



Part Number 554-165 – Module with Harness

Part Number 554-166 Module Only

Contents

Overview	1
Capabilities	1
I/O Types.....	1
Input Types	1
Input Broadcast Rate.....	1
Output Types	2
Output Timeout.....	2
Miscellaneous.....	2
Input/Output Configuration.....	2
Input Configuration.....	2
Wiring	7
Connector Pinout.....	8
LEDs	12
Input Power	12

Overview

The CAN Input/Output Module can be added to Holley EFI HP and Dominator and Terminator X and Terminator X Max ECU's. The module will add eight multi-purpose inputs and eight ground/PWM- outputs to the system. HP/Dominator Requires V6 Software version Build 200 and higher. Terminator X requires V2 Software Build 51 and higher.

Capabilities

The added inputs/outputs are added via the “Inputs/Outputs ICF” in the software. The IO Module only supports inputs and outputs added in the Inputs/Outputs ICF. It does not support pre-defined inputs and outputs within the other ICFs in the system (inputs and outputs in the Nitrous and Boost Control ICFs for example). Those inputs and outputs must be setup directly to the ECU itself.

I/O Types

Input Types

Each input channel on the module can be configured as one of the following types (These are the same as used in Holley EFI and Terminator X ECU's:

- Switched-high (“H”) – Used for a 12v switched input
- Switched-low (“G”) – Used for a ground switched input
- 5V Analog (“5”) – Used for transducers, sensors, etc. (any 0-5 volt input)
- 20V Analog (“2”) – Used when reading a signal from 0-20 volts
- Thermistor (“T”) – Used for 2 wire temperature sensors
- Frequency (“F”) – Typically used for a hall effect (3 wire) speed sensor

An un-configured input will appear as an open-circuit and will present no current draw if connected.

Input Broadcast Rate

The PC software allows for configuration of the input channel broadcast rate; the rate at which the sampled data is communicated to the ECU. Rates from 1.0 – 100Hz are allowed.

Output Types

Each output channel on the module can be configured as one of the following types:

- Switched-low (“G”)
- Switched-low PWM (“P-“)

An unconfigured output will be kept in the OFF/OPEN state, and will present no current draw if connected.

Output Timeout

Outputs should always be configured by the user such that OFF/OPEN is the “safe” state.

Should communications with the ECU be lost, the CAN IO module will deactivate outputs to avoid any dangerous conditions.

Miscellaneous

Configuration of the CAN IO module is done over the CAN bus by the ECU on each power cycle. Note that configuration is **not** stored in the CAN IO module, and is reloaded by the ECU on each power cycle.

Input/Output Configuration

To configure Inputs and Outputs, the Inputs/Outputs ICF (Individual Configuration File) must be present. If it is not, add it by selecting the “Toolbox” dropdown and then “Add Individual Config”. A window will open, select the “IO” directory and then select a .io file (the “Base Config – Blank.io” is best). You should then see the I/O icon.



Input Configuration

To configure an input, open the I/O ICF and select the “Inputs” tab. The Inputs setup screen will appear (see below). Check the Enable box for an input, type in a Name. Next select the “Type”. The IO Module selections are the CAN +12V, CAN Ground, CAN 5 Volt, CAN 20 Volt, CAN Digital Speed/Freq, and CAN Thermistor. Select the appropriate one (each is covered below).

Inputs 1-20		Inputs 21-40		Inputs 41-60		Inputs 61-80	
INPUTS							
NAME	TYPE	ECU PIN	ENABLE	Configure		Where Used	
#1 CAN IO Example 1	CAN 5 VOLT	NOT DEFINED	<input checked="" type="checkbox"/> Enable	Configure	Where Used		
#2	GROUND	NOT DEFINED	<input type="checkbox"/> Enable	Configure	Where Used		

Once the Type is selected, select the “Configure” tab. The following covers configuration of each type.

CAN Settings – Each of these types require the CAN Settings to be configured. Each one is set up the same way:

CAN SETTINGS			
CAN Device	CAN I/O Module	CAN Serial	0
CAN Channel	Input #1	Broadcast Rate	0.0 Hz
CAN Bus	CAN BUS 1		

CAN Device – Make sure CAN I/O Module is selected.

CAN Channel – For inputs, select Input #1 through #8. They represent the 8 inputs to the IO Module

CAN Bus – For HP and Terminator X, select CAN BUS 1. For Dominator ECU's select the proper channel (CAN BUS 1 is on the main harness/J1 connector, CAN BUS 2 is wired to connector J3).

