# DDX Help Manual

**PDF version:** 2026-10-19

The latest version of this manual is available on the DDX product page.

A short, practical guide to assemble, power, and operate DDX safely.

## What DDX Is

DDX is a rugged HF digital transceiver focused on FT8 operation.

- Typical output: about 5 W at 13.8 V on 10m (usually higher on lower bands)
- Band changes are manual (swap/select the correct filter/band setup)

## Before You Start

You need:

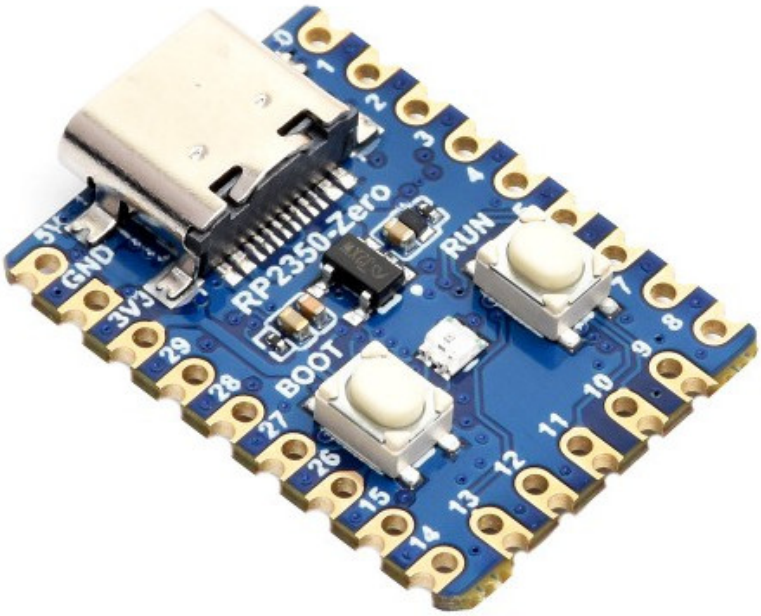
- DDX main PCB (JLCPCB assembled)
- Waveshare RP2350-Zero board (under 5 USD, **not included in JLCPCB assembly**)
- TO-220F Final FET (from LCSC Electronics, under a dollar, Tokmas CID10N65F)
  - Link for the TO-220 Final FET - Tokmas CID10N65F
- USB cable (USB-C to USB-C, or USB-A to USB-C)
- 12 V to 13.8 V DC supply (100mA current limit recommended for first power-up)
- Antenna
- LPF for your band (required)

  **Never transmit without an LPF and proper antenna/dummy load.** Risk of spurious emissions, and regulatory violations.

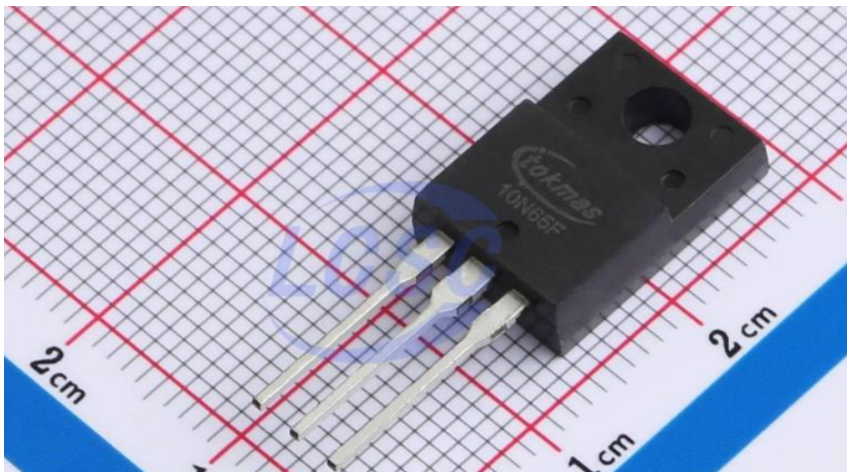
Recommended:

- Inline DC on/off switch
- Enclosure for safety
- Common-mode choke (CMC)
- 7-10 m (or more) coax for EFHW setups

Pictures (for reference):








