# AT-AUTO$_{(tm)}$
# QRO Keyline Upgrade Kit
### Installation Manual


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# *Thank-You!*

At Kessler Engineering, we endeavor to make your ham radio hobby more enjoyable and trust that our products will bring you many years of faithful service. We ***Thank-You*** for the confidence that you have placed in us and in our products. *73!*

Dr. Donald J. Kessler, Ph.D.,
President, Kessler Engineering, LLC

# Introduction

## 1.1 General Description and Purpose

The AT-AUTO$_{(tm)}$ first went into production in 2006. Over time, the AT-AUTO$_{(tm)}$ hardware and firmware features have continued to evolve and improve. One such hardware feature subsequently developed (and therefore lacking in the 2006-2008 AT-AUTO$_{(tm)}$ year models) is the QRO Keyline.

The QRO Keyline hardware was developed in 2008 as a method to prevent damage to an HF amplifier when inadvertently driving mis-tuned loads. The QRO Keyline feature was then included in all 2009 and subsequent models of the AT-AUTO$_{(tm)}$. AT-Autos$_{(tm)}$ so equipped with the QRO Keyline are able to automatically permit/inhibit keying of an HF amplifier. Use of the QRO Keyline hardware is entirely optional and completely independent of the automatic tuning process and does not otherwise change or alter the operation of the AT-AUTO$_{(tm)}$.

With the QRO Keyline, the user may configure the AT-AUTO (tm) to automatically prevent an HF linear amplifier from being keyed if the SWR exceeds a user-selectable level, to immediately unkey an HF amplifier should the SWR become excessive, or while the AT-AUTO$_{(tm)}$ is tuning. This may be particularly advantageous when using the AT-AUTO$_{(tm)}$ with HF amplifiers that feature SWR protection circuitry. If the user neglected to unkey the amplifier while the AT-AUTO$_{(tm)}$ is tuning, the amplifiers self-protection circuitry would likely disable the amplifier, necessitating a reset of the amplifier itself.

In normal operation, the AT-AUTO$_{(tm)}$ uses the QRO Keyline interface to automatically inhibit keying of an HF amplifier while the AT-AUTO$_{(tm)}$ is auto-tuning and then automatically permits keying of the amplifier once automatic tuning has completed.

Prior to the introduction of this "QRO Keyline Upgrade Kit", upgrading an AT-AUTO$_{(tm)}$ was costly – requiring replacement of the entire processor circuit board. This modification kit was developed to provide a very cost-effective solution to adding QRO Keyline capability to early models of the AT-AUTO$_{(tm)}$ (produced prior to 2009). AT-AUTOs$_{(tm)}$ produced in 2009 and thereafter included the QRO Keyline hardware.

The AT-AUTO$_{(tm)}$ QRO Keyline meter upgrade kit comes with the items listed in Table 1.1 and shown in Figure 1.1.

Table 1.1: AT-AUTO$_{(tm)}$ QRO Keyline Upgrade Kit Contents

| Quantity | Description |
|---|---|
| 1 | QRO Keyline Daughter Board |
| 1 | Wiring Harness |
| 2 | Female RCA Jacks |
| 6 | Nylon Wire Ties |

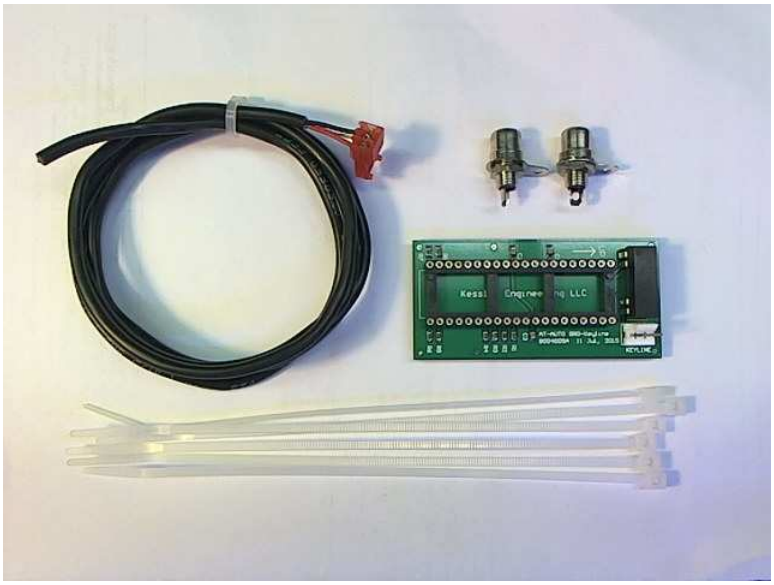

Figure 1.1: AT-AUTO$_{(tm)}$ QRO Keyline Upgrade Kit Contents

## 1.2 Tools Required

- #2 Phillips Head Screwdriver
- Ruler and Pencil
- Center Punch
- $\frac{1}{4}''$ Drill
- $\frac{11}{32}''$ Wrench or Socket
- Wire Cutters
- Small Needle-Nose Pliers
- Soldering Iron and Solder
- Volt-Ohm Meter or Electrical Continuity Tester

## 1.3 QRO Keyline Upgrade

**Synopsis**

The QRO Keyline upgrade is pretty straight-forward:

1. Install two RCA jacks
2. Install Daughterboard
3. Install Wiring Harness
4. Configure AT-AUTO$_{(tm)}$ firmware

**Preparation**

Turn off the AT-AUTO$_{(tm)}$ and remove power cord. The AT-AUTO's$_{(tm)}$ top cover is held in-place by ten Phillips-head screws: five along the left and right sides, respectively. Begin by removing these ten screws. Be careful not to loose the ten plastic washers.

