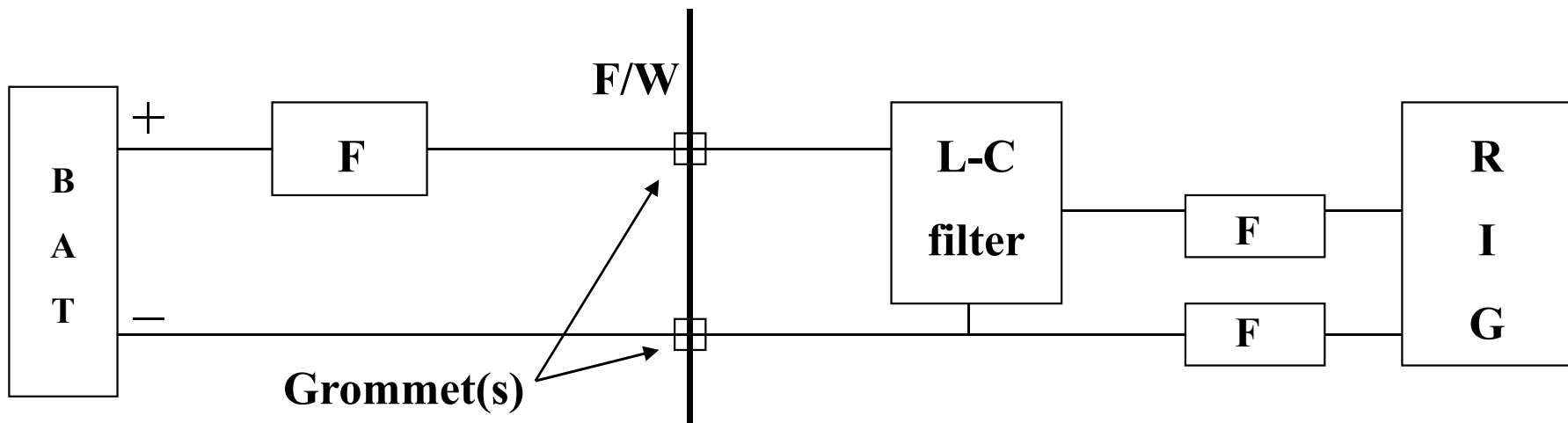
**INSTALLING THE DC POWER IS LOTS OF FUN –
REALLY !**





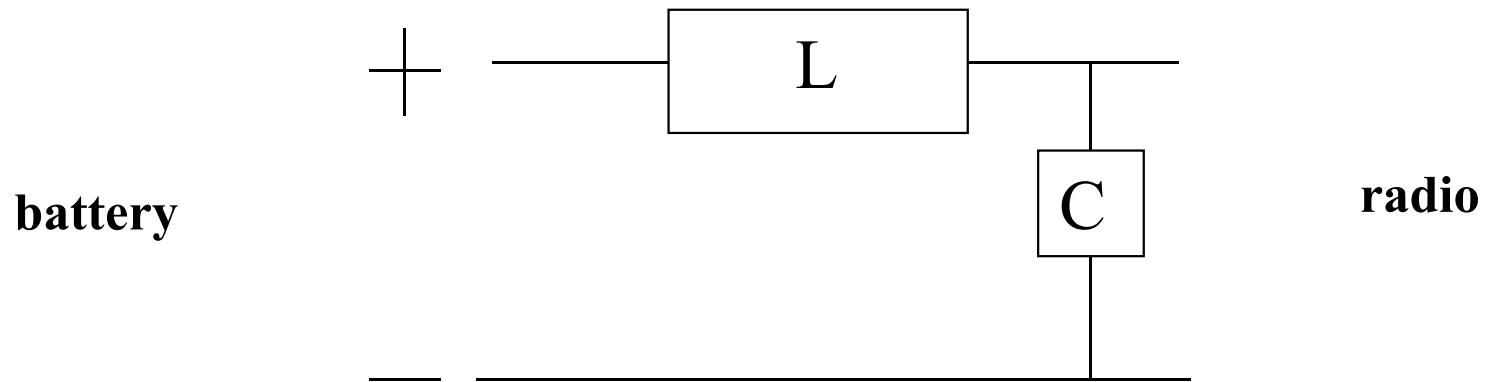
DC POWER

1. Safety precaution – remove all jewelry !!!
2. Connect directly to battery, use ring terminals
3. Use heavy gauge stranded copper wire; crimp connections
4. Fuse(s) close to the battery
5. Alternator noise filter

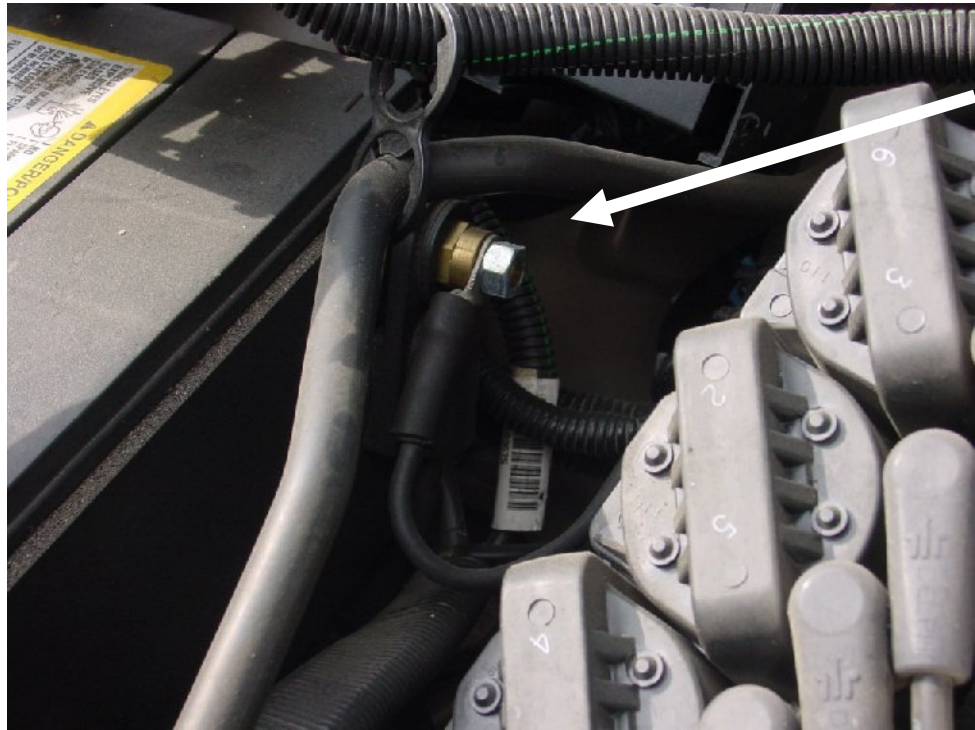




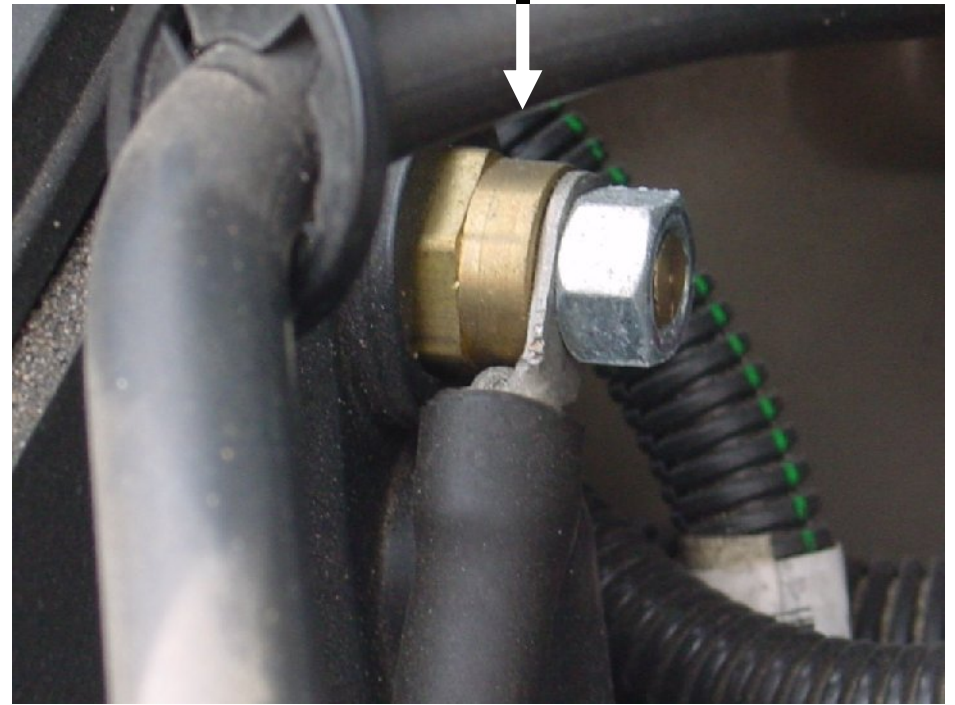
L-C ALTERNATOR NOISE FILTER



STOPS YOUR RADIO FROM “WHINING” AT LOW ENGINE RPMs
(THE WHINING IS VERY ANNOYING TO THOSE LISTENING TO
YOUR TRANSMISSIONS, AND COULD GET YOU UNWANTED
ATTENTION FROM THE REPEATER TRUSTEE)



