PROTAGD

User Guide: RTS/RTA

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1 Introduction

1.1 ATI2 Replacement

The Remote Tuning Sender (RTS) replaces the RI-ACC-ATI2, a Texas Instruments (TI) product for tuning an RFID antenna system using a remote power RFM, namely the *PRDRFM008B* from Protagd or the *RI-RFM-008B Series 2000 High Performance RFID Module* from Texas Instruments.

Figure 1.1 RTS box

1.2 Tuning pair RTS/RTA

Together with the Remote Tuning Annunciator (RTA) connected to an Antenna Tuning box, the RTS provides a more convenient method for tuning an RFID antenna system. By connecting the RTS to the RFM and connecting the RTA to a remotely located Antenna Tuning box, the tuning information (IN, OK, OUT) is displayed at both the RTS and the RTA, allowing one installer to tune the antenna system.

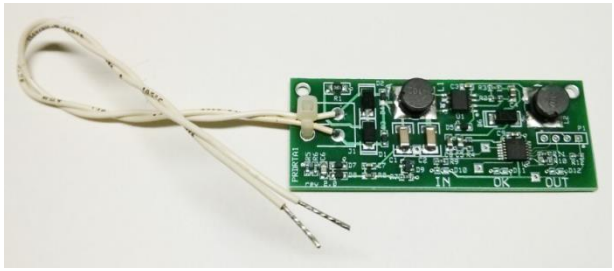

Figure 1.2 RTA board

1.3 Tuning pair RTS/AutoTuner

The RTS can also be used with the AutoTuner to remotely tune an antenna. In the case of the AutoTuner located at the antenna, it receives the tuning information from the RTS and tunes a built-in bank of tuning capacitors. Once the tuner information indicates 'OK', the AutoTuner stores this information in on-board EEPROM. The RTS can then be disconnected and the AutoTuner will remember its tuning settings.

Oregon RFID, a Protagd partner, offers the AutoTuner exclusively. The AutoTuner may be purchased from Oregon RFID (www.oregonrfid.com).

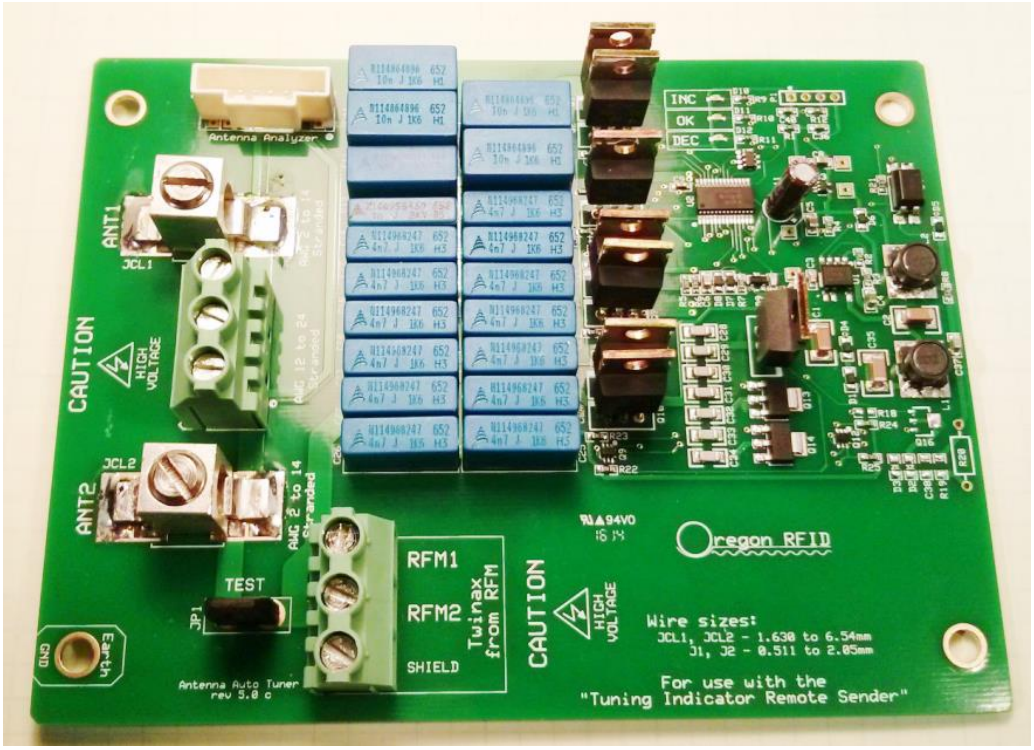

Figure 1.3 Autotuner board

2 RTS

The RTS is a drop-in replacement for the RI-ACC-ATI2 (ATI2) from Texas Instruments; however, its main function is to extend the tuning information to either an RTA or AutoTuner. The RTS comes with the standard 30cm ribbon cable and 6-pin connector which plugs into J2 of the RFM.

