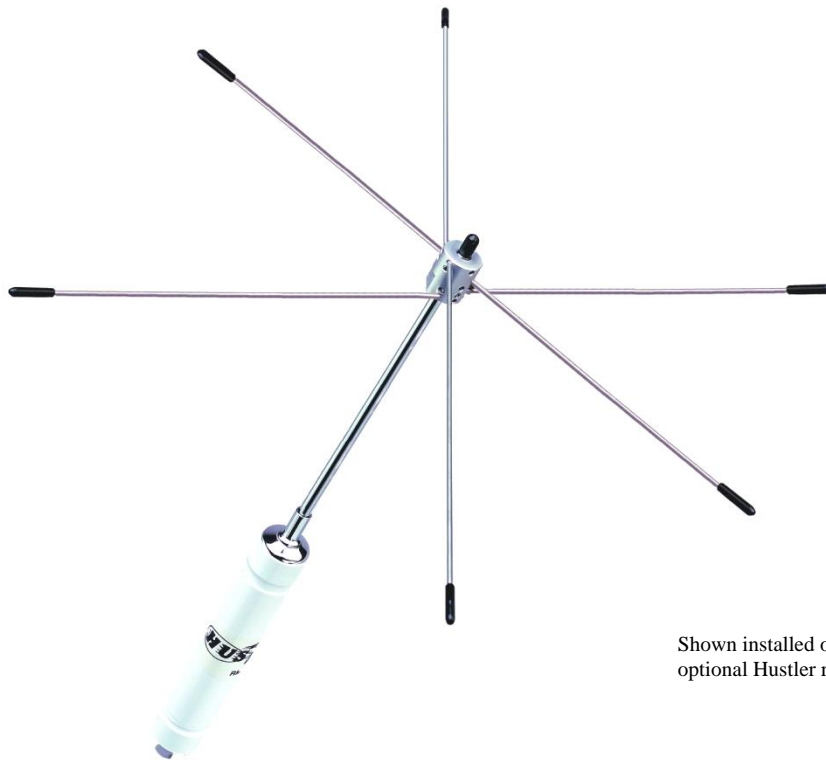




# Hot Rodz<sup>®</sup> Adjustable Capacity Hat

**DXE-HR-1P**

DXE-HR-1P-INS Revision 1f



Shown installed on an  
optional Hustler resonator

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1200 Southeast Ave, Tallmadge, OH 44278 USA  
Phone: (800) 777-0703 · Tech Support and International: (330) 572-3200  
Fax: (330) 572-3279 · E-mail: [DXEngineering@DXEngineering.com](mailto:DXEngineering@DXEngineering.com)

## Introduction

The DX Engineering Hot Rodz<sup>®</sup> is an adjustable capacity hat system that increases the efficiency and gain of single-band vertical antennas, such as those from Hustler and Pro Am. Hot Rodz<sup>®</sup> can even shorten the height of the antenna by eliminating the need for a whip. Hot Rodz<sup>®</sup> can also be used on the Hustler 4, 5 and 6-BTV series antennas by experienced antenna practitioners; however, the directions in this manual are specifically for mobile antennas.

## Part List for the DXE-HR-1P Hot Rodz<sup>®</sup>

DXE-HR-1P - Parts List	
Quantity	Description
6	6" stainless steel rod
6	12" stainless steel rod
6	24" stainless steel rod
1	Hot Rodz <sup>®</sup> Hub
1	Allen Wrench
3	8-32 x 1/4" - Long Set Screw (includes one spare)
8	8-32 x 1/8" - Short Set Screw (includes 2 spares)
1	Black Cap, for resonator tip
24	Black Tip Cap, for stainless steel rod



## Additional Requirements

You may need the following items that are not included in this package:

**SWR Meter.** The Configuration guide (**Table 2**) will help you get close to the ideal antenna size, but a SWR meter is necessary to fine-tune the final assembly.

**Antenna Matcher.** To match the impedance between your feedline and antenna, use a mobile matcher such as the **DXE-MM-1** Dual Impedance Transformer

**Guy Ropes.** Depending on the configuration of the Hot Rodz<sup>®</sup>, your antenna system may require additional support. **SYN-DBR-125-100** 1/8 in. Diameter, Dbl-Braid Dacron/Polyester Rope may be used.

## Theory of Operation

When an antenna is shortened from its natural resonant length, the feedpoint becomes capacitive. To offset the additional capacitance, it is common to add inductance in the form of a loading coil to restore the resonance. However, the additional inductor increases the resistance, which increases the loss of the antenna. Hot Rodz solve this problem by using a capacity hat - a series of horizontal rods that counters the effects of shortened vertical antennas.

## A Capacity Hat Increases Antenna Efficiency

A capacity hat can be thought of as an extension of the Marconi antenna design that adds horizontal elements to the design of an otherwise vertical antenna. The currents in Hot Rodz horizontal elements offset one another and preserve the vertical polarization of the radiated wave.