**Negative connection,
using adapter bolt**



2005 Chevrolet
Impala



positive tap with fuse,
plus negative tap

2003 Dodge
Grand Caravan

ANTENNA



1. Common antenna types
2. How much gain is enough?
3. Is it possible to have too much gain?
4. “Standard” antenna mount
5. Installation

INSTALLING THE ANTENNA IS LOTS OF FUN



**INSTALLING THE ANTENNA IS LOTS OF FUN –
REALLY !**



COMMON ANTENNA TYPES

1. NO GAIN
2. GAIN

NO GAIN = “SHORT”

QUARTER WAVE (19” on 2m)

GAIN = “LONGER”

MOST POPULAR: 5/8 WAVE (43”on 2M)

FUNDAMENTAL PHYSICS

VERTICAL MOBILE ANTENNAS
REQUIRE A 'GROUND PLANE' FOR
PROPER PERFORMANCE

This affects the mounting location, and
hence the selection of the antenna gain

WHERE BEST TO MOUNT THE ANTENNA?

CENTER OF ROOF TOP 😊

ANY WHERE ELSE ☹

ROOF TOP:

1. HIGHEST LOCATION
2. OMNIDIRECTIONAL PATTERN

OTHER:

1. LOWER LOCATION
2. DISTORTED RADIATION PATTERN

*Then again, there is the “real world”:
in other words, the “garage door clang-clang factor”*

Oh, by the way:

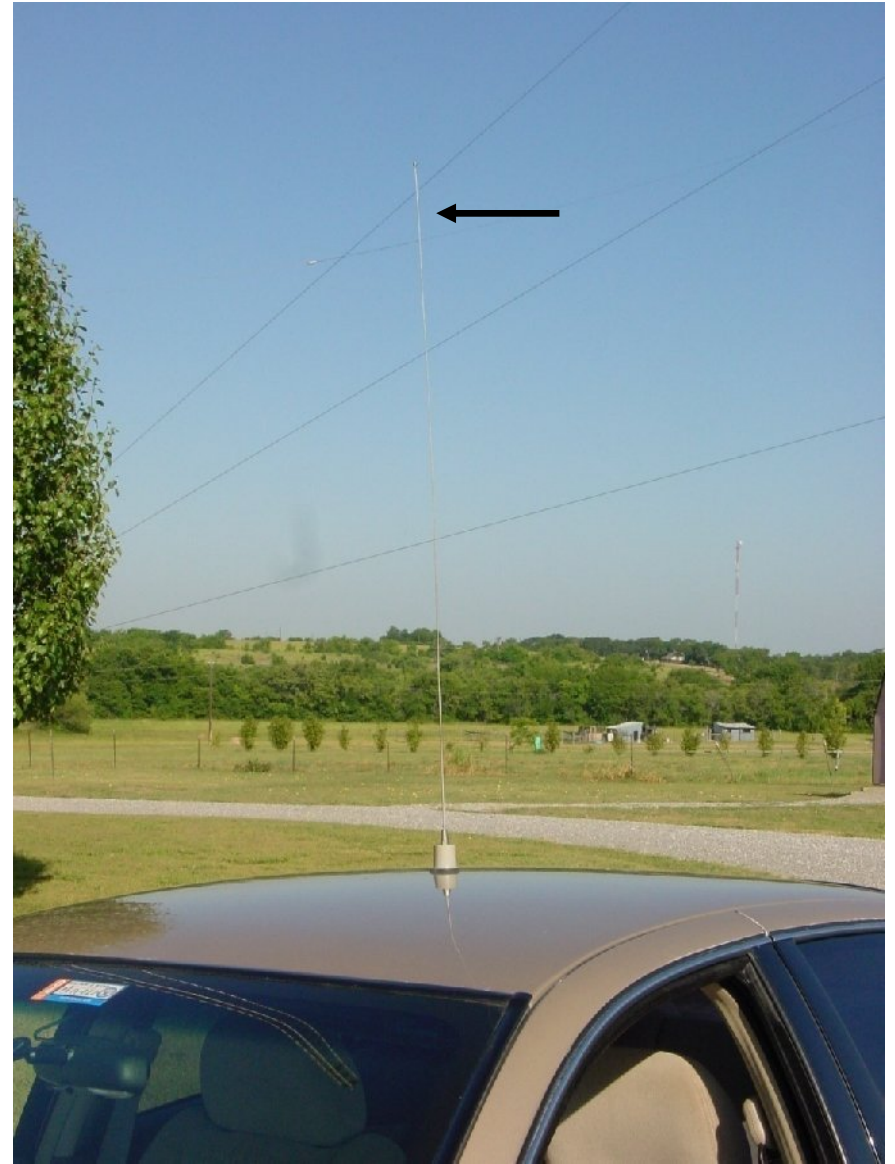
mag mounts, clip-on's, etc. are poorer choices
than a “real” mount

2M TOP 1/4 WAVE



CLANG !

2M TOP 5/8 WAVE



CLANG – CLANG !

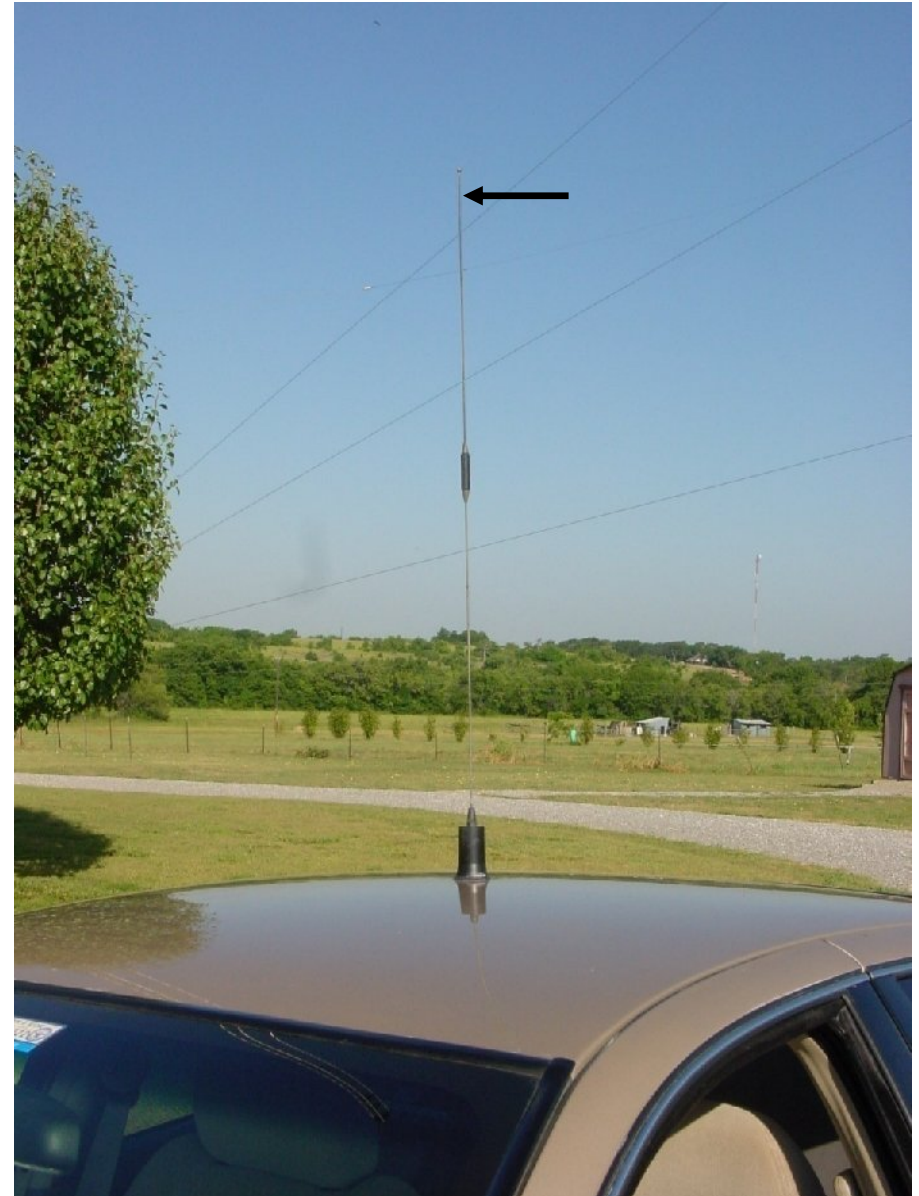
DUAL BAND 'SHORT'

19" – 2M UNITY, UHF GAIN



DUAL BAND 'LONG'