## Fast Bring-Up (Read This First)

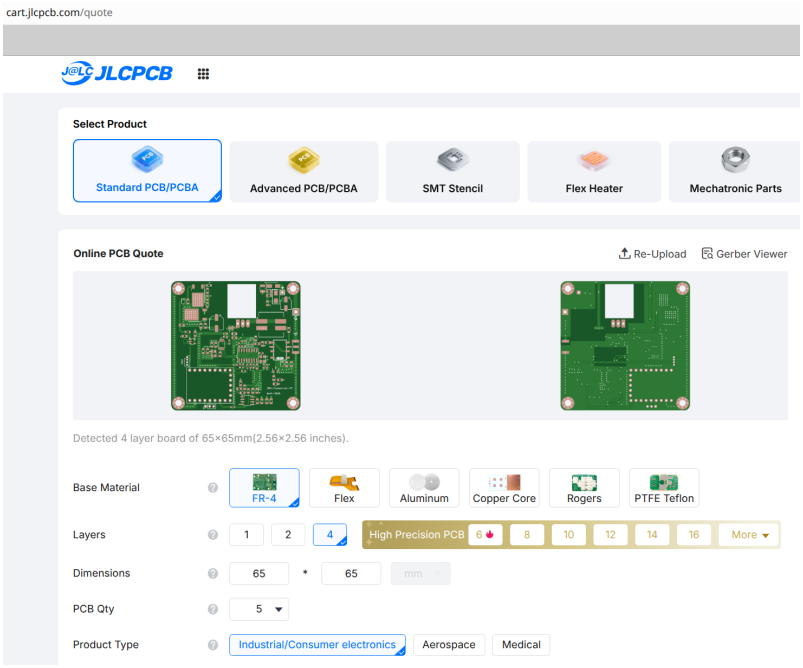
## JLCPCB Order (Minimal Steps)

Use these files from your hardware package - they are in the `DDX` sub-folder:

- `GERBER-DDX-Commercial-27.zip`
- `BOM-DDX-Commercial-27.csv`
- `CPL-DDX-Commercial-27.csv`

Order flow:

0. Login to https://jlcpcb.com/ site. This is required.
1. Upload gerber at https://cart.jlcpcb.com/quote.

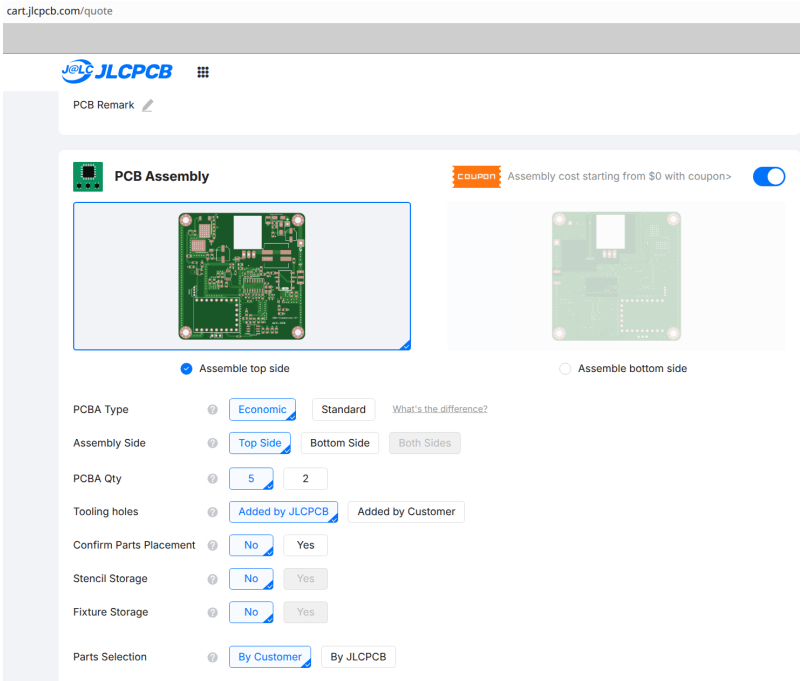



2. Keep standard 4-layer FR-4 defaults (1.6mm is fine).

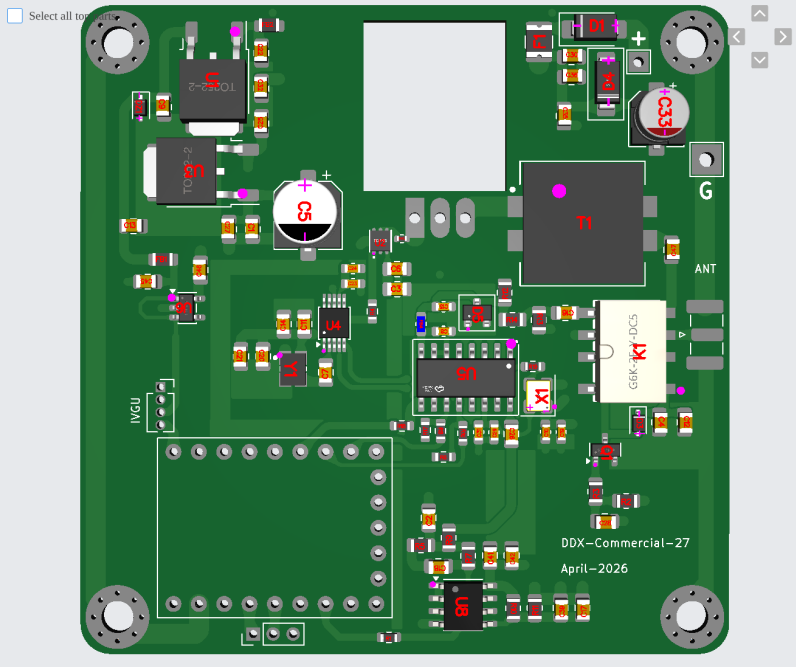
   Note: DDX-Commercial-27.2 is a four-layer board.

3. Enable PCB Assembly:

   - Economic
   - Top side




4. Upload BOM + CPL.
5. Confirm component mapping and placement preview.




6. Add to cart and checkout.

Note: You still hand-solder external connectors, final FET, and MCU header (if not assembled).

## PCB Assembly & First Power

1. Inspect the PCB for visible damage or solder bridges.
2. Hand-solder required through-hole parts (RF connector, DC connector, TO-220 FET, MCU header if needed), and attach a heatsink to the final FET before any TX test.

   Note: For the RP2350-Zero MCU board, solder only the two long side header rows. The short row on the edge opposite the USB-C connector is unused and does not need to be soldered.
3. Connect USB *first* (PC/phone to RP2350).
4. Set DC supply to **10V** with **100 mA current limit**.
5. Power DC input.
6. Check behavior:
   - The RP2350-Zero onboard LED should blink in two colors.
   - After DC power and startup, the LED should go off in normal operation.
   - A new USB audio device named `DDX` should appear on your computer / Android phone.

If current limit trips immediately, power off and inspect for shorts.

## Firmware (DEMO then FULL)

### Flash DEMO Firmware

1. Power off USB + DC.
2. Hold `BOOTSEL` on RP2350.
3. Connect USB while holding, then release after ~2 seconds.
4. Drag `DDX_DEMO.uf2` to the `RPI-RP2` drive.
5. Device reboots automatically.

Note: DEMO mode is receive-focused; TX is disabled.

### Get Serial Number (for FULL license)

Use the WebUSB reader; no helper executable or Python installation is needed.

1. Connect your radio to the computer with a data-capable USB cable and boot the DEMO firmware normally.
2. Open the USB serial number reader on rfcorner.in or Bunzee Labs in desktop **Chrome or Edge** on macOS, Windows, or Linux. Safari and Firefox do not support WebUSB.
3. Click **Choose USB device**, select your DDX / RP2350 board, and grant access in the browser chooser.
4. Read the **Serial number** and click **Copy serial number**. The page also displays the product, manufacturer, and USB VID:PID.
5. Before requesting a FULL license, verify that the USB serial matches the serial reported by your DEMO firmware. If they differ, use the DEMO firmware serial for licensing.

If the board is missing:

- Click **Choose USB device** to authorize it; the page lists only connected devices authorized for this site. Try **All authorized devices** if the default DDX / Pico / TinyUSB display filter hides it.
- Check the USB cable and connection. No tty/COM port is required.
- To identify the RP2350 in BOOTSEL mode, disconnect USB and DC power, hold `BOOTSEL`, and reconnect USB. Choose the bootloader device in the reader. **Bootloader and application serial numbers can differ**; verify the DEMO firmware serial before using a bootloader serial for licensing.
- If the page says **Not exposed by this device**, the firmware does not provide a serial descriptor accessible to the page. Browser and operating-system restrictions can also hide some devices.

The reader displays USB descriptors locally in your browser. It does not upload device data, open a USB interface, send commands, or flash the board.

- Go to https://bunzee-labs.com/products/ddx/buy/firmware to purchase the full, unrestricted firmware license.

### Flash FULL Firmware

Use the same BOOTSEL process and drag-drop your licensed `.uf2` file.

