USER MANUAL

IV-Indicators Nano User Manual

Product Line Golf/Jetta Mk1-2, Polo 3(1994-2001), Audi 80 B2

Online Release 2026

(Draft - February 21, 2026)

PHOL-LABS Kft

Contents

1 Prohibitions and precautions

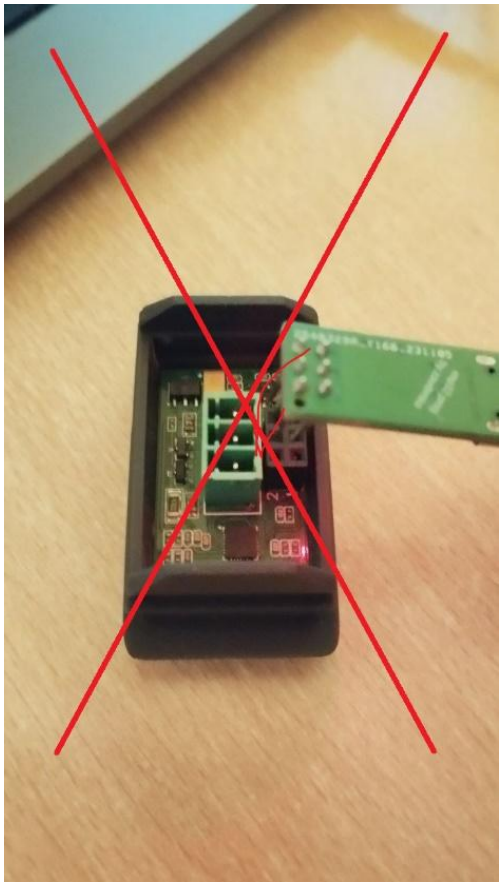
The IV-Indicators Nano programmer is not a standalone accessory; it is part of the indicator electronics. Incorrect handling can immediately destroy the power regulation stage or short exposed pogo pins. Always set the device on an insulating surface and follow the rules below before applying power.

1.1 Critical rules

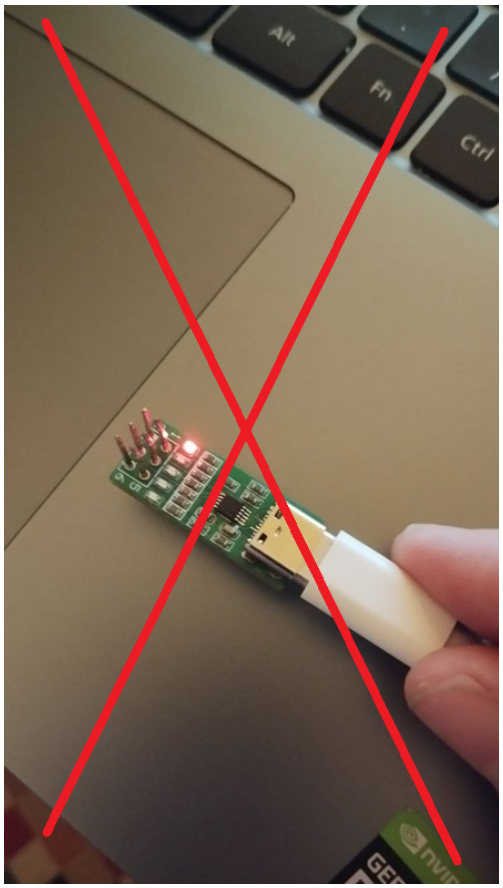
1. Never power the programmer outside the indicator. Connecting the programmer to a USB phone or computer without the gauge attached will burn the electronics. Only energise the tool once it is fully seated in the indicator housing.
2. Do not insert the programmer into a powered indicator. Make every mechanical connection with the system unpowered. Plug the programmer into the gauge first, verify that it sits straight, and only then connect the USB supply.
3. Do not attach or detach the programmer while it is live. Disconnect the USB cable before removing the programmer from the indicator and keep movement to a minimum while data is being transferred.
4. Secure the gauge during programming. Wobbling on a desk or dangling from a USB cable can bend pogo pins and cause shorts. Support the device so that the connector cannot shift.
5. Avoid conductive surfaces. Laptop cases, vehicle bodywork, or bare metal benches will short the programming contacts even if the system appears to work briefly. Use a clean non-conductive mat at all times.

   Warranty notice. No warranty or returns are available if the indicator was powered or programmed in ways that ignore these prohibitions. PHOL-LABS Kft can supply a replacement, but it will be billed to the customer.

1.2 Incorrect setups to avoid



(a) Do not leave the programmer hanging while powered.



(b) Avoid conductive work surfaces under the pogo pins.

Figure 1.1: Typical misuse scenarios that can destroy the electronics within seconds.

2 Introduction

IV-Indicators Nano is a button-style gauge platform developed by PHOL-LABS Kft for Volkswagen Golf and Jetta Mk II, Polo 86C, and Audi 80 B2 interiors. The series combines a compact retro look with firmware that can be tailored for voltage, pressure, temperature, lambda, or boost monitoring. Every indicator shares the same enclosure and USB programmer so that presets and firmware updates can be loaded without dismantling the dashboard.

The device is configured through an Android application or the IV-Conf web pack, allowing owners to change colour gradients, select bar or dot display modes, and calibrate the measurement range for their chosen sensor. This flexibility makes the gauge equally useful for preserving factory wiring or integrating modern engine upgrades.

This manual collates the official reference material originally released in HTML form. It guides you through safe handling, installation, configuration, and maintenance workflows while pointing out the known limitations of the beta Android app. Read the prohibitions in chapter 1 before connecting the programmer and refer to the configuration chapters whenever settings need to be restored or updated.

Figure 2.1: IV-Indicators Nano retains the original Digifiz-inspired styling while adding fully programmable firmware.

3 Product overview

IV-Indicators Nano modules are compact button gauges with a shared enclosure and interchangeable presets. The hardware is sold as a bundled three-pack or as dedicated indicators for a single measurement role.

3.1 Available variants

- IV-Indicators gauge three-pack. A complete bundle that contains voltmeter, barometer, and thermometer indicators for drivers who want a matched set.
- IV-Indicators Voltmeter. Ships with presets that monitor vehicle system voltage using a bar or dot display.
- IV-Indicators Barometer. Targets manifold or fuel pressure monitoring with profiles tuned for the VAG 03C906051A sensor.
- IV-Indicators Thermometer. Factory-calibrated to the Ossca 01176 NTC temperature sensor used in Volkswagen classics.
- IV-Indicators Lambda and Boost. Specialist gauges for air–fuel ratio and turbo pressure monitoring when paired with the recommended sensors and controllers.

3.2 Shared capabilities

Each indicator can be reconfigured using the supplied programmer and IV-Conf software. Owners can adjust colour gradients, define up to four segment transitions, and select dot or bar rendering. Calibration routines allow the gauge to be matched to aftermarket sensors or tuned for custom voltage ranges. Once configured, settings are stored on the device so that it remembers the chosen profile even after power is removed.

(a) Voltmeter indicator

(b) Barometer indicator

(c) Thermometer indicator

(d) Lambda and boost variants

Figure 3.1: Core IV-Indicators Nano product variants as supplied by PHOL-LABS Kft.

