

User manual

Portable Near Field Analyzer / Power meter 1 MHz to 4 GHz

This guide explains how to operate PNFA, interpret its display and choose settings for near-field troubleshooting and RF power measurements. Start with the quick-start procedure, then use the screen guides and menu map as references.

Contents

1 Getting started	2
2 Power and button operation	3
3 Charging and battery indications	4
4 Reading the Numeric screen	5
5 Reading the Graph screen	6
6 Sample Average Peak and Max Hold	7
7 Filters and fixed frequency operation	9
8 Gain attenuation and displayed units	11
9 Acoustic and haptic feedback	13
10 Display settings USB and device information	15
11 Measurement workflows and troubleshooting	17
12 Care and operating reference	18
13 Menu map	20
14 Communication protocol description	22

What PNFA measures

PNFA measures RF signal level at its SMA input. With a near-field probe, use changes in level to locate emission sources and compare modifications. The reading depends on the probe, distance, orientation, cable and selected input filter. It does not directly report electric or magnetic field strength.

The Graph screen shows level versus time. Full band scans the four filter paths and reports the strongest result; it does not display a frequency spectrum or add the power in all bands.

1 Getting started

Controls and connections

Use MODE and SET to control the instrument. SET also acts as the power button. The OLED shows measurements and menus; the SMA connector is the RF input, and USB-C provides the charging and computer connection.

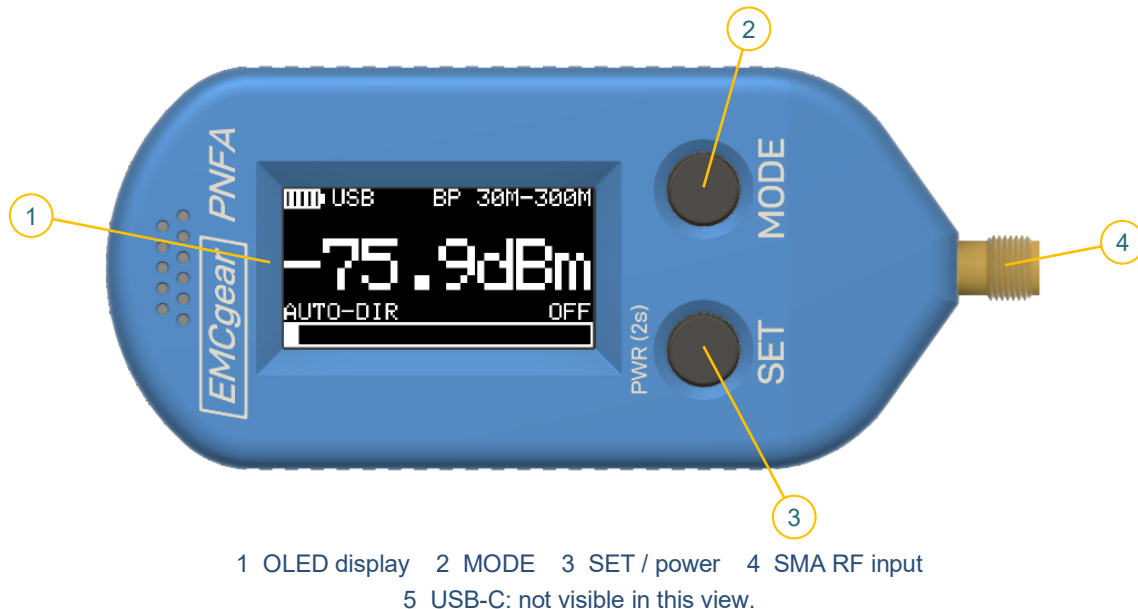


Figure 01. PNFA controls and connections.

First measurement

1. Connect a suitable near-field probe to the SMA input. For a direct RF connection, establish the source level and required attenuation before connecting it.
2. Hold SET for about 2 s to switch on, then release it. Wait for the startup screens and the measurement display.
3. Hold MODE for about 0.5 s to open the menu. Select View mode → Numeric, Math Mode → Sample, Filter mode → Wideband mode → Full band, and Gain mode → Auto.
4. Choose Feedback → Sensitivity → Medium. Enable audio, haptic feedback or both as required. Select [EXIT] to measure.
5. Move the probe slowly across the area of interest. Keep the probe orientation and distance consistent while comparing positions.

Before connecting a signal

Use the RF input only with a suitable RF source or probe. Do not connect it directly to mains wiring or use it as a voltage test probe. Vrms and Irms are calculated RF equivalents for 50 Ω, not general-purpose voltage or current measurements. An on-screen range indication is not an input-protection device.

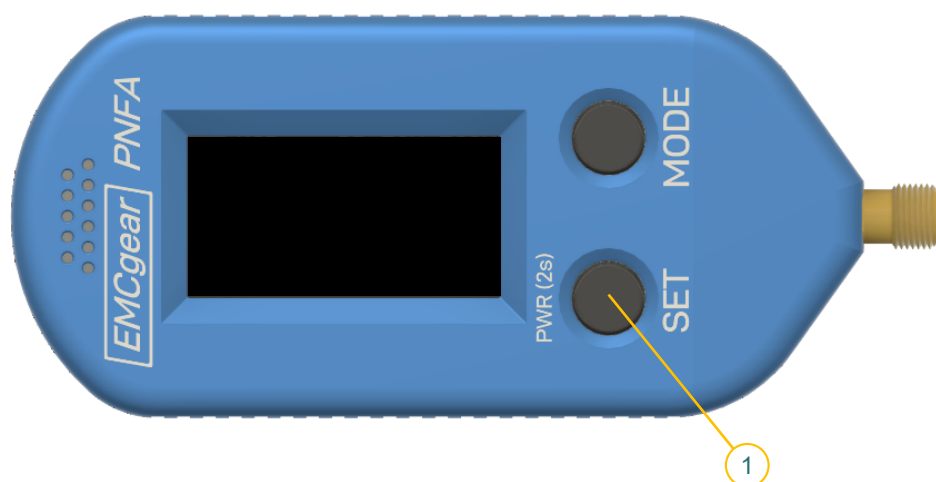
For an unknown source, determine its RF level and DC content before making a direct connection. Use an appropriately rated attenuator and DC blocking where required by the source and instrument specifications.

2 Power and button operation

Switching on and off

From the off state, hold SET for about 2 s and release it when the unit starts. The EMCgear logo and product-name screens appear before measurement. The instrument restores saved operating settings.

To switch off, return to the Numeric or Graph screen, then hold SET for about 2 s. A SET-only power-off hold is ignored while the menu is open. If USB charging is connected, switching off measurement can leave the charge-only battery screen visible.



1 SET: hold approximately 2 s, then release.

Power on from off; power off from the Numeric or Graph screen.

Figure 02. Starting PNFA and switching off from the measurement screen.

