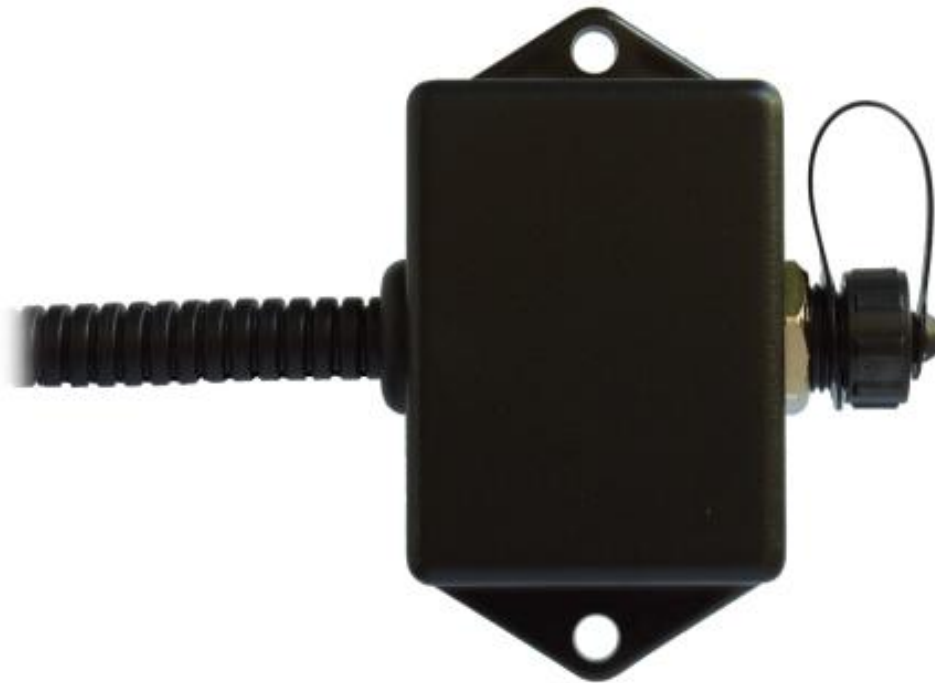

CANdo AUTO Module Datasheet

1 Overview

The **CANdo AUTO** Module is a rugged multi-purpose CAN bus module with a USB port, two precision analogue inputs & a DC power supply, encased in a waterproof & vibration proof housing. The module can be powered from the USB port, or from an external DC power source such as a 12 or 24V vehicle battery. When connected to a PC, the module becomes a CAN bus analyser, providing debugging, logging & analysis of the CAN bus. When powered from an external DC power source, the module becomes a standalone interface between the analogue inputs & the CAN bus. In this mode, the module may be configured to automatically transmit periodic CAN messages, containing dynamically changing analogue data or static data.

The module is designed to be configured using either the **CANdo AUTO** Configuration software or the **CANdo** SDK. The module is also compatible with the **CANdo** Application CAN bus analyser software.



