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PS-100 Digital Power / SWR Meter — User Manual

1. Overview
2. Specifications
3. Connection & Installation
4. Power On / Off
5. Button Operation (single button)
6. The Five Display Screens
7. Battery & Charge
8. Alarms & Tones
9. Power Calibration
10. Serial Data & Remote Control
11. Web Control (Phone / PC)
12. Troubleshooting
13. Safety Notes

PS-100 Digital Power / SWR Meter — User Manual

> Firmware V2.0 | Display 1.3″ 128×64 OLED

1. Overview

PS-100 is an **in-line (pass-through) digital RF power / SWR meter**. Connected between the transmitter and the antenna (or a dummy load), it measures forward power, reflected power and SWR in real time, with peak-hold, average power and a power-trend graph. It is powered by a single-cell Li-ion battery (1S), operated by one button, and features an audible/visible high-SWR alarm and a serial data output.

Key Features

- Real-time forward / reflected power and SWR measurement
- Five display screens, cycled by a single button
- Peak Envelope Power (PEP) hold and average-power statistics
- Power-vs-time trend graph with auto-ranging full scale
- Graphical battery indicator, low-battery warning and auto power-off
- Adjustable-threshold high-SWR audible/visible alarm
- Tuning-aid tone (pitch tracks SWR — helps tune an external manual ATU by ear)
- Continuous-transmit timeout reminder
- Built-in Bluetooth (BLE) + web tool — control from phone/PC, no app to install (Bluetooth by default as `PS100-BLE`; plugging a TTL cable switches to wired; optional Wi-Fi bridge, user add-on)
- 9600-baud serial data & remote configuration (over BLE or USB-TTL)
- 24-point power calibration

> ⚠️ This is a **pass-through** meter. A proper load (antenna or dummy load) must be present when transmitting. Never transmit at high power into an **open, short or badly mismatched** load — doing so may damage the transmitter and the meter.

2. Specifications

Item	Specification
Power range	approx. 0–100 W (depends on hardware & calibration)
SWR range	1.00 – >9.99
Display	1.3″ 128×64 mono OLED
Power	single 1S Li-ion cell (≈3.0–4.2 V)
Data/signal jack	4-pole 3.5 mm: GND / HISWR / TX / RX
Serial	UART, 9600 8N1, **3.3 V levels**
HISWR output	active-low, open-collector via 8050 (pulled low while alarming)
Frequency	per detector hardware (typically HF)
RF connectors	TX side / ANT side (connector type per unit)

> For items marked “per unit”, fill in according to your actual hardware.

3. Connection & Installation

1. **RF connection**: insert the meter between the transmitter and the antenna (or dummy load): transmitter → meter **TX (input)** → meter **ANT (output)** → antenna / dummy load. Mind the direction — **reversing it makes the meter inactive or swaps the forward/reflected readings**.
2. **Power**: built-in single Li-ion cell; press the button to power on.
3. **Data / signal jack (4-pole 3.5 mm)**: the high-SWR alarm output and the serial port share one 4-pole jack, in the order **GND / HISWR / TX / RX**.

Pin	Signal	Description
1	**GND**	ground, common with external device
2	**HISWR**	high-SWR alarm, **active-low (continuous)**, open-collector via internal 8050
3	**TX**	serial TX (meter→host), 3.3 V
4	**RX**	serial RX (host→meter), 3.3 V

> ⚠️ Use a **3.3 V** USB-TTL adapter; never feed 5 V into RX and do not back-feed power. **Cross TX/RX** when connecting to a PC: meter TX → adapter RX, meter RX → adapter TX, GND to GND.

> HISWR is an open-collector output via the internal 8050 (NPN): while alarming it pulls low and can sink current, directly driving a load tied between V+ and this pin (LED + resistor, small relay/buzzer, within the 8050 rating). Otherwise it is high-impedance; add a pull-up if a defined high level is needed.

4. Power On / Off

- **Power on**: from off, a short press powers on.
- **Power off**: **hold the button > 2 s** on any screen.
- **Auto screen-off**: the screen sleeps after a period of inactivity; **one press wakes it first** (that press does nothing else).
- **Remembers last screen**: the screen shown before power-off is restored on next boot.

