CITIZEN BAND (CB) RADIO SYSTEMS FOR MIATA ENTHUSIASTS

2024 EDITION #2

Compiled by Merv Embury {(613) 240-6870 / mervembury@gmail.com} – Dated Aug 7th, 2024

PREFACE

This document has been compiled to:

- *help new Miata owners make an informed decision for the purchase of their first CB radio system,*
- *help long-time Miata owners considering an upgrade for their CB radio system,*
- *publicize the availability of an "Ottawa Underground Miata Network (UMN) Exclusive" bumper mounted antenna for all NC and ND model vehicles, and*
- *provide new Miata owners with recommended CB radio system packages.*

Additionally, this document contains:

- *radio installation options,*
- *CB radio and antenna tuning instructions, and*
- *a "CB Radio Tuning and Troubleshooting Guide" to assist anyone experiencing communications problems with their CB radio system (attached as ANNEX A).*

A downloadable copy of this document ***will eventually be*** *posted on the UMN website page at:*

https://ottawamiata.net/wordpress1/

TABLE OF CONTENTS

ANNEXES

BRIEF HISTORY - MIATA ENTHUSIASTS AND CB RADIOS

In the mid-1990s, a few Ottawa Underground Miata Network (UMN) members had CB radios. However, their use was not widespread. Then, during one event a mid-convoy driver missed a turn and the rest of the convoy followed. To prevent similar recurrences, it was decided all Club members should own a CB radio. Thus, began the Club's reliance on CBs to help participants stay together and stay safe during touring events.

The UMN CB radio policy is detailed in the "Touring Information and Guidelines" posted online at:

> https://ottawamiata.net/wordpress1/wp-content/uploads/2024/06/UMN-Touring-Information-and-Guidelines-06-28-2021-1.pdf

The following are three pertinent extracts from the guidelines:

> ***CB Radios and Touring***
>
> *The use of CB radios on tours is strongly encouraged, for safety, control and to enhance the touring experience of all participants. TLs (Tour Leads) and Sweeps typically use CB radios to communicate between themselves and with cars in the convoy. The TL announces turns and stops in advance so that participants know where they're going and to prevent them from becoming separated from the convoy. TLs will also announce potentially dangerous situations along the route as they are encountered, such as pedestrians walking on the shoulder, cyclists, tight/blind corners, debris on the roadway, large bumps/potholes or the sudden need to decelerate or stop.*
>
> *We ask tour participants to avoid talking or keep chit-chat to a minimum on the CB channel. As described above, CB radios are primarily for the TL and sweep to manage and direct the convoy.*
>
> *CB radios are one of the most efficient ways to alert everyone and respond to an emergency situation, if one should arise. During a tour, all CB transmissions should be kept as short as possible so that the TL and sweep can maintain effective communication.*

INTRODUCTION

Comparable to debates about wheels, tires, exhaust systems and brake components, there will always be differing opinions about the components comprising a CB radio system. Therefore, to hopefully avoid as many divergent arguments as possible, this guide is primarily a non-technical fact-based document with purchasing recommendations based on an amalgamation of the long-time experiences of Club members.

CB Radio Choices

A variety of different Cobra, Maxon, Midland, Realistic (Radio Shack), Uniden, AnyTone and possibility other lesser-known brands of mobile *{fixed installation}* and handheld (HH) radios have been used since the UMN adopted CBs for touring communications in the mid-1990s. Based on this extensive experience, the performance and reliability of the **Uniden PRO500XL series** has outlived most of the other brands and continue to be a popular choice. As detailed in this document, the **Uniden PRO505XL** and **Uniden PRO510XL** are considered to be perfectly suited for Miata Club touring purposes.

CB RADIOS – GENERAL

Overview *– All CBs licensed for sale in Canada and the USA are fundamentally the same because Industry Canada and US Federal Communications Commission (FCC) regulations specify a maximum power output of 4-watts. As such, the primary difference between bargain basement priced and more expensive models is the number of features, the quality of the electronic components and the overall functionality of the radio. In the words of one expert and based on the saying, "you get what you pay for":*

> *People often think that the more you spend on a radio, the farther you'll be able to transmit a signal. Nothing could be further from the truth! While you may get additional radio features, you won't see any improvement in range from a larger radio investment. All CB radios are limited by FCC regulation to 4-watts of transmission power, so one radio model doesn't have more range potential than another. The biggest differentiator between models is a radio's features: weather, PA functionality, backlit displays, etc.*

Features

There are too many features, more than twenty-five in all, to list in this guide; however, the following features are of particular importance:

- Squelch *(**SQ or SQL**)* – All CBs have a ***SQ*** control which must be carefully tuned to adjust the receiver sensitivity. Detailed tuning instructions are in the "CB Radio Tuning and Troubleshooting" section on Page 16.
- Radio Frequency Gain *(**RFG**)* – Some CBs do not have a tunable ***RFG*** control. Somewhat like the ***SQ*** control, this feature is also used to fine-tune the receiver sensitivity to better hear weak and distant transmissions. For the CBs without a tunable ***RFG*** control, an automatic ***RFG*** is integrated in the electronic circuitry and is pre-set during the manufacturing process. Detailed tuning instructions are in the "CB Radio Tuning and Troubleshooting" section on Page 17.
- Automatic Noise Limiter *(**ANL**)* – All CBs have this feature which supresses unwanted ignition noise and static from other sources such as power lines, transformers and DC-AC power inverters. For many CBs, the ***ANL*** is integrated in the electronic circuitry and is pre-set during the manufacturing process whereas some CBs have a front-panel ***ANL*** switch. For CBs with a front-panel switch, the switch should ALWAYS be in the ***ANL*** position.
- Public Address *(**PA**)* – CBs with this feature can be fitted with an optional engine compartment installed loudspeaker permitting the radio to function as a Public Address system. Note: If the front-panel switch is intentionally or accidentally switched to the ***PA*** position, the ability to communicate with the radio will be disabled. To the best of my knowledge, this feature has never been used by a Club member.

  RECOMMENDATION*: a small daub of Hot Glue Gun glue is an excellent method to secure the **ANL** and **CB/PA** switches in the proper position and will prevent accidentally switching.*

For the folks interested in researching all the features, the information at the following website provides a detailed explanation of all the features used to describe CBs:

https://www.wearecb.com/radio-features.html

Common Purchasing Mistakes

https://www.rightchannelradios.com/blogs/selection-guides/18428347-common-purchasing-mistakes

#1 – Spending too much on the radio,

#2 – Spending too little on the antenna,

#3 – Not tuning the antenna with a **S**tanding **W**ave **R**atio (**SWR***)* meter (see Page 10),

#4 – Choosing convenience over function, and

#5 – Buying on price alone.

"Let the Buyer Beware"

It is important to be aware some CBs sold on international sites such as *amazon.com* and *ebay.com* are configured for countries other than Canada and the USA where the frequencies are different than the North American CB radio spectrum. Therefore, before completing an online purchase it is important to be certain the radio is configured for use in North America or can be reprogrammed for use in North America.

Classifications

There are two classifications of CBs, mobile *{ie: fixed installation}* and handheld (HH) *{sometimes called portable}* as follows:

- **Mobile** – installed in a vehicle, connected to the vehicle 12-volt system and attached to an antenna mounted on the exterior of the vehicle, and
- **HH** – can be hand-carried and are powered by disposable or rechargeable batteries. Most HH radios ship with an auxiliary outlet (cigarette lighter) power adapter to utilize the vehicle 12-volt system rather than the batteries.

