ELECRAFT KH1 TRANSCEIVER KIT ASSEMBLY MANUAL

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OVERVIEW

This document provides instructions for kit assembly of the KH1 hand-held transceiver and its options.

This is a modular, no-soldering kit. To ensure proper performance, all PCB modules are aligned, tested, and burned in prior to shipment. The ATU module, internal whip matching network, and heatsink assembly are supplied and attached to the main PCB module due to the small size of these assemblies.

■ KH1 OPTIONS AND ACCESSORIES

The following options are available for the KH1. **All are included in the KH1 Edgewood Package.**

Note: The KHATU1 automatic antenna tuner option is always included in the kit version of the KH1. This includes the internal whip-loading coil, telescoping whip, and whip clips.

- Automatic Antenna Tuner, whip, loading coil, whip clips (KHATU1)
- Keyer Paddle (KHPD1)
- Internal 11 V Li-ion Battery (KXBT2)
- Internal Battery Charger (KHIBC1)
- Log Tray & mini-ball-point pen (KHLOG1)
- Carrying Case (ES20)

These additional accessories are compatible with the KH1:

- KH1 Whip Right Angle Adapter (KHRA1)
- 40 Meter Extender (AXE1)
- External Fast Charger (KXBC2)

Note: The KXBC2 *external* fast-charger must NOT be used to charge the KH1's internal Li-ion battery while it is still inside the radio. You must remove the battery for this purpose. *Internal* charging is automatically handled by the KHIBC1 module whenever a 12.5 to 15 V power supply or battery is connected for operating the KH1.

■ TOOLS REQUIRED FOR ASSEMBLY

The following tools are needed to assemble the KH1 kit:

- **Anti-static mat with wrist strap.** Damage from static discharge is covered in the next section.
- Small Phillips screwdriver (#1). **Do not use a larger screwdriver,** as this makes it too easy to overtighten screws.
- Needle-nose pliers. (Standard long-nose pliers may be too large to allow tightening of the panel nuts on the two shaft encoders.)

■ PREVENTING DAMAGE FROM ELECTROSTATIC DISCHARGE (ESD)

⚠ **PCB assemblies may be damaged by electrostatic discharge (ESD) during handling. To avoid this, observe the following precautions.** (Note: Repairs resulting from ESD-related damage are not covered under Elecraft's product warranty. Please refer to https://elecraft.com/pages/warranty-repair.)

- **Keep the main module assembly inside its anti-static bag until used during assembly.** Anti-static bags allow the static charge to flow over their surface so that any part of the bag that touches the components inside are at the same potential at all times.

- **At your workbench, avoid dangerous voltages by tying everything together through a common main safety ground.** This includes everything you may touch at the worktable.

- **Obtain an inexpensive static dissipating work mat.** These are readily available, and will safely drain off any charges built up on parts or circuit boards placed on them. They are supplied with a lead that connects the mat to the common workbench ground, as well as a wrist strap (see below).

- **You must have a way of draining off any static charges that occur on your body.** Moving your feet on the floor or shifting position in your chair can produce destructive static charges. You can discharge yourself by touching an unpainted metal ground, but that will last only until you move in a way that produces a new static charge. **The safest technique is to wear a grounded wrist strap (supplied with an anti-static mat). The wrist strap must include a 1-megohm resistor to limit the current flow.**

■ EXPLODED VIEW

Below are all KH1 internal components and subassemblies. The front panel, back panel, and heat sink are fabricated from aluminum. The nylon 3D-printed "top panel" and "bottom panel" parts are shown in gray (actual color: black). Since the front panel is at the top in this view, the internal option modules are shown plugging into the main PCB from below. This includes ATU and battery charger (or DC IN) modules.

Note: In the kit version, the main PCB, heatsink, LCD, ATU, whip matching network, and top panel are supplied as a single aligned/tested unit to ensure proper performance.
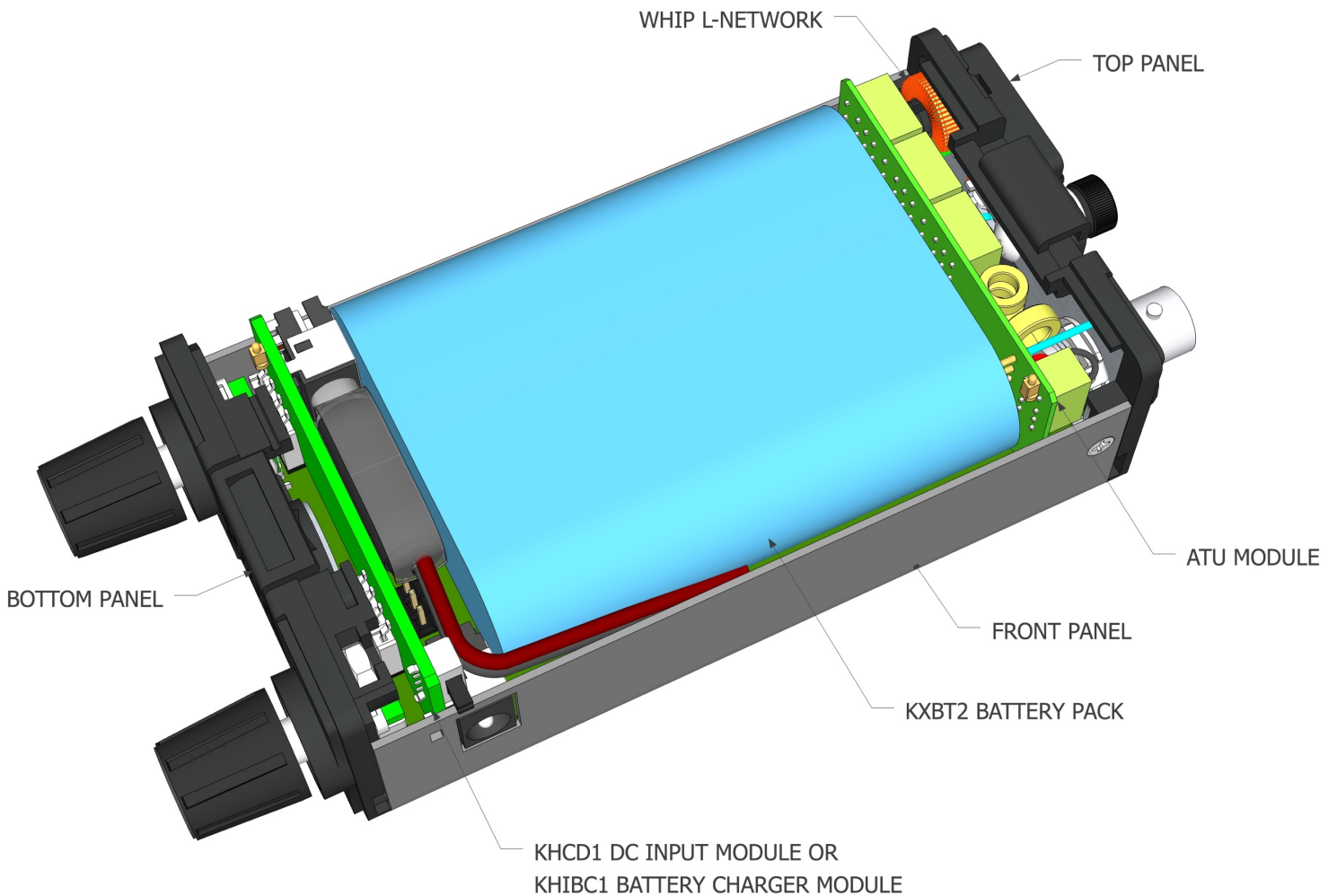
Not shown: Keyer paddle, log tray, telescoping whip, and whip clips.