## Power-Up Sequence (Always Use This)

1. Connect USB to RP2350 first.
2. Then turn on DC power.
3. Confirm DDX audio device appears.
4. Start operating software.

Tip: Keep first tests at 10V and 100mA limit until stable.

## Software Setup

Grab the required software from the following links:

- https://sourceforge.net/projects/wsjt-x-improved/files/WS_v3.2.1/ - WS - Digital Mode Suite Files
- https://github.com/WSJTX/wsjtx/releases/latest - WSJT-X 3.0.2 or later
- https://github.com/JS8Call-improved/JS8Call-improved - For JS8 mode
- https://github.com/sq9fve/wsjt-z/releases - WSJT-Z
- https://github.com/kholia/Decodium-3.0-Shannon-Plus-Plus - For FT2 mode

1. Open WSJT-X.
2. `Settings -> Radio`:
   - Rig: `Bunzee Labs Simple CAT`
   - PTT Method: `CAT`
   - Baud Rate: `115200`

3. `Settings -> Audio`:
   - Input: DDX audio device (OR the UAC2 headset device)
   - Output: DDX audio device (OR the UAC2 device)
4. `Settings -> Reporting`:
   - Enable PSK Reporter
   - Enable `Accept UDP requests`
5. Select band and wait 15-30 seconds.

Critical for FT8: The system time must be accurate within about 1 second. Use https://time.is/ to quickly check the time on your PC or other device.

## Android App Setup

1. Install **DDX FT8** from Google Play. In case you do not find it there, please reach out to us.
2. Connect phone to DDX via a USB-C cable.
3. Turn on the DC power supply.

Extra reference: https://github.com/kholia/DigitalRadioReceiverSupport/tree/master/NewApp

## Filters and Bands

Use the correct filter for the band in use.

See https://rfcorner.in/posts/easy-lpfs/ for help with building the LPF filters.

The LPF isn't necessary for testing reception (RX).

Signal chain:

```
DDX -> LPF (or TX-BPF) -> Antenna
```

Simple strategy:

- Start with one filter for your most-used band.
- Add more filters later.

Low-band-priority build option:

- If low-band operation is a priority, the 4R7 coupled inductor can be replaced with a 10R0 coupled inductor.

## First Troubleshooting Checks

### 1) No USB audio device

- Try a known good data USB cable.
- If using an OTG adapter, test it thoroughly with other devices.
- Try another USB port/computer.
- Reflash firmware with BOOTSEL.

### 2) LED blinks continuously

- Check Si5351 connections/power.

### 3) No signals in WSJT-X waterfall

- Verify antenna and band/filter selection.
- Confirm DDX is selected as audio input.
- Check propagation on that band.

### 4) Waterfall active but no decodes

- Fix system time sync first (most common issue).
- Confirm FT8 mode (not FT4/WSPR).

**5) No TX output**

- DEMO firmware: expected (TX disabled).
- FULL firmware: verify WSJT-X TX enabled, DC power present, filter/antenna path intact.

**6) High idle current (>300 mA)**

- Power off immediately.
- Inspect for shorts, solder bridges, or damaged parts.

**7) Thermal drift**

- If thermal drift is an issue, use an external USB fan, such as a Portronics USB fan, to keep airflow over the board.

**8) PC or phone disconnects from the DDX rig**

- Add a common-mode choke (CMC), which is easy to homebrew. This has a very high probability of solving the disconnection problem.

## Safe Operating Rules

- Always use an LPF and proper antenna/dummy load before transmitting.
- Before transmitting, attach a heatsink to the final FET. The TO-220 heatsink does not need an insulating pad for the supplied GaN FET, because it uses the insulated TO-220F package.
- Prefer first TX tests into a dummy load.
- Avoid reverse polarity and overvoltage.
- If any part looks burnt/discolored, stop and diagnose before powering again.

## Need Help

When asking for support, include:

- Your serial number
- Firmware type (DEMO or FULL)
- Exact symptom
- What you already tested
- Voltage/current measurements
- Clear board photos

## HW-Gotchas

1. **Finding 1 - 2026-06-10:** If the Si4732 fails to initialize at bootup, the DDX device may not appear and the LED may stay lit. This marginal signal integrity problem has only affected one board out of more than a few dozen boards. Replace the 2 kohm I2C resistors with the 30B SMD marking, which are common 0603 size parts, with 0 ohm resistors. Alternatively, the 30B I2C resistors can be bridged using a solder blob.