4 Operating principle

Every IV-Indicators Nano gauge integrates a segmented display, RGB backlight, and a microcontroller that stores measurement presets. A four-pin pogo connector on the rear mates with the supplied programmer so the indicator can receive firmware updates and configuration profiles from an Android phone or desktop browser.

4.1 Measurement presets

Each indicator ships with a preset aligned to its intended role:

- Voltmeter — monitors system voltage directly from the vehicle harness.
- Barometer — targets the VAG 03C906051A pressure sensor running from a regulated 5 V supply.
- Thermometer — reads NTC thermistors equivalent to the Ossca 01176 probe listed in section A.2.
- Lambda — interprets narrowband oxygen sensor signals and accepts linear 0–5 V outputs from wideband controllers.
- Boost — interfaces with the Dacia 223657266R sensor (also known as 161B0004/8200225971).

4.2 Configuration workflow

Configuration data is pushed over USB by the IV-Conf applications. The Android beta and the web pack both expose colour, gradient, and mode controls so the same hardware can render dot or bar indicators. You can define up to four colour segments, tune backlight intensity, and adjust minimum/maximum measurement ranges to match your sensors. Calibrated values are retained even after the gauge is unplugged, making it easy to experiment without losing a preferred setup.

4.3 Sensor integration

The barometer preset expects the OEM VAG 8K0973703 connector. The boost indicator is supplied without a dedicated harness; a sealed three-pin automotive connector such as the Bosch 1928403966 is recommended. For lambda monitoring, PHOL-LABS advises pairing the gauge with an external wideband controller (SLC Free, DIY-EFI TinyWB, Sigma Lambda Controller Free 2, or similar) that conditions a Bosch LSU 4.9 probe into a stable analogue voltage. Route the

controller's linear output to the gauge input while following the controller manual for heater power and calibration.

5 Technical specifications

5.1 Supported sensors

Factory presets and compatible sensors

Indicator	Sensor	Supply	Notes
Voltmeter	Vehicle harness	12 V system	Direct measurement of charging voltage.
Barometer	VAG 03C906051A	5 V	10 bar range, 0.4–0.5 V nominal output, M10 × 1.0 thread.
Thermometer	Ossca 01176 NTC	Passive	Reference values listed in section A.2.
Lambda	Narrowband O_2 sensor	Passive	0.1–0.9 V swing, accepts 0–5 V from wideband controllers.
Boost	Dacia 223657266R	5 V	20–250 kPa span, 1.8 V nominal output, single mounting bore.

5.2 Sensor compatibility tables

The following tables summarize compatible sensors and calibration references for the factory presets.

Oil/coolant temperature sensors

Oil/coolant temperature sensor compatibility

Compatible sensor	Signal/supply	Calibration parameters
Ossca 01176 NTC thermistor (thermometer preset)	Passive NTC	Validate against the Ossca 01176 resistance table (e.g., 270.0 Ω at 58 °C down to 15.9 Ω at 160 °C). Nominal calibration: $R_{25} = 1$ kΩ, $\beta = 3950$. For custom NTC probes, update beta and nominal resistance in IV-Conf.
RIDEX 829S0003 (Opel/BMW/Volvo compatible)	2-pin NTC, M12 × 1.5 thread	Nominal resistance 2080 Ω at 25 °C and 294 Ω at 80 °C ($\beta \approx 3740$ K). Operating range 25–80 °C. Sensor body ⌀ 7.4 mm, hex 19 mm, supplied with sealing gasket.

Air temperature sensors

Air temperature sensor compatibility

Compatible sensor	Signal/supply	Calibration parameters
MFA outside air temperature sensor (VAG 171 919 379 A, Golf Mk2/Jetta II/Passat B2/B3)	2-wire NTC, floating	Approximate display span −40°C to +96°C. Empirical calibration: $R_{25} \approx 510\ \Omega$, $\beta \approx 3400$–3500 K (fit between +4°C and +50°C). Diagnostic reference: 200 Ω ≈ +50°C. Connector housing 1J0973802; mating connector 1J0973702.
NTC thermistor equivalent to Ossca 01176 (thermometer preset)	Passive NTC	Use the Ossca 01176 resistance table as the reference and adjust beta/nominal resistance for custom NTC sensors via IV-Conf.

Oil pressure sensors

Oil pressure sensor compatibility

Compatible sensor	Signal/supply	Calibration parameters
VAG 03C906051A pressure sensor (barometer preset)	5 V supply, analogue output	10 bar absolute range, 0.4–0.5 V nominal output at rest. Configure the measurement range with the barometer preset and adjust minimum/maximum ranges in IV-Conf if required.

Fuel level gauges

Fuel level sensor compatibility

Compatible sensor	Signal/supply	Calibration parameters
Custom sensor (no specific model listed)	Depends on sensor	Use IV-Conf to set the minimum and maximum measurement range to match the installed sensor.

Boost pressure sensors

Boost pressure sensor compatibility

Compatible sensor	Signal/supply	Calibration parameters
Dacia 223657266R (also 161B0004/8200225971)	5 V supply, analogue output	20–250 kPa operating window, ∼1.8 V nominal output at boost. Use the boost preset and adjust range min/max if needed.

Wideband lambda

Wideband lambda controller compatibility

Compatible sensor	Signal/supply	Calibration parameters
Wideband controller (SLC Free, DIY-EFI TinyWB, Sigma Lambda Controller Free 2) with Bosch LSU 4.9 probe	0–5 V linear output to gauge	Wideband controllers translate the LSU 4.9 probe into a linear 0–5 V signal accepted by the gauge; narrowband sensors provide a 0.1–0.9 V swing.

5.3 Barometer preset

The barometer indicator is designed for the Volkswagen Group pressure sensor 03C906051A.

- Power supply: 5 V regulated.
- Measurement range: 10 bar absolute.
- Nominal analogue output: 0.4–0.5 V at rest.
- Mechanical thread: M10 × 1.0.
- Connector: VAG 8K0973703.

5.4 Thermometer preset

Thermometer presets ship calibrated for the Ossca 01176 NTC thermistor commonly fitted to Golf II cooling systems. Use the resistance table in section A.2 when validating alternative probes. For custom NTC sensors, update the beta coefficient and nominal resistance through the IV-Conf tools.

5.5 Boost preset

The boost indicator expects the Dacia 223657266R (161B0004/8200225971) sensor.

- Three-pin connector (use a sealed Bosch 1928403966 or equivalent).
- Supply voltage: +5 V.
- Operating window: 20–250 kPa.
- Analogue output: approximately +1.8 V at nominal boost.

5.6 Lambda integration

IV-Indicators Lambda reads narrowband sensors directly but is intended to work alongside a wideband controller for tuned engines. Recommended controllers include SLC Free, DIY-EFI TinyWB, and Sigma Lambda Controller Free 2. Each device converts a Bosch LSU 4.9 probe into a linear 0–5 V signal that the indicator can display.

5.7 Sensor reference images

(a) VAG 03C906051A pressure sensor

(b) Pinout for the barometer harness

(c) Boost sensor connection example

Figure 5.1: Reference hardware supplied or recommended for the barometer and boost presets.