CAN Serial – This MUST be entered properly and is unique to each CAN IO Module. This will be printed on the back of module and labeled "CAN ID".

Broadcast Rate – This is how often the module sends data for that channel from the module to the ECU. This ranges from .25 to 100 Hertz (Hz). 1 Hz = 1 sample sent per second. 100 Hz = 100 Samples sent per second (.01 seconds). You want to set this value to the "needed" value. Setting all the values to 100 loads the CAN bus more, and is not desirable unless those speeds are necessary for all channels. For something like a fluid temp that usually doesn't change more than once per second, a value of 1-5 Hz is adequate. For something like fuel pressure where you might be looking for a quick drop, setting it to 50-100 would be ideal. For outputs, the same thought applies, set the output rate only to what is necessary. For something like turning a cooling fan on, 1 Hz would be fine. If you are triggering something at the launch of a race car, set to 100 Hz.

Sensor Settings

The following covers how to set up each of the input types:

CAN 5 Volt (see image below)

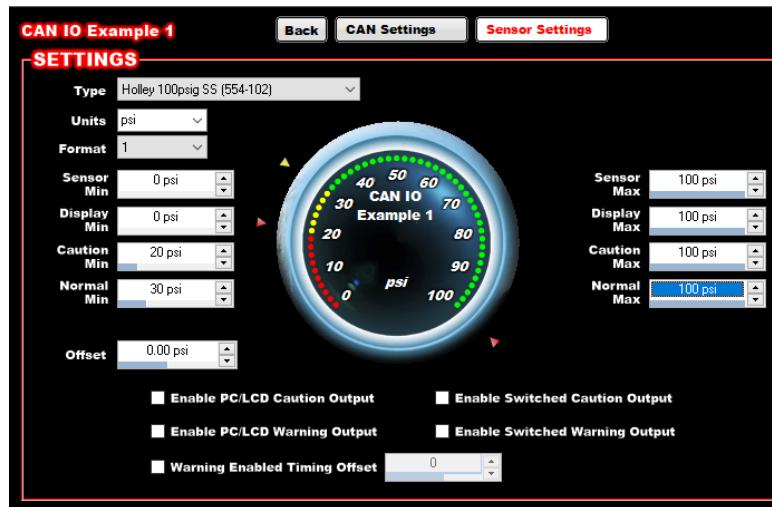
First, under "Type", select the see if the sensor you are using is in the dropdown. All Holley pressure transducers, MAP sensors, OEM sensors, some Raceraek sensors, and others are included. If yours is there, make the selection and the calibration is automatically loaded. If there any offset in the reading, use the "Offset" field to correct.

The "Units" will be populated for the predefined sensors. You can change or manually edit it if desired.

The "Format" is how many decimal places will be shown. Up to three can be chosen.

Sensor Min's and Max's – These values are only *required* if one is using the Switched Caution, Timing, and/or PC Warning Outputs. If using any of these, set the values to set low or high side Cautions.

The second image below is needed if the sensor used is not in the "Type" dropdown. In this case the user must pick "Custom 5V" as well as know the scaling to enter. The voltage values are entered at the bottom and the corresponding sensor values entered at the top. The example shows a sensor with a voltage range from .50V to 4.50V and sensor reading of 0-100 PSI.



