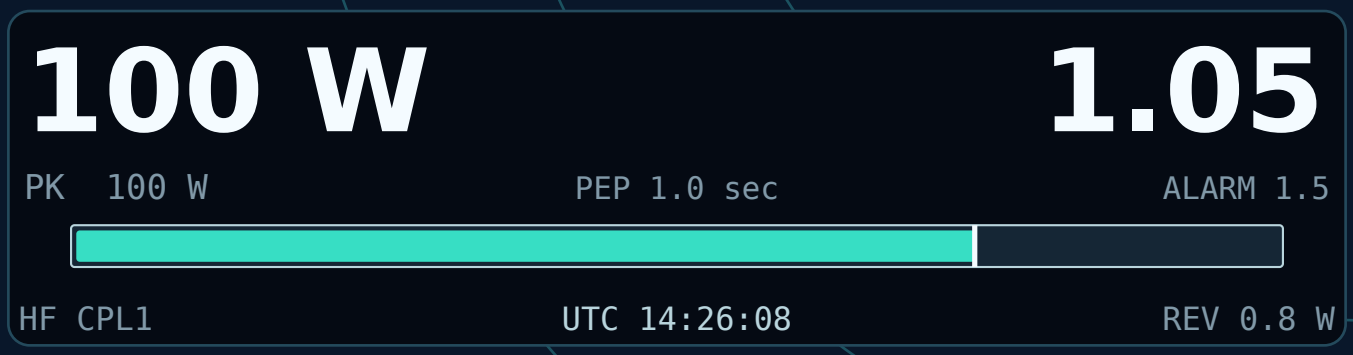
DR*electronics*

USER MANUAL

DR-100 *Dual*

Power and SWR Meter

A practical guide to the OLED displays, RF measurements, dual coupler controls, calibration, alarms, clock, and WiFi web interface.



Illustrative OLED display • actual values depend on RF input

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LIVE SCREENS

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CALIBRATION BANKS

Teensy 4.0 • 256 × 64 OLED • Optional XIAO ESP32-C3 WiFi

Firmware V3.116 | Web interface W3.8.1

START HERE

Meet the meter

The DR-100 *Dual* measures forward and reflected RF power and computes SWR. It combines a Teensy 4.0, a 256 × 64 grayscale OLED, two detector channels, and two selectable coupler calibration paths. A connected XIAO ESP32-C3 adds network time and browser control.

A five-screen instrument

01	**PK**	PEP power + power bar
02	**FWD / REV**	SWR bar and reverse power
03	**dBm**	PEP level in dBm
04	**ModScope**	Modulation envelope
05	**Time**	UTC and local clock

Time screen availability

The fifth OLED screen appears when the XIAO WiFi module is detected. Without it, turning from ModScope wraps back to PK.

Reading the display

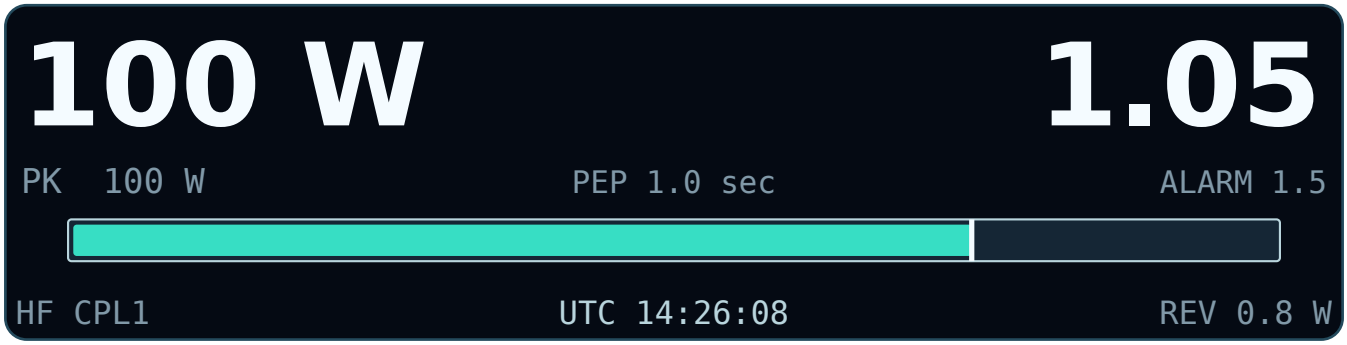
Big left: forward PEP power (or held dBm). **Big right:** SWR. **PK:** a separate short peak reading. **REV:** reflected power. The band and coupler label shows which calibration bank is active.