6 Safety notices

IV-Indicators Nano hardware is sensitive to short circuits and incorrect sensor wiring. Always review the prohibitions in chapter 1 before powering the programmer and keep the following guidelines in mind during installation.

6.1 Handling the programmer

- Treat the programmer as part of the indicator. Never energise it until the pogo connector is fully seated and supported on a non-conductive surface.
- Do not attach or detach the programmer while data is being transmitted. Disconnect the USB cable first and keep the device steady to avoid bending the pins.
- Avoid conductive worktops such as laptop cases, bare metal benches, or vehicle bodywork. Even brief contact can short the pogo pins and permanently damage the electronics.

6.2 Sensor safety

- Use the recommended connectors for each preset and provide strain relief on harnesses. The barometer relies on the VAG 8K0973703 plug, while the boost preset should be paired with a sealed three-pin connector.
- Pair the lambda indicator with a supported wideband controller when monitoring modified engines. Controllers such as SLC Free, DIY-EFI TinyWB, or Sigma Lambda Controller Free 2 translate the Bosch LSU 4.9 probe into a safe analogue voltage for the gauge.
- Confirm that calibration ranges match the installed sensor before driving. Incorrect limits can lead to misleading readings and misdiagnosis.

6.3 Warranty note

PHOL-LABS Kft does not offer warranty coverage for devices that were powered on conductive surfaces, connected with reversed polarity, or otherwise operated against the rules listed above. Replacement hardware is available, but it is supplied on a paid basis when misuse is detected.

7 Preparation and installation

Set up the workspace before unpacking the indicator. The pogo connector must stay clean and insulated, and the harness should be ready for the required sensor.

7.1 Workspace checklist

1. Disconnect the vehicle battery and place the indicator on a non-conductive mat. Keep metal laptop shells and other conductive objects away from the pogo pins.
2. Test-fit the mounting location so the harness can reach the target sensor without strain. Route cables away from sharp edges or high-temperature engine parts.
3. Install the socket supplied with the kit and confirm that the programmer can be attached later without removing surrounding trim.

7.2 Preparing the sensor harness

- Use the correct connector for the selected preset. The barometer relies on a VAG 8K0973703 plug, while the boost sensor needs a sealed three-pin connector such as Bosch 1928403966.
- When fitting a lambda gauge, plan for two oxygen sensors: the stock narrowband unit for the ECU and a Bosch LSU 4.9 connected to a dedicated controller. Feed the controller's analogue output into the indicator harness.
- Provide strain relief and insulation for every splice. The pogo connector and sensor leads are not designed to flex while the indicator is powered.

7.3 Support

PHOL-LABS Kft offers a one-time assistance session for wiring questions and provides extended consultations on a paid basis when custom sensor adaptations are required. Contact support before powering the system if any wiring step is unclear.

8 Configuring with the IV-Conf Android beta

An experimental IV-Conf Android application ships with the indicator set. The beta is functional for flashing presets and editing colour schemes, but PHOL-LABS recommends the web pack for mission-critical adjustments.

8.1 Connecting the programmer

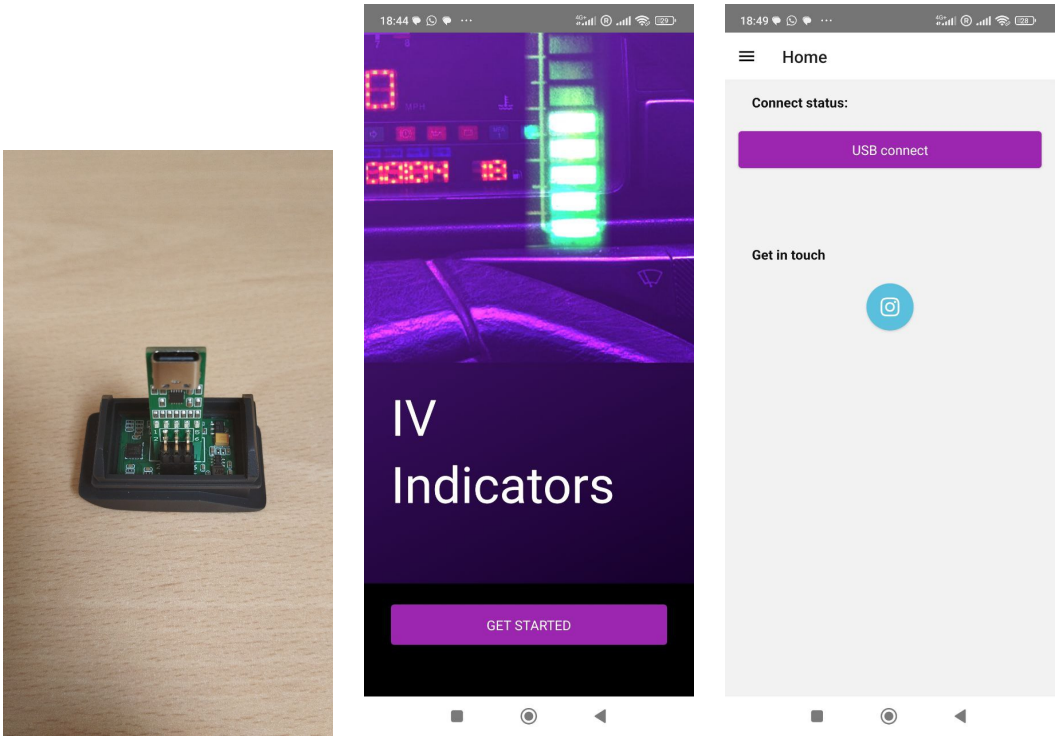
1. Insert the external programmer into the indicator before attaching any cables.
2. Connect the programmer to the Android phone with a USB-C OTG cable. If the handset uses a different connector, place a USB hub or USB-A adapter between the phone and the programmer.
3. Launch the IV-Conf beta, confirm the USB permission prompt, and tap USB Connect. Wait until the status reports Connected.

8.2 Loading presets and modes

1. Open the navigation drawer (three-bar icon) and select Settings.
2. Choose a preset that matches the physical indicator — Volts, Baro, Thermo, Lambda, or Boost.
3. Tap Set parameters and allow the transmission to complete. The indicator must stay still while data is sent.
4. Use the on-screen toggles to switch between dot and bar indication modes and adjust the backlight intensity slider.

8.3 Editing gradients

1. Select the gradient style (default: Gradient).
2. Choose the number of segments (up to four) and assign colours and transition positions to each segment.
3. Press Set parameters again so the updated gradient is written to the indicator.



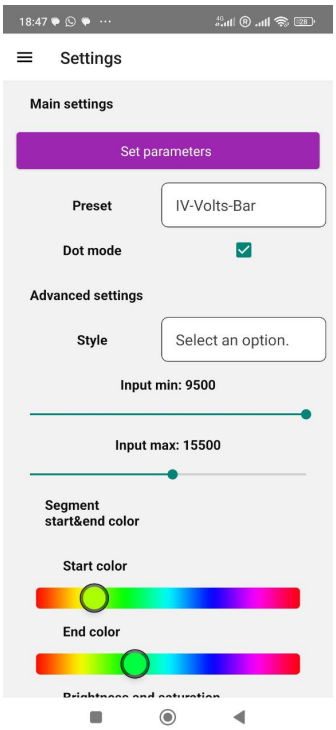
(a) Programmer wiring (b) App startup screen (c) Successful USB connection

Table 8.1: Key IV-Conf Android beta connection and startup screens.

