VINTAGE HF IRON

KENWOOD HYBRIDS

The tube-final transceivers that just keep working. TS-520 to TS-830S.



Mark Earnest KB3LYB

NHARC Meeting // 2026

AGENDA

01	THE STORY	What a 'hybrid' is, and why it mattered
02	THE FAMILY	Six models, TS-520 to TS-830S
03	UNDER THE HOOD	Receiver, transmitter, and the tube finals
04	THE LOST ART	Tuning a final, and the safety net
05	KEEPING ONE GOING	How they fail, and how to fix them
06	STILL ON THE AIR	Digital modes, buying one, the community

CATCHING THEM ALL

How a blurb in a 1990s study guide turned into a shelf full of tube rigs.

1990s The ARRL novice guide plants the seed.

2005 First rig: a TS-820S, new General in hand.

2022 A dead TS-530S off eBay, fully restored.

2025 A TS-830S rescued at the Butler Hamfest.

2026 Two TS-520s home from the Dayton Hamvention.



My shack: four generations of hybrids (and the keyboard that logs them).

Two TS-520 | TS-530S | TS-820S | TS-830S

The collection so far. It started with one paragraph in a study guide — send help.

WHAT 'HYBRID' MEANS

Kenwood's answer to a transitional moment (1973–1985): modern solid-state electronics, but the finals still glowed.

SOLID-STATE FRONT END

Transistors and early ICs run the receiver, VFO, driver, and control circuits. Reliable, cool-running, and sensitive.

TUBE FINALS

The power amplifier stayed vacuum tubes: a pair of 6146B / S2001 beam tetrodes putting out a clean 100 watts.

WHY BOTH?

In 1973 nobody could cheaply build a rugged solid-state 100W HF amp. Tubes were forgiving and shrugged off bad SWR.

THE SWEET SPOT

A modern, easy radio with a tube final's tolerance for abuse and an antenna-matching pi-network built right in.

WHY THEY MATTERED

The TS-520 set the template every manufacturer chased, and the line earned a 50-year reputation.

SET THE STANDARD

Self-contained, sophisticated, easy to tune and operate. The TS-520 defined what a compact SSB station should be.

BUILT TO LAST

Kenwood ran the finals conservatively for long life instead of chasing headline power. Many still have their original tubes.

A GREAT RECEIVER

Stable VFO, a real noise blanker, that distinctive 'Kenwood sound.' The 830S receiver is still rated among their best ever.

FIXABLE FOREVER

Through-hole parts, printed manuals, an active parts supply, and a design simple enough to actually repair on the bench.

THE FAMILY: SIX MAJOR MODELS

Roughly a decade of hybrids, each a step up from the last.

TS-520	**1973**	The original. Dual-conversion Rx, 100W, the standard-setter.
TS-520S	**1976**	Adds 160m and phone-patch jacks (handy for soundcard digital today).
TS-820	**1976**	IF shift, 160m, and an optional internal digital display.
TS-820S	**1977**	IF shift + built-in digital readout + FSK. The heavyweight.
TS-530S	**1981**	Quieter single-conversion Rx, WARC bands, smaller and lighter.
TS-830S	**1981**	VBT, IF notch, XIT. The finest receiver of the line, the culmination.

TS-520: THE ORIGINAL

The one that started it all (1973), and to many purists, still the finest.



HIGHLIGHTS

> Dual-conversion receiver, stable VFO, real noise blanker, 25 kHz calibrator
> 100W+ out from a pair of S2001 finals
> Optional DG-5 digital display via the DK-5 adapter
> Purists' favorite: the first and, to many, the best of the breed

1973 | S2001 finals | ~100W | Dual-conversion Rx

The template every SSB transceiver that followed was measured against.

TS-820S: THE HEAVYWEIGHT

The full 1970s Kenwood experience, and a boat-anchor lover's boat anchor.



HIGHLIGHTS

> IF shift, 160m coverage, and a built-in digital frequency readout
> Added FSK to the mode switch, plus an RF speech processor
> Analog dial AND digital readout: the best of both worlds
> Possibly the heaviest rig Kenwood ever made, with a superb receiver

1977 | 6146B finals | ~100W | IF shift + digital

If you want the full vintage Kenwood experience in one box, this is it.