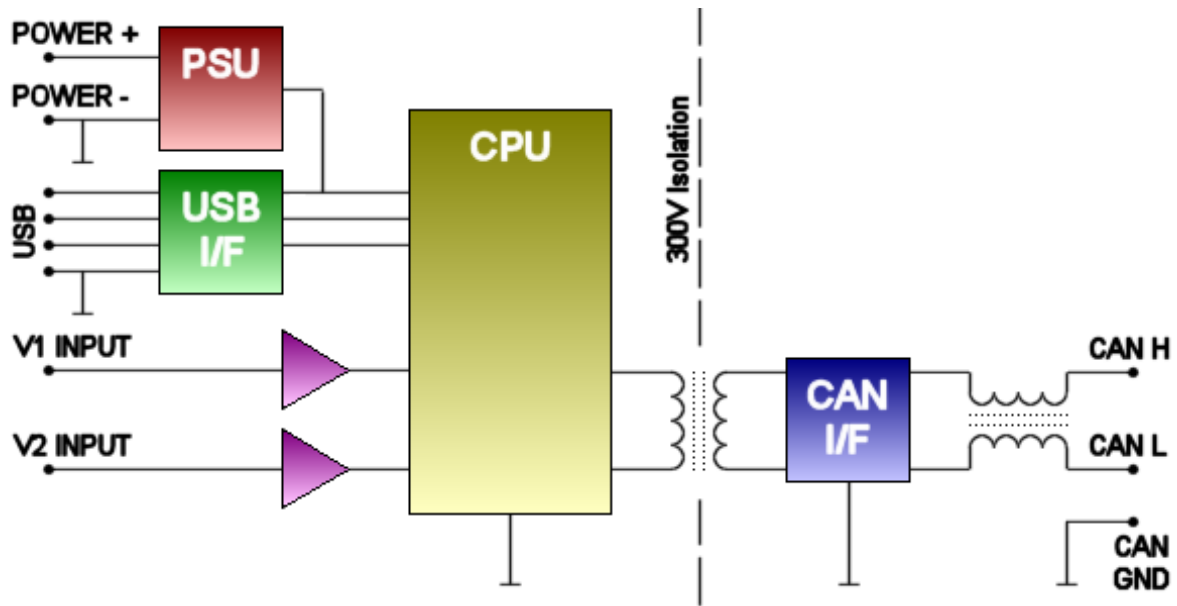
CANdo AUTO Module – Top View

- High speed CAN bus ISO11898-2 compliant interface
- USB v1.1, v2.0 & v3.0 compatible interface
- 2 precision analogue inputs each with a measuring range of 0 to 32V
- Module powered by USB or DC power in the range 8 – 32V
- DC power input protected against 100V transients & supply reversal
- 300V isolation between the CAN bus & other connections
- Rugged waterproof construction sealed to IP66
- 2 integral mounting flanges with fixing holes
- Waterproof mini USB connector with sealing cap
- Upgradeable firmware
- FREE **CANdo AUTO** Module configuration software
- FREE **CANdo** Application CAN bus analyser software
- FREE **CANdo** SDK

2 History

| Version | Date | Modifications | Author |
|----------------|-------------|----------------------|---------------|
| 1.0 | 12/08/13 | Created | MJB |

3 Description



CANdo AUTO Module Block Diagram

The CANdo AUTO Module is designed to work as a standalone device when powered through the 'POWER' inputs. In this mode, the module can be pre-configured to transmit CAN messages automatically on power up. The CAN messages may either be fixed messages or contain dynamic data derived from one of the two analogue inputs. The module is pre-configured by the user on a PC using the CANdo AUTO Configuration software. The software communicates with the module via the 'USB I/F'.

The CANdo AUTO Module is also designed to be used as a rugged CAN bus analyser, in conjunction with the CANdo Application software. In this mode, CAN messages can be viewed, logged, analysed & transmitted using the software.

3.1 PSU

The 'PSU' is designed to operate from a DC supply in the range 8 to 32V & is fully protected against transients & supply reversals. The module is designed to be powered from either a 12 or 24V vehicle battery supply in standalone mode & is protected to withstand transient events such as alternator load dump.

3.2 USB I/F

The 'USB I/F' provides power & communication to the module when connected to a PC. Various applications are available to communicate with the module when connected via the 'USB I/F' –

- CANdo AUTO Configuration software – configures the module for standalone operation
- CANdo Application software – converts the module into a CAN bus analyser
- CANdo SDK – allows the module to be integrated into 3rd party applications
- CANdo Programmer – allows firmware within module to be upgraded or customised



USB Cable Connected – Top View

3.3 V1 & V2 INPUTS

The analogue inputs V1 & V2 are designed to accurately measure DC voltages & convert those voltages into a digital format for transmitting as CAN messages. In a typical application, an input is connected to a sensor in the vehicle, such as a temperature or pressure sensor & the module periodically measures the sensor output & transmits the data as part of a CAN message. The format of CAN messages may be specified using either the [CANdo AUTO](#) Configuration software or the [CANdo SDK](#).

3.4 CPU

The CPU is programmed with a number of functions that control the operation of the CANdo AUTO Module. The main functions the CPU performs are –

- USB to CAN communications
- Sampling of analogue inputs & transmission of associated CAN message
- Transmission of fixed, periodic CAN messages

The [CANdo AUTO](#) Module serves as a USB to embedded CAN bus interface & maybe used to view, analyse & transmit CAN messages on the CAN bus from a PC, using either the [CANdo](#) Application software or the [CANdo SDK](#). Using the [CANdo SDK](#), custom programs may be written to perform specific tasks, such as downloading software over the CAN bus to an ECU or requesting & displaying OBD data from a vehicle.

The CPU also contains two non-volatile memory stores, one for the configuration of the two analogue inputs & associated CAN messages & the other for the configuration of fixed, periodic CAN transmit messages. Both of these stores are supplied empty & must be configured before the module will transmit any CAN messages in standalone mode. The stores may be configured using either the [CANdo AUTO](#) Configuration software or by API function calls using the [CANdo SDK](#). When each store is configured, the CPU calculates a CRC checksum of the configuration data & stores the checksum with the configuration. Every time the module is powered up, the CPU checks the contents of the store against the checksum & only enables CAN transmissions if these match. This is a security check to make sure that no invalid CAN transmissions take place if the non-volatile memory becomes corrupted.

