

# The Antenna BOSS™

For YAESU FT-100/D, FT-847,  
FT-857, and FT-897 Radios

*It's time to let the BOSS do the work!*

## GENERAL

The Antenna BOSS is a custom add-on accessory for the Yaesu FT-100/D, FT-847, FT-857, and FT-897 that allows these radios to interface with most motorized antennas (High Sierra, Hi-Q, Tarheel, etc.) such that the radios "think" the antenna is an ATAS-100/120.<sup>1</sup> It doesn't matter if your motorized antenna utilizes a shunt coil or not with The Antenna BOSS. It handles all situations and can be used at the legal power limit! The Antenna BOSS solves the tedious and annoying tuning process for motorized antennas that presently needs to be used with these radios when an ATAS or FC-20/30 Automatic Antenna Tuner isn't being utilized. Installation of The Antenna BOSS is a snap, just as simple as 1-2-3!

1. Mount The Antenna BOSS in a convenient location.
2. Plug the coax from the radio and from the antenna into the coax connectors on The Antenna BOSS.
3. Attach the leads from The Antenna BOSS cable to the antenna motor and radio (for power).

That's all there is to it. When you want to tune your radio, press the radio's TUNE button, and your radio and The Antenna BOSS take control of the adjustment of your motorized antenna. The radio will behave in the same manner as if it were connected to an ATAS antenna; however, remember that the lowest band that Yaesu allows "ATAS operation" on is 40 meters. The Antenna BOSS also provides a manual means for you to operate on 60, 80 and 160 m. If the run current of your antenna exceeds about 800 mA, you should contact your antenna provider and inquire about a motor upgrade.



Figure 1. The Antenna BOSS, (a) external view; (b) internal view.

The Antenna BOSS is shown in Fig. 1. The unit is about 4" by 3" by 1-1/4". The bottom is readily removed for easy access to the selection switch denoted by the arrow in Fig. 1 (b), which allows you to select the antenna motor voltage and the motor (pre)stall trip current. If you mount the The Antenna BOSS using the mounting holes "A" and "B," You may screw or bolt The Antenna BOSS into place. If you use another means to mount The Antenna BOSS, then be sure that the bottom is affixed to the unit.

<sup>1</sup> ATAS-100 and ATAS-120 are the two models of Yaesu's Active-Tuned Antenna System.

# READ THIS ENTIRE MANUAL BEFORE YOU INSTALL or APPLY POWER to *The Antenna BOSS*

## GENERAL INSTALLATION

**IT IS YOUR RESPONSIBILITY** to set the proper motor voltage and the current sense for your motorized antenna (set the trip current for the minimum value that works reliably). The Antenna BOSS draws about 60 mA when not in use. The Antenna BOSS and antenna are powered by the radio and the power is switched by the radio's power switch.

Your Antenna BOSS package contains three items, viz., (1) The Antenna BOSS unit, (2) an interface cable, and (3) a 4-pin Molex plug that can be used to connect a manual control switch. These items are shown in Fig. 2.

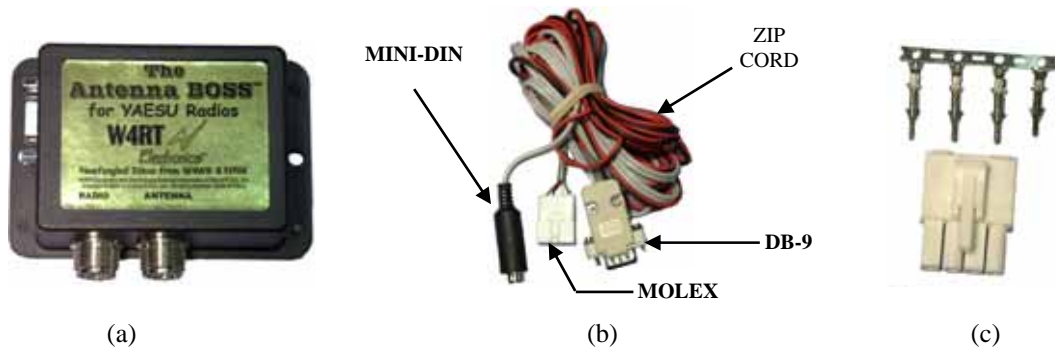


Figure 2. The Antenna BOSS Package. (a) The Antenna BOSS unit; (b) interface cable; and (c) Molex connector (can be used to attach a manual UP/DOWN switch and a W4RT Electronics One-Touch Tune module).