Button reference

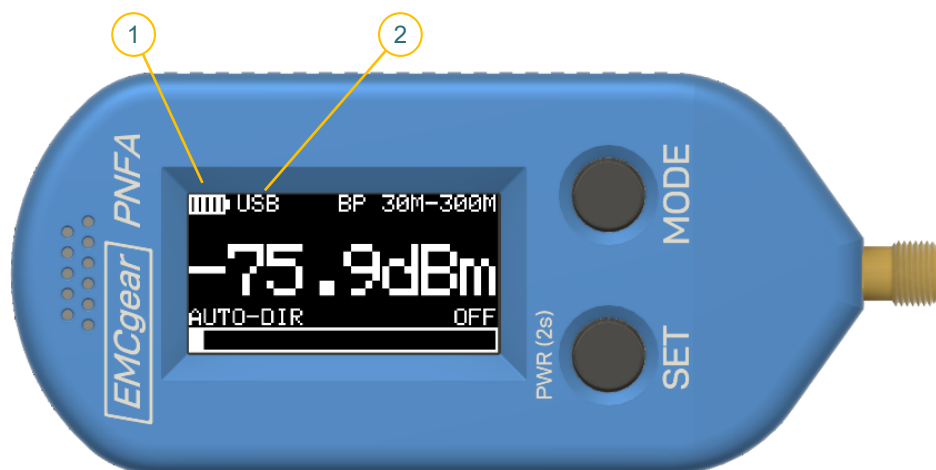
Context	Button action
Numeric or Graph	MODE short: next wideband filter. MODE hold ≈ 0.5 s: open menu. SET short: cycle feedback, except in Max Hold where it resets held values. SET hold ≈ 2 s: power off.
Menu with Flip = Left	MODE short: up. SET short: down. SET hold ≈ 0.5 s: confirm. MODE hold ≈ 0.5 s: back.
Menu with Flip = Right	MODE short: down. SET short: up. MODE hold ≈ 0.5 s: confirm. SET hold ≈ 0.5 s: back.
Frequency editor	MODE short: move digit. SET short: increase digit. MODE hold: decrease digit. SET hold: confirm. Orientation does not swap these controls.
Help screen	Hold MODE to return to the main menu.

Release a button after the intended action. Use [BACK] to move up one submenu, or [EXIT] at the root to return to measurement. Lists stop at their ends; they do not wrap. Long selected labels scroll to reveal their full text.

3 Charging and battery indications

Charging the instrument

1. Connect USB-C to a suitable 5 V USB power source using a suitable cable.
2. When measurement is off, the display shows a large battery symbol. Moving segments indicate charging; a steady full symbol indicates the firmware's full-battery state.
3. To measure while connected, hold SET for about 2 s. The normal display then shows the small battery symbol and charging *status*.
4. Disconnect USB when finished. In charge-only mode the screen returns to the off state after the connection change is recognised.



1 Battery segments 2 USB connection status

Operating-screen example; charge-only and CHRG views remain to be added.

Figure 03. Charge-only and operating-screen battery indications.

Indication	Meaning and action
Animated battery and CHRG	USB charging is detected. The moving segments indicate charging activity, not an exact percentage.
Full battery and USB	USB-connected operation with the visual full state reached. The firmware can show full from the battery estimate before the charger ends all top-up activity.
Battery segments only	Battery operation. Treat the segments as an approximate charge indication.
LOW	Low-battery warning. Connect USB and recharge.
LOW BATTERY / Powering off	The battery-protection threshold has been reached. PNFA briefly displays battery voltage and switches off measurement.

Automatic power off

Display → Automatic power off cycles through OFF, 15 min, 30 min and 60 min. The timer measures inactivity of the buttons; changing RF levels does not restart it. Pressing a button restarts the timer.

4 Reading the Numeric screen

Choose View mode → Numeric for a large numerical readout. The value follows the selected Math Mode and Display → Units setting. In dBm, the main readout uses one decimal place.

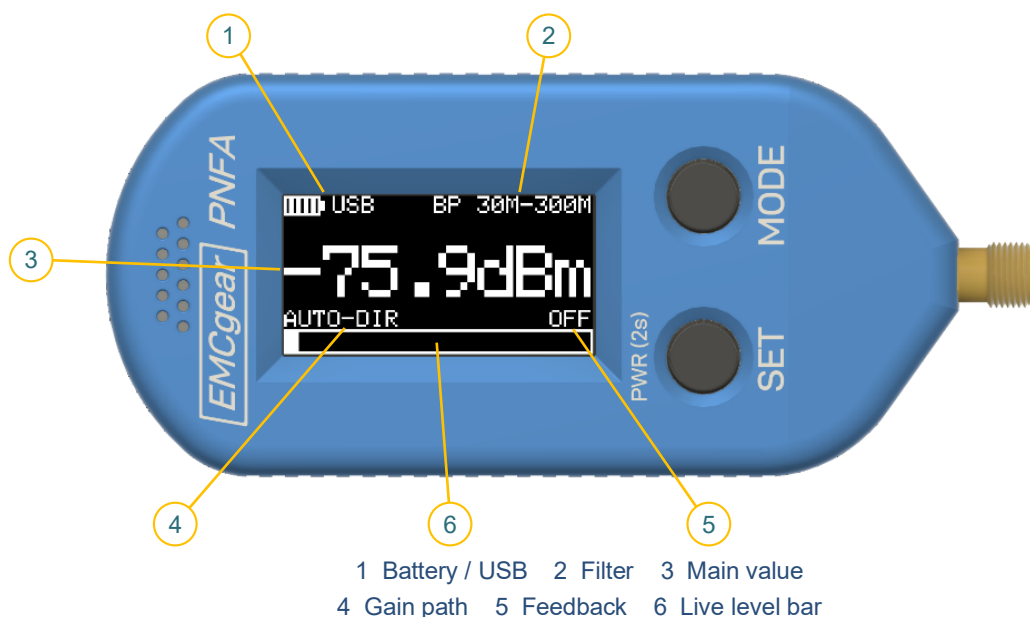


Figure 04. Numeric screen with its measurement and status areas.

Area	What to read
1 Battery and USB status	Battery segments and, when applicable, CHRG, USB or LOW.
2 Filter or fixed frequency	The selected band, FULL, Max.LP / Max.BP1 / Max.BP2 / Max.HP, or FIX / FIX-CAL followed by the entered frequency.
3 Main value	Measured level in the chosen unit. OVERRANGE or UNCAL replaces a normal measurement when applicable.
4 Gain path	DIR or ATT for a manual path; AUTO-DIR or AUTO-ATT for automatic switching; EXT. ATT when external compensation is enabled.
5 Feedback state	OFF, AUD+HAP, AUD or HAP.
6 Level bar	A quick visual level indication. Its scale depends on the active input path and external attenuation; it is not an additional calibrated range specification.

Understanding the status labels

FULL means all four filter paths are being scanned. Max. followed by a band abbreviation identifies the strongest band when its indication is stable and sufficiently above the path's noise threshold. At low levels, FULL can remain visible without a strongest-band label.

FIX identifies fixed-frequency operation. FIX-CAL indicates that production calibration is complete and the level is inside the firmware's calibrated-range classification for the active path. It does not establish that the entered frequency matches the signal.

In Max Hold, "max." appears below the retained value. The bottom bar continues to follow the live level, so it can fall while the main value remains unchanged.

5 Reading the Graph screen

Choose View mode → Graph to follow level changes over time. Graph settings then appears in the main menu. Use Graph settings → Time axis to cycle through nominal spans of 1 s, 5 s, 10 s, 30 s and 60 s.

