Hot Rodz®
Adjustable Capacity Hat for Screwdriver Antennas

DXE-HR-2P
DXE-HR-2P-INS Revision 1b
US Patent # 7,002,525

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Introduction

The patented DX Engineering Hot Rodz® is an adjustable capacity hat system that increases the efficiency and gain of screwdriver antennas. Hot Rodz® achieves this, in part by enabling the use of a smaller coil, so that RF energy typically lost through a larger coil is transferred to the antenna for a more powerful signal. Reciprocal action occurs in the receiving mode so that the received signal increases by a similar amount.

Part List for the DXE-HR-2P Hot Rodz®

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stainless Steel Mast, 22&quot; with 3/8-24 threads on both ends</td>
</tr>
<tr>
<td>1</td>
<td>3/8-24 Trim Nut (installed on bottom of the 22&quot; Mast)</td>
</tr>
<tr>
<td>1</td>
<td>3/8-24 Hex Nut (installed on top of the 22&quot; Mast)</td>
</tr>
<tr>
<td>6</td>
<td>6&quot; rods</td>
</tr>
<tr>
<td>6</td>
<td>12&quot; rods</td>
</tr>
<tr>
<td>6</td>
<td>24&quot; rods</td>
</tr>
<tr>
<td>1</td>
<td>Hot Rodz® Hub with internal threads - US Patent # 7,002,525</td>
</tr>
<tr>
<td>1</td>
<td>Allen Wrench</td>
</tr>
<tr>
<td>8</td>
<td>8-32 x 1/8&quot; - Set Screws (includes 2 spares)</td>
</tr>
<tr>
<td>1</td>
<td>3/8-24 x 1/2&quot; long Stainless Steel Hex Bolt</td>
</tr>
<tr>
<td>1</td>
<td>Rubber Washer</td>
</tr>
<tr>
<td>24</td>
<td>Black Tip Caps, for rods</td>
</tr>
</tbody>
</table>

Additional Requirements

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

**SWR Meter:** The Frequency Selection guide 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®, 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 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 related wave.

Antenna Length and Performance

The more the antenna is shortened, the larger the coil necessary to compensate. However, the larger coil increases the resistance and consumes more power, resulting in greater loss. The loss resistance is also seen at the feedpoint and is partly responsible for making it easy to match this shortened antenna to the 50 Ω feedline and radio. The base impedance will drop to about 16-22 Ω after the Hot Rodz® system is added.

We suggest using a mobile matcher, such as the DXE-MM-1 - Dual Impedance Transformer, to ensure your system operates at optimum efficiency.

The impedance at the feedpoint consists of the radiation resistance, coil loss and ground loss, with the radiation resistance of a full size vertical antenna equal to about 35 Ω. As the antenna is shortened, the radiation resistance decreases, but the other losses remain or even increase. To reduce the loss in a loading coil, we try to use one with the least inductance and resistance that still resonates the antenna.

Greater Efficiency at Half the Size

If the base impedance is reduced from 50 Ω total to 20 Ω total when the actual radiation resistance of the antenna is 3 Ω, then you will have more than doubled the RF power coming out of your antenna by raising its efficiency from 6% to 15%.

Half the Length on the 10-80 meter Bands

The Tarheel model 200A screwdriver antenna uses a 6-foot whip for the 10-80 meter bands (3.1 - 28.5 MHz). When combined with a Hot Rodz® system with three 12-inch rods, a 22-inch mast and a safety spring, the total of the antenna is 6-feet 11-inches, less than half the size of the standard 12-foot Tarheel. This makes an enormous difference in how often you have to get out of your vehicle to shorten the antenna.
The screwdriver antenna covers large portions of the HF spectrum with just three 24-inch rods, but antenna efficiency increases with a greater number of rods. Using more (or longer) rods is like extending the whip on a conventional antenna. The reason is that Tarheel and other screwdriver antennas are examples of the art of engineering for the mobile environment. Due to design considerations for screwdrivers, the Q (a measure of efficiency) of the coil is low - approximately 75-100 - and the smaller the coil, the better.

Hot Rodz® enable operators to use a smaller coil for any given frequency, which increases the radiated power and the feedpoint impedance. These increases result in stronger signals for transmitting and receiving.

**Installation and Maintenance**

While DX Engineering Hot Rodz® make it easy to modify screwdriver antennas, we suggest you read these instructions carefully before you begin the process.

**Safety Considerations**

- Hot Rodz® create additional aerodynamic drag. While Hot Rodz® 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®. Transmit only when people are a safe distance away.

- Be aware that Hot Rodz® makes your antenna diameter larger. Use caution when driving near pedestrians, and in crowded or confined areas.
Assembling the Antenna

1. If you are not using a whip, place the rubber washer on the 1/2” long hex head bolt, and screw this into the top of the hub.

