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Infinitybox IOX Universal
J1939 Input/Output Expander Module
Setup and Configuration Guide

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Overview

The Infinitybox IOX module offers simple J1939 input and output control to any CAN network. The IOX module has been designed to add switch inputs and low-current outputs to any network.

The IOX has 5 low-side switch inputs and 5 low-side switched outputs. The switches can be used to send J1939 commands to any J1939 compliant network running at 250 kb/second. Up to 16 IOX modules can be added to a single J1939 network, offering a total of 80 inputs. The outputs on the IOX can be used locally to drive switch indicators or other low-current outputs.

The IOX family of products are built to be small and integrated in the harness anywhere in the vehicle. The package is small enough to be loomed in the harness behind a panel of switches. Using true-multiplexing, you can add IOX modules anywhere in the vehicle and connect them to the output modules through 4 simple wires.

Warnings

THE INFINITYBOX IOX INPUT/OUTPUT EXPANDER MODULE IS PART OF A FUSED POWER DISTRIBUTION SYSTEM FOR VEHICLES. PROPER CARE MUST BE TAKEN TO FUSE THE INPUT FEEDS TO THE MODULE AND THE OUTPUT FEEDS FROM THE CELL. IMPROPER FUSE SELECTION CAN CAUSE DAMAGE TO THE VEHICLE ELECTRICAL SYSTEM RESULTING IN FIRE.

PROPER CARE MUST BE TAKEN TO ENSURE THAT POWER IS CORRECTLY APPLIED TO THE IOX. REVERSING POLARITY TO THE POWER AND GROUND FEEDS WILL CAUSE IRREPARABLE DAMAGE TO THE MODULE AND WILL VOID THE WARRANTY.

ADDING ANY ELECTRONICS MODULES TO A VEHICLE WILL INCREASE THE DEMAND ON THE BATTERY. CARE MUST BE TAKEN TO MAINTAIN A CHARGE ON THE BATTERY WHEN THE VEHICLE SITS IDLE FOR PERIODS OF TIME. THIS IS ESPECIALLY IMPORTANT WITH GEL-CELL AND AGM BATTERIES. WE STRONGLY RECOMMEND INSTALLING A DISCONNECT SWITCH THAT SEPARATES THE ELECTRICAL LOADS IN THE VEHICLE FROM THE BATTERY WHEN NOT IN USE.

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IOX Technical Details

- Dimensions: 1.12” X 0.50” X 3.0”
- Inputs: 5, low-side switched. Tolerant to +/- 60 VDC
- Outputs: 5, low-side switched. Maximum current draw per output of 500 mA
- Operating Voltage Range: 7 to 28 VDC
- Steady-State Current Draw: 0.010 A Nominal
- Operating Temperature Range: -30 C to +85 C

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IOX Installation Steps

Mounting the IOX

The IOX was designed to be mounted behind the switches in your vehicle. It can be easily zip tied with the harness anywhere. You simply need to bring the 4 wires from the Data Side of the IOX back to J1939 CAN network. The following illustration shows the important parts of the IOX.