**Table 1** illustrates the real radiation resistance of a 6-foot mobile whip. There is a lot of confusion about radiation resistance, but one definition is "*the resistive component of an antenna feedpoint impedance caused by radiation from an antenna*". Mathematically, radiation resistance is the total electromotive power divided by the square of the net current causing the radiation. In general, the greater the radiation resistance, the more efficient the antenna.

Radiation Resistance of 6-Foot Mobile Whips	
Frequency	Radiation Resistance
1.8 MHz	0.05 $\Omega$
3.5 MHz	0.17 $\Omega$
5.0 MHz	0.35 $\Omega$
7.0 MHz	0.69 $\Omega$
10 MHz	1.42 $\Omega$
14 MHz	2.77 $\Omega$
18 MHz	4.59 $\Omega$
21 MHz	6.24 $\Omega$
24 MHz	8.15 $\Omega$
28 MHz	11.1 $\Omega$
The radiation resistance increases dramatically as the frequency increases	

**Table 1 - Radiation Resistance of 6-Foot Mobile Whips**

For instance, a 72-inch, 20 Meter whip antenna with a SWR of 1:1 has a feedpoint impedance of 50  $\Omega$ . However, **Table 1** shows the true radiation resistance of the antenna is somewhere near 3  $\Omega$ , which means the loss in the system is 47  $\Omega$  (50  $\Omega$  - 3  $\Omega$ ) and the radiation efficiency is 6% (3 $\Omega$  / 50  $\Omega$ ). Therefore if an operator uses a 100-watt transmitter in the car, 94 watts are used to heat the air and only 6 watts remain for communication. The loading coil and ground system generate a loss of 94 watts; but if we remove the loss from the loading coil, then the base impedance drops by the amount of the loss in the coil.

When we add a capacity hat, the inductor (resonator) can be reduced, which lowers the resistance. As stated above, a reduction in the resonator resistance is reflected in the feedpoint resistance. In this case, the base impedance of the antenna drops to about 16-22  $\Omega$  when you increase the efficiency of the antenna with Hot Rodz<sup>®</sup>.

If the base impedance is reduced from 50  $\Omega$  to 20  $\Omega$  when the antenna's radiation resistance is really 3  $\Omega$ , then the loss is reduced from 47  $\Omega$  to just 17  $\Omega$  and the efficiency improves from 6% to 15% (3  $\Omega$  / 20  $\Omega$ ). This improved efficiency more than doubles the RF power radiating from your antenna. Any matching problems at the feedpoint will be handled by your rig's antenna matcher or with the DX Engineering **DXE-MM-1** Dual Impedance Transformer.

## Installation and Maintenance

While DX Engineering Hot Rodz<sup>®</sup> make it easy to modify Hustler mobile resonators and whips, we suggest you read these instruction carefully before you begin the process.