MOBILE RADIOS

Overview *– based on extensive user experience spanning more than 25-years, Uniden radios have very effectively withstood the test of time. The Uniden* ***505*** *and* ***510*** *models detailed below are some of the smallest CBs on the market and have proven to be extremely reliable and virtually 'plug and play' easy to operate. Regardless of the model, Uniden radios are high quality devices that are more than adequate for Miata Club touring purposes. Although the* ***Uniden PRO520XL*** *is briefly mentioned below, this radio is not a recommended choice because it has both a manual Squelch (****SQ****) and manual* ***R****adio* ***F****requency* ***G****ain (****RFG****) which present a learning challenge to master how to properly synchronize tuning these controls. If these controls are not properly tuned, reception will be significantly degraded or blocked entirely. (see Radio Tuning – The Process on Page 18) Conversely, the* ***505*** *and* ***510*** *models circumvent the challenge to master how to synchronize tuning the* ***Squelch*** *and* ***RFG*** *controls.* ***A mobile radio is recommended over any HH model because they are less clumsy to use and are far better suited for TL and Sweep communications.***

Uniden PRO505XL – is consistently in the "top 10" rated CBs. Measuring 4⅞" x 7½"x 1¾", this radio is slightly larger than the **Uniden PRO510XL** and **Uniden PRO520XL**. The **505** is relatively inexpensive and very easy to operate. As illustrated in the photo below, this radio only has four primary controls: ON/OFF/volume (VOL) control knob, UP/DOWN channel selector

buttons and a ***SQ*** control. The automatic ***RFG*** function is integrated in the electronic circuitry and is pre-set during the manufacturing process. There are three downsides with this radio:

- it is slightly larger than the **510** and **520** radios,
- the microphone is somewhat larger than the **510** and **520** microphones, and
- the LED screen is difficult to see in bright sunshine.

THE MOST BASIC UNIDEN MODEL – AN EXCELLENT FIRST CB RADIO CHOICE!

Uniden PRO505XL Manuals

- English manual

  https://cdn.shopify.com/s/files/1/0018/3543/4029/files/PRO505XL_10022013_RunChg2web.pdf?v=1689088847

- French manual

  https://cdn.shopify.com/s/files/1/0018/3543/4029/files/PRO505XL_OM_FR_10012013web.pdf?v=1689088847

Uniden PRO510XL – is regularly near the top of the "top 10" rated CBs. Measuring 4½" x 6¾"x 1⅜" and with the same functionality as the **505** is an extremely reliable, relatively inexpensive and very easy radio to operate. As illustrated in the picture below, this radio only has four primary controls: ON/OFF/volume (VOL) control knob, a channel selector knob, a ***SQ*** control knob and an Automatic Noise Limiter *(**ANL**)* switch. **Note**: the ***ANL*** switch should always be in the ***ANL*** position. The automatic ***RFG*** function is integrated in the electronic circuitry and is pre-set during the manufacturing process.

HIGHLY RECOMMENDED CHOICE

Uniden PRO510XL Manuals

- English manual

  https://www.uniden.info/download/ompdf/PRO510XLom.pdf

- French manual

  https://www.uniden.info/download/ompdf/PRO510XLom_FR.pdf

Uniden PRO520XL – Notwithstanding the fact the **520** is an excellent radio, it is not recommended because as mentioned in the *Overview* above, this radio has both a manually tunable ***SQ*** and ***RFG*** control which complicates the tuning process.

HANDHELD (HH) RADIOS

Overview *– Some of the most common HH radios are manufactured by Uniden, Midland and Cobra. Although 'out of the box' HH radios have proven to be reasonably effective for mid-convoy participants to monitor TL and Sweep broadcasts, the transmission range is not sufficiently reliable for TL and Sweep communications. Additionally, 'out of the box' HH radios are not recommended for aspiring TLs and Sweeps because:*

- *they are clumsy and unwieldy to handle, and*
- *the transmission range is extremely limited due to the fact the 'Rubber Duck' antenna is only about 8" long.*

As detailed on Pages 5 & 6, there are two HH optional items which provide the same basic functionality as mobile radios. Although all HHs are fitted with a short (approximately 8 inches long 'Rubber Duck') removable antenna that provide limited short-range communications, with an inexpensive "BNC Male to UHF Female Adapter", HH radios can be fitted with a magnetic mount antenna (see Pages 7 & 8) which provide a much greater range and far more reliable communications. In addition, some HH manufacturers market a combination headset/boom microphone which make it much more functional. Two basic HH models are:

Uniden - PRO401HH

Midland - 75-785

BNC Male to UHF Female Adapter

2024 7/10 Top Rated HH

Uniden PRO401HH Manuals

- **English**

  https://www.uniden.info/download/ompdf/PRO401HHom.pdf
- **French**

  https://www.uniden.info/download/ompdf/PRO401HHom_FR.pdf

Midland 75-785 Manuals

- **English**

  https://cdn.accentuate.io/81031332017/1623710723916/75-785-CB-Radio-Manual1.pdf?v=0
- Unfortunately, French manuals could not be sourced for any Midland radios

ALL-IN-HANDSET RADIOS

Overview *– All-in-Handset radios such as the AnyTone Apollo I and Midland 75-822 are clumsy to handle, unnecessarily complex and loaded with features that will never be required for Miata Club touring purposes. Additionally, All-in-Handset radios are not particularly user friendly and are therefore not a recommended option.* ***Fewer controls*** **= an easier to *use device*!**

There are several popular All-in-Handset choices manufactured under the AnyTone, Cobra and Midland brands to name a few. The handheld component is somewhat larger and heavier than conventional microphones leading some reviewers to state these radios are more awkward to hold and more difficult to operate than mobile radios. Furthermore, a lot of "abbreviated" programming and tuning options are packed into the small display. As such, the display is far more difficult to view than the displays on mobile and HH radios.

AnyTone Apollo I – one example of an *All-in-Handset* radio

AnyTone Apollo I Manual

- **English**

  https://www.manualslib.com/manual/2547333/Anytone-Apollo-I.html?page=2#manual

- Unfortunately, French manuals could not be sourced for any AnyTone radios

CB Radios – Summary

For those seeking more detailed information, the following websites are excellent sources of information about a wide range of subjects relating to CB radio installations and operations:

https://www.wearecb.com/the-best-cb-radio.html#mobile

https://www.rightchannelradios.com/blogs/learning-center

HANDHELD (HH) AND 'ALL-IN-HANDSET' OPTIONAL ITEMS

Overview *– Two UMNers are currently using an optional Speaker Microphone to great effect. One using a Uniden PRO401HH and the other a Midland 75-822 'All-in-Handset' radio.*

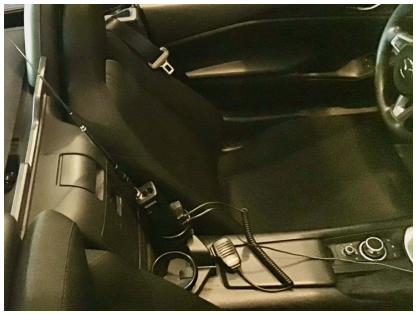
An optional telescopic antenna on a HH radio produces an increased transmission distance over the OEM 'Rubber Duck' antenna. The gentleman with the Midland 75-822 is using a bumper mounted antenna as detailed on Pages 8 & 9. The Speaker Microphone greatly simplifies using HH and 'All-in-Handset' radios. For ND owners, when using a Speaker Microphone, the radio can be conveniently placed in a cupholder. Alternatively for NA, NB and NC owners, a HH radio can be mounted vertically between the seats with a strip of 2" VELCRO. {photos of these installation methods are on Page 6}. Utilizing both optional items has proven to overcome the TL and Sweep limitations mentioned in the HANDHELD (HH) RADIOS Overview on Page 4.