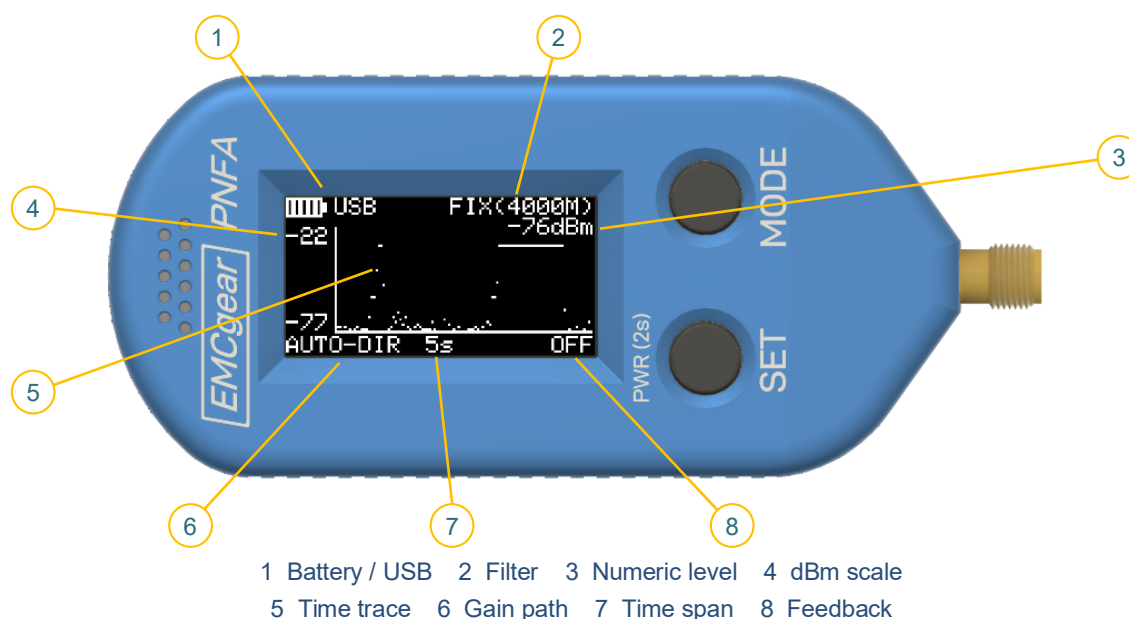


Figure 05. Graph screen showing signal level over time.

Area	Interpretation
Top status and level	The battery and filter labels match Numeric. The compact numerical value is below the filter label; dBm is displayed as a whole-number value here.
Vertical scale	The left-hand limits show dBm. The scale adjusts automatically to the displayed data. Changing Display → Units changes the compact readout, not the graph's dBm scale.
Horizontal direction	Samples run from oldest on the left to newest on the right of the populated trace. After a reset, the trace fills from the left; once full, the visible history advances.
Bottom row	Gain path at left, selected time span in the centre and feedback state at right.

Choosing the time span

Use a shorter span to follow rapid changes while moving a probe, and a longer span to observe slower variations. The 1 s option is nominal; the current sampling limit produces approximately 1.06 s across a full trace. The graph is a level-history view, not a waveform oscilloscope.

When the trace restarts

Changing the time axis, measurement view or Math Mode resets relevant display history. Input-path changes can also reset the graph, including an automatic gain change. A trace restart after a setting change is therefore expected.

6 Sample Average Peak and Max Hold

Math Mode is a cycling item in the main menu. Confirm repeatedly until the required mode is displayed, then return to measurement. It changes how samples are combined for the display; acoustic and haptic feedback continue to respond to the live corrected level.

Math Mode	Behaviour and typical use
Sample	Shows the most recent selected result. Use it for immediate feedback while moving a probe.
Average	Averages the dBm samples collected in each display interval. Use it to reduce visible fluctuation. This is an average in dBm, not an arithmetic average of power in watts.
Peak	Shows the highest sample collected in each display interval. The next interval starts a new peak search; this does not retain a session maximum.
Max Hold	Retains the maximum until reset or a measurement-context change. Use it to compare repeatable scans or capture the largest observed level.

Using Max Hold

1. Select Math Mode → Max Hold and return to measurement.
2. Press SET briefly to clear any previous held result before a new comparison.
3. Move the probe through the area of interest or run the test event. Read the retained maximum.
4. Press SET briefly before repeating the test. In this mode, SET does not cycle the feedback state; use the Feedback menu instead.

In Graph, the plotted trace remains live and a dashed reference represents the retained maximum when it is high enough above the display baseline. Very low maxima may have no dashed reference. In Numeric, the bar also remains live.

Numeric aggregation intervals are approximately 100 ms. Graph intervals depend on the selected time axis. In Full band, aggregated modes compare the per-band results and report the strongest; they do not sum the bands. An overrange within an aggregation interval can invalidate its result; Max Hold can retain that condition until reset.

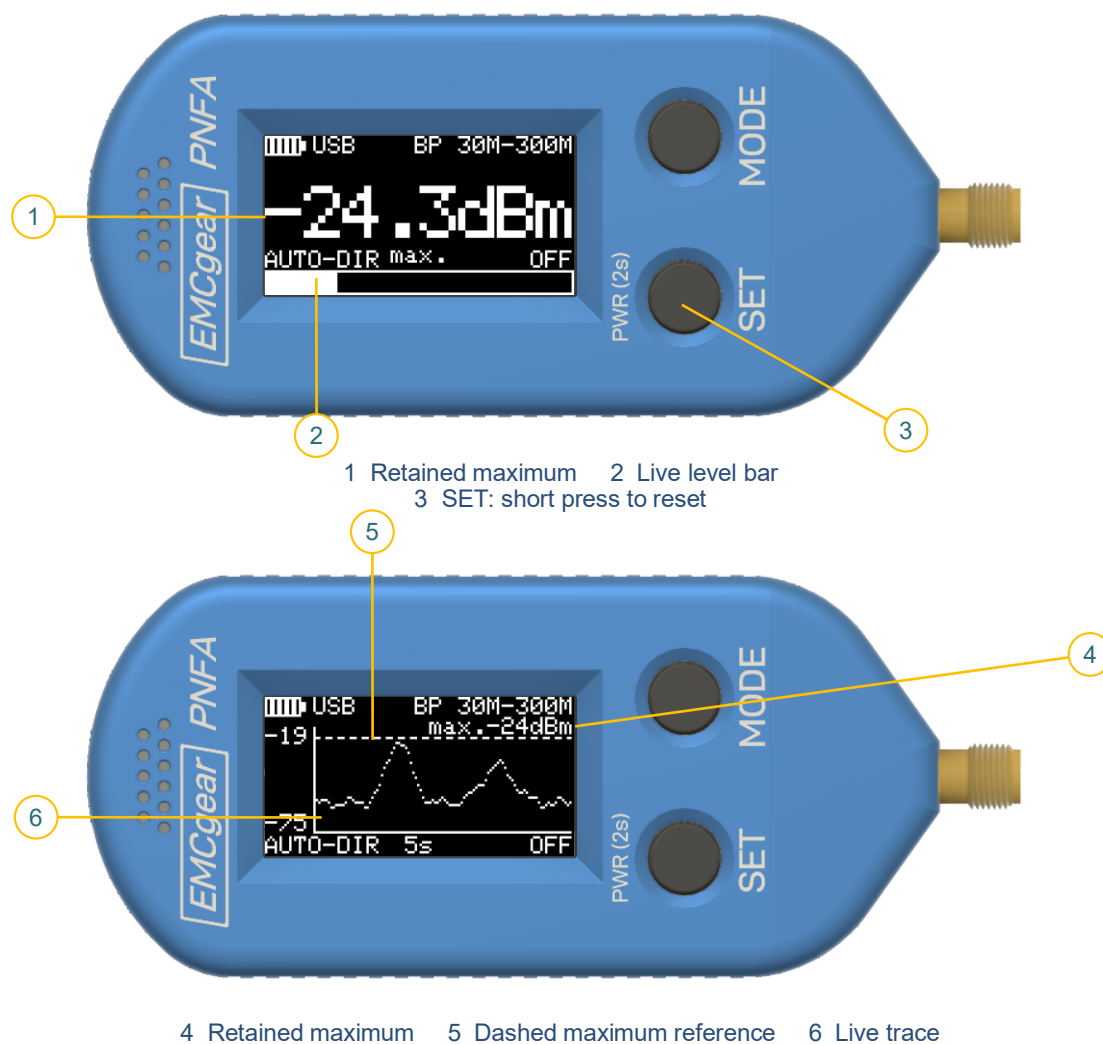


Figure 06. Max Hold retains a maximum while the live signal continues to change.