3.5 CAN I/F

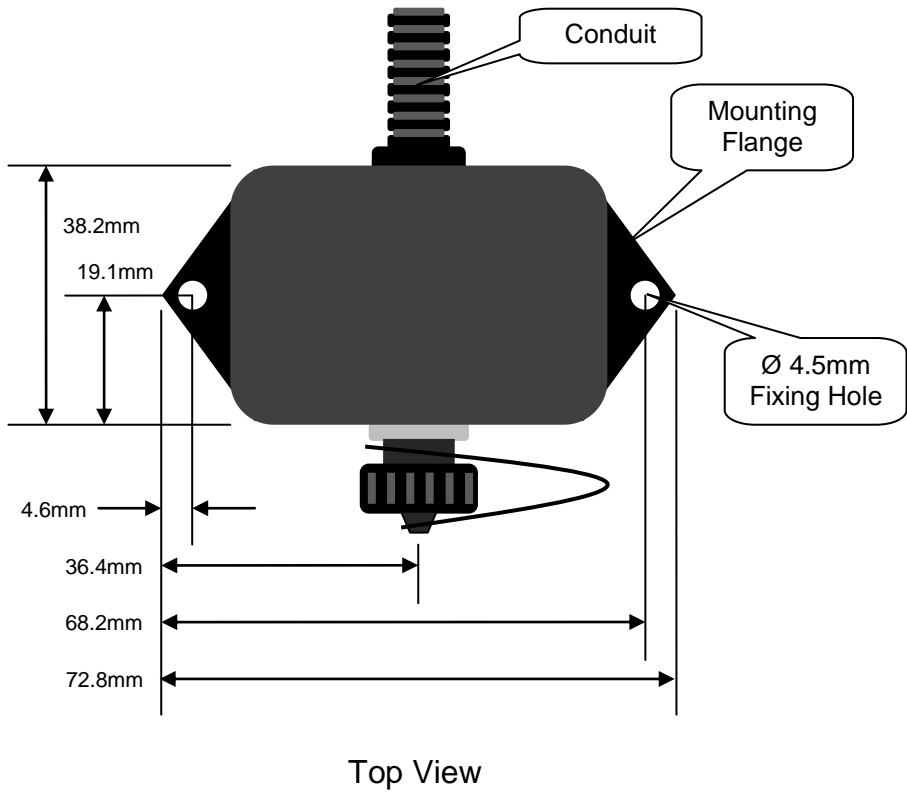
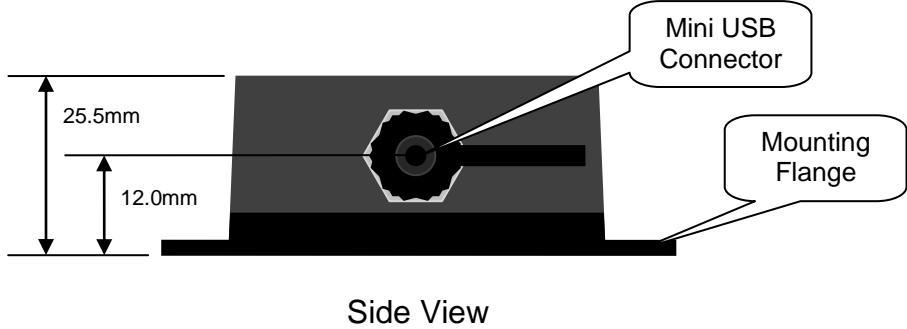
The CAN interface provides the electrical connection to the CAN bus & is electrically isolated from the other parts of the module by a 300V barrier. This isolation allows the module to be connected to the CAN bus in a safe manner, especially where higher voltages exist.

If isolation between the 'USB I/F' & the 'CAN I/F' is not required, then the 'POWER -' & 'CAN GND' connections may be joined. However, this is not normally necessary & the 'CAN GND' connection is usually omitted.



Conduit – Side View

4 Dimensions



5 Connections

5.1 Mini USB

The **CANdo AUTO** Module contains a mini USB type B connector on one side of the housing. The pinouts of the USB connector follow the industry standard, as detailed below.



Mini USB Connector

| Mini USB | |
|----------|-------------|
| Pin No. | Signal |
| 1 | VBUS (+5V) |
| 2 | Data- |
| 3 | Data+ |
| 4 | Ground (0V) |
| 5 | Ground (0V) |

The mating cable for the mini USB connector is 'Conec P/N 17-250031'.