5. Button Operation (single button)

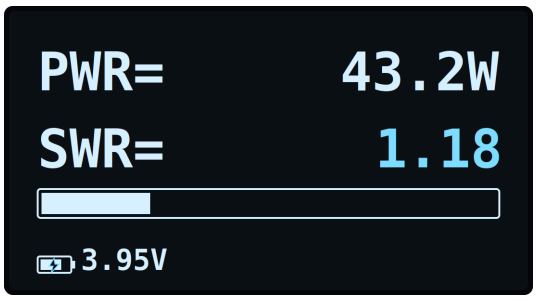
Action	Function
Single click	clear/reset values of the **current screen**
Double click	switch to the **next screen** (cycles through 5)
Triple click	toggle the buzzer **on/off**
Long press (> 2 s)	power off
Press while asleep	wake the screen first
Hold during power-on	enter **calibration mode** (Section 9)

> Switch screens while **not transmitting**. During transmit the button is ignored to prevent RF-induced false triggers (normal protection); keep the two clicks within ~0.5 s.

6. The Five Display Screens

Double-click to cycle through the five screens; the current screen is remembered at power-off. Each is described **top to bottom** below.

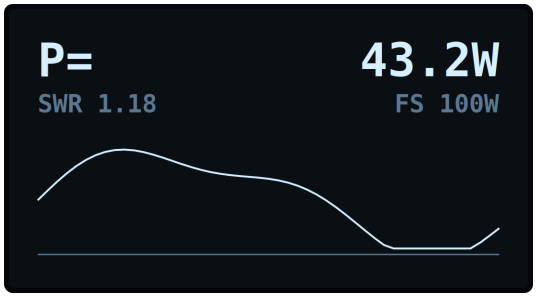
Screen 1: Main



Screen 1 Main

- Big line 1: current **forward power PWR** (W, 1 decimal).
- Big line 2: current **SWR**.
- Middle bar: SWR level bar, filling left-to-right (full ≈ SWR 5.0).
- Bottom: graphical **battery icon** (with a bolt while charging) + **battery voltage**.
- When SWR exceeds the alarm threshold, **`HI` appears at bottom-right**.

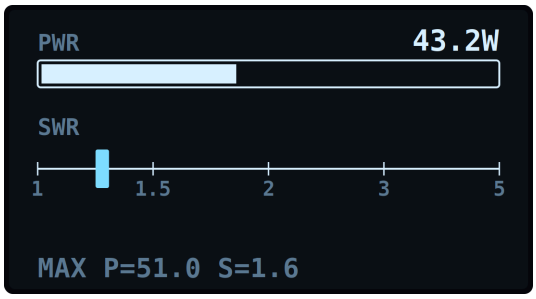
Screen 2: Power Trend



Screen 2 Power Trend

- Top big text: current power.
- Second line: current **SWR** and the vertical **FS** (full-scale watts at the top of the graph; auto-ranges 10 / 25 / 50 / 100 / 200…).
- Curve: power over time, scrolling right-to-left.
- **Single click** clears and restarts the curve.

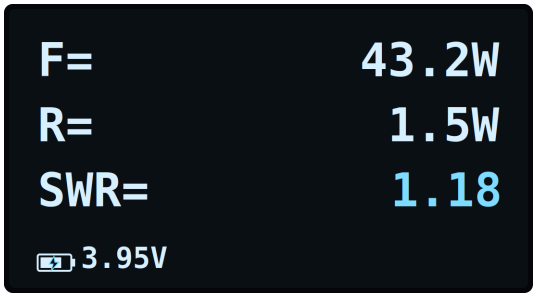
Screen 3: Power / SWR Dual-Bar



Screen 3 Dual-Bar

- Upper power bar: current power (small text) and a bar by power level.
- Middle SWR bar: a **baseline** with tick marks at **1 / 1.5 / 2 / 3 / 5** and a **pointer** that tracks SWR.
- Bottom `MAX` line: max power P and max SWR S since entering this screen.
- **While transmitting** (buzzer on) it emits a **tone whose pitch tracks SWR** — useful for tuning by ear.
- **Single click** clears this screen's `MAX`.