TS-530S: THE MODERN ONE

Smaller, quieter, and WARC-capable, but it kept all the knobs.



HIGHLIGHTS

> Quieter single-conversion receiver with the WARC bands added
> IF shift (borrowed from the 820S) and DIN-style rear connectors
> Smaller and lighter than the 520 / 820 series
> Still has all those handy knobs, not a menu or toothpick button in sight

1981 | 6146B finals | ~100W | Single-conversion + WARC

A great-sounding, easy rig with the distinctive Kenwood quality.

TS-830S: THE PINNACLE

The culmination of everything the hybrids learned (1981).



HIGHLIGHTS

> Variable Bandwidth Tuning (VBT) and a tunable IF notch that really works
> XIT in addition to RIT, a tone control, improved speech processing
> A receiver many consider the finest Kenwood ever built
> The one people cross-shop against every rig that came after

1981 | 6146B finals | ~100W | VBT + IF notch

If you buy one hybrid to keep forever, this is the usual answer.

UNDER THE HOOD: THE RECEIVER

A superheterodyne built when analog engineering was at its peak.

STABLE ANALOG VFO

A mechanically and thermally stable VFO you can leave on frequency for hours. No birdies, no menus, no drift.

THE 'KENWOOD SOUND'

Clean AGC, a genuinely effective noise blanker, and receive audio that people still praise 40 years on.

SINGLE vs DUAL

Early rigs used dual conversion; the 530S/830S refined it for a quieter band. All include a 25 kHz calibrator.

STILL COMPETITIVE

Out of the box, sensitivity and signal-to-noise rival almost anything built since. If it ain't broke...

UNDER THE HOOD: THE TRANSMITTER

Signal generation is all solid-state. Only the very last stage is a tube.

THE CHAIN

A gain-controlled generator makes CW/USB/LSB, a 12BY7A driver tube boosts it, and the finals amplify to 100W.

THE ALC SERVO

Borrowed from Collins: sense any final grid current and back off the drive to keep it near zero. Clean output, protected tubes.

READING THE METER

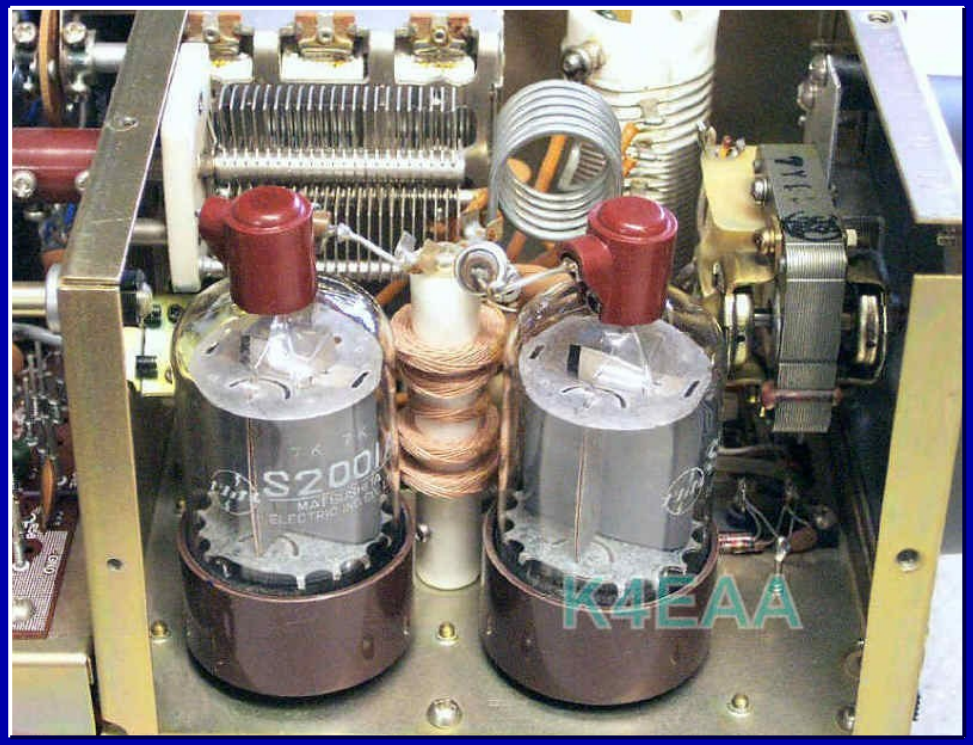
ALC, Ip, RF, and HV positions turn the front panel into a live diagnostic of the entire transmit chain.