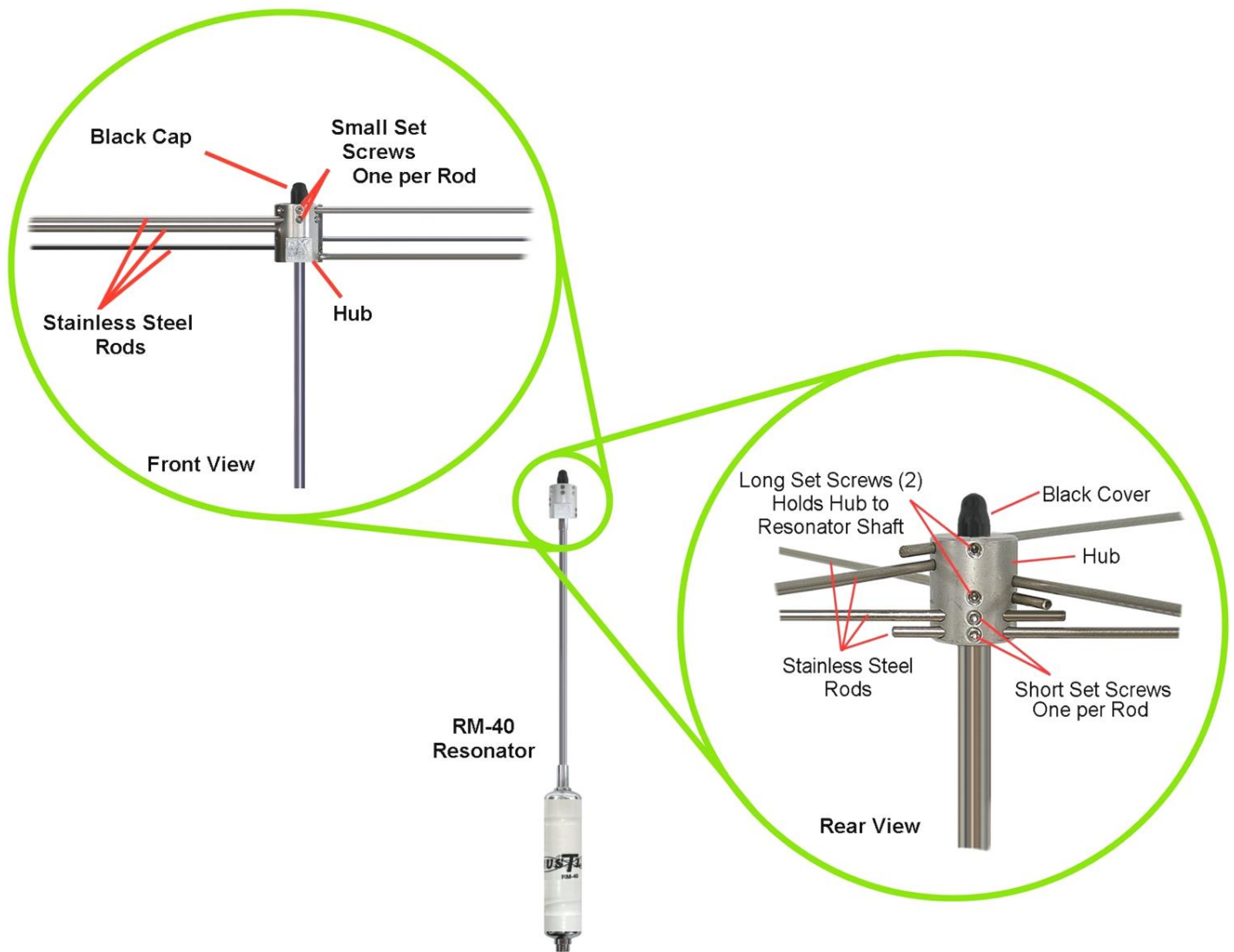
### Safety Considerations

- Hot Rodz<sup>®</sup> create additional aerodynamic drag. While Hot Rodz<sup>®</sup> have been made as aerodynamic as possible, additional guying of your antenna may be necessary.
- Install the plastic caps over the ends of all exposed rod ends. The ends may be sharp and can cause injury.
- Keep the end of the rods inside the body lines of your vehicle.
- High voltage exists on your antenna and the Hot Rodz<sup>®</sup>. Transmit only when people are a safe distance away.
- Be aware that Hot Rodz<sup>®</sup> makes your antenna diameter larger. Use caution when driving near pedestrians, and in crowded or confined areas.

### Assembling the Antenna

1. Refer to **Table 2** to select the resonator and stainless steel rods for the desired frequency.
2. Mount the Hot Rodz<sup>®</sup> Hub to the Hustler resonator flush with the flat area below the whip mounting threads as shown in **Figure 1**.
3. If you are not using the whip, then use the larger plastic cap over the end of the threads.
4. Place the correct number of the smaller caps over one end of the stainless steel rods you have chosen to use.
5. Insert the stainless steel rods into the hub in the configuration shown in **Table 2**.

6. Install the resonator and Hot Rodz<sup>®</sup> assembly to the antenna mast.
7. Adjust the stainless steel rods and the whip (if installed) for the lowest SWR for the desired frequency.
8. Refer to "Determining the Length of the Rods" for rod lengths.