37" – 2M GAIN, UHF GAIN

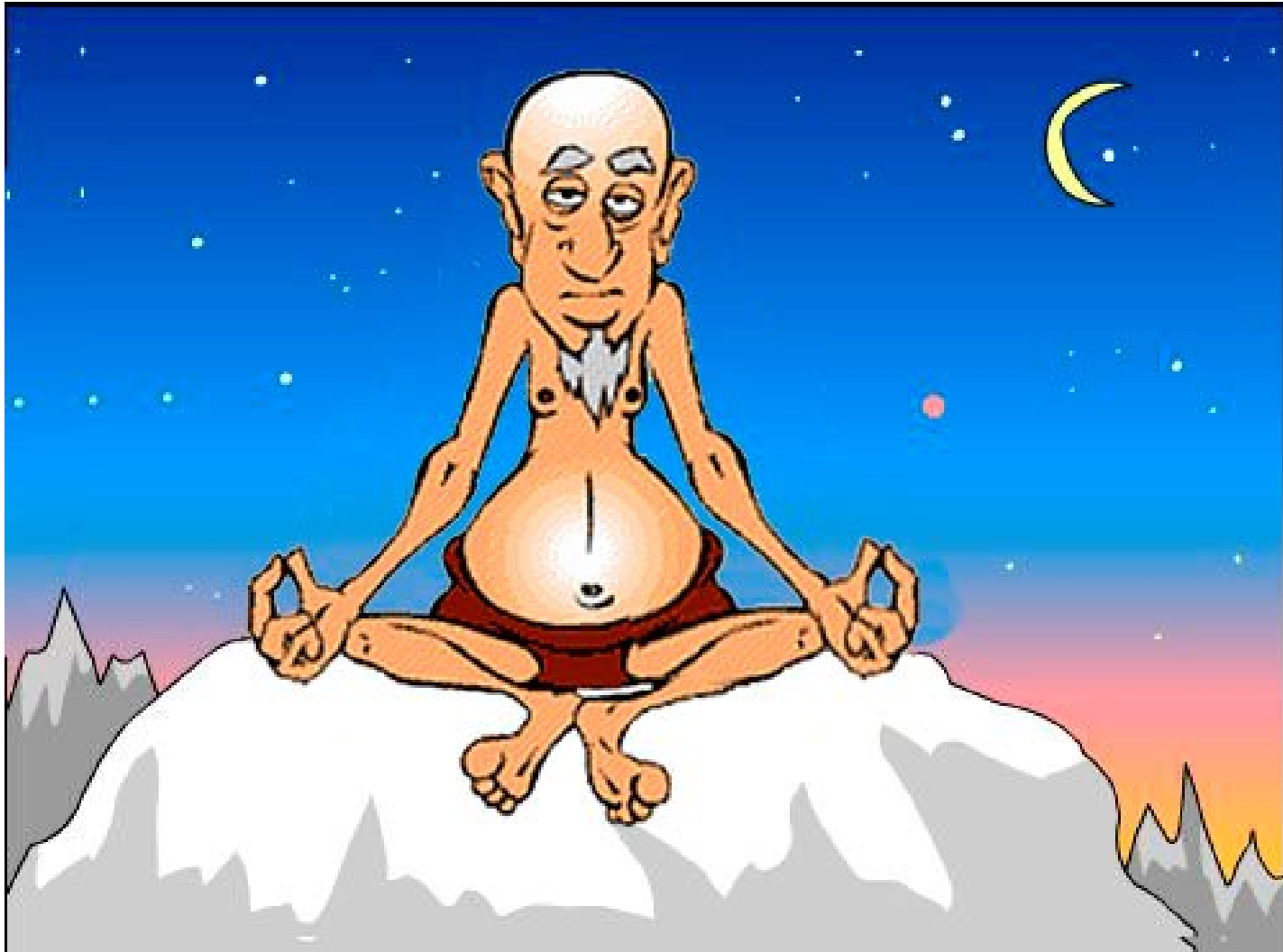


SO, WHAT IS THE GAIN OF A MOBILE ANTENNA?

How many dB?

THE ANSWER:

IT DEPENDS !



remember me? (the rf guru)

Mobile Antenna “Gain” – this is tricky

“Unity Gain” = defined as a $\frac{1}{4}$ wave, not a $\frac{1}{2}$ wave

so..... 0 dBq

The $\frac{5}{8}$ wave antenna is advertised as having 3 dB gain;

this is in reference to a $\frac{1}{4}$ wave, not to a $\frac{1}{2}$ wave!

So.... 3 dBq, NOT 3 dBd

Well, the bigger antenna has more gain, in any event..... but is more gain a good thing?.....

IT DEPENDS !

YOU CAN HAVE “TOO MUCH” GAIN

“gain” is actually achieved by lowering, or
“flattening” the radiation pattern

There are situations where a $1/4$ wave antenna will outperform a $5/8$ wave antenna, etc, depending on:

- Terrain
- Distance between mobile and base/repeater
- Height of base/repeater antenna

Antenna Installation

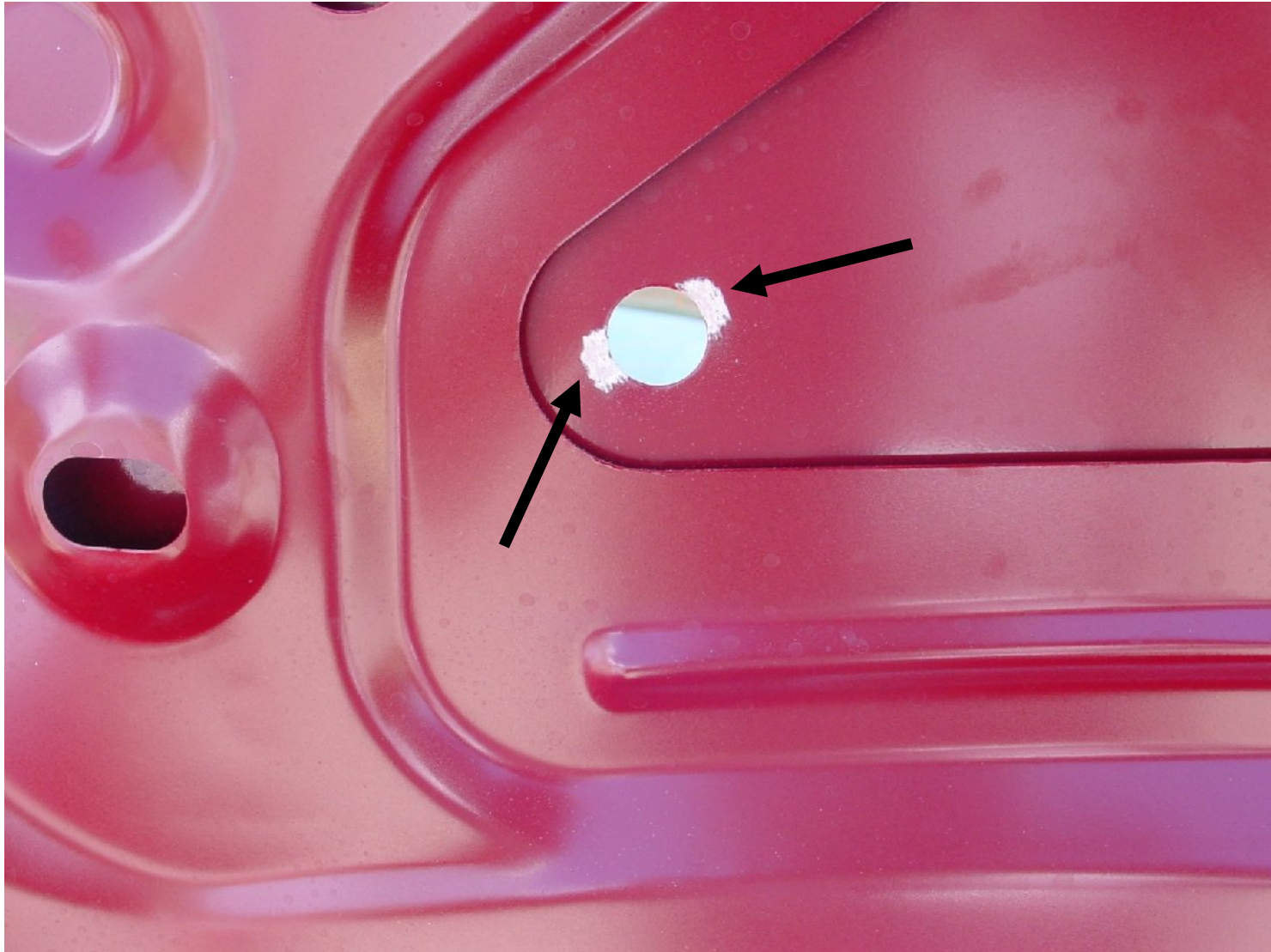
The standard – NMO mount – one “universal” mount that accepts many different antennas, fits in a $\frac{3}{4}$ ” hole

Anyone know what the NMO stands for?