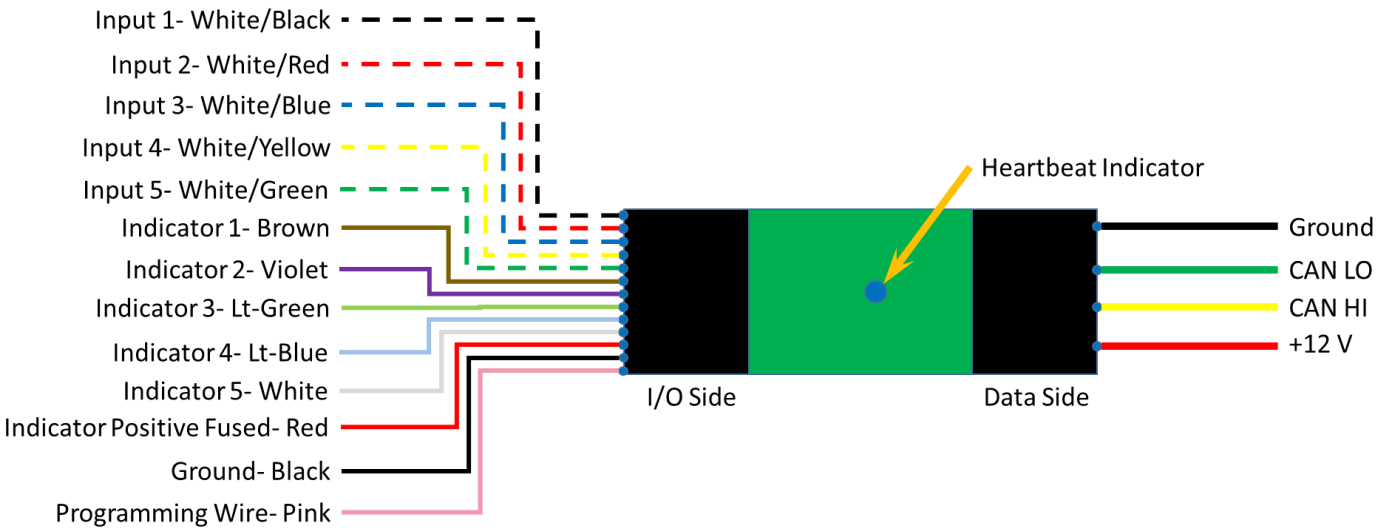

Figure 1: Important Parts of the IOX Module

Supplying 12-volt Power

The IOX has an internal voltage regulator for its own power. It simply needs battery voltage and ground. The red wire from the Data Side of the IOX needs to connect to battery power and the black wire from the Data Side needs to get connected to ground. We strongly recommend fusing the red wire at 5-amps.

Wiring the IOX Inputs

The IOX inputs are ground triggered. You simply connect your IOX input wire to one side of your switch then ground the other side of the switch. When the switch is turned on, the IOX input gets connected to ground. It then sends out a command on the J1939 network. The following image shows a representation of a switch wired to an IOX input.

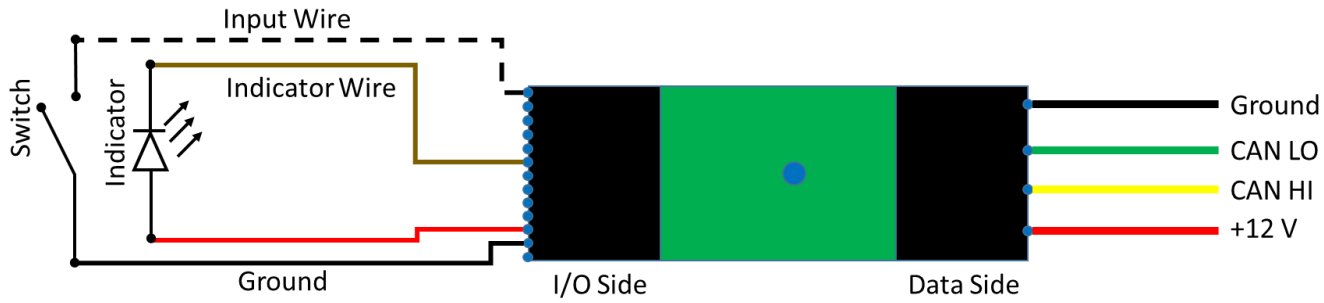

Figure 2: A sample switch wired to an IOX input.

The black wire o the I/O Side of the IOX is a ground reference that can be used for the switches. Alternately, you can ground your switches to the vehicle's chassis as long as you have a good electrical connection.

Wiring the Indicator Outputs

The IOX has built-in outputs to drive indicators on switches. When the corresponding command is received by the IOX, it will turn on the indicator output. See Figure 2 for an example of wiring an indicator to the IOX.

The IOX indicator outputs are ground sinking and are intended to switch small incandescent indicator lights or LED lights. Each of these outputs can carry 0.300 A. Any more current that this will damage the IOX board and void the warranty. These output can also be used to drive relay coils from CAN commands to the IOX.

There is a red wire on the switch side of the IOX. This is a fused 12-volt source. The wire is fused on the IOX board. Use caution not to short this wire to ground. It will open the fuse on the IOX printed circuit board and have to be repaired at the Infinitybox factory. The IOX modules ship with a piece of heat shrink tubing on this wire to protect it from getting shorted to ground.

Connecting J1939 CAN Network

The 4 wires on the Data Side of the IOX connect to the J1939 network. See Figure 1 for designation of the wire colors. NOTE: You must fuse the red wire on the input side of the IOX. We recommend a 5-amp fuse.

A 120-Ohm terminator resistor must be installed between the CAN HI and CAN LO wires to properly balance the impedance of the network.

Powering the System

Once the J1939 input devices are properly set up and configured, connect the network to +12 volts through the input harnesses to the cells. After 3 seconds, the system will be communicating with the J1939 input devices.

There is a blue LED located towards the center of the IOX module. This is the Heartbeat Indicator. This light indicates the status of the communication on the network.

Programming the IOX

The IOX has multiple pre-programmed configurations in it. These can be easily selected in the field. These different configurations change the PGN assigned to the IOX. The following table summarizes the IOX configurations.