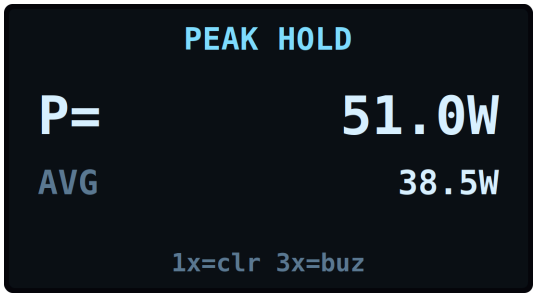
Screen 4: Detailed Data



Screen 4 Detail

- Three big lines: **F=** forward power, **R=** reflected power, **SWR=** ratio.
- Bottom: battery icon + voltage.
- Suited to watching forward and reflected power together (debugging, comparison).

Screen 5: Peak Hold



Screen 5 Peak Hold

- Title `PEAK HOLD`.
- Big `P=`: the **peak power (PEP)** of the current over.
- `AVG`: the maximum average power of the current over.
- **Auto-resets and re-measures at the start of each new over** (the value is held after the over ends; a gap of ≳1 s ends an over, so inter-syllable SSB gaps do not reset it).
- Bottom hint `1x=clr 3x=buz`; a **single click** also clears it.

7. Battery & Charge

- A **graphical battery icon** shows the charge level, with the voltage beside it.
- **While charging**, a lightning bolt appears inside the icon (charge status is read from the TP4056 CHRG pin; the MCU's internal pull-up is enabled, so no external resistor is needed).
- At **low battery** (≈3.4 V) the unit beeps once and the icon blinks.
- At **very low battery** (near 3.0 V) it **powers off automatically** to protect the cell — recharge promptly.
- **Timed auto power-off (optional)**: powers off after a long period with **no transmit, no button and no serial activity** to save battery; set the duration with `SET AOFF` (minutes, 0 = off, saved to EEPROM). Any transmit / button / serial data resets the timer — so **it will not power off while a PC is connected and sending data**.

8. Alarms & Tones

- **High-SWR alarm**: when SWR exceeds the threshold (factory default **3.00**) the buzzer sounds and the **HISWR pin goes low**. The threshold is set via the serial command `SET ALARM`. When serial streaming is on, a separate `ALARM,HISWR` line is also output for host software.
- **Tuning-aid tone**: see Screen 3 — pitch tracks SWR while transmitting.
- **Continuous-transmit reminder**: a beep when transmit exceeds the set time (default 60 s; change with `SET KDT`).
- All sounds obey the **master buzzer switch** (triple-click).

9. Power Calibration

The unit is normally calibrated at the factory. If you change detector parts or readings drift, re-calibrate the whole table or fine-tune individual points from the PC. Calibration needs a transmitter with **known, adjustable power** and an accurate **50 Ω dummy load**.

The table has **24 power points** (5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100 W); each maps to one ADC threshold.

9.1 On-device Calibration (OLED)

Enter: from off, **hold the button while powering on** for about half a second to enter calibration mode. The screen shows:

```
CAL MODE
LOAD 50R     connect 50Ω load
TX 50W..
2x=Start     double-click to start
```

- After connecting the 50 Ω load, **double-click** to start; **hold > 2 s** at any time to exit (without saving).

Point by point: the screen shows the point number and target power, e.g.:

```
Pt 1/24
Tgt  5W      target power
TX then      transmit at this power
```

- Set the transmitter to the shown target power and **key down**; the meter samples automatically once RF is detected, then shows **`RELEASE!`** with a beep — **unkey** now.
- A valid sample shows **`OK  Next`** and advances automatically; an invalid point (zero, or not greater than the previous) shows **`INVALID! / Retry...`** — redo that point.
- Repeat for all 24 target powers (5 W → 100 W).

Finish: when all 24 points are valid it shows **`CAL DONE / 24pt OK! / Saved!`** and saves automatically; bad data shows **`CAL FAIL / Bad data / NotSaved`** — redo.

> ADC thresholds must **increase** with power, so go low-to-high and make each point genuinely higher than the previous.