CAN 5 Volt

CAN IO Example 1**Back****CAN Settings****Sensor Settings****SETTINGS**

Type: Custom 5V

Units: PSI

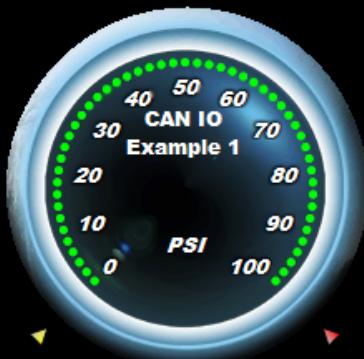
Format: 1

Sensor Min: 0 PSI

Display Min: 0 PSI

Caution Min: 0 PSI

Normal Min: 0 PSI



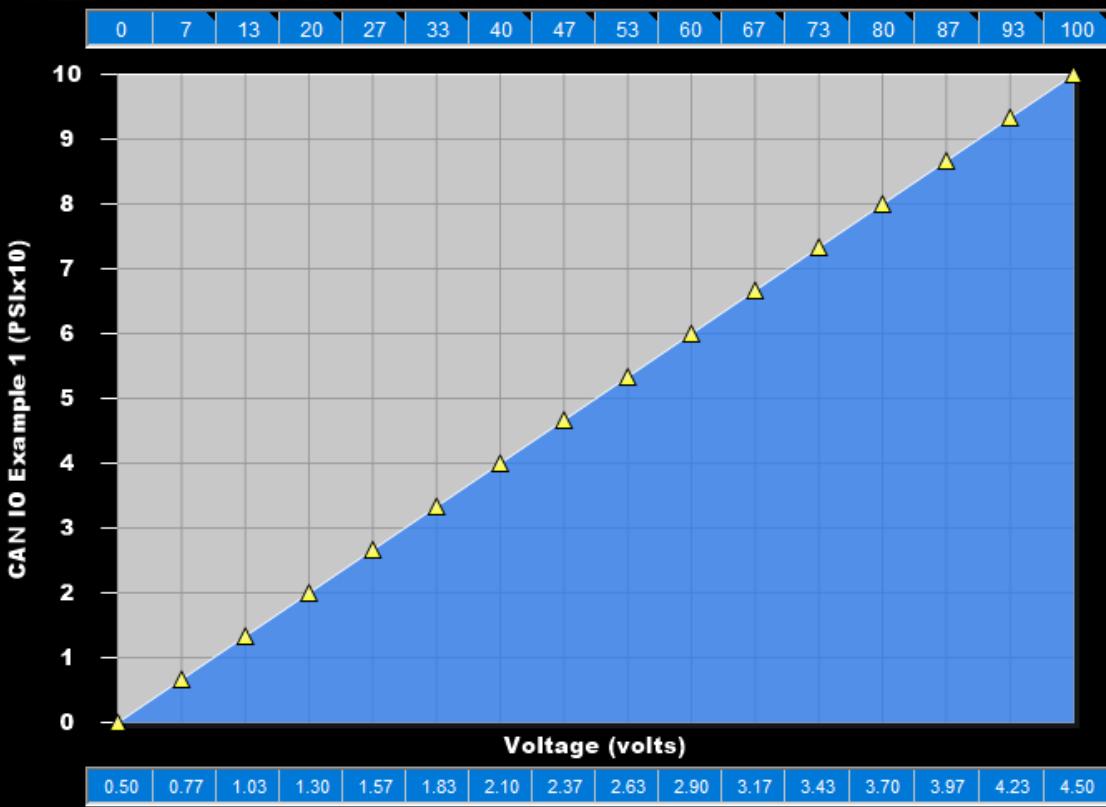
Sensor Max: 100 PSI

Display Max: 100 PSI

Caution Max: 100 PSI

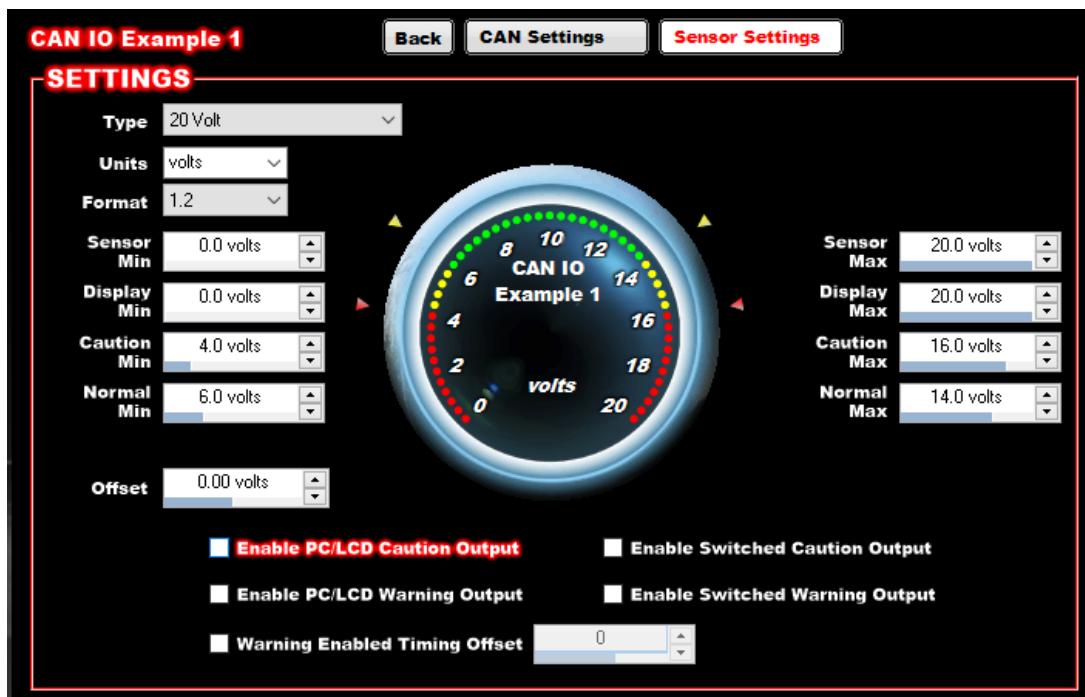
Normal Max: 100 PSI

- Enable PC/LCD Caution Output Enable Switched Caution Output
- Enable PC/LCD Warning Output Enable Switched Warning Output
- Warning Enabled Timing Offset: 0

CALIBRATION TABLE

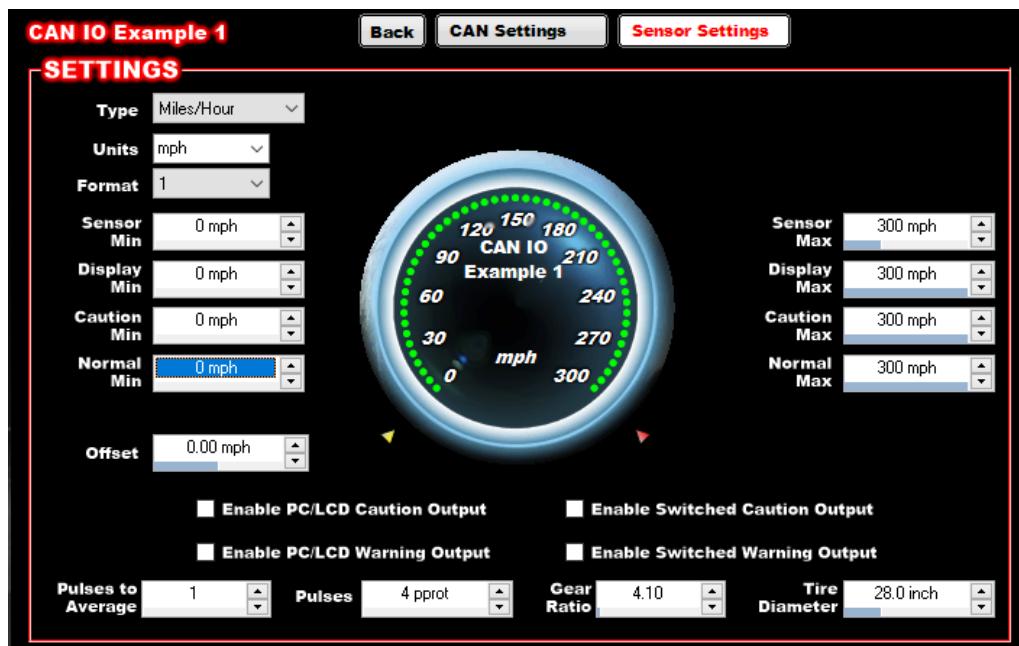
Custom 5V

The example below is for a “CAN 20 Volt” input. This input reads from 0-20 Volts. The “Type Choices are “20 Volt”, which would read the actual voltage the input is connected to. The second choice is “Custom 20V”. It is set up the same way a Custom 5V input above described.



20 Volt Input

The example below is for a Digital/Frequency input. The different “Type” choices drive different variables that must be entered so the ECU performs the calculations correctly. The example below is for Miles/Hour (vehicle speed). Miles per Hour and RPM are the most commonly used choices. There is an option for a GM flex fuel sensor. The pulses to average should be initially set to 1. If there is a reason to average them, this number can be increased. “Pulses” is how many triggers of on the sensor occurs during one rotation. If there is a trigger wheel on the driveshaft with 4 magnets, you’d enter 4 for example. Finally enter the rear axle gear ratio and tire diameter. Other “Types” have specialized uses not covered here. RPM would be used typically to measure driveshaft speed. Up to 64 teeth/rotation can be used. Frequency can be measured up to 20 kHz.