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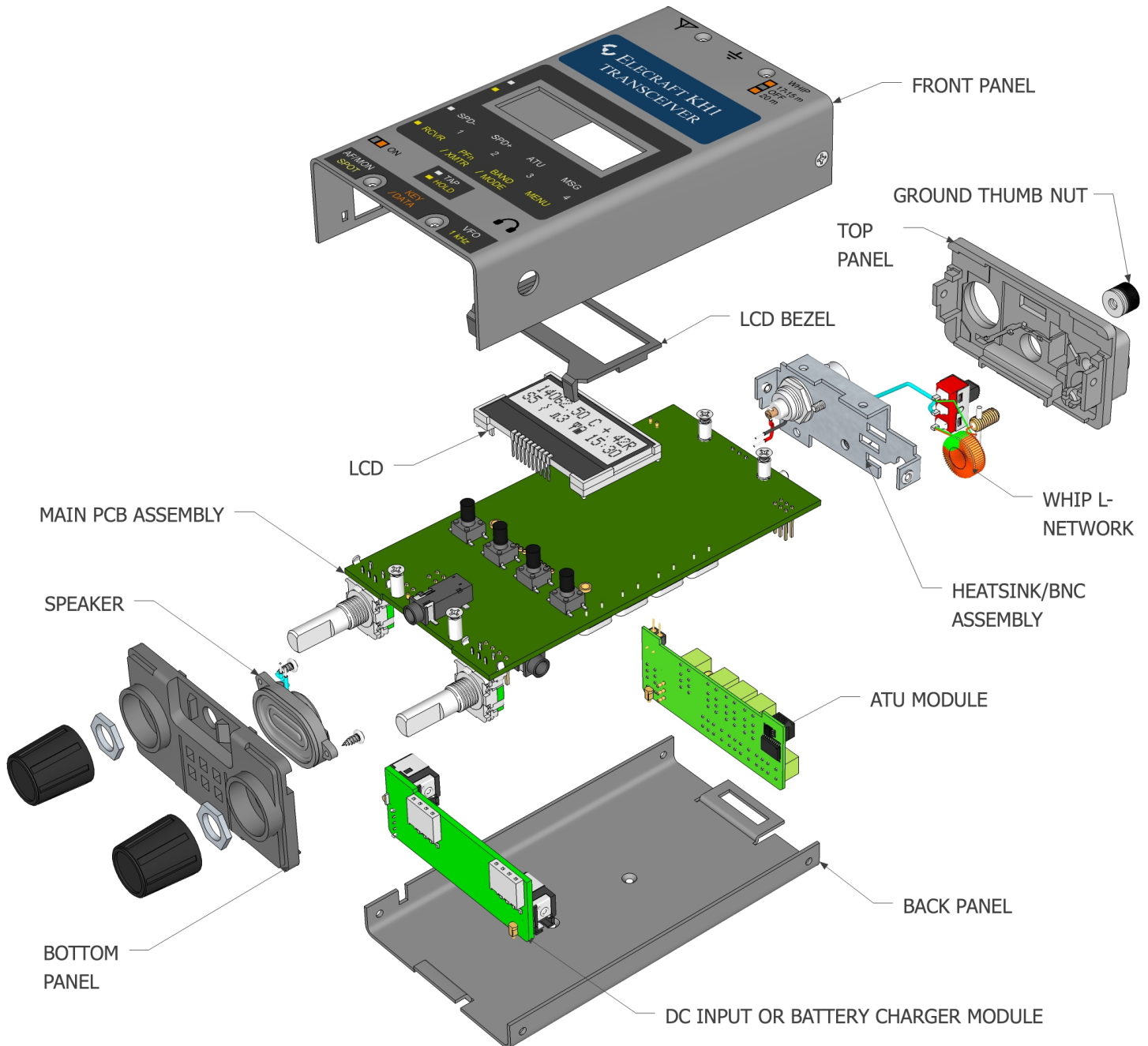
◼ INTERIOR VIEW

In the illustration below, the KH1 is shown fully assembled, from the back side, with the hinged back panel removed. A KHIBC1 internal battery charger module and a KHATU1 ATU module are shown plugged in, along with the KXBT2 battery pack. (The battery pack is shown in blue for clarity; the actual color is black or white.)

Note: The KH1 is typically operated hand-held, with the knobs facing downward. This is why the 3D printed plastic panels, shown here in black, are referred to as the "top panel" and "bottom panel," respectively.

WHIP L-NETWORK

TOP PANEL

BOTTOM PANEL

ATU MODULE

FRONT PANEL

KXBT2 BATTERY PACK

KHCD1 DC INPUT MODULE OR
KHIBC1 BATTERY CHARGER MODULE

INVENTORY

We suggest doing an inventory of all supplied items prior to starting assembly. Use the provided check-off boxes. Refer to the reference drawings in the previous section to identify the items described below.

Note: Loose hardware, knobs, and other miscellaneous small items can be found in the bags provided for modules. To complete inventory, all of these loose items should be removed from their bags. They are shown together at the bottom of this inventory list.

⚠️ **Before handling KH1 modules, read the previous section regarding prevention of damage due to ESD. Keep all modules inside their anti-static bags, where applicable, until they are needed.**

[ ] KH1 main unit (main PCB with LCD, ATU PCB, heatsink assembly, and top panel with internal whip matching network)

[ ] KH1 front panel sheet metal bag, which includes:

  [ ] Front panel sheet metal
  [ ] Bottom panel/speaker unit (with speaker and its cable attached)
  [ ] Plastic knobs (2)
  [ ] Encoder panel nuts (2)

  [ ] Hardware and miscellaneous items bag:

    [ ] 2-56 screws for front panel (4)
    [ ] keyer paddle hex wrench (1)

[ ] Hinged back panel assembly (with battery anti-slip pad and two whip clips attached)

[ ] Internal charger module; PCB is approx. 2.5 x 11 cm (KHIBC1)*

[ ] Lithium-ion battery pack (KXBT2)*

[ ] Keyer paddle (KHPD1)*

[ ] Log tray (KHLOG1) and ball-point pen*

[ ] Telescoping whip antenna

[ ] 13' [4 m] ground wire with lug

[ ] USB Cable

[ ] Power cable with DC barrel plug

[ ] Owner's manual and errata sheet

*These items are options for the KH1-K, sold separately. They are all included with the Edgewood package.

ASSEMBLY

⚠️ All KH1 assembly and option installation steps should be done in the order shown in this section. Before you begin, please review the section on ESD precautions. An inventory of all items should also be done.

■ BOTTOM PANEL/SPEAKER UNIT

[ ] Remove the panel nuts from the encoder shafts (see arrow in illustration below, left). These will be reinstalled in a later step.

[ ] Locate the bottom panel/speaker unit and place it near the encoder shafts as shown. Slide this unit onto the two encoder shafts as far as it will go. The speaker cable will be plugged in later.