**Figure 1 - Typical installation - optional RM-40 resonator shown as an example.**

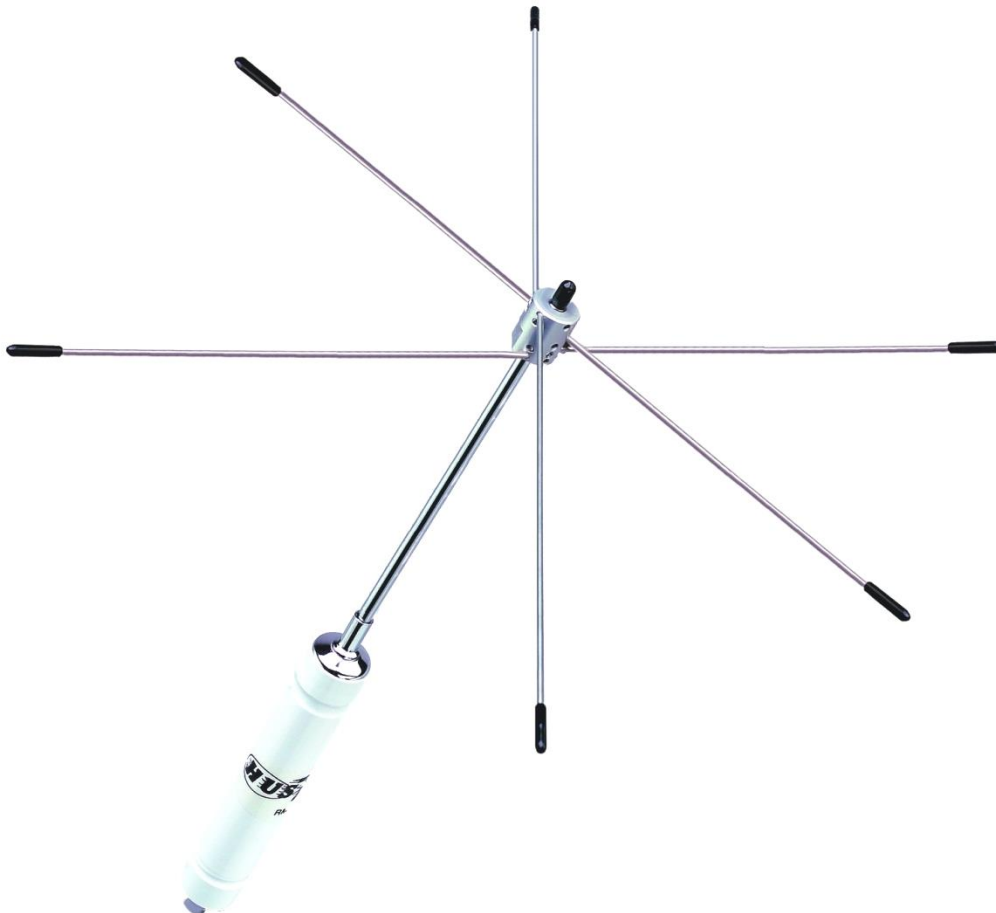
## Determining the Length of the Rods

To determine the lengths of the rods, refer to **Table 2** and do the following:

1. Beginning with the leftmost column of **Table 2**, read down successive columns of numbers until you reach the intended frequency or slightly below.
2. Note the configuration in the first column associated with that frequency.
3. If that configuration is acceptable, then build the design as outlined in "Assembling the Antenna".
4. If that configuration is not acceptable - too many rods or too long, for instance - then read down the next column to the right to obtain the desired frequency.
5. If the configuration is still not acceptable, then continue reading columns until you find an acceptable arrangement for the frequency of interest.

### Notes:

To achieve the highest efficiency, use the smallest resonator possible for the desired frequency.  
To adjust the antenna to a frequency not listed on **Table 2**, refer to "Selecting the Frequency".



## Selecting the Frequency

The rods can be adjusted to nearly any frequency. If the desired frequency lies outside the listings on **Table 2**, simply follow the directions below to fine-tune your system.

## Lowering the Frequency

To lower the frequency of a Hot Rodz<sup>®</sup> equipped antenna, do the following until you achieve the desired results:

1. Move the rods out from the center to form a larger capacity hat.
2. Add more stainless steel rods (6 maximum).
3. Use longer rods.
4. Add a whip.
5. Extend an existing whip further in length.

## Increasing the Frequency

To raise the frequency of a Hot Rodz<sup>®</sup> equipped antenna, do the following until you achieve the desired results:

1. Move the rods in toward the center to form a smaller capacity hat.
2. Add fewer stainless steel rods.
3. Use shorter rods.
4. Remove an existing whip.
5. Retract an existing whip (less length).

## Installation example for 40 Meters

Ordinarily mobile operation on 40 Meters requires users to install a 40 Meter coil and 32-inch whip on a Hustler MO-2 mobile mast, resulting in an antenna about 102 inches high (54 inches for the MO-2 and 48 inches for the resonator and whip). This combination resonates at about 7.16 MHz. From the chart you can see that by using DX Engineering Hot Rodz<sup>®</sup> you can install a Hustler 20 Meter coil (RM-20) and the 24-inch rods (supplied) and the 12-inch whip that resonates even lower at 7.1 MHz, but is only 78 inches high!

As a result, the base impedance drops to 20  $\Omega$ , a decrease of approximately 30  $\Omega$  resistance from your antenna system. This may not present a problem for you. This combination successfully was used with and automatic tuner in an FT-900 radio and excellent reports were received. The **DXE-MM-1** Dual Impedance Transformer will make it easier on your rig's tuner and may increase the frequency range that you can achieve a low SWR.