The illustrated numbers throughout this manual are examples. The firmware determines actual measurement and display values.

OLED / SCREEN 1

PK power screen

This is the primary operating screen. The large power number uses the selected PEP hold; the smaller PK number stays live on its own hold time.



Example display: 100 W forward PEP, 1.05 SWR, HF / coupler 1.

01 **Forward PEP**
Large power reading at upper left. PEP Hold selects 0.1, 1.0, or 2.0 seconds.

02 **SWR**
Large ratio at upper right. The alarm setting appears beneath it.

03 **Live PK**
Small PK reading directly below forward power. PK Hold is independently adjustable.

04 **Power bar**
Autoranging forward-power bar. It grows promptly and scales down after a stable delay.

05 **Status strip**
Band / coupler left, synchronized UTC in the center, PEP-held REV at right.

OLED / SCREEN 2

FWD / REV and SWR

This page keeps the large PEP power and SWR readings, then replaces the power bar with a logarithmic SWR bar. Reverse power appears below the forward number.



The scale marks are 1.0, 1.5, 2, 3, 5, and 10. Values are illustrative.

What the SWR bar shows

The left edge represents 1:1 and the right edge 10:1. Because the bar is logarithmic, each printed mark has its own spacing. Read the large SWR number for the precise value; use the bar to see the trend at a glance.

Forward and reverse timing

The large forward power and the small REV power follow the same selected PEP Hold period. Changing PEP Hold changes their displayed hold behavior together.

ON THIS SCREEN

Top middle: current band and coupler, for example HF CPL1.

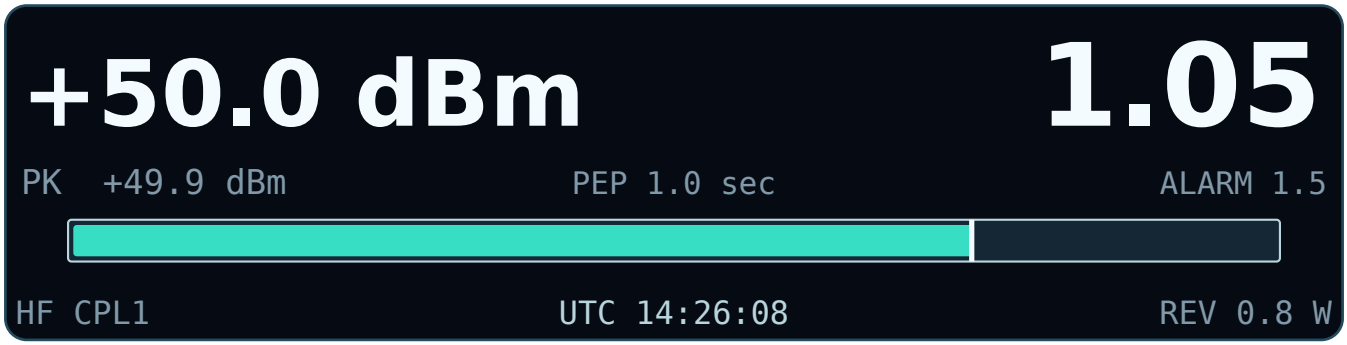
Middle: PEP period and SWR alarm setting.

Bottom: logarithmic SWR bar and six reference values.

