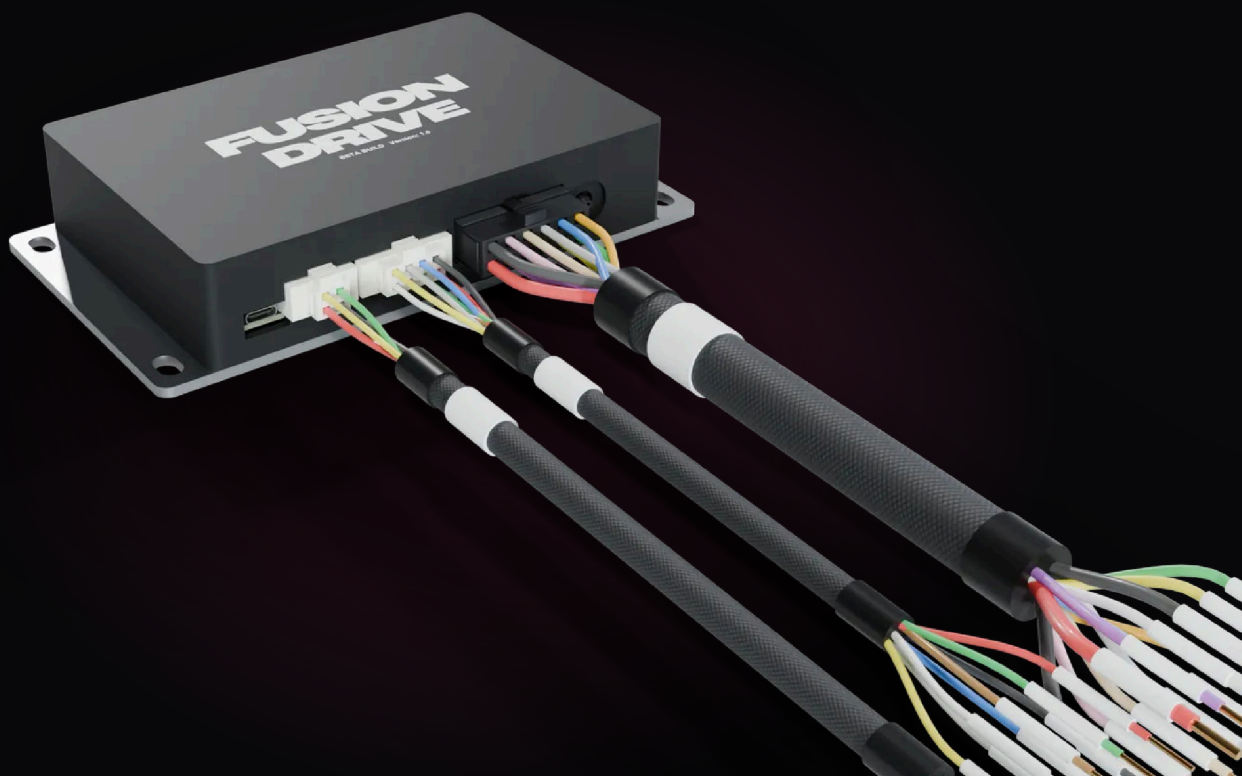




— 07 / KEEP YOUR INSTRUMENTS

# Sensors & gauges

Bring documented analog and CAN measurements into one place.



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## 1

## — SENSORS / KEEP

# Choose the connection by signal

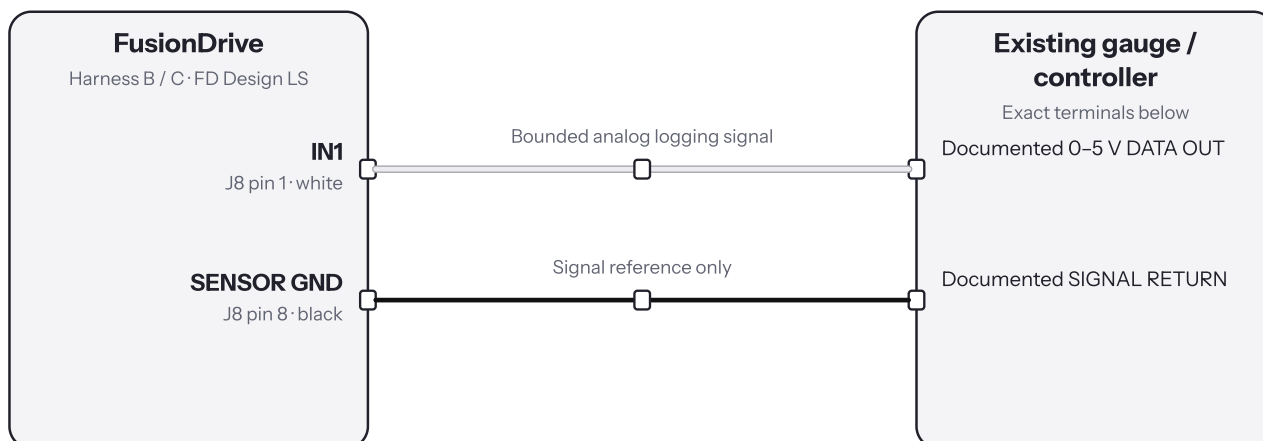
Keep the existing gauge, sender and controller working as intended. FD receives a documented logging output or decoded accessory CAN signal, names it, displays it alongside the car's data and makes it available to supported local rules. A gauge connected to FD does not automatically become remotely configurable.