Digital Speed/Frequency Example

The example below is for the “CAN Thermistor” setting. A Thermistor a two wire temperature sensor typically used for coolant and air temperature sensors. The “Type” offers a selection of Holley and OEM sensors. If a different sensor is used, select one of the “Custom” options. You will have to enter the calibration curve (sensor output vs sensor resistance) of the Custom options.

CAN IO Example 1

SETTINGS

Type	Holley MAT
Units	°F
Format	1
Sensor Min	-40 °F
Display Min	-40 °F
Caution Min	-40 °F
Normal Min	-40 °F
Offset	0.00 °F

Enable PC/LCD Caution Output Enable Switched Caution Output
 Enable PC/LCD Warning Output Enable Switched Warning Output
 Warning Enabled Timing Offset

Sensor Max	270 °F
Display Max	270 °F
Caution Max	240 °F
Normal Max	200 °F

CAN Thermistor

Wiring

The wiring kit includes the following contents. All wire is TXL.

Input Wiring:

INPUT 1-8 WIRING

Color	Length (Ft)	Gauge
Red/Black	12	20
Purple/Black	12	20
Green/Black	12	20
Orange/Black	12	20
Grey/Black	12	20
White/Black	12	20
Yellow/Black	12	20
Tan/Black	12	20

Output Wiring:

OUTPUT 1-8 WIRING

Color	Length (Ft)	Gauge
Red	12	18
Purple	12	18
Green	12	18
Orange	12	18
Grey	12	18
White	12	18
Yellow	12	18
Tan	12	18

Sensor Power/Ground:

SENSOR POWER/GROUND

Color	Length (Ft)	Gauge
Blue	3x12	20
Black/White	3x12	20

Parts Bag:

Description	Quantity
Tyco Pins	8
Cavity Plug	20
Ring Terminal (Ground)	1
Heat Shrink	1

Connector Pinout

The following is the complete connector pinout. Refer to it when connecting/installing the wiring in the following section.

CONNECTOR PINOUT

Pin	Color	Function
1	White	CAN Power
	Red	(Switched Ignition)
2		Output #2
3		Output #1
4	Black	Ground
5		5V Sensor Power
6		Output #4
7		5V Sensor Power
8		Sensor Ground
9		Output #3
10		5V Sensor Power
11	Tan	CAN_H
	Yellow	
12		Sensor Ground
13		Input #1
14		Input #2
15		Input #3
16		Input #4
17	Black	Ground
18	Black	Ground
19	Orange	CAN_L
	Blue	
20		Sensor Ground
21		Input #5
22		Input #6
23		Input #7
24		Input #8
25	Black	Ground
26		Output #5
27	Black	CAN Module Ground
	Green	
28		5V Sensor Ground
29		Output #6
30		Sensor Ground
31		Output #7
32		5V Sensor Power
33		Sensor Ground
34		Output #8

Main Harness

The main harness simply consists of the 34 pin connector. It is pre-terminated with CANbus wiring and has the four required grounds spliced into a single black 12 gauge wire (do not modify this wiring).

Wiring Installation:

CANbus – Connect the 4 pin CANbus connection to the main harness CANbus wiring. Note that the switched power and ground for this unit is supplied via this connection. Make sure that it has proper switched power and clean ground supplied.

Proper CAN device installation. Devices connected in a CANbus system should have a “termination resistor” at the beginning and end of the network. Holley EFI ECU’s, Terminator X ECU’s have an internal resistor in them. At the end of the network there should be a termination resistor as well. Holley EFI/Terminator X 3.5” Touch Screens also have an internal resistor. The CAN IO module should be connected into the main harness CAN connector directly, with the 3.5” Touch Screen then plugged into the IO Module CAN wiring. If there is no 3.5” Touch screen present PN 534-5 (CAN termination resistor) can be purchased to plug into the “end” of the CAN wiring. Note however that 99% of the time this isn’t needed unless the CAN wiring is extremely long/has been extended. Pro Dash Products come with the 534-5 resistor.

Ground – The loose 12 gauge ground needs to be grounded to a proper ground (a point that is coupled back to the battery).

Wire Installation into main IO module connector – The following wires will need to be installed as needed by the installer into the main 34 pin connector. To install or remove, simply push up on the small white tab on the bottom of the connector (use a small screwdriver, etc.). This unlocks the pins. Insert pins as needed. Once inserted, push the two white tabs on the top of the connector down until they are flush.