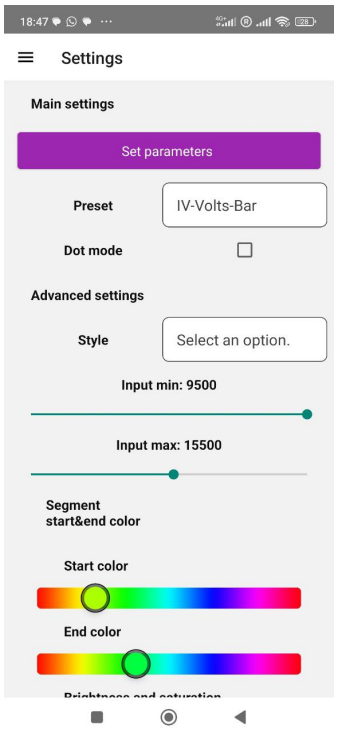
8.4 Interface overview

8.5 Beta limitations

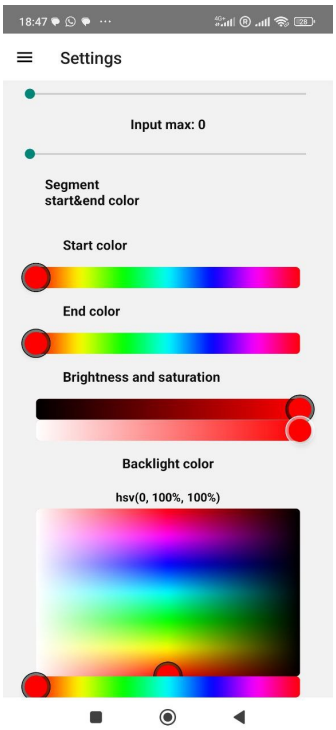
The beta application is under active development. Expect interface changes and occasional stability issues; fall back to the web pack if a setting is not applied correctly. Report reproducible bugs directly to PHOL-LABS so firmware and app updates can be aligned.



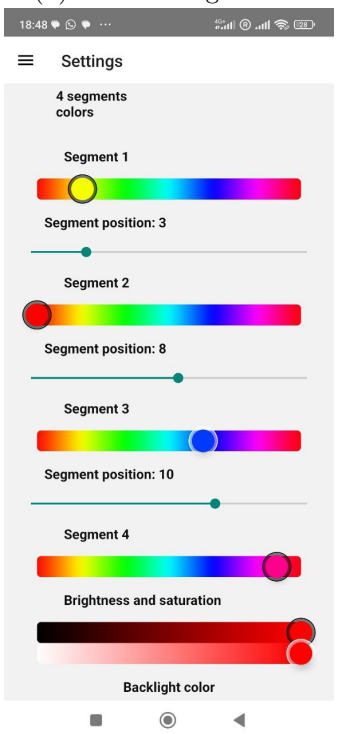
(a) Preset selection



(b) Mode configuration



(c) Backlight control



(d) Gradient editor

Table 8.2: Preset, mode, and gradient controls in the IV-Conf Android beta.

9 Configuring with the IV-Conf web pack

The IV-Conf web pack is the primary tool for configuring IV-Indicators Nano hardware. Open https://phol-labs.com/iv in a Chromium-based browser with Web Serial support and connect the supplied programmer via USB.

9.1 Connecting to the indicator

1. Click the serial port icon and select the entry that corresponds to the programmer.
2. Open the Settings panel and set the baud rate to 115200.
3. Press Connect MODBUS. The status banner should confirm the connection without red error indicators.

9.2 Preset catalogue

Multiple presets exist for each indicator type. The voltmeter, for example, includes variants with multi-bar graphics or yellow highlights. Select a preset that matches the physical gauge before uploading settings.

Preset name	Description
IV-Volts-Bar-Multi	Voltmeter with a multi-bar display.
IV-Volts-Bar-Multi4	Four-level multi-bar variant.
IV-Volts-BarYellow	Bar display with a yellow colour scheme.
IV-Volts-Bar	Standard bar display.
IV-Volts	Minimal preset without additional graphics.

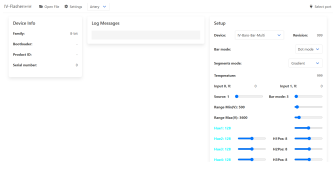
Table 9.1: Example voltmeter presets

9.3 Uploading and downloading data

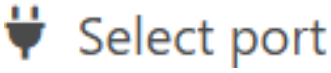
- Use the Send data button to push the current preset or manual adjustments to the indicator. The transfer completes automatically within 10–15 seconds.
- Click Get data to read the existing configuration from the gauge before editing ranges or colours.
- The Stop Send Data control cancels an in-progress upload if you selected the wrong preset or need to alter parameters.

Manual tuning allows the gradient start/end hue, backlight intensity, and numeric sensor ranges to be adapted for custom hardware. Confirm that every change matches the installed indicator to avoid misleading readings.

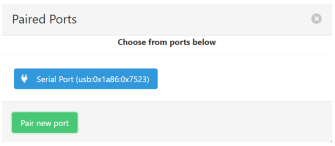
9.4 Interface overview



(a) Launching the web pack



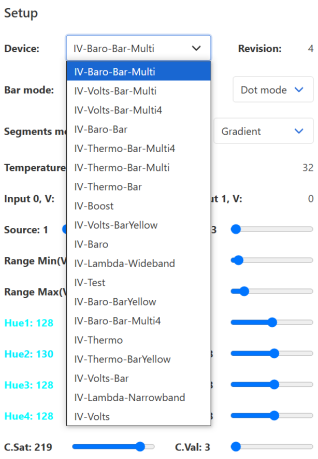
(b) Selecting the serial port



(c) Granting port access

(d) Setting the baud rate

(e) Connecting over MODBUS



(f) Preset selector

(g) Manual tuning controls

(h) Send data confirmation

Figure 9.2: Key IV-Conf web pack panels used for day-to-day configuration.

9.5 Usage notes

In most situations only the configuration panels are required. Firmware updates are handled separately in Appendix A. When a setting fails to apply, disconnect and reconnect the MODBUS session and ensure that the correct serial port and baud rate are selected.

10 Sensor connections

The following guidance consolidates the wiring notes supplied with the HTML reference. Always verify polarity and connector orientation before applying power.

10.1 Voltage monitoring

Connect the voltmeter indicator to a switched 12 V supply and vehicle ground. Share the ground reference with the rest of the instrumentation and protect the feed with an inline fuse.

10.2 Barometer

- Sensor: VAG 03C906051A supplied with 5 V.
- Connector: 8K0973703 (female) on the harness.
- Signal: single analogue output routed to the indicator input.

10.3 Thermometer

Use an Ossca 01176 NTC thermistor or an equivalent part. Route both leads to the indicator harness and confirm resistance against the values listed in section A.2 before calibration.

