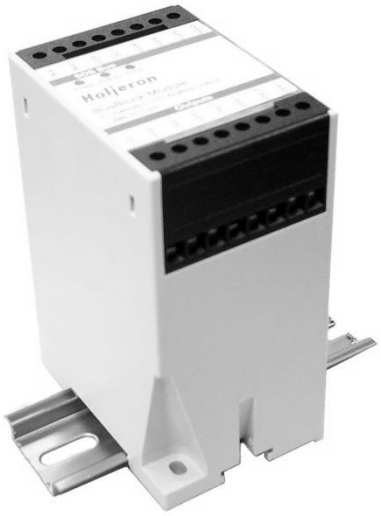
BusBlock Analog Input Module
for the Smart Distributed System

BBK-4052-7 Updated: 1-25-2021 **TECHNICAL DATA**

Description

The Holjeron BusBlock Analog Input Module is designed to handle small amounts of analog inputs in a limited amount of space. The BusBlock Analog Input Module has four channels, with each channel using bus power to power the analog device being connected. Each input can be either a separate SDS address, or can be configured to be four embedded objects within a single SDS address. Field terminations are captive screw terminals.

Other BusBlock products include an eight point configurable digital module; as well as analog output and frequency modules.



Warranty/Remedy

Seller warrants its products to be free from defects in design, material and workmanship under normal use and service. Seller will repair or replace without charge any such products it finds to be so defective on its return to Seller within 18 months after date of shipment by Seller. **The foregoing is in lieu of all other expressed or implied warranties (except title), including those of merchantability and fitness for a particular purpose.** The foregoing is also purchaser's sole remedy and is in lieu of all other guarantees, obligations, or liabilities or any consequences incidental, or punitive damages attributable to negligence or strict liability, all by way of example.

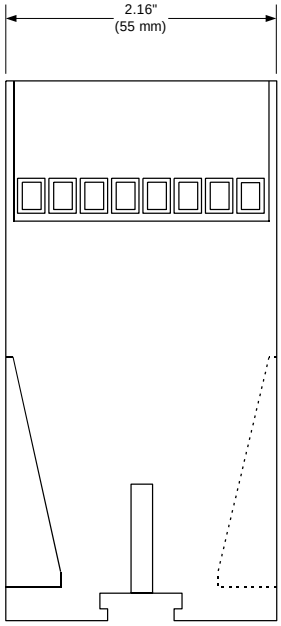
While Holjeron provides application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

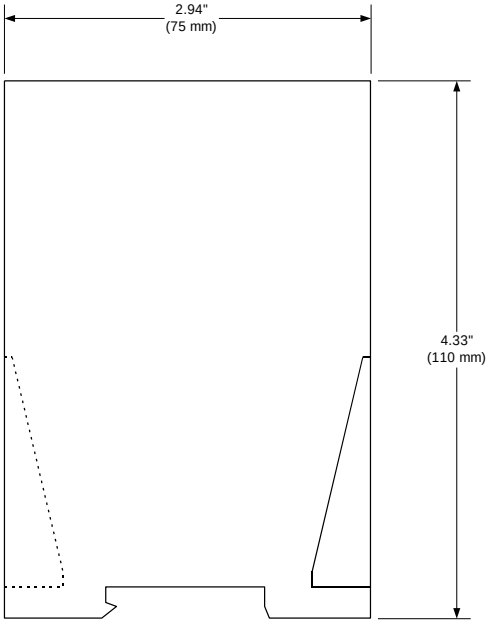
All information contained herein, including illustrations, specifications and dimensions, is believed to be reliable as of the date of publication, but is subject to change without notice.

Specifications

Part Number	4 Channel Analog Input Module		BBK-AIN104
Electrical	SDS Voltage Range		11-25 VDC
	Current Consumption		30 mA @ 24VDC+ analog loop power
	Data Rates		125, 250, 500 and 1000 kbps
Inputs	Type		0-40 mA / 0-10 VDC (selectable)
	Number		Four (4) with self-resetting 100mA fuses
Environmental	Temperature	Storage	-40° to 85° C (-40° to 185° F)
		Operating	-25° to 70° C (-13° to 158° F)
	Humidity		5-95% RH, non-condensing
	Vibration		2G at 10 to 500 Hz
	Shock		10G
Physical	Dimensions		2.95" H x 2.17" W x 4.33" D
	Weight		8 oz
	Color		Bone Gray
	Case Material		Polycarbonate
	Mounting		DIN Rail or foot mount
	Terminations		Cage Clamp Screw Terminal
	Indication	Power	Red-Green LED
	(details on page 4)	Activity	Red-Green LED
		Error	Red-Green LED
Certifications	CSA		C22.2 N0. 14-10
	UL		508 (17th Edition)