### Step By Step Instructions

1. The pin-out for the DB-9 connector and wires of the supplied interface cable are as follows:

| PIN | FUNCTION              | COLOR or CONNECTOR | COMMENT   |
|-----|-----------------------|--------------------|---|
| 1   | GROUND                | [MINI-DIN]         | Power ground from the radio using the supplied cable                              |
| 2   | GROUND                | [OPEN]             |   |
| 3   | MANUAL UP             | GREEN              | “UP” auxiliary switch   |
| 4   | MANUAL DOWN           | BLACK              | “DOWN” auxiliary switch   |
| 5   | OTT OUTPUT            | RED                | Connect to ring of the One-Touch Tune (OTT-100D/897) command jack (3.5 mm stereo) |
| 6   | V+ (13.8 VDC typical) | [MINI-DIN]         | Positive Power from the radio using the supplied cable                            |
| 7   | COMMON                | WHITE              | Common for auxiliary switch   |
| 8   | MOTOR (negative)      | [BLACK ZIP CORD]   | Motor output line (-)   |
| 9   | MOTOR (positive)      | [RED ZIP CORD]     | Motor output line (+)   |

Table 1. DB-9 and Cable Pin-Out.

2. If desired, attach an appropriate switch (not supplied) to the wires from pins 3, 4, and 7 to have auxiliary manual control of your antenna. You may connect the switch to the interface cable's Molex connector (Fig. 3(b)) using the supplied Molex connector (Fig. 3(c)). Review carefully Table 1 for specific wiring information. Mount the switch wherever desired.



Figure 3. Dipswitch shown set for 500 mA and 12 VDC.

| Trip Current (mA)    | Switch Number |     |     |     |     |     |     |     |
|----------------------|---------------|-----|-----|-----|-----|-----|-----|-----|
|                      | 1             | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| 1200                 | ON            | OFF | OFF | OFF | OFF |     |     |     |
| 900                  | OFF           | ON  | OFF | OFF | OFF |     |     |     |
| 700                  | OFF           | OFF | ON  | OFF | OFF |     |     |     |
| 500                  | OFF           | OFF | OFF | ON  | OFF |     |     |     |
| 100                  | OFF           | OFF | OFF | OFF | ON  |     |     |     |
| <b>Voltage (VDC)</b> |               |     |     |     |     |     |     |     |
| Supply               |               |     |     |     |     | OFF | OFF | OFF |
| 12                   |               |     |     |     |     | ON  | OFF | OFF |
| 9                    |               |     |     |     |     | OFF | ON  | OFF |
| 6                    |               |     |     |     |     | OFF | OFF | ON  |

Table 2. Dipswitch settings (only turn one switch ON in positions 1-5 and one in positions 6-8).  
Factory settings are shown highlighted in yellow.

- 3. Remove the cover of The Antenna BOSS and observe the dipswitch shown in Fig. 3.
  - 3.1. Set dipswitch 1-5 to select motor stop current per Table 2 (see Fig. 1; the white arrow points to the dipswitch). Note: Factory set for 700 mA.
  - 3.2. Set dipswitch 6-8 to select motor voltage. Note: Factory set for 12 VDC output.
  - 3.3. Replace the cover.
- 4. Mount The Antenna BOSS wherever you desire. This can be done using (not supplied) two screws/bolts or Velcro.
- 5. Attach the supplied cable to the DB-9 connector on The Antenna BOSS. Plug the 8-pin DIN plug into the radio.<sup>2</sup>
- 6. Connect a coax cable (not supplied) from the radio's HF antenna connector to the SO-239 coax connector on The Antenna BOSS marked **RADIO**.
- 7. Connect the antenna's coax cable to the SO-239 coax connector on The Antenna BOSS marked **ANTENNA**.
- 8. Connect the motor leads to pins 8 and 9. Note: These leads may need to be reversed should the motor move the wrong way. This connection is antenna manufacturer dependent. *You must make the determination of which is the correct connection.*
- 9. Set the menu of the radio to select the appropriate ATAS mode. Note: See your radio's manual.<sup>3</sup>
- 10. You are now *almost* ready to use your The Antenna BOSS with your radio and antenna. Read on!