## Standard Installation - Hot Rodz<sup>®</sup> Configuration Guide

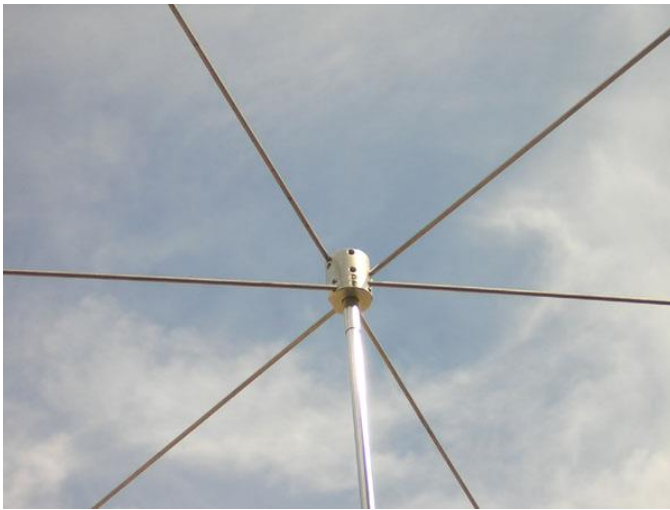
Standard Hot Rodz Configurations	Frequency (MHz) for RM Resonator and MO-2 Mast										
	RM10	RM11	RM12	RM15	RM17	RM20	RM20S	RM30	RM40	RM40S	RM80
(3) 6" Rods, Centered	27.1	27.1	25.6	21.4	21.2	15.7	15.6	11.1	—	8.6	—
(6) 6" Rods, Centered	27.0	26.4	25.0	21.0	20.7	15.3	15.3	10.9	—	8.5	—
(3) 6" Rods, Extended	26.1	25.4	24.0	20.2	19.8	14.8	14.8	10.5	—	8.3	—
(3) 6" Rods, Centered, 12" whip	23.6	23.0	21.7	18.0	17.9	13.3	13.7	9.7	—	7.7	—
(6) 6" Rods, Extended	23.5	22.9	21.7	18.0	17.6	13.2	13.7	9.7	7.7	7.7	4.2
(6) 6" Rods, Centered, 12" whip	23.3	22.7	21.4	17.8	17.6	13.2	13.5	9.6	—	7.7	—
(3) 12" Rods, Centered	23.0	22.5	21.2	17.5	17.4	13.0	13.4	9.5	7.5	7.6	4.1
(3) 6" Rods, Extended, 12" whip	22.6	22.1	20.9	17.3	17.0	12.8	13.1	9.4	—	7.5	—
(6) 12" Rods, Centered	22.3	21.7	20.5	16.9	16.7	12.6	13.0	9.2	7.4	7.4	4.0
(6) 6" Rods, Extended, 12" whip	21.2	20.6	19.4	16.1	15.8	12.0	12.5	8.8	7.1	7.1	3.8
(3) 12" Rods, Extended	21.1	20.5	19.3	16.0	15.9	11.8	12.4	8.8	7.0	7.1	3.8
(3) 12" Rods, Centered, 12" whip	21.0	20.3	19.1	15.9	15.6	11.8	12.3	8.7	7.0	7.0	3.8
(6) 12" Rods, Centered, 12" whip	20.5	19.9	18.6	15.5	15.2	9.5	12.0	8.6	6.9	6.9	3.7
(3) 12" Rods, Extended, 12" whip	19.4	18.7	17.6	14.8	14.5	10.8	11.6	8.2	6.5	6.6	3.6
(6) 12" Rods, Extended	17.8	17.2	16.2	13.7	13.4	10.2	10.7	7.6	6.1	6.2	3.3
(3) 24" Rods, Centered	17.2	17.2	16.0	13.8	13.2	10.0	10.7	7.5	6.1	6.2	3.3
(6) 12" Rods, Extended, 12" whip	16.9	16.4	15.5	13.1	12.8	10.5	10.3	7.3	5.9	5.9	3.2
(3) 24" Rods, Centered, 12" whip	16.7	16.4	15.3	13.1	12.9	9.6	10.2	7.1	5.8	5.9	3.2
(6) 24" Rods, Centered	16.5	16.4	15.4	13.1	12.7	9.5	10.7	7.3	5.9	6.0	3.2
(6) 24" Rods, Centered, 12" whip	15.9	15.7	14.9	12.4	12.4	9.2	9.8	7.0	5.7	5.8	3.1
(3) 24" Rods, Extended	15.9	15.3	14.7	12.2	12.2	9.0	9.8	6.7	5.5	5.7	3.0
(3) 24" Rods, Extended, 12" whip	15.2	14.7	13.9	11.6	11.4	8.6	8.5	6.5	5.4	5.4	2.9
(6) 24" Rods, Extended	13.1	12.5	11.8	10.0	9.9	7.3	8.1	5.7	4.6	4.7	2.5
(6) 24" Rods, Centered, 12" whip	12.9	12.3	11.6	9.9	9.6	7.1	7.9	5.6	4.5	4.6	2.5
Optional Hot Rodz <sup>®</sup> Configurations											
(3) 48" Rods, Centered	13.0	12.4	11.8	10.0	9.6	7.4	7.9	5.6	4.6	4.7	2.5
(6) 48" Rods, Centered	12.2	11.8	11.3	9.3	9.4	6.9	7.5	5.4	4.4	4.5	2.4
(3) 48" Rods, Extended 32" whip	12.0	11.5	10.9	9.1	9.0	6.9	7.4	5.3	4.3	4.4	2.3
(3) 48" Rods, Extended	11.8	11.2	10.6	9.0	8.8	6.6	7.3	5.2	4.1	4.3	2.2
(6) 48" Rods, Centered, 32" whip	11.6	11.2	10.5	8.9	8.8	5.0	7.1	5.0	4.1	4.3	2.2
(3) 48" Rods, Extended, 32" whip	11.0	10.4	9.9	8.5	8.5	6.3	6.9	4.8	3.9	4.1	2.1
(6) 48" Rods, Extended	9.0	8.7	8.7	6.8	6.7	5.1	5.6	4.0	3.3	3.4	1.8
(6) 48" Rods, Extended, 32" whip	8.6	8.5	8.1	6.6	6.6	6.7	5.5	3.9	3.2	3.3	1.7
Extended = Adjust the rods away from the Hub as far as possible Centered = Adjust the centers of the rods so they are at the center of the Hub.											