IOX Configuration	IOX PGN
1	FF31
2	FF32
3	FF33
4	FF34
5	FF35

The default configuration is for number 1. If you want to use configuration 1, you do not need to change the configuration.

There is a pink wire on the I/O Side of the IOX. This is the programming wire. To select the configuration on the IOX follow these steps.

1. Disconnect power from the IOX.
2. Strip the insulation off the end of the pink wire on the I/O Side of the IOX.
3. Temporarily connect the pink wire to ground. You can use the black wire on the I/O Side of the IOX.
4. Ground the input wires that correspond to the configuration that you'd like to select.
    a. Configuration 1- White-Green
    b. Configuration 2- White-Yellow
    c. Configuration 3- White-Yellow & White-Green
    d. Configuration 4- White-Blue
    e. Configuration 5- White-Green AND White-Blue
    f. Configuration 6- White-Yellow AND White-Blue
5. Apply power to the system.

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6. The heartbeat indicator light will flash for 30 seconds. It will flash twice per second for the first 15 seconds then once per second for the next 15 seconds.
7. At the end of 30 seconds, the light will go out for 5 seconds. It will then flash to indicate the configuration that was chosen. It will immediately repeat the configuration then pause for 5 seconds. For example, if you chose configuration 2, the light will flash twice, wait two seconds, then flash twice again, then turn off for 5 seconds. This pattern will repeat until you turn off the power.
8. Disconnect power from the IOX.
9. Disconnect the input wires from ground.
10. Disconnect the pick programming wire from ground. Apply tape or heat shrink to the end of this wire to insulate it.
11. Reapply power to the entire system. Confirm that you have a blinking light on the heartbeat indicator.

J1939 IOX Commands

Switch Closure Commands sent from IOX. Example shown for Configuration 1.

Switch Input	Priority (HEX)	PGN (HEX)	Source Address (HEX)	Byte 1 Bit 8	Byte 1 Bit 7	Byte 1 Bit 6	Byte 1 Bit 5	Byte 1 Bit 4	Byte 1 Bit 3	Byte 1 Bit 2	Byte 1 Bit 1
1	18	FF31	01	1							
2	18	FF31	01		1						
3	18	FF31	01			1					
4	18	FF31	01				1				
5	18	FF31	01						1		

Output Commands sent to IOX. Example shown for Configuration 1.

IOX Output	Priority (HEX)	PGN (HEX)	Source Address (HEX)	Byte 1 Bit 8	Byte 1 Bit 7	Byte 1 Bit 6	Byte 1 Bit 5	Byte 1 Bit 4	Byte 1 Bit 3	Byte 1 Bit 2	Byte 1 Bit 1
1	18	FF31	1A	1							
2	18	FF31	1A		1						
3	18	FF31	1A			1					
4	18	FF31	1A				1				
5	18	FF31	1A						1		

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Warranty Information

Infinitybox, LLC ("Infinitybox") warrants against any defects in materials and workmanship to the Product's modules, wiring harnesses and accessory modules for a period of one (1) year from the first date of purchase. Subject to the terms of this warranty described below, Infinitybox will replace any such defective Product that is returned to Infinitybox within the one (1) year period from initial purchase. Replacement of any defective part or Product will not extend the applicable warranty period.

The warranty does not apply to: (i) any Product that is not installed in compliance with the applicable Product documentation; (ii) any defect in, or failure of, the Product resulting from an accident, shock, negligence, water immersion or misuse; (iii) any Product that has been modified, adjusted, repaired, or disassembled by any party other than Infinitybox; or (iv) any defect other than in materials and workmanship.

This warranty covers only the original purchaser of Product purchased from an Infinitybox authorized dealer in the United States. In order to receive warranty service, purchaser must provide Infinitybox with a copy of the receipt stating the dealer name, product purchased and date of purchase. Products found to be defective during the warranty period will be replaced (with a product deemed to be equivalent or better) at the discretion of Infinitybox.

Infinitybox's sole liability for any defective Product is limited solely to the replacement of Product pursuant to this warranty. Infinitybox reserves the right to replace any repairable parts with new or refurbished parts.

INFINITYBOX DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, SUCH AS WARRANTIES OF MERCHANTABILITY AND FITNE SS FOR PURPOSE. IN NO EVENT SHALL INFINITYBOX BE LIABLE FOR ANY PUNITIVE, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LIABILITY FOR LOSS OF USE, LOSS OF PROFITS, LOSS OF PRODUCT OR BUSINESS INTERRUPTION HOWEVER THE SAME MAY BE CAUSED, INCLUDING NEGLIGENCE.