[ ] Secure the bottom panel to the encoders using the two encoder panel nuts (below, right). This will require slender long-nosed pliers. Note: DO NOT OVERTIGHTEN hardware.
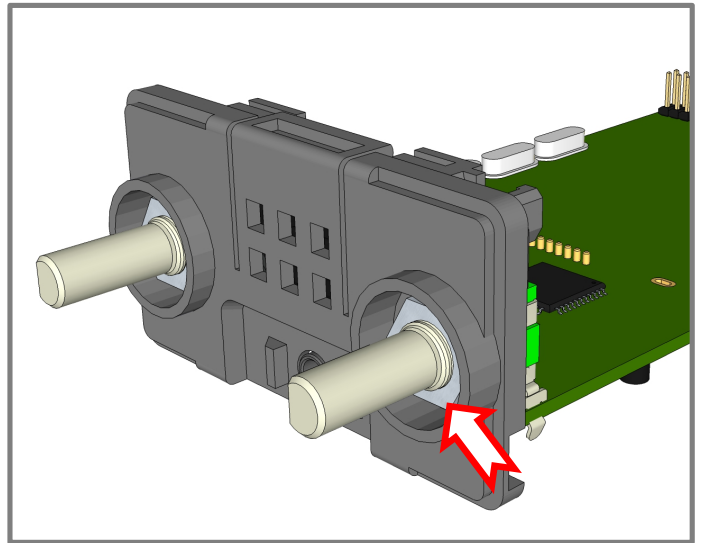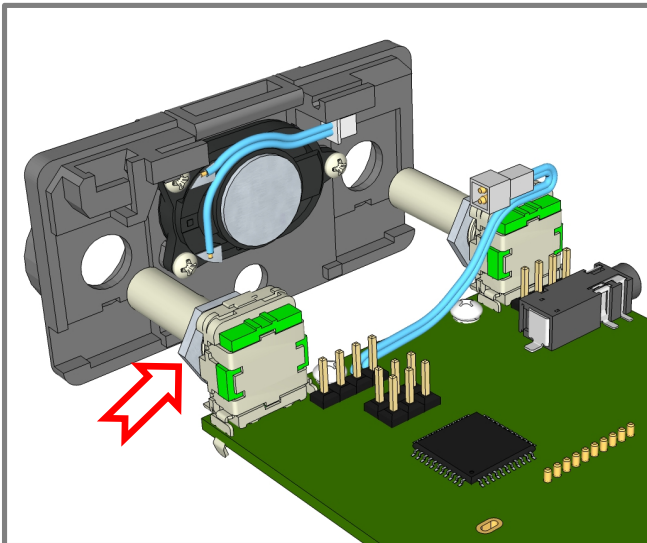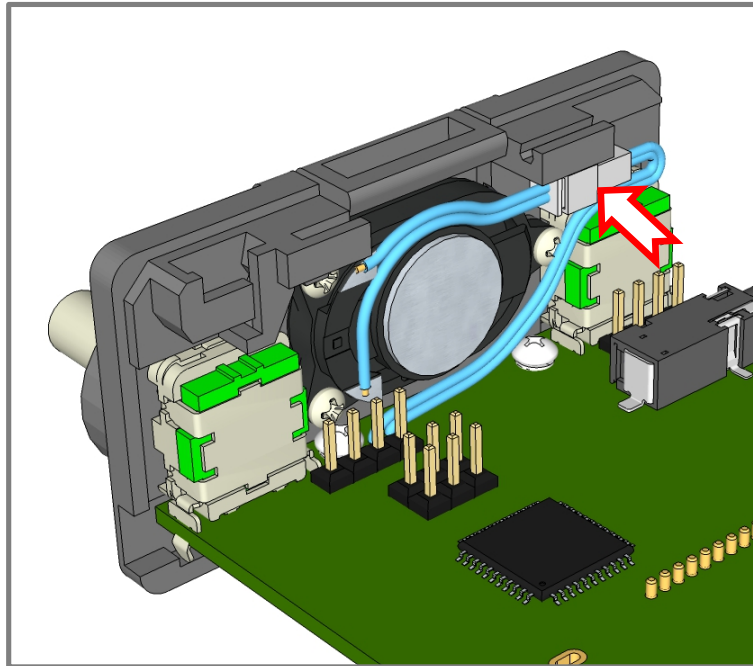

[ ] Slide knobs onto the two encoder shafts.
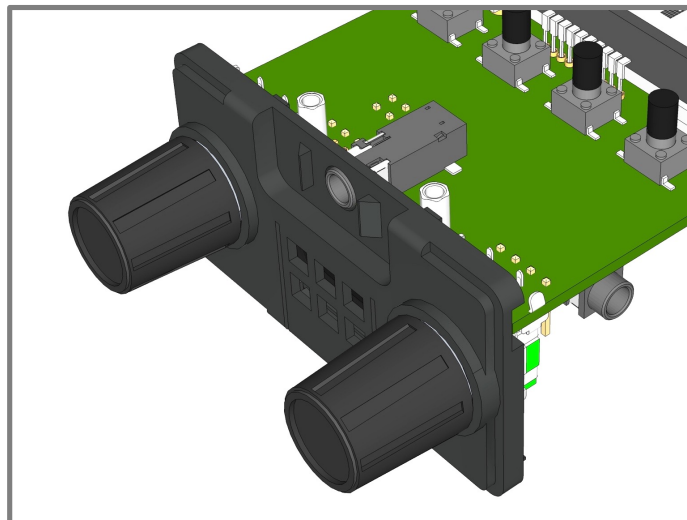
■ **SPEAKER CABLE**

[ ] Plug the speaker cable into the mating cable attached to the main PCB. Make sure the two halves of the connector are fully mated as shown (at location of arrow).

[ ] Route the two parts of the speaker cable as shown above. The wires soldered to the speaker must be routed <u>above</u> the magnet. The wires soldered to the main PCB must be routed <u>below</u> the magnet, and above the encoder. **If the wires are not routed as shown, they will interfere with battery charger PCB installation.**

■ **SPARE GROUND NUT**

[ ] **(Note: This step may have already been done at the factory.)** Insert a 4-40 stainless-steel hex nut into the cavity identified by the arrow below. Make sure the nut doesn't fall out when the unit is inverted. This nut is a spare that can be used if the regular ground thumb nut is lost.
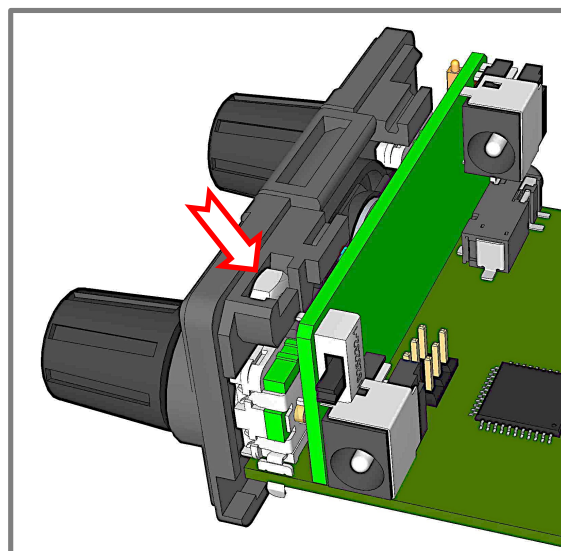
■ FRONT PANEL SHEET METAL

