# Designing the Elecraft KH1: From Vision to Reality

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# Special thanks to:

Rob Capon, W3DX (field operations)

Fred, KT5X (SOTA logging concepts)

Steve, WG0AT (field testing)

Rich Heineck, AC7MA (KH1 PCBs)

"**If** there is a place, and you can get to it, you must **operate** from there."

*Adrian Weiss, W0RSP*

# THE INVISIBLE ~~RIG~~ STATION:

- INTEGRATION
- MINIATURIZATION
- ALL-TERRAIN UI
- FIELD LOGGING
- ANTENNAS

# COUNTEREXAMPLES

The following collections of portable gear show what is often taken on a field outing.

(The objective of the KH1 is to eliminate 90% of it. The result is a pocket-sized, 5-band CW station with ATU, battery, whip, paddle and folding log tray.)


QRP Labs QCX-mini CW Transceiver
Bioenno Powers 8V 3AH
12 OZ CHEMI

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# CW HTs

# Why hand-held? There isn't always a place to sit:

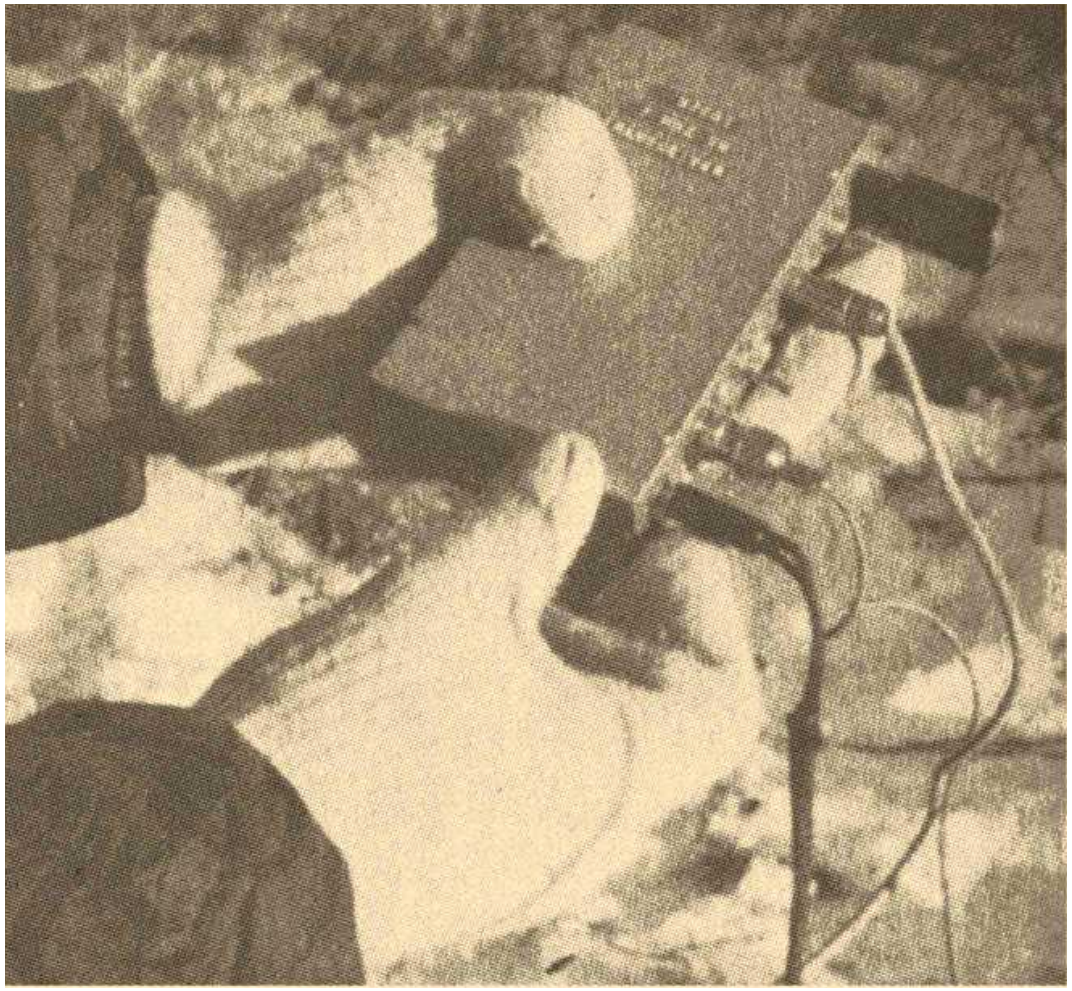
- Ants, spiders, ticks
- Puddles, mud, snow
- Tall weeds and thorns
- Sharp rocks

# Why CW?

- High S/N ratio vs. SSB
- Used for majority of HF SOTA contacts; popular for POTA
- Vs. data modes: simpler UI
  – and no computer needed

# CW HTs

The following slides show examples of CW HTs that provided inspiration for the refinements embodied in the KH1.



# Micro-Mountaineer, W7ZOI, 1970

40 m, 0.5 watts, pushbutton key, crystal control

# Koala, N6KR, 1995

40 m, 0.5 watts, alkaline 9V x2, keyer, VCXO


# Elecraft KX1, 2003


# KX1

40/20 m

Up to 4 watts

Angled paddle

DDS synthesizer

Narrow-range ATU

# Elecraft KX2, 2016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# KX2: 1.5 x 2.8 x 5.8”
# 22 oz. with battery

80-10 m + SWL, SDR
All modes
2.6 Ah battery/charger
Wide-range ATU
Built-in Mic
Side-mounted paddle

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# KX2 in Action, Sierra Buttes

# KH1

(H = Hand-Held)


# KH1 Form-Factor:

HT size & weight

Paddle plugs in between knobs


# 1.2 x 2.3 x 4.4”
# 12 oz. with battery

- 40/30/20/17/15 m + SWL
- Low-current superhet
- CW (+SSB cross-mode)
- 2.6 Ah battery / charger
- Medium-range ATU
- Bottom-mounted paddle
- Built-in whip loading coil

