

## Mechanical Engine to CAN J1939 interface



### Installation Instructions

Please read the following information before installing. A visual inspection of this product for damage during shipping is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product. If in doubt, please contact your local Murphy representative.

### General Information

WARNING

BEFORE BEGINNING INSTALLATION OF THIS PRODUCT

- ✓ Disconnect all electrical power to the machine
- ✓ Make sure the machine cannot operate during installation
- ✓ Follow all safety warnings of the machine manufacturer
- ✓ Read and follow all installation instructions

MeCAN™ is a compact, encapsulated interface module that translates resistive sender, fault switch and speed signals into SAE J1939 CAN bus data. MeCAN allows quick and simple integration of mechanical, non-ECU engines into modern CAN bus systems. Applications include the retrofit of older engine fleets with modern digital instruments, controls and telemetry and the development of standard control panels for both ECU and non-ECU engines.

MeCAN has three sensor inputs and one output. Two inputs are for oil pressure and coolant temperature sensing, either by fault switches or resistive senders. The third input measures engine speed, using a magnetic pickup or charge alternator signal. Input signals are translated into SAE J1939 CAN bus messages with appropriate PGN address, data scaling and transmission rate. The shut-down output operates and latches if the pressure, temperature or speed inputs deviate outside preset fault limits.

A fourth input is connected to a speed calibration potentiometer during set-up mode only. DIP switches allow selection of normal/set-up mode and two speed input ranges. An LED gives indication of operating mode and CAN bus activity.

MeCAN is compact and light enough for inclusion in many wiring harnesses but can also be surface mounted via four fixing holes. The case is fully sealed in epoxy resin for high impact and environmental resistance.

Two standard versions allow use with either fault switches or Murphy ES series resistive senders:

part number	model/description
E2501300	MEC301-1 MeCAN I/O module, for use with Murphy ES pressure & temperature senders
E2501200	MEC301-2 MeCAN I/O module, for use with pressure & temperature switches (closing to negative DC on fault)

Custom solutions are also available for non-standard, volume OEM requirements.



### Specifications

#### Power supply

**Operating voltage, steady state:** 7 to 35 VDC  
**Current consumption:** 25mA (typ.)

#### Inputs

**Maximum operating range:** -2 to +35 VDC  
**Oil pressure, coolant temperature:**  
MEC301-1, E2501300 : for resistive senders, Murphy ES series  
MEC301-2, E2501200 : for switches, closed to negative DC on fault  
**Speed (magnetic pickup):**  
opto-isolated, 3 – 30 Vrms, adjustable 10 – 180 pulses per rev  
**Speed calibration:** 0 – 5 kOhm potentiometer (setup only)

#### Outputs

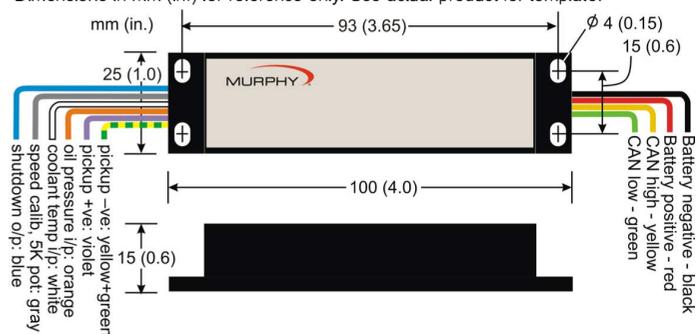
**Shutdown:** negative DC (open collector transistor), 250mA max.  
**CAN bus:**  
SAE J1939 protocol, 120 Ohm terminating resistor fitted.

#### Physical

**Case material:** high impact ABS, epoxy filled  
**Dimensions:** see diagram below  
**Weight:** approx 60g / 0.13 lb  
**Operating temperature:** -20 to +85 °C / -4 to +185 °F  
**Environmental sealing:**  
IP65 (with DIP switch protective film intact), exposed lead ends  
**Electromagnetic compatibility:** 2004/108/EC

### Connection and Dimensions

Dimensions in mm (in.) for reference only. Use actual product for template.