9.2 PC-side Fine-tuning

If only a few ranges are slightly off, you needn't redo the whole table — fine-tune single points on the web tool's **Calibration** tab (see Section 11).

1. Connect, open the Calibration tab, click **Read from device (CALDUMP)** to load the 24 thresholds into the table.
2. Click **Save to file** first to back up (so you can restore if a tweak goes wrong).
3. Transmit a known power, compare the reading with the true power, and locate the off point; **double-click** that point's **ADC threshold** cell to edit:
   - Reads **low** (shows less than the true power) → **decrease** that point's threshold slightly;
   - Reads **high** → **increase** it slightly;
   - Adjust in small steps (e.g. ±10 to ±50) and keep values **increasing**; if unsure of direction, nudge a little and transmit to see which way the reading moves.
4. Click **Write to device** (writes each point and marks valid), then transmit to verify; repeat until satisfied.
5. When done, **Save to file** again to keep a record.

> You can also fine-tune via serial: `CALDUMP` to view, `CALSET <index 0-23> <ADC>` to change one point, `CALVALID` to mark valid, `CALCLR` to clear.

10. Serial Data & Remote Control

Parameters: **9600 8N1**, 3.3 V levels, on the 4-pole jack (pinout in Section 3; cross TX/RX to the PC).

```
PWR=50.0,SWR=1.45,PEP=60.0,VBAT=3950,PCT=85,CHG=0
```

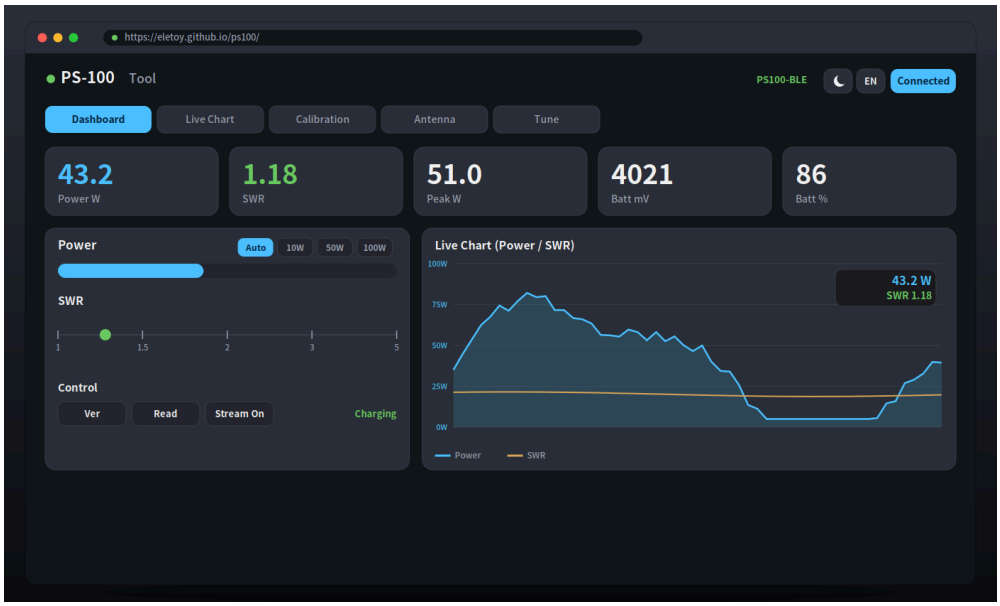
Fields: current power (W), SWR, peak power (W), battery voltage (mV), charge percentage, charge state (CHG: 1 = charging, 0 = not charging).

> **High-SWR line**: while transmitting above the threshold, a separate `ALARM,HISWR` line is also sent. Telemetry is sent **only while transmitting**; when idle, the web tool refreshes battery/charge by sending `READ` about every 2 s.