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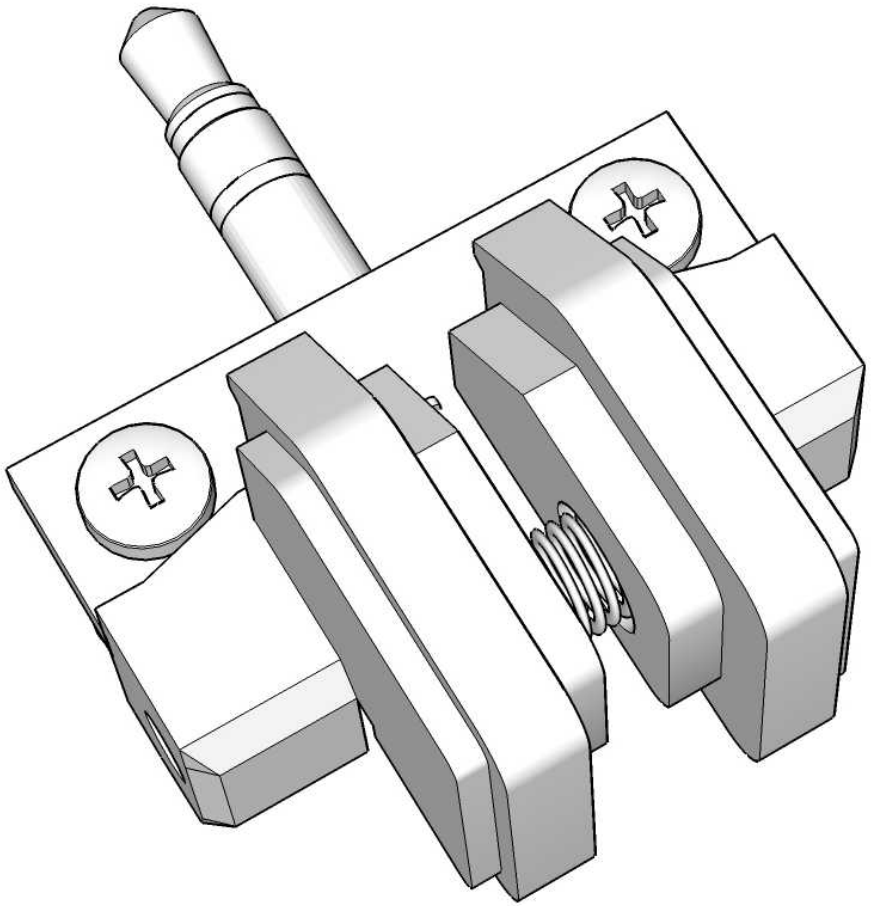
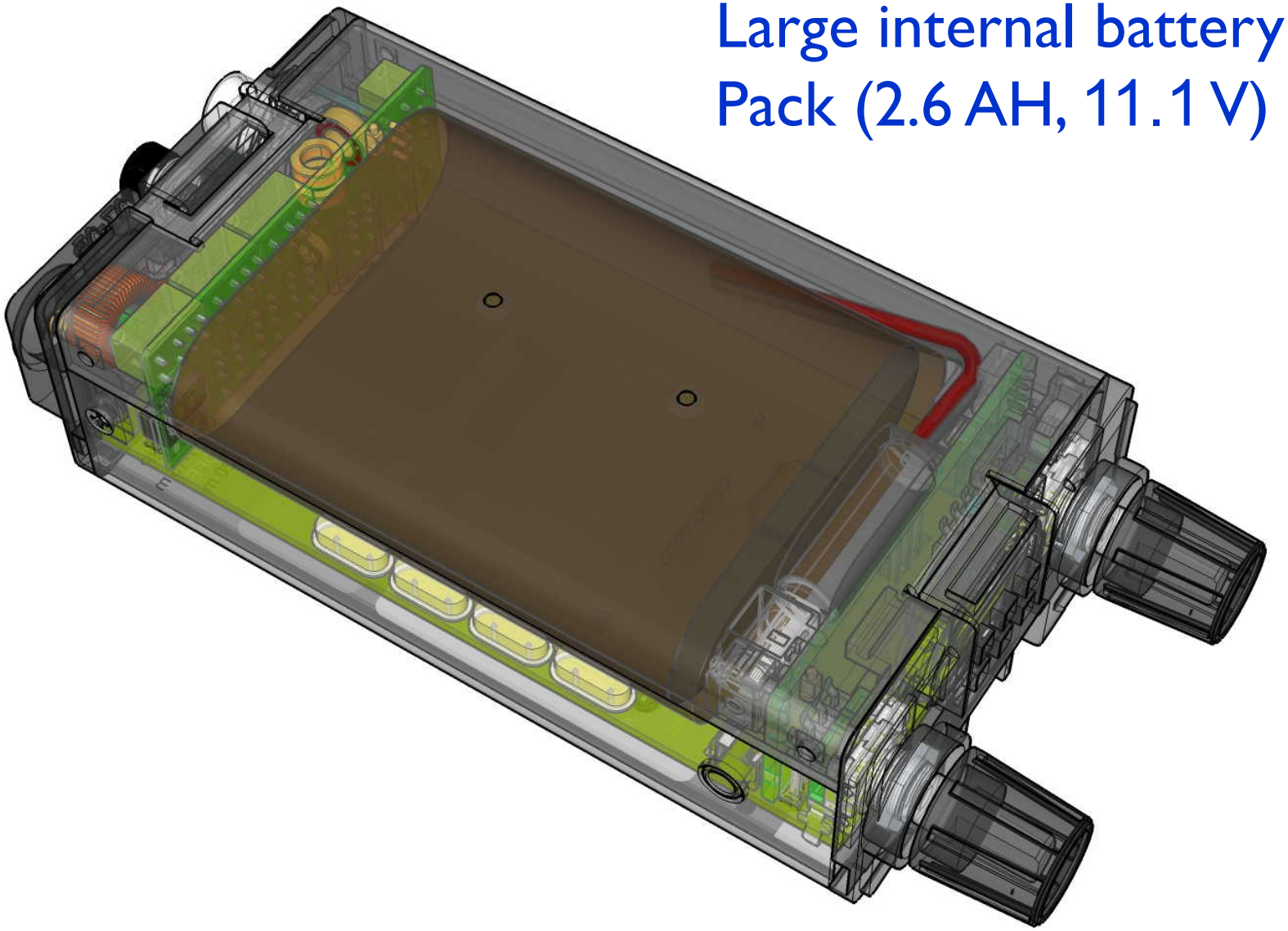