7 Filters and fixed frequency operation

Wideband operation

Select Filter mode → Wideband mode. Entering this submenu turns high precision off. Choose Full band to search across all bands, or select a manual band to focus a comparison. "M" in the menu labels means MHz.

Menu option	Purpose
Full band	Scan all four input-filter paths and report the strongest result.
Lowpass 30M	Low-pass path below 30 MHz within the instrument's operating range.
Bandpass 30-300M	Band-pass path for 30–300 MHz.
Bandpass 300-1000M	Band-pass path for 300–1000 MHz.
Highpass 1000M	High-pass path above 1000 MHz within the operating range.

On a normal measurement screen, a short MODE press cycles LP → BP1 → BP2 → HP → Full band → LP. This shortcut is inactive while high precision is enabled. Filter boundaries are nominal; the filters do not have ideal vertical cutoffs.

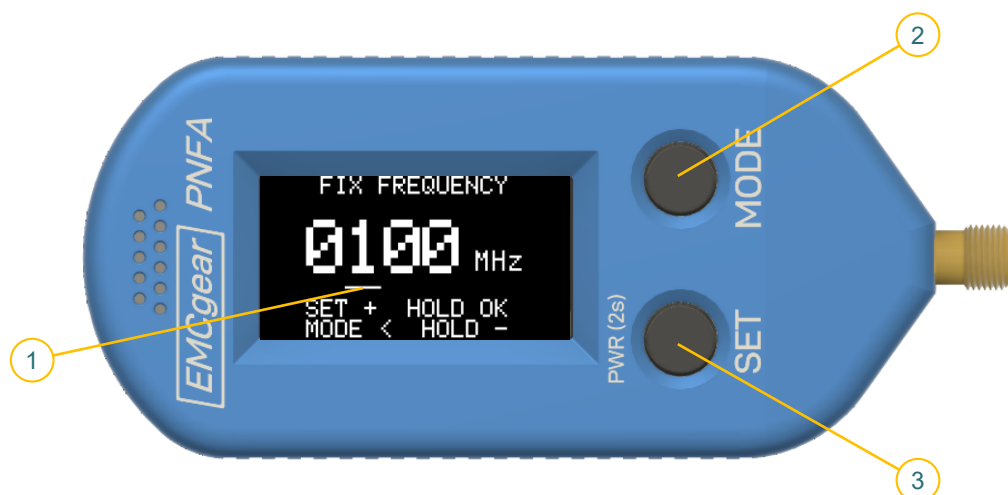


2 Strongest band 3 MODE: short press to cycle wideband filters

Figure 07. Wideband filter selection and strongest-band indication.

High precision operation

1. Use this mode when the signal frequency is known. Open Filter mode → High precision mode → Enter frequency.
2. Enter a whole-MHz frequency from 1 to 4000. MODE short moves between digits; SET short increases a digit; MODE hold decreases it.
3. Hold SET for about 0.5 s to confirm, then release it. PNFA selects the corresponding filter and returns to measurement.
4. To leave fixed-frequency operation, select High precision mode → Off, or enter Wideband mode.



- 1 Selected digit 2 MODE: short = move; hold 0.5 s = -1
3 SET: short = +1; hold 0.5 s = confirm

Figure 08. Entering the known signal frequency.

The entered value selects frequency-dependent correction and the appropriate filter. It does not tune a narrowband receiver to that frequency or reject other signals within the selected band. Use a known, suitable signal when evaluating absolute level.

8 Gain attenuation and displayed units

Choosing the input path

Gain mode	Behaviour
Auto	Switches between Direct and the internal attenuator as level changes. Use this for a first scan across an unknown range.
Direct	Keeps the direct path selected. Useful for weak-signal comparisons where a stable input path matters.
Int. attenuator	Keeps the internal attenuator selected for stronger input levels.
Ext. attenuator	Enables compensation for a physical external attenuator and forces the internal attenuator path. The screen shows EXT. ATT.

External attenuation

1. Connect a suitably rated external attenuator physically in the RF signal path.
2. Open Gain mode → Ext. attenuator. Select 20 dB for the preset, or confirm Custom repeatedly to set the intended attenuation. Custom increments by 1 dB and wraps from 100 dB to 0 dB.
3. Verify the displayed compensation against the attenuator you connected before interpreting the corrected reading.
4. Select Off to disable compensation. Auto, Direct or Int. attenuator also disables it. Off alone does not automatically restore the previous gain mode.

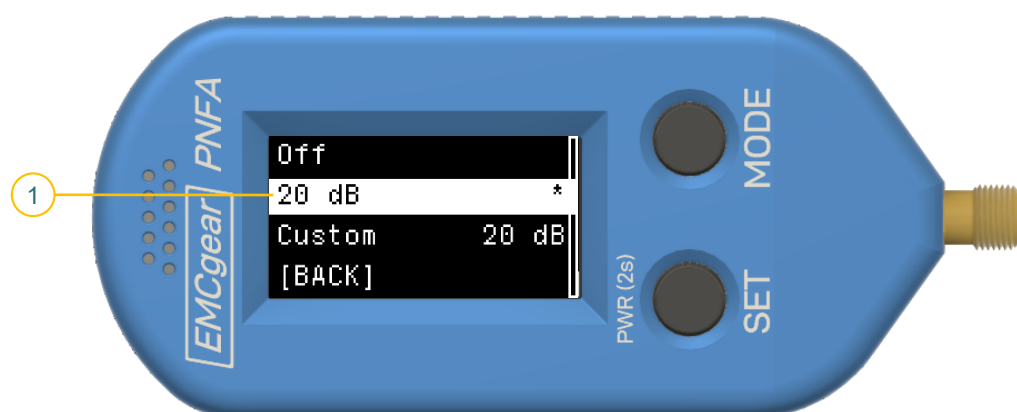
Units

Display → Units offers Power (dBm), Power (Watt), Voltage (Vrms) and Current (Irms). Linear units scale automatically with SI prefixes; the display uses "u" for micro. Voltage and current are calculated from RF power using a 50 Ω reference: $V_{rms} = \sqrt{P \times 50 \Omega}$ and $I_{rms} = \sqrt{P / 50 \Omega}$.

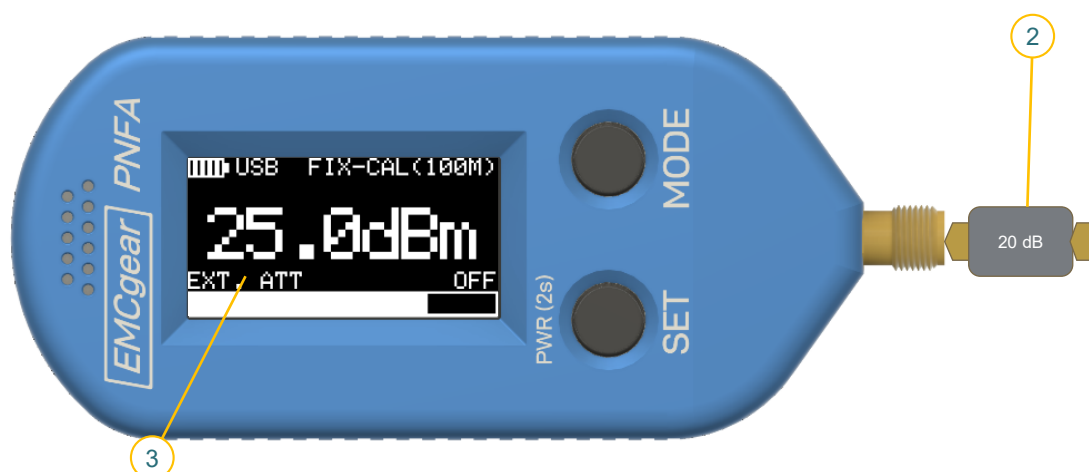
For example, 0 dBm corresponds to 1 mW, approximately 0.224 Vrms and 4.47 mArms in 50 Ω. Changing the unit does not change the input path or turn PNFA into a direct voltage/current meter.