THE 12BY7A DRIVER

When 10m drive goes weak, or falls off a few seconds into key-down, the driver tube is telling you it is tired.

THE TUBE FINALS

The heart of a hybrid: a pair of beam-tetrode finals in a pi-network.



HIGHLIGHTS

> Two 6146B (US) or S2001 (Matsushita) beam tetrodes in parallel
> About 800V on the plates, ~225mA, ~180W DC in for 100W out
> The PLATE and LOAD controls form a pi-network matching the tubes to 50 ohms
> Tubes shrug off mistuning and bad SWR that would fold back a solid-state rig

6146B / S2001 | ~800V plate | ~225mA Ip | 100W out

Run conservatively, a set of finals can last 35+ years.

THE LOST ART: TUNING A TUBE FINAL

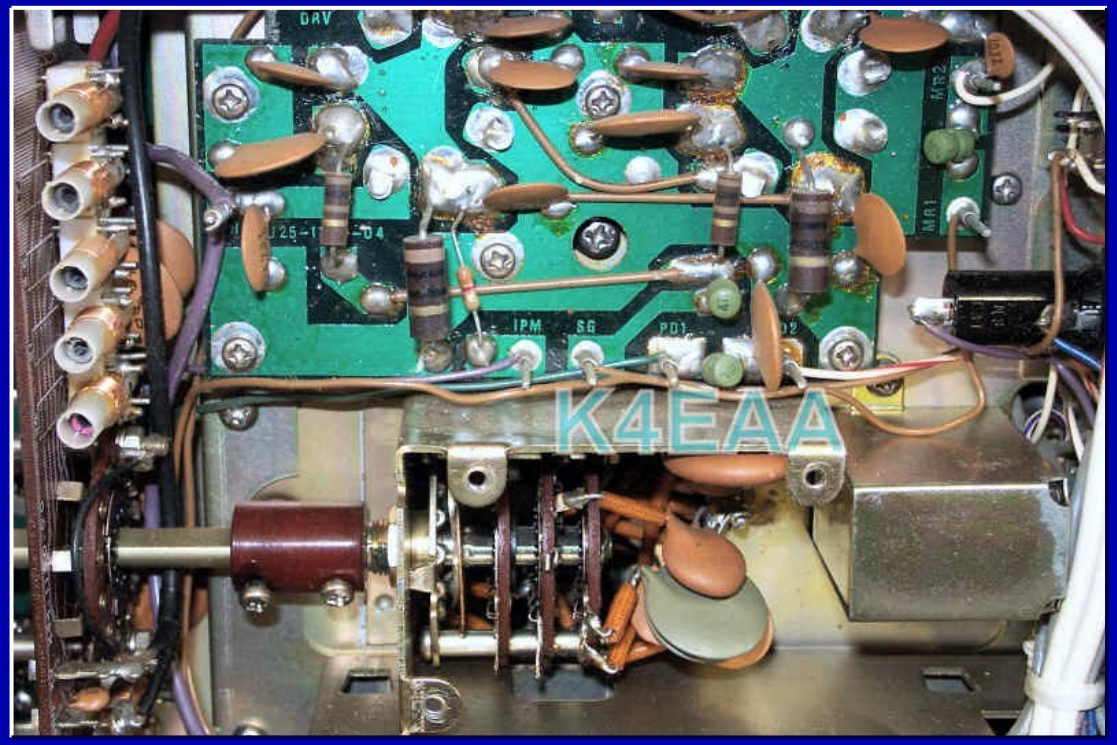
The skill every hybrid owner needs, and half the room has never done. It takes five seconds once you know it.

01	**START IN TUNE**	lowers screen voltage so a mis-tune can't hurt anything
02	**LOAD MIN, DIAL THE BAND**	set LOAD to minimum, band on the PLATE control
03	**PEAK DRIVE (meter=ALC)**	with the CAR control up about halfway
04	**DIP THE PLATE (meter=Ip)**	minimum plate current is maximum output
05	**CHASE 225 mA**	nudge LOAD up, re-dip PLATE, repeat until ~225mA
06	**DON'T PIN THE METER**	and don't hold key-down over ~5 seconds while learning

225 mA is the magic number: that's where the finals are matched to 50 ohms and making full, clean power.