In many applications of the RFM, the power module is separated from the antenna and its tuning box by tens of meters. Classically, the ATI2 plugs into the RFM located at one end of a long wire while the antenna tuning box is located, by necessity, next to the antenna. Such an arrangement usually requires two people to tune the installation properly.

The classical ‘antenna tuning box’ mentioned above consists of a collection of capacitors and their individual selection jumpers plus a variable inductor (coil). The capacitors are used to grossly tune the antenna to near-resonance, while the variable coil is used to fine-tune the resonance via a screw. Generally speaking, the closer to resonance the antenna is tuned, the better the read range, which can be achieved.

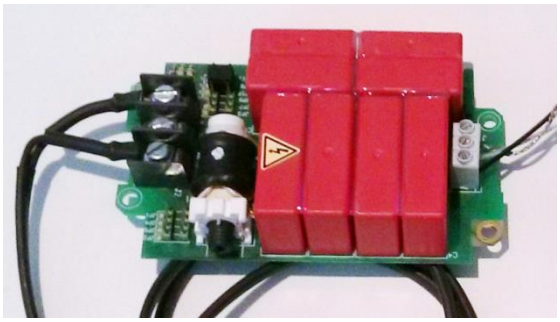

Figure 2.1 Antenna tuning board

The RTS/RTA pair from Protagd provides a simple method for one person to tune a remote antenna with the same precision provided by TI's ATI2 but at an arbitrary distance from the RFM. The RTS plugs into the RFM and measures the alignment of the antenna. This alignment information is displayed both locally on the RTS display (shown below) and remotely at the RTA (once installed in the antenna tuning box).

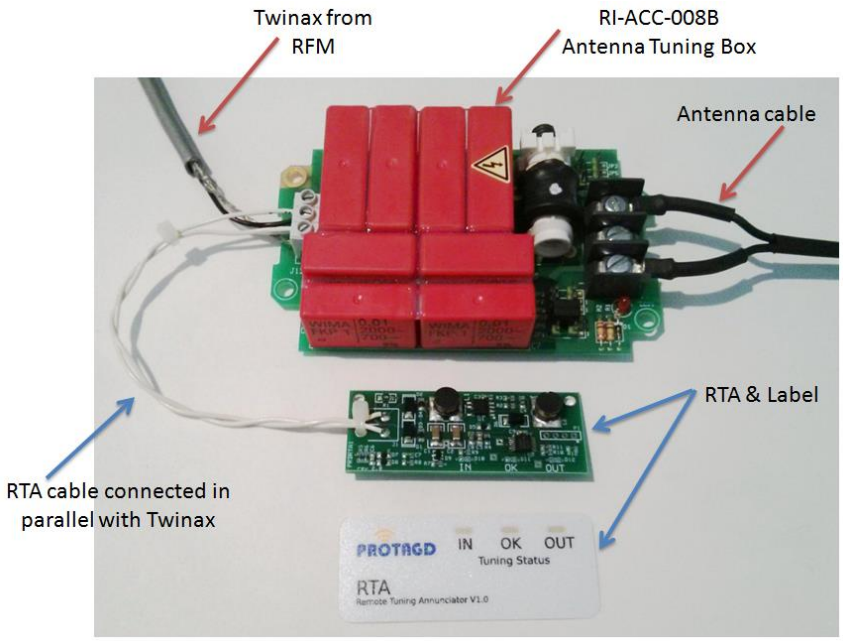

Figure 2.2 Antenna tuning box plus RTA board

2.1 Installation

To install the RTS simply plug its ribbon cable into the 6-pin connector on J2 of the RI-RFM-008B (or PRDRFM008B) with the cable facing AWAY from the RFM (see photo below).