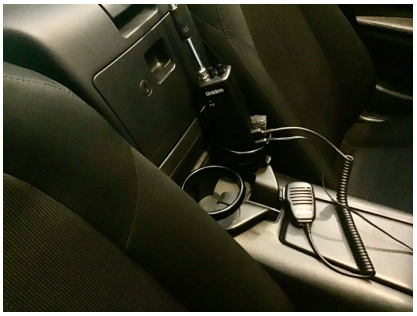
Telescopic Antenna (for all HH models)

Speaker Microphone

VELCRO Mounted HH Radio (in a 2007 NC PRHT)

HH Radio in Cupholder (in a 2019 ND Soft Top)





TELESCOPIC ANTENNA – amazon.ca Prime price on 31 Jul 2024 – $23.99

Product Description

HYS 27Mhz Antenna 9-Inch to 51-inch Telescopic/Rod HT Antennas for CB Handheld/Portable Radio with BNC Connector Compatible with Cobra, Midland, Uniden, Anytone CB Radio.

https://www.amazon.ca/dp/B093C3FVZR/?coliid=IVJM9JJRX0HTA&colid=GB4DMAZDX3NC&psc=1&ref_=list_c_wl_lv_ov_lig_dp_it

SPEAKER MICROPHONE – amazon.ca Prime price on 31 Jul 2024 – $35.40

Product Description

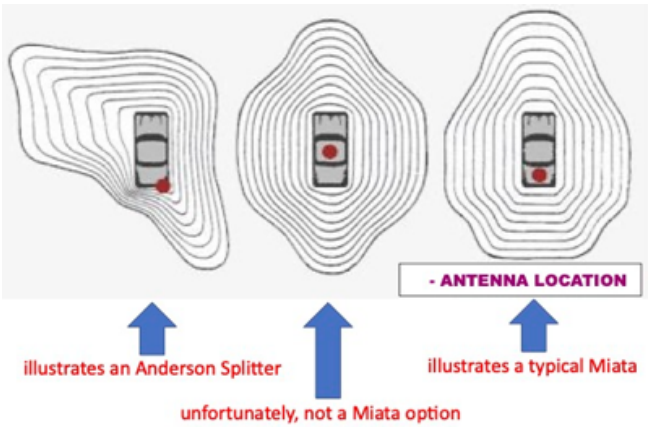
Durable Speaker Microphone with spring loaded clip and earphone/earbud jack for Cobra and Midland Handheld CB Radios. *{Has been UMN tested and proven to work extremely well on a Midland 75-822 and Uniden PRO401HH}*. Fits Cobra HH38WXST, HH40, HH45, HH46 and HH Road Trip, Midland 75-785, 75-820, and 75-822.

https://www.amazon.ca/Kalibur-Speaker-Midland-Handheld-Earphone/dp/B077H6162K/ref=sr_1_1?crid=2DPB2HN1E31JI&dib=eyJ2IjoiMSJ9.07U4LqudfFesu81UHCDmk8wRRh85q9UvGjhFgImzPuyk6HIwa1dtS2q4Z9cAuPBGOpib47P3Gnp0yCGObGPU932TRjYo7tuz1CGeBBof7szhdpnsqHQvrzFHhOiKqeH_YtLFGjQ2sRnd7X_gAB7--_L7YjJ6LVRrpJLHJK_41WBuje9wmZ1nTzX-RPNO0MaesKdSGIH_NiTkwmucFDTeYzAVV5CV8LqO8xLi6B5PKLotyfKORcl0InsKNnWVzivjOK5YCVXEVMHT_jPBs_70x2XULmsR0Zx1RHKiEvSL8zA.1nDynpu_zs0j2NnqjfVdG5hkgdL-qkZFmCHeDiMT8NU&dib_tag=se&keywords=Kalibur+Remote+Speaker+Mic+for+Cobra%2FMidland+Handheld+CB+with+3.+5mm+Earphone+Jack&qid=1722992266&sprefix=kalibur+remote+speaker+mic+for+cobra%2Fmidland+handheld+cb+with+3+5mm+earphone+jack%2Caps%2C128&sr=8-1

ANTENNAS

Overview *– All NA, NB, NC and the ND Soft Top have a suitable ferrous metal surface to affix a magnetic mount antenna; however, ND RF models lack such a surface. Unfortunately, a jury-jigged method to affix a magnetic mount antenna on the trunk lid of ND RF models by placing a large steel washer on the underside of the trunk lid is less than ideal because the antenna must be removed prior to opening and closing the retractable fastback roof. As detailed* *on Pages 8 & 9**, a highly efficient "UMN Exclusive" alternative has been devised to affix an antenna to the rear bumper of all NC and ND models.*

CB antennas use the metallic structure of the vehicle to create an invisible component of the antenna known as the ground plane. If an effective ground plane is not created by a solid magnetic coupling to the vehicle chassis, the transmission range will be limited. ***Additionally, as illustrated in the following images, the radiation pattern <u>will vary dramatically based upon where</u> the antenna is installed****.*



The following is an extract from: https://www.wearecb.com/the-best-cb-antenna.html

> *The antenna is the most important component of your CB system.*
>
> *CB radios, even the* best *CB radio on the market, come standard with only 4 watts of power, which is a great equalizer. The way that you can stand out is to get the* ***best CB antenna*** *that you can afford.*
>
> *Prices for antennas are affordable, so buying the best CB radio antenna won't set you back much more than if you buy a cheap antenna. If you want to maximize the distance that you're able to transmit and receive (and that's the point, to communicate, right?), you'll need to pay attention to the brand and type of antenna that you buy, how tall it is, and where and how you mount it.*
>
> *The best CB antenna for you is the one that best suits your needs and the type of vehicle that you're putting it on.*

Magnetic Mounted Antennas – for all NA, NB, NC and the ND Soft Top model

Overview *– Regardless of the physical length of the whip, the vast majority of magnetic mount antenna are "¼ wavelength antenna" meaning they are equivalent to an antenna 109.3" long. Although a Google search will source a wide variety of different brands and models, the following are two of the most common used antennas. All magnetic mount antennas include the magnetic base, whip and coax cable.*

- **Wilson K30 (35")** – this is one of the most commonly used antennas:

  https://www.rightchannelradios.com/collections/cb-antennas/products/k30-magnet-mount-cb-antenna-35

- **Wilson Little Wil (36")** – this highly rated magnetic mount antenna is very similar to the K30 in size, construction and performance:

  https://www.rightchannelradios.com/products/wilson-little-wil-cb-antenna-36

Bumper Mounted Antennas – a "UMN Exclusive" solution for all NC and ND models

Overview – *Unlike the ¼ wavelength magnetic mount antenna (equivalent to an antenna 9.1' / 109.3" long), the Firestik FireFly antenna detailed below is a "5/8 wavelength antenna" equivalent to an antenna 22.7' (273") long. All 5/8 wavelength antenna are known to be significantly more efficient than any ¼ wavelength antenna.*

The following "UMN Exclusive" mounting technique is applicable for the illustrated connector assembly and Firestik FireFly "FL" series antennas.