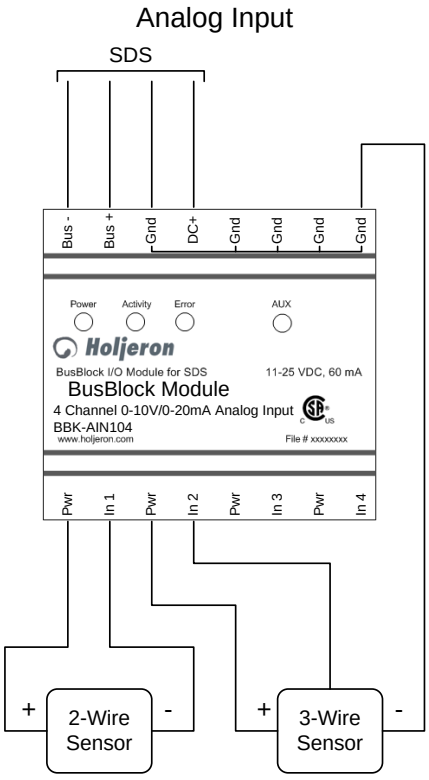
Dimensions



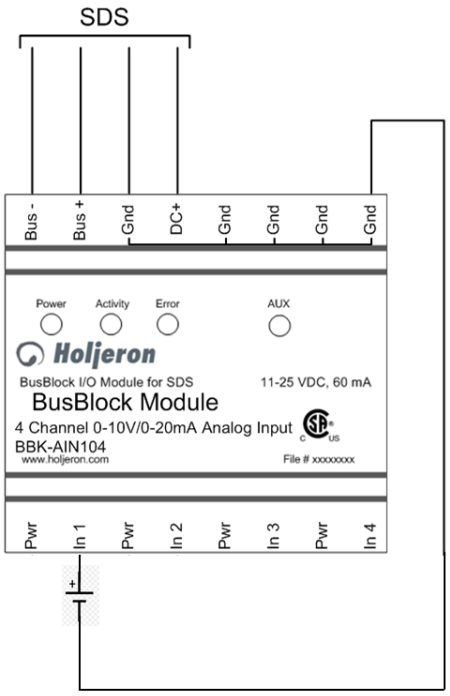


Wiring

Current Input Mode



Voltage Input Mode



Configuration Tools

Holjeron ZTC-F64 Multi-Config Tool (ZTC-F64-DOTS)

Holjeron offers a configuration tool that connects to the USB port of a personal computer and 24V power, either from the Bus or a dedicated power supply. This tool can be used to configure or master an SDS Network, a ViaBus network, or Holjeron's Zonelink.S serial communication for multi-zone MDR Controls.

Legacy Configuration Tools:

These tools below (and others) can be used for configuration, but are no longer sold or supported:

Holjeron HSIM Portable Configuration Tool for SDS (HSM-PTB101)

Honeywell hand-held activator

Honeywell Think & Do Software using Holjeron's PCI Interface Card to communicate with a PC.

Quick Start

The following steps are the minimum steps to configure BusBlock module. Default values are shown in bold.

Baud Rate

Baud rate selections are as follows:
0 = Autobaud
1 = 1000 kbps
2 = 500 kbps
3 = 250 kbps
4 = 125 kbps

Set Device Address

Using one of the tools described above, change the device address from the default. All units are shipped from the factory as **address 123-126** .

Note

Set the address before attaching any component to a complete bus. This will help prevent duplicate addresses on a bus. Please note: Per SDS Spec, Channel 1 will be address 126 Channel 2 will be address 125 and so on.

Channel Configuration

If using less than four channels, set the **Number of Channels (attribute 58)** to the appropriate value. Legal entries are 1, 2, 3 and **4**.

Each channel can also be configured as an embedded object within a single SDS address. This requires an SDS master that understands how to communicate with embedded objects.

Enable Objects (attribute 59), when set to a value of 1, each channel is configured as an embedded object within a single SDS address.