10.4 Lambda

IV-Indicators Lambda is intended to work with two probes: the factory narrowband sensor and an additional Bosch LSU 4.9 connected to a wideband controller.

- Narrowband sensors output 0.1–0.9 V and can be wired directly to the indicator after calibration.
- Wideband controllers (SLC Free, DIY-EFI TinyWB, Sigma Lambda Controller Free 2, and similar) provide a linear 0–5 V output that the indicator can display.
- Retain the stock ECU wiring and feed the controller's analogue output into the IV-Indicators harness.

10.5 Boost

- Sensor: Dacia 223657266R (161B0004/8200225971).

- Supply: regulated 5 V with a common ground to the indicator.
- Connector: sealed three-pin plug such as Bosch 1928403966 when the OEM connector is unavailable.

10.6 Connection diagrams

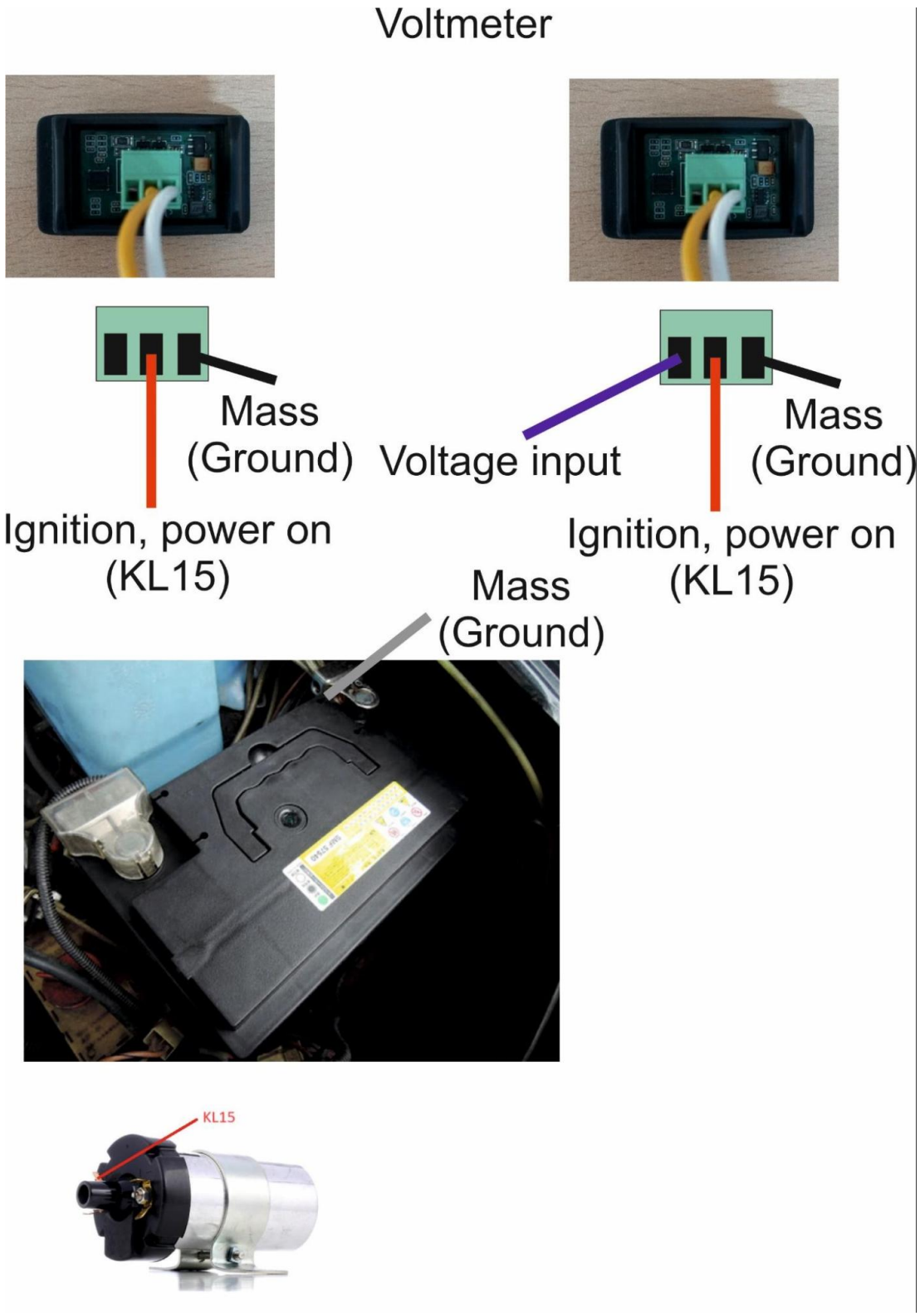


Figure 10.1: Voltmeter installation

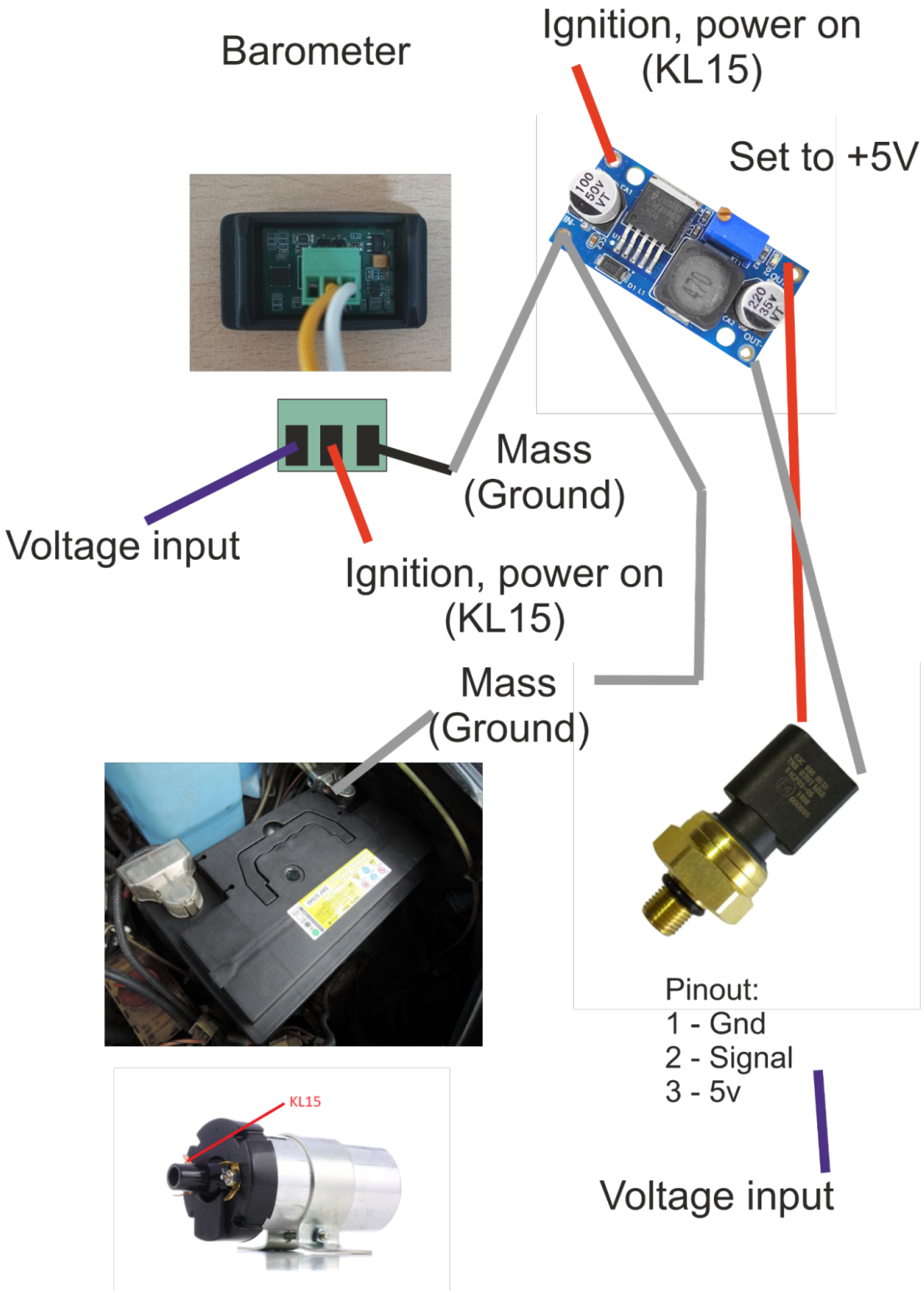


Figure 10.2: Barometer installation

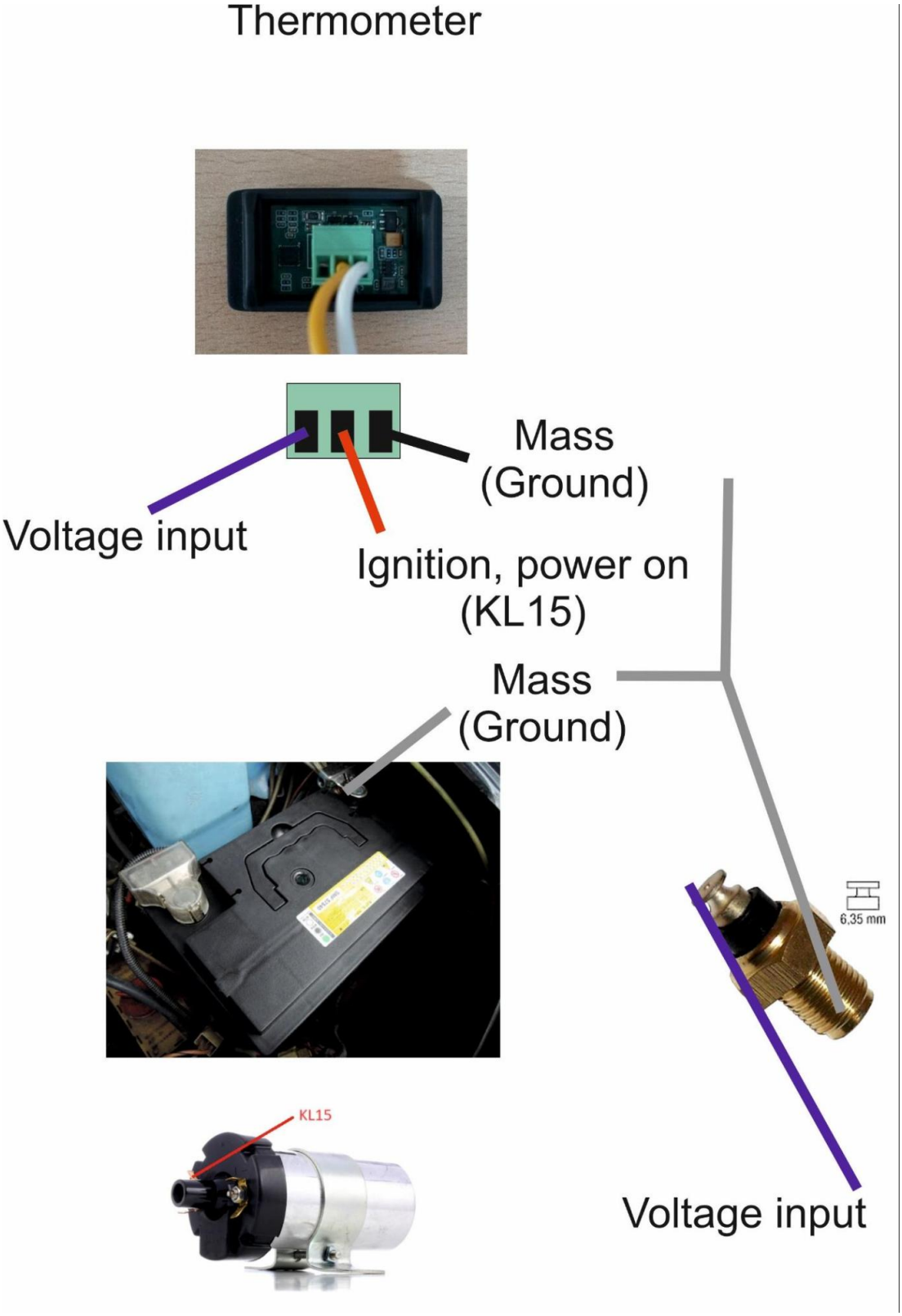


Figure 10.3: Temperature indicator installation.