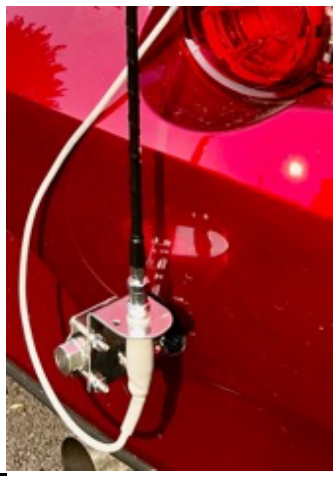
http://www.firestik.com/Catalog/FL3-FL4.htm

Firestik FireFly "FL" Antenna on a 2007 NC

Utilizing an Al a Custom Bolt

Firestik FireFly "FL" Antenna on a 2023 ND RF

Utilizing an Al Zarama Custom let



The items required for a bumper mounted antenna ***as priced on 07 Aug 2024:***

- Al Zarama Custom Bolt $40.00 – alzarama@gmail.com
  (price might be more based on the wholesale cost of stock stainless-steel rod)
- Radioworld (RW) Toronto (North York) – https://www.radioworld.ca
  - Coaxial Cable 18ft RW# K40-K4018FME *(installation guide Page B - 2/3)* 40.00

    https://www.radioworld.ca/product/k40-k4018fme/18-super-mini-8-cb-antenna-cable-with-removable-fme-connector
  - Mirror Mounting Bracket RW# LES-JBC995SS 20.00

    https://www.radioworld.ca/product/les-jbc995ss/stainless-steel-mirror-mount-3-8-24-with-so239-connection
  - Firestik Firefly RW# FIR-FL3 antenna 27.00

    Notes:

    1. Although the FireFly model is available in two lengths: 3-ft and 4-ft; the 3-ft option has proven to be highly efficient and ideal for Miata Club touring purposes. Furthermore, a 3-ft antenna is stealthier looking than a 4-ft antenna on both NC and ND model vehicles.

    2. Although the FireFly series is manufactured with three colour choices: B = Black, R = Red and W = White, at the present time Radioworld only carries Black and White antenna:

       Black (FIR-FL3B) – https://www.radioworld.ca/product/fir-fl3/firefly-lightweight-tunable-tip-cb-antenna-3-black

       White (FIR-FL3W) – https://www.radioworld.ca/product/fir-fl3w/firefly-lightweight-tunable-tip-cb-antenna-3-white

TOTAL $87.00 Plus HST and shipping

The following instructions included in ANNEX B **will eventually be** posted on the UMN website at: https://ottawamiata.net/wordpress1/

INSTRUCTION #1

NC & ND BUMPER MOUNTED FIRESTIK FIREFLY ANTENNA

****

ASSEMBLY AND INSTALLATION INSTRUCTION

INSTRUCTION #2

NC & ND BUMPER AND NA & NB FRANKENSTEIN BRACKET MOUNTED

FIRESTIK FIREFLY ANTENNA

****

TROUBLESHOOTING AND TEST INSTRUCTION

ANTENNA TUNING

Overview *– "Antenna tuning" refers to the process of adjusting the physical length of an antenna to optimize transmission efficiency of a radio. As such, tuning an antenna is essential to achieve optimum radio performance. An untuned antenna will more than likely have a detrimental effect on the effective transmission distance and can potentially damage the radio.*

> https://www.rightchannelradios.com/blogs/installation-guides/18330687-cb-antenna-tuning-instructions
>
> https://www.rightchannelradios.com/blogs/selection-guides/18428339-frequently-asked-cb-questions

Antenna Tuning – The Process

One expert states:

> So, you've wrestled your CB radio into the dashboard and you've got your antenna mounted on a space with decent ground plane. Everything is connected and ready to go, right? Wrong. ***It's vital that you tune your antenna before using your new CB radio.*** If you are not familiar with the concept behind SWR *(standing wave ratio)* or the necessity of adjusting it, improper tuning of your antenna has the potential to cause much worse than a weak broadcast signal – it can end the life of your radio before you get a chance to enjoy it.

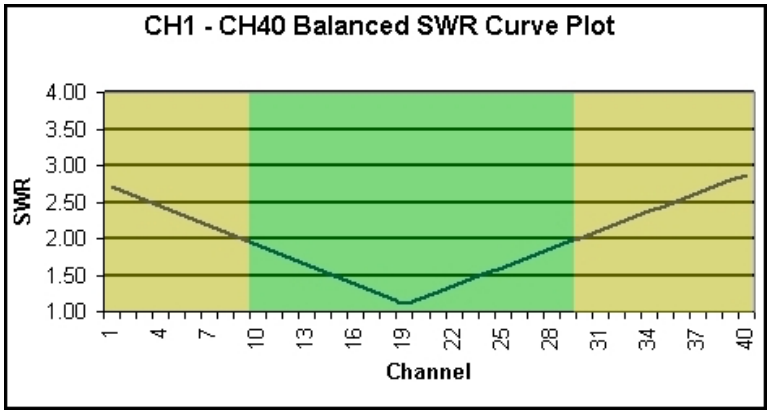
As shown in the images on Page 7, **the percise location where the antenna will always be mounted** must be determined before the antenna is tuned because the least amount of repositioning after the antenna is tuned will degrade the *ground plane effect* and decrease the *effective radiated power* from the antenna. Furthermore, as detailed at the link below "*The first thing you need to do is find a suitable location to park your vehicle. There should be no obstructions, such as trees or buildings, within 30 to 50 feet (or about 10 to 15 meters) of your antenna.* ***Neither you nor your buddies should be hanging out around the car either.*** *Make sure that you're inside with the doors ~~and windows~~ closed to ensure an accurate reading".* When not filled with vehicles on a Sat or Sun, most high school parking lots are suitable testing locations.

Most packaged antennas require assembly by inserting the whip into the base and tightening a set screw. At the time of assembly, ***new antennas should be tuned*** with a Standing Wave Ratio *(*SWR*)* meter to precisely adjust the physical length of the whip for optimum performance. The SWR testing process will ensure the strongest signal possible will be transmitted. In addition, it is important to properly tune an antenna because there is a risk an antenna that has not been turned might cause the radio to overheat causing permanent damage.