Output Wires – Insert the output wires to be used (18 gauge solid color wires) into Output 1 through 8 as needed. NOTE: Outputs can drive devices up to 2 AMPS MAXIMUM. If current draw is over 2 Amps, use the output to trigger a relay.

Input Wires – Insert the input wires to be used (20 gauge striped wires) into Inputs 1 through 8 as desired.

Additional wiring may be required depending on the type of input chosen (see diagram below):

Switched-high (“H”) – Connect to a 12v switched input. No other wiring is needed.

Switched-low (“G”) – Connect to a ground switched input. No other wiring is needed.

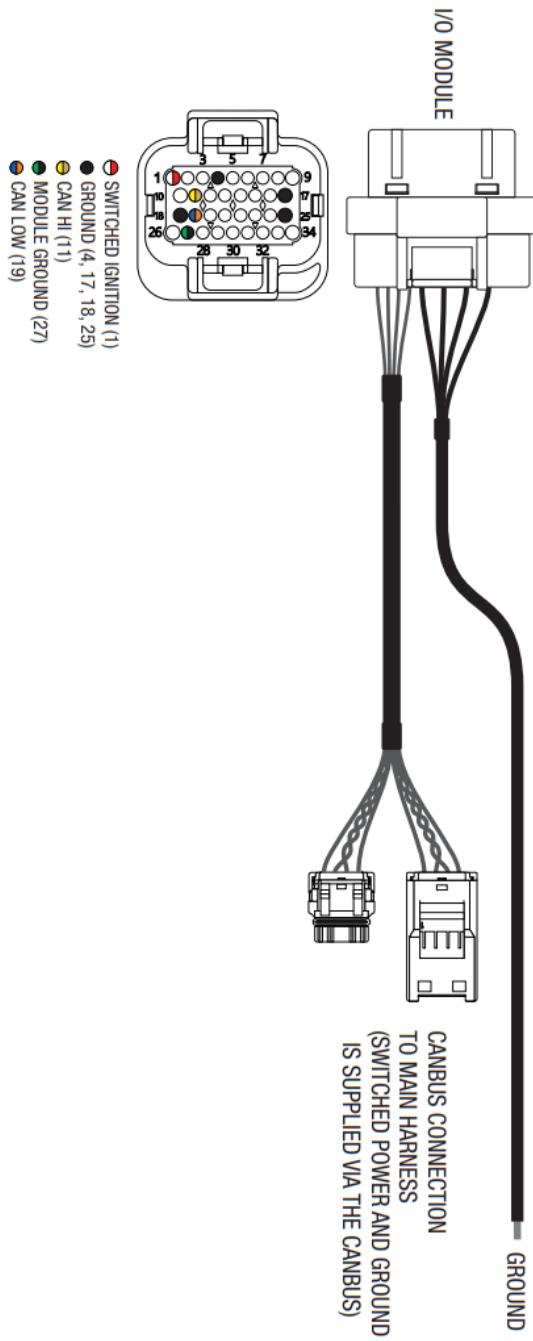
5V Analog (“5”) – Used for transducers, sensors, etc (any 0-5 volt input). These sensors also require a 5V analog sensor power (pins 5, 7, 10, 28, or 32) and sensor ground (pins 8, 12, 20, 30, or 33).

20V Analog (“2”) – Used when reading a signal from 0-20 volts. This input is typically connected directly to a source where the voltage is read.