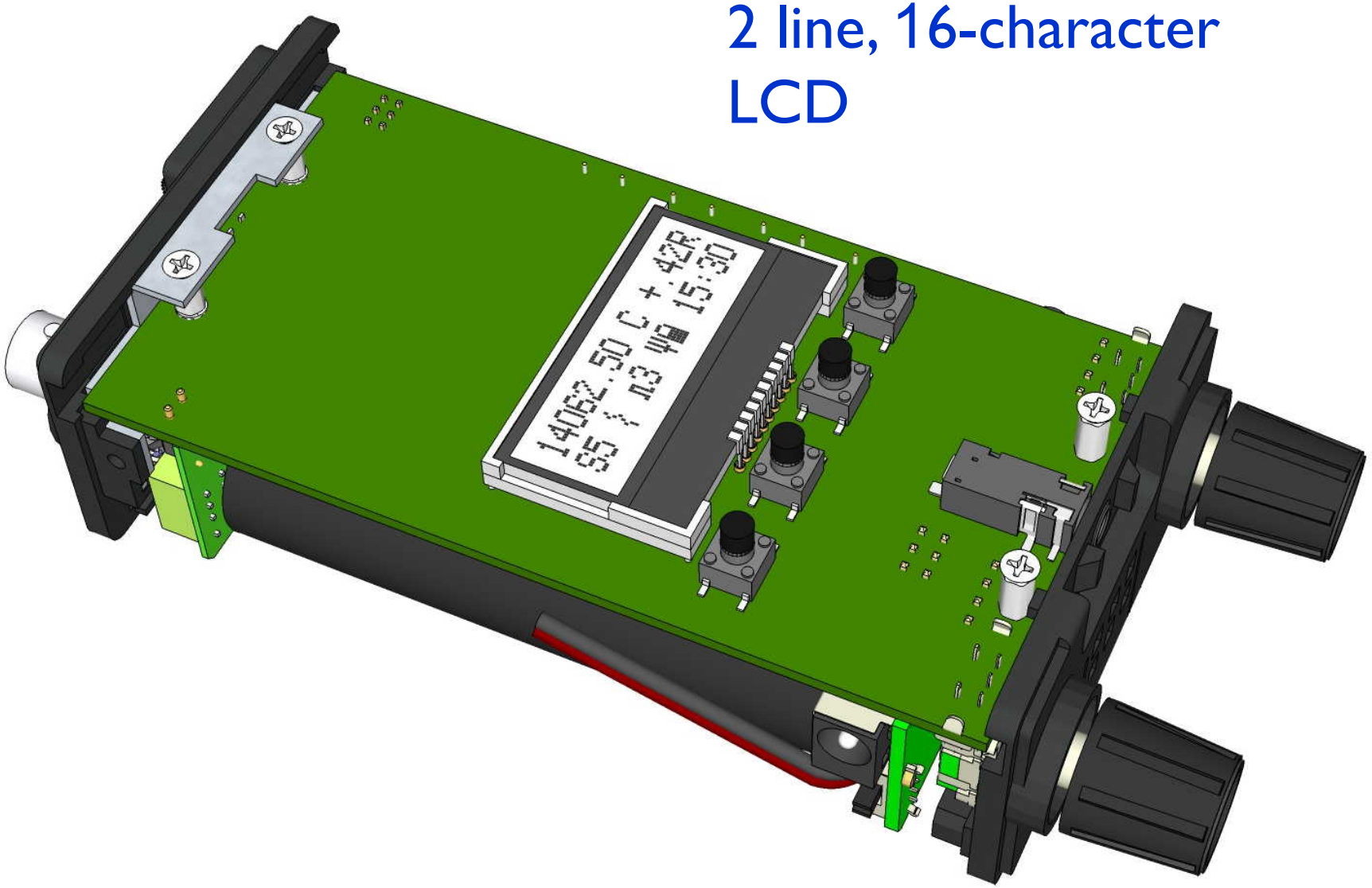
# Plug-in keyer paddle

- Ultralight
- Flips down for storage/transport
- Adjustable contact spacing & stop distance

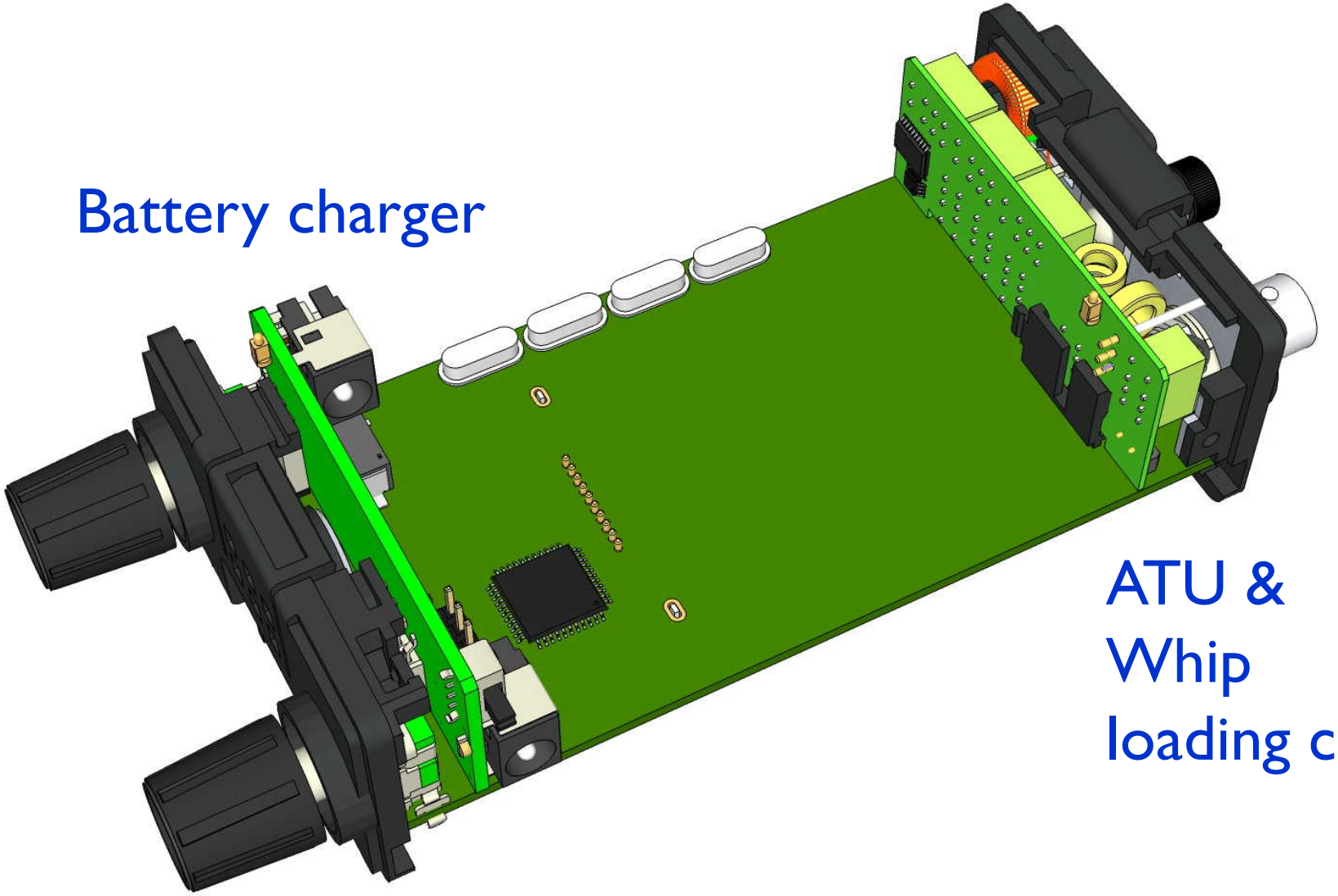
Large internal battery Pack (2.6 AH, 11.1 V)