**Table 2 - Hot Rodz<sup>®</sup> Configuration Guide - Standard Installation**

To determine the proper configuration for a Hot Rodz<sup>®</sup> antenna, refer to "Determining the Length of the Rods" on Page 5.







Additional information for the daring - Use 2 sets of Hot Rodz<sup>®</sup> and get additional benefits. Install the same as the original setup, plus an additional Hot Rodz<sup>®</sup> just below it. To determine the proper configuration for a Hot Rodz<sup>®</sup> antenna, refer to "Determining the length of the Rods on Page 5.

Dual Installation - Hot Rodz <sup>®</sup> Configuration Guide									
Dual Rod Configurations	Frequency (MHz) for RM Resonator and MO-2 Mast								
	RM10	RM11	RM12	RM15	RM17	RM20	RM30	RM40	RM80
(3) 6" Rods, Centered	25.7	25.4	24.3	19.8	19.7	-	10.4	-	-
(6) 6" Rods, Centered	25.1	24.8	23.7	19.2	19.1	14.2	10.3	8.1	4.4
(3) 6" Rods, Extended	23.2	22.9	21.8	18.0	17.6	-	9.6	-	-
(3) 6" Rods, Centered, 12" whip	22.6	22.3	21.1	17.2	17.0	-	9.3	-	-
(6) 6" Rods, Centered, 12" whip	22.2	22.1	21.0	17.1	16.8	12.6	9.2	7.4	4.0
(6) 6" Rods, Extended	21.1	21.0	19.8	16.1	15.9	11.9	8.9	7.1	3.9
(3) 6" Rods, Extended, 12" whip	20.9	20.7	19.3	16.1	15.9	-	8.8	-	-
(3) 12" Rods, Centered	20.5	20.3	18.9	15.7	15.8	11.6	8.6	7.0	3.8
(6) 12" Rods, Centered	19.9	19.9	18.4	15.2	15.1	11.2	8.4	6.8	3.7
(6) 6" Rods, Extended, 12" whip	19.4	19.1	18.0	14.9	14.8	11.0	8.3	6.7	3.6
(3) 12" Rods, Centered, 12" whip	19.0	18.6	17.6	14.6	14.8	10.8	8.1	6.6	3.6
(6) 12" Rods, Centered, 12" whip	18.6	18.1	17.2	14.3	14.2	10.6	7.9	6.4	3.5
(3) 12" Rods, Extended	17.6	18.8	16.4	13.6	13.4	10.0	7.5	6.1	3.4
(3) 12" Rods, Extended, 12" whip	16.7	17.8	15.7	12.9	12.8	9.5	7.2	5.9	3.2
(6) 12" Rods, Extended	15.4	15.1	14.5	11.8	11.7	8.8	6.7	5.5	3.0
(3) 24" Rods, Centered	15.1	14.8	14.1	11.7	11.8	8.6	6.6	5.4	2.9
(6) 12" Rods, Centered, 12" whip	14.9	14.6	13.9	11.5	11.4	8.5	6.5	5.3	2.9
(3) 24" Rods, Centered, 12" whip	14.7	14.4	13.8	11.3	11.2	8.4	6.4	5.3	2.9
(6) 24" Rods, Centered	14.5	14.4	13.6	11.3	11.4	8.3	6.4	5.3	2.9
(6) 24" Rods, Centered, 12" whip	14.3	14.0	13.3	11.0	10.9	8.2	6.2	5.2	2.8
(3) 24" Rods, Extended	12.7	12.5	11.8	9.8	9.7	7.2	5.6	4.6	2.5
(3) 24" Rods, Extended, 12" whip	12.4	12.2	11.6	9.6	9.5	7.1	5.5	4.6	2.5
(6) 24" Rods, Extended	10.8	10.6	10.0	8.3	8.2	6.1	4.8	4.0	2.2
(6) 24" Rods, Centered, 12" whip	10.7	10.5	10.0	8.3	8.2	6.1	4.7	3.9	2.1
(6) 24" Rods, adjusted to 18"	14.0	-	-	-	-	7.0	-	-	-
(6) 24" Rods, Extended, 32" whip	-	10.6	9.6	7.9	7.9	-	4.6	3.8	2.1

Extended = Adjust the rods away from the Hub as far as possible.  
Centered = Adjust the center of the rods so they are at the center of the hub.