“New MOtorola”

After punching* a nice $\frac{3}{4}$ " diameter hole in the car metal, clean the paint away on opposite sides underneath: this assures a good ground connection for the antenna and coax cable

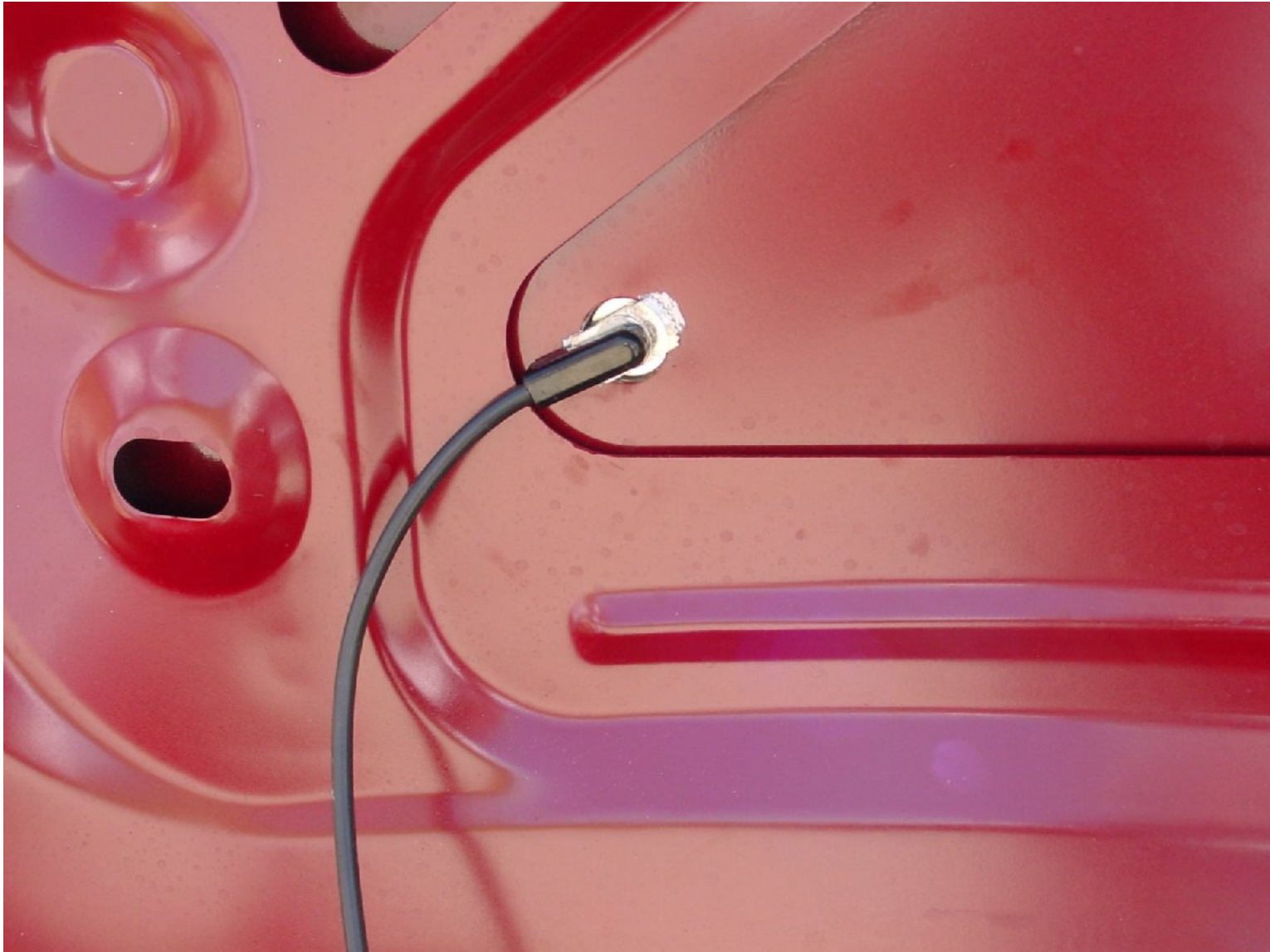


Insert the coax from the top

**** do NOT put the coax connector on first ! ****



The mount will “snug up” into the $\frac{3}{4}$ ” hole when the top nut is tightened. Be sure to align the inside clamp teeth on the bare metal. Seal the area with silicone goo.



“ How do I get the coax from the antenna to the radio? “

Step – by – step procedure:

Disassemble the car

- weatherstripping around doors
- Trim pieces along door, center column

(take heart: this is easy once you've already
put that $\frac{3}{4}$ " hole in your shiny new car)

Run the coax in nooks & crannies

Reassemble the car

RADIO INSTALLATION

EVERY ONE IS DIFFERENT !

So, there are no “rules”- only tips

➤ **SINGLE UNIT (rare these days)**

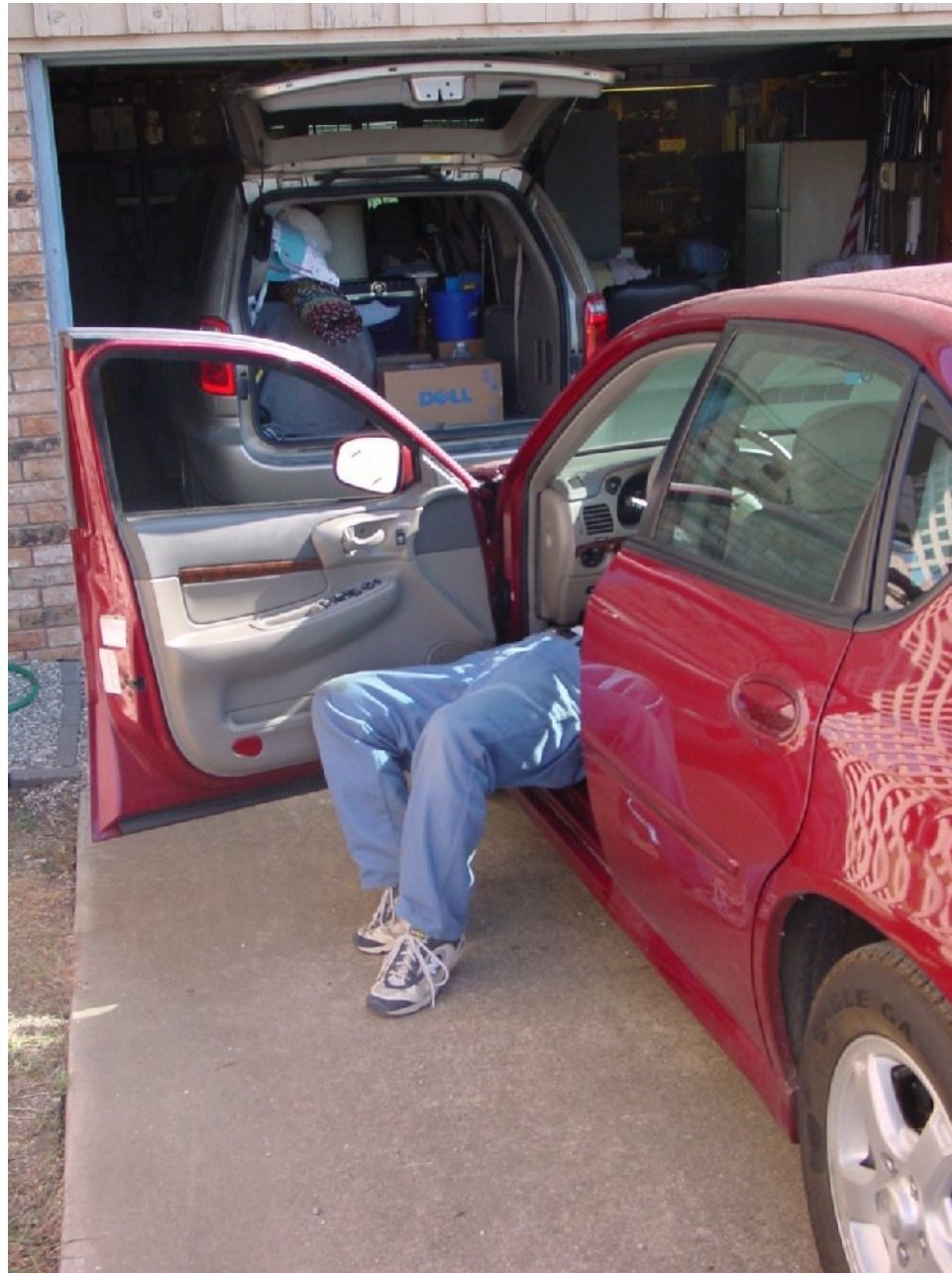
➤ **SEPARATED UNIT**

common now: control head and radio unit

INSTALLING THE RADIO IS LOTS OF FUN



**INSTALLING THE RADIO IS LOTS OF FUN –
REALLY !**



MAIN CONSIDERATIONS

- EASY TO REACH CONTROLS
- HEAT DISSIPATION FOR RADIO
- CONTROL UNIT OUT OF DIRECT SUN
- EXTERNAL SPEAKER
 - Highly recommended
 - Place it where you can see it

**W5VAL mobile
Radio, control head, mic.**



**KB8TJ mobile
Radio, control head, speaker, mic.**



W5VAL mobile - speaker



W8CM mobile control head, mic.