THE GENIUS SAFETY NET

Kenwood's cleverest trick: cheap resistors that give up so the expensive parts don't.



HIGHLIGHTS

> The cathode and screen resistors are sized to blow before the finals or power transformer
> Mis-tune or overdrive the rig and a 25-cent resistor gives up, not a $200 transformer
> They have saved thousands of hybrids from the scrap heap
> Spot cooked ones: a high plate-current reading paired with low output power

Cathode: ~5 ohm | Screen: 100+470 ohm | Cheap & quick | Check these first

The first thing a tech checks tells you whether the rig has been abused.

HOW THEY FAIL (AND IT'S USUALLY CHEAP)

Forty-year-old radios break in predictable, mostly affordable ways.

CATHODE/SCREEN R's

The sacrificial fuses. High Ip plus low power means it's time for a resistor kit.

SOFT / GASSY TUBES

A broad dip, falling power, or a gassy NOS tube popping the cathode resistors.

L41 / L8 INPUT XFMR

Antenna input transformer shorts, often after a nearby strike. No longer made, must be rewound.

ANTENNA RELAY

Dirty contacts cause intermittent or noisy receive. Usually cleans up (the 530S relay is the exception).

BANDSWITCH / WAFERS

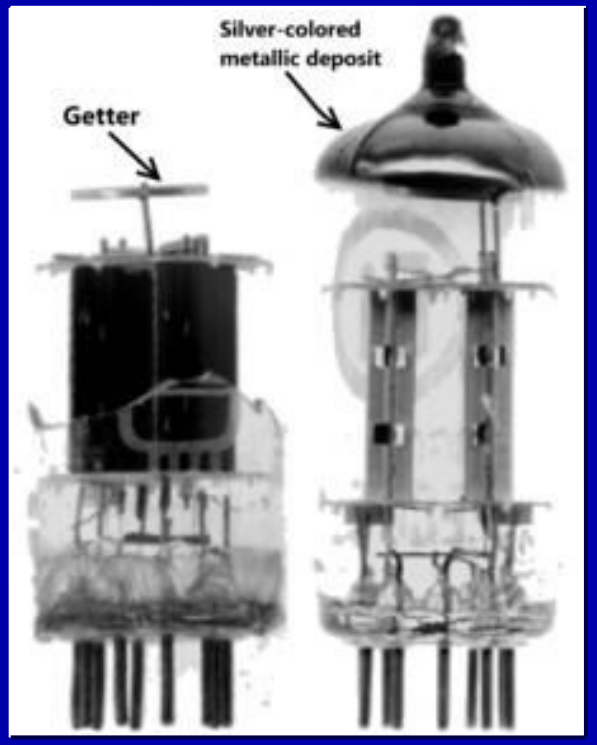
Dirty or worn wafer contacts and couplers, especially in the final cage.

UNSOLDERED JOINTS

Factory 'Monday-morning' joints that were never soldered and somehow worked for 35 years.

GASSY TUBES & THE GETTER

Buy a NOS tube that sat on a shelf since 1978 and it may test 'gassy.' Usually an easy fix.