Note

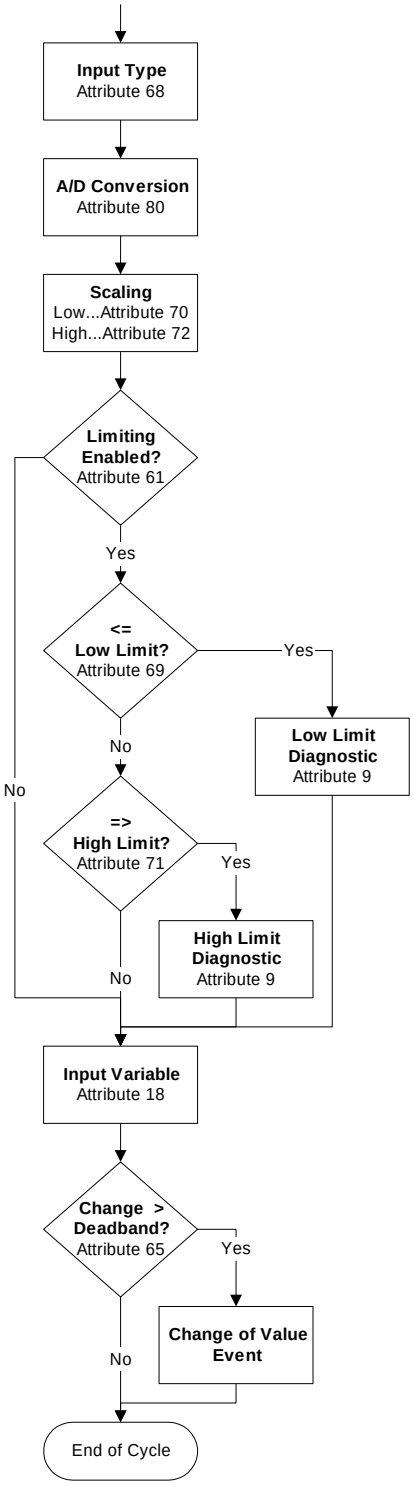
Changes to attributes 58 or 59 require power to be cycled to the module before changes take effect.

Tag Name

Tag Name (attribute 56) is a 32-character string that the user can enter to describe the functionality and/or location of each channel of the BusBlock Analog Input Module.

Operation

The BusBlock Analog Input module converts analog signals using the process defined below.



Input Range

The BusBlock Analog Input Module can be configured to accept either 0-10 VDC or 0-20 mA inputs through the **Input Range (attribute 68)**. See Input Mode Table)

Input Mode

Input Modes are defined in **Attribute 68** according to the table below:

Mode	Output Specifications*
0	0-20mA (Historical mode)
1	0-5V
2	-20 - 20mA
3	-5 - +5V
4	0-40mA
5	0-10V
6	-40 - +40mA
7	-10 - +10V

* Requires input terminal voltage of -0.5 and above. Inputs are designed to handle 10V and input terminal voltage should not exceed 12V.

The digital value resulting from the A/D conversion is **stored in Raw Data (attribute 80)**.

Scaling

The **Low Scale (attribute 70)** is the value to be transmitted over SDS when the incoming analog signal is at 0 (volts or milliamps) and, conversely, the **High Scale (attribute 72)** is the value to be sent when the incoming analog signal is at its highest value (10 VDC or 20 mA). The incoming analog signal is then linearized to the low and high scale values.

The default value for low scale is 0 (000 000). The default value for high scale is 32767 (127 255)..

Note

When using a packaged control system, such as Think & Do Software, it is not necessary to explicitly read input and output variables. The SDS I/O Driver and Interface Card perform this function. All that is required is to map inputs and outputs as described in the software user manual.

Limiting

When **Enable Limiting** (**attribute 61**) is set to 1, the input variable reported in a Change of Value Event will never be below the **Low Limit (attribute 69)** or above the **High Limit (attribute 71)**. If the actual value falls outside the bounds of the limits then a diagnostic bit is set and an event reported (see Diagnostics).

The default value for low limit is 0 (000 000). The default value for high limit is 32767 (127 255).

Input Variable

Attribute 18 functions as the input attribute for the BusBlock Analog Input Module. Whenever an event is generated that reports the state of inputs, the data in attribute 18 will be passed.