Command	Function
`READ`	return one data frame now
`STREAM 1` / `STREAM 0`	enable / disable continuous streaming
`VER`	firmware version & serial number
`SET ALARM 250`	set alarm threshold (SWR×100; here 2.50)
`SET FLIP 1` / `0`	screen flip on/off
`SET KDT 60`	continuous-TX reminder seconds (0 = off)
`SET AOFF 15`	auto power-off minutes (0 = off; after long inactivity with no RF/key/UART)
`CALDUMP`	dump the 24 calibration points
`CALSET <index> <value>`	write a calibration point (0–23)
`CALVALID`	mark calibration valid
`CALCLR`	clear the valid flag

11. Web Control (Phone / PC)

The meter has built-in Bluetooth (BLE) and a companion **single-page web tool**: open the page in Chrome/Edge on a phone or PC to connect, monitor and configure — **no app, no driver to install**. The UI is bilingual (Chinese/English), supports dark/light themes, and can be “Added to Home Screen” for offline use (PWA).



Web Control — Dashboard

Connecting

- **Bluetooth by default (BLE)**: the meter has built-in Bluetooth and advertises as `PS100-BLE` at power-on. Open the web page in **Chrome / Edge** on a **phone or computer** → click **Connect** → pick `PS100-BLE` to connect, monitor and configure.
- **Plugging in a TTL cable = wired mode, Bluetooth disconnects**: inserting a TTL serial cable into the **TTL socket** switches the meter to **wired serial**, and **Bluetooth disconnects** (the two are mutually exclusive); unplug the TTL cable and Bluetooth resumes advertising. Wired port is **9600 8N1, 3.3 V**; desktop browsers can use a USB-TTL adapter via “USB serial”.
- After connecting it auto-starts streaming, so transmitting shows readings and curves immediately; it **auto-reconnects and resumes streaming** after a drop or a device restart — no manual steps.
- (Optional) With an add-on Wi-Fi bridge module, you can connect over LAN/remotely for remote monitoring. **The Wi-Fi module is not included in the standard kit; it is a user upgrade.**

Main tabs

- **Dashboard**: five tiles (power, SWR, peak, battery voltage, charge) plus the power bar and SWR pointer; power/SWR/peak fall to zero when not transmitting. On `ALARM,HISWR` the SWR tile flashes red and beeps. The Basic/Settings/Log panels are collapsible for a cleaner view.
- **Chart**: plots **power** and **SWR** together; the power axis auto-ranges.
- **Calibration**: a table of the 24 points (index / mapped power / ADC threshold) with Read from device (CALDUMP), Write to device (CALSET + CALVALID) and Save/Load file backup (see 9.2).
- **Antenna**: CAT-linked automatic multi-band sweep — SWR-vs-frequency curve, band-health table, and open/short/detune diagnosis.
- **Tune**: a huge SWR readout + match bar + min-hold, with an optional audio tone (lower SWR = higher pitch) for tuning an external ATU by ear.

> Note: Web control needs a browser with Web Bluetooth / Web Serial (Android / desktop Chrome·Edge). **iPhone / iPad**: Safari and all wrapper browsers (including Chrome for iOS) do NOT support Web Bluetooth — install the **Bluefy** browser (App Store) and open this page in it to connect (Bluetooth only; USB-TTL is not supported on iOS), or use an Android phone / a PC. Grant the device permission in the dialog on first connect.

12. Troubleshooting

Symptom	Fix
Won’t power on	battery too low — charge it
Blank/garbled screen	check OLED wiring & type setting
Reversed or dead	RF in/out reversed — swap direction
Power inaccurate	re-run calibration (Section 9)
Button dead while TX	normal protection — operate when not transmitting
No/garbled serial	check 9600 8N1, 3.3 V adapter, crossed TX/RX
Can’t connect BLE	use Chrome/Edge, turn on Bluetooth, allow the dialog and pick PS100-BLE
Upside-down screen	adjust with `SET FLIP`

13. Safety Notes

1. Confirm the antenna/dummy load is connected before transmitting; **never transmit at high power into an open, short or high-SWR load**.
2. Do not exceed the unit’s rated power (per unit).
3. Always use a **3.3 V** USB-TTL adapter; never apply 5 V or back-feed power.
4. Observe Li-ion charging/discharging safety; store at a moderate charge if unused for long.
5. Keep away from antenna feedlines in thunderstorms to avoid lightning/ESD damage.

This manual is based on PS-100 firmware V2.0. Fill in items marked “per unit” according to your actual hardware.