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| Your equipment                                    | Preferred FD connection                                | What stays installed                            |
|---------------------------------------------------|--------------------------------------------------------|-------------------------------------------------|
| AEM 30-0300 Bosch X-Series                        | Analog logging output or published AEMnet CAN          | Powered gauge/controller and LSU harness        |
| AEM 30-0301 pressure gauge                        | Gauge logging output                                   | Gauge and its own pressure sender               |
| Innovate LC-2                                     | Spare programmed analog output                         | LC-2 module; existing display/ECU path          |
| Innovate MTX-L PLUS                               | Analog logging output, qualified for load              | Powered gauge/controller                        |
| AutoMeter analog wideband, manual 2650-1469 Rev B | Blue 0-4 V logging output                              | Powered gauge/controller                        |
| Defi ADVANCE Control Unit SE                      | No direct interface established here                   | Complete Defi system; add independent FD sensor |
| Bare sender already feeding a gauge/ECU           | Only a qualified buffered tap or approved spare output | Original excitation and receiver                |

**INSTALLATION NOTE**

Six FD inputs are conditioned 0-5 V analog inputs. The Digital (On/Off) option is a voltage threshold on the same input, not a 12 V input or pulse counter.

**S-01 | Retain gauge, read its logging output**

Wire colours: FD loom at left; documented accessory wire at right. Small sleeve = insulated splice.

Connector positions here are logical; use the mating-face drawings to locate FD cavities.

Never connect the sensor-heater wires, 12 V status, or two active outputs to an FD input.

**1.1 Read an output, do not disturb the measurement**

Use a manufacturer's dedicated logging output before considering a raw sender tap. An existing ECU or gauge may bias its input, monitor open circuits, power the sender, or require a particular load. FD's input conditioning can change that circuit. A high-impedance buffer may be needed even if a voltmeter sees 0–5 V. Two 5 V supplies must never be joined.

## 2

## — SENSORS / KEEP

# FD sensor setup - exact workflow

**Current app workflow:** Configure this installation from its function in Settings. Controls provides live actions and the Dashboard provides glance controls; use a card's edit menu to return to setup. A configured output remains visible even when disabled. Enabled rules operate their assigned enabled outputs automatically; there is no extra output mode to select. Live Off, On or duty takes over a generic output until you choose Resume automation. Setup keeps the electrical limits, calibration and response settings. Assigned boost, WMI and nitrous outputs use their controller-specific actions, preserving sensor protections and any paired fuel/stage logic. Nitrous Arm allows its configured activation conditions to operate; it is not an unconditional spray command.

**Setup and vehicle data:** Starting presets remain editable; Add Sensor includes calibration and fine tuning before Create. Use dedicated IGN, fresh running-engine OBD evidence, or both for vehicle activity; a dedicated IGN wire is optional when valid OBD evidence is available. If the pressure hose is unused, explicitly select OBD pressure in setup. A valid atmospheric sensor reading cannot identify a disconnected hose. These app choices do not change the product-specific electrical compatibility or limitations described below.

Carry out this sequence with actuator outputs isolated. Configuration is stored in the ESP; a screen that still contains an unsaved draft is not evidence the device accepted it.

- 1 Connect to the actual FD device. Open Sensors. Select an unused slot or use the plus button and choose its IN label. Match the printed J8 pin, not a slot number in an old screenshot.
- 2 In Add Sensor, choose the closest Sensor type, enter a descriptive Sensor Name and select Type: Analog. The preset is only a starting calibration; complete the voltage/reading endpoints and fine tuning before Create.
- 3 Open that card's Edit action. Set the free-text Unit to the actual quantity, for example AFR, lambda, psi or %. Leave Additional voltage scale at 1 unless a separately documented interface requires a scale. The board input divider is already compensated.
- 4 Under Calibration, enter Voltage Range Min V / Max V and Value Range Min / Max from the exact model chapter. Set Display Range separately; changing display limits does not establish signal validity.
- 5 Enable Show on Dashboard if wanted. Save, wait for success, refresh and reopen Edit. Confirm the saved values, input name and units. For decimal calibrations, verify the read-back and live result; do not rely on rounded presentation alone.
- 6 With the sender stable, compare Connector voltage against a calibrated meter referenced to FD sensor ground. Compare Current Value against the original display at a low, middle and high known value. Include both units powered separately and together in the electrical qualification.
- 7 Record Acquisition age. Remove the data source and confirm it becomes unavailable or is excluded by an explicit validity rule. A physically connected wire with a plausible voltage is not proof of a healthy sensor.