**NOTICE:** If you use an external RF amplifier with your Yaesu radio, then it is important that you install The Antenna BOSS between the radio and the amplifier. This is illustrated in Fig. 4. Almost all HF RF amplifiers include DC blocking at their input. Consequently, the ATAS control signals would be block from The Antenna BOSS should it be placed after the amplifier. NEVER tune your antenna with the amplifier activated!

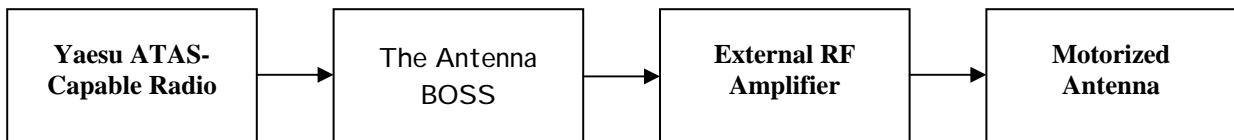


Figure 4. Proper RF order of radio, The Antenna BOSS, external RF amplifier, and motorized antenna.

<sup>2</sup> FT-100/D: BAND DATA Cable; FT-847: TUNER Jack; FT-857 & FT-897: CAT/LINEAR Jack.

<sup>3</sup> FT-100D: pp. 62-65; FT-847: pp. 62-63; FT-857: pp. 68-70; FT-897: pp. 39-40.

## TECHNICAL

It is important that you understand how the Yaesu ATAS control system operates in order to achieve the best operating performance from your system.

- You must have your radio and antenna installed properly. The importance of having a good RF ground can not be overstressed. If you don't, it is very likely that you will not be able to find a tuning of your antenna that will have a low SWR (< 1.5:1) or you may have multiple SWR dips that can result in false tuning. You are encouraged to sweep your antenna system with an antenna analyzer to determine if your system is okay or not.
- The above Yaesu radios include autotune circuitry to interface ONLY with either the FC-20/30 Automatic Antenna Tuner or the ATAS-100/120 antenna. The radio controls the ATAS by sending out controls signals and a low-power (about 10 W) RF carrier over the coax. The RF carrier is at a level low enough to not harm the radio when operating into a high SWR load. The control signal are decoded internally in the ATAS antenna to command it to extend or retract, and the control signal is used to power the ATAS motor thereby eliminating the need for supplying an external power source.
- The radio, coax connecting the radio to the antenna, ATAS-100/120, and the RF ground of your vehicle form a complete system. The radio internally measures the SWR and the current frequency of operation. If the radio doesn't "know" that it is tuned, it goes through an automatic initialization process. First, the ATAS is fully retracted or extended,<sup>4</sup> which is accomplished by sending a command that is timed to last approximately 60 seconds. If the antenna fully retracts/extends before then, the slip clutch disengages the motor drive. Next, the antenna is extended/retracted until the radio detects a dip in the SWR, stops the antenna motor, stores the frequency, and returns to normal operation of the radio.
- If an adequately low SWR isn't found, the radio display indicates this situation (see your manual for the particular indication). If this happens, you should carefully check your entire system to determine the cause.
- When you QSY by more than 10 kHz and press the TUNE button, the radio will then extend or retract the antenna in the appropriate direction since it knows your previous operating frequency. This makes tuning relatively fast. **NOTE: The radio's ATAS control will NOT activate the tuning function if you QSY 10 kHz or less from the last tuning frequency.**
- If you manually tune the ATAS antenna using the radio's UP and DOWN buttons (see your radio's user manual for the specific buttons to use), the ATAS control circuitry will detect this action and will revert to the initialization mode again the next time you use the radio's ATAS autotune function. (See your manual to determine the specific method to control the UP/DOWN function for your radio.)
- The ATAS control circuitry DOES NOT function at frequencies below 7.000 MHz. This is not changeable by the user or The Antenna BOSS. (See, on the next page, the section on manual tuning using The Antenna BOSS.)
- The Antenna BOSS connection to the coax incorporates RF blocking so that only the DC signals are processed by The Antenna BOSS. This means that its inclusion doesn't affect the RF tuning of your system.
- The Yaesu ATAS-capable radios all include a (relative) display of the SWR. You should read your radio's manual if not familiar with this display. The following table may help you locate the information in your manual.

| RADIO   | PAGE    | FUNCTION SETTING                                 |
|---------|---------|--|
| FT-100D | 53      | Function Row 7, Key A                            |
| FT-847  | 62      | N/A  |
| FT-857  | 27; 108 | Multi Function Row "i", Key A;<br>MENU MODE #061 |
| FT-897  | 16; 58  | Multi Function Row "i", Key A;<br>MENU MODE #061 |

Table 3. Information for locating the SWR display command.