Change of Value Deadband

A **Change of Value Deadband (attribute 65)** can also be set. This will limit events from being sent unless the input variable changes at least as much as the value entered in the Change of Value Deadband. This prevents insignificant changes in the input variable from generating events on the bus. The default value for the Change of Value Deadband is 16.

Input Event Mode

Most systems will require a BusBlock I/O Module to generate an event whenever one or more inputs change state. This requires the **Unsolicit Mode (attribute 6)** be enabled by setting its value to **1**. Other options are to disable change of value events (Unsolicit Mode = 0) or use the **Cyclic Timer (Attribute 10)** by setting it to some non-zero value. The Cyclic Timer will transmit the input variable on an interval equal to the value in the Cyclic Timer attribute times 10 milliseconds (0.01 seconds).

Diagnostics
The Diagnostics Register (**attribute 9**) is two bytes and contains the minimum diagnostics required for the Smart Distributed System, plus additional diagnostics specific to the BusBlock Analog Input module.

Diagnostic Register Bit Definitions Byte 0

Bit	Name	Description
0		Reserved
1		Reserved
2	BUSOFF	CAN bus off error
3		Reserved
4		Reserved
5		Reserved
6		Reserved
7	EPRM	EEPROM error detected

Diagnostic Register Bit Definitions Byte 1

Bit	Name	Description
0	SRVLIFE	Service Life exceeded
1		Reserved
2		Reserved
3	SDSPWR	SDS Supply Voltage Out of Range (11-27V)
4	LOLIM	Low Limit
5	HILIM	High Limit
6	CANOVRN	CAN Overrun
7		Reserved

SDS host controllers are equipped to receive a diagnostic event, then automatically obtain the information from the **Diagnostic Register (attribute 9)**. Consult the documentation for the host controller being used to determine how errors are handled.

BUSOFF

The CAN controller on the BusBlock module counts error messages. Every error message increments a counter by 8, every good message decrements the counter by 1. If the counter reaches 128 then the module will go BUSOFF, and will need to be reset by the host controller.

EPRM

The EPRM error will occur when the microprocessor on the BusBlock module is unable to read or write EEPROM.

SRVLIFE

BusBlock modules are equipped with two attribute settings for managing the service life of the module. The first, **Service Time (attribute 63)** is the number of hours the module has been in operation. The second, **Service Life (attribute 64)** is set by the user, and is the number of service hours before the unit requires maintenance and/or replacement. When the Service Time value reaches the Service Life setting then an SRVLIFE diagnostic is transmitted.

SDSPWR

This diagnostic is set when SDS bus voltage falls below the required level of 11 VDC.

LOLIM

A LOLIM diagnostic is generated when the scaled input value is at or below the Low Limit set in attribute 69.

HILIM

A HILIM diagnostic is generated when the scaled input value is at or above the High Limit set in attribute 71.

CANOVRN

The CAN Overrun error is generated when the buffer is overloaded. Check the SDS bus for bad devices or poor connections.

Attribute 54 – CAN Error Status Codes

0 No error
1 Stuff error
2 Form error
3 Acknowledgement error
4 Bit recessive error
5 Bit dominant error
6 CRC error
7 reserved

Application Example: 0-5V Mode

Here's how to set one of the channels to track a 0-5V input signal with a resolution of 0.001 V:

Set the scale on Address126 (RET1) to 5000 by writing 019 036 to Attribute 72:
(Two Byte number translation: 19*256 + 136 = 5000)

```
> w
Enter bus (1-2) [1]:
Enter logical address (1-126) [126]:
Enter variable (0-255) [72]:
Enter data (0-255): 019 136

> Message FROM 1:126, OBJECT 00, WRITE RESPONSE (PDU TYPE 4)
VARIABLE 072, DATA:                                        []

> r
Enter bus (1-2) [1]:
Enter logical address (1-126) [126]:
Enter variable (0-255) [72]:

> Message FROM 1:126, OBJECT 00, READ RESPONSE (PDU TYPE 5)
VARIABLE 072, DATA: 019 136                               [..]
```

To test, set up a bench power supply to provide 5V at 0.02 A
Connect 5V to RET1 and power supply Ground to GND on the BBK-AIN104 module
The voltage input can be viewed on Attribute 18, the Input Variable for the channel.
Again, translating the two-byte number 19*256 + 135 = 4999, or roughly 5V:

```
> r
Enter bus (1-2) [1]:
Enter logical address (1-126) [126]:
Enter variable (0-255) [72]: 18

> Message FROM 1:126, OBJECT 00, READ RESPONSE (PDU TYPE 5)
VARIABLE 018, DATA: 019 135                               [..]
```