- 8 Reboot FD with loads isolated. Reconnect and verify the calibration remains. Disconnect the phone and confirm intended local rules continue; phone logging will not continue without delivered samples.

## 2.1 Digital status after a qualified interface

Choose Digital (On/Off) when creating a status input. In Edit, set Switch threshold (V), Hysteresis half-band (V) and Reverse level logic. At startup the initial state uses voltage greater than the threshold. After that, the high state begins above threshold plus hysteresis; low is at or below threshold minus hysteresis. Test both states and an open wire. A floating wire must not be accepted as a healthy/armed state.

## 2.2 Inputs on J8

| Signal      | Connector pin | Signal        | Connector pin |
|-------------|---------------|---------------|---------------|
| IN1         | 1             | IN4           | 5             |
| IN2         | 2             | IN5           | 6             |
| IN3         | 3             | IN6           | 7             |
| Sensor +5 V | 4             | Sensor ground | 8             |

FD source: ios/FusionDrive/Features/Sensors/SensorsView.swift; SensorManager.swift; Models/HardwareMap.swift. Edition reflects the local source snapshot recorded with this library.

3

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# AEM 30-0300 Bosch X-Series

Scope: manual 10-0300, 12 July 2017, Bosch LSU4.9. A newer FAE document is a separate revision and is not covered by this pin/calibration recipe.

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## 3.1 Analog or CAN: use one measured channel identity

Connector A pin 9 white is analog positive, pin 10 brown analog return. White to IN1; brown to sensor ground. Retain AEM fused power and the LSU controller. Use 0.5 V = 8.5 AFR and 4.5 V = 18 AFR. These are gasoline-equivalent AFR values. Below 0.5 V means not ready; above 4.5 V means error. Do not apply a legacy UEGO calibration.

### S-02 | AEM 30-0300 Bosch analog logging



Wire colours: FD loom at left; documented accessory wire at right. Small sleeve = insulated splice.

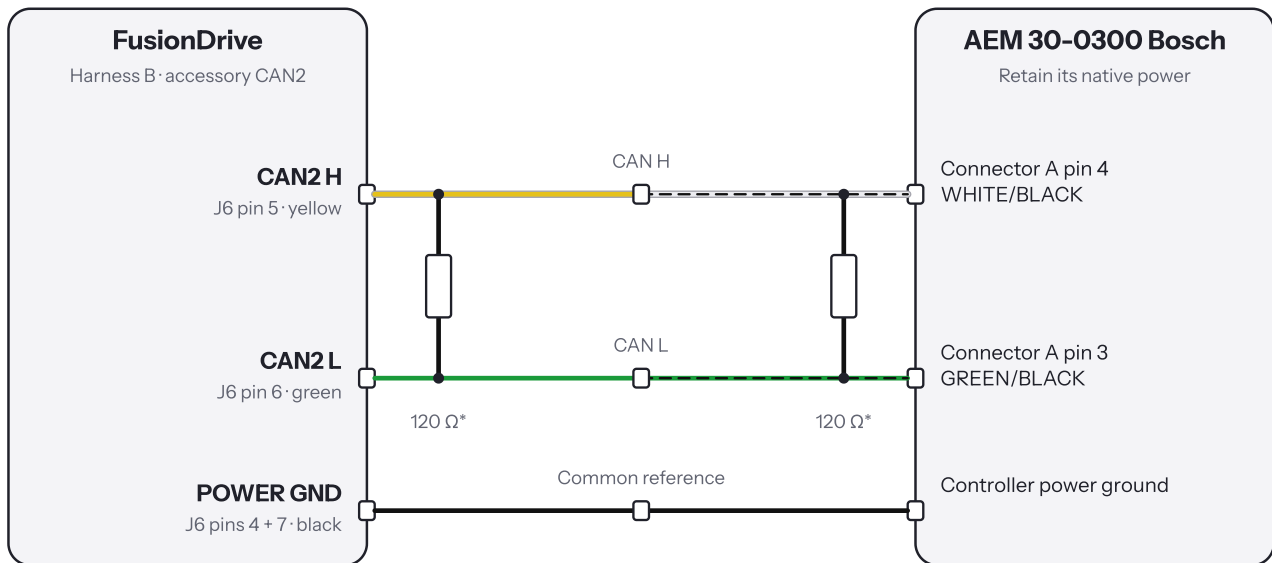
Connector positions here are logical; use the mating-face drawings to locate FD cavities.