# 2 line, 16-character LCD



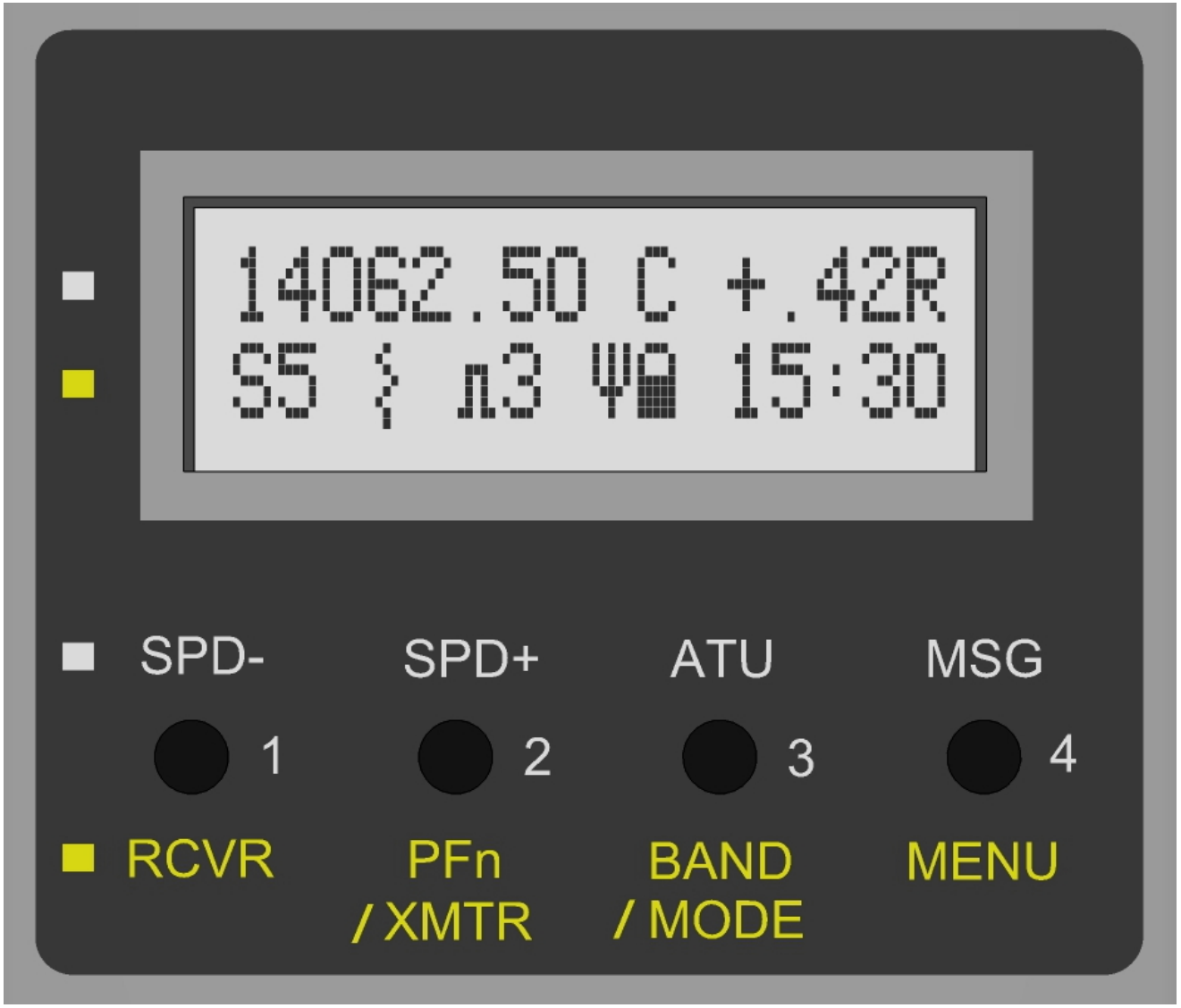
Battery charger



ATU &
Whip
loading coil

# FEATURES FOR FIELD OPS:

- Quick keyer speed change
- 6 messages; 50Kb log (EEPROM)
- Speaker or phones
- Scan/mini-pan for signal searching
- RIT and XIT




Close-up of normal operating display

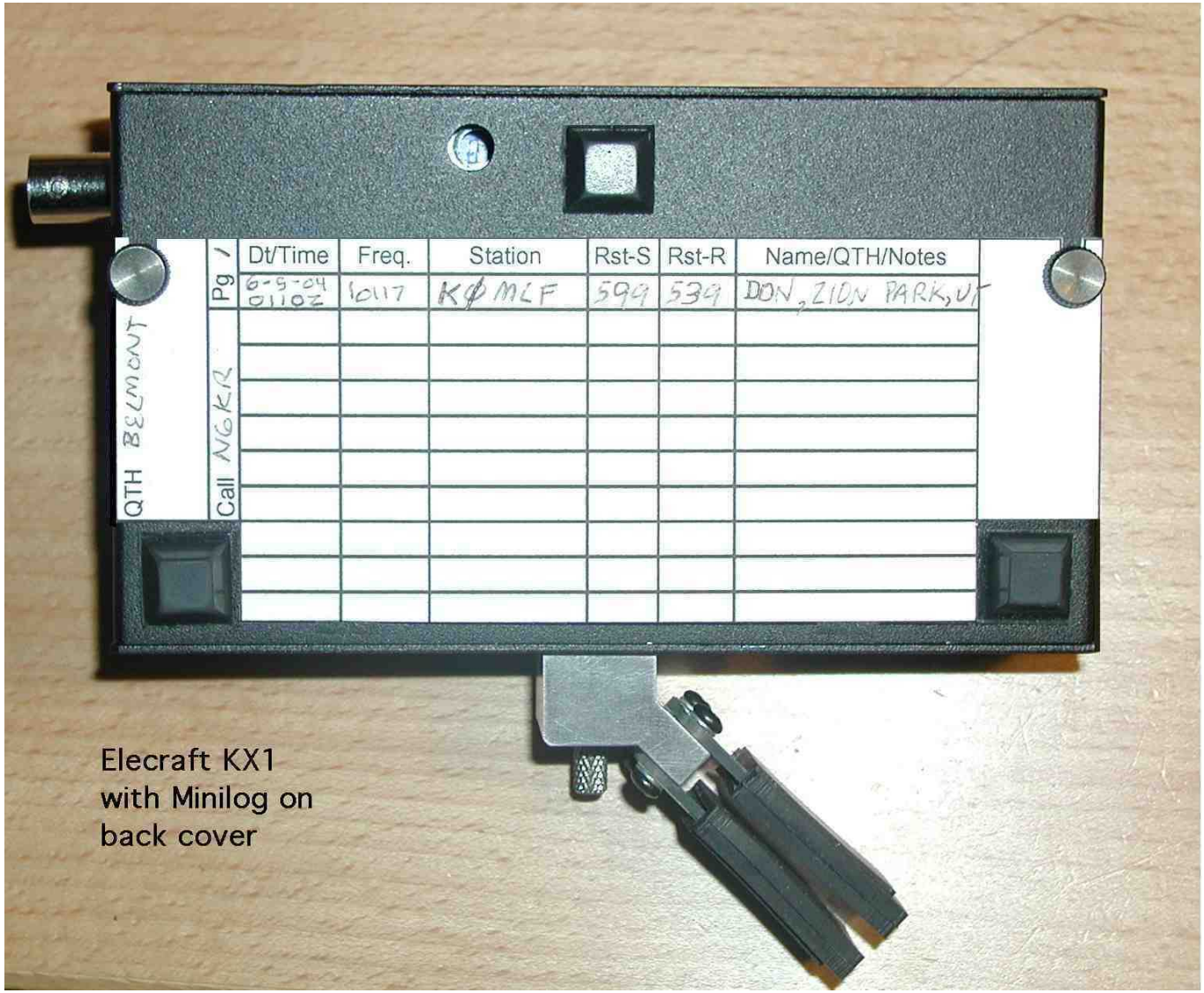
4-switch UI is intuitive, easy to use

# LOGGING

Portable/SOTA operators have created many clever schemes for paper logging.

A major KH1 design goal was to optimize the paper log for small size and easy of use. A real-time clock and electronic logging (to EEPROM) are also provided.

# Log sheets on back side of KX1




Elecraft KX1 with Minilog on back cover

# Very early KH1 logging concept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# Another logging idea, lacking in elegance