<sup>4</sup> When the radio is reinitializing itself, the antenna moves in the last direction. If you have used the radio's UP/DN buttons to manually move the antenna, the antenna will move first in the last direction that you moved it. Using the auxiliary UP/DN switches has no affect upon this behavior.

## AUTOMATIC TUNING OPERATION

1. Many motorized antennas cover 6-40 m, 10-40 m, 6-80 m, 10-160 m, etc. How fast the antenna can cover the range of frequencies varies from under 60 seconds to about 90 seconds. Since the ATAS control covers only the 6-40 m range, it is necessary for you to manually adjust the antenna to near its tuning position for the highest band (e.g., 6 or 10 m). This is an initialization of the antenna to get it into the range of the ATAS controller. This can be done by using the auxiliary switch to The Antenna BOSS or the UP/DOWN buttons on your radio (see your radio's instruction manual) and having the frequency of the radio set in the 6-40 m spectrum. It is desirable to use the radio's UP/DN buttons with the last command being in the direction of 6 m.
2. Be sure to have selected the ATAS mode in the menu of your radio. Read your manual for the correct setting.
3. Now select a frequency you desire for operation in the 6-40 or 10-40 m amateur bands depending upon the antenna you have and the ATAS mode selected.
4. Press the radio's TUNE button to begin the tuning process. (See your manual under the ATAS section for details regarding your specific radio.)
5. If this is the first time the radio has tuned the antenna, or if it needs to be initialized (read your radio's manual), the antenna will be driven to its extended or retracted position. It will then reverse and start its search for the tuned position.<sup>5</sup>
6. Once the tuned position is found, the motor is stopped and you are ready to operate on your selected frequency.
7. When you QSY (more than 10 kHz), you may retune by pressing the TUNE button again. The radio has stored the prior frequency and knows which way to move the antenna motor to achieve the next tuned position.

## MANUAL TUNING OPERATION

1. Manual tuning can be done by using the auxiliary switch to The Antenna BOSS (any radio frequency) or the UP/DOWN buttons on your radio (see your radio's instruction manual) and having the frequency of the radio set in the 6-40 m spectrum.<sup>6</sup>
2. You adjust the antenna's inductor to find a minimum in the observed SWR (see your radio's manual for the SWR mode). Remember the classical technique to manually locate the approximate resonate position of the antenna coil is to peak the background noise or a signal at the frequency of interest. Once done, then optimize the tuning by minimizing the SWR.
3. When you have the ATAS selected and use the radio's UP/DOWN button, the radio produces a RF carrier 6-40 m only).
4. When operating on bands lower than 40 m (60, 80, and 160 m), you must use the auxiliary switch to The Antenna BOSS to accomplish the tuning function **AND you must turn OFF the ATAS in the menu if you use the OTT**. The manual switch does not carry power, it is simply for control of The Antenna BOSS.
  - If you use a Tarheel Antennas' supplied switch for manual tuning control, you may connect it to the Molex connector of The Antenna BOSS as follows:
    - Switch WHITE wire: OPEN or cut it off
    - Switch RED wire: Molex COMMON (white wire)
    - Switch BLACK with WHITE STRIPE: Molex UP (green wire)
    - Switch BLACK wire: Molex DOWN (black wire).
  - For High Sierra Antennas and Hi-Q-Antennas, you will need to determine the wiring or use a simple momentary, single-pole, double-throw switch connected as stated in Table 1. If you have a momentary double-pole, double-throw switch typically used by antenna manufactures, you connect one of the switch wires designated as a motor lead to the COMMON of the Molex connector, leave the other motor lead OPEN, and the two switch wires designated as power leads connect to the UP and DOWN terminals of the Molex connector. You will have to determine which goes to UP and which goes to DOWN by experiment since it varies between antennas.
5. Tuning on 60, 80, and 160 m requires that you generate a stable carrier for the tuning process. You may accomplish this by selecting a mode of the radio that will produce a carrier (see your radio's manual) or you may use the W4RT Electronics One-Touch Tune (OTT-100D or OTT-897) for the FT-100D, FT-857, and FT-897. When you press the auxiliary switch, the OTT will be activated, which sends appropriate CAT commands to the radio. After tuning, the radio is restored to its prior mode of operation. Note: When using the FT-857 or