dBm and ModScope

03 / dBm

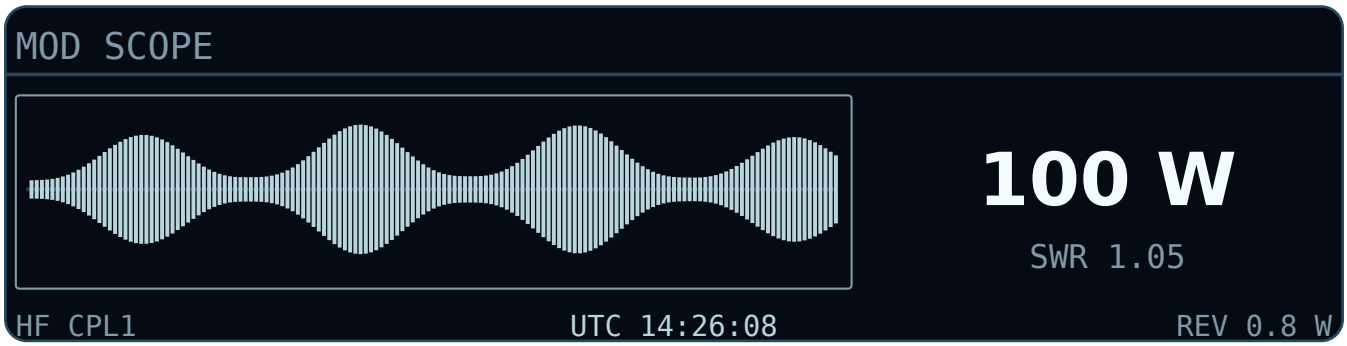
The big dBm value is held with PEP Hold. The smaller PK dBm remains live. The power bar, SWR, band/coupler, UTC, and PEP-held REV occupy the same positions as on the PK screen.



dBm expresses power relative to 1 mW; 40 dBm = 10 W and 50 dBm = 100 W.

04 / ModScope

A live modulation envelope fills the left side. The large right-hand number is selected forward PEP; below it is SWR. The bottom strip shows band/coupler, UTC, and PEP-held reverse power.



ModScope controls

Turn the encoder to move to another live screen. A short encoder push returns directly to the PK screen. The waveform has its own fast history and does not use the displayed PEP hold.

OLED / SCREEN 5

UTC and local time

With the XIAO WiFi module and synchronized network time, the clock page presents one large primary time plus the other time at the bottom.



Example date, time, locator, and time zone. Local offset and daylight saving depend on the stored zone.

Operate the clock

Short encoder push

Toggle the primary display between UTC and local time. The choice is stored; it can also be set through Clock Primary in setup.

Set your region

Use the Time Zone page in the browser to choose a region preset or enter a POSIX rule. The local clock follows that setting; UTC remains UTC.

Waiting for time

Until WiFi and NTP provide valid time, the OLED displays a waiting message and dashes instead of an old clock reading.

Clock Dim Time can lower the clock screen brightness after 5, 10, or 30 minutes, or disable dimming. The general screensaver and display-off functions do not replace the clock page.

OPERATING GUIDE

Controls and navigation

The encoder handles screens and setup. The separate coupler button handles the two RF couplers and band selection.

From a live measurement screen

Turn encoder	Move PK → FWD/REV → dBm → ModScope → Time, and reverse the other way.
Short encoder push	On ModScope, return to PK. On Time, toggle UTC / local primary.
Long encoder push	Open setup from a normal measurement screen.
Short coupler press	Select CPL1 or CPL2. Each recalls its own last-used band.
Hold coupler ≈ 0.8 s	Open BAND SELECT; turn encoder to HF, 6M, 2M, or 70cm; push encoder to store.

When the display is asleep

The first encoder turn wakes the display. A subsequent detent changes the screen.

When the SWR alarm is latched

The coupler button acknowledges the alarm first. It does not change couplers on that press.

SETTINGS REFERENCE

Setup menu · 1–10

Long-press the encoder to open setup. Rotate to highlight a setting, then push to select or store. The first nine entries are always available; Set Grid requires the XIAO.

1 **SWR Alarm**
Choose 1.5–3.9; 4.0 switches the alarm off.

2 **SWR Alarm Power**
Require at least 1 mW, 10 mW, 0.1 W, 1 W, or 10 W before alarming.

3 **PEP Hold**
Select 0.1, 1.0, or 2.0 s for large power, held dBm, and REV.

4 **PK Hold**
Select 0.1–2.0 s in 0.1 s steps for the smaller PK value.

5 **Noise Floor**
Set the idle/screen threshold: Off, 0.001, 0.01, 0.1, 1, or 10 mW.

6 **Screensaver Time**
Choose Off, 1, 2, 5, 10, 15, 30, or 60 min of idle time.

7 **Display Off Time**
Choose the additional delay after saver; direct delay if saver is Off.

8 **Power Bar Scale**
Adjust the three autorange range multipliers per decade.

9 **Set Your Call**
Enter a callsign with the on-screen encoder keyboard.

10 **Set Grid**
Enter a Maidenhead locator, shown on the clock screen.