# Log tray:

120 QSOs

Mini-pen

+RTC, CW Decoder, & large EEPROM

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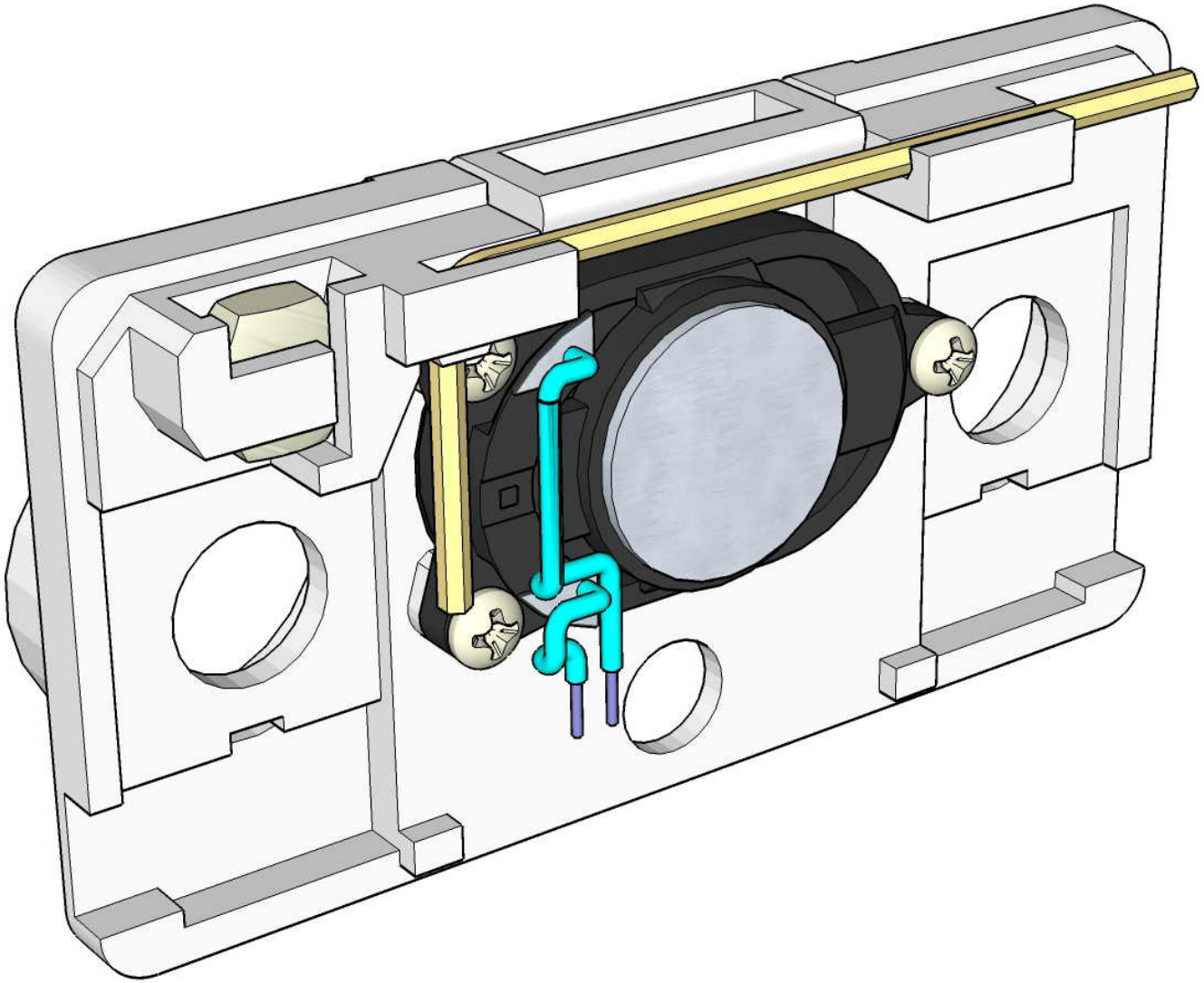
Log tray stored:

Protects front panel

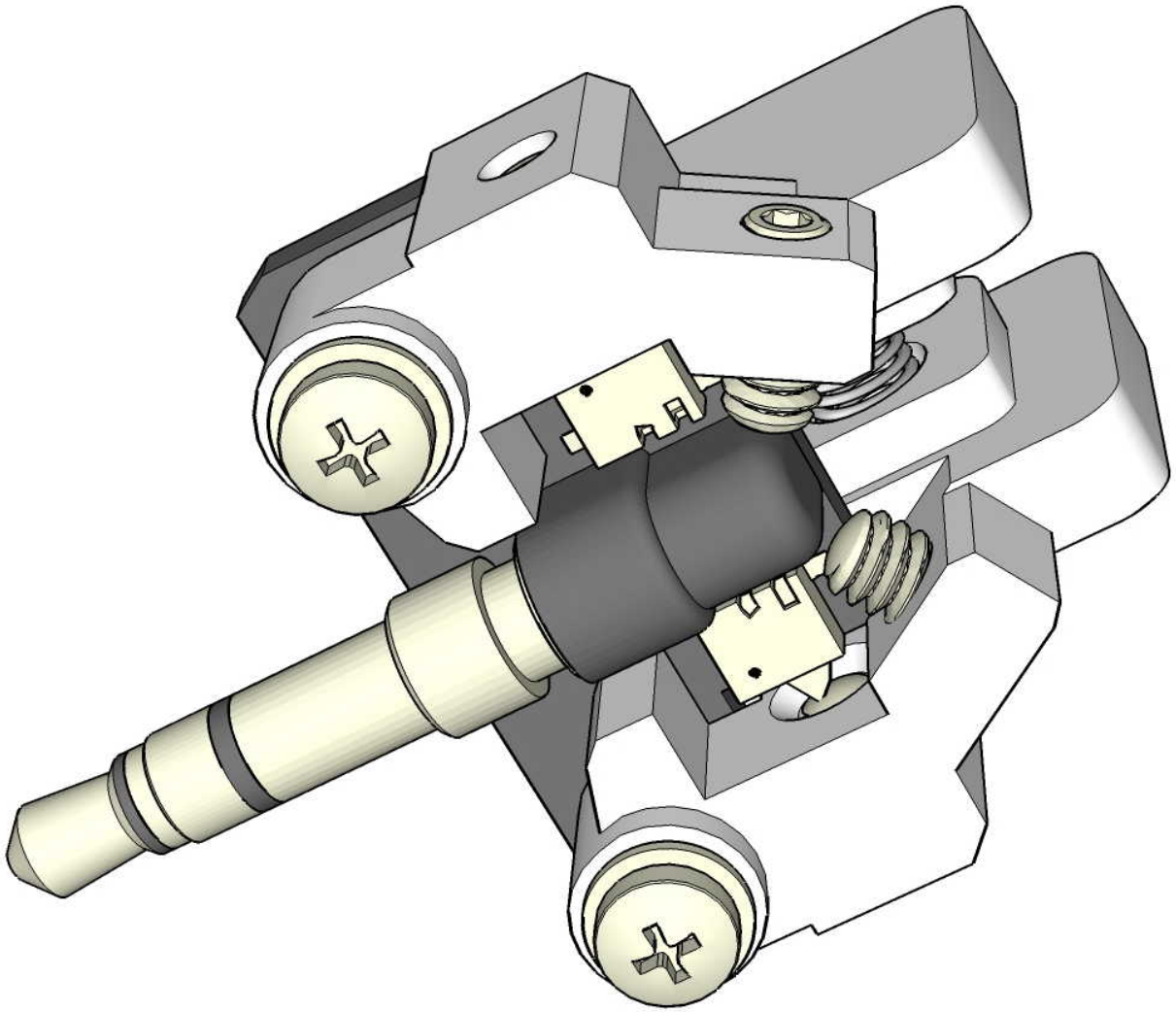
Operation still possible

# 3D MODELING / PRINTING



Most KH1 3D-printed parts serve multiple functions

The lower end panel holds the speaker, paddle wrench, and spare ground nut



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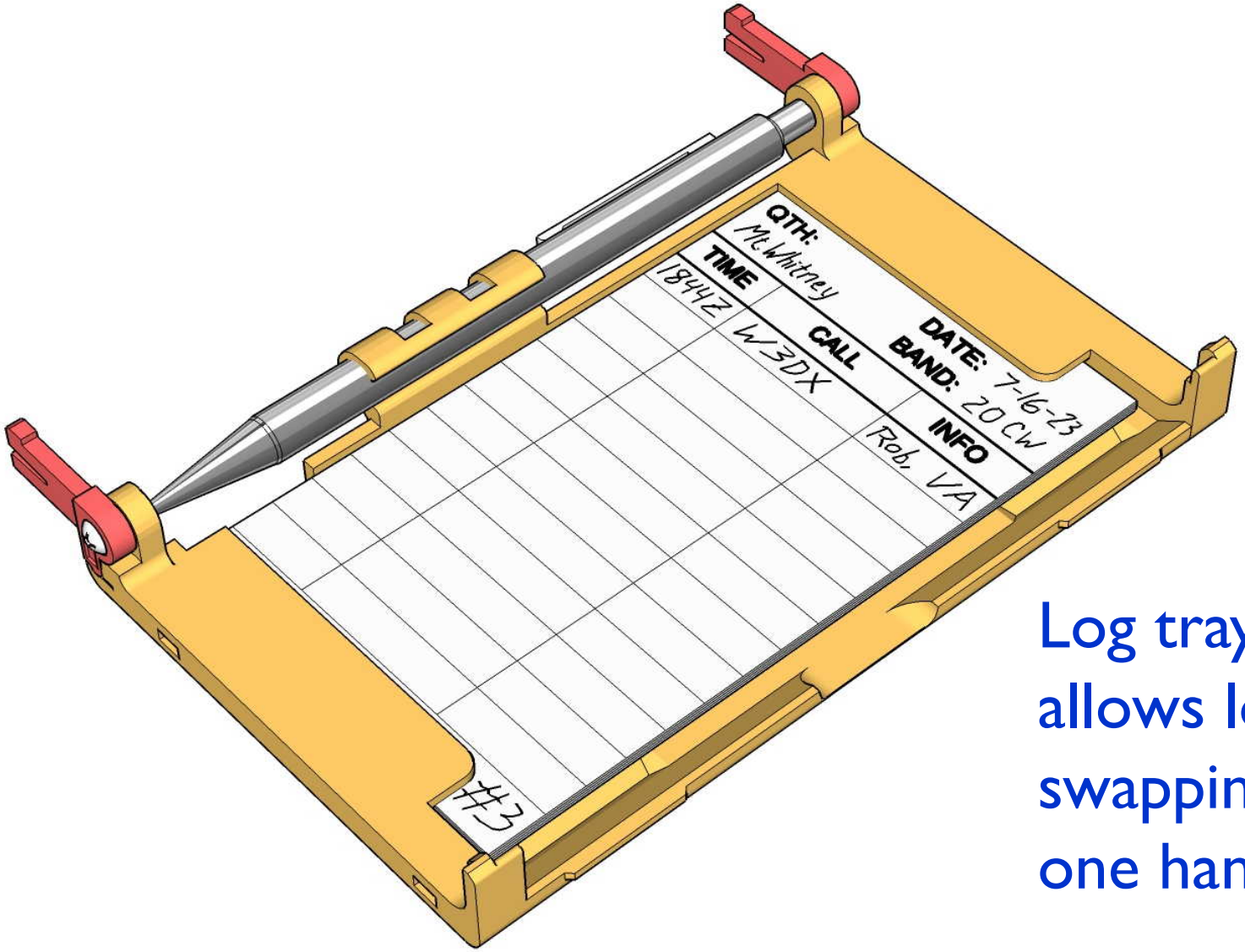
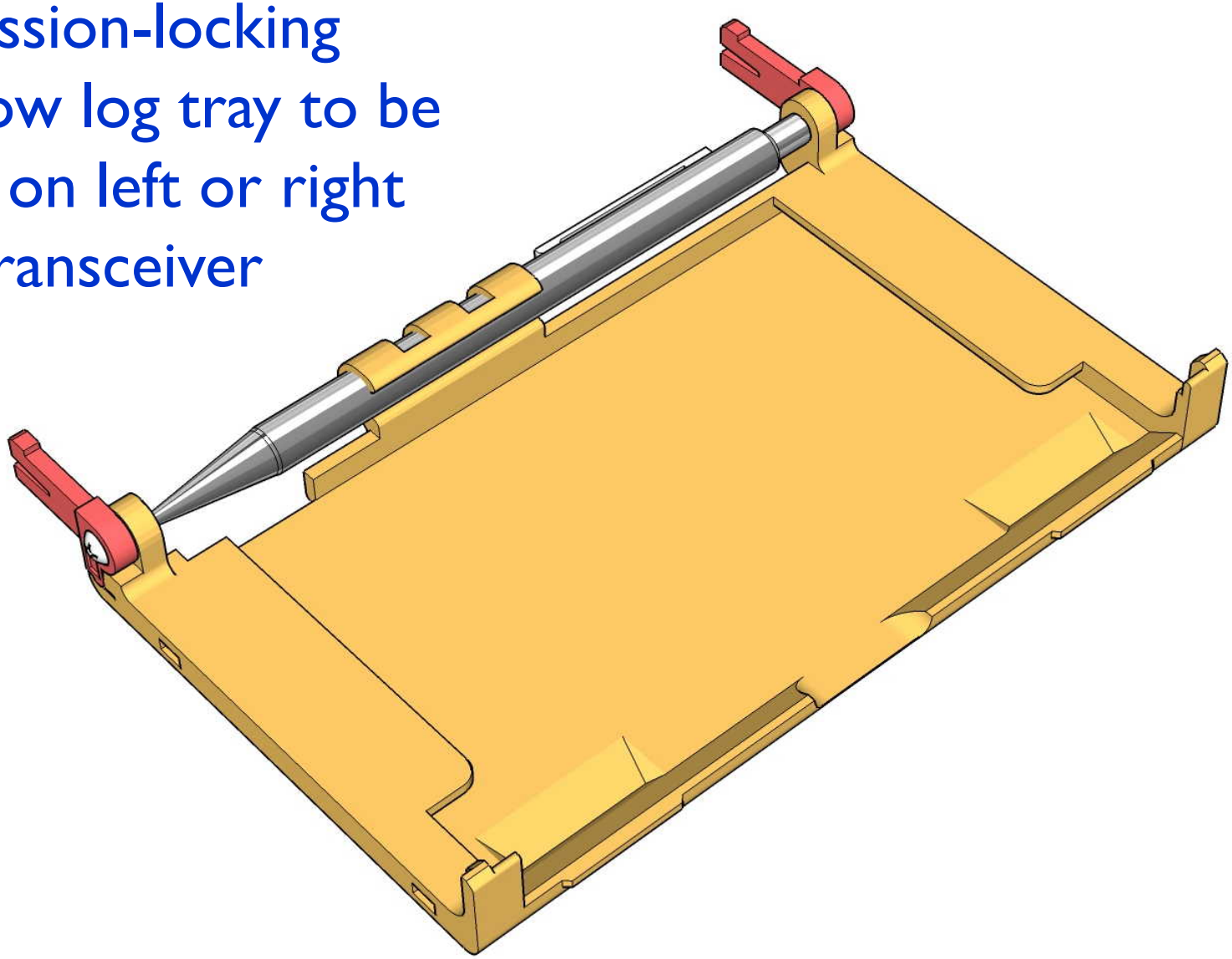



Log tray design allows log sheet swapping with one hand

Compression-locking arms allow log tray to be installed on left or right side of transceiver




ES20 custom carrying case – also designed using 3D modeling

# ANTENNAS

Many portable antenna solutions are possible, as illustrated by the following images.

The KH1 works with BNC-fitted whips or other conventional antennas. But it also has a built-in loading coil covering 20/17/15 meters with a 48" ultralight telescoping whip that collapses to only 6". The whip can be clipped to the side of the radio during transport.