**KB8TJ mobile
Radio, control head, speaker, mic.**

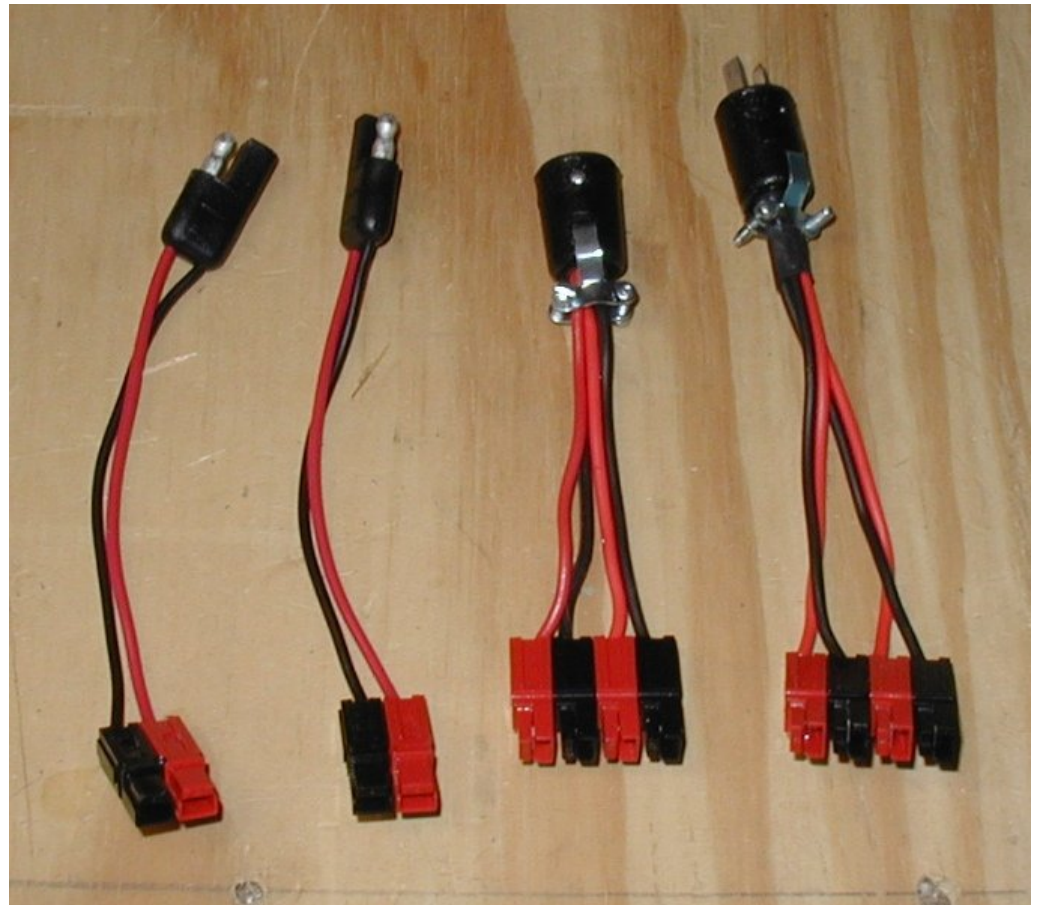


W5VAL mobile Radio, mic.



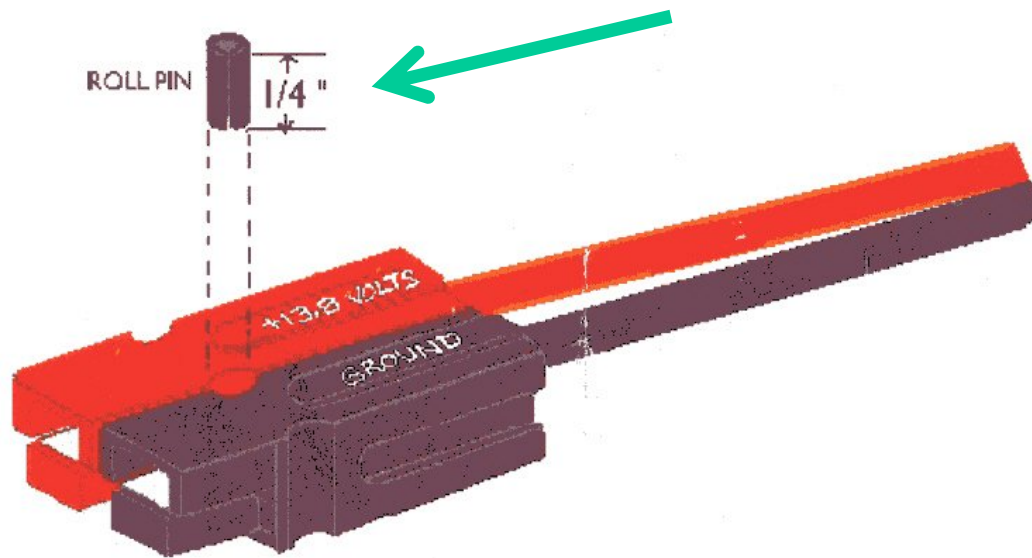
Recommended Connectors for Mobile Radios

RELIABLE!
Anderson
Power-Pole
30 Amp Connectors



THE ANDERSON POWER-POLE

WHY? The State of California OES prescribes the Anderson Powerpole as the standard dc power connector for use by State ACS/RACES personnel, and recommends its use by County and City RACES personnel as well. County of Orange RACES and other RACES groups throughout California and the United States have now adopted this connector. This standard, highly reliable connector allows quick and easy installation and substitution of radios, power supplies, batteries, and other equipment.



The Roll Pin is an option used to lock the two connectors together, but most hams do not use them where there is any chance that the pin could fall into critical radio equipment.



**BEFORE YOU GET ON THE AIR,
CHECK YOUR SWR!**



How to check SWR with an External SWR **Single Needle Meter**

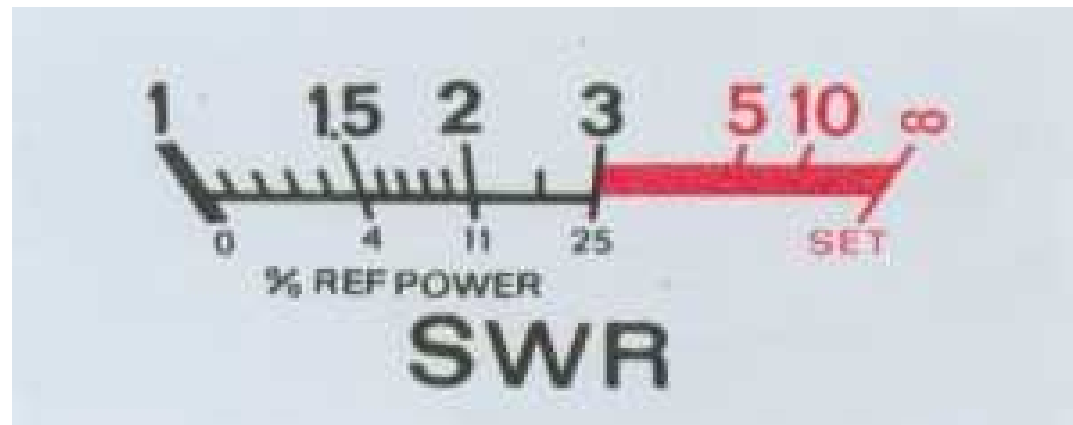
Start off by hooking up the SWR meter to your radio using a short coax jumper. The meter usually has a marking on the front or back of the meter to tell which connector goes to where. The "XMTR" or "Radio" side hooks to the transceiver with the jumper. The side marked "ANT" goes to the coax lead that connects to the antenna.

When using a multi function meter, be sure the mode selector is set to SWR. Then locate the switches you will need for this test.

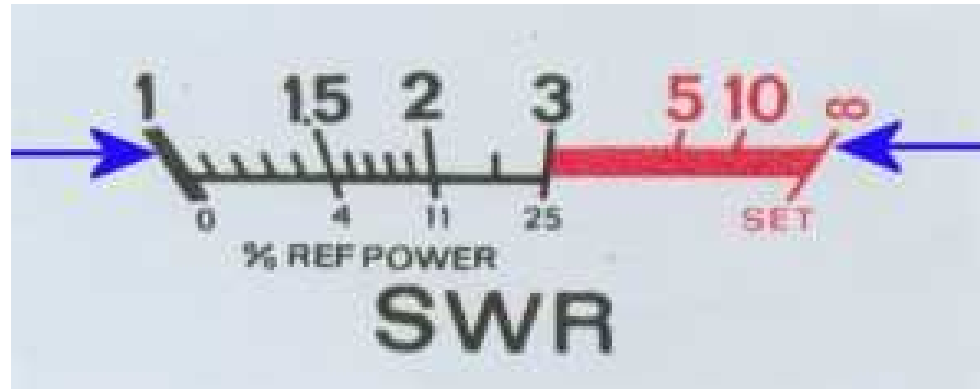
1) The Fwd/Ref or Cal/SWR switch.