2. Mount the hub on the mast and tighten the locking nut.

3. Insert the stainless steel rods into the hub and tighten in place using the short set screws and the supplied Allen wrench.

4. Place the small black caps on the ends of the rods.

5. Install the mast and the Hot Rodz® assembly to the antenna or to the optional resonator spring, and then tighten the locking nut.
Selecting the Frequency

The rods can be adjusted to nearly any frequency with a few simple adjustments. Follow the directions below to fine-tune your system to the desired frequency.

Lowering the Frequency

To lower the frequency of a Hot Rodz® 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® 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).

Matching the Modified Antenna

The base impedance of the antenna drops to about 16-22 Ω when you increase the efficiency of the antenna with the DX Engineering Hot Rodz®. In most cases, matching problems are solved with the use of an antenna matcher such as the DXE-MM-1-Dual Impedance Transformer.

Using the Modified Screwdriver Antenna as a Base Antenna

Hot Rodz® works for base systems as well as for mobile antennas, enabling you to operate at lower frequency bands than you might be otherwise able to do. Hot Rodz® also creates a lower profile antenna with increased efficiency so more of your RF power is transferred to the signal. A smaller antenna also improves aesthetics - replacing a 6-foot whip with a 24-inch capacity hat makes your system considerably less obtrusive.
Modifying the Screwdriver Antenna

Most screwdriver antennas are sold with a mounting bracket that can be attached between the main unit and a mounting tube of any outside diameter up to about 1.25-inch. To convert a screwdriver mobile antenna for base operations, do the following:

1. Drive a 1.25-inch OD pipe about 4 feet into the ground. Leave about 2-feet of pipe out of the ground. **Note:** The 1.25-inch OD is approximately the size of a 1-inch water pipe. Place a cap on the pipe to keep it from deforming while you hammer it into the ground.

2. Slip an optional DXE-RADP-3 Stainless Steel Radial Plate over the pipe and attach the radial plate to the pipe using a DXE-SSVC-2P Stainless Steel V-Clamp. Position the radial plate approximately 1-inch above the ground level to allow access to the radial wire hardware. When installing stainless steel hardware, it is suggested that UMI-81343, 81464, DXE-NSBT8, NMBT8 - Never-Seez or Anti-Seize be used to prevent thread galling.

3. Attach the radial wires to the radial plate. The radial plate comes with 20 sets of hardware, although additional hardware can be purchased to attach up to 60 radials. Visit the DX Engineering website (www.DXEngineering.com) for tips on how to hide radial wires without digging.

4. Use the mounting bracket from the screwdriver manufacturer to attach the antenna to the pipe.

5. Attach the coax to the radial plate by using the optional DXE-363-SST Bulkhead Fitting. Run a short section of coaxial cable to the bottom of the antenna feedpoint from the Radial Plate. Additional size rods are available, including 48-inch and 72-inch long rods for use on the 160 meter band.
Tarheel Screwdriver Antennas with DX Engineering Hot Rodz®
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 Silver/Teflon® 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

**Aluminum Mast, 3/8 x 24 Female Threads**
24 to 72 in. long, heavy duty 1/2 in. thick OD, 6061 Aluminum mast
- 6061 thick wall Aluminum mast
- Both ends threaded 3/8”-24 female
- Both ends knurled to offer better grip when tightening
- Can be used to construct custom mobile or base vertical antennas

<table>
<thead>
<tr>
<th>DXE Part Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>DXE-MT-24</td>
<td>24 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
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<tr>
<td>DXE-MT-36</td>
<td>36 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
</tr>
<tr>
<td>DXE-MT-48</td>
<td>48 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
</tr>
<tr>
<td>DXE-MT-54</td>
<td>54 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
</tr>
<tr>
<td>DXE-MT-60</td>
<td>60 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
</tr>
<tr>
<td>DXE-MT-72</td>
<td>72 in. Aluminum Mast, 3/8 x 24 Female Threads</td>
</tr>
</tbody>
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**Hot Rodz® - Stainless Steel Rods**
One set of six (6) stainless steel rods, and plastic safety tips. Available in four sizes.
Set includes: (6) Stainless Steel rods, 12 Plastic safety tips. For use with the Hot Rodz® Capacity Hat

<table>
<thead>
<tr>
<th>DXE Part Number</th>
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</tr>
</thead>
<tbody>
<tr>
<td>DXE-RODZ-36P</td>
<td>Hot Rodz®, 36 in. Stainless Steel Rods</td>
</tr>
<tr>
<td>DXE-RODZ-48P</td>
<td>Hot Rodz®, 48 in. Stainless Steel Rods</td>
</tr>
<tr>
<td>DXE-RODZ-60P</td>
<td>Hot Rodz®, 60 in. Stainless Steel Rods</td>
</tr>
<tr>
<td>DXE-RODZ-72P</td>
<td>Hot Rodz®, 48 in. Stainless Steel Rods</td>
</tr>
</tbody>
</table>
HSR-SSM-3 - Hustler 3 in. Stainless Steel Spring with 3/8 x 24 Coupling Stud
Heavy-duty stainless steel 4” spring
- Copper braided center conductor to prevent detuning
- Protective spring caps
- Exclusive hex nut tightening system
- 3/8 x 24 coupling stud