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# Elecraft BNC-fitted whips

< AX1

< AX2


# KX2 with AX1 20/17 m whip

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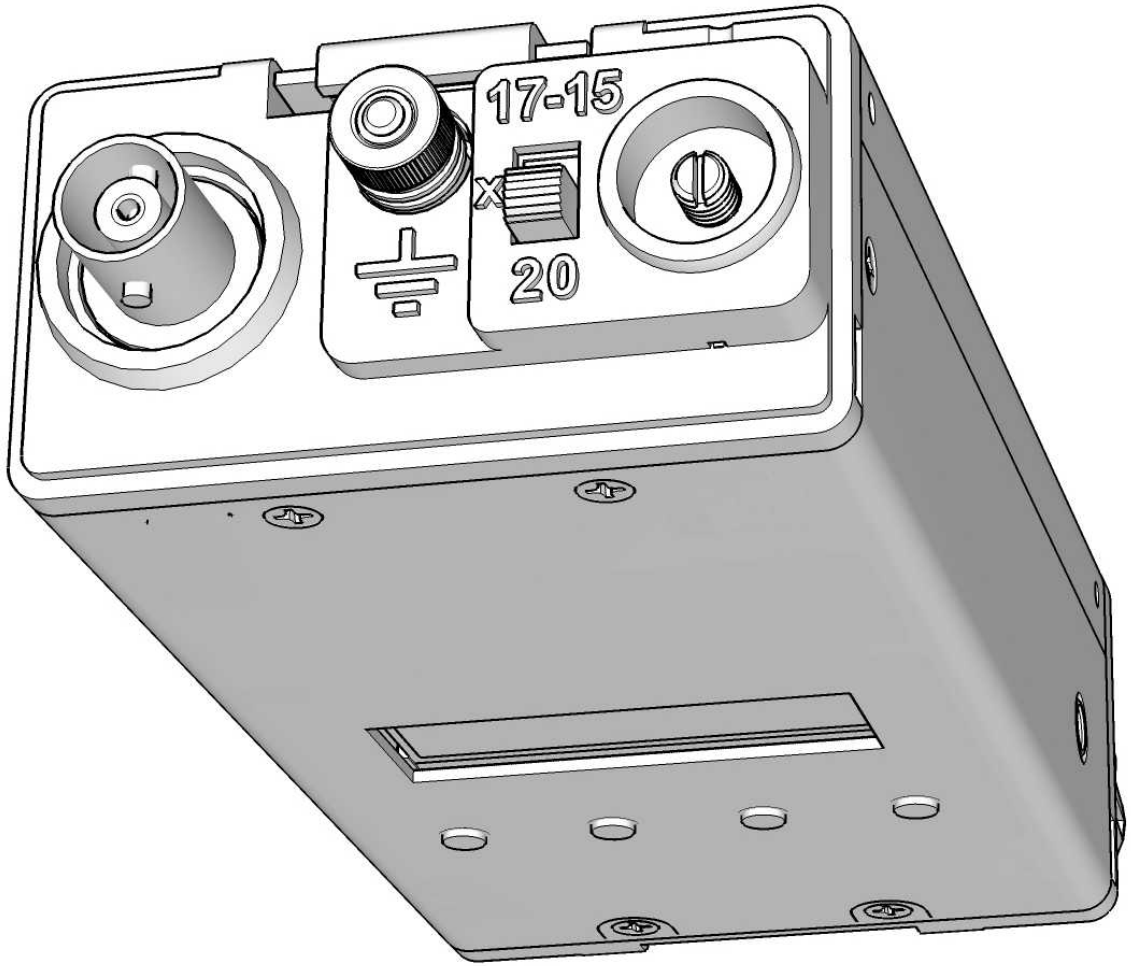
2 Ant. connectors:
BNC & whip post

Built-in loading coil
for 20/17/15 m

ATU works with
BNC and whip

Whip clips to side

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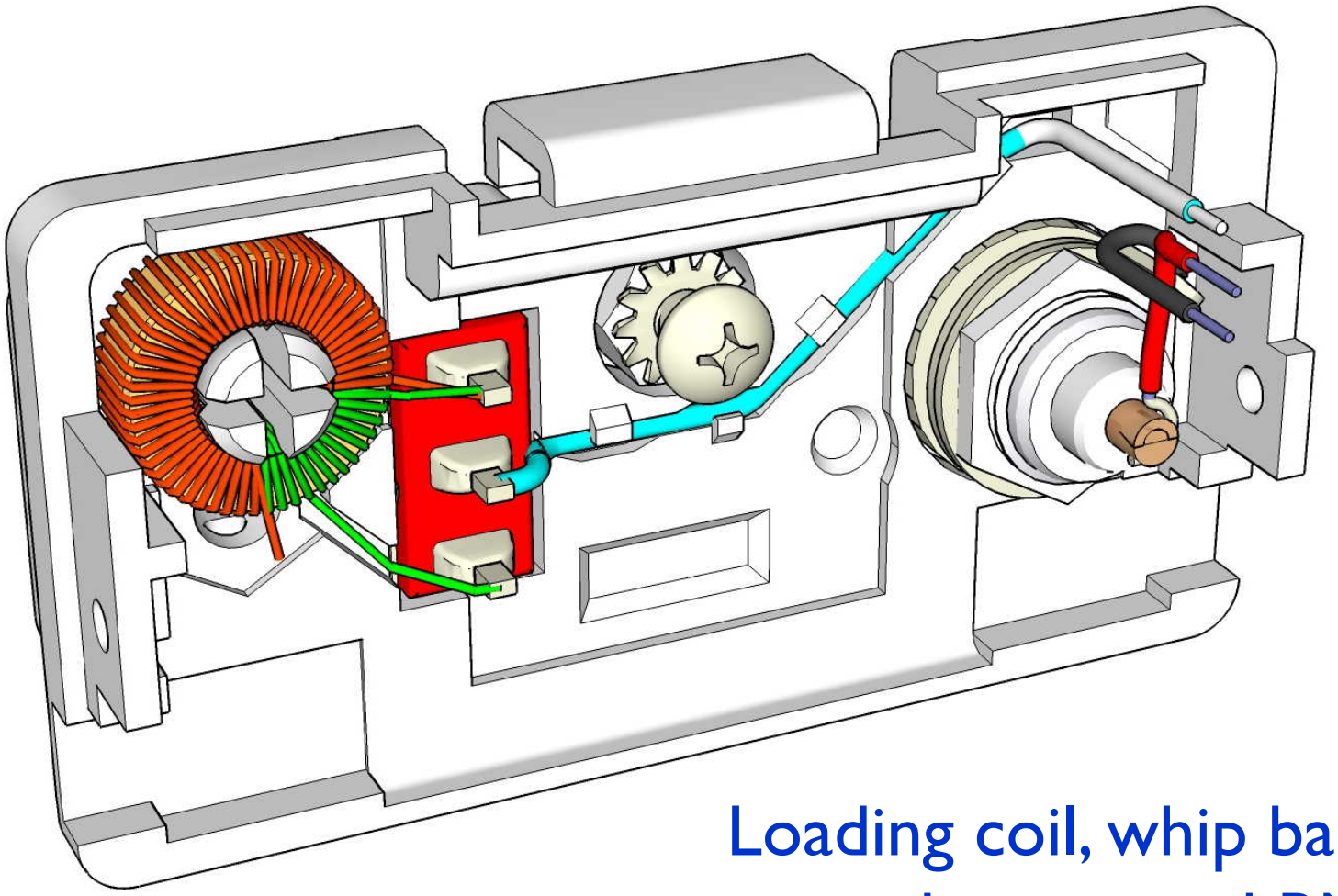
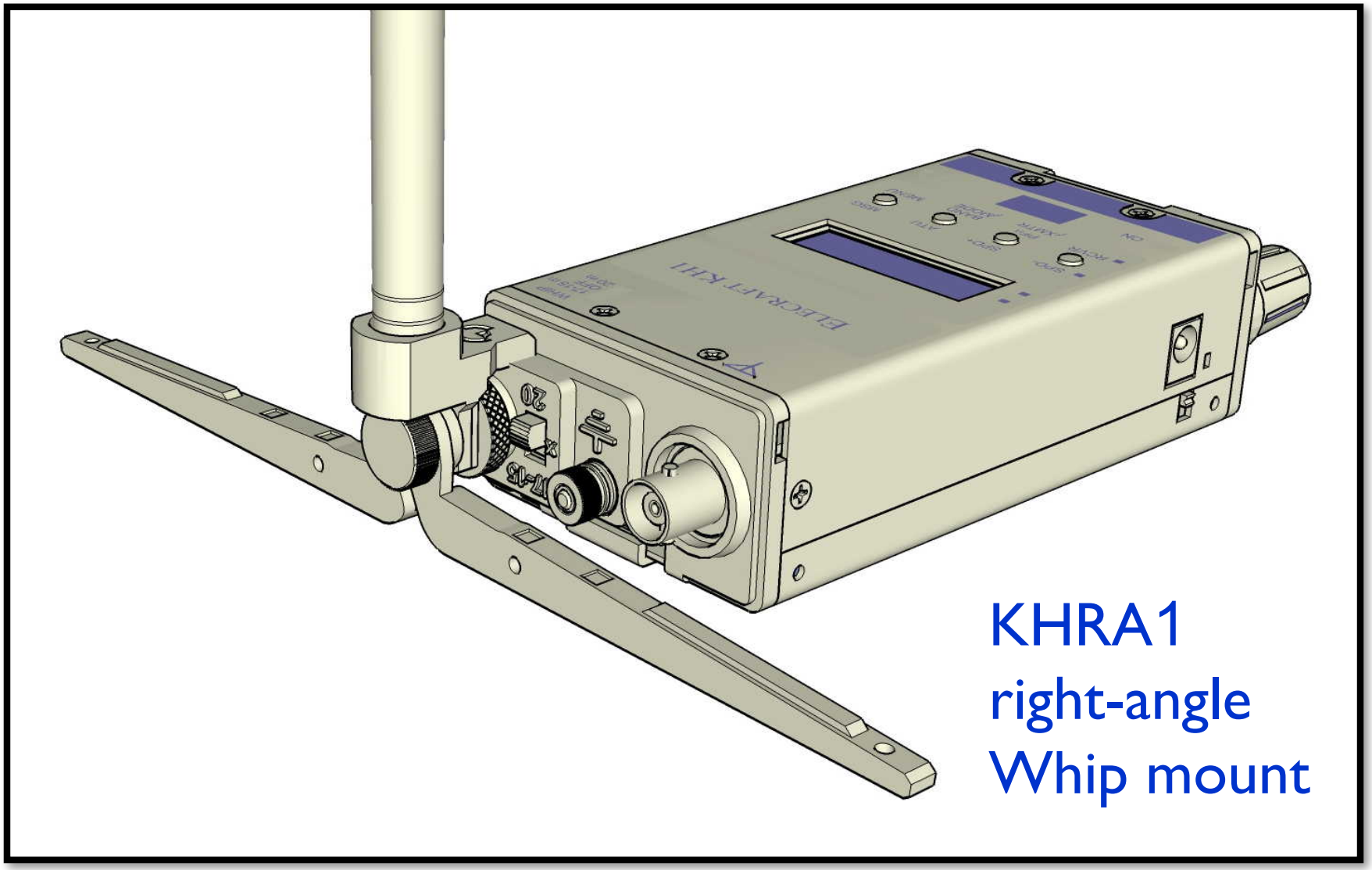