2) The variable "SWR Cal" knob

Then familiarize yourself with the meter and scale.



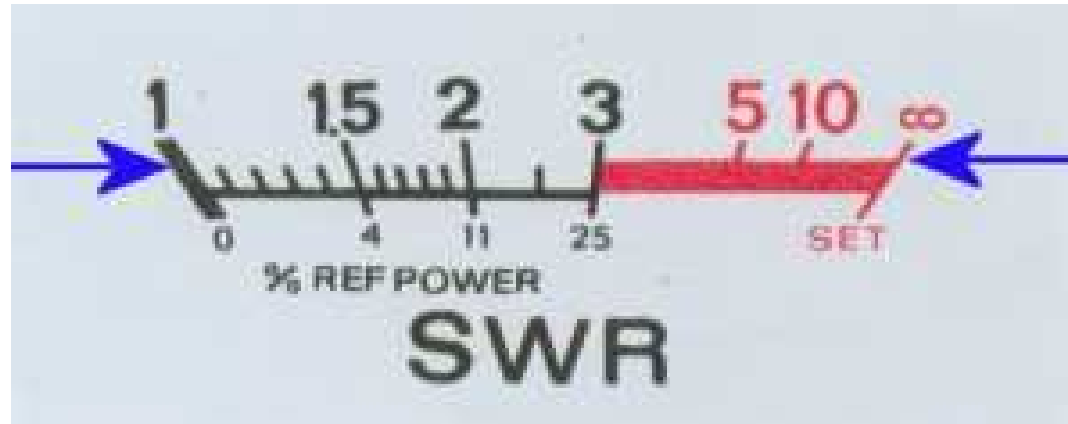
For this procedure you will only be interested in this scale



Tune your radio to a clear frequency.

Place Fwd/Ref or Cal/SWR switch to the "Fwd" or "CAL" position.

Key the mic on the radio and hold it keyed until noted. Slowly adjust the Variable "SWR Cal" knob until the needle is on the "Set" or "CAL" mark on the meter towards the end of the scale.



5. Now place the Fwd/Ref or Cal/SWR switch to the "Ref" or "SWR" position

6. Note the location of the needle *(It helps to jot it down on a piece of paper, you may need to do this test a few times more)*

7. Un-key the mic

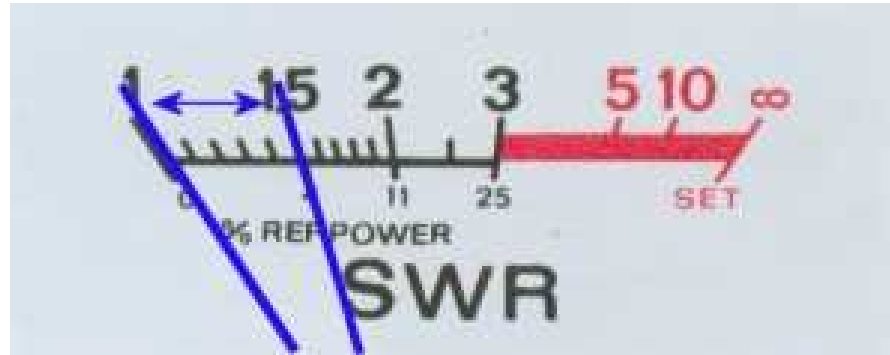
Tune the radio to another clear frequency

Repeat steps 2 thru 7

Wasn't that easy? You have just checked your SWR.

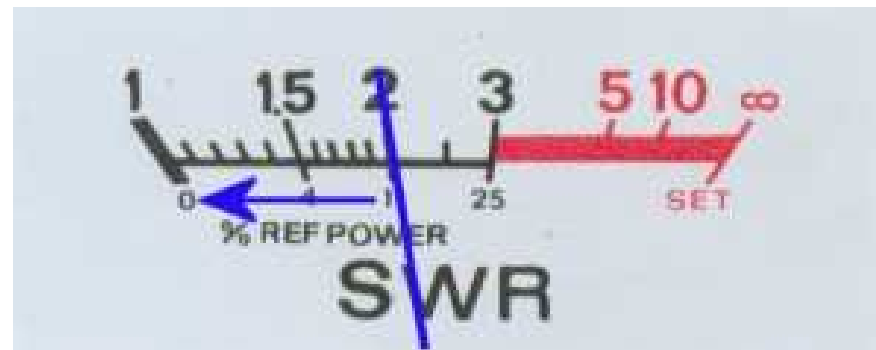
Ideally you should see a reading of 1.5 or less which would be here

GOOD

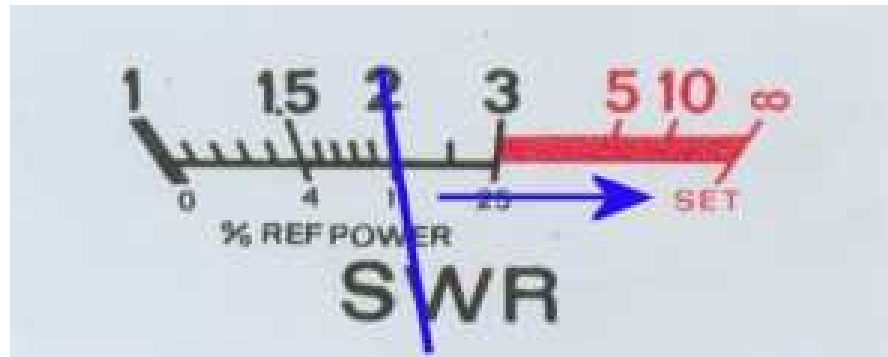


A reading of 2 or less is considered "Safe", (*As long as you are not running a "High Power" radio or an External amplifier*) which would be here

SAFE

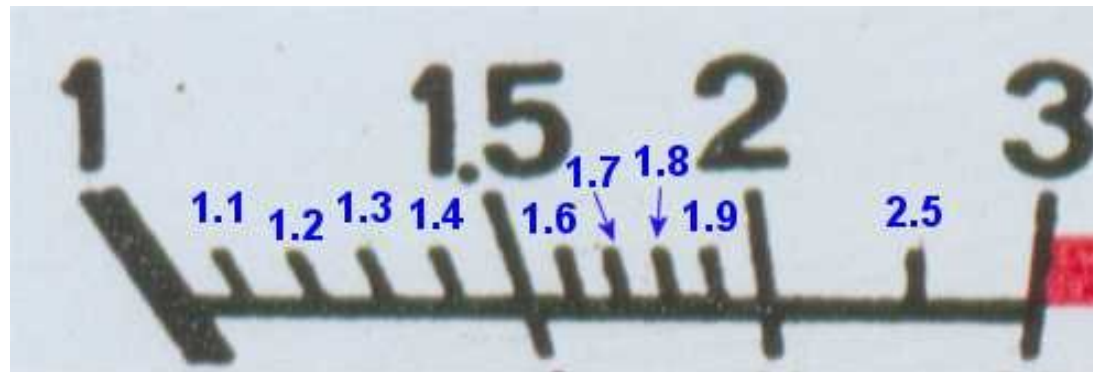


If your readings are higher than 2, your antenna system needs some attention and you should limit your talking until you get the SWR down



BAD

Here is a detailed picture of the Ext SWR meter



MOBILE RADIO INSTALLATION HALL OF FAME



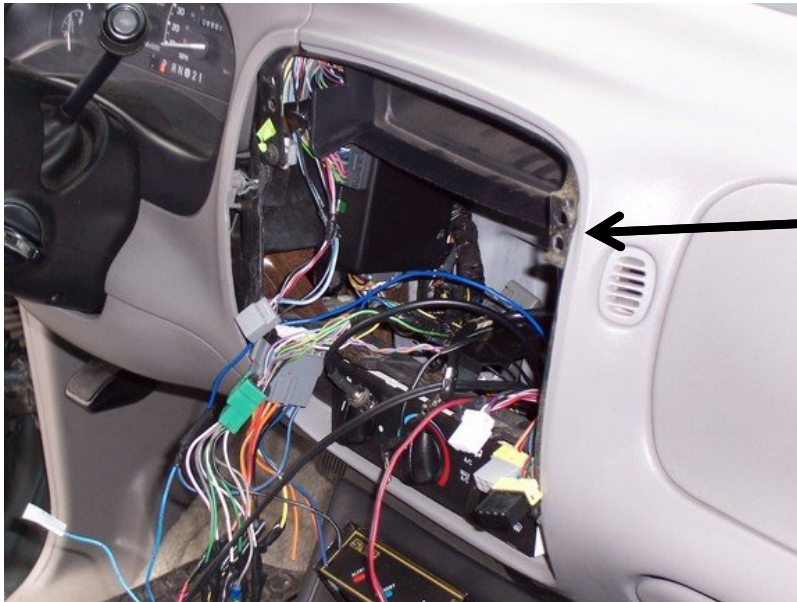
ENTER AT YOUR OWN RISK!