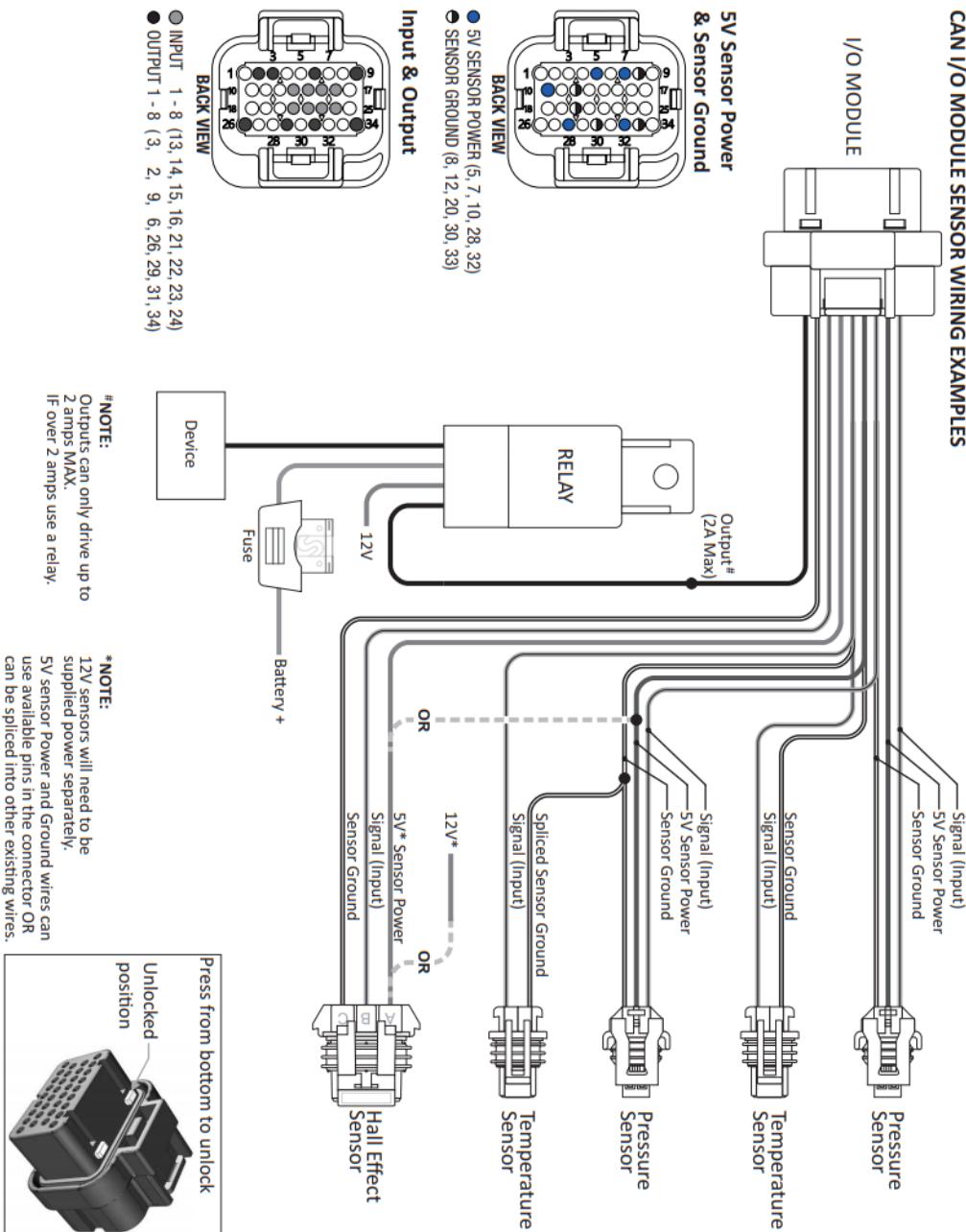
Thermistor (“T”) – Used for 2 wire temperature sensors. These sensors require a sensor ground (pins 8, 12, 20, 30, or 33).

Frequency, with points-to-average (“F”) – Typically used for a hall effect (3 wire) speed sensor. These sensor typically require a sensor ground (pins 8, 12, 20, 30, or 33) and power. Some are powered by 5 volts and can use pins 5, 7, 10, 28, or 32. Some are powered by 12v and will need to be supplied power separately.

CAN I/O MODULE WIRING
CAN & Ground Pre-terminated Harness



CAN I/O MODULE SENSOR WIRING EXAMPLES



LEDs

The Input/Output module contains 8 LEDs, one assigned to each input/output channel, indicating device operational status as follows:

LED State	Input State	Output State	Comment
OFF	Input Inactive or Not Configured	Output OFF	
Solid Green	Input Active	Output OFF	
Solid Blue	Input Inactive or Not Configured	Output ON	
Green/Blue Alternating	Input Active	Output ON	
Solid Red	Any	Any	Output fault (short to V+) detected
3 White Flashes	Any	Any	New Input OR Output configuration received from ECU
Flashing Red			All LEDs flashing Red indicates that the module is non-functional and requires a firmware update; will only occur if a failure occurs during a firmware upgrade

The following are the thresholds on inputs when the LED will show active:

5V Analog - 0.5-4.5V, 20V Analog - 2 – 18V, Thermistor - 100-100,000ohm, Frequency - 1-1333Hz

Input Power

Power should be provided by from a switched-ignition source. Allowable voltage range is 8 – 24VDC; maximum current draw is < 1.0A.

199R12232
Date: 3-4-21