⚠ **When the two screws in the next step are removed, the heatsink assembly will be supported only by the six short wires from the main PCB to the PA PCB. <u>Be very careful when handling the radio in this condition.</u> The screws will be re-installed in a later step.**

[ ] As shown by arrows in the illustration below-left, there are two flat head screws holding the heat sink to the main PCB standoffs. Remove and save these screws.
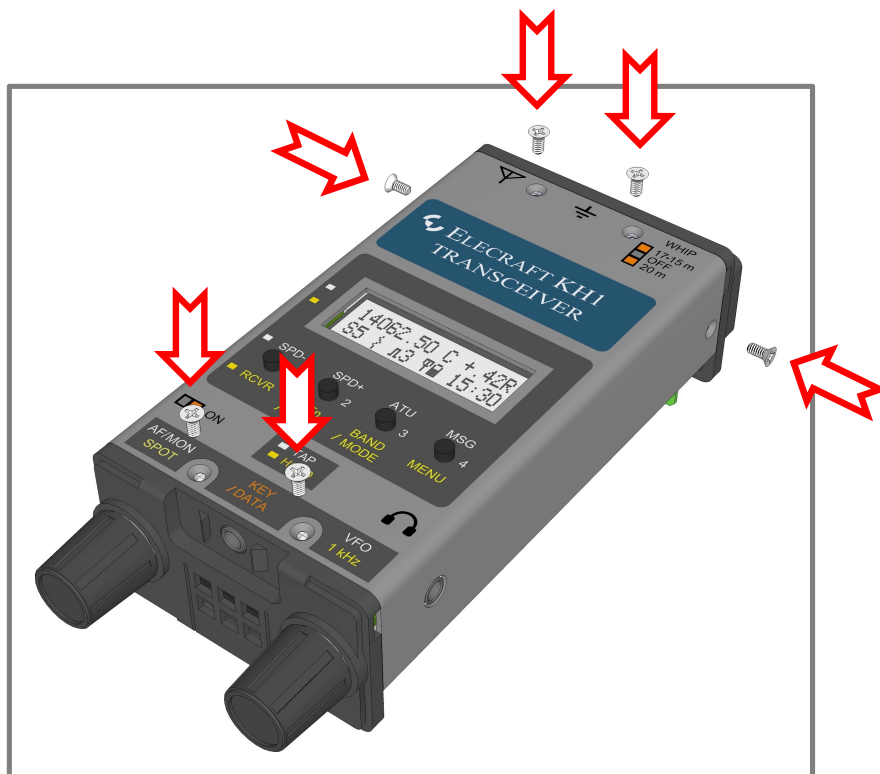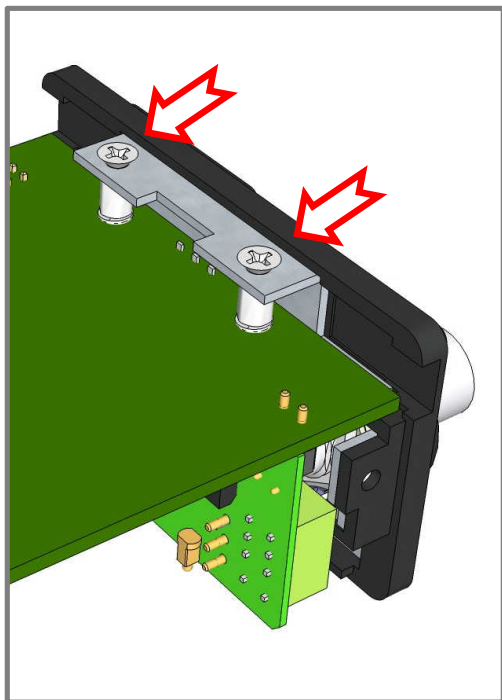
⚠ **The headphone jack protrudes through the front panel sheet metal. Because of this, the front panel must be flexed slightly as the panel is installed in the next step. After the panel is in its final position, make sure the jack is centered inside its hole.**

[ ] Install the front panel between the top and bottom end panels as shown above-right. Fully seat the side with the headphone jack first.

[ ] Secure the top side of the front panel to the main PCB standoffs using four 2-56 flat head screws (see downward-facing arrows).

[ ] Secure the front panel to the top panel and heat sink using two additional 2-56 flat head screws, coming in from the sides, as shown by the diagonal arrows. (The heat sink has pre-installed nuts at these locations.) The plastic top panel must be pressed all the way onto the heat sink to ensure that the holes in the front panel, top panel, and heat sink line up.

■ KHIBC1 INTERNAL CHARGER MODULE

[ ] Locate the internal battery charger module (KHIBC2) or DC IN module (KHDC1). One or the other is supplied. They both look similar to the image at below-left.
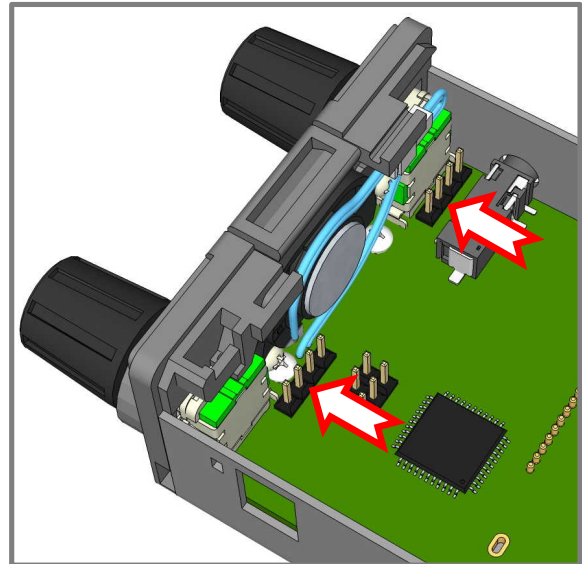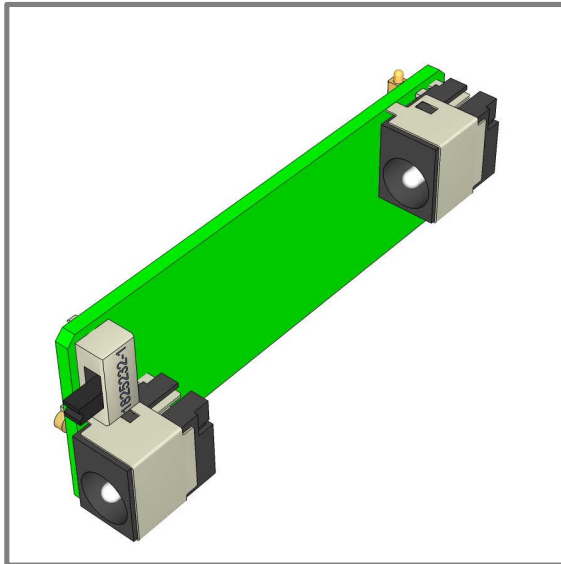
[ ] Locate the two 4-pin male connectors for the charger module (arrows, above-right). The internal charger (or DC IN) module will be plugged into these connectors. Tuck the speaker wires around the magnet as shown to make sure they will not interfere with the module.