Retain AEM power, power ground and the entire LSU sensor harness. No FD 5 V connection.

For CAN, pin 4 white/black is CAN H and pin 3 green/black CAN L. Set 500 kbit/s; select the gauge's actual extended ID (default 0x180). The 8-byte message is big-endian; lambda is unsigned bytes 0-1 x 0.0001. Byte 6 bit 7 is lambda-valid; byte 7 bit 6 is sensor-fault. Published transmission is 100 Hz, which is not an FD phone-log guarantee. The gauge has no internal termination. Use a twisted pair and compatible ground reference. Verify the actual end termination with power off; a conventional two-terminator bus measures about 60 ohms across H/L.

Source: AEM 10-0300 pp3,10-11. [https://documents.aemelectronics.com/techlibrary\\_30-0300.pdf](https://documents.aemelectronics.com/techlibrary_30-0300.pdf)

### S-03 | AEM 30-0300 on accessory CAN



\*Exactly two end terminations in the complete bus. Use existing resistors; add only missing ones.

Keep H/L twisted. The reference conductor is separate from the CAN pair. Match bitrate and frame format.

Twisted CAN pair, matching 500 kbit/s, 29-bit ID. Verify end termination and ACK availability.

## 4

## — SENSORS / KEEP

## CAN2 - configure the accessory data

CAN1 is the vehicle/OBD path. Use the separate CAN2 J6 pair for compatible accessories. FD supports classic frames up to eight bytes in the current driver; the CAN-FD-capable chip does not mean every CAN FD protocol is supported.

- 1 Isolate actuator outputs. Record accessory part number, firmware, bitrate, extended/standard ID, message definition, termination and existing receivers. Do not join CAN1 and CAN2 together.
- 2 Open More > OBD Settings > Accessories · CAN2. Enable the bus, select the specified Speed, initially leave Allow transmitting on this bus off, then Save CAN 2 connection. Reload stored settings.
- 3 For a new two-node bus consisting only of an accessory transmitter and silent FD, account for acknowledgement. A silent node does not ACK. If no other active receiver exists, a deliberately configured normal-mode FD or another ACK-capable receiver is needed. Keep all custom transmit/poll rules absent unless deliberately required; normal mode for ACK is not permission to send unknown commands.
- 4 Open Accessory signals & decoders. Locate the exact frame identity, including extended/standard format. Open CAN signals > Add signal. Enter Accessory / device name and Unique signal name; enable decoding.
- 5 For whole-byte values leave Packed bit layout (DBC) off. Enter Byte offset (zero-based), Byte length, Motorola / big endian, Signed integer, Multiplier, Offset and Unit from the definition. Save each signal; wait for the ESP acknowledgement.
- 6 For one-bit status fields enable Packed bit layout. Use Intel layout for a specified least-significant-bit-numbered flag: start bit = byte index x 8 + bit index, length 1, multiplier 1, offset 0. For the AEM flags above the starts are 55 and 62. Do not apply this Intel rule to a Motorola multi-bit field.

- 7 For lambda above, byte offset 0, length 2, Motorola on, Signed off, multiplier 0.0001, offset 0, Unit lambda. Verify a captured raw 0x2710 value yields 1.0000. This arithmetic check verifies the definition, not the actual accessory signal.
- 8 Power-cycle with loads isolated and verify definitions are restored from the ESP. Stop the accessory transmitter; inspect freshness and confirm rules release rather than use old data.

## 4.1 FD setup and qualification

Use the common analog workflow or the CAN setup steps above. Keep the analog channel named AEM AFR and the CAN channel AEM lambda if both are used; do not label one as independent confirmation of the same sensor's health. They share the same sensing element.

Decode status separately from value. The generic decoder does not automatically make a lambda signal invalid when another decoded bit changes. Until the validity and fault signals are included in an approved permission path, use this for monitoring only. FD analog validity permits a small margin around the calibration endpoints and clamps values: for this 0.5–4.5 V curve, a 0.45 V not-ready signal can still display 8.5 AFR and remain electrically valid. For any qualified actuator permission require the raw Input n Voltage to be  $\geq 0.5$  and  $\leq 4.5$ , plus the applicable ready/fault conditions; Input Valid alone is insufficient. Never relabel an AFR number as lambda: FD requires matching source/mixture units and does not automatically perform that conversion.