Upon removing the 5V from RET1 Attribute 18 then shows 9*256_189 = 2493, or ~2.5V.
This is what the inputs float at with nothing connected

```
> r
Enter bus (1-2) [1]:
Enter logical address (1-126) [126]:
Enter variable (0-255) [18]:

> Message FROM 1:126, OBJECT 00, READ RESPONSE (PDU TYPE 5)
VARIABLE 018, DATA: 009 189                               [..]
```

Connect RET1 to a GND connection on the opposite side of the BBK-AIN104 module.
Attribute 18 now shows 000 000,or 0 V:

```
> r
Enter bus (1-2) [1]:
Enter logical address (1-126) [126]:
Enter variable (0-255) [18]:

> Message FROM 1:126, OBJECT 00, READ RESPONSE (PDU TYPE 5)
VARIABLE 018, DATA: 000 000                               [..]
```

LED Diagnostic Indicator Patterns

Current (Third) Generation (Rev 6+)

- **Third Generation modules have Red-Green LEDs for all indicators.**

PWR	SDS	ERR	AUX	Indication
OFF	OFF	OFF	OFF	**OFF** (DC+ is less than 8 volts)
SG	SG	SG	SG	**1st LED Test Pattern (Third Gen)** (All Green segments ON)
SR	SR	SR	SR	**2nd LED Test Pattern (Third Gen)** (All Red segments ON)
SR	SR	SR	OFF	*** Waiting for DC+ to reach SDS minimum of 11V** (User never sees if normal start-up)
SR	SR	OFF	OFF	*** Waiting for valid EEPROM access** (User never sees if normal start-up)
SG	OFF	FG	OFF	**Waiting to Autobaud (Third Gen)** (Not seen if fixed rate is used.)
SG	OFF	SG	OFF	**NORMAL CONDITION - Nothing to transmit on the CAN bus**
SG	IG	SG	OFF	**NORMAL CONDITION - Trying to transmit on the CAN bus**
SG	OFF	FR	OFF	**Nothing to transmit on the CAN bus and minor diagnostic bit(s) set**
SG	IG	FR	OFF	**Trying to transmit on the CAN bus and minor diagnostic bit(s) set**
SG	OFF	SR	OFF	**Not transmitting on the CAN bus and MAJOR diagnostic bit(s) set**
SG	IG	SR	OFF	**Trying to transmit on the CAN bus and MAJOR diagnostic bit(s) set**
SG	SFR	SR	OFF	*** BUS OFF Condition** (SDS LED solid or flashing red only ***during*** BUS OFF condition)

*** These patterns available on units manufactured after June 2015, as identified by Serial Number (2015182X or higher)**

OFF = LED is OFF
SG = Solid Green
SR = Solid Red
FG = Flashing Green
FR = Flashing Red
SFR = Solid OR Flashing Red
IG = Intermittent Green
FR = Flashing Red
I/O = If AUX is Solid Green indicates that Power for I/O is Present

Attributes

ID	Description	R/W	Data Type	*Size*	*Count*	Default
0	Network Data Descriptor	R	Unsigned	Byte	3	18,04h,40h
1	Baud Rate	R	Unsigned	Byte	1	0 [autobaud]
2	Object Model	R	Unsigned	Byte	5	1, 2, 5, 1, 2
3	Vendor Id	R	Unsigned	Word	1	9 [Holjeron]
4	Logical Address	R	Unsigned	Byte	4	125, 124, 123, 122
6	Un/solicited Mode	W	Boolean	Undef	1	1
7	Software Version	R	Character	Undef	12	
8	Diagnostic Counter	R	Unsigned	Byte	1	
9	Diagnostic Register	W	Unsigned	Byte	2	
10	Cyclic Timer	W	Unsigned	Word	1	0 [disabled]
11	Serial Number	R	Unsigned	Long	1	
12	Date Code	R	Character	Undef	4	
13	Catalog Listing	R	Character	Undef	32	BBK-AIN104
14	Vendor	R	Character	Undef	32	Holjeron
15	Description	W	Character	Undef	32	4-Channel Analog Input
18	Input Variable	R	Signed	Word	1	
52	Factory Calibration Use Only					
53	Factory Calibration Use Only					
54	CAN Error Status Code	R	Unsigned	Byte	1	
55	Manufacturing Codes	R	Unsigned	Byte	1	0
56	Tag Name	W	Character	Undef	32	
58	Number of Channels Used	W	Unsigned	Byte	1	4
59	Enable Object Mode	W	Boolean	Undef	1	0
61	Enable Limiting	W	Boolean	Undef	1	0
63	Service Time	R	Unsigned	Word	1	
64	Service Life	W	Unsigned	Word	1	5000
65	Change of Value Deadband	W	Unsigned	Word	1	16
68	Input Mode	R/W	Unsigned	Byte	1	0 [current] (See Table)
69	Input Low Limit	W	Signed	Word	1	0
70	Input Low Scale	W	Signed	Word	1	0
71	Input High Limit	W	Signed	Word	1	32767
72	Input High Scale	W	Signed	Word	1	32767
80	Raw Analog Data	R	Unsigned	Long	1	