5.2 CAN Bus, DC Power & Analogue Inputs

The CAN Bus, DC power supply & analogue input connections are present as open ended wires, protected by a plastic conduit that exits one side of the **CANdo AUTO** Module housing. There are 3 variants of the **CANdo AUTO** Module (P/Ns NET50022-1 to -3) that differ in the number of external connections present, as detailed below.

| Variant | Conduit | | |
|-------------|-------------|-------------|-------------|
| | -1 | -2 | -3 |
| Wire Colour | Signal | | |
| Blue | *1 CAN Low | *1 CAN Low | *1 CAN Low |
| White | *1 CAN High | *1 CAN High | *1 CAN High |
| Green | *2 CAN GND | *2 CAN GND | *2 CAN GND |
| Red | | Power + | Power + |
| Black | | Power - | *3 Power - |
| Brown | | | *3 V1 Input |
| Orange | | | *3 V2 Input |

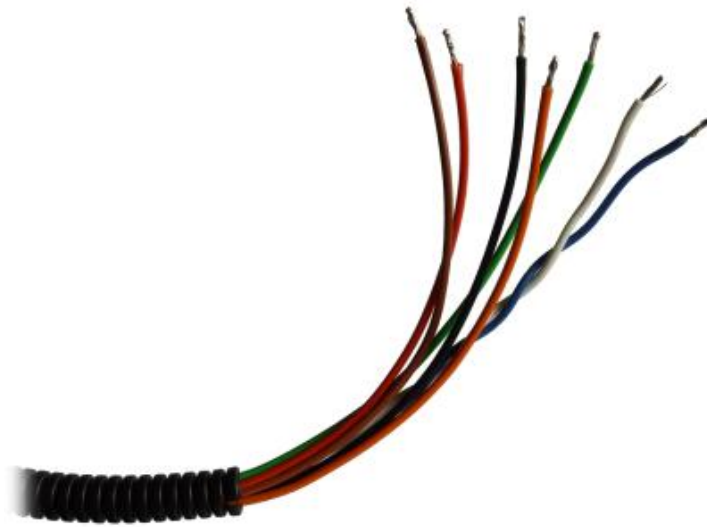
*1 'CAN High' & 'CAN Low' form an unscreened twisted pair

*2 Option 'G' only

*3 The 'Power -' connection is also the ground reference for the V1 & V2 inputs

An additional 'CAN GND' wire may be specified with any of the variants by adding a 'G' suffix to the part number, e.g. NET50022-1G. This is the ground wire for the isolated CAN bus in the module & is not normally needed, but is available for when the module is installed in an electrically noisy environment.

There is no resistive termination within the module between the 'CAN High' & 'CAN Low' connections.