[ ] As shown below, the internal charger (or DC IN) module must be plugged in with the on-off slide switch (arrow) to the <u>left</u>. **The DC barrel jack near this switch protrudes slightly through the front panel sheet metal. The panel is flexed outward slightly as the module is seated. The connector will then snap into its hole.**
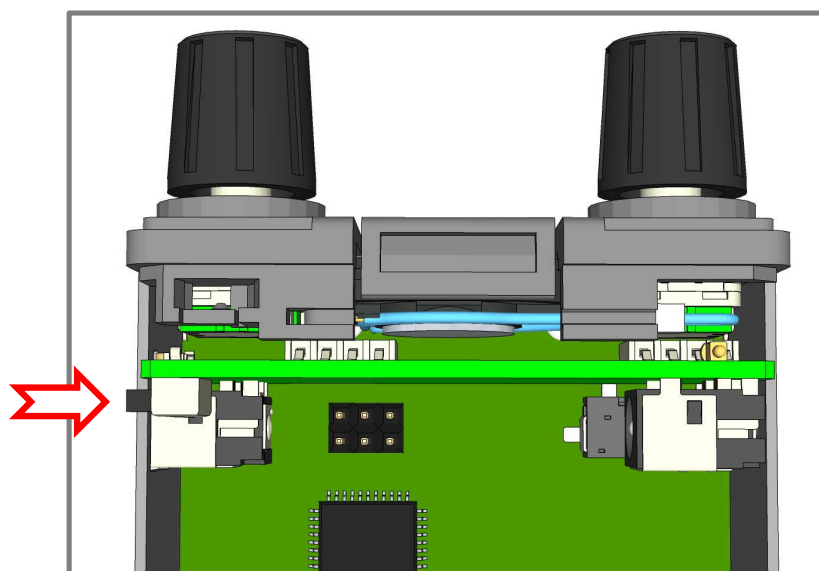
■ HINGED BACK PANEL ASSEMBLY

The back-panel sheet metal is attached to the KH1 via a hinge in the plastic top panel (at arrow below). It is held closed by a spring latch in the bottom panel.

[ ] Position the metal back panel to the right of the KH1 as shown. Slip the back panel's bent tab through the thin gap at the edge of the top panel's hinge. Once this is done, the back panel will be captured by the hinge.

⚠️ **When opening or closing the back panel, it may be necessary to slide the panel forward or backward slightly during rotation. The panel's bent tab is a close fit inside the channel formed by the plastic hinge.**
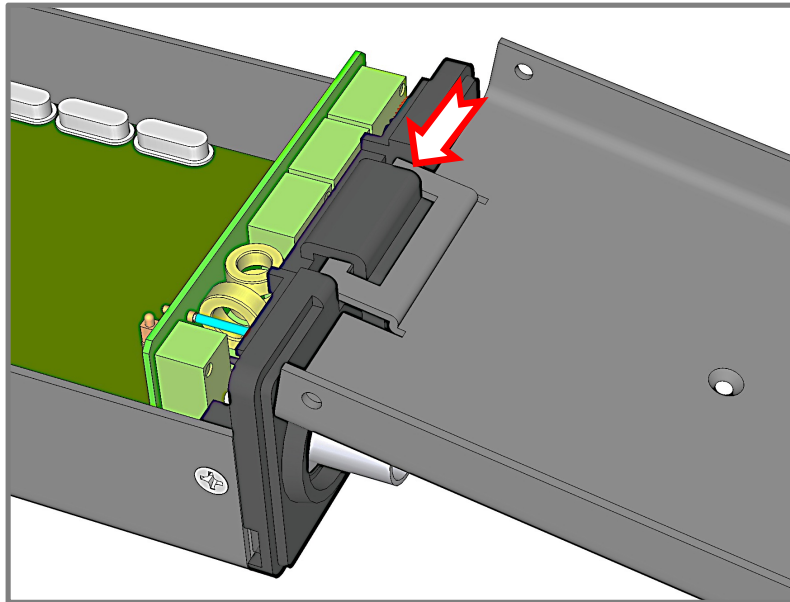
[ ] To close the back panel: (1) use a thumb to draw back the plastic spring latch (shown by the arrow below); (2) fully close the back panel; (3) release the latch.
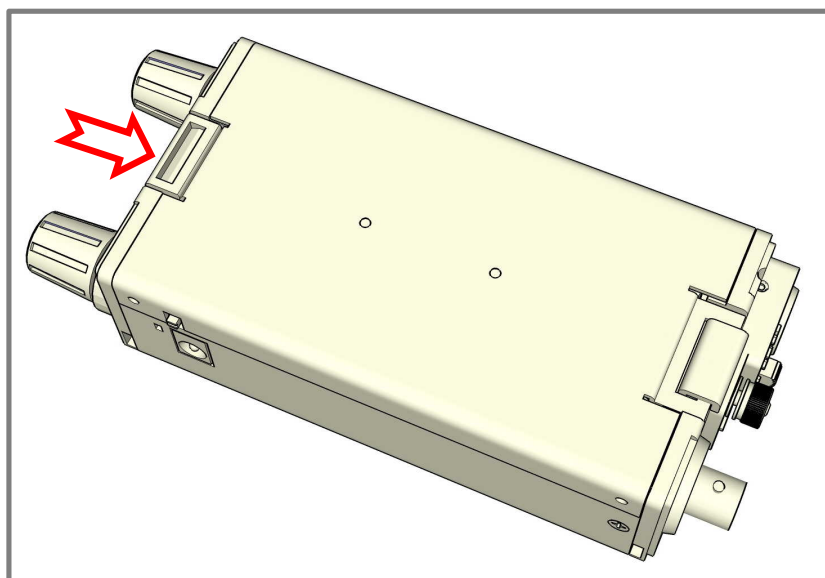
■ WHIP ANTENNA

The KHATU1 ATU option comes with a telescoping whip antenna, plus two clips to retain the whip when not in use. The illustration at the bottom left shows the whip in its stored location. The clips include serrated grooves (at arrows) that can be used to capture the free end of a counterpoise wire wrapped around the transceiver. The whip itself is fitted with clear heat-shrink tubing to improve retention.

The clips may already be installed on the back cover. If not, follow the steps below.

⚠️ **The whip clip installation shown here is appropriate for right-handed operators (who will hold the radio in their left hand). The clips can be moved to the other side if desired.**
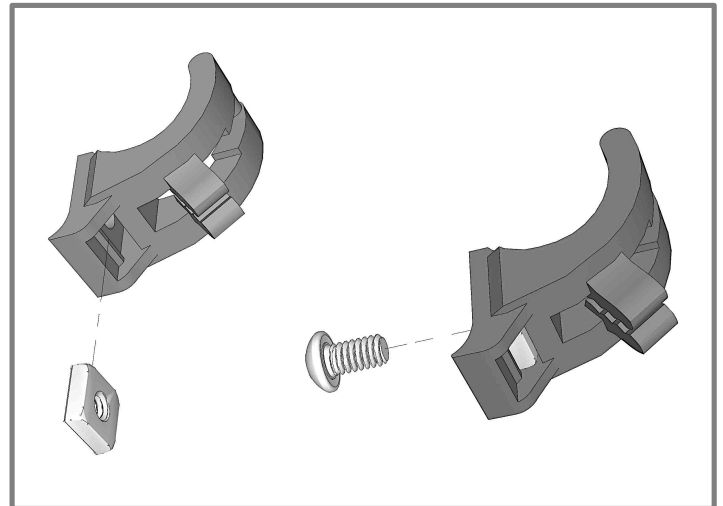

[ ]   Insert a 2-56 square nut into the recess of each clip as shown above-right. This illustration also shows the relationship between the whip-clip nut and the interior screws that will be installed in the next step.