HIGHLIGHTS

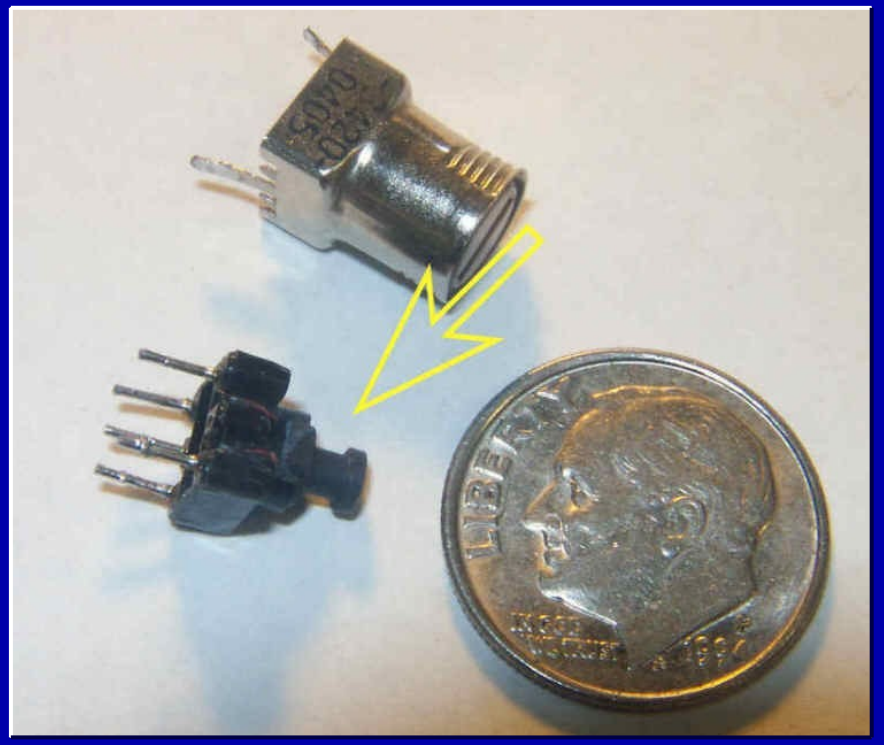
> Decades of sitting let trace gas accumulate inside the glass envelope
> That gas leaks grid current: a tube tester flags it, and the rig pops resistors
> The cure: run just the heater (finals' screen off) and let the getter re-absorb the gas
> The silver deposit on the glass is the getter doing its job

NOS = shelf gas | Heater-only cook | 5–30 minutes | No new tube needed

Don't toss a 'bad' NOS tube until you've let the getter do its work.

REWINDING THE UNOBTANIUM

Some parts simply aren't made anymore, so the community winds new ones by hand.



HIGHLIGHTS

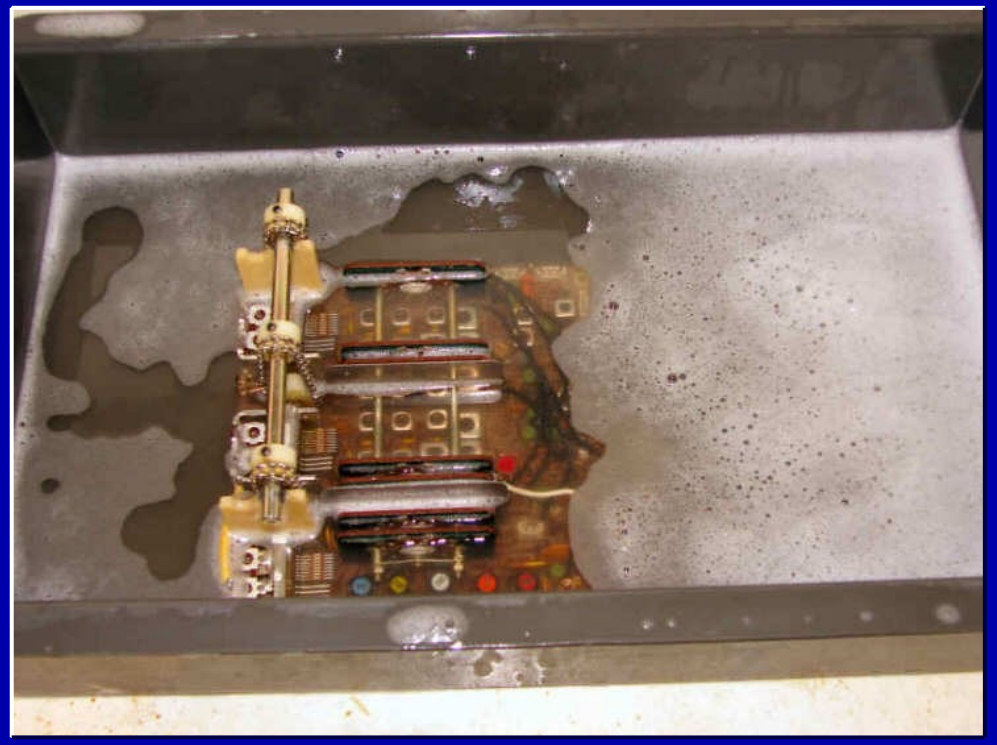
> The L41 / L8 antenna input transformers have been out of stock for years
> The fix is to rewind the tiny bobbin with #42 enameled wire
> About 6 turns primary, 26–33 turns secondary, under magnification
> For scale: the whole bobbin is smaller than Roosevelt's ear on a dime

#42 wire | 6 + 26 turns | Wound by hand | Or buy a remake

This is exactly why the hybrids stay in service: the community makes the unobtainable.