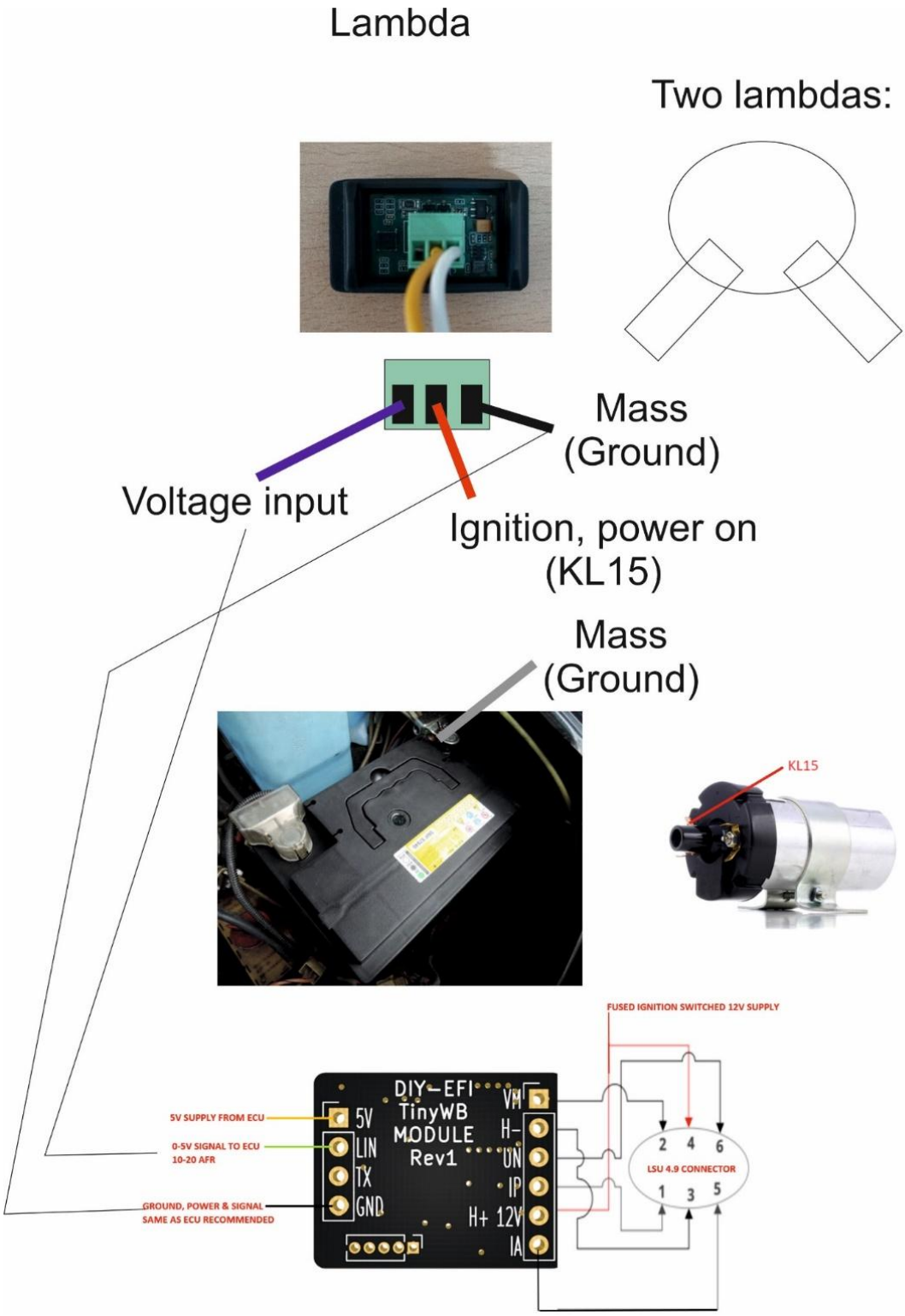


Figure 10.4: Wideband lambda indicator installation

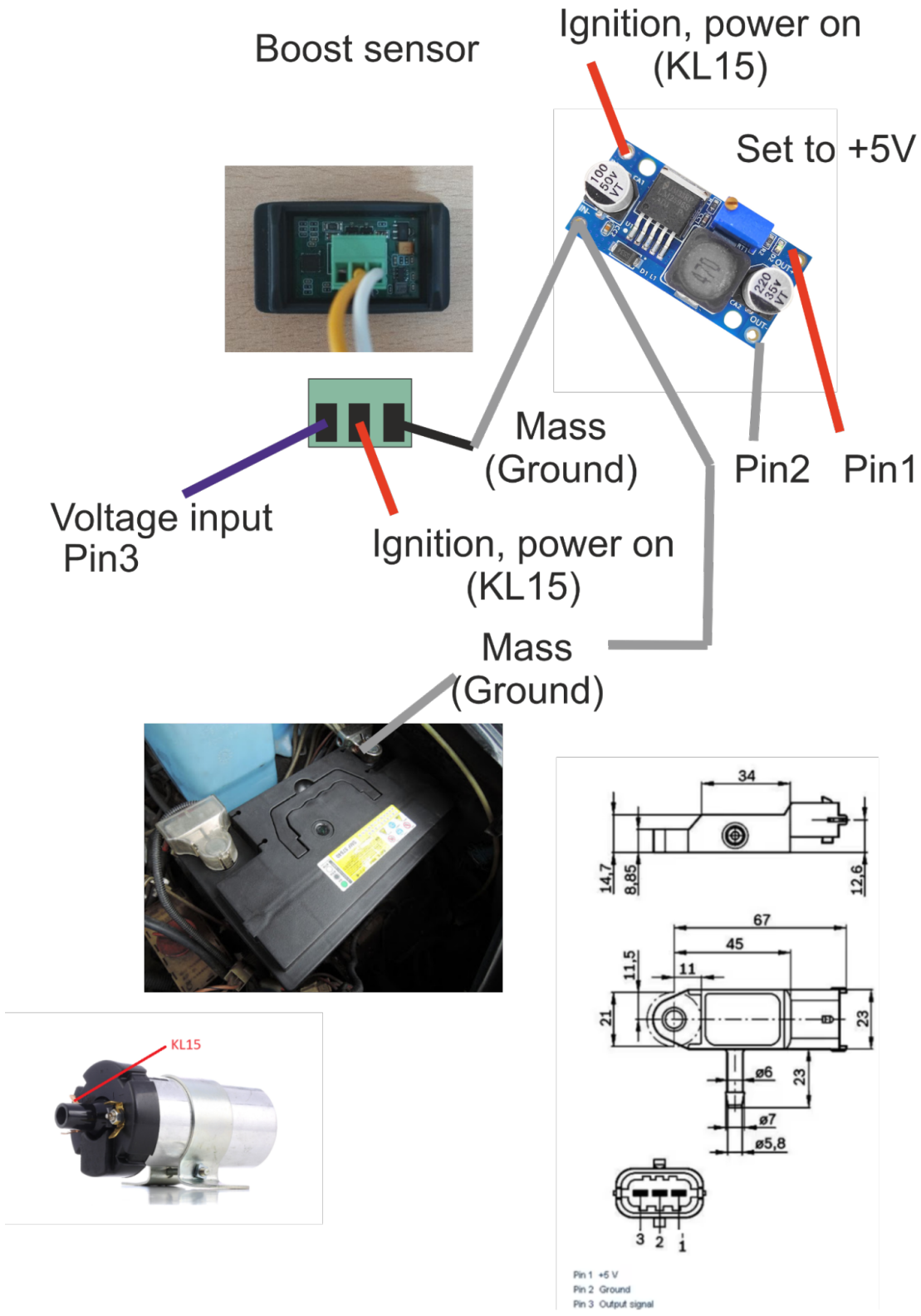


Figure 10.5: Boost indicator installation example

10.7 Support

PHOL-LABS Kft can assist with the initial connection of the indicators at no charge and offers extended consultation for complex setups. Contact support if custom sensors or additional controllers are being integrated.

11 Typical setup cases

Always establish a stable MODBUS session (no red error banners) before applying any of the following adjustments. The screenshots originate from the IV-Conf web pack but the Android beta offers equivalent controls.

11.1 Colour adjustments

1. Click Get data to read the current preset.
2. Change the hue controls to match the desired display colour. The preview text mirrors the indicator output.
3. Adjust the Bl backlight slider to tune the background intensity.
4. Press Send data and wait for the transfer to finish.

11.2 Range calibration

1. Retrieve the configuration with Get data.
2. Update Range min and Range max so the indicator reflects the true sensor span (voltmeter, barometer, lambda, or boost).
3. Send the data and verify the live reading against a trusted meter.