[ ]   Secure the clips to the back panel in the two locations shown below using 2-56 pan head screws.
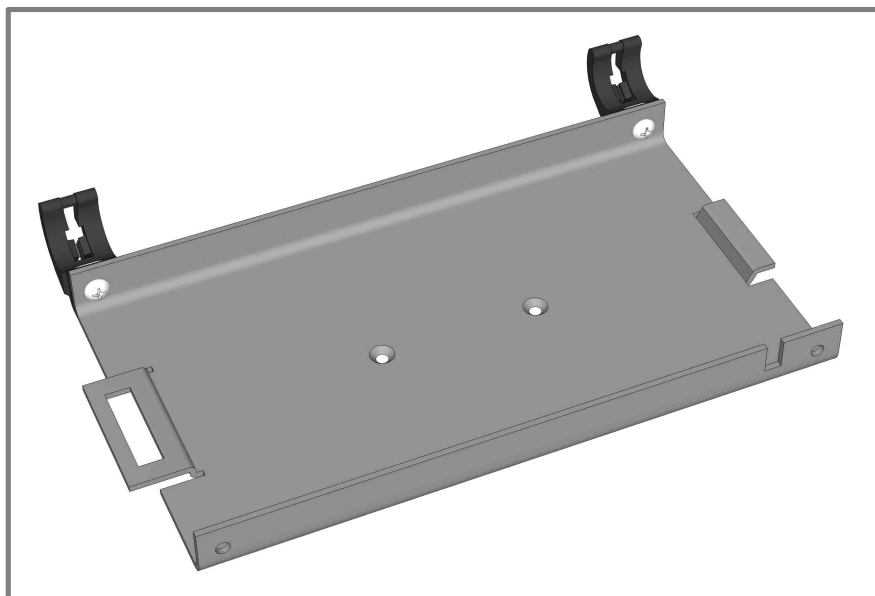
◼ KHLOG1 LOG TRAY

As shown below, the folding log tray is supported by two arms that slide out a short distance. The arms are inserted into slots (at arrows) near the top surface of the front panel. **The installation shown here is for right-handed operators (who will hold the radio in their left hand). The tray can be installed on the left side if desired. This can be done in the field to allow use by multiple operators.**
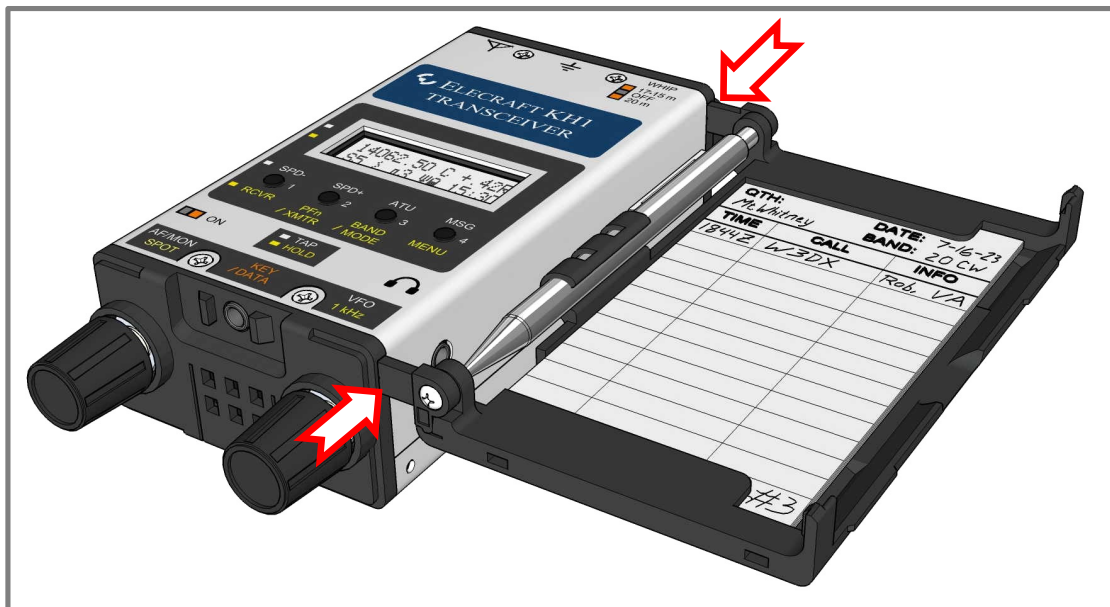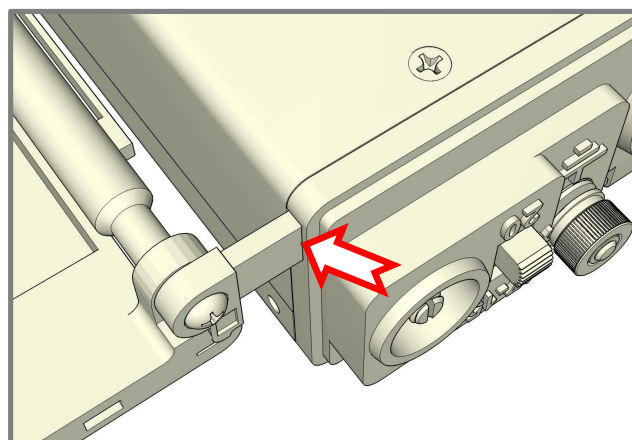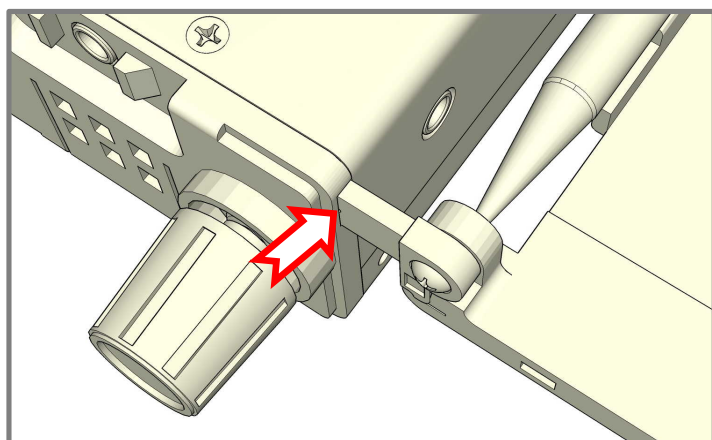

⚠ **The two arms are different. Be sure to orient the log tray and arms as shown in the two views below.**

[ ] Fit the arms into their slots (arrows). <u>Gently squeeze the forked end</u> of each arm while inserting it.

LEFT ARM	RIGHT ARM

[ ] If the tray is not already attached to the two arms, secure it using 2-56 x 3/16" pan-head screws. **The screws will form their own threads. Be sure to keep the screw aligned with the axis of the hole and thread it in slowly. Tighten only to the point where there's a small amount of friction as the tray is rotated.**

[ ] Make sure the log tray's detent holds it open when the radio is held with the front panel facing down.