Sources: FD CANBusConfigurationView.swift and CANDecodeEditorView.swift. CAN acknowledgement:

<https://kvaser.com/knowledge-base/what-is-silent-mode/>

## 5

## — SENSORS / KEEP

# AEM 30-0301 pressure gauge

Scope: 100 psi / 7 bar model, 10-0301 dated 23 March 2020. Connector A pin 9 white is the logging signal and pin 10 brown its return. Use these rather than teeing the sensor input. Pin 7 green is a sensor INPUT to the gauge; it is not the dedicated logging output. Pins 6 and 8 belong to its sender excitation/reference.

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The analog transfer is  $\text{psi} = 25 \times \text{volts} - 12.5$ : use  $0.5 \text{ V} = 0 \text{ psi}$ ,  $4.5 \text{ V} = 100 \text{ psi}$ . Wire white to the chosen FD input and brown to J8 pin 8. Retain the gauge supply and sender wiring.

Source: AEM 10-0301 pp2,7. [https://documents.aemelectronics.com/techlibrary\\_30-0301.pdf](https://documents.aemelectronics.com/techlibrary_30-0301.pdf)

## 5.1 FD installation and setup

- 1 Allocate an unused IN and name it for the physical pressure, for example Fuel rail pressure – AEM gauge. Record whether the reading is gauge pressure or differential fuel pressure; do not label it as both.
- 2 Use the common Analog setup. Enter the endpoints above and Unit psi. Do not choose a 150 psi sender preset simply because the connector looks similar.
- 3 Preserve the original gauge's independent alarm. Compare three stable pressure points and log supply/ground disturbance while switching other accessories on dummy loads.
- 4 Record the pressure port location. A rail sensor does not directly measure nozzle delivery, and a static fuel rail reading does not establish differential injector pressure unless the required manifold reference is also accounted for.
- 5 Before binding a fuel-pressure cut, determine the allowable pressure window, freshness and failure action with the tuner. A measurement intended for display needs additional fault qualification before it becomes a safety input.

## 5.2 If the gauge is removed later

The supplied sender in this gauge kit is not automatically the stainless sender described in Book 08. Identify the actual sender part number and its calibration first. Disconnect the gauge's excitation before powering a dedicated sender from FD; never parallel supplies.

## 6

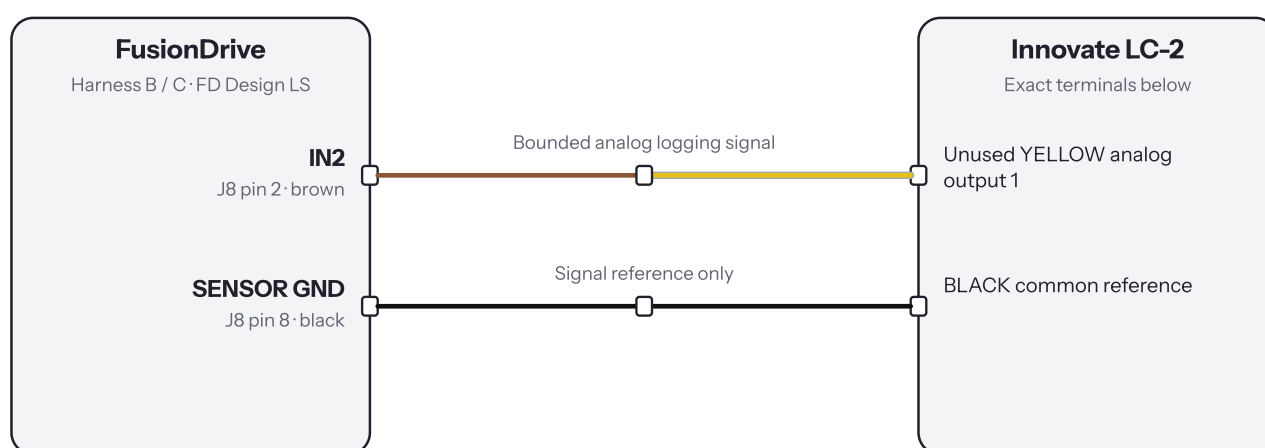
— SENSORS / KEEP

## Innovate LC-2

Scope: LC-2 user manual 11-0137C, wiring pp3-4, analog programming pp7-8. Yellow analog output 1 defaults to  $0\text{ V} = 7.35\text{ AFR}$  /  $5\text{ V} = 22.39\text{ AFR}$ . Brown analog output 2 defaults to narrowband simulation:  $1.1\text{ V} = 14\text{ AFR}$  /  $0.1\text{ V} = 15\text{ AFR}$ . They are independently programmable and each output is specified for one receiving device. Ground reference must be shared with the receiver. MTS is serial, not CAN.

