

BAND DECODER

Kenwood CAT (IF;) version — HW3

User Manual

1. Introduction

The band decoder is a standalone device that monitors the serial data output of a Kenwood transceiver (e.g. TS-590, TS-890, or similar CAT-compatible models), derives the current amateur band from the frequency, and automatically switches the antenna switch outputs accordingly. The device also tracks the transmit/receive (TX/RX) status and shows all relevant information on a color TFT display.

Main features:

- Automatic band detection from the frequency reported by the radio's Kenwood-style "IF;" command (160 m to 6 m, including 11 m/CB).
- 8 outputs (OUT1–OUT8) for controlling up to 8 antennas/relays.
- Display of the band, selected antenna, TX status and error conditions on screen.
- Detection of out-of-band operation ("Out of Band") and loss of the serial link ("No COM link").
- Optional antenna switch position feedback (AS feedback) via an analog input (outputs 1–4).
- Monitoring of output driver faults with automatic reset attempts.
- Manual antenna switching via a button, independent of the automatic logic.
- On-screen configuration menu — no PC or reprogramming required.

2. Controls and Display

2.1 Buttons

The device is operated using two buttons:

Button	Normal operation	In menu
Left button (SCROLL)	Manually switch to the next allowed antenna (outside TX)	Change value / move to next item
Right button (SELECT)	—	Confirm selection / enter submenu
Left + Right (hold together)	Enter main menu	—

NOTE: During transmission (TX), manual antenna switching and menu access are blocked for safety reasons — the device must not switch relays while transmitting.

2.2 States shown on the display

State	Description
RX / band	Normal operation — the current band and selected antenna are shown.
TX	Transmitting — frequency and relay are “frozen”, no switching takes place.
Out of Band	The transceiver frequency is outside the defined amateur bands. An orange warning triangle with “Out of Band” is shown.
No COM link	Loss of serial communication with the transceiver (no data). An orange warning triangle with “No COM link” is shown.
Driver Fault	An output driver (UDN2987A) fault detected (see chapter 5.1). A red warning triangle with “Driver Fault” is shown.
AS fault	The antenna switch did not reach the expected position (see chapter 5.2). A red warning triangle with “AS fault” is shown.

NOTE: The color of the warning triangle indicates severity: orange (Out of Band, No COM link) signals a normal operating condition related to the band or the serial link, while red (Driver Fault, AS fault) signals a hardware fault requiring operator attention.

3. Connecting to the Transceiver (Kenwood CAT / IF;)

The band decoder connects to the transceiver's serial data port via a straight 9-pin RS-232 connection.

The decoder simply polls the radio periodically by sending the ASCII command “IF;” and reads the reply frame, from which it extracts the operating frequency and the TX/RX status.

The serial baud rate is set in the menu (chapter 4.1) and must match the CAT/COM baud rate configured in the transceiver's own menu. Supported rates: **4800, 9600, 19200, 38400, 57600, 115200 baud** (factory default: 115200 baud).

NOTE: If “No COM link” is shown after power-up, check the data cable and make sure the baud rate set on the transceiver's CAT/COM port matches the rate set in the decoder's menu. Also make sure no other software (e.g. logging or rig-control software on a PC) is already using the same port, if applicable.

4. Configuration Menu

The main menu is entered by holding both buttons (left + right) together while outside TX. The main menu offers four items:

Item	Function
Baud rate	Sets the serial communication speed.
Antenna setup	Wizard for configuring the number of antennas, bands, preferences, outputs and icons.
AS feedback	Enables/disables and calibrates the antenna switch position feedback.
Exit	Returns to normal operation.

On most menu screens: **SCROLL** = change/move value, **SELECT** = confirm and continue.

4.1 Baud rate

The SCROLL button cycles through 115200 → 57600 → 38400 → 19200 → 9600 → 4800 baud. The SELECT button saves the chosen speed to memory and immediately restarts the serial line at the new speed.

4.2 Antenna setup (antenna configuration wizard)

This is a step-by-step **process that must be completed in full** — it is not possible to configure only part of it and skip the rest, since at the end the firmware checks that every antenna in use has a valid output assigned. Steps:

1. **Number of antennas** — SCROLL changes the number of antennas from 2 to 8, SELECT confirms. Confirming resets the previous band, output and icon assignments for all antennas.
2. **Band assignment per antenna** — for each antenna (A1, A2, ...) all bands (160 m ... 11 m) are stepped through in turn. SCROLL toggles Use: YES/NO for the given band, SELECT confirms and moves to the next band. If no band is selected for an antenna, the device shows a “Select ≥1 band!” warning and will not allow you to continue without a selection.
3. **Preferred antenna for a band** — this screen only appears if more than one antenna is assigned to a given band. SCROLL cycles through the candidates, SELECT confirms which antenna should be automatically active for that band.