SETTINGS REFERENCE

Setup menu · 11–21

Five entries here, plus Set Grid on the previous page, require the XIAO module. The other entries remain available in firmware order.

11 **Clock Primary**
Set the main clock to UTC or Local; return directly to the clock.

12 **Clock Dim Time**
Dim only the clock after 5, 10, or 30 min, or select Off.

13 **Time Zone menu**
Select the time zone for the local clock.

14 **WiFi SSID**
Select a scanned network, rescan, or type a name manually.

15 **WiFi Password**
Enter and store the network password for the XIAO.

16 **WiFi Status**
View SSID, IP address, RSSI, and XIAO firmware.

17 **Startup Logo**
Choose one of nine startup animations.

18 **Calibrate**
Open one-level, two-level, or calibration debug pages.

19 **Diagnostics**
Open three read-only detector, RF, and ADC pages.

20 **Factory Reset**
Two-step confirmation to restore settings and calibration defaults.

21 **Exit**
Leave setup and return to the live meter.

Calibrating RF power

There are eight independent calibration banks: four bands for each of the two couplers. Select the correct coupler and band before adjusting a bank.

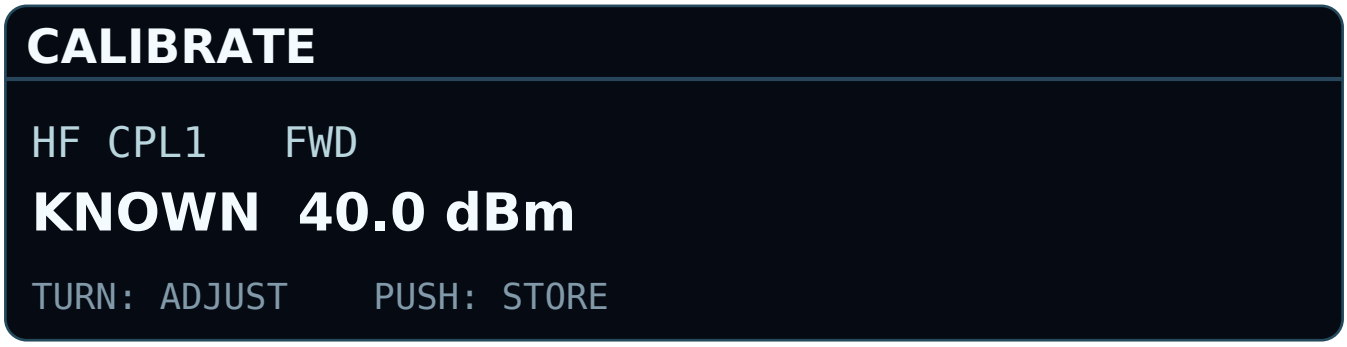


Illustration of a calibration entry screen; the live direction and value depend on the applied signal.

Choose a method

ONE-LEVEL

Apply a known RF level and set its dBm value. The firmware derives the second calibration point 30 dB lower using nominal slopes.

TWO-LEVEL

Use two known levels: the first / higher point, then a second / lower point. This determines the measured slope for that bank.

Store the correct detector

The calibration display indicates **FWD** or **REV** when the applied signal gives a valid direction. A FWD capture records the forward detector (and copies the reverse point); a REV capture records the reverse detector. A **---** cue means the input is not valid for storage. Rotate slowly for 0.1 dB steps, faster for 1.0 dB steps, and push to save.

Use a known reference

Connect a suitable RF source, load, and independent power reference for the selected band and coupler. For orientation, 10 W is 40 dBm and 100 W is 50 dBm.