Measurement range indications

The firmware's nominal FIX-CAL level windows are –50 to –15 dBm for Direct and –15 to +20 dBm for the internal attenuator, referenced before external compensation. Classification uses hysteresis to avoid rapid label changes. These are measurement-classification windows, not maximum safe input ratings. If OVERRANGE appears, reduce the applied level or use appropriate physical attenuation.



1 20 dB compensation selected



2 Physical 20 dB attenuator 3 EXT. ATT compensation
Example: +5.0 dBm at PNFA input; +25.0 dBm before the attenuator.

Figure 09. Matching external attenuation compensation to the connected attenuator.

9 Acoustic and haptic feedback

Feedback helps you follow signal changes while watching the probe position. Audio and haptic outputs can be used together, independently or switched off. Their response is based on live signal level, including enabled external attenuation compensation.

Setting	Operation
Audio → Enable	Select On or Off.
Audio → Volume	Cycle 20%, 40%, 60%, 80% and 100%. Use Enable → Off to mute audio; the volume cycle has no zero setting.
Audio → Audio mode → Tone	Pitch increases as signal level rises. The response is smoothed to reduce rapid pitch changes.
Audio → Audio mode → Geiger	Short clicks become more frequent as the level rises.
Haptic	Toggle vibration On or Off. Stronger signals produce denser pulses and can produce continuous vibration.
Sensitivity	Cycle Low, Medium and High. High makes feedback respond at lower signal levels; Low requires a stronger level. This setting changes the feedback response, not RF gain or displayed power.

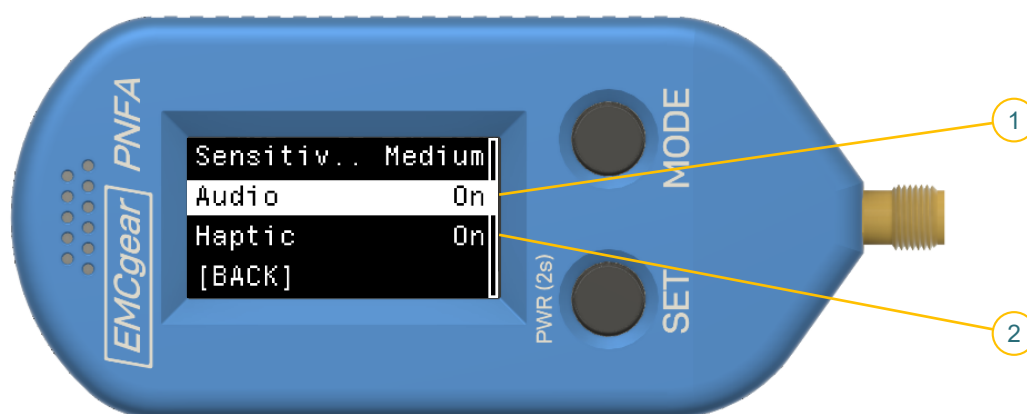
Quick switching during measurement

Outside Max Hold, briefly press SET to cycle OFF → AUD+HAP → AUD → HAP → OFF. Read the lower-right status label to confirm the active combination. In Max Hold, the same press resets the retained result; change feedback through the menu instead.

Practical use

Start with Medium sensitivity. If weak changes are difficult to notice, try High; if feedback stays near its strongest response, try Low or use an appropriate measurement setup for the source. Audio and haptic response thresholds differ, so an audible response without vibration can be normal.

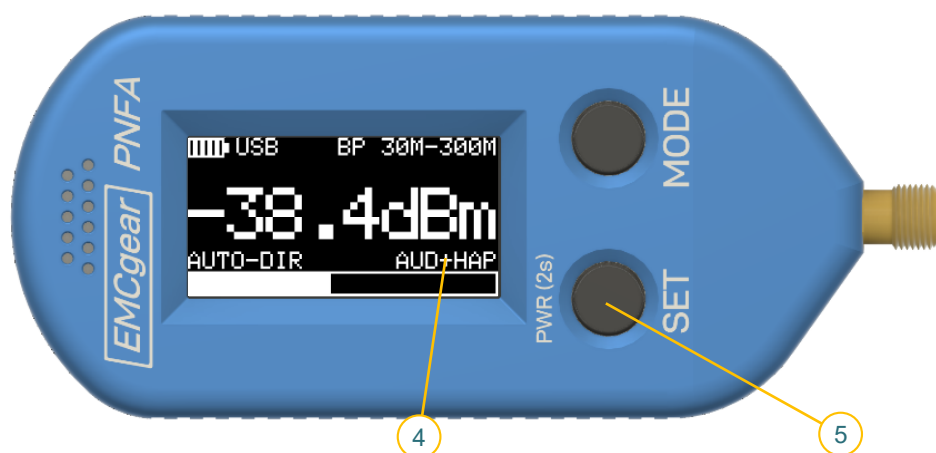
Keep sensitivity, volume, filter and probe geometry consistent during comparisons. A change in feedback settings can change the perceived response without changing the measured RF level. Judge quantitative differences from the readout with the same measurement settings.



1 Audio enabled 2 Haptic enabled



3 Tone selected; Geiger is the alternative



4 AUD+HAP 5 SET: short press cycles feedback
In Max Hold, SET resets the maximum instead.

Figure 10. Selecting feedback and interpreting its status label.

10 Display settings USB and device information

Display preferences and saving settings

Display → Flip selects Left or Right orientation. The menu roles of MODE and SET swap with orientation; power control, the measurement-screen shortcuts, the frequency editor and Help return control do not swap. Display → Invert changes the light/dark presentation. Backlight adjusts OLED brightness through 20%, 40%, 60%, 80% and 100%.

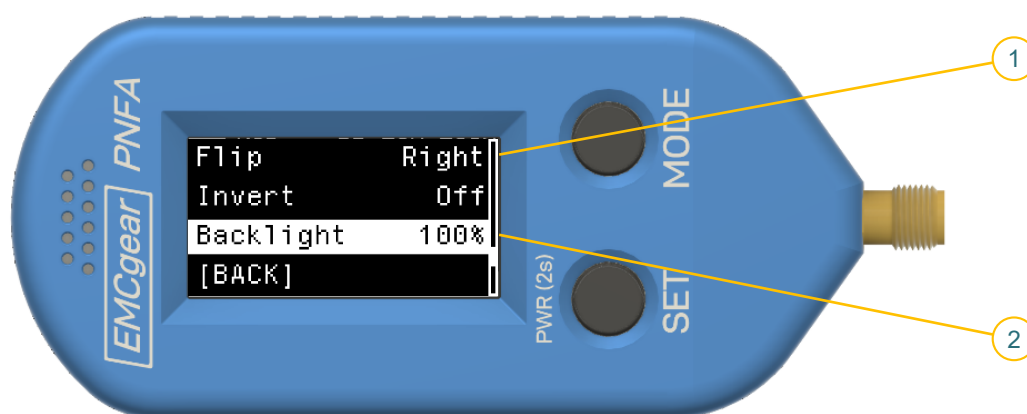
Operating preferences are saved by the normal power-off path and restored at startup, including the view, Math Mode, graph time axis, RF settings, feedback and display preferences. Return to measurement and use SET to switch off after making changes. Do not rely on an abrupt loss of power to save new settings. Held peaks and graph samples are not saved measurement records.