**RCA Jack Installation**

The two RCA jacks will be installed in the open space above the "TRANSCEIVER DATA INPUT" jack, and immediately adjacent to the RF coupler. See Figure 1.2 and Figure 1.3.

1. Using a ruler or caliper, draw a vertical line above the "TRANSCEIVER DATA INPUT" jack, $\approx 0.8$ inches from the right edge or the rear panel.
2. Measure and mark two horizontal intersecting lines spaced $\approx 0.8$ and 1.6 inches, respectively from the top edge of the rear panel.
3. Using a center punch, place a"dimple" at the two line intersections, marking the hole centers for the RCA jacks. See Figure 1.4.
4. Before proceeding further, ensure that the two hole locations will not encroach upon the RF coupler shown in Figure 1.3. Adjust/correct as necessary.
5. Drill and deburr a $\frac{1}{4}$ inch hole at each of the two locations marked previously. When finished, the rear panel should appear as shown in Figure 1.5.
6. Install the two RCA jacks and tighten.


Figure 1.2: AT-AUTO$_{(tm)}$ Rear Panel prior to QRO Keyline Jack installation

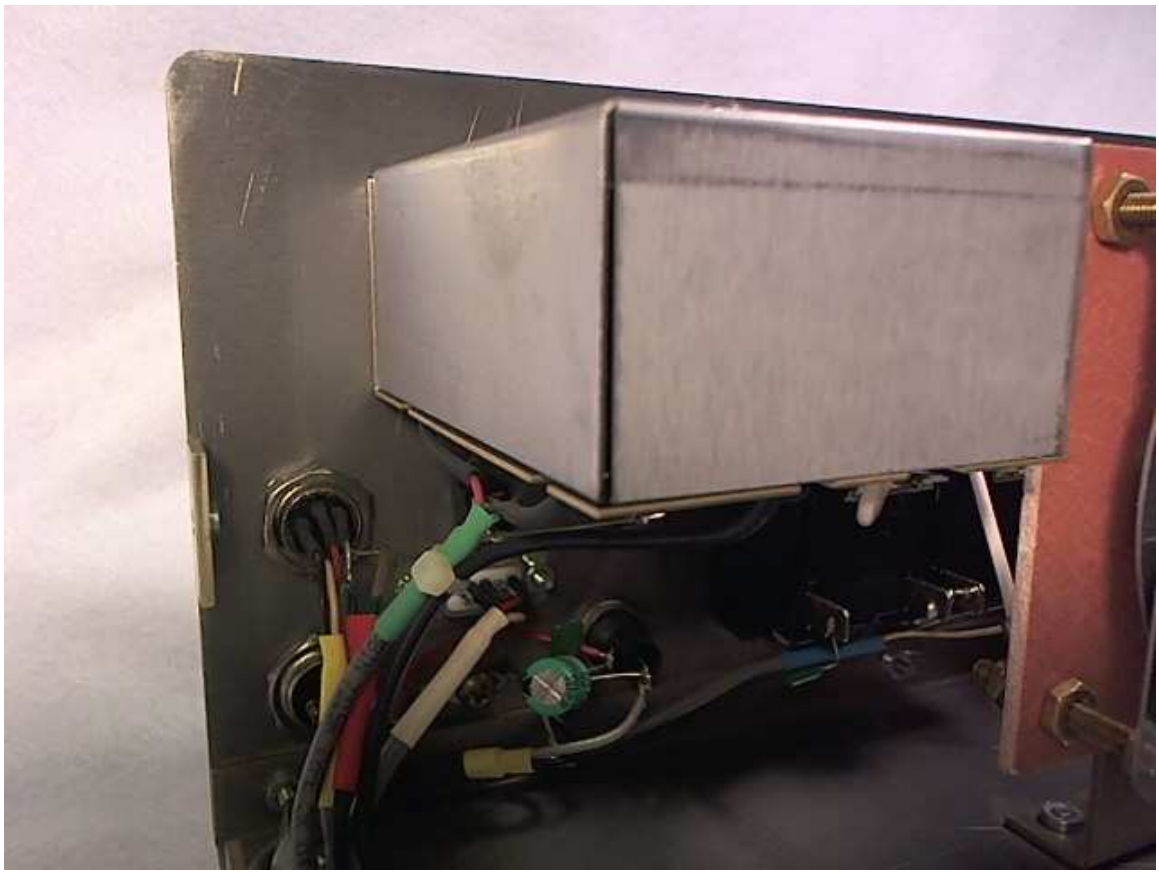

Figure 1.3: AT-AUTO$_{(tm)}$ Rear Panel (Interior) prior to QRO Keyline installation


Figure 1.4: AT-AUTO$_{(tm)}$ Rear Panel showing intended QRO Keyline (RCA) jack locations