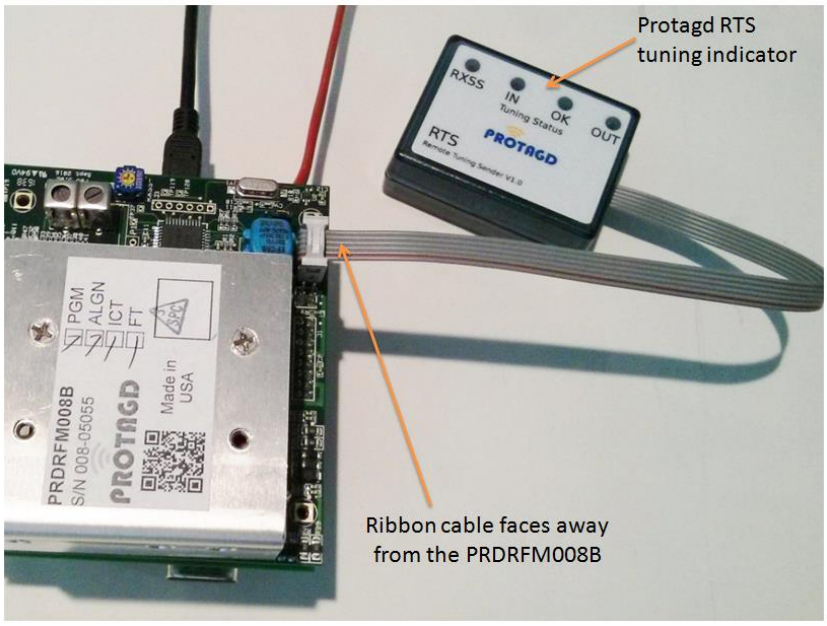

Figure 2.3 RTS connection

2.2 Details

The RTS has four LEDs—the same three as the RTA ('IN', 'OK', and 'OUT') plus a yellow LED which can be used to adjust the RXSS- potentiometer (pot) on the RFM. Not all controllers make use of the RXSS- signal but it is required in synchronized systems with multiple RFMs.

To adjust the RXSS- pot, use a small screwdriver to rotate it counter-clockwise until it stops (3/4 turn max). The yellow RXSS LED in the RTS may illuminate depending on ambient noise level. With all other RFMs in the synchronized system disabled from transmitting, slowly rotate the pot clockwise until the RXSS LED just goes out. This sets the threshold for the receiver so that background noise level is ignored by the controller.

> **Note:** The adjustment of the RXSS- pot does not affect the actual receive signal. It only indicates to certain controllers that the receive signal is stronger than the level you set on the pot. This helps keep the controller from being overburdened by processing unwanted noise.

Users of the ATI2 are accustomed to flipping a switch to go between antenna tuning and RXSS- pot adjustment. No switch is needed on the RTS as it is performed automatically. All four LEDs on the RTA are always correct.

To install the RTS simply plug its ribbon cable into the 6-pin connector on J2 of the RI-RFM-008B (PRDRFM007C, PRDRFM008B) with the cable facing AWAY from the RFM (see photo in Section 2.1 above).

3 RTA

The RTA board is delivered as shown below and should be installed into the antenna tuning box.