USB operation and screen capture

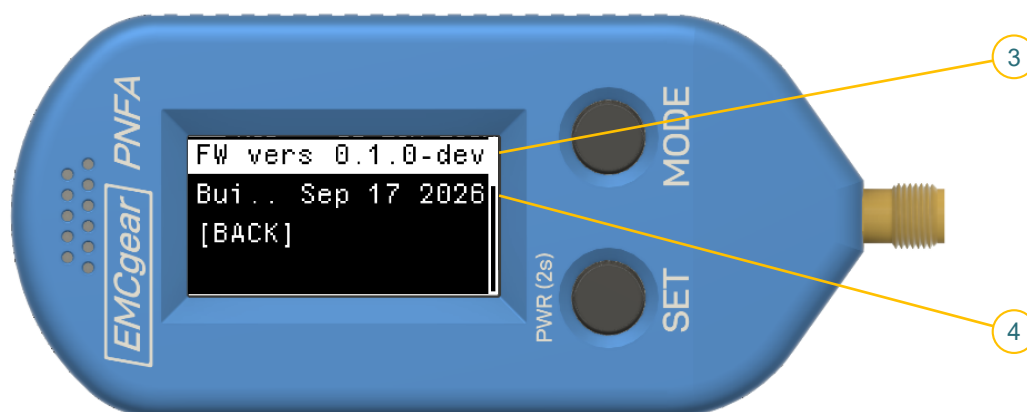
Connecting USB or opening its serial port does not start data acquisition automatically. Live text commands can read and configure measurement while local controls remain active. See chapter 14 for the supported communication commands.

Identification help and service

Misc → Identification displays Serial No and HW revision. Misc → Version displays FW version and Build date. Include these values and your measurement settings when requesting support. Help displays a QR code for the manual; hold MODE to return.



1 Flip = Right 2 Backlight = 100%



3 FW version = 0.1.0-dev 4 Build date = Sep 17 2026

Figure 11. Display preferences and firmware identification.

11 Measurement workflows and troubleshooting

Locate an emission source

1. Start with Numeric or Graph, Sample, Full band and Auto gain. Enable the required feedback.
2. Scan with the probe at a consistent height and orientation. Follow repeatable level increases and the strongest-band indication.
3. Select the relevant manual band, then repeat the scan to compare positions under consistent filtering. For before/after tests, keep probe, cable, gain and geometry unchanged.
4. Use Max Hold for repeated passes, resetting with a short SET press before each pass. Record the level and all settings.

Measure a known RF signal

Establish safe source level and DC conditions, then connect the appropriate RF cable and attenuation. Select High precision and enter the known signal frequency. Verify the gain path, external compensation and FIX-CAL indication before recording a result. Other energy within the selected band can contribute to the reading.

Symptom	Check or action
Does not start	Hold SET for about 2 s. Connect USB and check the charging display, then allow the battery to recharge.
SET does not switch off	Exit the menu first, then hold SET for about 2 s from the Numeric or Graph screen.
No sound or vibration	Check Feedback enable settings, Volume and Sensitivity. A weak signal can be below the selected response threshold.
MODE does not change filters	High precision disables the shortcut. Choose Wideband mode to select filters manually.
SET clears the reading	Max Hold is selected. SET short resets its retained result.
Graph settings is missing	Select View mode → Graph, then return to the main menu.
OVERRANGE	Reduce the input level or use an appropriate input path/physical attenuator. Reset Max Hold after correcting the setup.
UNCAL and ADC value	Production calibration is incomplete. Normal power readout is unavailable; arrange calibration/service.
FIX instead of FIX-CAL	Check calibration status and whether the signal level is within the active path's calibrated classification. Verify the entered frequency separately.
Graph restarts or scale changes	Check for gain switching or a setting change. Automatic rescaling and history resets are expected in these cases.
Reading is offset	Check physical versus configured attenuation, known frequency, units, filter and probe/cable geometry.

12 Care and operating reference

Handling and storage

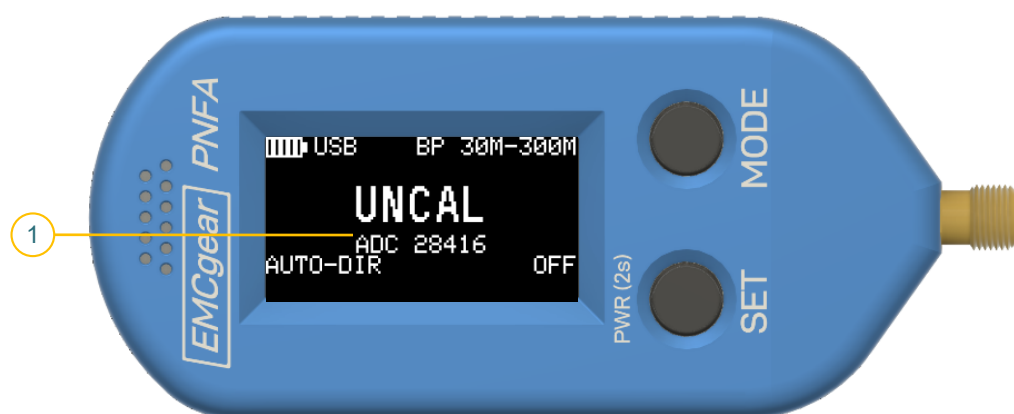
Keep the instrument and its connectors clean and dry. Disconnect external cables before cleaning; use a soft dry cloth. Avoid mechanical force on the SMA and USB-C connectors, and support attached adapters so they do not act as a lever on the instrument.

Inspect cables, probes and attenuators before use. If the instrument or battery is visibly damaged, stop using and charging it and arrange service. Follow the battery and environmental limits specified for the supplied hardware. Calibration and battery replacement should follow the applicable service instructions.

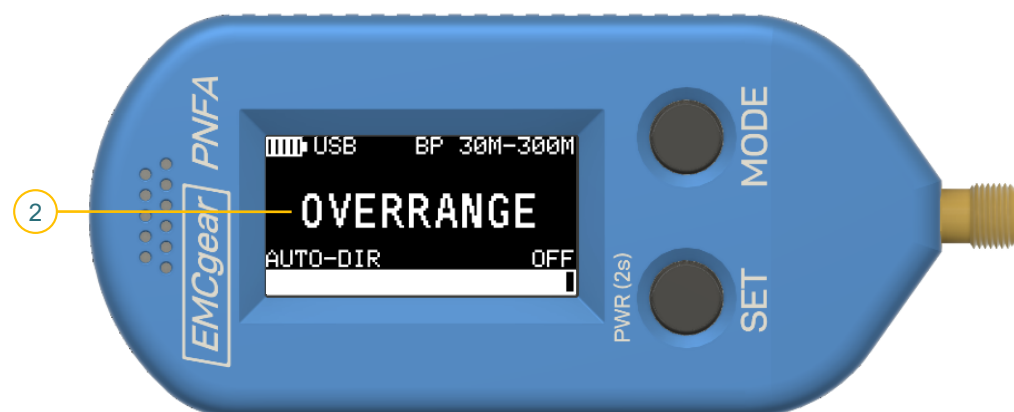
Operating reference

Parameter	Implemented or source-described value
RF operating frequency	1 MHz to 4 GHz; source datasheet range.
RF reference impedance	50 Ω nominal; SMA female RF input in the source datasheet.
Display	128 × 64 OLED; Numeric and Graph views.
Input-filter selection	Four bands plus Full band scanning.
Fixed-frequency entry	1–4000 MHz in whole-MHz steps.
Math modes	Sample, Average, Peak, Max Hold.
Graph spans	1, 5, 10, 30 and 60 s nominal.
Feedback	Tone or Geiger audio; haptic vibration; independent enables; three sensitivity settings.
External compensation	20 dB preset or Custom 0–100 dB in 1 dB steps.
Charging connection	USB-C, 5 V supply as described by the source datasheet.
Automatic power off	OFF, 15, 30 or 60 min of button inactivity.