RESTORATION & ALIGNMENT

Bring one back to spec: clean, recap, align, and check the safety resistors first.



HIGHLIGHTS

> Deoxidize and lube every switch and control (yes, that is an RF board soaking in Palmolive)
> Replace aging electrolytics; check the HV doubler caps (watch for HV sag on key-down)
> Align to the 25 kHz calibrator: 20m should read about S-9
> Change finals? You MUST re-bias (50mA) and re-neutralize. Every single time.

Clean + lube | Recap | Align to S-9 | Re-bias + neutralize

Safety: 900+ volts inside, and it lingers in the caps. Respect it, and keep one hand in your pocket.

OLD IRON, NEW TRICKS

Yes, you can run FT8 through a 1975 tube rig. It just needs a lighter touch.

DUTY CYCLE IS EVERYTHING

SSB and CW are low duty cycle; FT8 and PSK are 100%. The tubes can't dissipate that much heat continuously.

DIAL IT WAY BACK

Aim for about 110mA plate current, roughly 50W out, leaving headroom for the tubes. Many run 5–25W and do fine.

THE AUDIO PATH

The 520S and up have phone-patch RCA jacks: a perfect tap for a soundcard interface. No transformer surgery required.

WORTH IT

There's something deeply satisfying about working the world on FT8 through a radio older than most operators.

BUYING ONE TODAY

They're plentiful and cheap-ish. Buy on condition, not cosmetics.

CHECK THE FINALS

A sharp PLATE dip and an honest ~100W out means healthy tubes. A broad, shallow dip means they're tired.

CHECK THE RESISTORS

High plate current with low output power is cooked cathode/screen resistors, an easy tell of past abuse.

BEWARE QRO MODS

'Improved' to 150W? Look for a blackened plate choke and a stressed power transformer. Walk away, or negotiate hard.

PARTS ARE OUT THERE

K4EAA, KD7DNY, and kenwoodparts.com keep the line supplied. Almost nothing is truly unobtainable.

THE COMMUNITY IS ACTIVE

Fifty years on, the hybrids have a bigger support network than most current radios.

PARTS & SERVICE

Ken Kemski K4EAA (SK) built the definitive reference and parts store, which his wife Barbara still runs. Plus KD7DNY (Walter Dilley) and kenwoodparts.com.

THE REFLECTOR

The Groups.io [Kenwood-Hybrids] group: decades of collective troubleshooting, one search away.

ON-AIR NETS

WB4HFN's Kenwood Hybrid nets: Saturdays 7.242 MHz, Sundays 14.316 MHz. Bring your rig and check in.

THE REFERENCE

WB4HFN hosts the manuals, brochures, and ads; K4EAA has the how-to. Everything you need is online.

CLOSING THOUGHTS

Why a 40-year-old tube hybrid still deserves a place on your bench.

> Conservative engineering, built to be maintained instead of thrown away.

> A tube final's forgiveness and a solid-state radio's ease of use, in one box.

> A receiver that still holds its own, and audio people still compliment.

> The lost skill of tuning a final, and the quiet satisfaction of keeping one going.

> As the late Ken Kemski K4EAA put it: your hybrid is an excellent tube tester that happens to make contacts.

IN MEMORIAM

KEN KEMSKI K4EAA

June 30, 1946 – April 27, 2020

Electrical engineer, guitarist, and lifelong tinkerer. With his wife Barbara, Ken built the definitive Kenwood hybrid reference and parts store, and answered thousands of hams' questions with patience and good humor. Nearly every fact and photo in this talk traces back to his work. Barbara keeps the site and store running today.

Dedicated to his memory. 73, Ken.

Questions?

Credits & Sources

Mark Earnest KB3LYB

Reference & photos: K4EAA (Ken Kemski, SK), KD7DNY (Walter Dilley), WB4HFN (Mark WB0IQK)
With thanks to the late Ken Kemski K4EAA, whose site and parts store his wife Barbara keeps going.