4. **Output assignment (OUT)** — for each antenna, its physical output OUT1–OUT8 is selected, or NONE (no output — temporary/free slot). Only free outputs and the antenna's currently assigned output are offered; outputs already taken by other antennas are not offered.
5. **Icon assignment** — for an antenna with an assigned output, SCROLL selects the icon shown on the display, SELECT confirms. If OUT = NONE was selected, the icon is set automatically and this step is skipped.

NOTE: If, after completing the wizard, any antenna in use is left without a valid output, the firmware automatically returns the user to the output selection screen (safety fallback) and will not allow the configuration to be saved until the assignment is complete.

Once the wizard is complete, the entire antenna configuration is saved to EEPROM and the device returns to the main menu.

4.3 AS feedback (antenna switch feedback)

This function makes it possible to check whether the antenna switch actually reached the selected position, using an analog voltage input. AS feedback is only available for outputs **OUT1–OUT4**.

1. On the “AS feedback” screen, SCROLL toggles YES/NO (default NO) and SELECT confirms the choice.
2. If YES was selected, a confirmation screen “Run calibration?” appears — during calibration, outputs OUT1–OUT4 are switched in turn, so it should only be run with the antenna switch connected and functioning correctly.
3. Selecting YES and confirming with SELECT starts calibration; selecting NO enables AS feedback without calibration (until a valid calibration has been performed, the function remains inactive — see note below).

NOTE: AS feedback only works when it is set to YES **and** a valid calibration exists for the relevant outputs. Without calibration (or with an invalid calibration), the function remains inactive even if it is set to YES in the menu.

5. Protection and Diagnostic Functions

5.1 Output driver fault (Driver Fault)

The device continuously monitors the status of the driver (UDN2987A chip). When a fault is detected, an automatic driver reset sequence is triggered:

- After detecting the fault, the device waits briefly and then sends a reset pulse to the driver.
- After the pulse, it checks whether the fault has cleared. If so, the device resumes normal operation.
- If the fault persists, the whole cycle is repeated — up to **5 times**.
- If the fault is still present after 5 attempts, the device enters a permanent fault state (Driver Fault is shown) and no longer makes further automatic reset attempts — operator intervention / hardware inspection is required.

5.2 Antenna switch position feedback (AS feedback)

If AS feedback is enabled and calibrated, after each switch of outputs OUT1–OUT4 the device waits briefly and then checks the voltage at the MCU input against the calibrated values for that output (with a tolerance of about ± 0.2 V). The check is also performed continuously outside of switching events. On a mismatch (voltage out of tolerance, short to ground/supply, or wrong position), an “AS fault” error state is shown.

WARNING: Outputs OUT5–OUT8 are not monitored by feedback — only OUT1–OUT4 are checked.

6. Factory Reset

If the device needs to be restored to its original factory state (for example, in case of a configuration problem), proceed as follows:

1. Disconnect power from the device.
2. Hold the left button while powering the device on.
3. Keep the button held down continuously for at least **3 seconds** from power-on. If it is released earlier, the reset will not occur and the device will start normally with its existing configuration.

After a successful factory reset, an information screen is briefly shown at startup and the device starts up with its factory default values (including baud rate reset to 115200).

WARNING: A factory reset permanently erases the stored antenna configuration and the baud rate setting. Only use it if you intend to reconfigure the device from scratch.

7. Troubleshooting

Symptom on display	Possible cause	Recommended action
No COM link	Loss of serial link / baud rate mismatch	Check the data cable and compare the Baud rate menu setting with the transceiver's CAT/COM baud setting.
Out of Band	Frequency outside the defined amateur bands	Normal condition when tuning outside a band — no action required.
Driver Fault	Output driver fault after 5 failed reset attempts	Check the driver/relay wiring and power supply; restart the device once the cause has been fixed.
AS fault	Antenna switch did not reach the expected position / no valid calibration	Check the switch mechanics and A5 wiring; alternatively disable AS feedback or recalibrate.
Device does not switch antenna	TX active, or no other antennas assigned for the given band	Wait for return to RX; to resume automatic switching after an error, reconfigure via the menu.