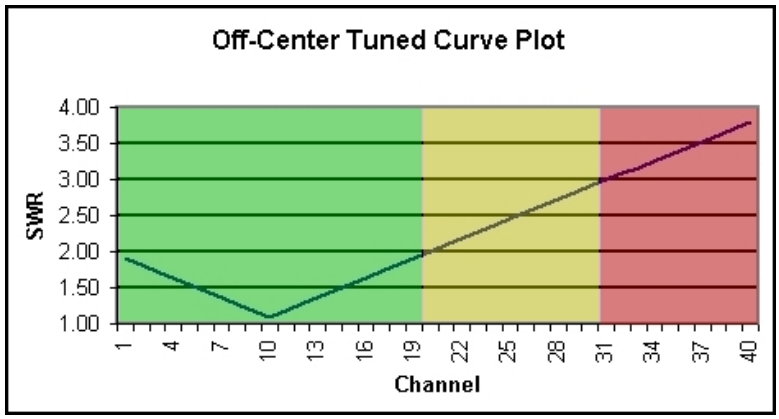
OPTIMAL ANTENNA TUNING – OFF CENTER TUNING METHOD

Overview *– "Off Center Tuning" is a process to optimize the SWR values and 'peak and tweak' the Effective Radiated Power (ERP) for a specific channel or a selected segment of the 40-channel band rather than across the entire band.*

As mentioned above, the normal procedure for tuning an antenna is to adjust the physical length of the whip to achieve the same, or virtually the same, SWR value on CH 1 and CH 40. Once the adjustment is completed, as illustrated below, the lowest SWR value will be in the middle of the 40-channel band at or near CH 19. This method of tuning will produce and balance the best possible SWR values across all 40-channels.



However, what if all 40-channels are not routinely used? For example, a construction, security or courier company might only use one permanently selected channel or in the case of the UMN, with very few exceptions only CHs 3 and 5 are used for touring purposes. For these examples and as illustrated below, the "off center tuning" method should be used to achieve the best possible SWR values for all the primarily used channels.



Off Center Tuning – http://www.firestik.com/Tech_Docs/Off-tune.htm

Effective Radiated Power (ERP)

Overview *– The following table illustrates how high SWR values reduce the power output of CB radios and theoretically the effective transmission distance.*

Optimum SWR - 1.5:1 or Less

SWR READING	POWER LOSS %	ERP	WATTS OUTPUT	REMARKS
1.0:1	0.0%	100.0%	4.00	**NOTE 1**
1.1:1	0.2%	99.8%	3.99	
1.2:1	0.8%	99.2%	3.97	
1.3:1	1.7%	98.3%	3.93	
1.4:1	2.8%	97.2%	3.89	
1.5:1	**4.0%**	**96.0%**	**3.84**	**NOTE 2**
1.6:1	5.3%	94.7%	3.79	
1.7:1	6.7%	93.3%	3.73	
1.8:1	8.2%	91.8%	3.67	
2.0:1	**11.1%**	**88.9%**	**3.56**	**NOTE 3**
2.2:1	14.1%	85.9%	3.44	
2.4:1	17.0%	83.0%	3.32	
2.6:1	19.8%	80.2%	3.21	
3.0:1	**25.0%**	**75.0%**	**3.00**	

NOTES:

1. 4-watts is the maximum legal power output for a CB radio in Canada and in the USA
2. **1.5:1 or less is an ideal maximum SWR value**
3. operating a CB radio with an SWR greater than 2.0:1 can potentially damage the radio

Unfortunately for UMN touring purposes, tuning an antenna to primarily use CHs 3 and 5 would be far too restrictive because:

- during the August 2015 Canada's Capital Miata Meet (C2M2) 12-channels were used each day; one channel assigned for the exclusive use of each of the 12- tour convoys. For that event, CH 3 was the lowest assigned channel and CH 23 was the highest assigned channel; likewise,
- the C2M2 2025 event will most likely require the simultaneous use of at least 12-channels; therefore,
- ***for optimum UMN touring purposes and as illustrated in the table below, a practical compromise is to ALWAYS off center tune UMNer owned antennas between CH 1 and CH 25.***

The table on the following page shows the off center tuning values for three antennas that were tuned on a 2007 NC PRHT and one antenna tuned on a 2023 ND Soft Top. The SWR values for CHs 30, 35 and 40 are shown for general interest purposes only.

The – and + symbols indicate results slightly below or above the SWR value marker. The readings without a – or + symbol are precisely on the indicated SWR value marker.

	YEAR & MODEL OF TEST MIATA				
	2007 NC PRHT	**2007 NC PRHT**	**2007 NC PRHT**	**2017 ND RF**	**2023 ND Soft Top**
CHANNEL	**35" WILSON K30 ANTENNA**	**ANDERSON SPLITTER & 31" METRA AW-RM22B ANTENNA**	**36" FIRESTIK FIREFLY BUMPER MOUNTED ANTENNA NOTE 2**	**36" FIRESTIK FIREFLY BUMPER MOUNTED ANTENNA NOTE 2**	**36" FIRESTIK FIREFLY BUMPER MOUNTED ANTENNA NOTE 2**
1	1.1+:1	1.4:1	1.0:1	1.5:1	1.4:1
3	1.1:1	1.2+:1	1.0:1	1.2+:1	1.3:1
5	1.0:1	1.1:1	1.0:1	1.0+:1	1.2:1
10	1.0:1	1.0:1	1.0:1	1.0:1	1.1:1
12	1.0:1	1.0:1	1.0:1	1.0:1	1.1:1
15	1.0:1	1.0:1	1.0:1	1.0:1	1.2:1
20	1.0:1	1.1+:1	1.2:1	1.4:1	1.5:1
25	1.1+:1	1.4:1	1.4+:1	1.5+:1	1.5:1
30	1.3+:1	1.7:1	2.0+:1	2.4:1	2.0–:1
35	1.5+:1	2.0+:1	2.5+:1	2.9:1	not recorded
40	2.0:1	2.5:1	3.0+:1	3.1:1	not recorded

NOTES:

1. Channels 3 and 5 are the UMN Primary #1 and #2 respectively.
2. The most likely reason the best achievable SWR values on the 2017 ND RF and the 2023 ND Soft Top are not quite as low as the 2007 NC PRHT values is because the body structures of the ND models have more aluminum components and less ferrous metal mass than the NC. Likewise, NA and NB trunk lid mounted K30 antennas achieve far better SWR values than NC trunk lid mounted K30 antennas because NAs and NBs have more ferrous metal body mass than NC models.
3. The precise frequency of CH 12 is midway between the CH 1 and CH 25 frequencies.

Antenna tuning can be performed by the staff at ProCom Electronics *(see Page 17 – Purchasing Sources)* or by a number of knowledgeable Club members. For antenna tuning by a Club member, send me an email (mervembury@gmail.com) and I will arrange a tuning session.

There is an excellent overview of antenna tuning at the following:

https://www.rightchannelradios.com/blogs/installation-guides/18428275-understanding-swr?utm_source=Klaviyo&utm_medium=campaign&_kx=DC-EBE5FXMHEsrjyKy1HawRo6uUxih6Be0IiPNuSweM.d9QqSj

MOBILE RADIO – INSTALLATION AND POWER OPTIONS

Overview *– It is relatively easy to install a mobile radio and connect the radio to a 12-volt power source.*

Radio Installation

There are essentially two methods to install a mobile radio on the driver or passenger side of the vehicle:

- non-destructive method – using strips of VELCO *(as illustrated in the three pictures below), or*
- slightly destructive method – using the OEM mounting bracket screwed on the driver or passenger side of the transmission tunnel or, to the panel below the steering wheel.

Radio fitted with 2" VELCRO

NC Driver Side

ND Passenger Side

Power Source Options

There are two options for connecting a radio to a vehicle 12-volt power source.