Actions

ID	Description	Request Data	Response Data
0	NOOP	---	---
1	Change Address	New logical address	
2	Self Test	---	---
6	Clear All Errors	---	---
8	Enroll Logical Device	---	Vendor Id, Serial Number
10	Change Baud Rate	New baud rate (0…4)	
36-38	Factory Calibration Use Only		
51	Force State	Input Variable	
52	Unforce State	---	---
53	Read Attribute Descriptor	Attribute Id	Attribute Id, Attribute Descriptor
57	Password	Password	
60	Reset Factory Defaults	---	---

Events

ID	Description	Event Data
0	Diagnostic Event	Number of diagnostic bits set in Attribute 9
3	End of Timer	Attribute, Input Variable
6	Change of Value	Attribute, Input Variable

Legacy LED Diagnostic Indicator Patterns

Second Generation (Rev 3 – Rev 5)

- **Second Generation modules have Red-Green LEDs for all indicators.**

PWR	SDS	ERR	Indication
OFF	OFF	OFF	**OFF** (DC+ is less than 8 volts)
SG	SG	SG	**1st LED Test Pattern (Second Gen)**
SG	SR	SR	**2nd LED Test Pattern (Second Gen)**
SG	OFF	FG	**Waiting to Autobaud (Second Gen)** (Not seen if fixed rate is used.)
SG	OFF	SG	**NORMAL CONDITION - Nothing to transmit on the CAN bus**
SG	IG	SG	**NORMAL CONDITION - Trying to transmit on the CAN bus**
SG	OFF	FR	**Nothing to transmit on the CAN bus and minor diagnostic bit(s) set**
SG	IG	FR	**Trying to transmit on the CAN bus and minor diagnostic bit(s) set**
SG	OFF	SR	**Not transmitting on the CAN bus and MAJOR diagnostic bit(s) set**
SG	IG	SR	**Trying to transmit on the CAN bus and MAJOR diagnostic bit(s) set**

OFF = LED is OFF
SG = Solid Green
SR = Solid Red
FG = Flashing Green
FR = Flashing Red
SFR = Solid OR Flashing Red
IG = Intermittent Green
FR = Flashing Red
I/O = If AUX is Solid Green indicates that Power for I/O is Present

Legacy LED Diagnostic Indicator Patterns

First Generation – (Rev 0 - Rev 2)

- **First Generation modules have Green LEDs for PWR, SDS, and AUX and Red LED's for ERR indication.**

PWR	SDS	ERR	Indication
OFF	OFF	OFF	**OFF** (DC+ is less than 8 volts)
SG	OFF	OFF	**NORMAL CONDITION - Not trying to transmit on the CAN bus**
SG	IG	OFF	**NORMAL CONDITION - Trying to transmit on the CAN bus**
SG	IG	SR	**Trying to transmit on the CAN bus and diagnostic bit(s) set**
SG	OFF	SR	**Not transmitting on the CAN bus and diagnostic bit(s) set**
SG	SG	SR	**BUS OFF fault condition**
SG	OFF	FR	**Nothing to transmit on the CAN bus and major diagnostic bit(s) set**

OFF = LED is OFF

SG = Solid Green

SR = Solid Red

FG = Flashing Green

FR = Flashing Red

IG = Intermittent Green

FR = Flashing Red

I/O = If AUX is Solid Green indicates that Power for I/O is Present