**“NORMAL”
INSTALLATIONS
WOULD LOOK
LIKE THIS**

**One mobile radio
mounted
conveniently near
the driver**





***BUT IF YOU
BEGIN HERE,
BE CAREFUL!***

**You didn't need all that stuff in your
center console anyway, and it will make
a great place for your ham radios!**



**It should be easy
to figure out
which wires to
use !**

***Sure,
right!***





**“MODEST”
INSTALLATIONS
MAY INCLUDE
TUNERS &
METERS**





**...AND TWO
RADIOS ARE
BETTER THAN
ONE!**



BUT MANY RADIOS ARE BEST!



SO WHY NOT HAVE THE ULTIMATE HAM MOBILE !

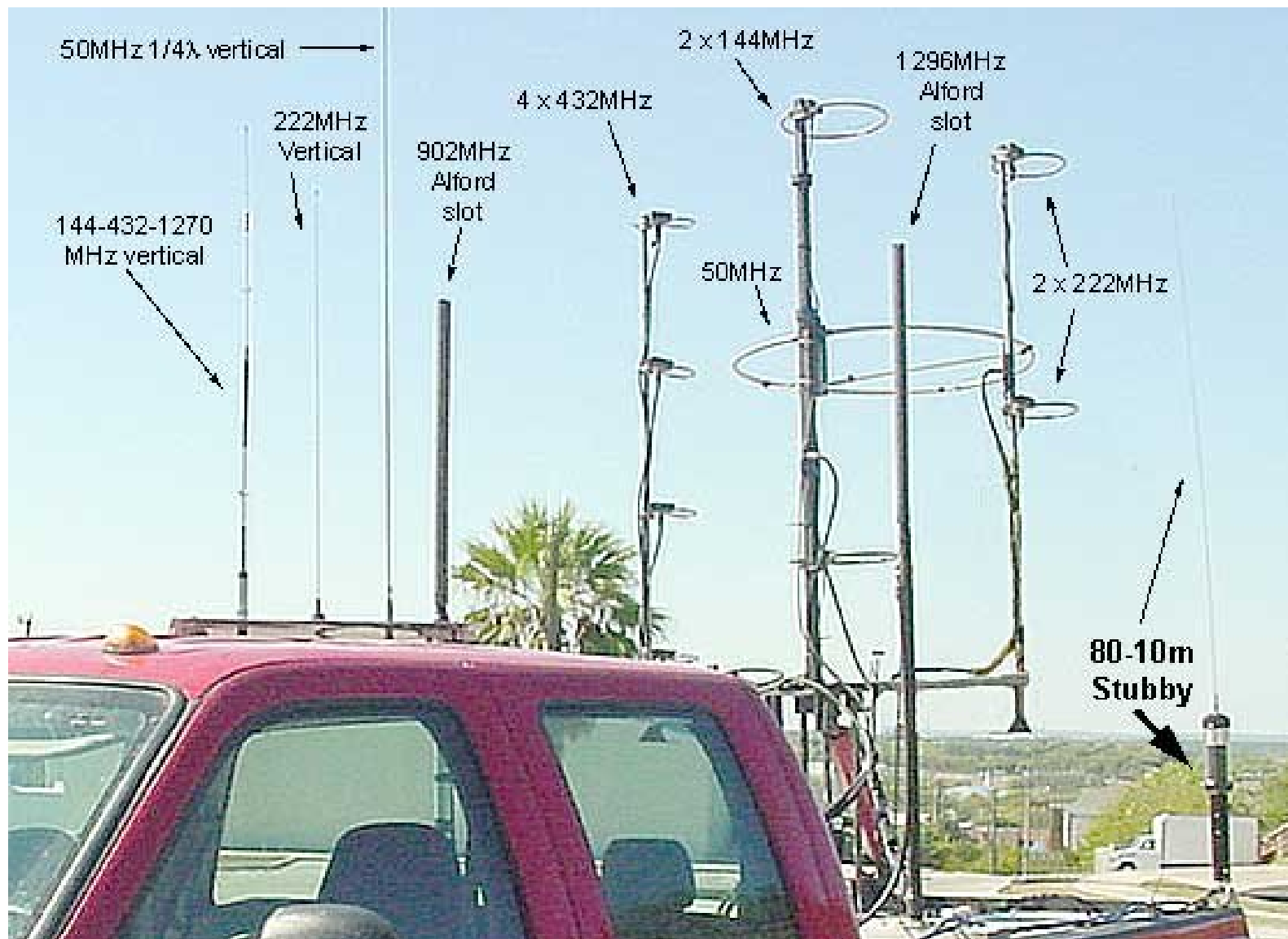


***YOU WILL NEED AN ANTENNA
FARM ON YOUR CAR ROOF!***

**L
E
A
K
S
?**



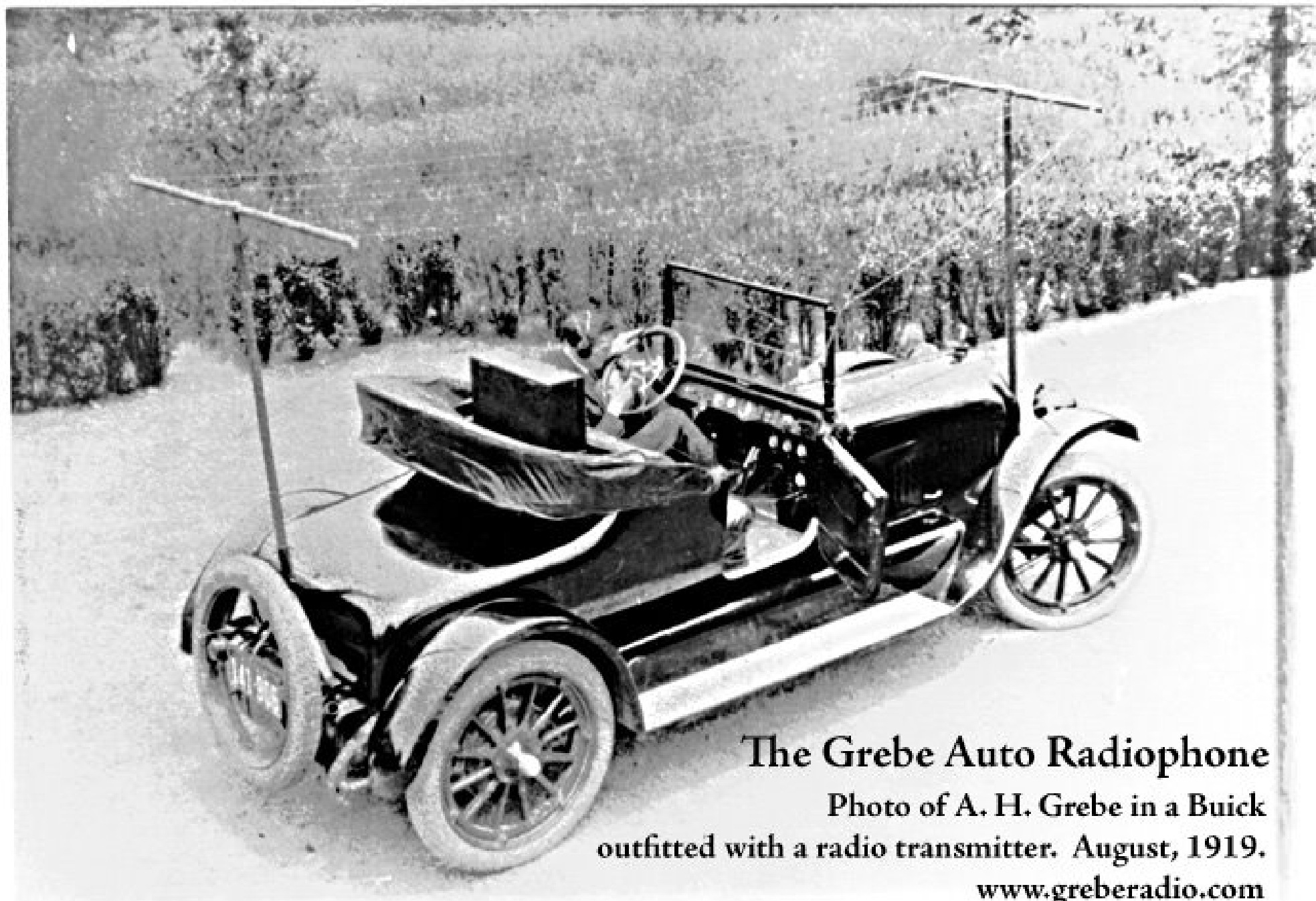
IT IS IMPOSSIBLE TO HAVE TOO MANY ANTENNAS !