SERVICE VIEWS

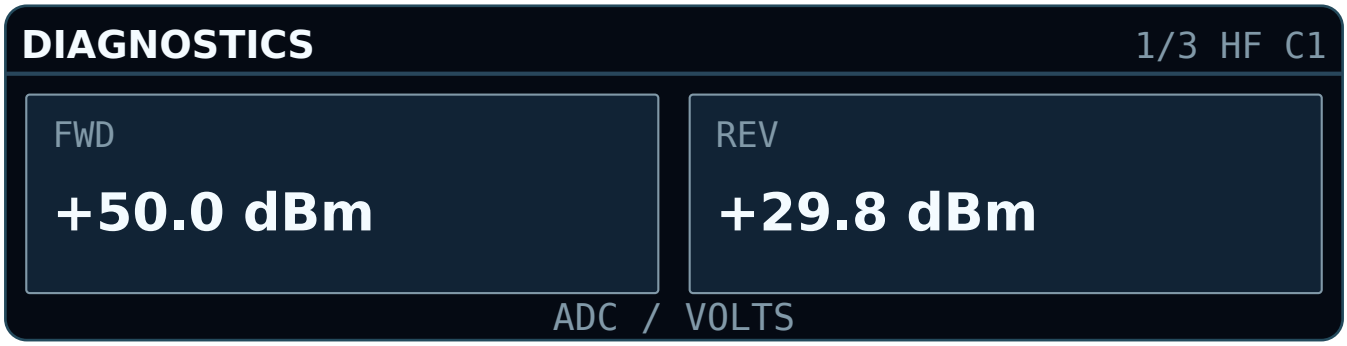
Banks and diagnostics

The active label, such as HF CPL1, identifies the band/coupler bank. Switching couplers recalls the last band used by that coupler.

Eight stored banks

HF	HF CPL1	HF CPL2
6M	6M CPL1	6M CPL2
2M	2M CPL1	2M CPL2
70cm	70cm CPL1	70cm CPL2

Diagnostics: three read-only pages



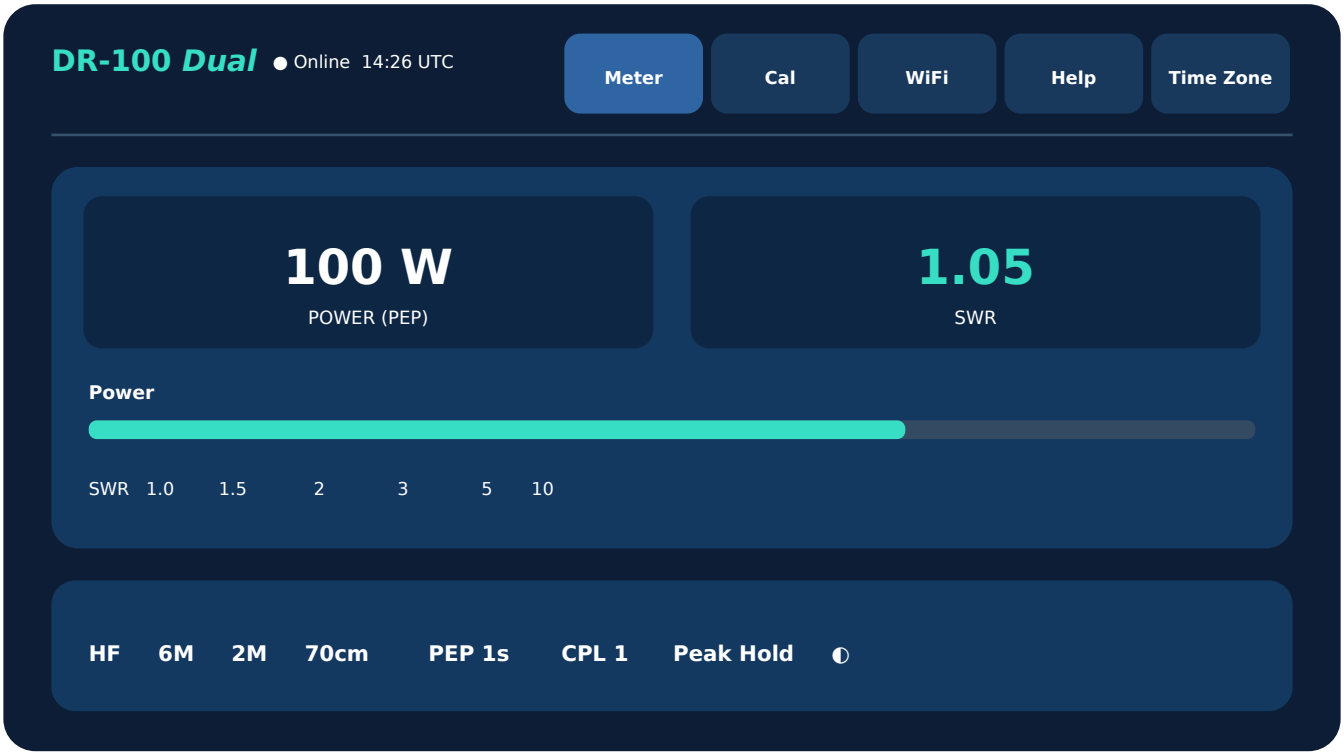
1 / Detectors	Calibrated FWD/REV dBm with ADC counts and detector voltages.
2 / RF values	Forward and reverse power, SWR, PK, PEP, and average.
3 / ADC health	Missed conversions, errors, raw channels, VREF, and I²C status.