[ ] Snap the mini ball-point pen into its clip. The pen must be retracted to fit in place.

[ ] Log sheets can be printed and cut out using instructions in the KH1 Owner's Manual.

⚠️ **Please follow the instructions below for closing and opening the log tray.**

CLOSING THE LOG TRAY

[ ] Slide the log tray inward until the arms are fully inserted into their slots.

[ ] Fold the tray over the front panel and snap it into place at the locations shown by arrows below.
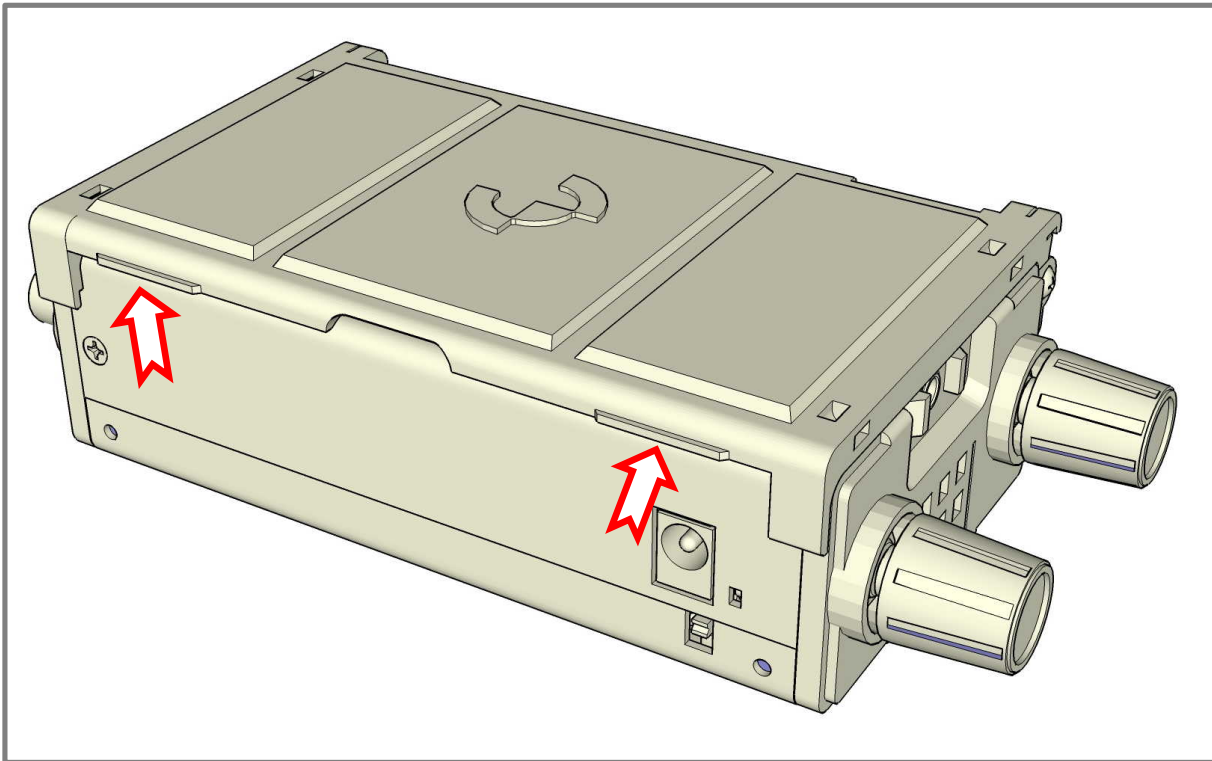
OPENING THE LOG TRAY

[ ] With one hand, hold the KH1 in the orientation shown above. Using the thumb and forefinger of the other hand, grip the log tray at the location of one arrow, above. Then push up with your thumb until the log snaps open. Similarly, unsnap the tray at the other arrow location.

[ ] Open the log all the way. You should then feel a small detent force that holds the tray open.

[ ] **SLOWLY** slide the tray out as far as it will go (about 1/2" [12 mm]). This creates a gap for your fingers.

■ KHPD1 KEYER PADDLE

The KHPD1 keyer paddle plugs into the KEY/DATA jack at the lower edge of the front panel. It plugs in flipped up for use, away from the knobs (below-left), and down for storage (below-right).
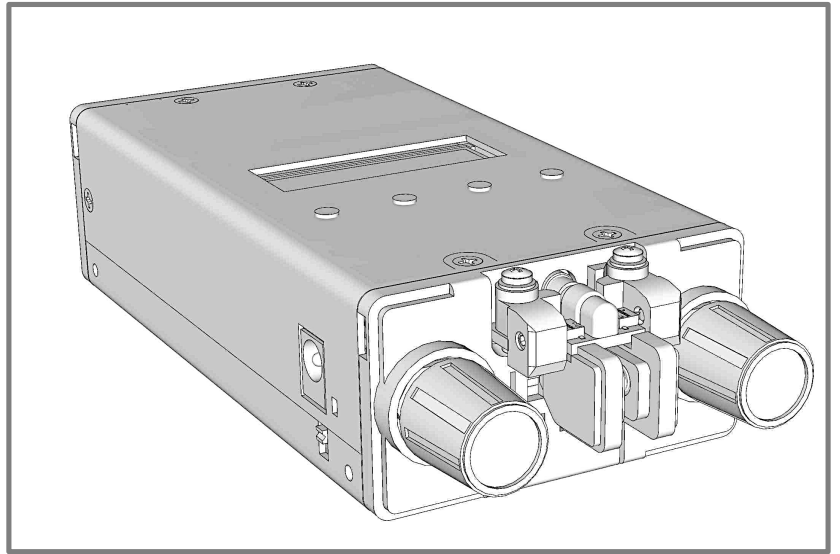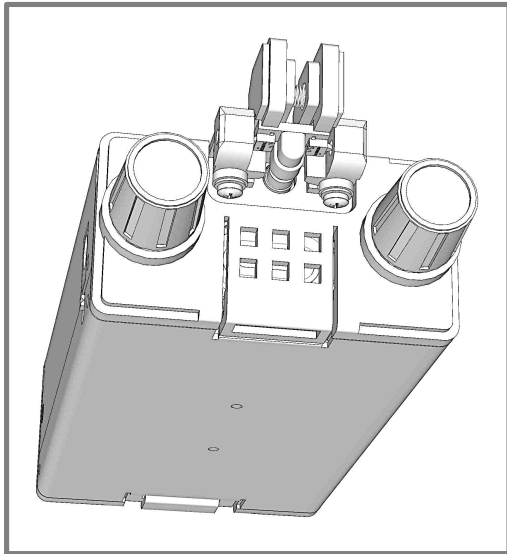
KEYER PADDLE HEX WRENCH