**Table 3 - Dual Hot Rodz<sup>®</sup> Configuration Guide**

## Optional Items

### DXE-MM-1 - Transformer Dual Impedance

The MM-1 is a dual ratio UN-UN (unbalanced to unbalanced transformer). Great for coupling your 50Ω coax to an antenna with a feed point impedance of either 25 or 12.5Ω, typically found in a mobile environment. Ideal for antennas that have been enhanced with a Hot Rodz® Capacity Hat. Unit is housed in an aluminum enclosure and uses PTFE SO-239 connectors.

MM-1 Power handling capability depends on the match:

Using the 25Ω to 50Ω port, with SWR below 2:1 on the 50Ω side, 750 watts PEP

Using the 12.5Ω to 50Ω port, with SWR below 2:1 on the 50Ω side, 500 watts PEP



### SYN-DBR-125-100 - 1/8 in. Diameter, Dbl-Braid Dacron/Polyester Rope, 100 ft. Roll

Synthetic Textile Industries Double-braided Dacron/Polyester ropes are not weakened by decay or mildew and provide excellent resistance to abrasion. The color sealed black polyester yarn used in the braided jacket also protects the cord from damage due to ultra-violet light.

- 100' spool - 1/8" diameter rope - Double-braided Dacron/Polyester rope - Excellent resistance to abrasion - NOT weakened by decay or mildew - UV-Resistant - Rated for a load of 420 lbs



### Hustler Standard and Super Resonator Parts

DXE Part Number	Description
HSR-3774-4	Replacement Ferrules for 10,12,15,17,20,30,40,60,75,75(S) and 80(S) Meter Hustler Resonator's
HSR-377HDW	Replacement Nut & Ferrules for 10,12,15,17,20,30,40,60,75,75(S) and 80(S) Meter Hustler Resonators
HSR-49-04-40S	Whip Replacement for RM-40S Super Resonator, Equipped with Corona Ball
HSR-49-04-80S	Replacement Whip for 75 & 80m Super Resonators, Equipped with Corona Ball

HSR-3774-4  
For older resonators



HSR-377HDW  
For older resonators

HSR-49-04-40S

RM-40S 32-1/2"



RM-80S 40-3/4"



HSR-49-04-80S

### DXE-HR-2P - Screwdriver Antenna Hot Rodz®, Hub & 3 Sets of Rods

The DX Engineering Hot Rodz® is an adjustable capacity hat system that increases the efficiency and gain of single-band vertical antennas. Hot Rodz® can even shorten the height of the antenna by eliminating the need for a whip.

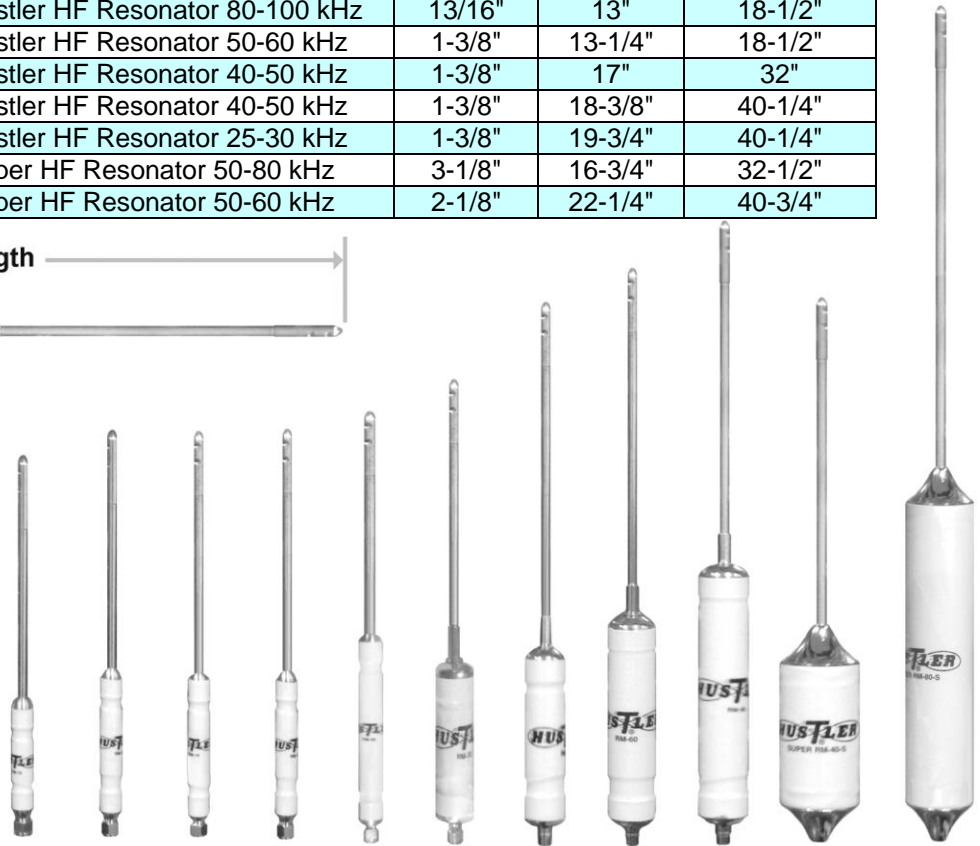
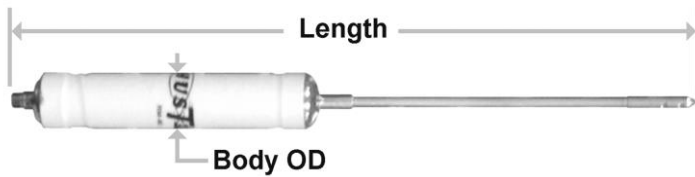
When an antenna is shortened from its naturally resonant length, the feedpoint becomes capacitive. To offset the additional capacitance, it is common to add inductance in the form of a loading coil to restore the resonance. However, the additional inductor increases the resistance, which increases the loss in the antenna. Hot Rodz® solve this problem by using a capacity hat-a series of horizontal rods that counters the effects of shortened vertical antennas.