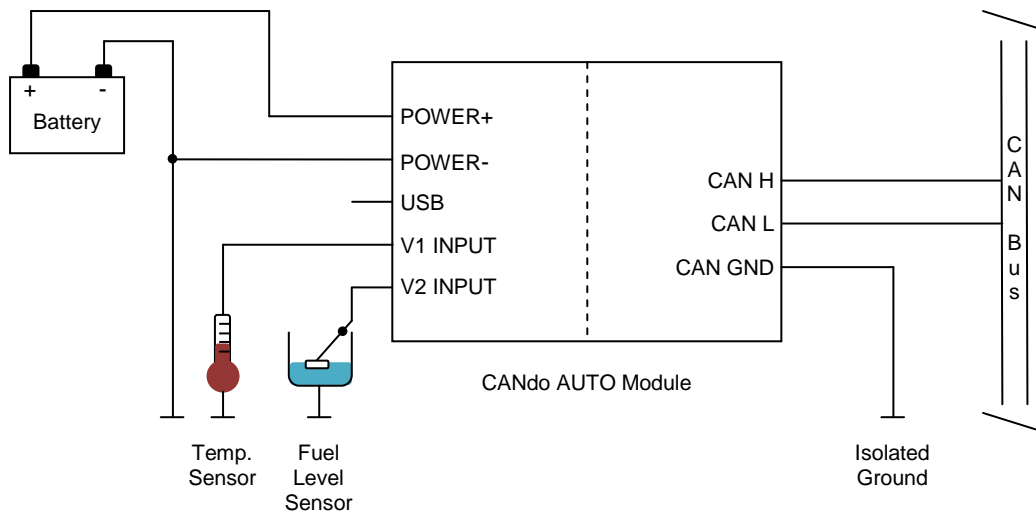


Variant NET50022-3G

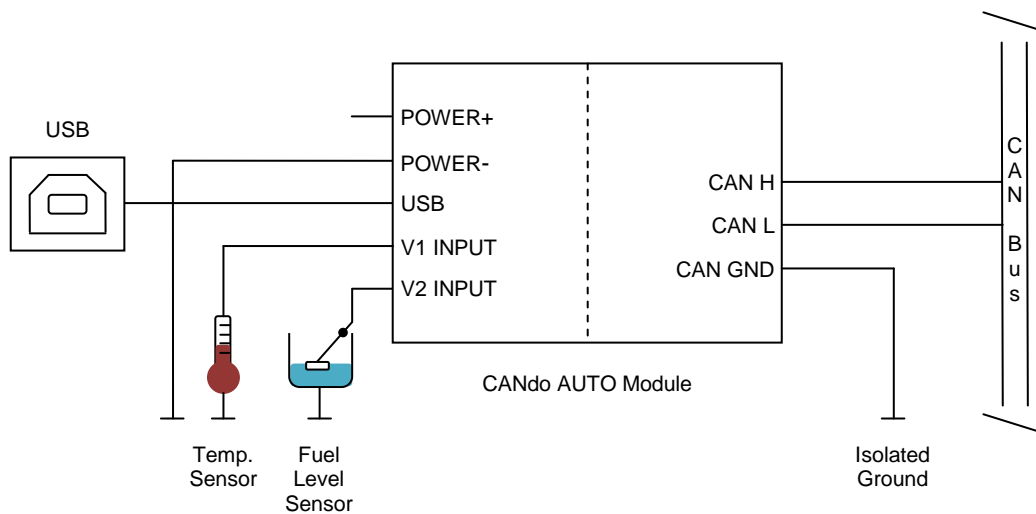


6 Application Information

The diagram below shows the CANdo AUTO Module in a typical automotive application.



The diagram below shows the typical setup when connected to a PC via the USB. This allows the module to be configured & sensors to be tested & calibrated. Analysis of the CAN bus from the PC is also possible with these connections.



The module contains no internal termination between the 'CAN H' & 'CAN L' connections. The CAN bus must be correctly terminated at either end for the module to communicate reliably with other CAN nodes on the bus.

7 Specification

| Parameter | Min. | Typ. | Max. | Units |
|--|----------------------------------|------|-------|--------|
| USB | | | | |
| USB supply voltage | 4.5 | - | 5.5 | V |
| USB supply current | - | 65 | 100 | mA |
| CAN | | | | |
| Bus output voltage – dominant state | | | | |
| CAN L | 0.8 | 1.2 | 1.5 | V |
| CAN H | 2.9 | 3.5 | 4.5 | V |
| Bus output voltage – recessive state | | | | |
| CAN L | 2.0 | 2.3 | 3.0 | V |
| CAN H | 2.0 | 2.3 | 3.0 | V |
| Common mode range relative to CAN GND | -27 | - | 40 | V |
| Short circuit output current to CAN GND | -110 | - | 110 | mA |
| Power +/- | | | | |
| Voltage Range | 8 | - | 32 | V |
| Voltage Transients (1s max.) | -100 | - | 100 | V |
| Current @ 12V | 30 | 45 | 60 | mA |
| Current @ 24V | 15 | 22 | 30 | mA |
| V1 & V2 Inputs | | | | |
| Voltage Range | 0 | - | 32 | V |
| Impedance | 125.7 | 126 | 126.3 | k ohms |
| Accuracy | ±(0.3% + 32mV) | | | |
| Isolation | | | | |
| CAN L/H/GND to other connections | 300 | - | - | V |
| Mechanical | | | | |
| Enclosure Dimensions (excl. connections) | 77mm (L) x 38mm (W) x 26mm (H) | | | |
| Enclosure Weight (incl. connections) | 100 | 115 | 130 | g |
| Conduit Length | 47 | 50 | 53 | cm |
| Conduit Wire Length | 57 | 60 | 63 | cm |
| Enclosure Material | ABS Polylac PA765 | | | |
| Conduit Material | Modified Polypropylene PP-MOD-BS | | | |
| Potting Material | Halogen Free Polyurethane Resin | | | |

8 Environmental

| Parameter | Min. | Typ. | Max. | Units |
|-----------------------------|------|------|------|-------|
| Operating Temperature Range | -20 | - | 75 | °C |
| Storage Temperature Range | -40 | - | 85 | °C |
| Ingress Protection Rating | IP66 | | | |