[ ]   Snap the hex wrench used for adjusting keyer paddle spacing into its clip in the plastic bottom panel. In this drawing, the DC Input (or charger) module has been removed to more clearly show the hex wrench (arrow).
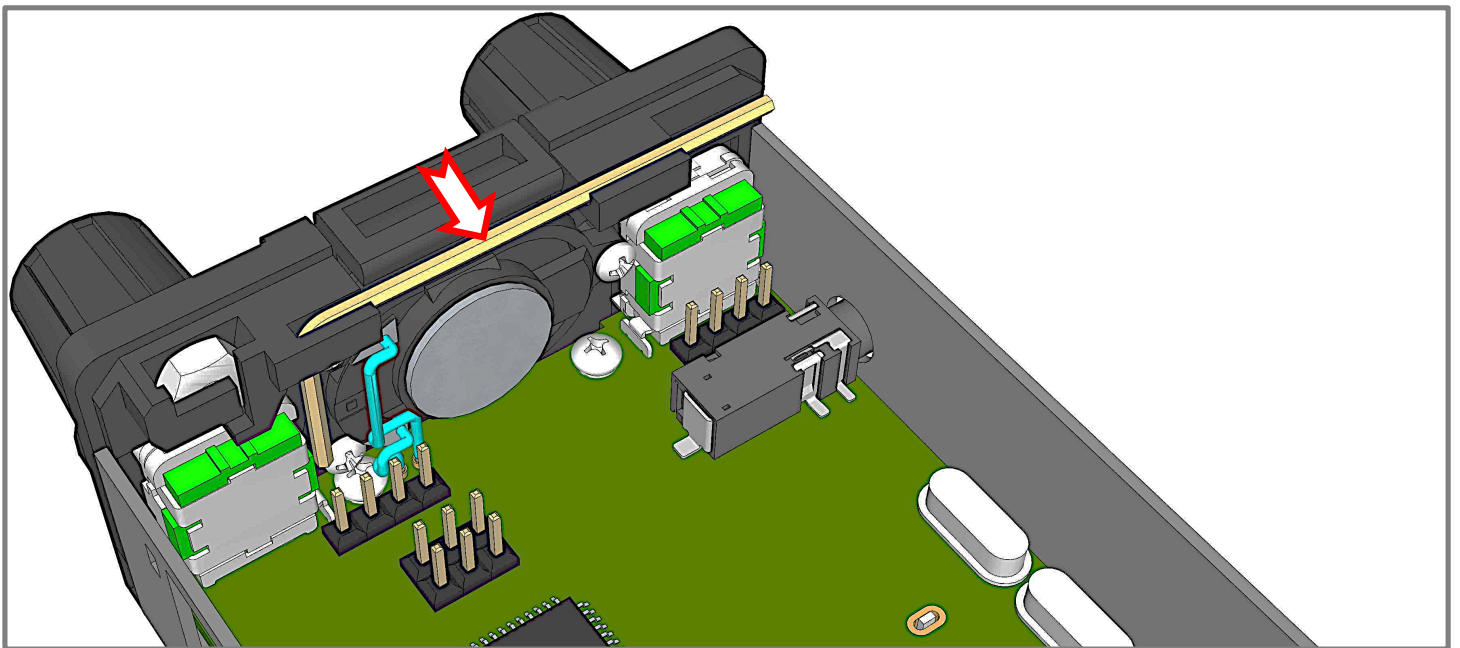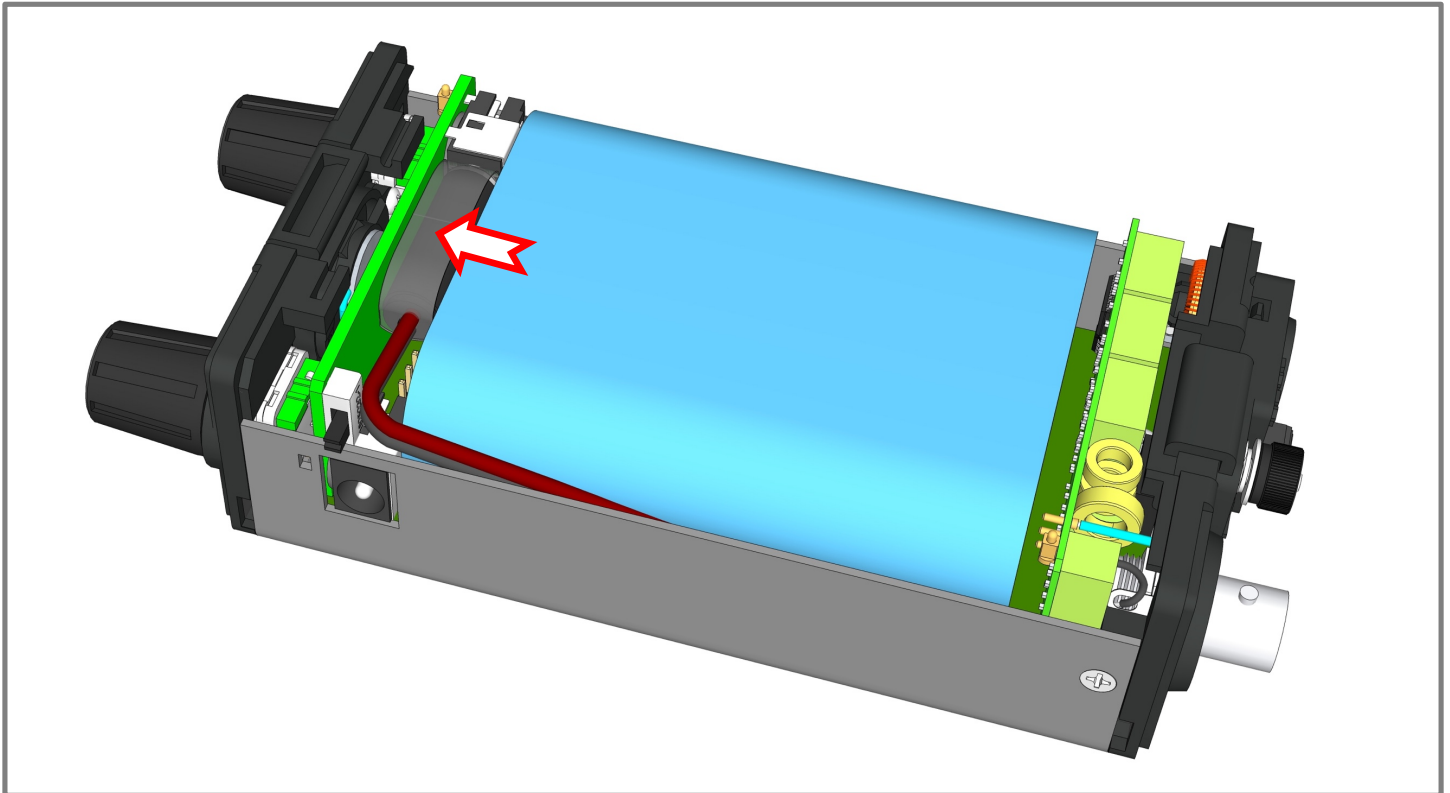
■ KXBT2 BATTERY PACK

[ ] Open the KH1's back panel using the sliding thumb latch. Plug the battery pack into the internal DC jack. **Make sure the plug is inserted all the way up to its shoulder.**

[ ]   Place the battery into position, then press the excess wire approximately as shown below.

⚠️   **When unplugging the battery, always use the plastic pull tab (arrow). DO NOT PULL ON THE WIRES.**

[ ]   Close the back panel and secure it using the thumb latch, which is on the edge of the bottom panel, between the two knobs. Be sure that the battery wires are not pinched by the panel.

* * *

This completes KH1 kit assembly. Please refer to the KH1 Owner's manual for operating instructions.