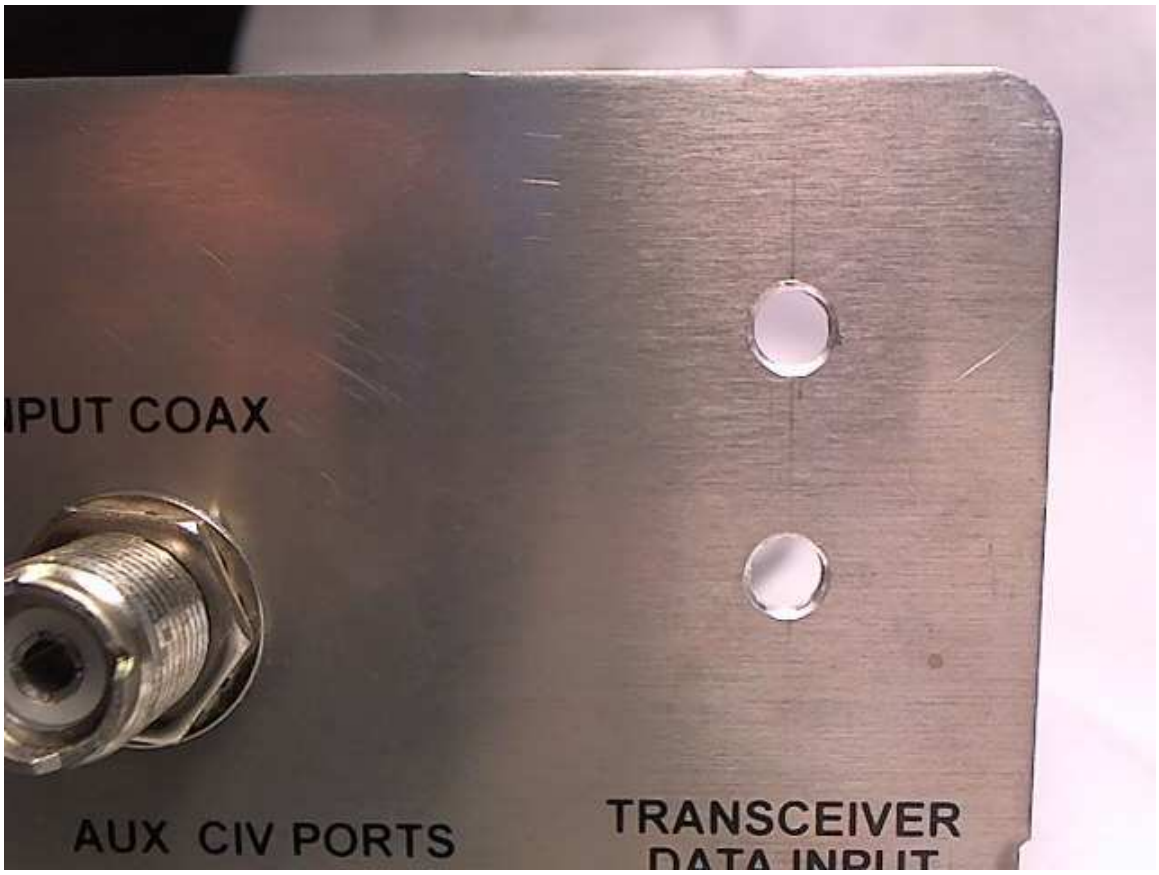


Figure 1.5: AT-AUTO$_{(tm)}$ Rear Panel with two holes added for RCA jacks

**Daughterboard Installation**

1. Locate and carefully remove the AT-AUTO$_{(tm)}$ microprocessor.

   We suggest using a long, narrow knife blade (See Figure 1.6). Begin by carefully inserting the knife blade between the microprocessor and the underlying socket and then working evenly, remove the microprocessor from the control board slowly, so as not to damage any of the microprocessor pins.

2. Locate the QRO Keyline Daughterboard and orient the microprocessor as shown in Figure 1.7 and insert. The microprocessor case has a "dimple" near Pin 1. When properly oriented, the microprocessor "dimple" should be approximately adjacent to the word "UP" printed on the Daughterboard.

   Be careful not to bend any of the microprocessor pins!

   Be very careful not to bend any of the pins extending from beneath the Daughterboard!

3. Ensure the microprocessor pins are fully seated in the socket.

4. Orient the Daughterboard over the vacated microprocessor socket on the AT-AUTO$_{(tm)}$ control board as shown in Figures 1.8 and 1.9 and very carefully align the Daughterboard pins with the control board socket and insert.

   The Daughterboard should be oriented so that the "UP" Arrow is pointing upward, away from the chassis.

   The fit will very likely be snug – be sure to fully seat the Daughterboard into the control board socket – There should be no space between the bottom of the Daughterboard and the socket.