- utilize the 12-volt accessory outlet (cigarette lighter outlet), or

Note: mobile radios are seldom shipped with an affixed 12-volt plug:

- Sources – these somewhat difficult to find plugs are available:
  - on amazon.ca, or
  - locally in Ottawa at Accessotronik Electronics #1 - 716 Industrial Ave

- hardwire to the under-dash fuse box utilizing an Add-a-Circuit fuse holder and Polarized Connector.

Light House Add-a-Circuit
Canadian Tire - $15.99
FHA200BP OFHA0200ZP 020-1594-2.

Reese Towpower Polarized Connector
Home Hardware - $6.49
Item #8730-021 Model #85208

EXTERNAL SPEAKER (OPTIONAL)

Given the relatively loud cabin noise when driving top down at highway speed and given the volume limitation of radio speakers, external speakers have proven to be extremely beneficial.

Although ProCom Electronics usually stock a few reasonably priced speakers, excellent competitive pricing in the range of $14.00 to over $50.00 are available from online resellers such as amazon.ca and eBay as well as numerous authorized dealers such as Radioworld Toronto. One excellent speaker pictured above (RoadPro RP-101C 2-1/2-Inch x 3-1/4-Inch CB Extension Speaker) was available on amazon.ca on 09 Jul 2024 for $16.45 CAD.

PAINT PROTECTION FOR MAGNETIC MOUNTED ANTENNAS

Overview – *Wanting to prevent paint damage, most magnetic antenna users place a piece of cloth or thin foam pad under the magnetic base to prevent scratches from dust particles and airborne metallic contaminants that are attracted to the base. Unfortunately, every barrier regardless of the material will adversely degrade the radiation performance of the antenna.*

Protective Barrier Testing

When searching for an ideal protective barrier, numerous tests were performed using a wide variety of materials. Although many of the materials are not practical for actual use, for testing purposes the following were used: wax paper, saran wrap, paper towel, thin felt craft fabric, foam pad (commonly used by Club members), standard bond printer paper and a 4½" circular disk of **3M XPEL ULTIMATE paint protection film**. Of all the materials, the “almost invisible” 3M film produced performance results far superior to any of the other materials. Based on these findings, numerous Club vehicles now have 3M disks affixed to their trunk lid.

Inconspicuous from a few feet away!

The information at the following link describes the 3M XPEL ULTIMATE product in detail:

https://www.xpel.com/products/paint-protection-film

3M XPEL FAQs

An important first question about the 3M XPEL ULTIMATE product:

Will my paint fade differently under the film than it does on the rest of the car?

No. UV rays will pass through the film. Your paint will not fade differently from the rest of the vehicle. (quote from: https://carprotectionpros.com/faq/)

Of the fifty FAQs on the product site (http://www.xpel.com/faqs/), the following will hopefully answer the most questions of concern:

Will XPEL Ultimate yellow over time?

XPEL ULTIMATE is warrantied for 10 years against a range of issues including yellowing. More information about the warranty can be found here at:

http://www.xpel.com/xpel-protection-film-warranty/

Will removing the film harm the vehicles paint, once removed?

It is highly unlikely for paint protection film to harm OEM paint. Paint systems used on modern assembly lines today produce a minimum bond strength of 16 MPa and maximum of 25 MPa between the panel and the paint depending on color, iridescence and the system used. Our film's bond to the painted surface at normal state (immediately following installation) is .0753 MPa. Even after years of heat and sun, the bond between the film and the paint increases to only 0.17 MPa. What that means is in the absolute worst-case scenario, the bond of factory paint to the panel is over 94 times stronger than the bond of our film to the paint. In the best case, the paint is 332 times stronger.

Can I run my car through an automatic car wash?

Yes. But wait 48 hours after installation to allow the film to dry completely.

Can I use a pressure washer, and how soon after install?

Yes, pressure washers can be used on XPEL paint protection films, provided the film has completely dried after installation (typically 48 hours) and provided the high-pressure water is not pointed directly at the edges of the film.

PURCHASING SOURCES

Overview *– CBs, antennas and external speakers can be purchased from ProCom Electronics, a Club sponsor, innumerable Amazon and eBay sellers and countless manufacturers authorized distributors.*

amazon.ca – usually has the best Canadian dollar prices:

- **Uniden PRO505XL** – although slightly less expensive than the **510** model, **the 510 model is the recommended best choice**.
- **Uniden PRO510XL** – **recommended best choice**!

Radioworld Toronto (North York) – https://www.radioworld.ca/

- a Canadian supplier with superb customer service and consistently prompt delivery.
  - **Radioworld shipping policy**

    https://help.radioworld.ca/en/category/shipping-cwcabt/

GPS Central Calgary – https://www.gpscentral.ca

- Canadian supplier that often has excellent sales including the two recommended Uniden radios.
    - **GPS Central shipping policy**

      https://www.gpscentral.ca/shipping-policy/

USA sources that ship to Canada

- **Right Channel Radios Bozeman Montana**

  https://www.rightchannelradios.com/
- **Walcott Radio Walcott Iowa**

  https://www.walcottradio.com

UMN Club Sponsor – **ProCom Electronics**

2814-B Highway 2
Johnstown, Ontario K0E1T1
(1-Km Southwest of the Ogdensburg-Prescott International Bridge)

Hours – as of 07 Aug 2024

- Tue, Wed, Thur & Fri – 8:00 AM to 1:00 PM
- phone Rock Mallin (613-925-7592) to schedule an appointment.

CB RADIO SYSTEMS – RECOMMENDED PACKAGES

Overview *– based on historic user experience, the following packages have proven to be extremely reliable for Miata Club touring purposes:*

- basic package "ideal" for all NA, NB, NC and ND Soft Top models (see the explanation in the first sentence on Page 5 under Antennas – Overview):
    - Uniden PRO505XL or Uniden PRO510XL,
    - 12-volt plug for utilizing the accessory outlet, and
    - Wilson K30 or Little Wil antenna.
- upgraded basic package "ideal" for all NA, NB, NC and ND Soft Top models (see the explanation in the first sentence on Page 5 under Antennas Overview):
    - Uniden PRO505XL or Uniden PRO510XL,
    - Add-a-Circuit device and Polarized Connector to hardwire to fuse box,
    - Wilson K30 or Little Wil antenna, and
    - external speaker.
- upgraded package "ideal" for all NC and ND models:
    - Uniden PRO505XL or Uniden PRO510XL,
    - Add-a-Circuit device and Polarized Connector to hardwire to fuse box,
    - Bumper Mounted Antenna (see Page 9 for a list of component items and Annex B for detailed installation instructions), and
    - external speaker.

CB RADIO TUNING AND TROUBLESHOOTING

Overview *– As mentioned above, the importance of a properly tuned radio cannot be overstated. With a properly installed radio and antenna, the vast major of "reception" problems result from improper tuning. Specifically, the* ***SQ*** *and/or* ***RFG*** *controls are not properly tuned.*

It is important to understand, the ***SQ*** *and* ***RFG*** *controls* only affect radio reception and do not have any *bearing on broadcast clarity or effective transmission distance. The effective operating distance is primarily governed by the quality of the antenna. Thus, the commonly quoted saying, "the antenna is the most important component of your CB system".*
For troubleshooting assistance and peak performance tuning, a self-help "CB Radio Tuning and Troubleshooting Guide" is in ANNEX A on Page A – 1/1.