HSR-RSS-2 - Stainless Steel "Resonator" Impact Spring, 3/8 x 24 Threads
3” stainless steel spring
- Use between resonators and mast
- Absorbs shock when antenna strikes overhanging objects
- Accepts 3/8 x 24 threaded antennas
- Female threads on one end male on other
- Copper braided center conductor to prevent detuning

DXE-363-SST - Bulkhead Fitting, SO-239 Socket, Silver Plating, Teflon Insulation
This hi-quality bulkhead connector uses silver plated outer and inner conductors and a Teflon insulator. The connector has very low loss and high electrical break down. It comes with two nuts to secure the connector to our radial plate or other flat surface. Perfect for use with the DX Engineering Radial Plate, (DXE-RADP-3) it ensures the radial ground system, the antenna ground and the feedline shield are common. It can also be used in other coaxial applications where the male ends (PL-259) of 2 coax cables need to be connected, such as when joining two pieces of coax together. Don't forget to waterproof coaxial connections.
- Silver plated
- Teflon insulated
- Very low loss
- High electrical break down
- 2 in. long

DXE-RADP-3 - Radial Plate, Stainless Steel w/20 sets Radial Attach Hardware
Unique enough to be covered by two US Patents, the DX Engineering Radial Plate is meant for those of you that have or are building a quarter wave vertical antenna and who want an easy, neat and effective way to connect those essential radial wires and the coax to your vertical antenna for the lowest takeoff angle and strongest signals. Stainless steel construction assures that your signal won't disappear like a disintegrating aluminum radial plate. This plate will work perfectly with most commercially available vertical antennas such as the Hustler BTV series (4-BTV thru the 6-BTV), the SteppIR (BiggIR or SmallIR) or one of your own construction. The DX Engineering Radial Plate is laser cut from tough stainless steel so that it has smooth edges, won’t corrode and will always look good. You will be proud of how good your installation looks. Radial Plate is made of 304 Stainless Steel, .125 inch thick, 12” x 12” outside dimensions. The use of an anti-seize compound such as Never-Seez must be used with any Stainless Steel hardware to prevent galling.

DXE-SSVC-2P - Stainless Steel V-Clamp for 1 to 2 inch steel pipe
This V-Clamp is made in one size that fits Steel tubing or pipe from 1 to 2” OD as used in antenna construction. The supplied V-bolt is long enough to attach tubing to thick plates and is made with anti-corrosive properties. The special Stainless Steel saddle has serrated teeth will clamp to the pipe securely by biting into the surface. For this reason, it is not recommended for softer aluminum tubing or pipe. Ideal for fastening a radial plate and antenna mounting to a steel pipe.
- U-Bolt thread dimensions: 5/16"-18 x 2.0”
- Used to clamp 1 to 2” (OD) steel tubing or pipe
- Designed for attachment to round steel support members
- V-bolt and saddle made from high-strength 18-8® stainless steel
DXE-RADP-1HWK - Radial Plate Wire Attachment Hardware Kit - Stainless Steel
Additional 20 Sets of ALL Stainless Steel Radial Hardware for use with the DX Engineering Stainless Steel Radial Plate.

- (20) 1/4" Bolts
- (20) 1/4" Nuts
- (20) 1/4" Flat Washers
- (20) 1/4" Split Washers
- (20) 1/4" Star Washers

UMI-81343 - Anti-Seize, 1 oz. Squeeze Tube
1 oz squeeze tube of Anti-Seize. Protects metal parts against rust, corrosion, and seizure. Particularly effective on stainless steel bolts and nuts which have a high likelihood of seizure.

- Squeeze tube
- Lubricant and sealant

This part is classified hazardous and is limited to domestic UPS Ground shipping only.
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

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

Warranty

All products manufactured by DX Engineering are warranted to be free from defects in material and workmanship for a period of one (1) year from date of shipment. DX Engineering’s sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by DX Engineering. If DX Engineering’s products are claimed to be defective in material or workmanship, DX Engineering shall, upon prompt notice thereof, issue shipping instructions for return to DX Engineering (transportation-charges prepaid by Buyer). Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing. The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation, damaged from severe weather including floods, or abnormal environmental conditions such as prolonged exposure to corrosives or power surges, or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer’s specifications. In addition, DX Engineering’s warranties do not extend to other equipment and parts manufactured by others except to the extent of the original manufacturer’s warranty to DX Engineering. The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR DX ENGINEERING ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

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