# Electrical Connection & Mounting

## Electrical connection

MeCAN connection is via 9 color-coded flying leads (see diagram on page 1).

**RED: Power supply positive DC**

**BLACK: Power supply negative DC**

Connect these wires to a smooth DC power supply in the range 7 to 35 VDC. A 1 Amp anti-surge fuse is recommended in the positive DC line. MeCAN operates with negative earth/ground or fully insulated DC systems. **DO NOT** use MeCAN with positive earth/ground systems.

**YELLOW: CAN bus high**

**GREEN: CAN bus low**

Connect these wires to the engine's CAN bus, using the appropriate twisted-pair cable to J1939 specification. MeCAN includes a non-removable 120 Ohm CAN terminating resistor.

**VIOLET: Speed input signal**

**YELLOW / GREEN: Speed input return**

**GRAY: Speed calibration input (5kOhm potentiometer)**

Connect the violet wire to a magnetic pickup or speed sensor signal output. Connect the yellow/green wire to the speed signal return wiring (or battery negative on ground/negative-return systems). This input requires a speed signal of 3 – 30 VAC rms.

Before calibrating the speed input (see section at right), connect a 5kOhm potentiometer between the gray wire and battery negative DC. MeCAN allows adjustment for speed signals between 10 and 180 pulses per engine revolution. The potentiometer can be removed in normal operation.

**BLACK: Sender/switch common (negative DC)**

**WHITE: Coolant temp sender/switch input**

**ORANGE: Oil pressure sender/switch input**

Part number E2501300 is designed for use with Murphy ES series resistive senders (see separate product info for pressure and temperature versus resistance data). For best measurement accuracy, use insulated return (2-wire) senders. Connect one terminal of each sender to the appropriate MeCAN input lead; connect the other sender terminals to MeCAN's Sender Common (black) wire. Where 1-wire (negative DC/ground return) senders are used, connect the black (sender common) wire to battery negative.

E2501200 is configured for use with low oil pressure and high coolant temperature switch contacts that close to negative DC on fault. For insulated return (2-wire) switches, connect one switch terminal to the appropriate MeCAN input; the second terminal from each switch (on 2-wire switches) or the body ground (on 1-wire switches) must be connected to MeCAN's sender/switch common (black) wire.

**BLUE: shut-down output**

This open-collector transistor output gives a negative DC signal, rated 250mA max, on detection of fault conditions:

Fault	part reference	
	E2501300 (sender inputs)	E2501200 (fault switch inputs)
oil pressure	< 10 psi	input closed to –DC
coolant temp	> 110°C/230°F	input closed to –DC
engine speed	> 3500 RPM	> 3500 RPM

The output latches following the fault condition and can be deactivated by removing the DC power supply. The output can be used to drive a warning lamp, audible alarm, suppressed relay coil or ECU shut-down circuit.

## Speed input calibration

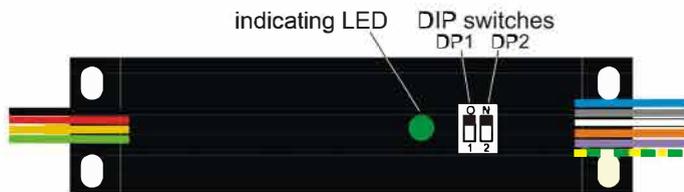
MeCAN's speed sensing input must be correctly calibrated before speed data can be correctly transmitted by J1939 CAN bus.



**WARNING:** speed calibration requires the setting of 2 DIP switches, which are environmentally protected by an adhesive film. To maintain sealing integrity, use a scalpel to carefully lift the film from the DIP switch, make switch adjustments, then replace the film firmly to ensure a good seal.