Source: [https://www.innovatemotorsports.com/wp/content/uploads/2022/05/LC-2\\_Manual.pdf](https://www.innovatemotorsports.com/wp/content/uploads/2022/05/LC-2_Manual.pdf)

## S-04 | LC-2 spare logging output



Wire colours: FD loom at left; documented accessory wire at right. Small sleeve = insulated splice.

Connector positions here are logical; use the mating-face drawings to locate FD cavities.

If yellow already feeds another device, use the spare programmed analog channel or a qualified buffer.

## 6.1 Preserve the original display or ECU connection

- 1 Inventory both analog wires. If yellow is unused, assign it to FD. If it already feeds an ECU or display, leave it there. Use an unused second output programmed to the intended wideband transfer, or a qualified buffer. Do not casually tee a one-device output.
- 2 Record the current LC-2 output configuration in LM Programmer before changing it. A brown wire connected to an ECU for narrowband simulation must retain that function; changing it could change engine fuelling.
- 3 Add the selected FD input as Analog. Name it LC-2 AFR; edit Unit to AFR and enter the actual saved LC-2 output endpoints. Confirm minimum, midpoint and maximum against the programmed curve.
- 4 Verify the original receiving device still reports correctly. Retain the LC-2 power, status indication, sensor harness and manufacturer calibration schedule.

- 5 Observe warm-up and error output values. The same analog voltage can be configured as an error value; an FD linear conversion is not automatic sensor-health decoding. Add an independently qualified readiness path before control use.

## 6.2 What FD adds

The LC-2 measurement can be overlaid with OBD RPM/TPS, boost duty, WMI demand, nitrous state and automation events. This does not make the LC-2 a remote-controlled tuning device. Serial programming remains the manufacturer's workflow.

## 7

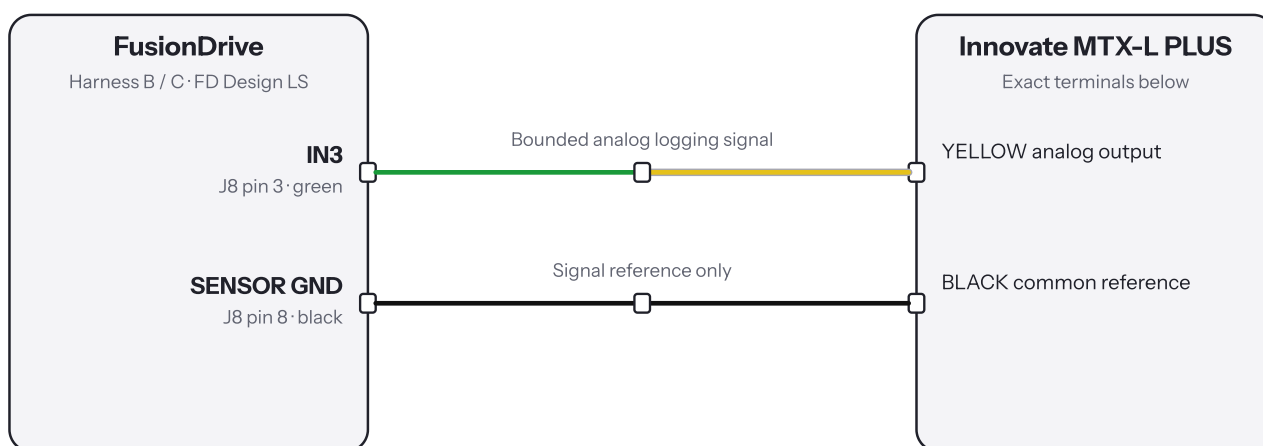
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# Innovate MTX-L PLUS

Scope: 11-0159A, wiring p3 and output programming pp8-10. Yellow is the configurable analog output, default 0 V = 7.35 AFR / 5 V = 22.39 AFR. Black is ground; white is the illumination input, not a data output. The powered gauge contains the wideband controller, and the sensor must remain connected to it. MTS serial is not a CAN2 interface.

Source: <https://www.innovatemotorsports.com/wp/content/uploads/2022/05/MTX-L-PLUS.pdf>

## S-05 | MTX-L PLUS logging output



Wire colours: FD loom at left; documented accessory wire at right. Small sleeve = insulated splice.

Connector positions here are logical; use the mating-face drawings to locate FD cavities.

Retain the powered gauge and sensor. A shared output needs verified loading or a buffer.