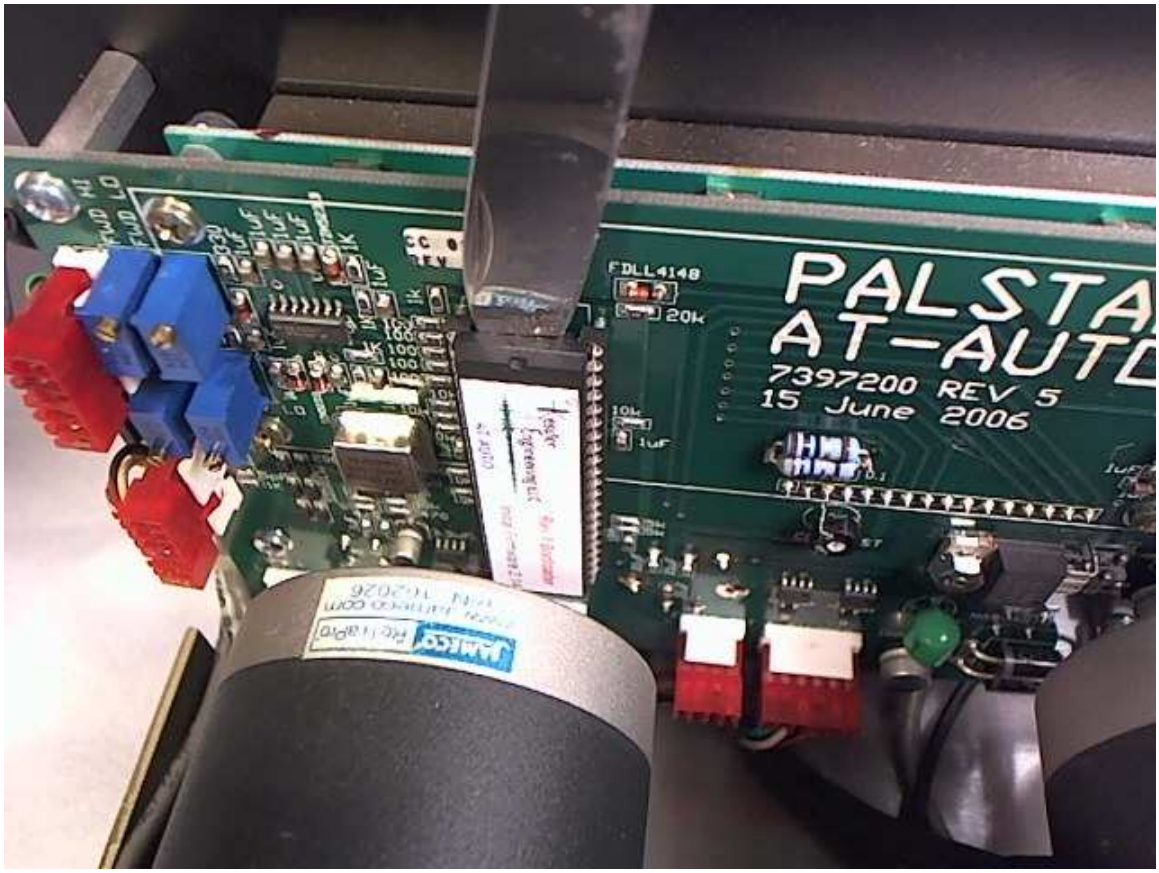


Figure 1.6: AT-AUTO$_{(tm)}$ Microprocessor Removal

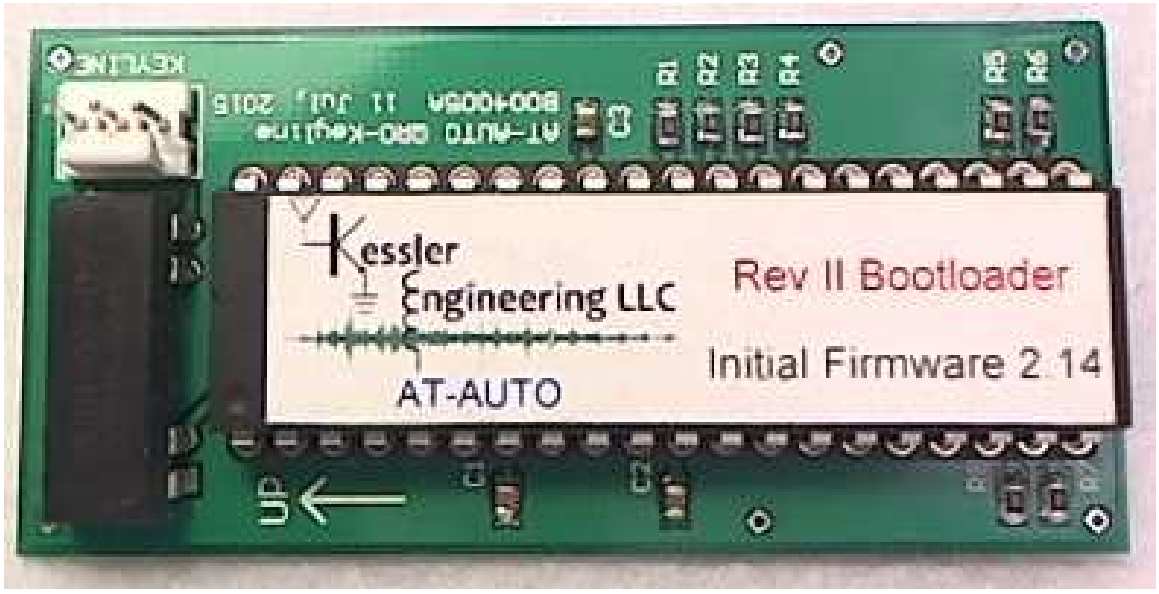


Figure 1.7: AT-AUTO$_{(tm)}$ Microprocessor to Daughterboard Orientation

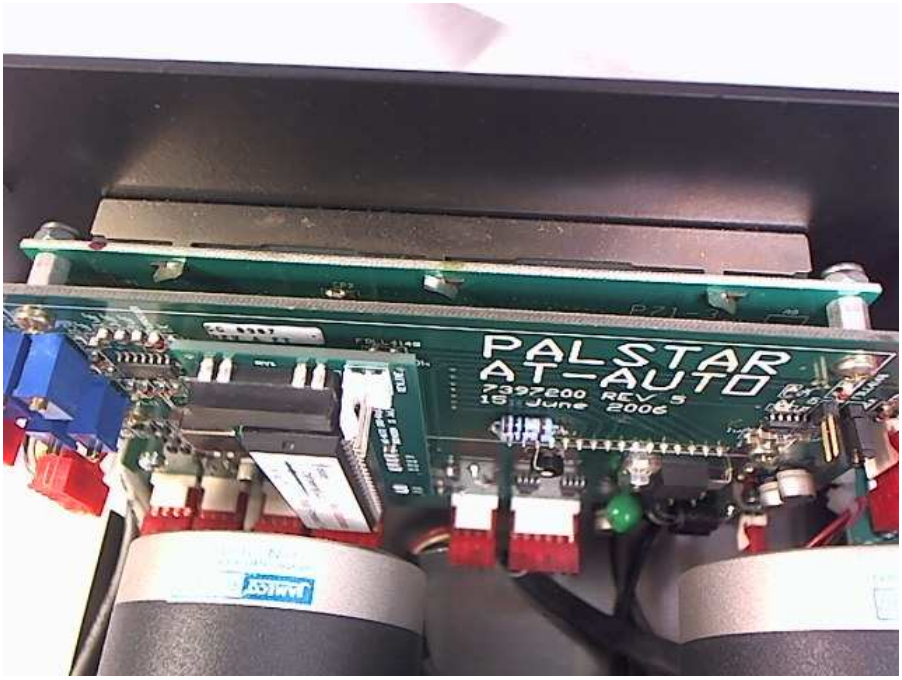


Figure 1.8: AT-AUTO$_{(tm)}$ Daughterboard Orientation

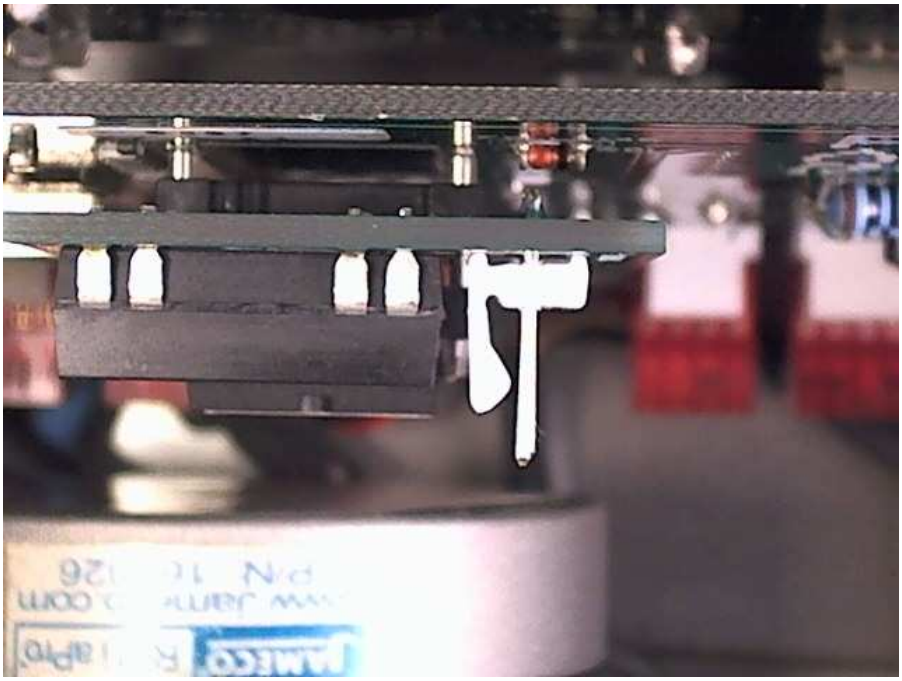

Figure 1.9: AT-AUTO$_{(tm)}$ Daughterboard Orientation

**Wiring Harness Installation**

1. Locate, cut, and remove the nylon wire ties running along the side of the AT-AUTO$_{(tm)}$.

2. Locate the wiring harness and attach the red connector to the Daughterboard as shown in Figure 1.10.

3. Route the wiring harness along the side of the AT-AUTO$_{(tm)}$ and secure with nylon wire ties as shown in Figure 1.11 and then trim nylon wire ties.

4. Remove excess wiring harness (Figure 1.12) and then strip and solder the harness to the RCA Jacks as shown Figure 1.13.

   Solder the harness shield to one of the RCA jack grounded solder tabs.

   Solder the red and white wires to either RCA jack as shown.