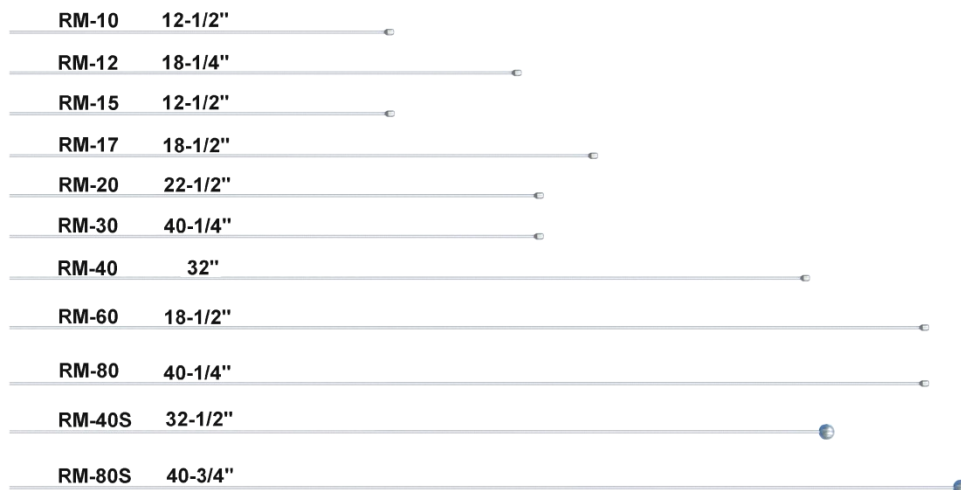
## Hustler Standard and Super Resonators

Individual Hustler Resonators are available for 10, 12, 15, 17, 20, 30, 40, 75 and 80 Meters. The standard resonators can handle 400 watts P.E.P. The Super Resonators, (S) which can handle 1 kW P.E.P. and have slightly more bandwidth, are available for 40 and 80 Meters. Use these resonators with Hustlers' mounts, mobile masts and other accessories to build a custom mobile antenna.

DXE Part #	Part Name	Body OD	Length	Whip Length
HSR-RM-10	10 Meter Hustler HF Resonator 150-250 kHz	5/8"	10-1/4"	12-1/2"
HSR-RM-12	12 Meter Hustler HF Resonator 100-150 kHz	5/8"	11-3/8"	18-1/4"
HSR-RM-15	15 Meter Hustler HF Resonator 100-150 kHz	5/8"	11-3/8"	12-1/2"
HSR-RM-17	17 Meter Hustler HF Resonator 120-150 kHz	5/8"	11-3/8"	22-1/2"
HSR-RM-20	20 Meter Hustler HF Resonator 80-100 kHz	13/16"	13"	18-1/2"
HSR-RM-30	30 Meter Hustler HF Resonator 50-60 kHz	1-3/8"	13-1/4"	18-1/2"
HSR-RM-40	40 Meter Hustler HF Resonator 40-50 kHz	1-3/8"	17"	32"
HSR-RM-60	60 Meter Hustler HF Resonator 40-50 kHz	1-3/8"	18-3/8"	40-1/4"
HSR-RM-80	80 Meter Hustler HF Resonator 25-30 kHz	1-3/8"	19-3/4"	40-1/4"
HSR-RM-40S	40 Meter Super HF Resonator 50-80 kHz	3-1/8"	16-3/4"	32-1/2"
HUS-RM-80S	80 Meter Super HF Resonator 50-60 kHz	2-1/8"	22-1/4"	40-3/4"



RM-10 RM-12 RM-15 RM-17 RM-20 RM-30 RM-40 RM-60 RM-80 RM-40S RM-80S



### Whips:

## Technical Support

If you have questions about this product, or if you experience difficulties during the installation, contact DX Engineering at (330) 572-3200. You can also e-mail us at:

[DXEngineering@DXEngineering.com](mailto:DXEngineering@DXEngineering.com)

For best service, please take a few minutes to review this manual before you call.

## Warranty

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