## 7.1 FD installation and setup

- 1 Confirm the MTX-L PLUS identity; an older MTX-L or another Innovate model needs its own manual. Save the existing analog-output programming.
- 2 Connect the unused analog output through an electrically qualified harness to the chosen FD input. If already consumed by an ECU, establish buffering/loading before sharing it. Keep power, lighting and sensor connections intact.
- 3 Create Analog, name MTX-L PLUS AFR, set Unit AFR in Edit, enter the actual programmed voltage and value endpoints, then save/read back.
- 4 Compare the gauge and FD at three steady conditions. Check any fuel-dependent display mode: a displayed AFR may differ from the output's configured interpretation. Use matching units rather than changing the physical signal until two numbers happen to agree.

- 5 Record warm-up, unplugged sensor and gauge-off behaviour. Do not infer that the analog line's electrical presence means the reading is usable for a cut or permit.

## 7.2 Removing its visible display

Removing power from this gauge removes the wideband controller. To hide the display, retain the module in a suitable location or replace it with a compatible dedicated wideband controller and its matched sensor/harness. Book 08 covers that migration; direct LSU-to-IN wiring is not supported.

## 8

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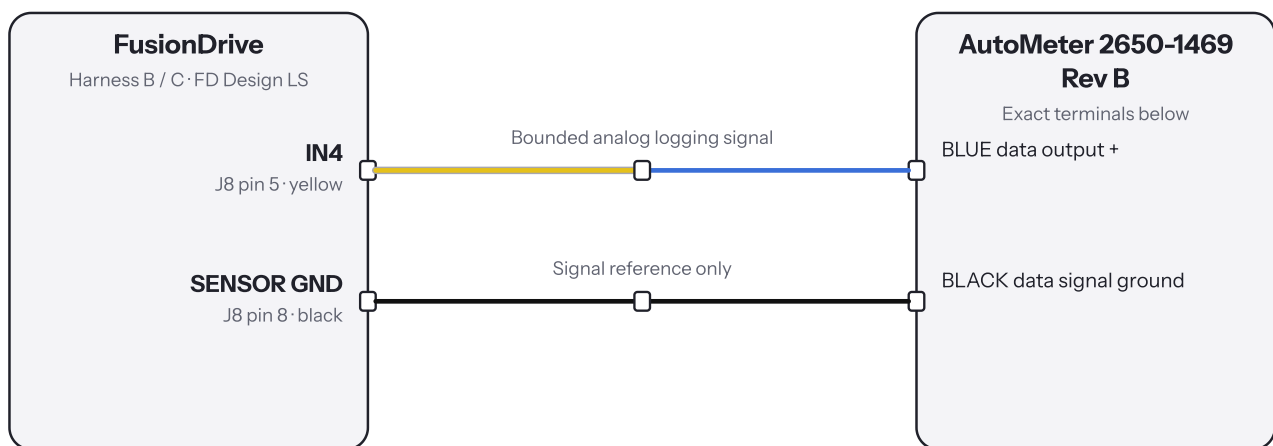
# AutoMeter analog wideband

Scope: manual 2650-1469-00 Rev B dated 2 February 2017, not all AutoMeter widebands. Blue is data output positive, black data signal ground is the reference. Brown is the heater override input and is not the logging wire. This document specifies 0-4 V = 10-18 AFR, so AFR = 2 x volts + 10. The gauge remains the sensor controller.

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Source: AutoMeter pp1-2. <https://autometer.com/media/manual/2650-1469.pdf>

## S-06 | AutoMeter 2650-1469 Rev B



Wire colours: FD loom at left; documented accessory wire at right. Small sleeve = insulated splice.

Connector positions here are logical; use the mating-face drawings to locate FD cavities.

This revision is 0-4 V = 10-18 AFR. BROWN is heater override, not an FD input signal.

## 8.1 FD installation and setup

- 1 Match the gauge to this exact manual. AutoMeter also has programmable 0-4 V products with different endpoints; do not transfer this calibration by brand alone.
- 2 Retain the existing power, heater operation, sensor and lighting circuit. Route blue to the chosen input and the logging reference to J8 sensor ground.
- 3 Create Analog; name AutoMeter AFR. Edit Unit to AFR and set Min V 0, Max V 4, value Min 10, Max 18. Leave Additional voltage scale 1.

- 4 Validate a 2 V test corresponds to 14 AFR. Verify the actual gauge's warm-up mode and sensor-error behaviour independently before assigning a protection function.
- 5 Save/read back and record the exact AutoMeter part number in the log session notes. A trace labelled simply AFR hides the transfer function needed by the tuner.



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# Defi ADVANCE and unlisted gauges

The ADVANCE Control Unit SE manual documents its own sensor ports, controller and meter interconnections. This review has not established a supported generic 0–5 V logging output or a public CAN definition for that system. The presence of linked gauges is not evidence that its bus is CAN.