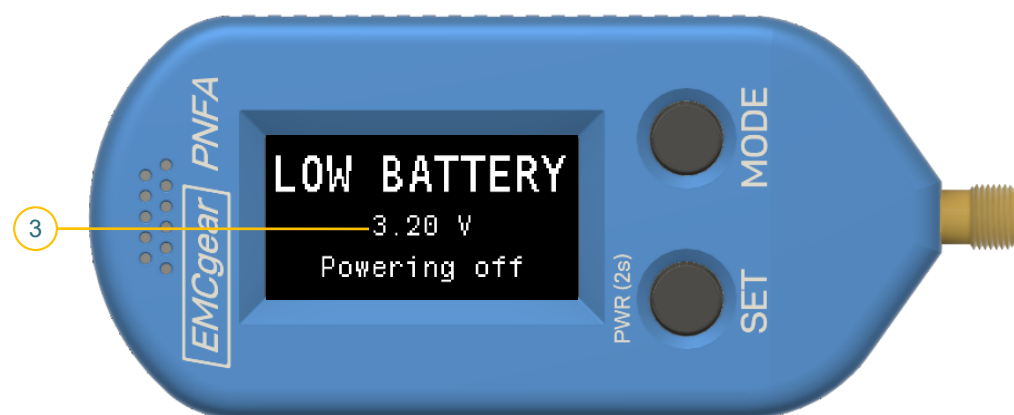
Measurement accuracy, absolute input limits, charging time and battery endurance depend on the released hardware and its qualification. Use the released product specification for those limits; the firmware's display and range settings do not define hardware safety ratings.



1 UNCAL and raw ADC value: production calibration incomplete



2 OVERRANGE: reduce the applied level or use physical attenuation



3 LOW BATTERY: 3.20 V; measurement is switching off

Figure 12. Diagnostic messages that replace a normal measurement.

13 Menu map

Use this map to find a setting and understand what confirming it does. Menu labels match the display; indentation shows the submenu hierarchy.

Navigation

Open the menu: hold MODE for about 0.5 s from Numeric or Graph. In Flip = Left, press MODE / SET to move up / down; hold SET to confirm and MODE to go back. In Flip = Right, these menu roles are swapped.

Select = choose a listed option. Cycle = confirm repeatedly to advance through values. Every submenu ends with [BACK]. An asterisk (*) marks the selected choice where supported.

Menu item	Options or action
View mode	Select the measurement screen
Numeric / Graph	Numeric readout / signal history graph.
Math Mode	Cycle: Sample → Average → Peak → Max Hold.
Graph settings	Visible when Graph is selected
Time axis	Cycle: 1 s → 5 s → 10 s → 30 s → 60 s.
Filter mode	Choose wideband or fixed-frequency operation
Wideband mode	Opens filter selection and turns high precision off.
Full band	Select automatic scanning across the filter bands.
Lowpass 30M	Select the low-pass filter below 30 MHz.
Bandpass 30-300M	Select the 30–300 MHz band-pass filter.
Bandpass 300-1000M	Select the 300–1000 MHz band-pass filter.
Highpass 1000M	Select the high-pass filter above 1000 MHz.
High precision mode	Opens the fixed-frequency settings.
Enter frequency	Enter 1–4000 MHz; confirm to activate the mode.
Off	Turn high precision off.
Gain mode	Choose the input gain path
Auto	Select automatic input-path switching.
Direct	Select the direct input path.
Int. attenuator	Select the internal attenuator.
Ext. attenuator	Open external-attenuator compensation settings.
Off / 20 dB / Custom	Off: disable compensation. 20 dB: enable preset. Custom: add 1 dB per confirmation, cycling 0–100 dB.

External attenuation: connect the matching physical attenuator. Enabling compensation also selects the internal attenuator. Auto, Direct or Int. attenuator disables external compensation.

PNFA menu map continued

Menu item	Options or action
Feedback	Configure signal-level feedback
Sensitivity	Cycle: Low → Medium → High.
Audio	Open audio settings.
Enable	Select: On / Off.
Volume	Cycle: 20% → 40% → 60% → 80% → 100%.
Audio mode	Select: Tone / Geiger.
Haptic	Toggle vibration feedback: On / Off.
Display	Configure units and screen behaviour
Units	Select the displayed measurement unit.
Power (dBm) Power (Watt) Voltage (Vrms) Current (Irms)	Power in dBm or watts; equivalent RMS voltage or current.
Automatic power off	Cycle: OFF → 15 min → 30 min → 60 min.
Flip	Toggle orientation: Left / Right. Also swaps menu button roles.
Invert	Toggle display inversion: On / Off.
Backlight	Cycle brightness: 20% → 40% → 60% → 80% → 100%.
Misc	Device information
Identification	Serial No / HW revision — read-only.
Version	FW version / Build date — read-only.
Help	Open the help screen. Hold MODE to return to the main menu.
[EXIT]	Close the menu and return to the measurement screen.

Entering a frequency

Filter mode → High precision mode → Enter frequency opens the frequency editor. Press MODE to move between digits; press SET to increase the selected digit, or hold MODE to decrease it. Hold SET to confirm and return to measurement, then release it. These editor controls stay the same in both display orientations.

Useful details

Changing View mode updates the menu immediately: Graph settings appears only for Graph in normal use. In Max Hold, a short SET press on the measurement screen clears the held values and graph trace. Cycle settings wrap back to their first value.

Service shortcuts

These are hidden actions, not ordinary menu entries. Highlight Misc → Version and hold MODE + SET together for 3 s to open Debug. Highlight Misc → Version → FW version and use the same hold to enter USB DFU firmware-update mode.

14 Communication protocol description

PNFA provides a USB CDC virtual serial port.

Connection and message format

Open the virtual serial port with DTR asserted. A suitable terminal setting is 115200 bit/s, 8 data bits, no parity, 1 stop bit and no hardware flow control. USB carries the data; the selected baud rate does not determine transfer speed.

Use uppercase ASCII commands and space-separated parameters. End each command with LF or CR+LF; CR alone does not execute it. Responses use CR+LF. Send one command at a time and consume its complete response before sending another. USB packet boundaries are not message boundaries.

Parse NAME=VALUE fields by name and ignore additional response fields. Examples wrapped across lines in this chapter are transmitted as one line unless an explicit multi-line response or binary payload is described. Use the documented parameter combinations; validation differs between command families.