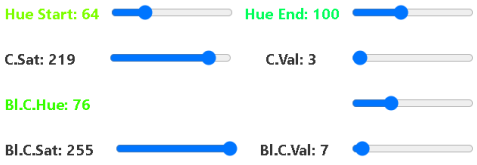
11.3 Thermometer tuning

1. Measure the sensor resistance with a multimeter and compare it to the values in section A.2. Replace the probe if it falls outside tolerance.
2. Use Get data to load the current parameters.
3. Enter the appropriate beta coefficient and nominal resistance for the custom NTC sensor.
4. Upload the changes with Send data.

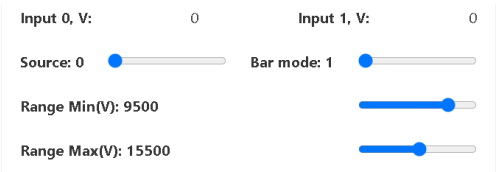
11.4 Switching bar and dot modes

1. Fetch the configuration via Get data.
2. Set Bar mode to 1 for a bar-style display or clear it for dot indication.
3. Press Send data to commit the change.

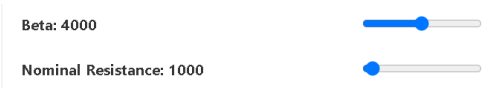
11.5 Interface highlights



(a) Gradient and hue editor



(b) Range calibration fields



(c) Custom NTC configuration

(d) Bar mode toggle

Figure 11.1: Common IV-Conf controls referenced in the setup cases.

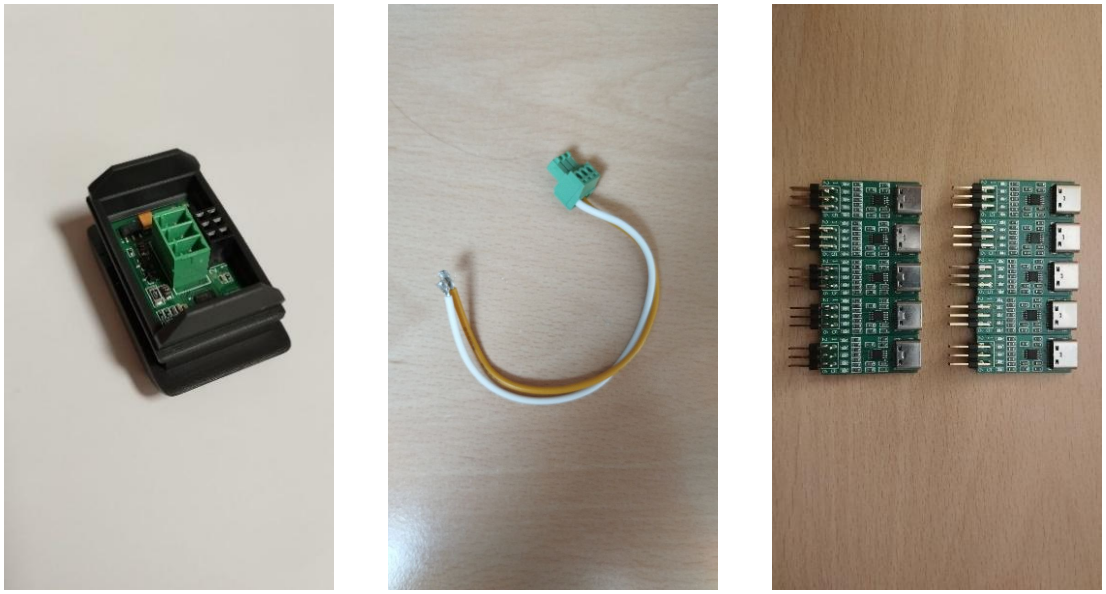
12 Marking and identification

Firmware revisions are shown in the IV-Conf tools after connecting to the indicator. The housing is not sealed with tamper stickers. Keep a record of the installation date for your maintenance logs. Retain the original packaging and documentation; they contain QR codes and serialised information that assists PHOL-LABS Kft when providing replacements or paid repairs.

13 Package contents

Each IV-Indicators Nano shipment contains the essentials required for installation:

- Button gauge or gauge set (depending on the ordered variant).
- Socket for connection to the vehicle harness.
- External programming tool with USB connectivity.



(a) Button gauge (b) Harness socket (c) External programmer

Figure 13.1: Core components bundled with the IV-Indicators Nano kit.

Inspect the package on arrival and contact PHOL-LABS Kft if any component is missing or damaged.

14 Storage and transport

Store IV-Indicators Nano modules in a dry environment between 0 °C and 40 °C. Avoid stacking heavy objects on top of the packaging to protect the display window and programmer pins.

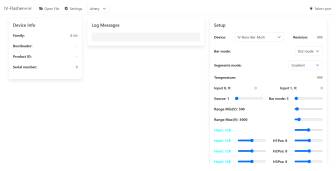
During transport, keep the indicators in their anti-static bags and ensure the programmer is disconnected from power. Do not leave the devices connected to a vehicle battery when the car is stored for long periods; disconnect the harness or remove the indicator from the socket.

Appendix

A.1 IV-Conf web pack reflashing

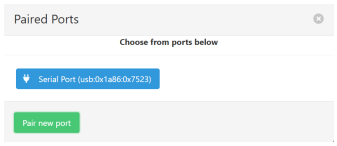
Use the web pack for firmware updates. Complete the steps below without disconnecting power once the transfer begins.

1. Open https://phol-labs.com/iv and connect to the programmer as described in chapter 9.
2. Ensure the baud rate is set to 115200 and click Connect MODBUS. Wait for a green status message.
3. Press Stop Send Data to halt any automatic preset uploads.
4. Click the firmware icon, choose the update file supplied with your indicator, and confirm the prompt.
5. Leave the indicator undisturbed until the progress bar completes and the device restarts.



(a) Open the web pack

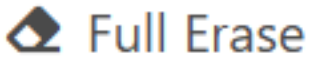
(b) Select the serial port



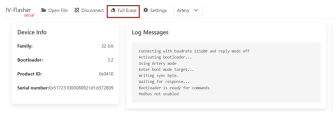
(c) Authorise access

(d) Set 115200 baud

(e) Stop active transfers

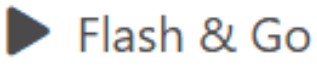


(f) Connect MODBUS

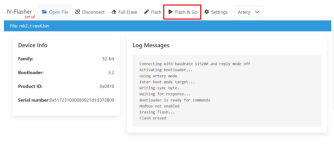


(g) Open the firmware dialog

(h) Select the update package



(i) Confirm the upload



(j) Wait for completion

Figure A.1: Sequence of IV-Conf web pack screens used during firmware reflashing.

A.2 Temperature sensor reference

The following table lists the nominal resistance values for the Ossca 01176 NTC sensor used with the thermometer preset.

Resistance (Ω)	Temperature (°C)
270.0	58
220.0	63
199.8	66
111.0	83
73.8	98
55.0	108
48.8	113
44.0	117
37.2	124
32.1	130
28.2	136
25.1	141
22.7	146
20.4	151
19.0	155
18.8	155
15.9	160

Table A.2: NTC resistance reference

Future revisions of this appendix will include additional sensor data and wiring diagrams.