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Source: Defi ADVANCE Control Unit SE English manual, system/wiring sections. [https://www.defi-shop.com/wp-content/uploads/2025/04/manual\\_unitse\\_e.pdf](https://www.defi-shop.com/wp-content/uploads/2025/04/manual_unitse_e.pdf)

## 9.1 Supported route in this edition

Keep the Defi system intact and fit an independent FD-compatible pressure sensor or a qualified signal conditioner at an appropriate measurement point. Use a proper pressure fitting and compatible wetted materials. FD can then overlay that separate measurement with the car's data without altering the Defi bus.

## 9.2 Hold points for any raw tap

- Exact sender datasheet, transfer function, excitation and permissible receiver load.
- Input impedance and bias of every attached receiver, with one powered and another unpowered.
- Open/short fault behaviour and original gauge/ECU diagnostic behaviour.
- Safe buffering and common-mode range; circuit documentation with measured results.

Until those are known, this guide does not provide a direct Defi sensor-tap pinout or a proprietary-bus decoder. PLX, generic clone gauges and other unlisted systems are likewise not certified by a similar connector or brand preset. Use the expansion worksheet in Book 00.

## 10

## — SENSORS / KEEP

# Automations, logs and acceptance

## 10.1 Add a rule only after the source is trusted

Open More > Automations and add a named rule. Select the configured sensor or decoded CAN signal as a condition, choose the required comparison and enter thresholds in that signal's actual units. Start with an isolated dummy-output action and inspect Automation Status and logged rule events; the current editor does not provide a general notification/log-event action. Use explicit valid/ready and fault conditions where needed; no decoder automatically understands every accessory's error code.

For a binary permission output, use an already-qualified relay/interface and an output initially at 0. Use ALL conditions and a 100% action with Restore Previous Value When False. The captured prior value must be 0; other rules/manual controls must not compete. Set release delay to 0 for a safety-related permission. Test missing/stale sources, disable, reboot and expiry before live loads.

## 10.2 Record what was requested and what happened

In Data Log settings, select the relevant sensor, OBD, decoded CAN, output, controller and automation channels. Include raw voltage/status and acquisition freshness where exposed. Set active/idle rate for the session and inspect achieved rate. A 100 Hz accessory broadcast does not guarantee 100 distinct samples per second in a phone log. Optional raw CAN capture has separate filters and capacity; it is not unlimited capture of all traffic.

Name channels by origin: Requested WMI permit, External WMI duty reference, Measured meth pressure, Measured lambda. Include raw sensor unit and calibration in notes. Cloud upload and Intelligence can help inspect patterns, but neither proves actual fuel/fluid delivery or guarantees a predicted failure.

## 10.3 Acceptance record - perform, do not assume passed

| Check                           | Expected observation                                 | Record                            |
|---------------------------------|------------------------------------------------------|-----------------------------------|
| Electrical endpoints            | Input stays in qualified range in every power state  | Meter/scope file and date         |
| Calibration low / middle / high | Within installed measurement tolerance               | Reference instrument and readings |
| Source off / unplugged / stale  | Marked unusable; dependent permission releases       | Timing and log marker             |
| Original gauge/ECU operation    | Unchanged by FD loading                              | Before/after comparison           |
| Save, reload and restart        | Correct stored source and calibration                | Screenshots/config export         |
| Phone disconnected              | Local configured logic persists; logging gap visible | Device/log evidence               |
| Concurrent loads                | No false measurement from ground shift/noise         | Waveform and worst-case load      |

FD source: SensorsView.swift; CANDecodeEditorView.swift; AutomationEditorView.swift; DataLog/LogSettingsView.swift and DataLogRecorder.swift. None of the physical checks above have been performed by creating this manual.



# Questions?

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**Support** · in the app: [More](#) → [Settings](#) → [Device & firmware](#) → [Report an Issue](#)

**Review copy** · [Local FD V3 installation library](#)

FusionDrive switches real current to real loads and can control boost, water/methanol injection and nitrous. Fuse every feed and every load, respect the ratings in the specifications, and set failsafes before you drive. Configure and tune with the vehicle stationary. The installer is responsible for compliance with local vehicle regulations. Local review draft. These accessory installations have not received physical compatibility sign-off or manufacturer approval. Follow the exact-model qualification and commissioning steps in this guide before use. Match the exact model, generation, connector and manual revision. Terminal labels identify electrical connections, not connector mating-face or cavity order. Follow cavity markings and the official harness view; do not wire by colour alone. Manufacturer names identify equipment only. These independent FD instructions do not replace the manufacturer's manual.