Normal live operation

```
PNFA:READ?
PNFA:FILTER:SET MODE=MANUAL FB=BP1
PNFA:FILTER:SET MODE=AUTO
PNFA:FILTER:STATUS?

PNFA:GAIN:SET MODE=AUTO
PNFA:GAIN:SET MODE=MANUAL PATH=DIR
PNFA:GAIN:SET MODE=MANUAL PATH=A15
PNFA:GAIN:SET EXT_ATT=20
PNFA:GAIN:SET EXT_ATT=OFF
PNFA:GAIN:STATUS?

PNFA:FIX:SET FREQ=100
PNFA:FIX:OFF
PNFA:FIX:STATUS?
```

All commands above work during normal local measurement. Opening USB or sending them does not disable front-panel controls or feedback. Local automatic power-off remains active. These setters do not explicitly save settings to flash.

The following pages cover live measurement and configuration commands, OLED capture and DFU entry. There are no implemented text setters for display units, Math Mode, graph span, audio, haptic or display preferences.

Read the current signal level

```
PNFA:READ?
```

Returns the latest successfully acquired live level in dBm, including enabled external attenuation compensation and active fixed-frequency correction. It ignores display units, Average, Peak and Max Hold and does not change measurement settings. Full band returns the strongest filter in the latest complete sweep, not a sum or the stabilized display label.

```
OK READ DBM=-42.30 FB=BP1 GAIN=DIR VALID=1
OVERRANGE=0 AGE_MS=12
```

DBM has a decimal point and two fractional digits; this resolution is not an accuracy specification. GAIN is DIR or A15. FB identifies the measured filter. VALID=1 means a usable acquisition for the current path. AGE_MS is elapsed time since that filter was sampled.

```
OK READ DBM=NA FB=BP1 GAIN=DIR VALID=0
OVERRANGE=1 AGE_MS=12
```

Overload suppresses the numeric level. Full band conservatively reports overload if any measured filter in the sweep has a latched overload. ERR SETTling is returned while the input path settles. ERR NO_DATA is returned before a usable sample, after an acquisition failure or after a path change without a fresh sample. After settling, retry; do not reuse a previous numeric level as a new sample.

Select a wideband filter

```
PNFA:FILTER:SET MODE=MANUAL FB=LP
PNFA:FILTER:SET MODE=MANUAL FB=BP1
PNFA:FILTER:SET MODE=MANUAL FB=BP2
PNFA:FILTER:SET MODE=MANUAL FB=HP
PNFA:FILTER:SET MODE=AUTO
```

MANUAL selects the requested physical filter without a frequency argument. AUTO enables Full band scanning and strongest-band selection. Both disable FIX and preserve gain mode, gain path and external attenuation settings. Previously enabled automatic gain continues to operate.

```
PNFA:FILTER:STATUS?
OK FILTER STATUS MODE=MANUAL FB=BP1 FIX=0
```

A successful SET uses the same fields and begins OK FILTER SET. MODE is MANUAL for one filter, including FIX, or AUTO for Full band. FIX=1 identifies active fixed-frequency operation. In AUTO, FB is the strongest filter of a valid sweep; FB=NA means no valid sweep for the current configuration yet. AUTO SET initially reports FB=NA.

FILTER:SET validates the entire request before changing settings. Missing, invalid or duplicate MODE gives ERR BAD_FILTER_MODE. Missing, invalid or duplicate FB, unknown parameters, or FB supplied with AUTO gives ERR BAD_FILTER. Parameter order is free.

Gain mode and input path

```
PNFA:GAIN:SET MODE=AUTO
PNFA:GAIN:SET MODE=MANUAL PATH=DIR
PNFA:GAIN:SET MODE=MANUAL PATH=A15
```

AUTO switches between the direct path and the internal attenuator according to signal level. MANUAL selects DIR or the nominal 15 dB internal attenuator A15. Each gain-mode command disables external attenuation compensation and leaves filter and FIX configuration unchanged.

```
PNFA:GAIN:STATUS?
OK GAIN STATUS GMODE=MANUAL GAIN=A15 FB=BP1
EXT_ATT=0 EXT_ATT_DB=20
```

A successful setter begins OK GAIN SET and has the same fields. GMODE is AUTO or MANUAL; GAIN is DIR or A15. In AUTO, GAIN can change after the response. FB is the selected manual filter; in Full band it is not the strongest-band result. Use FILTER:STATUS? or READ? for the strongest measured band.

External attenuation compensation

```
PNFA:GAIN:SET EXT_ATT=20
OK GAIN SET GMODE=MANUAL GAIN=A15 FB=BP1
EXT_ATT=1 EXT_ATT_DB=20
```

Enables compensation for a physically connected external attenuator. The value is a whole number from 0 to 100 dB. Enabling compensation also selects MANUAL gain and the A15 internal path. It adds the configured attenuation to the reported input-referred level; it does not create physical external attenuation.

```
PNFA:GAIN:SET EXT_ATT=OFF
```

Disables compensation while retaining the current gain mode, internal path and stored attenuation value. EXT_ATT_DB applies only when EXT_ATT=1. To return to automatic gain, send PNFA:GAIN:SET MODE=AUTO.

Send EXT_ATT in its own command. If combined with MODE or PATH, the external-attenuation operation takes precedence and the gain-mode operation is not applied. Invalid external attenuation gives ERR BAD_EXT_ATT.

Accepted aliases and validation limits

GAIN= may replace PATH=. ATT and ATT15 are accepted input aliases for A15; replies use A15. EXT_ATT_DB= may replace EXT_ATT=. Use the canonical forms above for new applications.

Missing or invalid MODE gives ERR BAD_GAIN_MODE; an invalid manual path gives ERR BAD_GAIN. Unlike FILTER:SET, GAIN:SET is not fully atomic: it can disable existing external compensation before reporting a bad mode or path. Unknown parameters may be ignored. Query status after a failed gain request before relying on the configuration.

Set and inspect a known frequency

PNFA:FIX:SET FREQ=100

Enables fixed-frequency correction for a known signal frequency, here 100 MHz. FREQ must be a whole number from 1 to 4000 MHz; otherwise the reply is ERR BAD_FREQ. The corresponding physical filter is selected. This is not narrowband receiver tuning. Gain mode and external attenuation settings are retained.

Selection boundaries are 1–29 MHz = LP, 30–299 MHz = BP1, 300–999 MHz = BP2 and 1000–4000 MHz = HP. These boundaries do not describe ideal physical filter cutoffs.

**OK FIX SET FREQ=100 FB=BP1 GMODE=AUTO GAIN=DIR
EXT_ATT=0 EXT_ATT_DB=20**

PNFA:FIX:STATUS?

Returns OK FIX STATUS with EN, FREQ, FB, GMODE, GAIN, EXT_ATT and EXT_ATT_DB. Additional response fields may be present; parse fields by name and ignore undocumented additions. EN indicates whether FIX is enabled. FB is the filter associated with stored FREQ and may differ from the active filter when EN=0.

PNFA:FIX:OFF

OK FIX OFF

FIX:OFF disables fixed correction and retains the current filter mode. Use FILTER:SET when an explicit wideband mode is required. MHZ= is accepted as an alias for FREQ=.

Example sequence for a known 100 MHz signal

PNFA:GAIN:SET MODE=AUTO

PNFA:FIX:SET FREQ=100

PNFA:FIX:STATUS?

PNFA:READ?

Process each reply before sending the next command. Check EN=1, FREQ=100, FB=BP1, GMODE=AUTO and EXT_ATT=0. If READ returns ERR SETTLING or ERR NO_DATA, retry after the next acquisition. Accept numeric DBM only when VALID=1 and OVERRANGE=0.

Example sequence for Full band

PNFA:FILTER:SET MODE=AUTO

PNFA:FILTER:STATUS?

PNFA:READ?

Expect FIX=0 and wait for a valid sweep if FB=NA. ERR UNKNOWN_CMD identifies an unrecognized PNFA: command; unrelated unknown text may receive no response.