Radio Tuning – The Process

It is important to note:

- **SQ** control – as mentioned on Page 1, all CBs have a ***SQ*** control:
  - low (counterclockwise) settings improve the reception of weak and distant transmissions; however, if set too low unwanted transmissions might be received. Conversely, high (clockwise) settings will minimize the chance of receiving wanted transmissions. The best compromise setting is slightly higher than the threshold where all the static noise is eliminated, and
  - as illustrated under the **RECEIVER TUNING** columns on the *"CB Radio Tuning and Troubleshooting Guide" (Page A – 1/1)* the further the ***Squelch*** is turned 'clockwise' the worse the reception.

    https://www.walcottradio.com/help/what-is-the-squelch-cb-radio.php
- ***RFG*** control – as mentioned above, many CBs such as the Uniden PRO505XL and PRO510XL **do not have** a manual ***RFG*** control:
  - the further the ***RFG*** control is turned 'clockwise' the better the reception with the best possible reception when the ***RFG*** is fully Open (clockwise). A negative consequence of a maximum ***RFG*** setting is weak and unwanted distant signals might be received. Therefore, a midway > ¾-Open ***RFG*** setting will usually produce optimum reception results.

    https://www.walcottradio.com/help/what-is-the-rfgain-cb-radio.php

QUESTIONS
AND
REQUESTS FOR ADDITIONAL INFORMATION

Email: *mervembury@gmail.com*

Cell: (613) 240-6870

CB RADIO TUNING AND TROUBLESHOOTING GUIDE

{Created for UMN Ottawa by Merv Embury May 2018}

NATURE OF PROBLEM	POWER			IF EQUIPPED		RECEIVER TUNING				MICROPHONE			ANTENNA	
	CONFIRM TURNED "ON"	CONFIRM POWER CORD IS PROPERLY CONNECTED	CHECK POWER ADAPTER AND INLINE FUSES	CONFIRM ANL IS "ON"	CONFIRM PA IS SWITCHED "OFF"	VOLUME TOO FAR	SQUELCH TOO FAR	RF GAIN TOO FAR	CONFIRM THE CORRECT CHANNEL IS SELECTED	CONFIRM THE CONNECTOR IS TIGHT	CONFIRM IT IS NOT FAULTY - TEST CB WITH A BORROWED MICROPHONE	FOR POWER MICROPHONES - TEST/REPLACE BATTERY	CONFIRM ALL COAX CONNECTORS ARE TIGHT	HAVE SWR TUNING CHECKED
"ON" LIGHT NOT ILLUMINATED	X	X	X											
EXCESSIVE NOISE AND STATIC				X										
CAN Tx BUT CAN NOT Rx						X	X	X						
CAN Rx BUT CAN NOT Tx										X	X	X		
CAN NOT Tx OR Rx					X	X	X	X	X	X	X	X	X	
POOR QUALITY OR INTERMITTENT Tx										X	X	X	X	X
LEGEND	GREEN COLUMNS - MOST COMMON PROBLEMS | PA - Public Address | ANL - Automatic Noise Limiter RF - Radio Frequency | Tx - Transmit | Rx - Receive | SWR - Standing Wave Ratio													
NOTES	On the rare occasion none of the above checks or adjustments resolve your inability to communicate there is a possibility either the radio, antenna or cabling is broken or in some other way faulty.													

FOR OPTIMUM "RECEIVER" TUNING: If you can tolerate the constant Squelch noise and want the best "reception" possible, turn the Squelch "OFF" and the RF Gain fully "ON".

NC & ND BUMPER MOUNTED FIRESTIK FIREFLY ANTENNA
ASSEMBLY AND INSTALLATION INSTRUCTION

Overview *– This instruction is applicable for the assembly and installation of the illustrated 3/8" X 24 Threaded Stud / SO-239 Connector Assembly and a Firestik FireFly "FL" series antenna:*

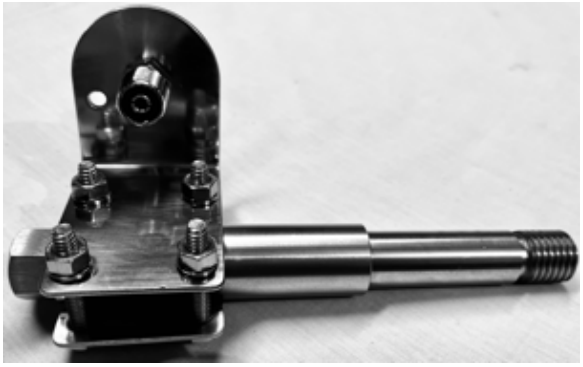
http://www.firestik.com/Catalog/FL3-FL4.htm

All NA, NB, NC and ND Soft Top models have a suitable ferrous metal surface to affix a magnetic mount antenna; however, ND RF models lack such a surface. Unfortunately, a jury-jigged method to affix a magnetic mount antenna on the trunk lid of ND RF models placing a large steel washer on the underside of the trunk lid is less than ideal because the antenna must be removed prior to opening and closing the retractable fastback roof. As detailed below, a highly efficient and non-destructive "UMN Exclusive" alternative has been devised to affix an antenna to the rear bumper of all NC and ND models.

As detailed on Pages 8 & 9, the bumper mounted antenna is a UMN innovation consisting of three commercially available components and an Al Zarama custom bolt, designed and manufactured by Al Zarama a master machinist and fellow UMNer. The three commercially available components from Radioworld Toronto (North York) are the antenna, coaxial cable and mirror mounting bracket listed on Page 8. For anybody wanting installation assistance, this is a Club DIY undertaking performed by Club members who have completed several installations on NCs and, both ND Soft Top and RF models. The installation and post-installation antenna tuning process take approximately 2 to 3 hours to complete. For additional information or to arrange an installation session, send me an email (mervembury@gmail.com) and I will coordinate the arrangements.

Assembly Instructions

To ensure the top of the mounting bracket is horizontal so the antenna will be vertical, the connector assembly must not be attached to the bolt until the bolt is securely installed on the vehicle. This is important because after the connector assembly is first attached to the bolt, it can remain permanently attached without any risk of striking the bumper when the bolt is removed and reinstalled on the vehicle. In this configuration, the assembly can be easily installed and/or removed in approximately two minutes.



Note: as illustrated in the image below, the outer edge of the bracket should be flush with the ridge between the nut portion of the bolt and the smooth shaft.

K40-K4018FME Coaxial Cable Installation Guide

Although the videos at the following links are for the installation of a backup camera in a ND Soft Top, in the first video the footage from 8:44 to 11:30 and 13:30 to 15:00 illustrates how to access the passenger's side cable channel between the trunk and cabin:

https://www.youtube.com/watch?v=AUoW6bCRQME

- the footage and narration from 6:10 to 9:35 and 22:40 to 24:40 in the following video explains how to feed a cable through the passenger's side cable channel:

  https://www.youtube.com/watch?v=8a904i_g9pw

For the installation of the 18ft K40-K4018FME cable:

- although the videos show the cable being installed through the passenger's side channel, there is also a cable channel on the driver's side; therefore, the channel to be used will depend upon where the radio will be installed, and
- as illustrated in the following images the white coupler, the CB radio end of the cable, must be fed from the trunk into the cabin whereas in the videos for the backup camera, the cable is fed from the cabin into the trunk.