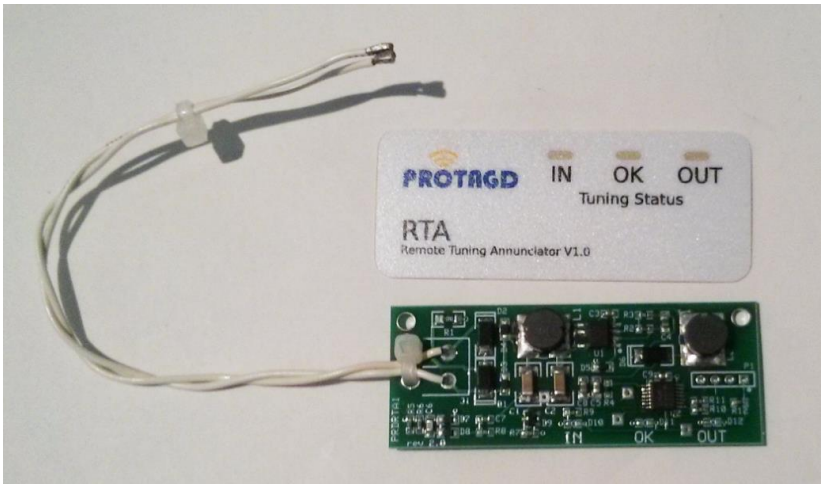

Figure 3.1 PRDRTA

3.1 Electrical Installation

The RTA is connected onto the Antenna Tuning board in parallel with either the Twinax coming from the RFM, or in parallel with the antenna leads. Below the RTA is shown connected to the same two leads as the Twinax cable coming from the RFM.

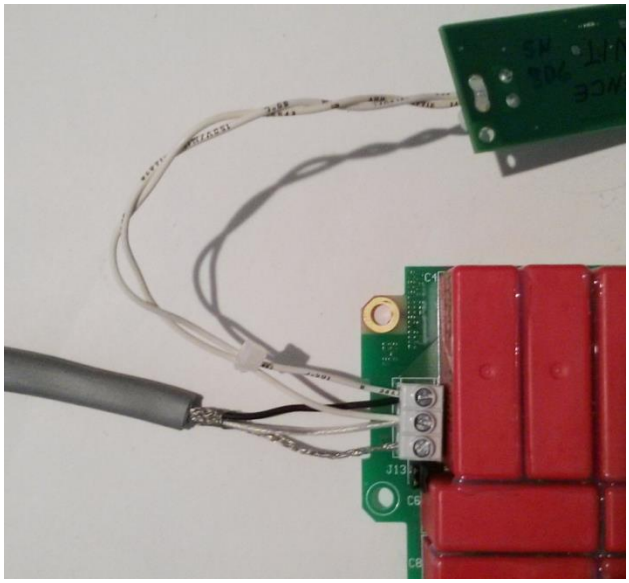

Figure 3.2 PRDRTA connection

3.2 Mechanical Installation

The RTA board is typically mounted in the clear plastic lid of the antenna tuning box. The RTA's LEDs are located on the back side of the board, opposite the other

components. The RTA can be mounted to the inside of the antenna tuning box lid using either double-sided foam tape or #4 hardware via the two 3mm holes in the printed circuit board (PCB) corners. When installing the board, please keep the following in mind:

- If using foam tape, once it touches, it is permanent so be careful where you allow it to touch.
- Make certain the 2 wire leads can easily reach either [1] the Twinax connector (input), or [2] the antenna connector (output).
- Position the board in the lid such that the external label has room to be applied over the LEDs.
- Pay attention to the orientation of the label so that 'IN', 'OK', and 'OUT' on the label are positioned over the correct LEDs. The 'IN' LED is located near the center of the PCB.
- Optionally, the most intuitive way to mount the board is such that the lit LED indicates the direction the slug is to be screwed.

3.3 Details

Most antenna tuning boxes have the coil slug pointing toward the bottom of the tuning box. This means easy tuning is best served if the RTA board is mounted with the leads pointing up. This positions the LEDs so they are more intuitive. For example, if the coil slug is turned 'in' too far, the bottom LED (OUT) will be illuminated indicating the slug should be screwed OUT more. Conversely, if the coil slug is turned 'out' too far, the top LED (IN) will be illuminated indicating the slug should be screwed IN more. In the region between these two areas, the green 'OK' LED will illuminate indicating proper tuning.

Figure 3.3 PRDRTA installed into Antenna tuning box

The RTA can be used not only for adjusting the coil, but also for installing the proper capacitor jumpers. Different antenna tuning boxes have different arrangements of capacitors and jumpers so how you proceed depends on the antenna tuning box on hand. You must have some capacitors in the system for the RTA to function. That is, the RTA relies on some degree of resonance to provide enough power for the LEDs. If

there are no capacitors selected, then there is no resonance and the RTA will not be able to power up.

Antenna tuning boxes come with manufacturer's instructions and tuning charts which aid in getting the approximate number of capacitors selected for your antenna's inductance. Follow their procedure to get near resonance, then the RTA will function to steer you in the right direction. Once the smallest capacitor switches the RTA from IN to OUT or from OUT to IN, then the variable coil can be adjusted to get the OK indication.