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<sup>5</sup> Some antennas cover the 60, 80, and perhaps the 160-m bands. Since the ATAS runs for a maximum of 60 seconds, you may need to use manual tuning to get the antenna in the correct mechanical range for automatic tuning. Read your antenna manual to understand where the rotary connector should be located.

<sup>6</sup> For example, the UP button on the FT-100/D commands the ATAS-100/120 to extend (towards 40 m) while the DN button commands the ATAS to retract towards the 6 m setting.

FT-897, you should manually reduce the power to about 10 W while tuning unless you are not moving so much that the SWR will rise over 2:1 or so.

6. See the your OTT manual for information regarding how to hook it up. Note: The signal from The Antenna BOSS to the OTT command jack is high when activated so that it connects to the OTT command jack ring.

## SUGGESTED DIPSWITCH SETTINGS

The following settings table for the dipswitch (Table 2) can be used for guidance. This table will be expanded as data becomes available. Remember that your settings might vary from these suggested values.

| Suggested Dipswitch Setting |                          |                     |
|-----------------------------|--------------------------|---------------------|
| Antenna Model               | Trip Current (set to ON) | Voltage (set to ON) |
| Little Tarheel              | 5                        | 6                   |
| HS-1800/PRO                 | 3                        | 6                   |
| Hi-Q-3/80-RT                | 3                        | 6                   |
|                             |                          |                     |
|                             |                          |                     |
|                             |                          |                     |

Table 4. Suggested Dipswitch Settings

**NOTICE:** If you should experience any problems, check your installation carefully to be sure that you have the antenna installation correct. If the problem is associated with the antenna, its installation, or the radio, then contact the antenna manufacturer or radio manufacturer. A common problem is that the antenna resonants at multiple setting of the loading coil and these resonances has an SWR of less than about 3:1. When this occurs, you have a problem because the ATAS control circuitry will likely become confused. You will need to improve your RF ground, assure that you have adequate capacitance/inductance for the antenna, etc. For example, if you can tune on 40 m and not on 20 m (SWR too high), you may have inadequate antenna capacitance. Be sure you read and understand the manual that came with your antenna. High Sierra, Hi-Q, and Tarheel in particular all do a good job in explaining how to install their antenna. A mobile HF installation is not an easy task to accomplish and often has many challenges to overcome; however, when you have the system working well, the reward is great ... receiving those excellent signal reports AND very convenient tuning of the antenna using The Antenna BOSS and the ATAS controller! The Antenna BOSS is not an antenna tuner ... it is an interface between your ATAS capable radio and motorized antenna.

If a problem is isolated to The Antenna BOSS, then contact W4RT Electronics by email or fax only. Email address is [BOSS@w4rt.com](mailto:BOSS@w4rt.com) and the fax number is 256.880.3866.

**ATTENTION:** W4RT Electronics encourages safe-driving practices when operating mobile. This means that when you are tuning/autoresonating your radio-antenna system using the Antenna BOSS, your vehicle should be safely stopped and off the roadway. To do otherwise could endanger you, your property, and that of others.

**WARRANTY:** The Antenna BOSS is warranted for a period of one year from the date of purchase to be free of electrical defects in materials and workmanship. If The Antenna BOSS is determined to be defective, the defective item(s) will be repaired or replaced, at the sole option of W4RT Electronics, provided that the purchaser returns said item(s), postage prepaid, with proof of purchase to W4RT Electronics, ATTN: Technical Support, 3077-K Leeman Ferry Rd, Huntsville, AL 35801. Include a description of the problem, daytime phone number, email address, and return mailing information. Any modification to The Antenna BOSS by purchaser voids the warranty. The warranty applies only to the original purchaser and is not transferable. 27 February 2005