The speed calibration procedure is as follow:

- Ensure minimum connection (details shown left) of CANbus, speed signal and (isolated) DC power supply wiring.
- Connect a 5 kOhm potentiometer between MeCAN's calibration input (gray wire) and battery negative DC.
- Connect (to the CAN network) and power up a J1939 compatible RPM display, e.g., Murphy PowerView® PV101.
- Set MeCAN switch DP1 to OFF (down) for calibration mode:



- Set switch DP2 for the speed sensor range, if known:
  - ON (up) = 10 to 62 pulses per rev
  - OFF (down) = 55 to 180 pulses to rev
- Run engine to known speed.
- Power up MeCAN. The LED flashes rapidly to indicate calibration mode.
- Adjust the 5kOhm calibration potentiometer until the J1939 RPM display indicates the known engine speed. If the indicated speed is too high/low and cannot be adjusted downward/upward, power down MeCAN, switch DP2 to a lower/ higher speed range, then repeat the procedure from g) above.
- Once the correct speed is indicated (and with MeCAN still powered), switch DP1 to ON (up) to save the calibration setting. Normal operation then resumes, indicated by a continuously lit LED (if CAN bus traffic is detected) or a slow flashing LED (if CAN bus traffic is not present).
- Stop the engine and power down MeCAN. The 5kOhm calibration resistor is not required for normal operation and may be removed. Restart the engine, power up MeCAN and check for correct operation.

## Mounting

MeCAN uses an epoxy resin-filled polycarbonate case for high impact and environmental resistance. The case is compact and light enough for inclusion in (or tie-wrapping to) an engine wiring harness; or, using the actual product as a template, it can be surface mounted by four M4 (0.15 in) holes - see diagram on page 1 for approximate dimensions.

MeCAN's case is sealed to IP65, provided that the DIP switch protective film remains intact. The exposed flying leads must use connectors appropriate for the environmental sealing required.

# Operation and Maintenance

## Operation

MeCAN begins transmitting J 1939 CAN bus data immediately after power up. Data can be viewed using a J1939 compatible display, e.g., the Murphy PV101, or used as part of a J1939 control system, e.g., Murphy CAN start or CASCADE modules.

### Engine oil pressure and coolant temperature

Model E2501300 transmits pressure and temperature data when the resistive sender inputs are within normal range. MeCAN also transmits appropriate J 1939 SPN (Suspect Parameter Number) and FMI (Fault Mode Indicator) codes if:

- input resistance is out of normal sender range, e.g., open or short circuit
- oil pressure drops below 20 psi (warning message) and 10 psi (shut-down/derate message)
- coolant temperature rises above 100°C/212°F (warning message) or 110°C/230°F (shut-down message)

Model E2501200 transmits pressure and temperature data in accordance with the input switch position:

	<i>Input switch closed (to -DC)</i>	<i>Input switch open</i>
<i>oil pressure data</i>	0 psi & SPN/FMI code	100 psi
<i>coolant temp data</i>	105°C / 221°F & SPN/FMI code	90°C / 194°F

Oil pressure fault codes are not transmitted until 10 seconds after engine starting, once speed has risen above 800 RPM.

### Engine speed data

RPM data is transmitted whenever a valid speed signal is present (above the minimum 3V rms). If engine speed exceeds 3500 RPM, MeCAN also transmits the appropriate J1939 overspeed fault SPN and FMI codes.

### Battery voltage

MeCAN measures its DC power supply voltage and transmits this as J1939 electrical potential data (PGN 65271).

### Hours run

MeCAN transmits engine hours run data (PGN 65253). The hours run value is stored in non-volatile flash memory and increases only while engine speed is above 500 RPM. To prolong internal flash memory life, hours run data is updated at 3 minute intervals.

## Maintenance and Warranty

MeCAN contains no user-serviceable parts. Maintenance is therefore limited to the following preventative checks:

- Check that MeCAN electrical connections are secure.
- Check that the case is mounted securely, with vibration and environmental exposure minimized where possible. The case may be wiped with a clean, damp cloth. Do not use cleaning solvents.

MeCAN is supplied with a two-year warranty on parts and workmanship. In the event of a fault or technical query and before returning equipment, please contact your Murphy representative for technical support.

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