Coaxial Cable 18ft K40-K4018FME

Preparation, Installation and final assembly of the FME Connector

As illustrated below, the cable is tightly coiled when unpackaged. Therefore, it is recommended the coiled cable be placed in the sun to become pliable and easier to uncoil. After the cable is warm, it is much easier to uncoiled and remains pliable thereafter.

To avoid damaging the threads or contaminating the small hole in the tip of the white coupler, it is recommended a tire 'valve cap' be placed over the coupler and taped in place before the cable is fed through the cable channel. After the cable is installed, affix the large coupling component and **securely tighten using two wrenches**.

Firestik FireFly Antenna Tuning Instruction

After the coax cable, antenna and CB radio are installed, it is critically important the Standing Wave Ratio *(*SWR*)* is tested in accordance with the instructions at the following link:

http://www.firestik.com/Tech_Docs/Setting_SWR.htm

As illustrated below, all Firestik antennas have a tunable tip and are topped with a vinyl cap. After the length of the antenna is adjusted, the vinyl cap must be installed before the SWR is tested. If the SWR is still too high or too low, remove the cap, readjust the length of the antenna, reinstall the cap and retest the SWR. Repeat as often as necessary until the SWR is a maximum of 2.0:1; the closer to 1.5:1 or even lower if possible is ideal.

NC & ND BUMPER AND NA & NB FRANKENSTEIN BRACKET MOUNTED FIRESTIK FIREFLY ANTENNA

****

TROUBLESHOOTING AND TEST INSTRUCTION

This instruction is applicable for testing the illustrated connector assembly (and 90° connectors of the same configuration) when fitted with the following antenna:

- **Firestik FireFly "FL" Series:** http://www.firestik.com/Catalog/FL3-FL4.htm

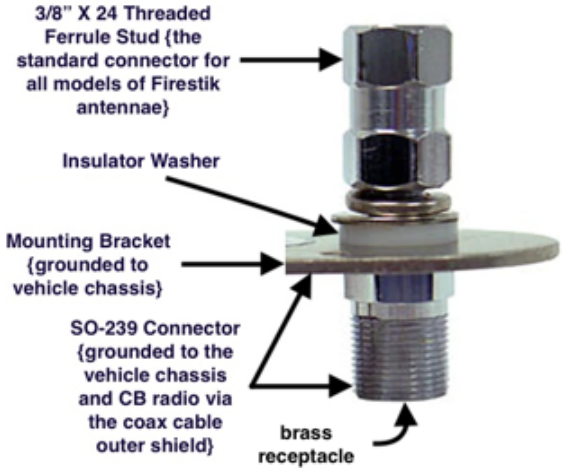
Overview *– upon completion of the installation, if a* ***Standing Wave Ratio (SWR)*** *below 2.0:1 cannot be achieved, the most likely reason is a connector assembly fault or the lack of an adequate ground connection between the* ***mounting bracket and the vehicle chassis****.*

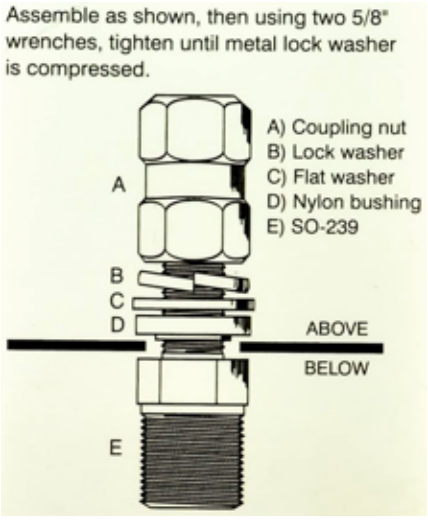
SWR Tuning – As illustrated below, all Firestik antennas have a tunable tip and are topped with a vinyl cap. After the length of the antenna is adjusted, the vinyl cap must be installed before the SWR is tested. If the SWR is still too high or too low, remove the cap, readjust the length of the antenna, reinstall the cap and retest the SWR. Repeat as often as necessary until the SWR is a maximum of 2.0:1; the closer to 1.5:1 or even lower if possible is ideal.

- **SWR Tuning Instruction** – http://www.firestik.com/Tech_Docs/Setting_SWR.htm

Tunable Tip

3/8" X 24 Threaded Stud / SO-239 Connector Assembly





Probable Fault

The Connector Assembly will be faulty if:

- the Insulator Washer (nylon bushing) is BELOW the Mounting Bracket – to remedy, reassemble as illustrated above, or
- the Insulator Washer (nylon bushing) is defective causing a short circuit between the Ferrule Stud and, the Mounting Bracket / SO-239 Connector.

Either of these connector assembly faults will create an unwanted ground and resultant short circuit (ie: electrical connection) between the antenna and the vehicle chassis, producing unacceptably high *(2.0:1 or greater)* SWR readings on all 40-channels and render the CB radio inoperable.

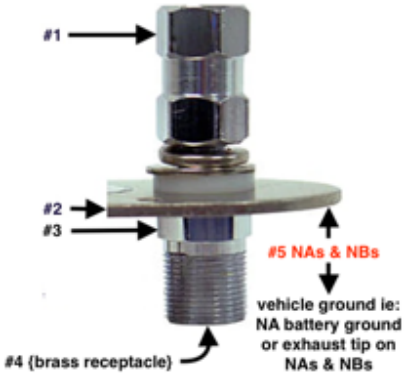
TEST PROCEDURE

Multimeter Setup

With Ω (ohms) selected for continuity testing.

Test Sequence 1

Perform **Tests 1**, **2**, **3** and **4** inclusive with the connector assembly attached to the vehicle and, ***without the antenna installed and with the coax cable disconnected***. If the coax is connected to the radio, it will ground the radio creating a misleading false sense the mount is properly grounded. Grounding the mount via the coax cable is not sufficient; it requires a direct ground.



Test	Path	Good Result
1	#1 ← → #2	no continuity
2	#1 ← → #3	no continuity
3	#2 ← → #3	continuity
4	#1 ← → #4	continuity

Test Sequence 2

With the antenna installed and the coax cable connected, repeat **Tests 1**, **2** and **3**. The results should be the same as for **Test Sequence 1**.

If there is continuity between #1 ← → #2 and #1 ← → #3, there is a short circuit most likely caused by a missing or defective Insulator Washer. Remedial options are to replace the Insulator Washer or replace the entire connector assembly:

- Firestik Nylon Insulator Washer Model: NW-1 *(difficult to source)*

  https://www.wearecb.com/firestik-nw1-nylon-insulator-washers.html
- Firestik K-4A SO-239 Stud Mount *(likely the easiest and least expensive option)*
  - usually available from https://www.radioworld.ca for less than $15.00 (plus HST and shipping) or amazon.ca for prices ranging from $8.95 to $25.00

Test Sequence 3 for NAs and NBs utilizing the Frankenstein Bracket to attach the Connector Assembly: after Tests 1, 2, 3 and 4 are successfully completed

Test	Path	Good Result
5	#2 ← → #5	continuity

- **if the result is "no continuity"**, a ground strap must be installed between the Frankenstein Bracket and the vehicle chassis. *(eg: trunk lid hinge mounting bolt)*

Ungrounded Antenna Mounts – http://www.firestik.com/Tech_Docs/Mnt-Grnd.htm