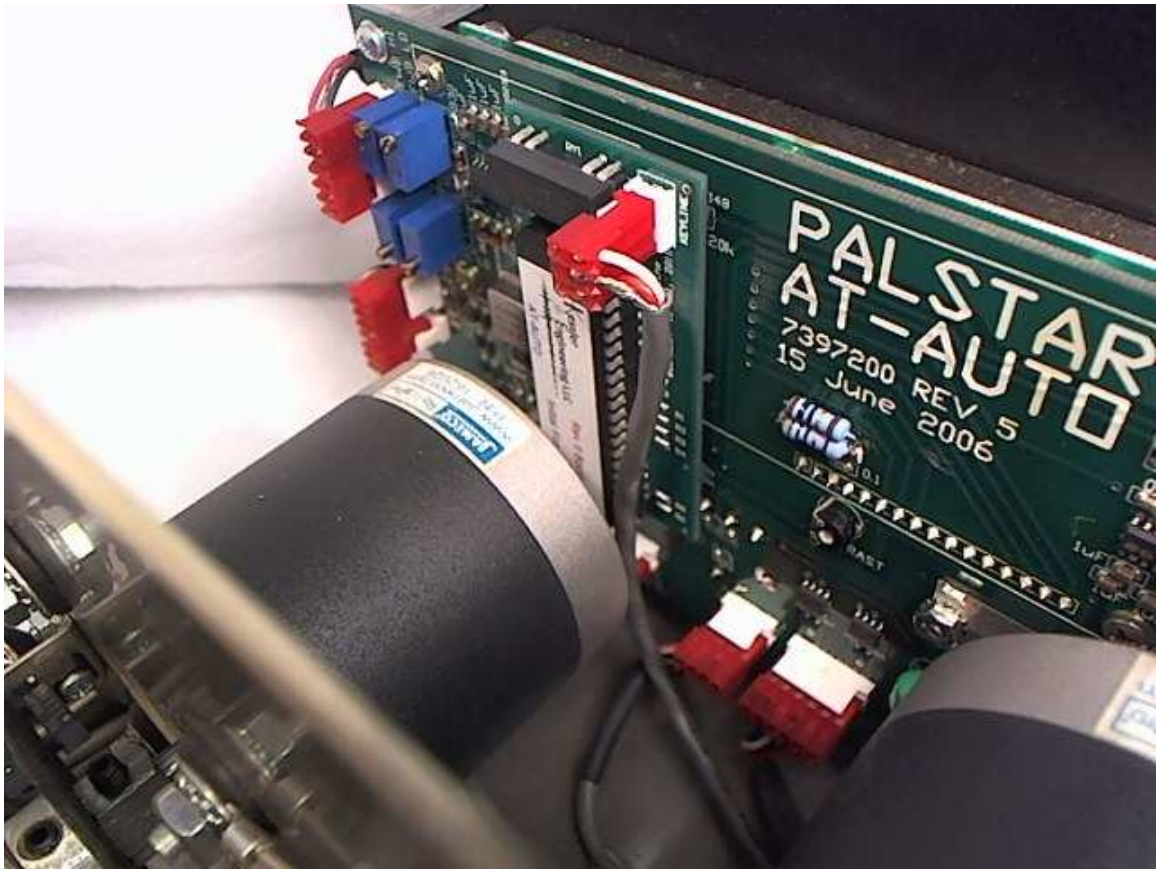


Figure 1.10: AT-AUTO$_{(tm)}$ Wiring Harness Plug-In

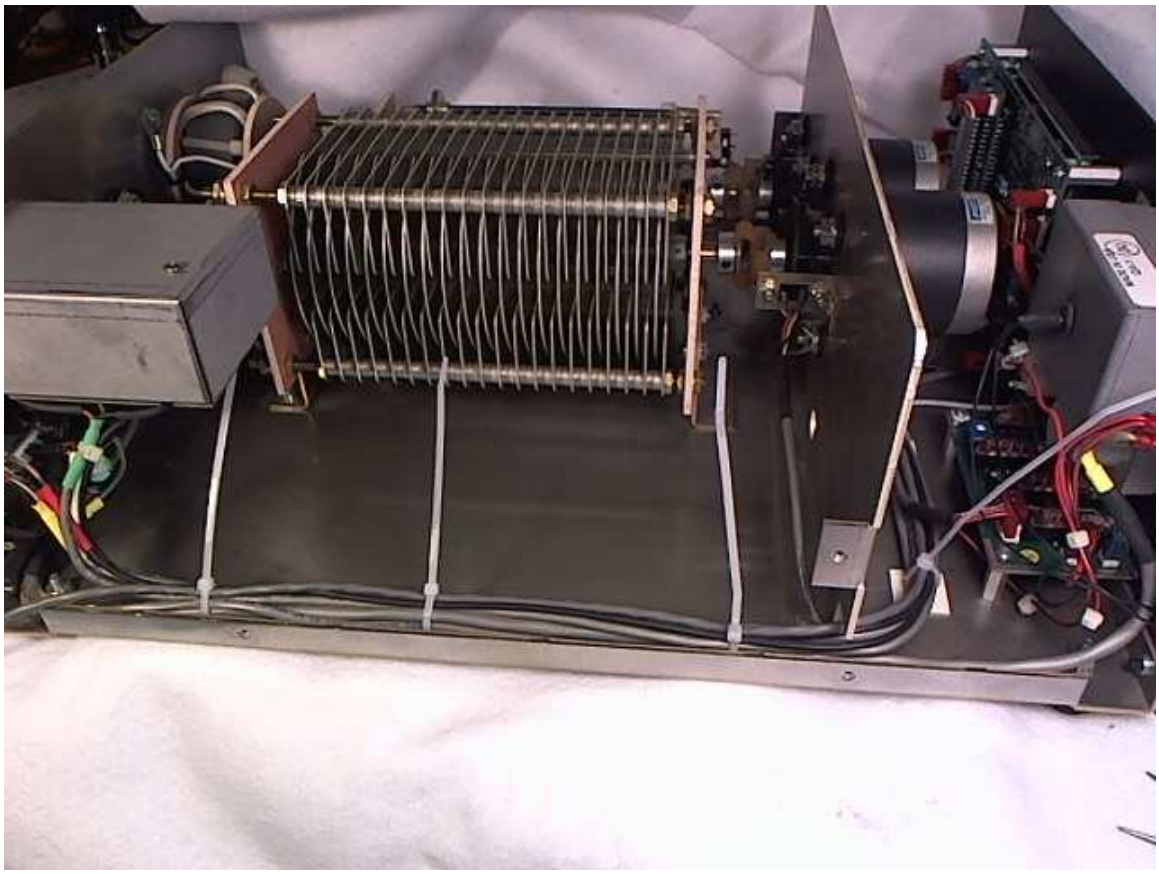

Figure 1.11: AT-AUTO$_{(tm)}$ Wiring Harness Installation

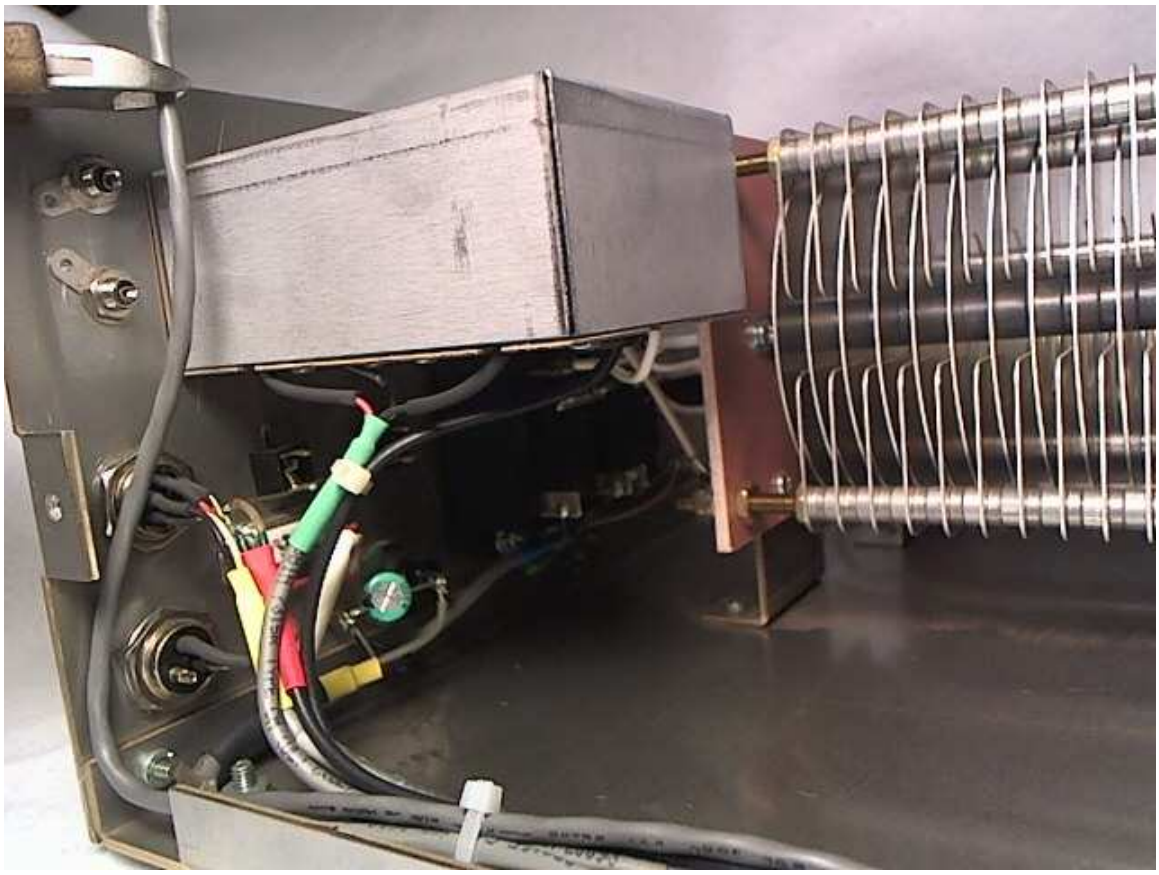

Figure 1.12: AT-AUTO$_{(tm)}$ Excess Wiring Harness Removal

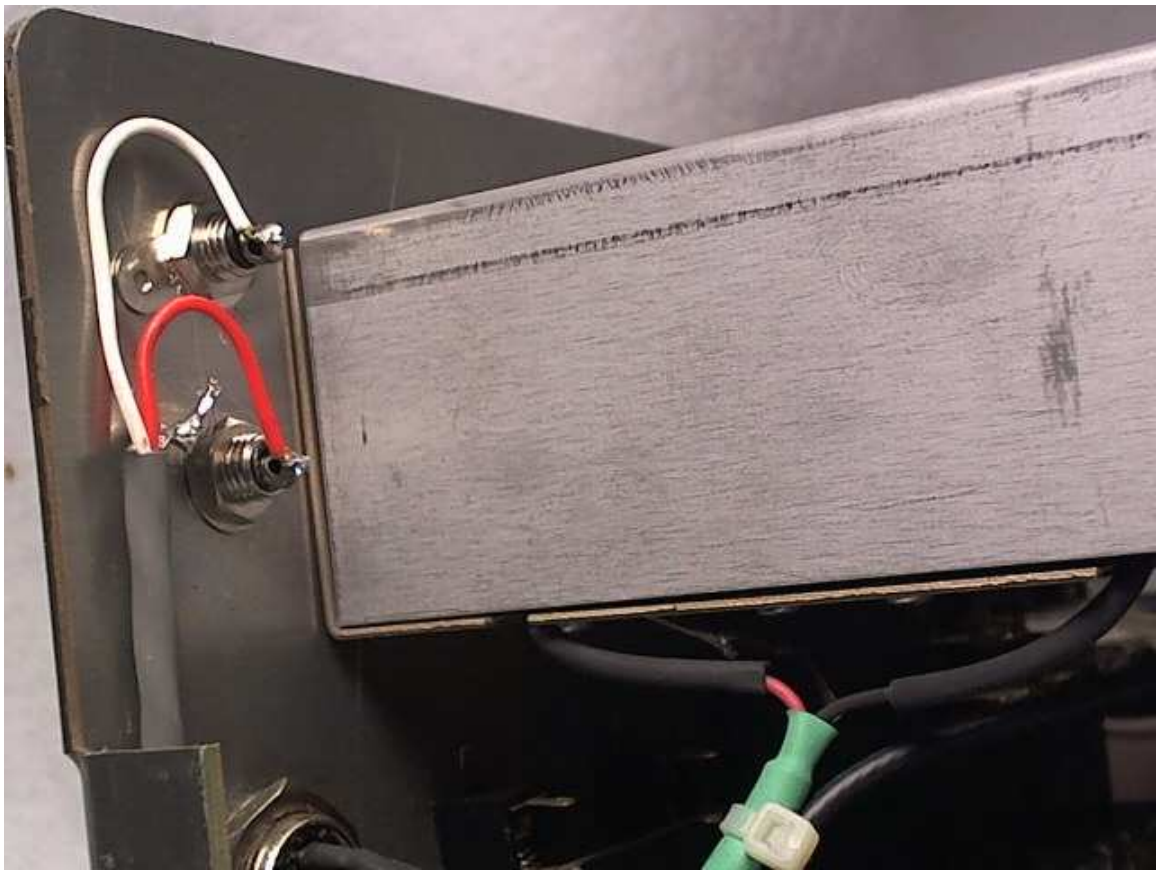

Figure 1.13: AT-AUTO$_{(tm)}$ Soldering Wiring Harness to RCA Jacks

**Checkout and Firmware Configuration**

The two RCA jacks of the QRO Keyline are connected to the contacts of a normally-open relay and are always *Open* whenever the AT-AUTO$_{(tm)}$ is turned *Off*. While the relay contacts are open, amplifier keying is inhibited.

Relay contact closure is only possible if the AUTO$_{(tm)}$ is powered *On*, with relay contact closure indicated by the presence of an asterisk (*) in the upper right corner of the AT-AUTO$_{(tm)}$ LCD. Presence of the * in the display indicates the relay contacts are closed and amplifier keying is enabled.

1. Re-inspect the orientation of the microprocessor, the daughterboard and the AT-AUTO's$_{(tm)}$ control board and correct if necessary.