Turn the encoder to change diagnostic pages; push to exit. Cal Debug is separate: it reviews the stored calibration points and slopes for each bank, two pages per bank.

BROWSER REMOTE

The WiFi meter page

With the XIAO connected to WiFi, open powermeter.local in a browser. If name resolution is unavailable, use the IP address shown in WiFi Status.



Illustrative layout of the W3.8.1 web Meter page; live values and network details vary.

Remote controls and readouts

The Meter page shows forward PEP, SWR, power and SWR bars, PK, average, reflected power, and dBm. It also offers band buttons, a coupler selector, a PEP period selector, Peak Hold, and a light/dark appearance toggle.

> **Appearance is remembered**
> The light/dark selection is saved on the XIAO. A browser launcher that deletes its own profile does not erase this device-side preference.

BROWSER REMOTE

Web pages and time zone

The navigation has five buttons: Meter, Cal, WiFi, Help, and Time Zone. These are separate from the OLED setup menu.

METER	Live PEP/SWR and secondary readings; choose band, coupler, PEP period, Peak Hold, and color mode.
CAL	Inspect eight bank entries; download or upload Calibration Data JSON and Config JSON.
WIFI	View network name, IP address, signal level, and update interval.
HELP	View operating guidance and the XIAO and Teensy firmware versions.
TIME ZONE	Select a local time zone preset or save a custom POSIX TZ rule. The UTC clock is unaffected.

Time zone vs. clock selection

Time Zone defines local offset and daylight saving rules. Clock Primary chooses which of UTC or local is largest on the OLED. A short push on the Time screen also toggles that choice.

SWR alarm and idle display

Set an SWR limit and a minimum RF power in setup. The meter only raises the alarm after two consecutive high-SWR 100 ms measurement blocks meet the conditions.

When the alarm trips

1. **OLED**
   The alarm indication is highlighted on the normal power screens.

2. **Buzzer**
   Sounds for approximately three seconds on an SWR event.

3. **LED**
   Flashes while the alarm remains latched.

4. **Digital output**
   Teensy pin 9 is active high at 3.3 V logic level until acknowledgment.

Acknowledge with the coupler button

One press clears the latched event. The input must become safe before it can trigger again. The startup buzzer test lasts about one second; it does not assert pin 9.

Idle behavior

Screensaver Time starts the idle display after its set delay. Display Off Time adds another delay after the saver, or acts directly if Screensaver Time is Off. The Clock screen uses Clock Dim Time instead.

REFERENCE

Quick problem solving

No local time

Check WiFi Status and the clock waiting message. Set the region on the web Time Zone page after NTP synchronization.

powermeter.local does not open

Use the XIAO IP shown in WiFi Status. Confirm the browser and meter are on the same network.

Power differs by band or coupler

Read the OLED band/CPL label and inspect that bank’s calibration. Each band/coupler has its own stored data.

PEP stays above current PK

PEP Hold and PK Hold use separate windows. Compare them after the hold period and at a stable RF level.

Unexpected high SWR alarm

Check the SWR limit, minimum alarm power, RF path, and coupler selection; acknowledge with the coupler button.

Screen goes dark

Wake it with an encoder turn. Check Screensaver Time and Display Off Time; the Clock has separate dim timing.

WiFi features absent in setup

The six network/clock menu entries require the XIAO module to be detected.

At-a-glance reference

Keep this page near the station for the display order, controls, and key settings.

Screen sequence

PK → FWD/REV → dBm → ModScope → Time → PK

Time is omitted when the XIAO is absent.

Most-used actions

Encoder turn	Next / previous live screen
Long encoder push	Setup menu
Short coupler press	Toggle CPL1 / CPL2
Hold coupler	Band select
Clock push	UTC / Local primary
Alarmed coupler press	Acknowledge

DR-100 *Dual*

Power and SWR Meter

Teensy firmware V3.116 • Web interface W3.8.1