We repeat: You can NEVER have too many antennas!





The Grebe Auto Radiophone

Photo of A. H. Grebe in a Buick
outfitted with a radio transmitter. August, 1919.

www.greberadio.com

***AND YOU WILL NEED THE ULTIMATE
FAMILY HAM RADIO VEHICLE!***

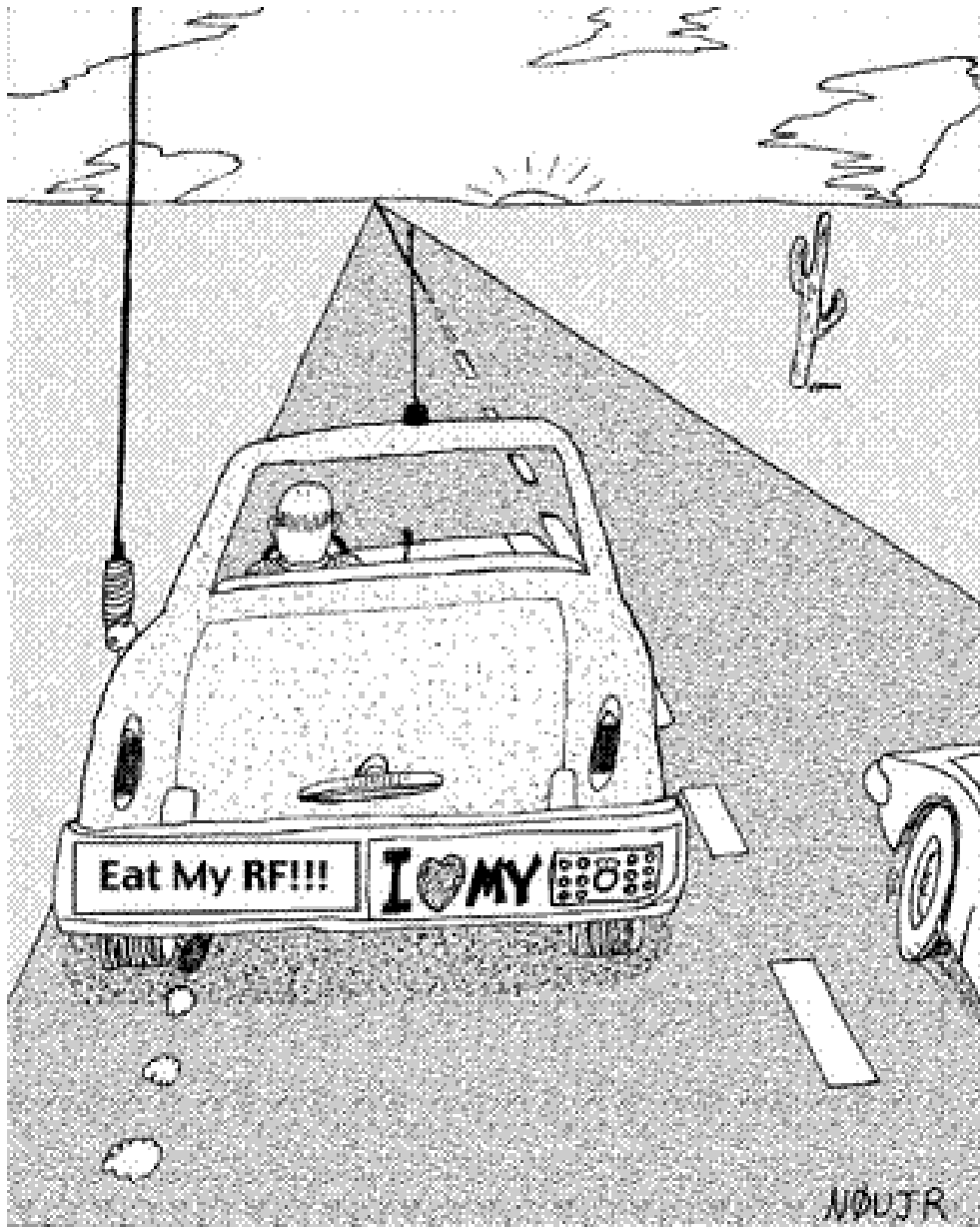


A HAM SHACK ON WHEELS IS NOT A NEW IDEA



***THE ECONOMY VERSION IS A SINGLE-
USER HAM RADIO VEHICLE !***

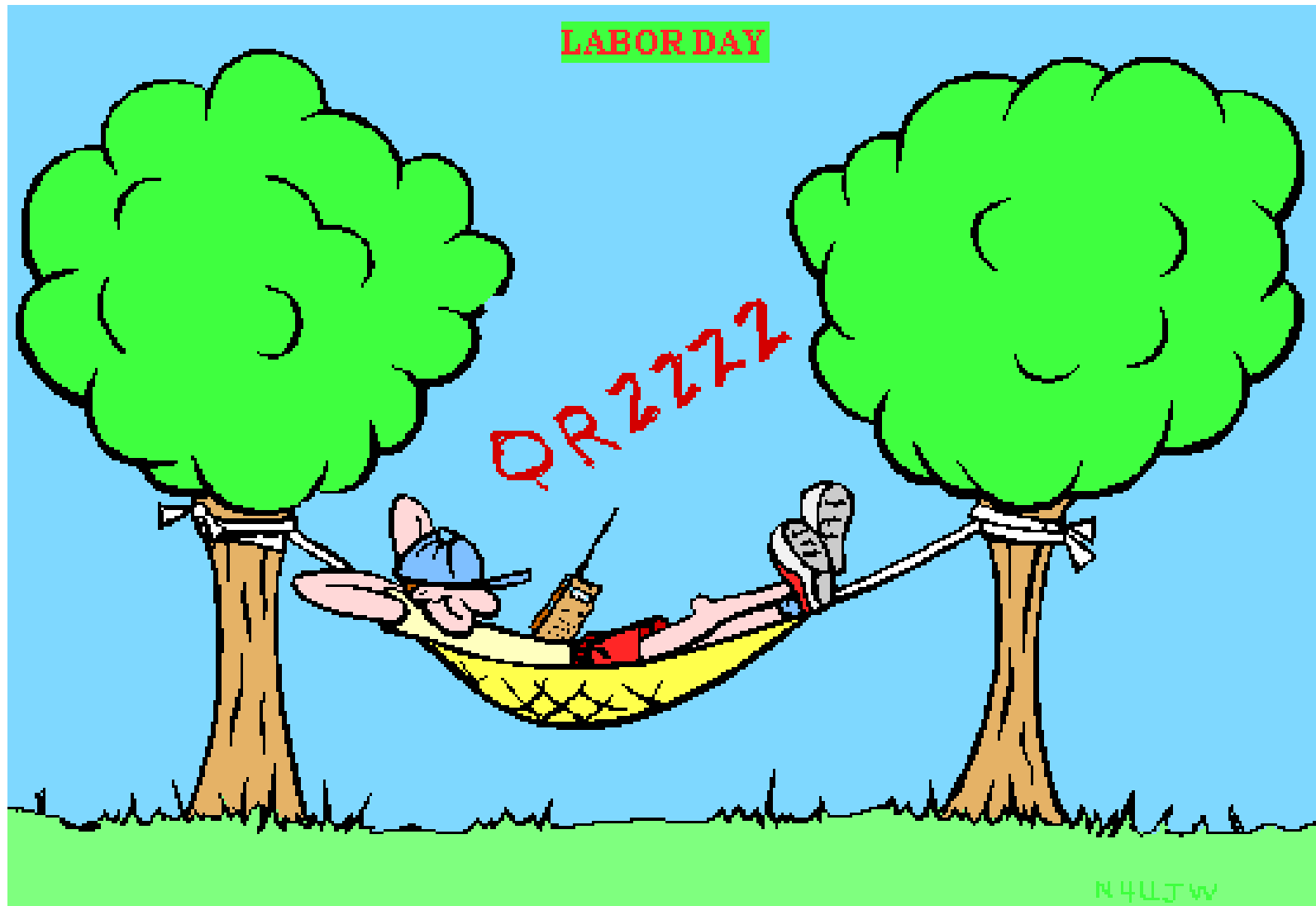




***BE A GERC
MEMBER
WITH AN
ATTITUDE !***



GO MOBILE !



***OR FORGET ALL THIS AND STICK
WITH THE BASIC MOBILE RIG!***

73 DE KG6MXP



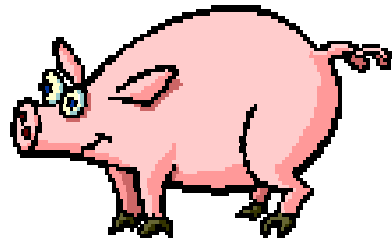
***GOOD LUCK IN
INSTALLING YOUR
MOBILE HAM RADIOS !***

Acknowledgements:

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***Mobile Radio Installation Hall of Shame*
created by Mark Hayden, N7YLA
June 2009**

HamStar



Productions

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THE
END