   **DO NOT TURN ON THE AT-AUTO$_{(tm)}$ or CONNECT DC POWER UNLESS THE MICROPROCESSOR AND DAUGHTER BOARD ARE CORRECTLY INSTALLED!!**

   If the AT-AUTO$_{(tm)}$ fails to power up or if you observe smoke, etc., immediately turn the tuner *Off* and re-inspect your work and proper component orientation.

2. Using a VOM or Continuity Tester, while the AT-AUTO$_{(tm)}$ is powered *Off* ensure the following conditions are met:

   No continuity ($\infty$ resistance) between the two respective RCA jack center pins.

   No continuity ($\infty$ resistance) from either of the two respective RCA jack center pins and the chassis.

3. Turn *On* the AT-AUTO$_{(tm)}$ and select "Automatic" mode.

   Ensure there is no * (asterisk) shown in the display.

   Measure and confirm that there is no continuity ($\infty$ resistance) between the two respective RCA jack center pins.

4. Select "Bypass" mode – The * should now appear in the display.

   With the * displayed, measure and confirm electrical continuity ($\approx 0$ Ohm) between the two respective RCA jack center pins.

5. Turn *Off* the AT-AUTO$_{(tm)}$ and re-install the top cover.

6. Refer to QRO Keyline instructions beginning on page 42 of the current AT-AUTO$_{(tm)}$ manual and configure the AT-AUTO$_{(tm)}$ firmware to provide the desired QRO Keyline behavior.

# Service and Warranty

## Warranty

Kessler Engineering, LLC. warrants all of our products to be free from defects in material and workmanship under normal use for a period of one year from the date of purchase. During this one-year warranty period, Kessler Engineering will opt to either repair or replace the product.

This warranty will be void if the product has been repaired or altered by anyone other than the staff at Kessler Engineering. This warranty does not apply to products damaged due to improper installation or abuse/misuse.

## Repair Policy

Please contact our service department for return authorization and shipping instructions prior to sending any product for service or repair. All items shipped to Kessler Engineering, must be packed appropriately and insured against damage. Kessler Engineering is not responsible for merchandise damaged in shipment. Be sure to include a note describing the problem in detail and include your contact information (phone number and e-mail).

## Return Policy

All returns must receive prior authorization. Returned items must also include a copy of the original sales receipt and be returned with the original box, manuals, and accessories. Returns must be received within 7 days of purchase and are subject to a restocking fee. Shipping expenses are not refundable.