Loading coil, whip band switch, ground screw, and BNC

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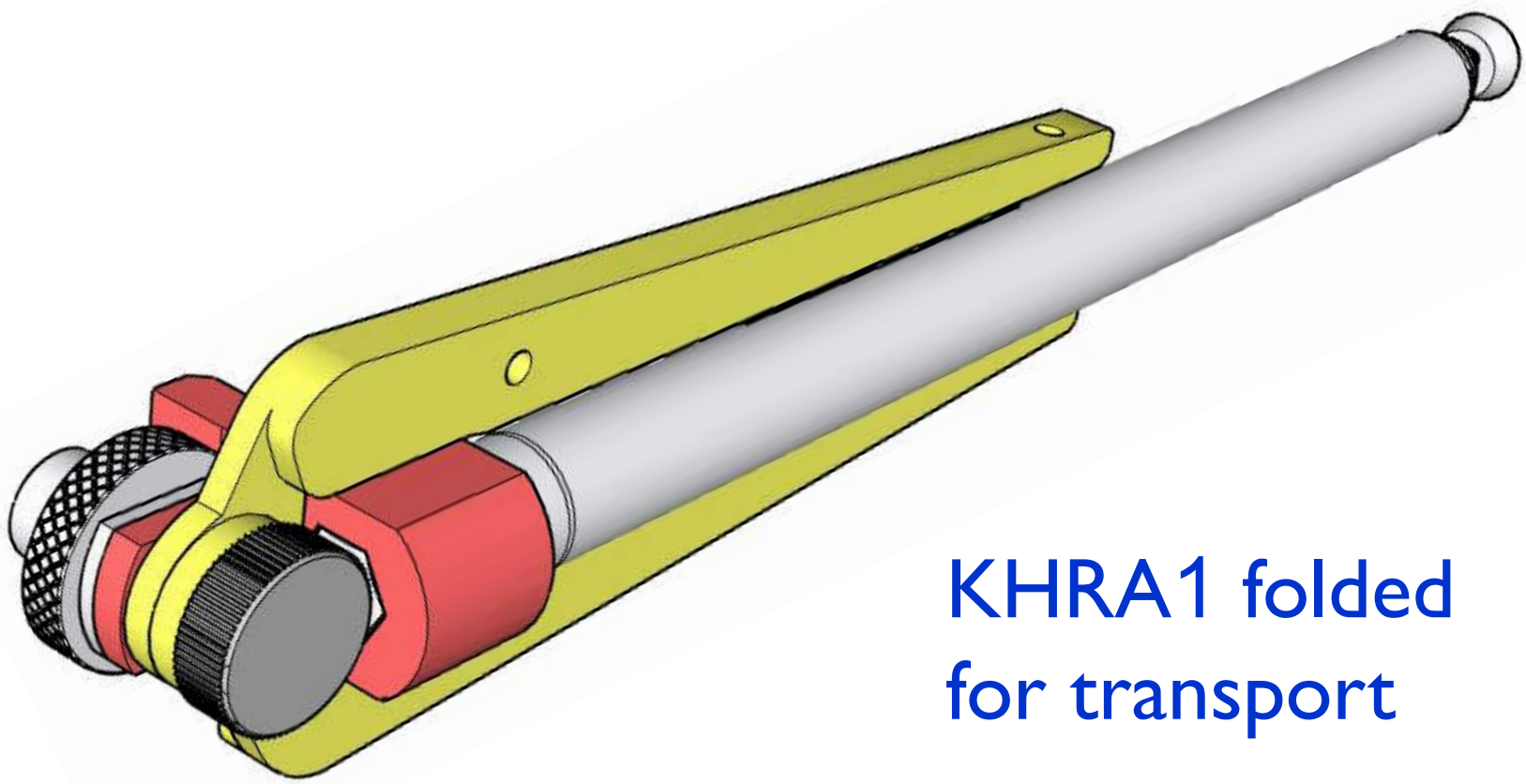

KHRA1 folded
for transport

# Making contacts with a whip:

- Always use a counterpoise wire
- Work louder stations first
- Take advantage of contests (CWT, WPX, CQ DX, ARRL DX, etc.)

# Steve (WG0AT), Santa Cruz with early production KH1